

July 9, 1999



Mr. Paul E. Skyllingstad Department of Ecology Industrial Section P.O. Box 47706 Olympia, Washington 98504-7706

Department of Ecology Industrial Section

RE:

Additional Subsurface Investigation Report

Former Columbia Marine Lines Facility, Vancouver, Washington

SECOR Job No.: F0319-001-01

Dear Mr. Skyllingstad:

SECOR International Incorporated, on behalf of Crowley Marine Services Incorporated (Crowley), is pleased to present the enclosed *Additional Subsurface Investigation Report* dated July 8, 1999. The investigation was completed in accordance with the *Limited Subsurface Investigation Workplan* dated April 27, 1999. Based on the results of this additional subsurface investigation, SECOR is currently preparing a work plan that will include a description of a pilot test for an interim remediation system to address the free product at the site. This workplan will also include a description for delineation of the impacted subsurface soils in the vicinity of monitoring wells MW-7 and MW-8 and geoprobes GP-2 and GP-3 with the intent of preparing a focused feasibility study for excavation, treatment and disposal of soils in the impacted area. It is Crowley's intent to initiate the workplan by August 1999.

If you have any questions or require additional information, please do not hesitate to contact Stephen Wilson of Crowley at (206) 443-8042 or myself at (503) 691-2030.

Sincerely

SECOR International Incorporated

Brent W. Brelje, P.E.

Principal Engineer

BWB:ald

Enclosure

cc: Mr. Stephen Wilson, Crowley Marine Services

Mr. Al Piecka, Alcoa

Mr. Rodney L. Brown, Marten & Brown, LLP





ADDITIONAL SUBSURFACE INVESTIGATION REPORT

Former Columbia Marine Lines Facility 6305 Lower River Road Vancouver, Washington

SECOR PN: F0319-001-01

Submitted by SECOR International Incorporated for

Crowley Marine Services 2401 Fourth Avenue Post Office Box 2287 Seattle, Washington 98121

July 9, 1999

Prepared by:

Catherine M. Westersund Associate Engineer

Reviewed by:

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TABLE OF CONTENTS

1.0	INT	RODUCTION AND SCOPE OF WORK					• •	• •		1
2.0	SITE	E DESCRIPTION	9 8 9 9		0 0 0		o e	a •	o 0	1
3.0	FIEI 3.1 3.2	LD INVESTIGATION				0 0	0 0			2
4.0	4.1 4.2 4.3 4.4	DINGS SITE GEOLOGY AND HYDROGEOLOGY ANALYTICAL METHODS SOIL SAMPLE ANALYTICAL RESULTS GROUNDWATER SAMPLE ANALYTICAL RES	SULT	 S		• •			• •	3 4 4 5
5.0	SUN	MMARY AND CONCLUSIONS					0 9	• •	0 0	5
		LIST OF FIGURES								
FIGUI FIGUI FIGUI FIGUI	RE 2 RE 3 RE 4	Vicinity Map Site Plan and Groundwater Elevation (5/7/99) Top of Silt Unit Groundwater Analytical Results Soil Analytical Results)							
		LIST OF TABLES								
TABL TABL TABL TABL TABL	E 2 E 3 E 4 E 5	Geoprobe and Monitoring Well Elevations Historical Groundwater Table Database Geoprobe Groundwater Analytical Results Geoprobe Soil Analytical Results Geoprobe Soil Analytical Results - Petroleum Geoprobe Soil Analytical Results - Polynucle	n Hydi ear Are	rocar	bon ic H	ydro	oca	rbo	ons	
Note:	Figu	ures and Tables appear at end of report.								
		LIST OF APPENDICES								
APPE APPE APPE	ENDI	X B Boring Logs	Custody	y Do	cum	enta	ıtio	n		

1.0 INTRODUCTION AND SCOPE OF WORK

SECOR International Incorporated (SECOR) conducted additional subsurface investigation at the former Columbia Marine Lines facility located at 6305 Lower River Road in Vancouver, Washington (the site, see Figure 1). Nine geoprobe temporary well points were installed on May 6, 1999; soil samples were collected from the geoprobe temporary well points during installation. Groundwater samples were collected from the temporary well points subsequent to their installation on May 7, 1999. The temporary well points were abandoned on May 7, 1999 after groundwater samples were collected.

The purpose of the additional subsurface investigation was to better characterize site stratigraphy and assess the potential presence and extent of separate phase hydrocarbons (SPH) and dissolved hydrocarbon constituents. Additionally, the investigation was to confirm the presence of a linear depression on top of flood plain deposits, representing a former drainage or channel feeding into the Columbia River. SECOR will use the results of this investigation to identify and design the remedial approach most applicable to existing site conditions.

The additional subsurface investigation consisted of the following activities:

- Drilling nine geoprobe soil borings.
- Continuously collecting soil samples from each boring for visual inspection (staining and odors), lithologic
 description and field screening for the presence of volatile organic compounds using a photoionization
 detector (PID).
- Installing nine geoprobe temporary well points.
- Surveying the top of casing of each geoprobe point to allow calculation of the elevation of the water table surface.
- Analyzing soil and groundwater samples collected during the installation activities for evidence of SPH and dissolved hydrocarbon constituents.
- Abandoning geoprobe temporary well points after surveying and sampling.
- Preparing this Additional Subsurface Investigation Report.

2.0 SITE DESCRIPTION

The site is located immediately north of the Columbia River and approximately 3 miles west of the city of Vancouver in Section 44, Township 2N, Range 1E, as indicated on Figure 1. Section 44 is designated as Section 19 on Metsker's Clark County map. The site is relatively flat, with the highest point on the site lying at an approximate elevation of 32 feet above mean sea level (msl) datum. The Columbia River is tidally dominated and typically ranges from about minus 5 to positive 5 feet msl.

The majority of the site is sparsely vegetated with grasses and moss. Alders and willows form a brushy thicket from the river's edge to about 200 feet inland. Willows, alders, and brush are present in isolated low-lying areas in the northern portion of the site. Two settling ponds occupy a portion of the site to the northwest. The settling ponds are currently operated by Vanalco (formerly operated by ALCOA) as part of the aluminum manufacturing process. Figure 2 is a site plan of the subject property.

3.0 FIELD INVESTIGATION

3.1 SOIL BORINGS AND SAMPLING

Nine soil borings (GP-1 through GP-9) were drilled on May 6, 1999 by Cascade Drilling Inc. of Portland, Oregon, using a track-mounted Model CME850 geoprobe rig. The borings were located in the vicinity of wells MW-7, MW-8, and MW-19, the area south of well MW-19 toward the Columbia River, the area east of wells MW-6 and MW-8, and the area north of well MW-16. SECOR advanced four geoprobe borings (GP-4, GP-5, GP-6, GP-7) in the vicinity of wells MW-7, MW-8, and MW-19 to better identify the potential presence of a linear depression on top of flood plain deposits that may be a pathway for migration of SPH and/or dissolved constituents to the Columbia River. Two geoprobe borings (GP-2 and GP-3) were advanced in the vicinity of the former West Pit (west of MW-7) to assess whether additional SPH is present. One geoprobe boring (GP-1) east of wells MW-6 and MW-8, and two borings (GP-8 and GP-9) north of well MW-16 were advanced to evaluate whether dissolved constituents are migrating beyond the perimeter monitoring well locations. The geoprobe borings locations are depicted on Figure 2.

Soil borings were advanced through the dredge sand to the contact with the underlying, confining silts and were completed to depths ranging from approximately 12 to 20 feet below ground surface (bgs). Saturated soil conditions were observed at a depth of approximately 9 feet bgs. Subsurface soils generally consisted of fine- to medium-grained sands and sandy silts.

Soil samples were collected continuously to characterize site stratigraphy. Field screening methods (observation of staining and odor, as well as volatile organic compound [VOC] measurements using a PID) were used to select a soil sample near, but above the groundwater surface from each boring for laboratory analysis. Field screening was completed by placing a portion of the collected soil into a sealable plastic bag and then monitoring headspace VOC concentrations using a PID.

Temporary groundwater piezometers were installed in all of the Geoprobe boreholes to provide information on groundwater gradient and flow direction in the vicinity of the site. Each piezometer was constructed of 3/4-inch polyvinyl chloride (PVC) with 0.010-inch slotted screen from the base of the boring to a level above the observed water level. Each piezometer was allowed to equilibrate for one day before water level data were acquired. The piezometer elevations were surveyed to top of casing of existing monitoring wells using a laser level surveying instrument.

After groundwater measurements and soil and water sampling were completed, each soil boring was abandoned with bentonite and sealed at the top with concrete if necessary. Detailed descriptions of soil sampling and field screening methodology and field forms are presented in Appendix A. Lithologic descriptions and field screening results are included on the boring logs included in Appendix B.

3.2 GROUNDWATER SAMPLING

A groundwater sample was collected at each boring location from the temporary geoprobe well points using a peristaltic pump. As a prelude to sampling, SECOR purged each sample point using micropurging techniques, by sealing the selecting a discrete interval, sealing that interval, and removing a volume of water approximately equal to three geoprobe boring diameters. SECOR also measured the temperature, pH, and conductivity of each volume removed. Dissolved oxygen was not measured. It was difficult to maintain slow draw down requirements of mircopurging techniques due to the small diameter of the geoprobe points. Groundwater was allowed to recharge to within 80% of the observed static water level. Subsequently, a water sample was collected from within the geoprobe casing. The water samples were transferred into laboratory-prepared sample containers for laboratory analysis.

4.0 FINDINGS

4.1 SITE GEOLOGY AND HYDROGEOLOGY

The soils encountered during the additional subsurface investigation consisted of unconsolidated sands (dredge fill material) and a underlying silty flood plain deposit. The silt was encountered at depths ranging from 8 feet bgs at geoprobe boring GP-1 and 16.5 feet bgs at geoprobe boring GP-7. Saturated soil was encountered within the unconsolidated sands at a depth of approximately 4 to 9 feet bgs.

The elevation of the top of the silt unit was contoured using the data collected during the additional subsurface investigation and past well investigations. The top of the silt unit contour map is presented as Figure 3. The contours in the northern portion of the site slope toward the east between point GP-8 and well MW-12. The area of the former pits are shown as a topographic high. The contours on the southwest corner of the site indicate a depression, possibly a buried stream channel trending toward the north east from the western edge of the former pond locations.

SECOR personnel collected water level data on May 7, 1999. Static water levels in the piezometers ranged from 5.05 to 10.89 feet bgs, as measured from the top of each well casing. Free product (SPH) was not encountered in any of the temporary geoprobe well points. However, sheen was encountered on the water surface in geoprobes GP-2, GP-3, GP-4, GP-5, and GP-7. Based on the results of the water level measurements collected on May 7, 1999, groundwater flow in the area was oriented in a west-southwesterly direction toward the Columbia River. The gradient in the southern portion of the site was 0.01 foot/foot; however, the gradient in the northern portion of the site is relatively flat. Groundwater elevation data and flow direction are presented on Figure 2. Table 1 provides groundwater elevation data for geoprobes GP-1 through GP-9 and monitoring wells MW-1 through MW-21. Table 2 shows historical groundwater elevation data for monitoring wells MW-1 through MW-21, along with historical groundwater concentrations for monitoring wells MW-1 through MW-21.

4.2 ANALYTICAL METHODS

Eleven soil samples and nine water samples were submitted for chemical analysis. All samples were stored in an ice-filled cooler and transported to North Creek Analytical Laboratory of Beaverton, Oregon for analysis under chain-of-custody control. Eight of the soil samples, collected from near but above the groundwater surface, and the nine groundwater samples were analyzed for total petroleum hydrocarbon (TPH) as gasoline by NWTPH-Gx Method, TPH as diesel and oil by NWTPH-Dx Method, and benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020A. An additional two soil samples from borings GP-2 and GP-3 at a depth of 3-4 feet bgs were also submitted to the laboratory for analysis based on field observations. One soil sample from boring GP-3 at a depth of 7-8 feet bgs, which yielded the most elevated PID reading, was also submitted to the laboratory for analytical speciation, in accordance with Washington Department of Ecology (WDOE) Interim TPH Policy Method. The WDOE Interim TPH Policy Method consists of the following analytical methods: extractable petroleum hydrocarbons (EPH), volatile petroleum hydrocarbons (VPH), polynuclear aromatic hydrocarbons by GC/MS-SIM, BTEX, naphthalene, and methyl tertiary-butyl ether (MTBE).

The laboratory analytical reports and chains-of-custody documentation are included in Appendix C. The geoprobe groundwater analytical results are shown on Table 3. Figure 4 shows groundwater analytical results for geoprobe points GP-1 through GP-9. The geoprobe soil analytical results are shown on Table 4 and Figure 5. The speciation analytical results are shown on Tables 5 and 6.

4.3 SOIL SAMPLE ANALYTICAL RESULTS

No constituents were detected at or above the laboratory reporting limits in the geoprobe soil samples submitted for analysis. TPH as gasoline was detected in soil samples collected from borings GP-1 (2.5-3.0 feet bgs) at 5.29 mg/Kg, GP-2 (7-8 feet bgs) at 584 mg/Kg, and GP-3 (3-4 feet bgs) at 13.7 mg/Kg. TPH as diesel was detected in GP-2 (3-4 feet bgs) and (7-8 feet bgs) at 104 and 6,700 mg/Kg, respectively and GP-3 (3-4 feet bgs) at 14,000 mg/Kg. No TPH as oil was detected at or above the laboratory reporting limits. The geoprobe soil analytical results for TPH as gasoline, diesel, oil, and BTEX are summarized on Table 4 and on Figure 5.

The soil sample collected from boring GP-3 (7-8 feet bgs) did not yield reportable concentrations of BTEX, naphthalene, and MTBE. Geoprobe sample GP-3 (7.8 feet bgs) was also analyzed for VPH and EPH. Carbon range C10-C12 aromatic and aliphatic compounds were detected at 649 and 856 mg/Kg, respectively. Carbon range C12-C13 aromatic compounds were detected at 1,500 mg/Kg. All other VPH range aromatic and aliphatic constituents were not detected above the associated laboratory reporting limits. The total detected concentration of VPH was 3,005 mg/Kg.

Carbon range C8-C10 aliphatic compounds were detected at 94.3 mg/Kg. Carbon range C10-C12, C12-C16, C16-C21, C21-C34 aromatic compounds were respectively detected at 46.6, 412, 409, and 237 mg/Kg. Carbon range C10-C12, C12-C16, C16-C21, C21-C34 aliphatic compounds were respectively detected at 961, 3,130, 1,730, and 339 mg/Kg. The total detected concentration of EPH was 7,360 mg/Kg. Analytical results for the carbon range speciation are shown on Table 5.

Acenaphthene, acenaphthylene, anthracene, chrysene, fluoranthene, fluorene, 2-methylnaphthalene, phenanthrene, and pyrene were detected at or above the laboratory reporting limit in concentrations ranging from 0.4 to 8.9 mg/Kg. Chrysene is the only carcinogenic petroleum aromatic hydrocarbon (cPAH) detected at a concentration of 0.485 mg/kg. The analytical results are summarized on Table 6.

4.4 GROUNDWATER SAMPLE ANALYTICAL RESULTS

Benzene, ethylbenzene, and total xylenes were not detected at or above laboratory reporting limits in any of the geoprobe groundwater samples. Toluene was detected in samples collected from points GP-2 and GP-3 at 5.85 and 0.515 ug/L, respectively. TPH as gasoline was detected in the samples collected from borings GP-2 at 2,170 ug/L; GP-3 at 2,780 ug/L; and GP-8 at 479 ug/L. With the exception of the sample collected from point GP-6, TPH as diesel was detected in samples collected from all geoprobe borings at or above the laboratory reporting limit. TPH as oil was not detected in any of the geoprobe groundwater samples. A summary of the geoprobe groundwater analytical results are shown on Figure 4 and on Table 3.

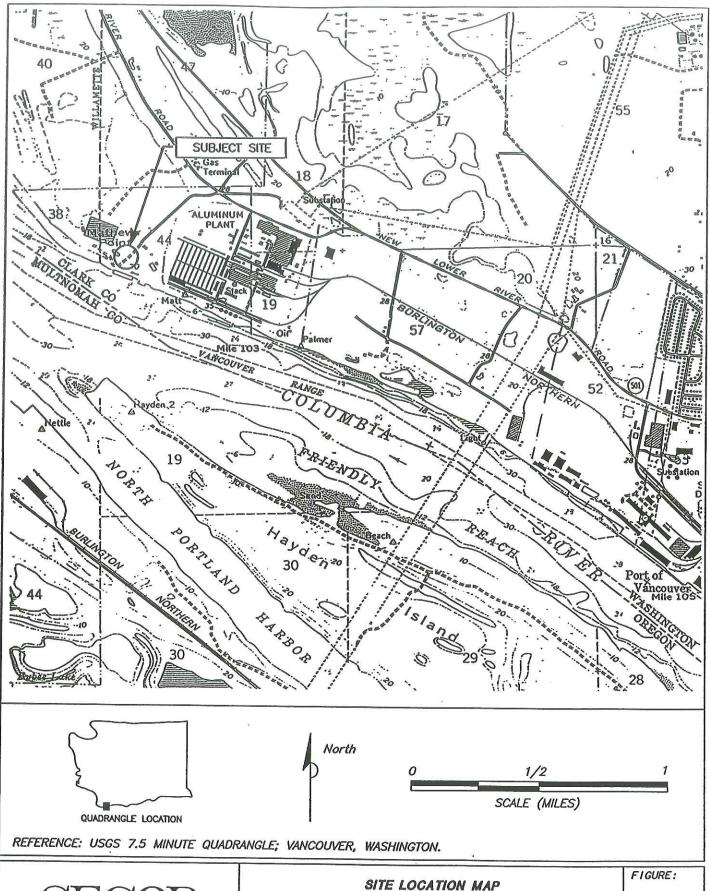
5.0 SUMMARY AND CONCLUSIONS

SECOR performed the described investigation to acquire additional data to more completely characterize the site subsurface, prior to initiating further remedial activities at the site. The investigation focused on assessing the potential presence and extent of SPH as well as dissolved hydrocarbon compounds beneath the site. Free product was not encountered in any of the geoprobe temporary well points installed, although a sheen was encountered on the water surface in borings GP-2, GP-3, GP-4, GP-5 and GP-7. Geoprobes GP-2 and GP-3 were located in the vicinity wells MW-7 and MW-8, inside the middle former pit; soil samples collected from these locations yielded high concentrations of TPH as diesel. TPH as diesel was not detected in soil samples collected from any of the other geoprobe temporary well points.

The geoprobe borings advanced during this investigation yielded water samples containing TPH as diesel across the site including the northern portion of the site in the vicinity of well MW-16. Geoprobe points GP-1, GP-4 and GP-6 yielded water samples containing TPH as diesel at concentrations less than 1 mg/L. Samples collected from the other geoprobe locations yielded TPH as diesel at concentrations between 1.97 and 17.9 mg/l. Those samples collected from points GP-2, GP-3, GP-7, and GP-8 yielded TPH as diesel in excess of 10 mg/L.

Based on the groundwater elevation contour as compared with the top of the silt contour, the top of the silt unit does not appear to dictate the groundwater flow direction, particularly in the northern portion of the site. In the northern portion of the site, the upper silt surface slopes to the east, however, the groundwater flow is to the west. The linear depression observed on aerial photographs (possibly a buried stream channel) may be a preferential path for groundwater flow, however, the analytical results from the geoprobe sample locations and existing monitoring wells do not suggest a preferential migration of dissolved hydrocarbons along this feature.

