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HARTCROWSER

Earth and Environmental Technologies

Hart Crowser, Inc.
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A-8397-05

August 28, 1995

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
May through July 1995
Anchorage Fire Department Station No. 4

Dear Mr. Clark:

This letter report presents the activities and results of groundwater sampling at the Municipality of Anchorage (MOA) Fire Department Station No. 4 (AFD-4) for the period of May 1995 through July 1995. AFD-4 is located at 4350 MacInnes Road in Anchorage, Alaska.

Remediation was undertaken in January 1995 to address floating hydrocarbons detected during the remedial site investigation conducted at this site in September 1994 (Hart Crowser, 1994). Hydrocarbons are being collected from two recovery wells at the site (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 Facility 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 May 22, June 12, July 7, and July 27, 1995 (Appendix A - Field Methods). An additional hydrocarbon thickness measurement was made in MW-1 on July 17,1995. Monitoring wells MW-2, MW-3, and MW-4 were purged and

sampled on July 27, 1995. 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).

In early May 1995, ice in the recovery well risers prevented Petro-trap removal. Some hydrocarbon recovery occurred during mid-May, but by May 22, it was discovered that the Petro-trap hydrocarbon recovery pumps had become completely submerged in water. This resulted in clogging of the hydrophobic filters by which the pumps operate. The pumps were removed and the filters allowed to completely dry. The pumps were reinstalled on July 17, 1995 when the filters had completely dried, and after measurable hydrocarbon had entered recovery well RW-2.

WATER TABLE CONDITIONS

Groundwater elevations in the monitoring wells, in general, rose between April and May 1995 and then declined slowly during June and July 1995 (Figures 2 and 3). With the exception of MW-2, groundwater elevations in the monitoring wells rose during the latter half of July 1995.

The inferred groundwater contours for this site for July 27, 1995, are presented on Figure 1. The groundwater flow direction is inferred to the northeast. Previous groundwater configurations (August and September 1994) showed a somewhat more northerly flow direction. The average hydraulic gradient was 0.016 feet/foot, and is 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. Since April 1995, the thickness of the hydrocarbon layer has decreased from 0.58 feet to 0.39 feet on July 27, 1995.

In early May 1995, 3 ounces of product were recovered from RW-2 after ice on the well riser had sufficiently thawed to allow Petro-trap removal. After submergence and clogging of the hydrophobic pump filters, and due to the thinned hydrocarbon layer over this period, no further hydrocarbon recovery was recorded during this time.

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 BTEX constituents were detected in any of the monitoring wells sampled. The DRO results (Table 2b) ranged from 0.27 mg/L in MW-3 to 0.16 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 as outlined in the Hart Crowser Quality Assurance Program Plan (QAPP). All data is accepted for the purposes of this report.

CONCLUSIONS

Groundwater elevations, which normally decline during the months of June and July, remained high during this period. It appears that the hydrocarbon thickness may have equilibrated over this period because the thickness in MW-1 has been consistent since May 1995, with little or no hydrocarbon removed (Table 1). This thickness more likely represents the true saturated hydrocarbon thickness in this area.

An estimate of the volume of floating hydrocarbon in the subsurface of 500 to 1,000 gallons was made in our June 1995 report for this site (Hart Crowser, 1995). The hydrocarbon thicknesses measured in MW-1 in January were utilized to make the volume calculation. Using the hydrocarbon thicknesses in MW-1 for the May through July period, and using the assumptions stated in the June 1995 report (area, porosity, etc.), the volume of free-phase floating hydrocarbon in the subsurface is estimated to be on the order of 60 to 125 gallons. Since we believe that the hydrocarbon thickness observed in MW-1 over the May through July period is more representative of the actual hydrocarbon thickness, we feel that the hydrocarbon volume estimate based on the summer thickness measurements provides a more realistic estimate than the hydrocarbon volume estimate made utilizing the January thickness measurements.

