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# HART CROWSER

Earth and Environmental Technologies

Hart Crowser, Inc.  
2550 Denali Street, Suite 705  
Anchorage, Alaska 99503-2737  
Fax 907.276.2104  
Tel 907.276.7475

A-8397-05

June 14, 1996

**RECEIVED**  
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Dept. of Environmental Conservation  
Underground Storage Tanks — FAP

Mr. Jon Clark  
Municipality of Anchorage  
Department of Property and Facilities Management  
3640 East Tudor Road  
Anchorage, Alaska 99519-6650

Re: Remediation System Operation and Monitoring  
January 25, 1996 through May 10, 1996  
Anchorage Fire Department Station No. 4

Dear Mr. Clark:

This letter report presents the hydrocarbon recovery activities and results of groundwater sampling at the Municipality of Anchorage (MOA) Fire Department Station No. 4 (AFD-4) for the period of January 25, 1996 through May 10, 1996. AFD-4 is located at 4350 MacInnes Road in Anchorage, Alaska.

In January 1995, two recovery wells were installed at the site to collect floating hydrocarbons (Figure 1) using Petro-trap passive hydrocarbon pumps. Work was conducted in accordance with the Corrective Action Plan for this site dated October 19, 1994. This plan was approved by the Alaska Department of Environmental Conservation in a meeting with the MOA - Department of Property and Facilities Management and Hart Crowser on January 13, 1995.

## WORK PERFORMED BY HART CROWSER

Groundwater elevation and product thickness measurements were made in the monitoring wells (MW-1 through MW-4; Figure 1) on April 18 and May 10, 1996 (Appendix A - Field Methods). Monitoring wells MW-2, MW-3, and MW-4 were purged and sampled on May 10, 1996. Samples were submitted to North Creek Analytical (NCA) laboratory for analyses of benzene, toluene, ethylbenzene, and xylenes (BTEX; EPA Method 8020) and diesel-range organics (DRO; EPA Method 8100M).





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## **WATER TABLE CONDITIONS**

Groundwater elevations in the monitoring wells, in general, rose by an average of 0.9 feet over the monitoring period (Figure 2). The inferred groundwater contours for this site for January 24, 1996 are presented on Figure 1. The groundwater flow direction is inferred to the northeast and the average hydraulic gradient was 0.02 feet/foot. This is generally consistent with previous observations.

## **HYDROCARBON THICKNESS AND RECOVERY**

The hydrocarbon thickness in MW-1 is presented in Table 1 and a comparison between hydrocarbon thickness and groundwater elevation is presented in Figure 3. Hydrocarbon thickness ranged from 0.79 feet in April 1996 to 0.37 feet in May 1996.

No product recovery occurred during this period because the hoarfrost formed within the recovery well walls and prevented removal of the Petro-traps. A total 16.8 gallons of fuel has been collected since the inception of hydrocarbon recovery, the majority of which has been collected since late September 1995.

## **PURGE WATER OBSERVATIONS**

No odor or sheen was observed in the purge water from MW-2, MW-3, or MW-4.

## **LABORATORY ANALYSES RESULTS**

The results of BTEX laboratory analyses are summarized in Table 2a. No benzene was detected in any of the monitoring wells sampled, and in MW-2 0.0006 mg/L of toluene was detected. No other BTEX constituents were detected in the wells. The DRO results (Table 2b) ranged from 0.30 mg/L in the MW-2 and to 0.14 mg/L in MW-4. All laboratory reports are presented in Appendix B.

### ***Data Validation***

Laboratory Quality Control Data provided by NCA on groundwater samples collected at AFD-4 indicated that reported results met the data quality objectives outlined in the Hart Crowser Quality Assurance Program Plan. All data is accepted for the purposes of this report.





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## CONCLUSIONS

The reduced hydrocarbon thickness in MW-1 between January 1995 and January 1996 suggests that the hydrocarbon recovery has been effective in removing the diesel fuel from the subsurface. Groundwater elevations should continue to fall over the winter; therefore we recommend continued recovery of hydrocarbons until May or June, 1996. At that time, methods for removal of residual free-phase hydrocarbons from the soil, and dissolved constituents from the groundwater, should be evaluated.