FIGURES



SECOR International Incorporated

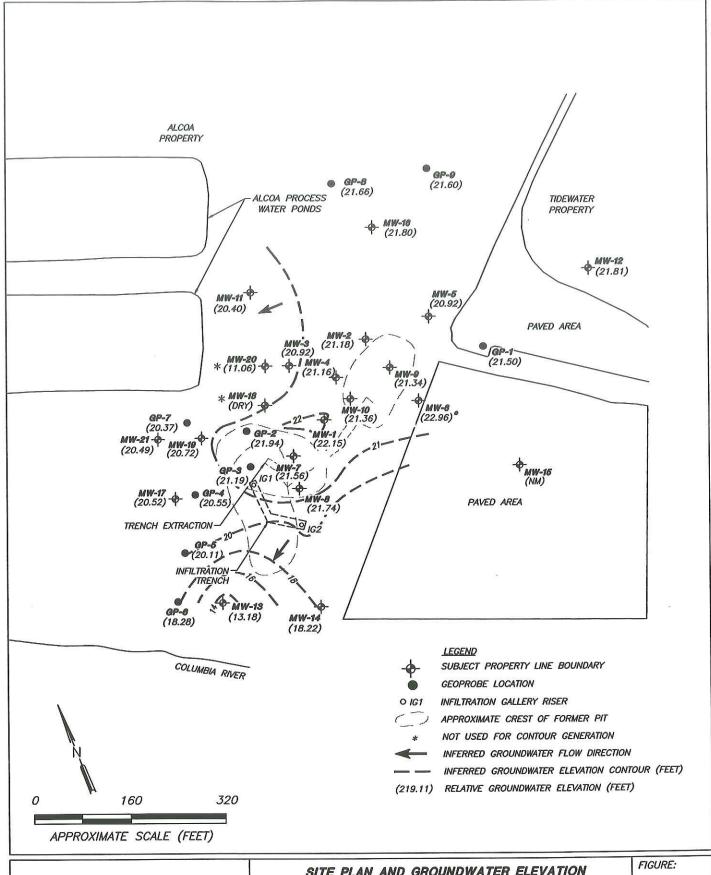
SITE LOCATION MAP
FORMER COLUMBIA MARINE LINES FACILITY

VANCOUVER, WASHINGTON

JOB#:00256-003-01 APPR: 1557 DWN:DJM

1

DATE: 12/2/97



SECOR
International Incorporated

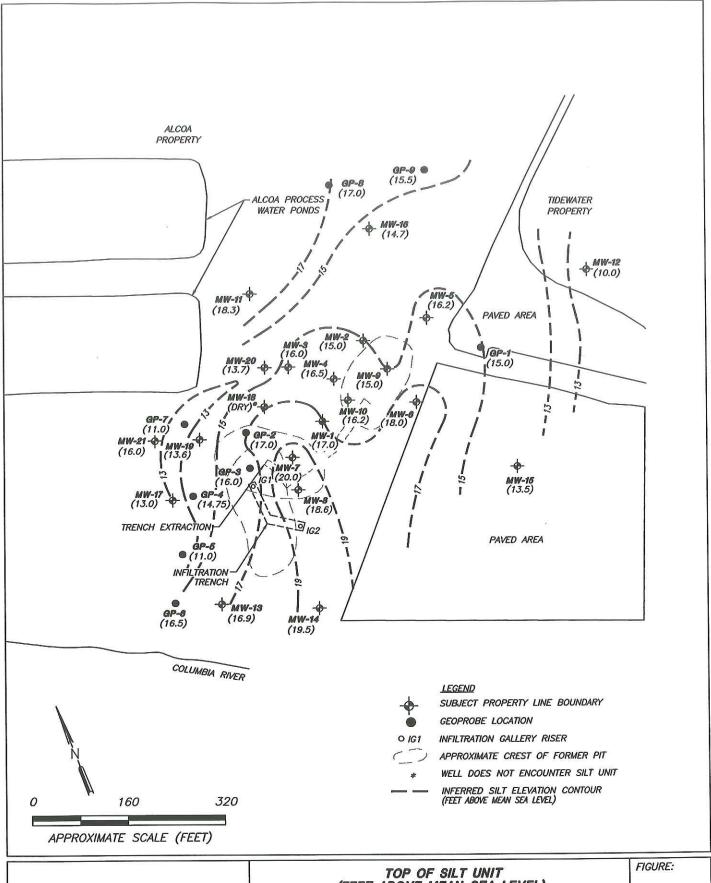
SITE PLAN AND GROUNDWATER ELEVATION (5/7/99) FORMER COLUMBIA MARINE LINES FACILITY 6305 LOWER RIVER ROAD VANCOUVER, WASHINGTON

2

JOB#: F0319-001-01

APPR:

DWN: KSM DATE: 7/7/99



SECOR
International Incorporated

TOP OF SILT UNIT (FEET ABOVE MEAN SEA LEVEL) FORMER COLUMBIA MARINE LINES FACILITY 6305 LOWER RIVER ROAD VANCOUVER, WASHINGTON

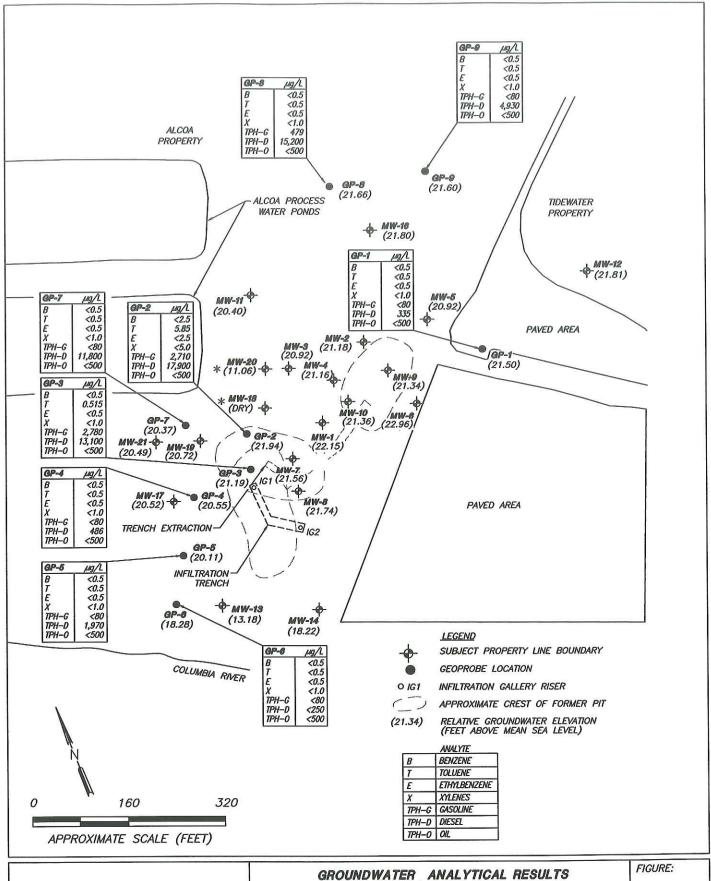
3

JOB#: F0319-001-01

APPR:

DWN: K8M

DATE: 7/7/99



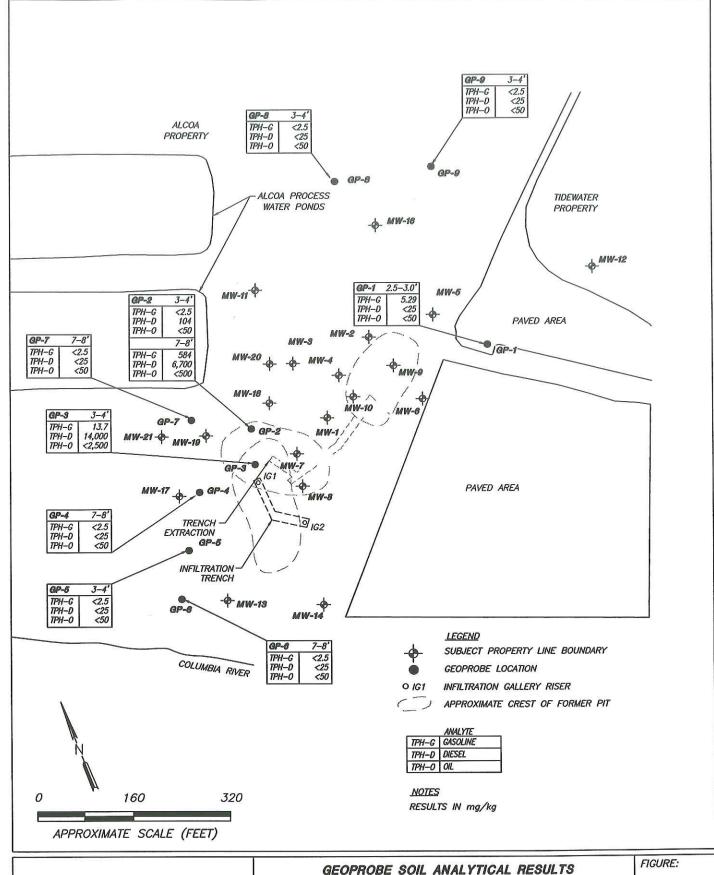
SECOR
International Incorporated

GROUNDWATER ANALYTICAL RESULTS
(5/7/99)

FORMER COLUMBIA MARINE LINES FACILITY
6305 LOWER RIVER ROAD
VANCOUVER, WASHINGTON

1

JOB#: F0319-001-01 APPR: DWN: K8M DATE: 7/7/99





GEOPROBE SOIL ANALYTICAL RESULTS
(5/7/99)

FORMER COLUMBIA MARINE LINES FACILITY
6305 LOWER RIVER ROAD
VANCOUVER, WASHINGTON

5

JOB#: F0319-001-01 APPR: DWN: KSM

DATE: 7/7/99

TABLES

Table 1. Geoprobe and Monitoring Well Groundwater Elevations (5/7/99) Former Columbia Marine Lines Facility 6305 Lower River Road, Vancouver, Washington

Well Number	TOC Elevation (feet)	DTW (feet)	SPH	Relative Groundwate Elevation (feet)
GP-1	26.55	5.05	0.0	21.50
GP-2	32.24	10.30	0.0	21.94
GP-3	32.08	10.89	0.0	21.19
GP-4	30.75	10.20	0.0	20.55
GP-5	26.97	6.86	0.0	20.11
GP-6	27.17	8.89	0.0	18.28
GP-7	30.87	10.50	0.0	20.37
GP-8	29.37	7.71	0.0	21.66
GP-9	29.66	8.06	0.0	21.60
MW-1	31.66	9.51	0.0	22.15
MW-2	33.97	12.79	0.0	21.18
MW-3	30.90	9.98	0.0	20.92
MW-4	28.42	7.26	0.0	21.16
MW-5	23.37	2.45	0.0	20.92
MW-6	26.14	3.18	0.0	22.96
MW-7	33.36	11.82	11.80	21.56
MW-8	33.49	12.05	11.68	21.74
MW-9	26.36	5.02	0.0	21.34
MW-10	25.89	4.53	0.0	21.36
MW-11	25.89	5.49	0.0	20.40
MW-12	28.17	6.36	0.0	21.81
MW-13	22.78	9.60	0.0	13.18
MW-14	26.25	8.03	0.0	18.22
MW-16	31.13	9.33	0.0	21.80
MW-17	33.94	13.42	0.0	20.52
MW-18	33.19	DRY	DRY	DRY
MW-19	33.67	12.95	0.0	20.72
MW-20	30.36	19.30	0.0	11.06
MW-21	30.06	9.57	0.0	20.49

TOC = Top of casing.
DTW = Depth to water.

 $SPH = Depth \ to \ separate \ phase \ hydrocarbons.$

WTE = Water table elevation.

Table 2. Historical Groundwater Table Database Former Columbia Marine Lines Facility 6305 Lower River Road, Vancouver, Washington

WTE	(feet)	1	1	22.47	21.43	77.77	19.40 22.15	1	1	ı	1	21.02	20.22	20.42	19.05	21.18	Ĩ	1	19.66	2.73	19.0/	70.02	76.07	1	1	20.15	20.02	19.97	18.77	21.10
LHT	(feet)	1	ı	0.00	1	1	0.00	i	1	1	1	0.00	I	1	1 8	0.00	1	1	0.00	1	1	1 8	3.6	E	1	0.00		ı	1 8	3.5
WLQ	(fæt)	1	1	9.19	10.23	ر لا	12.26 9.51	1	ŀ	1	l	12.95	13.75	13.55	14.92	12.79	ı		11.24	11.11	11.23	87.77	7.70	ı	1	8.27	8.40	8.45	9.65	07:/
PAHs	(µg/L)	1	1	2	ı	ı	1 1	1	ı	1	S	1	I	1	1	1	ı	ı	1	1	1	ı	1	1	1	ı	1	ı	E	1
HVOCs	(/T/B//r)	1		Q.	1	Į.	1 1	1	1	ı	1	1	ı	ŧ	1	ı	ı	1	ı	1	Ē	1	1	1	1	1	ı	1	ı	1
	Total Xylenes	1	<>>	< 0.50	1	1	<1.0	770	006	566	110	110	4	1	6.21	ı	8	1	< 0.50	1	1	<1.0	1	800	^	6.7	<1.0	1	<1.0	1
X [2]	Ethyl- benzene	<20	<5	<0.50	l	1	<0.50	100	110	< 100	35	22	20	1	< 0.50	ı	15	\ \ !	< 0.50	1	1	<0.50	1	110	<u>~</u>	1.1	<0.50	ſ	<0.50	ı
BTEX (µg/L)	Toluene	<20	<>>	< 0.50	ì	1	<0.50	450	390	< 100	3.0	2.3	1.0	ı	0.641		2	<u>~</u>	< 0.50	:	1	1.55	1	150	~	1.4	5.0	ı	1.0	-
	Benzene	<20	<>>	< 0.50	I	:	<0.50	510	69	< 100	6.3	1.7	2.3	ı	<0.50	-	95	^	<0.50	I	1	< 0.50	1	700	\ 1	3.0	1.6	i	<0.50	1
Ð.Ú	Heavy Oil		1	<5.0	1	1	1.23		1		ı	7.4	ı	1	<2.50	1	1	ŧ	<5.0	I	1	4.1	-	1	1	<5.0	1	1	2.92	-
TPH-D (mg/L)	Diesel	ı	ı	21	:	1	5.43		ı	26.4	10	40	4.7	1	9.03	ŧ	1	1	4.6	ı	t	11.4	Ĭ	1	:	7.8	11	}	11.2	
TPH-G	(mg/L)		1	< 0.08	ı	1	0.233			< 0.05	3.1	4.0	<0.08	ı	3.22	1	1	1	0.29	1	ľ	0.28	Ī		1	0.39	0.38	1	1.12	I.
	Date	11/08/83	12/13/84	11/13/95	08/01/96	10/30/97	10/29/98	11/08/83	m/05/86	08/28/90	08/02/94	11/13/95	08/01/96	10/30/97	10/29/98	05/01/99	11/08/83	12/17/84	11/13/95	08/01/96	10/30/97	10/30/98	05/07/99	11/08/83	12/12/84	11/13/95	08/01/96	10/30/97	10/29/98	05/01/99
Sample Location/	TOC Elevation (feet)	MW-1	31 66	20.15				NAIV 2	22 07	16:00							MW- 3	30.90						WW4	28.42	:				

Table 2. Historical Groundwater Table Database (Continued)
Former Columbia Marine Lines Facility
6305 Lower River Road, Vancouver, Washington

WTE	(feet)	20.30	20.91 20.64 20.70 22.96	20.82 20.31 20.26 18.92 21.56	20.99 20.63 20.46 18.69 21.74	22.11 20.55 24.49 20.05 21.34
THT	(feet)	1 1 0.0	0.00	0.00 0.62 0.17 0.07 11.80	0.50 0.15 0.21 0.14 11.68	0.00
DTW	(teet)	3.60	5.23 5.50 5.44 3.18	12.54 13.55 13.24 14.51 11.82	12.98 12.98 13.20 14.94 12.05	4.25 5.81 1.87 6.31 5.02
PAHs	(μg/L)	11111	11111	181111	1 1 1 1 1 1	
HVOCs	(µg/L)	11111	1111		11111	11111
	Total Xylenes	<0.50	<1<0.50-<1.0-	<pre><2.5 <1.0 </pre>	5.0	<0.50
χÇ	Ethyl- benzene	<22 <20 <0.50	<1 <0.50 - <0.50 -	<pre></pre>	2,1 1 1 1	<1 <0.50 - <0.50 -
BTEX (µg/L)	Toluene	<22 380 <0.50 -	<1 <0.50 - <0.50 -	<220 <22.5 11.2 11.2	2.5.	<1 <0.50 - <0.50
	Benzene	35 <20 <0.50 -	<pre>< 1 < 0.50 < 0.50 </pre>	<220 <22.5 1.6 	2.0	<1 <0.50 - - <0.50
-D	Heavy Oil	0.77	- 6.79		 41 DET	0.63
TPH-D (mg/L)	Diesel	1 1 2.6	48 	 7.7 43 DET	 490 DET	0.88
TPH-G	(mg/L)	1 1 0 0 0 1 1 1	0.74	1.6 1.8 1.3 1.0 1.1	5.4 - DET ₁	<pre>< 0.08</pre>
	Date	11/08/83 12/17/84 11/13/95 08/01/96 10/29/98 05/07/99	12/12/84 11/13/95 08/01/96 10/30/98 05/07/99	11/08/83 08/02/94 11/13/95 08/01/96 10/30/97 10/30/98 05/07/99	11/08/83 11/13/95 08/01/96 10/30/97 10/30/98 05/07/99	12/13/84 11/13/95 08/01/96 10/30/97 10/30/98 05/07/99
Sample Location/	TOC Elevation (feet)	MW-5 23.37	MW-6 26.14	33.36	33.49	MW-9 26.36

Table 2. Historical Groundwater Table Database (Continued) Former Columbia Marine Lines Facility 6305 Lower River Road, Vancouver, Washington

Market Commence		_				Т		_		_	-	_	\neg		_	_		_	1		_	_	_					
WTE	(feet)	20.80	20.27	20.25	DRY 21.36	00:17	1	1	19.32	19.18	19.14	17.77	20.40	1	22.10	21.02	21.50	20.16	18.12	1	ı	1	1 5	12.18	17.08	12.30	1 5	13.10
LHT	(feet)	00.00	1	: ;	DRY	0.00	1	1	0.00	1	ŧ	1 5	0.00	1	0.00	}	Î	1 8	0.00	1	ī	ı	1	0.00	1	I	1 8	9.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
WLQ	(feet)	5.09	5.62	5.64	DRY	4.33	ı	1	6.57	6.71	6.75	8.12	5.49	1	6.07	7.15	6.61	8.01	6.30	ı	1	ě.	1	10.60	10.70	10.48	1 %	9.00
PAHs	(µg/L)	ı	1	1	ı	1	Secretary and a second	2	ì	1	1	ı	:	ı	1	I	1	ľ	1	ŧ	1	t	2	ı	1	1	1	1
HVOCs	(ng/L)	:	ı	;	1	1	I	ľ	ı	£.	1		;	:	1	1		ľ		ï	Ă	1	1	ŀ	1	1	Ī	
	Total Xylenes	1.5	ı	1	1	1	1	0.92	<0.50	ı	1	<1.0	ī	1	<0.50			<1.0	1	V V	7	× 100	< 0.50	<0.50		\ \ !	ı	1
X []	Ethyl- benzene	1.2	1	1	1	ĭ	~	<0.50	<0.50	1	1	< 0.50	-	~	< 0.50	<0.50	1	<0.50	ŧ	\ \ !	<u>~</u>	< 100	<0.50	< 0.50	<0.50	< 0.50	ı	ı
BTEX (µg/L)	Toluene	1.0	ì	ı	ì	ı	~	< 0.50	< 0.50	ī	İ	< 0.50		~	< 0.50	< 0.50		< 0.50	ı	\ \ !	<u>~</u>	< 100	< 0.50	<0.50	< 0.50	<0.50	74	1
	Benzene	1.1	1	l	1	-	<1>	< 0.50	< 0.50		1	< 0.50	Į	~	< 0.50	<0.50	ı	<0.50	:	^	\ \	< 100	<0.50	<0.50	< 0.50	< 0.50	1	ı
.D	Heavy Oil	<5.0	t	1	E	1	ı	1	<5.0	ŀ	ı	0.70	1	1	<0.50	4	1	<0.50	1	1	1	ı	1	<0.50	1	0.75	1	:
TPH-D (mg/L)	Diesel	<0.25	1		ı	1	1	< 0.50	11	ı	1	3.16	1	1	< 0.25	< 0.25	1	<0.25	1	Ē	1	<0.05	1.2	1.4	06.0	1.53	1	1
D-HdT	(mg/L)	0.76	1	1	!	1		< 0.20	<0.08	1	ı	<0.08	1	1	< 0.08	<0.08	1	<0.08	1	:	I	< 0.05	< 0.20	< 0.08	< 0.08	<0.08	1	1
	Date	11/13/95	08/01/96	10/30/97	10/30/98	05/01/99	12/17/84	08/02/94	11/13/95	08/01/96	10/30/97	10/29/98	66/10/50	12/18/84	11/13/95	08/01/96	10/30/97	10/29/98	05/07/99	12/19/84	02/05/86	08/28/90	08/02/94	11/13/95	08/01/96	10/30/97	10/29/98	05/07/99
Sample Location/	TOC Elevation (feet)	MW-10	25.89	ì			MW-11	25.89						MW-12	28 17					MW-13	22.78	i						

Table 2. Historical Groundwater Table Database (Continued) Former Columbia Marine Lines Facility 6305 Lower River Road, Vancouver, Washington

														_	_	_		_		-	_	_		_	-	V	_	_	_	_	-
WTE	(feet)	1	18.17	17.10	17.36	18.22	10.44	ŀ	1	I	ı	1	1	1	1	21.19	20.77	20.87	19.70	21.80	1	DRY	19.32	18.33	DRY	20.52	24.72	23.23	DRY	DRY	DRY
LHT	(feet)	1	0.00	ı	1	8	3	ŧ	ı	ı	1		1	I	ı	0.00	ı	1	1	0.00	1	DRY	1	1	DRY	0.00	0.00	0.00	DRY	DRY	DRY
WLQ	(feet)	1	80.8	9.15	8.89	1 0	0.00	1	1	1	Ī	1	1	ı	Į	8.	10.36	10.26	11.43	9.33	1	DRY	14.62	15.61	DRY	13.42	8.47	96.6	DRY	DRY	DRY
PAHs	(µg/L)	1	1	1	Ĕ	1	1	1	S	ı	١	1	1	1	11*	1	ı	1	1	1	1	ŀ	ł	1	1	1	1	1	1	ł	;
HVOCs	(ug/L)	1	•	1	1	1	1	1	1	1	1	1	;	1	ı	1	1	1	1	:	1	i	1	ı	1	1	ı	1	1	1	1
	Total Xylenes	1	< 0.50	\ \ !	<u>^</u>	1	1	?	< 0.50	1	Ĩ	1	240	445	4.0*	7.9	3.0	4.43	<1.0	1	7	ı		1	1	:	< 0.50	<1.0	10.17	ı	-
×ſ	Ethyl- benzene	~	< 0.50	< 0.50	< 0.50	ı	1	~	<0.50	Ē	1		<10	< 100	0.74*	53	< 0.50	7.86	<0.50		~	ı	1	1	ı	1	<0.50	0.82	ŀ	1	-
BTEX (µg/L)	Toluene	7	<0.50	< 0.50	< 0.50	1	1	7	<0.50	ı		1	<10	< 100	0.73*	1.3	2.2	<0.50	3.73	1	7	1	-	;	i	1	<0.50	1:1	:	1	1
	Benzene	\ 	< 0.50	<0.50	<0.50	ı	1	~	<0.50	1	ŀ	1	93	< 100	2.0*	20.0	< 0.50	<0.50	<0.50	1	1 > 1	1	ı	1	Ĩ	:	<0.50	< 0.50	1	ı	1
-D L.)	Heavy Oil	ı	<0.50	1	<0.50	ı	:	1	1	ı	ŧ	1	:	1	ı	2.1	ı	2.70	2.59	1	ı	:	1	1	1	1	2.1	ı	1	ı	1
TPH-D (mg/L)	Diesel	1	1.0	1.8	<0.25	;	ı	ı	< 0.50	1	I	1	:	4.91	*	10	<0.50	9.01	11.6		1	1	1	1	;	1	4.9	9.6		i	ı
TPH-G	(mg/L)	1	<0.08	<0.08	<0.08	1	-	1	< 0.20	1	1			1.0	*	0.90	0.74	1.22	0.482		1	1	1000	:		1	×0.08	<0.08	1	1	ŀ
	Date	12/19/84	11/13/95	08/01/96	10/30/97	10/29/98	05/07/99	02/02/86	08/02/94	11/13/95	08/01/96	05/07/99	02/05/86	08/28/90	08/02/94	11/13/95	08/01/9	10/30/97	10/29/98	05/07/99	02/05/86	11/13/95	08/01/96	10/30/97	10/29/98	05/07/99	11/13/95	08/01/96	10/30/97	10/29/98	05/07/99
Sample Location/	TOC Elevation (feet)	MW-14	26.25					MW-15	26.24				MW-16	31 13	21.10						MW-17	33.94					MW 18	33 10	72.27		

