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Sparton Technology, Inc.
Former Coors Road Plant
Remedial Program

2012 Annual Report

S.S. PAPADOPULOS & ASSOCIATES, INC.
Environmental & Water-Resource Consultants

June 28, 2013

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S.S. PAPADOPULOS & ASSOCIATES, INC.
ENVIRONMENTAL & WATER-RESOURCE CONSULTANTS

JUL 2013

June 28, 2013

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Subject: Sparton Technology, Inc: Former Coors Road Plant Remedial Program 2012 Annual Report

Gentlemen:

On behalf of Sparton Technology, Inc. (Sparton), S.S. Papadopulos & Associates, Inc. (SSP&A) is pleased to submit the subject report. The report presents data collected at Sparton's former Coors Road Plant during the operation of the remedial systems in 2012, and evaluations of these data to assess the performance of the systems.

I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of either the person or persons who manage the system and/or the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify, to the best of my knowledge and belief, that this document is consistent with the applicable requirements of the Consent Decree entered among

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the New Mexico Environment Department, the U.S. Environmental Protection Agency, Sparton Technology, Inc., and others in connection with Civil Action No. CIV 97 0206 LH/JHG, United States District Court for the District of New Mexico. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions concerning the report, please contact me.

Sincerely,

S.S. PAPADOPULOS & ASSOCIATES, INC.

Stavros S. Papadopulos, PhD, PE, NAE
Founder & Senior Principal

cc: Secretary, Sparton Technology, Inc., c/o Mr. Ernesto Martinez
Mr. Marc Schlei, Senior Vice President and Chief Financial Officer of Sparton Corporation
Mr. Ernesto Martinez, EHS Corporate Manager of Sparton Corporation (3 copies)
Mr. James B. Harris, Thompson & Knight LLP
Mr. Tony Hurst, Hurst Engineering Services (2 copies)

Sparton Technology, Inc.
Former Coors Road Plant
Remedial Program

2012 Annual Report

Prepared for:

Sparton Technology, Inc.
Schaumburg, Illinois

Prepared by:

S.S. PAPADOPULOS & ASSOCIATES, INC.
Environmental & Water-Resource Consultants

June 28, 2013

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Executive Summary

The former Coors Road Plant (Site) of Sparton Technology, Inc. (Sparton) is located at 9621 Coors Boulevard NW, Albuquerque, New Mexico. The Site is at an elevation of about 5,050 feet above mean sea level (ft MSL); the land slopes towards the Rio Grande on the east and rises to elevations of 5,150-5,200 ft MSL within a short distance to the west of the Site. The upper 1,500 feet of the fill deposits underlying the Site consist primarily of sand and gravel with minor amounts of silt and clay. The water table beneath the Site is at an elevation of 4,975-4,985 ft MSL and slopes towards the northwest to an elevation of about 4,960 ft MSL within about one-half mile of the Site. At an elevation of about 4,800 ft MSL a 2- to 3-foot clay layer, referred to as the 4800-foot clay unit, has been identified.

Investigations conducted at and around the Site in the 1980s revealed that soils beneath the Site and groundwater beneath and downgradient from the Site were contaminated. The primary contaminants were volatile organic compounds (VOCs), specifically trichloroethene (TCE), 1,1-dichloroethene (DCE), and 1,1,1-trichloroethane (TCA), and chromium. Remedial investigations that followed indicated that groundwater contamination was limited to the aquifer above the 4800-foot clay; current measures for groundwater remediation were, therefore, designed to address contamination within this depth interval.

Under the terms of a Consent Decree entered on March 3, 2000, Sparton agreed to implement a number of remedial measures. These remedial measures consisted of: (1) the installation and operation of an off-site containment system; (2) the installation and operation of a source containment system; and (3) the operation of an on-site, 400-cfm (cubic feet per minute) soil vapor extraction (SVE) system for an aggregate period of one year. The goals of these remedial measures are: (a) to control hydraulically the migration of the off-site plume; (b) to control hydraulically any potential source areas that may be continuing to contribute to groundwater contamination at the on-site area; (c) to reduce contaminant concentrations in vadose-zone soils in the on-site area and thereby reduce the likelihood that these soils remain a source of groundwater contamination; and (d) in the long-term, restore the groundwater to beneficial use.

The installation of the off-site containment system began in late 1998 and was completed in early May 1999. The system consisted of: (1) a containment well near the leading edge of the plume, designed to pump at a rate of about 225 gallons per minute (gpm), (2) an off-site treatment system, (3) an infiltration gallery in the Arroyo de las Calabacillas, and (4) associated conveyance and monitoring components. The off-site containment well began operating on December 31, 1998; except for brief interruptions for maintenance activities or due to power outages, the well has operated continuously since that date. Based on an evaluation of the performance of the system and of alternative groundwater extraction systems, conducted in 2009, Sparton recommended and the regulatory agencies approved the increase of the pumping rate of this well to about 300 gpm to accelerate aquifer restoration; this rate increase was implemented on November 3, 2010. The year 2012 was the fourteenth full year of operation of this well.

The source containment system was installed during 2001 and began operating on January 3, 2002. This system consisted of: (1) a containment well immediately downgradient from the site, designed to pump at a rate of about 50 gpm, (2) an on-site treatment system, (3) six[a] on-site infiltration ponds, and (4) associated conveyance and monitoring components. The year 2012 was the eleventh year of operation of this well.

The 400-cfm SVE system was installed in the Spring of 2000 and began operating on April 10, 2000. The system operated for a total of about 372 days until June 15, 2001 and thus met the length-of-operation requirements of the Consent Decree. Monitoring conducted in the Fall of 2001 indicated that the system had also met its performance goals, and the system was dismantled in May 2002.

During 2012, considerable progress was made towards achieving the goals of the remedial measures:

- The off-site containment well continued to operate during the year at an average discharge rate of 287 gpm and maintained hydraulic containment of the off-site plume. The pumped water was treated and returned to the aquifer through the infiltration gallery. The concentrations of constituents of concern in the treated water met all the requirements of the Discharge Permit for the site.
- The source containment well continued to operate during the year at an average rate of 42 gpm, and to contain potential on-site source areas. The pumped water was treated and returned to the aquifer through the infiltration ponds. The concentrations of constituents of concern in the treated water met all the requirements of the Discharge Permit for the site.
- Groundwater monitoring was conducted as specified in the Groundwater Monitoring Program Plan (Monitoring Plan [Attachment A to the Consent Decree]) and the State of New Mexico Groundwater Discharge Permit DP-1184 (Discharge Permit). Water levels in all accessible wells and/or piezometers were measured quarterly. Samples were collected for water-quality analyses from monitoring wells at the frequency specified in the Monitoring Plan and analyzed for VOCs and total chromium.
- Samples were obtained from the influent and effluent of the treatment plants for the off-site and source containment systems, and the infiltration gallery and infiltration pond monitoring wells at the frequency specified in the Discharge Permit. All samples were analyzed for VOCs, total chromium, iron, and manganese.

[a] The performance of the six on-site infiltration ponds between 2002 and 2004 indicated that four ponds are more than adequate for handling the water pumped by the source containment well. With the approval of the regulatory agencies, Sparton backfilled two of the six ponds in 2005 to put the land to other beneficial use.

- The groundwater flow model that was developed in previous years was used to calculate the area of origin of the water pumped by the off-site and source containment wells during 2012 and the capture zones of these wells.[b]

The extent of groundwater contamination during 2012, as defined by the extent of the TCE plume, was essentially the same as during 2011. Of 57 wells sampled both in November 2011 and 2012, the 2012 concentrations of TCE were lower than in 2011 in 13 wells, higher in 14 wells, and remained the same in 30 wells (all but three below detection limits). Well MW-60, at 840 micrograms per liter (μg/L), continued to be the most contaminated off-site well. The corresponding results for DCE were 6 wells with lower, 10 wells with higher, and 41 wells with the same (all below detection limits) concentrations. The TCA plume ceased to exist in 2003, and this condition continued through 2012; the highest concentration of TCA during 2012 was 2.7 μg/L (also in well MW-60), significantly below the maximum allowable concentration of 60 μg/L set for groundwater by the New Mexico Water Quality Control Commission.

Changes in concentrations observed in monitoring wells since the implementation of the current remedial measures indicate that contaminant concentrations decreased significantly both in the on-site and off-site area. Data from 56 wells that were sampled both during 2012 and before, or soon after, the start of the remedial operations indicate that TCE concentrations decreased in 30 wells, increased in 5 and remained unchanged in 21 (all but two below detection limits). Of the five wells where current concentrations are higher than they were prior to the start of the current remedial operations, the highest increase (290 μg/L) was at the off-site containment well CW-1. The concentrations of contaminants in the water pumped from CW-1 rapidly increased after the start of its operation and have remained high for several years before starting a declining trend in the mid-2000s. The high concentrations in this well and in well MW-60 indicated that areas of high concentration existed upgradient from both of these wells; however, most of the groundwater upgradient from these wells has been captured by CW-1 and concentrations both in CW-1 and MW-60 are declining and are expected to continue to decline.

Two of the three monitoring wells completed below the 4800-foot clay (in the Deep Flow Zone or the DFZ), well MW-67 and well MW-79, which was installed in 2006 to address the continuing presence of contaminants in the third DFZ monitoring well MW-71R, continued to be free of any site-related contaminants throughout 2011. Well MW-71R continued to be contaminated; however, TCE concentrations in the well declined from 210 μg/L in August 2003 to 51 μg/L in May 2009. After that, the TCE concentrations in the well began increasing again reaching 91 μg/L in May 2011 and then declining to 58 μg/L by November 2011. The same pattern repeated in 2012 with TCE concentrations in the well increasing to 77 μg/L in August 2012 and then declining to 56 μg/L by November 2012.

The off-site and source containment wells operated at a combined average rate of aabout 330 gpm during 2012. A total of about 173 million gallons of water were pumped from the wells. The total volume of water pumped since the beginning of the current remedial operations

[b] In previous Annual Reports, this model was updated using data from the current year. However, under the terms of an agreement between USEPA, NMED, and Sparton entered on June 3, 2013, hereafter such model updates will be conducted once every three years with the next update to be included in the 2014 Annual Report.

on December 1998 is about 1.96 billion gallons and represents 173 percent of the initial volume of contaminated groundwater (pore volume).

A total of about 320 kilograms (kg) [700 pounds (lbs)] of contaminants consisting of about 290 kg (630 lbs) of TCE, 32 kg (70 lbs) of DCE, and 1.0 kg (2.2 lbs) of TCA were removed from the aquifer by the two containment wells during 2012. The total mass that was removed since the beginning of the of the current remedial operations through the end of 2012 is 6,910 kg (15,260 lbs) consisting of 6,450 kg (14,230 lbs) of TCE, 440 kg (980 lbs) of DCE, and 19 kg (42 lbs) of TCA. This represents about 88 percent of the total dissolved contaminant mass currently estimated to have been present in the aquifer prior to the testing and operation of the off-site containment well.

The containment systems were shut down several times during 2012 for routine maintenance activities, due to power and monitoring system failures, or due to the failure of other components of the systems. The downtime for these shutdowns ranged from 4 minutes to 7 days. The longer shutdowns, including the 7 day shutdown of the source containment system, were for repairs of leaks in air strippers; power failures at the treatment buildings were also responsible for frequent shutdowns that sometime lasted more than a day. The rate of migration of contaminants during a shutdown (90 ft/yr) and the distance between the leading edge of the plume and the limit of the containment area of the systems (more than 350 ft) indicate that shutdowns of this magnitude, or of even much longer duration, do not and will not allow the escape of any contaminants beyond the containment area of the systems.

Plans for next year include continuing the operation of the off-site and source containment systems, and the collection of monitoring data as required by the plans and permits controlling system operation, groundwater discharge, and air emissions. An evaluation of the system maintenance and operation processes will be conducted to assess whether there are actions that must be taken to improve the performance of both systems and reduce shutdown frequencies and durations.

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µg/L	Micrograms per liter
3rdFZ	Third depth interval of the Lower Flow Zone
cfm	cubic feet per minute
Cis-12DCE	cis-1,2-Dichloroethene
cm^2/s	Centimeter squared per second
CMS	Corrective Measure Study
COA	City of Albuquerque
Cr	Chromium
DCE	1,1-Dichloroethylene
DFZ	Deep Flow Zone below the 4800 -- foot clay
DO	Dissolved Oxygen
ft	foot or feet
ft MSL	feet above Mean Sea Level
ft/d	feet per day
ft/yr	feet per year
ft^2	square feet
ft^2/d	feet squared per day
ft^3	cubic feet
g/cm^3	grams per cubic centimeter
gpd	gallons per day
gpm	gallons per minute
IM	Interim Measure
kg	Kilogram
lbs	Pounds
LLFZ	Lower Lower Flow Zone
MCL	Maximum Contaminant Level
Metric	Metric Corporation
mg/L	Milligrams per liter
mg/m^3	Milligrams per cubic meter
MSL	Mean Sea Level

mV	Millivolt
ND	Not Detected
NMED	New Mexico Environment Department
NMEID	New Mexico Environmental Improvement Division
NMWQCC	New Mexico Water Quality Control Commission
ORP	Oxidation/Reduction Potential
O/S	On-Site
ppmv	parts per million by volume
RFI	RCRA Facility Investigation
rpm	Revolutions per minute
Sparton	Sparton Technology, Inc.
SSP&A	S.S. Papadopulos & Associates, Inc.
SVE	Soil Vapor Extraction
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
UFZ	Upper Flow Zone
ULFZ	Upper Lower Flow Zone
USEPA	United States Environmental Protection Agency
USF	Upper Santa Fe Group
USGS	United States Geological Survey
VC	Vinyl Chloride
VOC	Volatile Organic Compound

REPORT

Section 1
Introduction

The former Coors Road Plant of Sparton Technology, Inc. (Sparton) is located at 9621 Coors Boulevard NW (on the west side of the boulevard), Albuquerque, New Mexico, north of Paseo del Norte and south of the Arroyo de las Calabacillas (see Figure 1.1). Investigations conducted between 1983 and 1987 at and around the plant revealed that on-site soils and groundwater were contaminated by volatile organic compounds (VOCs), primarily trichloroethene (TCE), 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE), and by chromium, and that contaminated groundwater had migrated beyond the boundaries of the facility to downgradient, off-site areas.

In 1988, the United States Environmental Protection Agency (USEPA) and Sparton negotiated an Administrative Order on Consent, which became effective on October 1, 1988. Under the provisions of this Order, Sparton implemented in December 1988 an Interim Measure (IM) that consisted of an on-site, eight-well groundwater recovery and treatment system. The initial average recovery rate of the system was about 1.5 gallons per minute (gpm); however, the recovery rate began declining within a few years due to a regional decline in water levels. As a result, the system was shut down and permanently taken out of service on November 16, 1999.

In 1998 and 1999, during settlement negotiations associated with lawsuits brought by the USEPA, the State of New Mexico, the County of Bernalillo, and the City of Albuquerque (COA), Sparton agreed to implement a number of remedial measures and take certain actions, including: (1) the installation, testing, and continuous operation of an off-site extraction well designed to contain the contaminant plume; (2) the replacement of the on-site groundwater recovery system by a source containment well designed to address the release of contaminants from potential on-site source areas; (3) the operation of a 400 cubic feet per minute (cfm) capacity on-site soil vapor extraction (SVE) system for a total operating time of one year over a period of eighteen months; (4) the implementation of a groundwater monitoring plan; (5) the assessment of aquifer restoration; and (6) the implementation of a public involvement plan. Work Plans for the implementation of the measures and actions agreed upon by the parties were developed and included in a Consent Decree entered by the parties on March 3, 2000 [Consent Decree, 2000; S.S. Papadopulos & Associates, Inc. (SSP&A), 2000a; 2000b; 2000c; and Chandler, 2000].

