DOE–LM/GJ875–2005

Pinellas Environmental Restoration Project

Quarterly Progress Report
4.5 Acre Site
January through March 2005

April 2005

U.S. Department of Energy

Office of Legacy Management

Work Performed Under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management.
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Acronyms and Abbreviations

bls	below land surface
COPC	contaminants of potential concern
DCE	dichloroethene
DOE	U.S. Department of Energy
DPE	dual-phase extraction
FDEP	Florida Department of Environmental Protection
ft	feet
IRA	Interim Remedial Action
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
mg/L	milligrams per liter
mV	millivolts
NGVD	national geodetic vertical datum
NTU	Nephelometric Turbidity Units
RPD	relative percent difference
STAR Center	Young - Rainey Science, Technology, and Research Center
TCE	trichloroethene
TCOPC	total contaminants of potential concern
VC	vinyl chloride
VOCs	volatile organic compounds

1.0 Introduction

The *Pinellas Environmental Restoration Project Quarterly Progress Report for the 4.5 Acre Site* describes environmental restoration activities for the Pinellas 4.5 Acre Site located in Pinellas County, Largo, Florida. 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 1). 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 ground water 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 in Grand Junction, provides technical support to DOE for 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, northeast quarter of Section 13, Township 30 South, Range 15 East (Figure 2). This parcel was owned by DOE 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 ground water extraction and treatment via air stripping, and a routine ground water monitoring program were initiated in May 1990. In July 1997, a modification of the IRA involving installation of dual-phase extraction (DPE) wells provided a more aggressive system to remove ground water contamination. In November 1999, the DPE/air-stripping system was replaced with an in-situ biosparge treatment system.

Currently, ground water cleanup is proceeding according to provisions in the document *Remediation Agreement for the Four and One-Half Acre Site in Largo, Pinellas County, Florida* (Remediation Agreement) (FDEP 2001), an agreement between DOE and the Florida Department of Environmental Protection (FDEP); and in accordance with applicable portions of "Corrective Actions for Contamination Site Cases," an appendix to FDEP's *Enforcement Manual* (FDEP 1999).

The *4.5 Acre Site Biosparge System Integration Plan* (DOE 2000) was approved by 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 has been 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 2003).

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 consists of an extraction well field (three recovery wells), pumps and associated piping, transmission water pipeline, utility connection, a low profile tray air stripper unit, and effluent piping. The new IRA system began operations on April 26, 2004.

The new IRA system is 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.. Currently, the *Pinellas Environmental Restoration Project 4.5 Acre Site Remedial Action Plan Addendum* is being prepared. This document presents a proposed final action for the 4.5 Acre Site that involves closure of the site using the provisions of the recently adopted State of Florida Global Risk Based Corrective Action regulations. This addendum will be submitted to FDEP by April 14, 2005.

This document is the quarterly progress report for the 4.5 Acre Site for January through March 2005, as requested by FDEP. The results of monitoring activities and a summary of ongoing and projected work are provided in this report.

1.1 Quarterly Site Activities

- Obtained water-level measurements from all monitoring wells on January 10, 2005.
- Conducted the quarterly sampling event (i.e., collected ground water samples from 21 monitoring wells and three recovery wells) in January 2005. The wells were sampled for VOCs and analyzed using U.S. Environmental Protection Agency (EPA) SW-846 Method 8260. Arsenic analyses were conducted using EPA SW-846 Method 6010.
- Reported the results of quarterly sampling events (this document).

2.0 Monitoring Data

2.1 Ground Water Elevations and Flow

Within a 2-hour period on January 10, 2005, depth-to-water measurements were taken in all monitoring wells at the 4.5 Acre Site as part of the sitewide quarterly sampling event. The depth to water in each well was measured with an electronic water-level indicator. The January ground water elevation data for the 4.5 Acre Site are listed in Table 1. The data and information from deep wells were used to construct contours of water levels in the deep surficial aquifer in Figure 3.

The interpretative contours on Figure 3 show ground water flow generally to the west-northwest. These flow patterns are consistent with those observed at the site during the previous 2 years following shutdown of the biosparging system in May 2003. In addition, capture zones are apparent around the three new recovery wells at the 4.5 Acre Site. These capture zones indicate that the ground water recovery system at the site is maintaining hydraulic control along the west fence line.

The water table ranged from about 4 to 9.5 feet below land surface (ft bls), with ground water elevations that ranged from a high of 14.60 ft at PIN20–TE01 to a low of 9.22 ft at PIN20−M055. The hydraulic gradient across the site was approximately 0.008 feet per foot. This gradient is very similar to that observed the previous seven quarters. Using Darcy's Law, along with approximations of 1 ft/day for hydraulic conductivity and 0.3 for effective porosity, ground water at the site is estimated to move about 10 ft/year. This velocity is consistent with previously observed velocities of 3 to 10 ft/year.

2.2 Ground Water Sampling

Twenty-four monitoring and recovery wells were sampled by Stoller personnel in January 2005. Eighteen wells were sampled for VOCs, and six wells were sampled for arsenic.

All samples were collected in accordance with the *Pinellas Environmental Restoration Project Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site* (DOE 2004) using FDEP procedures. All samples collected were submitted to Accutest Laboratory for analysis. Accutest is accredited by the Florida Department of Health in accordance with the National Environmental Laboratory Accreditation Conference, certification number E83510. VOCs were analyzed using EPA SW-846 Method 8260 and arsenic was analyzed using EPA Method 6010.

All but one of the monitoring wells was micropurged with dedicated bladder pumps and samples were collected when the field measurements stabilized. Well PIN20−M019 used standard peristaltic pump purging (three casing volumes). Extraction wells were sampled using their associated flowlines with dedicated sampling ports. Table 2 lists measurements of pH, specific conductance, dissolved oxygen, oxidation/reduction potential, turbidity, and temperature recorded at the time each sample was collected. These measurements were collected using a flow cell and multiparameter meter.

2.3 Ground Water Analytical Results

Individual contaminants of potential concern (COPC) and total COPCs (TCOPCs) concentrations in samples collected from wells at the 4.5 Acre Site are included in Table 3. Arsenic data are shown on Table 4. The previous four quarters of results are included in Table 3 for comparison. Figure 4 shows the TCOPCs concentrations for October 2004.

No COPCs were detected in samples from the two sample locations listed below (results listed in Table 3).

PIN20–M019	PIN20–M055

Samples from 16 sample locations listed below contained COPCs at detectable levels (results listed in Table 3).

PIN20–M035	PIN20–M058	PIN20–M062	PIN20–M22D
PIN20–M053	PIN20–M059	PIN20–M063	PIN20–RW01
PIN20–M056	PIN20–M060	PIN20–M064	PIN20–RW02
PIN20–M057	PIN20–M061	PIN20–M18D	PIN20–RW03

The maximum TCOPCs value detected was 17,836 micrograms per liter (µg/L) at PIN20−M063. The compound detected at the highest concentration in PIN20−M063 was cis-1,2-DCE at a concentration of 9,610 µg/L. Reported "J" values are not considered in the TCOPC analyte concentrations. The maximum arsenic value detected was 0.0198 mg/L in PIN20−0503.

