LMS/PIN/N01440

Pinellas Environmental Restoration Project

Semiannual Progress Report for the 4.5 Acre Site June through November 2009

December 2009

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Abbreviations

cDCE	cis-1,2-dichloroethene
COPC	contaminants of potential concern
CTL	cleanup target level
DCE	dichloroethene
DOE	U.S. Department of Energy
DPE	dual-phase extraction
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
ft	feet
IRA	Interim Remedial Action
LDA	large-diameter auger
µg/L	micrograms per liter
MCL	maximum contaminant level
mg/L	milligrams per liter
QA/QC	quality assurance/quality control
RBCA	Risk-Based Corrective Action
RPD	relative percent difference
STAR Center	Young - Rainey Science, Technology, and Research Center
TCE	trichloroethene
TCOPC	total contaminants of potential concern
tDCE	trans-1,2-dichloroethene
VC	vinyl chloride
VOCs	volatile organic compounds

1.0 Introduction

The *Pinellas Environmental Restoration Project Semiannual Progress Report 4.5 Acre Site* describes environmental restoration activities for the Pinellas 4.5 Acre Site located in Pinellas County, Largo, Florida (Figure 1). The former U.S. Department of Energy (DOE) Pinellas Plant facility consisted of the 4.5 Acre Site and the Young - Rainey Science, Technology, and Research Center (STAR Center) (Figure 2). The facility was constructed in the mid-1950s as part of a nationwide nuclear weapons research, development, and production complex. Production of weapons-related components ceased in September 1994. However, as a result of these operations, contamination exists in the surficial groundwater beneath the site.

Administration of DOE activities at the 4.5 Acre Site is the responsibility of the DOE Office of Legacy Management in Grand Junction, Colorado. S.M. Stoller Corporation (Stoller), a prime contractor to DOE's Office of Legacy Management, provides technical support to DOE for the remediation and closure of all active solid-waste management units on site and for the 4.5 Acre Site.

The 4.5 Acre Site is located to the northwest of the STAR Center, in the northeast quarter of Section 13, Township 30 South, Range 15 East (Figure 1). DOE owned this parcel from 1957 to 1972, at which time it was sold to a private landowner. During the period of DOE ownership, the property was used for disposal of drums of waste resins and solvents. As a result of this practice, the surficial aquifer was impacted by volatile organic compounds (VOCs), primarily vinyl chloride (VC), toluene, trichloroethene (TCE), and 1,2-dichloroethene (DCE). DOE completed a source removal in 1985.

An Interim Remedial Action (IRA) consisting of groundwater extraction and treatment via air stripping, and a routine groundwater monitoring program were initiated in May 1990. In July 1997, a modification of the IRA, involving the installation of dual-phase extraction (DPE) wells, provided a more aggressive system to remove groundwater contamination. In November 1999, the DPE/air-stripping system was replaced with an in situ biosparge treatment system.

The *4.5 Acre Site Biosparge System Integration Plan* (DOE 2000) was approved by the Florida Department of Environmental Protection (FDEP) on January 17, 2001. This plan states that performance monitoring would be undertaken on a quarterly basis. Therefore, in April 2001, performance monitoring of the remedial system through the use of direct push technology was undertaken. However, the biosparge systems were shut off in May 2003 with no plans to restart them and no performance monitoring data have been collected since April 2003. Subsequent monitoring was then adapted to fit the new remediation scenario and performance monitoring as defined in the *Interim Remedial Action Plan for Ground Water Recovery at the 4.5 Acre Site* (DOE 2003b).

The IRA Plan for Ground Water Recovery at the 4.5 Acre Site was submitted to FDEP on August 29, 2003, and approved by FDEP on September 19, 2003. Implementation of the IRA Plan commenced on March 8, 2004, when construction activities began on the IRA treatment system. The treatment system consisted of an extraction well field (three recovery wells), pumps and associated piping, a transmission water pipeline, a utility connection, a low profile tray air stripper unit, and effluent piping. The new IRA system began operations on April 26, 2004.

The IRA system was a temporary measure that was outlined in the *Remedial Action Plan for the Pinellas 4.5 Acre Site* (DOE 2001) as a contingency option in the event that biosparging resulted in extending the contaminant plume. In April 2005, the *Pinellas Environmental Restoration Project 4.5 Acre Site Remedial Action Plan Addendum* (DOE 2005) was submitted to FDEP. This document presented a proposed final action for the 4.5 Acre Site that involves the closure of the site using the provisions of the recently adopted State of Florida Global Risk-Based Corrective Action (RBCA) regulations.

Technical discussions between FDEP and DOE regarding the proposed final action continue. Part of DOE's proposed final action for the 4.5 Acre Site was to shut down the IRA system and begin a 2-year monitoring period. Approval from FDEP to shut down the IRA system was received on December 20, 2005, thus commencing the DOE's 2-year monitoring period.

Although DOE has conducted numerous remediation activities at the 4.5 Acre Site since 1985, FDEP in 2005 suggested that, based on elevated levels of VOCs in groundwater, a source of VOCs may remain in the subsurface, and that removal of contaminated soil may be necessary (FDEP 2005). To investigate this concern, 1,172 soil samples were collected from 138 soil borings installed at two areas of the site during the summer of 2007. Analytical results demonstrated that the following contaminants were present in site sediments at concentrations that likely represent a source of contamination to groundwater: TCE; cis-1,2-DCE (cDCE); trans-1,2-DCE (tDCE); and toluene. Results from this characterization effort can be found in the *4.5 Acre Site Source Characterization Data Report* (DOE 2007).

In April 2008, DOE presented a feasibility study that evaluated the available contaminant source removal technologies. The preferred option for source removal at the 4.5 Acre Site was determined to be soil excavation using a large-diameter auger (LDA) and off-site disposal of soil (DOE 2008a). In a letter dated May 17, 2008, FDEP states "the report is acceptable for its intended purpose" and "the preferred option for source removal of soil excavation using large diameter auger and off-site soil disposal is also acceptable to the Department."

An *Interim Remedial Action Plan for Source Removal at the 4.5 Acre Site* (DOE 2008b) was prepared in late July 2008 and approved by FDEP on August 19, 2008. The objective of this IRA was to remove the source of contamination at the site. On March 31, 2009, LDA operations commenced at the 4.5 Acre Site and were completed on May 27, 2009. Two hundred twenty-one large-diameter and 325 small-diameter borings were completed. Approximately 7,035 cubic yards of soil were excavated; of this total, 4,464 cubic yards were removed as clean overburden, and 2,571 cubic yards of contaminated soil were removed, characterized for waste disposal, and disposed of at a Resource Conservation and Recovery Act Subtitle D landfill. Additional information regarding the 4.5 Acre Site LDA work can be found in the *Data Report for Overburden Soil at the Northeast Site and the 4.5 Acre Site* (DOE 2009b) and the *Interim Remedial Action Final Report for Source Removal at the 4.5 Acre Site* (DOE 2009c).

With the completion of the LDA project and the removal of contaminant source material, DOE is proceeding to close the site under the FDEP's RBCA rules (Chapter 62-780.680 Florida Administrative Code [F.A.C.]). The *Closure Monitoring Plan for the Northeast Site and 4.5 Acre Site* (DOE 2009a), describes the closure monitoring that is necessary under RBCA,

according to the requirements for Post Active Remediation Monitoring (Chapter 62-780.750 F.A.C.). This document is currently being reviewed by FDEP.

Routine monitoring at the site in March 2009 identified the presence of VC in monitoring well PIN20-M035. DOE reported this discovery to FDEP and to the property owner in accordance with FDEP notification requirements.

A planned follow up to the LDA project is an enhanced bioremediation task that will be conducted around the previous source areas. The purpose of the enhanced bioremediation is to treat any residual amounts of contaminants located in soils outside the excavation areas and to decrease dissolved-phase contaminant concentrations for a short distance downgradient from the former source areas. The *Addendum to the Interim Remedial Action Plans for Source Removal at the Northeast Site and the 4.5 Acre Site* is the work plan describing the details of the enhanced bioremediation work and is currently being developed. The full scale enhanced bioremediation project is scheduled to begin as early as January 2010.

