February 8, 2012
Project No. 9-915-14995-L.40

PACCAR Inc
777 106th Street NE
Bellevue, Washington 98024

Attention: Carole Robbins

Subject: **Final Remedial Investigation Report**
8801 East Marginal Way South
Tukwila, Washington
Agreed Order No. 6069

Dear Ms. Robbins:

AMEC Environment & Infrastructure, Inc., is pleased to submit this Final Remedial Investigation Report for the above-referenced property located in Tukwila, Washington. This report has been prepared in accordance with generally accepted environmental practice.

We appreciate the opportunity to work with PACCAR Inc on this project. If you have any questions or desire further information, please feel free to contact the undersigned at 425.368.1000.

Sincerely,

AMEC Environment & Infrastructure, Inc.

State of Washington
Hydrogeologist
Licensed Geologist
Margaret J. Strong

Meg Strong, LHg
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FINAL REMEDIAL INVESTIGATION REPORT

8801 East Marginal Way South

Tukwila, Washington

AGREED ORDER Number 6069

Prepared by:

AMEC Earth & Environmental, Inc.
11810 North Creek Parkway North
Bothell, Washington 98011

March 18, 2011

Project No. 9-915-14995-L

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ACRONYMS AND ABBREVIATIONS

AMEC	AMEC Earth & Environmental, Inc.
Anchor	Anchor Environmental, LLC
ARAR	applicable, relevant, and appropriate requirements
AS/SVE	air sparge and soil vapor extraction
AST	above ground storage tanks
BBP	butylbenzyl phthalate
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
CLARC	Ecology Cleanup Levels and Risk Calculations
cPAH	carcinogenic polycyclic aromatic hydrocarbon
COPCs	chemicals of potential concern
CSL	cleanup screening level
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESA	environmental site assessment
f_{oc}	fraction of organic carbon
GeoEngineers	GeoEngineers Inc.
HCIM	hydraulic control interim measure
IAAI	Insurance Auto Auctions, Inc.
Kennedy/Jenks	Kennedy/Jenks Consultants
Kenworth	Kenworth Motor Truck Corporation
K_d	partitioning coefficient
K_{oc}	organic carbon partitioning coefficient
Landau	Landau Associates
LDW	Lower Duwamish Waterway
LNAPL	light, non-aqueous phase liquid
MCH	Merrill Creek Holdings, LLC
MDL	method detection limit
MEK	butanone (methylethylketone)
Metro	King County Department of Metropolitan Services
MLLW	mean lower low water
Monsanto	Monsanto Company
MSL	mean sea level
MTCA	Model Toxics Control Act
µg/kg	micrograms per kilogram

µg/L	micrograms per liter
NFA	North Fire Aisle
NHP	Natural Heritage Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
NTR	National Toxics Rule
ORC	Oxygen-Releasing Compound
PACCAR	PACCAR Inc
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PHS	Priority Habitats and Species
PSC	preliminary screening criterion
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	remedial investigation
RM	river mile
RP	Rhône-Poulenc
SFA	South Fire Aisle
SMS	Sediment Management Standard
SQS	Sediment Quality Standards
SVOC	semi-volatile organic compounds
SWQS	Surface Water Quality Screening Criteria
SWS	southwest storage
TPH	total petroleum hydrocarbons
UST	underground storage tanks
VC	vinyl chloride
VCP	voluntary cleanup program
VOC	volatile organic compounds
WDFW	Washington Department of Fish and Wildlife
Windward	Windward Environmental LLC

FINAL REMEDIAL INVESTIGATION REPORT
8801 East Marginal Way South
Tukwila, Washington
AGREED ORDER Number 6069

1.0 INTRODUCTION

This report presents the results of remedial investigation (RI) work conducted at the 8801 East Marginal Way South Site (8801 site) located in Tukwila, Washington, (Figure 1) between 1986 and 2010. The 8801 site consists of both an upland portion (8801 property) and the adjoining sediments in the Lower Duwamish Waterway (LDW). The 8801 site is subject to two separate Agreed Orders: Agreed Order No. 6069, which applies to the 8801 property, and Agreed Order No. 3599, which applies to the sediments. This report fulfills the RI conditions in Agreed Order No 6069.

The LDW has been designated as a Superfund site for sediments by the United States Environmental Protection Agency (EPA). Washington State Department of Ecology (Ecology) is working with EPA to identify sources of contamination to the LDW.

1.1 OBJECTIVE OF THE REMEDIAL INVESTIGATION REPORT

This report was prepared in accordance the Model Toxics Control Act (MTCA) and Ecology's corresponding Cleanup Regulation (Chapter 173-340 WAC) (Ecology, 2007a).

The objective of the RI report is to outline the activities historically undertaken at the 8801 property, demonstrate how multiple past investigations targeted the areas where potential contaminants may be located, delineate the vertical and lateral limits of the potential contaminants, and identity any remaining data gaps. Sediments in the LDW are excluded from discussion in this RI report. The sediments within the 8801 site are adequately characterized by sampling undertaken by multiple parties. Data from the previous sampling events has been submitted to both EPA and Ecology in separate reports.

1.2 ORGANIZATION OF THE REPORT

The RI report is organized as follows:

Chapter 1 Introduction
Chapter 2 Site setting and background
Chapter 3 Previous environmental investigations and remedial actions
Chapter 4 Conceptual site model and pathways
Chapter 5 Chemicals of Potential Concern

Chapter 6 Analytical Results
Chapter 7 Limitations

2.0 SITE SETTING AND BACKGROUND

This chapter summarizes the 8801 site's background, physical setting, geology, hydrogeology, and provides an evaluation of tidal data with respect to groundwater elevations.

2.1 PROPERTY DESCRIPTION

The upland portion of the 8801 site occupies 24.30 acres on the east bank of the LDW at 8801 East Marginal Way South (Parcel 5422600060), Tukwila, Washington (Figure 1). The upland portion of the 8801 site is owned by Merrill Creek Holdings, LLC (MCH) and is leased to Insurance Auto Auctions, Inc. (IAAI), which uses the 8801 site to store and auction damaged and wrecked vehicles.

King County Tax Assessor records show the 8801 site is zoned for industrial use, and is surrounded primarily by industrial properties. To the north are two parcels (Parcel 0007400033 and 0001600014) owned by The Boeing Company (Boeing), one of which is used for jet engine research. To the south are two parcels (Parcel 5422600010 and 5422600020). The western parcel is currently owned by Container Properties, LLC and is leased to IAAI for storage of damaged and wrecked vehicles. The eastern parcel is currently owned by The Museum of Flight Foundation and is currently vacant. East Marginal Way South bounds the 8801 site to the east. The LDW forms the western boundary of the 8801 site (Figure 2).

2.2 PHYSICAL SETTING

The 8801 site is located in the Green-Duwamish River Watershed, which drains approximately 483 square miles in Northwestern Washington (Ecology, 1980). The Duwamish River comprises the lower 10 miles of the system of rivers and tributaries within the Green-Duwamish River Watershed that flow to Elliot Bay in Puget Sound from headwaters in the Cascade Mountains. The upland portion of the 8801 site lies on the LDW, approximately 4 miles upstream from the mouth of the river. The LDW adjacent to the 8801 site is classified as a Federal Superfund site for sediments. The upland portion of the 8801 site is relatively flat, with a ground surface elevation of approximately 20 feet above mean sea level (MSL).

2.3 PROPERTY INFRASTRUCTURE

Three primary buildings stand on the upland portion of the 8801 site. A one-story masonry building, formerly used for manufacturing activities, was built in approximately 1929 and occupies 165,600 square feet at the center of the 8801 site (Manufacturing Building). Attached to and adjacent to the north western side of the Manufacturing Building is a brick built building that was used as the boiler

and the power house (currently used as a storage area). A two-story, 24,520 square-foot building, formerly used for administrative functions, was built in 1964 and occupies the eastern portion of the 8801 site along East Marginal Way South (Administration Building). This building is currently used as an office by IAAI. A 43,200 square-foot warehouse, formerly used for manufacturing activities, was built in 1951 and sits at the western 8801 site boundary along the LDW (Fiberglass Shop). This building and the Manufacturing Building are currently used to store cars for auction by IAAI

The remainder of the upland portion of the 8801 site is paved and used for parking, and is surrounded by a tall chain-link electric fence. IAAI uses the 8801 site and a portion of the adjacent property to the south to store and auction damaged and wrecked vehicles.

Historic operations at the 8801 site were supported by aboveground storage tanks (ASTs) or underground storage tanks (UST) (Figure 3). None of the historical ASTs or USTs remains onsite. However; IAAI operates a number of ASTs located to the south of the Manufacturing Building. Underground utilities are installed in shallow subsurface trenches, predominantly located in and around the Manufacturing Building. The main underground utilities at the 8801 site are power cables and fire-suppression water lines. In addition, a utility trench runs from the boiler house to the Fiberglass Shop. The trench would have carried steam to the Fiberglass Shop, and the pipes are still likely present.

Two main storm systems drain the 8801 site and discharge to the LDW—one drains to the north, and one drains to the south of the property (North Outfall (No. 1) and Central Outfall (No. 2)). A middle outfall previously existed at the 8801 site, but was capped and closed in 2004. Storm water system upgrades were undertaken at the 8801 site in 2007. These upgrades included the installation of filter and cyclone units to remove particulates prior to discharge at both the north and south storm water outfalls. In addition to the 8801 site drainage, a King County storm drain crosses the eastern portion of the 8801 site, running from King County Airport to an outfall at Slip 6 on the LDW (Figure 4).

Sanitary sewage drains westwards along the same alignment as the north storm system to a pump station in the northwest corner of the 8801 site and is then returned under pressure back across the 8801 site to the main sewer line in East Marginal Way South. A sanitary sewer line from the Museum of Flight property to the south connects with the main sewer line on the 8801 site at the eastern end of the Manufacturing Building (Figure 4).

The western boundary of the upland portion of the 8801 site is protected from the LDW by a steel sheet-piling bulkhead installed in approximately 1930 to a depth of approximately 30 feet below ground surface (bgs). The bulkhead extends along the northern two thirds of the western boundary. The

southern one third of the western boundary is protected by riprap placed in approximately 1967 over the infilled shoreline (Kennedy/Jenks 2003c).

2.4 SITE HISTORY

The upland portion of the 8801 site was consolidated as a single parcel in 1966. Before then it consisted of two separate parcels. The northern parcel, which today makes up about two-thirds of the 8801 site, is approximately 15.6 acres. The southern parcel, which today makes up about one-third of the 8801 site, is approximately 8.7 acres.

2.4.1 Northern Parcel (Pre-1966 History)

Before 1900, the northern parcel was part of the King County fairgrounds. The fairgrounds reportedly moved to Renton in 1900. Between 1900 and 1920, the uses of the northern parcel are not known.

In 1920, Barton & Company acquired the northern parcel and operated a meat packing plant on the parcel. It is not known whether Barton & Company built new structures or converted structures that may have already existed on the parcel.

In 1927, Carstens Packing Company acquired the northern parcel from Barton & Company. Carstens also operated a meat packing plant on the parcel.

In 1929, Fisher Body Company of Seattle (Fisher), a subsidiary of General Motors Corporation (GM), acquired the northern parcel. Fisher built a “veneer” plant on the parcel to manufacture wooden automobile body parts for GM. Two railroad spurs connected the facility to a Great Northern rail line on the east side of the parcel. A few of the structures constructed by Fisher remain at the 8801 site today, namely the Manufacturing Building and the steel bulkhead along the northern 2/3 of the western boundary.

In 1934, GM acquired the northern parcel from Fisher.

In 1939, GM commenced leasing the northern parcel to Boeing. Boeing may have used the northern parcel for fabrication of airplane parts. Boeing leased and used the northern parcel until approximately March 1946.

In September 1945, Kenworth Motor Truck Corporation (Kenworth), a PACCAR subsidiary, purchased the northern parcel. Kenworth leased the northern parcel to Boeing until approximately March 1946.

Kenworth started building trucks at the northern parcel in 1946. Kenworth constructed various new structures on the northern parcel between 1946 and 1966, including the Administration Building, Fiberglass Shop, a parts warehouse (Parts Warehouse), and the Off-Highway Building.

2.4.2 Southern Parcel (Pre-1966 History)

In 1902, the King County Fair Association built the Meadows Race Track on the southern parcel. The facility included grandstands that seated 10,000, stalls for 1,000 horses, working quarters, and a clubhouse. Horse and automobile races were staged at the Meadows Race Track until approximately 1909, when the state legislature banned gambling.

Between approximately 1909 and 1920, some of the Meadows Race Track facilities were used for dairy and farming purposes. During World War I (1914-1918) some of the facilities were used to store military supplies. Between 1920 and 1927, the uses of the southern parcel are not known.

Between 1927 and 1946, the southern parcel was owned and operated by various companies apparently involved in the manufacture of glues, resins, and hardeners, including Stauffer Chemical Company, Consolidated Chemical Industries, Inc., and I.F. Laucks Inc. The southern parcel was reportedly used as a prisoner of war camp during World War II.

In 1946, Monsanto Chemical Company (Monsanto) purchased the southern parcel. Aerial photographs taken in 1948 and 1951 show the southern parcel is relatively undeveloped, except there are 12 light-colored rectangular features, probably former structures, in the eastern portion. A 1956 aerial photograph shows these structures removed completely and replaced by a parking lot and a building, identified as a cafeteria (Kennedy/Jenks 2003). The 1956 aerial photograph also shows a possible disposal area in the north-central portion of the southern parcel (GeoEngineers 1987). A 1959 aerial photograph shows the western portion of the southern parcel remains undeveloped; however, there appears to be disturbed soil along the western edge. A 1961 aerial photograph shows a new structure roughly in the middle of the southern boundary of the southern parcel. The use and purpose of that structure is unknown.

Between 1952 and 1962, Monsanto reportedly disposed of approximately 200 tons of waste by-product from vanillin manufacturing operations on the southern parcel. According to Monsanto, this insoluble residue formed on the walls of the vanillin reaction vessel. The constituents of the residues included calcium sulfate, calcium carbonate, calcium oxalate, sodium oxalate, metals (specifically copper) and possibly phenolic compounds. The wastes typically had a very high pH. Historically, Monsanto also applied waste vanillin black liquor solids and metal wastes to the shoreline banks for weed control (GeoEngineers 1987; Kennedy/Jenks/Chilton 1987).

PACCAR purchased the southern parcel from Monsanto in July 1966. Monsanto reserved an easement over a portion of the southern parcel for operation of a joint sewer line.

2.4.3 Site History after 1966

Kenworth built trucks at the 8801 site until April 1996, when it temporarily ceased manufacturing activities. In July 1997, Kenworth resumed building trucks at the 8801 site. In 2002, Kenworth terminated all truck building activities and decommissioned the facility. Various site structures were demolished as part of the decommissioning activities, including the Parts Warehouse and Off-Highway Building.

In October 2004, PACCAR sold the entire 8801 site to MCH. Since the purchase, MCH has leased the 8801 site to IAAI. Details of the ownership and operational history of the 8801 site are provided on Table 1.

Kenworth's historical truck-manufacturing operations included fabrication of fiberglass truck parts, truck component assembly, machining, fueling, lubrication, and painting. The locations and types of ancillary support services associated with truck manufacturing are clearly shown on the attached facility layout between the 1970s and 2000s (Figure 5). The operations used a variety of chemicals such as paints, primers, undercoating, thinners, 1,1,1-trichloroethane (used occasionally for cleaning parts), diesel, and resins. These chemicals were either delivered in 55-gallon drums and stored in an area formerly located south of the Fiberglass Shop (known as the Southwest Storage Area), or they were delivered directly to the various USTs and ASTs on the 8801 site (Figure 3). Other chemicals such as engine-starting fluid, tool cleaners, and degreasers were stored in flammable liquid cabinets near the work areas where these chemicals were used (Kennedy/Jenks 2003c).

Twenty USTs of various capacities and one oil and water separator were located on the 8801 site. These USTs contained diesel fuel, gasoline, lubricating oil, antifreeze, waste oil, paint thinner, and acetone (Table 2). The majority of the USTs were decommissioned in 1986.

Table 1 Ownership and Operational History of 8801 Site

Owner or Operator	Year	Portion of 8801 Site	Uses and Notable Features
King County Fair Association	Pre-1900	North	King County fairgrounds.
King County Fair Association	1902	South	Meadows Race Track built. Facilities include grandstands, horse stalls, working quarters, and a clubhouse.
Various	1920-1929	North	Two companies operated a meat packing plant: Barton & Company and Carstens Packing Company.
Various	1927-1946	South	Various companies manufacture glues, resins, and hardeners, including Stauffer Chemical Company, Consolidated Chemical Industries, Inc., and I.F. Laucks Inc.
General Motors	1929-1930	North	Manufacturing Building and steel bulkhead along western boundary constructed.
General Motors	1929-1939	North	Fabrication of wooden automobile body parts.
Boeing	1939-1946	North	Fabrication of airplane parts.
Monsanto	1946-1966	South	Manufacture of chemicals.
Kenworth	1946-1996	North	Production of trucks, primarily consisting of parts fabrication, painting, and assembly. Parts fabrication methods consisted of machine (drilling, milling boring cast metal), plastic (molding plastic resins followed by sanding) and weld shops (polyester resin). A cab washer, metal cleaning dip tanks, and paint booths were used in painting activities. Paint thinners and miscellaneous diesel, waste oil, and wastewater were temporarily stored at the site before use or off-site disposal.
Kenworth	1951	North	Fiberglass Shop and Parts Warehouse constructed.
Monsanto	1952-1962	South	Disposal of high pH waste material from chemical manufacturing.
Kenworth	1956	North	Parts Warehouse extended and Off Highway Building constructed.
Kenworth	1964	North	Administration Building constructed.
Kenworth	1966-1996	South	Ancillary uses supporting truck manufacturing, including shipping and receiving, administrative functions, and surface parking.
Kenworth	1979	North	Manufacturing Building expanded to west.
Kenworth	1996	All	Ceased truck production but continued to use property for parts storage, welding, and small parts manufacturing.
Kenworth	1997-2002	All	Truck production resumes.
Kenworth	2002	All	Termination of manufacturing activities.

Table 1 Ownership and Operational History of 8801 Site

Owner or Operator	Year	Portion of 8801 Site	Uses and Notable Features
Kenworth	2002-2004	All	Various structures demolished, including Parts Warehouse and Off-Highway Building.
MCH and IAAI	2004-present	All	MCH leases site to IAAI to store and auction wrecked and damaged vehicles. IAAI operates storm water system at site.

Table 2 UST Contents and Location

Number of USTs	Contents	Location
4	Paint thinner (typically non-chlorinated, constituents not documented and varied over time), oil	North of Manufacturing Building (North Fire Aisle)
6	Antifreeze, diesel, and oil	South of Manufacturing Building (South Fire Aisle)
4	Antifreeze, diesel, and oil	East of Manufacturing Building
1	Waste oil	West of Manufacturing Building
4	Diesel, gasoline, water/oil and acetone	Near Fiberglass Shop
1	New, state-of-the-art UST replacement (1987) for older acetone-containing UST	Adjacent to Fiberglass Shop

Twelve ASTs of various capacities that stored fresh paint thinner, used paint thinner, diesel fuel, oil, liquid polyester resin, and automatic transmission fluid were also located at the 8801 site (Table 3). The ASTs were placed in secondary containments and vaults to prevent possible releases or leaks from the tanks.

Table 3 AST Contents and Location

Number of ASTs	Contents and Capacity	Location
2	300 and 500 gallon storing clean and used paint thinner	Northwest of Manufacturing Building
1	12,000 gallon storing diesel	
1	200 gallon storing waste oil	
2	10,000-gallon ASTs storing liquid polyester resin	Fiberglass Shop
1	10,000 gallon storing diesel	South of Manufacturing Building (South Fire Aisle)
4	500 gallon storing various grades of oils	
1	660 gallon storing automatic transmission fluid	

Two wastewater ASTs were also present at the 8801 site. A 1,000-gallon AST containing wastewater from steam-cleaning was previously located north of the Manufacturing Building. In 1989, a 20,000-gallon AST was installed south of the Manufacturing Building to store process water from various on-site operations. Before 1999/2000, water from the wastewater AST was disposed of off-site as hazardous waste. However, after 2000, the wastewater from this AST was re-evaluated as non-hazardous and discharged to the sanitary sewer under the site's Permit from King County Department of Metropolitan Services (Metro) (Kennedy/Jenks 2003c).

In October, 2000, PACCAR entered into the voluntary cleanup program (VCP) with Ecology. The activities conducted under the program involved removal of USTs and soil contaminated by petroleum hydrocarbons, two major site investigations to characterize soil, groundwater, seeps, and storm water, and installation of an air sparge and soil vapor extraction (AS/SVE) system.

PACCAR terminated truck manufacturing operations in 2002 and decommissioned the facility between 2002 and 2004 (Kennedy/Jenks 2003c).

In February 2005, IAAI received an Industrial Storm Water General Permit (SO3-008681A) under the National Pollutant Discharge Elimination System (NPDES) for operations at the 8801 site.

Ecology has defined the 8801 site as including both the upland property currently owned by MCH and leased by IAAI and the adjacent sediments. In July 2006, PACCAR entered into an Agreed Order (No. 3599) with Ecology to investigate the lateral and vertical extent of contamination in sediments in the LDW adjacent to the 8801 site. In 2008, PACCAR and MCH entered into an Agreed Order (No. 6069) with Ecology for work associated with the upland portion of the 8801 site. This report is being generated as part of the Agreed Order (No. 6069).

2.5 HYDROLOGY

The 8801 site is located at river mile (RM) 3.9 of the LDW, which comprises the lowermost extent of the Green-Duwamish River system. Tidal influence from Elliot Bay reaches 11 miles upstream, resulting in a brackish estuarine system known as the LDW. The lower 5.3 miles of the LDW has been dredged and developed for water-dependent industry, and now contains deep water habitats that did not previously exist (Warner and Fritz 1995).

The LDW is a typical saltwater wedge estuary that has a density-driven two layer flow system. Under typical conditions (average flows), the less dense freshwater flows downstream in the surface layer and the denser saline water from Elliot Bay moves upstream on flood tides in the bottom layer, forming a saltwater wedge thickest at the downstream end and tapering to a thin layer upstream. Under average flow conditions (1,340 cubic feet per second) the toe of the saltwater wedge extends to between RM 4.3 and RM 5.5, depending on the height of the tide (Windward 2008 and Pritchard 1955). Under higher flow conditions, the toe of the saltwater wedge extends to between RM 1.8 and RM 3.1 depending on the height of the tide. The saltwater wedge has been observed to extend upstream as far RM 10.2 at high tide during periods of low freshwater inflow (Stoner 1967). Because the 8801 property is located between RM 3.9 and RM 4.05, the saltwater wedge is present along the 8801 property under most flow and tidal conditions.

2.5.1 Groundwater in Vicinity of Duwamish River

Groundwater flow directions within the Duwamish valley sediments are relatively complex and are a function of location and depth. At specific locations, the groundwater flow may be downward at some depths and upwards at other depths. The ultimate discharge location, however, is the LDW or seeps that drain to the river (Fabritz, et al. 1998).

The entire Duwamish industrial area is underlain by a single, large alluvial aquifer system. The aquifer consists of two groundwater zones that can be differentiated based on geology, vertical flow gradients, and/or the occurrence of saline groundwater pockets (Booth and Herman 1998). The upper zone consists of sand and silty sand, and extends from the water table to a depth of 70 to 80 feet bgs. The upper zone is generally unconfined, although interbedded layers of silt or clay can affect localized areas (Striplin Environmental Associates 2004).

Vertical groundwater flow within the upper aquifer is downward, reflecting infiltration and recharge. Flow rates depend on the degree of infiltration, the location relative to the river, and the degree and thickness of silt and sand interbedding. Groundwater flows upward within the lower aquifer, which generally limits contaminant migration from the upper to lower groundwater zones. Contaminant migration between the upper and lower groundwater zones is also limited by the relatively low permeability of the lower zone and the upward movement of the saline wedge.

Groundwater in the vicinity of the LDW discharges through seeps at the bases of upland slopes and through seepage faces along the waterway itself. A seepage face is a zone of groundwater discharge caused by the difference in water levels between two adjacent areas. During low tide the water table is higher than the level of the LDW and may become decoupled from the river, resulting in formation of a seepage face where groundwater outcrops on the intertidal profile. Seeps along the LDW with the highest discharge occur most prominently between RM 1 and 2 and RM 4 and 5 (Fabritz, et al. 1998).

Groundwater throughout the Duwamish Valley is unsuitable for use as drinking water due to poor water quality. The groundwater is brackish or saline due to mixing with salt water through both tidal action and the original estuarine deposits.

2.5.2 Site Geology

Soils in the Lower Duwamish River Valley typically consist of low to moderately permeable shallow alluvial deposits composed of stratified silt, clay, silty sand, and sand with layers of peat. The LDW channel has been modified by human activity, which has resulted in large inputs of sand, silt, and gravel required for channel alterations.

The 8801 site's geology is depicted in nine geologic cross-sections, A-A' through I-I'. The cross-section transects are presented in Figure 3 of the *Phase 2 Data Gaps Investigation Summary Report* (Kennedy/Jenks 2004). The cross-sections from that report are presented in Figures 4A through 12 of Appendix A, updated to show the screening intervals of monitoring wells and the groundwater elevation in 2006. Geologic cross-sections A-A' through D-D' are oriented east-west and geologic cross-sections E-E' through I-I' are oriented north-south. Geologic cross-sections A-A', B-B', and D-D' were extended westward into the Duwamish River using sediment core logs that were advanced in 2008 (Anchor Environmental, LLC, [Anchor] 2009). The extended cross-sections are presented as Figure 4A, 5A and 7A (Appendix A). The approximate lower limit of geological data is showed with a dashed line and question marks.

Previous investigations by other parties at the 8801 site documented interbedded silt and sand layers and lenses consistent with regional geology. Paved surfaces are underlain by fill material up to 10 feet thick in some locations. Fill materials include gravelly structural fill beneath buildings and paved areas, poorly-graded sand to silty sand dredge-fill deposits, and gravelly backfill materials in excavations. Up to approximately 13.5 feet of fill was also placed in the southwestern corner of the 8801 site behind the rip-rap in the southern one-third of the 8801 site's western boundary when the LDW bank was straightened.

Fill material at the 8801 site is underlain by a layer of fine-grained material including silt, sandy silt, and silty sand that extend to a depth of 5 to 15 feet bgs. This layer appears to be laterally continuous in the western portion of the 8801 site, but contains lenticular bodies toward the central and eastern portions. A poorly-graded sand layer, which typically contains less than 10 percent silt, is generally present beneath the fine-grained layer beginning at 10 to 15 feet bgs, although at some locations it is present immediately beneath the pavement surface or the fill material. This layer contains locally present thin lenses of silty sand or silt. A second layer of fine-grained materials, consisting mainly of silt and silty sand, is typically present beneath the poorly-graded sandy layer at approximate depths of 30 to 50 feet bgs. The lower fine-grained layer is typically underlain by poorly graded sand to the maximum depth explored at the 8801 site (60 feet bgs).

2.6 SITE HYDROGEOLOGY

Three groundwater zones (Zones A, B, and C) have been monitored at the 8801 site. Zone A comprises the uppermost portion of the upper aquifer, and is defined by the free water surface (typically 8 to 10 feet bgs as shown on the cross sections (Appendix A)) within a silty sand, sandy silt, and a poorly graded silty sand. Zone B comprises the lower portion of the upper aquifer, and monitoring wells have been screened above the silty confining layer present in the western portion of the 8801 site. Zone C comprises the lower aquifer and is a deeper groundwater zone beneath the silty confining layer (AMEC 2006).

Results of groundwater monitoring at the 8801 site indicate that the hydraulic gradient in the shallow aquifer (Zones A and B) is generally toward the west, and has been calculated to be 0.0017 feet per feet during low tide (GeoEngineers 1988). GeoEngineers and Kennedy/Jenks calculated the hydraulic conductivity in 1988 and 1998 respectively in the shallow aquifer using slug test data for the 8801 site. The results ranged from 0.01 to 0.0097 feet per minute, although tidal fluctuation would significantly reduce the flow rate of groundwater across the site (GeoEngineers 1988 and Kennedy/Jenks 1998). There is insufficient data to calculate a hydraulic gradient in Zone C, and groundwater in Zone C is assumed to flow west toward the LDW.

Groundwater elevation data from the 8801 site collected at or near low tide in 2002 and 2006 indicate downward vertical flow from Zone A to Zone B, and an upward hydraulic gradient between Zone C and Zones A and B along the western boundary of the 8801 site.

The hydraulic gradient at the western edge of the 8801 site is controlled by a sheet pile wall bulkhead that extends to a depth of approximately 30 feet bgs (-22 feet mean lower low water [MLLW]) for approximately two-thirds of the length of the 8801 site edge. Water table elevation contours drawn from previous monitoring events show a general westward flow of groundwater across the 8801 site, with localized flow to the southwest in locations close to the LDW. Groundwater that is upgradient of the sheet pile wall moves westward and flows under the wall before moving upward and discharging to the LDW. Groundwater also flows around the southern end of the sheet pile wall and discharges along a seepage face at low tide as discussed below.

2.7 TIDAL INFLUENCE

Tidal elevation data from 10 groundwater sampling events conducted from April, 1997, and August, 2006, were used to predict the full range of tidal activity at the 8801 site from high-high to low-low. Data from the sampling events were compared to National Oceanic and Atmospheric Administration (NOAA) tidal data and corrected for the tide and elevation difference between the NOAA station and the 8801 site. The tidal events were then plotted and used to determine tidal influence at the 8801 site (Appendix B).

Results of the analysis indicate that the maximum tidal fluctuation at the LDW 8801 site boundary ranges from -3.03 MSL to 1.85 MSL in the southern portion of the 8801 site, where rip-rap forms the 8801 site boundary. Farther north, where the sheet piling bulkhead forms the 8801 site boundary, the maximum tidal fluctuation ranges between -1.80 MSL and 1.32 MSL, and averages approximately 1.5 feet.

Chemical parameters measured in the monitoring wells at high and low tides showed no significant difference in laboratory analyzed chemical concentrations. Measured field parameters indicate that

the wells in Zone C had a saline content and that wells in Zones A and B only had a noticeable saline content in the area close to the rip-rap during high tide. This suggests that there is a vertical hydraulic gradient driven by tidal events along the 8801 site boundary and that tidal influence does not result in significant lateral inundation of water into or out of the groundwater column (AMEC 2006).

2.8 SEEPS

Seep discharge rates typically vary with tidal fluctuations, with the greatest estimated discharge flowing seaward during low tide. During high tide when tidal elevation is most likely greater than groundwater levels immediately east of the bank, saltwater infiltrates the beach slope and the underlying shallow alluvial aquifer. As the tide recedes, hydraulic gradients on the beach slope reverse. Groundwater levels then exceed the tide level, and fresh ground water and infiltrated saltwater stored in the bank begin to discharge (seep) onto the beach and directly into the LDW. At the lowest tide, fresh groundwater discharges directly onto the exposed beach near the low-tide line, although some of the infiltrated saltwater on the beach slope may still be retained in the intertidal beach zone landward of the low-tide line. This cycle of saltwater infiltration and ground-water discharge is repeated with the next rising tide (Barlow 2003).

Because seeps associated with the 8801 site are only exposed and discernable during low tide (approximately +1.5 to 0 feet MLLW), the sample collection from seeps during more recent sampling events (2006) was scheduled to coincide with a negative tide. Seep samples were collected at the 8801 site near the end of the outgoing (ebb) tide cycle to minimize the potential for tidal dilution. Seep samples ranged in salinity from 1.67 to 6.66 parts per thousand, which is indicative of brackish water (Hem 1959) and suggests some tidal mixing as discussed above.

3.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS AND REMEDIAL ACTIONS

This chapter addresses investigation and remedial activities undertaken at the 8801 site since 1986.

3.1 OVERVIEW

Various consultants have performed field activities at the 8801 site since 1986. The field investigation undertaken since 1986 has been extensive, area wide, and focused. As a result of the investigations, 42 groundwater monitoring wells were installed (Figure 6) and a large number of samples analyzed (1,399 data points and 98,841 analyte results). Major remedial activities included UST removals; installation of a groundwater-pumping treatment system; contaminated soil excavation and disposal; application of oxygen-releasing compounds to the subsurface soil; storm-drain inspection and cleaning; and installation of an AS/SVE system; A synopsis of investigations and remedial activities at the 8801 site in chronological order is presented below. Investigation results are discussed further in

Chapter 3.2. Monitoring and boring well logs are provided in Appendix C and historical excavation figures are provided in Appendix D.

3.1.1 1986

GeoEngineers Inc. (GeoEngineers) conducted two phases of an environmental site assessment (ESA) that evaluated the condition of the USTs at the 8801 site and assessed soil and groundwater within the corridors to the north and south of the Manufacturing Building (North Fire Aisle [NFA] and South Fire Aisle [SFA]). Eleven USTs and an oil/water separator linked to the sanitary sewer line were removed in 1986, and one UST was decommissioned in place (E2) (GeoEngineers Figure 6 in Appendix D). Monitoring well MW-1A was installed to evaluate groundwater conditions following the removal of the UST in the vicinity of the well (GeoEngineers, March and July 1986a, b).

3.1.2 1987

GeoEngineers performed an investigation of the former Monsanto portion of the 8801 site to determine if Monsanto's operations had contaminated the 8801 site. This assessment included drilling and installing monitoring wells in the southern one-third of the 8801 site and collecting soil and groundwater samples. Monitoring wells MW-2A through MW-12A were installed for this investigation (GeoEngineers, 1987a). Kennedy/Jenks/Chilton conducted a risk assessment with the information from the GeoEngineers investigation and concluded that chemicals on the former Monsanto portion of the 8801 site posed a minimal risk and that no remedial action would be required (Kennedy/Jenks/Chilton, 1987).

GeoEngineers also conducted a geotechnical investigation for a waste water plant to be constructed in the North Fire Aisle. Monitoring wells MW-18A through MW-21A were installed as part of the investigation. The wastewater plant was not constructed. The investigation identified volatile organic compounds (VOCs) in groundwater in the North Fire Aisle and petroleum hydrocarbons in the soil and groundwater at the South Fire Aisle (GeoEngineers, 1987b).

3.1.3 1988

Further evaluation was conducted to assess the VOCs at the North Fire Aisle and petroleum hydrocarbons at the South Fire Aisle. Monitoring wells MW-14A through MW-17A, and MW-22A and MW-23A were installed at this time. The collected data was used for a concurrent risk assessment study conducted by Kennedy/Jenks/Chilton (GeoEngineers, 1988).

GeoEngineers installed a 6-inch-diameter test well near MW-8A (RW-1) in the North Fire Aisle, and a pilot study was performed to assess remediation of the VOCs (GeoEngineers, 1990).

3.1.4 1990

GeoEngineers presented a feasibility assessment in 1990 for VOC remediation in the North Fire Aisle. It was determined that groundwater extraction and disposal to the Metro sewer would be the most effective remedial technology (GeoEngineers, 1990).

3.1.5 1993 through 1995

Groundwater extraction in the North Fire Aisle commenced in August, 1993. Extraction was from three recovery wells (RW-1 through RW-3) located adjacent to MW-8A (RW-1), southeast of MW-18A (RW-2), and west of MW-16A (RW-3) (Figure 6). These recovery wells were installed in 1990. Extracted groundwater was disposed to the Metro sewer under the site operations license. Extraction wells RW-2 and RW-3 failed in March, 1994, and RW-1 failed in May, 1995 (GeoEngineers, 1995a) due to corrosion from the brackish water (personal communication, 2010).

3.1.6 1995

Within the southwest portion of the 8801 site is an area defined as the Southwest Storage Area (SWS area), GeoEngineers advanced shallow soil borings near a hydraulic oil spill in the northern portion of the SWS area (GeoEngineers, 1995b).

3.1.7 1996

Kennedy/Jenks Consultants (Kennedy/Jenks) commenced groundwater monitoring in the North Fire Aisle to assess the extent of the VOC plume (Kennedy/Jenks, 1996).

3.1.8 1997

Additional groundwater monitoring wells were installed by Kennedy/Jenks in the western portion of the 8801 site and along the sheet-pilling bulkhead adjacent to the LDW. These additional wells (MW-24A, MW-25A, MW-26A, MW-26B, MW-26C, MW-27A, MW-28A, MW-28B, MW-29A, MW-30A, MW-31A, and MW-32A) were installed to investigate the lateral and vertical extent of VOCs in groundwater within the western portion of the 8801 site (Kennedy/Jenks, 1998).

3.1.9 1998 through 1999

Over these 2 years, a risk assessment and a cleanup action plan incorporating bioremediation were prepared by Kennedy/Jenks and presented to Ecology. When Ecology requested additional information, further reports and work plans were prepared and presented. One of these reports, entitled *Technical Addendum to Data Gaps Work Plan* provided a detailed report on where chemicals had been used at the facilities and where spills had or could have occurred. This detailed history was then used to identify locations where further investigation might be required and culminated in the Phase I Data Gap investigation that followed in 2002 (Kennedy/Jenks, 2002c).

3.1.10 2000

A release from the diesel UST (E3) located in the South Fire Aisle occurred and product entered the storm drain line that ran along the South Fire Aisle. Kennedy/Jenks removed the leaking diesel UST and excavated about 50 cubic yards of petroleum hydrocarbon-impacted soil (Appendix D, Kennedy/Jenks Figure 3). The UST and soil were disposed of off-site. In addition, Kennedy/Jenks replaced a 200-foot section of storm drain line within the South Fire Aisle and excavated about 150 cubic yards of petroleum hydrocarbon-impacted soil. Petroleum hydrocarbon-impacted soil was disposed of off the 8801 site at a permitted disposal facility (Kennedy/Jenks, 2000b).

3.1.11 2001

Kennedy/Jenks oversaw the decommissioning of two USTs that were disposed off-site. Both USTs (one containing oil and the other antifreeze) were removed from the South Fire Aisle, along with approximately 120 cubic yards of associated petroleum hydrocarbon-impacted soil. Petroleum hydrocarbon-impacted soil was disposed of off the 8801 site at a permitted disposal facility (Kennedy/Jenks, 2001d).