Table 2. Historical Groundwater Table Database (Continued) Former Columbia Marine Lines Facility 6305 Lower River Road, Vancouver, Washington

MTE.	র্	1		8 5	54.	.20	18.31	1	1 6	15.	2.5	\$ <i>\</i>	7.00	8	1 6	KY	141	5.50	KI	7.43	19.61	6.5	20.87	27.7	18.57	27.52	1	33.53
≱	g)			90 0	- 5	P. 19	2 2	3	. (oo t	- (0 0	. i	= +			7,	-	— —	4	- 12	3	22	15	10	7		33
Ħ	(fect)	1	1	0.00	3.0	1 6	0.75	3	1 3	0.00	E	1	1 8	00.00	1 1	DRY	1	1	DRY	3.0	0.00	1	0.00	1	0.00	1	1	1
DTW	(feet)	1		14.77	14.24	14.47	16.11	14.70	1	21.99	22.66	23.72	27.70	19.30	1	DRY	10.65	11.50	DRY 0.63	7.07	9.74	1	4.35	:	14.72	E	1	1
PAHs	(ug/L)	ı	1	1	1	T	1	:	1	1	Ĭ	1	Ī	1	1	t	1	ı	1	1	1	1	:	1	1	1	1	ı
HVOCs	(μg/L)	1	1	ţ	1	ŀ	ŀ	1	ı	S	1	1	1	1	1	ł	1	Ĭ	Ē	1	1	1	1	1	1	1	1	1
	Total Xylenes	<20	< 100	<2.5		1.45	1	1	7	< 0.50	:	ï	<1.0	-	4	1		i	1	1	1	-7	ı		1	1	2.4	1
X. L.)	Ethyl- benzene	30	× 100	<2.5	1	< 0.50	E	,	~	< 0.50	1	1	<0.50		7	ì	ŧ	1	1	1	ı	1	1	1	ı	1	0.54	1
BTEX (µg/L)	Toluene	<10	< 100	<2.5	t	<0.50	ı	1	^	<0.50	ſ		<0.50		~	1	ı	l	1	1	1		1	ı	:	1	1.3	
	Benzene	140	< 100	<2.5	ŀ	<0.50	;	ı	\ 	< 0.50	1	1	< 0.50	,	~	t	ı	1	1	:	1	Ĩ	1	1	1	ł	1.4	
.D	Heavy Oil		ı	<25	1	3.18	DET	1	-	0.73	1	1	<0.50	1		ı	1	ī	ı	1	1	1	!	ı	1	1	25	1
TPH-D (mg/L)	Diesel	1	35.2	69	1	21.6	DET	1	1	0.87	1	I	<0.25	ı	1	1	1	1	1	1	ŧ	1	,	1	,	,	12	3 1
TPH-G	(mg/L)	l	<0.05	4.3	1	2.86	DET,	1	1	< 0.08	1	1	<0.08	•	1	ı	:		I	1	1	1	,	1		1	6.3	Ç I
	Date	12/05/86	08/28/90	11/13/95	08/01/96	10/30/97	10/30/98	05/01/99	02/02/86	11/13/95	08/01/96	10/30/97	10/30/98	05/07/99	02/02/86	11/13/95	08/01/96	10/30/97	10/29/98	05/07/99	11/13/95	08/01/96	11/13/95	08/01/96	11/13/05	08/01/96	20,00,00	08/01/96
Sample Location/	TOC Elevation (feet)	MW-19	33.67						MW-20	30.36					MW-21	30.06					P-1	29.35	D.7	25.22	EV 1	32 30	00.30	EX-2 33.53

Table 2. Historical Groundwater Table Database (Concluded) 6305 Lower River Road, Vancouver, Washington Former Columbia Marine Lines Facility

Sample Location/		Đ-HđT	TPH-D (mg/L)	(-D		BT (u)	BTEX (µg/L)		HVOCs	PAHs	DTW	H	WTE
TOC Elevation (feet)	Date	(mg/L)	Diesel	Heavy	Benzene	Toluene	Ethyl- benzene	Total Xylenes	(µg/L)	(µg/L)	(feet)	(feet)	(feet)
PMX-5	08/02/94	<0.2	1.3	1	<0.5	<0.5	<0.5	<0.5	1	2	1	ı	1
26.70	11/13/95	1	Ī	ı	1	1	1	ı	ı	I,	ı	ţ	1 70
	08/01/96	ı	1	1	1	1	-	1	1	:	I	:	70./0
MTCA !	MTCA Method A	-			5	40	30	20	Various	0.1≈			
Clean	Cleanin Levels	•											

Top of casing elevation relative to assigned benchmark.

Depth to water below top of casing. TOC

Liquid hydrocarbon thickness. LHI

Water table elevation. WTE

Well was dry DRY

Not measured, not analyzed, or not sampled. II

Not detected above laboratory method reporting limit (MRL). Results include higher of 08/02/94 MW-16 or bind duplicate listed as "MW-30." Fluorene was detected at 11 µg/L in MW-30; all other PAH results were below

method reporting limits.

MTCA Method A cleanup level for carcinogenic PAHs.

TPH-G analysis by Washington DOE Method WTPH-G.

TPH-D analysis by Washington DOE Method WTPH-D Extended. BTEX analysis by EPA Method 8020.

HVOC analysis by EPA Method 8010.

PAH analysis by EPA Method 8310.

Detected hydrocarbons in gasoline range appear to be due to overlap of diesel-range hydrocarbons.

Analytical methods prior to 1995 include Hydrocarbon Scan by EPA Methods 3510/Modified 8015, and Oil and Grease by EPA Method 413.1.

Note: Water elevation corrected if liquid hydrocarbon present, corrected water level elevation = TOC - [(depth to water) -(LH thickness x 0.80)].

Table 3. Geoprobe Groundwater Analytical Results 6305 Lower River Road, Vancouver, Washington Former Columbia Marine Lines Facility

Geoprobe	Date		BTE	BTEX (ug/L)		D-HAL	G-HAL	TPH-0
Sample No.		Benzene	Toluene	Toluene Ethylbenzene	Total Xylenes	(ug/L)	(mg/L)	(mg/L)
GP - 1	66/L/5	< 0.50	< 0.50	< 0.50	< 1.0	> 80	0.335	< 0.50
GP - 2	66/L/5	< 2.5	5.85	< 2.5	< 5.0	2710	17.9	< 0.50
GP - 3	66/L/5	< 0.50	0.515	< 0.50	< 1.0	2780	13.1	< 0.50
GP - 4	66/L/5	< 0.50	< 0.50	< 0.50	< 1.0	08 >	0.486	< 0.50
	\$/7/00	050 >	< 0.50	< 0.50	< 1.0	> 80	1.97	< 0.50
G- 45	(())							
GP - 6	5/7/99	< 0.50	< 0.50	< 0.50	< 1.0	> 80	< 0.25	< 0.50
GP - 7	66/2/5	< 0.50	< 0.50	< 0.50	< 1.0	> 80	11.8	< 0.50
GP - 8	66/L/5	< 0.50	< 0.50	< 0.50	< 1.0	479	15.2	< 0.50
6- 65	66/2/5	< 0.500	< 0.50	< 0.50	< 1.0	< 80	4.93	< 0.50

Notes:

TPH-G = Total petroleum hydrocarbons as gasoline by NWTPH-Gx Method.

TPH-D = Total petroleum hydrocarbons as diesel by NWTPH-Dx Method.

TPH-0 = Total petroleum hydrocarbons as heavy oil by NWTPH-Dx Method.

Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX) by EPA Method 8020A.

< = Less than laboratory method reporting limits (MRLs).</p>

ug/L = Micrograms per liter; approximate parts per billion.

mg/L = Milligrams per liter, approximate parts per million.

6305 Lower River Road, Vancouver, Washington Table 4. Geoprobe Soil Analytical Results Former Columbia Marine Lines Facility

Sample No.	-			ALL CALL COLLEGE	1 1		7				
	חשלו	Date		BIL	BIEX (mg/kg)		7	7111	1		
	(foot hos)		Benzene	Toluene	Toluene Ethylbenzene	Total Xylenes	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/kg)
	75 30	66/9/5	< 0.05	< 0.05	< 0.05	< 0.05	5.29	< 25	< 50	1	1
GP-1	3-4	5/6/99	< 0.05	< 0.05	< 0.05	< 0.05	< 2.50	104	< 50	1	1
	· «- /	66/9/5	< 0.50	< 0.50	< 0.50	< 0.50	584	6,700	< 500ª	1	1
GP.3	3-4	66/9/5	< 0.05	< 0.05	< 0.05	< 0.05	13.7	14,000	< 2,500	1	1
	**-1	66/9/5	× 1.00	< 1.00	< 1.00	< 2.00	1	8	1	< 1.00	< 10.0
7 40	8 7	5/6/99	< 0.05	< 0.05	< 0.05	< 0.05	< 2.50	< 25	< 50	1	1
	0-1	2/2/20	\$0.0 /	> 0.05	< 0.05	< 0.05	< 2.50	< 25	< 50	1	1
GP-5	3-4	21010	50.0	50.0 /	> 0.05	< 0.05	< 2.50	< 25	< 50	1	1
GP-6	8-7	5/0/99	20.0	50.0	50.0 /	< 0.05	< 2.50	< 25	< 50	1	1
GP-7	7-8	5/6/99	> 0.00	20.0 >	50.0 \	< 0.05	< 2.50	< 25	< 50	1	1
GP-8	3-4	2/0/29	0.00	50.0	50.0	/ 0 US	< 250	< 25	< 50	1	1
GP-9	3 - 4	2/6/98	c0.0 >	< 0.05	CO.O.>	20:0	2000				

Notes:

TPH-G = Total petroleum hydrocarbons as gasoline by NWTPH-Gx Method.

Total petroleum hydrocarbons as diesel by NWTPH-Dx Method. TPH-D =

Total petroleum hydrocarbons as heavy oil by NWTHP-Dx Method. TPH-0 =

MTBE = Methyl tert-butyl ether, analyzed by WDOE Interim TPH Policy Method using GC/MS.

Reporting limits raised due to dilution necessary for analysis. (명 (명

BTEX and Naphthalene for GP3 depth 7-8 analyzed by WDOE Interim TPH Policy Method using GC/MS. This sample was analyzed outside the EPA recommended holding time. || *

Less than laboratory method reporting limits (MRLs). 11 ٧

mg/Kg = milligrams per kilogram; approximate parts per million.

bgs = Below ground surface.

Not analyzed.

Table 5. Geoprobe Soil Analytical Results - Petroleum Hydrocarbons
Former Columbia Marine Lines Facility
6305 Lower River Road, Vancouver, Washington

Sample	Depth	Carbon Range	Aromatics	Carbon Range	Aliphatics
GP3	7 - 8	C8 - C10		C8 - C10	94.3
		C10 - C12	46.6	C10 - C12	961
		C12 - C16	412	C12 - C16	3,130
		C16 - C21	409	C16 - C21	1,730
		C21 - C34	237	C21 - C34	339
		Total EPH			
		VPH (r			
Sample	Depth	Carbon Range	Aromatics	Carbon Range	Aliphatics
GP3	7 - 8	C5 - C6		C5 - C6	< 250
	5 (6)	C6 - C8	,	C6 - C8	< 250
		C8 - C10	< 250	C8 - C10	< 250
		C0 - C10			1797(1915)
		C10 - C12	649	C10 - C12	856

Notes:

EPH Extractable Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method VPH Volatile Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method.

Table 6. Geoprobe Soil Analytical Results - Polynuclear Aromatic Hydrocarbons GP-3, 7-8 feet bgs (5/6/99)

Former Columbia Marine Lines Facility 6305 Lower River Road, Vancouver, Washington

cPAH (mg/Kg)	< 0.4	non-cPAH Acenaphthene	0.685
Benzo(a)anthracene Benzo(a)pyrene	<0.4	Acenaphthylene	0.4
Benzo(a)pyrene Benzo(b)fluoranthene	< 0.4	Anthracene	3.48
Benzo(ghi)perylene	< 0.4	Fluoranthene	0.428
Benzo(k)fluoranthene	< 0.4	Fluorene	2.45
Chrysene	0.485	2-methylnaphthalene	0.4
Dibenz(a,h)anthracene	< 0.4	Naphthalene	< 0.4
Ideno(1,2,3-cd)pyrene	< 0.4	Phenanthrene	8.9
Idono(1,2,5 ca)p) rene		Pyrene	0.999

Notes:

cPAH = Carcinogenic polynuclear aromatic hydrocarbon. non-cPAH = Noncarcinogenic polynuclear aromatic hydrocarbon. All units tested in milligrams per kilogram (mg/kg).

bgs = Below ground surface.

< = Less than laboratory method reporting limits by GC/MS-SIM.

APPENDIX A FIELD SCREENING METHODS

Additional Subsurface Investigation Report Former Columbia Marine Lines Facility 6305 Lower River Road SECOR PN: F0319-001-01

July 9, 1999

APPENDIX A FIELD PROCEDURES

UNDERGROUND UTILITY LOCATIONS

A call was placed with One Call Concepts Utilities Notification Center to notify public utilities of the scheduled subsurface investigation. SECOR verified that the appropriate utilities were marked at the site prior to drilling.

DRILLING PROCEDURES

Soil borings were hand-probed from ground surface to 5 feet below ground surface (bgs) to ensure that underground utilities would not be encountered and damaged during drilling. The soil borings were drilled with a track-mounted Geoprobe rig. Each soil boring was abandoned with bentonite and sealed with concrete at the top of the borehole. All equipment was decontaminated in a non-phosphate detergent wash, rinsed in tap water, and rinsed a second time in distilled water before use in each borehole to minimize cross-contamination between boreholes.

Soil cuttings were not generated using Geoprobe direct push drilling methods.

SOIL SAMPLE COLLECTION

Soil samples were collected from approximately 1 to 15 feet bgs during drilling to describe lithology and to field screen for the presence of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Samples were collected using a hydraulically driven 4-foot-long split-spoon sampler lined with 4-foot-long polyethylene (PE) lining sleeves. The sampler was advanced into undisturbed soils at the bottom of the borehole and then withdrawn from the boring and removed from the Geoprobe casing. The PE liners containing the soil were prepared for evaluation and analysis. Soil samples retained for analysis were promptly extruded and transferred from the lower portion of the PE liner into a threaded laboratory-prepared glass jar and capped with a Teflon-lined lid. The samples were labeled and placed in a cooler with ice for transport to North Creek Analytical of Beaverton, Oregon under standard chain-of-custody procedures. The remaining upper portion of the sample retained in the PE liner was used to field screen for evidence of VOCs and SVOCs and to characterize soil lithology.

A log was compiled for each borehole, including descriptions of the soil types, color, texture, degree of consolidation, moisture content, and field screening results. Soil types were based on the Unified Soil Classification System.

FIELD SCREENING OF SOIL SAMPLES

Soil samples for field screening were observed for visual or olfactory indications of VOCs and SVOCs and tested for headspace vapor concentrations using a photoionization detector (PID).

Data generated from field screening instruments is considered qualitative in nature. Although semi-quantitative data are generated using a PID, the results cannot be relied upon with the confidence of a laboratory analysis. Data generated from this type of analysis may provide the following:

 Identification of soil, water, air, and waste locations that have a high likelihood of showing contamination through subsequent laboratory analysis.

- Real-time data used for health and safety considerations during site reconnaissance and subsequent intrusive activities.
- Quantitative data, if contaminant is known and the instrument is calibrated to that substance.

Field Screening Using Vapor Headspace Testing. The instrument used for headspace vapor testing was a Thermo-Environmental OVM 580B. Prior to use, this instrument was calibrated to a known isobutylene standard in accordance with the manufacturer's specifications.

The following sequential steps were completed for each sample analyzed:

- A representative portion of the soil sample was placed directly from the sampler into a new, sealable Ziploc-type plastic bag. The bag was immediately sealed.
- The sealed bag containing the sample was allowed to sit at field ambient temperature for approximately 2 minutes.
- After the 2-minute period, one end of the bag seal was slightly opened, and the intake port of a PID was carefully inserted through the opening.
- The stabilized numerical value was observed and recorded onto the boring log form.

This number does not represent a concentration of volatiles in parts per million; it is a relative measure of the amount of ionized compounds present. As the exact chemical species present is unknown, the units of concentration are referred to as parts per million of isobutylene.

Vapor headspace screening is only applicable as a screening method for the presence of ionizable compounds with first ionization potentials of less than 10.6 electron volts. In addition, variables which may affect measurable concentrations and which are unaccounted for in this procedure include, but are not limited to: temperature, soil moisture content, and soil organic content. Vapor headspace screening is not designed for screening for evidence of contamination by semi-volatile or non-volatile organic compounds or for the presence of elemental metals or compounds.

SAMPLE DOCUMENTATION AND CUSTODY

Chain-of-custody for a sample was defined by the following criteria:

- The sample was in SECOR's possession or in view after being in possession.
- The sample was in SECOR's possession and locked up, or transferred to a designated secure area by SECOR.

Each time the sample bottles or samples was transferred, both the sender and receiver signed and dated the chain-of-custody form and specified what was transferred. After transfer of sample custody from the sampling team to the laboratory sample custodian, one copy of the chain-of-custody record was given to the sampling team for placement into the project files; the original remained with the laboratory. A chain-of-custody record was completed for each shipment of containers.

The following information was included on the chain-of-custody form:

- Sample container type and container number
- Date and time of collection
- Sample collection location(s)
- Signatures of sampler, submitter, and receiver of samples
- Date and time samples were received by laboratory
- Total number of samples received
- Laboratory analyses requested for each sample
- Requested laboratory turn-around time

LABORATORY AND FIELD QUALITY CONTROL AND QUALITY ASSURANCE

Routine quality control procedures outlined in the laboratory's Quality Assurance Manual were used for this project. Routine procedures used by the laboratory included:

- Daily instrument calibration prior to analysis of any samples.
- Method blank analysis daily or at a frequency of one per 20 samples analyzed, whichever is greater.
- Daily analysis of EPA or NBS reference standards to assess the accuracy of calibration at the mid-range of the calibration curve.
- Analysis of matrix spike recoveries at approximately 10% frequency on each matrix to assess accuracy and identify possible matrix interferences.
- Analysis of laboratory duplicates on an approximate 10% frequency to assess the precision of the analysis.

EQUIPMENT CALIBRATION AND MAINTENANCE

All instruments and equipment used during this project were operated, calibrated, and maintained according to the manufacturers' guidelines and recommendations. Operation, calibration, and maintenance were performed by personnel who have been properly trained in these procedures. In addition, field instruments were checked periodically in the field using the above standards to verify meter calibrations. All calibration and field measurements were recorded in respective instrument log books and charted on respective control charts contained in each instrument log book.

Field screening instruments used were appropriate for detection of VOCs and SVOCs. Instruments were calibrated and maintained according to manufacturers' instructions.