Laboratory reports for quarterly samples collected in January 2005 are provided in Appendix A. IRA treatment system influent, effluent, and recovery well analytical results are provided in Appendix B.

2.4 Quality Assurance/Quality Control

Two duplicate samples were compared to their paired sample and the relative percent differences (RPDs) between the results were calculated. Results of analyses for each duplicate sample are listed in Table 5. From the two duplicate samples, 37 individual compounds were analyzed. The sample duplicate pair, PIN20−M064/0580, failed to meet the criteria that the RPD should be less than 30 percent when the concentration is more than five times the detection limit. The analyte that failed was cis-1,2-DCE. This is a failure rate of less than 3 percent. All data are considered Class A level, indicating that the data may be appropriately used for quantitative and qualitative purposes.

According to the Stoller Sampling Procedures, duplicate samples should be collected at a frequency of one duplicate for every 20 or less samples. There were 18 VOC samples and one duplicate sample. There were six arsenic samples and one duplicate sample. The duplicate criterion was met.

Sitewide and 4.5 Acre Site samples were shipped together. During this sampling event, four sitewide and two 4.5 Acre Site trip blanks were submitted for VOC analysis. Four of the trip blanks showed positive results for 1,1-DCE ranging from 2.4 to 2.8 µg/L. One trip blank showed an estimated value for 1,1-DCE that was above the instrument detection limit but below the reporting limit. In spite of the apparent contamination, the sample data do not appear to be affected. Of the 40 samples shipped and analyzed with the contaminated trip blanks, only one, PIN20−M062, showed positive results for 1,1-DCE and that location has been positive for 1,1-DCE in the past. Investigations are being conducted to determine the possible source for the contamination in the trip blanks.

No significant deficiencies were found during validation of the field data collected during the quarterly sampling event. A software module for identifying and tracking anomalous ground water data points within the SEEPro database was used to report which of the COPC values lie outside of historical minimum and maximums for that location. No anomalous concentrations were found in the results from this sampling event. No anomalous results are being tracked from previous events.

3.0 Treatment System and Recovery Well Operations

The 4.5 Acre Site IRA ground water treatment system and recovery wells began operation the week of April 20, 2004. The treatment system is a small skid-mounted assembly that contains a low-profile air stripper, a blower, and two transfer pumps. The air stripper contains four shallow

trays to strip the VOCs from the ground water. The treatment system and a surge tank reside on a concrete containment pad. The recovery wellfield consists of three recovery wells with electric submersible pumps in each well. The recovery wells are installed along the western boundary of the 4.5 Acre Site (Figure 4).

From January 1 through March 31, 2005, the treatment system processed 517,072 gallons of ground water. Figures 5, 6, and 7 present the monthly volume of ground water recovered during January through March 2005 from the 4.5 Acre Site recovery wells. The treatment system experienced some outages during this quarter due to heavy rainfall and a failed pressure switch. The switch was replaced in late March and continuous operations resumed.

A summary of analytical results for samples collected at the 4.5 Acre Site treatment system during this quarter is provided in Table 6. Treatment system influent and effluent samples were analyzed for VOCs and the effluent discharge volume was recorded to comply with the Pinellas County wastewater permit. In the effluent samples, all volatile organic aromatic concentrations were under the Pinellas County regulatory limit of 50 µg/L.

Table 7 presents the average monthly concentration and the calculated mass of selected analytes processed by the 4.5 Acre Site treatment system for each month of this quarter. These monthly results are based on the measured system influent concentration and ground water flow.

FeRemede® is being utilized at the new 4.5 Acre Site treatment system to control the deposition of iron and hardness salts in the air stripper. Additionally, sodium hypochlorite is also being utilized as a microbiocide to control biological growth in the air stripper.

4.0 Tasks to be Performed Next Quarter

The following tasks are scheduled during the next quarter (April through June 2005).

- Quarterly sampling and analysis of ground water and water level measurements in early April.
- Continue monitoring of the IRA treatment system for short-term ground water recovery action and monthly sampling and analysis of ground water will continue in order to provide compliance and system operations data.
- Submit the *Pinellas Environmental Restoration Project Remedial Action Plan Addendum* to FDEP by April 14, 2005.

5.0 References

Florida Department of Environmental Protection (FDEP), 1999. “Corrective Actions for Contamination Site Cases,” Appendix to FDEP *Enforcement Manual*, May.

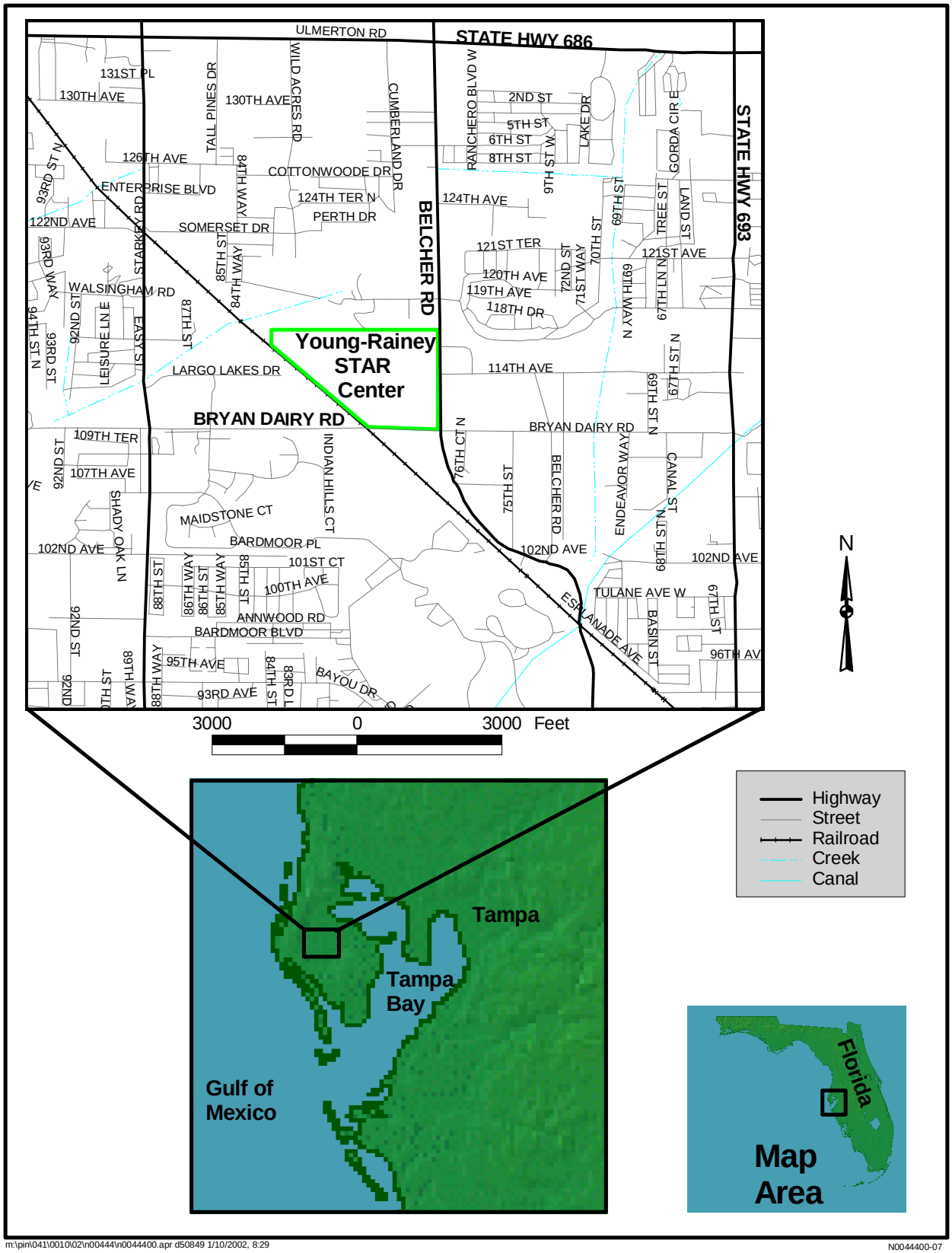
Florida Department of Environmental Protection (FDEP), 2001. *Remediation Agreement for the Four and One-Half Acre Site in Largo, Pinellas County, Florida*, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, January.