3.1.12 2002

Kennedy/Jenks performed a site-wide Phase I Data Gaps Investigation Study in 2002. This study was conducted to:

1. Evaluate the potential for existing or ongoing sources of VOCs in the North Fire Aisle;
2. Evaluate the area south of the Maintenance Building for the presence of potential contaminants associated with past activities at the 8801 site.
3. Evaluate the SWS area for metals and other potential contaminants;
4. Install 11 new monitoring wells to assist with the assessment of contaminants in groundwater (MW-8B, MW-29B, MW-29C, MW-33A, MW-34A, MW-35A, MW-35B, MW-36A, MW-36B, MW-37A and MW-37B); and
5. Conduct site-wide groundwater monitoring using the 38 existing and new monitoring wells. During the site-wide groundwater assessment, the groundwater samples were analyzed for total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), VOCs, semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and priority pollutant metals (Kennedy/Jenks, 2002c).

In addition, ambient air samples for VOC analyses were collected inside the existing buildings throughout the 8801 site (Kennedy/Jenks, 2002a).

3.1.13 2001 through 2003

Various video camera surveys of the storm water drain system were conducted by Kennedy/Jenks in the North Fire Aisle and the western portion of the 8801 site (Kennedy/Jenks, 2001a, 2001e, and 2003a).

3.1.14 2003

Kennedy/Jenks removed two diesel and oil USTs from the South Fire Aisle and one previously closed-in-place acetone UST from the northwest area adjacent to the Fiberglass Shop (Appendix D, Kennedy/Jenks Figures 3 and 4). About 735 tons of petroleum hydrocarbon-impacted soil was excavated from the South Fire Aisle and disposed of off-site at a permitted disposal facility. In addition, Oxygen-Releasing Compound (ORC©) was placed in the base of the South Fire Aisle excavation to enhance biodegradation of residual petroleum hydrocarbons in soil and groundwater in this area (Kennedy/Jenks, 2003b).

Kennedy/Jenks also provided in 2003, a comprehensive review of the history, and development of the 8801 site. The review provided details on the activities that were undertaken in each part of the operations, their locations and chemicals associated with the processes (Kennedy/Jenks, 2003c).

3.1.15 2004

Kennedy/Jenks performed a Phase II Data Gaps Investigation Study. This study was conducted to:

1. Evaluate soil over the entire 8801 site for the presence of VOCs, petroleum hydrocarbons, lead, and arsenic using a combination of 122 grid and 35 focused sample locations (the focused sample locations were selected using data from previous investigations and the review of historical activities);
2. Install additional monitoring wells MW-6AR (replacement well) and MW-42A in the SFA, and MW-38A, MW-39A, MW-40A and MW-41A in the area of the AS/SVE system;
3. Collect grab groundwater samples at 26 locations for VOCs, PAHs, and metal analysis;
4. Evaluate storm water from the northern and southern storm drain lines for the presence of VOCs and Ecology's Sediment Management Standard ([SMS] WAC 173-204, 1991) suite of compounds (with the addition of dioxins/furans and PCBs congeners); and
5. Collect solids samples from the northern, southern, and middle storm drain outfalls and selected catch basins for the SMS suite of compounds.

Vadose grid soil samples collected closest to the LDW were also analyzed for the SMS suite of compounds.

Grid and focused samples were collected from push probes driven to a depth of between 10 and 40 feet bgs collected from a split spoon approximately every two feet. Samples were screened with a photo-ionization detector and inspected for signs of staining or odor. In addition to submitting selected soil for analysis for characterization, soil with staining or odor was also analyzed. Grab groundwater samples were collected from the wells by using a temporary screen.

Kennedy/Jenks also performed the following remedial actions:

1. Installed an AS/SVE system in the western portion of the 8801 site (to remediate low levels of VOCs in shallow groundwater), and excavated about 1,100 tons of petroleum hydrocarbon-impacted soil during installation of AS/SVE system;
6. Excavated and removed about 1,470 tons of petroleum hydrocarbon-impacted soil off the 8801 site from the eastern end of the South Fire Aisle;
7. Excavated approximately 140 tons of petroleum hydrocarbon-impacted soil west of the Manufacturing Building at the H4 location;
8. Placed ORC© down-gradient of the South Fire Aisle; and
9. Undertook a comprehensive cleaning of the on-8801 site storm drain system, storm drain lines, and catch basins by flushing solids from the line, disposed of the collected solids and wash water at an off-site facility and closed and capped the former middle outfall (Figure 2). The soil excavated during the remedial actions was disposed of at a permitted off-site facility (Kennedy/Jenks, 2004).

Since the installation of the AS/SVE system in 2004, O&M and sampling work have been performed. Quarterly groundwater samples are collected from shallow-zone monitoring wells MW-41A, MW-7A, MW-26A, MW-29A, MW-30A, MW-35A, MW-36A, and MW-37A (Figure 6).

3.1.16 2005

AMEC investigated the storm water line in an attempt to identify the source of vinyl chloride (VC) detected in the storm water in 2002. The investigation comprised collecting samples of storm water and solids from catch basins in the northwestern portion of the 8801 site and undertaking a video survey of the storm drain lines. A major break was noted at the intersection of catch basin 74 and the outfall pipe just east of the oil/water separator in the northwestern area of the 8801 site (AMEC, 2005).

3.1.17 2006

After the former middle outfall outlet pipe was capped and closed in 2004, AMEC oversaw filling of the catch basin N, and former middle outfall piping with control density fill in 2006. In May 2006, AMEC raised and permanently reset the float on the oil water separator system. Prior to raising the float, the pump system depressed the oil water separator system tank water head to below groundwater level. This depression resulted in groundwater constantly flowing into the system through the break in the stormwater pipe. The entry of groundwater into the stormwater system significantly reduced once the float was lifted and terminated after the pipe was slipped lined later in 2006.

AMEC submitted a sampling analysis work plan to Ecology and then conducted two 8801 site-wide groundwater sampling events that included two wells on the adjacent Boeing property (for metals analysis only). For both events, 25 site wells were sampled and analyzed for dissolved priority pollutant metals (antimony, arsenic, beryllium, cadmium, total chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc), PAHs, SVOCs, VOCs, PCBs, and TPH. The first event was undertaken in February and March 2006 and included a tidal study. The tidal study used transducers to measure tidal variation between groundwater elevation at the 8801 site and the surface water in the LDW. The tidal study included sampling five wells at both high and low tide to assess chemical fluctuation in the groundwater at the different tidal stages. During the February/March sampling event, samples were also collected for analysis of natural attenuation parameters with respect to the degradation of the VOCs (AMEC, 2006d). The second groundwater sampling event was carried out in August, 2006 (AMEC, 2007b).

In October, 2006, Anchor collected storm water samples from the north and south outfalls, storm water solids from the north outfall and one of the Boeing outfall drains, surface sediment samples from 22 stations in the LDW, and seep water and co-located sediment samples from four seeps (seeps 2, 4, 5, and 6) close to the 8801 site. The samples were analyzed for the SMS suite of compounds (Anchor, 2007a).

In October, 2006, the storm water piping between catch basin 74 and the oil/water separator was repaired under AMEC oversight to prevent infiltration of groundwater at the pipe break that was noted in 2005. The repair consisted of injecting the break with a quick-setting sealant, then lining the pipe with a resin-impregnated felt that sealed to the existing pipe. The new lining was sealed at both ends, and the repair successfully prevented the inundation of groundwater into the storm water system at that location (AMEC, 2007a).

3.1.18 2006 to Early 2007

Between September, 2006, and March, 2007, AMEC conducted a video survey of the storm drain system at the eastern end of the 8801 site. The purpose of the video survey was two-fold: to assess

the location and condition of the storm drain system that discharges to the east of the 8801 site, and to verify if unknown connections from off-site sources connect to the 8801 site storm drain system (AMEC, 2007c).

3.1.19 2007

Between October and December 2007, a comprehensive end of pipe storm water treatment system was installed by IAAI. The work consisted of excavating two large vaults—one in the northwest portion of the 8801 site and one adjacent to the central outfall. The work adjacent to the central outfall also included some regrading to ensure sheet flow of storm water did not drain to the LDW. The storm water treatment system consisted of a cyclone and filter system designed to remove particulates and other contaminants to ensure that the storm water outfalls to the LDW were in compliance with regulatory requirements.

3.1.20 2008 through 2009

Various storm water sampling events for solids were undertaken between 2008 and 2009 by Ecology and IAAI.

3.1.21 2010

On behalf of IAAI, Windward Environmental LLC (Windward) submitted a storm water solid sampling work plan to Ecology. After approval of the work plan, solids from the storm water inserts and manholes in the storm water system were collected. The solids analyzed from the inserts had similar concentrations and range of constituents to those previously detected in the storm water treatment system (Windward 2010a and 2010b).

3.2 HISTORY AND INVESTIGATIONS OF SURROUNDING PROPERTIES

3.2.1 Boeing Properties

Boeing owns two parcels of property north of the 8801 site. The two parcels are together known as the Boeing Isaacson Thompson Site (Ecology Facility Site ID 2218). The parcel that borders the northern boundary of the 8801 site is known as the Boeing Thompson property. The parcel directly north of the Boeing Thompson property is known as the Boeing Isaacson property.

Historical Information

From the early 1900s until the late 1920s, the Boeing properties and the surrounding area were primarily undeveloped or used for agricultural purposes. A formed meander bend of the Duwamish River oriented in an east-west direction lay roughly between the two Boeing properties and was later the site of Slip 5.

On the Boeing Thompson property, the Bissell Lumber Yard operated from approximately 1917 to 1952 and had, among many functions, a waste burner, a transformer yard, and four storage tanks in a building. The property was developed in 1967 by Boeing to assemble and fatigue test various aircraft. Among the many known operations at the property were washing (reportedly with methyl isobutyl ketone) and painting (in Building 14-01) and hazardous materials storage in the north west of the property.

The Boeing Thompson property is listed as having two 10,000-gallon paint booth waste ASTs (west of Building 14-01), three 100-gallon sumps used to store paint booth waste (south of Building 14-01), two copper plating/acid/aqueous degreaser structures, one AST west of Building 14-01, and one sump in what appears to be the interior of Building 14-01. In addition, three releases of hydrocarbons were reported: two storm water/oil events west of Building 14-03 (northeast area of the property) and one release of hydraulic fluids from a sump east of Building 14-03 (Landau, 2010).

On the Boring Isaacson property the Duwamish Lumber Company and the a planning mill owned by Tyee Lumber Company occupied the area to the north and east of the former Slip 5 from approximately 1920 to before 1945. In 1945 the Mineralized Cell Wood Preserving Company is listed as occupying the property. Isaacson Iron Works bought the property in 1943 and expanded across the northern part of the property until 1966. The former Slip 5 was infilled by the mid-1960's. In 1984, the property was purchased by Boeing and the structures on the property were demolished in 1990. The property is currently vacant (Landau 2010).

In 2008, two outfalls were upgraded to include Vortech treatment systems: one on the Boeing Isaacson property and one on the northern outfall (Outfall A) on the Boeing Thompson property (Landau, 2010).

Environmental Investigations

Investigation on the Boeing properties commenced in 1983 and continued intermittently through 2009. The majority of the investigations focused on the Boeing Isaacson property with only limited sampling on the Boeing Thompson property except in 2008 and 2009 when investigations were undertaken to focus on the southern property boundary.

Soil investigations prior to 2006 detected elevated arsenic concentrations and only analyzed a couple of samples for the full suite of chemicals (based on the data provided). Arsenic contamination was found to depths of 15 feet bgs and found to be concentrated in the 12 to 14 feet bgs depth range. In 2008, a Focused Phase II site investigation was undertaken by Landau Associates (Landau, 2009a). The focus of the investigation included the former wash down system piping south of Building 14-01, the former wash down system piping inside Building 14-01, the substation (Building 14-22), the

transformer yard north of Building 14-02, the UST west of Building 14-02, the hazardous materials storage sheds, and the hydraulic fluid release area. A second investigation in 2009 (Landau, 2009b) focused on metals on the Boeing Isaacson property and VOCs along the southern boundary of the Boeing Thompson property.

Groundwater samples were collected between 1983 and 1988 from monitoring wells located primarily on the Boeing Isaacson property. Elevated arsenic concentrations were detected in the western portion of the Boeing Isaacson property and additional monitoring wells were installed in 1988 to include the eastern end of the Boeing Thompson property. Ongoing sampling since then has been focused on metals, with VOCs, hydrocarbons, SVOCs, and PCBs analyzed in 2008 and 2009 from the Boeing Thompson property (Landau 2010).

Groundwater analytical results from Boeing's Focused Phase II and the 8801 site investigations indicated high dissolved arsenic on the northern and western side of the Boeing properties. VOCs were detected in groundwater at a range of concentrations south and west of Building 14-01. SVOCs were detected near the hazardous storage shed areas and bis-(2-ethylhexyl)phthalates (BEHP) was detected across the Boeing Thompson property.

A pipe that runs along the southern Boeing Thompson property boundary was video surveyed by camera in 2008. The pipe runs parallel with the 8801 site boundary and discharges onto the 8801 site. This pipe was reported as having no inlets and it was concluded that the pipe served to prevent groundwater buildup behind the retaining wall at the property boundary. The pipe was reported as being perforated along the lower half (Landau 2010). The property elevation is approximately 7 feet higher than the 8801 site where the pipe is located. It is reported by Landau that VOCs have been found in groundwater in close proximity to the Boeing Thompson and 8801 site boundary. Since VOCs were used in Building 14-01 on the Boeing Thompson property, VOCs from site operations may have drained through the boundary pipe and discharged on the 8801 site before migrating west and northwards with groundwater flow.

A 2010 report prepared by Landau summarizes previous sediment sampling. In surface samples, arsenic was found in the LDW adjacent to the Boeing properties and PCBs were found adjacent to both the King County outfall and Boeing Outfall A. In the subsurface sediment samples, arsenic, PCBs, and other chemicals were detected. The concentrations were reported by Landau to be similar to those found adjacent to the 8801 site (Landau 2010).

3.2.2 Former Rhône-Poulenc Property

The Former Rhône–Polenc (RP) property lies to the south of the 8801 property and comprises two parcels, called the west and east parcels. The RP property is known as the Former Rhône -Polenc site (Ecology Facility Site ID 2150).

Historical Information

In the early 1900s, extensive fill materials were placed on the RP property during rechanneling of the LDW. The RP property is a former industrial facility where chemical manufacturing occurred from the 1930s through 1991. The western section of the RP property is currently used by IAAI for storage and auction of damaged and wrecked vehicles and the eastern section is currently vacant.

Between approximately 1927 and 1945, several companies manufactured chemical products at the RP property, including glues, resins, and hardeners. These companies include Stauffer Chemical Company, Consolidated Chemical Industries, Inc., and I.F. Laucks Inc. In the mid-1940s, the RP property was reportedly used as a prisoner-of-war camp (Geomatrix 2007).

In 1946, the RP property was purchased by Monsanto, which continued to manufacture glue and began to manufacture paints and resins on the property. In 1952, Monsanto began the manufacture of vanillin on the RP property. The chemical processing reportedly took place primarily in the western portion of the property. In the vicinity of the former main building, solvents and waste oil were reportedly disposed of on the ground surface. Monsanto also reportedly applied waste vanillin black liquor solids and metal wastes to the riprap shoreline bank of Slip 6. A former maintenance building is presumed to have contained lubricating oils and solvents based on the known use on the RP property. Waste oils and solvents were repeatedly disposed of on the ground surface around the maintenance building from 1952 to 1980. A former compressor building housed an autoclave compressor which reportedly leaked Pydraul A, a mineral oil carrier containing PCBs that was formerly manufactured by Monsanto.

In 1986, the facility and property were sold to RP, which continued to manufacture vanillin until April 1991, when all chemical manufacturing on the RP property ceased. In 1998, ownership of the property was transferred to Rhodia. Rhodia subsequently sold the RP property to Container Properties in November 1998.

In 2006, Container Properties redeveloped the entire property, dividing it into two separate parcels (the west parcel and the east parcel). Most of the contamination on the RP property is located on the west parcel, which is the former location of chemical processing and storage. In 2008, Container Properties entered a 15-year lease with IAAI which uses the west property as an extension of its

operations on the 8801 site to store and auction damaged and wrecked vehicles. Container Properties sold the east parcel to The Museum of Flight in February 2007.

Environmental Investigation

Historic releases of hazardous substances have occurred at the RP property. Released contaminants include caustic soda, toluene, mineral oil, PCBs, and copper (Geomatrix 2007).

Primary constituents of concern for the RP property are:

- Toluene, an industrial solvent used in the vanillin manufacturing process. Toluene in groundwater is primarily limited to southwest portion of RP property.
- Copper in soil and groundwater resulting from the application of vanillin black liquor solids for weed control, various releases of contaminated surface runoff water and process waste water, and strainer solids from vanillin manufacture. Copper-affected groundwater is limited to the western and southwestern corner of the property, based on historical data.
- Groundwater affected by elevated pH due to caustic releases, limited to the western and southwestern corner of the property, based on historical data.
- PAHs, methylene chloride, benzene, arsenic, chromium, lead, mercury, nickel, and vanadium, and SVOCs.
- PCBs in elevated concentrations in an area affected by past releases from a former PCB-containing compressor.

In 1986, Dames & Moore (Dames and Moore, 1986) performed a site screening investigation for RP. The investigation documented that contaminants had been released or disposed of on the RP property, concluded that the potential for groundwater contamination existed, and resulted in installation of 11 monitoring wells with three well pairs (shallow/deep). Groundwater was found to contain toluene and other contaminants.

In 1990, RP performed a RCRA Facility Assessment (RFA) of the facility (Rhone-Poulenc, 1990). The RFA determined that hazardous constituents and wastes had been released to the environment from various activities during operations at the RP property. These activities included pipeline and tank leaks of toluene and disposal of caustic autoclave scale and other wastes, as well as use of vanillin black liquor solids for weed control. The RFA concluded that releases to soil and groundwater had occurred because of past practices at the RP facility.

In May, 1993, RP and EPA entered into an Administrative Order on Consent using EPA's corrective action authority to address contaminant releases at the facility. Rhodia, Bayer CropScience, and Container Properties are the respondents to the Administrative Order and are responsible for carrying out all actions required by the Administrative Order.

West Parcel. In April, 2003, a hydraulic control interim measure (HCIM) required by EPA was completed by Container Properties to control the potential for contaminants, primarily toluene and copper, to migrate towards the LDW from the western portion of the property. The interim measure consisted of a subsurface low-permeability barrier wall enclosing most of the groundwater contamination. The underground grout wall is 6 inches thick and extends to depths of 65 to 85 feet bgs. A groundwater remediation system consisting of three extraction wells and a treatment system removes and treats groundwater from inside the contaminated area.

Copper contamination is present in excess of cleanup levels in groundwater outside the barrier wall. This copper contamination in groundwater presents an ongoing source of contamination to the LDW (Geomatrix 2007b).

In the northwest corner of the RP property, soil was removed where copper concentrations substantially exceeded the interim soil cleanup level for unrestricted land use. The most highly contaminated material was transported off site for landfill disposal while soil with nominal levels of contamination was placed onsite within the contained area. In addition, soil with low levels of TPH remains in areas adjacent to this excavation. Soil affected with petroleum hydrocarbons that appear to originate on the RP property are also present on the 8801 site north of the RP property (Geomatrix 2007a).

East Parcel. In June, 2006, Geomatrix completed an investigation of the east parcel after Container Properties informed EPA that it wished to proceed with redevelopment of the east parcel. A RCRA facility investigation conducted in 1995 indicated that groundwater beneath the east parcel had not been impacted by facility operations, so the investigation focused on soils. The investigation found arsenic, copper, mercury, PCBs, carcinogenic PAHs, and toluene in property soils. The east parcel was extensively investigated and remediated. EPA subsequently provided a determination of Corrective Action Complete Without Controls in a letter dated December 20, 2006.

Elevated concentrations of toluene are present in groundwater in the southwest corner of the east parcel. This groundwater contamination is located outside of the HCIM and adjacent to the Slip 6 inlet and may present an ongoing source of contamination to the LDW (Geomatrix 2007c).

A voluntary removal action, undertaken in 2006, excavated and disposed of 5,000 cubic yards of soil containing contaminants in concentrations exceeding the preliminary remediation goals for the property. A small amount of toluene was detected in the southwestern corner of the east parcel.

Surface sediment samples collected in the LDW adjacent to the RP property and in Slip 6 contained PAHs (acenaphthalene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, dibenzofuran, fluorathene, indeno (1,2,3-cd)pyrene and phenanthrene), total PCBs, phthalates, benzoic acid, and phenol. Subsurface sediment samples to a depth of 1 foot contained the same contaminants except for lead, but also included pentachlorophenol. None of the contaminants detected exceeded the Sediment Quality Standard (SQS) or the cleanup screening level (Ecology 2008).

3.3 SYNOPSIS OF ACTIVITIES ON THE 8801 SITE

3.3.1 Soil

From 1986 to 2004, soil samples were collected for chemical analysis from borings, excavations, and trenches. Soil samples were analyzed for TPH (gasoline, diesel, and oil range); VOCs; SVOCs; PAHs; PCBs; priority pollutant metals; dioxins/furans; and pesticides.

3.3.2 Groundwater

Of the 38 remaining wells on the 8801 site, 28 were screened in a shallow groundwater “A” zone; 8 were screened in the deeper groundwater “B” zone; and 2 were screened in a deeper aquifer “C” zone (Figure 6). Each monitoring well is identified with an “A,” “B,” or “C,” to reflect the aquifer zone in which it is screened. Groundwater samples were analyzed for TPH (gasoline, diesel, and oil range); VOCs; SVOCs; PAHs; PCBs; priority pollutant total and dissolved metals; and pesticides. Several groundwater samples were also analyzed for low-level mercury, chlorinated pesticides (DDT, aldrin, chlordane, dieldrin, heptachlor and lindane), hexachlorobenzene, and hexachlorobutadiene to compare with the sediment evaluation. In addition, groundwater samples collected from selected wells were analyzed for natural attenuation parameters including iron, nitrate, chloride, total alkalinity, and total organic carbon.

3.3.3 Storm Water and Storm Water Solids

Storm water samples and storm water solids samples were collected in 2002, 2004, 2006, 2007, and 2008 by Kennedy/Jenks during Phase I and Phase II Data Gap investigation activities (Kennedy/Jenks, 2002c and 2004), and by Anchor (2006, 2007a, and 2008). Storm water samples were obtained from both the northern storm drain outfall (now called the Northern Outfall (No. 1)) and the southern storm drain outfall (now called the Central Outfall No. 2)), while storm water solids samples were obtained from selected catch basins on the 8801 site. Storm water solid samples were also collected by Ecology and/or Windward in 2008, 2009 and 2010 (Windward, 2010).

Storm Water Samples

In 2002, storm water samples were analyzed for petroleum hydrocarbons, VOCs, SVOCs, PAHs, PCBs, total and dissolved priority pollutant metals, and glycols. In 2004, storm water samples were analyzed for VOCs and the SMS suite of compounds.

Storm water system sampling continued in 2006 (Anchor 2006). Storm water samples were collected from the North Outfall (Storm North) and the Central Outfall (Storm South) during storm events that were preceded by at least 24 hours of no measurable precipitation, with an intensity of at least 0.1 inch of rain in a 24-hour period. Grab samples were obtained within the first hour of storm water discharge from the 8801 site. Storm water samples were analyzed for cyanide, n-ammonia, total and dissolved metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc, and chromium VI for total metals only), PCBs, and SVOCs.

Storm Water Solids Samples

Storm water solids were analyzed for the SMS suite of compounds in 2002 and 2004. In 2004, the entire system was cleaned of all solids by jetting the lines and basins and collecting the solids and water in a vacuum truck. The solids and water were disposed of off-site on completion of the project (AMEC, 2006c).

Storm water solids samples collected in 2006 were analyzed for metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc), PCBs, SVOCs, and phenols. In 2008 and 2009, the IAAI treatment system solids were sampled by Ecology. Stormwater solids from the catch basins and catch basin inserts have been collected by Windward on two occasions in 2010 (Windward, 2010).

3.3.4 Seeps

Water samples from the seeps were collected and analyzed for a suite of compounds in 2002, 2004, and 2006, by Kennedy/Jenks during Phase I and Phase II Data Gap investigation activities (Kennedy/Jenks, 2002c and 2004), and by Anchor (2007a and 2009). In October 2006, Anchor collected seep samples from Seeps 2, 4, 5, and 6 along with co-located sediments (Appendix D, Kennedy/Jenks Figure 4). The seep samples were analyzed for cyanide, n-ammonia, salinity, total and dissolved metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc, and chromium VI for total metals), PCBs, and SVOCs.

3.3.5 Surface Water

No surface water samples were collected from the LDW.

3.3.6 Sediment

In October and December, 2006, Anchor collected surface sediment samples from the LDW. The samples were collected at 22 stations in proximity to the 8801 site at approximate depths ranging from 0 to 10 centimeters. Sediment samples were analyzed for metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc), total PCBs, low molecular weight PAHs, high molecular weight PAHs, chlorinated hydrocarbons, phthalates, dibenzofuran, hexachlorobutadiene, n-nitrosodiphenylamine, phenols, benzyl alcohol, benzoic acid, PCBs, SVOCs, and dioxins/furans (Anchor 2006). Further sampling was undertaken in February, 2008, to re-assess specific surface locations and collect core samples of the deeper sediment at four locations. The core samples were collected down the bank of the three outfalls and adjacent to the northern property boundary. Surface samples were collected adjacent to the northern property boundary. Samples were analyzed for the SMS suite of compounds (Anchor 2009).

3.3.7 Data Management

The soil, groundwater, storm water and storm water solids data were compiled into a database to facilitate management. Data were then selected to represent the existing conditions at the 8801 site as follows:

- Analytical results from soils that were excavated and disposed of off-site were segregated and excluded from further evaluation.
- Soil analytical results associated with investigation-derived waste that was disposed of off-site were segregated and excluded from further evaluation.
- Groundwater analytical results are dynamic with respect to time. As such, groundwater analytical results were screened to include only the most recent monitoring event for each analyte, for each sample location (from 2002 through the present day). Previous groundwater analytical results were segregated and typically excluded from further evaluation. The groundwater data from 2002 through the present includes data for each of the monitoring wells at the 8801 site. Where recent sampling has occurred associated with monitoring the AS/SVE system, only the last eight quarters of results were included.

Tables containing all the data, with the exclusion of items described above, for soil, groundwater, seeps, storm water, and storm water solids are provided on tables in Appendices F through J. Figures showing all the chemicals whether detected or below the reporting limit in soil, groundwater and seeps are also provided in Appendices F through J. (These appendices are provided on a compact disc due to the volume of data. In the appendices, the different chemicals are arranged in alphabetical order by category e.g VOCs, SVOCs etc.)

Since environmental investigations began in 1986, 50,904 analytical results from soil samples, 40,526 analytical results from groundwater samples, and more than 4,000 analytical results from seep, storm water solid and storm water samples have been generated.

4.0 CONCEPTUAL SITE MODEL AND PATHWAYS

This chapter presents the conceptual site model with applicable pathways along which potential contaminants from historical contamination may migrate to potential receptors on and off the 8801 site. Details on the ecology on the 8801 site appear below, followed by discussion of contaminant migration pathways and receptor exposure risks for each of the various media on the 8801 site.

Any known or potential sources of new or ongoing contamination are associated with IAAI's operations, flaking of paint or mastic or caulk on the buildings, spills from the co-mingled sanitary and storm water system, and area wide depositional sources, and are beyond the scope of this RI and control of PACCAR.

Details on the ecology on the 8801 site appear below, followed by discussion of contaminant migration pathways and receptor exposure risks for each of the various media on the 8801 site.

4.1 ECOLOGICAL CONDITIONS

This section presents ecological conditions at the 8801 site and its surroundings, combining information from the results of previous site investigations, the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database, the Washington Department of Natural Resources (DNR) Natural Heritage Program (NHP) database, and field investigations by AMEC biologists along the shoreline of the LDW and landward portions of the 8801 site on July 8 and July 12, 2010, respectively.

4.1.1 Overview

The western boundary of the 8801 site lies adjacent to the LDW, which is the main drainage feature of the Green-Duwamish Watershed. The 8801 site is entirely developed, and contains structures and paved areas bounded by a fence. Properties adjacent to the 8801 site are also developed, except for the eastern portion of the 8801 site to the south, which consists of a gravel lot. Narrow strips of dense vegetation are located on adjacent properties outside the perimeter of the fence and along the shoreline.

The 8801 site is separated from the LDW by rip-rap along the property boundaries at the southwest corner and by a sheet-piling bulkhead along the northern stretch of the western property boundary. Except for the LDW, the 8801 site has no connection to any undeveloped lands based on a review of

aerial photographs. The nearest natural areas in the vicinity of the 8801 site consist of small pockets of undeveloped lands along the shoreline of the LDW.

4.1.2 Vegetation

Vegetation on the 8801 site is limited to maintained landscape plantings around the Administration Building in the eastern portion of the 8801 site and weedy, mostly herbaceous vegetation growing along the inside perimeter of the fence, along the sides of buildings, and through cracks in the pavement. Dominant herbaceous species include common St. John's-wort, prickly sow-thistle, fireweed, herb-Robert, and tansy.

Dense, but limited, patches of shrubs dominated by Himalayan blackberry and butterfly bush grow in some areas along the outside of the fence and along the shoreline. Perennial pepperweed was also present on rip-rap along the southern portion of the shoreline, and one mature European birch tree stands on the shoreline in the northern portion of the 8801 site. No vascular aquatic vegetation or macro-algae was observed below the waterline during the field investigation.

The common and scientific names of all plant species observed during the field investigation are presented in Appendix E.

4.1.3 Wildlife

Terrestrial Wildlife

Use of the 8801 site by terrestrial wildlife appears to be limited by a lack of suitable breeding or foraging habitat for many species, and by the high level of human activity at the 8801 site and its surroundings. Except for flight pathways for birds, no overland migration or dispersal corridors exist that could provide 8801 site access for terrestrial wildlife in the vicinity.

During the field investigation, an osprey, several gulls, a pigeon, and a white-crowned sparrow were observed perching on structures throughout the 8801 site, including light poles, buildings, and fences, and house finches were observed flying over. The 8801 site is probably also used by other wildlife typical for the urban Seattle area, including house sparrows, crows, starlings, and rats. These species may use cavities, ledges, and platforms within the existing structures for roosting and/or breeding, in addition to foraging throughout the 8801 site. No osprey nesting platforms were observed within the 8801 site and osprey are not likely to use the 8801 site for breeding.

The common and scientific names of all wildlife species observed during the field investigation are presented in Appendix E.

Aquatic Wildlife

Use of the site by aquatic wildlife is likely limited by a lack of suitable breeding or foraging habitat for many species. No vascular aquatic vegetation or macro-algae was observed below the waterline during the field investigation, and use of the site by aquatic vertebrates (for example, fish and seals) is likely limited to passage during travel up and down the LDW, and foraging when water is present during high tide. Fish known to use the LDW which may be present in water adjacent to the 8801 site include anadromous salmonids, English sole, and sculpins, among others. Mammals, including river otters and harbor seals, may also be present.

Crabs, worms, and other aquatic and benthic invertebrates are also found in the LDW and may use the shoreline in the vicinity of the 8801 site.

4.1.4 Sensitive Habitat, Plants, and Wildlife

The DNR NHP database lists no sensitive plant species or habitats in the vicinity of the 8801 site in T24NR04E Section 33 (DNR 2010).

Species listed under the Endangered Species Act (ESA) and as WDFW PHS are known to be present in the vicinity of the 8801 site (WDFW 2010). ESA-listed fish species, including Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound steelhead (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentus*) use the marine waters of the Duwamish River and may be found in waters adjacent to the 8801 site. Priority wildlife identified in the vicinity of the 8801 site includes a peregrine falcon (*Falco peregrinus*) nest located under the 1st Avenue Bridge, approximately 1.8 miles northwest of the 8801 site, and several other species of anadromous salmonids.

Peregrine falcons may fly over the 8801 site during foraging activities. However, no suitable habitat for this species is present on the 8801 site. Fish are likely to be present in waters adjacent to the 8801 site while traveling up and down the LWD or foraging. However, the 8801 site does not appear to provide refuge or breeding habitat for fish due to a lack of suitable habitat structures.

4.2 MIGRATION PATHWAYS AND POTENTIAL EXPOSURE

This section evaluates the risk of exposure to contaminated media for aquatic and terrestrial plants and wildlife that may occur at the 8801 site. Based on the findings in this section and MTCA requirements (WAC 173-340-7491(1)(c)(i)), the 8801 site is exempt from a Terrestrial Ecological Evaluation, as it is covered entirely with buildings and pavement and contains less than 1.5 acres of contiguous undeveloped area on the site or within 500 feet of any area of the site Therefore, soil biota, terrestrial wildlife, and plants are not considered to be receptors at the 8801 site and screening criteria protective of these receptors are not required. However; screening criteria protective of aquatic and benthic species will be necessary to protect wildlife in the adjacent LDW.

Exposure pathways to contaminated soil and groundwater for terrestrial wildlife are limited because the entire 8801 site is paved. The activity on the 8801 site that may result in temporary exposure of terrestrial wildlife to soil is excavation work that results in temporary removal of the asphalt/concrete surface layer. This exposure would be entirely limited to activities associated with foraging.

Vegetation at the 8801 site is limited, and consists almost entirely of weed species, including many species listed on the 2010 King County Noxious Weed List (King County 2010). As such, no impacts to native vegetation on the 8801 site are likely due to contamination in soil or groundwater, regardless of the existence of an exposure pathway.

Because groundwater on the 8801 site eventually drains to the LDW, a direct exposure pathway to groundwater exists for benthic and aquatic organisms. Exposure to contaminated surface water and sediments impacted by groundwater draining from the 8801 site would likely be greatest for benthic invertebrates inhabiting sediments adjacent to the seeps. Foraging shorebirds and herons that prey on these invertebrates would also be at risk of exposure. Aquatic vertebrates (such as fish) and their predators (such as osprey and bald eagles) would be at lower risk for exposure to contaminated soils and groundwater from the 8801 site because lack of suitable habitat limits the time these species would likely use the site.

4.2.1 Soil

The 8801 site is zoned for industrial use and future potential uses will either be entirely industrial or industrial on the third of the 8801 site adjacent to the LDW and commercial on the remaining two thirds. Currently, all parts of the 8801 site are either paved with asphalt or concrete, or covered in buildings with interior floor slabs. The proposed future use of the 8801 site will continue to require pavement and/or buildings over the majority of the 8801 site. Currently, the 8801 site is used by employees of IAAI and the general public who attend weekly public auctions. Neither occupational workers nor the general public are exposed to soil or groundwater beneath the pavement although construction workers may be exposed for limited periods of time.

Three potential contamination migration pathways from soil to other media exist: soil to groundwater, soil to piped storm water and soil to vapor. Leaching (including infiltration and percolation) can transport soil particles and dissolved constituents to groundwater or storm water. Similarly, volatilization of chemicals from soil directly to vapor may transport contaminants from soil to air. Potential direct soil contributions to surface water, sediment pathways, and vapor by entrainment of soil particles in wind are incomplete because the asphalt/concrete cap limits the mobility of soil.

Since the 8801 site is covered with an asphalt/concrete surface (including buildings) that prevents direct contact with the underlying soil, soil on the 8801 site carries a low exposure potential to

occupational workers, the public, and terrestrial organisms via direct contact. Construction workers may be exposed to soil for limited periods of time. The occupational worker, public, construction worker, and/or terrestrial organism could potentially be exposed to vapors from off-gassing soil through cracks and fissures in the asphalt/concrete cap. The risk of off-gassing to vapor is discussed in Chapter 4.2.5 Vapor.

4.2.2 Groundwater

Groundwater is encountered at depths of 5 to 12 feet bgs. The groundwater generally moves in a westerly direction to the LDW (surface water body). Studies of tidal influence on the 8801 site have been conducted. Fluctuation in groundwater elevation due to tidal influence is estimated to range from 2.33 feet (behind the shoring wall) to 4.15 feet (adjacent to the rip-rap) in monitoring wells adjacent to the LDW, to less than 0.04 feet in monitoring wells on the east of the 8801 site farthest from the LDW.

Groundwater on the 8801 site is not currently used for potable purposes. The groundwater is also considered not to be usable for potable water in the future because of the proximity of a surface water body (the LDW) that is unsuitable for use as a domestic supply due to its saline content. In addition, any groundwater extraction on the 8801 site would rapidly draw saline water into the extraction point.

WAC 173-340-720(1)(a) states, “Groundwater cleanup levels shall be based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions.” The LDW in the vicinity of the 8801 site is classified as both marine water with brackish saline content and freshwater, and the groundwater discharges in the LDW through seeps and within the river bed. Therefore, the highest beneficial use for the groundwater is discharge to the LDW.

Three potential pathways from groundwater exist: groundwater to vapor (volatilization), groundwater direct discharge to piped storm water, and groundwater direct discharge to surface water. Volatilization of chemicals directly from groundwater to vapor is possible. Groundwater intrusion to storm water piping and structures below the water table is possible if cracks are present in the piping. Groundwater does migrate off-property to the LDW through seeps within the bank and river bed and could introduce dissolved contaminants directly to surface water and sediments.

Groundwater is in direct contact with soil below the groundwater table, and chemical precipitation or sorption to soil can occur from the dissolved phase. However, based on the evaluation of documented contaminant concentrations in areas where groundwater is in direct contact with soil, the impact from groundwater to soil is considered secondary.

The 8801 site is covered with an asphalt/concrete surface cap (including buildings), preventing human and ecological direct contact with the underlying groundwater. Therefore, groundwater carries a low potential for direct exposure of general workers, the public, and terrestrial organisms to soil. Construction workers may come into contact with groundwater for limited periods of time. The occupational worker, public, construction worker, and/or terrestrial organism could potentially be exposed to vapors from off-gassing groundwater through cracks and fissures in the asphalt/concrete cap. The risk of off-gassing to vapor is discussed in Chapter 4.2.5 Vapor.

