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December 28, 2000

Boston

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Mr. Ben Moyer
Frosty Fuels, Inc.
4700 West International Airport Road
Anchorage, Alaska 99502

DEPT. OF ENVIRONMENTAL CONSERVATION

Chicago

Re: Groundwater Quality Sampling Results
November 2000
Cold Bay Tank Farm
A-8474-01

Denver

Dear Mr. Moyer:

Fairbanks

This letter report presents the groundwater elevations, floating hydrocarbon thickness measurements, and the groundwater quality sampling results for the above-referenced project. The sampling was performed to monitor groundwater quality along the periphery of a zone of free-phase liquid hydrocarbon present in the subsurface.

Jersey City

WORK PERFORMED

A Hart Crowser representative was present at the Frosty Fuels, Inc. (FFI), Cold Bay tank farm on November 13 and 14, 2000. Groundwater levels were measured in monitoring wells MW-3, MW-3A, MW-4, MW-5, MW-6, and MW-7, and recovery well RW-2 (Figure 1; Attachment 1 - Field Methods). The wells were then purged and sampled except for MW-4 that bailed dry and did not recover after two days, and RW-2, that contained a measurable layer of floating hydrocarbons (0.02 feet). A duplicate sample was collected from MW-3A and labeled MW-3AD. Neither sheen nor odor were observed in the purge water of the wells sampled. Laboratory samples were submitted to CT&E Environmental Services, Inc. (CT&E), of Anchorage, Alaska, for analyses of benzene, toluene, ethylbenzene, and xylenes (BTEX) by United States Environmental Protection Agency (EPA) Method 8021B. Floating hydrocarbon thickness and hydrocarbon recovery measurements were provided by FFI.

Juneau

Long Beach

Portland

Seattle



GROUNDWATER TABLE CONDITIONS

Groundwater elevations for wells not containing floating hydrocarbons are presented in Table 1. The November 2000 groundwater levels in measured monitoring wells were, on average, 1.9 feet higher than in May 2000, and 2.1 feet higher than in September 1999.

Figure 1 presents the inferred groundwater contours for the site. (The reading from MW-3A was not used as it is from a deeper aquifer). As with past water table configurations, the groundwater flow direction is to the southeast. The average hydraulic gradient is calculated as 0.006 feet/foot.

FLOATING HYDROCARBON THICKNESSES

Floating hydrocarbon thicknesses were measured in monitoring wells MW-1, MW-1A, and MW-2, and in recovery wells RW-1, RW-1A, and RW3 by FFI personnel. Since the previous reporting period, measurements were made on June 8, 16, 23, and 30; July 28; August 19 and 25; September 29; October 10, 16, 18, and 30; November 2, 6, 9, 13, 16, 22, and 30; and December 5, 2000. Selected floating hydrocarbons thickness data since May 1993 is presented in Table 2.

— is there more data?

Floating hydrocarbon recovery was accomplished over the monitoring period using product recovery pumps and by hand pumping by FFI personnel. Table 3 presents the volume of product recovered from the recovery wells. Between May and December 2000, approximately 27 gallons of product was recovered. Approximately 254 gallons has been recovered since September 1998. It should be noted that hydrocarbon thicknesses have thinned considerably in the fall of this year and, subsequently, recovery quantities have been significantly reduced.

LABORATORY RESULTS

Analytical results for groundwater samples collected from the monitoring wells are summarized in Tables 4a and 4b and laboratory reports are presented in Attachment 2. BTEX constituents were not detected in any of the wells sampled.



Mr. Ben Moyer
December 28, 2000

A-8474-01
Page 3

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 FFI. This letter report is not meant to represent a legal opinion, and no other warranty, express or implied, is made.