Dissolved BTEX constituents do not appear to be migrating from the former excavation area. DRO concentrations detected in the monitoring wells were slightly lower in October than in July and remain just above the detection limit of 0.1 mg/L. The DRO concentrations observed in the wells do not appear to be significant because they are below 0.5 mg/L, and no sheen or odor was observed in the purge water.

## INFORMATION LIMITATIONS

Work for this project was performed, and this letter report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same and similar localities at the time the work was performed. It is intended for the exclusive use of MOA. This letter report is not meant to represent a legal opinion, and no other warranty, express or implied, is made.



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We trust that this report meets your needs. Any questions regarding the field work and this letter report, the presentation of the information, and the interpretation of the data are welcome and should be referred to Nino Muniz at (907) 276-7475.

Sincerely,

**HART CROWSER, INC.**

**Herminio R. Muniz**  
Sr. Project Hydrogeologist

**Mark G. Madden, P.E.**  
Associate

HRM/mm

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Attachments:	Table 1	Groundwater Elevations and Hydrocarbon Thickness in MW-1
	Table 2a	Groundwater Laboratory Analyses Results - BTEX
	Table 2b	Groundwater Laboratory Analyses Results - DRO
	Figure 1	Site Plan and Water Table Elevations on May 10, 1996
	Figure 2	Monitoring Well Hydrographs
	Figure 3	Hydrocarbon Thickness and Groundwater Elevation in MW-1
	Appendix A	Field Explorations Methods and Analyses
	Appendix B	Laboratory Reports





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**REFERENCES**

Hart Crowser, 1994; Remedial Site Investigation, Fire Station No. 4, Municipality of Anchorage, Anchorage, Alaska; 6 pp.



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TABLE 1: Groundwater Elevations and Hydrocarbon Thickness in MW-1  
AFD - 4

Date	Anchorage, Alaska		Depth to Groundwater (Feet)	Groundwater Elevation (Feet) {1} {2}	Hydrocarbon Thickness (Feet)
	Depth to Hydrocarbon (Feet)	Groundwater Elevation (Feet)			
8/1/94	Not Observed	89.07	10.30	89.07	0.00
8/10/94	9.73	89.50	10.58	89.50	0.85
9/8/94	9.99	89.08	11.86	89.08	1.87
1/24/95	10.69	88.24	13.43	88.24	2.74
1/27/95	10.77	88.19	13.33	88.19	2.56
2/3/95	10.99	88.19	12.19	88.19	1.20
2/10/95	10.97	88.21	12.15	88.21	1.18
2/15/95	10.85	88.34	11.97	88.34	1.12
2/24/95	10.88	88.30	12.09	88.30	1.21
3/9/95	11.03	88.13	12.33	88.13	1.30
3/27/95	11.20	87.95	12.56	87.95	1.36
4/21/95	9.34	89.94	9.92	89.94	0.58
5/22/95	7.86	91.46	8.19	91.46	0.33
6/12/95	8.29	91.03	8.60	91.03	0.31
7/7/95	8.83	90.48	9.19	90.48	0.36
7/17/95	9.02	90.30	9.35	90.30	0.33
7/27/95	8.57	90.74	8.96	90.74	0.39
8/3/95	8.08	91.23	8.44	91.23	0.36
8/29/95	8.60	90.71	8.95	90.71	0.35
9/28/95	8.43	90.88	8.81	90.88	0.38
10/25/95	8.68	90.63	9.05	90.63	0.37
11/21/95	9.11	90.20	9.51	90.20	0.40
12/22/95	9.74	89.51	10.47	89.51	0.73
1/24/96	10.15	89.11	10.85	89.11	0.70
4/18/96	9.56	89.68	10.35	89.68	0.79
5/10/96	8.90	90.41	9.27	90.41	0.37

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Notes:

- {1} Vertical Survey conducted on 7/2/94; elevation of 100.00 assumed at northeast corner of concrete flagpole footing.  
MW-1 measuring point elevation = 99.37
- {2} Groundwater elevation corrected using measured hydrocarbon specific gravity of 0.84 as determined by laboratory.

