URS

Technical Memorandum

Date: July 28, 2010

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Subject: **Phase III Upland Investigation Results and Geophysical Survey Work Plan**
Everett Shipyard
1016 14th Street
Everett, Washington

INTRODUCTION

On June 24 and 25, 2010, URS conducted a Phase III soil investigation at the Everett Shipyard Site located at 1016 14th Street in Everett, Washington ("Site"). The work was completed in accordance with Agreed Order No.: DE 5271 and the draft Phase III Upland Work Plan dated June 21, 2010 (URS 2010). The objectives of the investigation were to assess whether upland soils and groundwater east of the bulkhead located southeast of the travel lift are impacted with petroleum hydrocarbons. In May and June, 2010, petroleum hydrocarbons were detected in sediments samples collected between the bulkheads located immediately to the southeast of the travel lift. The upland investigation was conducted in an effort to identify a potential source of this petroleum hydrocarbon release.

The purpose of this memorandum is to present preliminary results of the soil and groundwater sampling conducted in the upland area adjacent to the bulkhead and to present a scope of work for a ground penetrating radar (GPR) survey of the area to assess a potential source(s) of the petroleum hydrocarbons. A comprehensive summary of the Phase III investigations will be presented in the 2nd draft of the Remedial Investigation/Feasibility Study (RI/FS) Report.

INVESTIGATION AND PRELIMINARY FINDINGS

Fifteen direct-push soil borings were completed to a depth of 16 feet below ground surface (bgs) as part of the Phase III upland investigation (Figure 1). This includes the 5 initial borings outlined in the draft Phase III Upland Work Plan (URS 2010) and 9 of the 10 proposed contingent borings. One contingent boring (SB-99) was not drilled due to access constraints adjacent to the Mercer Marine building. One additional contingent boring (SB-107) was drilled to the east of the planned contingent borings in an effort to delineate the extent of impacts based on field observations. The procedures used to drill the borings and collect the samples are described in the Remedial Investigation Feasibility Study Work Plan (URS 2008).

The soils encountered in the borings consisted primarily of sand with varying amounts of silt and clay. The fill soil included shell fragments, brick fragments and asphalt in some intervals. A few layers of fill comprised primarily of silt or clay were also encountered. Wood (potentially creosote-treated timbers in

some cases) was identified in 11 of 15 the borings at a depths between 12 and 15 feet bgs. Groundwater was encountered at depths between 6 and 9 feet bgs.

No hydrocarbon odor or sheen was evident in the samples collected from borings SB-93A, SB-106 and SB-107. Soil samples collected from the remaining 12 borings exhibited hydrocarbon odors and/or a sheen. The intervals exhibiting odors extended from depths of 2 to 16 feet bgs, with the shallowest (less than 4 feet bgs) evidence of impacts observed in borings SB-100, SB-101 and SB-102. A hydrocarbon sheen was evident on one or more of the soil samples collected from most of the borings where a petroleum hydrocarbon odor was observed. Free product was not evident in any of the borings and none of the samples exhibited elevated PID readings.

Three soil samples were collected from each boring with the exception of borings SB-101, SB-104 and SB-105, where only one or two samples could be collected because there was no sample recovery in the target intervals.

Up to three soil samples from each boring and quality assurance samples (e.g., field blank, duplicates and trip blank) were analyzed for diesel- and oil-range petroleum hydrocarbons using Ecology Method NWTPH-Dx. Based on the presence of odors and sheen, selected soil samples from borings SB-93, SB-94 and SB-95 were also analyzed for volatile organic compounds (VOCs) using EPA Method 8260B. The analytical results for detected constituents are summarized in Table 1. Table 1 also included preliminary soil cleanup levels.