This document is the semiannual progress report for the 4.5 Acre Site for June through November 2009, as requested by FDEP. The results of monitoring activities and a summary of ongoing and projected work are provided in this report.

1.1 Site Activities

- Obtained water-level measurements from all monitoring wells on August 13 and 26, 2009.
- Conducted the semiannual sampling event (i.e., collected groundwater samples for VOCs analysis from 30 monitoring wells in August and September 2009).
- Installed five new monitoring wells (PIN20-M065−M069) the week of October 23, 2009.
- Reported the results of the semiannual sampling event (this document).
- The stormwater permit for the 4.5 Acre Site LDA project was terminated in July 2009.

2.0 Monitoring Data

2.1 Groundwater Elevations and Flow

On August 26, 2009, depth-to-water measurements were taken in all monitoring wells and former recovery wells at the 4.5 Acre Site. The depth to water in each well was measured with an electronic water-level indicator. The groundwater elevation data are listed in Table 1. Surface water elevations for Pond 5 (southeast of the 4.5 Acre Site), the West Pond (to the east), and the pond immediately north of the 4.5 Acre Site are listed in Table 2. The water elevation data were used to construct contours of water levels in the shallow and deep portions of the surficial aquifer (Figures 3 and 4). Groundwater in the shallow surficial aquifer (Figure 3) generally flows to the west/northwest, although in the southeastern part of the site there is a southeastward component of flow toward Pond 5. The flow patterns in the deep surficial aquifer (Figure 4) were similar to those observed in the shallow surficial aquifer.

The average hydraulic gradient across the site was approximately 0.002 feet per foot in August 2009. This gradient is similar to those observed the previous 3 years at the site.

Calculations using Darcy's Law along with approximations of 1 ft/day for hydraulic conductivity and 0.3 for effective porosity indicate that groundwater at the site is estimated to move about 2.5 ft/year. Groundwater velocities at the site have historically ranged from 2 to 10 ft/year.

A special water-level measurement event occurred on August 13, 2009, to help assess any potential effects that LDA activities may have had on the natural groundwater flow patterns at the site. During this event, water levels were measured in all monitoring wells, former recovery wells, and the 4.5 Acre Site Pond. The data from this event, including the pond elevation, are listed in Table 3. Groundwater contours for the shallow and deep portions of the surficial aquifer are shown on Figures 5 and 6, respectively. In both the shallow and deep surficial aquifer, a general flow pattern to the northwest was observed. The southeastward component of flow in the southeastern part of the site was observed in the deep surficial aquifer. These data indicate that the LDA activities did not alter the natural flow patterns at the 4.5 Acre Site.

2.2 Groundwater Sampling

Groundwater samples were collected from 30 monitoring wells at the 4.5 Acre Site in August/September 2009. Samples from all 30 wells were analyzed for VOCs.

All samples were collected in accordance with the Stoller *Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site* (DOE 2006), using FDEP procedures. All samples were submitted to TestAmerica, Tampa, Florida for analysis. TestAmerica in Tampa, Florida, is accredited by the Florida Department of Health in accordance with the National Environmental Laboratory Accreditation Conference, certification number E84282. VOCs were analyzed using U.S. Environmental Protection Agency (EPA) method SW-846 8260B. All monitoring wells were micropurged using a dedicated bladder or peristaltic pumps, and sampling was performed when the field measurements stabilized. Table 4 lists field measurements of pH, specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity, and temperature recorded at the time the samples were collected. Measurements were made with a flow cell and a multiparameter instrument.

2.3 Groundwater Analytical Results

Table 5 presents individual contaminants of potential concern (COPC) and total COPCs (TCOPCs) concentrations in samples collected from wells at the 4.5 Acre Site. The results from the previous two semiannual sampling events are included in Table 5 for comparison. Figure 7 shows the TCOPCs concentrations for August/September 2009.

The maximum TCOPCs value detected in August/September was 2,594 micrograms per liter (μg/L) at PIN20-M001. The compound detected at the highest concentration in PIN20-M001 was VC at a concentration of 2,300 μg/L.

VC was detected at 3.8 μg/L in the sample collected from off-site well PIN20-M035 on August 28, 2009 (Table 5); this value exceeded the off-site cleanup level of 1 μg/L. The well was resampled on September 10, 2009, and VC was detected at 3.9 μg/L, confirming the initial result. An Initial Notice of Contamination Beyond Property Boundaries form was completed and submitted to FDEP on September 18, 2009.

Laboratory reports for semiannual samples collected in August/September 2009 are provided in Appendix A.

2.4 Quality Assurance/Quality Control

The results from the analytical laboratory, TestAmerica, were checked for quality assurance/quality control (QA/QC) through duplicate samples and trip blanks. Detected analytes for each duplicate sample collected from the 4.5 Acre Site are listed in Table 6. The duplicate sample results were compared and the relative percent differences (RPDs) between the results were calculated. All duplicate results met the EPA recommended laboratory duplicate criteria of less than 20 percent RPD for results that are greater than 5 times the practical quantitation limit. All data passed QA/QC criteria at a Class A level, indicating that the data may be used for quantitative and qualitative purposes.

As specified in the *Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site* (DOE 2006), duplicate samples should be collected at a frequency of one duplicate for every 20 or fewer samples. During the August/September 2009 event 30 samples were collected and two duplicate samples were collected, so this criterion was met.

A data validation software module for identifying and tracking anomalous groundwater data within the SEEPro database was used to generate a report of analytical results that fall outside of historical minimum or maximum values. There were no anomalies associated with these result and the data are acceptable as qualified.

3.0 Data Interpretation

This data interpretation section is included to aid in evaluating plume stability. This section consists of plots showing contaminant concentration trends (Section 3.1), and a discussion of site geochemistry (Section 3.2).

While most of the previous documents for the Pinellas site have compared groundwater contaminant concentrations to drinking water standards (i.e., maximum contaminant levels [MCLs]), those standards are not the applicable default CTLs for the purpose of evaluating site remediation under RBCA. Based on a comprehensive review of background data for the site (DOE 2003a), it has been determined that aluminum and iron levels in the shallow groundwater in the site vicinity are naturally elevated and far exceed State of Florida Secondary Drinking Water Standards (Chapter 62-550, F.A.C.). Specifically, the average background concentration of 1.1 milligrams per liter (mg/L) for aluminum exceeds the 0.2 mg/L secondary standard, and the average background concentration for iron (9.3 mg/L) exceeds the 0.3 mg/L secondary standard. The ambient shallow groundwater in the area is therefore designated as “poor quality” as defined in 62-780.200 (35), F.A.C. Thus, the applicable groundwater CTLs are those for groundwater of “low yield/poor quality” provided in Table 1 of Chapter 62-777, F.A.C. In essence, these CTL values are a factor of 10 higher than the MCL values.

3.1 Contaminant Concentration Trends

Figure 8 and Figure 9 show the cDCE and VC concentration trends in wells PIN20-0502 and -M001, respectively. These two wells, located hydraulically downgradient from the area of highest contaminant concentrations, have shown increasing concentration trends over the last few years. This appears to be a result of past operation of the biosparging system, as described in previous reports. However, it appears that the contaminant concentrations in both wells are now generally decreasing. Concentration trends for a few other wells have been shown in past reports, but these wells were abandoned during soil excavation activities in early 2009 and therefore were not sampled in August/September.

3.2 Geochemical Parameters

Geochemical parameters measured in the field in all wells at the 4.5 Acre Site during August/September 2009 are summarized in Table 4. Conditions across the site generally are reducing as evidenced by the low values of dissolved oxygen and oxygen reduction potential.