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Table 2a: Groundwater Laboratory Analysis Results - BTEX  
AFD-4

		Benzene (mg/L) - EPA 5030/8020							
Monitoring Well		8/1/94	1/25/95	4/21/95	7/27/95	10/26/95	1/24/96	5/10/96	
MW-1	2.3		N/S {2}	N/S	N/S	N/S	N/S	N/S	
Field Duplicate	2.2								
MW-2	ND(0.0005) {1}		N/S {3}	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	
Field Duplicate				ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	
MW-3	ND(0.0005)		ND(0.0005)	N/S {4}	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	
Field Duplicate			ND(0.0005)						
MW-4	0.0005		ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	
Trip Blank	ND(0.0005)		ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	
		Total BTEX (mg/L) - EPA 5030/8020							
Monitoring Well		8/1/94	1/25/95	4/21/95	7/27/95	10/26/95	1/24/96	5/10/96	
MW-1	40		N/S	N/S	N/S	N/S	N/S	N/S	
Field Duplicate	38								
MW-2	0.003		N/S	ND	ND	ND	0.0006	ND	
Field Duplicate				ND	ND	ND	ND	ND	
MW-3	0.006		ND	N/S	ND	ND	ND	ND	
Field Duplicate			ND						
MW-4	0.004		ND	ND	ND	ND	ND	ND	
Trip Blank	ND		ND	ND	ND	ND	ND	ND	

NOTES: {1} ND(0.0005) - Not Detected (Detection Limit)

{2} N/S - Not sampled due to floating hydrocarbons in well.

{3} N/S - Not sampled due to large snowpile over well.

{4} N/S - Not sampled due to ice blockage in well riser.

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Table 2b: Groundwater Laboratory Analysis Results - DRO

AFD-4  
Anchorage, Alaska

Monitoring Well	DRO (mg/L) - EPA 3510/8100M				
	4/21/95	7/27/95	10/26/95	1/24/96	5/10/96
MW-1	N/S {1}	N/S {1}	N/S {1}	N/S {1}	N/S {1}
MW-2	ND(0.25)	0.17	0.14	0.30	ND(0.25)
Field Duplicate	ND(0.25)	0.17	0.16	0.17	0.47
MW-3	N/S {2}	0.27	0.16	0.16	ND(0.25)
MW-4	ND(0.25)	0.16	0.13	0.14	ND(0.25)

NOTES:

- ND(0.0005) - Not Detected (Detection Limit)
- {1} N/S - Not sampled due to floating hydrocarbon in well.
- {2} N/S - Not sampled due to ice blockage in well riser.