Diesel-range petroleum hydrocarbons exceed the preliminary cleanup level (2,000 milligrams per kilogram [mg/kg]) in samples collected from 6 of the 15 borings (Table 1). Concentrations of oil-range petroleum hydrocarbons and VOCs did not exceed the cleanup level in any of the borings. The highest concentration of diesel-range petroleum hydrocarbons was detected in boring SB-102 at a depth of 4 to 5 feet bgs. The distribution of hydrocarbons (depth and concentration) suggests that this boring is located near a source of petroleum hydrocarbons. The extent of petroleum hydrocarbons in soil in this area is bounded to the west by the bulkhead. Soil with petroleum hydrocarbons concentrations exceeding the preliminary cleanup level was present in close proximity to the bulkhead at depths between 7 and 14 feet at borings SB-95, SB-96 and SB-97. The northern extent of impacted soil appears to be bounded by analytical results for samples collected from boring SB-98, and the southern extent is bounded by results from borings SB-93 and SB-103. The eastern extent of impacted soil is partially bounded by results from borings SB-104 through SB-107; however, the extent of impacted soil adjacent to the Harbor Marine building is uncertain.

Groundwater samples were collected from borings SB-93, SB-94 and SB-95 and analyzed for diesel- and oil- range petroleum hydrocarbons and VOCs. The analytical results for detected constituents are summarized in Table 2. Table 2 also includes preliminary groundwater cleanup levels. The highest concentration of diesel-range petroleum hydrocarbons (6.0 milligrams per liter [mg/L]) was detected in the sample from SB-94 and exceeded the preliminary cleanup level (0.5 mg/L). Diesel-range petroleum hydrocarbon concentrations in borings SB-93 and SB-95 were below preliminary cleanup level. Oil-range petroleum hydrocarbons and VOCS were not detected in any of the samples at concentrations exceeding preliminary cleanup levels.

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PROPOSED GEOPHYSICAL SURVEY

URS proposes to complete a magnetometer survey in the area where petroleum hydrocarbons were detected in an effort to identify the location of potential sources such as former or existing underground storage tanks (USTs). URS will retain Global Geophysics to complete the geophysical survey using a Geometrics Cesium magnetometer. The survey will include north-south and east-west transects over the area shown on Figure 1. This includes an area south of the Harbor Marine building that appears to have been developed with a former building in 1961 based on an aerial photograph provided by the Port. The spacing between transects will be approximately 3 to 5 feet. The magnetometer survey will be performed to identify potential metallic anomalies. A ground penetrating radar (GPR) survey will then be completed using a Geophysical Survey Systems, Inc. SIR GPR system to ascertain the subsurface profile in the areas of the metallic anomalies. The work will be complete following the appropriate procedures described in the updated site-specific Health and Safety Plan (URS 2009).

SCHEDULE

The geophysical survey is scheduled to be completed on July 28, 2010. A verbal or email report will be provided to Ecology within 1 or 2 working days of completion of the field work. A draft report from Global Geophysics should be available within one week of completion of the field work. Once the report from Global Geophysics is finalized, it will be submitted to Ecology.

URS will coordinate with the Port in an effort to make sure the survey area is free of equipment or vehicles that would prevent the completion of the geophysical survey.

REFERENCES

URS Corporation 2008. (URS) *Remedial Investigation Feasibility Study Work Plan, Everett Shipyard, 1016 14th Street, Everett, Washington.* October 31, 2008.

_____. 2009. *Site-Specific Health and Safety Plan, Everett Shipyard RI/FS*. October 23.

_____. 2010. *Draft Phase III Upland Work Plan, Everett Shipyard, 1016 14th Street, Everett, Washington.* June 21, 2010.

Attachments:

Figure 1 – Soil Boring Locations near Travel Lift

Table 1 – Summary of Soil Analytical Results for Samples Collected near Travel Lift
Table 2 – Summary of Groundwater Analytical Results for Samples Collected near Travel Lift