Since August is generally a month of high precipitation in Anchorage, we do not anticipate that the groundwater elevations at the site will fall significantly until late September or October, and that the thicker hydrocarbon accumulations observed within recovery wells with falling groundwater elevations will not be observed until October or November. Hydrocarbons can be slowly recovered during the next two months; however, the rate of hydrocarbon recovery with the Petro-trap system is proportional to the product thickness in the well.

Dissolved BTEX constituents do not appear to be migrating from the former excavation area. DRO concentrations were detected in the monitoring wells. MW-2 and MW-4 had been sampled for DRO (April 1995) and no DRO concentrations were detected. However, the detection limit for April DRO analyses was 0.25 mg/L (Table 2b). The DRO concentrations detected in July were still less than 0.25 mg/L but the laboratory detection limit has reduced to 0.1 mg/L. Since all groundwater DRO concentrations were below 0.5 mg/L, and no sheen or odor was observed in the purge water, these concentrations should not be of concern. We recommend that the DRO sampling be continued as part of the quarterly monitoring program to monitor the quantity and extent of dissolved DRO in the groundwater.

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 that 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.

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 Mark Madden or me at (907)276-7475.

Sincerely,

HART CROWSER, INC.

Herminio R. Muniz
Sr. Project Hydrogeologist

for
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 Elevation on July 27, 1995
	Figure 2	Monitoring Well Hydrographs
	Figure 3	Hydrocarbon Thickness and Groundwater Elevation in MW-1
	Appendix A	Field Explorations Methods and Analyses
	Appendix B	Quality Control Narrative and Laboratory Reports

REFERENCES

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

Hart Crowser, 1995; Corrective Action Start up Report, Anchorage Fire Department Station No. 4, Municipality of Anchorage, Anchorage, Alaska; 7pp.

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

Date	Depth to Hydrocarbon (Feet)	Depth to Groundwater (Feet)	Groundwater Elevation (Feet) {1} {2}	Hydrocarbon Thickness (Feet)
8/1/94	Not Observed	10.30	89.07	0.00
8/10/94	9.73	10.58	89.50	0.85
9/8/94	9.99	11.86	89.08	1.87
1/24/95	10.69	13.43	88.24	2.74
1/27/95	10.77	13.33	88.19	2.56
2/3/95	10.99	12.19	88.19	1.20
2/10/95	10.97	12.15	88.21	1.18
2/15/95	10.85	11.97	88.34	1.12
2/24/95	10.88	12.09	88.30	1.21
3/9/95	11.03	12.33	88.13	1.30
3/27/95	11.20	12.56	87.95	1.36
4/21/95	9.34	9.92	89.94	0.58
5/22/95	7.86	8.19	91.46	0.33
6/12/95	8.29	8.60	91.03	0.31
7/7/95	8.83	9.19	90.48	0.36
7/17/95	9.02	9.35	90.30	0.33
7/27/95	8.57	8.96	90.74	0.39
8/3/95	8.08	8.44	91.23	0.36

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
Anchorage, Alaska

Monitoring Well	Benzene (mg/L) - EPA 5030/8020			
	8/1/94	1/25/95	4/21/95	7/27/95
MW-1	**2.3**	N/S {2}	N/S	N/S
Field Duplicate	**2.2**			
MW-2	ND(0.0005) {1}	N/S{3}	ND(0.0005)	ND(0.0005)
Field Duplicate			ND(0.0005)	ND(0.0005)
MW-3	ND(0.0005)	ND(0.0005)	N/S{4}	ND(0.0005)
Field Duplicate		ND(0.0005)		
MW-4	**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)

Monitoring Well	Total BTEX (mg/L) - EPA 5030/8020			
	8/1/94	1/25/95	4/21/95	7/27/95
MW-1	**40**	N/S	N/S	N/S
Field Duplicate	**38**			
MW-2	**0.003**	N/S	ND	ND
Field Duplicate			ND	ND
MW-3	**0.006**	ND	N/S	ND
Field Duplicate		ND		
MW-4	**0.004**	ND	ND	ND
Trip Blank	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
MW-1	N/S {1}	N/S {1}
MW-2	ND(0.25)	0.17
Field Duplicate	ND(0.25)	0.17
MW-3	N/S {2}	0.27
MW-4	ND(0.25)	0.16

NOTES:

ND(0.0005) - Not Detected (Detection Limit)

{1} N/S - Not sampled due to floating hydrocarbon in well.