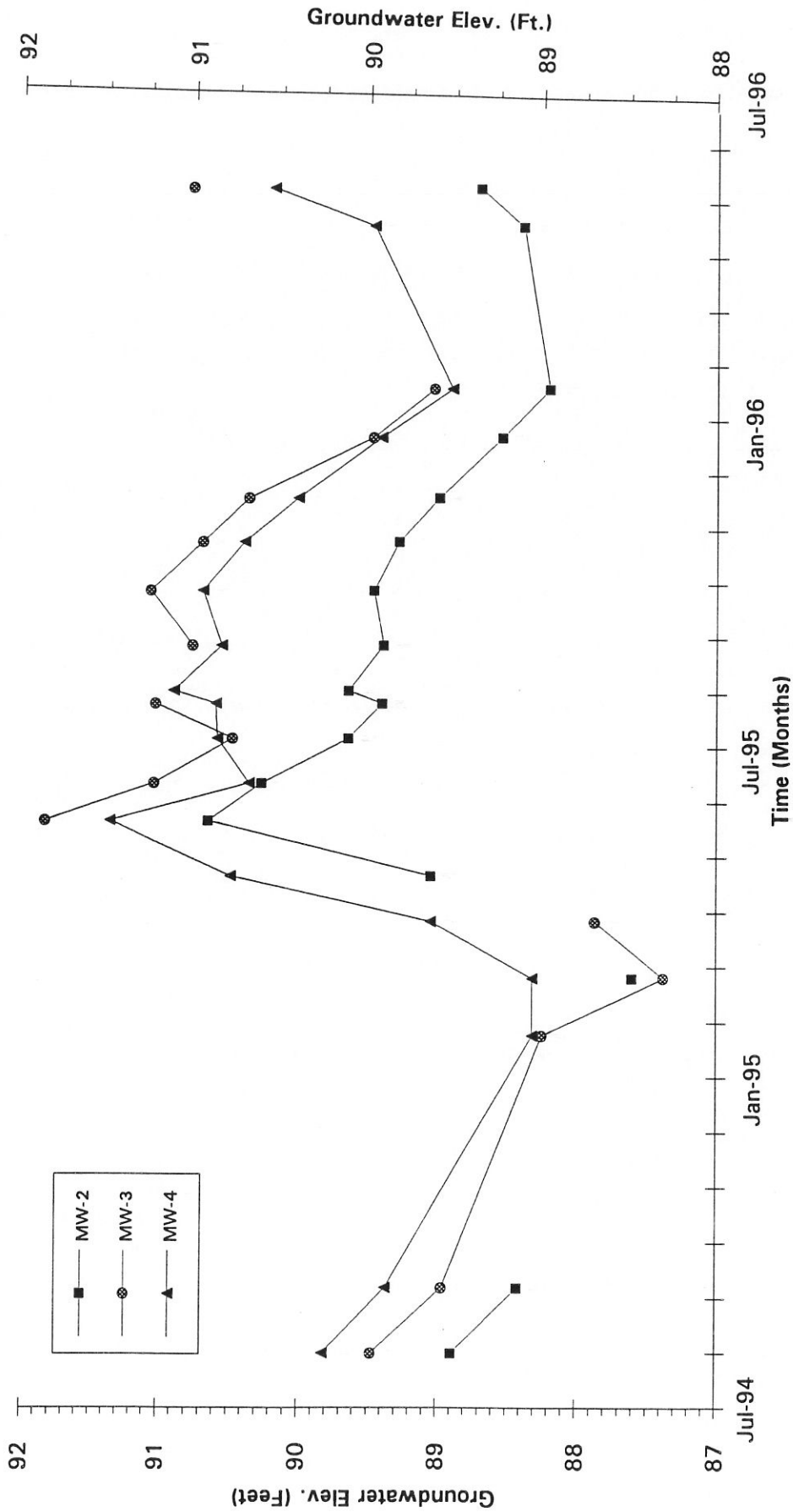




# Monitoring Well Hydrographs

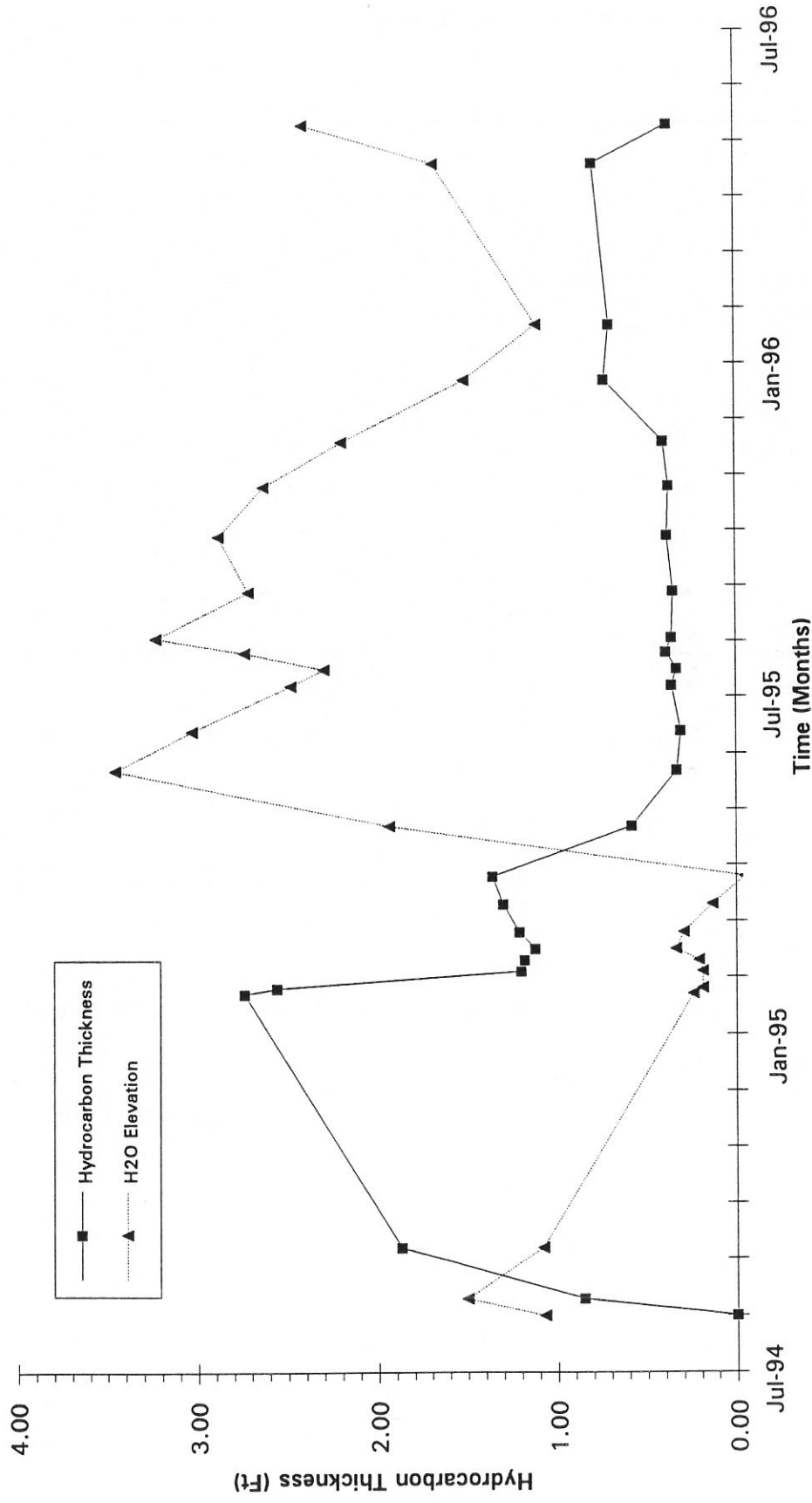
## AFD-4

### Anchorage, Alaska



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# Hydrocarbon Thickness and Groundwater Elevation in MW-1 AFD-4 Anchorage, Alaska



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A-8397-05

**APPENDIX A**  
**FIELD EXPLORATIONS METHODS AND ANALYSES**

## APPENDIX A FIELD EXPLORATIONS METHODS AND ANALYSES

This appendix documents the field methods used by Hart Crowser in determining the nature of the conditions underlying the project site addressed by this report. The discussion includes information on the following subjects:

- ▶ *Water/Floating Hydrocarbon Level Measurements*
- ▶ *Water Quality Sampling*
- ▶ *Petro-trap Operations*
- ▶ *Decontamination of Field Equipment*

### *Water/Floating Hydrocarbon Level Measurements*

The water level and floating hydrocarbon in each well was measured from a reference point or "measuring point" marked on the PVC casing. A Flexidip electronic oil/water interface well sounder was used to make the measurements, which were recorded to an accuracy of  $\pm 0.01$  feet.