1961 Aerial Photograph – North Marina

FIGURES

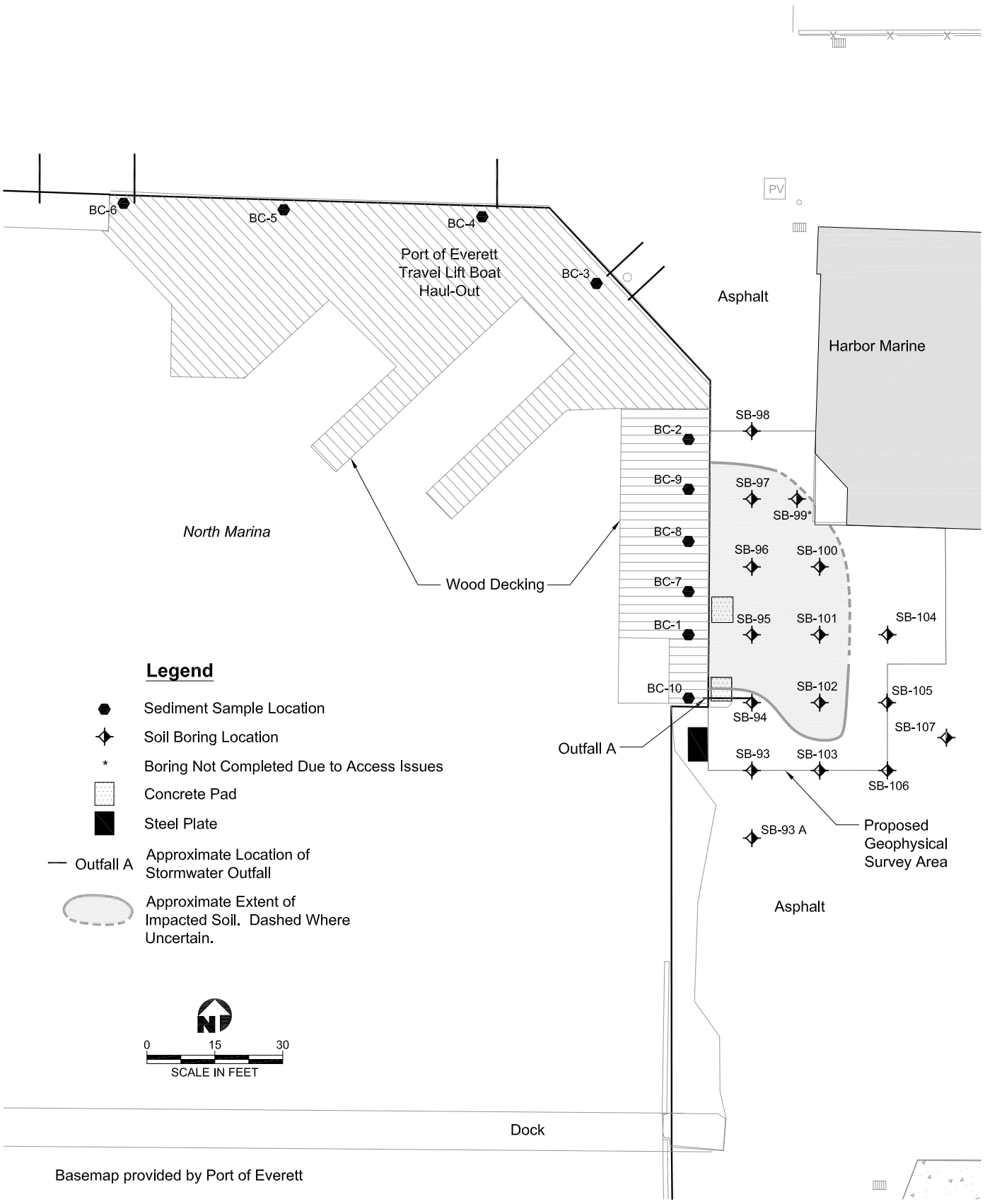

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Figure 1

Upland Soil Boring Locations Near Travel Lift

Everett Shipyard
Everett, Washington
PHASE III RI

TABLES

Table 1
Summary of soil Analytical Results for samples collected near Travel Lift
Everett Shipyard
Everett, WA