4.0 Upcoming Tasks

The following major tasks are scheduled during the next semiannual period (December 2009 through May 2010).

- Implementation of the enhanced bioremediation project commencing in January 2010.
- Quarterly closure monitoring of 13 monitoring wells to include water level measurements and sampling and analysis of groundwater in December 2009 and March 2010.

5.0 References

DOE (U.S. Department of Energy), 2000. *4.5 Acre Site Biosparge System Integration Plan*, GJO–2000–182–TAR, MAC–PIN 25.5.1.1, prepared by U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, December.

DOE (U.S. Department of Energy), 2001. *Remedial Action Plan for the Pinellas 4.5 Acre Site*, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, July.

DOE (U.S. Department of Energy), 2003a. *Historical Review and Evaluation of Contaminants of Potential Concern*, GJO-2002-359-TAC, February.

DOE (U.S. Department of Energy), 2003b. *Pinellas Environmental Restoration Project Interim Remedial Action Plan for Ground Water Recovery at the 4.5 Acre Site*, GJO-2003-480-TAC, prepared by U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, August.

DOE (U.S. Department of Energy), 2005. *Pinellas Environmental Restoration Project 4.5 Acre Site Remedial Action Plan Addendum*, DOE-LM/GJ858-2005, prepared by the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, April.

DOE (U.S. Department of Energy), 2006. *Pinellas Environmental Restoration Project Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site,* DOE-LM/GJ1159-2006, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, April.

DOE (U.S. Department of Energy), 2007. *4.5 Acre Site Source Characterization Data Report,* DOE-LM/1549-2007, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, December.

DOE (U.S. Department of Energy), 2008a. *4.5 Acre Site Source Removal Feasibility Study*, DOE-LM/1549-2008, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, April.

DOE (U.S. Department of Energy), 2008b. *Interim Remedial Action Plan for Source Removal at the 4.5 Acre Site*, LMS/PIN/N01215, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, July.

DOE (U.S. Department of Energy), 2009a. *Closure Monitoring Plan for the Northeast Site and 4.5 Acre Site*, LMS/PIN/N01401, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, August.

DOE (U.S. Department of Energy), 2009b. *Data Report for Overburden Soil at the Northeast Site and the 4.5 Acre Site*, LMS/PIN/N01395, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, July.

DOE (U.S. Department of Energy), 2009c. *Interim Remedial Action Final Report for Source Removal at the 4.5 Acre Site,* LMS/PIN/N01359, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, September.

FDEP (Florida Department of Environmental Protection), 2005. Letter from John Armstrong (FDEP) to David Ingle (DOE), dated July 7, 2005.