4.2.3 Storm Water

Storm water runoff from the 8801 property is collected in catch basins and flows in pipes westward to discharge into the LDW (Figure 4). A major break in the base of the storm water line, west of catch basin 74 in the north west of the 8801 site, which allowed groundwater to enter the system, was repaired in 2006. As stated earlier site soil and groundwater could infiltrate the storm water system. Figure 8 shows tidal fluctuation effects on groundwater levels at the 8801 site relative to the elevation of the storm water conveyance system. The figure illustrates that the northwest section of the northern storm water system and a short section within the Manufacturing Building is potentially below groundwater at high high tide. This area of the storm water system is located between the northern outfall and SSMH/SDMH-C and a very short section adjacent to SDMH-P. At other tidal states, only the area adjacent to the northern outfall has the potential to be below the groundwater table. Figure 8 is based on a recent survey of selected points on the northern storm water system and an earlier survey. However, there is some inconsistency related to the elevation of SDMH-B on different survey events due to the construction of the manhole. Therefore, although the northwest section of the northern storm system is depicted as being below the groundwater table at high high tide, sections of this portion of the line may actually be above the groundwater.

Few storm water systems have 100 percent integrity; however, contaminated soil is unlikely to enter the storm line because the majority of the system does not cross areas where contamination has been detected in soil. The only contaminants detected near elements of the storm water system are TPH in soil near the Off-Highway Building and VOCs in soil and groundwater. TPH has not been found in groundwater samples collected at or adjacent to the storm water system; therefore, it is unlikely that TPH from historical activities on the 8801 site is entering the system. VOCs have been detected in low concentrations at or in close proximity to the storm water pipelines and have the potential to enter and migrate through the storm water system and discharge to the LDW.

As well as the potential for groundwater to enter submerged portions of the storm water pipes, storm water can also exit the piping system from cracks in the pipes and discharge into groundwater. Leakage from the system is in fact more likely than entry of contaminated groundwater into the storm water system due to gravity.

Three potential contaminant migration pathways from storm water were identified: storm water to vapor, storm water to surface water, and storm water solids to sediments. Volatilization of chemicals directly from storm water to vapor is possible. Dissolved chemicals and chemicals absorbed on particles in storm water discharged to the LDW can introduce dissolved and solid contaminants directly to surface water and sediments.

The 8801 site contains a storm water collection system consisting of catch basins and subgrade piping. Improvements to the storm water infrastructure in 2007 included the installation of sets of filters and treatment equipment at each active outfall. Therefore, storm water currently conveyed through the storm water system carries a low potential for direct exposure of general workers, the public, and terrestrial organisms to storm water. The occupational worker, public, construction worker, and terrestrial organism could be exposed to vapors from off-gassing storm water through catch basins. The risk of off-gassing to vapor is evaluated in Section 4.2.5 Vapor.

Surface Water

Surface water is considered a terminal point of impact, and not a primary source of contaminants to other media, with the exception of vapor and sediment. Volatilization of chemicals directly from surface water to vapor is possible. Surface water could impact sediment via sorption of dissolved chemicals and settling of entrained particulates.

Access to the LDW and its banks on the 8801 site is restricted. Therefore, exposure time and risk to occupational workers, the general public, and construction workers are limited. Other potential receptors are terrestrial, aquatic, and benthic organisms. Occupational workers and construction workers, if in contact with surface water, could be exposed by dermal contact, ingestion, and/or inhalation from degassing of the surface water. Aquatic, terrestrial, and benthic organisms could also be exposed to dermal contact, ingestion, and inhalation, except that inhalation exposure is not applicable for benthic organisms.

Aquatic and benthic organisms are the potential receptors most likely to be exposed to surface water. Recreational and tribal users of the LDW could also be exposed by ingestion of aquatic organisms, if contaminated.

Sediment

Sediments are considered a terminal point of impact and not a primary source of contaminants to other media. Contaminants could leach from sediment to surface water or ground water. However, direct releases from the 8801 site to the sediment have not been documented and this pathway is considered not to be a primary source.

Aquatic and benthic organisms are the potential receptors most likely to be exposed to sediment in surface water. Aquatic organisms could be exposed to sediment by direct contact during low tide or by direct contact with suspended particles at the sediment/water interface through dermal absorption and ingestion. Benthic organisms could be exposed to sediment through ingestion and through dermal absorption from direct contact. Avian species may periodically be exposed to sediments during low tide.

Aquatic organisms that respire in potentially contaminated surface water and surface water with suspended sediment may be exposed to contaminants via dissolution of contaminants present in the sediment. Benthic organisms may be exposed to contaminated surface water by direct contact through dermal absorption and ingestion while burrowing in sediment. Recreational and tribal users of the LDW could also be exposed by ingestion of aquatic organisms, if contaminated.

All other potential receptors, including occupational workers, the public, construction workers, and terrestrial organisms have a low potential for direct contact with sediment or with secondary sources to sediment (such as from surface water).

4.2.4 Vapor

Residual VOC impacts to soil and groundwater could cause VOCs to volatize to the air. A VOC air sampling program was undertaken in 2002, and the contaminant concentrations detected within enclosed spaces of the buildings and in ambient air were deemed too low to pose a risk to human health (Kennedy/Jenks 2002a). However, with prospective future development of the 8801 site, the vapor pathway from VOCs in soil and groundwater will be examined further.

The vapor phase is considered a terminal point of impact, not a primary source of contaminants to other media. Vapors were evaluated as potentially emanating from other media such as soil, groundwater, storm water, surface water, and sediment.

Occupational workers, the public, construction workers, and terrestrial organisms could be exposed to vapors from off-gassing soil transported through cracks and fissures in the asphalt/concrete cap (including buildings). Additionally, aquatic organisms could be exposed to vapors via surface water degassing.

4.3 SUMMARY

In conclusion, the media of concern for the 8801 site are: soil; surface water; sediments; and vapor. Potential receptors of concern are: construction and site workers via direct contact and inhalation of contaminants onsite; benthic and aquatic organisms via direct contact and ingestion of contaminants offsite in the LDW; avian life via direct contact or ingestion of contaminants offsite; and recreational

and tribal users of the LDW via direct contact, inhalation, or ingestion of contaminants or aquatic organisms offsite.

5.0 CHEMICALS OF POTENTIAL CONCERN

This section presents the derivations of the screening criteria used for the 8801 site and their application to determine chemicals of potential concern (COPCs).

5.1 APPLICABLE RELEVANT AND APPROPRIATE REQUIREMENTS

Ecology regulations require that applicable, relevant, and appropriate requirements (ARARs) be used to evaluate a site. The various media may have different criteria; however, the screening criteria used must be protective of potential receptors by the relevant exposure pathways on the site. At the 8801 site, the selected screening criteria are protective of the following media: soil, surface water, sediments, and vapor. The criteria are also protective of construction and site workers via direct contact and inhalation of contaminants on site; benthic and aquatic organisms via direct contact or ingestion of contaminants off site in the LDW; avian life via direct contact or ingestion of contaminants off site; and recreational and tribal users of the LDW via direct contact, inhalation, or ingestion of contaminants off site. Table 4 provides a list of the screening criteria used in this report.

Table 4 Preliminary Screening Criteria

Media	Soil Human Health or Ecological Exposure	Vadose Soil	Saturated Soil	Surface Water	Sediment	Air
Units	**mg/kg**	**mg/kg**	**mg/kg**	**µg/L**	**mg/kg DW**	**ppbv**
2,3,7,8-TCDD (Dioxin)	2.00E-06	1.466E-08	7.3365E-10	0.000000005	0.000000141	4.42682E-09
Acenaphthene	20	0.335862284	0.017132026	2.614379085	0.5	
Acenaphthylene	NC	1.385448514	0.070669608	10.78431373	0.56	
Acetone	8000	NC	NC	800	NC	32890
Aluminum	NV	NC	NC	NC	7700	9062.268347
Anthracene	24000	4.464748393	0.224637255	10.78431373	0.96	200
Antimony	5	5.0736	0.254408	5.6	150	0.018314908
Arsenic (III)	7					
Arsenic (total)	0.24	0.010548	0.00052974	0.018	57	0.000189608
Arsenic (V)	10					
Barium	102				1500	0.028486128
Benzene	0.03	0.01164418	0.0007146	1.2		22.59
Benzo(g,h,i)perylene		0.620996263	0.031051319	0.011584454	0.67	
Benzo[a]anthracene	0.14	0.0129696	0.000648844	0.0028	1.3	21.41918528
Benzo[a]pyrene	0.1	0.0440776	0.002204244	0.0028	1.6	0.000139854
Benzo[b]fluoranthene	0.14	0.0449904	0.002249884	0.0028	3.2	
Benzo[k]fluoranthene	0.14	0.0440776	0.002204244	0.0028	3.2	
Benzoic acid	320000	13.48471698	0.965804003	2242.926156	0.65	
Benzyl alcohol	24000	1.148958371	0.081106705	181.9923372	0.057	
Beryllium	10	4315.038	215.78739	273		0.000200869
Bis(2-ethylhexyl) phthalate	71	0.938860612	0.046980061	0.284848485	1.3	
Bromodichloromethane	16	0.001849798	0.000125561	0.27		
Bromoform	130	0.028976541	0.001999672	4.3		2.3
Butyl benzyl phthalate	178.57	0.101130602	0.005124583	0.523504274	0.063	

Table 4 Preliminary Screening Criteria

Media	Soil Human Health or Ecological Exposure	Vadose Soil	Saturated Soil	Surface Water	Sediment	Air
Units	**mg/kg**	**mg/kg**	**mg/kg**	**µg/L**	**mg/kg DW**	**ppbv**
Cadmium	4	0.035	0.0017825	0.25	5.1	0.000302335
Carbazole	50					
Carbon disulfide	8000					320
Carbon tetrachloride	7.7	0.002042277	0.000110087	0.23		0.009204519
Chlorobenzene	40	0.23160985	0.01396	20		3064
Chloroethane	45000	0.002977324	0.000186033	0.41		236.4
Chloroform (trichloromethane)	160	0.039677673	0.002650728	5.7		4.92
Chloromethane	77	0.9192055	0.0590919	133		0.672980198
Chlorotoluene; o-	1600					
Chromium VI	19	3.86	0.1943	10		0.001721036
Chromium, total (or III)	42	1480.444	74.03182	74	260	235.1142396
Chrysene	0.14	0.013238401	0.000662284	0.0028	1.4	21.41918528
Cobalt	3200				10	20.74495164
Copper	50	1.07	0.05	2.4	530	38.4736428
Dibenz[a,h]anthracene	0.14	0.1468488	0.007342804	0.0028	0.23	17.56465517
Dibenzofuran	160	0.307719161	0.015557522	1.327433628	0.54	624
Di-butyl phthalate (di-n-butyl phth.)	200	0.284794521	0.284794521	150.6849315	1.4	439.7482014
Dichlorobenzene, 1,2-	7200	0.077868364	0.004533025	5.191873589	0.035	7952
Dichlorobenzene, 1,3-				320	0.17	
Dichlorobenzene, 1,4-	20	0.071629267	0.004167072	4.823	0.11	60.8755102
Dichloroethane, 1,1-	16000	5.679396996	0.372032	800		29220
Dichloroethane, 1,2-	11	0.002644595	0.00018004	0.38		5.25
Dichloroethylene, 1,1-	4000	0.00048742	2.65073E-05	0.057		11640

Table 4 Preliminary Screening Criteria

Media	Soil Human Health or Ecological Exposure	Vadose Soil	Saturated Soil	Surface Water	Sediment	Air
Units	**mg/kg**	**mg/kg**	**mg/kg**	**µg/L**	**mg/kg DW**	**ppbv**
Dichloroethylene;1,2-,cis	800			80		16
Dichloropropane; 1,2-	15	0.003776966	0.00024885	0.5		1.8
Diesel	2000*			10000		
Diethyl phthalate	2800000	4.126719392	0.269271429	484.1269841	0.048	550.6756757
Dimethyl phthalate	3500000	0.857142857	0.061428571	142.8571429	0.071	630.1546392
Dimethylphenol, 2,4-	70000	0.041123882	0.002318868	2.020624303	0.029	
Di-n-octyl phthalate	70000	0.011050977	0.000590949	0.295918367	0.42	
Ethylbenzene	6	8.964778025	0.502334	530	0.01	120.3
Ethylene glycol	160000					
Fluoranthene	3200	3.211284915	0.160857546	2.256699577	1.7	
Fluorene	30	0.471819192	0.023854867	2.03539823	0.54	
Gasoline	100			1000		300000
Gasoline (with benzene)	30					
Heavy Oil	2000			500		
Hexachlorobenzene	31	2.0642E-05	1.0668E-06	0.00028	0.022	0.113
Hexachlorobutadiene	700	0.043513732	0.00062634	0.44	0.011	0.0106875
Hexane;n-	4800					320
HPAH					17	
Indeno[1,2,3-cd]pyrene	3.42465753	0.1498728	0.007494004	0.0028		
Iron					5500	437.803284
Isopropyltoluene;4-						
Lead	50	500.015	25.001075	2.5	450	0.002088668
LPAH					5.2	
Manganese	1100				180	0.01019158

Table 4 Preliminary Screening Criteria

Media	Soil Human Health or Ecological Exposure	Vadose Soil	Saturated Soil	Surface Water	Sediment	Air
Units	**mg/kg**	**mg/kg**	**mg/kg**	**µg/L**	**mg/kg DW**	**ppbv**
Mercury	0.1	0.005399028	0.000270622	0.005161594	2.1	0.003656713
Mercury (organic)	0.4					1.133914621
Methyl isobutyl ketone	6400					32
Methyl naphthalene;1-						
Methyl naphthalene;2-	320					
Methylene chloride (dichloromethane)	0.02	0.031473435	0.002087204	4.6		339.5
Methylnaphthalene, 2-	320	1.191940457	0.061927273	18.18181818	0.67	3015
Methylphenol, 2- (o-cresol)	4000	0.05560557	0.003704628	7.110609481	0.063	5000
Methylphenol, 4- (p-cresol)	400	0.463133641	0.033191244	77.18894009	0.67	5000
Molybdenum	2				39	1274.233896
Naphthalene	5	2.301276257	0.121974457	53.80434783	2.1	140.2
Nickel	30	6.53	0.32715	5	140	0.043311191
Nitrosodiphenylamine, N-	204.0816327	0.252647853	0.012886833	1.957295374	0.028	
pcb - Aroclor 1016	5.6	0.003190607	0.000160283	0.00582	0.24	
pcb - Aroclor 1221	65.6	0.002977131	0.00015064	0.014		
pcb - Aroclor 1232	65.6	0.002977131	0.00015064	0.014		
pcb - Aroclor 1242		0.000209685	1.22948E-05	0.014		
pcb - Aroclor 1248	65.6	0.012376437	0.00062062	0.014	0.24	
pcb - Aroclor 1254	1.6	0.002521241	0.000126276	0.00166	0.24	
pcb - Aroclor 1260		0.058044334	0.00290402	0.014	0.24	
pcb mixtures	0.3	5.77552E-05	2.90E-06	0.000064	0.13	33.86426593
Pentachlorophenol	4.5	0.019872	0.0010287	0.27	0.14	45.88963964

Table 4 Preliminary Screening Criteria

Media	Soil Human Health or Ecological Exposure	Vadose Soil	Saturated Soil	Surface Water	Sediment	Air
Units	**mg/kg**	**mg/kg**	**mg/kg**	**µg/L**	**mg/kg DW**	**ppbv**
Phenanthrene		2.031745187	0.102211538		1.5	200
Phenol (total)	30	0.498953805	0.035112313	78.35820896	0.42	5000
Pyrene	2400	20.08934933	1.006340058	14.4092219	2.6	200
Selenium	0.3	0.53	0.02715	5	1	61.93009119
Silver	2	0.263547124	0.013376549	1.532250723	6.1	2.26665925
Styrene (phenylethylene)	33					1.028731988
Tetrachloroethane;1,1,2,2-	5	0.001387543	0.000091256	0.17		0.043
Tetrachloroethylene (perchloroethylene)	0.05	0.003636154	0.000207849	0.3872	0.057	28.41
Thallium	1	0.34224	0.0171432	0.24	0.51	11.96301008
Tin	50					411.9976409
Toluene	7	15.24542651	0.9074	1300		24590
Total Petroleum Hydrocarbons		0.001248	0.00008944	0.208	5.7	
Tributyltin					0.017	100
Trichlorethane, 1,1,1-	2	19926.88702	273.0099	417000		94730
Trichlorethane, 1,1,2-	18	0.012066995	0.000677084	0.59		6.548
Trichloro-1,2,2-trifluiroethane;1,1,2-	2400000					14000
Trichlorobenzene, 1,2,4-	20	0.008362201	0.000561472	1.128133705	0.031	12.31256198
Trichloroethylene	0.03	0.012320087	0.000761481	1.53	160	0.9655
Trichlorophenol, 2,4,6-	10	0.041608258	0.0022624	1.4		0.099780759
Trimethylbenzene, 1,3,5-	4000					295.6
Vanadium	2				39	23.99811549
Vinyl chloride	0.67	0.000211144	1.13435E-05	0.025		24.51

Table 4 Preliminary Screening Criteria

Media	Soil Human Health or Ecological Exposure	Vadose Soil	Saturated Soil	Surface Water	Sediment	Air
Units	**mg/kg**	**mg/kg**	**mg/kg**	**µg/L**	**mg/kg DW**	**ppbv**
(chloroethylene)						
Xylene (dimethylbenzene)	9	241.4786912	13.9696	16000	0.04	384500
Total Xylenes	160000					46
Zinc	86	40.5790522	2.033186379	32.56745762	410	

NC No Screening Criteria Identified

* Diesel value amended for Model Toxics Control Act (Method A)

5.2 PRELIMINARY SITE-SPECIFIC SCREENING CRITERIA

The preliminary screening criteria (PSCs) from Table 4 are primarily based on soil partition concentrations protective of sediment and surface water. Under MTCA, selected screening criteria may be adjusted to account for background values, practical quantitation limits (WAC 173-340-740(5)(c) and WAC 173-340-730(5)(c)), and empirical demonstration of equilibrium between soil and groundwater (WAC 173-340-747(9)). At Ecology's request, PSCs were not adjusted for background values, practical quantitation limits, or empirical demonstration of equilibrium. However, where relevant, following sections discuss the impact of corrections associated with background values, practical quantitation limits, or empirical demonstration of equilibrium.

The screening criteria were compiled for soil, groundwater, surface water, sediment, and vapor with respect to ARARs. Screening criteria compiled included:

- MTCA Methods A, B, and C and Ecological values,
- EPA Region 9 human health values;
- Ecology Surface Water Quality Screening criteria (SWQS),
- National Recommended Water Quality Criteria (NRWQC),
- National Toxics Rule (NTR), and
- Ecology's Sediment Management Standard (SMS).

Groundwater criteria are not shown on the final table. However, where a surface water criterion was less stringent than a groundwater criterion, the groundwater value was substituted.

5.2.1 Soil Screening Criteria

Soil PSCs came from MTCA method A (unrestricted and industrial) and B and C (carcinogenic and non-carcinogenic) values, as found in Ecology Cleanup Levels and Risk Calculations (CLARC) tables (Ecology April 2010). The partitioning screening criteria for soil-to-groundwater and soil-to-surface water pathways were calculated using the fixed parameter, three-phase partitioning model (MTCA Equations 747-1 and 747-2 [Ecology 2007a]). Organic carbon partitioning coefficients (K_{oc}s) and Henry's Law constants were obtained from EPA's Estimation Programs Interface (EPI) Suite, V.3.2 (2008). K_d values were acquired from Ecology's LDW Slip 4 Site evaluation for metals, or were derived by soil f_{oc} using MTCA Equation 747-2. Soil-to-sediment pathway values, calculated by Ecology for the LDW Slip 4 Site for Sediment Quality Standards (SQS) and cleanup screening levels (CSLs), were also used to determine the most stringent soil criteria.

5.2.2 Groundwater Screening Criteria

Groundwater PSCs are the most stringent criteria among MTCA method B and C (carcinogenic and non-carcinogenic) values from CLARC tables and Ecology's groundwater screening levels (based on SQS) developed for the LDW Slip 4 site.

5.2.3 Surface Water Screening Criteria

Surface water PSCs were based on MTCA B and C look-up values from Ecology CLARC tables. Other surface water screening and concentration values were obtained either from Ecology's SWQS, the NTR, or the NRWQC.

5.2.4 Sediment Screening Criteria

Sediment PSCs are the most stringent among those generated by Ecology for the LDW Slip 4 site and found in the SMS.

5.2.5 Vapor Screening Criteria

Soil gas (vapor) PSCs were calculated on the basis of partitioning from groundwater to vapor, using EPA's Evaluating Vapor Intrusion Using the Johnson and Ettinger Model (EPA 2006b).

5.2.6 Ecological Screening Criteria

Although the ecological evaluation of the 8801 site determined that protection of onsite species was not required, criteria protective of site wildlife, plants, and soil biota from Table 749-3 (WAC 173-340-900) were included in the PSC selection at Ecology's request.

5.3 CHEMICAL SCREENING USING PRELIMINARY SCREENING CRITERIA

The PSCs were used in conjunction with the 8801 site analytical data to determine the site preliminary chemicals of concern (COPCs). The data from soil, groundwater, and seeps were compared against PSCs for each medium and chemical. Tables 5 through 8 show the following results:

- Number of samples analyzed for each chemical;
- Number of samples in which the chemical was detected in excess of the laboratory detection limit (either the method detection or reporting limit);
- Number of samples in which the chemical concentration exceeded the PSC;
- Number of samples for which the detection limit exceeded the PSC; and

- Percentage of samples in which detected concentrations exceeded the PSC (based on total quantity of samples analyzed for the chemical). For soil the saturated and unsaturated numbers are summed to create one percentage per chemical.

Any chemical whose concentration did not exceed the PSC in any medium, or which was not detected when the PSC exceeded the detection limit, was removed from further consideration. If the detection limit in every sample of any chemical was greater than the PSC, the chemical and PSC were assessed to determine if further evaluation of the chemical was necessary. Factors in this assessment included whether the chemical was used on the 8801 site and if other related chemicals were COPCs (discussed in further detail in later sections).

Two sets of PSCs were used in screening chemicals in soil: one for saturated soil (below the water table) and one for unsaturated soil (above the water table). Screening criteria for saturated soil are considerably more stringent than those for unsaturated soil. Therefore, any sample collected and analyzed from below 6 feet bgs (a conservative estimate—see next paragraph) was assumed to come from saturated soil, and screened accordingly.

A site-wide investigation was conducted during the rainy season in 2004, when the water table was at or near its highest level for the year. Review of the boring logs from that investigation confirmed that in nearly all cases, the water table was deeper than 6 feet bgs. The only exceptions were perched groundwater observed in a few borings. Therefore, this 6-foot cutoff depth provides a conservative estimate of the unsaturated soil depth.

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
1,1,1,2-Tetrachloroethane	385	385	0	0	0%	0	0	---	---	NC
1,1,1-Trichloroethane	47	45	2	0	0%	1	2	2000	µg/kg	SO_SAT_SC
1,1,1-Trichloroethane	341	312	29	0	---	2	29	2000	µg/kg	SO_VADOSE_SC
1,1,2,2-Tetrachloroethane	47	47	0	0	0%	47	0	0.091256	µg/kg	SO_SAT_SC
1,1,2,2-Tetrachloroethane	341	341	0	0	---	93	0	1.38754	µg/kg	SO_VADOSE_SC
1,1,2-Trichloro-1,2,2-trifluoroethane	9	9	0	0	0%	0	0	2.4E+09	µg/kg	SO_Sat_SC
1,1,2-Trichloro-1,2,2-trifluoroethane	40	40	0	0	---	0	0	2.4E+09	µg/kg	SO_vadose_SC
1,1,2-Trichloroethane	47	47	0	0	0%	36	0	0.677084	µg/kg	SO_SAT_SC
1,1,2-Trichloroethane	341	340	1	1	---	37	0	12.067	µg/kg	SO_VADOSE_SC
1,1-Dichloroethane	47	46	1	0	0%	1	1	372.032	µg/kg	SO_SAT_SC
1,1-Dichloroethane	341	334	7	0	---	0	7	5679.4	µg/kg	SO_VADOSE_SC
1,1-Dichloroethene	49	49	0	0	2%	49	0	0.026507	µg/kg	SO_SAT_SC
1,1-Dichloroethene	352	345	7	7	---	319	0	0.48742	µg/kg	SO_VADOSE_SC
1,1-Dichloropropene	385	385	0	0	0%	0	0	---	---	NC
1,2,3-Trichlorobenzene	385	385	0	0	0%	0	0	---	---	NC
1,2,3-Trichloropropane	385	385	0	0	---	0	0	---	---	NC
1,2,4-Trichlorobenzene	64	64	0	0	0%	59	0	0.561472	µg/kg	SO_SAT_SC
1,2,4-Trichlorobenzene	381	381	0	0	---	93	0	8.3622	µg/kg	SO_VADOSE_SC
1,2,4-Trimethylbenzene	384	335	49	0	0%	0	0	---	---	NC
1,2-Dibromo-3-chloropropane	386	386	0	0	0%	0	0	---	---	NC
1,2-Dichlorobenzene	64	64	0	0	0%	37	0	4.53302	µg/kg	SO_SAT_SC
1,2-Dichlorobenzene	382	381	1	0	---	20	1	77.8684	µg/kg	SO_VADOSE_SC
1,2-Dichloroethane	47	47	0	0	0%	47	0	0.18004	µg/kg	SO_SAT_SC
1,2-Dichloroethane	342	341	1	1	---	55	0	2.64459	µg/kg	SO_VADOSE_SC
1,2-Dichloropropane	47	47	0	0	0%	47	0	0.24885	µg/kg	SO_SAT_SC
1,2-Dichloropropane	342	340	2	0	---	73	2	3.77697	µg/kg	SO_VADOSE_SC
1,3,5-Trimethylbenzene	46	35	11	0	0%	0	11	4000000	µg/kg	SO_Sat_SC
1,3,5-Trimethylbenzene	339	317	22	0	---	0	22	4000000	µg/kg	SO_vadose_SC
1,3-Dichlorobenzene	446	446	0	0	0%	0	0	---	---	NC
1,3-Dichloropropane	386	386	0	0	0%	0	0	---	---	NC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
1,4-Dichlorobenzene	64	64	0	0	0%	37	0	4.16707	µg/kg	SO_SAT_SC
1,4-Dichlorobenzene	382	382	0	0	---	20	0	71.6293	µg/kg	SO_VADOSE_SC
1-Methylnaphthalene	35	24	11	0	0%	0	0	---	---	NC
2,2'-Oxybis(1-Chloropropane)	30	30	0	0	0%	0	0	---	---	NC
2,2-Dichloropropane	386	386	0	0	0%	0	0	---	---	NC
2,3,7,8-TCDD	6	5	1	1	16%	5	0	1.47E-05	µg/kg	SO_VADOSE_SC
2,4,5-Trichlorophenol	58	58	0	0	0%	0	0	---	---	NC
2,4,6-Trichlorophenol	17	17	0	0	2%	17	0	2.2624	µg/kg	SO_SAT_SC
2,4,6-Trichlorophenol	42	41	1	1	1%	25	0	41.6083	µg/kg	SO_VADOSE_SC
2,4-Dichlorophenol	59	59	0	0	0%	0	0	---	---	NC
2,4-Dimethylphenol	17	17	0	0	0%	17	0	2.31887	µg/kg	SO_SAT_SC
2,4-Dimethylphenol	42	42	0	0	---	27	0	41.1239	µg/kg	SO_VADOSE_SC
2,4-Dinitrophenol	59	58	1	0	0%	0	0	---	---	NC
2,4-Dinitrotoluene	58	58	0	0	0%	0	0	---	---	NC
2,6-Dinitrotoluene	58	58	0	0	0%	0	0	---	---	NC
2-Butanone (Methyl ethyl ketone)	387	335	52	0	0%	0	0	---	---	NC
2-Chloroethylvinylether	50	50	0	0	0%	0	0	---	---	NC
2-Chloronaphthalene	59	59	0	0	0%	0	0	---	---	NC
2-Chlorophenol	59	59	0	0	0%	0	0	---	---	NC
2-Hexanone	387	387	0	0	0%	0	0	---	---	NC
2-Methylnaphthalene	30	18	12	0	0%	0	12	320000	µg/kg	SO_SAT_SC
2-Methylnaphthalene	84	59	25	0	---	0	25	320000	µg/kg	SO_VADOSE_SC
2-methylphenol (o-cresol)	17	17	0	0	0%	17	0	3.70463	µg/kg	SO_SAT_SC
2-methylphenol (o-cresol)	41	41	0	0	---	26	0	55.6056	µg/kg	SO_VADOSE_SC
2-Nitroaniline	58	58	0	0	0%	0	0	---	---	NC
2-Nitrophenol	59	59	0	0	0%	0	0	---	---	NC
3,3'-Dichlorobenzidine	33	33	0	0	0%	0	0	---	---	NC
3,4-Methylphenol	3	3	0	0	0%	0	0	---	---	NC
3-Nitroaniline	58	58	0	0	0%	0	0	---	---	NC
4,4'-DDD	3	3	0	0	0%	0	0	---	---	NC
4,4'-DDE	3	3	0	0	0%	0	0	---	---	NC
4,4'-DDT	3	3	0	0	0%	0	0	---	---	NC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
4,6-Dinitro-2-Methylphenol	59	58	1	0	0%	0	0	---	---	NC
4-Bromophenyl-phenylether	59	59	0	0	0%	0	0	---	---	NC
4-Chloro-3-methylphenol	59	58	1	0	0%	0	0	---	---	NC
4-Chloroaniline	58	58	0	0	0%	0	0	---	---	NC
4-Chlorophenyl-phenylether	59	59	0	0	0%	0	0	---	---	NC
4-Chlorotoluene	386	386	0	0	0%	0	0	---	---	NC
4-Isopropyltoluene	385	360	25	0	0%	0	0	---	---	NC
4-Methyl-2-Pentanone (MIBK)	387	384	3	0	0%	0	0	---	---	NC
4-methylphenol (p-cresol)	17	17	0	0	0%	8	0	33.1912	µg/kg	SO_SAT_SC
4-methylphenol (p-cresol)	38	38	0	0	---	0	0	463.134	µg/kg	SO_VADOSE_SC
4-Nitroaniline	58	58	0	0	0%	0	0	---	---	NC
4-Nitrophenol	59	57	2	0	0%	0	0	---	---	NC
Acenaphthene	30	17	13	12	16%	12	1	17.132	µg/kg	SO_SAT_SC
Acenaphthene	85	66	19	6	---	0	13	335.862	µg/kg	SO_VADOSE_SC
Acenaphthylene	30	30	0	0	0%	5	0	70.6696	µg/kg	SO_SAT_SC
Acenaphthylene	85	77	8	0	---	0	8	1385.45	µg/kg	SO_VADOSE_SC
Acetone	46	25	21	0	0%	0	21	8000000	µg/kg	SO_Sat_SC
Acetone	341	274	67	0	---	0	67	8000000	µg/kg	SO_vadose_SC
Acrolein	47	47	0	0	0%	0	0	---	---	NC
Acrylonitrile	47	47	0	0	0%	0	0	---	---	NC
Aldrin	3	3	0	0	0%	0	0	---	---	NC
alpha Chlordane	3	3	0	0	0%	0	0	---	---	NC
alpha-BHC	3	3	0	0	0%	0	0	---	---	NC
Aniline	3	3	0	0	0%	0	0	---	---	NC
Anthracene	30	20	10	7	7%	1	3	224.637	µg/kg	SO_SAT_SC
Anthracene	85	64	21	1	---	0	20	4464.75	µg/kg	SO_VADOSE_SC
Antimony	1	1	0	0	5%	0	0	254.408	µg/kg	SO_SAT_SC
Antimony	21	18	3	1	---	0	2	5000	µg/kg	SO_VADOSE_SC
Aroclor 1016	9	9	0	0	0%	9	0	0.160283	µg/kg	SO_SAT_SC
Aroclor 1016	37	36	1	0	---	19	1	3.19061	µg/kg	SO_VADOSE_SC
Aroclor 1221	9	9	0	0	0%	9	0	0.15064	µg/kg	SO_SAT_SC
Aroclor 1221	37	36	1	0	---	20	1	2.97713	µg/kg	SO_VADOSE_SC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
Aroclor 1232	9	9	0	0	0%	9	0	0.15064	µg/kg	SO_SAT_SC
Aroclor 1232	37	36	1	0	---	19	1	2.97713	µg/kg	SO_VADOSE_SC
Aroclor 1242	9	9	0	0	0%	9	0	0.012295	µg/kg	SO_SAT_SC
Aroclor 1242	37	36	1	0	---	36	1	0.209685	µg/kg	SO_VADOSE_SC
Aroclor 1248	9	9	0	0	0%	7	0	0.62062	µg/kg	SO_SAT_SC
Aroclor 1248	37	36	1	0	---	11	1	12.3764	µg/kg	SO_VADOSE_SC
Aroclor 1254	9	8	1	1	41%	8	0	0.126276	µg/kg	SO_SAT_SC
Aroclor 1254	37	18	19	18	---	5	1	2.52124	µg/kg	SO_VADOSE_SC
Aroclor 1260	9	7	2	2	13%	3	0	2.90402	µg/kg	SO_SAT_SC
Aroclor 1260	37	28	9	4	---	3	5	58.0443	µg/kg	SO_VADOSE_SC
Aroclor 1262	27	26	1	0	0%	0	0	---	---	NC
Aroclor 1268	27	26	1	0	0%	0	0	---	---	NC
Arsenic	26	1	25	25	99%	1	0	0.52974	µg/kg	SO_SAT_SC
Arsenic	279	2	277	276	---	2	1	10.548	µg/kg	SO_VADOSE_SC
Barium	11	0	11	11	100%	0	0	102	µg/kg	SO_Sat_SC
Barium	45	0	45	45	---	0	0	102	µg/kg	SO_vadose_SC
Benzene	46	44	2	2	1%	34	0	0.7146	µg/kg	SO_SAT_SC
Benzene	342	335	7	3	---	36	4	11.6442	µg/kg	SO_VADOSE_SC
Benzo(a)anthracene	30	16	14	14	37%	16	0	0.648844	µg/kg	SO_SAT_SC
Benzo(a)anthracene	85	54	31	29	---	40	2	12.9696	µg/kg	SO_VADOSE_SC
Benzo(a)pyrene	30	20	10	2	12%	8	8	2.20424	µg/kg	SO_SAT_SC
Benzo(a)pyrene	85	57	28	12	---	4	16	44.0776	µg/kg	SO_VADOSE_SC
Benzo(b)fluoranthene	30	20	10	10	27%	20	0	2.24988	µg/kg	SO_SAT_SC
Benzo(b)fluoranthene	85	53	32	21	---	10	11	44.9904	µg/kg	SO_VADOSE_SC
Benzo(g,h,i)perylene	30	20	10	7	6%	5	3	31.0513	µg/kg	SO_SAT_SC
Benzo(g,h,i)perylene	85	65	20	0	---	0	20	620.996	µg/kg	SO_VADOSE_SC
Benzo(k)fluoranthene	30	20	10	10	26%	17	0	2.20424	µg/kg	SO_SAT_SC
Benzo(k)fluoranthene	85	57	28	20	---	16	8	44.0776	µg/kg	SO_VADOSE_SC
Benzoic Acid	17	17	0	0	0%	8	0	965.804	µg/kg	SO_SAT_SC
Benzoic Acid	41	41	0	0	---	0	0	13484.7	µg/kg	SO_VADOSE_SC
Benzyl Alcohol	17	17	0	0	0%	12	0	81.1067	µg/kg	SO_SAT_SC
Benzyl Alcohol	41	41	0	0	---	0	0	1148.96	µg/kg	SO_VADOSE_SC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
Beryllium	1	1	0	0	0%	0	0	10000	µg/kg	SO_SAT_SC
Beryllium	21	17	4	0	---	0	4	10000	µg/kg	SO_VADOSE_SC
Beta-BHC	3	3	0	0	0%	0	0	---	---	NC
bis(2-Chloroethoxy) Methane	58	58	0	0	0%	0	0	---	---	NC
Bis(2-chloroisopropyl) ether	28	28	0	0	0%	0	0	---	---	NC
bis(2-Ethylhexyl)phthalate	17	8	9	7	15%	6	2	46.9801	µg/kg	SO_SAT_SC
bis(2-Ethylhexyl)phthalate	42	18	24	2	---	0	22	938.861	µg/kg	SO_VADOSE_SC
Bis-(2-Chloroethyl) Ether	59	59	0	0	0%	0	0	---	---	NC
Bromobenzene	386	386	0	0	0%	0	0	---	---	NC
Bromochloromethane	361	361	0	0	0%	0	0	---	---	NC
Bromodichloromethane	47	47	0	0	0%	47	0	0.125561	µg/kg	SO_SAT_SC
Bromodichloromethane	342	342	0	0	---	78	0	1.8498	µg/kg	SO_VADOSE_SC
Bromoethane	47	47	0	0	0%	0	0	---	---	NC
Bromoform	47	47	0	0	0%	22	0	1.99967	µg/kg	SO_SAT_SC
Bromoform	342	342	0	0		32	0	28.9765	µg/kg	SO_VADOSE_SC
Bromomethane	389	389	0	0	0%	0	0	---	---	NC
Butylbenzylphthalate	17	13	4	4	14%	13	0	5.12458	µg/kg	SO_SAT_SC
Butylbenzylphthalate	42	34	8	4	---	2	4	101.131	µg/kg	SO_VADOSE_SC
Cadmium	14	9	5	5	47%	9	0	1.7825	µg/kg	SO_SAT_SC
Cadmium	85	42	43	42	---	42	1	35	µg/kg	SO_VADOSE_SC
Carbazole	17	12	5	0	0%	0	5	50000	µg/kg	SO_Sat_SC
Carbazole	41	38	3	0	---	0	3	50000	µg/kg	SO_vadose_SC
Carbon Disulfide	40	31	9	0	0%	0	9	8000000	µg/kg	SO_Sat_SC
Carbon Disulfide	322	298	24	0	---	0	24	8000000	µg/kg	SO_vadose_SC
Carbon Tetrachloride	47	47	0	0	0%	47	0	0.110087	µg/kg	SO_SAT_SC
Carbon Tetrachloride	342	342	0	0		78	0	2.04228	µg/kg	SO_VADOSE_SC
Chlordane (technical)	3	3	0	0	0%	0	0	---	---	NC
Chlorobenzene	47	47	0	0	0%	11	0	13.96	µg/kg	SO_SAT_SC
Chlorobenzene	342	336	6	0	---	6	6	231.61	µg/kg	SO_VADOSE_SC
Chloroethane	47	47	0	0	0%	47	0	0.186033	µg/kg	SO_SAT_SC
Chloroethane	342	341	1	1	---	300	0	2.97732	µg/kg	SO_VADOSE_SC
Chloroform	47	46	1	0	0%	20	1	2.65073	µg/kg	SO_SAT_SC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
Chloroform	342	324	18	0	---	30	18	39.6777	µg/kg	SO_VADOSE_SC
Chloromethane	47	47	0	0	0%	8	0	59.0919	µg/kg	SO_SAT_SC
Chloromethane	342	340	2	0	---	4	2	919.206	µg/kg	SO_VADOSE_SC
Chromium	87	0	87	0	0%	0	0	---	---	NC
Chromium (VI)	5	3	2	1	4%	0	1	194.3	µg/kg	SO_SAT_SC
Chromium (VI)	22	16	6	0	---	0	6	3860	µg/kg	SO_VADOSE_SC
Chrysene	30	14	16	16	47%	14	0	0.662284	µg/kg	SO_SAT_SC
Chrysene	85	42	43	38	---	32	5	13.2384	µg/kg	SO_VADOSE_SC
cis-1,2-Dichloroethene	49	43	6	0	0%	0	6	800000	µg/kg	SO_Sat_SC
cis-1,2-Dichloroethene	352	295	57	0	---	0	57	800000	µg/kg	SO_vadose_SC
cis-1,3-Dichloropropene	389	389	0	0	0%	0	0	---	---	NC
Copper	7	0	7	7	98%	0	0	53.832	µg/kg	SO_SAT_SC
Copper	43	0	43	42	---	0	1	1070.4	µg/kg	SO_VADOSE_SC
delta-BHC	3	3	0	0	0%	0	0	---	---	NC
Di-n-Butylphthalate	17	13	4	0	3%	1	4	284.795	µg/kg	SO_SAT_SC
Di-n-Butylphthalate	42	35	7	2		0	5	284.795	µg/kg	SO_VADOSE_SC
Di-n-Octyl phthalate	17	17	0	0	0%	17	0	0.590949	µg/kg	SO_SAT_SC
Di-n-Octyl phthalate	42	42	0	0	---	42	0	11.051	µg/kg	SO_VADOSE_SC
Dibenz(a,h)anthracene	30	26	4	3	5%	21	1	7.3428	µg/kg	SO_SAT_SC
Dibenz(a,h)anthracene	85	74	11	3	---	2	8	140	µg/kg	SO_VADOSE_SC
Dibenzofuran	21	10	11	9	18%	10	2	15.5575	µg/kg	SO_SAT_SC
Dibenzofuran	55	44	11	5	---	0	6	307.719	µg/kg	SO_VADOSE_SC
Dibromochloromethane	389	389	0	0	0%	0	0	---	---	NC
Dibromomethane	386	386	0	0	0%	0	0	---	---	NC
Dibutyltin	3	2	1	0	0%	0	0	---	---	NC
Dichlorodifluoromethane	339	339	0	0	0%	0	0	---	---	NC
Dieldrin	3	3	0	0	0%	0	0	---	---	NC
Diesel Range Hydrocarbons	93	28	65	3	2%	0	62	2000000	µg/kg	SO_Sat_SC
Diesel Range Hydrocarbons	359	123	236	5	---	0	231	2000000	µg/kg	SO_vadose_SC
Diethyl phthalate	17	17	0	0	0%	1	0	269.271	µg/kg	SO_SAT_SC
Diethyl phthalate	41	41	0	0	---	0	0	4126.72	µg/kg	SO_VADOSE_SC
Dimethyl phthalate	17	17	0	0	0%	2	0	61.4286	µg/kg	SO_SAT_SC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
Dimethyl phthalate	42	41	1	0	---	0	1	857.143	µg/kg	SO_VADOSE_SC
Endosulfan I	3	3	0	0	0%	0	0	---	---	NC
Endosulfan II	3	3	0	0	0%	0	0	---	---	NC
Endosulfan Sulfate	3	3	0	0	0%	0	0	---	---	NC
Endrin	3	3	0	0	0%	0	0	---	---	NC
Endrin Aldehyde	3	3	0	0	0%	0	0	---	---	NC
Endrin Ketone	3	3	0	0	0%	0	0	---	---	NC
Ethylbenzene	46	34	12	3	1%	0	9	502.334	µg/kg	SO_SAT_SC
Ethylbenzene	342	317	25	2	---	0	23	6000	µg/kg	SO_VADOSE_SC
Ethylene Dibromide	386	386	0	0	0%	0	0	---	---	NC
Ethylene Glycol	1	1	0	0	0%	0	0	1.6E+08	µg/kg	SO_Sat_SC
Ethylene Glycol	2	1	1	0	---	0	1	1.6E+08	µg/kg	SO_vadose_SC
Fluoranthene	30	12	18	12	12%	1	6	160.858	µg/kg	SO_SAT_SC
Fluoranthene	85	43	42	2	---	0	40	3211.28	µg/kg	SO_VADOSE_SC
Fluorene	30	16	14	12	16%	11	2	23.8549	µg/kg	SO_SAT_SC
Fluorene	85	64	21	6	---	0	15	471.819	µg/kg	SO_VADOSE_SC
gamma-BHC (Lindane)	3	3	0	0	0%	0	0	---	---	NC
gamma-Chlordane	3	3	0	0	0%	0	0	---	---	NC
Gasoline Range Hydrocarbons	24	10	14	7	13%	0	7	30000	µg/kg	SO_Sat_SC
Gasoline Range Hydrocarbons	53	36	17	3	---	0	14	30000	µg/kg	SO_vadose_SC
Heavy Oils	10	0	10	0	0%	0	10	2000000	µg/kg	SO_vadose_SC
Heptachlor	3	3	0	0	0%	0	0	---	---	NC
Heptachlor Epoxide	3	3	0	0	0%	0	0	---	---	NC
Hexachlorobenzene	17	17	0	0	0%	17	0	0.001067	µg/kg	SO_SAT_SC
Hexachlorobenzene	42	42	0	0	---	42	0	0.020642	µg/kg	SO_VADOSE_SC
Hexachlorobutadiene	64	63	1	1	0%	60	0	0.62634	µg/kg	SO_SAT_SC
Hexachlorobutadiene	381	380	1	1	---	36	0	43.5137	µg/kg	SO_VADOSE_SC
Hexachlorocyclopentadiene	59	59	0	0	0%	0	0	---	---	NC
Hexachloroethane	59	59	0	0	0%	0	0	---	---	NC
Hexane	5	3	2	0	0%	0	2	4800000	µg/kg	SO_Sat_SC
Hexane	3	3	0	0	---	0	0	4800000	µg/kg	SO_vadose_SC
Indeno(1,2,3-cd)pyrene	30	21	9	9	13%	17	0	7.494	µg/kg	SO_SAT_SC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
Indeno(1,2,3-cd)pyrene	85	67	18	6	---	2	12	149.873	µg/kg	SO_VADOSE_SC
Isophorone	58	58	0	0	0%	0	0	---	---	NC
Isopropylbenzene	385	361	24	0	0%	0	0	---	---	NC
Lead	42	1	41	7	17%	0	34	25001.1	µg/kg	SO_SAT_SC
Lead	314	0	314	53	---	0	261	50000	µg/kg	SO_VADOSE_SC
Lube Oil Range Hydrocarbons	73	26	47	3	4%	0	44	2000000	µg/kg	SO_SAT_SC
Lube Oil Range Hydrocarbons	269	104	165	9	---	0	156	2000000	µg/kg	SO_Vadose_SC
m,p-Xylenes	80	63	17	0	0%	0	0	---	---	NC
Mercury	12	9	3	3	36%	9	0	0.2706	µg/kg	SO_SAT_SC
Mercury	69	43	26	26	---	43	0	5.39903	µg/kg	SO_VADOSE_SC
Methoxychlor	3	3	0	0	0%	0	0	---	---	NC
Methyl Iodide	47	47	0	0	0%	0	0	---	---	NC
Methyl tert-Butyl Ether	305	305	0	0	0%	0	0	---	---	NC
Methylene Chloride	47	39	8	0	1%	16	8	20	µg/kg	SO_SAT_SC
Methylene Chloride	342	299	43	3	---	48	40	20	µg/kg	SO_VADOSE_SC
Monobutyltin	3	2	1	0	0%	0	0	---	---	NC
Motor Oil	19	4	15	0	4%	0	15	2000000	µg/kg	SO_SAT_SC
Motor Oil	70	22	48	4	---	0	44	2000000	µg/kg	SO_Vadose_SC
N-Ammonia	3	2	1	0	0%	0	0	---	---	NC
n-Butylbenzene	360	343	17	0	0%	0	0	---	---	NC
N-Nitroso-Di-N-Propylamine	58	56	2	0	0%	0	0	---	---	NC
N-Nitrosodiphenylamine	58	58	0	0	0%	0	0	---	---	NC
n-Propylbenzene	385	359	26	0	0%	0	0	---	---	NC
Naphthalene	76	51	25	7	1%	2	18	121.974	µg/kg	SO_SAT_SC
Naphthalene	421	376	45	0	---	1	45	2301.28	µg/kg	SO_VADOSE_SC
Nickel	7	0	7	7	70%	0	0	327.15	µg/kg	SO_SAT_SC
Nickel	43	0	43	28	---	0	15	6530	µg/kg	SO_VADOSE_SC
Nitrobenzene	58	58	0	0	0%	0	0	---	---	NC
o-Chlorotoluene	386	386	0	0	0%	0	0	---	---	NC
o-Xylene	17	13	4	0	0%	0	4	1.6E+08	µg/kg	SO_Sat_SC
o-Xylene	63	55	8	0	---	0	8	1.6E+08	µg/kg	SO_vadose_SC
Pentachlorophenol	17	17	0	0	3%	17	0	1.0287	µg/kg	SO_SAT_SC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
Pentachlorophenol	42	40	2	2	---	38	0	19.872	µg/kg	SO_VADOSE_SC
Phenanthrene	30	13	17	15	18%	1	2	102.212	µg/kg	SO_SAT_SC
Phenanthrene	85	40	45	6	---	0	39	2031.75	µg/kg	SO_VADOSE_SC
Phenol	59	59	0	0	0%	0	0	---	---	NC
Propylene Glycol	3	3	0	0	0%	0	0	---	---	NC
Pyrene	30	12	18	7	6%	0	11	1006.34	µg/kg	SO_SAT_SC
Pyrene	85	41	44	0	---	0	44	20089.3	µg/kg	SO_VADOSE_SC
sec-Butylbenzene	385	367	18	0	0%	0	0	---	---	NC
Selenium	12	8	4	4	14%	8	0	27.15	µg/kg	SO_SAT_SC
Selenium	66	58	8	7	---	55	1	300	µg/kg	SO_VADOSE_SC
Silver	12	10	2	2	11%	10	0	13.3765	µg/kg	SO_SAT_SC
Silver	69	58	11	7	---	52	4	263.547	µg/kg	SO_VADOSE_SC
Styrene	46	45	1	0	0%	0	1	33000	µg/kg	SO_Sat_SC
Styrene	341	341	0	0	---	0	0	33000	µg/kg	SO_vadose_SC
Sulfide	3	3	0	0	0%	0	0	---	---	NC
tert-Butylbenzene	385	385	0	0	0%	0	0	---	---	NC
Tetrabutyltin	3	3	0	0	0%	0	0	---	---	NC
Tetrachloroethene	49	44	5	5	10%	44	0	0.207849	µg/kg	SO_SAT_SC
Tetrachloroethene	353	286	67	37	---	38	30	3.63615	µg/kg	SO_VADOSE_SC
Thallium	1	1	0	0	0%	1	0	17.1432	µg/kg	SO_SAT_SC
Thallium	21	21	0	0	---	0	0	342.24	µg/kg	SO_VADOSE_SC
Toluene	46	35	11	1	1%	1	10	907.4	µg/kg	SO_SAT_SC
Toluene	342	297	45	1	---	0	44	7000	µg/kg	SO_VADOSE_SC
Total Oil & Grease	3	2	1	0	0%	0	1	2000000	µg/kg	SO_SAT_SC
Total Oil & Grease	5	0	5	0	---	0	5	2000000	µg/kg	SO_Vadose_SC
Total Phenols	3	2	1	1	25%	2	0	35.1123	µg/kg	SO_SAT_SC
Total Phenols	5	0	5	1	---	0	4	498.954	µg/kg	SO_VADOSE_SC
Total Xylene	46	32	14	2	2%	0	12	9000	µg/kg	SO_SAT_SC
Total Xylene	336	293	43	4	---	0	39	9000	µg/kg	SO_VADOSE_SC
Toxaphene	3	3	0	0	0%	0	0	---	---	NC
trans-1,2-Dichloroethene	389	371	18	0	0%	0	0	---	---	NC
trans-1,3-Dichloropropene	389	389	0	0	0%	0	0	---	---	NC