### *Water Quality Sampling*

Monitoring wells were purged immediately prior to sampling, until a minimum of three casing volumes of water were removed, and two of the three parameters of pH, conductivity, and temperature had stabilized. All purge water was containerized. Purging and sampling was performed by lowering a factory-decontaminated disposable bailer into the well with single-use polypropylene rope. Samples were collected in 40 ml clear, glass, VOA vials fitted with TEFLON septa and 1-Liter brown bottles (when appropriate) provided by the laboratory. A duplicate sample was collected for each well sampling event. Immediately after collection, the samples were labeled and placed in a cooler with "blue-ice" for shipment to NCA laboratories under chain-of-custody procedures.

### *Petro-trap Operations*

Petro-trap hydrocarbon collectors were placed in recovery wells with their screened sections within the floating hydrocarbon zone. Hydrocarbon collection was performed by slowly removing the Petro-trap from the recovery well, and emptying its contents into a graduated container. The petro-trap was then slowly lowered back into position in the well.

The hydrocarbon quantity was read from the graduated container and recorded on a log sheet. Hydrocarbons were then placed in a 55-gallon drum.

*Equipment Decontamination*

The Flexi-dip interphase probe was cleaned prior to and between sampling attempts using an anionic detergent wash (Alconox) followed by two potable water rinses.