Figure 1. Young - Rainey STAR Center Location

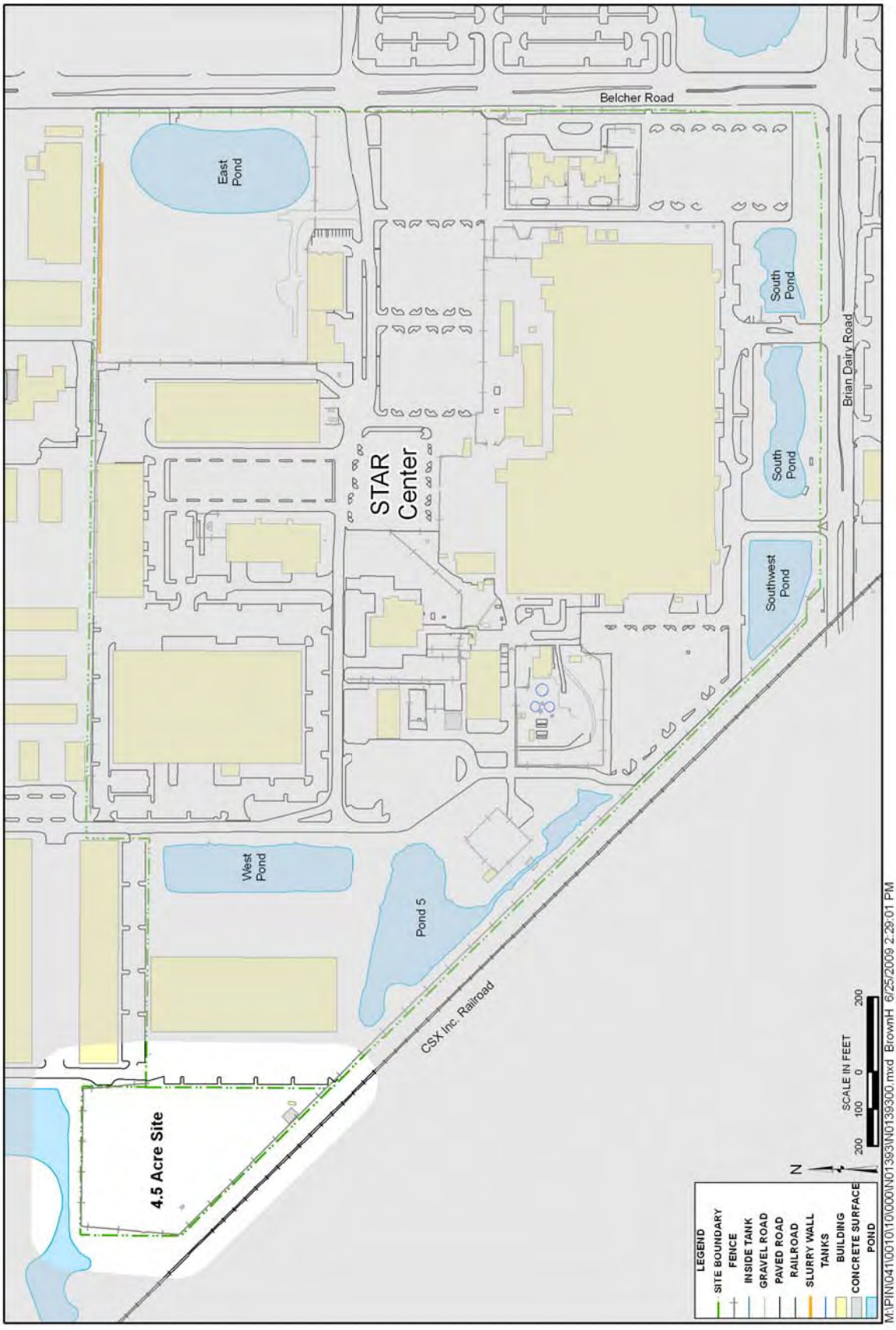

Figure 2. 4.5 Acre Site Location

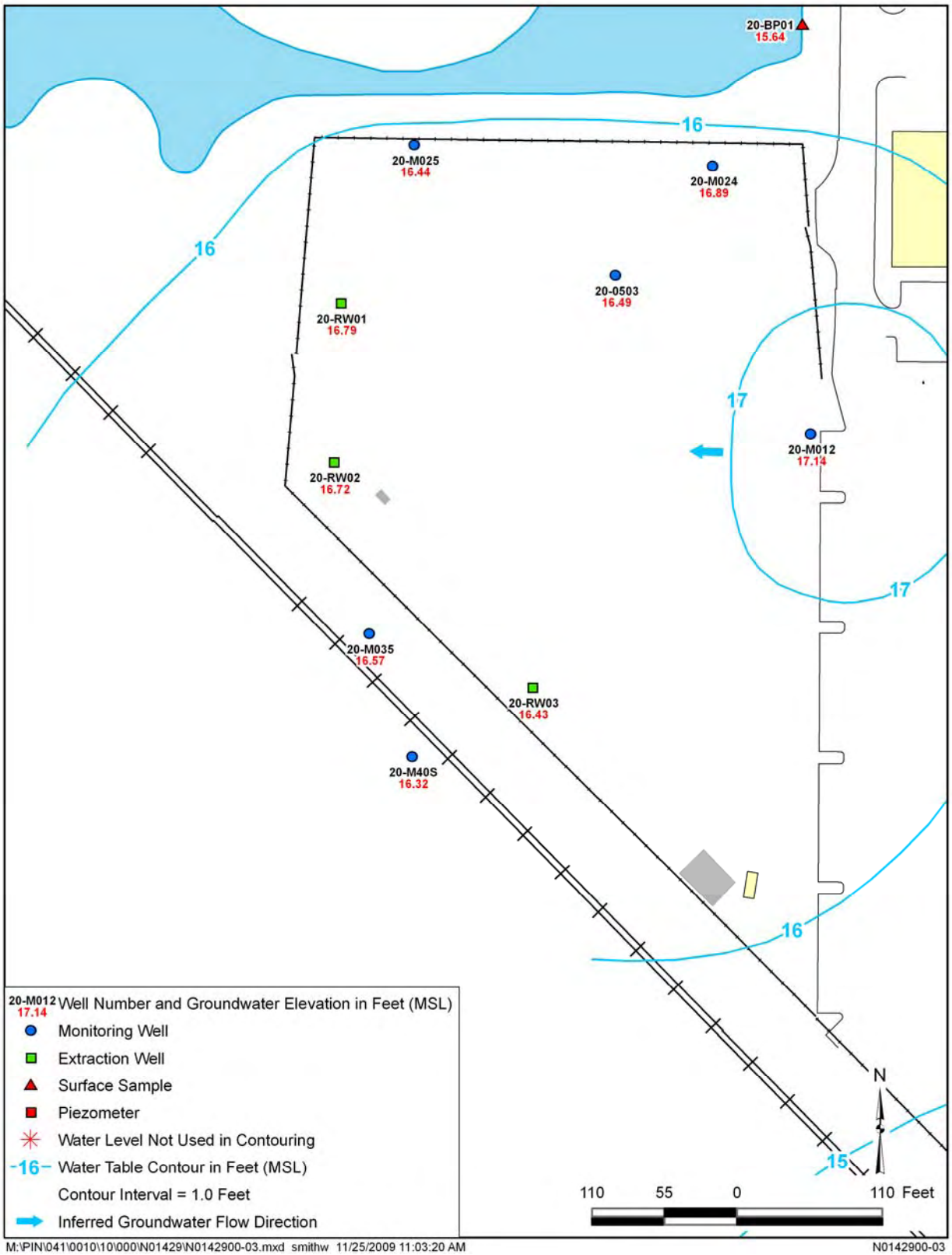

Figure 3. Groundwater Elevations and Shallow Surficial Aquifer Flow, 4.5 Acre Site, August 26, 2009

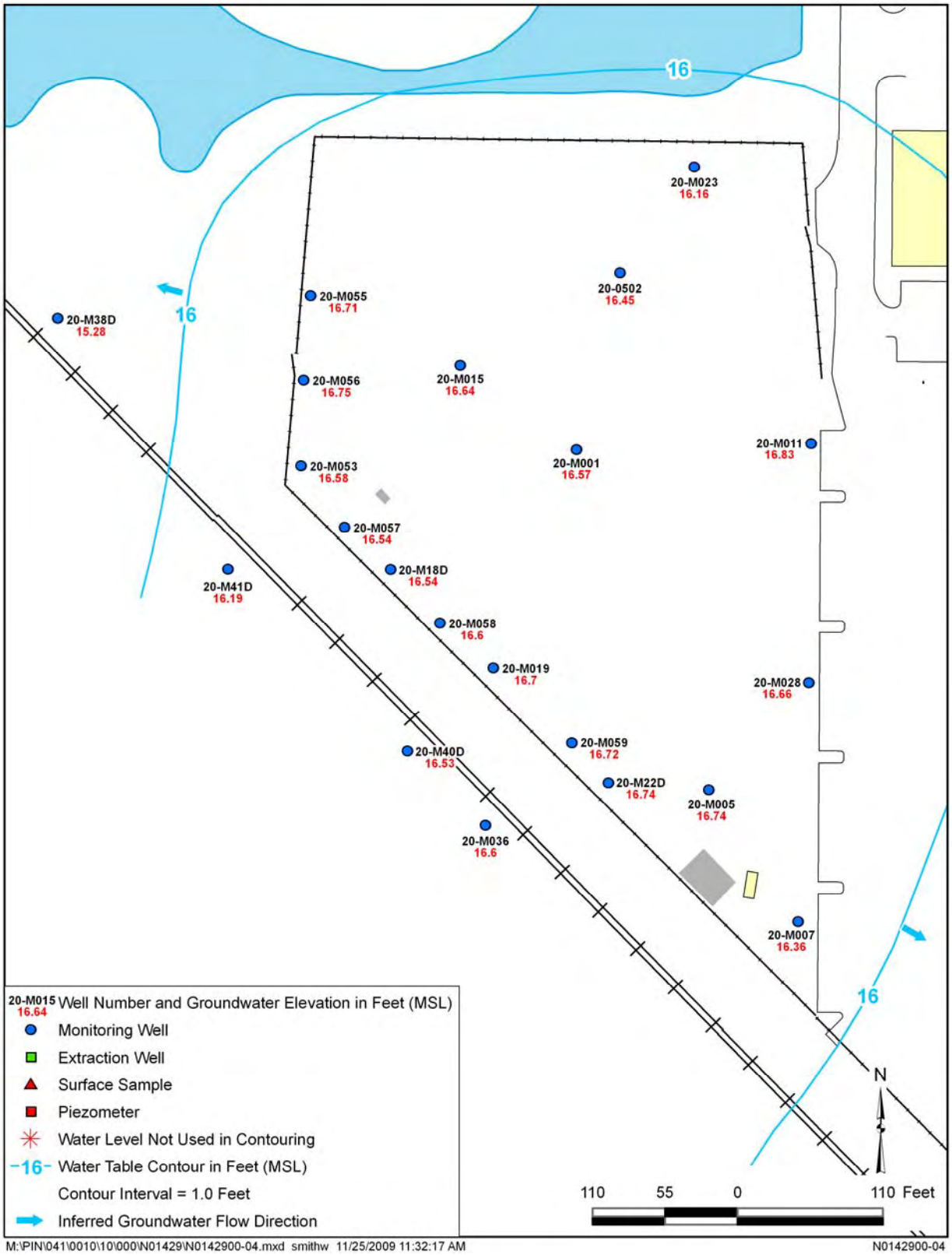

Figure 4. Groundwater Elevations and Deep Surficial Aquifer Flow, 4.5 Acre Site, August 26, 2009