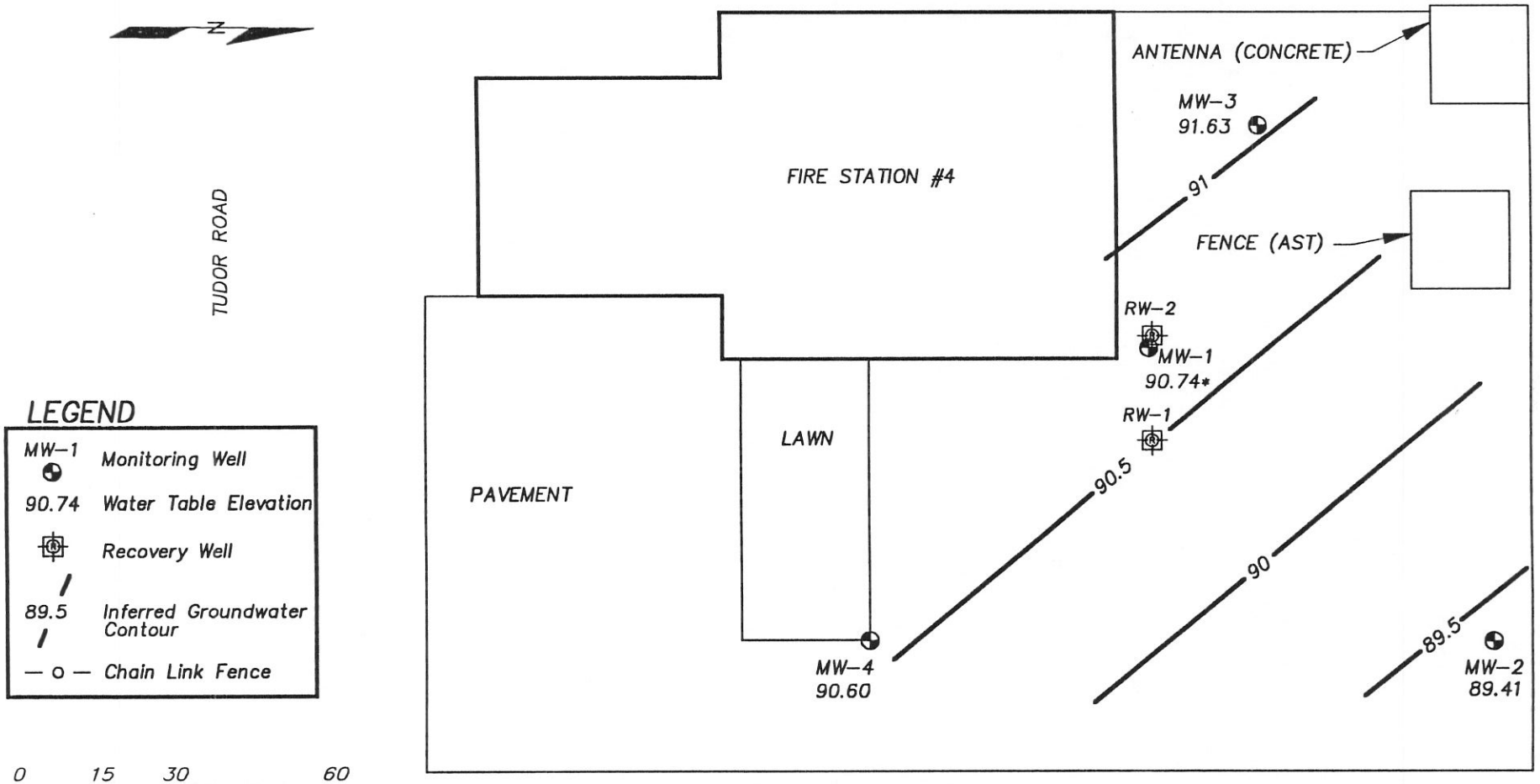
{2} N/S - Not sampled due to ice blockage in well riser.