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A-8397-05

**APPENDIX B  
LABORATORY REPORTS**

**APPENDIX B  
QUALITY CONTROL NARRATIVE**

All field and laboratory quality control criteria provided by North Creek Analytical regarding the groundwater samples collected and analyzed for this project meet the quality control/quality assurance objectives as stated in Hart Crowser's Standard QAPP, dated September 7, 1994 except the following:

- ▶ No RPD could be calculated for DRO as sample MW-2 did not contain a detectable DRO concentration and the field duplicate (Duplicate) had a DRO concentration of 0.45 mg/L. However we accept this data for the purposes of this report.

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**NORTH  
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ANALYTICAL**  
*Environmental Laboratory Services*

200244

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PORTLAND ■ (503) 643-9200 ■ FAX 644-2202

Hart Crowser, Inc. - Alaska 2550 Denali Street, Ste 705 Anchorage, AK 99503	Project: Firestation #4 Project Number: A-8397-05 Project Manager: Matt Flynn	Sampled: 5/10/96 Received: 5/14/96 Reported: 5/28/96
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**Project Summary**

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-2	B605233-01	Water	5/10/96
MW-3	B605233-02	Water	5/10/96
MW-4	B605233-03	Water	5/10/96
Duplicate	B605233-04	Water	5/10/96
TRIP BLANK	B605233-05	Water	5/10/96

North Creek Analytical, Inc.

*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.*

  
Matthew Essig, Project Manager



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Hart Crowser, Inc. - Alaska  
2550 Denali Street, Ste 705  
Anchorage, AK 99503

Project: Firestation #4  
Project Number: A-8397-05  
Project Manager: Matt Flynn

Sampled: 5/10/96  
Received: 5/14/96  
Reported: 5/28/96

**BTEX by EPA Method 8020A**

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
<b>MW-2</b>				<b><u>B605233-01</u></b>			<b><u>Water</u></b>	
Benzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Toluene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Ethylbenzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Xylenes (total)	6050413	5/16/96	5/16/96		1.00	ND	ug/l (ppb)	
Surrogate: 4-BFB (PID)	6050413	5/16/96	5/16/96	53.0-136		93.1	%	
<b>MW-3</b>				<b><u>B605233-02</u></b>			<b><u>Water</u></b>	
Benzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Toluene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Ethylbenzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Xylenes (total)	6050413	5/16/96	5/16/96		1.00	ND	ug/l (ppb)	
Surrogate: 4-BFB (PID)	6050413	5/16/96	5/16/96	53.0-136		93.1	%	
<b>MW-4</b>				<b><u>B605233-03</u></b>			<b><u>Water</u></b>	
Benzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Toluene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Ethylbenzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Xylenes (total)	6050413	5/16/96	5/16/96		1.00	ND	ug/l (ppb)	
Surrogate: 4-BFB (PID)	6050413	5/16/96	5/16/96	53.0-136		88.7	%	
<b>Duplicate</b>				<b><u>B605233-04</u></b>			<b><u>Water</u></b>	
Benzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Toluene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Ethylbenzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Xylenes (total)	6050413	5/16/96	5/16/96		1.00	ND	ug/l (ppb)	
Surrogate: 4-BFB (PID)	6050413	5/16/96	5/16/96	53.0-136		91.3	%	
<b>TRIP BLANK</b>				<b><u>B605233-05</u></b>			<b><u>Water</u></b>	
Benzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Toluene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Ethylbenzene	6050413	5/16/96	5/16/96		0.500	ND	ug/l (ppb)	
Xylenes (total)	6050413	5/16/96	5/16/96		1.00	ND	ug/l (ppb)	
Surrogate: 4-BFB (PID)	6050413	5/16/96	5/16/96	53.0-136		91.3	%	

North Creek Analytical, Inc.

\*Refer to end of report for text of notes.

Matthew Essig, Project Manager



Hart Crowser, Inc. - Alaska 2550 Denali Street, Ste 705 Anchorage, AK 99503	Project: Firestation #4 Project Number: A-8397-05 Project Manager: Matt Flynn	Sampled: 5/10/96 Received: 5/14/96 Reported: 5/28/96
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**Diesel Hydrocarbons (C10-C28) by EPA Method 8100 (modified)**