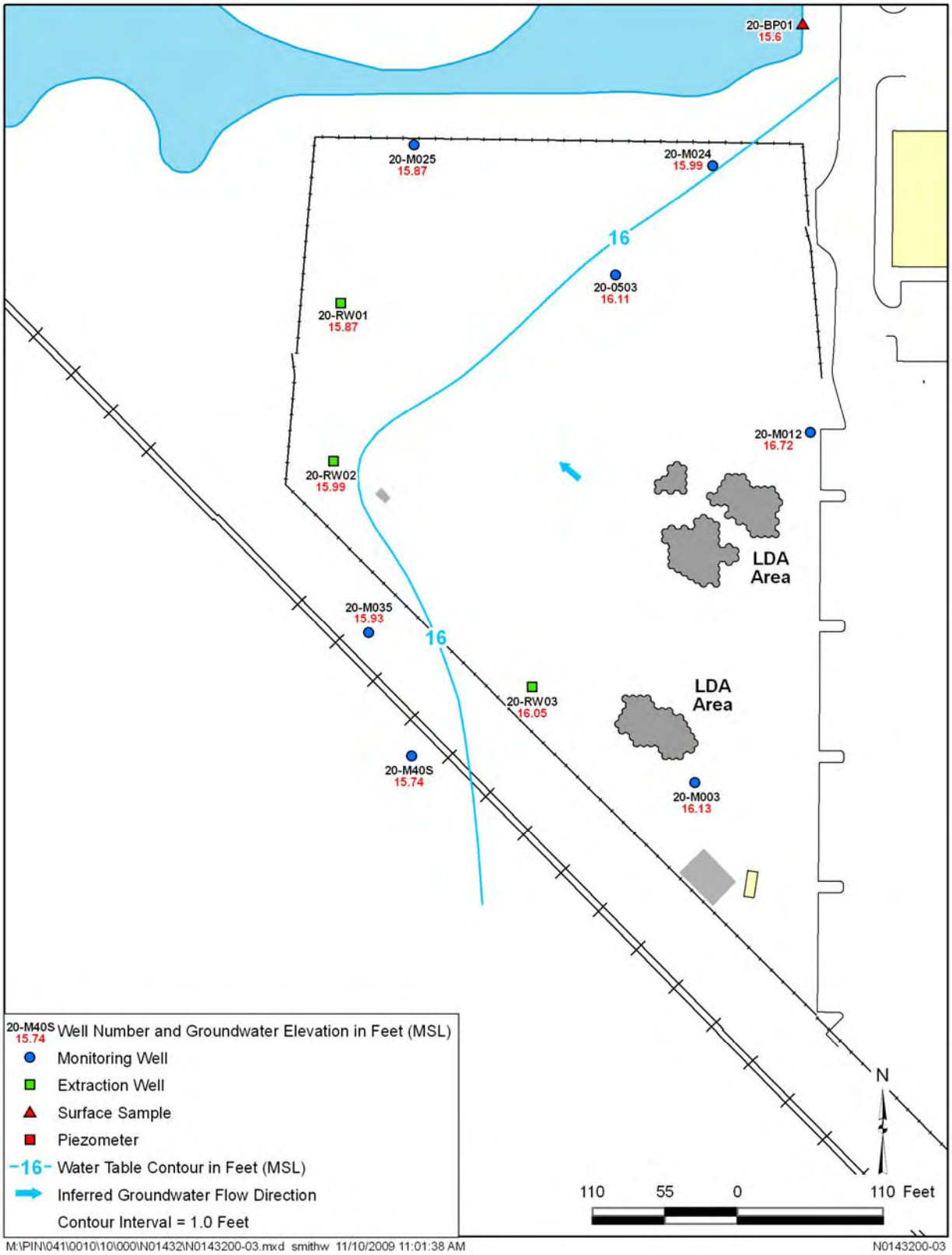

Figure 5. 4.5 Acre Site Shallow Surficial Aquifer Contours—August 13, 2009

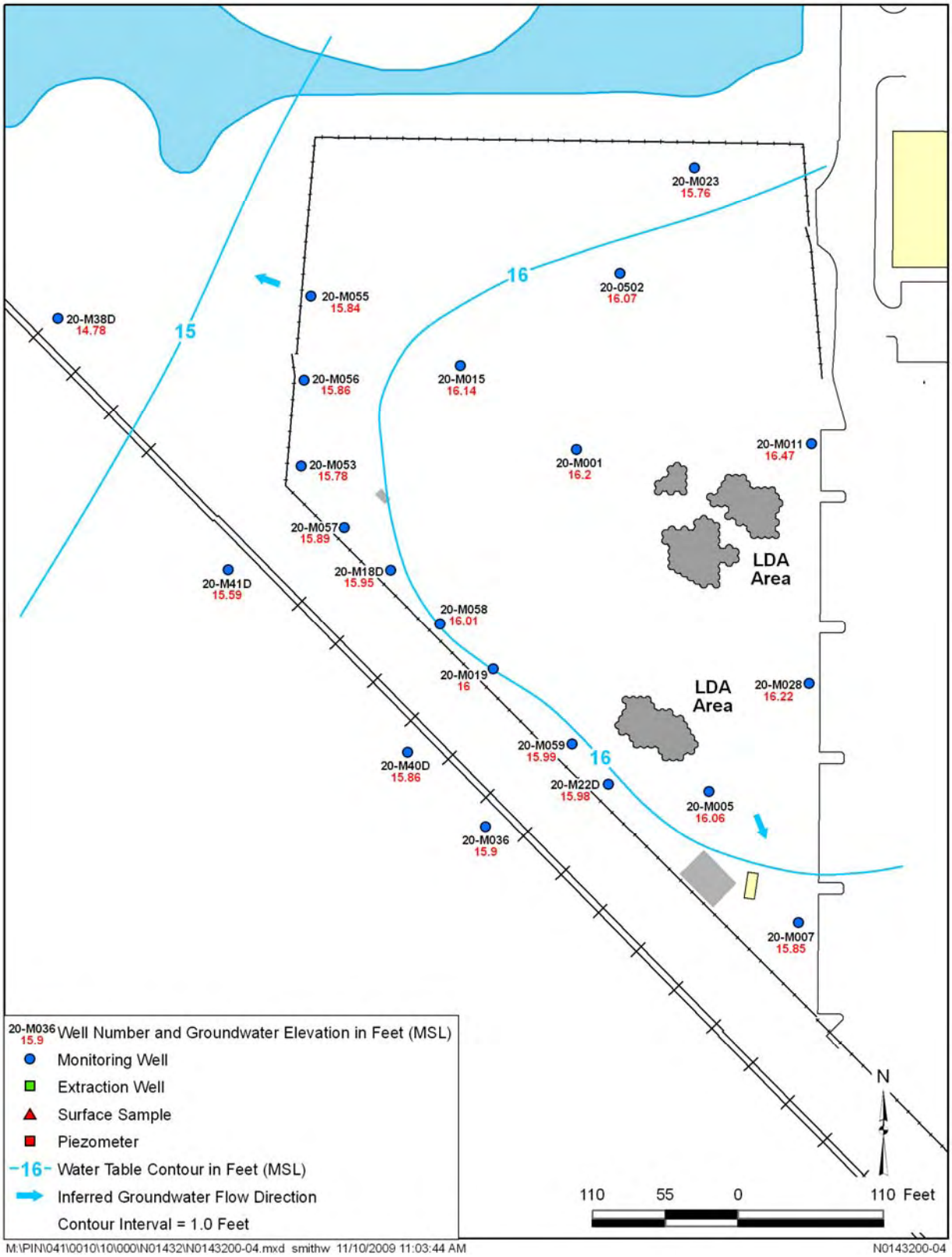

Figure 6. 4.5 Acre Site Deep Surficial Aquifer Contours—August 13, 2009

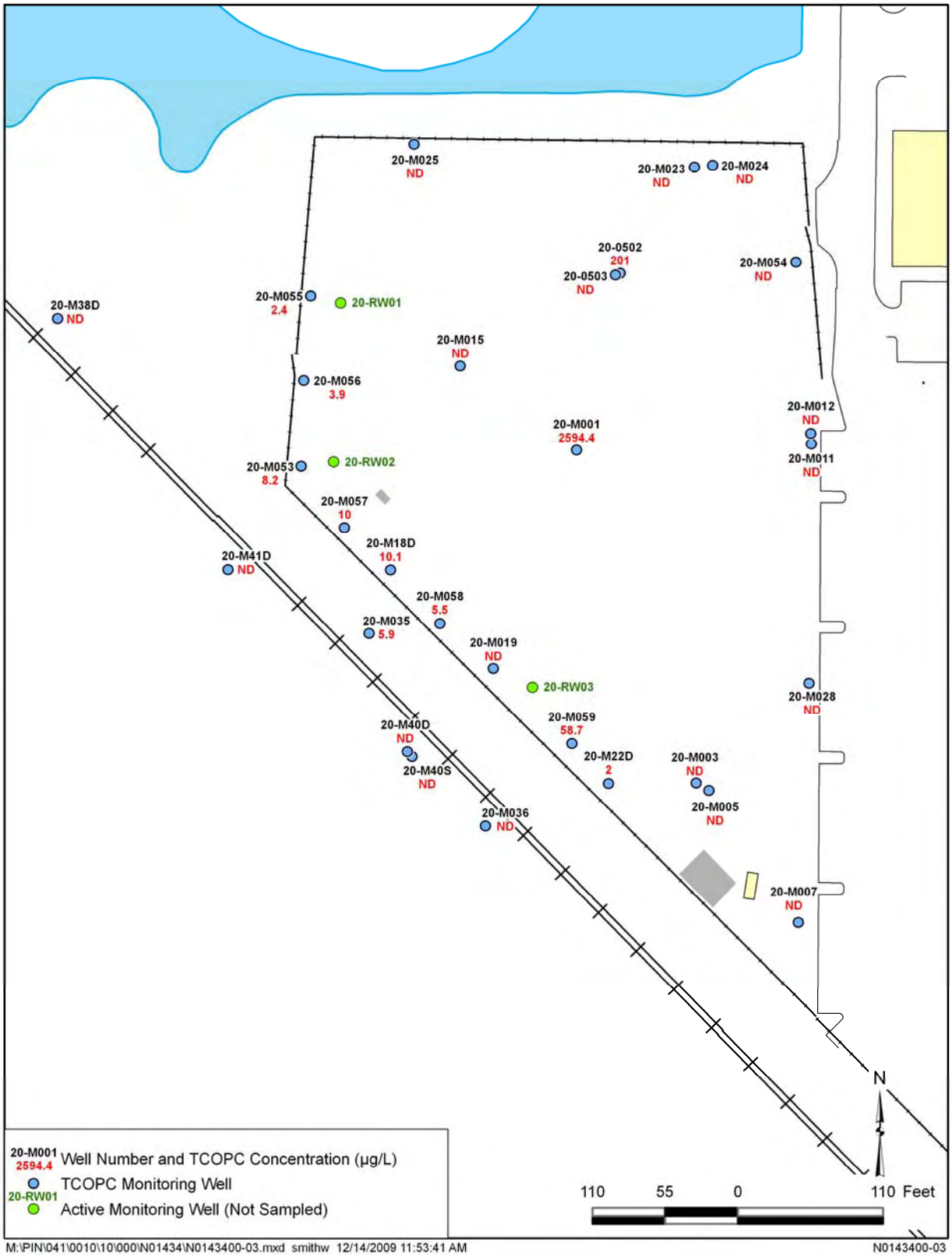

Figure 7. 4.5 Acre Site TCOPC Concentrations August/September 2009 Sampling Event