The off-site containment well was installed and tested in late 1998. Based on the test results, a pumping rate of about 225 gpm was determined to be adequate for containing the off-site plume (SSP&A, 1998), and the well began operating at approximately this rate on December 31, 1998. An air stripper for treating the pumped water and an infiltration gallery for returning the treated water to the aquifer were constructed in the spring of 1999, and the well was connected to these facilities in late April 1999. In 2000, due to chromium concentrations that exceeded the permit requirements for the discharge of the treated water, a chromium reduction process was added to the treatment system and began operating on December 15, 2000; however, chromium concentrations declined in 2001 and the process was discontinued on October 31, 2001. In late 2009, Sparton recommended that the pumping rate of the off-site containment well

be increased to 300 gpm to expedite aquifer restoration in the off-site plume area; this recommendation was approved by USEPA and the New Mexico Environment Department (NMED) on March 26, 2010[1] and implemented by Sparton on November 3, 2010. The year 2012 constitutes the fourteenth year of operation of the off-site containment system.

Sparton applied for and obtained approvals for the different permits and work plans required for the installation of the source-containment system in 1999 and 2000. The Construction Work Plan for the system was approved on February 20, 2001, and construction began soon after that date. The installation of the system was completed by the end of 2001, and the system began operating on January 3, 2002. Thus, the year 2012 constitutes the eleventh year of operation of the source containment system.

SVE systems of different capacities were operated at the Sparton Facility between April and October 1998, and between May and August 1999. The 400-cfm SVE system required under the Consent Decree was installed in the spring of 2000 and operated for an aggregate of about 372 days between April 10, 2000 and June 15, 2001, meeting the one-year operation requirement of the Consent Decree. The performance of the system was evaluated by conducting two consecutive monthly sampling events of soil gas in September and October 2001, after a 3-month shut-off period. The results of these two sampling events, which were presented in the Final Report on the On-Site Soil Vapor Extraction System [Chandler and Metric Corporation (Metric), 2001] and on Table 4.7 of the 2001 Annual Report (SSP&A, 2002), indicated that TCE concentrations at all monitoring locations were considerably below the 10 parts per million by volume (ppmv) remediation goal of the Consent Decree. Based on these results, the operation of the SVE system was permanently discontinued by dismantling the system and plugging the vapor recovery well and vapor probes in May 2002.

In accordance with the requirements of the Consent Decree [Attachment D - Work Plan for the Assessment of Aquifer Restoration (SSP&A, 2000b)], a numerical groundwater flow and contaminant transport model of the aquifer system underlying the Sparton site and its vicinity was developed in 2000 and recalibrated each year until 2009. The initial development of this model is described in the 1999 Annual Report (SSP&A, 2001a), and major revisions to the model in the 2003 and 2008 Annual Reports (SSP&A, 2004; 2009a). In 2009, the model was deemed reliable for making future predictions and was used to evaluate the performance of the existing system and of several alternate groundwater extraction systems with respect to the time each system would take to restore the aquifer. The recommendation to increase the pumping rate of CW-1 to 300 gpm, made by Sparton and approved by USEPA and NMED, was based on the results of this evaluation (SSP&A, 2009b).[2]

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[1] Letter dated March 26, 2010 from John E. Kieling of NMED and Chuck Hendrickson of USEPA to Joseph S. Lerczak of Sparton, Re: Sentinel Well Installation Workplan Request, Sparton Technology, Inc., EPA ID No. NMD083212332.

[2] The report presenting the results of the evaluation (SSP&A, 2009b) was approved on July 9, 2010 (letter dated July 9, 2010 from John E. Kieling of NMED and Chuck Hendrickson of USEPA to Joseph S. Lerczak of Sparton, Re: 2007 & 2008 Annual reports Approval, Sparton Technology, Inc., EPA ID No. NMD083212332).

Between the beginning of the current remedial operations in December 1998 and the end of May 2011, Metric Corporation of Albuquerque and then of Los Lunas, New Mexico was responsible for the operation of the remedial systems, the collection of monitoring and of system performance data, and for other field activities; after the passing away of Gary Richardson of Metric in May of 2011, SSP&A took over the responsibility for these activities effective June 1, 2011.

The purpose of this 2012 Annual Report is to:

- provide a brief history of the former Sparton plant and affected areas downgradient from the plant,
- summarize remedial and other actions taken in prior years and during 2012,
- present the data collected during 2012 from operating and monitoring systems, and
- provide interpretations of these data with respect to meeting remedial objectives.

This report was prepared by SSP&A on behalf of Sparton. Background information on the site, the implementation of remedial actions, and initial site conditions as they existed prior to the implementation of the remedial actions agreed upon in the Consent Decree are discussed in Section 2; a brief summary of operations during 1999 through 2011 is included in this section. Issues related to the year-2012 operation of the off-site and source containment systems are discussed in Section 3. Data collected to evaluate system performance and to satisfy permit or other requirements are presented in Section 4. Section 5 presents interpretations of the data and discusses the results with respect to the performance and the goals of the remedial systems. Evaluations made using the site's groundwater model are presented in Section 6. Section 7 summarizes the report and discusses future plans. References cited in the report are listed in Section 8.

Section 2
Background

2.1 Description of Facility

The site of Sparton's former Coors Road plant is approximately a 12-acre property located in northwest Albuquerque, on Coors Boulevard NW. The property is about one-quarter mile south of the Arroyo de las Calabacillas, about three-quarters of a mile north of the intersection of Coors Boulevard and Paseo del Norte, and about one-half mile west of the Rio Grande (see Figure 1.1). The property sits on a terrace about 60 feet (ft) above the Rio Grande floodplain. An irrigation canal, the Corrales Main Canal, is within a few hundred feet from the southeast corner of the property. About one-quarter mile west of the property the land rises approximately 150 ft forming a hilly area with residential properties.

The plant consisted of a 64,000-square-foot manufacturing and office building and several other small structures that were used for storage or as workshops (see Figure 2.1). Manufacturing of electronic components, including printed-circuit boards, began at the plant in 1961 and continued until 1994. Between 1994 and the end of 1999, Sparton operated a machine shop at the plant in support of manufacturing at the company's Rio Rancho plant and other locations. The property was leased to Melloy Dodge in October 1999. During 2000 and early 2001, the tenant made modifications and renovations to the property to convert it to an automobile dealership and has been operating it as a dealership since April 23, 2001.

2.2 Waste Management History

The manufacturing processes at the plant generated two waste streams that were managed as hazardous wastes: a solvent waste stream and an aqueous metal-plating waste stream. Waste solvents were accumulated in an on-site concrete sump (Figure 2.1) and allowed to evaporate. In October 1980, Sparton discontinued using the sump and closed it by removing remaining wastes and filling it with sand. After that date, Sparton began to accumulate the waste solvents in drums and disposed of them off-site at a permitted facility.

The plating wastes were stored in a surface impoundment (Figure 2.1) and wastewater that accumulated in the impoundment was periodically removed by a vacuum truck for off-site disposal at a permitted facility. Closure of the former impoundment and sump area occurred in December 1986 under a New Mexico State-approved closure plan. The impoundment was backfilled, and an asphaltic concrete cap was placed over the entire area to divert rainfall and surface-water run-on, and thus to minimize infiltration of water into the subsurface through this area.

2.3 Hydrogeologic Setting

The Sparton site lies in the northern part of the Albuquerque Basin. The Albuquerque Basin is one of the largest sedimentary basins of the Rio Grande rift, a chain of linked basins that extend south from central Colorado into northern Mexico. Fill deposits in the basin are as much

as 15,000 ft thick. The deposits at the site have been characterized by more than 100 borings advanced for installing monitoring, production, and temporary wells, and soil vapor probes, and by a 1,520 ft deep boring (the Hunters Ridge Park 1 Boring) advanced by the U.S. Geological Survey (USGS) about 0.5 mile north of the facility on the north side of the Arroyo de las Calabacillas (Johnson and others, 1996).

The fill deposits in the upper 1,500 ft of the subsurface consist primarily of sand and gravel with minor amounts of silt and clay. The near-surface deposits consist of less than 200 ft of Quaternary (Holocene and Pleistocene) alluvium associated with terrace, arroyo fan, and channel and floodplain deposits. These deposits are saturated beneath the facility and to the east of the facility toward the Rio Grande, but are generally unsaturated to the west of the site. Two distinct geologic units have been mapped in the saturated portion of these deposits: Recent Rio Grande deposits, and a silt/clay unit (Figure 2.2). The Recent Rio Grande deposits occur to the east of the facility adjacent to the Rio Grande. These deposits consist primarily of pebble to cobble gravel and sand, and sand and pebbly sand. These deposits are Holocene-age and are up to 70-ft thick. Beneath the facility, and in an approximately 1,500 ft wide band trending north from the facility, a silty clay unit has been mapped between an elevation of about 4,965 ft above mean sea level (ft MSL) and 4,975 ft MSL. This unit, which is referred to as the 4970-foot silt/clay unit, represents Late-Pleistocene-age overbank deposits. The areal extent of the unit at and in the vicinity of the Sparton site is shown in Figure 2.3. Additional information on this unit is presented in Appendix A to both the 1999 and 2000 Annual Reports (SSP&A, 2001a; 2001b).) Holocene-age arroyo fan and terrace deposits, which are primarily sand and gravel, overlie this unit.

The Pliocene-age Upper Santa Fe Group (USF) deposits underlie the Quaternary alluvium. These USF deposits, to an elevation of 4,800 ft MSL, consist primarily of sand with lenses of sand and gravel and silt and clay. The lithologic descriptions of these deposits are variable, ranging from "sandy clay," to "very fine to medium sand," to "very coarse sand," to "small pebble gravel." Most of the borings into this unit were advanced using the mud-rotary drilling technique, and as a result, it has not been possible to map the details of the geologic structure. The sand and gravel unit is primarily classified as USF2 lithofacies assemblages 2 and 3 (Hawley, 1996). Locally, near the water table in some areas, the sands and gravels are classified as USF4 lithofacies assemblages 1 and 2. Lithofacies assemblages 1 and 2 represent basin-floor alluvial deposits; assemblage 1 is primarily sand and gravel with lenses of silty clay, and assemblage 2 is primarily sand with lenses of pebbly sand and silty clay. Lithofacies assemblage 3 represents basin-floor, overbank, and playa and lake deposits that are primarily interbedded sand and silty clay with lenses of pebbly sand.

At an elevation of approximately 4,800 ft MSL, a 2- to 4-foot thick clay layer is encountered. This clay layer, referred to as the 4800-foot clay unit (Figure 2.2), likely represents lake deposits. The 4800-foot clay unit was encountered in borings for seven wells (MW-67, MW-71, MW-71R, MW-79, CW-1, OB-1, and OB-2) installed during site investigations and remedial actions. The unit was also encountered in the USGS Hunter Ridge Park 1 Boring which is located about 0.5 mile north of the Sparton Site on the north side of the Arroyo de las Calabacillas. The nature of the depositional environment (i.e. lake deposits), and the fact that the unit has been encountered in every deep well drilled in the vicinity of the site, as well as at the

more distant USGS boring, indicate that the unit is areally extensive. The deposits of the Santa Fe Group immediately below the 4800-foot clay are similar to those above the clay. The USGS Hunter Ridge Park 1 Boring also indicates the presence of two other deeper clay units, a 15-foot thick unit between elevations 4,705 and 4,720 ft MSL, and a second 20-foot thick unit between elevations 4,520 and 4,540 ft MSL (see Figure 2.2).

The water table beneath the Sparton Site and between the Site and the Rio Grande lies within the Quaternary deposits; however, to the west and downgradient from the site the water table is within the USF deposits. As of the beginning of 2012 a total of 91 wells had been installed at the site and its vicinity to define hydrogeologic conditions and the extent and nature of groundwater contamination and to implement and monitor remedial actions. Of these 91 wells, 23 had been plugged and abandoned, leaving 68 wells that were active at the site at the beginning of 2012. Four of these 68 wells (MW-14R, MW-37R, MW-52R, and MW-71R) are replacements for nearby wells that became dry and were plugged and abandoned, and two wells (MW-53D, and MW-57D) are wells that were deepened after becoming dry to continue to provide data. The locations of these 68 wells are shown in Figure 2.3, and those of the plugged and abandoned 23 wells are shown in Figure A-1 of Appendix A. During 2012, three additional wells (MW-47, MW-58 and MW-61) were plugged and abandoned (locations shown in both Figures 2.3 and A-1), and a new well, MW-47R, was installed to replace one of these wells (see Figure 2.3 for location).

The off-site containment well, CW-1, and the two associated observation wells, OB-1 and OB-2, were drilled to the top of the 4800-foot clay unit and are screened across the entire saturated thickness of the aquifer above the clay unit. The source containment well, CW-2, was drilled to a depth of 130 ft and is equipped with a 50-foot screen from the water table to total depth. The monitoring wells have short screened intervals (5 to 30 ft) and were classified during their installation according to their depth and screened interval. Wells screened across, or within 15 ft of, the water table were referred to as Upper Flow Zone (UFZ) wells. Wells screened 15-45 and 45-75 ft below the water table were referred to as Upper Lower Flow Zone (ULFZ) and Lower Lower Flow Zone (LLFZ) wells, respectively.[3] Wells completed below the 4800-foot clay unit were referred to as Deep Flow Zone (DFZ) wells. Wells, which were installed at locations where an ULFZ or a LLFZ well already existed and which were screened at a deeper interval than the adjacent existing well, were referred to as LLFZ or Third Flow Zone (3rdFZ) wells, regardless of the depth of their screened interval with respect to the water table.[4] This classification, except for a few exceptions (see Footnote 5), has been maintained in this report.

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[3] This classification was based on the height of the water table as it existed in 1998 and prior years. Since then, the water table in the off-site area has declined; the water-table declines range from about 4 ft to more than 7 ft and average about 5.5 ft. Because of these declines, some UFZ wells have become dry and the depth from the water table to the screened interval of ULFZ and LLFZ wells is smaller than specified in this classification.

[4] Because of this practice, the classification of three existing monitoring wells, MW-32, MW-49, and MW-70, was not consistent with the depth of their screened intervals; well MW-32, which was completed within the ULFZ, was classified as LLFZ, and MW-49 and MW-70, which were completed within the LLFZ, were classified as 3rd FZ wells. This inconsistency was corrected during the first (1999) Annual Report prepared under the Consent Decree (SSP&A, 2001a) and, since then, MW-32 has been referred to and treated as a ULFZ well and MW-49 and MW-70 as LLFZ wells.

The completion flow zone, location coordinates, and measuring point elevation of all existing wells are presented in Table 2.1; their diameters and screened intervals are summarized in Table 2.2. Similar information on wells that have been abandoned is presented on Tables A-1 and A-2 of Appendix A. In Figure 2.4, the screened interval of each existing well is projected onto a schematic cross-section through the site to show its position relative to the flow zones defined above. [Monitoring wells screened in the DFZ (MW-67, MW-71R, and MW-79), wells screened across the entire aquifer above the 4800-foot clay (CW-1, OB-1 and OB-2), and infiltration gallery monitoring wells (MW-74, MW-75, and MW-76) are not included in this figure.]