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), 2003. *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.

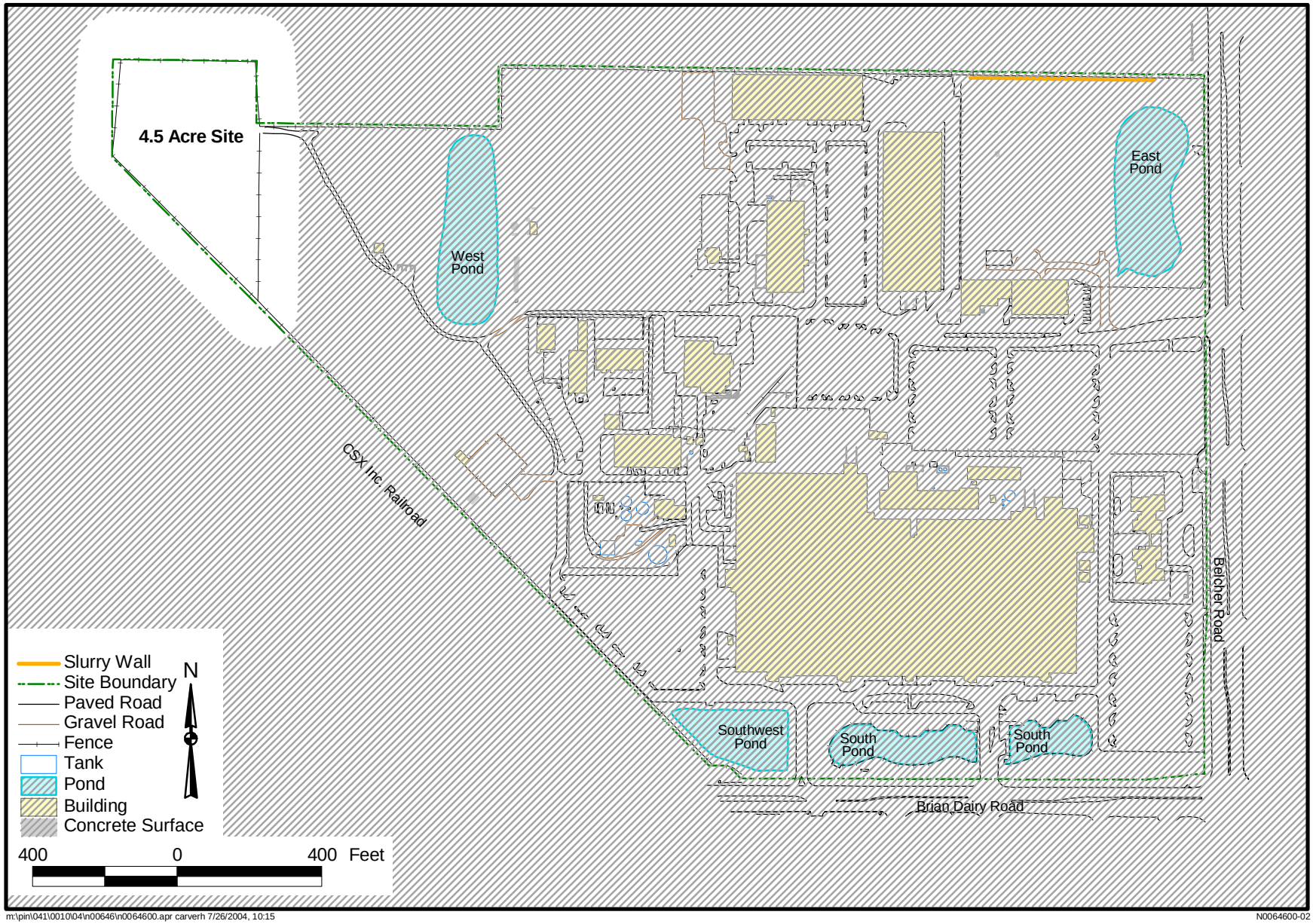
DOE (U.S. Department of Energy), 2004. *Pinellas Environmental Restoration Project Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site*, DOE-LM/GJ718-2004, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, September.