We trust this letter report meets your needs. Questions regarding the field work and this letter report, the presentation of the information, or 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, C.P.G.
Associate Hydrogeologist

hrm/tlm

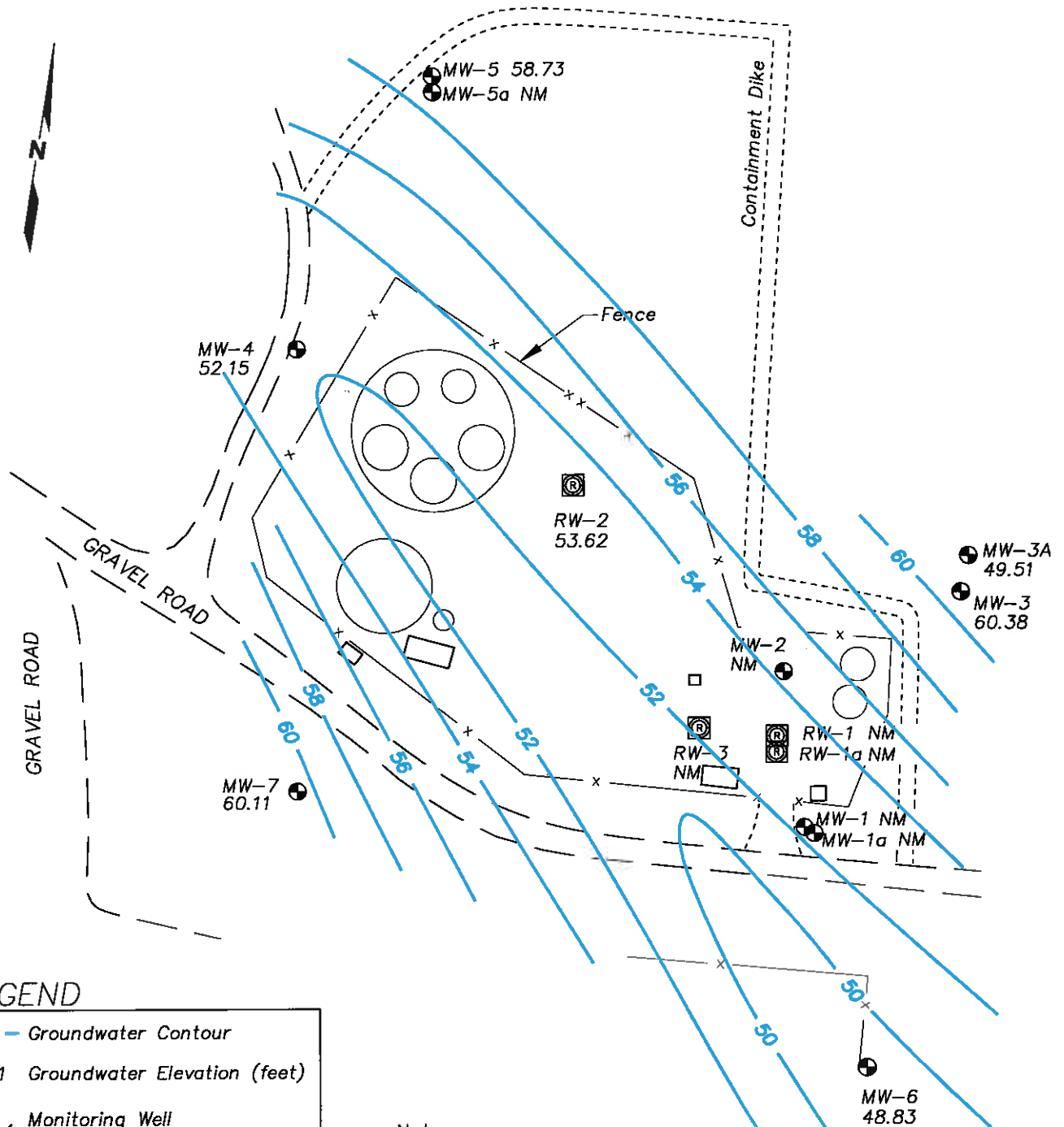
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Attachments:	Table 1	Groundwater Table Elevations for Wells Without Floating Hydrocarbons
	Table 2	Depth to Product and Product Thickness
	Table 3	Floating Hydrocarbon Recovery
	Table 4a	Groundwater Quality Data for Benzene - May 1995 through November 2000
	Table 4b	Groundwater Quality Data for Total BTEX - May 1995 through November 2000
	Figure 1	Groundwater Elevations on 11/15/00
	Attachment 1	Field Methods
	Attachment 2	Data Quality Review and Laboratory Reports