H20DRO.XLS

Site Plan and Water Table Elevations on July 27, 1995.

AFD-4

Anchorage, Alaska



* Elevation corrected for floating product.

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FIGURE 1

REF. NO: \ACAD-DWG\8397\WL8-95

Monitoring Well Hydrographs

AFD-4

Anchorage, Alaska

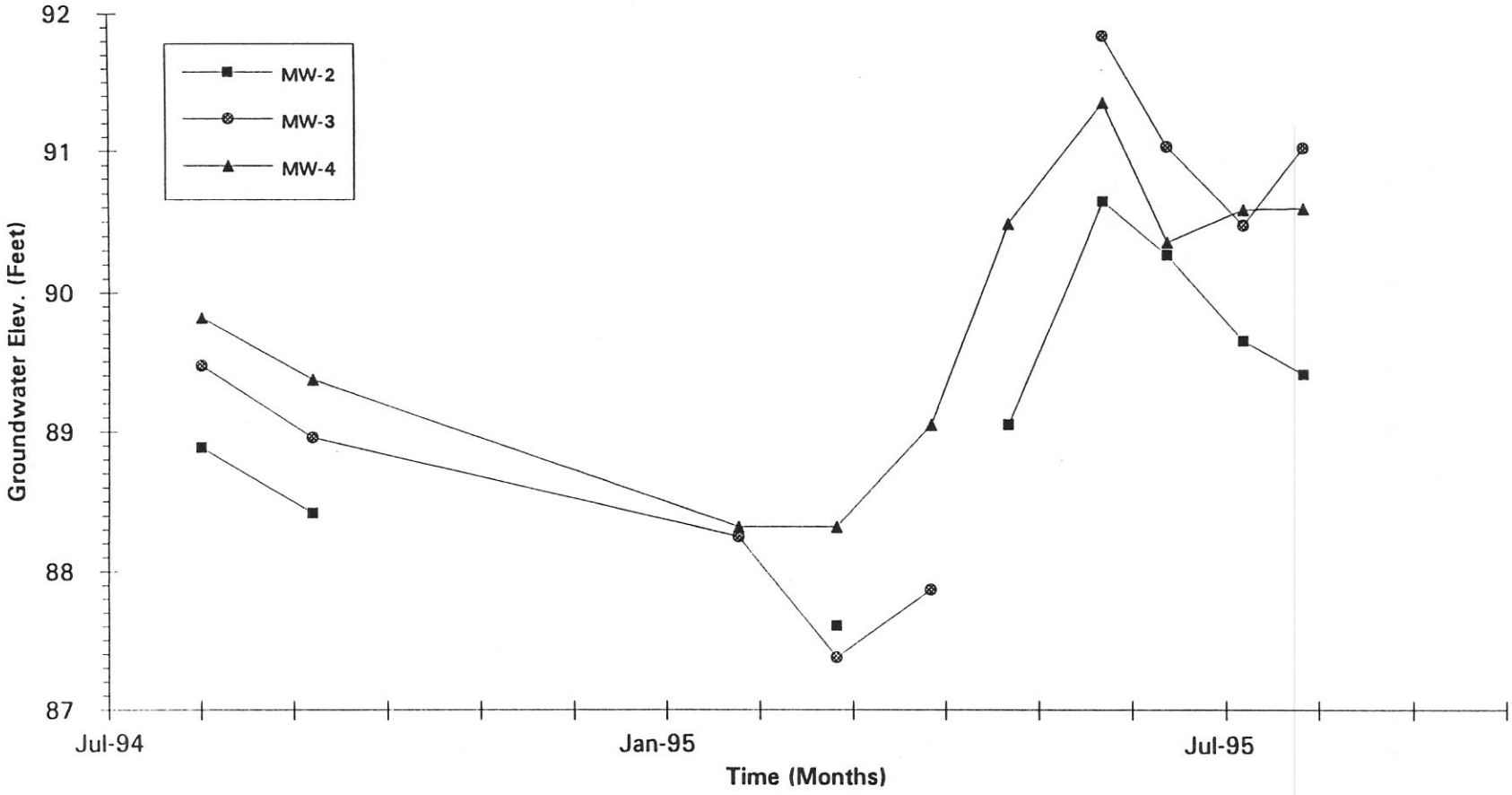

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FIGURE 2

Hydrocarbon Thickness and Groundwater Elevation in MW-1

AFD-4

Anchorage, Alaska