m:\pin\041\0010\02\n00444\n0044400.apr d50849 1/10/2002, 8:29

N0044400-07

Figure 1. Young - Rainey STAR Center Location



m:\pin\041\0010\04\n00646\n0064600.apr carverh 7/26/2004, 10:15

N0064600-02

Figure 2. 4.5 Acre Site Location

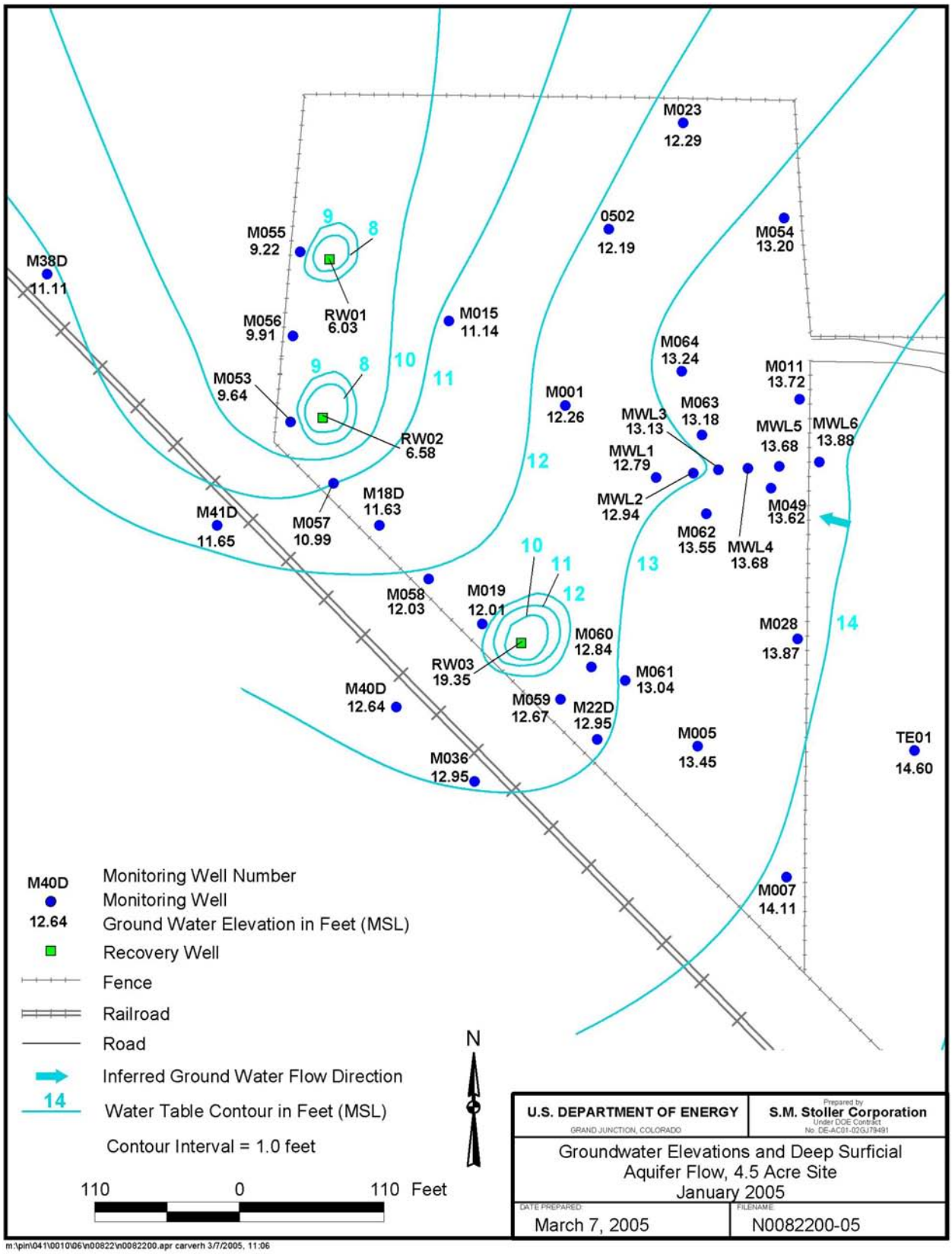


Figure 3. Ground Water Elevations and Deep Surficial Aquifer Flow, 4.5 Acre Site, January 2005