Sample ID: Sample ID Depth Interval (feet bgs): Date Collected: Field QC:	**Preliminary Cleanup Level**	SB-93-8 8 6/24/2010	SB-93-10 10 6/24/2010	SB-93-14 14 6/24/2010	SB-93A-6 6 6/25/2010	SB-93A-10 10 6/25/2010	SB-93A-15 15 6/25/2010	SB-94-5 5 6/24/2010	SB-94-10 10 6/24/2010
TPH (mg/kg) [Method NWTPH-Dx]									
Diesel-range	2,000	1,900	25	52	6.9 U	6.6 U	5.6 U	53	200
Oil-range	2,000	110	14 U	13 U	14 U	13 U	11 U	380	12 U
VOCs (ug/kg) [Method 8260B]									
Acetone	3,200	NA	27	NA	NA	NA	NA	NA	3.6 U
Carbon disulfide	5,600	NA	4.9	NA	NA	NA	NA	NA	5.1
Benzene	30	NA	1.4	NA	NA	NA	NA	NA	1.4
Toluene	7,000	NA	0.7 U	NA	NA	NA	NA	NA	0.9 M
m,p-xylene	9,000	NA	1	NA	NA	NA	NA	NA	0.8
Isopropylbenzene	8,000,000	NA	0.7 U	NA	NA	NA	NA	NA	0.7 U
n-Propylbenzene	NE	NA	0.8	NA	NA	NA	NA	NA	0.7 U
tert-Butylbenzene	NE	NA	0.7 U	NA	NA	NA	NA	NA	1.1 M
sec-Butylbenzene	NE	NA	1.1	NA	NA	NA	NA	NA	3.3
n-Butylbenzene	NE	NA	0.7 U	NA	NA	NA	NA	NA	0.7 U
Naphthalene	5,000	NA	3.3 U	NA	NA	NA	NA	NA	3.6 U

Notes:
NE - Not established
TPH - Total petroleum hydrocarbons
VOCs - Volatile Organic Compounds
bgs - below ground surface
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
M flag - estimated values for analyte detected and confirmed by analyst but with low spectral match parameters. This flag is used only for GC-MS analyse.
BOLD exceeds most stringent screening level
U flag - indicates that the target analyte was not detected at the reported concentration.
NA - Not analyzed.

Table 1
Summary of soil Analytical Results for samples collected near Travel Lift
Everett Shipyard
Everett, WA

Sample ID: Sample ID Depth Interval (feet bgs): Date Collected: Field QC:	**Preliminary Cleanup Level**	SB-94-15 15 6/24/2010	SB-95-8 8 6/24/2010	SB-95-11 11 6/24/2010	SB-95-14 14 6/24/2010	SB-96-8 8 6/24/2010	SB-96-11 11 6/24/2010	SB-96-14 14 6/24/2010	SB-97-7 7 6/24/2010
TPH (mg/kg) [Method NWTPH-Dx]									
Diesel-range	2,000	1,900	**3,100**	24	290	**3,300**	**2,100**	1,200	5.6 U
Oil-range	2,000	80	110	13 U	22	260	140	50	11 U
VOCs (ug/kg) [Method 8260B]									
Acetone	3,200	160 U	190 U	NA	230 U	NA	NA	NA	NA
Carbon disulfide	5,600	32 U	37 U	NA	46 U	NA	NA	NA	NA
Benzene	30	32 U	37 U	NA	46 U	NA	NA	NA	NA
Toluene	7,000	32 U	37 U	NA	46 U	NA	NA	NA	NA
m,p-xylene	9,000	32 U	37 U	NA	46 U	NA	NA	NA	NA
Isopropylbenzene	8,000,000	290	37 U	NA	58	NA	NA	NA	NA
n-Propylbenzene	NE	460	37 U	NA	46 U	NA	NA	NA	NA
tert-Butylbenzene	NE	32 U	37 U	NA	46 U	NA	NA	NA	NA
sec-Butylbenzene	NE	260	37 U	NA	78	NA	NA	NA	NA
n-Butylbenzene	NE	120	37 U	NA	87	NA	NA	NA	NA
Naphthalene	5,000	160 U	190 U	NA	230 U	NA	NA	NA	NA

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Summary of soil Analytical Results for samples collected near Travel Lift
Everett Shipyard
Everett, WA

Sample ID: Sample ID Depth Interval (feet bgs): Date Collected: Field QC:	**Preliminary Cleanup Level**	SB-97-11 11 6/24/2010	SB-97-14 14 6/24/2010	SB-98-6 6 6/24/2010	SB-98-10 10 6/24/2010	SB-98-15 15 6/24/2010	SB-100-5 5 6/25/2010	SB-100-10 10 6/25/2010	SB-100-14 14 6/25/2010
TPH (mg/kg) [Method NWTPH-Dx]									
Diesel-range	2,000	96	**2,800**	5.1 U	560	23	**2,000**	**4,600**	**2,800**
Oil-range	2,000	13 U	110	10 U	120	13 U	100	210	180
VOCs (ug/kg) [Method 8260B]									
Acetone	3,200	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	5,600	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	30	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	7,000	NA	NA	NA	NA	NA	NA	NA	NA
m,p-xylene	9,000	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	8,000,000	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	5,000	NA	NA	NA	NA	NA	NA	NA	NA

