REPORT

Frontier Chemical - Pendleton Site Semi-Annual Ground Water Monitoring Report

Pendleton Site PRP Group

March 2000

O'BRIEN & GERE
ENGINEERS, INC.

5829/24532

REPORT

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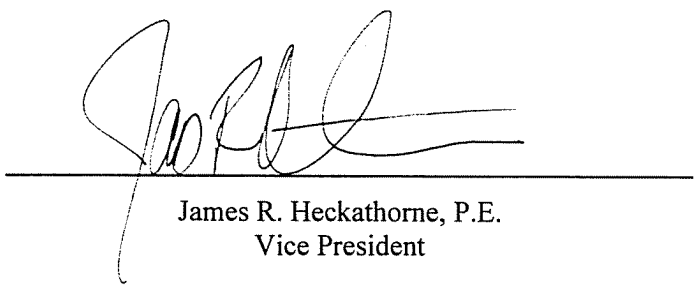

James R. Heckathorne, P.E.
Vice President

March 2000

O'BRIEN & GERE ENGINEERS, INC.

5000 Brittonfield Parkway
Syracuse, New York 13221

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1. Introduction

This document is the second 1999/2000 Semi-Annual Ground Water Monitoring Report for the Frontier Chemical - Pendleton Site (Site), located on Town Line Road in the Town of Pendleton, Niagara County, New York. This report is prepared based on the New York State Department of Environmental Conservation (NYSDEC)-approved Operation & Maintenance (O&M) Manual (O'Brien & Gere Engineers, 1997) for the Site, which addresses, among other items, long-term ground water monitoring at the Site. This Semi-Annual Ground Water Monitoring Report presents a discussion of the following:

- Piezometer/monitoring well inspection
- Hydraulic evaluation of the capped area and collection trench
- Evaluation of ground water chemistry in the intermediate and deep ground water zones.

These items are described in the following sections.

1.1. Piezometer/monitoring well inspection

The piezometer/monitoring well inspection was conducted on February 7, 2000, and included the piezometers (P-1 through P-8), standpipe (SP-1), and ground water monitoring wells (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D) identified as the Site monitoring network in the O&M Manual for the Site.

Results of the inspection indicated that each piezometer and monitoring well was in an acceptable condition for collecting water elevation measurements and sampling. Similar maintenance issues to those identified in previous inspection reports were noted at the Site:

- Piezometer P-6 is currently angled 20 to 30 degrees from vertical.
- Monitoring wells URS-14I and URS-14D should have fill material installed around the concrete pads.
- Water (in the form of ice) was observed in the annular space of monitoring well URS-14I.

It should be noted that, at this time, these issues are not affecting the integrity of the piezometers or monitoring wells. February 2000 inspection forms are included in Appendix A.

1.2. Hydraulic evaluation of capped area and collection trench

In accordance with the O&M Manual, a complete round of static ground water elevations was collected from the piezometers (P-1 through P-8), standpipe (SP-1), and ground water monitoring wells (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D). The ground water elevation measurements were collected on February 7, 2000. Glynn Geotechnical Engineering, Inc. attempted to measure the surface water elevation of Quarry Lake on February 7, 2000. Since the lake was ice covered and could not be penetrated, the ice surface elevation was measured. The ground water elevations measured in the piezometers and standpipe, and in the monitoring wells, are summarized on Tables 1 and 2, respectively. Quarry Lake elevations are summarized on Table 3. As shown on Table 3, the February 7, 2000 ice surface elevation of Quarry Lake is slightly above the outlet weir elevation of 577.2 ft.

The water level measurements collected on February 7, 2000 are illustrated on Figure 1. These measurements are the eighth round collected since remedial construction was substantially completed in August 1996. The water elevation data was used to evaluate the following:

- Whether an inward hydraulic gradient exists at the site by comparing water level measurements within the capped area (P-2, P-3, P-4, P-6, and P-7) to those measured outside the capped area (P-1, P-5, P-8, SP-1, and Quarry Lake)
- The ground water flow potential inside the capped area
- Whether the ground water collection trench is effectively controlling ground water migration away from the capped area.

The data indicates that an inward hydraulic gradient exists at the site, except in the eastern portion of the capped area, where the data indicates a slight outward hydraulic gradient. The ground water elevation in piezometer P-2, located inside the capped area, is higher than the ground water elevation in piezometer P-1, installed outside the capped area. An inward hydraulic gradient exists in the northern and southern portions of the capped area, as the ground water elevations inside the capped area (P-6 and P-7) are less than the ground water elevations outside the capped area (P-5 and P-8, respectively). Along the western portion of the site, the ground water elevation at P-4 is higher than the elevation in

the ground water collection trench (SP-1). The ground water elevation in piezometer P-3, installed within the center of the capped area, is greater than ground water elevations measured in piezometers P-1, P-5, and P-8, installed outside the capped area.

Although the data indicates an outward hydraulic gradient within the eastern portion of the capped area, the ground water elevations collected in the piezometers installed within the capped area (P-2, P-3, P-4, P-6, and P-7) are lower than originally measured in June 1997. The slight fluctuations in water elevations in the piezometers located within the capped area (P-2, P-3, P-4, P-6, and P-7) may be attributed to differences in: barometric pressure during sampling events; the movement of water within the capped area; and/or the low permeability of the materials. The fluctuations in water elevations in the piezometers located outside the capped area (P-1, P-5, and P-8) may be attributed to seasonal variations.

The contrasting fluctuations of ground water levels within and outside the capped area demonstrate that ground water within the capped area has been isolated. In addition, the ground water elevation in the standpipe (SP-1) in the ground water collection trench is less than the ice surface elevation of Quarry Lake, indicating that Quarry Lake is isolated from the capped area.

Ground water elevations of piezometers installed within the capped area along the northern (P-7), western (P-4), eastern (P-2), and southern (P-6) portions of the Site are higher than the invert elevations (bottom) of the ground water collection trench. The invert elevations of the ground water collection trench vary from 568.80 ft to 563.37 ft. This information indicates that the overall hydraulic gradient is to the west towards the ground water collection trench. In summary, the data indicates that the ground water collection trench is effectively removing shallow ground water from within the capped area.

As discussed in the March 1998 monitoring report (O'Brien & Gere Engineers, 1998), based on an average daily flow rate to the ground water collection trench of 170 gallons/day and a hydraulic conductivity adjacent to the ground water collection trench of 3.3×10^{-6} cm/sec, it is estimated that approximately 110 years will be required to dewater the containment area. However, the amount of water present within the capped area and the time to dewater beneath the capped area has minimal impact on the effectiveness of the containment, since hydraulic isolation within the capped area has been established and ground water beneath the capped area is migrating towards the ground water collection trench.

1.3. Ground water sampling and chemistry

Between February 7 and 9, 2000, the sixth round of post-closure ground water samples was collected in accordance with the protocols presented in the O&M Manual. Ground water samples were obtained from the ten ground water monitoring wells identified for sampling in the O&M Manual (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D).

Following sample collection, the ground water samples were submitted to O'Brien & Gere Laboratories, Inc., for analysis of the parameters shown in Table 1-1.

Table 1-1. *Ground water analytical methods.*

Parameter	Method
VOCs	USEPA Method 8260B
Inorganics	USEPA Methods 6010B/7470A/7841
Cyanide	USEPA Method 9010B/9014

Source: O'Brien & Gere Engineers, Inc.

Ground water sampling logs and chain of custody forms are included in Appendix B.

In accordance with the O&M Manual and as approved by the NYSDEC, sampling and analysis for target compound list (TCL) semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs)/pesticides were discontinued for the second through fifth years of monitoring. In accordance with the O&M Manual, sampling is to be continued semi-annually for TCL volatile organic compounds (VOCs) and target analyte list (TAL) metals during the second through fifth years of monitoring. In accordance with the NYSDEC-approved O&M Manual, the required sampling frequency will be re-evaluated after the fifth year of monitoring.

Purge water generated during sampling was contained, passed through a 25-micron bag filter, and discharged to manhole MH-3. The water in manhole MH-3 was conveyed through the pre-treatment system prior to discharge to the Niagara County Sewer District (NCSD) interceptor system at manhole MH-16.

The laboratory analytical data was validated by Data Validation Services of North Creek, New York. The validation was performed in accordance with guidance from the most current editions of the United States Environmental Protection Agency (USEPA) Contract Laboratory Procedures (CLP) National Functional Guidelines for Organic and

Inorganic Data Review, and the USEPA Standard Operating Procedures (SOPs) HW-2 and HW-6. Results of the validation indicated that the samples were processed and analyzed in compliance with protocol requirements, and with adherence to quality criteria. All of the analytical results are useable, although minor qualifications are needed for some of the results. A copy of the data validation report is included in Appendix C.

Results of the ground water analyses, along with a comparison of the results with New York State Class GA Standards, are summarized on Table 4. The New York State Class GA Standards presented on Table 4 have been revised to reflect revisions to the New York State water quality standards (NYSDEC, 1999). In general, the February 2000 ground water chemistry is similar to previous sampling events.

Detected constituents exceeding New York State Class GA Standards included iron at one location (URS-9I) and sodium at ten locations (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D). Concentrations of iron have previously been detected in background wells URS-14I and URS-14D at similar concentrations. Concentrations of sodium have also been detected above the New York State Class GA Standards in background wells URS-14I and URS-14D at similar concentrations. It is likely that the elevated concentrations of sodium are naturally occurring and are not related to previous site activities. VOCs were not detected above the New York State Class GA Standards. The database will be updated with data from future sampling events, and ground water standards will be reviewed annually to evaluate whether standards have been revised.

As specified in the O&M Manual, statistical analyses of the ground water chemistry data have been completed. A preliminary exploratory data analysis, using univariate statistics in SAS®, was performed for fifteen analytes that have been detected a total of nine or more times in various monitoring wells since the initial post-construction sampling event in June 1997. Based on the results of the preliminary exploratory data analysis, concentrations for thirteen analytes (at $\alpha = 0.10$) do not appear to be normally distributed. Magnesium and 1,2-dichloroethene appear to be normally distributed.

The February 2000 data represents the results of the sixth baseline data collection effort. A t-test analysis was conducted based on the data collected from the post-construction sampling events, between June 1997 and February 2000, to evaluate whether downgradient concentrations exceed upgradient concentrations, based on a comparison of downgradient wells with the appropriate upgradient wells, URS-14I or URS-14D. Based on the results of the t-test, Table 1-2 presents a summary of locations where constituent concentrations in downgradient wells exceeded concentrations at the appropriate upgradient comparison well, at a confidence level (α) equal to 0.05.

Table 1-2. *Results of the t-test analysis.*

Monitoring Well	Analytes with Higher Concentrations than in Upgradient Wells
85-5R	Calcium, Magnesium
URS-5D	Calcium, Manganese, Sodium
85-7R	Calcium, Magnesium, Sodium
URS-7D	Calcium, Magnesium, Manganese, Sodium
URS-9I	Calcium, Magnesium
88-12C	Calcium, Magnesium, Arsenic
88-12D	Calcium, Magnesium, Manganese, Potassium, Sodium

Source: O'Brien & Gere Engineers, Inc.

It should be noted that there are currently no New York State Class GA Standards for calcium, magnesium, or potassium. Concentrations of arsenic and manganese have not been detected above the New York State Class GA Standards during the post-construction sampling. In addition, it is likely that elevated concentrations of calcium, magnesium, manganese, potassium, and sodium are naturally occurring and are not related to previous site activities.