Data collected from these wells indicate that the thickness of the saturated deposits above the 4,800-foot clay ranges from about 180 ft at the Site to about 160 ft west of the Site and averages about 170 ft. Outside the area underlain by the 4970-foot silt/clay unit, groundwater occurs under unconfined conditions; however, in the area where this unit is present, it provides confinement to the underlying saturated deposits. The water table in this area occurs within the Late-Pleistocene-age arroyo fan and terrace deposits that overlie the 4970-foot silt/clay unit and is higher than the potentiometric surface of the underlying confined portion of the aquifer.

Analyses of data from aquifer tests conducted at the Site (Harding Lawson Associates, 1992; SSP&A, 1998; 1999b) indicate that the hydraulic conductivity of the aquifer is in the range of 25 to 30 ft per day (ft/d), corresponding to a transmissivity of about 4,000 to 5,000 ft squared per day (ft^2/d). A transmissivity of about 4,000 ft^2/d, corresponding to a hydraulic conductivity of about 25 ft/d, is also indicated by the response of water levels to long-term pumping from the off-site containment well CW-1. Analyses of the water levels measured quarterly in observation wells OB-1 and OB-2, and in monitoring wells within 1,000 ft of the off-site containment well, indicate that the response of these wells to the long-term pumping from CW-1 is best explained with a transmissivity of 4,000 ft^2/d; that is, a transmissivity of 4,000 ft^2/d produces the smallest residual between calculated and measured water levels in these wells.

Water-level data indicate that the general direction of groundwater flow is to the northwest with gradients that generally range from 0.0025 to 0.006; however, within the deposits that lie above the 4970-foot silt/clay unit at the Sparton Site, the direction of groundwater flow is to the west-southwest and the water table has a steeper gradient ranging from 0.010 to 0.016. Groundwater production from the deeper aquifers and a reduction in the extent of irrigated lands in the vicinity of the Site has resulted in a regional decline of water levels. Vertical flow is, therefore, downward with hydraulic gradients that change as rates of regional water-level decline change. During the 1990s the regional decline averaged about 0.65 foot per year (ft/yr) and the vertical hydraulic gradient was 0.002; this information was used in estimating the vertical hydraulic conductivity of the sand units above the 4800-foot clay unit (SSP&A, 2001a). The rate of regional water-level decline slowed down in the early 2000s and averaged about 0.3 ft/yr until 2007; the corresponding average hydraulic gradient was 0.0009. In early 2007, regional water levels rose by about one foot and then began declining again at rates that ranged between 0.47 ft/yr and 0.62 ft/yr and averaged 0.55 ft/yr (see well hydrographs presented in Figure 2.5); the average vertical hydraulic gradient during these years was 0.0017.

2.4 Site Investigations and Past Remedial Actions

In 1983, several groundwater monitoring wells were installed around the impoundment and sump area to determine whether there had been a release of constituents of concern from the impoundment or the sump. Analytical results from groundwater samples taken from these wells indicated concentrations of several constituents above New Mexico State standards.

Since this initial finding in 1983, several investigations were conducted to define the nature and extent of the contamination and to implement remedial measures; these investigations continued through 1999. The results of the investigations indicated that the primary constituents of concern found in on-site soil and in both on-site and off-site groundwater were VOCs, primarily TCE, TCA and its abiotic transformation product DCE. Of these constituents, TCE had the highest concentrations and was the constituent used to define the extent of groundwater contamination. Concentrations of DCE in groundwater were lower relative to those of TCE, but it had the second largest plume extent. Groundwater contamination by TCA was primarily limited to the facility and its immediate vicinity. Various metals were also detected in both soil and groundwater samples; of these, chromium had the highest frequency of occurrence at elevated concentrations.

During the period 1983 to 1987, Sparton worked closely with the New Mexico Environmental Improvement Division (NMEID), the predecessor to NMED. Several investigations were conducted during this period (Harding and Lawson Associates, 1983; 1984; 1985). In 1987, when it became apparent that contaminants had migrated beyond plant boundaries, the USEPA commenced negotiations with Sparton to develop an Administrative Order on Consent. This Order was signed and became effective on October 1, 1988. Under the provisions of this Order, Sparton implemented an IM in December 1988. The IM consisted of groundwater recovery through eight on-site wells (PW-1, MW-18, and MW-23 through MW-28), and treatment of the recovered water in an on-site air stripper (Figure 2.1). The purpose of this IM was to remove contaminants from areas of high concentration in the UFZ. Due to the regional decline of water levels, the total discharge rate from the IM system dropped to less than 0.25 gpm by November 1999. As a result, the system was shut down and taken permanently out of service on November 16, 1999. Groundwater production from this system, during its 11-year operation, is summarized on Table 2.3. A total of 4.4 million gallons of water were recovered during the 11-year operation period, as shown on this table.

From 1988 through 1990, horizontal and vertical delineation of the groundwater plume continued under the October 1, 1988 Order on Consent. On July 6, 1990, the first draft of the RCRA Facility Investigation (RFI) report was submitted to USEPA; the final RFI was issued on May 20, 1992 (Harding Lawson Associates, 1992) and approved by USEPA on July 1, 1992. A draft Corrective Measures Study (CMS) report was submitted to USEPA on November 6, 1992. The report was revised in response to USEPA comments, and a draft Final CMS was issued on May 13, 1996; the draft was approved, subject to some additional revisions, by USEPA on June 24, 1996. The Revised Final CMS was issued on March 14, 1997 (HDR Engineering, Inc., 1997). Nine additional monitoring wells (MW-65 through MW-73) were installed between 1996 and 1999 to delineate further the groundwater plume.

The investigations conducted at the site included several soil-gas surveys to determine the extent of groundwater contamination and to characterize vadose zone soil contamination and its potential impacts on groundwater quality. The results of soil-gas surveys conducted in 1984, 1985, 1987, and 1991 were reported in the RFI and the CMS. Additional soil-gas investigations to characterize vadose zone contamination were conducted between April 1996 and February 1997 (Black & Veatch, 1997). This work included the installation and sampling of a six-probe vertical vapor probe cluster in the source area, five vapor sampling probes at various radial distances from the former sump area, and vapor sampling of nine on-site and four off-site UFZ monitoring wells that are screened across the water table. The locations of the vapor probes (VP-1-6 and VR-1 through VR-5) and of the sampled on-site monitoring wells are shown in Figure 2.6; the locations of the sampled off-site monitoring wells MW-37, MW-48, MW-57, and MW-61, which are now plugged and abandoned, are shown on Figure A-1 of Appendix A. The area where TCE concentrations in soil-gas exceeded 10 ppmv was determined from the results of this investigation (Figure 2.7).

Following this investigation, a SVE pilot test was conducted on February 27 and 28, 1997 (Black & Veatch, 1997). The test was conducted on vapor recovery well VR-1 using an AcuVac System operating at a flow of 65 cfm at a vacuum of 5 inches of water.

Based on the results of this pilot test, an AcuVac System was installed at the site in the spring of 1998 and operated at a flow rate of 50 cfm on vapor recovery well VR-1 from April 8, 1998 to October 20, 1998 (195 days). Influent and effluent concentrations measured during the operation of the system are shown in Figure 2.8. As shown in this figure, influent TCE concentrations dropped from about 18,000 milligrams per cubic meter (mg/m^3), or about 4,000 ppmv, during the first day of operation, to about 150 mg/m^3 (34 ppmv) in about 120 days. Trend lines determined by analysis of the data (see Figure 2.8) indicate that influent TCE concentration was probably as low as 75 mg/m^3 (17 ppmv) prior to the shut-down of the system after 195 days of operation. The mass of TCE removed during this operation of the SVE system was calculated to be about 145 kilograms (kg) or 320 pounds (lbs).

2.5 Implementation of Current Remedial Actions

Based on settlement negotiations that led to the March 3, 2000 Consent Decree, Sparton agreed to implement the following remedial measures: (a) installation and operation of an off-site containment system designed to contain the contaminant plume; (b) replacement of the on-site groundwater recovery system by a source containment system designed to address the release of contaminants from potential on-site source areas; and (c) operation of a robust SVE system for a total operating time of one year over a period of eighteen months.

Implementation of the off-site containment system, as originally planned, was completed in 1999. A chromium reduction process was added to the treatment component of the system in 2000. The chromium treatment process was discontinued in 2001 because the chromium concentration in the influent dropped below the New Mexico groundwater standard. The system currently consists of:

- a containment well (CW-1) installed near the leading edge of the TCE plume;
- an off-site treatment system for the water pumped by CW-1, consisting of an air stripper housed in a building;
- an infiltration gallery installed in the Arroyo de las Calabacillas for returning treated water to the aquifer;
- a pipeline for transporting the treated water from the treatment building to the gallery;
- a piezometer, PZG-1, with an horizontal screen placed near the bottom of the gallery, for monitoring the water level in the gallery; and
- three monitoring wells (MW-74, MW-75, and MW-76) for monitoring potential water-quality impacts of the gallery.

The locations of these components of the off-site containment system are shown in Figure 2.9.

The containment well was installed in August 1998, and aquifer tests were conducted on the well and evaluated in December (SSP&A, 1998). The well began operating at a design rate of 225 gpm on December 31, 1998. During the testing of the well and during its continuous operation between December 31, 1998 and April 14, 1999, the groundwater pumped from the well was discharged into a sanitary sewer without treatment. Installation of the air stripper, the infiltration gallery, and other components of the system (except the chromium reduction process) was completed in early April, 1999. The containment well was shut down on April 14, 1999 to install a permanent pump and to connect the well to the air stripper. Between April 14 and May 6, 1999, the well operated intermittently to test the air stripper and other system components. The tests were completed on May 6, 1999, and the well was placed into continuous operation. Due to increases in chromium concentrations in the influent to, and hence in the effluent from, the air stripper, a chromium reduction process was added to the treatment system on December 15, 2000. Chromium concentrations, however, declined during 2001 and the chromium reduction process was removed on November 1, 2001. The pumping rate of the off-site containment well was increased to 300 gpm on November 3, 2010, and the system is now operating at approximately this rate with all system components functioning.

All permits and approvals required for the implementation of the source containment system were obtained between May 1999 and February 2001. The installation of the system began soon after the approval of the Construction Work Plan for the system in February 2001, and completed in December 2001. The system was tested in December 2001 and placed into operation on January 3, 2002. The system consists of:

- a source containment well (CW-2) installed immediately downgradient of the Site;
- an on-site treatment system for the water pumped by CW-2, consisting of an air stripper housed in a building;
- six on-site infiltration ponds for returning the treated water to the aquifer;
- pipelines for transporting the pumped water to the air stripper and the treated water to the ponds; and

- three monitoring wells (MW-17, MW-77, and MW-78) for monitoring the potential water-quality impacts of the ponds.

The layout of the system is shown in Figure 2.10. The chromium concentrations in the influent to, and hence in the effluent from, the air stripper meets the New Mexico water-quality standard for groundwater and, therefore, treatment for chromium is not necessary. Based on the first three years of operation of the system, Sparton concluded that four infiltration ponds were sufficient for returning to the aquifer the water treated by this system. Therefore, in April 2005 Sparton requested USEPA and NMED approval to backfill two of the six ponds (Ponds 5 and 6 in Figure 2.10), and upon approval of this request in June 2005, the two ponds were backfilled between August and December 2005.

An AcuVac SVE system was installed on vapor recovery well VR-1 (see Figure 2.6) in the spring of 1998 and operated between April 8 and October 20, 1998. Additional SVE operations at this location with the AcuVac system at 50 cfm and with a 200-cfm Roots blower occurred in 1999 between May 12 and June 23 and between June 28 and August 25, respectively. An additional 200-cfm Roots blower was installed in 2000, and the SVE system was operated at 400 cfm between April 10, 2000 and June 15, 2001. The total operating time during this period, 371 days and 13 hours, and the results of the performance monitoring conducted after the shut-down of the system met the requirements of the Consent Decree for the termination of the SVE operations at the site. The system was, therefore, dismantled, and the recovery well and vapor probes associated with the system were plugged in May 2002.

2.6 Initial Site Conditions

Initial site conditions, as referred to in this report, represent hydrogeologic and soil-gas conditions as they existed prior to the implementation of the current remedial measures (the installation and operation of the off-site and source containment systems, and the 1999-2001 operation of SVE systems).

2.6.1 Hydrogeologic Conditions

2.6.1.1 Groundwater Levels

The elevation of water levels in monitoring wells, based on measurements made in November 1998, is presented on Table 2.4. These data were used to prepare maps showing the configuration of the water levels at the site prior to the implementation of the current remedial measures.

Water-level data from UFZ and ULFZ well pairs indicate that UFZ wells screened above or within the 4970-foot silt/clay unit (most of the UFZ wells on the Sparton Site) have a water level that is considerably higher than that in the adjacent ULFZ wells that are screened below this unit. These water-level differences range from less than one foot near the western and southwestern limit of the unit to more than 10 ft north and northeast of the Sparton site. Outside the area underlain by the 4970-foot silt/clay unit, however, the water-level difference between UFZ and ULFZ well pairs is 0.2 foot or less. This relationship between UFZ and ULFZ water levels is illustrated in the schematic cross-section shown in Figure 2.4 (see also Figure 5.14).

In early interpretations of water-level data, including those presented in the 1999 and 2000 Annual Reports (SSP&A, 2001a; 2001b), separate water-level maps were prepared using data from UFZ, ULFZ, and LLFZ wells without taking into consideration the above-discussed relationship between the water levels in UFZ and ULFZ wells. Since the 2001 Annual Report (SSP&A, 2002), however, this relationship has been taken into consideration, and water level conditions at the site and its vicinity are presented in three maps depicting: (1) the water table above the 4970-foot silt/clay unit underlying the Sparton site and at the area north of the site, based on water-level data from UFZ wells screened above or within the silt/clay unit (referred to as the "on-site water table"); (2) the combined UFZ/ULFZ water levels based on data from UFZ and ULFZ wells outside the area underlain by the silt/clay unit (using the average water level at UFZ/ULFZ well pair locations) and ULFZ wells screened below this unit; and (3) the LLFZ water levels based on data from LLFZ wells.

The elevation of the on-site water table in November 1998 is shown in Figure 2.11. The corresponding water-level elevations in the UFZ/ULFZ and LLFZ are shown in Figures 2.12 and 2.13, respectively. These water-level maps indicate that in the off-site areas downgradient from the site, the direction of groundwater flow is generally to the northwest with a gradient of approximately 0.0025. On-site, the direction of flow is also northwesterly in both the UFZ/ULFZ and the LLFZ; however, the gradients are steeper, approximately 0.005 in the UFZ/ULFZ and 0.006 in the LLFZ. The on-site water table is affected by the on-site groundwater recovery system, which was operating during the November 1998 water-level measurements, and the presence of the 4970-foot silt/clay unit; the direction of flow changes from westerly north of the site to southwesterly on the site, with gradients that range from 0.01 to 0.016.