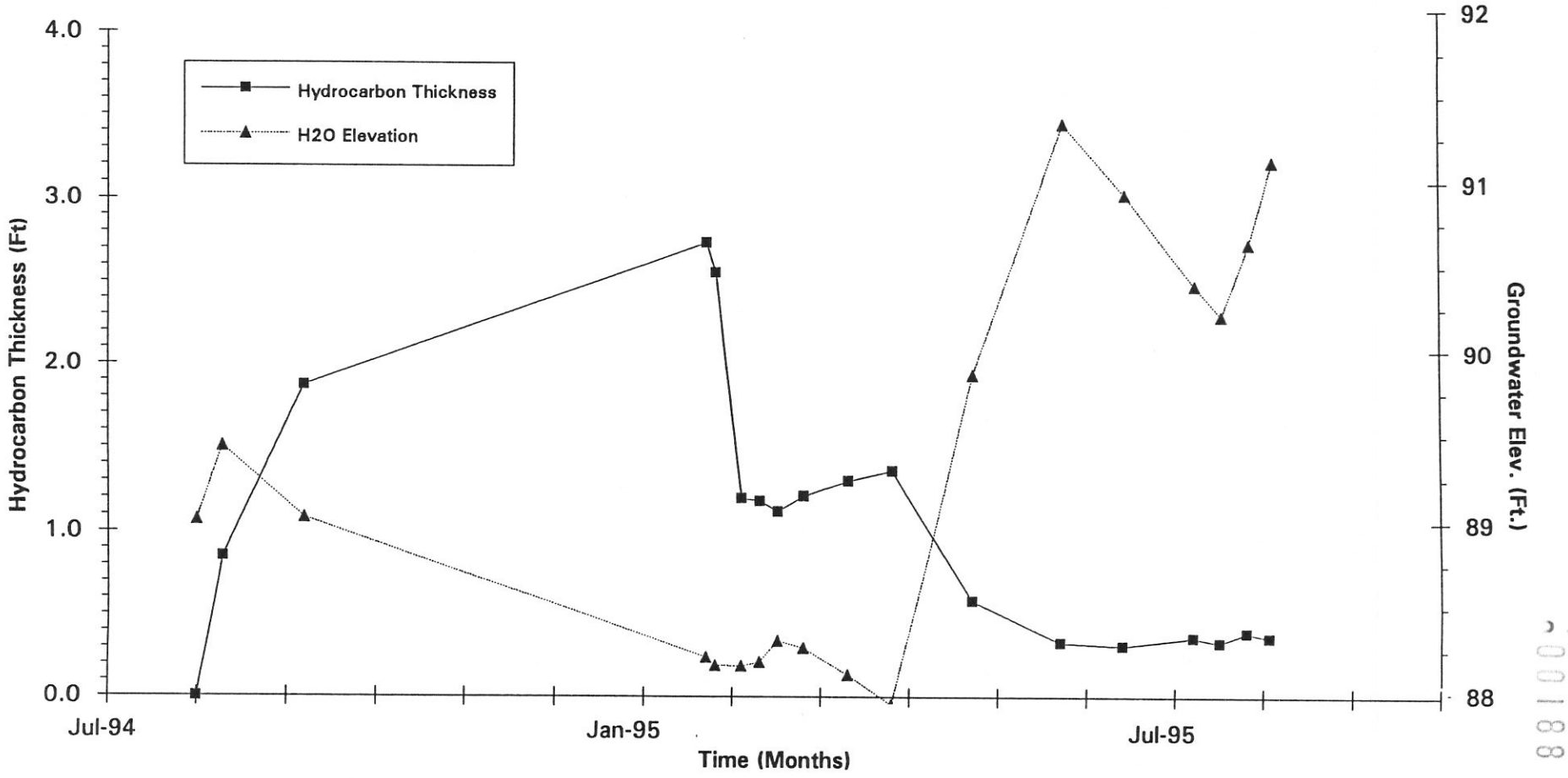

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FIGURE 3

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 ± 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 labelled and placed in a cooler with "blue-ice" for shipment to North Creek Analytical 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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APPENDIX B
QUALITY CONTROL NARRATIVE AND LABORATORY REPORTS

APPENDIX B
QUALITY CONTROL NARRATIVE

All field and laboratory quality control criteria 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.

NORTH CREEK ANALYTICAL

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

Hart Crowser, Anchorage	Project Name:	Firestation #4	
2550 Denali Street, #705	Client Project :	#A-8397-05	
Anchorage, AK 99503			Received: Jul 28, 1995
Attention: Nino Muniz	NCA Project #:	B507486	Reported: Aug 4, 1995

PROJECT SUMMARY PAGE

Laboratory Sample Number	Sample Description	Sample Matrix	Date Sampled
B507486-01	MW-2	Water	7/27/95
B507486-02	MW-3	Water	7/27/95
B507486-03	MW-4	Water	7/27/95
B507486-04	DUPLICATE	Water	7/27/95
B507486-05	TRIP BLANK	Water	7/27/95

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.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig for
Project Manager

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000197

Hart Crowser, Anchorage	Client Project ID:	Firestation #4	Sampled:	Jul 27, 1995
2550 Denali Street, #705	Sample Matrix:	Water	Received:	Jul 28, 1995
Anchorage, AK 99503	Analysis Method:	EPA 8020	Analyzed:	Aug 1, 1995
Attention: Nino Muniz	First Sample #:	B507486-01	Reported:	Aug 4, 1995

BTEX DISTINCTION

Sample Number	Sample Description	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)	Surrogate Recovery %
B507486-01	MW-2	N.D.	N.D.	N.D.	N.D.	97
B507486-02	MW-3	N.D.	N.D.	N.D.	N.D.	93
B507486-03	MW-4	N.D.	N.D.	N.D.	N.D.	96
B507486-04	DUPLICATE	N.D.	N.D.	N.D.	N.D.	95
B507486-05	TRIP BLANK	N.D.	N.D.	N.D.	N.D.	90
BLK080195	Method Blank	N.D.	N.D.	N.D.	N.D.	94
Reporting Limits:		**0.50**	**0.50**	**0.50**	**1.0**	

4-Bromofluorobenzene surrogate recovery control limits are 59 - 144 %.
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

Hart Crowser, Anchorage	Client Project ID:	Firestation #4	Analyst: B. Christlieb, F. Shino
2550 Denali Street, #705	Sample Matrix:	Water	
Anchorage, AK 99503	Analysis Method:	EPA 8020	
Attention: Nino Muniz	Units:	µg/L (ppb)	Analyzed: Aug 1, 1995
	QC Sample #:	B507382-03	Reported: Aug 4, 1995

MATRIX SPIKE QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Sample Result:	2.9	N.D.	N.D.	N.D.
Spike Conc. Added:	10.0	10.0	10.0	30.0
Spike Result:	13.9	11.1	11.2	34.6
Spike % Recovery:	110%	111%	112%	115%
Spike Dup. Result:	13.9	11.0	10.9	34.1
Spike Duplicate % Recovery:	110%	110%	109%	114%
Upper Control Limit %:	115	116	122	122
Lower Control Limit %:	82	81	85	85
Relative % Difference:	0.0%	<1.0%	2.7%	1.5%
Maximum RPD:	16	16	16	17

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

% Recovery: $\frac{\text{Spike Result - Sample Result}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Spike Result - Spike Dup. Result}}{\text{(Spike Result + Spike Dup. Result) / 2}} \times 100$

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Hart Crowser, Anchorage	Client Project ID:	Firestation #4	Sampled:	Jul 27, 1995
2550 Denali Street, #705	Matrix Descript:	Water	Received:	Jul 28, 1995
Anchorage, AK 99503	Analysis Method:	EPA 8100 Modified	Extracted:	Jul 31, 1995
Attention: Nino Muniz	First Sample #:	B507486-01	Analyzed:	Aug 3, 1995
			Reported:	Aug 4, 1995

EXTRACTABLE PETROLEUM HYDROCARBONS - DIESEL RANGE ORGANICS

Sample Number	Sample Description	Sample Result mg/L (ppm)	Surrogate Recovery %
B507486-01	MW-2	0.17	87
B507486-02	MW-3	0.27	79
B507486-03	MW-4	0.16	81
B507486-04	DUPLICATE	0.17	76
BLK073195	Method Blank	N.D.	90

Reporting Limit:	**0.10**

Extractable Petroleum Hydrocarbons are quantitated as Diesel Range Organics (C10 - C28). Surrogate recovery reported is for 2-Fluorobiphenyl.
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

Hart Crowser, Anchorage	Client Project ID:	Firestation #4	Analyst: T. Fitzgibbon
2550 Denali Street, #705	Sample Matrix:	Water	
Anchorage, AK 99503	Analysis Method:	EPA 8100 Modified	Extracted: Jul 31, 1995
Attention: Nino Muniz	Units:	mg/L (ppm)	Analyzed: Aug 3, 1995
	QC Sample #:	BLK073195	Reported: Aug 4, 1995

BLANK SPIKE QUALITY CONTROL DATA REPORT

ANALYTE	Diesel Fuel
Sample Result:	N.D.
Spike Conc. Added:	2.0
Spike Result:	1.4
Spike % Recovery:	70%, Q-1
Spike Dup. Result:	1.4
Spike Duplicate % Recovery:	70%, Q-1
Upper Control Limit %:	121
Lower Control Limit %:	73
Relative % Difference:	0.0%
Maximum RPD:	14

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

Please Note:
Q-1 = The Spike Recovery for this QC sample is outside of NCA established control limits.

Sample Custody Record

DATE 7/27/95 PAGE 1 OF 1

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Hart Crowser, Inc.
2550 Denali Street, Suite 705
Anchorage, Alaska 99503

JOB NUMBER A-8397-05 LAB NUMBER

PROJECT MANAGER NINO MUNIZ

PROJECT NAME Firestation #4

SAMPLED BY: MATT FLYNN

LAB NO.	SAMPLE	TIME	STATION	MATRIX	TESTING: BTEX 8020	TESTING: DRO 8100	NO. OF CONTAINERS	OBSERVATIONS / COMMENTS / COMPOSITING INSTRUCTIONS
	MW-2	10:00A		Water	✓	✓	3	B507486-01
	MW-3	10:35A		" "	✓	✓	3	02
	MW-4	11:05A		" "	✓	✓	3	03
	Duplicate			" "	✓	✓	3	04
	Trip Blank			" "	✓		2	05

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE: Matt Flynn	7/27/95	SIGNATURE: Jeff Callicrate	7/28/95
PRINTED NAME: MATT FLYNN	TIME	PRINTED NAME: JEFF CALLICRATE	TIME
COMPANY: HC-ANC	12:00P	COMPANY: NCA	1000
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE		SIGNATURE	
PRINTED NAME	TIME	PRINTED NAME	TIME
COMPANY		COMPANY	

TOTAL NUMBER OF CONTAINERS: 14

METHOD OF SHIPMENT: Fed Ex

SPECIAL SHIPMENT / HANDLING OR STORAGE REQUIREMENTS: No charge on DRO per Matt Bessig.

Results to NINO MUNIZ

DISTRIBUTION:

1. PROVIDE WHITE AND YELLOW COPIES TO LABORATORY
2. RETURN PINK COPY TO PROJECT MANAGER
3. LABORATORY TO FILL IN SAMPLE NUMBER AND SIGN FOR RECEIPT
4. LABORATORY TO RETURN WHITE COPY TO HART CROWSER

10200