	N	0755-003	(-6) D	ATE: 5	17/99	WELL NO.	GP-1	
SECO	OR PN:O	Form (Tolombia	Marin	TEM	PERATURE:	60 of	or °C
FACI	LITT NAME	r 1-Vavr	1~	MEAT	HER: (2(00),		
FIEL	FIELD PERSONNEL: _ V. Warre WEATHER: Cloudy							
	MEASUREM					(5.05_FT.	os (M
A. Static Water Level (SWL) below top of cashig/plezometer.						8		
B. Thickness of Free Product, if present: InchesC. Total Depth of well (TD) from top of casing/piezometer:					2.06 FT.	or IN.		
						7,0\FT.	or IN.	
E. U	lseful approxin	nate Purge Volu	mes (PV) per	foot of water	r column for o	common casing	g sizes:	
2	diameter =	3 Well Vols 0.5 gals/ft		Ift X feet	of water		PV (ga	
4	diameter =	2.0 gals/ft	3.25 gals.		of water		PV (ga PV (ga	
6	diameter =	4.4 gals/ft	7.35 gals.	/it X leet X F&1	of water			
PUR	GING METHOD	0.07 gal / D:	ristalti-	pu	DU	RATION:	8 min	
OBSERVATI		ε		ŗ				
-	Time	Turbidity	Color	Sheen	pH	Temp.	Conduct:	SWL
1st Volume	3:08	100,9	brow	Nov	6.7	. 11.4	188.3	
∠nd Volume		11) (EA	6.8	12.2	114.3	
rd Volume		Clew	Clea	Nort	6.7	12.4	112.2	
4th Volume			n —	τ λ	6.7	12.5	110,2	
ddl. Volun		u			67	12.5	110.6	
		OF WATER PUR	IGED FROM W	/ELL:).60		
PUS	GE WATER S	TORED/DISPOS	ED OF WHERE	E/HOW:	57	sile drum		
	VIPLES COLLEC							
	00				ber of Contai		Preserv	rative
	nple Number(s	3.					14 C C	
99	0507-691			1-11-	me was		1466	
				-				
co	MMENTS:		*			-		
Cas	Casing Capacities: 2-inch hole0.16 gal/lin ft. 4-inch hole0.65 gal/lin ft. Recharge Calculation at Time of Sample Collection Total Depth of Well:						ollection:	
6.5	6.5-inch hole1.70 gal/lin ft. Original Water Column: x 0.50 =							
	8-inch hole2.60 gal/lin ft. Collect sample when Depth to Water mediatros Less than or equal to:							

SECOR PN: 00755-003-01 DATE: 5/7/69 WELL NO. 6P-7
FACILITY NAME: Former Colombia Marine TEMPERATURE: 60 °F or °C
FACILITY NAME: FOR COISE OF THE
FIELD PERSONNEL: Y. WAY MW WEATHER: (\widehitsty y)
FIELD MEASUREMENTS:
A. Static Water Level (SWL) below top of casing/piezometer: B. Thickness of Free Product, if present: Inches C. Total Depth of well (TD) from top of casing/piezometer: 17.04 FT. or IN.
D. Height of Water Column in casing (n = 10 - 5WL):
E. Useful approximate Purge Volumes (PV) per foot of water column for common casing sizes: 3 Well Vols. 5 Well Vols. 2" diameter = 0.5 gals/ft 0.82 gals/ft X feet of water = PV (gallons) 4" diameter = 2.0 gals/ft 3.25 gals/ft X feet of water = PV (gallons) 6" diameter = 4.4 gals/ft 7.35 gals/ft X feet of water = PV (gallons) 74" DIA = 0.07 qal / 6! X feet of water = DURATION: 8 min
DBSERVATIONS:
Time Turbidity Color Sheen pH Temp. Conduct: SWL
1st Volume: 1258 Slight 600 yes 6.1 12.7 251.4
and Volume: 1011 Claw Claw 400 6.1 17.9 258.9
d Volume: 104 11 11 11 6.1 17.9 249.6
4th Volume: 166 11 11 6.1 12.8 259.3
ddl. Volumes:
TOTAL VOLUME OF WATER PURGED FROM WELL: 6,50 gallons PURGE WATER STORED/DISPOSED OF WHERE/HOW: 000 Site of the control of the
SAMPLES COLLECTED: Depth to Water at time of sample collection:
Sample Number(s) Time Size/Number of Container(s) Preservative
990507-6P2 1:10 2-40 ML VOM HILL
COMMENTS:
Recharge Calculation at Time of Sample Collection
Casing Capacities: 2-inch hole0.16 gal/lin ft. 4-inch hole0.65 gal/lin ft. 6.5-inch hole1.70 gal/lin ft. 8-inch hole2.60 gal/lin ft. 10-inch hole4.10 gal/lin ft. Collect sample when Depth to Water measures Less than or equal to:

SECOR PN: 00255-003 -0	1 DATE: 5/7/99 V	VELL NO. GP-3
EACHITY NAME: Kover Colo	Loic Marine TEMPER	ATURE: 60 °F or °C
FIELD PERSONNEL: K. Warn	WEATHER: C	(0~ g)
FIELD MEASUREMENTS:		
A. Static Water Level (SWL) below topB. Thickness of Free Product, if presentC. Total Depth of well (TD) from top of	: Inches	16.90 FT. or IN.
D. Height of Water Column in casing (h	= TD - SWL):	(,0) FT. or IN.
2" diameter = 0.5 gals/ft 0.	Well Vols. 82 gals/ft	= PV (gallons) = PV (gallons) = PV (gallons)
OBSERVATIONS:		emp. <u>Conduct: SWL</u>
Time Turbidity Color	<u> </u>	701.1
1st Volume: 1236 turbid Gury		12.8 215.7
2nd Volume: 1242 Clew Cler	y y - -	
d Volume: 119 Clev 11	- \(\) \(\) \(12.9 217.6
4th Volume: 1246 Clev 11	<u> 165</u> 6.2	711.0
ddl. Volumes:		
TOTAL VOLUME OF WATER PURGED IN PURGE WATER STORED/DISPOSED OF		o gallons
SAMPLES COLLECTED: Depth to Wa	ater at time of sample collection:	
Sample Number(s) Time	Size/Number of Container	
996507-68-3 1248	2 40 MC VOA	HCV HCV
COMMENTS:		
Casing Capacities: 2-inch hole0.16 gal/lin ft. 4-inch hole0.65 gal/lin ft. 6.5-inch hole1.70 gal/lin ft.	Total C	Depth of Well: X 0.80 =()
8-inch hole2.60 gal/lin ft. 10-inch hole4.10 gal/lin ft.	Collect sample when Debth to water	er measures or equal to:

SECOR PN: 00255-003-01 DATE: 5/7/99 WELL NO. 68-4						
FACILITY NAME: Kure Colochic Marine TEMPERATURE: 60 °F or °C						
FIELD PERSONNEL: K. Warm WEATHER: WEATHER:						
FIELD MEASUREMENTS:						
A Static Water Level (SWL) below top of casing/piezometer:						
B. Thickness of Free Product, if present: Inches C. Total Depth of well (TD) from top of casing/piezometer: Inches						
D. Height of Water Column in casing (h = TD - SWL):						
E. Useful approximate Purge Volumes (PV) per foot of water column for common casing sizes:						
3 Well Vols. 5 Well Vols. 9 V (gallons) 1						
OBSERVATIONS:						
Time Turbidity Color Sheen pH Temp. Conduct: SWL						
1st Volume: 1220 forbid boom 405 6.6 1168 53.2						
2nd Volume: 1222 11 11 6.6 12.0 55.7						
d Volume: 1224 Flutoid 11 6.5 16.1						
4th Volume: 1226 Clear Over 11 6.5 12.1 66.3						
TOTAL VOLUME OF WATER PURGED FROM WELL: 0.50 gallow)						
PURGE WATER STORED/DISPOSED OF WHERE/HOW:						
SAMPLES COLLECTED: Depth to Water at time of sample collection:						
Sample Number(s) Time Size/Number of Container(s) Preservative						
990507-684 1230 2-40 mL VOAS HCC						
COMMENTS:						
Casing Capacities: Recharge Calculation at Time of Sample Collection:						
2-inch hole0.16 gal/lin ft. 4-inch hole0.65 gal/lin ft. 6.5-inch hole1.70 gal/lin ft. 8-inch hole2.60 gal/lin ft. 10-inch hole2.60 gal/lin ft. Collect sample when Depth to Water measures Less than or equal to:						

			- 5/1/6	6 WELL NO	6P-5		
	SECOR PN: 00255	003-01 D	ATE:	WELL NO.	(.0 05 00		
	FACILITY NAME:	Corner (o) De la	Marine	TEMPERATURE	1 01 0		
	FIELD PERSONNEL:	K. Warne	WEATHER:	Cloudy			
	FIELD MEASUREMENTS	<u>S:</u>			. 51		
9 €0	A Static Water Level (SWL) below top of casing/piezometer:						
	B. Thickness of Free Product, if present: Inches C. Total Depth of well (TD) from top of casing/piezometer:				16.81 FT. or IN.		
		-	9,95 FT. or IN.				
	D. Height of Water Column in casing (h = TD - SWL): E. Useful approximate Purge Volumes (PV) per foot of water column for common casing sizes:						
		3 Well Vols. 5 Well Vo	ols.	estar . =	PV (gallons)		
	4" diameter =	2.0 gals/ft 3.25 gals	Ift X feet of w	rater =	PV (gallons) PV (gallons)		
		1 1 1-164 7 25 02 5	Iff X teet of W	rater =			
	PURGING METHOD:	0.07 gal /ft Devistation	pup	DURATION:	6 min		
OBSER	VATIONS:	#:					
	· Time_ <u>Tur</u>	bidity Color	Sheen	pH Temp.	Conduct: SWL		
1et Vol	ume: 1122 tu	rbio bran	yes 6	12.5	121.4		
		LHy brown	<u> 107 6.</u>	12.6	153,9		
		11 (1		.1 12.6	169.8		
	lume: 126	len den		.1 124	169.7		
4th Vo	lume: 128 C				,		
. lbt	/olumes:			6,70 gallo			
	TOTAL VOLUME OF V	VATER PURGED FROM V ED/DISPOSED OF WHER	VELL: E/HOW:	On sile porch			
		THE SHE ST MANAGE AS TO SUPPLIES		lection:			
	SAMPLES COLLECTED		Size/Number o		Preservative		
	Sample Number(s)	Time			11cc-		
	990507-685	1:36	2 - 40 mc	A-b-	MCC		
	COMMENTS:	#					
	COMMICIVIO.						
			Rachar	ge Calculation at Tim	e of Sample Collection:		
	Casing Capacities: 2-inch hole0.16 gal/	T +- (Death of)	of Wall:				
	4-inch hole0.65 gal/lin ft. Original Water Column: x 0.80 =(
	8-inch hole2.60 gal/	llin ft. Collec	t sample when De	epth to Water measur Less than or equal	Co		
	10-inch hole4.10 gal	i/iii it.					

DATE 5/166 WELL NO. GP-6	
SECOR PN: 00255-003-01 DATE: 5/199 WELL NO. 6P-6 FACILITY NAME: Form Columbia Marine TEMPERATURE: 60 °F or °C	
FACILITY NAME: Form Colombia Marine TEMPERATURE: _ FORCE	
FIELD PERSONNEL: K. WAVVV WEATHER: Clowdy	
FIELD MEASUREMENTS:	
A. Static Water Level (SWL) below top of casing/piezometer:	
B. Thickness of Free Product, if present: Inches C. Total Depth of well (TD) from top of casing/piezometer: 13.40 FT. or IN.	
D. Height of Water Column in casing (h = TD - SWL):	
E. Useful approximate Purge Volumes (PV) per foot of water column for common casing sizes: 3 Well Vols. 5 Well Vols.	
O.S. L.W. O.S. coloff: Y feet of water = PV (gallons)	
2" diameter = 0.5 gals/ft 0.62 gals/ft X feet of water = PV (gallons) 4" diameter = 2.0 gals/ft 3.25 gals/ft X feet of water = PV (gallons)	
6" diameter = 4.4 gais/11 7.55 gais/11 1/ 1665 of 1820 = 0.32 PV (qlns)	
4" diameter = 2.0 gals/ft 3.25 gals/ft X feet of water _ = PV (gallons) 6" diameter = 4.4 gals/ft 7.35 gals/ft X feet of water _ = PV (gallons) $3/4$ " DIA = 0.07 91 / Ft X FEET OF 1120 DURATION: _ 3 min	
OBSERVATIONS:	
Time Turbidity Color Sheen pH Temp. Conduct: SWL	purped
1st Volume: 1:52 tubid brown nove 6.1 14.1 543. dy	. 1
2nd Volume: 1:55 11 11 6.0 14.4 512	
d Volume:	
4th Volume:	
ddl. Volumes:	
TOTAL VOLUME OF WATER PURGED FROM WELL: PURGE WATER STORED/DISPOSED OF WHERE/HOW: ON GITE OFFICE OF THE PURGE OF THE PU	
A Continue D	
Sample Number(s) Time Size Number of Software	
990507-616 1158 7-40 MC VONS MCC	4 33
1- lita Alba No	Ė
COMMENTS:	_
	=
Casing Capacities: Recharge Calculation at Time of Sample Collection	<u>:</u>
2-inch hole0.16 gal/lin ft.	_
4-inch hole0.65 gal/lin ft. Original Water Column: x 0.80 =(-
8-inch hole2.60 gal/lin ft. Collect sample when Depth to Water measures Less than or equal to:	<u> </u>
Less than or equal to.	25

SECOR GROUNDWATER SAMPLING FIELD DATA SHEET

12 202 - 01 DATE: 5/7/69 WELL NO.	GP-7
SECOR PN: 00 255 -002 -01 DATE: 5/7/69 WELL NO.	(O °F or °C
FACILITY NAME: Colonica Prince Temperature.	
FACILITY NAME: Columbia Marine TEMPERATURE: FIELD PERSONNEL: F. WAYN WEATHER: Cloudy	
FIELD MEASUREMENTS:	0,50 FT. or IN.
A. Static Water Level (SWL) below top of casing/piezometer:	0817 Big
C. Total Depth of well (TD) from top of casing/piezometer:	2.95 FT. or IN.
D. Height of Water Column in casing (h = 1D - SWL):	,95 FT. or IN.
E. Useful approximate Purge Volumes (PV) per foot of water column for common casing Well Vols. 5 Well Vols.	ng sizes:
2" diameter = 0.5 gals/ft 0.82 gals/ft X feet of water =	PV (gallons) PV (gallons)
4" diameter = 2.0 gals/ft 3.25 gals/ft X feet of water =	PV (gallons)
of diameter - 4.7 galant	2 Min
PURGING METHOD: Devisible purp DURATION:	7 77112
DBSERVATIONS:	CVAII
Time Turbidity Color Sheen pH Temp.	Conduct: SWL
ist Volume: 1155 torbody Brown yes 6.3 13.2	323.5
2nd Volume: 1157 Clear Clar Nes 611. 13.2	319.1
3rd Volume: 1200 Clar (hr /c) 6.1 13.3	<u>323, 4</u>
1th Volume: 12.62 11 11 11 6-1 13.3	322.9
Addl. Volumes:	
PURGE WATER STORED/DISPOSED OF WHERE/HOW: ON SILE DV UN	
SAMPLES COLLECTED: Depth to Water at time of sample collection:	
Size/Number of Container(S)	Preservative
Dampio Humberter	14cc
990507-687 1265 2-40mc VONT 1-1.16m AMber	KLL
COMMENTS:	¥.
•	
Casing Capacities: Recharge Calculation at Tim	e of Sample Collection:
2-inch hole0.16 gal/lin ft.	Vell:
6.5-inch hole1.70 gal/lin ft. Original Water Column: X 0.00	= <u></u>
8-inch hole2.60 gal/lin ft. Collect sample when Depth to Water measure to the content of	<u>.o</u> :

S.E.C.O.R GROUNDWATER SAMPLING FIELD DATA SHEET

		ant m	2 61	DATE: 5	1-7-59	WELL NO.	GP-8	
SECO	R PN:OC	-	3-01	Marcin	e TEN	MPERATURE: _	60 .	F or °C
FACIL	ITY NAME: _	corner	(8/0m/p	16 Maria	1 [WIFERA TORES _		
FIELD	PERSONNEL:	: K. W)avnu	WE	ATHER:	Cloudy		
	MEASUREM				***		7.71_FT	or IN.
A. S	tatic Water Le	vel (SWL)	below top of c	asing/piezome: Inc	ter: nes		3.5 FT	
B. To	otal Depth of	well (TD) for	om top of cas	ing/piezomete	េះ	-		
	eight of Wate				.1 18		5,79FI	ī. or IN.
E. U	seful approxin	nate Purge 3 Well	Vols. 5 We	ell vois.		common casin	PV ((gallons)
	diameter =			nale/ft X 1	eet of water eet of water	=	PV ((gallons)
	diameter =			1 11. 1/ 1	ב ב ב ב ב ב ב ב ב	GITTE GITTE	PV ((ganons)
3/4	" DIA =	0.07	941 /Ft	K 1	FEET OF 420	uration:	6 min	C -(,)
PURC	GING METHO):/)	evistalti	c. pury)	υ	ORATION		
OBSERVATION			80				Conduct:	
	Time	Turbidity	Color	Sheen	<u>Hq</u>	Temp.		
1 _{St} Volume:	2:28	bidrut	prom	None	6.4	15.8	205,5	
∠nd Volume		Clew	Clè	how	6.3	12.6	197.2	
d Volume:		Clew	· //	no-C	6.2	12,7	194.9	
4th Volume					6.2	12,7	192.9	
ddl. Volun	nes:		·					
TOT PUF	AL VOLUME	OF WATER	PURGED FROSED OF W	om Well: /Here/How: _	onsit	a Drum		
	MPLES COLLE			r at time of sa	mple collection	:		-
San	nple Number(s	;) T	ime		lumber of Cont			ervative
	0507-GP8		240	2-	Jome Vo	<u>ns</u> -	HUL	
				1-	liter Aub	√		
CO	MMENTS:		(0)					
_	ine Conneitions				Recharge Cal	culation at Tim	ne of Sample	Collection
2-in	ing Capacities: ach hole0.1						Mall:	
	ich hole0.6		O	riginal Water C	Column:	otal Depth of V	1 = <u></u> [
	ach hole2.6		C	Collect sample		Water measur than or equal		
	inch hole 4				ress	thun o. ogour		

SECOR GROUNDWATER SAMPLING FIELD DATA SHEET

	this	WELLNO	GP-9
SECOR PN: 00255-003-0	DATE: 3/1/41	WELE NO	/2
FACILITY NAME: Former Colon	by Marine	TEMPERATURE:	10 For C
FIELD PERSONNEL: K. WAVE	WEATHER:	Raining	
FIELD MEASUREMENTS:		ş	3.66 FT. or IN.
A. Static Water Level (SWL) below top	of casing/piezometer:	*	
B. Thickness of Free Product, if preserC. Total Depth of well (TD) from top of	f casing/piezometer:	13	,15 FT. or IN.
D. Height of Water Column in casing (h = TD - SWL):		.05 FT. or IN.
E. Useful approximate Purge Volumes	(PV) per foot of water column	for common casing	ı sizes:
3 Well Vols.	<u>5 Well Vols.</u> 0.82 gals/ft X feet of wate	er <u> </u>	PV (gallons)
4" diameter = 2.0 gals/ft	3.25 gals/ft X feet of water	=	PV (gallons) PV (gallons)
6" diameter = 4.4 gals/ft 34" DIA = 0.07 941 / Ff		0 = -	136 PV (9/ns)
PURGING METHOD: Devista	Iti- purp	_ DURATION:	/ MIC
OBSERVATIONS:			
Time Turbidity Col	or Sheen pH	Temp.	Conduct: SWL
1st Volume: 247 tub. 8	on non 6.7	12.0	2056
and Volume: 250 Single 11	n 6.5	12.3	188.0
	una 6.5	12.3	188.3
	1 11 6.5	12-3	187.6
dl. Volumes:			
TOTAL VOLUME OF WATER PURGED	FROM WELL:	il gallous	
PURGE WATER STORED/DISPOSED ()F WHERE/HOW:OM_	5/100	
SAMPLES COLLECTED: Depth to V	Vater at time of sample collec	tion:	
Sample Number(s) Time	Size/Number of C	Container(s)	Preservative
990507-689 255	2- 40 mc Vol	<u> </u>	19CC
	1- liter But		Mes
COMMENTS:		×	
<u> </u>			
Cooling Co-relations	Recharge	Calculation at Time	of Sample Collection:
Casing Capacities: 2-inch hole0.16 gal/lin ft.		- 10 th of 101	oll:
4-inch hole0.65 gal/lin ft. 6.5-inch hole1.70 gal/lin ft.	Original Water Column:	x 0.80	=1
8-inch hole2.60 gal/lin ft.	Collect sample when Debu	I fo Marcor misses and	s :
10-inch hole4.10 gal/lin ft.	<u>-</u>		

APPENDIX B BORING LOGS

Additional Subsurface Investigation Report Former Columbia Marine Lines Facility 6305 Lower River Road SECOR PN: F0319-001-01 July 9, 1999



International Incorporated JOB # **F0319-001-01** BORING/WELL GP-1 FACILITY FORMER COLUMBIA MARINE LINES FACILITY LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION 23.05 CASING TOP ELEVATION_ FINISH <u>10:30 am</u> START 10 am MONITORING DEVICE MODEL 580B OVM LOGGED BY DEC SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.76" I.D. Below feet Classification Well Construction Depth feet Soil Below PENETRATION feel PID Reading Depth B Surface, RESULTS Unified Schematic Lithologic Description Depth B. Surface, Sheen Sample BLOWS 6"/6"/6" 5 Asphalt surface NS 3.9 Brown SAND (SP). Sand is medium grained, ∇ well sorted, very loose, dry, no odor. SP 5 0 NS 5 ML 10 Dark grey SILT (ML). Silt contains a few micas, dense, moist, no odor. 0 NS Boring terminated at 12' feet bgs Groundwater encountered at approximately 3.5 feet during drilling. 15 - 15 20 20 25 25 10/20 Groundwater Level at Time of Drilling Field Screen/Lithologic Description Sample Concrete ∇ Gradational Contact Colorado Silica Sand Casing V Static Groundwater Level 3/4" PVC Screen Preserved Sample Contact Located Sheen Detected SD Casing (0.010 slots) No Recovery NS No Sheen Detected **Approximately** Sample Submitted for Laboratory NT Not Tested End Cap