Table 5 Soil Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Value	SC Unit	SC
trans-1,4-Dichloro-2-butene	47	47	0	0	0%	0	0	---	---	NC
Tributyltin	3	3	0	0	0%	0	0	---	---	NC
Trichloroethene	49	37	12	12	20%	30	0	0.761481	µg/kg	SO_SAT_SC
Trichloroethene	353	232	121	68	---	27	53	12.3201	µg/kg	SO_VADOSE_SC
Trichlorofluoromethane	389	389	0	0	0%	0	0	---	---	NC
Vinyl Acetate	49	49	0	0	0%	0	0	---	---	NC
Vinyl Chloride	49	48	1	1	2%	48	0	0.011344	µg/kg	SO_SAT_SC
Vinyl Chloride	353	346	7	7	---	346	0	0.211144	µg/kg	SO_VADOSE_SC
Zinc	7	0	7	7	60%	0	0	2033.19	µg/kg	SO_SAT_SC
Zinc	43	0	43	23	---	0	20	40579.1	µg/kg	SO_VADOSE_SC

ND: Number of samples not detected above Method Detection Limit for a specific compound

>=: Greater than or equal to

SC: Screening Criteria

µg/kg: micrograms per kilogram

NC: no screening criteria

Percent Samples >= SC: Percent of total samples (summed for unsaturated and saturated zone) with detections greater than the screening criteria

SO_SAT_SC: saturated zone screening criteria

SO_VADOSE_SC: unsaturated zone screening criteria

Table 6 Groundwater Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
1,1,1,2-Tetrachloroethane	298	298	0	0	0%	0	0		NC
1,1,1-Trichloroethane	298	273	25	0	0%	0	25	µg/l	417000
1,1,2,2-Tetrachloroethane	298	298	0	0	0%	154	0	µg/l	0.17
1,1,2-Trichloro-1,2,2-trifluoroethane	186	186	0	0	0%	0	0		NC
1,1,2-Trichloroethane	298	296	2	1	0%	127	1	µg/l	0.59
1,1-Dichloroethane	298	172	126	0	0%	1	126	µg/l	800
1,1-Dichloroethene	298	265	33	33	11%	219	0	µg/l	0.057
1,1-Dichloropropene	298	298	0	0	0%	0	0		NC

Table 6 Groundwater Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
1,2,3-Trichlorobenzene	298	298	0	0	0%	0	0		NC
1,2,3-Trichloropropane	298	298	0	0	0%	0	0		NC
1,2,4-Trichlorobenzene	394	394	0	0	0%	76	0	µg/l	1.1281
1,2,4-Trimethylbenzene	298	287	11	0	0%	0	0		NC
1,2-Dibromo-3-chloropropane	298	298	0	0	0%	0	0		NC
1,2-Dichlorobenzene	394	392	2	0	0%	5	2	µg/l	5.192
1,2-Dichloroethane	298	296	2	1	0%	127	1	µg/l	0.38
1,2-Dichloropropane	298	297	1	0	0%	127	1	µg/l	0.5
1,3,5-Trimethylbenzene	298	290	8	0	0%	0	0		NC
1,3-Dichlorobenzene	394	386	8	0	0%	2	8	µg/l	320
1,3-Dichloropropane	298	298	0	0	0%	0	0		NC
1,4-Dichlorobenzene	394	394	0	0	0%	5	0	µg/l	4.823
1-Chlorohexane	56	56	0	0	0%	0	0		NC
1-Methylnaphthalene	30	10	20	0	0%	0	0		NC
2,2'-Oxybis(1-Chloropropane)	96	96	0	0	0%	0	0		NC
2,2-Dichloropropane	298	298	0	0	0%	0	0		NC
2,4,5-Trichlorophenol	96	96	0	0	0%	0	0		NC
2,4,6-Trichlorophenol	96	96	0	0	0%	54	0	µg/l	1.4
2,4-Dichlorophenol	96	96	0	0	0%	0	0		NC
2,4-Dimethylphenol	96	96	0	0	0%	0	0	µg/l	2.021
2,4-Dinitrophenol	96	96	0	0	0%	0	0		NC
2,4-Dinitrotoluene	96	96	0	0	0%	0	0		NC
2,6-Dinitrotoluene	96	96	0	0	0%	0	0		NC
2-Butanone (Methyl ethyl ketone)	298	293	5	0	0%	0	0		NC
2-Chloroethylvinylether	186	186	0	0	0%	0	0		NC
2-Chloronaphthalene	96	96	0	0	0%	0	0		NC
2-Chlorophenol	96	96	0	0	0%	0	0		NC
2-Hexanone	298	298	0	0	0%	0	0		NC
2-Methylnaphthalene	222	169	53	1	0%	0	52	µg/l	18.1819
2-methylphenol (o-cresol)	96	96	0	0	0%	0	0	µg/l	7.11061
2-Nitroaniline	96	96	0	0	0%	0	0		NC
2-Nitrophenol	96	96	0	0	0%	0	0		NC
3,3'-Dichlorobenzidine	96	96	0	0	0%	0	0		NC
3-Nitroaniline	96	96	0	0	0%	0	0		NC
4,4'-DDT	22	22	0	0	0%	0	0		NC

Table 6 Groundwater Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
4,6-Dinitro-2-Methylphenol	96	96	0	0	0%	0	0		NC
4-Bromophenyl-phenylether	96	96	0	0	0%	0	0		NC
4-Chloro-3-methylphenol	96	96	0	0	0%	0	0		NC
4-Chloroaniline	96	96	0	0	0%	0	0		NC
4-Chlorophenyl-phenylether	96	96	0	0	0%	0	0		NC
4-Chlorotoluene	298	298	0	0	0%	0	0		NC
4-Isopropyltoluene	298	295	3	0	0%	0	0		NC
4-Methyl-2-pentanone	29	29	0	0	0%	0	0		NC
4-Methyl-2-Pentanone (MIBK)	269	268	1	0	0%	0	0		NC
4-methylphenol (p-cresol)	96	95	1	0	0%	0	1	µg/l	77.189
4-Nitroaniline	96	96	0	0	0%	0	0		NC
4-Nitrophenol	96	96	0	0	0%	0	0		NC
Acenaphthene	222	165	57	7	3%	0	50	µg/l	2.6144
Acenaphthylene	222	211	11	0	0%	0	11	µg/l	10.78431
Acetone	298	216	82	0	0%	0	0		NC
Acrolein	186	186	0	0	0%	0	0		NC
Acrylonitrile	186	186	0	0	0%	0	0		NC
Aldrin	22	22	0	0	0%	0	0		NC
Alkalinity	23	0	23	0	0%	0	0		NC
alpha Chlordane	22	22	0	0	0%	0	0		NC
alpha-BHC	22	22	0	0	0%	0	0		NC
Anthracene	222	186	36	0	0%	0	36	µg/l	10.7843
Antimony	162	114	48	0	0%	0	48	µg/l	5.6
Aroclor 1016	92	92	0	0	0%	4	0	µg/l	0.00582
Aroclor 1221	92	92	0	0	0%	4	0	µg/l	0.014
Aroclor 1232	92	92	0	0	0%	4	0	µg/l	0.014
Aroclor 1242	92	92	0	0	0%	4	0	µg/l	0.014
Aroclor 1248	92	92	0	0	0%	4	0	µg/l	0.014
Aroclor 1254	92	83	9	9	10%	48	0	µg/l	0.00166
Aroclor 1260	92	92	0	0	0%	4	0	µg/l	0.014
Arsenic	162	8	154	154	95%	8	0	µg/l	0.018
Benzene	300	280	20	2	1%	5	18	µg/l	1.2
Benzo(a)anthracene	222	214	8	8	4%	179	0	µg/l	0.0028
Benzo(a)pyrene	222	215	7	4	2%	2	3	µg/l	0.0028
Benzo(b)fluoranthene	222	218	4	4	2%	218	0	µg/l	0.0028

Table 6 Groundwater Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Benzo(g,h,i)perylene	222	216	6	3	1%	102	3	µg/l	0.01159
Benzo(k)fluoranthene	222	219	3	3	1%	166	0	µg/l	0.0028
Benzoic Acid	96	96	0	0	0%	0	0	µg/l	2242.926
Benzyl Alcohol	96	95	1	0	0%	0	1	µg/l	181.99
Beryllium	162	157	5	0	0%	0	5	µg/l	273
bis(2-Chloroethoxy) Methane	96	96	0	0	0%	0	0		NC
bis(2-Ethylhexyl)phthalate	96	63	33	33	34%	63	0	µg/l	0.285
Bis-(2-Chloroethyl) Ether	96	96	0	0	0%	96	0	µg/l	0.03
Bromobenzene	298	298	0	0	0%	0	0		NC
Bromochloromethane	298	298	0	0	0%	0	0		NC
Bromodichloromethane	298	298	0	0	0%	129	0	µg/l	0.27
Bromoethane	186	186	0	0	0%	0	0		NC
Bromoform	298	297	1	0	0%	4	1	µg/l	4.3
Bromomethane	298	298	0	0	0%	4	0	µg/l	47
Butylbenzylphthalate	96	91	5	5	5%	91	0	µg/l	0.5235
Cadmium	162	160	2	2	1%	0	0	µg/l	0.25
Calcium	10	0	10	0	0%	0	0		NC
Carbazole	96	95	1	0	0%	0	0		NC
Carbon Disulfide	298	293	5	0	0%	0	0		NC
Carbon Tetrachloride	298	298	0	0	0%	153	0	µg/l	0.23
Chlordane (cis)	22	22	0	0	0%	0	0		NC
Chloride	16	0	16	0	0%	0	0		NC
Chlorobenzene	298	297	1	0	0%	4	1	µg/l	20
Chloroethane	298	272	26	22	7%	126	4	µg/l	0.41
Chloroform	298	281	17	0	0%	4	17	µg/l	5.7
Chloromethane	298	293	5	0	0%	3	5	µg/l	133
Chromium	162	68	94	5	3%	0	89	µg/l	10
Chrysene	222	212	10	10	5%	133	0	µg/l	0.0028
cis-1,2-Dichloroethene	298	128	170	8	3%	1	162	µg/l	80
cis-1,3-Dichloropropene	298	298	0	0	0%	0	0		NC
Copper	162	11	151	51	31%	0	100	µg/l	2.4
Di-n-Butylphthalate	96	84	12	0	0%	0	12	µg/l	150.685
Di-n-Octyl phthalate	96	96	0	0	0%	96	0	µg/l	0.2959
Dibenz(a,h)anthracene	222	219	3	3	1%	198	0	µg/l	0.0028
Dibenzofuran	191	180	11	2	1%	0	9	µg/l	1.32743

Table 6 Groundwater Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Dibromochloromethane	298	298	0	0	0%	0	0		NC
Dibromomethane	298	298	0	0	0%	0	0		NC
Dichlorodifluoromethane	112	112	0	0	0%	0	0		NC
Dieldrin	22	22	0	0	0%	22	0	µg/l	0.000052
Diesel Range Hydrocarbons	128	89	39	9	7%	0	30	µg/l	500
Diethyl phthalate	96	95	1	0	0%	0	1	µg/l	484.127
Dimethyl phthalate	96	96	0	0	0%	0	0	µg/l	142.8571
Ethylbenzene	300	291	9	2	1%	0	7	µg/l	530
Ethylene Dibromide	298	298	0	0	0%	0	0		NC
Ethylene Glycol	4	3	1	0	0%	0	0		NC
Ferrous Iron	16	2	14	0	0%	0	0		NC
Fluoranthene	222	193	29	0	0%	0	29	µg/l	2.2567
Fluorene	222	196	26	2	1%	0	24	µg/l	2.0354
gamma-BHC (Lindane)	22	22	0	0	0%	0	0		NC
Gasoline Range Hydrocarbons	119	94	25	2	2%	0	23	µg/l	800
Heptachlor	22	22	0	0	0%	22	0	µg/l	0.000079
Hexachlorobenzene	118	118	0	0	0%	118	0	µg/l	0.00028
Hexachlorobutadiene	416	416	0	0	0%	203	0	µg/l	0.44
Hexachlorocyclopentadiene	96	96	0	0	0%	0	0	µg/l	40
Hexachloroethane	96	96	0	0	0%	0	0	µg/l	1.4
Hexane	72	72	0	0	0%	0	0		NC
Indeno(1,2,3-cd)pyrene	222	216	6	6	3%	150	0	µg/l	0.0028
Iron	30	2	28	0	0%	0	0		NC
Isophorone	96	96	0	0	0%	0	0		NC
Isopropylbenzene	298	291	7	0	0%	0	0		NC
Lead	162	150	12	5	3%	0	7	µg/l	2.5
Lube Oil Range Hydrocarbons	34	15	19	1	3%	0	18	µg/l	500
m,p-Xylenes	251	241	10	0	0%	0	0		NC
Magnesium	10	0	10	0	0%	0	0		NC
Manganese	6	0	6	0	0%	0	0		NC
Mercury	161	155	6	6	4%	99	0	µg/l	0.0052
Methyl Iodide	186	186	0	0	0%	0	0		NC
Methyl tert-Butyl Ether	105	105	0	0	0%	0	0		NC
Methylene Chloride	298	288	10	0	0%	88	10	µg/l	4.6
Motor Oil	94	93	1	1	1%	41	0	µg/l	500

Table 6 Groundwater Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
n-Butylbenzene	298	294	4	0	0%	0	0		NC
N-Nitrate	15	9	6	0	0%	0	0		NC
N-Nitrite	15	15	0	0	0%	0	0		NC
N-Nitroso-Di-N-Propylamine	96	96	0	0	0%	96	0	µg/l	0.005
N-Nitrosodiphenylamine	96	96	0	0	0%	0	0	µg/l	1.95
n-Propylbenzene	298	292	6	0	0%	0	0		NC
Naphthalene	520	449	71	0	0%	4	71	µg/l	53.8
Nickel	162	3	159	16	10%	0	143	µg/l	5
Nitrobenzene	96	96	0	0	0%	0	0	µg/l	17
o-Chlorotoluene	298	297	1	0	0%	0	0		NC
o-Xylene	298	291	7	0	0%	0	0		NC
Pentachlorophenol	96	96	0	0	0%	96	0	µg/l	0.27
pH	9	0	9	0	0%	0	0		NC
Phenanthrene	222	170	52	0	0%	0	52	µg/l	4.8
Phenol	96	96	0	0	0%	0	0	µg/l	78.35
Propylene Glycol	4	3	1	0	0%	0	0		NC
Pyrene	222	178	44	0	0%	0	44	µg/l	14.40922
sec-Butylbenzene	298	295	3	0	0%	0	0		NC
Selenium	162	82	80	13	8%	0	67	µg/l	5
Silver	162	153	9	0	0%	0	9	µg/l	1.5323
Styrene	298	298	0	0	0%	0	0		NC
Sulfate	15	1	14	0	0%	0	0		NC
Sulfide	16	16	0	0	0%	0	0		NC
tert-Butylbenzene	298	298	0	0	0%	0	0		NC
Tetrachloroethene	298	279	19	16	5%	127	3	µg/l	0.3872
Thallium	162	161	1	1	1%	0	0	µg/l	0.24
Toluene	300	283	17	3	1%	0	14	µg/l	1300
Total Xylene	89	89	0	0	0%	0	0	µg/l	16000
trans-1,2-Dichloroethene	298	241	57	0	0%	0	0		NC
trans-1,3-Dichloropropene	298	298	0	0	0%	0	0		NC
trans-1,4-Dichloro-2-butene	186	186	0	0	0%	0	0		NC
Trichloroethene	298	169	129	73	24%	4	56	µg/l	1.53
Trichlorofluoromethane	298	298	0	0	0%	0	0		NC
Vinyl Acetate	186	186	0	0	0%	0	0		NC
Vinyl Chloride	298	178	120	120	40%	178	0	µg/l	0.025

Table 6 Groundwater Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Zinc	162	97	65	3	2%	0	62	µg/l	32.56

ND: Number of samples not detected above Method Detection Limit for a specific compound

>=: Greater than or equal to

SC: Screening Criteria

µg/l: micrograms per liter

NC: no screening criteria

Percent Samples >= SC: Percent of total samples with detections greater than the screening criteria

Table 7 Seep Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
1,1,1,2-Tetrachloroethane	5	5	0	0	0%	0	0		NC
1,1,1-Trichloroethane	5	4	1	0	0%	0	1	µg/l	417000
1,1,2,2-Tetrachloroethane	5	5	0	0	0%	0	0	µg/l	0.17
1,1,2-Trichloro-1,2,2-trifluoroethane	5	5	0	0	0%	0	0		NC
1,1,2-Trichloroethane	5	5	0	0	0%	0	0	µg/l	0.59
1,1-Dichloroethane	5	4	1	0	0%	0	1	µg/l	800
1,1-Dichloroethene	5	5	0	0	0%	5	0	µg/l	0.057
1,1-Dichloropropene	5	5	0	0	0%	0	0		NC
1,2,3-Trichlorobenzene	5	5	0	0	0%	0	0		NC
1,2,3-Trichloropropane	5	5	0	0	0%	0	0		NC
1,2,4-Trichlorobenzene	13	13	0	0	0%	0	0	µg/l	1.1281
1,2,4-Trimethylbenzene	5	5	0	0	0%	0	0		NC
1,2-Dibromo-3-chloropropane	5	5	0	0	0%	0	0		NC
1,2-Dichlorobenzene	13	13	0	0	0%	0	0	µg/l	5.192
1,2-Dichloroethane	5	5	0	0	0%	0	0	µg/l	0.38
1,2-Dichloropropane	5	5	0	0	0%	0	0	µg/l	0.5
1,3,5-Trimethylbenzene	5	5	0	0	0%	0	0		NC
1,3-Dichlorobenzene	13	13	0	0	0%	0	0	µg/l	320
1,3-Dichloropropane	5	5	0	0	0%	0	0		NC
1,4-Dichlorobenzene	13	13	0	0	0%	0	0	µg/l	4.823

Table 7 Seep Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
2,2'-Oxybis(1-Chloropropane)	8	8	0	0	0%	0	0		NC
2,2-Dichloropropane	5	5	0	0	0%	0	0		NC
2,4,5-Trichlorophenol	8	8	0	0	0%	0	0		NC
2,4,6-Trichlorophenol	8	8	0	0	0%	0	0	µg/l	1.4
2,4-Dichlorophenol	8	8	0	0	0%	0	0		NC
2,4-Dimethylphenol	8	8	0	0	0%	0	0	µg/l	2.021
2,4-Dinitrophenol	8	8	0	0	0%	0	0		NC
2,4-Dinitrotoluene	8	8	0	0	0%	0	0		NC
2,6-Dinitrotoluene	8	8	0	0	0%	0	0		NC
2-Butanone (Methyl ethyl ketone)	5	5	0	0	0%	0	0		NC
2-Chloroethylvinylether	5	5	0	0	0%	0	0		NC
2-Chloronaphthalene	8	8	0	0	0%	0	0		NC
2-Chlorophenol	8	8	0	0	0%	0	0		NC
2-Hexanone	5	5	0	0	0%	0	0		NC
2-Methylnaphthalene	12	11	1	0	0%	0	1	µg/l	18.1819
2-methylphenol (o-cresol)	8	8	0	0	0%	0	0	µg/l	7.11061
2-Nitroaniline	8	8	0	0	0%	0	0		NC
2-Nitrophenol	8	8	0	0	0%	0	0		NC
3,3'-Dichlorobenzidine	8	8	0	0	0%	0	0		NC
3-Nitroaniline	8	8	0	0	0%	0	0		NC
4,6-Dinitro-2-Methylphenol	8	8	0	0	0%	0	0		NC
4-Bromophenyl-phenylether	8	8	0	0	0%	0	0		NC
4-Chloro-3-methylphenol	8	8	0	0	0%	0	0		NC
4-Chloroaniline	8	8	0	0	0%	0	0		NC
4-Chlorophenyl-phenylether	8	8	0	0	0%	0	0		NC
4-Chlorotoluene	5	5	0	0	0%	0	0		NC
4-Isopropyltoluene	5	5	0	0	0%	0	0		NC
4-Methyl-2-Pentanone (MIBK)	5	5	0	0	0%	0	0		NC
4-methylphenol (p-cresol)	8	8	0	0	0%	0	0	µg/l	77.189
4-Nitroaniline	8	8	0	0	0%	0	0		NC
4-Nitrophenol	8	8	0	0	0%	0	0		NC
Acenaphthene	12	10	2	0	0%	0	2	µg/l	2.6144
Acenaphthylene	12	12	0	0	0%	0	0	µg/l	10.78431
Acetone	5	4	1	0	0%	0	0		NC
Acrolein	5	5	0	0	0%	0	0		NC

Table 7 Seep Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Acrylonitrile	5	5	0	0	0%	0	0		NC
Ammonia	4	0	4	0	0%	0	0		NC
Anthracene	12	10	2	0	0%	0	2	µg/l	10.7843
Antimony	8	0	8	0	0%	0	8	µg/l	5.6
Aroclor 1016	8	8	0	0	0%	0	0	µg/l	0.00582
Aroclor 1221	8	8	0	0	0%	0	0	µg/l	0.014
Aroclor 1232	8	8	0	0	0%	0	0	µg/l	0.014
Aroclor 1242	8	8	0	0	0%	0	0	µg/l	0.014
Aroclor 1248	8	8	0	0	0%	0	0	µg/l	0.014
Aroclor 1254	8	3	5	5	63%	3	0	µg/l	0.00166
Aroclor 1260	8	4	4	2	25%	0	2	µg/l	0.014
Aroclor 1262	4	4	0	0	0%	0	0		NC
Aroclor 1268	4	4	0	0	0%	0	0		NC
Arsenic	16	1	15	15	94%	1	0	µg/l	0.018
Benzene	5	5	0	0	0%	0	0	µg/l	1.2
Benzo(a)anthracene	12	10	2	2	17%	8	0	µg/l	0.0028
Benzo(a)pyrene	12	11	1	0	0%	4	1	µg/l	0.0028
Benzo(b)fluoranthene	12	10	2	2	17%	10	0	µg/l	0.0028
Benzo(g,h,i)perylene	12	10	2	1	8%	8	1	µg/l	0.01159
Benzo(k)fluoranthene	12	10	2	2	17%	10	0	µg/l	0.0028
Benzoic Acid	8	8	0	0	0%	0	0	µg/l	2242.926
Benzyl Alcohol	8	8	0	0	0%	0	0	µg/l	181.99
Beryllium	8	8	0	0	0%	0	0	µg/l	273
bis(2-Chloroethoxy) Methane	8	8	0	0	0%	0	0		NC
bis(2-Ethylhexyl)phthalate	8	8	0	0	0%	4	0	µg/l	0.285
Bis-(2-Chloroethyl) Ether	8	8	0	0	0%	8	0	µg/l	0.03
Bromobenzene	5	5	0	0	0%	0	0		NC
Bromochloromethane	5	5	0	0	0%	0	0		NC
Bromodichloromethane	5	5	0	0	0%	0	0	µg/l	0.27
Bromoethane	5	5	0	0	0%	0	0		NC
Bromoform	5	5	0	0	0%	0	0	µg/l	4.3
Bromomethane	5	5	0	0	0%	0	0	µg/l	47
Butylbenzylphthalate	8	8	0	0	0%	4	0	µg/l	0.5235
Cadmium	16	15	1	0	0%	0	1	µg/l	0.25
Carbazole	8	8	0	0	0%	0	0		NC

Table 7 Seep Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Carbon Disulfide	5	5	0	0	0%	0	0		NC
Carbon Tetrachloride	5	5	0	0	0%	0	0	µg/l	0.23
Chlorobenzene	5	5	0	0	0%	0	0	µg/l	20
Chloroethane	5	5	0	0	0%	0	0	µg/l	0.41
Chloroform	5	5	0	0	0%	0	0	µg/l	5.7
Chloromethane	5	4	1	0	0%	0	1	µg/l	133
Chromium	16	0	16	0	0%	0	16	µg/l	10
Chromium (VI)	4	4	0	0	0%	0	0	µg/l	10
Chrysene	12	10	2	2	17%	8	0	µg/l	0.0028
cis-1,2-Dichloroethene	5	4	1	0	0%	0	1	µg/l	80
cis-1,3-Dichloropropene	5	5	0	0	0%	0	0		NC
Copper	16	2	14	14	88%	0	0	µg/l	2.4
Cyanide	4	3	1	0	0%	0	0		NC
Di-n-Butylphthalate	8	7	1	0	0%	0	1	µg/l	150.685
Di-n-Octyl phthalate	8	8	0	0	0%	8	0	µg/l	0.2959
Dibenz(a,h)anthracene	12	12	0	0	0%	12	0	µg/l	0.0028
Dibenzofuran	12	10	2	0	0%	0	2	µg/l	1.32743
Dibromochloromethane	5	5	0	0	0%	0	0		NC
Dibromomethane	5	5	0	0	0%	0	0		NC
Diethyl phthalate	8	8	0	0	0%	0	0	µg/l	484.127
Dimethyl phthalate	8	8	0	0	0%	0	0	µg/l	142.8571
Ethylbenzene	5	5	0	0	0%	0	0	µg/l	530
Ethylene Dibromide	5	5	0	0	0%	0	0		NC
Fluoranthene	12	10	2	0	0%	0	2	µg/l	2.2567
Fluorene	12	10	2	0	0%	0	2	µg/l	2.0354
Gasoline Range Hydrocarbons	4	4	0	0	0%	0	0	µg/l	800
Hexachlorobenzene	8	8	0	0	0%	8	0	µg/l	0.00028
Hexachlorobutadiene	13	13	0	0	0%	4	0	µg/l	0.44
Hexachlorocyclopentadiene	8	8	0	0	0%	0	0	µg/l	40
Hexachloroethane	8	8	0	0	0%	0	0	µg/l	1.4
Indeno(1,2,3-cd)pyrene	12	10	2	2	17%	9	0	µg/l	0.0028
Isophorone	8	8	0	0	0%	0	0		NC
Isopropylbenzene	5	5	0	0	0%	0	0		NC
Lead	16	11	5	3	19%	0	2	µg/l	2.5
m,p-Xylenes	5	5	0	0	0%	0	0		NC