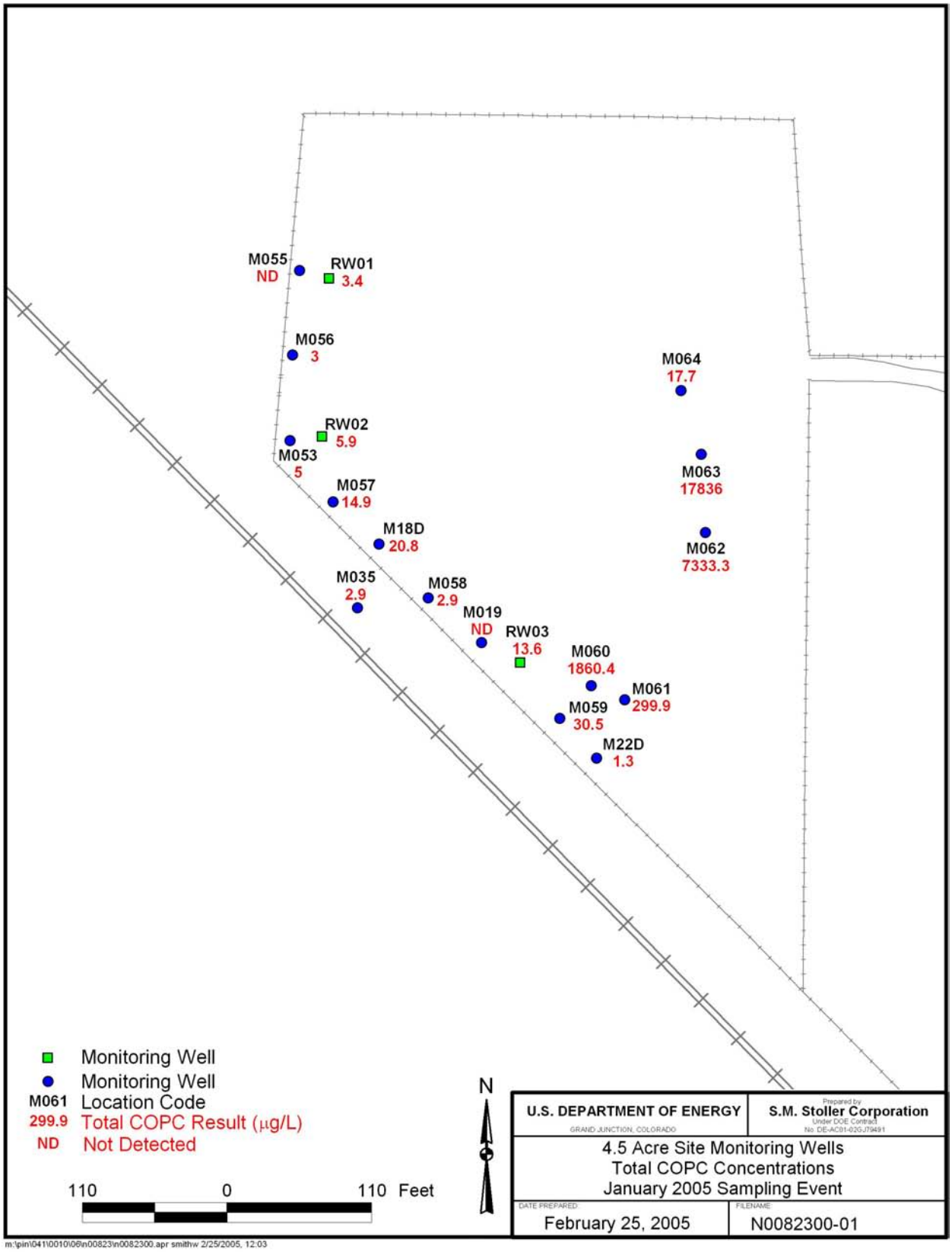


Figure 4. 4.5 Acre Site TCOPC Concentrations January 2005 Sampling Event

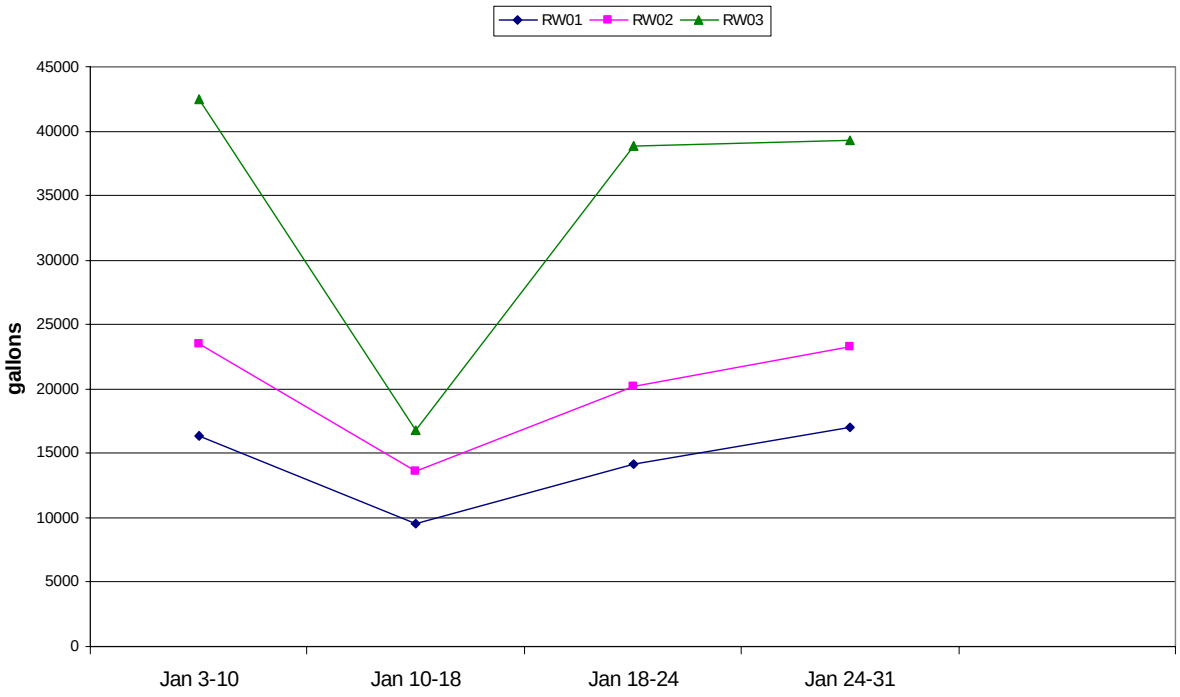


Figure 5. January 2005 4.5 Acre Site Ground Water Recovery

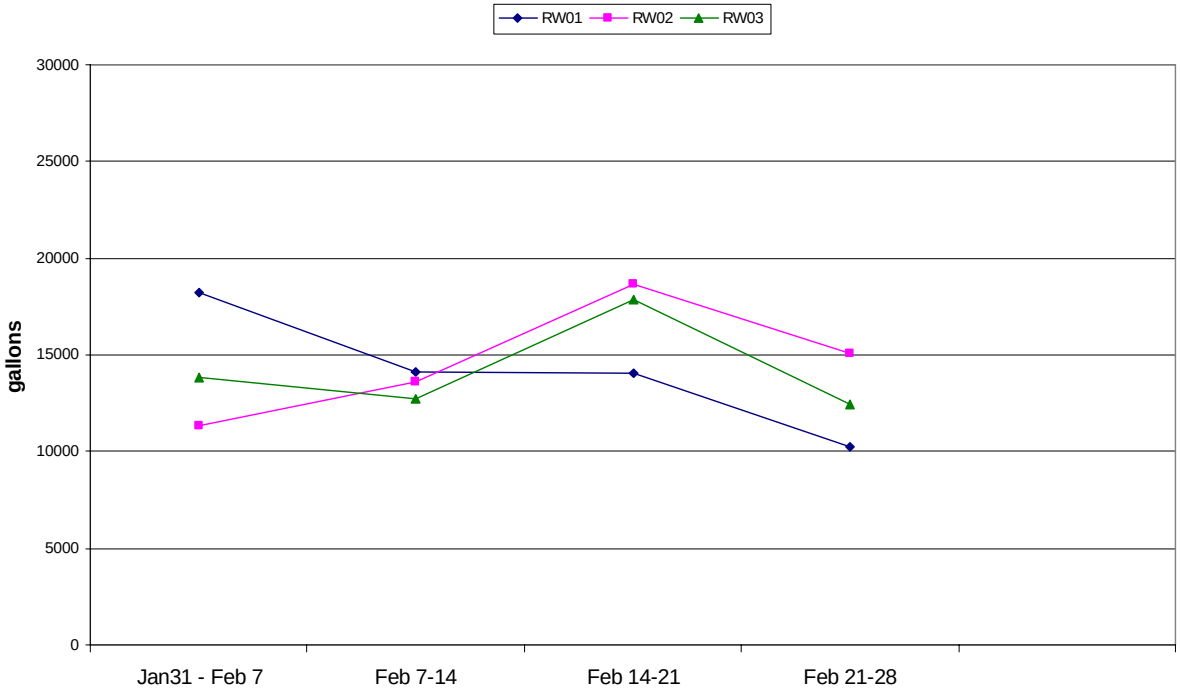


Figure 6. February 2005 4.5 Acre Site Ground Water Recovery

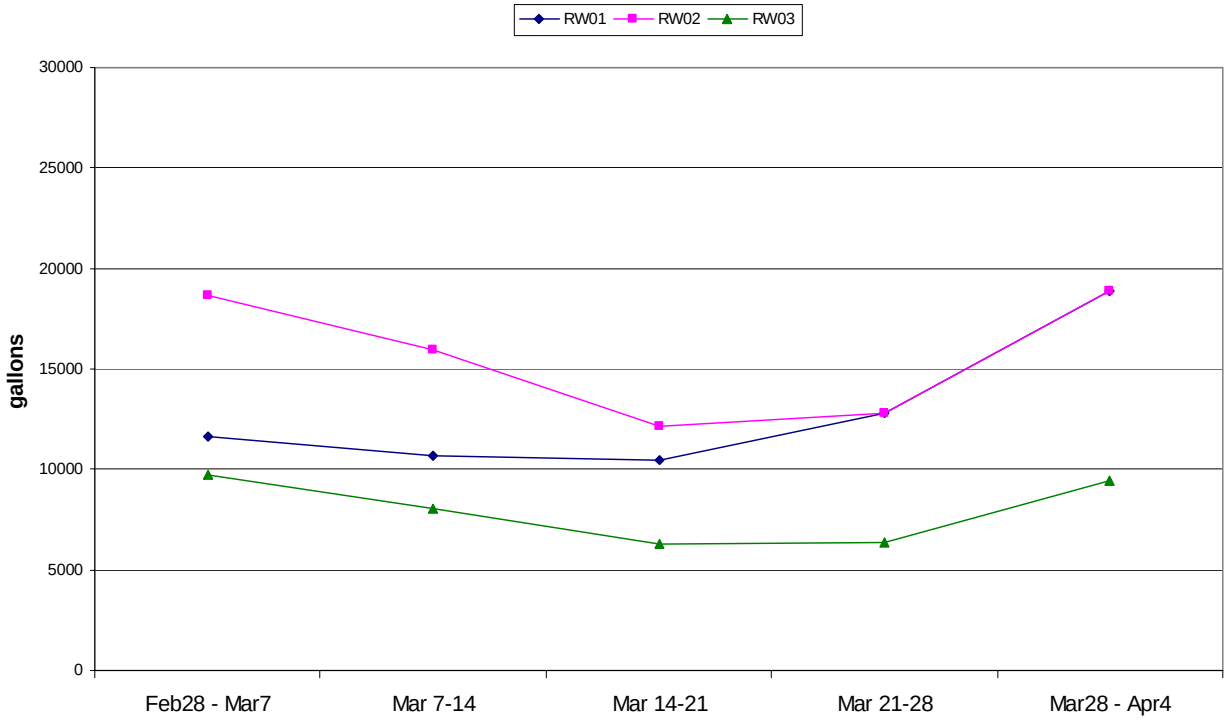


Figure 7. March 2005 4.5 Acre Site Ground Water Recovery

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

Location	Measurement		Water Depth From Land Surface (ft)	Ground Water Elevation (ft NGVD)
	Date	Time		
PIN02			**West Pond**	
502D	1/10/2005	09:58	2.77	15.73
W004	1/10/2005	10:10		16.16
PIN05			**Trench Site**	
0500	1/10/2005	10:00	3.40	15.10
PIN20			**4.5 Acre Site**	
0502	1/10/2005	09:36	5.21	12.19
0503	1/10/2005	09:38	5.29	12.11
M001	1/10/2005	09:40	5.34	12.26
M003	1/10/2005	09:07	4.56	13.64
M005	1/10/2005	09:08	4.85	13.45
M007	1/10/2005	09:09	5.34	14.11
M011	1/10/2005	09:51	4.38	13.72
M012	1/10/2005	09:50	4.20	13.80
M015	1/10/2005	09:42	6.36	11.14
M019	1/10/2005	09:04	5.99	12.01
M023	1/10/2005	09:35	7.18	12.29
M024	1/10/2005	09:34	5.16	12.64
M025	1/10/2005	09:45	5.38	10.92
M028	1/10/2005	09:10	4.33	13.87
M035	1/10/2005	08:40	6.77	12.03
M036	1/10/2005	08:47	6.35	12.95
M049	1/10/2005	09:11	4.18	13.62
M053	1/10/2005	08:57	7.56	9.64
M054	1/10/2005	09:31	4.50	13.20
M055	1/10/2005	08:58	8.18	9.22
M056	1/10/2005	09:00	7.19	9.91
M057	1/10/2005	09:01	6.91	10.99
M058	1/10/2005	09:03	5.67	12.03
M059	1/10/2005	09:05	5.13	12.67
M060	1/10/2005	09:16	4.49	12.84
M061	1/10/2005	09:15	4.24	13.04
M062	1/10/2005	09:13	4.28	13.55
M063	1/10/2005	09:26	4.92	13.18
M064	1/10/2005	09:25	4.47	13.24
M18D	1/10/2005	09:02	6.07	11.63
M22D	1/10/2005	09:06	4.85	12.95
M38D	1/10/2005	08:37	7.39	11.11
M40D	1/10/2005	08:43	6.76	12.64
M40S	1/10/2005	08:50	6.49	12.71
M41D	1/10/2005	08:39	7.45	11.65
MWL1	1/10/2005	09:18	5.45	12.79
MWL2	1/10/2005	09:20	4.83	12.94
MWL3	1/10/2005	09:21	4.57	13.13
MWL4	1/10/2005	09:22	4.06	13.68

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

Location	Measurement		Water Depth From Land Surface (ft)	Ground Water Elevation (ft NGVD)
	Date	Time		
MWL5	1/10/2005	09:24	4.89	13.68
MWL6	1/10/2005	09:54	4.57	13.88
RW01	1/10/2005	09:04	11.57	6.03
RW02	1/10/2005	09:00	10.52	6.58
RW03	1/10/2005	08:56	-1.75	19.35
TE01	1/10/2005	10:02	3.50	14.60

Table 2. 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	25.1	1,889	12.8	6.73	-106.5	0.73
0503	13.2–23.2	25	1,573	17.5	6.76	-78.4	0.61
M019	22–27	22.89	881	1.27	7.59	53.5	0.45
M035	9–14	23	2,380	1.73	6.86	-91.1	0.2
M053	20–30	24.79	1,189	22.2	6.98	-124.1	0.15