Contact

DWG: F319011L

(2.5Y 4/2) Munsell (1990) Soil Color Charts

Analysis

End Cap

DWG: F319011L



International Incorporated BORING/WELL GP-2 F0319-001-01 FACILITY FORMER COLUMBIA MARINE LINES FACILITY JOB # LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION 28.74 CASING TOP ELEVATION_ FINISH <u>11:45 am</u> START 11:20 am MONITORING DEVICE MODEL 580B OVM LOGGED BY DEC SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.76" I.D. Below Classification Soil Well Construction PENETRATION #5 #5 #5 #5 #5 feel Depth Be Surface, Schematic Lithologic Description Unified Depth Be Surface, **BLOWS** 6"/6"/6" 5 Vegetative cover (moss) 0 0 Brown SAND (SP). Sand is fine to medium 0 NS grained, well sorted, very loose, dry, no odor. 5 5 SP Sand is fine grained, Grey silty SAND (SM). damp, product odor. 35.2 SD Δ 10 10 105.8 SD (Same) 15 Grey sandy SILT (ML). Firm, wet, no odor. 50 SD Boring terminated at 16' feet bgs Groundwater encountered at approximately 9.5 feet during drilling. 20 20 25 25 3/4" PVC 10/20 Colorado Blank Groundwater Level at Time of Drilling Field Screen/Lithologic
Description Sample Concrete Gradational Contact ∇ Casing 1 Static Groundwater Level 3/4" PVC Screen Preserved Sample Contact Located Sheen Detected SD Casing (0.010 slots) No Recovery No Sheen Detected Approximately NS Sample Submitted for Laboratory Analysis Not Tested

NT

(2.5Y 4/2) Munsell (1990) Soil Color Charts

Contact

End Cap

DWG: F319011L



Sample Submitted for Laboratory

Analysis

NT

Not Tested

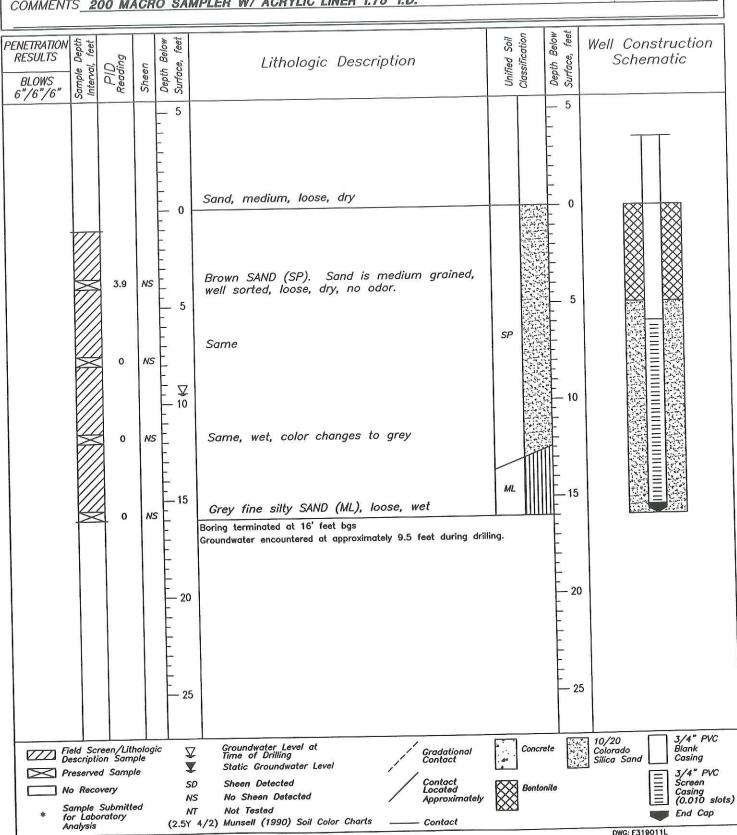
(2.5Y 4/2) Munsell (1990) Soil Color Charts

Contact

PAGE 1 OF 1 International Incorporated JOB # **F0319-001-01** BORING/WELL GP-3 FACILITY FORMER COLUMBIA MARINE LINES FACILITY LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION CASING TOP ELEVATION_ FINISH <u>12:35 pm</u> START 11:50 am MONITORING DEVICE MODEL 580B OVM LOGGED BY DEC SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.75" I.D. Below feet Classification Well Construction PENETRATION Below Soil RESULTS Surface, PID Reading Schematic Lithologic Description Depth B. Surface, Depth Sheen BLOWS 6"/6"/6" 5 Vegetative cover (moss) Brown SAND (SP). Sand is fine to medium 0 NS grained. Some organic matter present. 5 5 Loose, damp. SP Same, color change to grey, odor 200 SD ∇ 10 10 Same, wet 137.1 SD ML 15 - 15 Grey Sandy SILT (ML). Firm, wet 11.7 NS Boring terminated at 16' feet bgs Groundwater encountered at approximately 9.5 feet during drilling. 20 20 25 25 3/4" PVC Blank 10/20 Field Screen/Lithologic Description Sample Groundwater Level at Time of Drilling ∇ Gradational Contact Colorado Silica Sand Casing T Static Groundwater Level 3/4" PVC Screen Preserved Sample Contact Located SD Sheen Detected No Recovery Casing (0.010 slots) NS No Sheen Detected **Approximately**



FACILITY FORMER COLUMBIA MARINE LINES FACILITY JOB # F0319-001-01 BORING/WELL GP-4
LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON
START 13:05 pm FINISH 13:35 pm CASING TOP ELEVATION 30.75
LOGGED BY DEC MONITORING DEVICE MODEL 580B OVM
SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG
COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.75° I.D.





PAGE 1 OF 1 International Incorporated JOB # **F0319-001-01** BORING/WELL GP-5 FACILITY FORMER COLUMBIA MARINE LINES FACILITY LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION _ CASING TOP ELEVATION_ FINISH <u>14:35 pm</u> START <u>14:03 pm</u> MONITORING DEVICE MODEL 580B OVM LOGGED BY DEC SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.75" I.D. Below PENETRATION to the period of t Classification Well Construction Below Soil Depth Br Surface, PID Reading Schematic Lithologic Description Unified Depth B. Surface, Sheen Sample l Interval, BLOWS 6"/6"/6" 5 5 Sand, grey, medium, loose, dry 0 0 Brown SAND (SP). Sand is medium grained, 0 NS well sorted, loose damp. 5 5 ∇ SP Brown silty SAND (SP). Sand is fine grained, loose, wet. 0 NS 10 10 Same 0 NS Grey/brown sandy SILT (ML). Sand is fine ML grained, mottled, firm. Some reddish brown - 15 appears as rust. 0 NS Boring terminated at 16' feet bgs Groundwater encountered at approximately 6 feet during drilling. 20 20 25 25 3/4" PVC 10/20 Field Screen/Lithologic Description Sample Groundwater Level at Time of Drilling Concrete Blank Gradational Contact Colorado Silica Sand ∇ Static Groundwater Level ∇ 3/4" PVC Screen Preserved Sample Contact Located SD Sheen Detected No Recovery Casing (0.010 slots) No Sheen Detected NS **Approximately** Sample Submitted for Laboratory Analysis Not Tested NT End Cap

(2.5Y 4/2) Munsell (1990) Soil Color Charts

Contact

DWG: F319011L

End Cap

DWG: F319011L



Sample Submitted for Laboratory

Analysis

Not Tested

(2.5Y 4/2) Munsell (1990) Soil Color Charts

Contact

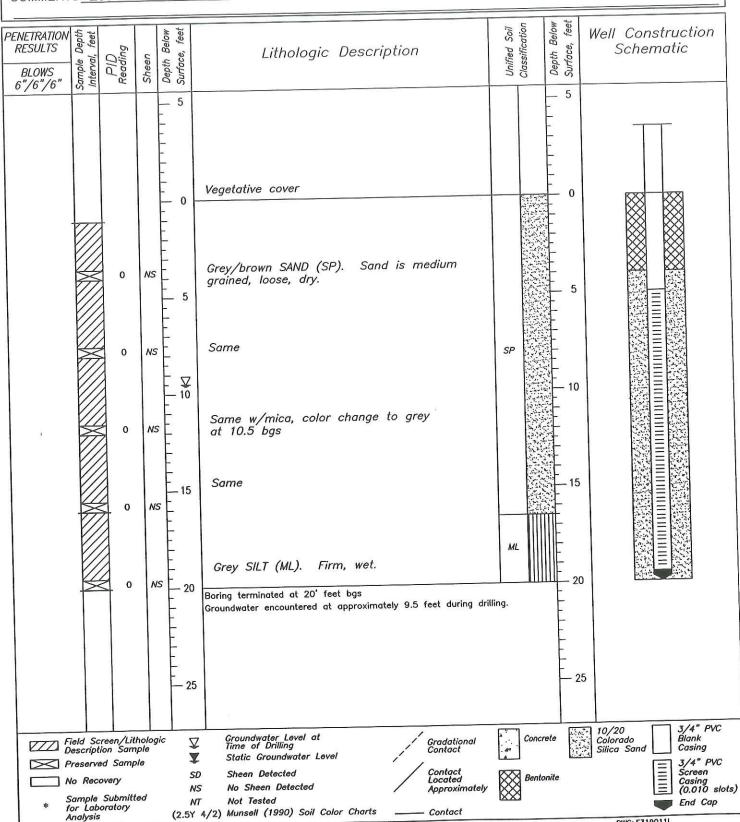
NT

International Incorporated JOB # **F0319-001-01** BORING/WELL GP-6 FACILITY FORMER COLUMBIA MARINE LINES FACILITY LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION 24.17 CASING TOP ELEVATION FINISH 15:03 pm START 14:42 pm MONITORING DEVICE MODEL 580B OVM SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG LOGGED BY DEC COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.75" I.D. Below Classification PENETRATION #2 Well Construction Below feet Surface, Schematic PID Reading Unified Lithologic Description Depth B. Surface, Depth Sheen Sample L Interval, BLOWS 6"/6"/6" 5 5 Gravel, SAND, dirt 0 0 Brown SAND (SP). Sand is fine to medium grained. Some organic matter. Loose, dry. SP NS 0 5 5 Color change to grey 0 NS ∇ 10 ML 10 Grey SILT (ML). Firm, wet. 0 NS Boring terminated at 12' feet bgs Groundwater encountered at approximately 9 feet during drilling. 15 15 20 20 - 25 - 25 3/4" PVC 10/20 Groundwater Level at Time of Drilling Field Screen/Lithologic Description Sample Concrete Blank Colorado Gradational Contact ∇ Casing Silica Sand \mathbf{Z} Static Groundwater Level 3/4" PVC Screen Preserved Sample Sheen Detected Contact Located SD Bentonite Casing (0.010 slots) No Recovery No Sheen Detected NS

DWG: F319011L



JOB # **F0319-001-01** BORING/WELL GP-7 FACILITY FORMER COLUMBIA MARINE LINES FACILITY LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION 24.17 CASING TOP ELEVATION_ FINISH 15:55 pm START 15:20 pm MONITORING DEVICE MODEL 580B OVM LOGGED BY DEC SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.75° I.D.





International Incorporated

FACILITY FORMER COLUMBIA MARINE LINES FACILITY JOB # F0319-001-01 BORING/WELL GP-8

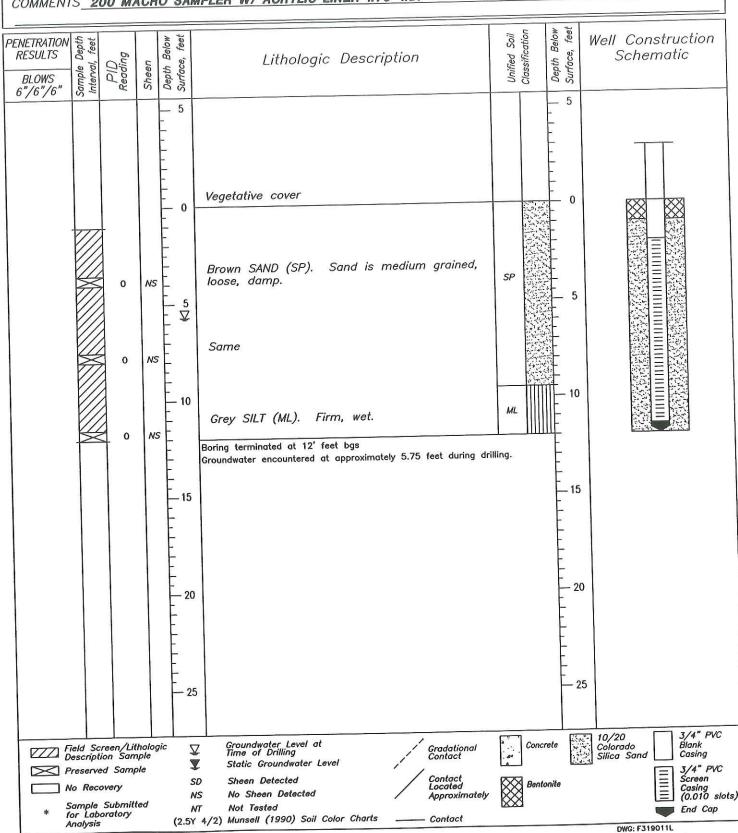
LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION 26.37

START 16:30 pm FINISH 17:09 pm CASING TOP ELEVATION 29.37

LOGGED BY DEC MONITORING DEVICE MODEL 580B OVM

SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG

COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.75° I.D.





Analysis

International Incorporated JOB # **F0319-001-01** BORING/WELL GP-9 FACILITY FORMER COLUMBIA MARINE LINES FACILITY LOCATION 6305 LOWER RIVER ROAD, VANCOUVER, WASHINGTON SURFACE ELEVATION 26.66 CASING TOP ELEVATION_ FINISH <u>17:45 pm</u> START 17:15 pm MONITORING DEVICE MODEL 580B OVM LOGGED BY DEC SUBCONTRACTOR AND EQUIPMENT CASCADE DRILLING INC. TRACK MOUNTED CME850 GEOPROBE RIG COMMENTS 200 MACRO SAMPLER W/ ACRYLIC LINER 1.75° I.D. Below Classification Depth feet Soil PENETRATION Well Construction Below P1D Reading RESULTS Surface, Schematic Unified Lithologic Description Surface, Depth Sheen Sample Interval, Depth BLOWS 6"/6"/6" 5 5 Vegetative cover 0 0 Brown SAND (SP). Sand is medium grained, SP loose, damp. 0 NS 5 5 V Same NS 0 10 10 Grey SILT (ML). Firm, wet. NS 0 Boring terminated at 12' feet bgs Groundwater encountered at approximately 5.75 feet during drilling. 15 - 15 20 20 25 25 3/4" PVC 10/20 Field Screen/Lithologic Description Sample Groundwater Level at Time of Drilling Concrete **Blank** ∇ Gradational Contact Colorado Casina Static Groundwater Level 1 Preserved Sample 3/4" PVC Screen Sheen Detected SD No Recovery Casing (0.010 slots) No Sheen Detected NS **Approximately** Sample Submitted for Laboratory NT Not Tested End Cap

Contact

DWG: F319011L

(2.5Y 4/2) Munsell (1990) Soil Color Charts

APPENDIX C LABORATORY ANALYSIS REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION

Additional Subsurface Investigation Report Former Columbia Marine Lines Facility 6305 Lower River Road SECOR PN: F0319-001-01

July 9, 1999



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 Bend
 20354 Empire Avenue, Suite E-9, Bend, OR 97708-1883 541.383.9310 fax 541.382.7588
 Portland

Secor P.O. Box 1508 Tualatin, OR 97062 Project: Former Columbia Marine

Project Number: F0319-001-01

Project Manager: Katy Westersund

Sampled: 5/7/99

Received: 5/10/99

Reported: 5/17/99 17:42

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
990507-GP1	P905177-01	Water	5/7/99
990507-GP2	P905177-02	Water	5/7/99
990507-GP3	P905177-03	Water	5/7/99
990507-GP4	P905177-04	Water	5/7/99
990507-GP5	P905177-05	Water	5/7/99
990507-GP6	P905177-06	Water	5/7/99
990507-GP7	P905177-07	Water	5/7/99
990507-GP8	P905177-08	Water	5/7/99
990507-GP9	P905177-09	Water	5/7/99

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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9405 SW Nimbus Avenue, Beaverton, OR 97008-7132 Portland

503.906.9200 fax 503.906.9210 20354 Empire Avenue, Suite E-9, Bend, OR 97708-1883 541.383.9310 fax 541.382.7588

Sampled: 5/7/99 Project: Former Columbia Marine Secor 5/10/99 Received: Project Number: F0319-001-01 P.O. Box 1508 5/17/99 17:42 Project Manager: Katy Westersund Reported: Tualatin, OR 97062

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting	189600 EN-4	5-24-476	120
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
990507-GP1			P9051'	77-01			Water	
Benzene	0590258	5/11/99	5/11/99	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.500	ND	ug/l	
Toluene	"	11	"		0.500	ND	"	
Ethylbenzene	(1)	n	u		0.500	ND	310	
Xylenes (total)		11	n.		1.00	ND	11	
Gasoline Range Hydrocarbons	/E **	H	10		80.0	ND	,11	
Surrogate: 4-BFB (PID)	"	"	- 11	50.0-150	00.0	77.7	%	
	"	<i>;</i>	"	50.0-150		77.3	"	
Surrogate: 4-BFB (FID)				30.0-130		77.5		
990507-GP2			P9051	77-02			Water	
Benzene	0590385	5/14/99	5/14/99		2.50	ND	ug/l	
Toluene					2.50	5.85	111	
Ethylbenzene	ñ	п	311		2.50	ND	.00	
Xylenes (total)	ñ	11	**		5.00	ND	.tr	
Gasoline Range Hydrocarbons	1100	11	**		400	2710	п	
Surrogate: 4-BFB (PID)	"	"	· n	50.0-150		92.0	%	
Surrogate: 4-BFB (FID)	"	n .	±11	50.0-150		107	"	
990507-GP3			P9051	<u>77-03</u>			Water	
Benzene	0590299	5/12/99	5/13/99		0.500	ND	ug/l	
Toluene	11.	u	.0		0.500	0.515	u	
Ethylbenzene	11	u	u		0.500	ND	110	
Xylenes (total)	11	ii .	u		1.00	ND	Ü.	
Gasoline Range Hydrocarbons	3113	ii .	II.		80.0	2780	II.	
Surrogate: 4-BFB (PID)	п	"	"	50.0-150		99.0	%	
Surrogate: 4-BFB (FID)	n	"	#	50.0-150		NR	"	I
				== 0.4			Water	
990507-GP4	V. and foresteen order at 1 Automotive	MANAGARIN MANAGAN	P9051	77-04	0.500	NID	Water	
Benzene	0590258	5/11/99	5/11/99		0.500	ND	ug/l "	
Toluene	п	10	ii)		0.500	ND		
Ethylbenzene		"	n		0.500	ND		
Xylenes (total)	1.11	0	Tr.		1.00	ND	"	
Gasoline Range Hydrocarbons	· u	ut.	U		80.0	ND		
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		87.3	%	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		85.7	"	
000505 CD5			D00#1	177.05			Water	
990507-GP5	0500050	5/11/00	-	<u>177-05</u>	0.500	NID	0	
Benzene	0590258	5/11/99	5/11/99		0.500	ND	ug/l "	
Toluene	11		2.I.T.		0.500	ND	50	

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*Refer to end of report for text of notes and definitions.



Spokane

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Secor P.O. Box 1508 Tualatin, OR 97062 Project: Former Columbia Marine

Sampled:

5/7/99

Project Number: F0319-001-01 Project Manager: Katy Westersund Received: 5/10/99 Reported:

5/17/99 17:42

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting	50402 5m377	±22 ±00	2205 WYO
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes'
990507-GP5 (continued)			P9051	77-05			Water	
Ethylbenzene	0590258	5/11/99	5/11/99	77 00	0.500	ND	ug/l	
Xylenes (total)	"	11	"		1.00	ND	"	
Gasoline Range Hydrocarbons	11	ű			80.0	ND	9107	
Surrogate: 4-BFB (PID)	n n	"	п	50.0-150	00.0	86.7	%	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		82.7	"	
Surrogaie: 4-BFB (FID)				30.0-130		02.7		
990507-GP6			P9051	<u>77-06</u>			Water	
Benzene	0590258	5/11/99	5/11/99		0.500	ND	ug/l	
Toluene	**	11			0.500	ND	ж	
Ethylbenzene	Ü	If .	n		0.500	ND	ii.	
Xylenes (total)	ũ		11		1.00	ND	31	
Gasoline Range Hydrocarbons	ä	11			80.0	ND	316	
Surrogate: 4-BFB (PID)	"	"	a	50.0-150	-	85.0	%	
Surrogate: 4-BFB (FID)	11	"	n	50.0-150		81.3	n n	
54.1084.0. 1 21 2 (1 1 2)								
990507-GP7			P9051	77-07			Water	
Benzene	0590258	5/11/99	5/11/99		0.500	ND	ug/l	
Toluene		•			0.500	ND	Ü	
Ethylbenzene	•	n	· ii		0.500	ND	**	
Xylenes (total)	n	n	ū		1.00	ND	ŭ	
Gasoline Range Hydrocarbons		11	ű.		80.0	ND	"	
Surrogate: 4-BFB (PID)	"	n n	"	50.0-150		80.7	%	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		88.7	"	
			700##	W# 00			Water	
990507-GP8	0.4000.40	E /1 1 (00	// ***********************************	77-08	0.500	ND	ug/l	
Benzene	0590258	5/11/99 "	5/11/99 "			ND	ug/i	
Toluene			11		0.500		10	
Ethylbenzene	"	TI .	II.		0.500	ND		
Xylenes (total)	n	ű			1.00	ND	311	
Gasoline Range Hydrocarbons					80.0	479		
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		88.3	%	
Surrogate: 4-BFB (FID)	ü	"	in.	50.0-150		108	"	
990507-GP9			P905	177-09			Water	
Benzene	0590258	5/11/99	5/11/99	Salaria de la companione de la companion	0.500	ND	ug/l	
	0390236	J/11/JJ	11		0.500	ND	"	
Toluene	ñ	n	10		0.500	ND	49	
Ethylbenzene	11	11	u.		1.00	ND	U	
Xylenes (total)					1.00	IND		

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*Refer to end of report for text of notes and definitions.