A discussion of water levels in the DFZ had not been included in the 2006 and earlier Annual Reports because data from only two monitoring wells (MW-67 and MW-71 or MW-71R) were available from this zone; these data indicated steep downward gradients across the 4,800-foot clay (water-level differences of about 6 feet between the LLFZ and the DFZ) but provided little information on the direction of groundwater flow in this zone. The installation of a third DFZ monitoring well (MW-79) in 2006, and the water-level data collected from the three DFZ wells between the installation of MW-79 and the end of 2008 indicate that the average direction of groundwater flow in the DFZ during this period was to the west-northwest (W 19.1° N) with an average gradient of about 0.00200 (see Figure 2.14). This direction of flow and gradient are similar to those observed in the flow zones above the 4800-foot clay.

The lower water levels in the DFZ are due to municipal and industrial pumping from the deeper horizons of the aquifer several miles to the north, west, and southwest of the Sparton site. These lower water levels and the resulting steep gradients across the 4800-foot clay unit create a potential for the downward migration of contaminants. The off-site containment well, which is fully penetrating the aquifer above the clay unit, is expected to create horizontal gradients that may counteract the downward migration potential across the clay unit.

2.6.1.2 Groundwater Quality

The concentrations of TCE, DCE, and TCA in groundwater samples obtained from monitoring wells during the Fourth Quarter 1998 sampling event are summarized on Table 2.5. Also included on this table are data obtained on September 1, 1998, from the off-site containment well, CW-1, and the nearby observation wells, OB-1 and OB-2, and from temporary wells, TW-1 and TW-2, drilled in early 1998 at the current location of MW-73 and sampled on February 18 and 19, 1998, respectively. For each of the compounds reported on Table 2.5, concentrations that exceed the more stringent of its Maximum Contaminant Level (MCL) for drinking water or its maximum allowable concentration in groundwater set by the New Mexico Water Quality Control Commission (NMWQCC) are highlighted.

These concentration data were used to prepare maps showing the horizontal extent of the TCE, DCE and TCA plumes as they existed in November 1998, prior to the beginning of pumping from the off-site containment well. The procedures presented in the Work Plan for the Off-Site Containment System were used in preparing these maps (SSP&A, 2000a). The horizontal extent of the TCE plume (in November 1998) is shown in Figure 2.15 and the extent of the DCE and TCA plumes is shown in Figures 2.16 and 2.17, respectively. This initial extent of the plumes forms a basis for comparing their extent during the years of operation of the remedial systems that have been implemented at the site and for evaluating the effectiveness of these remedial systems.

2.6.1.3 Pore Volume of Plume

TCE is the predominant contaminant at the Sparton site and has the largest plume. Calculation of the initial volume of water contaminated above MCLs, referred to as the pore volume of the plume, was, therefore, based on the horizontal and vertical extent of the TCE plume.

In preparing the plume maps presented in the previous section (Figures 2.15 through 2.17), the completion zone of monitoring wells was not considered; that is, data from an UFZ well at one location was combined with data from an ULFZ or LLFZ well at another location. At well cluster locations, the well with the highest concentration was used, regardless of its completion zone. As such, the horizontal extent of the TCE plume shown in Figure 2.15 represents the envelope of the extent of contamination at different depths, rather than the extent of the plume at a specific depth within the aquifer.

To estimate the initial pore volume of the plume, three separate maps depicting the horizontal extent of the TCE plume were prepared using water-quality data from UFZ, ULFZ, and LLFZ monitoring wells. The concentrations measured in the fully-penetrating containment well CW-1 and observation wells OB-1 and OB-2 were assumed to represent average concentrations present in the entire aquifer above the 4800-foot clay, and these data were used in preparing all three maps. An estimate of the horizontal extent of TCE contamination at the top of the 4800-foot clay was also made by preparing a fourth plume map using the data from the containment well and the two observation wells, and data from two temporary wells that obtained samples from about 30-35 ft above the top of the clay during the construction of DFZ wells MW-67 (July 1996) and MW-71 (June 1998). [These four TCE plume maps were

presented in Appendix B to both the 1999 and the 2000 Annual Reports (SSP&A, 2001a; 2001b).]

The extent of the plume based on UFZ wells was assumed to represent conditions at the water table; based on the elevation of the screened intervals in ULFZ and LLFZ wells (see Figure 2.4), the extent of the plume estimated from ULFZ wells was assumed to represent conditions at an elevation of 4,940 ft MSL, and that estimated from LLFZ wells conditions at an elevation of 4,900 ft MSL. The extent of the plume at the top of the clay was assumed to represent conditions at an elevation of 4,800 ft MSL. The area of the TCE plumes at each of these four horizons was calculated.[5] Using these areas, the thickness of the interval between horizons, and a porosity of 0.3, the pore volume was estimated to be approximately 150 million cubic ft (ft^3), or 1.13 billion gallons, or 3,450 acre-ft.

2.6.1.4 Dissolved Contaminant Mass

As discussed in both the 1999 and 2000 Annual Reports (SSP&A, 2001a; 2001b), calculations of the initial dissolved contaminant mass based on a plume-map approach, such as the one used above to estimate the initial pore volume (Section 2.6.1.3), significantly underestimate the dissolved contaminant mass present in the aquifer underlying the site. The calibration of the numerical transport model that was developed for the site and its vicinity (see Section 6.2.3) was, therefore, used to provide an estimate of the initial contaminant mass. During the calibration process of this model, the initial TCE concentration distribution within each model layer is adjusted, in a manner consistent with the initial concentrations observed in monitoring wells, until the computed concentrations of TCE in the water pumped from each containment well, and hence the computed TCE mass removal rates, closely match the observed concentrations and mass removal rates. Based on the calibration of the model against 1999 through 2009 water-quality data, the initial dissolved TCE mass is currently estimated to be (see Table 6.1) about 7,360 kg (16,230 lbs).[6] Using this estimate, and ratios of the removed TCE mass to the removed DCE and TCA mass, the initial masses of dissolved DCE and TCA are estimated to be approximately 460 kg (1,010 lbs) and 22 kg (48 lbs), respectively. Thus, the total initial mass of dissolved contaminants is currently estimated to be about 7,840 kg (17,290 lbs).

2.6.2 Soil Gas Conditions

A supplemental vadose zone characterization was conducted between March 15 and May 5, 1999, which included installation and sampling of eight additional vapor probes, VP-7 through VP-14 (Figure 2.6) and resampling of 15 vapor-monitoring points that had exhibited soil-gas concentrations greater than 10 ppmv during the initial characterization. The results of the supplemental investigation are presented in Figure 2.18, with the approximate 10 ppmv TCE

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[5] The features of the commercially available mapping program Surfer 7.0 (copyright © 1999, Golden Software, Inc.) were used in generating the plume maps and in calculating plume areas.

[6] Comparison of mass removal rates and of containment-system influent concentrations during 2010 and 2011 with model predicted mass removal rates and influent concentrations (see Figure 6.8) indicates that this estimate of initial TCE mass continues to be valid.

plume limit delineated. The extent of the TCE plume presented in this figure represents the initial conditions prior to the resumption of soil vapor extraction remedial actions in 1999.

2.7 Summary of the 1999 through 2011 Operations

During 1999 through 2011, significant progress was made in implementing and operating the remedial measures Sparton agreed to implement under the terms of the Consent Decree entered on March 3, 2000. These remedial measures resulted in the containment of the plume at the site, the removal of a significant amount of mass from the plume of groundwater contamination, and a significant reduction in soil-gas concentrations in the on-site source areas.

The remedial measures undertaken in 1999 through 2011 included the following:

- Between December 31, 1998 and April 14, 1999, and from May 6, 1999 through November 3, 2010, the off-site containment well was operated at a rate sufficient to contain the plume; the pumping rate of the well was increased on November 3, 2010 to accelerate aquifer restoration. The air stripper for treating the pumped water and the infiltration gallery for returning the treated water to the aquifer were constructed in the spring of 1999. These systems were connected to the containment well and tested between April 14 and May 6, 1999. A chromium reduction process was added to the off-site treatment system on December 15, 2000, to control chromium concentrations in the air stripper effluent and thus meet discharge permit requirements for the infiltration gallery; the process was discontinued on November 1, 2001, after chromium concentrations in the influent decreased to levels that no longer required treatment.
- A 50-cfm AcuVac SVE system was operated at vapor recovery well VR-1 from May 12 through June 23, 1999, and a 200-cfm Root blower system was operated at this well from June 28 to August 25, 1999. A second 200-cfm Root blower was added to the system in the Spring of 2000, and the 400-cfm SVE system operated for a total of 372 days between April 10, 2000 and June 15, 2001 meeting the length-of-operation requirement of the Consent Decree. The results of the performance monitoring that was conducted in September and October 2001 indicated that the system had met the termination criteria specified in the Consent Decree, and the system was dismantled in May 2002.
- The source containment system, consisting of a containment well immediately downgradient from the site, an on-site treatment system, six on-site infiltration ponds, and associated conveyance and monitoring components, was installed and tested during 2001. Operation of the system began on January 3, 2002, and the system continued to operate through December 31, 2009 at a rate sufficient for containing any potential sources that may remain at the site. Two of the six infiltration ponds were backfilled in 2005 when an evaluation of the pond performance indicated that four ponds more than adequate for infiltrating the treated water.
- Groundwater monitoring was conducted as specified in the Groundwater Monitoring Program Plan, hereafter "Monitoring Plan," (Consent Decree, 2000, Attachment A) and in the State of New Mexico Groundwater Discharge Permit DP-1184 that controls the discharge of the treated water through the infiltration gallery and ponds, hereafter

"Discharge Permit." Water levels in monitoring wells, containment wells, observation wells and piezometers were measured quarterly. Until the end of 2010 the water level was also measured quarterly in the Corrales Main Canal; since these data were not used for any of the annual evaluations, measurement of the water level in the canal was discontinued at the beginning of 2011 with the approval of the USEPA and the NMED. Samples were collected for water-quality analyses from monitoring wells and from the influent and effluent of the air stripper at the frequency specified in the Monitoring Plan and the Discharge Permit, and analyzed for TCE, DCE, TCA, and other constituents, as required by these documents.

- A groundwater flow and transport model of the hydrogeologic system underlying the site was developed in 2000. The model was calibrated against data available at the end of 1999, and again against data available at the end of each subsequent year, and used to simulate TCE concentrations in the aquifer from the start-up of the containment well in December 1998 through the end of 2009. After significant modifications in early 2009, during the preparation of the 2008 Annual Report, the model was deemed reliable for making predictions of future conditions, and was used in late 2009 to evaluate alternative groundwater extraction schemes for expediting aquifer restoration (SSP&A, 2009b). Based on this evaluation, and with the approval of the regulatory agencies, the pumping rate of the off-site containment well was increased to 300 gpm in November 2010.

A total of about 1.53 billion gallons of water, corresponding to an average rate of about 224 gpm, were pumped from the off-site containment well between the start of its operation and the end of 2011. An additional total of about 0.25 billion gallons of water, corresponding to an average rate of 48 gpm, were pumped by the source containment well between the start of its operation on January 3, 2002 and the end of 2011. The total volume of water pumped by both the off-site and source containment wells between the start of the off-site containment well operation and the end of 2011 was about 1.78 billion gallons, and represents about 158 percent of the initial volume of contaminated groundwater (pore volume). Evaluation of quarterly water-level data indicated that the off-site containment well maintained control of the off-site contaminant plume throughout each year, and that the source containment well developed a capture zone that contains potential on-site source areas that may be contributing to groundwater contamination.

The total mass of contaminants that was removed by the off-site containment well between the start of its operation and the end of 2011 was about 6,360 kg (14,040 lbs) and consisted of 5,960 kg (13,150 lbs) of TCE, 383 kg (843 lbs) of DCE, and 14.9 kg (32 lbs.) of TCA. An additional 235 kg (517 lbs) of contaminants consisting of about 203 kg (447 lbs) of TCE, 28.0 kg (61.8 lbs) of DCE, and 3.4 kg (7.4 lbs.) of TCA were removed from the aquifer by the source containment well. Thus, the total mass of contaminants removed from the aquifer by both wells between the start of the off-site containment well operation on December 1998 and the end of 2011 was about 6,600 kg (14,560 lbs) consisting of 6,170 kg (13,600 lbs) of TCE, 411 kg (905 lbs) of DCE, and 18.3 kg (40.3 lbs) of TCA. This removed mass represented about 84 percent of the contaminant mass currently estimated to have been present in the aquifer prior to the operation of the off-site containment well.

The operation of the soil vapor extraction systems at vapor recovery well VR-1 in 1999 and 2000 had a measurable impact on soil-gas concentrations at the site. The 1999 SVE operations had reduced TCE concentrations in soil gas below 10 ppmv at all but one of the monitored locations. Soil-gas was not monitored during the 2000 and 2001 operation of the 400-cfm system. The system was shut down on June 15, 2001; and performance monitoring was conducted near the end of 2001, three months after the shut-down. The results of this monitoring indicated that soil gas concentrations at all monitoring locations were considerably below the 10 ppmv termination criterion for the system, and the system was dismantled in May 2002.

The remedial systems were operated with only minor difficulties during 1999 through 2011. In 1999, the metering pump adding anti-scaling chemicals to the influent to the off-site air-stripper was not operating correctly. This problem was solved in December 1999 by replacing the pump. Also, chromium concentrations in the influent to, and hence in the effluent from, the air stripper increased from 20 μg/L at system start-up to 50 μg/L by May 1999, and fluctuated near this level, which is the discharge permit limit for the infiltration gallery, throughout the remainder of 1999 and during 2000. To solve this problem, a chromium reduction process was added to the treatment system on December 15, 2000; the process was discontinued on November 1, 2001, after chromium concentrations declined to levels that no longer required treatment. A new pump was installed in the off-site containment in October 2010 to accommodate the proposed new pumping rate of 300 gpm; however, after the pumping rate was increased on November 3, 2010, difficulties were encountered in maintaining this new pumping rate, and the pump was replaced on November 17, 2010. This pump failed again during late 2011 and was replaced again on November 7, 2011.

In 2006, the discharge rate of the source containment well began declining during the latter half of the year; it was thought that this was due to the inefficiency of its pump and a new pump was installed in 2007. Further testing conducted when the new pump did not improve the flow rate indicated that the pipeline between the well and the air-stripper building was clogged with iron and manganese deposits; the pipeline was cleaned with acid in June 2007 to restore the capacity of the well. A similar reduction in the pumping rate due to the clogging of the pipeline occurred again in late 2010 and the pipeline was cleaned in January 2011; also, the well pump failed a few weeks later and had to be replaced on February 18, 2011.

Another issue of concern that developed during these years was the continuing presence of contaminants in the DFZ monitoring well MW-71. During 2001, an investigation was conducted on the well and the well was plugged. Based on the results of the investigation, a replacement well, MW-71R located about 30 ft south of the original well, was installed in February 2002. Samples collected from the replacement well between its installation and the end of 2003 indicated the continuing presence of contaminants in the Deep Flow Zone (TCE concentrations of 130 to 210 μg/L). In late 2003, USEPA/NMED and Sparton began negotiating potential approaches for addressing this problem; these negotiations led to the agreement in October 2004 of installing a DFZ monitoring/stand-by extraction well near CW-1, with the understanding that the decision to use this well as a monitoring or extraction well was to be based on whether the well is clean or contaminated. A Work Plan for the installation, testing, monitoring, and/or operation of this DFZ well was submitted to USEPA/NMED on December 6, 2004 and approved by USEPA/NMED on January 6, 2005. Difficulties in obtaining an easement

agreement from the City of Albuquerque to provide access through a City owned park for moving a drilling rig to the proposed well location delayed the installation of the well until the beginning of 2006. The well was installed in February 2006, and the first samples from the well were obtained during its testing in April 2006. The analyses of these samples indicated that the well did not contain any site-related contaminants. Details on the installation, testing and sampling of the well were included in a letter-report[7] presented to USEPA/NMED in June 2006, and the results of the analysis of aquifer test data from the well were presented in Appendix E of the 2007 Annual Report (SSP&A, 2008). Based on the sampling results, the well was designated as monitoring well MW-79, and added to the Monitoring Plan under a semi-annual sampling schedule. Water-quality data collected from MW-79 and MW-71R until the end of 2010 indicated that MW-79 continued to remain free of contaminants, and that VOC concentrations in MW-71R began declining in 2005, from about 185 μg/L in November 2004 to about 77 μg/L in November 2007, and they remained in the 50-70 μg/L range since that time; the November 2011 concentrations in the well were 58 μg/L for TCE, 2.2 μg/L for DCE and <1.0 μg/L for TCA.

Six water table (UFZ) monitoring wells (MW-14, MW-15, MW-28, MW-37, MW-50, and MW-52) that became dry due to declining water levels were plugged during 2002 and 2003; three of these wells were replaced by wells with longer screens (MW-14R, MW-37R, and MW-52R) spanning both the UFZ and ULFZ. Three other water table monitoring wells that became dry during 2004 through 2006 (PW-1, MW-35, and MW-36) were plugged and abandoned in 2007. Well MW-53, which was dry in November 2005 and again in November 2007 and 2008, was deepened in December 2008; the well is now referred to as MW-53D. Well MW-33, which had been dry since 2006, was plugged and abandoned in July 2009. Three other wells, MW-13, MW-48, and MW-57, started becoming dry in 2008 and remained dry throughout 2009, 2010, and early 2011; MW-13 and MW-48 were plugged and abandoned in June 2011 and MW-57 was deepened (MW-57D) in July 2011.

In their comments on the 2003-2007 Annual Reports[8] USEPA and NMED requested that one or more wells or well clusters be installed "west to-northwest of MW-65 and OB-2." After negotiations between agency and Sparton representatives, Sparton agreed on March 30, 2009 to install one "sentinel" well (monitoring well MW-80) downgradient of the existing plume. Agreement on the location, and completion of such a sentinel well was reached in early 2010 (see SSP&A and Metric, 2010), and the well was installed in July-August 2010. The well was found free of site-related contaminants when first sampled on August 18, 2010, and remained clean in November 2010 and during quarterly sampling events since August 2011.

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[7] Letter dated June 2, 2006 to USEPA and NMED representatives from Stavros S. Papadopulos of SSP&A and Gary L. Richardson of Metric with subject "Sparton Technology, Inc. Former Coors Road Plant Remedial Program - Transmittal of Data from the Installation, Testing, and Sampling of a new DFZ Well."

[8] Letter dated December 30, 2008 from Chuck Hendrickson of USEPA, Region 6 and John Kieling of NMED to Tony Hurst of Hurst Engineering Services, Re: 2003-2007 Annual Reports, Sparton Technology, Inc., Former Coors Road Plant, Sparton Technology, Inc., Consent Decree, Civil Action No. CIV 97 0206 LH/JHG, EPA ID No. NMD083212332, with enclosure on "EPA/NMED Comments on Sparton, Inc., Annual Reports for 2003-2007."

Other minor problems during the past years of operation included the occasional shutdown of the containment systems due to power failures, failures of the monitoring or paging systems, and failures of the discharge pumps or air-stripper blower motors. Appropriate measures were taken to address these problems.

Section 3
System Operations - 2012

3.1 Monitoring Well System

During 2012, water levels were measured in and samples were collected from all monitoring wells that were not dry and had sufficient water during the measurement or sampling event. Water levels were measured quarterly and samples were collected from each well at the frequency specified either in the Monitoring Plan, or the Discharge Permit.

3.1.1 Upper Flow Zone

As in past years, the continuing water-level declines in the Albuquerque area affected the monitoring of some of the shallow monitoring wells (UFZ wells) during 2012. Monitoring wells MW-47, MW-58, and MW-61, whose water level has been below the bottom of their screen and which could not be sampled because of insufficient water during the last several years were plugged and abandoned in June 2012 and a replacement well, well MW-47R, was installed in July 2012, after the Work Plan (SSP&A, 2011b) for doing this work was approved by USEPA and NMED.[9] The screen of the replacement well MW-47R extends to a depth of about 25 ft below the bottom of the screen of the original well (see Table 2.2) and will continue to provide water-level and water-quality data at this location (see Figure 2.3). As it has been the case during the last several years, water levels measured in wells MW-07 and MW-09 continued to be below the elevation of the screen bottom for these wells during all four quarters of 2012; that is, the measured water level in these wells was within blank casing below the screen. A similar situation existed in wells MW-54 and PZ-1, which had a water level below the screen bottom during the Third and Fourth Quarters. Because of these conditions, water-level and water-quality data from these wells may not represent conditions in the aquifer, unless there is significant leakage through the plug at the bottom of the blank casing.

During the 2012 Fourth Quarter sampling event, when all wells are sampled, well MW-18 could not be sampled because it did not have sufficient water.

3.1.2 Deeper Flow Zones

There were no problems associated with the measurement of the water levels or with the sampling of any monitoring wells completed in the ULFZ, LLFZ, or the DFZ.

[9] Letter dated February 6, 2012 from John E. Kieling of NMED and Chuck Hendrickson of USEPA to Joseph S. Lerczak of Sparton, Re: Approval with Modification, Work Plan for Plugging and Abandoning Three Monitoring Wells and for Installing a Replacement Well, Sparton Technology Inc., EPA ID No.:NMD083212332.

3.2 Containment Systems

3.2.1 Off-Site Containment System

The Off-Site Containment System operated for about 8,720 hours, or 99.3 percent of the 8,784 hours available during 2012. The system was down for about 64 hours due to 21 interruptions ranging in duration from 4 minutes to about 14 hours. A summary of the downtime for the year is presented in Table 3.1 (a). These downtimes consisted of eight shutdowns due to power failure at the treatment building, six for leak repairs, four due to sump overloads, two for resetting/restarting the pump, and one for system inspection.

The infiltration gallery continued to accept the treated water from the off-site system throughout the year. The piezometer completed in the gallery was dry for the first ten and a half years of the operation of the system; water was measured in the piezometer for the first time in August of 2009. Since then, the water level in the piezometer has been rising at a rate of about 0.1 ft/yr; the average water level during 2012 was only about 0.4 ft above the water level measured in August 2009. Given the slow rate of water-level rise, and the fact that part of this rise was due to the increased discharge rate into the gallery since November 2010, no problems are anticipated with the continued use of the gallery in the near future.

3.2.2 Source Containment System

The Source Containment System operated for about 8,476 hours, or 96.5 percent of the 8,784 hours available during 2012. The system was down for about 308 hours due to 31 interruptions ranging in duration from 5 minutes to about 170 hours. A summary of the downtime for the year is presented on Table 3.1 (b). These downtimes consisted of eight shutdowns due to power failure at the treatment building, seven for cleaning up the pipeline to the air stripper, the pond water filters and gages, six for leak repairs, six due to sump overloads, two due to pump failure, one for water meter replacement, and one due to low well discharge.

The rapid infiltration ponds performed well during 2012. Three ponds were used to discharge the treated water during January through May; ponds 1, 3, and 4 were used in January and May, ponds 1, 2, and 4 in February, ponds 1, 2, and 3 in March, and ponds 2, 3, and 4 in April. During the remainder of the year the treated water was discharged to two ponds; ponds 1 and 2 were used in July, September, and November, and ponds 3 and 4 were used in June, August, October, and December. The amount of water evaporating from the ponds has been estimated to be about 1 percent of the discharged water, that is, about 0.5 gpm.

3.3 Problems and Responses

During 2012, difficulties were encountered in maintaining the pumping rate of the source containment well CW-2 at its design rate of 50 gpm. These difficulties had been encountered before in 2006 and 2010 and were determined to be due to back-pressure from scale accumulation in the pipeline to the treatment plant; cleaning of the pipeline in June 2007 and January 2011 restored the pumping rate of the well to its design rate. The pipeline was again cleaned on August 13, 2012 but it appears that this clean up was not as effective as before in restoring the pumping rate of the well. This scaling of the pipeline and the numerous shutdowns

due air stripper leaks and sump overloads resulted in an average annual pumping rate of 42 gpm for the well. A review of the source containment system to address maintenance and operation problems has been scheduled for the third quarter of 2013. An evaluation of the chemistry of CW-2 will also be conducted to determine whether the scaling of the pipeline to the air stripper can be prevented.

Section 4
Monitoring Results - 2012

The following data were collected in 2012 to evaluate the performance of the operating remedial systems and to meet the requirements of the Consent Decree and of the permits for the site:

- water-level and water-quality data from monitoring wells,
- data on containment well flow rates, and
- data on the quality of the influent to and effluent from the water-treatment systems.

4.1 Monitoring Wells

4.1.1 Water Levels

Water levels during 2012 were measured quarterly, in February, May, August and November, as it has been the case in past years.[10] During each round of measurements, the depth to water was measured in all monitoring wells that were not dry during the measurement round, the off-site and source containment wells, the two observation wells, and the piezometer installed in the infiltration gallery.[11] The corresponding elevations of the water levels during each of the four measurement rounds, calculated from these data, are summarized on Table 4.1.

4.1.2 Water Quality

Monitoring wells within and in the vicinity of the plume were sampled at the frequency specified in the Monitoring Plan and the Discharge Permit. The samples were analyzed for VOCs and for total chromium (unfiltered, and occasionally filtered, samples). The results of the analysis of the samples collected from monitoring wells during all sampling events conducted in 2012, and for all of the analyzed constituents, are presented in Appendix B-1. Data on TCE, DCE, and TCA concentrations in samples collected during the Fourth Quarter of 2012 are summarized on Table 4.2. Quarterly samples from the infiltration gallery monitoring wells (MW-74, MW-75, and MW-76) and from the infiltration pond monitoring wells (MW17, MW-77, and MW-78) were analyzed for VOCs, total chromium, iron, and manganese, as specified in the Discharge Permit. The results of the analysis of these samples are presented in Appendix B-2; data on TCE, DCE and TCA concentrations in the Fourth Quarter (November 2012) samples from these wells are also included on Table 4.2. For each of the compounds reported on Table 4.2 and in Appendix B, concentrations that exceed the more stringent of its

[10] An exception was year 2010 when an additional round of water-level measurements was conducted in December to evaluate the effects of the increase in the CW-1 pumping rate from about 225 gpm to about 300 gpm.

[11] In past years, the water level was also measured in the Corrales Main Canal near the southeast corner of the Sparton property. The water level in the canal (when not dry) is more than 10 feet above the water table at the site, and hence these measurements were of no use in the interpretation of the local water table configuration; therefore, measurement of the canal level was discontinued effective the beginning of 2011,

MCL for drinking water or its maximum allowable concentration in groundwater set by NMWQCC are highlighted.

4.2 Containment Systems

4.2.1 Flow Rates

The volumes of groundwater pumped by the off-site and source containment wells during 2012 and the corresponding flow rates are summarized on Table 4.3. As shown on this table, a total of about 173.4 million gallons of water, corresponding to a combined flow rate of 329 gpm were pumped by the two containment wells. The volume and average flow rate of each well are discussed further below.

4.2.1.1 Off-Site Containment Well

The volume of the water pumped by the off-site containment well during 2012 was monitored with a totalizer meter that was read at irregular frequencies. The intervals between meter readings ranged from about 3.0 days to about 9.0 days, and averaged about 6.5 days. During each reading of the meter, the instantaneous flow rate of the well was calculated by timing the volume pumped over a specific time interval. The totalizer data collected from these flow meter readings and the calculated instantaneous discharge rate during each reading of the meter are presented in Appendix C-1. Also included in this appendix are the average discharge rate between readings and the total volume pumped between the start of continuous pumping on December 31, 1998 and the time of the measurement, calculated from the totalizer meter readings.

The average monthly discharge rate and the total volume of water pumped from the off-site containment well during each month of 2012, as calculated from the totalizer data, are summarized on Table 4.3. As indicated on this table, approximately 151.3 million gallons of water, corresponding to an average rate of 287 gpm, were pumped in 2012.

4.2.1.2 Source Containment Well

The volume of the water pumped by the source containment well during 2012 was also monitored with a totalizer meter that was also read at irregular frequencies. The intervals between meter readings ranged from about 2.1 days to about 14.0 days, and averaged 6.5 days. During each reading of the meter, the instantaneous flow rate of the well was calculated by timing the volume pumped over a specific time interval. The totalizer data collected from these flow meter readings and the calculated instantaneous discharge rate during each reading of the meter are presented in Appendix C-2. Also included in this appendix are the average discharge rate between readings and the total volume pumped between the start of continuous pumping on January 3, 2002, and the time of the measurement, calculated from the totalizer meter readings.

The average monthly discharge rate and the total volume of water pumped from the source containment well during each month of 2012, as calculated from the totalizer data, are summarized on Table 4.3. As indicated on this table, approximately 22.1 million gallons of water, corresponding to an average rate of 42 gpm, were pumped in 2012.

4.2.2 Influent and Effluent Quality

4.2.2.1 Off-Site Containment System

During 2012, the influent[12] to and effluent from the treatment plant for the off-site containment system were sampled monthly. These monthly samples were analyzed for VOCs, total chromium, iron, and manganese. The results of these influent and effluent sample analyses are presented in Appendix D-1. Concentrations of TCE, DCE, TCA, and total chromium in samples collected during 2012 are summarized on Table 4.4 (a). For each of the compounds shown on Table 4.4 (a), concentrations that exceed the more stringent of its MCL for drinking water or its maximum allowable concentrations in groundwater set by NMWQCC are highlighted. Data on TCE, DCE, and TCA concentrations for the November sample of influent are also included in Table 4.2, as the Fourth Quarter concentrations in CW-1, and were used in the preparation of the plume maps discussed in the next section.

4.2.2.2 Source Containment System

During 2012, the influent to and effluent from the treatment plant for the source containment system were sampled monthly. These monthly samples were analyzed for VOCs, total chromium, iron, and manganese. The results of these influent and effluent sample analyses are presented in Appendix D-2. Concentrations of TCE, DCE, TCA, and total chromium in samples collected during 2012 are summarized on Table 4.4 (b). For each of the compounds shown on Table 4.4 (b), concentrations that exceed the more stringent of its MCL for drinking water or its maximum allowable concentrations in groundwater set by NMWQCC are highlighted. Data on TCE, DCE, and TCA concentrations for the November sample of influent are also included in Table 4.2, as the Fourth Quarter concentrations in CW-2, and were used in the preparation of the plume maps discussed in the next section.

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[12] The "discharge from the containment wells" is the "influent" to the treatment systems; therefore, the two terms are used interchangeably in this report.

Section 5
Evaluation of Operations - 2012

The goal of the off-site containment system is to control hydraulically the migration of the plume in the off-site area and, in the long-term, restore the groundwater to beneficial use. The goal of the source containment system is to control hydraulically, within a short distance from the site, any potential source areas that may be continuing to contribute to groundwater contamination at the on-site area. This section presents the results of evaluations based on data collected during 2012 of the performance of the off-site and source containment systems with respect to their above-stated goals.

5.1 Hydraulic Containment

5.1.1 Water Levels and Capture Zones

The water-level elevation data presented in Table 4.1 were used to evaluate the performance of both the off-site and source containment wells with respect to providing hydraulic containment for the plume and potential on-site source areas. Maps of the elevation of the on-site water table and of the water levels in the UFZ/ULFZ and the LLFZ during each quarterly round of water-level measurements in 2012 are shown in Figures 5.1 through 5.12. Also shown on these water-level maps are: (1) the limit of the capture zones of the containment wells in the UFZ/ULFZ or the LLFZ, as determined from the configuration of the water levels; and (2) the extent of the TCE plume. The extent of the TCE plume shown in Figures 5.1 through 5.9 is based on previous year's (November 2011) water-quality data from monitoring wells; the extent of this plume is representative of the area that should have been contained between November 2011 and November 2012. The extent of the plume shown on the water-level maps for November 2012 (Figures 5.10 through 5.12), however, is based on the November 2012 water-quality data since this extent represents the area to be captured during the remainder of the year.

As shown in Figures 5.1, 5.4, 5.7, and 5.10, the pumping from the source containment well CW-2 has a relatively small effect on the on-site water table contours. Well CW-2 is screened between an elevation of 4,968.5 and 4,918.5 ft MSL. The sand-pack extends about 10 ft above the top of the screen, to an elevation of about 4,978.5 ft MSL. The top of the 4970-foot silt/clay at this location is also at an elevation of about 4,968.5 ft MSL. Most of the water pumped from the well, therefore, comes from the ULFZ and LLFZ underlying the 4970-foot silt/clay unit. The average pumping water level in CW-2 during 2012 was 4,950.8 ft MSL, about 18 ft below the top of the silt/clay unit; thus, the direct contribution of water from the aquifer above the silt/clay unit into the well is by leakage through the sand pack, and is controlled by the elevation of the top of the silt/clay unit at the well location. In preparing the water-table maps for the on-site area, the elevation of the water table at the location of CW-2 was, therefore, assumed to be near the top of the 4970-foot silt/clay, that is, at an elevation of 4,968.5 ft MSL. A similar condition exists at the location of infiltration pond monitoring wells MW-77 and MW-78. These two monitoring wells are equipped with 30-foot screens that span across the

silt/clay unit, and thus allow water to flow from the on-site water table into the underlying ULFZ. The effects of this downward flow were also considered in preparing the water table maps.

The on-site water table maps (Figures 5.1, 5.4, 5.7, and 5.10) also indicate that the treated groundwater infiltrating from the infiltration ponds has created a water-table mound in the vicinity of the ponds. Comparisons of the water-level data collected before and after the start of the operation of CW-2 and of the infiltration ponds on January 3, 2002 indicate that soon after the start of the source containment system operation water levels rose in response to the infiltrating water in all but seven of the wells completed above the 4970-foot silt/clay unit; the rise in the water level of the affected wells, between November 2001 and November 2002, ranged from 1.4 ft in well MW-22 to more than 8 ft in well MW-27 and averaged about 4.2 ft. After this initial rise, water levels resumed their declining trend due to regional effects, albeit at a smaller rate than the unaffected wells (see for example the hydrographs of wells MW-17 and MW-22 shown in Figure 2.5). The seven unaffected wells (MW-07, MW-09, MW-12, MW-13, MW-23, MW-26 and MW-33) are located near or along the southern limit of the silt/clay unit; water levels in these seven wells were not significantly affected by the infiltrating water, and continued to decline under the regional trends (see for example the hydrograph of well MW-12 in Figure 2.5). In fact, this regional decline caused two of the wells along the southern boundary of the 4970-foot silt/clay (wells MW-13 and MW-33) to go dry in recent years;[13] a similar situation started developing in well MW-07 during 2011 and continued in 2012. The lack of a response to the infiltrating water in the wells located along or near the southern boundary of the silt/clay unit suggests the presence of a low permeability barrier that isolates these wells from the effects of the water infiltrating from the ponds.

The quarterly water levels and the capture zones of the off-site and source containment wells within the UFZ/ULFZ are shown in Figures 5.2, 5.5, 5.8, and 5.11; those within the LLFZ are shown in Figures 5.3, 5.6, 5.9, and 5.12. As shown in these figures, at a pumping rate that averaged about 290 gpm during 2012, the capture zone of the off-site containment well CW-1 extends well beyond the November 2011 or November 2012 extent of the TCE plume and provides an ample safety margin to the hydraulic containment of the off-site plume. The figures also indicate that, despite its lower average pumping rate of 42 gpm during 2012, the source containment well CW-2 continued to provide containment for any potential on-site source areas that may still be contributing to groundwater contamination.

Cross-sectional views of the November 2012 water table are shown on the schematic east-west (C-C') and north-south (D-D') cross-sections that are presented in Figure 5.13 (see Figures 5.10 through 5.12 for the location of these cross-sections). The cross-sections also show the water table that prevailed in November 1998, prior to the start of the off-site containment system. Other features shown on these cross-sections are: (1) the 4970-ft silt/clay unit, (2) the 4800-ft clay unit, (3) the screened intervals of the wells through which the cross-sections are passing (the deepest well at cluster locations), (3) the screened intervals of the DFZ wells, (4) the limits of the containment well capture zones, and (5) the pump intake elevation in the

[13] Well MW-33 was plugged and abandoned in July 2009 and well MW-13 in June 2011.

containment wells. The divergence of the water table from the ULFZ potentiometric surface in the area underlain by the 4970-foot silt/clay is shown in greater detail, for both the 1998 and the 2012 conditions in Figure 5.14.

The direction of groundwater flow and the hydraulic gradient in the DFZ during each quarterly round of the 2012 water-level measurements in the three DFZ wells, MW-67, MW-71R, and MW-79, and for the average water level in these wells are shown in Figure 5.15. As shown in this figure, during 2012 the direction of groundwater flow in the DFZ ranged from W 7.3° N in November to W 28.3° N in February, and the hydraulic gradient from 0.00213 in November to 0.00256 in February. The average direction of groundwater flow in the DFZ during 2011 was W 19.3° N with an average hydraulic gradient of 0.00238.

5.1.2 Effects of Containment Well Shutdown on Capture

As discussed in Section 3, the containment systems are occasionally shut down for maintenance and repairs, and sometimes due to power or equipment failures. For example, during 2012 the off-site containment system was shut down for about fourteen hours due to building power outage, and the source containment system was shut down for about seven days for repairs of leaks at the air sripper. Shutdowns ranging from more than five days at the source containment well (2007) to more than eight days at the off-site containment well (2010) have occurred in the past for pump replacement.

In their review of the 2007 Annual Report USEPA/NMED expressed some concern on whether these shutdowns may result in the escape of contaminants beyond the capture zones of these systems. The capture zone for the source containment well lies within the capture zone of the off-site containment well, and its downgradient limit is within the plume area. Any shutdown of this well would cause some contaminants to escape beyond its capture zone, but these contaminants will remain within the capture zone of the off-site containment well and eventually captured by this well.

Given the distance between the leading edge of the off-site plume and the limits of the capture zone of the off-site containment well, it is highly unlikely that any contaminants would escape beyond the capture zone of the well during a shutdown of limited duration. Under non-pumping conditions, the hydraulic gradient (see Figures 2.12 and 2.13) near the leading edge of the plume (see Figure 2.15) is about 0.003. The aquifer above the 4800-foot clay has a hydraulic conductivity of 25 ft/d and a porosity of 0.3. Thus, the rate at which groundwater, and hence contaminants, would move under non-pumping conditions is 0.25 ft/d or about 90 ft/yr. The downgradient distance between the limit of the capture zone of the off-site containment well and the leading edge of the plume is more than 350 ft (see Figures 5.1 through 5.12). Thus, shutdowns of the length that have been experienced in the past, and of even much longer periods, could not cause any contaminants to escape beyond the capture zone of the well. Hydraulic containment of the plume has been, therefore, maintained during any past shutdowns of the off-site containment system, and will continue to be maintained during any future shutdowns of reasonable duration.

5.2 Groundwater Quality in Monitoring Wells

5.2.1 Concentration Trends

Plots showing temporal changes in the concentrations of TCE, DCE, and TCA were prepared for a number of on-site and off-site wells to evaluate long-term water-quality changes at the Sparton site. Plots for on-site wells are shown in Figure 5.16 and plots for off-site wells in Figure 5.17. The concentrations in the on-site wells (Figure 5.16) indicate a general decreasing trend. In fact, the data from wells MW-9 and MW-16, which have the longest record, suggest that this decreasing trend started before 1983. A significant decrease in concentrations occurred in well MW-16 during 1999 through 2001. This well is located near the area where the SVE system was operating during those years, and it is apparent that the SVE operations affected the concentrations in the well. The TCE concentrations in the well had been less than 10 μg/L since November 2003 but they rose to 10 μg/L in November 2012 (from 2.1 μg/L in November 2011). Since the termination of the SVE operations in 2001, low concentrations have been observed not only in this well but also in all other onsite wells completed above the 4970-foot silt/clay unit. Of the eleven such wells sampled in November 2012 the highest TCE concentrations were measured in wells MW-7 (33 μg/L), MW-9 (18 μg/L), and MW-25 (16 μg/L);[14] the remaining eight wells had TCE concentrations of 10 μg/L or less. The lower concentrations measured in these onsite wells indicate that the cleanup of the unsaturated zone beneath the former Sparton plant area by the SVE system, and the flushing provided by the water infiltrating from the infiltration ponds of the source containment system has been very effective in reducing contaminant concentrations in the saturated sediments overlying the 4970-foot silt clay.

As shown in Figure 5.16, the TCE concentrations in on-site well MW-19, which is completed in the ULFZ below the 4970-foot silt/clay unit (see Figure 2.4), were in the several thousand μg/L level when the well was installed in 1986 and remained at that level for a few years before starting to decline. By November 1998, the TCE concentrations in the well had declined to a few μg/L levels. This declining trend reversed in November 2002 when the TCE concentration rose to 23 μg/L, and then to 630 μg/L by November 2003. The TCE concentrations in the well remained at the several hundred μg/L level until November 2008; however, they began declining again after that date, down to a concentration of 61μg/L by November 2010; the November 2011 TCE concentration in the well was at about the same level (64 μg/L) and remained at about the same level in November 2012 (68 μg/L). A similar pattern is also displayed in the DCE concentration in this well, albeit at lower levels. The concentration increases that occurred in this well soon after the start of the source containment system are attributed to an increase in the downward migration rate of contaminants present within the 4970-foot silt/clay unit that was caused by increased downward leakage rates across this unit; the increase in leakage rates were induced by the drawdowns below the unit caused by the pumping at CW-2 and the simultaneous increases in the water levels above the unit caused by seepage from the infiltration ponds.

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[14] As noted in Section 3, during the last several years the water level in wells MW-7 and MW-9 has been within the blank casing below the bottom of the screen; therefore, the reliability of the water-quality data obtained from these wells is questionable.

The concentration plots of the six off-site monitoring wells shown in Figure 5.17 indicate that concentrations in most wells have declined and are much lower than their pre-remediation levels. There are some wells where concentrations had been increasing during the last few years (see for example the plots for MW-37/37R, MW-53/53D, and MW-55); note, however, that this increasing trend was reversed in November 2012. On the other hand, well MW-56 which had a declining trend during the last few years, had higher concentrations in November 2012. These temporary changes are consistent with the sporadic manner groundwater contamination occurred at the site and with the changes in groundwater flow patterns that resulted from the operation of the off-site containment system.

The concentrations in well MW-60 continued to be the highest observed in an off-site well, as it has been the case since the beginning of remedial operations. The concentrations of TCE in this well increased from low μg/L levels in 1993 to a high of 11,000 μg/L in November 1999 and then declined to 2,900 μg/L in November 2000. Then, they began increasing again reaching a second peak of 18,000 μg/L in November 2004; since then TCE concentrations in the well have declined to 840 μg/L in November 2012. The DCE and TCA concentrations in this well also declined from 830 μg/L and 59 μg/L in November 2004 to 110 μg/L and 2.7 μg/L, respectively, in November 2012. In general, the "rule-of-thumb" is that the presence of a contaminant at concentrations equal to or exceeding 1% of its solubility indicates the potential nearby presence of that contaminant as a free product (Newell and Ross, 1991; Pankow and Cherry, 1996) usually referred to as a non-aqueous phase liquid (NAPL). The solubility of TCE, a dense NAPL or DNAPL, is 1,100,000 μg/L; the concentrations of 11,000 μg/L and of 18,000 μg/L that were observed in MW-60 in November 1999 and 2004, respectively, meet the criteria of this rule-of-thumb. There are several factors, however, that preclude the presence of a DNAPL source near MW-60. First, the well is screened in the upper part of the aquifer and located almost 2,000 feet downgradient from the site; there is no plausible physical mechanism by which TCE could migrate to such a distance from the site as a DNAPL within a thick and fairly homogeneous aquifer. Second, although TCE concentrations above 10,000 μg/L and as high as 59,000 μg/L have been observed in several on-site wells in 1984 (Harding Lawson Associates, 1985), DNAPL has not been reported for any on-site boring or monitoring well. Finally, the gradual increase in the concentrations between 1993 and 1999, the occurrence of the high concentrations as two separate peaks with relatively lower concentrations in between, and the subsequent decrease in concentrations indicate that the contaminant concentrations in this well represent two slugs of highly contaminated groundwater that migrated from the site rather than a nearby DNAPL source. The migration of slugs of highly contaminated groundwater from the site is consistent with the high TCE concentrations that were observed at the site in 1984. It is of interest to note that Pankow and Cherry (1996, p. 459) state that "[t]he use of a 1% rule-of-thumb in any assessment of the spatial distribution of DNAPL zones must be performed cautiously, particularly in the downgradient direction. For example, the dissolved plume emitted from a very large DNAPL zone may exhibit dissolved concentrations above 1% of saturation for a substantial distance downgradient of the source zone."