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Table 1
Summary of soil Analytical Results for samples collected near Travel Lift
Everett Shipyard
Everett, WA

Sample ID: Sample ID Depth Interval (feet bgs): Date Collected: Field QC:	**Preliminary Cleanup Level**	SB-101-5 5 6/25/2010	SB-101-15 15 6/25/2010	SB-102-5 5 6/25/2010	SB-102-11 11 6/25/2010	SB-102-14 14 6/25/2010	SB-103-6 6 6/25/2010	SB-103-10 10 6/25/2010	SB-103-13 13 6/25/2010
TPH (mg/kg) [Method NWTPH-Dx]									
Diesel-range	2,000	**2,000**	**3,100**	**8,400**	**4,800**	1,300	6.2 U	6.4 U	1,300
Oil-range	2,000	77	190	350	200	54	12 U	13 U	45
VOCs (ug/kg) [Method 8260B]									
Acetone	3,200	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	5,600	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	30	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	7,000	NA	NA	NA	NA	NA	NA	NA	NA
m,p-xylene	9,000	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	8,000,000	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	5,000	NA	NA	NA	NA	NA	NA	NA	NA

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Table 1
Summary of soil Analytical Results for samples collected near Travel Lift
Everett Shipyard
Everett, WA

Sample ID: Sample ID Depth Interval (feet bgs): Date Collected: Field QC:	**Preliminary Cleanup Level**	SB-104-5 5 6/25/2010	SB-105-6 6 6/25/2010	SB-105-11 11 6/25/2010	SB-106-5 5 6/25/2010	SB-106-10 10 6/25/2010	SB-106-14 14 6/25/2010	SB-107-5 5 6/25/2010	SB-107-10 10 6/25/2010
TPH (mg/kg) [Method NWTPH-Dx]									
Diesel-range	2,000	6.7	5.5 U	8 U	6.9 U	7.2 U	6.7 U	5.8 U	7.1 U
Oil-range	2,000	10 U	11 U	16 U	14 U	22	13 U	12 U	14 U
VOCs (ug/kg) [Method 8260B]									
Acetone	3,200	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	5,600	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	30	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	7,000	NA	NA	NA	NA	NA	NA	NA	NA
m,p-xylene	9,000	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	8,000,000	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	5,000	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2
Summary of Groundwater Analytical Results for Samples collected near Travel Lift
Everett Shipyard
Everett, WA

	Preliminary Cleanup Level	SB-93-GW	SB-94-GW		SB-95-GW
		6/24/2010	6/24/2010	Field Duplicate	6/24/2010
TPH (mg/L) [Method NWTPH-Dx]					
Diesel-range	0.5	0.37	**6**	**2.7**	0.17
Oil-range	0.5	0.2 U	0.2 U	0.2 U	0.2 U
VOCs (ug/L) [Method 8260B]					
Carbon disulfide	800	0.2 U	0.2 U	0.2	0.2 U
Toluene	15,000	0.3	0.2 U	0.2 U	0.2 U
m,p-xylene	10,000	0.4	0.4 U	0.4 U	0.4 U
o-Xylene	10,000	0.3	0.2	0.3	0.2 U
1,2,4-Trimethylbenzene	400	0.4	0.3	0.3	0.2 U
Isopropylbenzene	800	0.2	6.1	5.4	1.1
n-Propylbenzene	NE	0.2	6.8	6.1	1.2
tert-Butylbenzene	NE	0.2 U	0.2	0.2	0.2 U
sec-Butylbenzene	NE	0.2 U	2	2	0.8
n-Butylbenzene	NE	0.2U	0.8	0.8	0.6
1,2,4-Trichlorobenzene	70	0.5 U	0.5 U	0.5 U	0.5 U
Naphthalene	4,900	0.5 U	0.5 U	0.5 U	0.5 U

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AERIAL PHOTOGRAPH