M055	21–31	24.35	1,293	19.7	6.95	-107	0.21
M056	19–29	24.3	1,201	15.2	6.94	-122.7	0.22
M057	20–30	23.81	1,076	8.77	6.94	-112.9	0.27
M058	18–28	23.74	1,096	19.8	6.95	-101.6	0.18
M059	19–29	23.43	1,144	19.7	6.98	-113.5	0.17
M060	18–28	24.15	908	157	6.9	-118.3	0.29
M061	20–30	24.15	803	775	7	-154.8	0.12
M062	20–30	23.45	1,428	13.9	6.84	-104.3	0.25
M063	19.5–29.5	24.11	2,561	18.8	6.56	-115.3	0.29
M064	15–25	24.13	2,973	19.3	6.58	-100	0.34
M18D	20–30	23.83	1,455	2.34	6.96	-108.2	0.32
M22D	20–30	23.57	1,638	2.05	6.86	-105.1	0.23
MWL2	21–26	23.89	2,520	2.49	6.72	-113.1	0.17
MWL3	21–26	23.5	2,053	7.59	6.6	-97	0.19
MWL4	20.8–25.8	23.48	897	1.95	6.88	-115.9	0.17
MWL6	21.5–26.5	22.64	967	2.02	6.87	-107.3	0.23

[a]Temperature corrected to 25°C
-- Not measured

Table 3. 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]
FDEP MCL			**3**	**70**	**100**	**63**	**1**	**1**	
PIN20		**4.5 Acre Site**							
0502	21.2–31.2	1/14/2004	<0.5	154	1.3	155.3	162	<0.5	317.3
		4/19/2004	<2.5	145	<2.5	145	193	<2.5	338
		7/14/2004	<2.5	146	<2.5	146	195	<2.5	341
		10/12/2004	<2.5	106	<2.5	106	209	<2.5	315
0503	13.2–23.2	1/14/2004	<5	<5	<5	ND	<5	<5	ND
		4/20/2004	<0.5	<0.5	<0.5	ND	0.55J	<0.5	ND
		7/20/2004	<0.5	<0.5	<0.5	ND	0.95J	<0.5	ND
		10/12/2004	<0.5	<0.5	<0.5	ND	3.2	<0.5	3.2
M001	20–25	1/14/2004	<25	496	<25	496	748	<25	1,244
		4/19/2004	<5	405	17.4	422.4	814	<5	1,236.4
		7/13/2004	8J	789	47	836	1,420	<5	2,256
		10/14/2004	21.4	1,120	87.7	1,207.7	1,580	<10	2,809.1
M003	9–14	4/21/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M005	25.8–30.7	4/21/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M007	25.3–30.3	4/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M011	23.7–28.7	1/14/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/21/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M012	8.6–13.6	1/14/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/21/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M015	20.8–25.8	1/14/2004	<5	<5	<5	ND	<5	<5	ND
		4/21/2004	<0.5	<0.5	<0.5	ND	2.2	<0.5	2.2
		7/13/2004	<0.5	<0.5	<0.5	ND	1.3	<0.5	1.3
		10/15/2004	<0.5	<0.5	<0.5	ND	0.8J	<0.5	ND
M019	22–27	1/14/2004	<0.5	<0.5	<0.5	ND	3.4	<0.5	3.4
		4/21/2004	<0.5	<0.5	<0.5	ND	2.3	<0.5	2.3
		7/15/2004	<0.5	0.74J	<0.5	0.74J	1.9	<0.5	1.9
		10/14/2004	<0.5	1.3	<0.5	1.3	1.4	<0.5	2.7
		1/13/2005	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M023	19.8–24.8	1/14/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/12/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M024	8.7–13.7	1/14/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/13/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND

Table 3 (continued). COPC Concentrations from Wells at the 4.5 Acre Site (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]
FDEP MCL			**3**	**70**	**100**	**63**	**1**	**1**	
M025	8.6–13.6	1/14/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/12/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M028	22–27	4/19/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M035	9–14	1/15/2004	<5	<5	<5	ND	<5	<5	ND
		4/16/2004	<0.5	0.61J	<0.5	0.61J	<0.5	<0.5	ND
		7/20/2004	1.5	<0.5	<0.5	ND	<0.5	<0.5	1.5
		10/7/2004	<0.5	1.4	<0.5	1.4	<0.5	<0.5	1.4
		1/12/2005	<0.5	2.9	<0.5	2.9	<0.5	<0.5	2.9
M036	25–30	1/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/7/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M049	20–30	1/14/2004	<0.5	17.2	1.1	18.3	5.9	<0.5	24.2
		4/21/2004	<0.5	17.5	1.7	19.2	9.1	<0.5	28.3
		7/21/2004	<0.5	9.6	1.1	10.7	6.3	<0.5	17
		10/14/2004	<0.5	7.7	0.69J	7.7	4.8	<0.5	12.5
M053	20–30	1/14/2004	<5	<5	<5	ND	<5	<5	ND
		4/20/2004	<0.5	<0.5	<0.5	ND	1.8	<0.5	1.8
		7/14/2004	<0.5	<0.5	<0.5	ND	2.7	<0.5	2.7
		10/14/2004	<0.5	<0.5	<0.5	ND	5.1	<0.5	5.1
		1/12/2005	<0.5	<0.5	<0.5	ND	5	<0.5	5
M054	20–30	1/14/2004	<2.5	<2.5	<2.5	ND	<2.5	<2.5	ND
		4/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M055	21–31	4/21/2004	<0.5	1.5	<0.5	1.5	9.9	<0.5	11.4
		7/16/2004	<0.5	<0.5	<0.5	ND	2.2	<0.5	2.2
		10/13/2004	<0.5	<0.5	<0.5	ND	0.8J	<0.5	ND
		1/12/2005	<0.5	<0.5	<0.5	ND	0.56J	<0.5	ND
M056	19–29	4/21/2004	<0.5	<0.5	<0.5	ND	9.6	<0.5	9.6
		7/15/2004	<0.5	<0.5	<0.5	ND	5.4	<0.5	5.4
		10/14/2004	<0.5	<0.5	<0.5	ND	5.5	<0.5	5.5
		1/12/2005	<0.5	<0.5	<0.5	ND	3	<0.5	3
M057	20–30	4/21/2004	<0.5	3.8	<0.5	3.8	3.8	<0.5	7.6
		7/20/2004	<0.5	1.7	<0.5	1.7	4.5	<0.5	6.2
		10/14/2004	<0.5	8.4	<0.5	8.4	4.6	<0.5	13
		1/12/2005	<0.5	11.4	<0.5	11.4	3.5	<0.5	14.9

Table 3 (continued). COPC Concentrations from Wells at the 4.5 Acre Site (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]
FDEP MCL			**3**	**70**	**100**	**63**	**1**	**1**	
M058	18–28	4/21/2004	<0.5	5.6	0.69J	5.6	3.7	<0.5	9.3
		7/15/2004	<0.5	2	<0.5	2	1.4	<0.5	3.4
		10/14/2004	<0.5	2.9	<0.5	2.9	2.3	<0.5	5.2
		1/12/2005	<0.5	1.9	<0.5	1.9	1	<0.5	2.9
M059	19–29	4/21/2004	<0.5	<0.5	<0.5	ND	8.3	<0.5	8.3
		7/14/2004	<0.5	<0.5	<0.5	ND	44.1	<0.5	44.1
		10/14/2004	<0.5	6.1	0.99J	6.1	47.3	<0.5	53.4
		1/12/2005	<0.5	2.8	0.64J	2.8	27.7	<0.5	30.5
M060	18–28	7/16/2004	7.9	63.5	31.9	95.4	339	<0.5	442.3
		10/13/2004	1.7	76.7	27	103.7	455	<0.5	560.4
		1/13/2005	2.4	977	136	1,113	745	<0.5	1,860.4
M061	20–30	7/15/2004	242	353	49.5	402.5	647	<5	1,291.5
		10/13/2004	14.3	37.9	19	56.9	520	<0.5	591.2
		1/13/2005	18.5	28.4	6.7J	28.4	253	<5	299.9
M062	20–30	7/21/2004	<25	1,810	<25	1,810	2,310	<25	4,120
		10/15/2004	<0.5	1,190	9.9	1,199.9	2,310	1.2	3,511.1
		1/13/2005	<0.5	2,840	11.8	2,851.8	4,480	1.5	7,333.3
M063	19.5–29.5	7/19/2004	4,880	12,600	612	13,212	3,580	<100	21,672
		10/13/2004	5,930	8,160	562	8,722	3,100	1.2	17,753.2
		1/13/2005	4,290	9,610	486	10,096	3,450	<50	17,836
M064	15–25	7/16/2004	<0.5	10.3	<0.5	10.3	45.2	<0.5	55.5
		10/14/2004	<0.5	1	<0.5	1	9.4	<0.5	10.4
		1/13/2005	<0.5	3.5	<0.5	3.5	14.2	<0.5	17.7
M18D	20–30	1/14/2004	<0.5	10.2	<0.5	10.2	4.6	<0.5	14.8
		4/20/2004	<0.5	10.2	<0.5	10.2	5.7	<0.5	15.9
		7/14/2004	<0.5	11.1	<0.5	11.1	5.6	<0.5	16.7
		10/14/2004	<0.5	13.3	<0.5	13.3	6.9	<0.5	20.2
		1/12/2005	<0.5	15	<0.5	15	5.8	<0.5	20.8
M22D	20–30	1/14/2004	<0.5	<0.5	<0.5	ND	2.3	<0.5	2.3
		4/20/2004	<0.5	<0.5	<0.5	ND	1.9	<0.5	1.9
		7/14/2004	<0.5	<0.5	<0.5	ND	1.6	<0.5	1.6
		10/14/2004	<0.5	<0.5	<0.5	ND	1.4	<0.5	1.4
		1/12/2005	<0.5	<0.5	<0.5	ND	1.3	<0.5	1.3
M38D	20–30	1/15/2004	<5	<5	<5	ND	<5	<5	ND
		4/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/7/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M40D	18–28	1/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/7/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND

Table 3 (continued). COPC Concentrations from Wells at the 4.5 Acre Site (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]
FDEP MCL			**3**	**70**	**100**	**63**	**1**	**1**	
M40S	4–14	1/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		4/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/7/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
M41D	16–26	1/15/2004	<5	<5	<5	ND	<5	<5	ND
		4/16/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/7/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
MWL1	21–26	1/14/2004	<25	<25	<25	ND	<25	<25	ND
		4/21/2004	<0.5	<0.5	<0.5	ND	4	9.2	13.2
		7/21/2004	<0.5	<0.5	<0.5	ND	6.8	3.6	10.4
		10/15/2004	<0.5	<0.5	<0.5	ND	5.4	6.1	11.5
MWL2	21–26	1/14/2004	<10	14J	<10	14J	120	<10	120
		4/19/2004	0.91J	16.1	14.7	30.8	99.3	1.6	131.7
		7/21/2004	<1	11.8	17.5	29.3	110	<1	139.3
		10/14/2004	<0.5	23.7	23.8	47.5	124	0.74J	171.5
MWL3	21–26	1/14/2004	<5	<5	<5	ND	<5	<5	ND
		4/19/2004	<0.5	0.54J	<0.5	0.54J	735	<0.5	735
		7/16/2004	<0.5	8.9	<0.5	8.9	2,180	<0.5	2,188.9
		10/13/2004	<0.5	224	1.7	225.7	2,820	<0.5	3,045.7
MWL4	20.8–25.8	1/14/2004	<10	993	17.9J	993	347	<10	1,340
		4/19/2004	<10	873	19.8J	873	422	<10	1,295
		7/16/2004	113	2,350	63.3	2,413.3	546	<0.5	3,072.3
		10/13/2004	84.5	1,940	75.9	2,015.9	498	<0.5	2,598.4
MWL5	20.8–25.8	1/14/2004	<5	<5	<5	ND	<5	<5	ND
		4/21/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/21/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/14/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
MWL6	21.5–26.5	1/14/2004	<5	<5	<5	ND	<5	<5	ND
		4/22/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		7/20/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		10/15/2004	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
RW01	10–30	4/20/2004	<0.5	1.2	<0.5	1.2	7.4	<0.5	8.6
		7/6/2004	<0.5	2.9	<0.5	2.9	4.7	<0.5	7.6
		10/5/2004	<0.5	2	<0.5	2	1.3	<0.5	3.3
		1/6/2005	<0.5	2.1	<0.5	2.1	1.3	<0.5	3.4
RW02	8–28	4/20/2004	<0.5	<0.5	<0.5	ND	1.2	<0.5	1.2
		7/6/2004	<0.5	1.1	<0.5	1.1	4.6	<0.5	5.7
		10/5/2004	<0.5	2.3	<0.5	2.3	3.2	<0.5	5.5
		1/6/2005	<0.5	3.3	<0.5	3.3	2.6	<0.5	5.9

Table 3 (continued). COPC Concentrations from Wells at the 4.5 Acre Site (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]
FDEP MCL			**3**	**70**	**100**	**63**	**1**	**1**	
RW03	8–28	4/20/2004	<0.5	<0.5	<0.5	ND	4.9	<0.5	4.9
		7/6/2004	<0.5	0.57J	1.3	1.3	7.3	<0.5	8.6
		10/5/2004	<0.5	1.8	1.4	3.2	9.5	<0.5	12.7
		1/6/2005	<0.5	2.5	1.9	4.4	9.2	<0.5	13.6

[a]Before December 18, 2003, "<" values are reporting limits. On or after December 18, 2003, "<" values are method detection limits.
[b]Total 1,2–DCE is the sum of cis–1,2–DCE and trans–1,2–DCE.
[c]Total COPC is the sum of the individual COPC concentrations. The cis–1,2–DCE and trans–1,2–DCE 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 4. Arsenic Concentrations from Wells at the 4.5 Acre Site

Location	Sample Date	Concentration (mg/L)
PIN20	**4.5 Acre Site**	
0502	1/13/2005	<0.0035
0503	1/13/2005	0.0198
MWL2	1/13/2005	<0.0035
MWL3	1/13/2005	<0.0035
MWL4	1/13/2005	<0.0035
MWL6	1/14/2005	<0.0035

"<" values are method detection limits.

Table 5. RPD for Duplicate Samples, 4.5 Acre Site

Sample ID	Duplicate ID	Case Number	Constituent	S[a]	D[b]	RPD Value	5 times DL[c]	Fail[d]
PIN20–M064	PIN20–0580	F29278	cis-1,2-dichloroethene	3.5	2.1	50.0	2.5	Fail
			Vinyl chloride	14.2	12.4	13.5	2.5	
PIN20–MWL2	PIN20–0581	F29278	Non detect for arsenic and VOCs					
PIN20–M064	PIN20–0580	F29278	cis-1,2-dichloroethene	3.5	2.1	50.0	2.5	
			Vinyl chloride	14.2	12.4	13.5	2.5	

[a]S = Original sample (N001), VOC concentration in . g/L.
[b]D = Duplicate sample (N002), VOC concentration in . g/L.
[c]DL = Detection limit.
[d]Fail is an RPD greater than ±30% and an original or duplicate sample more than 5 times the detection limit.

Table 6. Summary of Analytical Results for the 4.5 Acre Site Treatment System (reported in micrograms per liter unless otherwise noted)[a]

Location	Date Sampled	TCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE[c]	Vinyl chloride	Benzene	Total COPC[d]	$CaCO_3$ mg/L	Fe mg/L
PIN20		**4.5 Acre Site**								
TRTI[b]	1/6/2005	<0.5	2.2	<0.5	2.2	2.3	<0.5	4.5	924	6.7
	2/2/2005	<0.5	2	<0.5	2	3	<0.5	5	978	6.84
	3/11/2005	<0.5	2.1	<0.5	2.1	2.6	<0.5	4.7	1,020	7.25
TRTE[b]	1/6/2005	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND	934	6.61
	2/2/2005	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND	994	7
	3/11/2005	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND	1,010	7.13

[a]"<" values are method detection limits.
[b]TRTI is the system influent and TRTE is the system effluent.
[c]Total 1,2-DCE is the sum of cis-1,2-DCE and trans-1,2-DCE.
[d]Total COPC is the sum of the individual COPC concentrations. The cis-1,2-DCE and trans-1,2-DCE values are not part of the total COPC value because this value is included in the total 1,2-DCE value. "J" values are not included in the total COPC value.

J = Estimated value, result is between the reporting limit and the method detection limit.
ND = Not detected.

Table 7. Estimated Mass of VOCs Recovered from the 4.5 Acre Site Recovery Wells During January, February, and March 2005

Month	Volume Treated (gallons)	Concentration[a]						
		cis–1,2–DCE (µg/L)	trans–1,2–DCE (µg/L)	Toluene (µg/L)	TCE (µg/L)	Methylene Chloride (µg/L)	Vinyl Chloride (µg/L)	Total VOCs (µg/L)
January 2005	161,836	2.2	0.3	0.3	0.3	2.3	0.5	5.8
February 2005	174,790	2	0.3	0.3	0.3	3	0.5	6.3
March 2005	180,446	2.1	0.3	0.3	0.3	2.6	0.5	6.0

Month	Volume Treated (gallons)	Mass Recovered[b]						
		cis–1,2–DCE (lbs)	trans–1,2–DCE (lbs)	Toluene (lbs)	TCE (lbs)	Methylene Chloride (lbs)	Vinyl Chloride (lbs)	Total VOCs (lbs)
January 2005	161,836	0.0	0.0	0.0	0.0	0.0	0.0	0.01
February 2005	174,790	0.0	0.0	0.0	0.0	0.0	0.0	0.01
March 2005	180,446	0.0	0.0	0.0	0.0	0.0	0.0	0.01

[a]These concentrations represent the average of monthly sampling results.
[b]Includes "J" (estimated) values. For any detection of "<", which indicates the laboratory could not detect that analyte, 50 percent of the "<" value was used for the calculation of recovery.