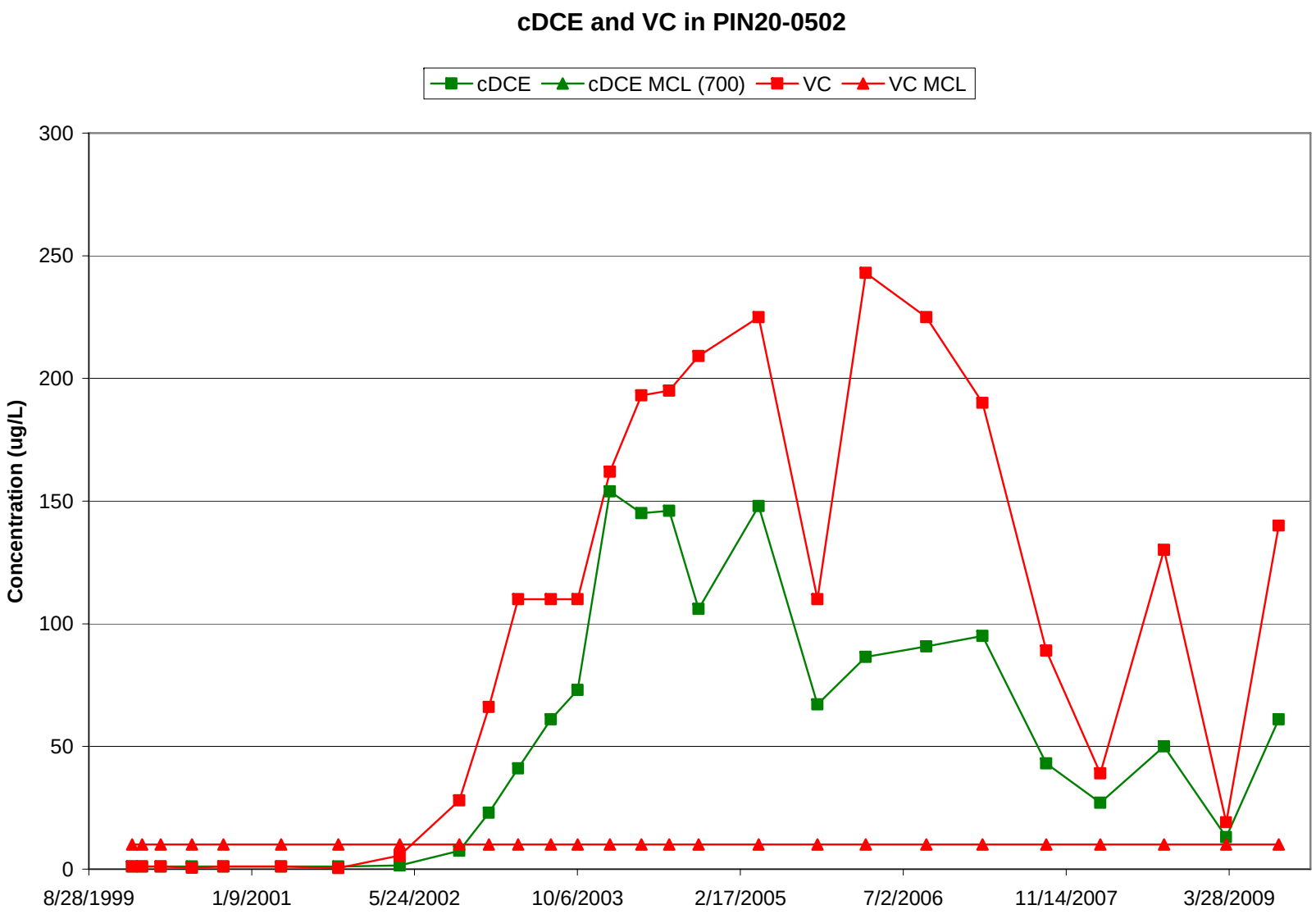

Figure 8. cDCE and VC in PIN20-0502

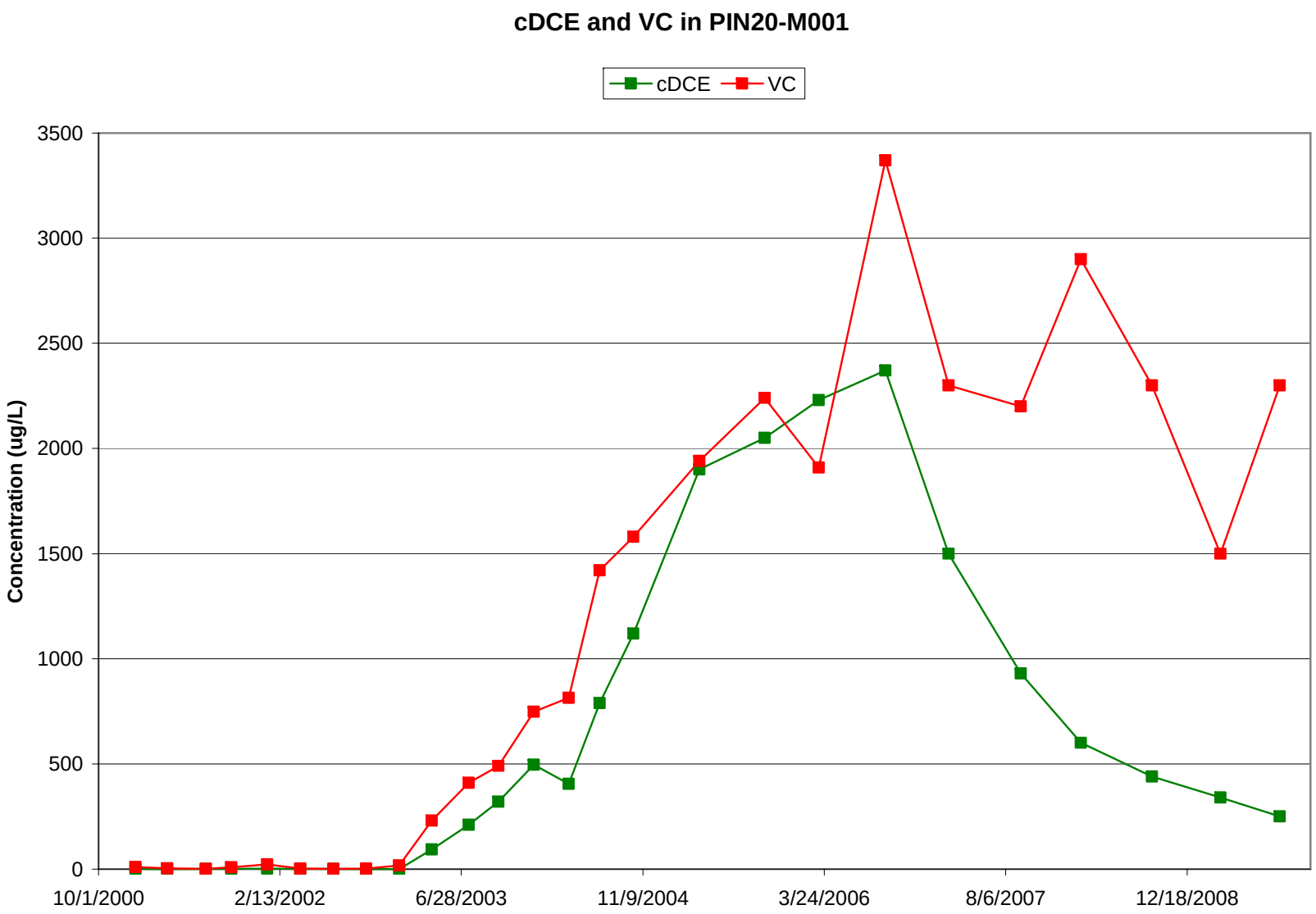

Figure 9. cDCE and VC in PIN20-M001

Table 1. Water-Level Data at the 4.5 Acre Site

Location	Measurement		Water Depth From Land Surface (ft)	Groundwater Elevation (ft NGVD)
	Date	Time		
PIN20	**4.5 Acre Site**			
0502	8/26/09	06:10	0.95	16.45
0503	8/26/09	08:10	0.91	16.49
M001	8/26/09	09:07	1.03	16.57
M003	8/28/09	14:40	0.64	17.56
M005	8/26/09	08:51	1.56	16.74
M007	8/26/09	08:54	3.09	16.36
M011	8/26/09	09:03	1.27	16.83
M012	8/26/09	09:05	0.86	17.14
M015	8/26/09	08:18	0.86	16.64
M019	8/26/09	08:39	1.30	16.70
M023	8/26/09	08:09	3.31	16.16
M024	8/26/09	06:02	0.91	16.89
M025	8/26/09	09:31	-0.14	16.44
M028	8/26/09	08:58	1.54	16.66
M035	8/26/09	09:19	2.23	16.57
M036	8/26/09	09:24	2.70	16.60
M053	8/26/09	08:32	0.62	16.58
M054	8/31/09	09:57	1.01	16.69
M055	8/26/09	08:24	0.69	16.71
M056	8/26/09	08:28	0.35	16.75
M057	8/26/09	08:34	1.36	16.54
M058	8/26/09	08:38	1.10	16.60
M059	8/26/09	08:45	1.08	16.72
M18D	8/26/09	08:37	1.16	16.54
M22D	8/26/09	08:47	1.06	16.74
M38D	8/26/09	09:12	3.22	15.28
M40D	8/26/09	09:22	2.87	16.53
M40S	8/26/09	09:21	2.88	16.32
M41D	8/26/09	09:16	2.91	16.19
RW01	8/26/09	08:27	0.81	16.79
RW02	8/26/09	08:30	0.38	16.72
RW03	8/26/09	08:42	1.17	16.43

NGVD = national geodetic vertical datum

Table 2. 4.5 Acre Site Surface Water Elevations

Location	Measurement		Groundwater Elevation (ft NGVD)
	Date	Time	
PIN01	**Pond 5**		
P501	8/26/09	10:40	14.28
P502	8/26/09	10:33	14.51
PIN02	**West Pond**		
W005	8/26/09	10:30	14.23
PIN20	**North of 4.5 Acre Site**		
BP01	8/26/09	08:01	15.64

Table 3. Water Levels at the 4.5 Acre Site on August 13, 2009

Location	Water Depth From Land Surface (ft)	Groundwater Elevation (ft NGVD)
PIN20	**4.5 Acre Site**	
0502	1.33	16.07
0503	1.29	16.11
M001	1.40	16.20
M003	2.07	16.13
M005	2.24	16.06
M007	3.60	15.85
M011	1.63	16.47
M012	1.28	16.72