Table 7 Seep Sample Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Mercury	12	12	0	0	0%	4	0	µg/l	0.0052
Methyl Iodide	5	5	0	0	0%	0	0		
Methylene Chloride	5	5	0	0	0%	0	0	µg/l	4.6
n-Butylbenzene	5	5	0	0	0%	0	0		NC
N-Nitroso-Di-N-Propylamine	8	8	0	0	0%	8	0	µg/l	0.005
N-Nitrosodiphenylamine	8	8	0	0	0%	0	0	µg/l	1.95
n-Propylbenzene	5	5	0	0	0%	0	0		
Naphthalene	17	15	2	0	0%	0	2	µg/l	53.8
Nickel	16	4	12	1	6%	0	11	µg/l	5
Nitrobenzene	8	8	0	0	0%	0	0	µg/l	17
o-Chlorotoluene	5	5	0	0	0%	0	0		NC
o-Xylene	5	5	0	0	0%	0	0		NC
Pentachlorophenol	8	8	0	0	0%	8	0	µg/l	0.27
Phenanthrene	12	10	2	0	0%	0	2	µg/l	4.8
Phenol	8	8	0	0	0%	0	0	µg/l	78.35
Pyrene	12	8	4	0	0%	0	4	µg/l	14.40922
sec-Butylbenzene	5	5	0	0	0%	0	0		NC
Selenium	16	12	4	4	25%	0	0	µg/l	5
Silver	16	16	0	0	0%	0	0	µg/l	1.5323
Styrene	5	5	0	0	0%	0	0		NC
tert-Butylbenzene	5	5	0	0	0%	0	0		NC
Tetrachloroethene	5	5	0	0	0%	0	0	µg/l	0.3872
Thallium	8	8	0	0	0%	0	0	µg/l	0.24
Toluene	5	5	0	0	0%	0	0	µg/l	1300
Total Xylene	5	5	0	0	0%	0	0	µg/l	16000
trans-1,2-Dichloroethene	5	5	0	0	0%	0	0		NC
trans-1,3-Dichloropropene	5	5	0	0	0%	0	0		NC
trans-1,4-Dichloro-2-butene	5	5	0	0	0%	0	0		NC
Trichloroethene	5	1	4	1	20%	0	3	µg/l	1.53
Trichlorofluoromethane	5	5	0	0	0%	0	0		NC
Vinyl Acetate	5	5	0	0	0%	0	0		NC
Vinyl Chloride	5	5	0	0	0%	5	0	µg/l	0.025
Zinc	16	2	14	1	6%	0	13	µg/l	32.56

ND: Number of samples not detected above Method Detection Limit for a specific compound

>=: Greater than or equal to

SC: Screening Criteria

µg/l: micrograms per liter

NC: no screening criteria

Percent Samples >= SC: Percent of total samples with detections greater than the screening criteria

Table 8 Stormwater Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
1,1,1,2-Tetrachloroethane	4	4	0	0	0%	0	0		NC
1,1,1-Trichloroethane	4	3	1	0	0%	0	1	µg/l	417000
1,1,2,2-Tetrachloroethane	4	4	0	0	0%	0	0	µg/l	0.17
1,1,2-Trichloro-1,2,2-trifluoroethane	4	4	0	0	0%	0	0		NC
1,1,2-Trichloroethane	4	4	0	0	0%	0	0	µg/l	0.59
1,1-Dichloroethane	4	1	3	0	0%	0	3	µg/l	800
1,1-Dichloroethene	4	4	0	0	0%	4	0	µg/l	0.057
1,1-Dichloropropene	4	4	0	0	0%	0	0		NC
1,2,3-Trichlorobenzene	4	4	0	0	0%	0	0		NC
1,2,3-Trichloropropane	4	4	0	0	0%	0	0		NC
1,2,4-Trichlorobenzene	16	16	0	0	0%	0	0	µg/l	1.1281
1,2,4-Trimethylbenzene	4	2	2	0	0%	0	0		NC
1,2-Dibromo-3-chloropropane	4	4	0	0	0%	0	0		NC
1,2-Dichlorobenzene	16	16	0	0	0%	0	0	µg/l	5.192
1,2-Dichloroethane	4	4	0	0	0%	0	0	µg/l	0.38
1,2-Dichloropropane	4	4	0	0	0%	0	0	µg/l	0.5
1,3,5-Trimethylbenzene	4	2	2	0	0%	0	0		NC
1,3-Dichlorobenzene	16	16	0	0	0%	0	0	µg/l	320
1,3-Dichloropropane	4	4	0	0	0%	0	0		NC
1,4-Dichlorobenzene	16	16	0	0	0%	0	0	µg/l	4.823
1-Methylnaphthalene	2	2	0	0	0%	0	0		NC
2,2'-Oxybis(1-Chloropropane)	12	12	0	0	0%	0	0		NC
2,2-Dichloropropane	4	4	0	0	0%	0	0		NC
2,4,5-Trichlorophenol	12	12	0	0	0%	0	0		NC
2,4,6-Trichlorophenol	12	12	0	0	0%	6	0	µg/l	1.4
2,4-Dichlorophenol	12	12	0	0	0%	0	0		NC
2,4-Dimethylphenol	12	12	0	0	0%	0	0	µg/l	2.021
2,4-Dinitrophenol	12	12	0	0	0%	0	0		NC

Table 8 Stormwater Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
2,4-Dinitrotoluene	12	12	0	0	0%	0	0		NC
2,6-Dinitrotoluene	12	12	0	0	0%	0	0		NC
2-Butanone (Methyl ethyl ketone)	4	2	2	0	0%	0	0		NC
2-Chloroethylvinylether	4	4	0	0	0%	0	0		NC
2-Chloronaphthalene	12	12	0	0	0%	0	0		NC
2-Chlorophenol	12	12	0	0	0%	0	0		NC
2-Hexanone	4	4	0	0	0%	0	0		NC
2-Methylnaphthalene	16	12	4	0	0%	0	4	µg/l	18.1819
2-methylphenol (o-cresol)	12	12	0	0	0%	0	0	µg/l	7.11061
2-Nitroaniline	12	12	0	0	0%	0	0		NC
2-Nitrophenol	12	12	0	0	0%	0	0		NC
3,3'-Dichlorobenzidine	12	12	0	0	0%	0	0		NC
3-Nitroaniline	12	12	0	0	0%	0	0		NC
4,6-Dinitro-2-Methylphenol	12	12	0	0	0%	0	0		NC
4-Bromophenyl-phenylether	12	12	0	0	0%	0	0		NC
4-Chloro-3-methylphenol	12	12	0	0	0%	0	0		NC
4-Chloroaniline	12	12	0	0	0%	0	0		NC
4-Chlorophenyl-phenylether	12	12	0	0	0%	0	0		NC
4-Chlorotoluene	4	4	0	0	0%	0	0		NC
4-Isopropyltoluene	4	4	0	0	0%	0	0		NC
4-Methyl-2-Pentanone (MIBK)	4	4	0	0	0%	0	0		NC
4-methylphenol (p-cresol)	12	12	0	0	0%	0	0	µg/l	77.189
4-Nitroaniline	12	12	0	0	0%	0	0		NC
4-Nitrophenol	12	12	0	0	0%	0	0		NC
Acenaphthene	16	13	3	0	0%	0	3	µg/l	2.6144
Acenaphthylene	16	13	3	0	0%	0	3	µg/l	10.78431
Acetone	4	2	2	0	0%	0	0		NC
Acrolein	4	4	0	0	0%	0	0		NC
Acrylonitrile	4	4	0	0	0%	0	0		NC
Ammonia	8	0	8	0	0%	0	0		NC
Anthracene	16	12	4	0	0%	0	4	µg/l	10.7843
Antimony	8	4	4	0	0%	0	4	µg/l	5.6
Aroclor 1016	12	12	0	0	0%	0	0	µg/l	0.00582
Aroclor 1221	12	12	0	0	0%	0	0	µg/l	0.014
Aroclor 1232	12	12	0	0	0%	0	0	µg/l	0.014

Table 8 Stormwater Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Aroclor 1242	12	12	0	0	0%	0	0	µg/l	0.014
Aroclor 1248	12	12	0	0	0%	0	0	µg/l	0.014
Aroclor 1254	12	7	5	5	42%	4	0	µg/l	0.00166
Aroclor 1260	12	11	1	1	8%	0	0	µg/l	0.014
Aroclor 1262	8	8	0	0	0%	0	0		NC
Aroclor 1268	8	8	0	0	0%	0	0		NC
Arsenic	25	0	25	25	100%	0	0	µg/l	0.018
Benzene	4	2	2	0	0%	0	2	µg/l	1.2
Benzo(a)anthracene	16	14	2	2	13%	12	0	µg/l	0.0028
Benzo(a)pyrene	16	15	1	0	0%	8	1	µg/l	0.0028
Benzo(b)fluoranthene	16	14	2	2	13%	14	0	µg/l	0.0028
Benzo(g,h,i)perylene	16	14	2	2	13%	12	0	µg/l	0.01159
Benzo(k)fluoranthene	16	14	2	2	13%	14	0	µg/l	0.0028
Benzoic Acid	12	12	0	0	0%	0	0	µg/l	2242.926
Benzyl Alcohol	12	12	0	0	0%	0	0	µg/l	181.99
Beryllium	8	8	0	0	0%	0	0	µg/l	273
bis(2-Chloroethoxy) Methane	12	12	0	0	0%	0	0		NC
bis(2-Ethylhexyl)phthalate	12	10	2	2	17%	10	0	µg/l	0.285
Bis-(2-Chloroethyl) Ether	12	12	0	0	0%	12	0	µg/l	0.03
Bromobenzene	4	4	0	0	0%	0	0		NC
Bromochloromethane	4	4	0	0	0%	0	0		NC
Bromodichloromethane	4	4	0	0	0%	0	0	µg/l	0.27
Bromoethane	4	4	0	0	0%	0	0		NC
Bromoform	4	4	0	0	0%	0	0	µg/l	4.3
Bromomethane	4	4	0	0	0%	0	0	µg/l	47
Butylbenzylphthalate	12	12	0	0	0%	10	0	µg/l	0.5235
Cadmium	24	9	15	11	46%	0	4	µg/l	0.25
Carbazole	12	12	0	0	0%	0	0		NC
Carbon Disulfide	4	4	0	0	0%	0	0		NC
Carbon Tetrachloride	4	4	0	0	0%	0	0	µg/l	0.23
Chlorobenzene	4	4	0	0	0%	0	0	µg/l	20
Chloroethane	4	2	2	1	25%	0	1	µg/l	0.41
Chloroform	4	4	0	0	0%	0	0	µg/l	5.7
Chloromethane	4	4	0	0	0%	0	0	µg/l	133
Chromium	24	0	24	0	0%	0	24	µg/l	10

Table 8 Stormwater Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Chromium (VI)	9	9	0	0	0%	0	0	µg/l	10
Chrysene	16	14	2	2	13%	12	0	µg/l	0.0028
cis-1,2-Dichloroethene	4	1	3	0	0%	0	3	µg/l	80
cis-1,3-Dichloropropene	4	4	0	0	0%	0	0		NC
Copper	24	0	24	22	92%	0	2	µg/l	2.4
Cyanide	8	8	0	0	0%	0	0		NC
Di-n-Butylphthalate	12	12	0	0	0%	0	0	µg/l	150.685
Di-n-Octyl phthalate	12	11	1	1	8%	9	0	µg/l	0.2959
Dibenz(a,h)anthracene	16	16	0	0	0%	16	0	µg/l	0.0028
Dibenzofuran	16	16	0	0	0%	0	0	µg/l	1.32743
Dibromochloromethane	4	4	0	0	0%	0	0		NC
Dibromomethane	4	4	0	0	0%	0	0		NC
Diethyl phthalate	12	12	0	0	0%	0	0	µg/l	484.127
Dimethyl phthalate	12	12	0	0	0%	0	0	µg/l	142.8571
Ethylbenzene	4	1	3	0	0%	0	3	µg/l	530
Ethylene Dibromide	4	4	0	0	0%	0	0		NC
Fluoranthene	16	12	4	0	0%	0	4	µg/l	2.2567
Fluorene	16	14	2	0	0%	0	2	µg/l	2.0354
Gasoline Range Hydrocarbons	4	4	0	0	0%	0	0	µg/l	800
Hexachlorobenzene	12	12	0	0	0%	12	0	µg/l	0.00028
Hexachlorobutadiene	16	16	0	0	0%	7	0	µg/l	0.44
Hexachlorocyclopentadiene	12	12	0	0	0%	0	0	µg/l	40
Hexachloroethane	12	12	0	0	0%	0	0	µg/l	1.4
Indeno(1,2,3-cd)pyrene	16	14	2	2	13%	13	0	µg/l	0.0028
Isophorone	12	12	0	0	0%	0	0		NC
Isopropylbenzene	4	4	0	0	0%	0	0		NC
Lead	24	6	18	12	50%	0	6	µg/l	2.5
m,p-Xylenes	4	1	3	0	0%	0	0		NC
Mercury	24	21	3	3	13%	4	0	µg/l	0.0052
Methyl Iodide	4	4	0	0	0%	0	0		
Methylene Chloride	4	4	0	0	0%	0	0	µg/l	4.6
n-Butylbenzene	4	4	0	0	0%	0	0		NC
N-Nitroso-Di-N-Propylamine	12	12	0	0	0%	12	0	µg/l	0.005
N-Nitrosodiphenylamine	12	12	0	0	0%	0	0	µg/l	1.95
n-Propylbenzene	4	4	0	0	0%	0	0		NC

Table 8 Stormwater Counts at the 8801 Site

Parameter	Number of Samples Analyzed	ND	Detect	Detect >= SC	Percent Samples >= SC	ND >= SC	Detect <= SC	SC Unit	SC
Naphthalene	20	16	4	0	0%	0	4	µg/l	53.8
Nickel	24	0	24	3	13%	0	21	µg/l	5
Nitrobenzene	12	12	0	0	0%	0	0	µg/l	17
o-Chlorotoluene	4	4	0	0	0%	0	0		NC
o-Xylene	4	1	3	0	0%	0	0		NC
Pentachlorophenol	12	12	0	0	0%	12	0	µg/l	0.27
Phenanthrene	16	12	4	0	0%	0	4	µg/l	4.8
Phenol	12	12	0	0	0%	0	0	µg/l	78.35
Pyrene	16	12	4	0	0%	0	4	µg/l	14.40922
sec-Butylbenzene	4	4	0	0	0%	0	0		NC
Selenium	24	19	5	0	0%	0	5	µg/l	5
Silver	24	24	0	0	0%	0	0	µg/l	1.5323
Styrene	4	4	0	0	0%	0	0		NC
tert-Butylbenzene	4	4	0	0	0%	0	0		NC
Tetrachloroethene	4	4	0	0	0%	0	0	µg/l	0.3872
Thallium	8	8	0	0	0%	0	0	µg/l	0.24
Toluene	4	1	3	0	0%	0	3	µg/l	1300
Total Xylene	4	1	3	0	0%	0	3	µg/l	16000
trans-1,2-Dichloroethene	4	2	2	0	0%	0	0		NC
trans-1,3-Dichloropropene	4	4	0	0	0%	0	0		NC
trans-1,4-Dichloro-2-butene	4	4	0	0	0%	0	0		NC
Trichloroethene	4	3	1	0	0%	0	1	µg/l	1.53
Trichlorofluoromethane	4	4	0	0	0%	0	0		NC
Vinyl Acetate	4	4	0	0	0%	0	0		NC
Vinyl Chloride	4	1	3	3	75%	1	0	µg/l	0.025
Zinc	24	0	24	22	92%	0	2	µg/l	32.56

ND: Number of samples not detected above Method Detection Limit for a specific compound

>=: Greater than or equal to

SC: Screening Criteria

µg/l: micrograms per liter

NC: no screening criteria

Percent Samples >= SC: Percent of total samples with detections greater than the screening criteria

6.0 ANALYTICAL RESULTS

This section presents a comprehensive summary of the laboratory analytical results from soil, groundwater, and seeps collected at the 8801 site between 1986 and 2007. Stormwater and solid samples from the catch basins are briefly discussed for context and are discussed more fully in Anchor QEA's report (Anchor QEA 2009) and Windward's reports (Windward 2010a and 2010b). To maintain relevance to current conditions, the summary excludes soil samples collected in areas that were remediated (where soil was excavated and removed from the site) and groundwater samples collected before 2002. The results of the laboratory analyses are presented in Tables and Figures in Appendices F through J.

6.1 SOIL ANALYTICAL RESULTS

Between 1986 and 2007, soil samples were collected from 361 locations on the 8801 site. Chapter 3 reviews the purposes of the soil investigations and analytical programs undertaken for each sampling event. Soil data were first sorted by depth of collection. Samples collected from the upper 6 feet of soil are assumed to be unsaturated, and samples collected below 6 feet bgs are assumed to be saturated (see Chapter 5). When the majority of the sampling interval straddled the 6-foot threshold, samples were considered to be a saturated. Sorted soil data were then screened against PSCs for saturated or unsaturated soil as appropriate. Soil data were also screened against criteria for human health and ecological exposure if the value was more stringent than the soil partition value. As a definition, a sample refers to a discrete soil sample and a location refers to a discrete boring or sample point. Multiple samples may be collected in a location.

A review of the data indicates that the following compounds and metals were detected in excess of their respective PSCs in soil:

<u>Total Petroleum Hydrocarbons (analyzed by NWTPH Gx and NWTPH Dx Extended)</u>

- Gasoline range hydrocarbons*
- Diesel range hydrocarbons*
- Lube oil / motor oil / heavy oil range hydrocarbons*

<u>VOCs (analyzed by EPA Method 8260B and 8260C)</u>

- 1,1,2-Trichloroethane*
- 1,1-Dichloroethene*
- 1,2-Dichloroethane*

- Benzene*
- Chloroethane*
- Chloroform
- cis-1,2-Dichloroethene*
- Ethylbenzene*
- Hexachlorobutadiene
- Methylene chloride
- Tetrachloroethene*
- Toluene*
- Total xylenes
- Trichloroethene*
- Vinyl chloride*

SVOCs (analyzed by EPA Method 8270C, 8270C-SIM, 8270D, and 8270D-SIM)

- 2,4,6-Trichlorophenol
- Acenaphthene*
- Anthracene
- Benzo[a]anthracene*
- Benzo[a]pyrene*
- Benzo[b]fluoranthene*
- Benzo[g,h,i]perylene*
- Benzo[k]fluoranthene*
- Bis(2-ethylhexyl)phthalate*
- Butylbenzyl phthalate*
- Chrysene*
- Di-n-butylphthalate
- Dibenzo[a,h]anthracene*

- Dibenzofuran*
- Fluoranthene
- Fluorene*
- Hexachlorobutadiene
- Indeno(1,2,3-cd)pyrene*
- Naphthalene
- Pentachlorophenol
- Phenanthrene
- Pyrene
- Total phenols

PCBs (analyzed by EPA Method 8081)

- Aroclor 1254*
- Aroclor 1260

Metals (analyzed by EPA Method 6010)

- Arsenic*
- Antimony
- Barium
- Cadmium*
- Chromium (VI)
- Copper*
- Lead*
- Mercury*
- Nickel*
- Selenium*
- Silver
- Zinc*

* Chemical is also detected in groundwater in excess of PSC.

The compounds detected in excess of their respective PSCs are further discussed in sections that follow.

6.1.1 Gasoline, Diesel, and Oil Range Hydrocarbons

Soil samples were analyzed for gasoline-, diesel-, motor oil-, heavy oil-, and lube-oil-range hydrocarbons using methods NWTPH Gx, NWTPH Dx, and SW8270-SIM. With the exception of five samples analyzed for lube-oil-range hydrocarbons (SFA-B5-8, SFA-B8-5.5, SFA-E3-3.5, SFA-N6-7.5, and SFA-S9-4), the method detection limits (MDLs) did not exceed their PSCs.

Soil samples were analyzed for gasoline range hydrocarbons using method NWTPH Gx. The MDL did not exceed the PSC of 30,000 micrograms per kilogram (µg/kg). Gasoline range hydrocarbons were detected in 26 samples on the 8801 site. In eight of these samples, the detected concentrations exceeded the PSC (boring locations A1, FPD-1, FPD-4, FPD-5, FWW-1, MBS-2, M4, and E7). The locations with the elevated gasoline concentrations occur in distinct clusters northwest of the Fiberglass Shop, beneath the Off-Highway Building, beneath the Manufacturing Building, in the NFA, and east of the SWS area (E7) at depths ranging from 2.5 to 10.5 feet bgs. Seven of the exceedances were detected in samples collected from the saturated zone, including the three highest concentrations, collected in locations A1 (5,180,000 µg/kg), FPD-1 (2,830,000 µg/kg), and FWW-1 (1,860,000 µg/kg). The gasoline range hydrocarbons were delineated with depth.

Diesel range hydrocarbons were detected in 306 samples on the 8801 site. Concentrations in eight of these samples at six locations slightly exceeded the PSC of 2,000,000 µg/kg for both saturated and unsaturated zones. The greatest concentration was detected in the saturated zone of a sample collected from FPD-1 (6,480,000 µg/kg). The locations of the elevated diesel concentrations are beneath the Off-Highway Building, the SFA (SFA), in the NFA, and in the SWS area (boring locations: FPD-1, FPD-4, FPD-5, SFA-7, NA-5, and BY-1). In the SWS area, diesel was detected in elevated concentrations in the shallow surface soil. In the other areas, the elevated concentrations were detected between 2.5 and 10.5 feet bgs. Diesel-impacted soil concentrations did not exceed the PSC in soil samples collected below 12.5 feet bgs.

Oil range (includes lube oil- and motor oil-range) hydrocarbons were detected in 280 samples on the 8801 site. Concentrations in 13 of these locations exceeded the PSC of 2,000,000 µg/kg for both saturated and unsaturated zones. The elevated diesel concentrations occur in isolated locations in the SFA, beneath the Off-Highway Building, the northwest corner and within and south of the SWS area. In the SWS area, the elevated concentrations of oil were detected in the shallow surface soil. In the other areas, the elevated concentrations of oil were detected between 2.5 and 10.5 feet bgs.

6.1.2 VOCs

Within soil, the following VOCs were detected in concentrations exceeding the PSCs: 1,1,2-trichloroethane, 1,1-dichloroethene, 1,2-dichloroethane, benzene, chloroethane, ethylbenzene, methylene chloride, tetrachloroethene, toluene, total xylenes, trichloroethene, and vinyl chloride. Of the VOCs detected in concentrations exceeding the PSCs, only tetrachloroethene and trichloroethene exceeded the PSCs in more than 10% of the total samples analyzed for VOCs.

Due to the presence of a VOCs in groundwater, additional details on the distribution of acetone, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, 1,1-dichloroethene, and vinyl chloride are provided below.

1,1,2-Trichlorethane

1,1,2-Trichloroethane was detected in only one location, FPD-5. The sample, collected in 2004 from a depth of 2.5 to 4 feet bgs, had a concentration of 26.2 µg/kg, which exceeded the unsaturated soil PSC of 12.067 µg/kg. 1,1,2-Trichloroethane was not detected in samples collected from both above and below the sample with the detected concentration. The detection limit for samples collected below 4 feet bgs significantly exceeded the PSC for saturated soil, except in the deepest sample (12.5 to 14 feet bgs), where the detection limit was close to the PSC. Samples collected in the vicinity of FPD-5 did not have any detectable concentrations of 1,1,2-Trichloroethane.

1,1-Dichloroethene

1,1-Dichloroethene was detected in seven locations on the 8801 site. Five of the detected concentrations exceeded the unsaturated soil PSC of 0.49 µg/kg and two of the detections exceeded the saturated soil screening level of 0.027 µg/kg. An elevated concentration was detected at one location in the NFA, at NA-3 (4 to 5 feet bgs). 1,1-Dichloroethene was not detected in the sample below the detected concentration in NA-3. The remaining six samples were located in the SWS area in the western portion of the 8801 site. The highest concentration was detected in BY-3 at 6 to 8 feet bgs. Other samples that were collected in the vicinity of the SWS area had detection limits at or near the unsaturated soil PSC.

1,2-Dichlorethane

1,2-Dichloroethane was detected in one location, NA-3, in the NFA on the 8801 site. The sample, collected in 2002 at a depth of 4 to 5 feet bgs, had a concentration of 4.0 µg/kg, which exceeded the unsaturated soil PSC of 2.64 µg/kg. 1,2-Dichloroethane was not detected in the sample below the detected concentration in NA-3, with a detection level lower than the PSC. Samples collected in the vicinity of NA-3 did not have any detectable concentrations with the detection limit consistently below the PSC.

Acetone

Acetone was detected in 67 locations on the 8801 site. None of the detected concentrations exceeded the PSC of 8,000,000 µg/kg. The highest concentration (59,200 µg/kg) was detected in location MBS-2 between 5.5 and 7 feet bgs.

Benzene

Benzene was detected in nine samples from the 8801site. Of those, the PSC was exceeded in three locations. In the unsaturated soil, benzene exceeded the PSC of 11.6 µg/kg at location E7 on the southern boundary of the 8801 site, at depths of 0.5 to 2 and 3 to 4.5 feet bgs. The concentration in the deeper sample at E7 also exceeded the PSC for saturated soil of 0.715 µg/kg from 5.5 to 7 feet bgs. No deeper sample was collected at E7. The saturated soil PSC was also exceeded at TSA-2 in the northwest corner at 16 to 18 feet bgs and at HM-6 in the SWS area at 10 to 12 feet bgs. Benzene was not delineated at depth in any of the three locations.

Chloroethane

Chloroethane was only detected in one sample from the 8801 site. The sample was taken at NA-5 in the NFA at 3 to 5 feet bgs, and the concentration of chloroethane exceeded the unsaturated soil PSC of 2.98 µg/kg. Chloroethane was not detected in the deeper sample, with the detection limit exceeding the PSC.

cis-1,2-Dichloroethene

cis-1,2-Dichloroethene was detected in 40 locations. None of the detected concentrations exceeded the 800,000 µg/kg PSC for saturated and unsaturated soil.

Ethylbenzene

Ethylbenzene was detected in 37 samples from the 8801 site, with only five exceeding the PSCs. Ethylbenzene was primarily detected in areas at or near the locations of detected hydrocarbons: the Off-Highway Building area, E7 on the southern property boundary, and to a lesser degree, the northwest corner and the NFA. In the five samples, two concentrations exceeded the PSC for unsaturated soil (6,000 µg/kg) and three exceeded the PSC for saturated soil (502 µg/kg). Concentrations of ethylbenzene exceeding the PSCs were detected in NA-7 (5.5 to 6.5 feet bgs), NA-5 (5 to 7 feet bgs), FPD–1 (7 to 8.5 feet bgs), FPD-5 (9 to 10 feet bgs), and A1 (7.5 to 8.5 feet bgs). Concentrations in samples from the saturated zone did not exceed the PSC in FPD-1, FPD-5, or A1. No deeper samples were collected at or near NA-5 and NA-7.

Methylene Chloride

Methylene chloride was detected in 51 samples on the 8801 site. Concentrations exceeded the PSC of 20 µg/kg at two locations. The samples that exceeded the screening criteria were at D0 (0.5 to 2 feet bgs), and F0 (0.5 to 2 feet bgs). Concentrations in deeper samples at D0 and F0 did not exceed the PSC.

Tetrachloroethene

Tetrachloroethene was detected in 50 locations on the 8801 site, and in 42 of those samples, the concentrations exceeded the relevant PSC for unsaturated (3.64 µg/kg) or saturated (0.208 µg/kg) soil. Concentrations of tetrachloroethene exceeding PSCs were detected at depths ranging from 0.5 to 9 feet bgs. Concentrations of tetrachloroethene that exceeded the PSCs were concentrated in the NFA (20 samples), in the northwest area (6 samples), and under the Maintenance Building (5 samples). The remaining samples that exceeded the PSC were from isolated locations across the 8801 site. The maximum concentration (10,600 µg/kg) was detected in unsaturated soil at location G0 (0.5 to 2 feet bgs) on the northern boundary of the 8801 site. The sample immediately below at G0 (3 to 4.5 feet bgs) had a concentration of 22.3 µg/kg. Vertical delineation of tetrachloroethene has been completed in all areas except the NFA.

Toluene

Toluene was detected in 56 samples on the 8801 site. In only two samples did concentrations exceed relevant PSCs for unsaturated (7,000 µg/kg) or saturated (907.4 µg/kg) soil. The concentration at A1 (7.5 to 8.5 feet bgs) exceeded the saturated soil PSC, but the deeper samples had detectable concentrations of toluene that did not exceed the PSC. The other sample was located at MBS-2 (3.5 to 5 feet bgs) exceeded the PSC. No deeper samples were collected at MBS-2 however at deeper sample collected at a nearby location (MBS-1) had toluene below the MDL.

Total Xylenes

Total xylenes were detected in 58 samples on the 8801 site. Concentrations exceeded the PSC of 9,000 µg/kg in six samples. The samples that exceeded the screening criteria came from NA-5 (5 to 7 feet bgs), NA-7 (5.5 to 6.5 feet bgs), MBS-2 (3.5 to 5 feet bgs), FPD-1 (7 to 8.5 feet bgs), A1 (7.5 to 8.5 feet bgs) and E7 (3 to 4.5 feet bgs). In four of the locations, concentrations in deeper samples did not exceed PSCs or were not detected. The two locations in the NFA (NA-5 and NA-7) were not delineated vertically for total xylenes.

Trichloroethene

Trichloroethene was detected in 133 samples on the 8801 site, and in 64 locations the detected concentrations exceeded the relevant PSCs for unsaturated (12.3 µg/kg) or saturated (0.761 µg/kg)

soil. Concentrations of trichloroethene that exceeded the PSCs were concentrated in the NFA (15 samples), along the northern area (13 samples), in the northwest area (7 samples), under the Off Highway Building (9 samples), in the AS/SVE trench area (8 samples) and in the SWS area (7 samples). The remaining samples were located at E3 and F4 in the center of the 8801 site. The maximum concentration (78,200 µg/kg) was detected in unsaturated soil at location G0 (0.5 to 2 feet bgs). The samples immediately below at G0 (3 to 4.5 and 6 to 7.5 feet bgs) had concentrations of 189 and 13.4 µg/kg, respectively. The only other samples with significantly elevated concentrations of trichloroethene were from D0 (0.5 to 2 feet bgs), with a concentration of 1,650 µg/kg, and FPD-5 (0.5 to 2, and 2.5 to 4 feet bgs) with concentrations of 4,010 and 1,560 µg/kg, respectively. Deeper samples at both D0 and FPD-5 had significantly lower concentrations than shallow soil, and trichloroethene was not detected in the deepest sample at FPD-5 (12.5 to 14 feet bgs), although the detection limit marginally exceeded the PSC for saturated soil. Trichloroethene in the NFA and the northern boundary of the 8801 site has not been fully delineated vertically.

Vinyl Chloride

Vinyl chloride was detected in seven locations on the 8801 site. The PSCs for vinyl chloride in soil was significantly lower than the detection limit. Therefore, the detection limit for all the soil samples exceeded the PSC. At the seven locations where vinyl chloride was detected, the concentrations exceeded the relevant PSCs for unsaturated (0.21 µg/kg) and saturated (0.01 µg/kg) soil. Vinyl chloride was detected in one sample from TSA-2 in the northwest corner, and the remaining six samples were located in the SWS area.

6.1.3 SVOCs

Soil samples were analyzed for SVOCs using EPA Methods 8270C and 8270C-SIM or 8270D and 8270D-SIM. Analysis of the SVOC samples using the SIM method yielded lower MDLs for 19 of the 67 SVOCs reported. MDLs exceeded their respective PSCs in one or more samples for the following compounds:

- 2,4,6-Trichlorophenol[>]
- 2,4-Dimethylphenol[>]
- 2-methylphenol (o-cresol)[>]
- 4-methylphenol (p-cresol)[>]
- Acenaphthene
- Acenaphthylene[>]
- Anthracene

- Benzo[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[g,h,i]perylene
- Benzo[k]fluoranthene
- Benzoic acid[>]
- Benzyl alcohol[>]
- Bis(2-ethylhexyl)phthalate
- Butylbenzyl phthalate
- Carbon tetrachloride[>]
- Chrysene
- Di-n-butyl phthalate
- Di-n-octyl phthalate[>]
- Dibenz[a,h]anthracene
- Dibenzofuran
- Diethyl phthalate[>]
- Dimethyl phthalate[>]
- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Pentachlorophenol
- Phenanthrene
- Total Phenols

[>] Chemical not detected in concentrations exceeding MDLs.

Eleven of these compounds were not detected in concentrations exceeding the MDLs in any of the samples analyzed. In addition, when detected, concentrations of di-n-butyl phthalate did not exceed

relevant PSCs for samples collected in the saturated or unsaturated zones. Because these compounds were not detected in the 8801 site groundwater in concentrations in excess of the groundwater PSCs, these compounds are not considered COPCs for the 8801 site. Detections of the remaining compounds are discussed in further detail in this section.

A review of the drawings in Appendix F indicates that concentrations of SVOCs exceeding the PSCs are clustered in the following areas of the 8801 site:

- The northwest corner, north of the Fiberglass Shop;
- Beneath the southern portion of the Off-Highway Building;
- In the NFA, northwest and west of the Manufacturing Building;
- In the SFA; and
- Within and south of the SWS Area.

Elevated concentrations of the SVOCs were detected from the ground surface to a maximum depth of 23 feet bgs. In general, concentrations of SVOCs decreased significantly below 10 feet bgs.

Acenaphthene

Detected concentrations exceeding PSCs ranged from 180 µg/kg to 4,800 µg/kg in 12 sample locations on the 8801 site. When acenaphthene was detected elsewhere, its concentration did not exceed PSCs. The elevated concentrations were primarily detected in the SWS area. In the northern portion of the SWS area near BY-1, elevated concentrations were detected at the ground surface but not in deeper samples collected from other sample points near BY-1. In the area south of BY-1, elevated concentrations were detected between 6 and 15 feet bgs (HM samples). Acenaphthene was also detected in elevated concentrations in two borings advanced in the NFA (NA-5 and NA-6) at depths between 1 and 7 feet bgs and at one sample just south of the NFA (WP-6). The samples in the NA locations were not delineated with depth and the WP location was delineated with depth for this chemical.

Anthracene

Anthracene was detected in 25 sample locations on the 8801 site. Detected concentrations of anthracene exceeded the saturated soil PSC of 225 µg/kg in five sample locations in the SWS area. No other detected concentration exceeded the relevant PSC. The elevated concentrations were detected between 7 and 14 feet bgs, and the maximum concentration (4,000 µg/kg) was detected at HM-4. No vertical delineation of anthracene was undertaken. One isolated sample that also exceeded the PSC was identified at WP-6.

Carcinogenic polycyclic aromatic hydrocarbons (cPAHs)

The EPA has identified the following seven SVOCs as carcinogenic polycyclic aromatic hydrocarbons (cPAHs): benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno(1,2,3-cd)pyrene. Detection patterns of these cPAHs are similar, so this section discusses these compounds as a group.

The cPAHs have been detected in 41 locations on the 8801 site. In 36 locations, one or more cPAHs were detected in concentrations exceeding the relevant PSCs. Chrysene was detected more frequently in elevated concentrations than were the other cPAHs. The detected concentration ranges for each cPAH are as follows:

- Benzo[a]anthracene: 2.83 to 2,700 µg/kg
- Benzo[a]pyrene: 0.0085 to 890 µg/kg
- Benzo[b]fluoranthene: 3.5 to 1,800 µg/kg
- Benzo[k]fluoranthene: 1.1 to 2,400 µg/kg
- Chrysene: 3.54 to 3,000 µg/kg
- Dibenz[a,h]anthracene: 1 to 249 µg/kg
- Indeno(1,2,3-cd)pyrene: 3.9 to 870 µg/kg

cPAHs were detected in the following areas: the north west corner, within and southwest of the Off-Highway Building, in the NFA, west of the Manufacturing Building, in the SFA, and within and south of the SWS area. Elevated concentrations of cPAHs were detected from the ground surface to a depth of 8 feet bgs in these areas, except in the SWS area, where they were detected as deep as 14 feet bgs. Vertical delineation of cPAHs in the SWS area is incomplete.

Benzo[g,h,i]perylene

Benzo[g,h,i]perylene was detected in 27 sample locations on the 8801 site. Concentrations in samples collected from depths between 7 and 15 feet bgs in the SWS area (locations HM-1, HM-3, HM-4, HM-6, SS-BOT-2, and SS-SW-05) exceeded the saturated soil PSC of 31.1 µg/kg. Although still exceeding the PSC, the detected concentrations decreased below 10 feet bgs.

Bis(2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate was detected in concentrations exceeding the PSCs in three areas (north of the Fiberglass Shop [SS-BOT-05], in the NFA northwest of the Manufacturing Building [WP-6], and in the SWS area [HM-3, HM-4, HM-6, BY-6, SS-SW-08, and DS-2]). Elevated concentrations of bis(2-

ethylhexyl)phthalate where detected at the following depths: from 0 and 23 feet bgs to the north of Fiberglass Shop, from 5 and 6 feet bgs in the area northwest of the Manufacturing Building, and from 7 and 10 feet bgs in the SWS area. The maximum concentration (1300 µg/kg) was detected in samples from the saturated and unsaturated zones in two sample locations in the SWS area. Bis(2-ethylhexyl)phthalate concentrations appear to decrease below 10 feet bgs in the SWS area.

Butylbenzyl Phthalate

Butylbenzyl phthalate was detected in concentrations exceeding PSCs in distinct areas in the SWS area and in the NFA area northwest of the Manufacturing Building. In the SWS area, elevated concentrations of butylbenzyl phthalate were detected in both the saturated and unsaturated zones up to a maximum depth of 12 feet bgs. Deeper samples were below the PSC. In the NFA, butylbenzyl phthalate was detected at an elevated concentration in a near-surface sample collected between 1 and 2 feet bgs in location WP-6 and the lower sample was below the PSC.

Dibenzofuran

Dizenzofuran was detected in concentrations exceeding PSCs in unsaturated soil (307.7 µg/kg) or saturated soil (15.6 µg/kg) in nine locations. Dibenzofuran exceedances were primarily located in the SWS area and were not delineated with depth. Two samples were located in the NFA (WP-6 and NA-5). The WP-6 sample was delineated with depth.

Fluoranthene

Fluoranthene was detected in 43 sample locations on the 8801 site, and in 11 of those locations, the detected concentrations exceeded the relevant PSC for either saturated or unsaturated soil. Fluoranthene was observed in elevated concentrations primarily in the SWS area at depths between 6 and 15 feet bgs. Fluoranthene was also detected in isolated boring locations beneath the Off-Highway Building (FPD-1, between 7 and 8.5 feet bgs) and in the NFA area (WP-6, between 1 and 2 feet bgs).

Fluorene

Fluorene was detected in 26 locations on the 8801 site, and in 13 of those locations, the detected concentrations exceeded the relevant PSC for either saturated or unsaturated soil. Fluorene was detected in elevated concentrations primarily in the SWS area at depths between the ground surface and 15 feet bgs. Fluorene was also detected in isolated boring locations in the Off-Highway Building (FPD-1, between 7 and 8.5 feet bgs) and in the NFA area (WP-6, between 1 and 2 feet bgs, and NA-5, between 5 and 7 feet bgs). Fluorene was delineated by depth at all the locations except at NA-5.

Indeno(1,2,3-cd)pyrene

Indeno(1,2,3-cd)pyrene was detected in 25 locations on the 8801 site, and in 13 of those locations, the detected concentrations exceeded the relevant PSC for either saturated or unsaturated soil. Indeno(1,2,3-cd)pyrene was observed in elevated concentrations primarily in the SWS area at depths between 6 and 15 feet bgs. Indeno(1,2,3-cd)pyrene was also detected in isolated boring locations in the NFA between the ground surface and 2 feet bgs.

Naphthalene

Napthalene was detected in three locations above the saturated soil PSC of 121.97 µg/kg. The samples were located under the Off-Highway Building and within the stormwater excavations in the SWS area and north west corner. The highest concentration was detected in FPD-1 (5,900 µg/kg). All three occurrences are in areas where petroleum range hydrocarbons have been detected. The samples from the stormwater excavation in the north west corner and at FPD-1 are delineated with depth.

Pentachlorophenol

Pentachlorophenol was detected above the unsaturated PSC of 19.9 µg/kg at two locations. Both were isolated locations namely, MW-10A (decommissioned well south west of the SFA) and C6 (near the SWS area). The highest concentration was 140 µg/kg at C6.

Phenanthrene

Phenanthrene was detected above the PSC concentration for unsaturated soil of 2031.75 µg/kg or for saturated soil of 102.2 µg/kg at 12 locations. The locations were primarily in the SWS area down to a depth of 15 feet bgs. The other locations were under the Off-Highway Building (FPD-1) and the NFA (NA-5 and WP-6). The highest concentration was at HM-4 (25,000 µg/kg from 8 to 10 feet bgs). The WP-6 location was delineated at depth.

Total Phenols

Only four samples have been analyzed for total phenols on the 8801 site. Two of the detected samples exceeded the saturated soil PSC of 35.1 µg/kg. The two samples were located south west of the SFA (MW-10 and MW-11). Total Phenols are delineated with depth.

6.1.4 Metals

Soil samples were analyzed for metals using one or more of the following methods: 161E, E200.8, SW6020, SM3500CR-D, SW6010, SW6010B, SW6020, SW7471, and SW7471A. MDLs exceeded their respective PSCs in one or more samples of the following compounds: arsenic, cadmium,

mercury, selenium, silver, and thallium. The PSC for metals do not account for background concentrations.

Arsenic

Arsenic was detected in concentrations exceeding PSCs in soil samples collected site-wide from the ground surface to 23 feet bgs. Detected concentrations ranged from 3.03 µg/kg (in C6 at 4.5 feet bgs) to 58,600 µg/kg (in SFA-S15-3 at 3 feet bgs). In only one sample collected from C6 between 3 and 4.5 feet bgs, did the detected level of arsenic not exceed the PSCs. Detected concentrations on the 8801 site greater than 10,000 µg/kg were observed in samples collected between the ground surface and 5 feet bgs.

Cadmium

Because the PSCs for cadmium is lower than the detection limit for all but one sample collected on the 8801 site, all detected concentrations of cadmium (except for the sample collected from C6) exceeded the PSCs. Cadmium was detected in soil samples collected site-wide. Detected concentrations ranged from 0.195 µg/kg in C6 (3 to 4.5 feet bgs) to 22,800 µg/kg in BY-1 (1 to 3 feet bgs). Concentrations greater than 10,000 µg/kg were detected only in samples collected from the SWS area between the ground surface and 8 feet bgs.

Copper

Similar to cadmium, copper was detected in concentrations exceeding the PSCs in all samples except for the sample collected from C6 between 3 and 4.5 feet bgs. Detected concentrations ranged from 226 µg/kg in C6 to 3,290,000 µg/kg in HM-1 (1 to 2 feet bgs). Concentrations of copper greater than 10,000 µg/kg were detected in the SWS area between the ground surface and 15 feet bgs and in an isolated area in the NFA (NA-2 and NA-5) between 1 and 3 feet bgs. Elevated concentrations of copper less than 10,000 µg/kg were also detected north of the Fiberglass Shop.

Lead

Lead was detected in soil site-wide with the highest concentrations detected primarily in the SWS area at depths between 1 and 15 feet bgs. Detected concentrations ranged from 29,500 µg/kg in SS-BOT-2 (15 feet bgs) to 9,220,000 µg/kg in BY-1 (1 to 3 feet bgs).

Mercury

Mercury was detected in 30 locations on the 8801 site. Because the PSCs for both saturated and unsaturated soil are lower than the MDL, all detected concentrations of mercury exceed PSCs. Mercury was detected only in the following areas: northwest corner; in the SFA; in the SWS area; and in the NFA. Mercury was detected in samples collected between the ground surface and 15 feet bgs.

Nickel

Nickel was detected in all soil samples collected from the 8801 site. Detected concentrations ranged from 10.8 µg/kg in C6 (3 to 4.5 feet bgs) to 109,000 µg/kg in BY-3 (3 to 5 feet bgs). Elevated concentrations were detected north of the Fiberglass Shop, in the NFA, and in the SWS area from the ground surface to 23 feet bgs.

Selenium

Selenium was detected in 12 locations on the 8801 site. In 11 of these locations, the detected concentrations exceeded the relevant PSC for saturated (27.2 µg/kg) or unsaturated (300 µg/kg) soil. Concentrations exceeding the PSCs were detected in the SFA and in the NFA at depths between the ground surface and 8 feet bgs.

Silver

Silver was detected in 15 locations on the 8801 site. In nine of these locations, the concentrations exceeded the relevant PSC for saturated (13.4 µg/kg) or unsaturated (263 µg/kg) soil. The silver-impacted soil appears to lie in isolated areas east of the Fiberglass Shop, in the NFA, in the eastern portion of the SFA, and in the SWS area. The maximum concentration (5,300 µg/kg) was detected in the unsaturated zone of a sample collected in the SWS area (BY-3). Elevated levels of silver were not detected in samples collected below 8 feet bgs.

Zinc

Zinc was detected in all soil samples collected on the 8801 site. Elevated concentrations of zinc were detected in samples from the areas north of the Fiberglass Shop, northwest of the Manufacturing Building, and in the SWS area. The highest concentrations (greater than 100,000 µg/kg) were detected in soil samples from the SWS area collected between the ground surface and 5 feet bgs.

6.1.5 PCBs

Soil samples were analyzed for PCBs using EPA Method SW8082. The MDLs exceeded the PSCs for the following aroclors: 1016, 1221, 1232, 1242, 1248, 1254, and 1260. These aroclors were detected in one or more soil samples collected from the 8801 site. However, only aroclor 1254 and 1260 were detected at concentrations exceeding their PSCs. Elevated concentrations of these aroclors were reported in the SWS area at depths between 0 and 15 feet bgs; in the north west corner at depths up to 23 feet bgs, under the Off-Highway Building between 4.5 and 8.5 feet bgs, in the NFA between 1 and 7 feet bgs, in the NFA west of the Manufacturing Building between 0 and 1.5 feet bgs, and in the SFA between 2 and 8 feet bgs.

6.1.6 Dioxins/Furans

Six samples were collected and analyzed for dioxin/furans. The samples came from A1, B2, B3, B4, C5, and C6, which are from north-to-south spaced grid locations on the western boundary of the 8801 site. 2,3,7,8-tetrachlorodibenzodioxin (TCDD) was detected in location C6 (between 3 to 4.5 feet bgs) at a concentration of 0.000016 µg/kg. The remaining samples for this chemical were not detected at an MDLs that exceeded the PSC of 0.00000007 µg/kg. The samples reported concentrations were corrected using TEFs (using Ecology 2007 numbers) values and one-half (1/2) the MDL for concentration reported below the laboratory MDL. TEF corrected values still exceeded the PSC. No source for the chemical detected at C6 is known, although C6 appears to be located on the perimeter of the infill associated with the SWS area.

6.2 GROUNDWATER ANALYTICAL RESULTS

Between 2002 and 2009, groundwater samples were collected from 84 locations on the 8801 site during approximately 30 sampling events. The purposes of the sampling events, identification of the monitoring wells sampled, and the analytical programs undertaken for each sampling event are described in Chapter 3. The groundwater data were compared to PSC values protective of surface water and sediments.

Groundwater samples were collected from temporary borings and from permanent monitoring wells with developed sandpacks. Details on the nature of the type of samples are discussed in the relevant sections because particulates can be entrained into grab groundwater samples. In the event that only grab groundwater samples exceeded the preliminary screening criteria the chemical was given further evaluation to determine if entrained particles may have produced or contributed to the exceedance. The one exception to this approach is at boring A1 (formerly located in the north west corner of the 8801 site to the north of the Fiberglass Shop). A1 is considered to have an elevated level of COPCs and no chemical at this location was excluded if detected above their respective PSC.

The following compounds and metals were detected in concentrations exceeding their PSCs:

<u>Total Petroleum Hydrocarbons</u>

- Gasoline range hydrocarbons
- Diesel range hydrocarbons
- Lube oil / motor oil / heavy oil range hydrocarbons

<u>VOCs</u>

- 1,1,2-Trichloroethane

- 1,1-Dichloroethene
- 1,2-Dichloroethane
- Acetone
- Benzene
- Chloroethane
- cis-1,2-Dichloroethene
- Ethylbenzene
- Tetrachloroethene
- Toluene
- Trichloroethene
- Vinyl chloride

SVOCs

- 2-Methylnaphthalene
- Acenaphthene
- Benzo[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[g,h,i]perylene
- Benzo[k]fluoranthene
- Bis(2-ethylhexyl)phthalate
- Butylbenzyl phthalate
- Chrysene
- Dibenz[a,h]anthracene
- Dibenzofuran
- Fluorene
- Indeno(1,2,3-cd)pyrene

Metals

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Thallium

PCBs

- Aroclor 1254

Except for thallium and 2-methylnaphthalene, the compounds and metals listed above were also detected in concentrations exceeding their respective PSCs in the 8801 site soil. The compounds detected in concentrations exceeding their PSCs are discussed in detail below.

Total Petroleum Hydrocarbons

Groundwater samples were analyzed for gasoline, diesel, and oil range hydrocarbons using NWTPH Gx and NWTPH Dx. None of the sample MDLs exceeded their respective PSCs.

Gasoline range hydrocarbons were detected in 25 locations (see figure). Two of the concentrations exceeded the PSCs of 800 µg/L (with benzene present) or 1,000 µg/L (with no benzene present). The exceedances were at location A1 (269,000 µg/L) northwest of the Fiberglass Shop and location MW-6A (2,300 µg/L) in the central area of the 8801 site. MW-6A was decommissioned during excavation to remove USTs in the SFA and was replaced with a new monitoring well MW-6AR in 2004. Concentrations in a sample collected and analyzed from MW-6AR in 2004 did not exceed the PSCs for gasoline range hydrocarbons.

Diesel range hydrocarbons were detected in 39 locations and exceeded the PSC of 500 µg/L in 9 of those samples. The samples that exceeded the screening criteria were SFA-5 (2004), MW-6A (2002), MW-6AR (2004), MW-4A (2002), MW-42A (2004), all in the SFA area; and MW-8A (2002); L1 (grab

sample in 2004); HM6 (grab sample in 2004); and A1 (grab sample in 2004). In the area of the SFA, concentrations of diesel range hydrocarbons in groundwater dropped below the PSC after excavation and injection of ORC© in 2004. Concentrations in subsequent samples collected in 2006 at MW-8A also did not exceed PSCs. No further samples have been collected at L1, HM-6, or A1. Wells located down-gradient of L1 and cross-gradient to HM-6 do not have detectable concentrations of diesel range hydrocarbons. A1 is located on the 8801 site western boundary, and no well is located in this area.

Lube oil range hydrocarbons (and motor oil range hydrocarbons) were detected in 2 samples, from HM-6 and A1, with both concentrations exceeding the PSC of 500 µg/L. Lube oil range hydrocarbons were not detected in MW-30A, cross-gradient to HM-6, in 2006.

VOCs

Groundwater samples were analyzed for VOCs using EPA Methods 8021, 8260B, and 8260C.

Samples did not exceed the PSCs but the MDLs exceeded their respective PSCs in one or more samples for the following compounds:

- 1,1,2,2-Tetrachloroethane
- 1,2,4-Trichlorobenzene
- 1,4-Dichlorobenzene
- Bromodichloromethane
- Bromomethane
- Carbon tetrachloride
- Hexachlorobenzene
- Hexachlorobutadiene

Samples were detected on the 8801 site, but not in concentrations exceeding PSCs for the following chemicals:

- 1,1-Dichloroethane
- 1,2-Dichlorobenzene
- 1,2-Dichloropropane
- 1,3-Dichlorobenzene

- Bromoform
- Chlorobenzene
- Chloroform
- Chloromethane
- Methylene chloride

Eight of the compounds with MDLs exceeding their PSCs were not detected in any of the groundwater samples collected. Nine of the compounds with MDLs exceeding their PSCs were detected, but not in concentrations exceeding their PSCs. The remaining compounds are discussed in subsequent sections because they were detected in concentrations exceeding their respective PSCs in one or more samples.

1,1,2-Trichlorethane

1,1,2-Trichloroethane was detected in only one location, MW-14A. In 2002, the detected concentration of 0.6 µg/L exceeded the PSC of 0.59 µg/L. Follow-up testing in 2006 found that the concentration of 1,1,2-trichloroethane had decreased to 0.4 µg/L in this well.

1,1-Dichloroethene

1,1-Dichloroethene was detected in 18 locations on the 8801 site. The concentrations in all of these locations exceeded the PSC of 0.057 µg/L. Elevated concentrations were detected in the northern, central, and western portions of the 8801 site. The maximum concentration (13.2 µg/L) was detected in temporary well A1, formerly located in northwest of the Fiberglass Shop, in 2004.

1,2-Dichlorethane

1,2-Dichloroethane was detected in two locations on the 8801 site (J2 and NA-7). The PSC of 0.38 µg/L was exceeded in only one location, J2, at a detected concentration of 1.57 µg/L. J2 is a temporary well advanced during 2004 near the central portion of the 8801 site.

Acetone

Acetone was detected in 81 samples at the 8801 site and exceeded the PSC of 800 µg/L in temporary well A1 (28,100 µg/L) and in well MW-14A (4500 µg/L in 2002). Subsequent sampling at MW-14A during two events in 2006 detected acetone at concentrations well below the PSC (6.60 µg/L and 1.60 µg/L). No additional sampling has been undertaken at A1, located on the northwestern property line.

Benzene

Benzene was detected in 14 locations on the 8801 site. At only two of these locations was benzene detected at concentrations exceeding the PSC of 1.2 µg/L. In temporary well A1, formerly located northwest of the Fiberglass Shop, benzene was detected at a concentration of 40.4 µg/L. In temporary well J2, formerly located in the central portion of the 8801 site, benzene was detected at a concentration of 1.86 µg/L.

Chloroethane

Chloroethane was detected in 17 locations. In 14 of these, concentrations exceeded the PSC of 0.41 µg/L. Chloroethane was detected in the northern, central, southern, and western areas of the 8801 site. The concentration detection (240 µg/L) was detected in MW-37A, located along the western boundary of the 8801 site.

cis-1,2-Dichloroethene

cis-1,2-Dichloroethene was detected in 51 locations. In four of those locations (A1, F1, H3, and MW-28A), the detected concentrations exceeded the PSC of 80 µg/L. With the exception of MW-28A, the locations with the elevated concentrations of cis-1,2-dichloroethene were temporary wells. Detected concentrations of cis-1,2-dichloroethene in these temporary wells ranged from 90.6 µg/L in H3 to 8,940 µg/L in A1 during 2004. In permanent well MW-28A, cis-1,2-dichloroethene was detected at concentrations of 480 µg/L in 2002 and 98 µg/L in 2006.

Ethylbenzene

Ethylbenzene was detected in 7 locations. In only one location (temporary well A1, formerly located in northwest of the Fiberglass Shop), the detected concentration of ethylbenzene exceeded the PSC of 530 µg/L.

Tetrachloroethene

Tetrachloroethene was detected in 13 locations. In 10 of the locations, the concentrations detected exceeded the PSC of 0.38 µg/L. These elevated concentrations were detected in wells located in the northern portion of the 8801 site, northwest of the Manufacturing Building. No elevated concentrations were detected in the western portion of the 8801 site.

Toluene

Toluene was detected in 12 locations on the 8801 site. In only one location (temporary well A1, formerly located in the northwest corner of the 8801 site) did the detected concentration of toluene exceed the PSC of 1,300 µg/L. Toluene was detected at a concentration of 101,000 µg/L in A1, during 2004. No other detected concentrations exceeded the PSC.

Trichloroethene

Trichloroethene was detected in 35 locations on the 8801 site, and concentrations in 17 locations exceeded the PSC of 1.53 µg/L during one or more sampling events. Trichloroethene is present in the groundwater in the northern and western portions of the 8801 site. The locations with the three highest detected concentrations of trichloroethene (MW14A, MW33A, and F1) are clustered in the northern portion of the 8801 site, northwest of the Manufacturing Building.

Vinyl Chloride

Vinyl chloride was detected in 45 locations on the 8801 site. Because the MDL exceeds the PSC, all detected concentrations of vinyl chloride exceed the PSC of 0.025 µg/L. Vinyl chloride is present in the groundwater in the northern and western portions of the 8801 site. Concentrations exceeding 1,000 µg/L were detected in locations A1 (4,580 µg/L), F1 (2,660 µg/L), and H3 (1,190 µg/L). These were detected in temporary wells advanced in 2004. It should be noted that concentrations greater than 75 µg/L have not been detected in the permanent monitoring wells (constructed with sand pack) on the 8801 site after 2002.

6.2.1 SVOCs

Groundwater samples were analyzed for SVOCs using EPA Methods 8270C and 8270C-SIM or 8270D and 8270D-SIM. Analysis of the SVOC samples using the SIM method yielded lower MDLs for 19 of the 64 SVOCs reported. MDLs exceeded their respective PSCs in one or more samples for the following compounds:

- Benzo[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[g,h,i]perylene
- Benzo[k]fluoranthene
- Bis(2-ethylhexyl)phthalate
- Butylbenzyl phthalate
- Chrysene
- Dibenz[a,h]anthracene
- Indeno(1,2,3-cd)pyrene

The following chemicals were not detected in 8801 site groundwater:

- 2,4,6-Trichlorophenol
- Bis(2-chloroethyl)ether
- Di-n-octyl phthalate
- n-Nitroso-di-n-propylamine
- Pentachlorophenol

Although the MDLs for 2,4,6-trichlorophenol, bis(2-chloroethyl) ether, di-n-octylphthalate, pentachlorophenol, and *n*-nitroso-di-*n*-propylamine exceeded their respective PSCs, these compounds were not detected in groundwater on the 8801 site. In addition, where detected, naphthalene concentrations did not exceed the PSC. The remaining compounds are discussed in subsequent sections because they were detected in concentrations exceeding their respective PSCs in one or more samples.

2-Methylnaphthalene

2-methylnaphthalene was detected in 53 samples at the 8801 site, and only one concentration (23 µg/L) exceeded the PSC of 18.18 µg/L. This exceedance was in a sample from MW-6A (2002) (qualified to state there was low spectral match). Monitoring well MW-6A was removed during excavation work and replaced with MW-6AR in 2004. Groundwater samples collected in 2004 from MW-6AR did not exceed the PSC for 2-methylnapthalene.

Acenaphthene

Acenaphthene was detected in 57 samples at the 8801 site. Of those samples, concentrations in four exceeded the PSC of 2.61 µg/L. These came from MW-25A, MW-26A, and MW-32A, located along the northern boundary of the 8801 site and MW-6A located in the SFA. Subsequent analysis of groundwater from the replacement well at MW-6A (MW-6AR) in 2004 found concentrations well below the PSC, while at MW-25A, concentrations of 2 µg/L were detected on two separate occasions in 2006. No further groundwater samples have been collected at MW-24A and MW-32A.

Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)

Individual analytical results for the seven cPAHs (benzo[a]anthracene, benzo[a]pyrene, chrysene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno(1,2,3-cd)pyrene) were compared to the PSC of 0.0028 µg/L. One or more of the cPAHs exceeded the PSC in temporary wells A1, L1, N2, and HM-6 and in monitoring wells MW-4A (2002), MW-6A (2002), MW-6AR (2004), MW-8A (2002), and MW42A (2006). No additional sampling has been undertaken at the temporary well locations, but cPAHs were not detected in permanent monitoring wells in the vicinity of L1 and HM-6 during two sampling events in 2006. There are no wells

close to A1 and L1. MW-42A, located down-gradient of MW-4A and MW-6A (now removed), was sampled in March and August, 2006. At MW-6A, only chrysene was detected in March, 2006, and the August 2006 concentration did not exceed the PSC. Subsequent sampling of MW-8A detected concentrations of four cPAHs, including benzo[a]pyrene, not exceeding either the MDLs or PSCs.

Bis(2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate (BEHP) was detected in 31 samples. Because the MDL exceeds the PSC, all detected and non detect concentrations of BEHP also exceed the PSC of 0.285 µg/L. BEHP was detected in the following wells in either or both of the March and August sampling events in 2006: MW-1A, MW-7A, MW-8B, MW-9A, MW-11A, MW-16A, MW-25A, MW-26A, MW-26B, MW-26C, MW-28A, MW-28B, MW-29A, MW-29C, MW-30A, MW-35A, MW-35B, MW-36B, MW-39A, MW-41A and MW-42A. It was also detected in MW-6A in 2002. BEHP occurs site–wide, based on the distribution of wells with detected concentrations of BEHP.

Butylbenzyl Phthalate

Butylbenzyl phthalate (BBP) was detected in four samples. Because the MDL exceeds the PSC, all detected and non detected concentrations of BBP also exceed the PSC of 0.524 µg/L. Two monitoring wells (MW-26C and MW-29C) had detectable concentrations of BBP in March and August, 2006.

Dibenzofuran

Eleven samples at the 8801 site contained detectable concentrations of dibenzofuran. Of the 11, only one sample collected from MW-6A in 2002, exceeded the PSC of 1.33 µg/L. Subsequent samples from MW-42A, the closest well down-gradient to the former monitoring well MW-6A, did not contain dibenzofuran in concentrations exceeding the PSC.

Fluorene

Fluorene was detected in 26 samples, and only one concentration exceeded the PSC of 2.035 µg/L. The sample came from MW-6A in 2002. Sampling in 2006 at the replacement well for MW-6A (MW-6AR) contained concentrations of fluorene that did not exceed the PSC.

6.2.2 Metals

Groundwater samples were analyzed for metals using EPA Methods E 200.8, 6010B, 6020, or 7470A. The metals analyzed include: antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, magnesium, mercury, nickel, selenium, silver, thallium, and zinc. In 2002, samples were analyzed for total and dissolved (filtered) metals. All other sampling events included analysis for dissolved (filtered) metals only. The MDL in one or more samples analyzed for arsenic and mercury exceeded the PSC.

Both of these metals were detected in concentrations exceeding their PSCs and are discussed further below. The PSC for metals do not account for background concentrations.

Arsenic

Total arsenic (unfiltered) samples were collected from 42 locations onsite. With the exception of one sample collected from MW-26B, all of the detected concentrations exceeded the PSC of 0.018 µg/L. The three highest concentrations were detected in locations MW-25A (26.2 µg/L), HM-6 (15.9 µg/L), and MW-12A (14.4 µg/L). These wells are located in the western portion of the 8801 site.

Dissolved (filtered) arsenic samples were collected from 120 locations. Arsenic was detected in every location during one or more sampling events. Because the MDL for arsenic exceeds the PSC (0.018 µg/L), all detected concentrations of arsenic also exceed the PSC. Elevated concentrations were detected predominantly in temporary wells except for locations MW-25A, MW-35A, MW-29C, and MW-12A, where concentrations decreased significantly between the 2002 and 2006 sampling events. The highest concentration of dissolved arsenic was detected in the north western boundary of the 8801 site, at MW-25A, at a concentration of 26.8 µg/L.

Cadmium

Cadmium was detected in two samples, and both the concentrations exceeded the PSC of 0.25 µg/L. The concentrations were detected in a filtered sample from MW-11A in March, 2006, (0.4 µg/L) and a total sample from MW-8A in 2002 (0.3 µg/L). Subsequent sampling in both wells found concentrations exceeding neither the MDL nor the PSC. The concentration in the filtered sample from MW-8A in 2002 also did not exceed the PSC.

Chromium

Total chromium (unfiltered) samples were collected from 69 locations on the 8801 site. In two of the locations, HM-6 (SWS area) and MW-19B (northwest of the Manufacturing Building), detected concentrations of 39 µg/L and 15 µg/L, respectively, exceeded the PSC of 10 µg/L. The groundwater sample collected from HM-6 was collected from a temporary well. Both samples were collected in 2002.

Dissolved (filtered) chromium samples were collected from 120 locations. In locations G6 (10.6 µg/L in 2004), MW-19B (13 µg/L in 2002), and MW-29C (20.7 µg/L in 2006), the detected concentrations exceeded the PSC. Monitoring well MW-19B has been decommissioned. Sampling in 2006, at MW-28A, down-gradient of MW-19B, had samples with non detect concentration of chromium.

Copper

Total copper (unfiltered) samples were collected from 42 locations onsite. In 18 of those locations, the detected concentration of copper exceeded the PSC of 2.4 µg/L. The samples displaying elevated concentrations of copper appear to be clustered in the Off-Highway Building; NFA; areas northwest, southwest, and east of the Manufacturing Building; SFA; and SWS area.

Dissolved (filtered) copper samples were collected from 69 locations. In 22 of those locations, the detected concentration of copper exceeded the PSC. The elevated samples of dissolved copper were distributed similarly to elevated concentrations of total copper. The maximum detection of 21.3 µg/L was observed in MW-39A, located in the western portion of the 8801 site.

Lead

Total lead (unfiltered) samples were collected from 35 locations on the 8801 site. In five of the locations, the detected concentration exceeded the PSC of 2.5 µg/L. The elevated lead concentrations detected in temporary wells BY-5, DS-2, and HM-6 in the SWS area and in monitoring wells MW-22A (2002) and MW-8A (2002) in the SFA.

Dissolved (filtered) lead samples were collected from 150 locations. Lead concentrations did not exceed the PSC in any of the 150 locations, including where total lead samples exceeded the PSC.

Mercury

Total mercury (unfiltered) samples were collected from 39 locations onsite. The mercury concentration in one sample (0.14 µg/L) collected from HM-6 in the SWS area exceeded the PSC of 0.0025 µg/L. No other detected concentration of total mercury exceeded the PSC.

Dissolved (filtered) mercury samples were collected from 114 locations. Mercury was detected in five samples from temporary monitoring wells: F1, L3, P1, R1, and R3. Because the MDL for mercury in most samples exceeded the PSC (0.0025 µg/L), the majority mercury concentrations not exceeding the MDL still exceed the PSC.

Nickel

Total nickel (unfiltered) samples were collected from 42 locations on the 8801 site. In five of those locations, the detected concentrations exceeded the PSC of 5 µg/L. These elevated concentrations were detected in the NFA and SWS area of the of the 8801 site.

Dissolved (filtered) nickel samples were collected from 69 locations. Nickel was detected in concentrations exceeding the PSC in nine of those. The elevated concentrations appear to be

clustered in the northern, southern, and western areas of the 8801 site. The maximum concentration (46.7 µg/L) was detected in location MW-11A, in the southern area of the 8801 site.

Selenium

Total selenium (unfiltered) samples were collected from 42 locations onsite. In five of those locations, the detected concentrations exceeded the PSC of 5 µg/L. These elevated concentrations were detected in the SWS area and on the western boundary of the 8801 site.

Dissolved (filtered) selenium samples were collected from 120 locations. Selenium was detected in concentrations exceeding the PSC in nine of those. The elevated concentrations appear to be clustered in the SWS area and on the western boundary of the 8801 site. The dissolved concentration for two samples in the SWS area with elevated total selenium concentrations (DS-2 and MW-36B) are below the screening criteria. The maximum concentration (16 µg/L) was detected in location MW-35B, on the western boundary of the 8801 site.

Thallium

Total thallium (unfiltered) was collected from 42 locations onsite. None of the samples collected had total thallium levels that exceeded the PSC of 0.24 µg/L.

Dissolved (filtered) thallium samples were collected from 120 locations. The thallium PSC was exceeded in one temporary boring location, N5, with a concentration of 0.24 µg/L (qualified a J flag stating estimated).

Zinc

Total zinc (unfiltered) was detected in 18 locations onsite. The sample, collected from temporary well HM-6, had a concentration of 73 µg/L, which exceeded the PSC of 32.56 µg/L. No other detected concentration of total zinc exceeded the PSC.

Dissolved (filtered) zinc samples were collected from 69 locations. The zinc screening level of 32.56 µg/L was exceeded in two sample locations (temporary well L1 and monitoring well MW-11A). The detected concentrations were 271 µg/L and 59 µg/L, respectively.

6.2.3 Polychlorinated Biphenyls (PCBs)

The individual aroclors were compared to their respective screening criteria. Ninety-two groundwater samples from across the 8801 site were analyzed for the individual aroclors. All aroclors were either undetected or their concentrations did not exceed their PSCs, with the exception of nine samples with concentrations of aroclor 1254 that exceeded the PSC. The MDLs for the individual aroclors

exceeded their PSCs in only four samples, collected from temporary locations BY-5, DS-2, HM-6, and WP-5.

Aroclor 1254

Aroclor 1254 was detected in a total of nine samples in concentrations exceeding the PSC of 0.00166 µg/L. The samples were collected between 2002 and 2006 from the following monitoring wells: MW-16A (2002, March and August 2006 sampling events exceeding PSC) and MW-34A (2002 sampling event exceeding PSC) on the northern boundary of the 8801 site; MW-42A (March and August 2006 sampling events exceeding PSC), located in the SFA area; and MW-30A (2002 and February 2006 sampling events exceeding the PSC; August 2006 sampling result non detect, not exceeding the PSC) and MW-29C (August 2006 sampling events exceeding the PSC) on the south and western boundary. The highest concentration was detected in MW-42A at 0.230 µg/L. A sample collected 6 months later in 2006 had a concentration of 0.0840 µg/L.

6.3 SEEP ANALYTICAL RESULTS

During sampling events between 2002 and 2006, seep samples were collected from one or more locations on the western boundary of the 8801 site. The purposes of the sampling events, identification of the locations sampled, and the analytical programs undertaken for each sampling event are described in Chapter 3. The seep data were compared to values protective of surface water and sediments. The seep sample locations are situated along the southwestern shoreline of the 8801 site, along the LDW. The monitoring wells nearest to the seep locations are MW-37A, MW-37B and MW-30A.

Seep samples collected in 2002 are reported to have contained a high quantity of entrained particles which are considered at the time of reporting the results to have biased the data. Although results for 2002 sample analysis are discussed below certain chemicals results are noted to potentially be a product of entrained particles.

The following compounds and metals were detected in concentrations exceeding their PSCs:

<u>VOCs</u>

- Trichloroethene

<u>SVOCs</u>

- Benzo[a]anthracene
- Benzo[b]fluoranthene

- Benzo[g,h,i]perylene
- Benzo[k]fluoranthene
- Chrysene
- Indeno(1,2,3-cd)pyrene

Metals

- Arsenic
- Copper
- Lead
- Nickel
- Selenium
- Zinc

PCBs

- Aroclor 1254
- Aroclor 1260

The compounds and metals listed above were also detected in concentrations exceeding their respective PSCs in soil on the 8801 site. With the exception of zinc and aroclor 1260, these compounds and metals were also detected on at least one occasion in elevated concentrations from groundwater on the 8801 site. The compounds detected in concentrations exceeding their respective PSCs in seep samples are discussed in further detail below.

Total Petroleum Hydrocarbons

Seep samples were analyzed for gasoline, diesel, and oil range hydrocarbons using NWTPH Gx and NWTPH Dx. None of the sample MDLs exceeded their respective PSCs, and none of the detected concentrations of gasoline, diesel, and oil range hydrocarbons exceeded their respective PSCs.

VOCs

Seep samples were analyzed for VOCs using EPA Method 8260B. In 2002, MDLs exceeded their respective PSCs for one or more samples analyzed for 1,1-dichloroethene and vinyl chloride. These compounds were not analyzed in more recently collected samples.

Trichloroethene

Trichloroethene was detected in four one seep locations (Seeps 1, 2, 4 and 6). Only one detected concentration in Seep 4 (1.8 µg/L) above the PSC of 1.53 µg/L.

SVOCs

Seep samples were analyzed for SVOCs using EPA Methods 8270C, 8270D, or 8270-SIM during 2002 and 2006. Analysis of the SVOC samples using the SIM method yielded lower MDLs for 19 of the 64 SVOCs reported. MDLs exceeded their respective PSCs in one or more samples for the following compounds:

Concentration of the chemical was non detect in seep samples:

- Bis(2-ethylhexyl)phthalate
- Bis-(2-chloroethyl) Ether
- Butylbenzyl phthalate
- Di-n-octyl phthalate
- Dibenz[a,h]anthracene
- Hexachlorobenzene
- Hexachlorobutadiene
- n-Nitroso-di-n-propylamine
- Pentachlorophenol

Concentration of chemical was detected in one or more seep samples:

- Benzo[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[g,h,i]perylene
- Benzo[k]fluoranthene
- Chrysene
- Indeno(1,2,3-cd)pyrene

The compounds detected in one or more seep samples are discussed below.

Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)

Individual analytical results for the seven cPAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno(1,2,3-cd)pyrene) were compared to the PSCs of 0.0028 µg/L. In 2002, five cPAHs were detected in Seep 1 and Seep 2: benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene. In Seep 1, these cPAHs were detected at a concentration of 0.0100 µg/L. In Seep 2, these cPAHs were detected at a concentrations of 0.0200 µg/L. Both concentrations exceeded the PSCs for these cPAHs. Benzo[a]pyrene was detected in one sample collected from Seep 2 in 2002. The detected concentration (0.00001 µg/L) did not exceed the PSC. During 2006, cPAHs were not detected in concentrations exceeding the MDLs. The 2002 results were reported to contain entrained particles at the time of sampling. The difference in concentration between the 2002 and the 2006 cPAHs analytical results are therefore attributed to the presence of particulates in the 2002 samples.

6.3.1 Metals

Seep samples were analyzed for metals using methods E200.8, SW7470A, and A3500D in 2002 and 2006. The metals analyzed include antimony, arsenic, beryllium, cadmium, total chromium, chromium VI, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. Both total (non-filtered) and dissolved (filtered) samples were analyzed. MDLs exceeded their respective PSCs for one or more samples analyzed for arsenic and mercury. Mercury was not detected in concentrations exceeding the MDLs in any of the samples analyzed. Metals detected in concentrations exceeding their PSCs (including arsenic) are discussed below. The PSC for metals do not account for background concentrations.

Arsenic

Arsenic was detected in all seep samples except the dissolved (filtered) sample collected from Seep 4 during 2006. The detected concentrations of the non-filtered samples ranged from 1 µg/L in Seep 4 during 2006 to 7.5 µg/L in Seep 2 during 2002. The maximum concentration (3 µg/L) in the filtered samples was detected in Seep 5 during 2006. All detected concentrations exceeded the PSC of 0.018 µg/L.

Copper

Copper was detected in all seep samples except for the dissolved (filtered) sample collected from Seep 4 during 2006 and the total (unfiltered) sample collected from Seep 2 during 2006. The concentrations detected in the non-filtered samples ranged from 3.5 µg/L in Seep 6 during 2006 to

33.8 µg/L in Seep 2 during 2002. In 2006, the maximum concentration (3.5 µg/L) in the filtered samples was detected in Seep 5. All detected concentrations exceeded the PSC of 2.4 µg/L.

Lead

Lead was detected only in the unfiltered samples collected from Seeps 1, 2, and 4 during 2002 and from Seeps 4 and 6 during 2006. The maximum concentration (16 µg/L) was detected in Seep 2. Lead was not detected in concentrations exceeding the MDL in the filtered samples.

Nickel

Nickel was detected in all seep locations except Seep 3. Only one detected concentration, 7 µg/L in Seep 2 during 2002, exceeded the PSC of 5 µg/L. None of the filtered sample concentrations exceeded the MDL of 4.2 µg/L.

Selenium

Selenium was detected in concentrations exceeding the PSC of 5 µg/L in Seep 2, Seep 5, and Seep 6. The highest concentration (11 µg/L) was detected in the unfiltered sample collected from Seep 5 during 2006. The dissolved concentration of selenium in Seep 5 (8 µg/L) during 2006 also exceeded the PSC. No other filtered seep samples contained concentrations of selenium exceeding the PSC.

Zinc

Zinc was detected in all samples except for the filtered samples collected from Seeps 1 and 5 during 2002. The detected concentration of zinc exceeded the PSC of 32.56 µg/L in only one sample. This unfiltered sample was collected from Seep 2 during 2002, and the detected concentration was 53 µg/L. The highest concentration detected in the filtered samples was 11 µg/L, detected in Seep 4 during 2006.

6.3.2 PCBs

Seep samples were analyzed for PCBs using method SW8082 during 2002 and method 8082M during 2006. The MDL for aroclor 1254 exceeded the PSC (0.00166 µg/L) during 2006. No other MDLs exceeded their PSCs. Aroclors 1254 and 1260 were detected in concentrations exceeding their PSCs and are discussed below. The other aroclors (1016, 1221, 1232, 1242, 1248, 1262, and 1268) were not detected in concentrations exceeding their MDLs.

Aroclor 1254

Aroclor 1254 was detected in Seeps 1, 2, 4, and 5 during 2002, and in only Seep 2 during 2006. Detected concentrations ranged from 0.01 µg/L in Seeps 4 and 5 (2002) to 0.09 µg/L in Seep 2 (2002). By 2006, the aroclor 1254 concentration decreased slightly in Seep 2 to 0.012 µg/L.

Aroclor 1260

Aroclor 1260 was detected in Seeps 1, 2, 4, and 5 during 2002 and was not detected in concentrations exceeding the MDL in the seep samples during 2006. In 2002, the detected concentrations in Seep 1 (0.02 µg/L) and Seep 2 (0.08 µg/L) exceeded the PSC of 0.014 µg/L.

6.4 STORMWATER SOLIDS AND STORMWATER SAMPLES

Stormwater samples (water and solids) have been collected on the 8801 site on multiple occasions since at least 2002. Six recent comprehensive stormwater sampling events have been undertaken in 2002, 2004, 2006, and 2007 (three separate events in 2007) (Appendix J). Collection and analysis of samples collected from catch basins and/or the outfalls of the stormwater system on the 8801 site have been undertaken in 2004, 2006, 2007, 2008, 2009 and 2010. Sampling of stormwater solids from the Boeing Thompson property to the north of the 8801 site was also undertaken in 2008 and 2009 (Appendix J).

More recently in 2010, Windward on behalf of IAAI, has collected and analyzed solid samples from inserts and within the manholes and catch basins of the stormwater system at the 8801 site (Windward 2010a and 2010b). This analytical data, collected to determine if current 8801 site operations are contributing to the stormwater solids, shows a strong correlation both in chemical type and concentration to the values and chemicals previously found in the stormwater system solids.

6.4.1 Stormwater

Various chemicals have been detected above the respective PSCs in stormwater samples. As the results are reported elsewhere (Kennedy/Jenks, 2002c and 2004 and AnchorQEA, 2009), the following is a list of the chemicals that have been detected above the current PSC for the 8801 site in more than 10% of the samples: Metals (arsenic, cadmium, copper, lead, mercury, nickel and zinc); VOCs (chloroethane and vinyl chloride); SVOCs (cPAHs and BEHP); and PCBs (aroclor 1254).

6.4.2 Stormwater Solids

Concentrations in stormwater solid samples have been screened against the SMS values and are reported elsewhere (Kennedy/Jenks 2004, AnchorQEA, 2009 and Windward 2010a and 2010b). Since the SMS screening numbers have not been changed between the different sampling events and the sampling is still on-going the numbers of detects have not been calculated for stormwater solid samples.

6.5 SUMMARY OF COPCS

This section provides a list of the COPCs identified at the 8801 site and the justification for the removal of certain chemicals that exceeded the PSC.

6.5.1 Excluded from COPCs

Chemicals have been excluded from the CPOC list for the 8801 site based on a couple of parameters. Since no allowance has been made for background concentrations, method detection limits or equilibrium partition between soil and groundwater, the arguments for the removal of the chemicals are considered to be valid and conservative.

In the detailed narrative of chemicals that have been identified above their respective PSCs, there are some chemicals that have only one occurrence or location above the PSC in either soil or groundwater. Alternatively, there are chemicals that have an occurrence in a couple of locations in soil but have not been detected in groundwater or if located in the SWS area in seeps and groundwater. In the event that there is only this limited occurrence and 2006 groundwater concentrations do not exceed the PSC for that chemical, the chemical is considered not to be a CPOC for the 8801 site. The chemicals to be removed from the CPOC list are 1,1,1-Trichloroethane, 1-2-Dichloroethane, 2-methylnaphthene, acetone, benzene, cis-1,2-Dicloroethene, dibenzofuran, ethylbenzene, methyl chloride, pentachlorophenol, toluene and total xylenes. Although metal concentrations have been detected on site above respective PSCs no correction for background concentration has been applied to the group. The metals above their respective PSC are included as COPCs and the occurrence are discussed further in the data gaps section.

6.5.2 Identified COPCs

The following chemicals are considered to be present either across the 8801 site or are present in relatively higher concentrations:

<u>Total Petroleum Hydrocarbons</u>

- Gasoline range hydrocarbons
- Diesel and lube oil range hydrocarbons

<u>VOCs</u>

- Tetrachloroethene
- Trichloroethene
- 1-2-Dichloroethene
- Vinyl Chloride
- Chloroethane

SVOCs

- cPAHs
- PAHs - Acenthaphthene, anthracene, benzo(g,h,i)perylene, fluoranthene, fluorene, phenanthrene, phenols and naphthalene
- BEHP
- Butylbenzylphthalate

Metals

- Arsenic
- Cadmium
- Cooper
- Lead
- Mercury
- Nickel
- Selenium
- Zinc

PCBs

- Aroclor 1254

6.6 DATAGAPS

This section addresses the distribution of identified COPCs with respect to potential sources and outlines areas where additional information would assist in clarifying the extent of the COPCs. A list of 8801 site COPCs and their location is given on Table 9 below.

Table 9 Chemicals of Potential Concern

Chemical	Comments
acetone	A1 only
acenaphthene	Limited to areas of TPH only
anthracene	Limited to areas of TPH only

Chemical	Comments
benzene	Limited areas only - Off Highway Building, NW corner, E7 and BY 1/3 of SWS area.
benzo(g,h,i)perylene	Limited to areas of TPH only
benzo[a]anthracene	Limited to areas of TPH only
benzo[a]pyrene	Limited to areas of TPH only
benzo[b]fluoranthene	Limited to areas of TPH only
benzo[k]fluoranthene	Limited to areas of TPH only
bis(2-ethylhexyl) phthalate	Limited areas only
butyl benzyl phthalate	Limited areas only
chloroethane	Groundwater and limited areas in soil
chloromethane (methyl chloride)	Groundwater and limited areas in soil
chrysene	Limited to areas of TPH only
dibenz[a,h]anthracene	Limited to areas of TPH only
dichloroethane, 1,1-	Groundwater and limited areas in soil
dichloroethane, 1,2-	Groundwater and limited areas in soil
dichloroethylene, 1,1-	Groundwater and limited areas in soil
dichloroethylene, 1,2-	Groundwater and limited areas in soil
dibenzofuran	South west storage area only
dimethyl phthalate	Sediment only
di-n-octylphthlate	Sediment only
ethylbenzene	VOC will analyze where known TPH- see benzene
fluoranthene	Limited to areas of TPH only
fluorene	Limited to areas of TPH only
indeno[1,2,3-cd]pyrene	Limited to areas of TPH only
methyle chloride (dichloromethane)	Groundwater and limited areas in soil
methylnaphthalene, 2-	Sediment only
naphthalene	Limited to areas of TPH only
pcb mixtures	Limited to area near catach basin N, SWS and north corner only
pcb - Aroclor 1016	See PCB mixtures
pcb - Aroclor 1221	See PCB mixtures
pcb - Aroclor 1232	See PCB mixtures
pcb - Aroclor 1242	See PCB mixtures
pcb - Aroclor 1248	See PCB mixtures
pcb - Aroclor 1254	See PCB mixtures
pcb - Aroclor 1260	See PCB mixtures
phenanthrene	Limited to areas of TPH only
tetrachloroethylene (perchloroethylene)	Groundwater and limited areas in soil
trichlorethane, 1,1,1-	Groundwater and limited areas in soil

Chemical	Comments
trichlorethane, 1,1,2-	Groundwater and limited areas in soil
trichloroethylene	Groundwater and limited areas in soil
trimethylbenzene, 1,3,5-	VOC will analyze where known TPH- see benzene
toluene	VOC will analyze where known TPH- see benzene - and A1
vinyl chloride (chloroethylene)	Groundwater and limited areas in soil
xylene (dimethylbenzene)	VOC will analyze where known TPH- see benzene
benzoic acid	Storm water solids only
benzyl alcohol	Storm water solids only
pentachlorophenol	Limited to SWS and close to catch basin N
phenol (total)	Limited areas and media only
Tributyltin	Limited areas and media only
Arsenic (III)	Limited areas and media only
Arsenic (V)	Limited areas and media only
Arsenic (total)	Limited areas and media only
Cadmium	Limited areas and media only
Chromium (VI)	Limited areas and media only
Chromium, total (or III)	Limited areas and media only
Copper	Limited areas and media only
Lead	Limited areas and media only
Mercury	Limited areas and media only
Nickel	Limited areas and media only
Selenium	Limited areas and media only
Silver	Limited areas and media only
Zinc	Limited areas and media only
Gasoline	Limited to areas of TPH only
Diesel	Limited to areas of TPH only
Lube oil	Limited to areas of TPH only
2,3,7,8-TCDD (Dioxin)	Limited to SWS and close to catch basin N

The 8801 site has been used as an industrial facility since the 1920s. Historical operations at the 8801 site predating Kenworth could have produced some of the isolated locations of COPCs. Some of the areas with COPCs are attributable to known sources, namely the USTs in the SFA, the NFA, and adjacent to the Fiberglass Shop; and storage of materials in the SWS area. Fill material from an unknown source may be a source of COPCs in the SWS area.

Certain COPCs at the 8801 site may be attributable to releases of contaminants at properties to the north and south of the 8801 site that migrated to the 8801 site. As further explained below, petroleum

hydrocarbons present in borings D7 and E7 in the southwest corner of the 8801 site may have originated at the adjacent RP property to the south. Also some of the VOCs present in the north portions of the 8801 site may have originated at the adjacent Boeing Thompson property. Boeing reportedly used VOCs in production processes at this property in close proximity to the northern boundary of the 8801 site. These VOCs may have migrated onto the 8801 site through the drainage pipe behind the retaining wall between the two properties (approximately midway between E0 and D0 on the northern boundary of the 8801 site). As further explained below, the Boeing Thompson property also has an arsenic groundwater plume on the western side of the property that appears to be migrating to the 8801 site.

The discussion below present conclusions on potential sources and identifies areas in which the sources of the CPOC are unknown.

6.6.1 South Fire Aisle

The SFA contained six USTs, which were removed during or before 2004. Multiple investigations were undertaken along the SFA, including an investigation at the eastern and western ends of the aisle beyond the UST excavations. In 2004, excavation work extended east beyond where the USTs were removed, between the Manufacturing Building and the Administration Building, to remove additional hydrocarbon-contaminated soil along the route of the former railroad tracks. After completion of the excavations associated with the UST removals, ORC© was injected in 2004 along the western end of the SFA to remediate any residual petroleum hydrocarbons that remained.

Diesel- and lube oil-range hydrocarbons were detected in the SFA at one location (SFA-7). At one location just north of the SFA, within the Manufacturing Building (FTF-2), an elevated concentration of lube oil was detected. Gasoline-range hydrocarbons were detected in two locations (M4 and FWW-1) in the same vicinity. All four locations were delineated vertically, and all but the gasoline-range hydrocarbons were delineated laterally. Gasoline-range hydrocarbons have only been partially delineated to the north. Because the storm drain lies to the north of the M4 and FWW-1 locations, one soil boring to the north of M4 to a depth of 10 feet bgs will be installed. Soils will be analyzed for petroleum-range hydrocarbons. Groundwater samples that were collected from cross and down-gradient monitoring wells after the remediation activities in the SFA were completed confirms that gasoline-, diesel-, and lube oil-range hydrocarbons are not present in groundwater in elevated concentrations.

6.6.2 Southwest Storage Area

The SWS area and the area to the south were within the LDW until filled in approximately 1967 (Figure 9). The source of the fill material is unknown. The limits of the SWS area fill are as follows: to the north, the northern boundary of the parcel of property Kenworth acquired from Monsanto in 1966;

to the south, the southern boundary of the 8801 site; to the west, the western boundary of the upland portion of the 8801 site; and to the east, a line approximately 36 feet east from the western boundary of the upland portion of the 8801 site. In 2007, IAAI undertook an excavation in the central part of the SWS area to install the new stormwater treatment system. The soil excavated during the work was disposed off site. Exceedances of multiple chemicals have been identified primarily in the northern portion of the SWS area, including diesel- and lube oil-range hydrocarbons in soil, VOCs primarily in soil with limited groundwater occurrence, PCBs in soil and in one monitoring well, metals (arsenic, copper, lead, nickel, silver, and zinc) primarily in soil but with some groundwater occurrences, BEHP in soil and groundwater, and cPAHs in soil. Samples were collected north of the SWS area during the AS/SVE trench excavation. Some VOCs and metals were detected in the AS/SVE trench samples; however, the concentrations are generally lower than concentrations in the SWS area. Samples collected from the east of the SWS area generally did not exceed PSCs except at location E7, which is discussed below. Many of the contaminants have been vertically delineated, though the extent of some chemicals is not fully defined below the water table.

Groundwater data is needed in the SWS area to determine if COPCs identified in soil are partioning to groundwater and to determine if exceedances of the PSC in seep data from along the LDW is related to entrained particulates or are dissolved in the groundwater. To close this data gap, one new groundwater monitoring well, screened in the A groundwater aquifer, is proposed within the SWS area. This monitoring well will also determine if the chemicals that have not been vertically delineated occur in concentrations sufficient to partition into groundwater. The new monitoring well will be set back from the western boundary of the upland portion of the 8801 site due to the presence of an embankment that was constructed to form the shoreline during infilling that would inhibit drilling (Figure 9). A boring will be advanced prior to the installation of monitoring wells, and discrete soil samples will be collected for analysis. Groundwater samples will be collected and analyzed after well development. On the eastern and north edge of the SWS area, additional soil data is also needed to ensure that lead and PCBs are adequately delineated. Three borings to 15 feet bgs are proposed to fill this data gap.

6.6.3 North West Corner

The north west corner consists of the area between the Fiberglass Shop, the northern boundary of the 8801 site, the western boundary of the upland portion of the 8801 site, and the eastern edge of the former USTs in this vicinity. An acetone UST, various hydrocarbon-containing USTs, a still used to reprocess acetone, and an MEKP storage shed were formerly located in this area. IAAI undertook a large excavation in the central part of this area in 2007 to install the new stormwater treatment system. The soil excavated during the work was disposed off site. Within the north west corner, high concentrations of VOCs have been detected at boring A1 in both soil and groundwater and total

petroleum hydrocarbons have been identified adjacent to the northeast corner of the Fiberglass Shop; both the VOCs and petroleum hydrocarbons have been vertically delineated in this location.

One new groundwater monitoring well is proposed in the western perimeter of the north west corner to determine if the COPCs identified at boring A1 and in scattered locations throughout the area have partitioned to groundwater and are migrating to the LDW. A boring will be advanced before the installation of the monitoring well, and discrete soil samples will be collected for analysis. Groundwater samples will be collected and analyzed after well development.

6.6.4 North Fire Aisle

Four USTs were removed from the NFA area in 1986. These USTs were part of a storage and recycling system for thinners used in the painting area of the Manufacturing Building. The thinners were recycled in an MEK still located in a small building adjacent to the east of the Manufacturing Building. The former wash pit is also located in the NFA to the west of the Manufacturing Building. This area was used to wash oil- and grease-containing articles. The waste water was stored in an AST and disposed of off-site. Racks from the paint booths were also dipped in caustic in this area. Paint chips were collected from the caustic tanks and disposed of off-site.

Soil and groundwater samples collected in 1986 and 1987, shortly after the USTs were removed, had high concentrations of 1,1,1-trichloroethane, 4-methyl-2-pentanone (also known as methyl isobutyl ketone and used on the site to the north), toluene, and 1,1-dichloroethane (a breakdown product of 1,1,1-trichloroethane). Trichloroethene and vinyl chloride were present in the groundwater at significantly lower concentrations than the chemicals above at the time of the 1986 investigation. Examination of both 8801 site data and recent data from an investigation on the Boeing Thompson property to the north shows that the elevated concentrations of trichloroethene and tetrachloroethene in soil are located to the west of the NFA near sample point G0. Therefore, the USTs in the NFA may not be the only sources of the contamination detected in soil and groundwater in the northern area of the 8801 site. Shallow soils in the area of the wash pit contain metals (arsenic, cadmium, copper, nickel, and zinc) and PAHs. Gasoline-range petroleum hydrocarbons were found in one soil sample (MBS-2) to the west of the wash pit area in concentrations exceeding the PSC at a depth between 3.5 and 5 feet bgs. The gasoline was delineated vertically. No data gaps are associated with the wash pit area.

To fill data gaps associated with the NFA, vertical delineation of the VOCs is proposed in the vicinity of G0 and D0 and sampling of near-surface soils is proposed in this area to examine whether the soils continue to contain the elevated concentrations previously detected. Two borings that will be completed as new monitoring wells are proposed in the NFA to close the data gaps.

6.6.5 Off-Highway Building Area

The Off-Highway Building was used primarily for assembly of off highway trucks, although it had previously been used as a repair shop. Paint storage and a paint booth were located at the south end of the building and a fueling are was formerly located to the west of the building. Both grid and focused investigation borings in the area identified elevated levels of petroleum hydrocarbons, VOCs, and occasionally PAHs in the soil; and VOCs in the groundwater. The primary VOCs identified in this location were ethylbenzene, toluene, total xylenes, trichloroethene, and tetrachloroethene although only the latter two have been detected down-gradient. For the most part, the COPCs in soil under the building have been vertically delineated. Groundwater contamination is likely augmented by up-gradient sources of VOCs. The direct source of the contamination under the Off-Highway Building is unknown but the petroleum hydrocarbons could be attributed to the former fueling location.

Petroleum hydrocarbon concentrations have been detected in soil beneath the Off-Highway Building and there are no monitoring wells down-gradient of these soil sample locations. To close this data gap, one new monitoring well, screened in the A groundwater aquifer, is proposed. A boring will be advanced prior to the installation of the monitoring well, and discrete soil samples will be collected and analyzed for EPH/VPH and VOCs. Groundwater samples will be collected and analyzed for total petroleum hydrocarbons and VOCs after well development.

6.6.6 VOCs in Groundwater

VOCs (primarily 1,1-dichloroethene, chloroethane, tetrachloroethene [no later than 2006], trichloroethene, and vinyl chloride) have been detected in groundwater at the 8801 site in concentrations exceeding PSCs. Excluding grab groundwater samples collected in 2004, for which there is no additional data, the VOCs mentioned above are located in the NFA at MW-8B, and in wells on the western part of the 8801 site through to the SWS area, although detected concentrations of all the VOCs in all locations does not occur. 1,1-dichloroethene, chloroethane, trichloroethene, and vinyl chloride concentrations have exceeded PSCs in samples from monitoring wells on the western boundary of the 8801 site as recently as 2009.

A comprehensive sampling of groundwater in all permanent monitoring wells west of MW-16A is proposed (including newly proposed wells). The groundwater samples would be analyzed for 1,1-dichloroethene, cis-1,2-dichloroethene, chloroethane, tetrachloroethene, trichloroethene, and vinyl chloride, with a low detection limit to meet the revised PSC for vinyl chloride.

6.6.7 Other Areas of CPOC Concentration

E7. One sample located near the southern boundary of the 8801 site (E7) had soil concentrations of gasoline-range hydrocarbons, benzene, and total xylenes exceeding PSCs. No known source on the 8801 site has been identified; however, hydrocarbon contaminated soil was excavated on the

adjacent RP property to the south in approximately the same vicinity as E7. At the 8801 site, no gasoline was detected in soil samples collected to the north, west, and east of E7. Gasoline was delineated vertically, but benzene was not. Since no benzene is detected in groundwater in the down gradient well of MW-30 or MW-41A, migration of benzene to the LDW is considered not to be occurring. No data gaps are associated with this area.

Metals in near surface soil site-wide. Elevated levels of arsenic and copper have been found primarily in the shallow fill that has been sampled on the 8801 site. The site wide occurrence of these metals may be a function of the conservative PSC being used and the frequency of detections above the PSC may reduce after background concentrations are applied. The distribution of these metals is reasonably widespread within the fill that has been analyzed and appears to be confined to the near surface. Other metals have also been identified in more discrete locations also in fill. The source of the fill on the 8801 site is unknown. Since the concentrations of metals in groundwater are elevated primarily where known sources have been identified (such as the SWS area or adjacent to the northwestern boundary of the 8801 site) no further delineation appears warranted.

Manufacturing Building. Tetrachloroethene has been detected in near surface soils under the Manufacturing Building. As noted earlier, Kenworth did not use tetrachloroethane in its operations. Kenworth used 1,1,1-trichlorethane as a surface cleaner and methyl ethyl ketone and toluene for paint gun cleaning. The shallow occurrences of tetrachloroethene under the Manufacturing Building appear to be sporadic and may be related to operations undertaken at some time prior to Kenworth's. Given the random locations of the spills and close spacing of the grid sampling throughout the Manufacturing Building, no data gaps are identified for this location.

Former Middle Outfall Area. Sampling of solids from within the drainage pipe near the now closed middle outfall identified elevated concentrations of PCBs. More recent stormwater solids samples and soil samples collected in close proximity to former middle outfall piping have not been analyzed for PCBs. Although elevated concentrations were identified within the stormwater system and the piping and outfall were sealed in 2004, the soil in the vicinity of the catch basin and outfall has not been sampled. Four shallow borings are proposed to the north and south of the middle outfall piping and catch basin N. The borings would extend to 5 feet bgs, and samples would be analyzed for PCBs by aroclor.

Arsenic in Groundwater. Arsenic concentrations significantly exceeding the screening criteria have been detected in groundwater samples from monitoring wells along the northwest boundary of the 8801 site. Historically, elevated arsenic concentrations in soil and groundwater have been identified on the adjacent Boeing Thompson property to the north. Since no specific source of arsenic is known to be present at the 8801 site, the elevated levels in groundwater along the property boundary likely

derive from contamination at the Boeing Thompson property. No data gaps are associated with the arsenic in this area of the 8801 site.

7.0 LIMITATIONS

This RI report dated March 18, 2011, was prepared exclusively for PACCAR Inc by AMEC. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation; ii) data supplied by outside sources; and iii) the assumptions, conditions, and qualifications set forth in this report and AMEC proposal. This report is intended to be used by PACCAR Inc for the 8801 Site only, subject to the terms and conditions of the Master Services Agreement between PACCAR Inc and AMEC. Any other use of, or reliance on, this report by any third party is at the sole risk of the party.

8.0 REFERENCES

AMEC Earth & Environmental (2005). Investigation of Groundwater Infiltration to the North Part of the Storm Drain System Letter-Report, 8801 East Marginal Way South, Tukwila, May 9, 2005. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2006a). Catch Basin "N" Closure Letter of Completion, 8801 East Marginal Way South, Tukwila, Washington, February 1, 2006. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2006b). Draft Site Wide Storm Line System Cleanup Activities Letter-Report, 8801 East Marginal Way South, Tukwila, Washington, May 18, 2006. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2006c). Historical Storm Line System Sampling and Cleaning Activities Report, 8801 East Marginal Way South, Tukwila, Washington, June 1, 2006. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2006d). Draft Wet Season Groundwater Study Report, 8801 East Marginal Way South, Tukwila, June 3, 2006. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2007a). Storm Drain System Repair (CB74 to Lift Station) Letter-Report, 8801 East Marginal Way South, Tukwila, Washington, February 16, 2006. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2007b). Draft Dry Season Groundwater Study Report, 8801 East Marginal Way South, Tukwila, February 23, 2007. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2007c). Video Survey of Storm Drain System, East End of Site Letter-Report, 8801 East Marginal Way South, Tukwila, Washington, April, 13, 2007. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

AMEC Earth & Environmental (2008). Air Sparging and Soil Vapor Extraction System, 4th Quarter 2007 Operations Report, 8801 East Marginal Way South, Tukwila, January 26, 2008. Submitted to PACCAR Inc by AMEC, Kirkland, Washington.

Anchor Environmental, LLC (2006). Sediment Evaluation Work Plan, 8801 Marginal Way South, July 2006. Prepared for PACCAR Inc by Anchor, Seattle, Washington.

Anchor Environmental, LLC (2007a). Technical Memorandum on Sediment, Seep and Storm water Results at 8801 Marginal Way South, January 2007. Prepared for PACCAR Inc by Anchor, Seattle, Washington.

Anchor Environmental, LLC (2007b). Draft Technical Memorandum on Phase 1 Sediment, Seep Water, Storm water, and Storm water Solids Data, 8801 Marginal Way South, March 2, 2007. Prepared for PACCAR Inc by Anchor, Seattle, Washington.

Anchor Environmental, LLC (2007c). Phase 2 Sediment Evaluation Work Plan, Contingency Task A, November 2 2007. Prepared for Department of Ecology, NWRO by Anchor, Seattle, Washington.

Anchor Environmental, LLC (2008a). Technical Memorandum on Evaluation of Tidal Influence on Groundwater Elevation at 8801 Marginal Way South, February 14, 2008. Prepared for PACCAR Inc by Anchor, Seattle, Washington.

Anchor Environmental, LLC (2008b). Draft Technical Memorandum on Phase 2 SEWP Surface and Subsurface Sediment Results at 8801 Marginal Way South, May 12, 2008. Prepared for PACCAR Inc by Anchor, Seattle, Washington.

Anchor QEA, LLC, (2009). Final Sediment Evaluation Data Report, 8801 East Marginal Way South Property. June.

Barlow, P. M., (2003). Ground water in fresh water-saltwater environments of the Atlantic Coast. US Geological Survey Circular 1262. 113 p.

Dames and Moore, 1986. Phase II Site Screening Investigation. October.

Environmental Protection Agency, (2003a). Aerial Photographic Analysis of Jorgenson Forge Corporation/Duwamish River, Seattle, Washington. Environmental Sciences Division, Las Vegas, NV. TS-PIC-20310003S. January.

Environmental Protection Agency, (2003b). Procedure for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. EPA-600-R-02-013. November 2003 Washington, D.C: U.S. Environmental Protection Agency, Office of Research and Development.

Environmental Protection Agency, (2006a). National Recommended Water Quality Criteria, Office of Water, Office of Science and Technology.

Environmental Protection Agency, (2006b). Evaluating Vapor Intrusion Using the Johnson and Ettinger Model. June 25, 2006. <http://www.epa.gov/Athens/learn2model/part-two/onsite/JnE_lite.htm>.

Environmental Protection Agency, (2007). Rhône-Poulenc, Museum of Flight Expansion RCRA Status Report. October.

Environmental Resources Management (ERM) and Exponent. (2000). Request for Groundwater NFA Determination Hydrogeologic Investigation and Site-Specific Action Level for Arsenic in Groundwater, Boeing Isaacson Site, VCP ID# NW0453. November.

Fabritz, J., Massmann, J., and Booth, D., (1998). Development of a three-dimensional groundwater flow model for the Duwamish River Basin, University of Washington Center for Urban Resources Management, Department of Civil and Environmental Engineering, Seattle, WA. August.

GeoEngineers (1990). Remedial Feasibility Assessment, Subsurface Solvent Contamination, NFA, Kenworth Truck Manufacturing Facility, Tukwila, Washington, May 25, 1990. Prepared for Kenworth Truck Company by GeoEngineers, Bellevue, Washington.

GeoEngineers (1995a). Interim Status Report, NFA, Kenworth Truck Manufacturing Facility, Seattle, Washington, August 1, 1995. Prepared for Kenworth Truck Company by GeoEngineers, Bellevue, Washington.

GeoEngineers (1995b). Remediation Monitoring Boneyard Hydraulic Oil Spill, Kenworth Truck Plant, Seattle, Washington, September 21, 1995. Prepared for Kenworth Truck Company by GeoEngineers, Bellevue, Washington.

GeoEngineers Incorporated (1986a). Phase I Report, Site Environmental Assessment, Underground Storage Tank Management Program, Kenworth Truck Manufacturing Facility, King County, Washington, March 1986. Prepared for Kenworth Truck Company by GeoEngineers Inc, Bellevue, Washington.

GeoEngineers Incorporated (1986b). Phase II Engineering Report, Site Environmental Assessment, Underground Storage Tank Management Program, Kenworth Truck Manufacturing Facility, King County, Washington, July 1986. Prepared for Kenworth Truck Company by GeoEngineers Inc, Bellevue, Washington.

GeoEngineers Incorporated (1987a). Site Environmental Assessment, Former Monsanto Waste Disposal Area, Seattle, Washington, January 1987. Prepared for Kenworth Truck Company by GeoEngineers Inc, Bellevue, Washington.

GeoEngineers Incorporated (1987b). Report of Geotechnical Services, Proposed Wastewater Treatment Facility and Chemical Management Facility, Kenworth Truck Manufacturing Facility, King County, Washington, September 25, 1987. Prepared for Kenworth Truck Company by GeoEngineers Inc, Bellevue, Washington.

GeoEngineers Incorporated (1988). Phases 3 and 4 Technical Report, Site Environmental Assessment, Kenworth Truck Manufacturing Facility, King County, Washington, January 26, 1988. Prepared for Kenworth Truck Company by GeoEngineers Inc, Bellevue, Washington.

GeoEngineers, (1990). Remedial Feasibility Assessment, Subsurface Solvent Contamination, NFA, Kenworth Truck Manufacturing Facility, Tukwila, Washington, May 25, 1990. Prepared for Kenworth Truck Company by GeoEngineers, Bellevue, Washington.

Geomatrix Consultants Inc, (2007a). Northwest Corner Affected Soil Removal Report, Former Rhône-Poulenc Site, Tukwila, Washington. January.

Geomatrix Consultants Inc, (2007b). Final Operations and Maintenance Report 2003-2006, Former Rhône-Poulenc Site, Tukwila, Washington. September.

Geomatrix Consultants Inc, (2007c). Final East Parcel Corrective Measures Implementation Work Plan, Former Rhône-Poulenc Site, Tukwila, Washington. December.

Hem, J. D., (1959). Study and Interpretation of the Chemical Characteristics of Natural Water. U.S. Geological Survey Water Supply Paper 2254.

Jeng, D-S, Mao, X., Enot, P., Barry, D. A., Li, L., and Binlet, A., (2005). Spring-neap tide-induced beach water table fluctuations and its influence on the behavior of a coastal aquifer adjacent to

a low-relief estuary. University of Sydney Department of Civil Engineering, Research Report No R856. November.

Kennedy/Jenks Consultants (2000b). Diesel UST Closure Report, Seattle, Washington, September 2000. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2001a). Dry Well Evaluation, May 2000, PACCAR Inc - Seattle, Washington, January 2001. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2001b). Semi-Annual Groundwater Monitoring Report, PACCAR Inc - Seattle, Washington, April 2001. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2001c). Draft Data Gaps Investigation Work Plan, PACCAR Inc - Seattle, Washington, September 2001. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2001d). 15W-40 Oil and Antifreeze UST Closure Report, PACCAR Inc - Seattle, Washington, November 2001. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2001e). Dry Well Catch Basin Cleaning Activities, PACCAR Inc - Seattle, Washington, November 2001. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2001f). Supplemental Groundwater Monitoring Report, PACCAR Inc - Seattle, Washington, December 27, 2001. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2002a). Ambient Air Monitoring Report, PACCAR Inc - Seattle, Washington, March 2002. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2002b). Air Sparging and Soil Vapor Extraction Pilot Study, PACCAR Inc - Seattle, Washington, dated November 2002. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2002c). Phase I Data Gaps Investigation Summary Report, December 12, 2002. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2003a). Dry Well Evaluation Letter – Report, PACCAR Inc – Seattle, Washington, April 2003. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2003b). Underground Storage Tank Closure Report, SFA USTs E2, E5, and E6, and Acetone UST E7, June 2003. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2003c). Technical Addendum to Data Gaps Work Plan, PACCAR Inc - Seattle Facility, June 2003. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2004). Phase II Data Gaps Investigation Summary Report, 8801 East Marginal Way South Property, November 2004. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants (2005a). Air Sparging and Soil Vapor Extraction System Installation, Startup, and Quarterly Operations Report, 8801 East Marginal Way South Property, February 7, 2995. Prepared for PACCAR Inc by Kennedy/Jenks Consultants, Federal Way, Washington.

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

Kennedy/Jenks Consultants. (1996). Groundwater Monitoring Status Report – NFA Project, May 1996. Prepared for the Kenworth Truck Company, Tukwila, Washington. by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants. (1998). Interim VOC Investigation Report, 8801 East Marginal Way South, Tukwila, Washington, Jane 1998. Prepared for the Kenworth Truck Company by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants. (1999a). Underground Storage Tank Investigation Report, 8801 East Marginal Way South, Tukwila, Washington, September 13, 1998. Prepared for the Kenworth Truck Company by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants. (1999b). Catch basin Sampling Results, Kenworth Truck Company Facility, December 9, 1999. Prepared for the Kenworth Truck Company by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks Consultants. (2000a). Cab-Line Excavation Activities and Analytical Results, August 2000. Prepared for the Kenworth Truck Company by Kennedy/Jenks Consultants, Federal Way, Washington.

Kennedy/Jenks, 2004. Phase 2 Data Gaps Investigation Summary Report. Kennedy/Jenks Consultants.

Kennedy/Jenks/Chilton (1987a). Data Evaluation/Risk Assessment, Former Monsanto Disposal Area, Kenworth Truck Company, January 1987. Prepared for GeoEngineers by Kennedy/Jenks/Chilton, Federal Way, Washington.

Kennedy/Jenks/Chilton (1987b). Report on Assessment of Storm/Non-Contact Cooling Water Quality, Kenworth Truck Company, October 1988. Prepared for GeoEngineers by Kennedy/Jenks/Chilton, Federal Way, Washington.

Kennedy/Jenks/Chilton (1988). Report Soil Investigation, Kenworth Truck Company, January 1987. Prepared for Kenworth Truck Company by Kennedy/Jenks/Chilton, Federal Way, Washington.

King County 2010. King County Noxious Weed List. Accessed on July 12, 2010 at http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/laws.aspx

Landau Associates (2009a). *Data Summary Report, Boeing Thompson-Isaacson Property, 8625-8811 East Marginal Way South, Tukwila, Washington*. Prepared for The Boeing Company. September 2.

Landau Associates (2009b). *Property Boundary Investigation, Boeing Thompson-Isaacson Property, 8625-8811 East Marginal Way South, Tukwila, Washington*. Prepared for The Boeing Company. September 9.

Landau Associates (2010). *Ecology Draft Review Work Plan Remedial Investigation/Feasibility Study, Boeing Thompson-Isaacson Property, 8625-8811 East Marginal Way South, Tukwila, Washington*. Prepared for The Boeing Company. July 21.

NOAA. (2006, last updated: April 13, 2006). 2006 Tide Predictions Duwamish Waterway, Eighth Avenue South, Retrieved February 13 2006, from http://www.noaa.gov.

Pritchard, D. W., (1955). Estuarine circulation patterns. Proceedings of the American Society of Civil Engineers, vol. 81, no. 171, pp. 1-11.

Puls, R.W., and M.J. Barcelona (1996). Low Flow Groundwater Sampling Procedures. U.S. Environmental Protection Agency.

Rhône-Poulenc (1995). RCRA Facility Investigation (RFI) Report, Washington. January.

Stoner, J. D., (1967). Prediction of salt-water intrusion in the Duwamish River Estuary, King County, Washington. Geological Survey Research 1967, Geological Survey Professional Paper 575D.

Striplin Environmental Associates (2004). Lower Duwamish Waterway Slip 4 Early Action Area, Summary of Existing Information and Identification of Data Gaps, Final. January 15.

Warner, E. J. and Fritz, R. L., (1995). The distribution and growth of Green River Chinook salmon (Onchorhynchus tshawytscha) and Chum salmon (Onchorhynchus keta) outmigrants in the Duwamish estuary as a function of water quality and substrate. Muckleshoot Indian Fisheries Department, Auburn, Washington.

Washington Department of Fisheries (1975). A Catalog of Washington Streams and Salmon Utilization – Volume 2 – Puget Sound Region, November 1975.

Washington State Department of Ecology (1980). Water Resources Management Program. Green-Duwamish River Basin Instream Resources Protection Program including Proposed Administrative Rules, and Supplemental Environmental Impact Statement, June 1980.

Washington State Department of Ecology (1980). Water Resources Management Program. Green-Duwamish River Basin Instream Resources Protection Program including Proposed Administrative Rules, and Supplemental Environmental Impact Statement, June 1980.

Washington State Department of Ecology (1980). Water Resources Management Program. Green-Duwamish River Basin Instream Resources Protection Program including Proposed Administrative Rules, and Supplemental Environmental Impact Statement, June 1980.

Washington State Department of Ecology (1994). Publication No 94-115: Natural Background Soil Metals Concentrations in Washington State, Toxics Cleanup Program, October 1994.

Washington State Department of Ecology (1995). Publication No. 94-49: Guidance on Sampling and Data Analysis Methods, January 1995.

Washington State Department of Ecology (2006b). Water Quality Standards for Surface Water for the State of Washington, WAC 173-201A-240, November 2006.

Washington State Department of Ecology (2007a). Publication No. 94-06: Model Toxics Control Act Statue and Regulation, RCW 70.105D, RCW 64.70, WAC 173-340, Revised November 2007.

Washington State Department of Ecology (2007b). Lower Duwamish Waterway Source Control Action Plans, Summary of Existing Information and Identification of Data Gaps Draft Report. Contract No. C0700036, Work Assignment No. EANE012. December.

Washington State Department of Ecology (2008). Lower Duwamish Waterway River Mile 3.9-4.3 East (Slip 6) Source Control Action Plan. Publication No. 08-09-001. September.

Washington State Department of Ecology (2010). Cleanup Levels and Risk Calculation (CLARC), updated April 24, 2010 https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx.

Windward Environmental LLC, (2007), Draft Remedial Investigation Report-Executive Summary, Lower Duwamish Waterway Remedial Investigation, Submitted to the US Environmental Protection Agency, Region 10 and The Washington State Department of Ecology, Northwest Field Office, November 5, 2007

Windward Environmental, LLC, and Retec. (2007). Lower Duwamish Waterway Remedial Investigation, Data Report Subsurface Sediment Sampling for Chemical Analyses. January 29.

Windward Environmental, LLC, (2004). Data Report: Survey and Sampling of Lower Duwamish Waterway Seeps. Final. Prepared by Windward Environmental, L.L.C., Seattle, Washington for the Lower Duwamish Waterway Group, Seattle, Washington. November 18.

Windward Environmental, LLC, (2007). Lower Duwamish Waterway Remedial Investigation. Draft Remedial Investigation Report. Prepared by Windward Environmental, L.L.C., Seattle, Washington, for the Lower Duwamish Waterway Group, Seattle, Washington. November 5.

Windward Environmental, LLC, (2008). Lower Duwamish Waterway. Final Sediment Transport Analysis Report. Prepared by Windward Environmental, L.L.C., Seattle, Washington for the Lower Duwamish Waterway Group, Seattle, Washington. January 24.

Windward Environmental, LLC, (2010a). Stormwater System Investigation, First Quarter Status Report. Prepared by Windward Environmental, L.L.C., Seattle, Washington for the Insurance Auction Auctions, Seattle, Washington. August 27.

Windward Environmental, LLC, (2010b). Stormwater System Investigation, Second Quarter Status Report. Prepared by Windward Environmental, L.L.C., Seattle, Washington for the Insurance Auction Auctions, Seattle, Washington. November 9.

Yim, C. S. and Mohsen, M. F. N., (1992), Simulation of Tidal Effects on Contaminant in Porous Media, Ground Water, Vol. 30, Issue 1, pp 78-86, January.

FIGURES

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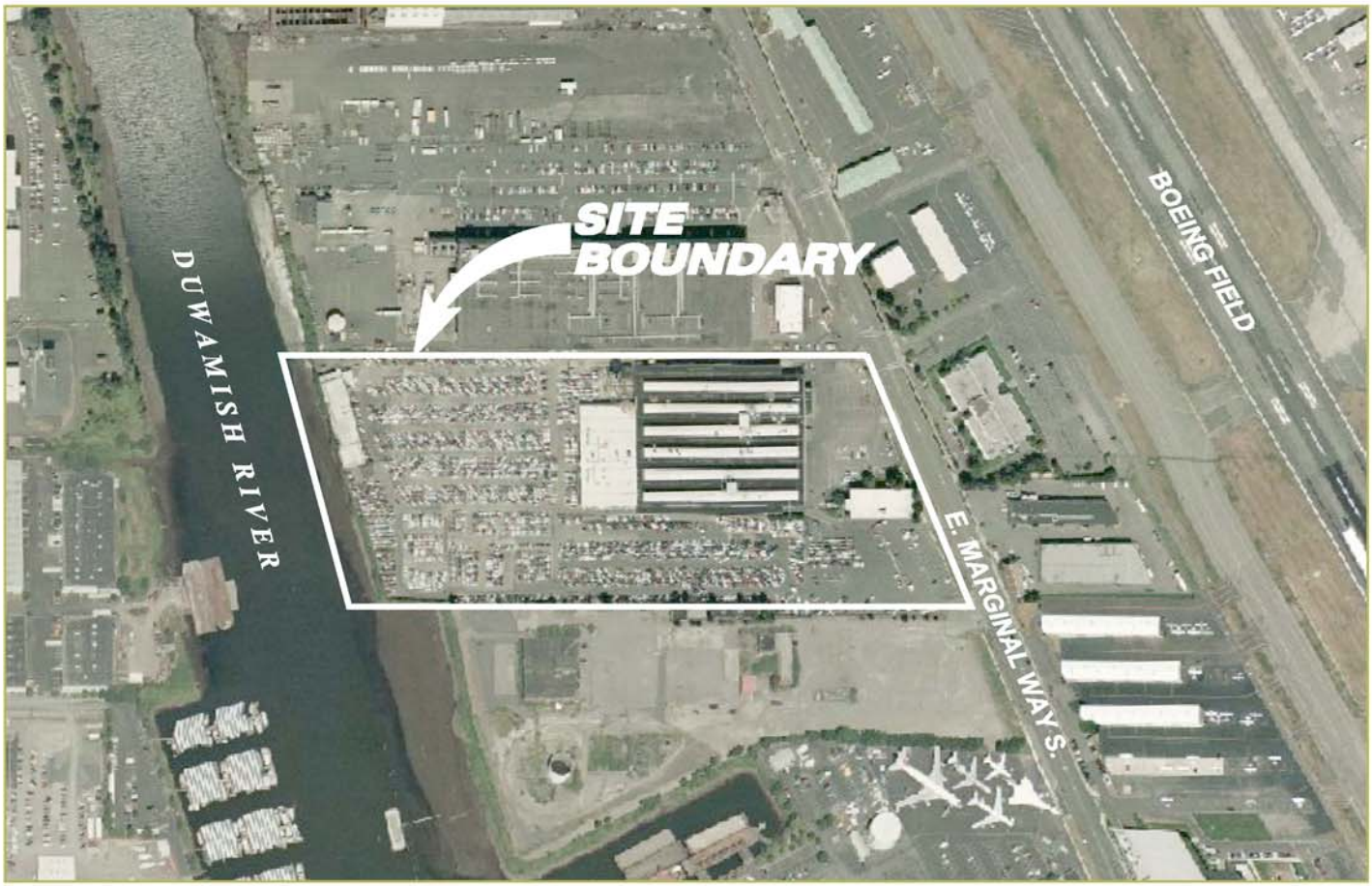

NOT TO SCALE

IMAGE PROVIDED BY KING COUNTY iMAP.
IMAGE DATE 2005

AMEC Earth & Environmental 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201	amec	CLIENT LOGO	CLIENT PACCAR INC	
PROJECT 8801 SITE, 8801 EAST MARGINAL WAY SOUTH, Tukwila, Washington		DWN BY: JRS	DATUM:	DATE: SEPTEMBER 2010
TITLE 8801 SITE VICINITY MAP		CHK'D BY: MS	REV. NO.:	PROJECT NO: 9-915-14995-L
		PROJECTION:	SCALE: NOT TO SCALE	FIGURE No. 1

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BOEING THOMPSON PROPERTY

NORTH OUTFALL (NO. 1)

FORMER FIBERGLASS SHOP

OFF-HWY BUILDING DEMOLISHED

DEMOLISHED

NORTH FIRE AISLE

FORMER MANUFACTURING BUILDING

EAST MARGINAL WAY

FORMER STORM - MIDDLE OUTFALL (CLOSED 2004)

DUWAMISH WATERWAY

SEEP 4

SEEP 3

SEEP 2

SEEP 1

SEEP 6

CENTRAL OUTFALL (NO.2) (FORMER 8801 SOUTH OUTFALL)

FORMER SOUTHWEST STORAGE AREA

SOUTH FIRE AISLE

FORMER ADMINISTRATION BUILDING

FORMER MONSANTO PARCEL

KING COUNTY STORM DRAIN LINE

SEEP 5

0 60 120 240

SCALE IN FEET

LEGEND

EXISTING BUILDINGS

FORMER BUILDINGS

CONTAINER PROPERTY LLC

(INSURANCE AUTO AUCTIONS INCOPRATED VEHICLE STORAGE ON BOTH 8801 AND CONTAINER PROPERTY)

MUSEUM OF FLIGHT

	CLIENT LOGO	CLIENT: PACCAR INC	DWN BY: JRS	PROJECT: 8801 SITE 8801 EAST MARGINAL WAY SOUTH Tukwila, Washington	DATE: NOVEMBER 2010
			CHK'D BY: MS		PROJECT NO: 9-915-14995-L
		AMEC Earth & Environmental 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201	DATUM:	TITLE: 8801 SITE KEY SITE FEATURES	REV. NO.:
			PROJECTION:		FIGURE No. 2
			SCALE: AS SHOWN		

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0 100 200

SCALE IN FEET

NORTH OUTFALL (NO.1)

ACETONE CLOSED IN PLACE 1991 REMOVED 2003

WATER/OIL REMOVED 1986

GASOLINE REMOVED 1986

DIESEL REMOVED 1986

ACETONE REMOVED 1991

FORMER FIBERGLASS SHOP

DEMOLISHED

DEMOLISHED

DEMOLISHED

POLYESTER RESIN

WASTE OIL REMOVED 1986

THINNER/OIL REMOVED 1986

THINNER REMOVED 1986

THINNER REMOVED 1986

DIESEL

WASTE OIL

CLEAN/USED PAINT THINNER

MAINTENANCE WASTE WATER

FORMER MANUFACTURING BUILDING

30 WT. OIL REMOVED 1986

DIESEL REMOVED 1986

ANTI-FREEZE REMOVED 1986

20 WT. OIL REMOVED 1986

15W 40 OIL REMOVED 2001

DIESEL REMOVED 2000

DIESEL

OIL

AFT

20,000-GALLON WASTE WATER

ANTIFREEZE REMOVED 2001

FORMER DIESEL CLOSED IN PLACE 1986 REMOVED 2003

OIL REMOVED 2003

DUWAMISH WATERWAY

CENTRAL OUTFALL (NO.2)

DEMOLISHED

P(OH)

N88°51'08"W 1506.71'

S88°51'40"E 1561.97'

S88°51'08"E 1058.10'

S14°00'31"E 653.86'

S27°10'39"E 46.03'

LEGEND

- FORMER UNDERGROUND STORAGE TANKS (UST) WITH REMOVAL DATES
- FORMER ABOVEGROUND STORAGE TANKS (AST)
- FORMER WASTE WATER ABOVEGROUND STORAGE TANKS
- ATF AUTOMATIC TRANSMISSION FLUID

CLIENT: PACCAR INC	DWN BY: JRS	PROJECT: 8801 SITE, 8801 EAST MARGINAL WAY SOUTH, Tukwila, Washington	DATE: NOVEMBER 2010
	CHK'D BY: MS		PROJECT NO: 9-915-14995-L
	DATUM: NONE	TITLE: 8801 SITE FORMER UNDERGROUND AND ABOVEGROUND STORAGE TANK LOCATIONS	REV. NO.: 0
	PROJECTION: NONE		FIGURE No. 3
	SCALE: AS SHOWN		

AMEC Earth & Environmental
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

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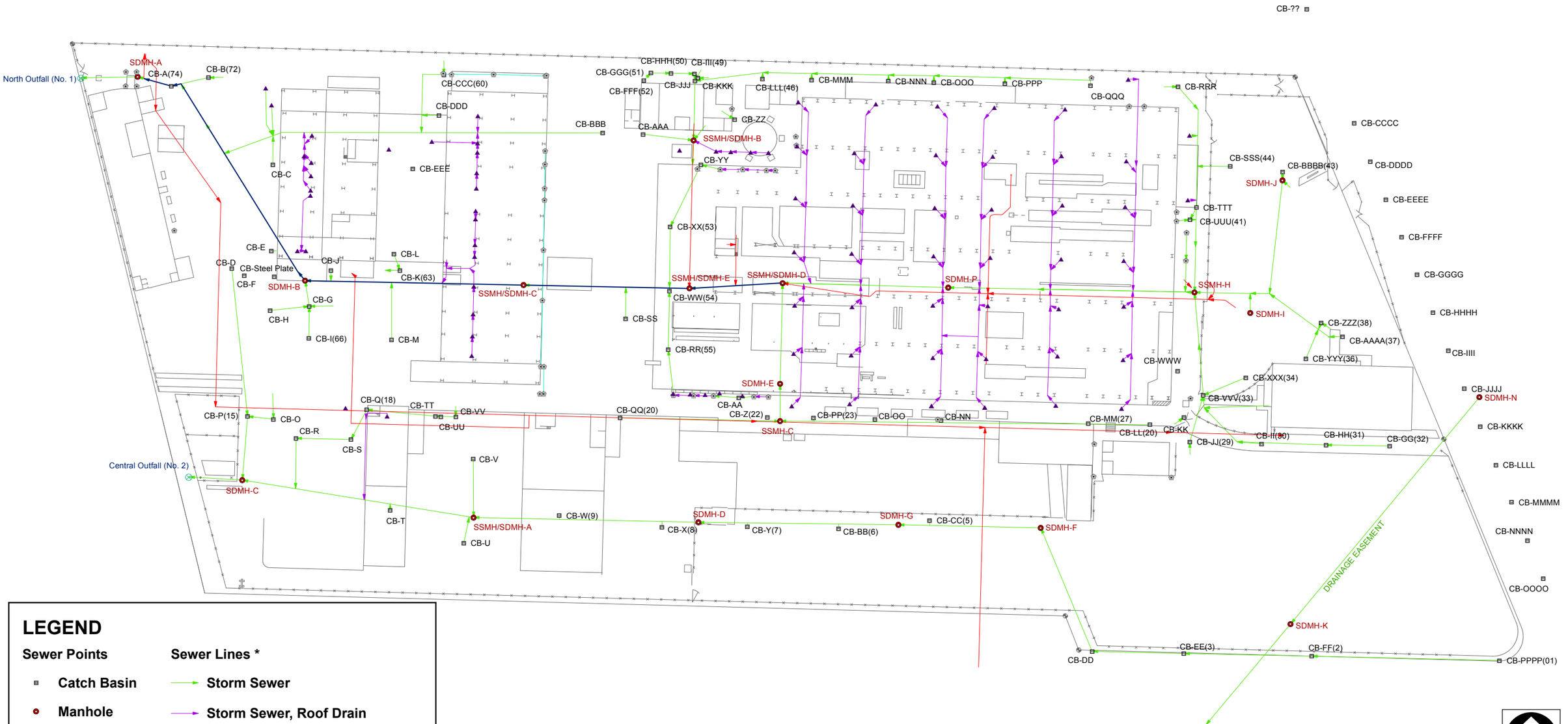

LEGEND

Sewer Points	Sewer Lines *
Catch Basin	Storm Sewer
Manhole	Storm Sewer, Roof Drain
Outfall	Sanitary Sewer
Roof Drain	Combined Storm-Sanitary Sewer
Storm Drain	Trench Drain

0 120 240 360 Feet

Source:
Surveyed locations of catch basins, manholes, and storm drains from **Barghausen Consulting Engineers, Inc** figure dated 11/16/04 - **ALTA / ASCM LAND TITLE SURVEY**

Location and connection of sewer lines from **Kenworth Truck Company** figure dated 01/31/99 - **Sewer and Drainage Map** and from some limited survey information.

* All locations are approximate.

FINAL

CLIENT: PACCAR INC

AMEC Earth & Environmental
11810 North Creek Parkway N
Bothell, WA 98011

DWN BY:	BRJ
CHK'D BY:	-
DATUM:	NAD27
PROJECTION:	WA SP North
SCALE:	1 inch = 120 feet

PROJECT:
8801 SITE
8801 EAST MARGINAL WAY SOUTH
TUKWILA, WASHINGTON

TITLE:
8801 SITE
SITE STORM WATER AND SANITARY DRAINAGE LAYOUT

DATE:	SEPTMEBER 2010
PROJECT NO.:	991514995L
REV. NO.:	1
FIGURE NO.:	4

K:\AMEC US OFFICES\KIRKLAND\14995 Paccar Seattle\DWG\arcview\2010-09\Figure 4 Site Stormwater and Sanitary Drainage Layout.mxd

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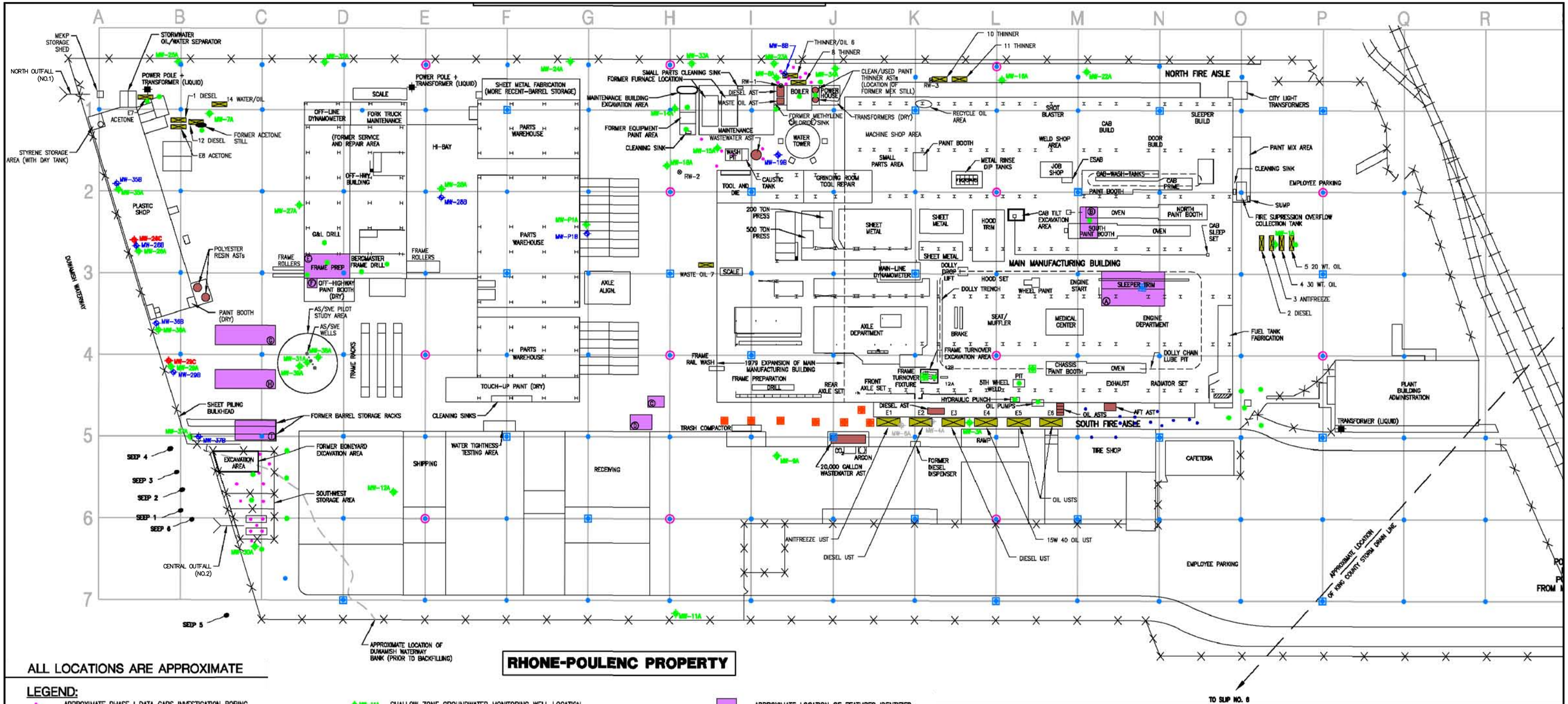

ALL LOCATIONS ARE APPROXIMATE

RHONE-POULENC PROPERTY

LEGEND:

- APPROXIMATE PHASE I DATA GAPS INVESTIGATION BORING (DIRECT-PUSH PROBE) LOCATION
- APPROXIMATE 2003 UST REMOVAL INVESTIGATION BORING (DIRECT-PUSH PROBE) LOCATION
- GRID SOIL SAMPLING LOCATION
- GRID RECONNAISSANCE GROUNDWATER SAMPLING LOCATION
- FOCUSED SOIL SAMPLING LOCATION
- FOCUSED RECONNAISSANCE GROUNDWATER SAMPLING LOCATION
- SOUTH FIRE AISLE (SFA) ASSESSMENT SOIL SAMPLING LOCATION
- SFA RECONNAISSANCE GROUNDWATER SAMPLING LOCATION
- GRID BORING ADVANCED TO SILTY CONFINING LAYER
- MW-11A SHALLOW ZONE GROUNDWATER MONITORING WELL LOCATION
- MW-28B INTERMEDIATE ZONE GROUNDWATER MONITORING WELL LOCATION
- MW-28C DEEP ZONE GROUNDWATER MONITORING WELL LOCATION
- MW-5A GROUNDWATER MONITORING WELL ABANDONED
- RW-2 FORMER GROUNDWATER EXTRACTION WELL LOCATION
- FORMER UNDERGROUND STORAGE TANK (UST) LOCATION
- ABOVEGROUND STORAGE TANK (AST) LOCATION
- SEEP 5 SEEP LOCATION
- APPROXIMATE LOCATION OF FEATURES IDENTIFIED ON SANBORN MAPS
  - (A) PAINT SPRAYING AREA
  - (B) PAINT SPRAYING AREA
  - (C) PAINT SHOP
  - (D) PAINT SHOP
  - (E) PAINT SPRAYING AREA
  - (F) PAINT STORAGE
  - (G) STORAGE BUILDING (CASTING)
  - (H) STORAGE BUILDING (GENERAL, TIRE)
  - (I) STORAGE BUILDING (OFF SURPLUS, GENERAL)

NOTES:

1. BASE DRAWING PROVIDED BY PACCAR INCORPORATED.
2. ALL FEATURE AND BORING LOCATIONS ARE APPROXIMATE (TO BE CONFIRMED IN FIELD)
3. PROPOSED BORING LOCATIONS MAY NEED TO BE MODIFIED BASED ON FIELD CONDITIONS, ACCESS, AND UNDERGROUND UTILITIES.

0 60 120 240

SCALE IN FEET

REFERENCE: Base map and historical data by Kennedy/Jenks, 2003.

CLIENT: PACCAR INC	DWN BY: JRS	PROJECT: 8801 SITE 8801 EAST MARGINAL WAY SOUTH Tukwila, Washington	DATE: NOVEMBER 2010
	CHK'D BY: MS		PROJECT NO: 9-915-14995-L
AMEC Earth & Environmental 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201	DATUM: NONE	TITLE: 8801 SITE HISTORICAL SITE ACTIVITIES CIRCA 1970S THROUGH 2000	REV. NO.: 0
	PROJECTION: NONE		FIGURE No. 5
	SCALE: AS SHOWN		

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LEGEND

MW-35B — MONITORING WELLS
- A - SCREEN INSTALLED IN ZONE A AQUIFER
- B - SCREEN INSTALLED IN ZONE B AQUIFER
- C - SCREEN INSTALLED IN ZONE C AQUIFER

RW3 — RECOVERY WELLS (REMOVED)

MW-21 — WELLS REMOVED OR COVERED

NOTE: LOCATION OF MW-17 WAS NOT IDENTIFIED IN PREVIOUS INVESTIGATION REPORTS.

CLIENT: PACCAR INC

AMEC Earth & Environmental
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	JRS
CHK'D BY:	MS
DATUM:	NONE
PROJECTION:	NONE
SCALE:	1" = 100'

PROJECT
8801 SITE
8801 EAST MARGINAL WAY SOUTH
Tukwila, Washington

TITLE
8801 SITE
GROUNDWATER MONITORING WELL LOCATIONS

DATE:	NOVEMBER 2010
PROJECT NO:	9-915-14995-L
REV. NO.:	0
FIGURE No.	6

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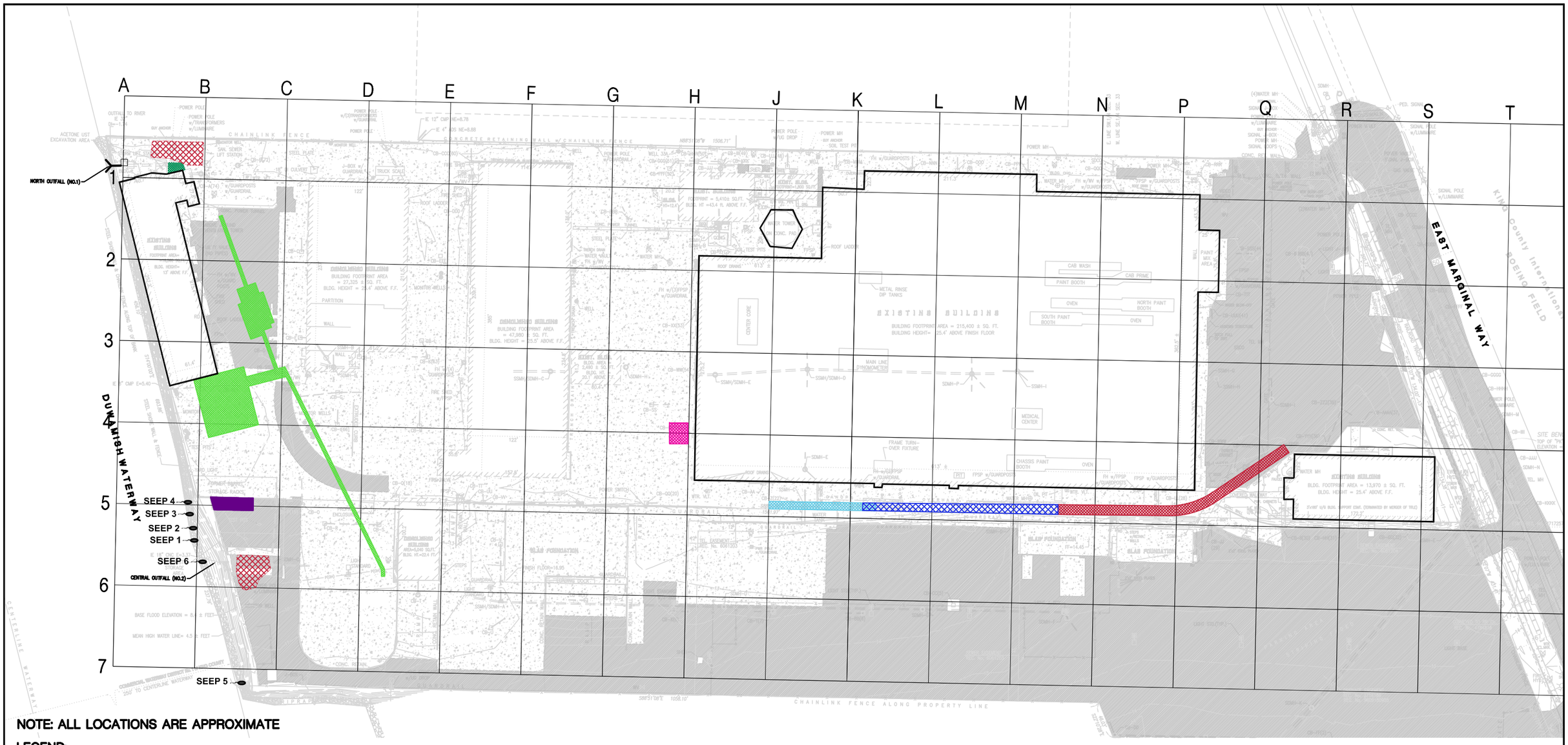

NOTE: ALL LOCATIONS ARE APPROXIMATE

LEGEND:

- SOUTHWEST STORAGE AREA (BONEYARD) APPROXIMATE EXCAVATION AREA (1995)
- APPROXIMATE UST REMOVAL EXCAVATION AREA (2000–2003)
- APPROXIMATE ACETONE UST SOIL EXCAVATION AREA (2003)
- APPROXIMATE SFA SOIL EXCAVATION AREA (2004)
- APPROXIMATE AS/SVE SOIL EXCAVATION AREA (2004)
- APPROXIMATE SOIL EXCAVATION AREA (2004)
- APPROXIMATE ORC INJECTION AREA (2004)
- APPROXIMATE SOIL EXCAVATION AREA (2007)
- SEEP LOCATION

0 60 120 240

SCALE IN FEET

CLIENT LOGO

CLIENT: PACCAR INC

AMEC Earth & Environmental
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY: JRS
CHK'D BY: MS
DATUM:
PROJECTION:
SCALE: AS SHOWN

PROJECT
8801 SITE
8801 EAST MARGINAL WAY SOUTH
Tukwila, Washington

TITLE
8801 SITE
SYNOPSIS OF HISTORICAL EXCAVATION AND ORC INJECTION AREAS 1987-2007

DATE: NOVEMBER 2010
PROJECT NO: 7-915-14995-D
REV. NO.:
FIGURE No. 7

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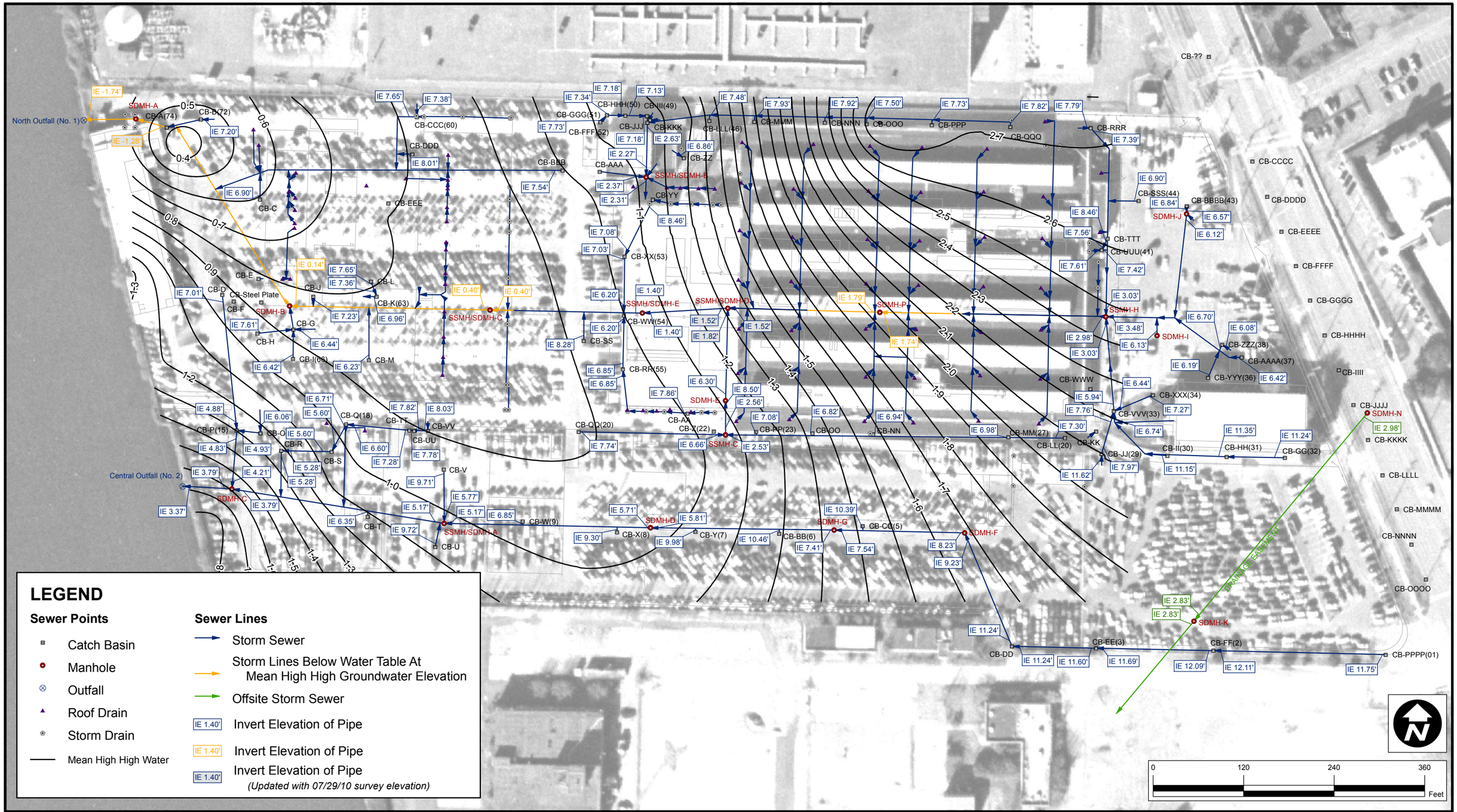

LEGEND

Sewer Points

- Catch Basin
- Manhole
- Outfall
- Roof Drain
- Storm Drain
- Mean High High Water

Sewer Lines

- Storm Sewer
- Storm Lines Below Water Table At Mean High High Groundwater Elevation
- Offsite Storm Sewer
- IE 1.40' — Invert Elevation of Pipe
- IE 1.40' — Invert Elevation of Pipe
- IE 1.40' — Invert Elevation of Pipe *(Updated with 07/29/10 survey elevation)*

Source:
2005 aerial from **WSDOT Aerial Photography Branch**

Surveyed locations of catch basins, manholes, and storm drains from **Barghausen Consulting Engineers, Inc** figure dated 11/16/04 - **ALTA / ASCM LAND TITLE SURVEY**

Location and connection of sewer lines from **Kenworth Truck Company** figure dated 01/31/99 - **Sewer and Drainage Map** and from some limited survey information.

Mean High High Water Elevation data is in NGVD29 Datum from **Anchor Environmental.**

CB-A(74), SDMH-B, SSMH/SDMH-C, SSMH/SDMH-D, and **SSMH/SDMH-E** were resurveyed on July 29, 2010 by **True North Land Surveying, Inc.**

FINAL

CLIENT: PACCAR INC

AMEC Earth & Environmental
11810 North Creek Parkway N
Bothell, WA 98011

DWN BY: BRJ
VERTICAL DATUM: NGVD29
HORIZONTAL DATUM: NAD27
PROJECTION: WA SP North
SCALE: 1 inch = 120 feet

PROJECT: 8801 SITE
8801 EAST MARGINAL WAY SOUTH
TUKWILA, WASHINGTON

TITLE: 8801 SITE
INVERT LEVEL VERSUS
MEAN HIGH HIGH GROUNDWATER ELEVATION
(UPDATE WITH ELEVATIONS FROM JULY 29, 2010 SURVEY)

DATE: SEPTEMBER 2010
PROJECT NO.: 991514995L
REV. NO.: 2
FIGURE NO.: FIGURE 8

K:\AMEC US OFFICES\KIRKLAND\14995 Paccar Seattle\DWG\arcview\StormSewerWork\Figure 2 MHHW Level (2010-09-10 edits).mxd

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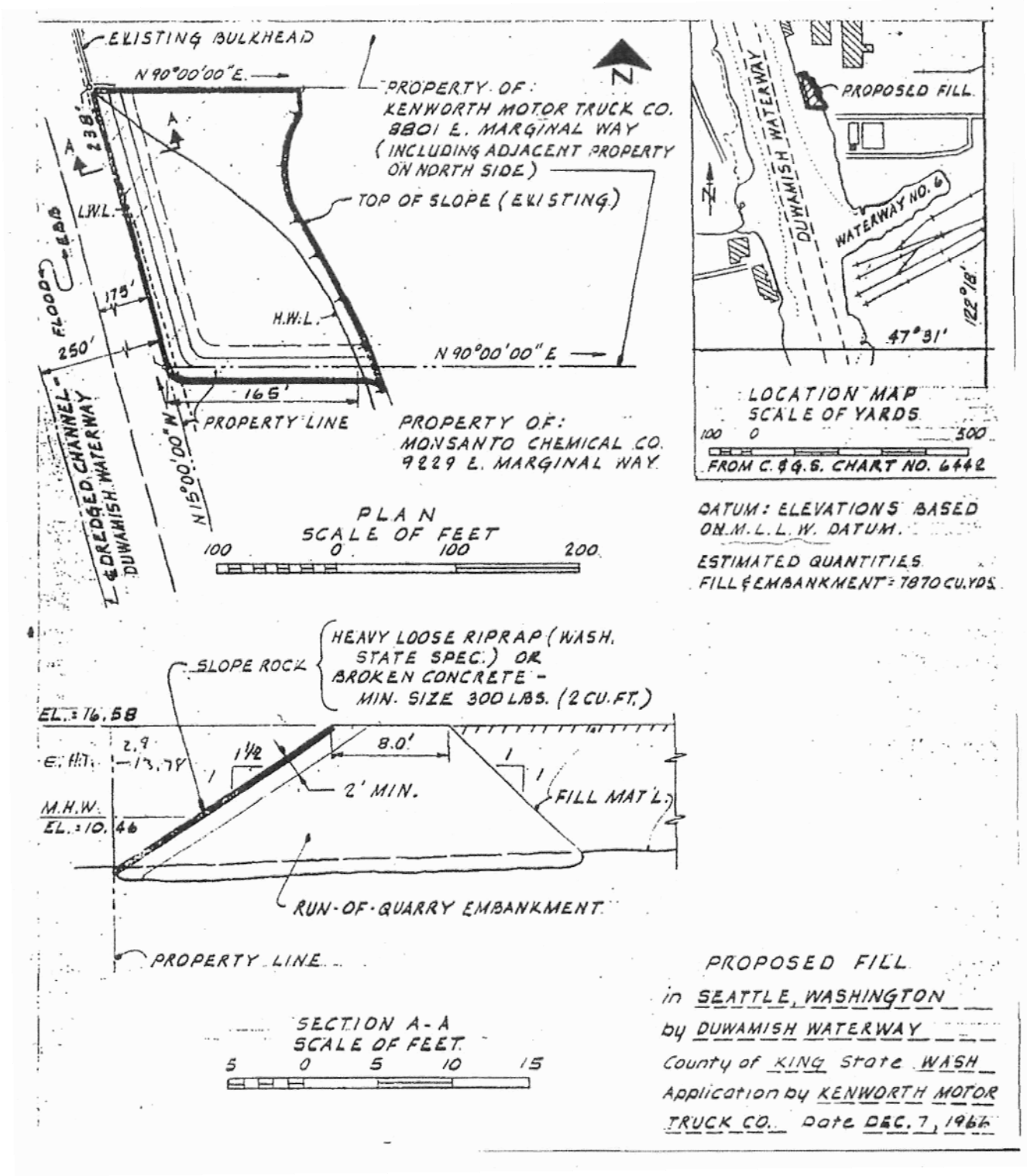

AMEC Earth & Environmental 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201		CLIENT LOGO	CLIENT PACCAR INC	
PROJECT 8801 SITE, 8801 EAST MARGINAL WAY SOUTH, Tukwila, Washington		DWN BY: JRS	DATUM:	DATE: NOVEMBER 2010
TITLE 1966 PROPOSED FILL		CHK'D BY: MS	REV. NO.:	PROJECT NO: 9-915-14995-L
		PROJECTION:	SCALE: NOT TO SCALE	FIGURE No. 9

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