Monitoring well MW-65, whose concentration trends are also shown in Figure 5.17, had low μg/L levels of TCE when first sampled after installation in 1996; TCE, at concentrations up to about 15 μg/L, was the only contaminant detected in this well before and at the start of the off-

site containment system. The concentrations of TCE in the well declined rapidly after the start of the off-site containment system to "not detected" (at a detection limit of 1 μg/L) in August 1999, and remained "not detected" for almost two years. The well became contaminated again in 2001 but, as shown in Figure 5.17, this time the well contained not only TCE but also DCE and TCA with the dominant contaminant being DCE; the concentrations of these contaminants peaked around 2005 or 2006 and they have been declining since then. There are only two other wells, besides MW-65's post-2001 contamination, where the dominant contaminant is DCE; these are wells MW-62 and MW-52R. A plot of the contaminant concentrations in these two wells is presented in Figure 5.18; the plot for MW-65 is also repeated in this figure to provide for easy comparison. The dominant contaminant in all other wells associated with the Sparton Site is TCE (see for example the concentration plots of all the other wells shown in Figures 5.16 and 5.17). This indicates that the post-2001 contamination of MW-65 and that of MW-62 and MW-52R is due to a separate, DCE-dominated plume, although some mixing with the main plume may be occurring in the vicinity of MW-52R. During 2012, DCE continued to be the dominant contaminant in these three wells with concentrations of 39 μg/L, 5.1 μg/L, and 4.9 μg/L, in MW-52R, MW-65, and MW-62, respectively. Evaluations of the available data, including backward tracking from well MW-65 using water level data collected since 1992,[15] and review of historical water-quality data from monitoring wells MW-34 and MW-35,[16] which show that these wells were historically free of contaminants, indicate that the source of this separate plume lies somewhere south or southeast of wells MW-62 and MW-34, and that, therefore, this plume does not originate at the Sparton Facility.[17] Well MW-80, which was installed during 2010 to address agency concerns that this separate plume may have migrated beyond the capture zone of the off-site containment well, was free of the contaminants detected in wells MW-52R, MW-62, and MW-65, or of any other site-related contaminants, when it was first sampled on August 18, 2010, and remained clean in November 2010 and during the six quarterly sampling events conducted between August 2011 and November 2012.

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[15] See Attachment 3 to letter dated February 12, 2009 from Charles B. Andrews of SSP&A to Chuck Hendrickson of USEPA Region 6, and John Kieling of NMED, on the subject: Response to EPA/NMED comments on Sparton Technology, Inc., Former Coors Road Plant Remedial Program, 2003-2007 Annual Reports (including 5 attachments), with cc to Susan Widener, James B. Harris, Tony Hurst, and Gary L. Richardson.

[16] Well MW-35 became dry in 2002 and was plugged and abandoned in 2007; the well was located along Irving Boulevard, as shown in Figure A-1 of Appendix A..

[17] USEPA and NMED agree that the contaminants detected in MW-65 and MW-62 are due to a separate plume, but they disagree that this plume did not originate at the Sparton facility; the agencies were also concerned that contaminants that belong to this plume or that have not been captured by the off-site containment system, may be present outside the capture zone of the off-site containment well, and they requested the installation of a sentinel well northwest of MW-65 (see document in Footnote 9 and memorandum dated March 24, 2009 from Stavros S. Papadopulos of SSP&A to Charles Hendrickson of USEPA, Region 6, and John Kieling, Braid Swanson, and Brian Salem of NMED on the subject: Sparton Technology, Inc. Former Coors Road Plant Remedial Program, Minutes of Conference Call between Representatives of Sparton, USEPA and NMED [including 2 attachments], with cc to Richard Langley and Susan Widener of Sparton, James B. Harris of Thompson & Knight, Tony Hurst of Hurst Eng.'g Services, and Gary Richardson of Metric). Sparton agreed to install this well, and the well was installed in July-August 2010.

Of the three monitoring wells completed in the DFZ, well MW-67 of the MW-55/56/67 cluster had been clean since its installation in July 1996, and continued to be free of any contaminants in 2012. The second DFZ well, MW-71R, located about 30 ft south of the MW-60/61 cluster, was installed in February 2002 as a replacement for DFZ well MW-71 which was plugged and abandoned in October 2001 because of persistent contamination.[18] The first sample from MW-71R, obtained in February 2002, had a TCE concentration of 130 μg/L and the well has remained contaminated since then with TCE concentrations reaching a high of 210 μg/L in August 2003, and then declining to 51 μg/L in May 2009. After that, the TCE concentrations in the well began increasing again reaching 91 μg/L in May 2011 and then declining to 58 μg/L by the Fourth Quarter 2011 sampling event. The same pattern repeated in 2012 with TCE concentrations in the well increasing again reaching 77 μg/L in August 2012 and then declining to 56 μg/L by the Fourth Quarter 2012 sampling event. The third DFZ well, MW-79, was installed near the off-site containment well CW-1 in February 2006 as a monitoring/stand-by extraction well to address the contamination detected in MW-71R; the decision on whether the well was to be a monitoring or an extraction well was to be based on the results of the initial sampling of the well. The initial sampling of the well showed the well to be free of site-related contaminants; therefore, the well was designated as a monitoring well, and added to the Monitoring Plan under a semi-annual sampling schedule. Samples collected from the well since then have been free of any site-related contaminants.

5.2.2 Concentration Distribution and Plume Extent

The Fourth Quarter 2012 TCE and DCE data presented in Table 4.2 were used to prepare concentration distribution maps showing conditions near the end of 2012. The horizontal extent of the TCE and DCE plumes and the concentration distribution within these plumes in November 2012, as determined from the monitoring well data, are shown on Figures 5.19 and 5.20, respectively.[19] In preparing these figures, the fact that wells MW-62, MW-65, and MW-52R are affected by a separate plume was taken into consideration. Concentrations of TCA in all monitoring and extraction wells have been below regulatory standards since 2003; in November 2012 only five of the 58 sampled wells contained TCA above the detection limit of 1 μg/L. The highest TCA concentrations were measured in well MW-60 (2.7 μg/L); the concentrations in the other four wells where TCA was detected were less than 2 μg/L (see Table 4.2). Based on the low concentrations of TCA that have been observed since 2003, Sparton proposed in the 2008 Annual Report (SSP&A, 2009a) that evaluations of TCA data be discontinued, unless concentrations increase above regulatory standards; this proposal was approved by both

[18] See 1999 Annual Report (SSP&A, 2001a) for a detailed discussion of the history of well MW-71, and SSP&A and Metric (2002) for actions taken prior to its plugging and abandonment.

[19] At well cluster locations, the concentration shown in Figures 5.19 and 5.20 is that for the well with the highest concentration.

USEPA[20] and NMED[21] in May 2010. Inclusion of a concentration distribution map for TCA and of other evaluations of TCA data in the Annual Reports has been, therefore, discontinued since the 2011 Annual Report; however, TCA concentrations in the off-site containment well continue to be used in calculations of mass removal by this well.

5.2.3 Changes in Concentrations

A total of 58 wells were sampled in November 2012; 57 of these 58 wells were also sampled in November 2011. In these 57 wells, the November 2012 TCE concentrations were lower than the November 2011 concentrations in 13 wells, higher in 14 wells, and remained the same in 30 wells (all but three below the detection limit of 1 μg/L). The largest decrease was in well MW-72 where the concentration of TCE decreased by 770 μg/L, from 1,200 μg/L in 2011 to 430 μg/L in 2012; the largest increase in a monitoring well was at MW-46 where the concentration of TCE increased by 190 μg/L, from 310 μg/L in 2011 to 500 μg/L in 2012. The corresponding numbers for DCE were 6 wells with lower, 10 wells with higher, and 41 wells with the same (all below the detection limit of 1 μg/L) concentrations. The largest decrease in DCE concentrations was also in well MW-72 (97 μg/L), and the largest increase also in well MW-46 (29 μg/L).

Of the 58 wells sampled in November 2012, 41 are wells that existed in November 1998 (prior to the implementation of the current remedial activities), 7 are replacement or deepened version of wells that existed in November 1998, 5 are wells that were installed in early 1999 (MW-72, MW-73, MW-74, MW-75, and MW-76), 3 are wells that were installed in 2001 (MW-77, MW-78, and CW-2), and 2 (MW-79 and MW-80) are wells that were installed in 2006 and 2010, respectively. Changes between the TCE and DCE concentrations measured in these wells in November 2012 and those measured in November 1998, or during the first sampling event after their installation, are summarized on Table 5.1. The concentrations of TCE decreased in 30 of the 58 wells listed on Table 5.1, increased in 5, and remained unchanged in 23 (all but two below detection limits during both sampling events). The corresponding number of wells where DCE concentrations decreased, increased, or remained unchanged are 27, 5, and 26 (all below detection limits during both sampling events), respectively. Twenty-five of the 58 wells listed on Table 5.1 are wells, or their replacements/deepened versions, that were used for defining both the November 1998 and the November 2012 plume; another 15 are wells that were used to define either the November 1998 or the November 2011 plume. Concentration changes in these 40 wells are presented in Figures 5.21, and 5.22 to show the distribution of concentration changes that occurred since the implementation of the off-site and source containment systems.

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[20] E-mail dated May 11, 2010 from Charles Hendrickson of USEPA to Stavros Papadopulos of SSP&A with cc to Baird Swanson and Brian Salem of NMED on the subject "Re: Extension approval and Comments on 2008 Report," with an attachment titled "Annual Report 2008 draft comments" which included draft comments by C. Hendrickson, dated March 11, 2010.

[21] E-mail dated May 17, 2010 from John Kieling of NMED to Stavros Papadopulos of SSP&A with cc to Charles Hendrickson of USEPA, Baird Swanson and Brian Salem of NMED, Joe Lerczak of Sparton, James Harris of Thompson & Knight, Gary Richardson of Metric, and Tony Hurst of Hurst Engineering on the subject "Re: TCA valuation" indicating that NMED agrees to discontinuing TCA evaluations.

Also shown on these figures is the extent of the plumes in November 1998 and November 2012. Among these 40 wells, TCE concentrations decreased in 27 wells, increased in 5 wells, and remained unchanged in 8 wells (7 below detection limits during both sampling events, and one [MW-62] at 2 μg/L during both events); the corresponding number of these wells where DCE concentrations decreased, increased, or remained unchanged are 24, 4, and 12.

The largest decreases in contaminant concentrations since the beginning of the current remedial operations occurred in on-site wells MW-23, MW-25 and MW-26, and in off-site well MW-60. Concentrations of TCE in on-site wells MW-23, MW-25, and MW-26 decreased by 6,197, 5,584, and 6,493 μg/L, respectively, from levels that were in the 5,500-6,500 μg/L range in 1998 to levels of less than 20 μg/L 2012; DCE concentrations in these three wells decreased by 400, 73, and 590 μg/L, to "not detected" (ND) since 2007 (since 2004 in MW-26). At off-site well MW-60, TCE concentrations decreased by 6,860 μg/L, from 7,700 μg/L in 1998 to 840 μg/L in November 2012; DCE concentrations in the well decreased by 240 μ`g/L from 350 μg/L in 1998 to 110 μg/L in 2012.

Of the five wells where the current (2012) TCE concentrations were larger than those in 1998, the largest increase occurred in the off-site containment well CW-1 (290 μg/L); this well also had the largest increase in DCE concentration (51 μg/L). These increases in the TCE and DCE concentrations in well CW-1 are based on concentrations observed in this well in September 1998 (140 μg/L and 2.9 μg/L, respectively), prior to the start of its operation on December 31, 1998, and those observed in the water pumped from the well on November 1, 2012 (430 μg/L and 54 μg/L, respectively). The concentration of TCE and DCE in the water pumped from this well increased rapidly after the start of its operation, rising to 900 μg/L and 38 μg/L, respectively, by April 23, 1999 and to 1,200 μg/L and 73 μg/L, respectively, by September 10, 1999. In the next several years concentrations in the well, except for a few outliers, fluctuated in the 1,200 μg/L to 1,400 μg/L range for TCE and in the 60 μg/L to 80 μg/L range for DCE, but started declining in the mid-2000s (see Figure 6.3 for historic TCE concentrations in this well). During 2012, TCE concentrations in the well ranged from 460 μg/L to 750 μg/L and averaged about 620 μg/L; DCE concentrations ranged from 53 μg/L to 69 μg/L and averaged 61 μg/L. Thus, even though comparison of current concentrations to pre-operational concentrations indicates an increase, as cited above, current concentration are considerably lower than those observed during its early years of operation.

The persistence of high concentrations in the off-site containment well CW-1, and in monitoring well MW-60 during the early years of the current remedial operations indicated that areas of high concentration existed upgradient from both of these wells. Most of the water in these upgradient areas, however, has been already captured and pumped out by the off-site containment well (see Figure 5.26), and concentrations both in MW-60 and CW-1 are declining (see Figure 5.17and 6.3) and are expected to continue to decline.

5.3 Containment Systems

5.3.1 Flow Rates

A total of about 173.4 million gallons of water, corresponding to an average pumping rate of about 329 gpm, were pumped during 2012 from the off-site and source containment wells (see Table 4.3). The volume of water pumped during each year of the operation of the containment wells is summarized on Table 5.2. As shown on this table, the total volume pumped from both wells since the beginning of remedial pumping in December 1998 is about 1.96 billion gallons, and corresponds to an average rate of 266 gpm over the 14 years of operation. This volume represents approximately 173 percent of the initial plume pore volume reported in Subsection 2.6.1.3 of this report. The volume pumped from each well and the average flow rates are discussed below.

5.3.1.1 Off-Site Containment Well

The volume of water pumped from the off-site containment well during each month of 2012 is shown on Table 4.3; a plot of the monthly production is presented in Figure 5.23. Based on the total volume of water pumped during the year (approximately 151 million gallons), the average discharge rate for the year was 287 gpm. Due to downtimes (see Table 3.1), the well was operated 99.3 percent of the time available during the year, thus the average discharge rate of the well during its operating hours was about 289 gpm.

The volume of water pumped during each year of the operation of the well is summarized on Table 5.2. As shown on this table, the off-site containment well pumped a total of about 1.68 billion gallons of water from the aquifer since the beginning of its operation in December 1998. This represents approximately 149 percent of the initial plume pore volume reported in Subsection 2.6.1.3 of this report. A cumulative plot of the volume of water pumped from the off-site containment well is presented in Figure 5.24.

5.3.1.2 Source Containment Well

The volume of water pumped from the source containment well during each month of 2012 is shown on Table 4.3; a plot of the monthly production is presented in Figure 5.23. Based on the total volume of water pumped during the year (approximately 22 million gallons), the average discharge rate for the year was 42 gpm. The well was operated 96.5 percent of the time available during the year, thus the average discharge rate of the well during its operating hours was about 43.5 gpm.

The volume of water pumped during each year of the operation of the well is summarized on Table 5.2. As shown on this table, the source containment well pumped a total of about 274 million gallons of water from the aquifer since the beginning of its operation on January 3, 2002. This represents approximately 24 percent of the initial plume pore volume reported in Subsection 2.6.1.3 of this report. A cumulative plot of the volume of water pumped from the source containment well is presented in Figure 5.24. Also shown in Figure 5.24 is a cumulative plot of the total volume of water pumped by both containment wells.

5.3.2 Influent and Effluent Quality

5.3.2.1 Off-Site Containment System

The concentrations of TCE, DCE, TCA, and total chromium in the influent to and effluent from the off-site air stripper during 2012, as determined from samples collected at the beginning of each month, are presented on Table 4.4 (a). Plots of the TCE, DCE, and total chromium concentrations in the influent are presented in Figure 5.25.

The concentrations of TCE in the influent during 2012 ranged from a high of 700 μg/L in the January sample to a low of 350 μg/L in the December sample. The average concentration for the year was 500 μg/L; this average concentration was 120 μg/L lower than the average concentration during 2011 (620 μg/L). The highest (35 μg/L) and lowest (23 μg/L) concentrations of DCE were detected in the July and December samples, respectively; the average concentration for the year was about 30 μg/L. Concentrations of TCA in the influent fluctuated within a relatively narrow range (2.0 μg/L to 1.4 μg/L) and averaged 1.7 μg/L. Throughout the year, total chromium concentrations in the influent were well below the 50 μg/L maximum allowable concentration in groundwater set by NMWQCC and averaged about 9 μg/L.