M015	1.36	16.14
M019	2.00	16.00
M023	3.71	15.76
M024	1.81	15.99
M025	0.43	15.87
M028	1.98	16.22
M035	2.87	15.93
M036	3.40	15.90
M053	1.42	15.78
M055	1.56	15.84
M056	1.24	15.86
M057	2.01	15.89
M058	1.69	16.01
M059	1.81	15.99
M18D	1.75	15.95
M22D	1.82	15.98
M38D	3.72	14.78
M40D	3.54	15.86
M40S	3.46	15.74
M41D	3.51	15.59
RW01	1.73	15.87
RW02	1.11	15.99
RW03	1.55	16.05
BP01	NA	15.60

NA=Not Applicable

Table 4. Field Measurements of Samples Collected at the 4.5 Acre Site

Location	Screen Depth (ft bls)	Temperature (°C)	Specific Conductance (µmhos/cm)[a]	Turbidity (NTU)	pH	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)
PIN20	**4.5 Acre Site**						
0502	21.2–31.2	25.79	1,432	13.1	6.48	-19	1.24
0503	13.2–23.2	25.74	1,053	12.8	6.55	-80.4	1.27
M001	20–25	25.71	1,678	17.9	6.64	-82.9	0.35
M003	9–14	28.63	801	2.84	6.38	-10.3	0.73
M005	25.8–30.7	26.68	878	0.95	6.81	-68	0.64
M007	25.3–30.3	27.43	1,216	1.6	6.6	-26.6	0.68
M011	23.7–28.7	26.29	833	12.9	6.57	-61.9	0.83
M012	8.6–13.6	28.3	809	20	6.34	-32.2	0.91
M015	20.8–25.8	26.89	1,220	3.66	6.84	-76.7	0.34
M019	22–27	26.83	2,383	3.6	6.85	-80.6	1.15
M023	19.8–24.8	26.34	922	13	6.67	-83	1.07
M024	8.7–13.7	27.11	799	2.99	6.56	-38.8	1.37
M025	8.6–13.6	25.9	2,039	9.7	6.64	-67	1.04
M028	22–27	28.23	797	6.36	6.53	-66.8	0.74
M035	9–14	26.35	2,833	25.4	6.87	-102.2	0.68
M036	25–30	26.72	809	3.6	6.86	-70.3	0.78
M053	20–30	26.73	1,723	11.8	6.88	-64.6	0.53
M054	20–30	27.68	1,310	7.3	6.84	-83.6	0.8
M055	21–31	25.9	1,201	18.5	6.58	-47	1.01
M056	19–29	27.78	1,389	4.4	6.81	-80.6	0.42
M057	20–30	26.62	2,498	10.1	6.85	-52.8	1.27
M058	18–28	27.18	2,015	NM	6.83	-95.3	0.34
M059	19–29	25.08	1,202	14.2	6.86	-89.7	0.27
M18D	20–30	26.52	1,911	6.4	6.88	-90.8	0.64
M22D	20–30	25.76	1,239	3.59	6.88	-93.5	0.35
M38D	20–30	25.55	782	2.7	7.02	-41.9	0.41
M40D	18–28	26.78	2,125	7.8	6.8	-84.6	0.95
M40S	4–14	27.76	271	8.6	6.55	56.8	1.8
M41D	16–26	25.6	2,337	18.9	6.84	-57	0.77