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
<b>MW-2</b>				<b>B605233-01</b>			<b>Water</b>	
Diesel Range Hydrocarbons	6050305	5/15/96	5/17/96		0.250	ND	mg/l (ppm)	
Surrogate: Octacosane	6050305	5/15/96	5/17/96	50.0-150		ND	%	
Surrogate: 2-FBP	6050305	5/15/96	5/17/96	50.0-150		84.9	%	
<b>MW-3</b>				<b>B605233-02</b>			<b>Water</b>	
Diesel Range Hydrocarbons	6050305	5/15/96	5/17/96		0.250	ND	mg/l (ppm)	
Surrogate: Octacosane	6050305	5/15/96	5/17/96	50.0-150		ND	%	
Surrogate: 2-FBP	6050305	5/15/96	5/17/96	50.0-150		83.3	%	
<b>MW-4</b>				<b>B605233-03</b>			<b>Water</b>	
Diesel Range Hydrocarbons	6050305	5/15/96	5/17/96		0.250	ND	mg/l (ppm)	
Surrogate: Octacosane	6050305	5/15/96	5/17/96	50.0-150		ND	%	
Surrogate: 2-FBP	6050305	5/15/96	5/17/96	50.0-150		78.8	%	
<b>Duplicate</b>				<b>B605233-04</b>			<b>Water</b>	
Diesel Range Hydrocarbons	6050305	5/15/96	5/17/96		0.250	0.465	mg/l (ppm)	
Surrogate: Octacosane	6050305	5/15/96	5/17/96	50.0-150		ND	%	
Surrogate: 2-FBP	6050305	5/15/96	5/17/96	50.0-150		93.3	%	



# NORTH CREEK ANALYTICAL

Environmental Laboratory Services

00247

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Hart Crowser, Inc. - Alaska 2550 Denali Street, Ste 705 Anchorage, AK 99503	Project: Firestation #4 Project Number: A-8397-05 Project Manager: Matt Flynn	Sampled: 5/10/96 Received: 5/14/96 Reported: 5/28/96
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### BTEX by EPA Method 8020A Quality Control

Analyte	Date Prepared	Date Analyzed	Spike Level	Sample Result	QC Sample Result	Units	Rec. Limits	Rec. %	RPD Limit	RPD %	Notes*
<b>Batch: 6050413</b>											
<b>Blank</b>											
	<b>6050413-BLK1</b>						<b>Water</b>				
Benzene	5/16/96	5/16/96			ND	ug/l (ppb)					
Toluene	5/16/96	5/16/96			ND	ug/l (ppb)					
Ethylbenzene	5/16/96	5/16/96			ND	ug/l (ppb)					
Xylenes (total)	5/16/96	5/16/96			ND	ug/l (ppb)					
Surrogate: 4-BFB (PID)	5/16/96	5/16/96	16.0		14.1	ug/l (ppb)	53.0-136	88.1			
<b>Matrix Spike</b>											
	<b>6050413-MS1</b>			<b>B605233-02</b>		<b>Water</b>					
Benzene	5/16/96	5/16/96	10.0	ND	7.93	ug/l (ppb)	51.0-135	79.3			
Toluene	5/16/96	5/16/96	10.0	ND	8.66	ug/l (ppb)	72.0-120	86.6			
Ethylbenzene	5/16/96	5/16/96	10.0	ND	9.14	ug/l (ppb)	69.0-129	91.4			
Xylenes (total)	5/16/96	5/16/96	30.0	ND	28.1	ug/l (ppb)	73.0-126	93.7			
Surrogate: 4-BFB (PID)	5/16/96	5/16/96	16.0		17.3	ug/l (ppb)	53.0-136	108			
<b>Matrix Spike Dup</b>											
	<b>6050413-MSD1</b>			<b>B605233-02</b>		<b>Water</b>					
Benzene	5/16/96	5/16/96	10.0	ND	8.36	ug/l (ppb)	51.0-135	83.6	8.00	5.28	
Toluene	5/16/96	5/16/96	10.0	ND	9.41	ug/l (ppb)	72.0-120	94.1	9.00	8.30	
Ethylbenzene	5/16/96	5/16/96	10.0	ND	9.79	ug/l (ppb)	69.0-129	97.9	12.0	6.87	
Xylenes (total)	5/16/96	5/16/96	30.0	ND	30.0	ug/l (ppb)	73.0-126	100	13.0	6.50	
Surrogate: 4-BFB (PID)	5/16/96	5/16/96	16.0		17.3	ug/l (ppb)	53.0-136	108			

  
 Matthew Essig, Project Manager