Lisa Domenighini, Project Manager

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Page 3 of 11



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Project: Former Columbia Marine Secor Project Number: F0319-001-01 P.O. Box 1508 Project Manager: Katy Westersund Tualatin, OR 97062

Sampled: 5/7/99 5/10/99 Received:

Reported: 5/17/99 17:42

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
990507-GP9 (continued)			P9051	77-09			Water	
Gasoline Range Hydrocarbons	0590258	5/11/99	5/11/99		80.0	ND	ug/l	
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		86.0	%	
Surrogate: 4-BFB (FID)	ï	"	"	50.0-150		87.7	7	



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P.O. Box 1508

Tualatin, OR 97062

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Bend 20354 Empire Avenue, Suite E-9, Bend, OR 97708-1883 541.383.9310 fax 541.382.7588

Sampled: 5/7/99 Project: Former Columbia Marine Received: 5/10/99

Reported: 5/17/99 17:42

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method North Creek Analytical - Portland

Project Number: F0319-001-01

Project Manager: Katy Westersund

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
, and an area of the second of			700024	77 01			Water	
990507-GP1	0500407	E /1 4 /00	P9051'	<u>//-U1</u>	0.250	0.335	mg/l	2
Diesel Range Organics	0590407	5/14/99	5/14/99		0.500	0.333 ND	mg/i	2
Heavy Oil Range Hydrocarbons	"		"	50.0-150	0.300	102	%	
Surrogate: 1-Chlorooctadecane	51.0			30.0-130		102	70	
990507-GP2			P9051	77-02			Water	
Diesel Range Organics	0590407	5/14/99	5/15/99		0.250	17.9	mg/l	2
Heavy Oil Range Hydrocarbons	10	91	ii		0.500	ND	" =	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		112	%	
990507-GP3			P9051	77-03			Water	
Diesel Range Organics	0590407	5/14/99	5/15/99		0.250	13.1	mg/l	2
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND		
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		120	%	
990507-GP4			P9051	<u>77-04</u>			Water	
Diesel Range Organics	0590407	5/14/99	5/15/99		0.250	0.486	mg/l	2
Heavy Oil Range Hydrocarbons	in .	"	#1		0.500	ND		
Surrogate: 1-Chlorooctadecane	<i>n</i> °	"	"	50.0-150		104	%	
990507-GP5			P9051	<u>77-05</u>			Water	
Diesel Range Organics	0590407	5/14/99	5/15/99		0.250	1.97	mg/l	2
Heavy Oil Range Hydrocarbons	ū	n .	11		0.500	ND	111	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150	a trial laboration in the second	111	%	
990507-GP6			P9051	77-06			Water	20
Diesel Range Organics	0590407	5/14/99	5/15/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"		.11		0.500	ND	Ü	
Surrogate: 1-Chlorooctadecane	"	n .	"	50.0-150		91.0	%	
990507-GP7			P9051	177-07			Water	
Diesel Range Organics	0590407	5/14/99	5/15/99		0.250	11.8	mg/l	2
Heavy Oil Range Hydrocarbons	11	"	11		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150	35 No. 45 45	70.5	%	38830 389
990507-GP8			P9051	177-08			Water	
Diesel Range Organics	0590407	5/14/99	5/15/99	177-00	0.250	15.2	mg/l	2
Heavy Oil Range Hydrocarbons	"	3/14/33 "	J/13/33		0.500	ND	"	1.000
Surrogate: 1-Chlorooctadecane	"		····	50.0-150	0.500	106	%	

North Creek Analytical - Portland

Lisa Domenighini, Project Manager

*Refer to end of report for text of notes and definitions.

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541.383.9310 fax 541.382.7588 Spokane

Portland

Project: Former Columbia Marine Sampled: 5/7/99

Project Number: F0319-001-01 Received: 5/10/99 P.O. Box 1508 Reported: 5/17/99 17:42 Project Manager: Katy Westersund Tualatin, OR 97062

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
990507-GP9			P9051	77-09			Water	
Diesel Range Organics	0590407	5/14/99	5/15/99		0.250	4.93	mg/l	2
Heavy Oil Range Hydrocarbons	.00	II	ü		0.500	ND	U	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		82.0	%	



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Spokane

Portland

503.924.3200 18X 503.324.3250 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132 503.906.9200 fax 503.906.9210 20354 Empire Avenue, Suite E-9, Bend, OR 97708-1883 541.383.9310 fax 541.382.7588

Sampled: 5/7/99 Project: Former Columbia Marine Secor Received: 5/10/99 Project Number: F0319-001-01 P.O. Box 1508 Reported: 5/17/99 17:42 Tualatin, OR 97062

Project Manager: Katy Westersund

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A/Quality Control North Creek Analytical - Portland

	Date	Spike	Sample	QC		Reporting Limit	Recov.	RPD	RPD
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	% Notes*
Timely to	,	XXXXXXXXXXXXX							
Batch: 0590258	Date Prepar	red: 5/11	/99		Extra	ction Method: EP	A 5030		
Blank	0590258-BI								
Benzene	5/11/99			ND	ug/l	0.500			
Toluene	ii)			ND		0.500			
Ethylbenzene	117			ND	10	0.500			
Xylenes (total)	(1 2			ND	11	1.00			
Gasoline Range Hydrocarbons	11			ND		80.0		10000	
Surrogate: 4-BFB (PID)	"	50.0		42.2	"	50.0-150	84.4		
Surrogate: 4-BFB (FID)	"	50.0		40.5	<i>"II</i>	50.0-150	81.0		
	0500350 B6	7.4							
LCS	0590258-BS			1230	/I	50.0-150	98.4		
Gasoline Range Hydrocarbons	5/11/99	1250	46	57.4	ug/l	50.0-150	115		
Surrogate: 4-BFB (FID)	4.77	50.0		37.4		30.0-130	113		
LCS	0590258-BS	<u>S2</u>							
Benzene	5/11/99	20.0		17.4	ug/l	67.0-130	87.0		
Toluene	u	20.0		17.8	u	75.0-126			
Ethylbenzene	n	20.0		17.9	Ü	76.0-124			
Xylenes (total)	n	60.0		54.1	ार	75.0-126			
Surrogate: 4-BFB (PID)	"	50.0		47.2	"	50.0-150	94.4		
<u>Duplicate</u>	0590258-D	TIP1	P905177-04						
Gasoline Range Hydrocarbons	5/11/99	<u> </u>	ND	ND	ug/l			50.0	
Surrogate: 4-BFB (FID)	"	30.0	- ND	24.6	"	50.0-150	82.0		
Barroguie. 7 DI D (1 12)									
Matrix Spike	0590258-M	<u>IS1</u>	P905177-01						
Benzene	5/11/99	20.0	ND	16.5	ug/l	67.0-130			
Toluene	"	20.0	ND	17.4	316	75.0-126			
Ethylbenzene		20.0	ND	16.8		76.0-124			
Xylenes (total)	11	60.0	ND	51.3		75.0-126			
Surrogate: 4-BFB (PID)	"	30.0		29.3	"	50.0-150	97.7		
Matrix Spike Dup	0590258-M	ISD1	P905177-01						
Benzene	5/11/99	20.0	ND	16.4	ug/l	67.0-130	82.0	13.0	0.608
Toluene	"	20.0	ND	16.4	"	75.0-126			5.92
Ethylbenzene	"	20.0	ND	16.5	4	76.0-124			1.80
	"	60.0	ND	50.2	и	75.0-120			2.13
Xylenes (total)	3.00		INIT 3	30.7		/ 1.1/-1/1) (7.7.7	13.0	4.10

North Creek Analytical - Portland

*Refer to end of report for text of notes and definitions.

Lisa Domenighini, Project Manager

North Creek Analytical, Inc. Environmental Laboratory Network

Page 7 of 11



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Sampled: 5/7/99 Project: Former Columbia Marine Secor 5/10/99 Project Number: F0319-001-01 Received: P.O. Box 1508 Reported: 5/17/99 17:42 Project Manager: Katy Westersund Tualatin, OR 97062

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A/Quality Control North Creek Analytical - Portland

	Date	Spike	Sample	QC		Reporting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
i many to		1700-17 VOLUME								
Batch: 0590299	Date Prepa		99		Extrac	tion Method: EPA	5030			
Blank	0590299-BI	<u>LK1</u>								
Benzene	5/13/99			ND	ug/l	0.500				
Toluene	W.			ND	**	0.500				
Ethylbenzene	II.			ND	Ü	0.500				
Xylenes (total)	111			ND	ü	1.00				
Gasoline Range Hydrocarbons	, u			ND	11	80.0				
Surrogate: 4-BFB (PID)	"	50.0		47.9	"	50.0-150	95.8			
Surrogate: 4-BFB (FID)	n	50.0		52.5	"	50.0-150	105			
LCS	0590299-B	<u>S1</u>								
Gasoline Range Hydrocarbons	5/13/99	1250		1220	ug/l	50.0-150	97.6			
Surrogate: 4-BFB (FID)	"	50.0	193	58.1	n	50.0-150	116			
LCS	0590299-B	<u>S2</u>								
Benzene	5/13/99	20.0		17.9	ug/l	67.0-130	89.5			
Toluene	ti .	20.0		18.2	310	75.0-126	91.0			
Ethylbenzene	11	20.0		18.4	H	76.0-124	92.0			
Xylenes (total)	H	60.0		54.8		75.0-126	91.3			
Surrogate: 4-BFB (PID)	п	50.0		44.8	"	50.0-150	89.6			
Batch: 0590385	Date Prepa	red: 5/14/	99		Extrac	ction Method: EPA	A 5030			
Blank	0590385-B	LK1								
Benzene	5/14/99			ND	ug/l	0.500				
Toluene	III.			ND	111	0.500				
Ethylbenzene	11			ND		0.500				
Xylenes (total)	11			ND	ü	1.00				
Gasoline Range Hydrocarbons				ND	0	80.0				
Surrogate: 4-BFB (PID)	"	50.0		46.2	"	50.0-150	92.4			
Surrogate: 4-BFB (FID)	"	50.0		44.8	"	50.0-150	89.6			
LCS	0590385-B	<u>8S1</u>								
Gasoline Range Hydrocarbons	5/14/99	1250		1420	ug/l	50.0-150	114			
Surrogate: 4-BFB (FID)	"	50.0		57.7	"	50.0-150	115			
LCS	0590385-E	<u>8S2</u>								
Benzene	5/14/99	20.0		19.4	ug/l	67.0-130	97.0			
Toluene	u.	20.0		19.5	n	75.0-126	97.5			
Ethylbenzene	n.	20.0		19.7	11	76.0-124	98.5			

North Creek Analytical - Portland

*Refer to end of report for text of notes and definitions.

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Secor

Project: Former Columbia Marine

Sampled: 5/7/99

P.O. Box 1508

Project Number: F0319-001-01

5/10/99 Received:

Tualatin, OR 97062

Project Manager: Katy Westersund

5/17/99 17:42 Reported:

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A/Quality Control North Creek Analytical - Portland

	Date	Spike	Sample	QC		Reporting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
LCS (continued)	0590385-B	<u>S2</u>								
Xylenes (total)	5/14/99	60.0		59.6	ug/l	75.0-126	99.3			
Surrogate: 4-BFB (PID)	"	50.0		51.0	"	50.0-150	102			



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425.420.9200 Tax 425.420.9210 East 11115 Montgomery, Suite B, Spokane, WA 99206-4776 509.924.9200 fax 509.924.9290 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132 503.906.9200 fax 503.906.9210 Spokane

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5/7/99 Sampled: Project: Former Columbia Marine Secor Received: 5/10/99 F0319-001-01

P.O. Box 1508 Project Number: Reported: 5/17/99 17:42 Project Manager: Katy Westersund Tualatin, OR 97062

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method/Quality Control North Creek Analytical - Portland

	Date	Spike	Sample	QC		Reporting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
harden and the second					VW1H-32 500					
Batch: 0590407	Date Prepa	red: 5/14/	99		Extrac	ction Method: TP	H-D Extr	<u>action</u>		
Blank	0590407-B	<u>LK1</u>								
Diesel Range Organics	5/14/99			ND	mg/l	0.250				
Heavy Oil Range Hydrocarbons				ND	11	0.500				
Surrogate: 1-Chlorooctadecane	"	0.100		0.108	"	50.0-150	108			
LCS	0590407-B	<u>S1</u>								
Diesel Range Organics	5/14/99	2.57		2.18	mg/l	50.0-150	84.8			
Heavy Oil Range Hydrocarbons	"	1.02		0.925	"	50.0-150	90.7			
Surrogate: 1-Chlorooctadecane	"	0.100		0.0980	"	50.0-150	98.0			
LCS Dup	0590407-B	SD1								
Diesel Range Organics	5/14/99	2.57		2.40	mg/l	50.0-150	93.4	50.0	9.65	
Heavy Oil Range Hydrocarbons	, m	1.02		1.03	11	50.0-150	101	50.0	10.7	
Surrogate: 1-Chlorooctadecane	"	0.100		0.107	"	50.0-150	107			



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Bend

Secor

Project: Former Columbia Marine

Sampled: 5/7/99

P.O. Box 1508

Project Number: F0319-001-01

Received: 5/10/99

Tualatin, OR 97062

Project Manager: Katy Westersund

Reported: 5/17/99 17:42

Notes and Definitions

#	Note
1	The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.
2	Detected hydrocarbons in the diesel range do not have a distinct diesel pattern and may be due to heavily weathered diesel.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical - Portland

Lisa Domenighini, Project Manager

North Creek Analytical, Inc. **Environmental Laboratory Network**





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FAX 420-9210 FAX 924-9290 FAX 906-9210

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(503) 906-9200

965177

Work Order

CHAIN OF CUSTODY REPORT

REPORT TO: SELGR	INVOICE TO:	TURNAROUND REQUEST in Business Days *
-7(ATTENTION:	Organic & Inorganic Analyses
·	ADDRESS:	10 7 5 4 3 2 1 Name
		Fuels & Hydrocarbon Analyses
	P.O. NUMBER: NCA QUOTE #:	Same Sankin
THAME Komer Colons	Sissippe Sis	_
8	Request:	OTHER Specify:
Z,	The state of the s	ound Regue
CLIENT SAMPLE		MATRLX # OF (W. S. A. O) CONTAINERS COMMENTS
DATE/LIME	>	rs and
, 990507 - 6P2 5/7/11:0	× ×	
, 990507 CP3 5/1/96/1248	×	m 3
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2071	\ \ \ \	2
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8001		3
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10.	DATE: 5/10/ac RECEIVED BY (Signature)	DATE: S-10-49
KELINQUISITED BI INFORMATION OF THE SECOND	TIME (235 PRINT NAME: MACH SI AND INV	FIRM: NGA TIME (2357
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REMARKS:		
		PAGE OF



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Secor P.O. Box 1508 Project: Crowley - Vancouver, WA

Sampled: 5/6/99

Project Number: 00255-003-01

Received: 5/7/99

Tualatin, OR 97062

Project Manager: Brian Pletcher

Reported: 5/28/99 16:19

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
GP1 @ 2.5-3.0	P905167-01	Soil	5/6/99
GP2 @ 3-4	P905167-04	Soil	5/6/99
GP2 @ 7-8	P905167-05	Soil	5/6/99
GP3 @ 3-4	P905167-08	Soil	5/6/99
GP3 @ 7-8	P905167-09	Soil	5/6/99
GP4 @ 7-8	P905167-13	Soil	5/6/99
GP5 @ 3-4	P905167-16	Soil	5/6/99
GP6 @ 7-8	P905167-21	Soil	5/6/99
GP7 @ 7-8	P905167-24	Soil	5/6/99
GP8 @ 3-4	P905167-28	Soil	5/6/99
GP9 @ 3-4	P905167-31	Soil	5/6/99

North Creek Analytical - Portland

Lisa Domenighini, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Sampled: 5/6/99 Project: Crowley - Vancouver, WA Secor 5/7/99 Project Number: 00255-003-01 Received: P.O. Box 1508 5/28/99 16:19 Reported: Project Manager: Brian Pletcher Tualatin, OR 97062

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting	9 <u>24</u> 0 PESS	***	37
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
CD1 @ 2 5 2 0			P90510	57 <u>-</u> 01			Soil	
GP1 @ 2.5-3.0	0590228	5/10/99	5/11/99	<u> </u>	0.0500	ND	mg/kg dry	
Benzene	0390228	3/10/99	J/11/99		0.0500	ND	11	
Toluene	11	,,	"		0.0500	ND	.00	
Ethylbenzene	11		11		0.0500	ND	н	
Xylenes (total)		11	11%		2.50	5.29	11.	
Gasoline Range Hydrocarbons		"	"	500 150	2.30	97.4	%	
Surrogate: a,a,a-TFT (FID)				50.0-150			70 !!	
Surrogate: a,a,a-TFT (PID)	"	"	"	50.0-150		71.9		
GP2 @ 3-4			P9051	67-04			Soil	
Benzene	0590228	5/10/99	5/11/99	<u> </u>	0.0500	ND	mg/kg dry	
	0390228	J/10/33	J/11///		0.0500	ND	"	
Toluene	311	**	17		0.0500	ND	· n	
Ethylbenzene	0 Hz	40	**		0.0500	ND	-m	
Xylenes (total)		11	116		2.50	ND		
Gasoline Range Hydrocarbons		"	"	50.0-150	2.50	99.3	%	
Surrogate: a,a,a-TFT (FID)	,,	n .	n n	50.0-150 50.0-150		73.4	"	
Surrogate: a,a,a-TFT (PID)		79 25 .	**	30.0-130		73.4		
GP2 @ 7-8			P9051	67-05			Soil	
Benzene	0590228	5/10/99	5/11/99		0.500	ND	mg/kg dry	
Toluene	11	n	Ü		0.500	ND	11	
Ethylbenzene	n:	11	"		0.500	ND	10	
Xylenes (total)	317	ा।	ü		0.500	ND	n	
Gasoline Range Hydrocarbons	н		u ·		25.0	584	11	
Surrogate: a,a,a-TFT (FID)			"	50.0-150		59.7	%	
Surrogate: a,a,a-TFT (PID)	"	"	"	50.0-150		74.5	"	
							(2) (2)	
GP3 @ 3-4			-	<u> 167-08</u>			<u>Soil</u>	
Benzene	0590228	5/10/99	5/13/99		0.0500	ND	mg/kg dry	
Toluene	an.	11			0.0500	ND	**	
Ethylbenzene	11	11	**		0.0500	ND	III	
Xylenes (total)	H	II.	107		0.0500	ND	n	
Gasoline Range Hydrocarbons	••				2.50	13.7	ii.	
Surrogate: a,a,a-TFT (FID)	"	"	"	50.0-150		67.9	%	
Surrogate: a,a,a-TFT (PID)	"	"	"	50.0-150		63.4	"	
							C.ii	
<u>GP4 @ 7-8</u>		1000 BW810		<u>167-13</u>	0.0500) IP	Soil	
Benzene	0590228	5/10/99	5/12/99		0.0500	ND	mg/kg dry	
Toluene	u .	EH4	.(1)		0.0500	ND	"	

North Creek Analytical - Portland

*Refer to end of report for text of notes and definitions.

Lisa Domenighini, Project Manager



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Project: Crowley - Vancouver, WA Sampled: 5/6/99 Secor 5/7/99 Received: Project Number: 00255-003-01 P.O. Box 1508 Reported: 5/28/99 16:19 Project Manager: Brian Pletcher Tualatin, OR 97062

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting	000- MATERI	2007. 220	
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
GP4 @ 7-8 (continued)			P90510	57-13			Soil	
Ethylbenzene	0590228	5/10/99	5/12/99	<u> </u>	0.0500	ND	mg/kg dry	
Xylenes (total)	"	"	"		0.0500	ND	"	
Gasoline Range Hydrocarbons	u.	11	11		2.50	ND	on .	
Surrogate: a,a,a-TFT (FID)	"	"	"	50.0-150		84.2	%	
Surrogate: a,a,a-TFT (PID)	<i>,</i> ,,	"	"	50.0-150		75.1	"	
Burrogute. 4,4,4-11 1 (112)								
GP5 @ 3-4			P9051	<u>67-16</u>			<u>Soil</u>	
Benzene	0590228	5/10/99	5/11/99		0.0500	ND	mg/kg dry	
Toluene	"	•	10		0.0500	ND	**	
Ethylbenzene	n	н	n		0.0500	ND	11	
Xylenes (total)	II.	•			0.0500	ND	II.	
Gasoline Range Hydrocarbons	m .	11	11		2.50	ND	(1)	
Surrogate: a,a,a-TFT (FID)	"	"	"	50.0-150		95.9	%	
Surrogate: a,a,a-TFT (PID)	8 <i>11</i>	"	n	50.0-150		71.0	"	
GP6 @ 7-8			P9051	<u>67-21</u>			Soil	
Benzene	0590228	5/10/99	5/11/99		0.0500	ND	mg/kg dry	
Toluene		"	ar		0.0500	ND	11	
Ethylbenzene	11	ņ	11		0.0500	ND	31	
Xylenes (total)	(11	ii.			0.0500	ND	tt.	
Gasoline Range Hydrocarbons	ü	"			2.50	ND	11	
Surrogate: a,a,a-TFT (FID)	"	"	· · ·	50.0-150		91.6	%	
Surrogate: a,a,a-TFT (PID)	"	n	"	50.0-150		68.4	ű.	
ODE OF 0			P0051	67-24			<u>Soil</u>	
GP7 @ 7-8 Benzene	0590228	5/10/99	5/11/99	107-24	0.0500	ND	mg/kg dry	
Toluene	0390228	J/10/99	"		0.0500	ND	"	
	ii .				0.0500	ND	11	
Ethylbenzene Values (tatal)	n	11	ii .		0.0500	ND	Ü	
Xylenes (total)	"	11	Ü		2.50	ND	HT.	
Gasoline Range Hydrocarbons		"	"	50.0-150	2.30	105	%	
Surrogate: a,a,a-TFT (FID)	"	"	,,	50.0-150		77.7	"	
Surrogate: a,a,a-TFT (PID)				30.0-130		27.2		
GP8 @ 3-4			P905	167-28			<u>Soil</u>	
Benzene	0590228	5/10/99	5/11/99		0.0500	ND	mg/kg dry	
Toluene	"	u	ii.		0.0500	ND	311	
Ethylbenzene	311	ű	11		0.0500	ND	891	
Xylenes (total)		Ü	u		0.0500	ND	11.	
Try tottos (total)								

North Creek Analytical - Portland

*Refer to end of report for text of notes and definitions.