Groundwater Elevations on 11/15/00

FFI Cold Bay Tank Farm

Cold Bay, Alaska



LEGEND

	Groundwater Contour
60.11	Groundwater Elevation (feet)
	Monitoring Well
MW-4	
	Recovery Well
RW-2	
	Utility Structure
	Fuel Storage Tank
NM	Not Measured

Note:

1. Prepared from base map provided by Frosty Fuel Company.



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Figure 1

**TABLE 1 - GROUNDWATER TABLE ELEVATIONS FOR WELLS WITHOUT FLOATING HYDROCARBONS
FFI COLD BAY TANK FARM
COLD BAY, ALASKA**

Date	MW-3 Water Table Elevation ¹ (feet)	MW-3A Water Table Elevation (feet)	MW-4 Water Table Elevation (feet)	MW-5 ² Water Table Elevation (feet)	MW-6 ² Water Table Elevation (feet)	MW-7 ² Water Table Elevation (feet)	RW-2 ² Water Table Elevation (feet)
3/23/92	55.66		51.76				
11/17/92	46.68		48.06				
12/28/92	58.09		51.24				
2/9/93	55.45		55.12				
4/19/93	54.09		52.90	54.03	49.48	55.14	51.57
4/30/93	56.43		53.49	55.53	49.42	58.13	52.44
7/27/93	50.43		50.33	51.73	48.13	52.27	49.31
12/15/93	57.59		56.42	57.49	51.40	58.38	54.20
2/23/94	56.05		56.00	56.30	51.85	58.01	53.80
5/10/94	55.39		54.52	55.60	50.71	55.88	52.90
8/17/94	50.92		50.36	51.47	48.01	53.45	49.48
12/15/94	56.69		53.17	55.55	49.51	59.22	52.46
2/8/95	56.11		53.66	55.56	50.14	52.26	52.41
5/1/95	59.81		56.06	58.95	49.46	57.60	54.33
8/24/95	48.61		49.00	50.36	46.90	53.78	48.02
11/29/95	54.31		51.60	53.78	47.89	53.81	50.52
5/23/96	51.77		51.77	53.90	49.23	52.27	51.04
11/20/96	56.58		50.88	53.30	47.64	58.33	47.85
5/7/96	46.44		Dry	49.02	45.92	Dry	46.46
12/16/97	54.83	46.56	Dry	52.52	46.77	54.17	49.51
6/18/98	55.53	48.32	53.46	55.11	45.77	57.10	51.96
11/18/98	56.51	50.15	Dry	57.37	49.80	60.26	56.26
5/26/99	57.57	Dry	55.72	Dry	51.10	Dry	53.68
9/23/99	49.85	45.44	Dry	51.43	47.30	56.88	48.53
5/31/00	58.20	49.54	Dry	56.07	Dry	Dry	52.88
11/14/00	60.38	49.51	52.15	58.73	48.83	60.11	53.62

Hart Crowser

A-8474-01

cbw/als

Notes:
¹Measuring point elevations were resurveyed on 4/18/93 and 7/28/93 assuming an elevation of 62.89 feet for the measuring point of MW-3.
²Wells MW-5 to MW-7 and RW-2 were installed between 4/15/93 and 4/17/93.
³Water elevation in RW-2 corrected for floating product using a product specific gravity of 0.8.