Results of the t-test analysis also indicate that barium concentrations are greater in upgradient well URS-14I than in corresponding downgradient wells URS-9I and 88-12C, and greater in upgradient well URS-14D than in corresponding downgradient well 88-12D, at a confidence level of α=0.05. T-test analysis results also indicate that sodium concentrations are greater in upgradient well URS-14I than in corresponding downgradient wells URS-9I and 88-12C, at a confidence level of α=0.05. Concentrations of barium in URS-9I, 88-12C, 88-12D, URS-14I, and URS-14D are below the New York State Class GA Standard.

Although carbon disulfide was detected in some of the samples at levels above typical laboratory contamination, many samples show evidence of sulfur dioxide, based on a review of the analytical spectrum by the data validator, which may be related to the detection of carbon disulfide. There are currently no New York State Standards for carbon disulfide. In addition, carbon disulfide has been detected in the background wells.

2. Conclusions

Based on the data contained in this semi-annual report, the following conclusions are presented:

- The isolation of ground water within the capped area has been established.
- The ground water elevation data indicates that ground water within the capped area is migrating to the west toward the ground water collection trench.
- The ground water elevation data indicates that the ground water collection trench is effectively removing shallow ground water from within the capped area.
- The February 2000 ground water chemistry is similar to previous sampling events.
- Results of the t-test analysis indicate that concentrations of arsenic (88-12C), calcium (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, 88-12C, and 88-12D), magnesium (85-5R, 85-7R, URS-7D, URS-9I, 88-12C, and 88-12D), manganese (URS-5D, URS-7D, and 88-12D), potassium (88-12D), and sodium (URS-5D, 85-7R, URS-7D, and 88-12D) exceed upgradient concentrations, based on a comparison of downgradient wells with the appropriate upgradient wells, URS-14I or URS-14D. There are currently no New York State Class GA Standards for calcium, magnesium, or potassium. Concentrations of arsenic and manganese have not been detected above the New York State Class GA Standards during the post-construction sampling. It is likely that elevated concentrations of calcium, magnesium, manganese, potassium, and sodium are naturally occurring and are not related to previous site activities.
- Results of the t-test analysis indicate that barium concentrations are greater in upgradient well URS-14I than in corresponding downgradient wells URS-9I and 88-12C, and greater in upgradient well URS-14D than in corresponding downgradient well 88-12D, at a confidence level of α=0.05. Concentrations of barium in URS-9I, 88-12C, 88-12D, URS-14I, and URS-14D are below the New York State Class GA Standard.

- T-test analysis results indicate that sodium concentrations are greater in upgradient well URS-14I than in corresponding downgradient wells URS-9I and 88-12C, at a confidence level of α=0.05.

- Iron was detected in one monitoring well at a concentration above New York State Class GA Standards. Concentrations of iron have previously been detected in the background wells at similar concentrations. In addition, results of the t-test analysis indicate that concentrations of iron are not statistically higher downgradient than upgradient at the Site, indicating that the capped area is not impacting ground water.

- Sodium was detected in ten monitoring wells at concentrations above New York State Class GA Standards. It is likely that this element is naturally occurring and is not related to previous site activities.

- Although carbon disulfide was detected in some of the samples at levels above typical laboratory contamination, many samples show evidence of sulfur dioxide, based on a review of the analytical spectrum by the data validator, which may be related to the detection of carbon disulfide. There are currently no New York State Standards for carbon disulfide. In addition, carbon disulfide was detected in the background wells.

References

New York State Department of Environmental Conservation, 1999. Title 6, Chapter X, Subchapter A, Article 2, Part 703.5, Table 1, Water Quality Standards Surface Waters and Groundwater, Effective August 4, 1999.

O'Brien & Gere Engineers, 1997. Operation and Maintenance Manual, Frontier Chemical - Pendleton Site, Town of Pendleton, Niagara County, New York, Pendleton Site PRP Group, March 1997.

O'Brien & Gere Engineers, 1998. Frontier Chemical - Pendleton Site, Semi-Annual Ground Water Monitoring Report, Pendleton Site PRP Group, March 1998.

TABLES

Table 1

Frontier Chemical - Pendleton Site

Piezometer Ground Water Elevation Summary Table

Piezometer		Location	Top of Riser Elev. (ft)	Top of Cover Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Ground water elevation (ft)							
							6/24/97	9/30/97	2/23/98	4/28/98	9/17/98	2/3/99	8/11/99	2/7/00
P-1	(O)	Eastern portion	583.21	583.30	16.4	576.8 - 566.8	579.54	577.09	579.25	579.60	575.62	572.97	575.83	573.76
P-2	(I)	of capped area	582.90	583.20	15.7	577.2 - 567.2	579.60	579.24	578.20	578.37	578.76	576.96	578.27	575.59
P-3	(I)	Center of capped area	606.33	606.64	39.7	586.6 - 566.6	580.36	580.38	580.06	579.94	579.80	579.96	579.38	579.29
P-4	(I)	Adjacent to	582.31	583.85	15.6	576.7 - 566.7	577.15	577.43	576.70	575.11	575.96	574.58	575.56	573.96
SP-1	(T)	Quarry Lake	579.86	580.07	15.0	bop = 564.9	<564.9	<564.9	<564.9	<564.9	<564.9	<564.9	<564.9	<564.9
P-5	(O)	Southern portion	583.05	583.55	15.5	577.6 - 567.6	576.87	577.25	578.57	579.31	576.13	574.70	576.48	578.16
P-6	(I)	of capped area	584.45	584.60	16.2	578.3 - 568.3	578.77	579.17	578.14	578.20	578.63	577.94	578.28	577.74
P-7	(I)	Northern portion	580.97	582.00	15.9	575.0 - 565.0	578.33	578.62	576.45	576.17	577.15	574.43	575.55	573.02
P-8	(O)	of capped area	582.83	583.00	17.3	575.5 - 565.5	577.76	578.87	578.75	579.61	576.90	574.72	576.15	576.12

Notes:

1. Elevation based on USGS Datum.
2. bop = bottom of pipe.
3. O = piezometer located outside of capped area.
4. I = piezometer located inside capped area.
5. T = standpipe located within the ground water collection trench.
6. The top of riser of piezometer P-4 was modified on 4/28/98 from 583.68 ft to 582.31 ft to allow clearance for the installation of a locking expansion plug beneath the flush-mounted cover.
7. The top of riser of piezometer P-7 was modified on 4/28/98 from 581.84 ft to 580.97 ft to allow clearance for the installation of a locking expansion plug beneath the flush-mounted cover.

Table 2

Frontier Chemical - Pendleton Site

Monitoring Well Ground Water Elevation Summary Table

Monitoring Well	Location	Top of Riser Elev. (ft)	Ground Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Ground water elevation (ft)							
						6/24/97	9/30/97	2/23/98	4/28/98	9/17/98	2/3/99	8/11/99	2/7/00
URS-14I	Upgradient well nest	581.14	580.84	31.0	550.1 - 555.1	577.15	578.77	580.24	580.14	574.76	577.35	575.42	577.68
URS-14D	in church parking lot	580.71	580.85	41.5	539.2 - 544.2	575.50	574.28	575.87	576.05	573.94	572.89	571.92	571.87
URS-9I	Southern well nest	581.68	579.90	46.0	535.6 - 540.6	575.38	574.22	575.69	575.91	573.76	572.67	571.82	571.78
URS-9D	along Town Line Road	580.80	579.00	46.5	534.3 - 539.3	575.36	574.21	575.68	575.89	573.64	572.66	571.24	571.66
85-5R	Middle well nest	580.84	578.70	40.0	540.9 - 542.9	574.70	573.97	575.39	575.70	574.98	572.78	571.92	571.10
URS-5D	along Town Line Road	580.60	578.00	49.9	530.8 - 535.8	574.73	574.02	575.42	575.74	573.80	572.12	571.97	571.39
85-7R	North well nest	577.90	576.60	27.8	550.2 - 552.2	575.09	574.21	575.53	575.87	573.74	572.30	572.04	571.52
URS-7D	along Town Line Road	579.35	576.50	39.9	539.5 - 544.5	575.15	574.35	575.60	575.99	573.75	572.40	571.99	571.57
88-12C	Well nest outside northeast	583.12	583.70	31.3	551.8 - 553.8	576.60	574.03	576.53	577.06	572.79	571.72	571.26	571.12
88-12D	portion of capped area	582.87	583.28	54.5	528.4 - 533.4	575.72	574.54	576.17	576.33	574.00	572.97	572.36	572.33

Notes:

1. Elevation based on USGS Datum.

Table 3
Frontier Chemical - Pendleton Site
Quarry Lake Surface Water Elevation Summary Table

Date	Quarry Lake Surface Water Elevation (ft) (1)
9/8/97	572.3
2/23/98	578.0
4/30/98	578.26
9/21/98	577.42
2/4/99	577.97
8/4/99	577.60
2/7/00	578.16 (2)

Notes:
1. Elevation based on USGS Datum.
2. Ice surface elevation.

Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	85-5R 7/86	8/90	2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)											
Acetone	—	NA	R	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	15	ND	ND	ND	0.34 J	ND	ND	0.10 J	ND
2-Butanone	—	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	—	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	—	NA	ND	ND	ND	ND	ND	ND	ND	ND	18
Chlorobenzene	5	ND	NA	NA	NA	ND	0.28 J	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	—	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	NA	ND	ND	ND	ND	ND	ND	ND	0.17 J	0.10 J
Ethylbenzene	5	ND	ND	ND	ND	ND	0.24 J	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	—	NA	2J	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	2J	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	0.14 J	ND	ND	ND	ND
Total Xylenes	5	NA	ND	ND	ND	ND	0.96	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)											
Aluminum	—	1,060	214	37.8B	153	ND	300	ND	ND	ND	ND
Antimony	3	NA	ND	42.4B	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	NA	1B	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1000	20	73.5B	23.4B	15	40	80	50J	ND	60	60
Beryllium	—	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	—	380,000	355,000	378,000	321,000	270,000	220,000	220,000	130,000	220,000	200,000
Chromium	50	40	7.5B	ND	ND	ND	30	10	ND	ND	ND
Cobalt	—	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	10	ND	ND	11	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	1,020	669	915	419	140	2,300	190	ND	100	ND
Lead	25	150	ND	1.2B	ND	ND	ND	ND	ND	ND	ND
Magnesium	—	179,000	106,000	170,000	139,000	130,000	85,000	110,000	59,000	99,000	90,000
Manganese	300	100	40	57.5	42	50	260	40	ND	80	110
Mercury	0.7	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	10	48.1	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	—	9,500	60,700	6,280	6,400	ND	ND	ND	ND	5,000	ND
Selenium	10	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	30	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	126,000	132,000	120,000	100,000	93,000 J	58,000	87,000	52,000	96,000	67,000
Thallium	—	NA	ND	ND	ND	ND	8	ND	ND	ND	ND
Vanadium	—	35	4B	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	—	75	12.9B	17.6B	ND	ND	ND	ND	ND	10 J	10

Notes:

1. R = Indicates compound rejected due to blank contamination.
2. J = Indicates result is less than sample quantitation limit but greater than zero.
3. B = Indicates compound is less than quantitation limits but greater than or equal to instrument detection limits.
4. E = Estimated value due to interferences.
5. W = Post-digestion spike is out of control limits.
6. Sample data presented for 6/97, 2/98, 9/98, 2/99, 8/99, and 2/00 sampling events is for cis-1,2-dichloroethene.
7. NA = Not analyzed; ND = Not detected; N = Tentative.
8. Data validation was performed in accordance with USEPA CLP National Functional Guidelines for Organic and Inorganic Data Review, and the USEPA SOPs HW-2 and HW-6.

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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	URS-5D 8/90	2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)										
Acetone	---	250	R	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	1	ND	0.25 J	0.11 J	ND	0.16 J	ND
2-Butanone	---	ND	R	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	ND	ND	ND	ND	ND	ND	ND	4.2
Chlorobenzene	5	NA	NA	NA	ND	0.31 J	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	0.32 J	ND	ND	ND	ND
Methylene Chloride	5	ND	R	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	1J	ND	ND	0.19 J	ND	ND	ND	ND
Total Xylenes	5	ND	0.5J	ND	ND	1.5	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)										
Aluminum	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Antimony	3	ND	31.5B	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	1.3B	1B	ND	ND	ND	ND	ND	ND	ND
Barium	1000	224	71.7B	32	20	ND	ND	ND	20	ND
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	378,000	407,000	387,000	440,000	300,000	490,000	510,000	490,000	500,000
Chromium	50	3B	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	---	ND	ND	ND	ND	61	210	850	350	59
Copper	200	ND	ND	8	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	188	143	25	ND	120	ND	ND	ND	ND
Lead	25	ND	1.3B	12	ND	ND	ND	ND	ND	ND
Magnesium	---	33,300	2450B	570,000	100,000	24,000	87,000	76,000	93,000	97,000
Manganese	300	8.8B	3.5B	ND	50	10	70	70	50	60
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	11.4B	ND	ND	90	ND	180	90	80	50
Potassium	---	22,700	16,900	8,500	ND	ND	ND	5,000	ND	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	192,000	194,000	114,000	88,000	93,000	94,000	120,000	110,000	120,000
Thallium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	---	3.8B	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	---	19.9B	14.7B	ND	ND	10	ND	ND	10 J	10

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7. NA = Not analyzed; ND = Not detected; N = Tentative.
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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	85-7R									
		7/86	8/90	2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)											
Acetone	---	NA	ND	R	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	6	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	---	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	71	ND	ND	ND	ND	ND	ND	0.93 J	ND	32
Chlorobenzene	5	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	NA	ND	ND	ND	0.14J	0.19 J	0.14 J	0.21 J	0.40 J	0.11 J
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	1J	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)											
Aluminum	---	1,200	277	265	249	ND	ND	ND	ND	ND	ND
Antimony	3	NA	28.3B	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	NA	1.4B	1.7B	ND	ND	ND	ND	ND	ND	ND
Barium	1000	30	91B	143B	106	100	80	50J	ND	40	40
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	490,000	354,000	298,000	389,000	350,000	350,000	420,000	400,000	440,000	410,000
Chromium	50	20	ND	ND	ND	ND	ND	ND	10	ND	ND
Cobalt	---	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	10	ND	ND	8	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	920	586	820	435	190	310	270	170	90	70
Lead	25	120	ND	2.6B	ND	ND	ND	ND	ND	ND	ND
Magnesium	---	131,000	119,000	42,600	124,000	120,000	120,000	140,000	140,000	130,000	130,000
Manganese	300	110	40.5	31.5	30	70	80	90	80	40	40
Mercury	0.7	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	ND	7.4B	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	---	28,000	5,540	5,770	6,700	5,000	5,000	6,000	6,000	7,000	6,000
Selenium	10	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	107,000	67,900	38,900	73,100	66,000 J	67,000	75,000	74,000	85,000	72,000
Thallium	---	NA	ND	ND	ND	ND	6	ND	ND	ND	ND
Vanadium	---	35	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	---	65	ND	21.5	ND	ND	ND	ND	ND	ND	ND

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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	URS-7D 8/90	2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)										
Acetone	---	120	R	ND	ND	ND	61	6.0 J	ND	ND
Benzene	1	ND	ND	ND	ND	0.11 J	ND	ND	ND	ND
2-Butanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	0.5J	ND	ND	ND	ND	ND	1.3 J	ND	5.2
Chlorobenzene	5	NA	NA	NA	ND	ND	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	ND	0.37 J	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)										
Aluminum	---	167B	52.5B	ND	ND	ND	ND	ND	ND	100
Antimony	3	20.5B	36.3B	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1000	20.3B	47.2B	29	30	40	ND	ND	30	30
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	277,000	333,000	403,000	360,000	300,000	480,000	400,000	470,000	420,000
Chromium	50	ND	ND	ND	ND	ND	10	10	ND	10
Cobalt	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	ND	ND	8	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	387	283	63	ND	70	ND	100	ND	180
Lead	25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium	---	96,200	115,000	140,000	120,000	89,000	140,000	130,000	140,000	140,000
Manganese	300	71.2	140	86	40	30	40	50	50	70
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	23.5B	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	---	5,990	8,550	8,300	5,000	ND	6,000	ND	6,000	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	82,700	68,900	78,900	66,000 J	54,000	79,000	74,000	81,000	68,000
Thallium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	---	4.2B	6.7B	ND	ND	ND	ND	ND	ND	ND
Zinc	---	5.6B	12.2B	ND	ND	ND	ND	ND	ND	ND

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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	URS-9I 8/90	2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)										
Acetone	---	R	R	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	0.12J	0.29 J	ND	ND	ND	ND
2-Butanone	---	ND	2J	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	ND	ND	ND	ND	0.13 J	ND	ND	8.5
Chlorobenzene	5	NA	NA	NA	ND	0.20 J	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	0.14 J	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	0.7J	ND	ND	ND	0.11 J	ND	ND	0.16 J	ND
Total Xylenes	5	ND	ND	ND	0.29J	0.54	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)										
Aluminum	---	221	197	110	ND	ND	ND	200	ND	200
Antimony	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	1.7B	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1000	30.1B	22.8B	14	30	ND	ND	ND	ND	ND
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	106,000	143,000	123	170,000	150,000	160,000	160,000	160,000	170,000
Chromium	50	8.6B	10.1	ND	ND	ND	10	10	ND	ND
Cobalt	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	12.7B	ND	ND	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	1,020	1,170	808	460	440	290	590	240	520
Lead	25	ND	1B	ND	ND	ND	ND	ND	ND	ND
Magnesium	---	54,500	71,300	63,500	70,000	69,000	77,000	70,000	75,000	76,000
Manganese	300	67.5	80	75	50	30	40	50	40	50
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	7.6B	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	---	3,910B	4,250B	2,900	ND	ND	ND	ND	ND	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	34,500	54,000	52,400	43,000 J	45,000	49,000	39,000	54,000	48,000
Thallium	---	ND	ND	ND	ND	11	ND	ND	ND	ND
Vanadium	---	ND	9.6B	ND	ND	ND	ND	ND	ND	ND
Zinc	---	19.3B	34.6	ND	ND	ND	20	ND	10 J	ND

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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	URS-9D 8/90	2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)										
Acetone	---	R	R	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	ND	1.9	ND	ND	ND	ND
2-Butanone	---	ND	6J	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	4J	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	ND	ND	ND	ND	ND	ND	ND	16
Chlorobenzene	5	NA	NA	NA	ND	0.79	ND	ND	ND	ND
Chloroform	7	8	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	1J	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	0.7	0.37J	0.34 J	0.17 J	0.16 JN	0.15 J	0.14 J
1,2-Dichloroethene	5	ND	ND	1	0.66	0.59	0.33 J	0.35 J	0.29 J	0.25 J
Ethylbenzene	5	ND	ND	ND	ND	0.44 J	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	2	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	0.6J	ND	ND	ND	0.51	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	ND	1.8	ND	ND	ND	ND
Trichloroethene	5	ND	ND	0.6	0.36J	0.24 J	0.20 J	0.21 J	0.14 J	ND
Vinyl Chloride	2	ND	ND	ND	0.26J	0.44 J	0.11 JN	ND	ND	ND
Metals (ppb)										
Aluminum	---	128	64.2B	ND	ND	ND	ND	ND	ND	ND
Antimony	3	ND	28B	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	1.6B	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1000	110B	38.2B	23	ND	ND	ND	ND	ND	ND
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	56,500	146,000	120,000	200,000	190,000	190,000	200,000	210,000	220,000
Chromium	50	ND	ND	ND	ND	ND	10	ND	ND	ND
Cobalt	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	5.2B	ND	ND	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	11.1B	ND	ND	ND	ND	ND	ND	ND
Iron	300	127	506	252	ND	70	80	70	60	50
Lead	25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium	---	29,900	70,200	60,000	58,000	73,000	71,000	72,000	77,000	78,000
Manganese	300	20.1	25.5	9	ND	ND	10	10	10	10
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	15.3B	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	---	9,880	4,170B	3,600	ND	ND	ND	ND	ND	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	27,400	37,000	42,800	48,000 J	52,000	41,000	38,000	52,000	48,000
Thallium	---	ND	ND	ND	ND	14	ND	ND	ND	ND
Vanadium	---	10.7B	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	---	50.5	16.7B	ND	ND	ND	ND	ND	ND	ND

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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	88-12C 8/90	2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)										
Acetone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	ND	ND	ND	ND	ND	ND	ND	0.84
Chlorobenzene	5	NA	NA	NA	ND	ND	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	0.19 J
Total Xylenes	5	ND	ND	ND	ND	ND	ND	ND	ND	0.15 J
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)										
Aluminum	---	481	187B	453	ND	900	ND	600	ND	ND
Antimony	3	19.2B	28B	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	10	12.3B	14	9	7	10	12	11 J	12
Barium	1000	11.4B	17.3	14	ND	ND	ND	ND	ND	ND
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	62,600	68,500	68,900	73,000	70,000	71,000	76,000	80,000	78,000
Chromium	50	21	4.6B	ND	ND	10	10	20	ND	ND
Cobalt	---	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	4.2B	ND	5	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	1,530	1,040	1,560	ND	2,200	330	1,600	100	200
Lead	25	1.5B	1.2B	ND	ND	ND	ND	ND	ND	ND
Magnesium	---	88,500	103,000	92,500	110,000	98,000	110,000	100,000	110,000	110,000
Manganese	300	45.4	37.8	54	10	70	10	40	20	20
Mercury	0.7	ND	ND	NA	ND	ND	ND	ND	ND	ND
Nickel	100	14.6B	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	---	2,520B	3,200B	3,000	ND	ND	ND	ND	ND	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	34,600	41,100	41,300	47,000 J	43,000	40,000	42,000	50,000	47,000
Thallium	---	ND	ND	ND	ND	13	ND	ND	ND	ND
Vanadium	---	22.1B	10B	ND	ND	ND	ND	ND	ND	ND
Zinc	---	10.1B	15.7B	ND	20	20	ND	ND	20 J	20

Notes:

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3. B = Indicates compound is less than quantitation limits but greater than or equal to instrument detection limits.
4. E = Estimated value due to interferences.
5. W = Post-digestion spike is out of control limits.
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7. NA = Not analyzed; ND = Not detected; N = Tentative.
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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	88-12D 8/90	2/91	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)									
Acetone	---	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	1J	0.9J	ND	0.13 J	0.13 J	ND	0.16 J	ND
2-Butanone	---	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	6	ND	ND	0.56	0.70 J	ND	77
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	ND	2J	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	0.11 J	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	R	13	ND	ND	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	0.48 J	ND	ND	ND	ND
Trichloroethene	5	ND	6	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)									
Aluminum	---	ND	172B	ND	ND	ND	ND	ND	ND
Antimony	3	50.7B	56.1B	ND	ND	ND	ND	ND	ND
Arsenic	25	ND	1.3BW	ND	ND	ND	ND	ND	6
Barium	1000	2.9B	7.9B	ND	ND	ND	ND	ND	ND
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	464,000	623,000E	490,000	480,000	630,000	630,000	670,000	720,000
Chromium	50	7.6B	27.8E	10	30	30	90	ND	20
Cobalt	---	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	ND	ND	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	12	ND
Iron	300	168	250	180	480	110	650	90	70
Lead	25	ND	1.8BW	ND	ND	ND	ND	ND	ND
Magnesium	---	109,000	199,000E	130,000	110,000	180,000	160,000	180,000	210,000
Manganese	300	33.9	696	90	60	40	50	30	30
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	0.2 J
Nickel	100	11.5B	25.5B	ND	ND	ND	70	ND	ND
Potassium	---	5,310	12,000E	600	6,000	10,000	9,000	9,000	11,000
Selenium	10	ND	ND	ND	ND	6	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	66,400	474,000	140,000 J	100,000	330,000	250,000	330,000	450,000
Thallium	---	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	---	51.6	2.4B	ND	ND	ND	ND	ND	ND
Zinc	---	7.9B	ND	ND	10	ND	ND	10 J	10

Notes:

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4. E = Estimated value due to interferences.
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Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 2000

Parameter	Standard ug/L (ppb)	URS-14I 2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)									
Acetone	---	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	1	ND	ND	ND	ND
2-Butanone	---	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	ND	ND	ND	ND	ND	ND	1.2
Chlorobenzene	5	NA	NA	ND	0.81	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	0.13 J	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	0.17 J
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	0.15 J	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)									
Aluminum	---	7,140	1,170	1300	400	ND	300	ND	ND
Antimony	3	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	7.2B	ND	ND	ND	ND	5	ND	6
Barium	1000	115B	47	50	40	40J	40	50	50
Beryllium	---	1.2B	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	1	ND	ND	ND	2
Calcium	---	73,900	35,200	28,000 J	21,000	23,000	26,000	30,000	34,000
Chromium	50	30.9	ND	ND	160	ND	ND	ND	10
Cobalt	---	5.8B	ND	ND	ND	ND	ND	ND	ND
Copper	200	18.5B	8	ND	10	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	10,400	2,060	1,800	2,300	ND	320	ND	ND
Lead	25	7.5	ND	ND	ND	ND	ND	ND	ND
Magnesium	---	32,800	22,300	21,000	17,000	21,000	23,000	25,000	29,000
Manganese	300	484	145	70	60	ND	ND	ND	ND
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	30.4B	ND	ND	170	ND	ND	ND	ND
Potassium	---	17,100	5,500	ND	25,000	8,000	6,000	6,000	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	44,700	42,500	58,000 J	48,000	48,000	54,000	62,000	67,000
Thallium	---	ND	ND	ND	6	ND	ND	ND	ND
Vanadium	---	16.1B	ND	ND	ND	ND	ND	ND	ND
Zinc	---	52.3	ND	10	30	ND	ND	30 J	20

Notes:

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4. E = Estimated value due to interferences.
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Table 4
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February 2000

Parameter	Standard ug/L (ppb)	URS-14D 2/91	10/92	6/97	2/98	9/98	2/99	8/99	2/00
VOCs (ppb)									
Acetone	---	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	---	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	ND	ND	ND	0.47 J	1.1 J	ND	6.7
Chlorobenzene	5	NA	NA	ND	ND	ND	ND	ND	ND
Chloroform	7	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	R	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	5	ND	ND	0.11J	0.21 J	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2	ND	ND	ND	ND	ND	ND	ND	ND
Metals (ppb)									
Aluminum	---	99.8	ND	ND	ND	ND	ND	ND	ND
Antimony	3	32.1B	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	2B	ND	ND	ND	ND	ND	ND	ND
Barium	1000	25.5B	23	20	ND	ND	40	30	30
Beryllium	---	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	---	255,000	292,000	210,000	250,000	310,000	280,000	360,000	310,000
Chromium	50	10.3	7	ND	ND	10	ND	ND	ND
Cobalt	---	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	ND	8	ND	ND	ND	ND	ND	ND
Cyanide	200	ND	ND	ND	10	10	ND	ND	ND
Iron	300	357	193	ND	ND	ND	80	ND	ND
Lead	25	1.1B	ND	ND	ND	ND	ND	ND	ND
Magnesium	---	75,200	78,000	61,000	66,000	81,000	71,000	91,000	83,000
Manganese	300	30.8	27	ND	ND	ND	ND	10	ND
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	---	4,250B	3,700	ND	ND	ND	ND	ND	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	40,700	38,700	52,000 J	49,000	50,000	48,000	58,000	47,000
Thallium	---	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	---	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	---	26.8	ND	ND	10	10	ND	ND	ND

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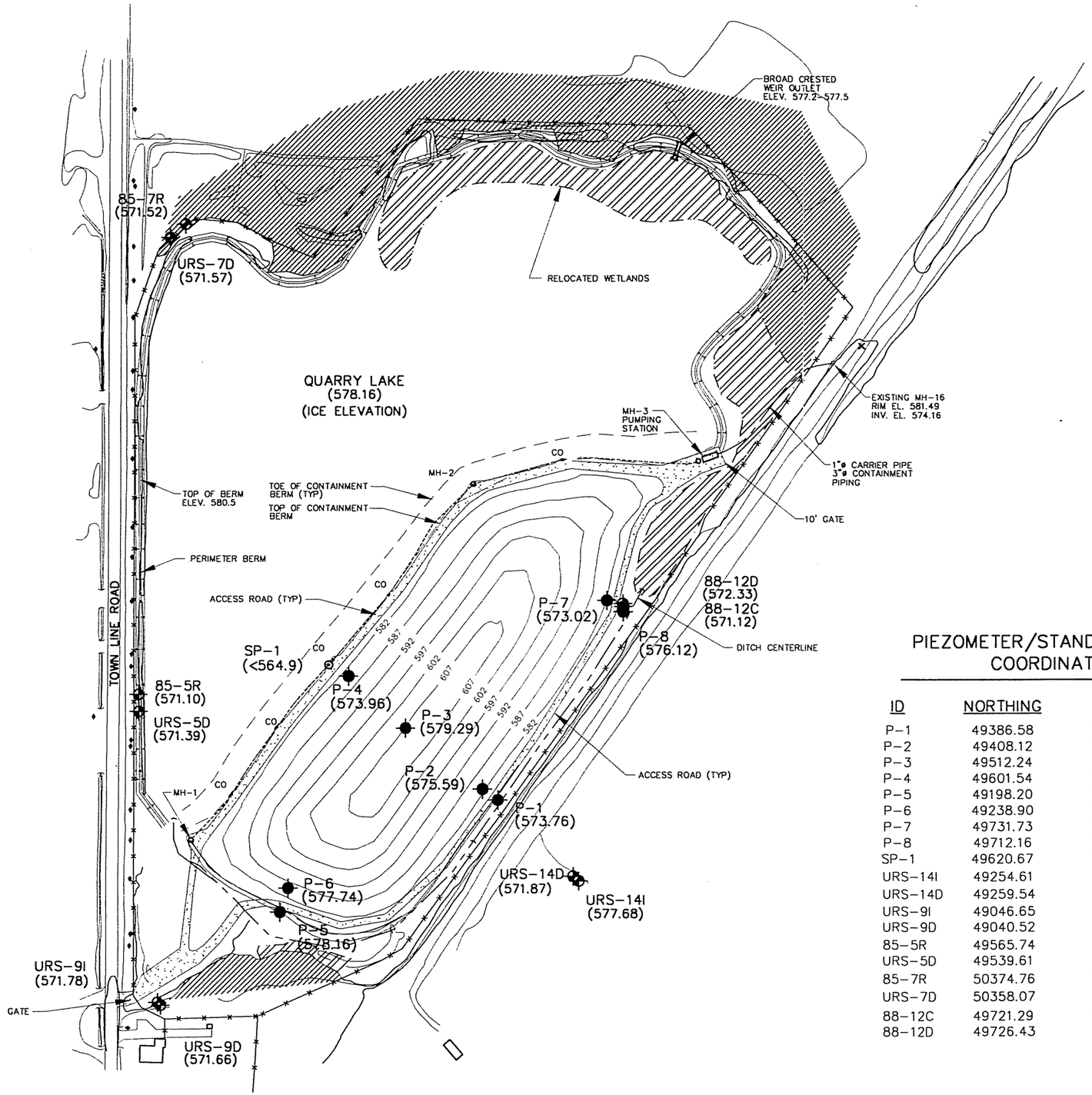
FIGURES

FIGURE 1



LEGEND

URS-7D	MONITORING WELL
P-1	PIEZOMETER
(580.24)	WATER ELEVATION
	CREATED WETLAND AREA
	EXISTING WETLAND AREA
-X-X-	6' HIGH CHAIN LINK FENCE
580	GRADE ELEVATION CONTOUR
CO	GROUND WATER COLLECTION TRENCH & CLEAN OUT
	STANDPIPE
	UTILITY POLE

PIEZOMETER/STANDPIPE AND MONITORING WELL COORDINATES AND ELEVATIONS

ID	NORTHING	EASTING	RISER	COVER
P-1	49386.58	100656.87	583.21	583.30
P-2	49408.12	100630.30	582.90	583.20
P-3	49512.24	100496.39	606.33	606.64
P-4	49601.54	100399.33	583.68	583.85
P-5	49198.20	100282.65	583.05	583.55
P-6	49238.90	100296.52	584.45	584.60
P-7	49731.73	100842.30	581.84	582.00
P-8	49712.16	100869.82	582.83	583.00
SP-1	49620.67	100365.59	579.86	580.07
URS-14I	49254.61	100794.43	581.14	580.84
URS-14D	49259.54	100789.09	580.71	580.85
URS-9I	49046.65	100075.10	581.68	579.90
URS-9D	49040.52	100076.81	580.80	579.00
85-5R	49565.74	100036.14	580.84	578.70
URS-5D	49539.61	100035.69	580.60	578.00
85-7R	50374.76	100115.55	577.90	576.60
URS-7D	50358.07	100095.40	579.35	576.50
88-12C	49721.29	100870.45	583.12	583.70
88-12D	49726.43	100869.13	582.87	583.28

FRONTIER CHEMICAL
PENDLETON SITE
TOWN OF PENDLETON,
NIAGARA COUNTY, NY

HYDRAULIC POTENTIAL MAP (FEBRUARY 7, 2000)

200 0 200

SCALE IN FEET

FILE NO. 5829.24532.002
DATE: MARCH 2000

O'BRIEN & GERE ENGINEERS INC.

APPENDICES

Appendix A

Piezometer/monitoring well inspection forms

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chem. Well Identification : P-1

Personnel : TPP / DEL Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above Ground~~	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	9.45'	
Well Depth:	16.43'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chem Well Identification : P-2

Personnel : TPP/DEL Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch
Depth to Ground Water :	7.31'	
Well Depth:	15.73'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no	
2. Well covers and locks in good condition and secure ?	yes	no	
3. Is the well stand pipe vertically aligned and secure ?	yes	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	
5. Are soils surrounding the well pad eroded ?	yes	no	
6. Is the well casing in good condition ?	yes	no	
7. Is the measuring point on casing well marked ?	yes	no	
8. Is there standing water in the annular space ?	yes	no	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : P-3

Personnel : TPP/DEL Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	~~Flush Mounted~~
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch
Depth to Ground Water :	TP ~~39.77~~ 27.04'	
Well Depth:	39.77'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : P-4

Personnel : TPP/DEL Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	~~Flush Mounted~~
Well Construction	~~PVC~~	Stainless Steel
Well Diameter	~~2-inch~~	~~4~~-inch
Depth to Ground Water :	8.35'	
Well Depth:	16.92'	

WELL INTEGRITY

1. Well identification clearly marked ?	~~yes~~	no
2. Well covers and locks in good condition and secure ?	~~yes~~	no
3. Is the well stand pipe vertically aligned and secure ?	~~yes~~	no
4. Is the concrete pad and surface seal in good condition ?	~~yes~~	no
5. Are soils surrounding the well pad eroded ?	yes	~~no~~
6. Is the well casing in good condition ?	~~yes~~	no
7. Is the measuring point on casing well marked ?	~~yes~~	no
8. Is there standing water in the annular space ?	yes	~~no~~
9. Is the stand pipe vented at the base to allow drainage ?	yes	no N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : P-5

Personnel : TPP/DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above Ground~~	Flush Mounted
Well Construction	~~PVC~~	Stainless Steel
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	4.89'	
Well Depth:	15.58'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : P-6

Personnel : TPP/DEL Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	~~Flush Mounted~~
Well Construction	~~PVC~~	Stainless Steel
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	6.71'	
Well Depth:	16.15'	

WELL INTEGRITY

1. Well identification clearly marked ?	~~yes~~	no
2. Well covers and locks in good condition and secure ?	~~yes~~	no
3. Is the well stand pipe vertically aligned and secure ?	yes	~~no~~
4. Is the concrete pad and surface seal in good condition ?	~~yes~~	no
5. Are soils surrounding the well pad eroded ?	yes	~~no~~
6. Is the well casing in good condition ?	~~yes~~	no
7. Is the measuring point on casing well marked ?	~~yes~~	no
8. Is there standing water in the annular space ?	yes	~~no~~
9. Is the stand pipe vented at the base to allow drainage ?	yes	no N/A

COMMENTS:

Standpipe leaning 20° - 30° at surface.

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : ~~MW~~ - P - 7

Personnel : TPP/DEL Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	~~Flush Mounted~~
Well Construction	~~PVC~~	Stainless Steel
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	7.95'	
Well Depth:	16.65'	

WELL INTEGRITY

1. Well identification clearly marked ?	~~yes~~	no	
2. Well covers and locks in good condition and secure ?	~~yes~~	no	
3. Is the well stand pipe vertically aligned and secure ?	~~yes~~	no	
4. Is the concrete pad and surface seal in good condition ?	~~yes~~	no	
5. Are soils surrounding the well pad eroded ?	yes	~~no~~	
6. Is the well casing in good condition ?	~~yes~~	no	
7. Is the measuring point on casing well marked ?	~~yes~~	no	
8. Is there standing water in the annular space ?	yes	~~no~~	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : P-8

Personnel : TPP/DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.71'	
Well Depth:	17.22'	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : SP - 1

Personnel : TPP / DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above~~ Ground	~~Flush Mounted~~
Well Construction	~~PVC~~	~~Stainless Steel~~ HDPE
Well Diameter	~~2-inch~~	~~4-inch~~ 6" ∅
Depth to Ground Water :	Dry	
Well Depth:	14.9'	

WELL INTEGRITY

1. Well identification clearly marked ?	~~yes~~	no
2. Well covers and locks in good condition and secure ?	~~yes~~	no
3. Is the well stand pipe vertically aligned and secure ?	~~yes~~	no
4. Is the concrete pad and surface seal in good condition ?	~~yes~~	no
5. Are soils surrounding the well pad eroded ?	yes	~~no~~
6. Is the well casing in good condition ?	~~yes~~	no
7. Is the measuring point on casing well marked ?	~~yes~~	no
8. Is there standing water in the annular space ?	yes	~~no~~
9. Is the stand pipe vented at the base to allow drainage ?	yes	no N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : 85-5R

Personnel : TPP/DEL Date : 2/1/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch
Depth to Ground Water :	9.74'	
Well Depth:	38.02'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : VES -5D

Personnel : TPP/DR Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	9.21'	
Well Depth:	49.84'	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : 85-7R

Personnel : TPP/DEL Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above Ground~~	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	6.38'	
Well Depth:	27.71'	

WELL INTEGRITY

1. Well identification clearly marked ?	~~yes~~	no
2. Well covers and locks in good condition and secure ?	~~yes~~	no
3. Is the well stand pipe vertically aligned and secure ?	~~yes~~	no
4. Is the concrete pad and surface seal in good condition ?	~~yes~~	no
5. Are soils surrounding the well pad eroded ?	yes	~~no~~
6. Is the well casing in good condition ?	~~yes~~	no
7. Is the measuring point on casing well marked ?	~~yes~~	no
8. Is there standing water in the annular space ?	yes	~~no~~
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : URS-7D

Personnel : TPP/DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above Ground~~	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	7.78'	
Well Depth:	59.84'	

WELL INTEGRITY

1. Well identification clearly marked ?	~~yes~~	no
2. Well covers and locks in good condition and secure ?	~~yes~~	no
3. Is the well stand pipe vertically aligned and secure ?	~~yes~~	no
4. Is the concrete pad and surface seal in good condition ?	~~yes~~	no
5. Are soils surrounding the well pad eroded ?	yes	~~no~~
6. Is the well casing in good condition ?	~~yes~~	no
7. Is the measuring point on casing well marked ?	~~yes~~	no
8. Is there standing water in the annular space ?	yes	~~no~~
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : URS. 9I

Personnel : TPP/DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above Ground~~	Flush Mounted
Well Construction	PVC	~~Stainless Steel~~
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	9.90'	
Well Depth:	46.18'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : URS - 9D

Personnel : TPP/DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch
Depth to Ground Water :	9.14'	
Well Depth:	50.89'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : 88-12C

Personnel : TPP/DR Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above Ground~~	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch
Depth to Ground Water :	12.00'	
Well Depth:	31.31'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no

COMMENTS:

Concrete pad under gravel.

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : 88 12D

Personnel : TPP/DE Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	~~Above Ground~~	Flush Mounted
Well Construction	PVC	~~Stainless Steel~~
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	10.54'	
Well Depth:	52.38'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no

COMMENTS: Concrete pad under gravel.

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : URS - 14 I

Personnel : TPP/DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch
Depth to Ground Water :	3.46'	
Well Depth:	31.08'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no
2. Well covers and locks in good condition and secure ?	yes	no
3. Is the well stand pipe vertically aligned and secure ?	yes	no
4. Is the concrete pad and surface seal in good condition ?	yes	no
5. Are soils surrounding the well pad eroded ?	yes	no
6. Is the well casing in good condition ?	yes	no
7. Is the measuring point on casing well marked ?	yes	no
8. Is there standing water in the annular space ?	yes	no
9. Is the stand pipe vented at the base to allow drainage ?	yes	no N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Well Identification : URS-14D

Personnel : TPP/DEC Date : 2/7/00

WELL SPECIFICATIONS

Protective Casing	Above Ground	~~Flush Mounted~~
Well Construction	PVC	~~Stainless Steel~~
Well Diameter	~~2-inch~~	4-inch
Depth to Ground Water :	8.84'	
Well Depth:	41.61'	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no	
2. Well covers and locks in good condition and secure ?	yes	no	
3. Is the well stand pipe vertically aligned and secure ?	yes	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	
5. Are soils surrounding the well pad eroded ?	yes	no	
6. Is the well casing in good condition ?	yes	no	
7. Is the measuring point on casing well marked ?	yes	no	
8. Is there standing water in the annular space ?	yes	no	
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	no	N/A

COMMENTS:

Appendix B

Ground water sampling logs

O'Brien & Gere Engineers, Inc. — Standard Ground Water Sampling Log

Date 2/8/00
Site Name Frontier Chemical
Location Pendleton
Project No. 24532
Personnel TPP/DEC

Weather Sunny 3°
Well # 85-5R
Evacuation Method SS Bailer
Sampling Method SS Bailer

Well Information:

Depth of Well *	38.02	ft.
Depth to Water *	9.74	ft.
Length of Water Column	28.28	ft.
Volume of Water in Well	4.6	gal.(s)
3X Volume of Water in Well	13.8	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 10 gal.(s)
Did well go dry? Yes

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.01	1413 S Standard	
10.0 Standard	10.01		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial 0.5	initial 8.5	initial 8.52	initial 959
4.5	8.8	8.48	1148
8.0	7.5	8.05	1142
10.0	7.4	7.35	1135

Water Sample:
Time Collected 1545

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	Clear
Odor	None	Odor	none
Turbidity (> 100 NTU)	91	Turbidity (> 100 NTU)	56
Sheen/Free Product	None	Sheen/Free Product	none

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 Liter	plastic	1	Yes	HNO3	<2
1 Liter	plastic	1	No	NaOH	>10

Notes:
PID - 0 PPM

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date: 2/8/00
Site Name: Frontier Chemical
Location: Pendleton
Project No.: 24532
Personnel: TPP / DEC

Weather: Sunny 3°
Well #: URS-5D
Evacuation Method: SS Bailer
Sampling Method: SS Bailer

Well Information:

Depth of Well *	49.84	ft.
Depth to Water *	9.21	ft.
Length of Water Column	40.63	ft.
Volume of Water in Well	6.6	gal.(s)
3X Volume of Water in Well	19.8	gal (s)

Water Volume /ft. for:
- x 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 13 gal.(s)
Did well go dry? Yes

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.01	1413 S Standard	
10.0 Standard	10.01		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial 1	initial 9.2	initial 9.59	initial 1747
6	9.2	8.31	2160
13	9.1	7.70	2650

Water Sample:
Time Collected: 11:00

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	lgt grey
Odor	slight	Odor	Urine
Turbidity (> 100 NTU)	10	Turbidity (> 100 NTU)	232
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	< 2
1 Liter	Plastic	1	Yes	HNO_3	< 2
1 Liter	Plastic	1	No	NaOH	> 10

Notes:
PID - 0 PPM Dry @ 10 gal Sample @ 13

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date: 2/9/00
Site Name: Frontier Chemical
Location: Pendleton
Project No.: 24532
Personnel: TPP / DEL

Weather: Sunny 44°±
Well #: 85-7R
Evacuation Method: SS Bailer
Sampling Method: SS Bailer

Well Information:

Depth of Well *	27 71	ft.
Depth to Water *	6 38	ft.
Length of Water Column	21 33	ft.
Volume of Water in Well	3.48	gal.(s)
3X Volume of Water in Well	10.4	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 11 gal.(s)
Did well go dry? NO

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.00	1413 S Standard	
10.0 Standard	10.00		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial Ø	initial 8.7	initial 11.94	initial 2790
3.5	9.8	11.73	1896
7.0	10.2	8 33	1772
11	9.9	7 46	1799

Water Sample:
Time Collected: 15 15

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	lt Brown
Odor	None	Odor	None
Turbidity (> 100 NTU)	20	Turbidity (> 100 NTU)	654
Sheen/Free Product	None	Sheen/Free Product	None.

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	Plastic	1	Yes	HNO_3	<2
1 liter	Plastic	1	No	NaOH	>10

Notes:
PID - Ø PPM

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 2/9/00
Site Name Frontier Chemical
Location Pendleton
Project No. 24532
Personnel TPP/DEL

Weather Sunny 44°+
Well # URS 7D
Evacuation Method SS. Bailer
Sampling Method SS Bailer

Well Information:

Depth of Well *	39.84 ~~49.84~~	ft.
Depth to Water *	7.78 ~~9.24~~	ft.
Length of Water Column	32.06 ~~40.65~~	ft.
Volume of Water in Well	5.23 ~~6.62~~	gal.(s)
3X Volume of Water in Well	15.7 ~~19.9~~	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 20 gal.(s)
Did well go dry? NO

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.00	1413 S Standard	
10.0 Standard	10.00		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial 0	initial 8.6	initial 7.16	initial 1295
7.0	9.8	7.74	1435
14	9.0	7.62	1689
20	9.0	7.06	1676

Water Sample:
Time Collected 1525

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	clear/slt cloudy
Odor	Slight Sulphur	Odor	Slight Sulfur
Turbidity (> 100 NTU)	20	Turbidity (> 100 NTU)	34
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	Plastic	1	Yes	HNO_3	<2
1 liter	Plastic	1	No	NaOH	>10

Notes:
PID - 0 ppm

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 2/8/00
Site Name Frontier Chemical
Location Pendleton
Project No. 24532
Personnel TPP/DEC

Weather Sunny 30's
Well # URS - 9I
Evacuation Method SS Bailer
Sampling Method SS Bailer

Well Information:

Depth of Well *	46.18	ft.
Depth to Water *	9.90	ft.
Length of Water Column	36.28	ft.
Volume of Water in Well	5.91	gal.(s)
3X Volume of Water in Well	17.7	gal.(s)

Water Volume /ft. for:
- x 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 18 gal.(s)
Did well go dry? NO

* Measurements taken from [x] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.01	1413 S Standard	
10.0 Standard	10.01		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial 1	initial 8.3	initial 7.96	initial 1255
6	8.8	7.82	1289
12	8.3	7.45	1224
18	9.5	7.35	1233

Water Sample:
Time Collected 1300

Physical Appearance at Start		Physical Appearance at Sampling	
Color	LT Grey	Color	Milky
Odor	Slight	Odor	Slight
Turbidity (> 100 NTU)	200	Turbidity (> 100 NTU)	TOO
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	Plastic	1	Yes	HNO_3	<2
1 liter	Plastic	1	No	NaOH	>10

Notes:
PID - 0 ppm

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date: 2/8/00
Site Name: Frontier Chemical
Location: Pendleton
Project No.: 24532
Personnel: TPP/DFC

Weather: Sunny 3°
Well #: URS-9D
Evacuation Method: SS Bailer
Sampling Method: SS Bailer

Well Information:

Depth of Well *	50.89	ft.
Depth to Water *	9.14	ft.
Length of Water Column	41.75	ft.
Volume of Water in Well	6.8	gal.(s)
3X Volume of Water in Well	20.4	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 20.5 gal.(s)
Did well go dry? NO

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.01	1413 S Standard	
10.0 Standard	10.01		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial 0.5	initial 7.7	initial 7.87	initial 1436
6.5	7.7	7.94	1430
13	8.5	7.48	1458
20.5	7.6	7.31	1395

Water Sample:
Time Collected: 1315

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	clear
Odor	None	Odor	None
Turbidity (> 100 NTU)	30	Turbidity (> 100 NTU)	25
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	Plastic	1	Yes	HNO3	<2
1 liter	Plastic	1	No	NaOH	>10

Notes:
PID – 0 PPM
BLIND DUPE collected

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O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date: 2/7/00
Site Name: Frontier Chemical
Location: Pendleton, NY
Project No.: 24532
Personnel: TPP, DEC

Weather: Sunny 25°±
Well #: 88-12 ~~B~~ C
Evacuation Method: Hand Bail
Sampling Method: SS Bailer

Well Information:

Depth of Well *	31.31	ft.
Depth to Water *	12.00	ft.
Length of Water Column	19.31	ft.
Volume of Water in Well	3.15	gal.(s)
3X Volume of Water in Well	9.45	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 10 gal.(s)
Did well go dry? NO

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.00	1413 S Standard	
10.0 Standard	10.00		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial ∅	initial 9.3	initial 8.01	initial 1158
3.5	9.5	7.71	1130
6.5	8.8	7.43	1108
9.5	8.9	7.46	1127

Water Sample:
Time Collected: 1518

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	Brownish
Odor	sulfur	Odor	Sulfur
Turbidity (> 100 NTU)	55.4	Turbidity (> 100 NTU)	7,000 - OUT OF RANGE
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	plastic	1	Yes	HNO_3	<2
1 liter	plastic	1	No	NaOH	>10

Notes:
PID @ ppm

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 2/7/00
Site Name Frontier Chemical
Location Pendleton, NY
Project No. 24532
Personnel TPP, DEC

Weather Sunny 25° ±
Well # 88-12 & D
Evacuation Method Hand Bail
Sampling Method SS Bailer

Well Information:

Depth of Well *	52.38	ft.
Depth to Water *	10.54	ft.
Length of Water Column	41.84	ft.
Volume of Water in Well	6.82	gal.(s)
3X Volume of Water in Well	20.5	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 20 gal.(s)
Did well go dry? NO

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.00	1413 S Standard	
10.0 Standard	10.00		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial Ø	initial 9.1	initial 7.31	initial 4130
4	9.4	6.20	11530
12	8.3	6.70	4930
15	8.9	6.7	4760
20	8.0	6.82	41950

Water Sample:
Time Collected 1555

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	clear
Odor	slight sulphur	Odor	slight sulfur
Turbidity (> 100 NTU)	17.7	Turbidity (> 100 NTU)	109
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	Plastic	1	Yes	HNO_3	<2
1 liter	Plastic	1	No	NaOH	>10

Notes:
PID - Ø ppm

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date: 2/8/00
Site Name: Frontier Chemical
Location: Pendleton
Project No.: 24532
Personnel: TPP / DEL

Weather: Sunny 30's
Well #: URS 14I
Evacuation Method: S.S Bailer
Sampling Method: S.S Bailer

Well Information:

Depth of Well *	31.08	ft.
Depth to Water *	3.46	ft.
Length of Water Column	27.62	ft.
Volume of Water in Well	4.50	gal.(s)
3X Volume of Water in Well	13.5	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 10 gal.(s)
Did well go dry? Yes

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.01	1413 S Standard	
10.0 Standard	10.01		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial 0.5	initial 6.8	initial 9.04	initial 460
4.5	8.8	9.03	515
9.5	8.7	7.87	605

Water Sample:
Time Collected: 1415 *2/9/00

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear	Color	Clear/milky
Odor	None	Odor	None
Turbidity (> 100 NTU)	25	Turbidity (> 100 NTU)	277
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	Plastic	1	Yes	HNO_3	<2
1 liter	Plastic	1	No	NaOH	>10

Notes:
PID - 0 PPM Dry @ 10 gals

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 2/8/00
Site Name Frontier Chemical
Location Rendleton
Project No. 24532
Personnel TPP/DEC

Weather Sunny 3° ±
Well # URS 14D
Evacuation Method SS Bailer
Sampling Method S.S. Bailer

Well Information:

Depth of Well *	41.61	ft.
Depth to Water *	8.84	ft.
Length of Water Column	32.77	ft.
Volume of Water in Well	5.34	gal.(s)
3X Volume of Water in Well	16.02	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 16 gal.(s)
Did well go dry? No

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard	7.01	1413 S Standard	
10.0 Standard	10.01		

Water parameters:

Gallons Removed	Temperature Readings °C	pH Readings	Conductivity Readings uS/cm
initial 0	initial 8.4	initial 10.99	initial 1049
5	8.6	9.04	1128
10	8.4	6.97	1690
16	8.4	6.96	1609

Water Sample:
Time Collected 1003

Physical Appearance at Start		Physical Appearance at Sampling	
Color	Clear / Lt Grey Seds	Color	Clear
Odor	Slight Sulphur	Odor	Slight
Turbidity (> 100 NTU)	20	Turbidity (> 100 NTU)	14
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass	2	No	1:1 HCl	<2
1 liter	Plastic	1	Yes	HNO_3	<2
1 liter	Plastic	1	No	NaOH	>10

Notes:
Collect MS/MSD 3X PID - 0 PPM

O'Brien & Gere Laboratories, Inc.

5000 Brittonfield Parkway
East Syracuse, New York 13057
(315) 437-0200

Chain of Custody

Client: OLIN

Project: FRONTIER CHEMICAL Pendleton New York

Sampled by: T. Prawel, D. Canestrari

Client Contact: 24532 Phone #

Sample Description

Sample Location	Date Collected	Time Collected	Sample Matrix	Comp. or Grab	No. of Containers	Analysis/Method: VOC's	Metals (Filtered) 95-1	CN					Comments
85-5R	2/8/00	1545	Water	Grab	5	3	1	1					
URS-5D	2/8/00	1600	Water	Grab	5	3	1	1					
EQUIP. BLANK	2/9/00	1355	WATER	GRAB	5	3	1	1					
URS-14I	2/9/00	1415	Water	Grab	5	3	1	1					
85-7R	2/9/00	1515	Water	Grab	5	3	1	1					
URS-7D	2/9/00	1525	Water	Grab	5	3	1	1					
TRIP BLANKS	2/9/00	—	Water	—	2	2							

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by: Donald E. Canestrari	Date: 2/9/00	Time: 1620	Received by Lab:	Date:	Time.
Shipment Method: FED EX			Airbill Number: 8184 8066 4960		

Turnaround Time Required:
Routine_____
Rush (Specify)_____

Comments:

Cooler Temperature:_____

Original-Laboratory Copy-Client

O'Brien & Gere Laboratories, Inc.

5000 Brittonfield Parkway
East Syracuse, New York 13057
(315) 437-0200

Chain of Custody

Client: OLIN

Project: Frontier Chemical Pendleton

Sampled by: T. Prawel D Carnestrari

Client Contact: 24532 Phone #

Sample Description

Sample Location	Date Collected	Time Collected	Sample Matrix	Comp. or Grab	No. of Containers	Analysis/Method: VOC's	95-1 Metals (Filtered)	CN					Comments
88-12C	2/7/00	1518	Water	Grab	5	3	1	1					
88-12D	2/7/00	1555	Water	Grab	5	3	1	1					
URS-14D MS/MSD	2/8/00	1003	Water	Grab	15	9	3	3					
URS-9I	2/8/00	1300	Water	Grab	5	3	1	1					
URS-9D	2/8/00	1315	Water	Grab	5	3	1	1		J			
Blind Dupe	—	—	Water	Grab	5	3	1	1					
Trip Blank	—	—	Water	Grab	2	2							

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by: Ronald E. Carnestrari	Date: 2/8/00	Time: 1630	Received by Lab:	Date:	Time.
Shipment Method: FED EX			Airbill Number: 8184 8066 4981		

Turnaround Time Required:
Routine_____
Rush (Specify)_____

Comments:

Cooler Temperature:_____

Original-Laboratory Copy-Client

Appendix C

Data validation report

Data Validation Services

120 Cobble Creek Road P. O. Box 208
North Creek, N. Y. 12853
Phone 518-251-4429
Facsimile 518-251-4428

March 21, 2000

Jennifer Smith
O'Brien & Gere Engineers
5000 Brittonfield Parkway
P. O. Box 4873
Syracuse, NY 13221

RE: Validation of Frontier Chemical Site Data Packages
OBG Labs Report for Samples Collected 2/07/00 through 2/09/00

Dear Ms. Smith:

Review has been completed for the data package generated by OBG Laboratories, pertaining to samples collected at the Frontier Chemical Site on February 7 through February 9, 2000. Eleven aqueous samples were analysed for TCL volatiles and TAL filtered metals/cyanide parameters. Matrix spikes/duplicates, and equipment and trip blanks were also processed. Methodologies utilized are those of the USEPA SW846.

Data validation was performed with guidance from the most current editions of the USEPA CLP National Functional Guidelines for Organic and Inorganic Data Review and the USEPA SOPs HW-2 and HW-6. The following items were reviewed:

* Data Completeness
* Custody Documentation
* Holding Times
* Surrogate and Internal Standard Recoveries
* Matrix Spike Recoveries/Duplicate Correlations
* Preparation/Calibration Blanks
* Control Spike/Laboratory Control Samples
* Instrumental Tunes
* Calibration Standards
* Instrument IDLs
* Method Compliance
* Sample Result Verification

Those items showing deficiencies are discussed in the following sections of this report. All others were found to be acceptable as outlined in the above-mentioned validation procedures, and as applicable for the methodology. Unless noted specifically in the following text, reported results are substantiated by the raw data, and generated in compliance with protocol requirements.

In summary, sample processing was primarily conducted with compliance to protocol requirements and with adherance to quality criteria, and most reported results are usable as reported, or with minor qualification as estimated. Certain edits to, and qualification of, reported results are indicated. These issues are discussed in the following analytical sections.

The laboratory summary data package, with recommended qualifiers applied in red ink to the sample result forms is attached to this narrative, and should be reviewed in conjunction with this text.

Data Completeness

The laboratory data packages were not directly in compliance with the required NYSDEC ASP Category B deliverables, but the information needed for validation of the data was present. Volatile summary forms 2, 4, and 5 were not present, the laboratory NYSDEC Sample Preparation and Analysis Summary Forms were not provided, and no verbatim certification statement was made in the case narrative.

Volatile Analyses

Carbon disulfide was detected in some of the project samples, at levels above typical laboratory contamination. None was detected in the associated blanks, and no qualification to the reported results is made. Many samples also showed evidence of sulfur dioxide, which may be related to the detection of carbon disulfide.

The reported value for carbon disulfide in the sample 88-12D should be derived from the dilution analysis. All other analyte values can be used from the initial analysis.

Due to low response factors in the calibration standards, results for acetone, 2-butanone, 2-hexanone, and 4-methyl-2-pentanone should be considered estimated in the project samples

Matrix spikes of URS-14D involved evaluation of recoveries of all target analytes. Chloroethane produced an elevated recovery (960%) in one of the matrix spikes due to contribution to the mass fragment response from sulfur dioxide in the spiked sample. Sample reported results are unaffected. All other accuracy and precision values, and control spiked recoveries, were acceptable.

The Tentatively Identified Compounds should be qualified as estimated in value, and should be reported to one significant figure. Those identified as "solvent" or "column bleed" are analysis artifacts and should be disregarded as sample components.

Field duplicate correlation of URS-9D and X-1 was acceptable.

Metals/CN Analyses

Accuracy and precision evaluations for URS-14D were acceptable, with the exception of the recovery of selenium, which was 70%. Therefore the sample selenium results should be considered estimated ("J") in all project samples. This element also produced a low recovery in the low concentration standard (CRI) (57%). No corrective action was required of the laboratory.

Due to elevated recovery of the mercury CRI (130%), the detected value reported in sample 88-12D, which was at a concentration equal to that of the CRDL, should be regarded as estimated, possibly biased high.

The serial dilution determinations for URS-14D produced acceptable correlations.

Field duplicate correlation between URS-9D and X-1 was acceptable.

Reported results are substantiated by the raw data.

Please do not hesitate to contact me if questions or comments arise during your review of this report.

Very truly yours,

Judy Harry

Data Validation Services

120 Cobble Creek Road P. O. Box 208
North Creek, NY 12853
Phone (518) 251-4429
Facsimile (518) 251-4428

Facsimile Transmission

TO: Jen Smith

COMPANY: OBG Engineers

FAX NUMBER: 315 463 7554

FROM: Judy Harry

DATE: 03-20-00

No. of pages (including cover): 1

COMMENTS: RE: Frontier Chemical data packages

The spectrum that I would like to review is that pertaining to the broad peak present around retention time 3.5-4.0' in sample N9181-DL (file G7775 on 2/17). They may need to do a manual subtract of background from about 3', or after 4.5'. The early part of the response is likely due to moisture, but the latter may be the sulfur dioxide.

Hope this helps. Thanks.

___ Hardcopy to follow _X__ Hardcopy not to follow

TELEFAX

O'BRIEN & GERE ENGINEERS, INC. *Direct Line Fax No. (315) 463-7554*

CONFIDENTIALITY NOTICE

Job Number: 5829/24532

Number of Pages: 3 (including cover sheet) Date: March 21, 2000

If pages are missing or illegible, please contact telefax operator at (315) 437-1990, ext. 2593, as soon as possible. Thank you.

TO: **Judy Harry**

COMPANY: **Data Validation Services**

FAX NO: **518-251-4428**

FROM: **Jennifer Smith**

ORIGINAL —

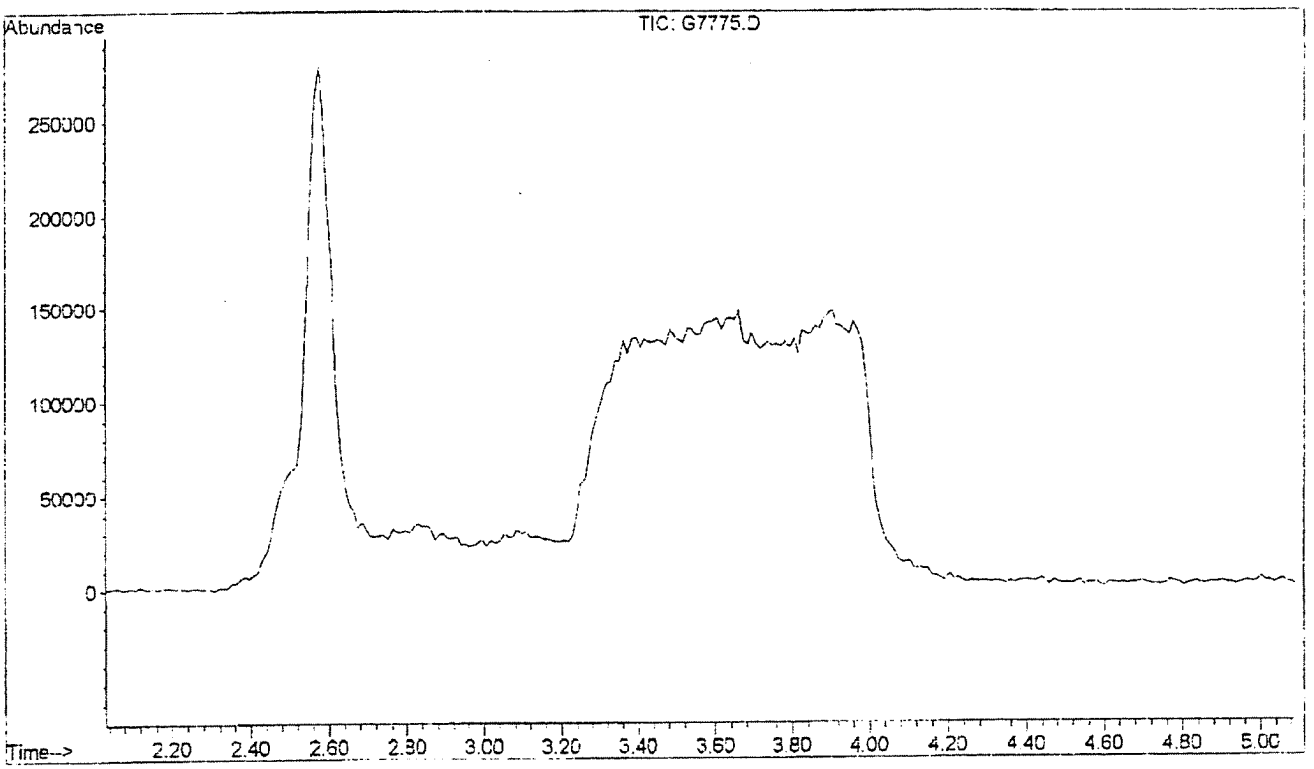
____ will follow via regular mail ____ will follow via overnight delivery __x__ will not follow

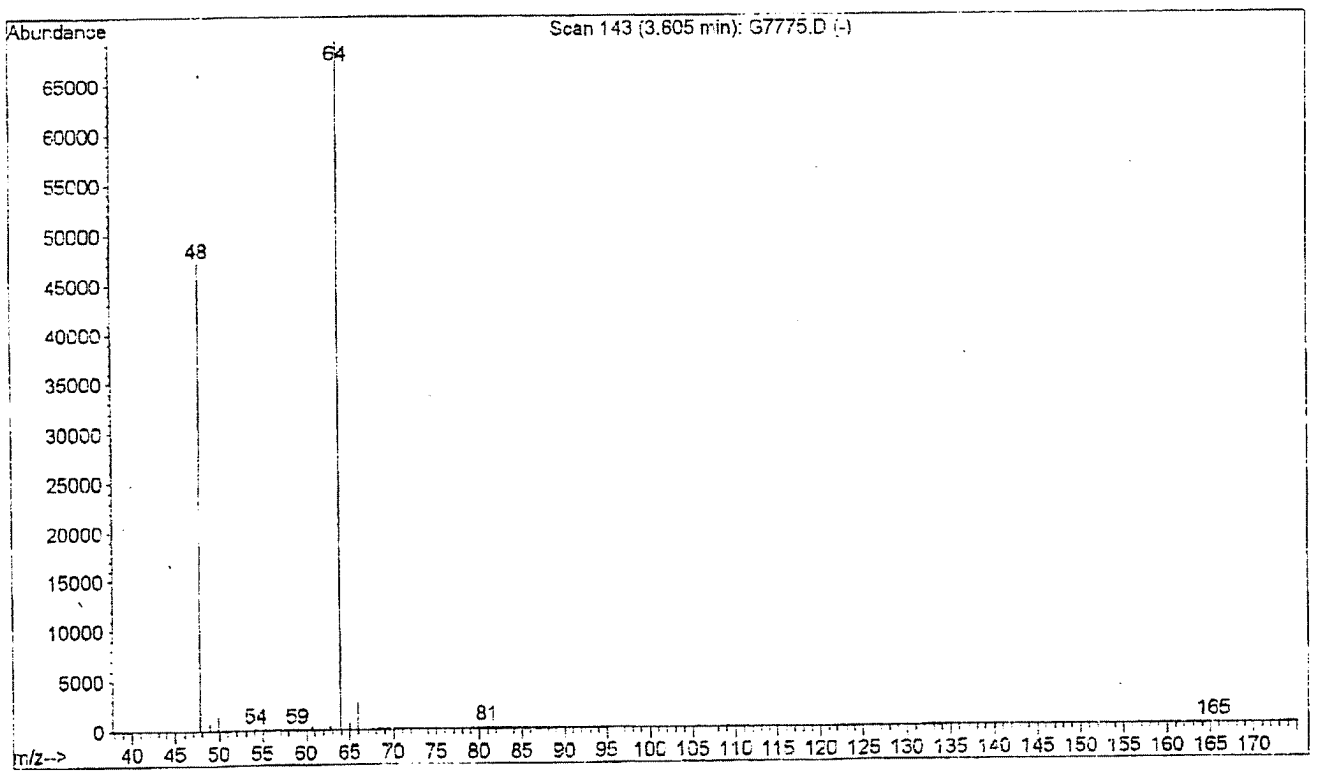
MESSAGE:

Hi Judy,
As discussed, attached is the spectrum for the N9181-DL sample. Please feel free to call me if you have any questions or need additional information.

Thank you,
Jen

File : J:\MS2\G7775.D
Operator : MSV
Acquired : 17 Feb 00 11:37 am using AcqMethod G216VOCW
Instrument : #2MS12
Sample Name: N9181DL 5x
Misc Info :
Vial Number: 6





NARRATIVE

INTRODUCTION/ANALYTICAL RESULTS

This report summarizes the laboratory results for samples from Frontier Chemical - Pendleton Site, Town of Pendleton, Niagara County, NY. Immediately following the narrative is the Cross Reference Table that lists the site descriptions, sample numbers, dates collected, dates received and package numbers.

CONDITION UPON RECEIPT/CHAIN OF CUSTODY

The coolers were received intact. When the coolers were received by the laboratory, the sample custodian(s) opened and inspected the shipments for damage, custody inconsistencies and proper preservation. The chain of custody forms documenting receipt are presented in the chain of custody section. Each sample was assigned a unique laboratory number and a custody file created. The samples were placed in a secured walk-in cooler and signed in and out by the chemists performing the tests. The sign out record, or lab chronicle, is presented in the chain of custody section.

No discrepancies were noted upon receipt. The cooler temperatures upon receipt were 3 and 4°C.

METHODOLOGY

The following methods were used to perform the analyses:

PARAMETER	METHOD	REFERENCE
Volatile Organics	8260B	1
ICP Metals	6010B	1
Mercury	7470A	1
Thallium	7841	1
Cyanide	9010B/9014	1

1) Test Methods for Evaluating Solid Wastes, SW-846 Third Edition, Final Update III, December 1996.

QUALITY CONTROL

The quality control for this program includes internal standards, surrogates, matrix spike (MS), matrix spike duplicate (MSD), laboratory duplicate (D), equipment blank, laboratory control sample (LCS), prep blank and QC trip blank samples. QA/QC results are summarized in the Sample Data Summary Package and are also included in the raw data.

RAW DATA

The raw data is organized in a format similar to the US EPA Contract Laboratory Program order of data requirements.

GC/MS Volatile Organics Case Narrative

Client: Frontier Chemical
Job Number: 5829.001.517
Package #: 4663, 4671
Methodology: 8260B

Analyzed/Reviewed by (Date/Initials): 2-23-00 SG

Supervisor/Reviewed by (Date/Initials): 7-24-00

QA/QC Review (Date/Initials): 3/7/00

File Name in G/ Drive: C:\WPWIN60\WPDOCS\V4663.NAR

GC/MS Volatile Organics

The GC/MS Volatile instruments used a J&W DB-VRX, 75 m x 0.45 mm ID capillary column and a Vocarb 3000 trap.

Holding Times and Sample Preservation

All samples were prepared and analyzed within the method and/or QAPP specified holding time requirements. Samples had a pH of less than 2.

Laboratory Control Sample

All spike recoveries met method and/or project specific QC criteria.

MS/MSD

The following compound(s) did not meet matrix spike/matrix spike duplicate percent recovery and/or RPD criteria:

Sample Description	Sample #	Compound	% REC	RPD	Corrective Action
URS-14D	N9182	Chloroethane	X	X	1

1. Due to high level sulfur dioxide in the sample N9182MSD. Ion 64 of chloroethane was co-eluted with sulfur dioxide. LCS passed for this compound. No corrective action was taken.

Surrogate

All surrogate recoveries met method and/or project specific QC criteria.

Internal Standards

All internal standard areas met method and/or project specific QC criteria.

Calibrations

For calibration check standard compounds that had a linear regression performed, a percent drift was calculated between the true value of the calibration check standard and the calculated value. For compounds using an average response factor, the percent difference between the average response factor and the daily response factor was calculated. Summary sheets for both calculations are included in the raw data section.

Client: Frontier Chemical
Job Number: 5829.001.517
Package #: 4663, 4671
Methodology: 8260B

The following continuing calibration compound(s) exceeded method percent drift and/or RRF criteria:

Calibration Date	Instrument	Compound	%D	RRF	Corrective Action
2/17/00	MS2	1,1-Dichloroethene	-20.5		1

1. The compound failed high. There were no positive hits for the compound in associated samples. The associated LCS met criteria. No corrective action was taken.

Preparation Blanks
All preparation blanks met method and/or project specific QC criteria.

Trace Metals Case Narrative

Client: Frontier Chemical
Job Number: 5829.001.517
Package #: 4663,4671
Methodology: ICP metals - 6010B

Analyzed/Reviewed by (Date/Initials): 3-2-00 MT

Supervisor/Reviewed by (Date/Initials): 3-2-00 MT

QA/QC Review (Date/Initials): 3-7-00

File Name in G/ Drive: G:\NARRATIV\4663FRON.ICP

Trace Metals

Holding Times
All samples were prepared and analyzed within the method and/or QAPP specified holding time requirements.

Laboratory Control Sample
All spike recoveries met method and/or project specific QC criteria.

MS/MSD AND MS/MSD RPD
The following analytes did not meet matrix spike/matrix spike duplicate percent recovery and/or MS/MSD RPD criteria:

Sample Description	Sample #	Analyte	% REC	RPD	Corrective Action
UPS-14D (Field Filtered)	N9189	Calcium	X		2
		Magnesium	X		2
		Selenium	X		1
		Potassium		X	3

1. A post-digestion spike was performed as required. No further corrective action was taken.

2. The concentration of the analyte in the sample was much greater than the concentration of the spike added. A post-digestion spike was performed as required. No further corrective action was taken.

3. The RPD for the sample and duplicate was within control limits. No further corrective action was taken.

Sample Duplicate
All sample duplicate RPD data met method and/or project specific QC criteria.

Client: Frontier Chemical
Job Number: 5829.001.517
Package #: 4663,4671
Methodology: ICP metals - 6010B

ICP Serial Dilution
All percent differences met method and/or project specific QC criteria.

.Calibrations
All calibrations and calibration verifications met method and/or project specific QC criteria.

Preparation Blanks
All preparation blanks met method and/or project specific QC criteria.

Trace Metals Case Narrative

Client:	Frontier Chemical
Job Number:	5829.001.517
Package #:	4663,4671
Methodology:	Mercury - 7470A
Analyzed/Reviewed by (Date/Initials):	3-2-00 mt
Supervisor/Reviewed by (Date/Initials):	3-2-00 mt
QA/QC Review (Date/Initials):	3/7/00
File Name in G/ Drive:	G:\NARRATIV\4663FRON.HG

Trace Metals

There were no excursions to note. All QC results were within established control limits.

Trace Metals Case Narrative

Client:	Frontier Chemical
Job Number:	5829.001.517
Package #:	4663,4671
Methodology:	Thallium - 7841
Analyzed/Reviewed by (Date/Initials):	3-2-00 MT
Supervisor/Reviewed by (Date/Initials):	3-2-00 MT
QA/QC Review (Date/Initials):	3/7/00
File Name in G/ Drive:	G:\NARRATIV\4663FRON.TL

Trace Metals

There were no excursions to note. All QC results were within established control limits.

Wet Chemistry Case Narrative

Client:	Frontier Chemical
Job Number:	5829.001.517
Package #:	4663,4671
Methodology:	Total cyanide - 9010B/9014
Analyzed/Reviewed by (Date/Initials):	3-2-00 mt
Supervisor/Reviewed by (Date/Initials):	3-2-00 mt
QA/QC Review (Date/Initials):	3/4/00
File Name in G/ Drive:	G:\NARRATIV\4663FRON.WC

Wet Chemistry

There were no excursions to note. All QC results were within established control limits.

CROSS REFERENCE TABLE

Site	Sample Number	Date Collected	Date Received	Pkg
88-12C	N9180	02/07/00	02/09/00	4663
88-12D	N9181	02/07/00	02/09/00	4663
URS-14D	N9182	02/08/00	02/09/00	4663
URS-14D	N9182MS	02/08/00	02/09/00	4663
URS-14D	N9182MSD	02/08/00	02/09/00	4663
URS-14D	N9182D	02/08/00	02/09/00	4663
URS-9I	N9183	02/08/00	02/09/00	4663
URS-9D	N9184	02/08/00	02/09/00	4663
Blind Dup	N9185	02/08/00	02/09/00	4663
QC Trip Blank	N9186	02/07/00	02/09/00	4663
88-12C (Field Filtered)	N9187	02/07/00	02/09/00	4663
88-12D (Field Filtered)	N9188	02/07/00	02/09/00	4663
URS-14D (Field Filtered)	N9189	02/08/00	02/09/00	4663
URS-14D (Field Filtered)	N9189MS	02/08/00	02/09/00	4663
URS-14D (Field Filtered)	N9189MSD	02/08/00	02/09/00	4663
URS-14D (Field Filtered)	N9189D	02/08/00	02/09/00	4663
URS-9I (Field Filtered)	N9190	02/08/00	02/09/00	4663
URS-9D (Field Filtered)	N9191	02/08/00	02/09/00	4663
Blind Dup (Field Filtered)	N9192	02/08/00	02/09/00	4663
85-5R	N9219	02/08/00	02/10/00	4671
URS-5D	N9220	02/08/00	02/10/00	4671
Equip. Blank	N9221	02/09/00	02/10/00	4671
URS-14I	N9222	02/09/00	02/10/00	4671
85-7R	N9223	02/09/00	02/10/00	4671
URS-7D	N9224	02/09/00	02/10/00	4671
QC Trip Blank	N9225	02/08/00	02/10/00	4671
85-5R (Field Filtered)	N9226	02/08/00	02/10/00	4671
URS-5D (Field Filtered)	N9227	02/08/00	02/10/00	4671
Equip. Blank (Field Filtered)	N9228	02/09/00	02/10/00	4671

URS-14I (Field Filtered)	N9229	02/09/00	02/10/00	4671
85-7R (Field Filtered)	N9230	02/09/00	02/10/00	4671
URS-7D (Field Filtered)	N9231	02/09/00	02/10/00	4671

Volume 1 of 3 of the validated analytical data is separately bound.