Lisa Domenighini, Project Manager

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Page 3 of 22



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Project: Crowley - Vancouver, WA Sampled: 5/6/99 Secor Received: 5/7/99 P.O. Box 1508 Project Number: 00255-003-01

Reported: 5/28/99 16:19 Project Manager: Brian Pletcher Tualatin, OR 97062

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
GP8 @ 3-4 (continued)			P9051	67-28			Soil	
Gasoline Range Hydrocarbons	0590228	5/10/99	5/11/99		2.50	ND	mg/kg dry	
Surrogate: a,a,a-TFT (FID)	"	"	"	50.0-150		97.0	%	
Surrogate: a,a,a-TFT (PID)	"	"	u	50.0-150		73.4	11	
GP9 @ 3-4			P9051	<u>67-31</u>			Soil	
Benzene	0590228	5/10/99	5/11/99		0.0500	ND	mg/kg dry	
Toluene	H	316			0.0500	ND	II*	
Ethylbenzene	11	11	11		0.0500	ND	n	
Xylenes (total)	u	**	11		0.0500	ND	ir.	
Gasoline Range Hydrocarbons	ii.	n	ũ		2.50	ND	lt.	
Surrogate: a,a,a-TFT (FID)	"	"	"	50.0-150		105	%	
Surrogate: a,a,a-TFT (PID)	"	"	"	50.0-150		77.9	<i>n</i>	



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Sampled: 5/6/99 Secor Project: Crowley - Vancouver, WA Project Number: 00255-003-01 Received: 5/7/99 P.O. Box 1508

Reported: 5/28/99 16:19 Tualatin, OR 97062 Project Manager: Brian Pletcher

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
GP1 @ 2.5-3.0			P9051	<u>67-01</u>			Soil	
Diesel Range Organics	0590315	5/12/99	5/12/99		25.0	ND	mg/kg dry	
Heavy Oil Range Hydrocarbons	n	11	Ü		50.0	ND	U	
Surrogate: 1-Chlorooctadecane	"	n .	"	50.0-150		117	%	
GP2 @ 3-4			P9051	<u>67-04</u>			<u>Soil</u>	
Diesel Range Organics	0590315	5/12/99	5/13/99		25.0	104	mg/kg dry	
Heavy Oil Range Hydrocarbons	99	II	10		50.0	ND	11	
Surrogate: 1-Chlorooctadecane	u	"	"	50.0-150		109	%	
GP2 @ 7-8			P9051	67-05			Soil	
Diesel Range Organics	0590315	5/12/99	5/13/99		250	6700	mg/kg dry	1
Heavy Oil Range Hydrocarbons	91	U			500	ND	11	1
Surrogate: 1-Chlorooctadecane	"	H	"	50.0-150		55.0	%	7
GP3 @ 3-4			P9051	67-08			Soil	
Diesel Range Organics	0590315	5/12/99	5/13/99		1250	14000	mg/kg dry	1
Heavy Oil Range Hydrocarbons	0	11	11		2500	ND		1
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		NR	%	2
GP4 @ 7-8			P9051	67-13			Soil	
Diesel Range Organics	0590315	5/12/99	5/13/99	07 10	25.0	ND	mg/kg dry	
Heavy Oil Range Hydrocarbons	"	11	"		50.0	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		104	%	2000
GP5 @ 3-4			P9051	<u> 167-16</u>			Soil	
Diesel Range Organics	0590315	5/12/99	5/13/99	107-10	25.0	ND	mg/kg dry	
Heavy Oil Range Hydrocarbons	"	11	11		50.0	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150	0010	108	%	
GP6 @ 7-8			P0051	167-21			Soil	
Diesel Range Organics	0590315	5/12/99	5/13/99	107-21	25.0	ND	mg/kg dry	
Heavy Oil Range Hydrocarbons	0390313	3/12/99	3/13/77 "		50.0	ND	mg/kg dry	
Surrogate: 1-Chlorooctadecane			,,	50.0-150	50.0	111	%	
CD7 (-) 7 9			DOAE:	167-2 <u>4</u>			Soil	
<u>GP7 @ 7-8</u>	0590315	5/12/99	5/13/99	10/-44	25.0	ND	mg/kg dry	
Diesel Range Organics	0390313	3/12/99	3/13/99		50.0	ND	mg/kg dry	
Heavy Oil Range Hydrocarbons				50.0-150	30.0	99.1	%	
Surrogate: 1-Chlorooctadecane				30.0-130		77.1	70	

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*Refer to end of report for text of notes and definitions.

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Page 5 of 22



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Secor P.O. Box 1508 Tualatin, OR 97062

Crowley - Vancouver, WA Project:

Project Number: 00255-003-01

Project Manager: Brian Pletcher

Sampled: 5/6/99 Received: 5/7/99

Reported: 5/28/99 16:19

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method North Creek Analytical - Portland

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
							120	
GP8 @ 3-4			P9051	<u>67-28</u>			Soil	
Diesel Range Organics	0590315	5/12/99	5/13/99		25.0	ND	mg/kg dry	
Heavy Oil Range Hydrocarbons	ii.	11	0		50.0	ND	10	
Surrogate: 1-Chlorooctadecane	"	u	"	50.0-150		98.9	%	
GP9 @ 3-4			P9051	<u>67-31</u>			<u>Soil</u>	
Diesel Range Organics	0590315	5/12/99	5/13/99		25.0	ND	mg/kg dry	
Heavy Oil Range Hydrocarbons	n .	11	II.		50.0	ND	u.	
Surrogate: 1-Chlorooctadecane	"	"	· ·	50.0-150	Valle, Elizabeth	106	%	



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Secor P.O. Box 1508 Tualatin, OR 97062

Project: Crowley - Vancouver, WA

Sampled:

5/6/99 Received: 5/7/99

Project Number: 00255-003-01 Project Manager: Brian Pletcher

Reported:

5/28/99 16:19

Volatile Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method North Creek Analytical - Bothell

Batch	Date	Date	Surrogate	Reporting			
Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
		D0051	67.00			Soil	
		-	07-02	250	MD		
0590417	5/17/99	5/21/99					
11"				250	ND	u.	
103	u			250	ND	Ü	
0.	**	0		250	856	n	
11.	"			250	ND	ii .	
***	u	n .		250	649	10 %	
41.0	ñ	n		250	1500	110	
"	"	"	60.0-140		NR	%	2
"	"	11.	60.0-140		NR	"	2
	Number 0590417	Number Prepared 0590417 5/17/99 " " " " " " " " " " " " " " " " " " "	Number Prepared Analyzed P90516 0590417 5/17/99 5/21/99 " " " " " " " " " " " " " " " " " " " " "	Number Prepared Analyzed Limits P905167-09 0590417 5/17/99 5/21/99 " " " " " " " " " " " " " " 60.0-140	Number Prepared Analyzed Limits Limit P905167-09 0590417 5/17/99 5/21/99 250 " " " 250 " " " 250 " " " 250 " " " 250 " " " 250 " " " 250 " " " 60.0-140	Number Prepared Analyzed Limits Limit Result P905167-09 0590417 5/17/99 5/21/99 250 ND " " " 250 ND " " " 250 ND " " " 250 856 " " " 250 ND " " " 250 649 " " " 60.0-140 NR	Number Prepared Analyzed Limits Result Units P905167-09 Soil 0590417 5/17/99 5/21/99 250 ND mg/kg dry """"""""""""""""""""""""""""""""""""



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Sampled: 5/6/99 Project: Crowley - Vancouver, WA Secor Received: 5/7/99 Project Number: 00255-003-01 P.O. Box 1508

Reported: 5/28/99 16:19 Project Manager: Brian Pletcher Tualatin, OR 97062

BTEX, MTBE and Naphthalene by WDOE Interim TPH Policy Method using GC/MS North Creek Analytical - Bothell

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
							e _e :1	2
GP3 @ 7-8			P9051	<u>67-09</u>		200	Soil	<u>3</u>
Methyl tert-butyl ether	0590750	5/27/99	5/27/99		10.0	ND	mg/kg dry	
Benzene	"	11	n		1.00	ND	ii.	
Toluene	u	"	11		1.00	ND	11	
Ethylbenzene	1g	"	.,		1.00	ND	311	
m,p-Xylene	U	<u>u</u>	"		2.00	ND	**	
o-Xylene	ü	W.			1.00	ND	111	
Naphthalene	Ü	ii .	"		1.00	ND	11	
Surrogate: 2-Bromopropene	"	"	"	70.0-130		122	%	
Surrogate: 1,2-DCA-d4	"	"	"	70.0-130		112	""	
Surrogate: Toluene-d8	"	"	Ĥ	70.0-130		94.9	<i>H</i> =	
Surrogate: 4-BFB	"	"	· n	70.0-130		94.4	"	



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Secor P.O. Box 1508 Tualatin, OR 97062 Project: Crowley - Vancouver, WA

Sampled: 5/6/99

Project Number: 00255-003-01

Received: 5/7/99

Project Manager: Brian Pletcher

Reported: 5/28/99 16:19

Extractable Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method North Creek Analytical - Bothell

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
							21 10	
GP3 @ 7-8			P90510	<u> 67-09</u>			<u>Soil</u>	
C8-C10 Aliphatics	0590526	5/20/99	5/21/99		20.0	94.3	mg/kg dry	
	iii	a	!!		20.0	961	"	
/ 110 %	W.	Ü	11		20.0	3130	"	
C12-C16 Aliphatics	u	II .	Ð		20.0	1730	n :	
C21-C34 Aliphatics	ii	ŏ	Ũ		20.0	339	Í.	
C10-C12 Aromatics	ı ÎÎ	Ü	5/24/99		20.0	46.6	11	
C12-C16 Aromatics } DCM	"	110	ir		20.0	412	11	
C16-C21 Aromatics	ü	H/I	n		20.0	409	T.	
C21-C34 Aromatics	11	"	11		20.0	237		
Extractable Petroleum Hydrocarbons	ii .	11	11			(7360)	11	
Surrogate: 2-FBP	"	"	"	50.0-150		116	%	
Surrogata: Octacosana	"	"	5/21/99	50.0-150		118	"	
Surrogate: Undecane \[\begin{align*} \text{polor} \\ p	"	"	n	30.0-150		NR	M.	4

hexane

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Page 9 of 22



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Crowley - Vancouver, WA Project:

Sampled: 5/6/99

Tualatin, OR 97062

Project Number: 00255-003-01 Brian Pletcher Project Manager:

Received: 5/7/99 Reported: 5/28/99 16:19

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM North Creek Analytical - Bothell

	Batch	Date	Date	Surrogate	Reporting			
Analyte	Number	Prepared	Analyzed	Limits	Limit	Result	Units	Notes*
GP3 @ 7-8			P9051	<u>67-09</u>	28		Soil	
Acenaphthene	0590526	5/20/99	5/23/99		0.400	0.685	mg/kg dry	
Acenaphthylene	u .	.11	11		0.400	0.400		
Anthracene	и				0.400	3.48	u	
Benzo (a) anthracene	n	ж			0.400	ND		
Benzo (a) pyrene	11	11	n		0.400	ND	u	
Benzo (b) fluoranthene	аC	n	***		0.400	ND	п	
Benzo (ghi) perylene	110	311	ti.		0.400	ND	ü	
Benzo (k) fluoranthene	n.	20	11		0.400	ND	ñ.	
Chrysene	11		11		0.400	0.485	Ĭt.	
Dibenz (a,h) anthracene	n	ш	n		0.400	ND	ti i	
Fluoranthene	11	11	11		0.400	0.428	11	
Fluorene	11	ij	"		0.400	2.45	11	
Indeno (1,2,3-cd) pyrene	**	ij	Ü		0.400	ND	11	
2-Methylnaphthalene	n	**	ii		0.400	0.400	16	
Naphthalene	υď	ü			0.400	ND	110	
Phenanthrene	200	н	11		0.400	8.90		
Pyrene	11	**	ii.		0.400	0.999	H	
Surrogate: p-Terphenyl-d14	"	ii .	"	30.0-150		110	%	



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Secor P.O. Box 1508 Project: Crowley - Vancouver, WA

5/6/99 Sampled:

Tualatin, OR 97062

Project Number: 00255-003-01

Received: 5/7/99

Project Manager: Brian Pletcher

Reported: 5/28/99 16:19

Dry Weight Determination North Creek Analytical - Bothell

Sample Name	Lab ID	Matrix	Result	Units
GP3 @ 7-8	P905167-09	Soil	93.4	%

North Creek Analytical - Portland

Lisa Domenighini, Project Manager



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Secor P.O. Box 1508 Project: Crowley - Vancouver, WA

Sampled: 5/6/99

Project Number: 00255-003-01

Received: 5/7/99

Project Manager: Tualatin, OR 97062

Brian Pletcher

Reported: 5/28/99 16:19

Dry Weight Determination North Creek Analytical - Portland

Sample Name	Lab ID	Matrix	Result	Units
GP1 @ 2.5-3.0	P905167-01	Soil	91.2	%
GP2 @ 3-4	P905167-04	Soil	93.6	%
GP2 @ 7-8	P905167-05	Soil	75.8	%
GP3 @ 3-4	P905167-08	Soil	86.2	%
GP4 @ 7-8	P905167-13	Soil	94.3	%
GP5 @ 3-4	P905167-16	Soil	85.3	%
GP6 @ 7-8	P905167-21	Soil	90.8	%
GP7 @ 7-8	P905167-24	Soil	94.7	%
GP8 @ 3-4	P905167-28	Soil	95.1	%
GP9 @ 3-4	P905167-31	Soil	94.9	%



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Sampled: 5/6/99 Project: Crowley - Vancouver, WA Secor Received: 5/7/99 P.O. Box 1508 Project Number: 00255-003-01

Reported: 5/28/99 16:19 Project Manager: Brian Pletcher Tualatin, OR 97062

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A/Quality Control North Creek Analytical - Portland

	Date	Spike	Sample	QC	300 ACC - 100	rting Limit	Recov.	RPD	RPD
Analyte	Analyzed	Level	Result	Result	Units Re	ecov. Limits	%	Limit	% Notes*
£	ation (64)		2020			e 1 1 1 e	OFF IS	gre.	
Batch: 0590228	Date Prepa		99		Extraction N	vlethod: Me	OH Extr	action	
Blank	0590228-BI	LK1				0.0500			
Benzene	5/11/99			ND	mg/kg dry	0.0500			
Toluene				ND	:11	0.0500			
Ethylbenzene	u .			ND		0.0500			
Xylenes (total)	"			ND	0	0.0500			
Gasoline Range Hydrocarbons				ND		2.50	00.0		
Surrogate: a,a,a-TFT (FID)	"	2.50		2.47		50.0-150	98.8		
Surrogate: a,a,a-TFT (PID)	"	2.50		2.53	"	50.0-150	101		
LCS	0590228-B	<u>S1</u>							
Gasoline Range Hydrocarbons	5/13/99	31.3		34.5	mg/kg dry	50.0-150			
Surrogate: a,a,a-TFT (FID)	"	2.50		2.90	"	50.0-150	116		
LCS	0590228-B	S2							
Benzene	5/13/99	0.500		0.485	mg/kg dry	69.0-138	97.0		
Toluene	n	0.500		0.530		53.0-151	106		
Ethylbenzene	ĬI.	0.500		0.523	11	61.0-141	105		
Xylenes (total)	ii .	1.50		1.62	n	62.0-144	108		
Surrogate: a,a,a-TFT (PID)	11	2.50		1.82	"	50.0-150	72.8		
<u>Duplicate</u>	0590228-D	UP1 P	905148-02						
Gasoline Range Hydrocarbons	5/11/99		955	654	mg/kg dry			50.0	37.4
Surrogate: a,a,a-TFT (FID)	"	3.12		2.30	"	50.0-150	73.7		
<u>Duplicate</u>	0590228-D	UP2 P	905167-01						
Gasoline Range Hydrocarbons	5/11/99		5.29	ND	mg/kg dry			50.0	
Surrogate: a,a,a-TFT (FID)	"	2.74		2.74	"	50.0-150	100		
Matrix Spike	0590228-N	ISI F	905148-01						
Benzene	5/11/99	0.535	ND	0.444	mg/kg dry	56.0-123	83.0		
Toluene	"	0.535	ND	0.473	"	54.0-123	88.4		
Ethylbenzene	311	0.535	ND	0.489	U	45.0-130	91.4		
Xylenes (total)	.11	1.60	ND	1.54	"	50.0-127	96.2		
Surrogate: a,a,a-TFT (PID)	"	2.67	- 1	1.69	"	50.0-150		4-1-20-11	40-10[1
Matrix Spike Dup	0590228-N	ISD1 F	2905148- <u>01</u>						
Benzene	5/11/99	0.535	ND	0.425	mg/kg dry	56.0-123	79.4	17.0	4.43
Toluene	"	0.535	ND	0.465	"	54.0-123		24.0	1.71
			100000						

North Creek Analytical - Portland

*Refer to end of report for text of notes and definitions.

Lisa Domenighini, Project Manager

North Creek Analytical, Inc. **Environmental Laboratory Network**

Page 13 of 22



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503.906.9200 fax 503.906.9210 20354 Empire Avenue, Suite E-9, Bend, OR 97708-1883 541.383.9310 fax 541.382.7588

Sampled: 5/6/99 Crowley - Vancouver, WA Project: Secor 5/7/99 Project Number: 00255-003-01 Received: P.O. Box 1508 5/28/99 16:19 Reported: Project Manager: Brian Pletcher Tualatin, OR 97062

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX per EPA Method 8020A/Quality Control North Creek Analytical - Portland

	Date	Spike	Sample	QC	R	eporting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
Matrix Spike Dup (continued)	0590228-N	ISD1 P	905148-01							
Ethylbenzene	5/11/99	0.535	ND	0.484	mg/kg dr	y 45.0-130	90.5	20.0	0.990	
Xylenes (total)	n.	1.60	ND	1.53	11	50.0-127	95.6	20.0	0.626	
Surrogate: a,a,a-TFT (PID)	"	2.67		1.51	"	50.0-150	56.6			



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20354 Empire Avenue, Suite E-9, Bend, OR 97708-1883 541.383.9310 fax 541.382.7588

5/6/99 Sampled: Secor Project: Crowley - Vancouver, WA Project Number: 00255-003-01 Received: 5/7/99 P.O. Box 1508

Reported: 5/28/99 16:19 Project Manager: Brian Pletcher Tualatin, OR 97062

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method/Quality Control North Creek Analytical - Portland

	Date	Spike	Sample	QC	Rep	oorting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
2000016	D 4 D		00		Extraction	Method: TP	H.D. Evti	raction		
Batch: 0590315	Date Prepa		99		Extraction	Method. 11	II-ID IBALI	action		
<u>Blank</u>	0590315-Bl	<u>JKI</u>		n 1700	" 1	25.0				
Diesel Range Organics	5/12/99			ND	mg/kg dry "	25.0				
Heavy Oil Range Hydrocarbons	**			ND		50.0				
Surrogate: 1-Chlorooctadecane	"	5.00		5.08	"	50.0-150	102			
LCS	0590315-BS	<u>51</u>								
Diesel Range Organics	5/12/99	128		131	mg/kg dry	50.0-150	102			
Heavy Oil Range Hydrocarbons	"	51.0		53.8	11.	50.0-150	105			
Surrogate: 1-Chlorooctadecane	"	5.00		6.30	"	50.0-150	126			
<u>Duplicate</u>	0590315-D	<u>UP1 </u>	905167-01							
Diesel Range Organics	5/12/99		ND	ND	mg/kg dry			50.0		
Heavy Oil Range Hydrocarbons	II.		ND	ND	n			50.0		
Surrogate: 1-Chlorooctadecane	"	5.48	CO Source Co.	5.62	"	50.0-150	103			
Duplicate	0590315-D	UP2 P	905167-04							
Diesel Range Organics	5/13/99		104	103	mg/kg dry			50.0	0.966	
Heavy Oil Range Hydrocarbons	19		ND	ND	11			50.0		5
Surrogate: 1-Chlorooctadecane	"	5.34		5.80	"	50.0-150	109		2010	
<u>Duplicate</u>	0590315-D	UP3 F	905167-31							
Diesel Range Organics	5/13/99		ND	ND	mg/kg dry			50.0		
Heavy Oil Range Hydrocarbons			ND	ND	"			50.0		
Surrogate: 1-Chlorooctadecane	"	5.27		5.51	"	50.0-150	105			

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Secor P.O. Box 1508

Project: Crowley - Vancouver, WA

Sampled: 5/6/99

Tualatin, OR 97062

Project Number: 00255-003-01

Received: 5/7/99

Project Manager: Brian Pletcher

Reported: 5/28/99 16:19

Volatile Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method/Quality Control North Creek Analytical - Bothell

	Date	Spike	Sample	QC	R	eporting Limit		RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
Batch: 0590417	Date Prepa	red: 5/17/9	99		Extraction					
Blank	0590417-BI				-					
C5-C6 Aliphatics	5/20/99			ND	mg/kg dry	5.00				
C6-C8 Aliphatics	"			ND	"	5.00				
C8-C10 Aliphatics				ND	S.M.	5.00				
C10-C12 Aliphatics				ND	зй	5.00				
C8-C10 Aromatics	II.			ND	n	5.00				
C10-C12 Aromatics	ü			ND	ii.	5.00				
C12-C13 Aromatics	10.			ND	u	5.00				
Surrogate: 4-BFB (FID)	"	4.00		3.97	"	60.0-140	99.3			
Surrogate: 4-BFB (PID)	n/i	4.00		4.06	"	60.0-140	101			
Blank	0590417-B	LK2								
C5-C6 Aliphatics	5/22/99			ND	mg/kg dr	y 5.00				
C6-C8 Aliphatics	ũ			ND	HE	5.00				
C8-C10 Aliphatics	ii .			ND	W	5.00				
C10-C12 Aliphatics	ii			ND	•	5.00				
C8-C10 Aromatics	Ü			ND	11	5.00				
C10-C12 Aromatics	Ü			ND	11	5.00				
C12-C13 Aromatics	m:			ND	•	5.00				
Surrogate: 4-BFB (FID)	"	4.00		3.75	"	60.0-140	93.8			
Surrogate: 4-BFB (PID)	"	4.00		4.23	n	60.0-140	106			
LCS	0590417-B	<u>S1</u>								
C5-C6 Aliphatics	5/20/99	2.00		1.32	mg/kg di					6
C6-C8 Aliphatics	11	1.00		1.08	u	70.0-130				
C8-C10 Aliphatics		1.00		1.16	II	70.0-130				
C10-C12 Aliphatics	21.	1.00		1.22	u	70.0-130				
C8-C10 Aromatics	311	4.00		4.10	11	70.0-130				
C10-C12 Aromatics	11.	1.00		1.10	H	70.0-130				
C12-C13 Aromatics	"	2.00		2.30	*1	70.0-130			Taxana a	
Surrogate: 4-BFB (FID)	"	4.00		4.15	"	60.0-140				
Surrogate: 4-BFB (PID)	Ü	4.00		4.12	"	60.0-140	103			
<u>Duplicate</u>	0590417-Г	OUP1	P905167-09							
C5-C6 Aliphatics	5/21/99		ND	ND	mg/kg d	ry		25.0		
C6-C8 Aliphatics	"		ND	ND	11			25.0		
C8-C10 Aliphatics	TH.		ND	ND	o.			25.0	9000000	
C10-C12 Aliphatics	ü		856	911	3172			25.0	6.23	

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*Refer to end of report for text of notes and definitions.