**TABLE 2 - DEPTH TO PRODUCT AND PRODUCT THICKNESS
VARIOUS DATES 1992 - 2000
FFI COLD BAY TANK FARM
COLD BAY, ALASKA**

Date	MW-1		MW-1a		MW-2	
	Product Thickness (feet)	Depth to Product (feet)	Product Thickness (feet)	Depth to Product (feet)	Product Thickness (feet)	Depth to Product (feet)
11/17/1992	6.30	18.31			0.00	12.26
5/1/1993	2.60	14.37	0.03	13.24	0.00	—
6/1/1994	7.06	7.59	0.46	11.91	0.04	5.40
11/8/1994	7.35	14.26	4.35	13.08	0.17	7.49
5/6/1995	1.90	13.38	0.06	12.61	0.01	2.10
11/10/1995	0.69	16.74	1.24	14.09	0.11	5.23
6/4/1996	1.47	16.97	0.15	14.29	0.00	—
9/20/1996	2.98	16.35	0.01	14.93	0.15	8.21
6/26/1997	5.60	18.37	5.68	17.96	1.34	13.66
10/7/1997	5.95	16.94	5.74	17.34	1.10	10.05
5/8/1998	3.78	15.12	0.35	13.15	0.00	—
11/19/1998	9.97	12.30	0.76	9.87	0.00	—
2/18/1999	3.80	17.57	1.26	11.41	0.00	—
5/14/1999	7.90	13.08	0.01	11.14	0.00	—
8/24/1999	9.70	14.94	1.70	13.99	0.25	9.06
11/10/1999	4.35	16.17	1.65	15.41	0.38	10.23
1/19/2000	4.45	17.05	4.13	16.91	N/M	N/M
2/25/2000	5.75	13.14	0.70	10.99	7.55	—
3/2/2000	4.44	13.00	0.40	10.64	6.15	—
3/15/2000	5.95	11.12	3.68	8.94	5.17	—
3/23/2000	1.43	11.61	1.61	8.03	4.85	—
3/30/2000	4.35	11.54	1.11	9.28	1.12	2.49
5/11/2000	6.07	11.70	1.29	10.22	0.06	4.43
5/25/2000	5.54	12.31	1.38	11.37	0.01	4.93
6/8/2000	6.30	11.89	0.60	10.39	0.01	3.82
6/16/2000	6.60	11.89	0.50	10.14	0.01	3.51
6/23/2000	4.90	11.69	0.40	9.79	0.03	3.56
6/30/2000	4.90	12.59	0.90	10.29	0.10	4.26
7/28/2000	3.80	13.89	0.30	12.89	0.15	5.91
8/19/2000	2.75	14.59	0.35	13.34	0.00	—
8/25/2000	2.20	15.04	0.35	13.89	0.00	—
9/29/2000	3.10	15.53	0.37	14.32	0.00	—
10/10/2000	2.40	15.59	0.40	14.39	0.00	—
10/16/2000	2.11	15.01	0.31	13.49	0.00	—
10/18/2000	2.34	14.71	0.09	12.97	0.00	—
10/30/2000	1.60	13.79	0.10	11.09	0.00	—
11/2/2000	0.05	13.79	0.10	11.09	0.00	—
11/6/2000	0.55	13.49	0.05	10.51	0.00	—
11/9/2000	0.35	13.29	0.10	10.42	0.00	—
11/13/2000	0.35	12.59	0.10	9.29	0.00	—
11/16/2000	0.30	11.89	0.12	8.67	0.00	—
11/22/2000	0.27	11.02	0.11	7.90		
11/30/2000	0.20	11.49	0.06	8.64		
12/5/2000	0.30	10.49	0.08	7.71		

TABLE 2 - DEPTH TO PRODUCT AND PRODUCT THICKNESS (Continued)

Date	RW-1		RW-1a		RW-3	
	Product Thickness (feet)	Depth to Product (feet)	Product Thickness (feet)	Depth to Product (feet)	Product Thickness (feet)	Depth to Product (feet)
5/1/1993	11.59	9.67	0.01	8.68	11.19	9.28
6/1/1994	0.03	10.74	9.62	—	0.84	11.41
11/8/1994	5.90	10.13	9.64	7.84	5.98	10.73
5/6/1995	7.57	7.52	3.16	4.37	0.15	13.73
11/10/1995	0.75	11.72	3.51	8.84	2.38	12.64
6/4/1996	0.55	11.90	0.85	10.29	0.48	13.05
9/20/1996	N/A(1)	N/A(1)	1.52	10.79	N/A(1)	N/A(1)
6/26/1997	N/A(1)	N/A(1)	3.70	14.15	N/A(1)	N/A(1)
10/7/1997	N/A(1)	N/A(1)	3.80	10.19	N/A(1)	N/A(1)
5/8/1998	N/A(1)	N/A(1)	0.30	6.39	N/A(1)	N/A(1)
11/19/1998	0.43	8.75	1.04	3.94	N/A(1)	N/A(1)
2/18/1999	0.50	9.20	0.44	6.52	N/A(1)	N/A(1)
5/14/1999	N/A(1)	N/A(1)	0.01	4.21	N/A(1)	N/A(1)
8/24/1999	N/A(1)	N/A(1)	0.01	10.03	4.65	11.68
11/10/1999	0.02	13.65	0.22	10.92	5.24	13.87
12/2/1999	0.53	12.22	0.32	8.57	5.75	12.43
1/19/2000	0.89	14.71	0.25	12.99	N/A(1)	N/A(1)
2/25/2000	1.15	10.10	0.05	5.94	N/A(1)	N/A(1)
3/2/2000	1.23	9.18	0.02	5.04	N/A(1)	N/A(1)
3/15/2000	1.57	6.68	0.04	3.10	11.72	7.26
3/23/2000	1.10	7.90	0.20	2.74	6.92	7.83
3/30/2000	1.17	8.28	0.15	4.09	1.60	9.58
5/11/2000	1.05	9.18	0.25	5.32	7.67	8.64
5/25/2000	1.02	9.76	0.14	6.02	7.06	9.45
6/8/2000	1.12	9.30	0.05	4.74	7.75	9.18
6/16/2000	1.00	9.30	0.05	4.54	8.80	8.83
6/23/2000	1.00	9.00	0.05	4.04	3.00	9.83
6/30/2000	1.10	9.60	0.05	4.99	1.60	10.03
7/28/2000	1.05	10.95	0.10	7.64	5.40	10.73
8/19/2000	1.05	11.40	0.20	8.04	1.40	12.03
8/25/2000	0.45	12.00	0.20	8.84	1.40	12.43
9/29/2000	0.41	12.37	0.15	9.16	4.39	12.66
10/10/2000	0.44	12.41	0.17	9.57	1.95	12.93
10/16/2000	0.35	11.82	0.15	8.46	1.05	12.66
10/18/2000	0.38	11.55	0.14	7.27	0.53	12.61
10/30/2000	0.45	10.45	0.05	4.84	1.65	11.28
11/2/2000	0.43	10.22	0.00	—	0.70	11.23
11/6/2000	0.41	10.10	0.00	—	0.73	11.05
11/9/2000	0.36	9.84	0.00	—	0.55	10.83
11/13/2000	0.40	9.35	0.00	—	0.78	10.35
11/16/2000	0.44	8.81	0.00	—	0.47	9.88
11/22/2000	0.39	8.22	0.11	2.61	1.22	8.91
11/30/2000	0.35	8.30	0.06	3.58	0.78	8.85
12/5/2000	0.40	7.65	0.15	2.54	0.57	8.26

**TABLE 3 - FLOATING HYDROCARBON RECOVERY
FFI COLD BAY TANK FARM
COLD BAY, ALASKA**

Date	Inches Recovered per Event ¹	Gallons ² Recovered per Event	Total Recovery in Gallons
9/10/98	21.8	34.8	34.8
10/14/98	8.6	13.8	48.6
10/29/98	4.5	7.2	55.8
11/12/98	3.3	5.3	61.1
11/20/98	2.2	3.5	64.6
2/25/99	11.1	17.8	82.4
4/16/99	4.9	7.8	90.2
4/29/99	4.1	6.6	96.8
5/14/99	3.1	5.0	101.8
5/21/99	1.5	2.4	104.2
6/5/99	3.5	5.6	109.8
6/23/99	3.0	4.8	114.6
8/5/99	0.8	1.2	115.8
8/24/99	2.8	4.4	120.2
8/25/99	3.5	5.6	125.8
8/27/99	0.8	1.2	127.0
9/24/99	3.6	5.8	132.8
10/1/99	0.6	1.0	133.8
10/8/99	1.3	2.0	135.8
10/15/99	2.1	3.4	139.2
11/10/99	4.6	7.4	146.6
12/2/99	13.8	22.0	168.6
1/19/00	6.8	10.8	179.4
2/25/00	12.8	20.4	199.8
3/2/00	1.0	1.6	201.4
3/15/00	5.3	8.4	209.8
3/23/00	3.0	4.8	214.6
3/30/00	1.0	1.6	216.2
5/11/00	4.1	6.6	222.8
5/25/00	2.8	4.4	227.2
6/16/00	3.0	4.8	232.0
6/23/00	1.3	2.0	234.0
6/30/00	0.9	1.4	235.4
7/28/00	2.3	3.6	239.0
8/11/00	1.5	2.4	241.4
8/18/00	1.4	2.2	243.6
8/25/00	0.4	0.6	244.2
9/29/00	2.6	4.2	248.4
10/10/00	1.0	1.6	250.0
10/16/00	0.9	1.4	251.4
10/18/00	0.4	0.6	252.0
10/30/00	0.8	1.2	253.2
11/2/00	0.1	0.2	253.4
11/6/00	0.1	0.2	253.6
11/9/00	0.1	0.2	253.8
11/13/00	0.1	0.1	253.9

Notes:

¹Total recovery from MW-1, RW-1 and RW-3

²1 inch recovery in drum equals 1.6 gallons.

Hart Crowser

A-8474-01

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TABLE 4a - GROUNDWATER QUALITY DATA FOR BENZENE - MAY 1995 THROUGH NOVEMBER 2000
FBI COLD BAY TANK FARM

MONITORING WELL	Benzene in mg/L									
	05/01/95	08/24/95	11/29/95	05/23/96	11/25/96	05/07/97	12/16/97	06/18/98	11/18/98	05/26/99
MW-3	0.0005U ¹	0.0005U	0.0005U	0.0005U	0.0005U	0.001U	0.001U	0.001U	0.001U	0.0005U
MW-3A	---	---	---	---	---	---	0.001U	0.001U	0.0054	N/S ²
MW-4	0.0005U	N/S ²	0.0005U	0.0005U	0.0005U	N/S ²	N/S ²	0.001U	N/S ²	0.0005U
MW-5	0.0005U	0.0005U	0.0005U	0.0005U	0.0005U	0.001U	0.001U	0.001U	0.001U	N/S ²
MW-5A	0.0005U	0.0005U	0.0005U	0.0005U	0.0005U	0.001U	N/S ⁴	N/S ⁴	N/S ⁴	N/S ⁴
MW-6	0.0005U	0.0005U	0.0005U	0.0005U	0.0005U	0.001U	0.001U	0.001U	0.001U	0.0005U
Field Duplicate	0.0005U	0.0005U	0.0005U	0.0005U	0.0005U	0.001U	0.001U	0.001U	0.001U	0.0005U
MW-7	0.0005U	0.0005U	0.0006	N/S ²	N/S ²	N/S ²	0.001U	0.001U	0.001U	N/S ²
RW-2	0.0022	0.0011	N/S ³	0.0005U	0.0005U	0.002U	N/S ³	N/S ³	0.001U	0.005U
Field Duplicate	0.0023			0.0005U	0.0005U	0.002U	0.002U			0.0083

MONITORING WELL	Benzene	
	09/23/99	11/14/00
MW-3	0.0005U	0.0005U
MW-3A	0.0061	0.0061
Field Duplicate	0.0061	0.0005U
MW-4	N/S ²	N/S ²
MW-5	0.0005U	0.0005U
Field Duplicate	0.0005U	0.0005U
MW-5A	N/S ⁴	N/S ⁴
MW-6	0.0005U	0.0005U
MW-7	0.0005U	0.0005U
RW-2	0.0025U	N/S ³

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NOTES:
¹0.005U = Not detected at concentration shown
²N/S - Not sampled due to insufficient water in well.
³N/S - Not sampled due to floating product in well.
⁴Well dropped from monitoring program.