[a]Temperature corrected to 25 °C
NM = not measured
bls = below land surface
µmhos/cm = micromhos per centimeter
mV = millivolt
NTU = Nephelometric Turbidity Units

Table 5. COPC Concentrations from Wells at the 4.5 Acre Site[a]
(reported in micrograms per liter)

Location	Screen Depth (ft)	Date Sampled	TCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE[b]	Vinyl chloride	Benzene	Total COPC[c]
Cleanup Target Level:			**30**	**700**	**1,000**	**630**	**10**	**10**	
PIN20	**4.5 Acre Site**								
0502	21.2–31.2	10-Sep-08	<0.5	50	0.59J	50	130	<0.5	180
		19-Mar-09	<0.5	13	<0.44	13	19	<0.5	32
		27-Aug-09	<0.5	61	<0.44	61	140	<0.5	201
0503	13.2–23.2	10-Sep-08	<0.5	<0.65	<0.44	ND	3.1	<0.5	3.1
		20-Mar-09	<0.5	<0.65	<0.44	ND	4.1	<0.5	4.1
		27-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M001	20–25	12-Sep-08	4	440	70	510	2,300	2.4	2,816.4
		20-Mar-09	<12	340	140	480	1,500	<12	1,980
		31-Aug-09	<0.5	250	43	293	2,300	1.4	2,594.4
M003	9–14	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		23-Mar-09	<5	<6.5	<4.4	ND	<5	<5	ND
		28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M005	25.8–30.7	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		23-Mar-09	<0.5	<0.65	<0.44	ND	0.88J	<0.5	ND
		31-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M007	25.3–30.3	28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M011	23.7–28.7	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		20-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M012	8.6–13.6	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		20-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M015	20.8–25.8	12-Sep-08	<0.5	<0.65	<0.44	ND	3	<0.5	3
		19-Mar-09	<0.5	1.3	<0.44	1.3	3.8	<0.5	5.1
		31-Aug-09	<0.5	<0.65	<0.44	ND	0.6J	<0.5	ND
M019	22–27	12-Sep-08	<0.5	0.71J	<0.44	0.71J	0.8J	<0.5	ND
		23-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		31-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M023	19.8–24.8	10-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		27-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M024	8.7–13.7	11-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		27-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M025	8.6–13.6	10-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		10-Sep-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND

Table 5 (continued). COPC Concentrations from Wells at the 4.5 Acre Site[a] (reported in micrograms per liter)

Location	Screen Depth (ft)	Date Sampled	TCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE[b]	Vinyl chloride	Benzene	Total COPC[c]
Cleanup Target Level:			**30**	**700**	**1,000**	**630**	**10**	**10**	
M028	22–27	12-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		20-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M035	9–14	15-Sep-08	<0.5	2.4	<0.44	2.4	<0.5	<0.5	2.4
		19-Mar-09	<0.5	2.9	<0.44	2.9	<0.5	<0.5	2.9
		28-Aug-09	0.54J	2.1	0.53J	2.1	3.8	<0.5	5.9
		10-Sep-09	<0.5	2.7	0.79J	2.7	3.9	<0.5	6.6
M036	25–30	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M053	20–30	12-Sep-08	<0.5	10	<0.44	10	2.1	<0.5	12.1
		19-Mar-09	<0.5	13	<0.44	13	4.7	<0.5	17.7
		27-Aug-09	<0.5	8.2	<0.44	8.2	<0.5	<0.5	8.2
M054	20–30	10-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		20-Mar-09	<0.5	<0.65	<0.44	ND	3.9	<0.5	3.9
		06-Apr-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		31-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M055	21–31	12-Sep-08	<0.5	1.6	<0.44	1.6	2	<0.5	3.6
		19-Mar-09	<0.5	1.3	<0.44	1.3	4.4	<0.5	5.7
		27-Aug-09	<0.5	1.1	<0.44	1.1	1.3	<0.5	2.4
M056	19–29	12-Sep-08	<0.5	3.1	<0.44	3.1	2.8	<0.5	5.9
		19-Mar-09	<0.5	3.7	<0.44	3.7	5.6	<0.5	9.3
		31-Aug-09	<0.5	2.2	<0.44	2.2	1.7	<0.5	3.9
M057	20–30	12-Sep-08	<0.5	13	0.48J	13	3	<0.5	16
		20-Mar-09	<0.5	16	<0.44	16	5.1	<0.5	21.1
		27-Aug-09	<0.5	10	0.46J	10	<0.5	<0.5	10
M058	18–28	12-Sep-08	<0.5	2.3	<0.44	2.3	2.3	<0.5	4.6
		20-Mar-09	<0.5	1.4	<0.44	1.4	4.1	<0.5	5.5
		31-Aug-09	<0.5	1.9	<0.44	1.9	3.6	<0.5	5.5
M059	19–29	12-Sep-08	<0.5	1.4	0.5J	1.4	8.3	<0.5	9.7
		20-Mar-09	<0.5	<0.65	<0.44	ND	4.8	<0.5	4.8
		31-Aug-09	<0.5	2.7	0.48J	2.7	56	<0.5	58.7
M18D	20–30	12-Sep-08	<0.5	7.5	0.57J	7.5	6.1	<0.5	13.6
		20-Mar-09	<0.5	11	<0.44	11	6.5	<0.5	17.5
		31-Aug-09	<0.5	3.8	<0.44	3.8	6.3	<0.5	10.1
M22D	20–30	15-Sep-08	<0.5	<0.65	<0.44	ND	0.77J	<0.5	ND
		20-Mar-09	<0.5	<0.65	<0.44	ND	4.2	<0.5	4.2
		31-Aug-09	<0.5	<0.65	<0.44	ND	2	<0.5	2
M38D	20–30	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		27-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND

Table 5 (continued). COPC Concentrations from Wells at the 4.5 Acre Site[a]
(reported in micrograms per liter)

Location	Screen Depth (ft)	Date Sampled	TCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE[b]	Vinyl chloride	Benzene	Total COPC[c]
Cleanup Target Level:			**30**	**700**	**1,000**	**630**	**10**	**10**	
M40D	18–28	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M40S	4–14	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		28-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M41D	16–26	15-Sep-08	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		19-Mar-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		27-Aug-09	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND

[a]"<" values are reporting limits.
[b]Total 1,2–DCE is the sum of cDCE and tDCE.
[c]Total COPC is the sum of the individual COPC concentrations. The cDCE and tDCE values are not part of the total COPC value because these values are included in the total 1,2–DCE value. "J" values are not included in the total COPC value.
ND = Not detected.
J = Estimated value, result is between the reporting limit and the method detection limit.

Table 6. Relative Percent Difference for Duplicate Samples

Sample ID	Duplicate ID	Analyte	Result	Duplicate Result	MDL	Units	RPD
PIN20-0502	PIN20-2807	cis-1,2-Dichloroethylene	61	62	0.65	µg/L	1.6
		Vinyl chloride	140	130	2.5	µg/L	7.4
PIN20-M001	PIN20-2806	cis-1,2-Dichloroethylene	250	250	16	µg/L	0.0
		trans-1,2-Dichloroethylene	43	43	0.44	µg/L	0.0
		Vinyl chloride	2300	2500	12	µg/L	8.3

MDL = method detection limit

Appendix A

Laboratory Reports
August/September 2009 Semiannual Results