Lisa Domenighini, Project Manager

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Page 16 of 22



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Secor P.O. Box 1508 Project: Crowley - Vancouver, WA

5/6/99 Sampled:

Tualatin, OR 97062

Project Number: 00255-003-01 Project Manager: Brian Pletcher Received: 5/7/99

Reported: 5/28/99 16:19

Volatile Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method/Quality Control North Creek Analytical - Bothell

					7		D	DDD	DDD	
	Date	Spike	Sample	QC		Reporting Limit		RPD	RPD	(2) (2) (2)
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
- W - / W - N	0200412 101	r turad	D005165 00							
<u>Duplicate (continued)</u>	0590417-D	UPI	P905167-09					0.5.0		
C8-C10 Aromatics	5/21/99		ND	ND	mg/kg d	ry		25.0		
C10-C12 Aromatics	ii .		649	651	11			25.0	0.308	
C12-C13 Aromatics	311		1500	1350	16			25.0	10.5	
Surrogate: 4-BFB (FID)	"	4.28		ND	"	60.0-140	NR			2
Surrogate: 4-BFB (PID)	"	4.28		21.1	"	60.0-140	NR			4
<u>Duplicate</u>	0590417-D	UP2	B905273-03							
C5-C6 Aliphatics	5/24/99		ND	ND	mg/kg d	lry		25.0		
C6-C8 Aliphatics	Ű		ND	ND	u			25.0		
C8-C10 Aliphatics	Ű		ND	ND	Ü			25.0		
C10-C12 Aliphatics	ű		ND	ND	ŭ			25.0		
C8-C10 Aromatics	11		ND	ND	ũ			25.0		
C10-C12 Aromatics	11		ND	ND	10			25.0		
C12-C13 Aromatics	9		5.45	7.42	**			25.0	30.6	7
Surrogate: 4-BFB (FID)	"	5.13	94.0 (dec em ex 17)	4.22	"	60.0-140	82.3			
Surrogate: 4-BFB (PID)	"	5.13		4.44	H	60.0-140	86.5			

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Page 17 of 22



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DDD

5/6/99 Project: Crowley - Vancouver, WA Sampled: Secor Received: 5/7/99 Project Number: 00255-003-01 P.O. Box 1508

Reported: 5/28/99 16:19 Project Manager: Brian Pletcher Tualatin, OR 97062

BTEX, MTBE and Naphthalene by WDOE Interim TPH Policy Method using GC/MS/Quality Control North Creek Analytical - Bothell

	Date	Spike	Sample	QC	Repo	rting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units R	ecov. Limits	%	Limit	% N	otes'
		P (MODEL WATER			90 W W W W W W W W W W W W W W W W W W W			(20 100)		
Batch: 0590750	Date Prepar		9		Extraction I	Method: EPA	5030B	[P/T]		
<u>Blank</u>	0590750-BL	<u>K1</u>			1921 10					
Methyl tert-butyl ether	5/27/99			ND	mg/kg dry	1.00				
Benzene	11			ND	Ü	0.100				
Toluene	···			ND	ti I	0.100				
Ethylbenzene	311			ND	1193	0.100				
m,p-Xylene	11			ND	n.	0.200				
o-Xylene	u			ND	n	0.100				
Naphthalene	ii			ND		0.100				
Surrogate: 2-Bromopropene	11.	2.00	200000	1.73	"	70.0-130	86.5			
Surrogate: 1,2-DCA-d4	n	2.00		1.41	"	70.0-130	70.5			
Surrogate: Toluene-d8	"	2.00		1.69	"	70.0-130	84.5			
Surrogate: 4-BFB	n	2.00		1.76	"	70.0-130	88.0			
<u>LCS</u>	0590750-BS	<u>81</u>					8 2 5			
Benzene	5/27/99	1.00		0.922	mg/kg dry	70.0-130	92.2			
Toluene	II.	1.00	910-00-00-2-2-2-	0.872	n .	70.0-130	87.2			
Surrogate: 2-Bromopropene	"	2.00		1.96	"	70.0-130	98.0			
Surrogate: 1,2-DCA-d4	"	2.00		1.92	"	70.0-130	96.0			
Surrogate: Toluene-d8	u	2.00		1.88	"	70.0-130	94.0			
Surrogate: 4-BFB	"	2.00		1.83	"	70.0-130	91.5			
Matrix Spike	0590750-M	<u>S1 B</u>	905510-0 <u>5</u>							
Benzene	5/27/99	1.08	ND	0.988	mg/kg dry	70.0-130	91.5			
Toluene	11	1.08	ND	0.942	"	70.0-130	87.2			
Surrogate: 2-Bromopropene	"	2.16	*******	1.96	"	70.0-130	90.7		- 000000000000000000000000000000000000	
Surrogate: 1,2-DCA-d4	ä	2.16		1.99	"	70.0-130	92.1			
Surrogate: Toluene-d8	e u	2.16		1.84	"	70.0-130	85.2			
Surrogate: 4-BFB	n	2.16		1.76	n	70.0-130	81.5			
Matrix Spike Dup	0590750-M	ISD1 B	905510-05							
Benzene	5/27/99	1.08	ND	0.960	mg/kg dry	70.0-130	88.9	20.0	2.88	
Toluene	"	1.08	ND	0.942	11	70.0-130	87.2	20.0	0	
Surrogate: 2-Bromopropene	<i>"</i>	2.16		1.94	"	70.0-130	89.8			
Surrogate: 1,2-DCA-d4	"	2.16		1.87	"	70.0-130	86.6			
Surrogate: Toluene-d8	n	2.16		1.90	H	70.0-130	88.0			
Surrogate: 4-BFB	"	2.16		1.84	"	70.0-130	85.2			
Surrogate: 4-DFD		2.10		1.04		, 0.0 100				

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Sampled: 5/6/99 Crowley - Vancouver, WA Secor 5/7/99 00255-003-01 Received: P.O. Box 1508 Project Number: 5/28/99 16:19 Reported: Project Manager: Brian Pletcher Tualatin, OR 97062

Extractable Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method/Quality Control North Creek Analytical - Bothell

	Date	Spike	Sample	QC	R	eporting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	% N	otes*
[DEVELOPER, Delf	120/2000/100/2007	-decemboossements						
Batch: 0590526	Date Prepa	red: 5/20/9	99		Extractio	n Method: EPA	4 3550B			
Blank	0590526-BI	LK1								
C8-C10 Aliphatics	5/21/99			ND	mg/kg dry	5.00				
C10-C12 Aliphatics	Σ II			ND	.01	5.00				
C12-C16 Aliphatics	8316			ND	11	5.00				
C16-C21 Aliphatics	ū			ND	H	5.00				
C21-C34 Aliphatics	u.			ND	× 41	5.00				
C10-C12 Aromatics	ü			ND	211	5.00				
C12-C16 Aromatics	o o			ND	W.	5.00				
C16-C21 Aromatics	**			ND	ii.	5.00				
C21-C34 Aromatics	11			ND	n .	5.00				
Extractable Petroleum Hydrocarbons	ii			ND	y .					
Surrogate: 2-FBP	"	12.0		10.8	"	50.0-150	90.0			
Surrogate: Octacosane	"	12.3		12.6	"	50.0-150	102			
Surrogate: Undecane	"	13.3		11.0	"	30.0-150	82.7			
<u>Blank</u>	0590526-B	LK2								
C8-C10 Aliphatics	5/21/99			ND	mg/kg dr					
C10-C12 Aliphatics	n			ND	0	5.00				
C12-C16 Aliphatics	11			ND	••	5.00				
C16-C21 Aliphatics	II.			ND	11	5.00				
C21-C34 Aliphatics	**			ND	11	5.00				
C10-C12 Aromatics	ns			ND		5.00				
C12-C16 Aromatics	ii.			ND	11	5.00				
C16-C21 Aromatics				ND	II .	5.00				
C21-C34 Aromatics	n .			ND	H	5.00				
Extractable Petroleum Hydrocarbons	11			ND						a street
Surrogate: 2-FBP	"	12.0		11.4	"	50.0-150	95.0			
Surrogate: Octacosane	"	12.3		12.0	"	50.0-150	97.6			
Surrogate: Undecane	"	13.3		10.6	"	30.0-150	79.7			
LCS	0590526-B				629 E		2.1			
Extractable Petroleum Hydrocarbons	5/21/99	167		141	mg/kg di					nuser.
Surrogate: 2-FBP	n .	12.0		11.4	"	50.0-150	95.0			
Surrogate: Octacosane	"	12.3		12.1	"	50.0-150				
Surrogate: Undecane	"	13.3		10.3	"	30.0-150	77.4			
	0.000.000	CD 4								
LCS Dup	0590526-B			125		200 120	80.8	40.0	4.36	
Extractable Petroleum Hydrocarbons	5/21/99	167		135	mg/kg d	ry 30.0-120	00.0	40.0	4.50	

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Secor P.O. Box 1508 Tualatin, OR 97062 Project: Crowley - Vancouver, WA

Sampled: 5/6/99

Project Number: 00255-003-01

Received: 5/7/99

Project Manager: Brian Pletcher

5/28/99 16:19 Reported:

Extractable Petroleum Hydrocarbons by modified WDOE Interim TPH Policy Method/Quality Control North Creek Analytical - Bothell

	Date	Spike	Sample	QC	Re	eporting Limit	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units	Recov. Limits	%	Limit	%	Notes*
LCS Dup (continued)	0590526-BS	<u>SD1</u>								
Surrogate: 2-FBP	5/21/99	12.0		9.86	mg/kg dry	50.0-150	82.2			
Surrogate: Octacosane	"	12.3		11.6	10	50.0-150	94.3			
Surrogate: Undecane	· //	13.3		10.3	"	30.0-150	77.4			
Matrix Spike	0590526-M	<u>S1</u> P	905167-09							
Extractable Petroleum Hydrocarbons	5/21/99	178	7360	1810	mg/kg dry	30.0-120	NR			8
Surrogate: 2-FBP	"	12.9		31.3	"	50.0-150	NR			9
Surrogate: Octacosane	"	13.2		14.5	"	50.0-150	110			
Surrogate: Undecane	"	14.2		ND	"	30.0-150	NR			4



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503 306 9200 Tax 503.906.9210 20354 Empire Avenue, Suite E-9, Bend, OR 97708 1883 541.383.9310 Tax 541.382.7588

Project: Crowley - Vancouver, WA Sampled: 5/6/99 Secor Project Number: 00255-003-01 Received: 5/7/99 P.O. Box 1508

Reported: 5/28/99 16:19 Project Manager: Brian Pletcher Tualatin, OR 97062

Polynuclear Aromatic Hydrocarbons by GC/MS-SIM/Quality Control North Creek Analytical - Bothell

	Date	Spike	Sample	QC	Repo	rting Limit I	Recov.	RPD	RPD	
Analyte	Analyzed	Level	Result	Result	Units Re	ecov. Limits	%	Limit	% No	otes*
						30				
Batch: 0590526	Date Prepa	red: 5/20/9	99		Extraction N	Method: EPA	3550B			
Blank	0590526-B)	LK1								
Acenaphthene	5/23/99			ND	mg/kg dry	0.0100				
Acenaphthylene	n			ND	•	0.0100				
Anthracene	n.			ND	11	0.0100				
Benzo (a) anthracene	:05			ND	11	0.0100				
Benzo (a) pyrene	THE STATE OF THE S			ND	U .	0.0100				
Benzo (b) fluoranthene	n .			ND	***	0.0100				
Benzo (ghi) perylene	w			ND	911	0.0100				
Benzo (k) fluoranthene	11			ND	н	0.0100				
Chrysene	10			ND	or .	0.0100				
Dibenz (a,h) anthracene	.11			ND	U	0.0100				
Fluoranthene	ii .			ND	u	0.0100				
Fluorene	n			ND	a	0.0100				
Indeno (1,2,3-cd) pyrene	105			ND	ü	0.0100				
2-Methylnaphthalene	7.00			ND	ü	0.0100				
Naphthalene	11			ND	11	0.0100				
Phenanthrene	11			ND	H	0.0100				
Pyrene				ND	ū	0.0100			#1	
Surrogate: p-Terphenyl-d14	"	0.267		0.269	"	30.0-150	101			
LCS	0590526-B	<u>S1</u>								
Chrysene	5/23/99	0.333		0.310	mg/kg dry	10.0-125	93.1			
Fluorene	II.	0.333		0.248	10	11.0-116	74.5			
Indeno (1,2,3-cd) pyrene	"	0.333		0.285	H .	10.0-147	85.6	WCG		
Surrogate: p-Terphenyl-d14	"	0.267		0.286	"	30.0-150	107			
LCS Dup	0590526-B	SD1								
Chrysene	5/23/99	0.333		0.316	mg/kg dry	10.0-125	94.9	28.0	1.91	
Fluorene	11	0.333		0.187	o ·	11.0-116	56.2	32.0	28.0	
Indeno (1,2,3-cd) pyrene	Ĭi :	0.333		0.278	11	10.0-147	83.5	34.0	2.48	
Surrogate: p-Terphenyl-d14	"	0.267	(1111-111-1111-1111-1111-1111-1111-1111-1111	0.279	"	30.0-150	104			
Matrix Spike	0590526-N	<u> MS1 P</u>	905167-09							
Chrysene	5/23/99	0.357	0.485	0.770	mg/kg dry	10.0-125	79.8			
Fluorene	"	0.357	2.45	2.43	"	10.0-154	NR			10
Indeno (1,2,3-cd) pyrene	11	0.357	ND	0.371	11	10.0-144	104			
Surrogate: p-Terphenyl-d14	"	0.285		0.285	ii .	30.0-150	100		1 (200)	

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*Refer to end of report for text of notes and definitions.



Seattle 18939 120th Avenue NE, Suite 101, Bothell, WA 98011-9508 425-420-9200 fax 425-420-9210

Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776 509 924 9290 fax 509 924 9290 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132 503.906.9200 fax 503.906.9210

Bend 20354 Empire Avenue, Suite F-9, Bend, OR 97708-1883 541.383.9310 1ax 541.382.7588

Crowley - Vancouver, WA Sampled: 5/6/99 Project: Secor Received: 5/7/99 Project Number: 00255-003-01

P.O. Box 1508 Reported: 5/28/99 16:19 Tualatin, OR 97062 Project Manager: Brian Pletcher

Notes and Definitions

#	Note
1	Reporting limits raised due to dilution necessary for analysis.
2	The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.
3	This sample was analyzed outside the EPA recommended holding time.
4	The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.
5	RPD is not applicable for analyte concentrations less than 5 times the MRL.
6	The spike recovery for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
7	Analyses are not controlled on RPD values from sample concentrations less than 10 times the reporting limit.
8	Analyses are not controlled on matrix spike RPD and/or percent recoveries when the sample concentration is significantly higher than the spike level.
9	The recovery of this surrogate is outside control limits due to sample dilution required from high analyte concentration and/or matrix interferences.
10	The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical - Portland

Lisa Domenighini, Project Manager

ANALYTICAL Environmental Laboratory Services NORTH

CHAIN OF CUSTODY REPORT

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132

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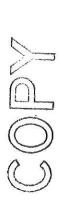
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FAX 420-9210 FAX 924-9290 FAX 906-9210 (425) 420-9200 (509) 924-9200 (503) 906-9200

Work Order #

TURNAROUND REQUEST in Business Days *	Organic & Inorganic Analyses	10 7 5 4 3 2 1 Name	Standard Fluels & Hydrocarbon Analyses	5 3-4 2 1 Same	Sandard	OTHER Specify:	 Turnaround Requests less than standard may incur Rush Charges. 	MATRIX # OF COMMENTS	hold 1									→	PATE STAP	FIRM: NCA TIME: 1100	97.5. Zate 5.7.99	FIRM: NCA TIME 1000	
INVOICE TO:	ATTENTION: SUME	ADDRESS:		P.O. NUMBER: NCA QUOTE #:)	cst. / / / / / / / /													DATE: 5-7-99 RECEIVED BY (Signalant)	TIME: 11 00 PRINT NAME: LAND SYANGLAY	RECEIVED BY (SIRMAL)	TIME 1000 PRINT NAME: Saya Mc Clina	
	ethos	7730 SW. Molaut St.		5030 FX: 503-692-7074	FNAME: COUNTY MACINE	10-200-55290	SAMPLED BY:	CLIENTSAMPLE SAMPLING	GP 0.2.5-3.0 5/699 1006	199 0, 4.5-5.0 100	3 GP/ (2) (025	. GPZ @ 3-4 1123	s Gp 2 @ 7-8 1128	6 GP2 @ 11-12 (133	1592 @ 15-16 1138	h511 h-5 @ Ed5"	. GP3 @ 7-8 1200	11-12 V 1212	RELINQUISHED BY ISINAMA J. There M. A. M.	PRINTINAME: D. Flived (ASCA) FIRM: SECOL	RELINQUISHED BY (Squaure:	PRINT NAME: (MM S/14 119/1200 FIRM: NCA.	DEM A DIVE





18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132

FAX 924-9290 (425) 420-9200

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Work Order #

000/ DATE S-7-89 DATE 5-799 TIME //00 Sume Day Turnaround Requests less than standard may incur Rush Charges. TURNAROUND REQUEST in Business Days * TIME COMMENTS Same 3 hold > 5 3-4 2 SS CONTAINERS FIRM: 7 OTHER (W. S. A. O) MATRIX 10 Standard LAMY Changler PRINT NAME: SAM MC CLUYA NCA QUOTE #: DATE: 5-7-99 RECEIVED BY ISIGNALITY RECEIVED BY (Signature): PRINT NAME: ATTENTION: SUMP CHAIN OF CUSTODY REPORT DATE: S-7-99 TIME: (DQ) TIME: 1100 INVOICE TO: P.O. NUMBER: ADDRESS: Analysis Request: PHONE: 503-641-2030 FAX: 503-692-7074 FIRM: NOT (Laboratory Use Only) NCA SAMPLE ID Tualethi Orgen 97062 1309 9/b/99 (220 99/ 91/4/ 198 1316 1422 13/2 95h) ~ 1321 SAMPLING PROJECT NAME: Coole, Morris Ciuss PROJECT NUMBER: 06255 - 063-01 long some la REPORT TO: SECOR
ATTENTION: Brian Pletcher 7730 SW. RELINQUISHED BY 15 FORMAGE THE COLUMN V. Fanary SP4 0, 11-12 91-51 @ hds 91-51 @ Sdg CLIENT SAMPLE OP3 @ 15-16 GPS @ 11-12 IDENTIFICATION @ 3-h 例の GPY @ 7-8 GPS @ 3-4 GPS @ 7-8 6-84 @ 3-4 RELINQUISHED BY ISINGUISE ADDITIONAL REMARKS SAMPLED BY: PRINT NAME: PRINT NAME: ADDRESS:





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CHAIN OF CUSTODY REPORT

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PAGE 4 OF 4

East 11115 Montgomery, Suite 101, Bothell, WA 98011-9508

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ADDITIONAL REMARKS: