

September 2007 Monitoring Results for Centralia, Kansas

Environmental Science Division



United States Department of Agriculture

Work sponsored by Commodity Credit Corporation,
United States Department of Agriculture

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September 2007 Monitoring Results for Centralia, Kansas

by
Applied Geosciences and Environmental Management Section
Environmental Science Division, Argonne National Laboratory

January 2008



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Notation

AGEM	Applied Geosciences and Environmental Management
AMSL	above mean sea level
BGL	below ground level
°C	degree(s) Celsius
CCC	Commodity Credit Corporation
COC	chain of custody
EDB	ethylene dibromide
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
gal	gallon(s)
hr	hour(s)
in.	inch(es)
ISCR	<i>in situ</i> chemical reduction
KDHE	Kansas Department of Health and Environment
µg/L	microgram(s) per liter
µS/cm	microsiemen(s) per centimeter
mg/L	milligram(s) per liter
mV	millivolt(s)
NAD	North American Datum
NGVD	National Geodetic Vertical Datum
nM	nanomolar
ORP	oxidation-reduction potential
TOC	top of casing
TU	tritium unit(s)
USDA	U.S. Department of Agriculture
VOC	volatile organic compound

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1 Introduction and Background

In September 2005, periodic sampling of groundwater was initiated by the Commodity Credit Corporation of the U.S. Department of Agriculture (CCC/USDA) in the vicinity of a grain storage facility formerly operated by the CCC/USDA at Centralia, Kansas. The sampling at Centralia is being performed on behalf of the CCC/USDA by Argonne National Laboratory, in accord with a monitoring program approved by the Kansas Department of Health and Environment (KDHE). The objective is to monitor levels of carbon tetrachloride contamination identified in the groundwater at Centralia (Argonne 2003, 2004, 2005a). Under the KDHE-approved monitoring plan (Argonne 2005b), the groundwater is being sampled twice yearly (for a recommended period of two years) for analyses for volatile organic compounds (VOCs), as well as measurement of selected geochemical parameters to aid in the evaluation of possible natural contaminant degradation (reductive dechlorination) processes in the subsurface environment. The sampling is presently conducted in a network of 10 monitoring wells and 6 piezometers (Figure 1.1), at locations approved by the KDHE (Argonne 2006a).

The results of groundwater sampling and VOCs analyses in September-October 2005, March 2006, September 2006, and March 2007 were documented previously (Argonne 2006a,b, 2007a). The results have demonstrated the presence of carbon tetrachloride contamination, at levels exceeding the KDHE Tier 2 Risk-Based Screening Level of 5 µg/L for this compound, in a broad groundwater plume that has shown little movement.

This report presents the results of the groundwater sampling at Centralia in September 2007, performed in accord with the KDHE-approved monitoring plan (Argonne 2005b). The September 2007 sampling represents the fifth and final monitoring event performed under the recommended two-year monitoring program approved by the KDHE.

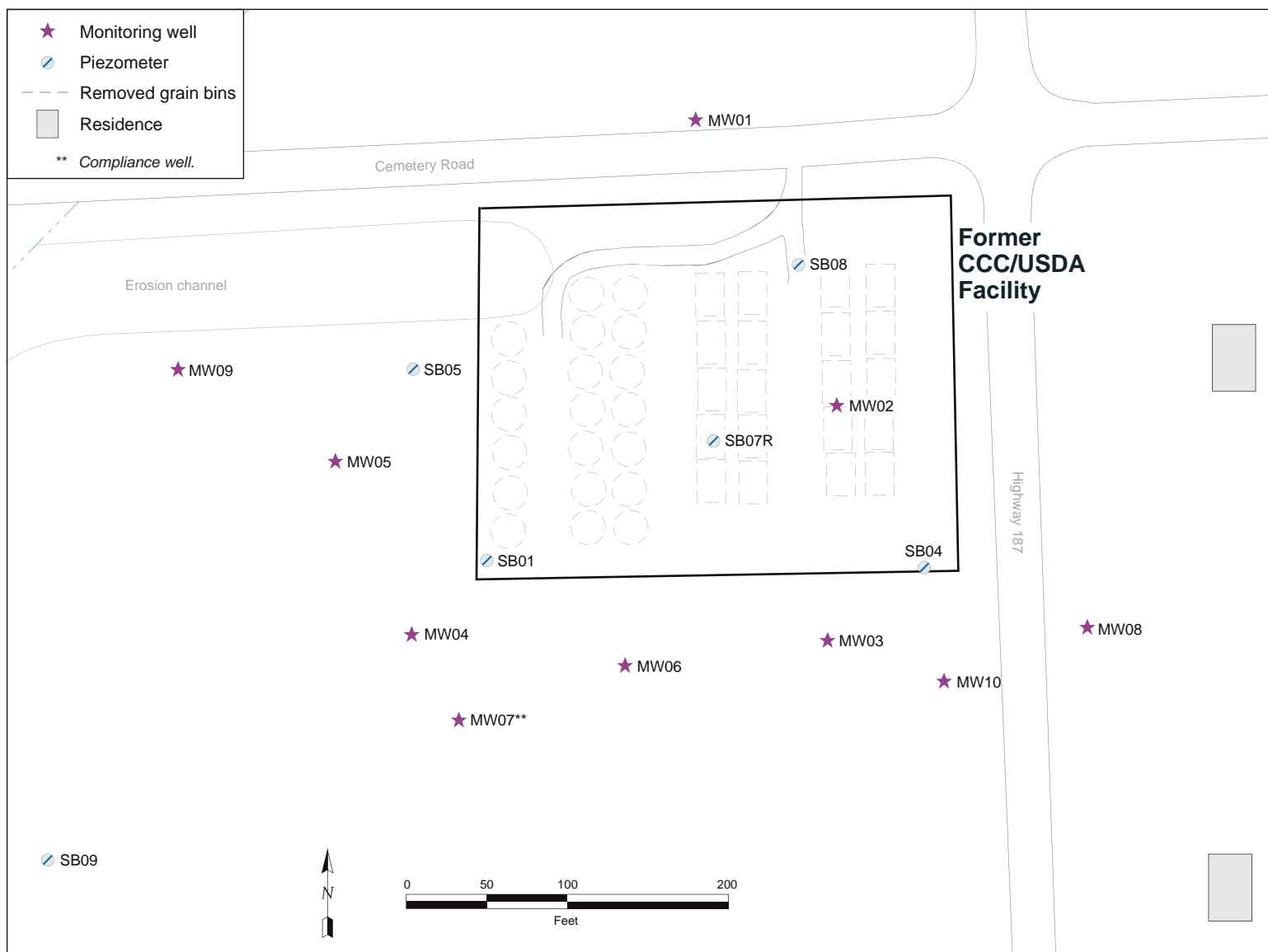


FIGURE 1.1 Monitoring network at Centralia, as of September 2007.

2 Sampling and Analysis Activities

2.1 Measurement of Groundwater Levels

Monitoring wells MW01-MW10 and piezometers SB01, SB04, SB05, SB07R, SB08, and SB09 (Figure 1.1) were sampled on September 24-27, 2007. Before the wells were purged, a water level indicator was used to measure the depth to groundwater and the total depth of each well, to within 0.01 ft, from the top of the well casing.

Data recorders currently installed in MW01-MW06 are gathering long-term data on the groundwater elevation and gradient at Centralia. The data recorders in these wells were downloaded, and water levels were measured manually at all monitoring points, on July 27, 2007.

The groundwater level data are discussed in Section 3.1.

2.2 Monitoring Well and Piezometer Sampling and Analyses

After measurement of water levels and dissolved oxygen levels, the monitoring points were purged of a minimum of three well volumes. Field measurements of temperature, pH, and conductivity were taken during purging until the measurements stabilized. Field measurements of carbon dioxide, iron(II), and oxidation reduction potential (ORP) were made for the evaluation of possible biodegradation processes, as outlined in the monitoring plan (Argonne 2005b). All sampling and field analyses were performed in accord with procedures in the *Master Work Plan* (Argonne 2002). The sequence of activities during the September well sampling event is summarized in Appendix A.

Groundwater samples designated for VOCs analyses and selected geochemical analyses identified in the monitoring plan (Argonne 2005b) were collected in appropriate laboratory containers, labeled, packaged, and chilled to 4°C by placement in ice-filled coolers. The samples were shipped by an overnight delivery service to the Applied Geosciences and Environmental Management (AGEM) Laboratory at Argonne for VOCs analyses with U.S. Environmental Protection Agency (EPA) Method 524.2 (EPA 1995). Aliquots of selected samples (chosen in

the field) were also shipped to EnviroSystems, Inc., Columbia, Maryland, for verification VOCs analyses.

Samples designated for laboratory analyses of degradation parameters were collected and shipped to TestAmerica Laboratories (formerly Severn-Trent Laboratories), South Burlington, Vermont. The analyses included dissolved chloride, sulfate, nitrate, and phosphate concentrations by EPA Method 300; total alkalinity by EPA Method 310.1; nitrate-nitrite nitrogen by EPA Method 353.2; sulfide by EPA Method 376.2; total organic carbon by EPA Method 415.1; and dissolved metals (aluminum, calcium, iron, magnesium, manganese, phosphorus, potassium, silicon, sodium, and zinc) by EPA Method 6010 (EPA 1998a). Analyses for the natural attenuation indicators methane, ethane, and ethene were conducted with Method RSK-175 (Kampbell and Vandegrift 1998).

The analytical results are presented and discussed in Section 3.2.

2.3 Handling and Disposal of Investigation-Derived Waste

Purge water generated as potentially contaminated investigation-derived waste was containerized on-site. The accumulated purge water was sampled and analyzed by Pace Analytical Services, Inc., Lenexa, Kansas. Methods used were EPA Method 5030/8260 for VOCs, EPA Method 504.1 for ethylene dibromide (EDB), and EPA Method 300 for nitrate as nitrogen. Carbon tetrachloride was detected at 5.3 µg/L, but EDB and other VOCs were not detected. Nitrate was present at 3.3 mg/L. With the approval of KDHE, the water was disposed of at the Sabetha, Kansas, publicly owned treatment works on October 25, 2007 (Sabetha 2007).

2.4 Quality Control for Sample Collection, Handling, and Analysis

Quality assurance/quality control procedures followed during the September 2007 monitoring event are described in detail in the *Master Work Plan* (Argonne 2002). The results are summarized as follows:

- Sample collection and handling activities were monitored by the documentation of samples as they were collected and the use of chain-of-

custody forms and custody seals to ensure sample integrity during handling and shipment.

- Samples designated for VOCs analyses were received with custody seals intact and at the appropriate preservation temperature. All samples were analyzed within the required holding times.
- Quality control samples (a field blank, an equipment rinsate, and trip blanks) were collected to monitor sample collection and handling activities. Method blanks were analyzed to monitor analytical methodologies. Carbon tetrachloride was detected in the rinsate sample associated with the sample from MW01 that was collected after sampling of contaminated well MW02. The trace concentration of carbon tetrachloride ($1.0 \mu\text{g/L}$) detected in the sample from MW01 is therefore discounted. Other quality control samples were free of carbon tetrachloride and chloroform contamination.
- Groundwater samples were analyzed for VOCs at the AGEM Laboratory with the purge-and-trap method on a gas chromatograph-mass spectrometer system. Calibration checks with each sample delivery group were required to be within $\pm 20\%$ of the standard. Surrogate standard determinations performed on samples and blanks were within the specified range of 80-120% for all samples, in either the initial analysis or a successful reanalysis.
- In accordance with the procedures defined in the *Master Work Plan* (Argonne 2002), the analyses of water samples at the AGEM Laboratory were verified at a second laboratory. Two groundwater samples were analyzed according to the EPA's Contract Laboratory Program methodology by EnviroSystems, Inc. For the samples from both monitoring well MW03 and piezometer SB07R, lower carbon tetrachloride concentrations were reported by EnviroSystems than by the AGEM Laboratory. In contrast, for the chloroform results, agreement between the two laboratories was good. Low recovery was noted for some surrogate spikes in the EnviroSystems analyses. Summary pages for the verification organic analyses are in Appendix B.

- Samples shipped to TestAmerica Laboratories for attenuation parameter analyses were received with custody seals intact and at the appropriate preservation conditions. All samples were analyzed within the required holding times. (Although the analyses of some samples for nitrate with EPA Method 300 did occur beyond the 48-hr holding time limit, the primary analyses of preserved sample volumes for total nitrogen with EPA Method 353.2 were within the holding time limit.) Results were within the acceptable limits for laboratory quality control samples prepared and analyzed with the samples to evaluate accuracy and precision.

3 Results and Discussion

3.1 Groundwater Level Data

Depths to groundwater were measured manually in all available monitoring wells on July 27, 2007, and September 24-27, 2007 (during sampling). The hand-measured water level data are in Table 3.1. The tables for Section 3 are grouped at the end of the section's text, before the figures.

The potentiometric surface at Centralia, interpreted from manual measurements on July 27, 2007, is depicted in Figure 3.1. The recent results are consistent with previous measurements (Figures 4.1-4.3 in Argonne 2006a and Figure 3.1 in Argonne 2007a), indicating an apparent groundwater flow direction toward the southwest across much of the former CCC/USDA facility. Like previous depictions of the potentiometric surface, Figure 3.1 indicates that groundwater flow is focused toward a localized low in the potentiometric surface, defined by the water level measurements at SB01, MW04, MW06, and MW07. Argonne's earlier investigations (Argonne 2003, 2004) suggested that the increased hydraulic gradients observed near these wells are a reflection of relatively low-permeability silts and clays that comprise the aquifer unit in this portion of the study area, in comparison to the more coarse-grained deposits identified in the northern and eastern portions of the site. The results of groundwater analyses at Centralia (discussed in Section 3.2) support an interpretation of slow groundwater flow (and carbon tetrachloride migration) to the south-southwest, in keeping with the observed water level patterns.

3.2 Groundwater Analysis Results

3.2.1 Results of the Groundwater Analyses for VOCs

The analytical data for VOCs in the groundwater samples collected in September 2007 are in Table 3.2, together with data for the previous sampling events conducted at Centralia since sampling of the monitoring well network began in 2004. The September 2007 data for carbon tetrachloride are illustrated in Figure 3.2, along with the lateral margins of the plume, as

interpreted by Argonne on the basis of each of the groundwater sampling events summarized in Table 3.2.

Carbon tetrachloride was detected in September 2007 at 10 of the 16 monitoring locations on and downgradient from the former CCC/USDA facility (Figure 3.2), at concentrations ranging from 1.2 µg/L (at MW05) to a maximum of 1,138 µg/L (at MW02). Chloroform concentrations ranging from < 1 µg/L to 18 µg/L were detected at 6 of the 16 sampled locations (Table 3.2), in association with the more elevated carbon tetrachloride levels identified beneath the former CCC/USDA facility (at MW02, SB01, SB04, SB07R, and SB08) and immediately to the west (at SB05).

The present carbon tetrachloride concentrations are consistent with previous measurements. The data in Table 3.2 and Figure 3.2 continue to suggest longer-term trends of increasing carbon tetrachloride levels at monitoring points SB05, MW03, MW04, and MW07, along the western and southern margins of the groundwater plume and in the apparent direction of groundwater flow.

3.2.2 Results of the Groundwater Analyses for Indicators of Possible Contaminant Degradation

The results of field measurements and selected laboratory geochemical analyses on the groundwater samples are summarized in Tables 3.3 and 3.4. The reported parameters can be used to estimate whether the *in situ* conditions at Centralia are suitable for possible degradation of carbon tetrachloride by natural anaerobic (reductive dechlorination) processes, as outlined in regulatory guidance for the evaluation of these conditions (KDHE 2001; EPA 1998b).

The monitoring results to date give limited evidence for possible anaerobic biodegradation of carbon tetrachloride at Centralia. The persistent occurrence of the carbon tetrachloride breakdown product chloroform at relatively elevated concentrations at monitoring points SB01, SB05, and (particularly) MW02 during the March 2005 sampling event and each of the subsequent sampling events (Table 3.2 in the present report; see also Argonne 2005a, 2006a,b, 2007a) suggests that carbon tetrachloride is being degraded at these locations.

TABLE 3.1 Groundwater levels measured by hand at Centralia on July 27 and September 24-27, 2007.

Well	Horizontal Location ^a (ft)		Top of Casing Elevation ^b (ft AMSL) ^c	Groundwater Level on July 27, 2007		Groundwater Level on September 24-27, 2007	
	Northing	Easting		Depth (ft TOC) ^d	Elevation (ft AMSL)	Depth (ft TOC)	Elevation (ft AMSL)
MW01	515257.2	1839058.4	1329.30	13.42	1315.88	14.55	1314.75
MW02	515079.9	1839143.0	1334.82	22.51	1312.31	23.05	1311.77
MW03	514935.9	1839135.8	1334.70	22.37	1312.33	22.60	1312.10
MW04	514942.5	1838880.5	1322.71	26.09	1296.62	26.24	1296.47
MW05	515049.6	1838835.0	1318.11	11.17	1306.94	10.80	1307.31
MW06	514922.3	1839011.2	1329.82	38.37	1291.45	38.50	1291.32
MW07	514889.0	1838906.8	1324.83	29.90	1294.93	29.07	1295.76
MW08	514939.6	1839294.4	1332.41	20.15	1312.26	20.72	1311.69
MW09	515104.0	1838737.4	1310.49	3.51	1306.98	4.00	1306.49
MW10	514909.9	1839205.5	1334.56	22.28	1312.28	22.89	1311.67
SB01	514987.3	1838927.1	1325.16	19.52	1305.64	20.05	1305.11
SB04	514979.9	1839195.6	1335.73	23.42	1312.31	24.49	1311.24
SB07R	515059.3	1839067.0	1331.71	19.89	1311.82	20.00	1311.71
SB08	515167.1	1839120.5	1332.56	20.25	1312.31	21.37	1311.19
SB09	514805.7	1838653.4	1311.04	7.02	1304.02	6.92	1304.12

^a Horizontal coordinates are target location centers. Northings and eastings are Kansas State Plane Coordinates. Horizontal datum is North American Datum (NAD) 83.

^b Vertical datum is National Geodetic Vertical Datum (NGVD) 88.

^c AMSL, above mean sea level.

^d TOC, below top of casing.

Source of data: Schwab-Eaton, Manhattan, Kansas.

TABLE 3.2 Analytical results from the AGEM Laboratory for volatile organic compounds in groundwater samples collected at Centralia, August 2004 to September 2007.

Well	Screen Interval (ft BGL)	Sample	Sample Date	Concentration (µg/L)		
				Carbon Tetrachloride	Chloroform	Methylene Chloride
MW01	54.5-64.5	CNMW01-W-16158	8/24/04	ND ^a	ND	ND
		CNMW01-W-19276	9/10/05	ND	ND	ND
		CNMW01-W-16308	10/11/05	ND	ND	ND
		CNMW01-W-19890	3/15/06	ND	ND	ND
		CNMW01-W-22501	9/25/06	ND	ND	ND
		CNMW01-W-16326	3/29/07	ND	ND	ND
		CNMW01-W-16228	9/26/07	1.0 R ^b	ND	ND
MW02	49.5-59.5	CNMW02-W-16159	8/26/04	215	6.2	ND
		CNMW02-W-19282	9/11/05	776	33	ND
		CNMW02-W-16309	10/12/05	528	21	ND
		CNMW02-W-19908	3/16/06	847	21	ND
		CNMW02-W-22508	9/26/06	1233	25	ND
		CNMW02-W-15489	3/26/07	829	14	ND
		CNMW02-W-16227	9/26/07	1138	18	ND
MW03	50.5-60.5	CNMW03-W-16178	8/24/04	1.2	ND	ND
		CNMW03-W-19277	9/10/05	1.6	ND	ND
		CNMW03-W-16310	10/11/05	1.8	ND	ND
		CNMW03-W-19909	3/17/06	2.6	0.2 J ^c	ND
		CNMW03-W-22513	9/26/06	2.7	ND	ND
		CNMW03-W-15494	3/27/07	2.5	ND	ND
		CNMW03-W-16223	9/25/07	3.5	ND	ND
MW04	37.5-47.5	CNMW04-W-16180	8/24/04	ND	ND	ND
		CNMW04-W-19280	9/11/05	0.9 J	ND	ND
		CNMW04-W-16311	10/11/05	0.8 J	ND	ND
		CNMW04-W-19891	3/15/06	1.3	ND	ND
		CNMW04-W-22506	9/25/06	1.4	0.1 J	ND
		CNMW04-W-16210	3/28/07	2.1	ND	ND
		CNMW04-W-16220	9/24/07	2.0	ND	ND
MW05	34.5-44.5	CNMW05-W-16183	8/25/04	ND	ND	ND
		CNMW05-W-19279	9/10/05	1.9	ND	ND
		CNMW05-W-16312	10/11/05	1.5	ND	ND
		CNMW05-W-19976	3/15/06	1.3	ND	ND
		CNMW05-W-22505	9/25/06	1.3	ND	ND
		CNMW05-W-16213	3/28/07	0.5 J	ND	ND
		CNMW05-W-16218	9/24/07	1.2	ND	ND
MW06	46.5-56.5	CNMW06-W-16184	8/25/04	ND	ND	ND
		CNMW06-W-19278	9/10/05	ND	ND	ND
		CNMW06-W-16313	10/11/05	0.3 J	ND	ND
		CNMW06-W-19889	3/15/06	0.2 J	ND	ND
		CNMW06-W-22511	9/27/06	ND	ND	ND
		CNMW06-W-16208	3/27/07	ND	ND	ND
		CNMW06-W-16222	9/24/07	ND	ND	ND

TABLE 3.2 (Cont.)

Well	Screen Interval (ft BGL)	Sample	Sample Date	Concentration (µg/L)		
				Carbon Tetrachloride	Chloroform	Methylene Chloride
MW07	45-55	CNMW07-W-19887	3/14/06	0.4 J	0.6 J	ND
		CNMW07-W-22512	9/26/06	1.1	ND	ND
		CNMW07-W-15492	3/26/07	1.8	ND	ND
		CNMW07-W-16221	9/24/07	2.4	ND	ND
MW08	38-53	CNMW08-W-19284	3/14/06	ND	ND	ND
		CNMW08-W-22507	9/26/06	ND	ND	ND
		CNMW08-W-15493	3/27/07	ND	ND	ND
		CNMW08-W-16226	9/25/07	ND	ND	ND
MW09	25-35	CNMW09-W-19285	3/15/06	ND	ND	ND
		CNMW09-W-22504	9/25/06	ND	ND	ND
		CNMW09-W-16209	3/27/07	ND	ND	ND
		CNMW09-W-16219	9/24/07	ND	ND	ND
MW10	30-45	CNMW10-W-19886	3/14/06	ND	ND	ND
		CNMW10-W-22510	9/26/06	ND	ND	ND
		CNMW10-W-16215	3/28/07	ND	ND	ND
		CNMW10-W-16224	9/25/07	ND	ND	ND
SB01	40-50	CNSB01-W-16188	8/26/04	186	6.5	ND
		CNSB01-W-19274	9/9/05	269	6.8	ND
		CNSB01-W-16314	10/12/05	288	6.6	ND
		CNSB01-W-19979	3/17/06	320	5.7	ND
		CNSB01-W-22516	9/27/06	267	6.3	ND
		CNSB01-W-15491	3/27/07	222	4.9	ND
		CNSB01-W-16232	9/27/07	283	4.6	ND
SB04	51-61	CNSB04-W-16189	8/26/04	30	ND	ND
		CNSB04-W-19273	9/9/05	47	0.6 J	ND
		CNSB04-W-16315	10/12/05	44	0.5 J	ND
		CNSB04-W-19906	3/16/06	51	0.5 J	0.4 J B ^d
		CNSB04-W-22503	9/25/06	54	0.7 J	ND
		CNSB04-W-16216	3/28/07	44	0.5 J	ND
		CNSB04-W-16230	9/26/07	36	0.4 J	ND
SB05	32-42	CNSB05-W-16190	8/26/04	59	5.5	ND
		CNSB05-W-19275	9/9/05	77	7.2	ND
		CNSB05-W-16323	10/12/05	54	5.5	ND
		CNSB05-W-19904	3/17/06	104	7.2	ND
		CNSB05-W-19940	9/27/06	139	12	ND
		CNSB05-W-16212	3/28/07	138	12	ND
		CNSB05-W-16233	9/26/07	221	16	ND
SB07R	45-60	CNSB07R-W-19978	3/15/06	41	2.7	ND
		CNSB07R-W-19924	9/26/06	30	1.7	ND
		CNSB07R-W-15490	3/26/07	30	1.7	ND
		CNSB07R-W-16225	9/25/07	50	2.4	ND

TABLE 3.2 (Cont.)

Well	Screen Interval (ft BGL)	Sample	Sample Date	Concentration (µg/L)		
				Carbon Tetrachloride	Chloroform	Methylene Chloride
SB08	52-62	CNSB08-W-16192	8/26/04	79	3.1	ND
		CNSB08-W-19272	9/8/05	80	2.6	ND
		CNSB08-W-16317	10/12/05	77	2.8	ND
		CNSB08-W-19903	3/17/06	91	2.7	ND
		CNSB08-W-22500	9/21/06	53	1.6	ND
		CNSB08-W-16214	3/28/07	64	2.0	ND
		CNSB08-W-16229	9/26/07	68	1.8	ND
SB09	32-42	CNSB09-W-16193	8/26/04	ND	ND	ND
		CNSB09-W-19281	9/11/05	ND	ND	ND
		CNSB09-W-16318	10/11/05	ND	ND	ND
		CNSB09-W-19902	3/17/06	ND	ND	ND
		CNSB09-W-22502	9/25/06	ND	ND	ND
		CNSB09-W-16211	3/28/07	ND	ND	ND
		CNSB09-W-16231	9/26/07	ND	ND	ND

^a ND, not detected at an instrument detection limit of 0.1 µg/L.

^b Qualifier R indicates that the contaminant was present in the associated equipment rinsate.

^c Qualifier J indicates an estimated concentration below the method quantitation limit of 1.0 µg/L.

^d Qualifier B indicates that the contaminant was present in the associated method blank.

TABLE 3.3 Field measurements for groundwater samples collected at Centralia, August 2004 to September 2007.

Location	Screen Interval (ft BGL)	Sample Date	Temperature (°C)	pH	Conductivity (µS/cm)	Concentration (mg/L)			ORP (mV)
						Dissolved Oxygen	Carbon Dioxide	Iron(II)	
MW01	54.5-64.5	8/24/04	16.3	7.39	652	0.06	25	0	230
		9/10/05	16.3	7.26	599	6.31	— ^a	0	104
		10/11/05	16.4	6.45	634	—	—	—	—
		3/15/06	14.3	7.56	621	9.33	30	0.04	297
		9/25/06	13.3	7.01	782	6.82	50	0.31	92
		3/29/07	16.5	6.54	629	4.39	—	0	174
		9/26/07	17.8	7.06	630	0.89	35	0.09	146
MW02	49.5-59.5	8/26/04	14.4	7.31	729	0.16	20	0.12	235
		9/11/05	15.3	7.02	739	1.28	—	—	—
		10/12/05	14.8	6.60	766	—	—	—	—
		3/16/06	14.2	6.78	759	1.24	—	0	295
		9/26/06	13.2	6.98	957	3.05	40	0.06	67
		3/26/07	15.7	6.39	739	2.29	50	—	67
		9/26/07	15.4	7.04	763	3.39	25	0	156
MW03	50.5-60.5	8/24/04	13.1	7.28	783	0.10	55	0.21	230
		9/10/05	15.1	7.05	715	10.42	65	0	142
		10/11/05	16.3	6.46	765	—	—	—	—
		3/17/06	13.8	6.75	753	9.39	77	0	290
		9/26/06	13.2	6.92	960	11.57	45	0.08	251
		3/27/07	15.3	6.40	774	7.73	25	—	268
		9/25/07	14.3	6.97	738	8.44	30	0	162
MW04	37.5-47.5	8/24/04	16.2	7.39	717	0.11	40	0.04	210
		9/11/05	15.4	7.18	665	8.43	60	0	226
		10/11/05	14.4	7.14	811	—	—	—	—
		3/15/06	13.5	7.78	675	6.82	55	0.06	283
		9/25/06	—	7.02	613	9.13	40	0.19	46
		3/28/07	15.4	6.47	678	5.46	—	0	197
		9/24/07	17.4	7.10	667	6.94	35	0.24	261
MW05	34.5-44.5	8/25/04	14.3	7.14	613	0.08	25	0.06	215
		9/10/05	14.2	6.80	620	1.40	110	0	160
		10/11/05	14.8	6.35	610	—	—	—	—
		3/15/06	14.3	6.90	701	0.90	30	0.06	156
		9/25/06	13.6	6.95	768	0.09	50	0.02	55
		3/28/07	14.4	6.44	573	4.53	35	0	295
		9/24/07	15.8	7.06	368	3.09	45	0	182
MW06	46.5-56.5	8/25/04	15.9	7.50	637	0.05	15	0	215
		9/10/05	14.6	7.23	659	0.04	60	0	41
		10/11/05	15.8	6.99	638	—	—	—	—
		3/15/06	14.1	7.38	630	9.87	35	0.02	263
		9/27/06	13.1	6.16	652	0.05	45	1.12	63
		3/27/07	19.0	6.42	466	0.11	20	0	13
		9/24/07	16.8	7.11	463	8.00	25	0.41	191

TABLE 3.3 (Cont.)

Location	Screen Interval (ft BGL)	Sample Date	Temperature (°C)	pH	Conductivity (µS/cm)	Concentration (mg/L)			ORP (mV)
						Dissolved Oxygen	Carbon Dioxide	Iron(II)	
MW07	45-55	3/14/06	14.7	6.61	709	0.34	—	0.03	143
		9/26/06	13.1	7.23	642	2.91	50	0	—
		3/26/07	15.8	6.50	642	1.87	30	0	261
		9/24/07	19.0	7.18	609	9.05	60	0.18	190
MW08	38-53	3/14/06	13.5	6.35	854	5.32	—	0	145
		9/26/06	13.3	6.75	1095	0.16	50	0.18	37
		3/27/07	15.8	6.31	874	1.49	30	0.21	237
		9/25/07	15.8	6.92	627	1.42	45	0.14	219
MW09	25-35	3/15/06	17.7	7.33	664	0.95	55	0.09	214
		9/25/06	12.8	6.87	859	1.59	45	0.18	90
		3/27/07	14.9	6.35	689	4.10	30	0.69	152
		9/24/07	16.6	6.94	1999	3.86	55	0.14	186
MW10	30-45	3/14/06	14.8	6.60	834	6.42	65	0	166
		9/26/06	13.6	6.87	1058	6.94	50	0.50	51
		3/28/07	17.0	6.36	834	5.09	35	0	270
		9/25/07	15.8	6.94	827	6.64	35	0.21	199
SB01	40-50	8/26/04	26.0	7.46	699	5.21	30	0	210
		9/9/05	25.0	7.11	674	6.25	95	0	140
		10/12/05	13.8	7.23	686	—	—	—	—
		3/17/06	12.4	7.30	692	5.98	55	0	185
		9/27/06	14.4	7.03	832	6.54	40	0.52	198
		3/27/07	18.0	6.37	659	3.81	25	0.23	173
		9/27/07	13.5	7.24	720	6.55	45	1.04	143
SB04	51-61	8/26/04	17.9	7.14	765	3.78	55	0.37	230
		9/9/05	16.0	7.09	708	8.67	100	—	206
		10/12/05	13.9	7.17	813	—	—	—	—
		3/16/06	13.0	7.57	799	5.96	30	—	276
		9/25/06	14.9	7.16	791	9.32	70	1.18	64
		3/28/07	16.2	6.45	850	6.18	—	0.23	266
		9/26/07	19.8	7.03	760	6.61	30	0	202
SB05	32-42	8/26/04	15.7	7.25	761	—	25	0.06	220
		9/9/05	16.9	6.98	687	7.58	100	—	—
		10/12/05	14.0	7.00	728	—	—	—	—
		3/17/06	13.3	7.67	718	4.80	40	0.18	253
		9/27/06	13.7	6.58	763	4.70	50	0.25	78
		3/28/07	16.7	4.03	0.11	2.58	35	0.07	296
		9/26/07	15.1	6.98	810	4.10	30	0.5	221
SB07R	45-60	3/15/06	16.8	7.24	685	7.41	60	0.08	83
		9/26/06	13.2	6.89	842	6.17	55	0.26	67
		3/26/07	19.0	6.38	668	5.08	40	0.07	237
		9/25/07	17.4	7.06	642	6.30	35	0.11	170
SB08	52-62	8/26/04	19.5	7.31	635	0.16	20	0.53	235
		9/8/05	21.2	7.27	598	3.21	75	0	111
		10/12/05	13.9	7.15	630	—	—	—	—
		3/17/06	12.9	7.14	645	3.40	40	0	246
		9/21/06	14.1	6.96	809	4.53	40	0	37
		3/28/07	15.8	6.53	645	3.57	35	0.24	208
		9/26/07	17.4	7.11	617	4.56	40	0.77	156

TABLE 3.3 (Cont.)

Location	Screen Interval (ft BGL)	Sample Date	Temperature (°C)	pH	Conductivity (µS/cm)	Concentration (mg/L)			ORP (mV)
						Dissolved Oxygen	Carbon Dioxide	Iron(II)	
SB09	32-42	8/26/04	30.9	7.09	910	0.26	75	0	185
		9/11/05	14.6	6.71	877	0.13	225	0	—
		10/11/05	13.9	6.85	910	—	—	—	—
		3/17/06	11.7	7.03	969	1.53	99	0	206
		9/25/06	14.2	7.00	976	0.29	70	0.38	86
		3/28/07	14.3	6.32	957	0.89	40	0.09	236
		9/26/07	15.2	6.77	969	1.53	45	0.12	199

^a Measurement not recorded.

TABLE 3.4 Results of attenuation parameter analyses for groundwater samples collected at Centralia, August 2004 to September 2007.

Well	Screen Interval (ft BGL)	Sample Date	Concentration (mg/L)												
			Total Alkalinity	Chloride	Sulfate	Sulfide	Nitrate	Nitrite	Nitrate-Nitrite Nitrogen	Phosphate	Aluminum	Calcium	Iron	Magnesium	Manganese
MW01	54.5-64.5	8/24/04	324	12.3	5.83	–	0.459	U ^a < 0.005	0.299	U < 0.2	U < 0.2	66.2	U < 0.1	27.2	U < 0.015
		9/10/05	303	U < 0.2	U < 0.2	0.054	0.434	U < 0.005	0.299	0.328	U < 0.2	71.7	U < 0.1	30.2	0.0153
		3/16/06	325	14.9	6.30	U < 0.02	0.820	U < 0.005	0.315	U < 0.2	U < 0.2	72.2	U < 0.1	30.1	0.217
		9/25/06	325	11.6	5.08	U < 0.02	0.561	–	0.294	U < 0.2	U < 0.2	67.2	U < 0.1	27.6	U < 0.015
		3/29/07	310	11.0	5.00	U < 0.02	0.330 H ^b	–	0.230	U < 0.2	U < 0.2	66.6	0.140 B ^c	28.5	U < 0.015
		9/26/07	310	11.0	5.10	U < 0.02	0.270	–	0.250	U < 0.2	U < 0.2	68.6	U < 0.1	30.4	U < 0.015
MW02	49.5-59.5	8/26/04	354	7.95	5.45	–	7.92	0.018	8.30	U < 0.2	U < 0.2	71.7	U < 0.1	27.5	U < 0.015
		9/11/05	352	7.03	14.7	0.0563	9.31	0.028	9.79	U < 0.2	U < 0.2	71.8	U < 0.1	27.2	0.0167
		3/16/06	364	8.45	12.2	0.0381	9.92	0.007	9.27	0.250	U < 0.2	73.6	U < 0.1	28.0	U < 0.015
		9/26/06	362	8.01	13.9	U < 0.02	9.73	–	9.25	U < 0.2	U < 0.2	69.0	U < 0.1	25.0	U < 0.015
		3/26/07	360	8.20	15.0	U < 0.02	8.80 H	–	9.00	U < 0.2	U < 0.2	70.6	U < 0.1	26.0	U < 0.015
		9/26/07	340	7.50	17.0	U < 0.02	8.00	–	9.10	U < 0.2	U < 0.2	69.4	U < 0.1	26.6	U < 0.015
MW03	50.5-60.5	8/24/04	353	20.6	8.63	–	6.43	0.0053	6.79	U < 0.2	U < 0.2	77.2	U < 0.1	27.6	U < 0.015
		9/10/05	338	19.6	7.82	U < 0.02	7.06	0.019	8.36	0.351	U < 0.2	78.9	U < 0.1	28.8	U < 0.015
		3/17/06	353	24.0	9.15	U < 0.02	9.17	U < 0.005	8.59	U < 0.2	U < 0.2	83.2	U < 0.1	29.7	U < 0.015
		9/26/06	356	25.5	7.82	U < 0.02	8.41	–	8.80	U < 0.2	U < 0.2	79.8	U < 0.1	28.1	U < 0.015
		3/27/07	370	22.0	7.60	U < 0.02	7.30 H	–	9.70	U < 0.2	U < 0.2	79.1	U < 0.1	28.6	U < 0.015
		9/25/07	330	25.0	7.60	U < 0.02	7.90 H	–	–	U < 0.2	U < 0.2	77.9	U < 0.1	30.0	U < 0.015
MW04	37.5-47.5	8/24/04	337	10.1	10.7	–	4.28	0.0254	4.42	0.276	U < 0.2	61.1	U < 0.1	23.3	U < 0.015
		9/11/05	336	10.2	7.90	U < 0.02	4.45	0.015	5.05	0.435	U < 0.2	74.5	U < 0.1	29.4	0.0373
		3/15/06	337	11.9	6.38	0.0794	4.97	U < 0.005	4.84	U < 0.2	U < 0.2	69.8	U < 0.1	27.2	0.0626
		9/25/06	338	12.5	5.89	U < 0.02	4.51	–	4.31	U < 0.2	U < 0.2	65.0	U < 0.1	24.8	0.0485
		3/28/07	360	11.0	5.10	0.027	3.40 H	–	2.60	U < 0.2	U < 0.2	65.7	U < 0.1	26.0	0.0296
		9/24/07	320	13.0	5.90	U < 0.02	4.00 H	–	4.10	U < 0.2	U < 0.2	64.6	U < 0.1	26.7	0.0316
MW05	34.5-44.5	8/25/04	315	4.58	4.56	–	2.46	0.0158	2.55	U < 0.2	U < 0.2	77.2	U < 0.1	27.2	U < 0.015
		9/10/05	303	9.42	5.35	U < 0.02	3.07	0.022	3.22	0.312	U < 0.2	85.4	U < 0.1	30.2	U < 0.015
		3/15/06	304	9.66	5.17	U < 0.02	3.36	0.0073	3.20	U < 0.2	U < 0.2	79.8	U < 0.1	27.7	U < 0.015
		9/25/06	319	7.11	3.90	U < 0.02	2.98	–	2.77	U < 0.2	U < 0.2	74.0	U < 0.1	25.4	U < 0.015
		3/28/07	320	5.20	3.00	U < 0.02	2.60 H	–	2.00	U < 0.2	U < 0.2	76.8	U < 0.1	27.6	U < 0.015
		9/24/07	300	8.00	3.80	U < 0.02	2.80 H	–	2.60	U < 0.2	U < 0.2	74.8	U < 0.1	28.2	U < 0.015
MW06	46.5-56.5	8/25/04	334	9.25	5.72	–	0.379	U < 0.005	0.267	U < 0.2	U < 0.2	73.4	U < 0.1	23.9	U < 0.015
		9/10/05	317	6.88	4.61	0.0228	0.580	0.0094	0.345	0.283	U < 0.2	77.2	U < 0.1	29.8	0.305
		3/16/06	343	8.98	5.00	U < 0.02	0.524	0.0055	0.218	U < 0.2	U < 0.2	73.2	U < 0.1	28.9	0.124
		9/27/06	345	7.83	4.69	U < 0.02	0.472	–	0.117	0.681	U < 0.2	69.7	U < 0.1	26.7	1.30
		3/27/07	330	8.40	5.20	U < 0.02	0.150 H	–	0.044	U < 0.2	U < 0.2	66.2	U < 0.1	25.1	0.156
		9/24/07	310	7.30	4.40	U < 0.02	0.16 H	–	U < 0.1	U < 0.2	U < 0.2	63.8	U < 0.1	25.5	0.510

TABLE 3.4 (Cont.)

Well	Screen Interval (ft BGL)	Sample Date	Concentration (mg/L)												
			Total Alkalinity	Chloride	Sulfate	Sulfide	Nitrate	Nitrite	Nitrate-Nitrite Nitrogen	Phosphate	Aluminum	Calcium	Iron	Magnesium	Manganese
MW07	45-55	3/14/06	299	8.72	28.5	U < 0.02	1.18	0.0175	0.978	U < 0.2	U < 0.2	59.6	U < 0.1	23.1	0.077
		9/26/06	351	6.03	23.3	U < 0.02	1.49	–	1.12	0.653	U < 0.2	66.1	U < 0.1	25.7	U < 0.015
		3/26/07	350	5.90	20.0	U < 0.02	1.10 H	–	0.710	U < 0.2	U < 0.2	64.9	U < 0.1	26.3	0.0152
		9/24/07	330	6.30	23.0	U < 0.02	1.10 H	–	0.900	U < 0.2	U < 0.2	63.8	U < 0.1	27.7	U < 0.015
MW08	38-53	3/14/06	342	47.4	14.4	U < 0.02	2.47	0.0124	2.14	U < 0.2	U < 0.2	86.5	U < 0.1	33.1	0.194
		9/26/06	249	21.9	9.64	U < 0.02	1.44	–	3.10	U < 0.2	U < 0.2	83.1	U < 0.1	30.6	0.0306
		3/27/07	390	34.0	11.0	U < 0.02	3.00 H	–	3.20	U < 0.2	U < 0.2	85.0	U < 0.1	32.1	U < 0.015
		9/25/07	390	40.0	10.0	U < 0.02	2.80 H	–	–	U < 0.2	U < 0.2	82.3	U < 0.1	33.0	U < 0.015
MW09	25-35	3/15/06	329	6.39	6.23	U < 0.02	3.25	0.0203	2.93	U < 0.2	U < 0.2	83.2	U < 0.1	28.8	0.133
		9/25/06	360	7.04	5.41	U < 0.02	3.86	–	3.54	U < 0.2	U < 0.2	85.5	U < 0.1	29.5	U < 0.015
		3/27/07	360	6.90	6.40	U < 0.02	4.10 H	–	3.80	U < 0.2	U < 0.2	87.4	U < 0.1	31.3	U < 0.015
		9/24/07	340	7.30	7.50	U < 0.02	3.80 H	–	3.70	U < 0.2	U < 0.2	87.5	U < 0.1	33.2	U < 0.015
MW10	30-45	3/14/06	298	74.3	10.8	U < 0.02	1.23	0.0175	0.814	U < 0.2	U < 0.2	91.6	U < 0.1	32.0	0.129
		9/26/06	319	97.9	8.80	U < 0.02	1.22	–	1.34	0.606	U < 0.2	88.4	U < 0.1	29.7	U < 0.015
		3/28/07	330	100	9.10	U < 0.02	1.20 H	–	1.10	U < 0.2	U < 0.2	89.4	U < 0.1	31.1	U < 0.015
		9/25/07	310	97.0	8.90	U < 0.02	0.99 H	–	–	U < 0.2	U < 0.2	88.8	U < 0.1	32.4	U < 0.015
SB01	40-50	8/26/04	292	61.8	10.6	–	2.32	U < 0.005	1.94	U < 0.2	U < 0.2	75.0	U < 0.1	30.6	0.106
		9/9/05	339	18.9	4.31	U < 0.02	1.05	0.0082	1.86	U < 0.2	U < 0.2	75.2	U < 0.1	30.3	U < 0.015
		3/17/06	338	22.5	4.87	U < 0.02	1.14	–	2.50	U < 0.2	U < 0.2	66.1	U < 0.1	26.5	U < 0.015
		9/27/06	336	60.6	46.2	U < 0.02	3.34	–	3.46	0.233	U < 0.2	74.6	U < 0.1	28.5	U < 0.015
		3/27/07	340	30.0	7.40	U < 0.02	1.10 H	–	0.800	U < 0.2	U < 0.2	67.9	U < 0.1	27.3	U < 0.015
		9/27/07	320	34.0	8.30	U < 0.02	1.30	–	–	U < 0.2	U < 0.2	72.6	U < 0.1	30.4	U < 0.015
SB04	51-61	8/26/04	375	40.3	5.89	–	1.84	U < 0.005	1.93	U < 0.2	U < 0.2	78.8	U < 0.1	30.2	U < 0.015
		9/9/05	369	45.5	5.05	U < 0.02	1.73	0.0077	2.64	U < 0.2	U < 0.2	79.0	U < 0.1	30.0	U < 0.015
		3/16/06	371	40.0	5.98	U < 0.02	3.07	U < 0.005	2.85	U < 0.2	U < 0.2	82.6	U < 0.1	31.4	U < 0.015
		9/25/06	374	45.1	6.67	U < 0.02	2.44	–	2.56	U < 0.2	U < 0.2	76.0	U < 0.1	27.7	U < 0.015
		3/28/07	370	48.0	15.0	U < 0.02	1.70 H	–	4.60	U < 0.2	U < 0.2	79.1	U < 0.1	28.6	U < 0.015
		9/26/07	370	42.0	8.50	U < 0.02	1.30	–	2.00	U < 0.2	U < 0.2	77.4	U < 0.1	29.5	U < 0.015
SB05	32-42	8/26/04	326	51.9	6.07	–	2.42	U < 0.005	2.28	U < 0.2	U < 0.2	98.5	U < 0.1	37.0	U < 0.015
		9/9/05	318	57.4	4.27	U < 0.02	2.57	0.010	2.41	U < 0.2	U < 0.2	88.1	U < 0.1	33.0	U < 0.015
		3/17/06	324	57.1	2.96	U < 0.02	2.56	U < 0.005	2.73	U < 0.2	U < 0.2	92.6	U < 0.1	35.0	U < 0.015
		9/27/06	320	67.1	4.11	U < 0.02	2.33	–	2.47	0.521	U < 0.2	86.6	U < 0.1	31.1	U < 0.015
		3/28/07	320	66.0	4.90	U < 0.02	2.40 H	–	2.10	U < 0.2	U < 0.2	67.7	U < 0.1	23.4	U < 0.015
		9/26/07	300	41.0	14.0	U < 0.02	2.00	–	2.30	U < 0.2	U < 0.2	93.4	U < 0.1	37.2	U < 0.015

TABLE 3.4 (Cont.)

Well	Screen Interval (ft BGL)	Sample Date	Concentration (mg/L)												
			Total Alkalinity	Chloride	Sulfate	Sulfide	Nitrate	Nitrite	Nitrate-Nitrite Nitrogen	Phosphate	Aluminum	Calcium	Iron	Magnesium	Manganese
SB07R	45-60	3/15/06	318	30.4	16.8	U < 0.02	1.27	0.0084	1.04	U < 0.2	U < 0.2	72.4	U < 0.1	26.0	0.179
		9/26/06	333	25.2	17.2	U < 0.02	1.47	–	1.62	0.612	U < 0.2	71.0	U < 0.1	25.1	U < 0.015
		3/26/07	310	23.0	11.0	U < 0.02	1.00 H	–	1.10	U < 0.2	U < 0.2	70.2	U < 0.1	25.4	U < 0.015
		9/25/07	300	27.0	14.0	U < 0.02	1.10 H	–	–	U < 0.2	U < 0.2	69.8	U < 0.1	27.1	U < 0.015
SB08	52-62	8/26/04	322	17.9	8.51	–	1.12	U < 0.005	0.892	U < 0.2	U < 0.2	74.9	U < 0.1	30.1	U < 0.015
		9/8/05	319	16.2	7.83	U < 0.02	1.37	0.012	1.28	U < 0.2	U < 0.2	73.0	U < 0.1	29.2	U < 0.015
		3/17/06	327	19.3	9.25	U < 0.02	1.69	U < 0.005	1.41	U < 0.2	U < 0.2	72.7	U < 0.1	29.1	U < 0.015
		9/21/06	323	16.9	7.08	U < 0.02	1.34	–	1.15	U < 0.2	U < 0.2	69.5	U < 0.1	27.4	U < 0.015
		3/28/07	330	17.0	7.40	U < 0.02	1.20 H	–	0.68	U < 0.2	U < 0.2	71.9	U < 0.1	29.0	U < 0.015
		9/26/07	300	14.0	6.90	U < 0.02	0.940	–	1.10	U < 0.2	U < 0.2	71.7	U < 0.1	30.1	U < 0.015
SB09	32-42	8/26/04	449	14.8	32.0	–	4.92	0.009	5.08	U < 0.2	U < 0.2	108	U < 0.1	39.1	U < 0.015
		9/11/05	446	13.4	30.1	U < 0.02	4.37	0.021	4.91	U < 0.2	U < 0.2	119	U < 0.1	42.2	U < 0.015
		3/17/06	495	15.6	38.8	U < 0.02	4.67	U < 0.005	4.76	U < 0.2	U < 0.2	115	U < 0.1	40.4	U < 0.015
		9/25/06	504	15.5	34.5	U < 0.02	4.17	–	4.13	U < 0.2	U < 0.2	108	U < 0.1	36.5	U < 0.015
		3/28/07	530	16.0	32.0	U < 0.02	4.40 H	–	1.20	U < 0.2	U < 0.2	112	U < 0.1	39.5	U < 0.015
		9/26/07	480	16.0	30.0	U < 0.02	3.90	–	4.00	U < 0.2	U < 0.2	110	U < 0.1	40.3	U < 0.015
<hr/>															
Well	Screen Interval (ft BGL)	Sample Date	Concentration (mg/L)					Concentration (µg/L)			Total Organic Carbon (mg/L)	Dissolved Hydrogen (nM)	Tritium (TU)		
			Phosphorus	Potassium	Silicon	Sodium	Zinc	Ethane	Ethene	Methane					
MW01	54.5-64.5	8/24/04	–	U < 5	14.9	23.4	U < 0.02	< 4	< 3	< 2	< 1	–	0.11 ± 0.09		
		9/10/05	U < 0.25	U < 5	31.6 E ^d	24.6	U < 0.02	< 4	< 3	< 2	< 1	–			
		3/16/06	U < 0.25	U < 5	15.2	24.8	U < 0.02	< 4	< 3	< 2	6.19	–			
		9/25/06	U < 0.25	U < 5	15.8	22.8	U < 0.02	< 4	< 3	< 2	< 1	–			
		3/29/07	U < 0.25	U < 5	16.1	24.0	U < 0.02	< 4	< 3	< 2	< 1	–			
		9/26/07	U < 0.25	U < 5	16.7	24.8	U < 0.02	< 4	< 3	< 2	1.50	–			
MW02	49.5-59.5	8/26/04	U < 0.25	U < 5	15.1	49.8	U < 0.02	< 4	< 3	< 2	1.84	–	0.78 ± 0.09		
		9/11/05	U < 0.25	U < 5	15.9	56.4	U < 0.02	< 4	< 3	59	< 1	3.1			
		3/16/06	U < 0.25	U < 5	16.4	56.1	U < 0.02	< 4	< 3	34	3.57	–			
		9/26/06	U < 0.25	U < 5	15.4	53.0	U < 0.02	< 4	< 3	43	1.29	–			
		3/26/07	U < 0.25	U < 5	15.8	55.1	U < 0.02	< 4	< 3	21	1.10	–			
		9/26/07	U < 0.25	U < 5	14.4	57.0	U < 0.02	< 4	< 3	13	1.30	–			

TABLE 3.4 (Cont.)

Well	Screen Interval (ft BGL)	Sample Date	Concentration (mg/L)					Concentration (µg/L)			Total Organic Carbon (mg/L)	Dissolved Hydrogen (nM)	Tritium (TU)
			Phosphorus	Potassium	Silicon	Sodium	Zinc	Ethane	Ethene	Methane			
MW03	50.5-60.5	8/24/04	–	U < 5	15.1	44.7	U < 0.02	< 4	< 3	< 2	1.14	–	0.09 ± 0.09
		9/10/05	U < 0.25	U < 5	30.9 E	44.4	U < 0.02	< 4	< 3	< 2	< 1	–	
		3/17/06	U < 0.25	U < 5	15.0	46.8	U < 0.02	< 4	< 3	< 2	1.23	–	
		9/26/06	U < 0.25	U < 5	15.9	44.0	U < 0.02	< 4	< 3	< 2	1.02	–	
		3/27/07	U < 0.25	U < 5	15.8	44.5	U < 0.02	< 4	< 3	< 2	< 1	–	
		9/25/07	U < 0.25	U < 5	15.6	44.2	U < 0.02	< 4	< 3	< 2	1.50	–	
MW04	37.5-47.5	8/24/04	–	U < 5	15.4	59.3	U < 0.02	< 4	< 3	< 2	< 1	–	0.15 ± 0.09
		9/11/05	U < 0.25	U < 5	15.5	48.0	U < 0.02	< 4	< 3	4.5	< 1	–	
		3/15/06	U < 0.25	U < 5	15.1	43.8	U < 0.02	< 4	< 3	51	5.07	–	
		9/25/06	U < 0.25	U < 5	14.9	38.3	U < 0.02	< 4	< 3	140	< 1	–	
		3/28/07	U < 0.25	U < 5	15.3	40.5	U < 0.02	< 4	< 3	6.2	< 1	–	
		9/24/07	U < 0.25	U < 5	14.0	40.2	0.057	< 4	< 3	6.8	< 1	–	
MW05	34.5-44.5	8/25/04	–	U < 5	15.1	13.5	U < 0.02	< 4	< 3	< 2	< 1	–	0.16 ± 0.09
		9/10/05	U < 0.25	U < 5	15.6	12.5	U < 0.02	< 4	< 3	< 2	< 1	–	
		3/15/06	U < 0.25	U < 5	14.2	11.6	U < 0.02	< 4	< 3	< 2	5.54	–	
		9/25/06	U < 0.25	U < 5	14.6	9.43	U < 0.02	< 4	< 3	< 2	< 1	–	
		3/28/07	U < 0.25	U < 5	15.5	10.6	U < 0.02	< 4	< 3	< 2	< 1	–	
		9/24/07	U < 0.25	U < 5	15.4	9.96	U < 0.02	< 4	< 3	< 2	1.20	–	
MW06	46.5-56.5	8/25/04	–	U < 5	13.6	26.7	U < 0.02	< 4	< 3	< 2	1.62	–	0.10 ± 0.09
		9/10/05	U < 0.25	U < 5	15.6	27.1	U < 0.02	< 4	< 3	< 2	< 1	–	
		3/16/06	U < 0.25	U < 5	15.5	25.8	U < 0.02	< 4	< 3	2.3	4.12	–	
		9/27/06	U < 0.25	U < 5	14.1	22.8	U < 0.02	< 4	< 3	65	< 1	–	
		3/27/07	U < 0.25	U < 5	14.2	23.0	U < 0.02	< 4	< 3	6.5	4.00	–	
		9/24/07	U < 0.25	U < 5	14.0	21.7	U < 0.02	< 4	< 3	74	1.50	–	
MW07	45-55	3/14/06	U < 0.25	U < 5	10.5	33.3	U < 0.02	< 4	< 3	< 2	35.4	–	0.31 ± 0.09
		9/26/06	U < 0.25	U < 5	12.7	34.9	U < 0.02	< 4	< 3	< 2	2.24	–	
		3/26/07	U < 0.25	U < 5	13.6	35.6	0.197	< 4	< 3	< 2	1.00	–	
		9/24/07	U < 0.25	U < 5	13.5	35.9	0.102	< 4	< 3	< 2	< 1	–	
MW08	38-53	3/14/06	U < 0.25	U < 5	15.8	57.5	U < 0.02	< 4	< 3	< 2	9.00	–	4.63 ± 0.15
		9/26/06	U < 0.25	U < 5	14.4	51.9	0.0239	< 4	< 3	< 2	1.96	–	
		3/27/07	U < 0.25	U < 5	14.7	53.8	U < 0.02	< 4	< 3	< 2	1.90	–	
		9/25/07	U < 0.25	U < 5	14.8	54.2	U < 0.02	< 4	< 3	< 2	4.80	–	
MW09	25-35	3/15/06	U < 0.25	U < 5	13.6	11.6	U < 0.02	< 4	< 3	< 2	10.7	–	1.87 ± 0.09
		9/25/06	U < 0.25	U < 5	14.6	11.5	U < 0.02	< 4	< 3	< 2	< 1	–	
		3/27/07	U < 0.25	U < 5	15.0	13.2	U < 0.02	< 4	< 3	< 2	< 1	–	
		9/24/07	U < 0.25	U < 5	15.7	13.2	U < 0.02	< 4	< 3	< 2	1.10	–	

TABLE 3.4 (Cont.)

Well	Screen Interval (ft BGL)	Sample Date	Concentration (mg/L)					Concentration (µg/L)			Total Organic Carbon (mg/L)	Dissolved Hydrogen (nM)	Tritium (TU)
			Phosphorus	Potassium	Silicon	Sodium	Zinc	Ethane	Ethene	Methane			
MW10	30-45	3/14/06	U < 0.25	U < 5	14.5	38.7	U < 0.02	< 4	< 3	< 2	7.96	—	1.39 ± 0.09
		9/26/06	U < 0.25	U < 5	13.4	41.9	U < 0.02	< 4	< 3	< 2	1.69	—	
		3/28/07	U < 0.25	U < 5	14.0	45.0	U < 0.02	< 4	< 3	< 2	1.20	—	
		9/25/07	U < 0.25	U < 5	15.2	41.9	0.0477	< 4	< 3	< 2	< 1	—	
SB01	40-50	8/26/04	U < 0.25	U < 5	14.2	44.0	U < 0.02	< 4	< 3	< 2	4.04	—	
		9/9/05	U < 0.25	U < 5	31.7 E	44.1	U < 0.02	< 4	< 3	< 2	1.86	71	
		3/17/06	U < 0.25	U < 5	16.1	35.8	U < 0.02	< 4	< 3	< 2	8.97	—	
		9/27/06	U < 0.25	U < 5	14.6	47.7	0.0339	< 4	< 3	< 2	1.59	—	
		3/27/07	U < 0.25	U < 5	15.5	36.7	U < 0.02	< 4	< 3	< 2	< 1	—	
		9/27/07	U < 0.25	U < 5	15.5	47.1	U < 0.02	< 4	< 3	< 2	1.70	—	
SB04	51-61	8/26/04	U < 0.25	U < 5	15.4	57.8	U < 0.02	< 4	< 3	< 2	3.00	—	
		9/9/05	U < 0.25	U < 5	15.0	54.9	U < 0.02	< 4	< 3	< 2	< 1	24	
		3/16/06	U < 0.25	U < 5	16.5	56.9	U < 0.02	< 4	< 3	< 2	3.78	—	
		9/25/06	U < 0.25	U < 5	15.6	51.2	U < 0.02	< 4	< 3	< 2	1.20	—	
		3/28/07	U < 0.25	U < 5	16.1	62.2	U < 0.02	< 4	< 3	< 2	2.00	—	
SB05	32-42	9/26/07	U < 0.25	U < 5	16.4	58.0	U < 0.02	< 4	< 3	< 2	1.20	—	
		8/26/04	U < 0.25	U < 5	15.3	34.0	U < 0.02	< 4	< 3	< 2	2.26	—	
		9/9/05	U < 0.25	U < 5	33.4 E	20.3	U < 0.02	< 4	< 3	< 2	< 1	11	
		3/17/06	U < 0.25	U < 5	14.5	21.3	U < 0.02	< 4	< 3	< 2	4.97	—	
		9/27/06	U < 0.25	U < 5	15.0	21.9	U < 0.02	< 4	< 3	< 2	1.17	—	
		3/28/07	U < 0.25	U < 5	16.6	52.3	U < 0.02	< 4	< 3	< 2	1.20	—	
SB07R	45-60	9/26/07	U < 0.25	U < 5	15.7	24.5	U < 0.02	< 4	< 3	< 2	1.60	—	
		3/15/06	U < 0.25	U < 5	13.8	38.2	U < 0.02	< 4	< 3	< 2	11.2	—	
		9/26/06	U < 0.25	U < 5	14.0	34.5	0.0371	< 4	< 3	< 2	1.35	—	
		3/26/07	U < 0.25	U < 5	14.1	32.5	U < 0.02	< 4	< 3	< 2	1.10	—	
SB08	52-62	9/25/07	U < 0.25	U < 5	14.9	33.7	0.0546	< 4	< 3	< 2	1.00	—	0.32 ± 0.09
		8/26/04	U < 0.25	U < 5	15.9	27.1	U < 0.02	< 4	< 3	< 2	1.88	—	
		9/8/05	U < 0.25	U < 5	14.9	26.7	U < 0.02	< 4	< 3	< 2	< 1	6.1	
		3/17/06	U < 0.25	U < 5	14.6	26.1	U < 0.02	< 4	< 3	< 2	5.99	—	
		9/21/06	U < 0.25	U < 5	16.1	24.4	U < 0.02	< 4	< 3	< 2	< 1	—	
		3/28/07	U < 0.25	U < 5	16.2	26.6	U < 0.02	< 4	< 3	< 2	< 1	—	
		9/26/07	U < 0.25	U < 5	16.7	26.8	U < 0.02	< 4	< 3	< 2	1.30	—	

TABLE 3.4 (Cont.)

Well	Screen Interval (ft BGL)	Sample Date	Concentration (mg/L)					Concentration (µg/L)			Total Organic Carbon (mg/L)	Dissolved Hydrogen (nM)	Tritium (TU)
			Phosphorus	Potassium	Silicon	Sodium	Zinc	Ethane	Ethene	Methane			
SB09	32-42	8/26/04	U < 0.25	U < 5	14.7	52.5	U < 0.02	< 4	< 3	< 2	1.94	—	
		9/11/05	U < 0.25	U < 5	15.0	57.0	U < 0.02	< 4	< 3	< 2	1.57	—	
		3/17/06	U < 0.25	U < 5	14.2	54.9	U < 0.02	< 4	< 3	< 2	6.88	—	
		9/25/06	U < 0.25	U < 5	15.0	49.5	U < 0.02	< 4	< 3	< 2	1.86	—	
		3/28/07	U < 0.25	U < 5	16.0	53.2	U < 0.02	< 4	< 3	< 2	1.50	—	
		9/26/07	U < 0.25	U < 5	15.0	52.1	U < 0.02	< 4	< 3	< 2	3.70	—	

^a U, not detected at the indicated reporting limit.

^b Qualifier H indicates that the holding time for the analysis was exceeded.

^c Qualifier B indicates that the analyte was present in the blank.

^d Qualifier E indicates that interference with the analysis was reported.

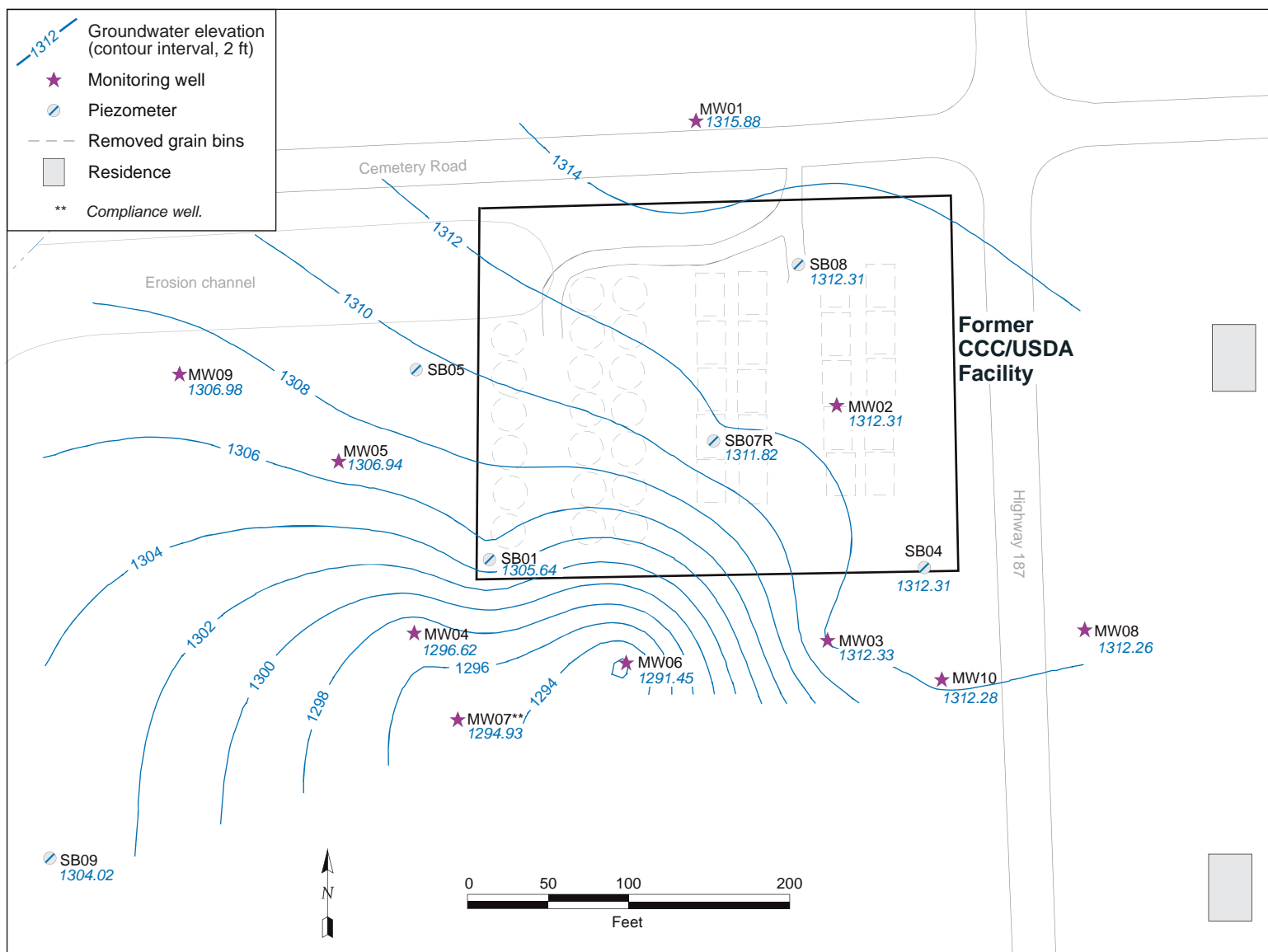


FIGURE 3.1 Potentiometric surface at Centralia, based on water levels measured manually on July 27, 2007.

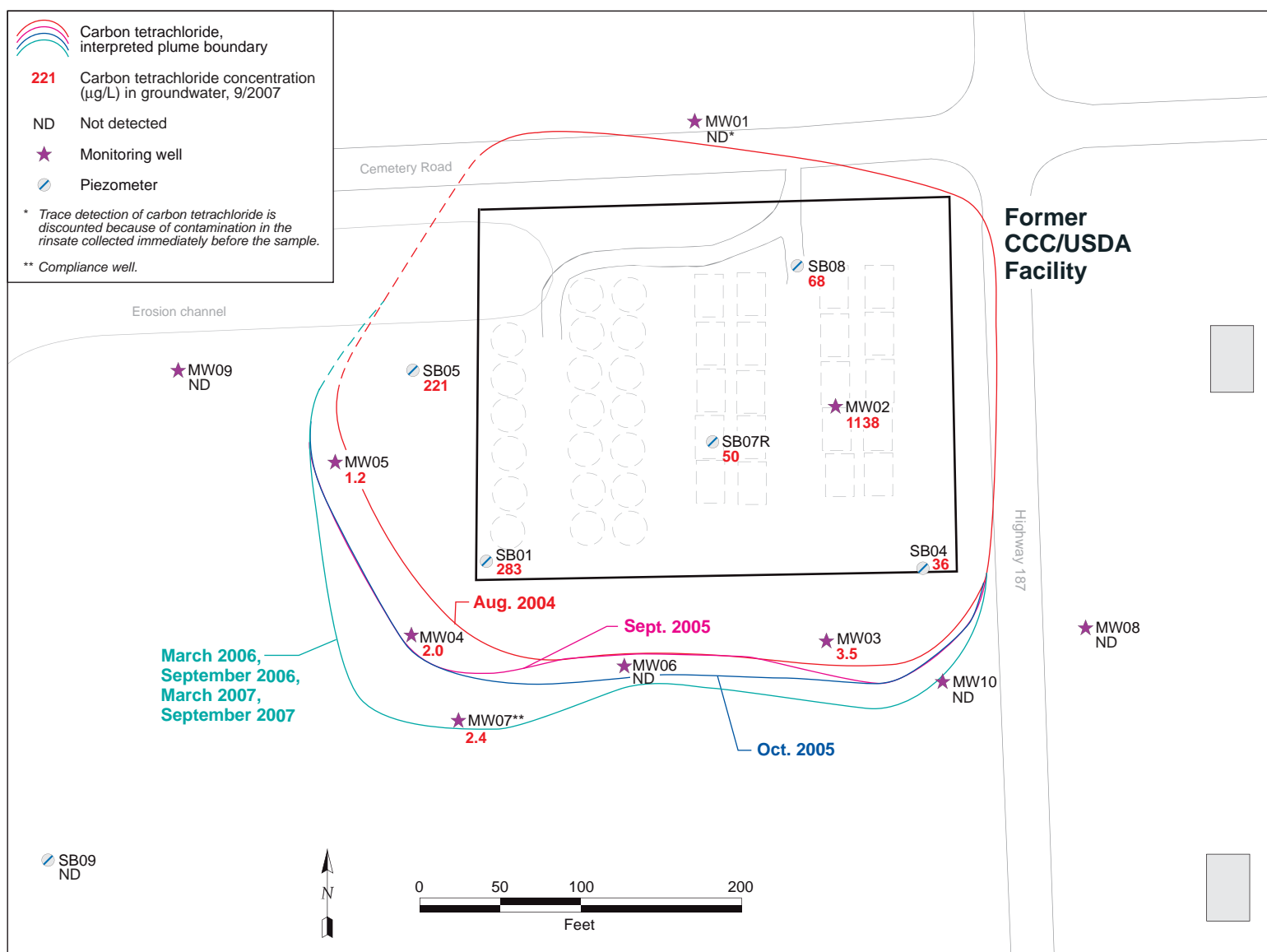


FIGURE 3.2 Carbon tetrachloride levels in groundwater at Centralia in March 2007, with the interpreted lateral extent of the contaminant at intervals during the period August 2004 to September 2007.

4 Conclusions and Recommendations

4.1 Conclusions

The findings of the September 2007 monitoring event at Centralia support the following conclusions:

- Measurements of groundwater levels obtained manually and through the use of automatic recorders have consistently indicated an apparent direction of groundwater flow to the south-southwest across the former CCC/USDA facility.
- The September 2007 well sampling data are generally consistent with previous results. Longer-term trends of increasing carbon tetrachloride concentrations continue to be observed at monitoring points SB05, MW03, MW04, and MW07, along the western and southern margins of the groundwater plume. These trends suggest slow expansion of the plume at the downgradient locations.
- Sampling to date has yielded only limited evidence for the presence of subsurface conditions at Centralia conducive to anaerobic degradation of the carbon tetrachloride contamination in groundwater. Nevertheless, chloroform has consistently been detected at relatively elevated concentrations at monitoring points SB01, SB05, and (particularly) MW02, suggesting that carbon tetrachloride is being degraded at these locations.

4.2 Recommendations

The CCC/USDA developed an *Interim Measure Conceptual Design* (Argonne 2007b), proposing a pilot test of the Adventus EHC *in situ* chemical reduction (ISCR) technology, that was approved by the KDHE in November 2007 (KDHE 2007). Further information about the Adventus ISCR product is available online (<http://www.adventusgroup.com/pdfs/Release-ISCR-ISCO.pdf>).

Groundwater sampling was incorporated into the design of the pilot test, to be implemented as part of the compliance monitoring program to evaluate the effectiveness of the EHC remediation technology at the Centralia site. Implementation of the proposed interim measure occurred in the late fall of 2007. The results presented here serve as pre-injection baseline data for existing monitoring points, per agreement with the KDHE.

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Appendix A:

Sequence of Sampling Activities at Centralia, Kansas, in September 2007

TABLE A.1 Sequence of sampling activities at Centralia in September 2007.

Sample Date	Time	Location	Sample	Sample Medium	Type ^a	Depth (ft TOC)	Chain of Custody No.	Sample Description
09/24/07	11:25	MW05	CNMW05-W-16218	Water	MW	34.5-44.5	6252	Depth to water from TOC = 10.80 ft. Depth of well from TOC = 47.60 ft. Sample collected from 4-in. monitoring well at low flow after purging of 72 gal with Redi-Flo pump. Purged to container.
09/24/07	12:40	MW09	CNMW09-W-16219	Water	MW	25-35	6252	Depth to water from TOC = 4.00 ft. Depth of well from TOC = 39.15 ft. Sample collected from 2-in. monitoring well at low flow after purging of 18 gal with Redi-Flo pump. Purged to container.
09/24/07	12:41	MW09	CNMW09D-W-16219	Water	MW	25-35	6252	Replicate of sample CNMW09-W-16219.
09/24/07	15:42	MW07	CNMW07-W-16221	Water	MW	45-55	6252	Depth to water from TOC = 29.07 ft. Depth of well from TOC = 58.70 ft. Sample collected from 2-in. monitoring well by using a valved tube after purging of 15 gal. Purged to container.
09/24/07	16:28	MW04	CNMW04-W-16220	Water	MW	37.5-47.5	6252	Depth to water from TOC = 26.24 ft. Depth of well from TOC = 49.22 ft. Sample collected from 4-in. monitoring well at low flow after purging of 40 gal with Redi-Flo pump. Purged to container. Well dry after 25 gal. Sampled after recovery.
09/24/07	18:01	MW06	CNMW06-W-16222	Water	MW	46.5-56.5	6252	Depth to water from TOC = 38.50 ft. Depth of well from TOC = 60.00 ft. Sample collected from 4-in. monitoring well at low flow after purging of 32 gal with Redi-Flo pump. Purged to container. Well dry at 30 gal. Sampled after recovery.
09/25/07	8:35	MW03	CNMW03-W-16223	Water	MW	50.5-60.5	6253	Depth to water from TOC = 22.60 ft. Depth of well from TOC = 62.30 ft. Sample collected from 4-in. monitoring well at low flow after purging of 75 gal with Redi-Flo pump. Purged to container.
09/25/07	9:52	MW10	CNMW10-W-16224	Water	MW	30-45	6253	Depth to water from TOC = 22.89 ft. Depth of well from TOC = 47.71 ft. Sample collected from 2-in. monitoring well at low flow after purging of 13 gal with Redi-Flo pump. Purged to container.
09/25/07	11:27	SB07R	CNSB07R-W-16225	Water	CPT/P	45-60	6253	Depth to water from TOC = 20.00 ft. Depth of well from TOC = 58.50 ft. Sample collected from 2-in. monitoring well at low flow after purging of 19 gal with Redi-Flo pump. Purged to container.

TABLE A.1 (Cont.)

Sample Date	Time	Location	Sample	Sample Medium	Type ^a	Depth (ft TOC)	Chain of Custody No.	Sample Description
09/25/07	13:53	QC	CNQCTB-W-16234	Water	TB	–	6259	Trip blank sent to EnviroSystems, Inc., for verification organic analysis with samples listed on chain-of-custody form (COC) 6259.
09/25/07	13:57	QC	CNQCTB-W-16235	Water	TB	–	6253	Trip blank sent to the AGEM Laboratory for organic analysis with samples listed on COCs 6252 and 6253 .
09/25/07	13:58	QC	CNQCFB-W-16236	Water	FB	–	6253	Field blank of water used during September 2007 sampling event.
09/25/07	15:52	MW08	CNMW08-W-16226	Water	MW	38-53	6253	Depth to water from TOC = 20.72 ft. Depth of well from TOC = 57.10 ft. Sample collected from 2-in. monitoring well at low flow after purging of 18 gal with Redi-Flo pump. Purged to container.
09/25/07	16:30	QC	CNQCTB-W-16237	Water	TB	–	6263	Trip blank sent to Severn-Trent Laboratories for methane, ethane, and ethene analyses with samples listed on COCs 6254, 6255, 6260, and 6263.
09/25/07	16:32	QC	CNQCTB-W-16239	Water	TB	–	6255	Trip blank sent to Severn-Trent Laboratories for VOCs analyses with samples listed on COCs 6254, 6255, 6260, and 6263. (Not required. Not analyzed.)
09/26/07	9:24	MW02	CNMW02-W-16227	Water	MW	49.5-59.5	6265	Depth to water from TOC = 23.05 ft. Depth of well from TOC = 61.25 ft. Sample collected from 4-in. monitoring well at low flow after purging of 75 gal with Redi-Flo pump. Purged to container.
09/26/07	9:25	MW02	CNMW02D-W-16227	Water	MW	49.5-59.5	6265	Replicate of sample CNMW02-W-16227.
09/26/07	10:00	QC	CNQCRI-W-16240	Water	RI	–	6265	Rinsate of decontaminated sampling pump and hose after collection of sample CNMW02-W-16227.
09/26/07	11:15	MW01	CNMW01-W-16228	Water	MW	54.5-64.5	6265	Depth to water from TOC = 14.55 ft. Depth of well from TOC = 69.50 ft. Sample collected from 4-in. monitoring well at low flow after purging of 100 gal with Redi-Flo pump. Purged to container.
09/26/07	11:29	SB08	CNSB08-W-16229	Water	CPT/P	52-62	6265	Depth to water from TOC = 21.37 ft. Depth of well from TOC = 59.78 ft. Sample collected from 1-in. monitoring well by using a valved tube after purging of 5 gal. Purged to container.
09/26/07	13:07	SB04	CNSB04-W-16230	Water	CPT/P	51-61	6265	Depth to water from TOC = 24.49 ft. Depth of well from TOC = 59.37 ft. Sample collected from 1-in. monitoring well by using a valved tube after purging of 5 gal. Purged to container.

TABLE A.1 (Cont.)

Sample Date	Time	Location	Sample	Sample Medium	Type ^a	Depth (ft TOC)	Chain of Custody No.	Sample Description
09/26/07	14:06	SB09	CNSB09-W-16231	Water	CPT/P	32-42	6265	Depth to water from TOC = 6.92 ft. Depth of well from TOC = 35.85 ft. Sample collected from 1-in. monitoring well by using a valved tube after purging of 3 gal. Purged to container.
09/26/07	15:48	SB05	CNSB05-W-16233	Water	CPT/P	32-42	6265	Depth to water from TOC = 11.75 ft. Depth of well from TOC = 41.00 ft. Sample collected from 1-in. monitoring well by using a valved tube after purging of 3 gal. Purged to container.
09/27/07	7:22	SB01	CNSB01-W-16232	Water	CPT/P	40-50	6269	Depth to water from TOC = 20.05 ft. Depth of well from TOC = 49.00 ft. Sample collected on Sept. 27 from 1-in. monitoring well by using a valved tube. Well was dry after purging of 1.5 gal on Sept 26. Purged to container.
09/27/07	7:57	QC	CNQCTB-W-16244	Water	TB	–	6269	Trip blank sent to the AGEM Laboratory for organic analyses with samples listed on COCs 6265 and 6269.
09/27/07	12:30	QC	CNQCTB-W-16242	Water	TB	–	6268	Trip blank sent to Severn-Trent Laboratories for methane, ethane, and ethene analyses with samples listed on COCs 6267, 6268, 6273, and 6274.
09/27/07	12:35	QC	CNQCTB-W-16243	Water	TB	–	6274	Trip blank sent to Severn-Trent Laboratories for VOCs analyses with samples listed on COCs 6267, 6268, 6273, and 6274. (Not required. Not analyzed.)
10/09/07	6:00	QC	CN-WW	Water	BT	–	1132596	Containerized waste purge water generated during September 2007 monitoring event. Analyzed at Pace Analytical Services for VOCs, ethylene dibromide, and nitrate.

^a Sample types: BT, wastewater composite; CPT/P, cone penetrometer piezometer; FB, field blank; RI, rinsate; MW, monitoring well; TB, trip blank.

Appendix B:

Data Summary for Verification VOCs analyses by Envirosystems, Inc.

ENVIROSYSTEMS, INC.

9200 Rumsey Road • Suite B102 • Columbia, Maryland 21045-1934
Phone (410) 964-0330 • Fax (410) 740-9306
Email: info@envsystems.com • Webpage: www.envsystems.com/envsys

October 10, 2007

Jorge S. Alvarado, PH. D
Argonne National Laboratory
Environmental Research Division
Applied Geosciences and Environmental
Management Section
9700 South Cass Avenue, ER-203
Argonne, Illinois 60439

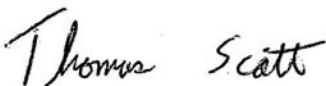
RE: Report #070287

Dear Jorge,

Enclosed is the Analytical Data Package for Organics Analysis for the samples received on September 26, 2007. These samples were analyzed by using method SW-846 8260B and USEPA CLP SOWOLM04.3 and the chain of custody instructions.

Please do not hesitate to call if you have any questions, comments, or require additional information.

Sincerely,



Mohan Khare Ph.D.
President/CEO

Enclosure (1)
MK/ncc

Envirosystems, Inc.
Report **R070287**

SDG NARRATIVE VOLATILE ORGANICS (VOC)

Envirosystems, Inc.

Contract: N/A

Client: Argonne National Laboratory

Case: N/A

SDG: ARG70912

1. SAMPLE RECEIPT

Date received: 09-26-2007

Cooler Temperature: 2

Sample Summary

Client ID	Laboratory ID	Matrix	pH
CN-MW03-W-16223	0070912-01	WATER	7
CN-SB07R-W-16225	0070912-02	WATER	7
CN-QCTB-W-16234	0070912-03	WATER	7

2. HOLDING TIMES

A. Sample Preparation: All holding times were met.

B. Sample Analysis: All holding times were met.

3. METHODS

The samples were analyzed and reported by using method SW-846 8260B and USEPA CLP SOW OLM04.3 for target compound list.

4. INSTRUMENT AND CHROMATOGRAPHIC CONDITIONS

A Hewlett Packard 6890 gas chromatograph equipped with a Hewlett Packard 5975 MSD was used for sample analysis. The capillary column used was a Restek 20m by 0.18 mm ID by 1.0 μ m film thickness (Restek Cat. # RTX-624). The trap used with the sample concentrator is an OI Analytical Trap #10, 3 packed with Tenax/silica gel/cms (PN#228122).

5. PREPARATION

The submitted samples were analyzed as received.

6. ANALYSIS

A. Calibration:

I. Initial calibration

All acceptance criteria as stipulated by SW-846 8260b were met for all SPCC's and CCC's. All target compounds met the required percent RSD.

**SDG NARRATIVE
VOLATILE ORGANICS (VOC)**

II. Blanks:

All acceptance criteria were met.

II. Surrogates:

All acceptance criteria were met except for sample CN-MW03-W-16223, two surrogates were outside qc limits.

B. Spikes:

I. Laboratory Control Spikes (LCS)

LCS and LCSD samples were not analyzed.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The client did not request a MS/MSD.

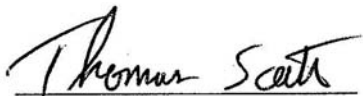
C. Internal Standards:

All acceptance criteria were met.

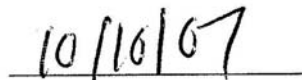
D. Samples

Sample analysis proceeded normally.

I certify that this Sample Data Package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in the hard copy Sample Data Package and in the Electronic Data Deliverables has been authorized by the laboratory manager or the manager's designee, as verified by the following signatures.



Laboratory Manager



Date



6259

[illegible]

1A - FORM I VOA-1
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CN-MW03-W-16223

Lab Name: Envirosystems, Inc. Contract: _____
Lab Code: ENVSYS Case No.: _____ Mod. Ref No.: _____ SDG No.: Arg70912
Matrix: (SOIL/SED/WATER) WATER Lab Sample ID: 0070912-01
Sample wt/vol: 5.00 (g/mL) ML Lab File ID: H73FA058.D
Level: (TRACE/LOW/MED) LOW Date Received: 09/26/2007
% Moisture: not dec. Date Analyzed: 10/02/2007
GC Column: RTX-624 ID: 0.18 (mm) Dilution Factor: 1.0
Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)
Purge Volume: 5.00 (mL)

CAS NO:	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) <u>UG/L</u>	Q
75-71-8	Dichlorodifluoromethane	5.0	U
74-87-3	Chloromethane	5.0	U
75-01-4	Vinyl chloride	5.0	U
74-83-9	Bromomethane	5.0	U
75-00-3	Chloroethane	5.0	U
75-69-4	Trichlorofluoromethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	U
67-64-1	Acetone	5.0	U
75-15-0	Carbon disulfide	5.0	U
79-20-9	Methyl acetate	5.0	U
75-09-2	Methylene chloride	5.0	U
156-60-5	trans-1,2-Dichloroethene	5.0	U
1634-04-4	Methyl tert-butyl ether	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	cis-1,2-Dichloroethene	5.0	U
78-93-3	2-Butanone	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
110-82-7	Cyclohexane	5.0	U
56-23-5	Carbon Tetrachloride	2.6	J
71-43-2	Benzene	5.0	U
107-06-2	1,2-Dichloroethane	5.0	U

1B - FORM I VOA-2
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CN-MW03-W-16223

Lab Name: EnviroSystems, Inc. Contract: _____
Lab Code: ENVSYS Case No.: _____ Mod. Ref No.: _____ SDG No.: Arg70912
Matrix: (SOIL/SED/WATER) WATER Lab Sample ID: 0070912-01
Sample wt/vol: 5.00 (g/mL) ML Lab File ID: H73FA058.D
Level: (TRACE/LOW/MED) LOW Date Received: 09/26/2007
% Moisture: not dec. Date Analyzed: 10/02/2007
GC Column: RTX-624 ID: 0.18 (mm) Dilution Factor: 1.0
Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)
Purge Volume: 5.00 (mL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)UG/L	Q
79-01-6	Trichloroethene	5.0	U
108-87-2	Methylcyclohexane	5.0	U
78-87-5	1,2-Dichloropropane	5.0	U
75-27-4	Bromodichloromethane	5.0	U
10061-01-5	cis-1,3-Dichloropropene	5.0	U
108-10-1	4-Methyl-2-pentanone	5.0	U
108-88-3	Toluene	5.0	U
10061-02-6	trans-1,3-Dichloropropene	5.0	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	5.0	U
591-78-6	2-Hexanone	5.0	U
124-48-1	Dibromochloromethane	5.0	U
106-93-4	1,2-Dibromoethane	5.0	U
108-90-7	Chlorobenzene	5.0	U
100-41-4	Ethylbenzene	5.0	U
95-47-6	o-Xylene	5.0	U
179601-23-1	m,p-Xylene	5.0	U
100-42-5	Styrene	5.0	U
75-25-2	Bromoform	5.0	U
98-82-8	Isopropylbenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	U
541-73-1	1,3-Dichlorobenzene	5.0	U
106-46-7	1,4-Dichlorobenzene	5.0	U
95-50-1	1,2-Dichlorobenzene	5.0	U
96-12-8	1,2-Dibromo-3-chloropropane	5.0	U
120-82-1	1,2,4-Trichlorobenzene	5.0	U
91-20-3	Naphthalene	5.0	U

1A - FORM I VOA-1
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CN-SB07R-W-16225

Lab Name: Envirosystems, Inc. Contract: _____
Lab Code: ENVSYS Case No.: _____ Mod. Ref No.: _____ SDG No.: Arg70912
Matrix: (SOIL/SED/WATER) WATER Lab Sample ID: 0070912-02
Sample wt/vol: 5.00 (g/mL) ML Lab File ID: H73FA059.D
Level: (TRACE/LOW/MED) LOW Date Received: 09/26/2007
% Moisture: not dec. Date Analyzed: 10/02/2007
GC Column: RTX-624 ID: 0.18 (mm) Dilution Factor: 1.0
Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)
Purge Volume: 5.00 (mL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) UG/L	Q
75-71-8	Dichlorodifluoromethane	5.0	U
74-87-3	Chloromethane	5.0	U
75-01-4	Vinyl chloride	5.0	U
74-83-9	Bromomethane	5.0	U
75-00-3	Chloroethane	5.0	U
75-69-4	Trichlorofluoromethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	U
67-64-1	Acetone	5.0	U
75-15-0	Carbon disulfide	5.0	U
79-20-9	Methyl acetate	5.0	U
75-09-2	Methylene chloride	5.0	U
156-60-5	trans-1,2-Dichloroethene	5.0	U
1634-04-4	Methyl tert-butyl ether	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	cis-1,2-Dichloroethene	5.0	U
78-93-3	2-Butanone	5.0	U
67-66-3	Chloroform	2.3	J
71-55-6	1,1,1-Trichloroethane	5.0	U
110-82-7	Cyclohexane	5.0	U
56-23-5	Carbon Tetrachloride	25	
71-43-2	Benzene	5.0	U
107-06-2	1,2-Dichloroethane	5.0	U

1B - FORM I VOA-2
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CN-SB07R-W-16225

Lab Name: Envirosystems, Inc. Contract: _____
Lab Code: ENVSYS Case No.: _____ Mod. Ref No.: _____ SDG No.: Arg70912
Matrix: (SOIL/SED/WATER) WATER Lab Sample ID: 0070912-02
Sample wt/vol: 5.00 (g/mL) ML Lab File ID: H73FA059.D
Level: (TRACE/LOW/MED) LOW Date Received: 09/26/2007
% Moisture: not dec. Date Analyzed: 10/02/2007
GC Column: RTX-624 ID: 0.18 (mm) Dilution Factor: 1.0
Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)
Purge Volume: 5.00 (mL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)UG/L	Q
79-01-6	Trichloroethene	5.0	U
108-87-2	Methylcyclohexane	5.0	U
78-87-5	1,2-Dichloropropane	5.0	U
75-27-4	Bromodichloromethane	5.0	U
10061-01-5	cis-1,3-Dichloropropene	5.0	U
108-10-1	4-Methyl-2-pentanone	5.0	U
108-88-3	Toluene	5.0	U
10061-02-6	trans-1,3-Dichloropropene	5.0	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	5.0	U
591-78-6	2-Hexanone	5.0	U
124-48-1	Dibromochloromethane	5.0	U
106-93-4	1,2-Dibromoethane	5.0	U
108-90-7	Chlorobenzene	5.0	U
100-41-4	Ethylbenzene	5.0	U
95-47-6	o-Xylene	5.0	U
179601-23-1	m,p-Xylene	5.0	U
100-42-5	Styrene	5.0	U
75-25-2	Bromoform	5.0	U
98-82-8	Isopropylbenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	U
541-73-1	1,3-Dichlorobenzene	5.0	U
106-46-7	1,4-Dichlorobenzene	5.0	U
95-50-1	1,2-Dichlorobenzene	5.0	U
96-12-8	1,2-Dibromo-3-chloropropane	5.0	U
120-82-1	1,2,4-Trichlorobenzene	5.0	U
91-20-3	Naphthalene	5.0	U

1A - FORM I VOA-1
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
CN-QCTB-W-16234

Lab Name: Envirosystems, Inc. Contract: _____
Lab Code: ENVSYS Case No.: _____ Mod. Ref No.: _____ SDG No.: Arg70912
Matrix: (SOIL/SED/WATER) WATER Lab Sample ID: 0070912-03
Sample wt/vol: 5.00 (g/mL) ML Lab File ID: H73FA060.D
Level: (TRACE/LOW/MED) LOW Date Received: 09/26/2007
% Moisture: not dec. Date Analyzed: 10/02/2007
GC Column: RTX-624 ID: 0.18 (mm) Dilution Factor: 1.0
Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)
Purge Volume: 5.00 (mL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) <u>UG/L</u>	Q
75-71-8	Dichlorodifluoromethane	5.0	U
74-87-3	Chloromethane	5.0	U
75-01-4	Vinyl chloride	5.0	U
74-83-9	Bromomethane	5.0	U
75-00-3	Chloroethane	5.0	U
75-69-4	Trichlorofluoromethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	U
67-64-1	Acetone	5.0	U
75-15-0	Carbon disulfide	5.0	U
79-20-9	Methyl acetate	5.0	U
75-09-2	Methylene chloride	5.0	U
156-60-5	trans-1,2-Dichloroethene	5.0	U
1634-04-4	Methyl tert-butyl ether	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	cis-1,2-Dichloroethene	5.0	U
78-93-3	2-Butanone	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
110-82-7	Cyclohexane	5.0	U
56-23-5	Carbon Tetrachloride	5.0	U
71-43-2	Benzene	5.0	U
107-06-2	1,2-Dichloroethane	5.0	U

1B - FORM I VOA-2
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CN-QCTB-W-16234

Lab Name: Envirosystems, Inc. Contract: _____
Lab Code: ENVSYS Case No.: _____ Mod. Ref No.: _____ SDG No.: Arg70912
Matrix: (SOIL/SED/WATER) WATER Lab Sample ID: 0070912-03
Sample wt/vol: 5.00 (g/mL) ML Lab File ID: H73FA060.D
Level: (TRACE/LOW/MED) LOW Date Received: 09/26/2007
% Moisture: not dec. Date Analyzed: 10/02/2007
GC Column: RTX-624 ID: 0.18 (mm) Dilution Factor: 1.0
Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)
Purge Volume: 5.00 (mL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)UG/L	Q
79-01-6	Trichloroethene	5.0	U
108-87-2	Methylcyclohexane	5.0	U
78-87-5	1,2-Dichloropropane	5.0	U
75-27-4	Bromodichloromethane	5.0	U
10061-01-5	cis-1,3-Dichloropropene	5.0	U
108-10-1	4-Methyl-2-pentanone	5.0	U
108-88-3	Toluene	5.0	U
10061-02-6	trans-1,3-Dichloropropene	5.0	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	5.0	U
591-78-6	2-Hexanone	5.0	U
124-48-1	Dibromochloromethane	5.0	U
106-93-4	1,2-Dibromoethane	5.0	U
108-90-7	Chlorobenzene	5.0	U
100-41-4	Ethylbenzene	5.0	U
95-47-6	o-Xylene	5.0	U
179601-23-1	m,p-Xylene	5.0	U
100-42-5	Styrene	5.0	U
75-25-2	Bromoform	5.0	U
98-82-8	Isopropylbenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	U
541-73-1	1,3-Dichlorobenzene	5.0	U
106-46-7	1,4-Dichlorobenzene	5.0	U
95-50-1	1,2-Dichlorobenzene	5.0	U
96-12-8	1,2-Dibromo-3-chloropropane	5.0	U
120-82-1	1,2,4-Trichlorobenzene	5.0	U
91-20-3	Naphthalene	5.0	U



Environmental Science Division

Argonne National Laboratory

9700 South Cass Avenue, Bldg. 203

Argonne, IL 60439-4843

www.anl.gov



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