Except for the April (1.1 μg/L) sample, the concentrations of TCE in the air stripper effluent were below the detection limit of 1 μg/L during 2012; the concentration of DCE and TCA in the effluent were below the detection limit of 1 μg/L throughout 2012. Total chromium concentrations in the effluent were essentially the same as those in the influent.

5.3.2.2 Source Containment System

The 2012 concentrations of TCE, DCE, TCA, and total chromium in the influent to and effluent from air stripper for the source containment system, as also determined from samples collected at the beginning of each month, are presented on Table 4.4 (b). Plots of the TCE, DCE, and total chromium concentrations in the influent are presented in Figure 5.25.

The concentrations of TCE in the influent during 2012 ranged from 35 μg/L in July to 23 μg/L in December, and averaged about 30 μg/L. This average concentration was 5 μg/L lower than the average concentration during 2011 (35 μg/L). The concentrations of DCE fluctuated within a relatively narrow range during the year (2.7 μg/L to 4.0 μg/L) and averaged about 3.4 μg/L. The concentrations of TCA in the influent were below the detection limit of 1 μg/L throughout the year. The total chromium concentrations during 2012 were below the 50 μg/L maximum allowable concentration in groundwater set by NMWQCC. The average total chromium concentration for the year was about 30 μg/L.

The concentrations of TCE, DCE, and TCA in the air stripper effluent were below detection limits throughout 2012, and chromium concentrations were at about the same level as those in the influent.

5.3.3 Origin of the Pumped Water

The groundwater pumped from the off-site and the source containment wells is water that was originally (prior to the start of pumping) in storage around each well. The areal extent of the

volume of the aquifer within which the water pumped during a particular period was originally stored is referred to as the "area of origin" of the water pumped during that period. Particle tracking analysis (see Section 6.2) with the calibrated model of the site was used to determine the areas of origin of the water pumped from the off-site containment well during the last fourteen years and from the source containment well during the last eleven years. The results of this analysis are presented in Figure 5.26. The areas from where the water pumped during different periods originated are shown in Figure 5.26 (a); the schematic cross-section of Figure 5.26 (b) shows the vertical extent of these areas of origin. The areas of origin of the water pumped by each of the two containment wells are discussed below.

5.3.3.1 Off-Site Containment Well

For the off-site containment well, which is fully penetrating the aquifer above the 4,800-foot clay, the area of origin of the water pumped during the first few years of its operation (1999-2001) is an almost circular area around the well, with the well off-centered on the down-gradient side of the area [Figure 5.26 (a)]. The areas of origin corresponding to subsequent years of operation form rings around this first area, which become more and more elliptical and more and more skewed towards the upgradient side (southeast) of the well and towards the Arroyo de las Calabacillas which is a source of recharge for the aquifer. The shape and location of the areas of origin with respect to the containment well are controlled by the capture zone of the well. Since the capture zone is a limiting flow line, the areas of origin become narrower as they approach the downgradient (northwestern) limit of the capture zone and the stagnation point of the flow field. The area of origin of the water pumped until the end of 2009 had already reached this limit of the capture zone as it existed prior to the increase in the pumping rate of the off-site containment well; therefore, very little of the water pumped during 2010 had originated from this area [see Figure 5.29 (a) of the 2010 Annual Report]. The increase in the pumping rate of CW-1 that was implemented in November 2010 has pushed the limit of the capture zone farther downgradient; therefore, some of the water pumped during 2011 and 2012 originated from the area between the pre- and post-increase limit of the capture zone. This will continue for the next few years until all water in this area has moved into CW-1 and the area of origin of the pumped water has reached the new downgradient limit of the capture zone. Note also that on the upgradient side the area of origin extends towards the Arroyo de las Calabacillas, beneath the 4970-foot silt/clay unit, and around the northern limit of the CW-2 capture zone; the area of origin will continue to expand in this direction until the pumping rate of the off-site containment well is balanced by recharge from the arroyo and leakage through the silt/clay unit, and a steady state is reached.

Since the well is fully penetrating, the areas of origin of the water pumped by this well remain essentially the same at different depths [see Figure 5.26 (b)], except that water derived from vertical drainage due to the decline of the water table reduces the areal extent of the area of origin in the upper horizons of the aquifer; the effect of vertical drainage was more pronounced during the early years of operation when the rapid decline of the water table in response to the start of pumping contributed a greater percentage of the pumped water than in later years.

5.3.3.2 Source Containment Well

Hydrogeologic conditions in the vicinity of the source containment well are different than in the vicinity of the off-site containment well because of the presence of the 4970-foot silt/clay unit, the presence of different deposits in the upper part of the aquifer between the Site and the Rio Grande (the Upper Sand Unit and the Recent Rio Grande deposits, as shown in Figure 2.2), and the partial penetration of the aquifer by the source containment well. The screened interval of the well extends about 40 ft into the aquifer below the 4970-foot silt/clay unit; therefore, most of the water pumped by this well comes from the upper part of the aquifer where the well is screened with contributions from downward leakage through the silt/clay unit and from the Upper Sand Unit, from flow through the Recent Rio Grande deposits, and from upward leakage from horizons of the aquifer below the screened interval. The volume of groundwater that was originally stored in the upper part of the aquifer in the vicinity of the well and within the area which is now limited by the capture zone of the well is relatively small; by the mid-2000s most of this water had already moved into and pumped out by the well. This is reflected by the area of origin of the water pumped during 2002-2006 which, as shown in Figure 5.26 (a), had already extended to the downgradient (northwestern) limit of the capture zone; and by the end of 2011, the area of origin of all the water pumped from the well extended not only to the downgradient limit of the capture zone, but also to the southwestern and northeastern limits of the capture zone. Thus, the water pumped during 2012 originated from a narrow strip along the upgradient part of the area of origin near the Corrales Main Canal [see Figure 5.26 (a)]. Since the areas of origin of the water pumped by the end of 2012 had essentially reached the downgradient, southwestern and northeastern limits of the capture zone, water to be pumped by CW-2 in future years will continue to originate primarily from upgradient areas; eventually, however, the area of origin will stop expanding when a steady state is reached, that is, when the pumping rate of the well is balanced by leakage from above and below and by infiltration from the Rio Grande.

Because well CW-2 is partially penetrating the aquifer, the extent of the areas of origin of the water pumped by the well is different at different depths. As shown in Figure 5.26 (b), the areas of origin become smaller with depth, and do not extend below the upper half of the aquifer.

5.3.4 Contaminant Mass Removal

A total of about 318 kg (701 lbs) of contaminants, consisting of about 286 kg (629 lbs) of TCE, 31.8 kg (70.2 lbs) of DCE, and 0.974 kg (2.15 lbs) of TCA, were removed by the two containment wells during 2012 [see Table 5.3 (a)]. A plot of the TCE, DCE and total mass removed by the two containment wells during each month of 2012 is presented in Figure 5.27. The total mass of contaminants removed by the two containment wells during each year of their operation is summarized on Table 5.4 (a), and a plot of the cumulative TCE, DCE, and total mass removed by the wells is presented in Figure 5.28. As shown on Table 5.4 (a), the total mass removed by the containment wells, since the beginning of the current remedial operations in December 1998, is about 6,910 kg (15,260 lbs), consisting of about 6,450 kg (14,230 lbs) of TCE, 442 kg (975 lbs) of DCE, and 19.3 kg (42.5 lbs) of TCA. This represents about 88 percent of the total dissolved contaminant mass currently estimated to have been present in the aquifer

prior to the testing and operation of the off-site containment system (see Section 2.6.1.4). The mass removal rates by each well are discussed below.

5.3.4.1 Off-Site Containment Well

The monthly mass removal rates of TCE, DCE, and TCA by the off-site containment well during 2012 were estimated using the monthly discharge volumes presented on Table 4.3 and the concentration of these compounds shown on Table 4.4 (a). These monthly removal rates are summarized on Table 5.3 (b); plots of the monthly TCE and DCE removal rates are presented in Figure 5.27. As shown on Table 5.3 (b), about 315 kg (695 lbs) of contaminants, consisting of about 283 kg (623 lbs) of TCE, 31.6 kg (69.6 lbs) of DCE, and 0.974 kg (2.15 lbs) of TCA were removed by the off-site containment well during 2012.

The mass of contaminants removed by this well during each year of its operation is summarized on Table 5.4 (b), and a plot showing the cumulative TCE, DCE, and total mass removal by the off-site containment well is presented in Figure 5.28. As shown on Table 5.4(b), by the end of 2012 the off-site containment well had removed a total of approximately 6,680 kg (14,740 lbs) of contaminants, consisting of approximately 6,250 kg (13,770 lbs) of TCE, 414 kg (913 lbs) of DCE, and 15.9 kg (35.0 lbs) of TCA. This represents about 85 percent of the total dissolved contaminant mass currently estimated to have been present in the aquifer prior to the testing and operation of the off-site containment system (see Section 2.6.1.4).

5.3.4.2 Source Containment Well

The monthly mass removal rates of TCE and DCE by the source containment well during 2012 were estimated using the monthly discharge volumes presented on Table 4.3 and the concentration of these compounds shown on Table 4.4 (b). These monthly removal rates are summarized on Table 5.3 (c) and plotted in Figure 5.27. As shown on Table 5.3 (c), about 2.82 kg (6.22 lbs) of contaminants, consisting of about 2.53 kg (5.58 lbs) of TCE and 0.290 kg (0.639 lbs) of DCE were removed by the source containment well during 2012. The TCA concentrations in the influent from this well have been below the detection limit of 1 μg/L since 2007. Between 2007 and 2010, an upper limit for the removed TCA mass was estimated by assuming TCA concentrations to be at half the detection limit (0.5 μg/L); this practice was discontinued in 2011 and estimates for TCA mass removal rates by the source containment well have not been made since that time.

The mass of contaminants removed by this well during each year of its operation is summarized on Table 5.4 (c), and a plot showing the cumulative TCE, DCE, and total mass removal by the source containment well since the beginning of its operation on January 3, 2002 is presented in Figure 5.28. As shown on Table 5.4 (c) and Figure 5.28, the total mass of contaminants removed by the well by the end of 2012 was about 238 kg (523 lbs), consisting of 206 kg (453 lbs) of TCE, 28.3 kg (62.5 lbs) of DCE, and 3.37 kg (7.44 lbs) of TCA. This represents about 3 percent of the total dissolved contaminant mass currently estimated to have been present in the aquifer prior to the testing and operation of the off-site containment system (see Section 2.6.1.4).

5.4 Site Permits

The infiltration gallery associated with the off-site containment system and the rapid infiltration ponds associated with the source containment system are operated under a Discharge Permit issued by the State of New Mexico (State of New Mexico Groundwater Discharge Permit DP-1184). This Discharge Permit was originally issued for a five-year period on June 23, 1998 and renewed for another five-year period on December 29, 2006. An application for another renewal of the permit was submitted by Sparton on November 16, 2011, and a renewed five-year permit was issued by the Groundwater Bureau of the NMED on October 18, 2012.[22]

The air stripper associated with the off-site containment system is operated under Air Quality Source Registration No. NM/001/00462/967, issued by the Air Quality Services Section, Air Pollution Control Division, Environmental Health Department, City of Albuquerque, and the source containment system air stripper is operated under Albuquerque/Bernalillo County Authority-to-Construct Permit No. 1203.

The performance of the off-site and source containment systems with respect to the requirements of these permits is discussed below.

5.4.1 Off-Site Containment System

Discharge Permit DP-1184 requires monthly sampling of the treatment system effluent, and the quarterly sampling of the infiltration gallery monitoring wells MW-74, MW-75 and MW-76. The samples are analyzed for TCE, DCE, TCA, chromium, iron, and manganese. The concentrations of these constituents must not exceed the maximum allowable concentrations for groundwater set by NMWQCC. As required by the current Discharge Permit, the analysis results of all samples collected during 2012 were reported to the NMED Groundwater Bureau in the 2012 Annual Monitoring Report for the permit submitted to the Bureau on January 28, 2013.[23] The sampling results met the permit requirements throughout the year.

The Air Quality Source Registration No. NM/001/00462/967, under which the off-site air stripper is operated, limits the hourly and annual VOC mass emitted by the stripper to 0.32 lbs/hr and 1.37 tons/yr. The emissions from the air stripper were calculated in June 1999, after the stripper had been put into continuous operation; the results of this calculation, which were reported to the agency that issued the registration, were in full compliance with the specified emission limits. Under the terms of the registration, further monitoring and/or reporting of the emissions from the air stripper was not required, and has not been carried out since that time. Based on the VOC mass removed by the off-site containment well during 2012 (315 kg or 695 lbs), and assuming that 100% of this mass was transferred to the air-stripper stack, the VOC

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[22] Letter dated October 18, 2012 from Mr. Jerry Schoeppner, Chief, Ground Water Quality Bureau of NMED to Mr. Ernesto Martinez, Corporate EHS Manager of Sparton, Re: Discharge Permit Renewal, DP-1184, Sparton Technology, Inc. Coors Blvd Ground Water Remediation Facility, with 2 enclosures (1. Discharge Permit Renewal, DP-1184, and 2. Ground Water Discharge Permit Monitoring Well Construction and Abandonment Conditions, Revision 1.1, March 2011).

[23] Letter dated January 28, 2013 to Ms Naomi Davidson of the NMED Groundwater Bureau from Stavros S. Papadopulos of SSP&A on the subject: 2012 Annual Monitoring Report for Discharge Permit DP-1184.

mass emitted during the year averaged 0.08 lbs/hr or 0.35 tons/yr, well within the specified emission limits.

No violation notices were received during 2012 for activities associated with the operation of the off-site containment system.

5.4.2 Source Containment System

The rapid infiltration ponds associated with the source containment system are also subject to the above-stated requirements of Discharge Permit DP-1184. The monitoring wells for this system are MW-17, MW-77 and MW-78; the data collected from these wells met the requirements of the permit throughout 2012, and were also included in the 2012 Annual Monitoring Report for the permit.

The Authority-to-Construct Permit No. 1203 specifies emission limits for total VOCs (TCE, DCE, and TCA) from the source containment system air stripper. Emissions from the air stripper are calculated annually and reported to the Albuquerque Environmental Health Department, Air Quality Division by March 15 every year as required by the permit. The calculated emissions for 2012, 0.0007 lbs/hr or 0.0032 tons/yr, which were reported to the Albuquerque Air Quality Division on January 22, 2013,[24] met the requirements of Permit No. 1203 throughout 2012.

No violation notices were received during 2012 for activities associated with operation of the source containment system.

5.5 Contacts

Under the terms of the Consent Decree,[25] Sparton is required to prepare an annual Fact Sheet summarizing the status of the remedial actions, and after approval by USEPA/NMED, distribute this Fact Sheet to property owners located above the plume and adjacent to the off-site treatment plant water discharge pipeline. Fact Sheets reporting on remedial activities during 1999 through 2010 were prepared by Sparton, approved by the regulatory agencies, and distributed to the property owners. After the approval of the 2011 Annual Report on August 30, 2012[26] Sparton prepared a 2011 Fact Sheet and submitted it to the USEPA/NMED for approval on September 25, 2012. The agencies approved the Fact Sheet on October 3, 2012,[27] and the

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[24] Letter dated January 22, 2013 to Ms. Regan Eyerman of the Albuquerque Environmental Health Department, Air Quality Division from Stavros S. Papadopulos of SSP&A on the subject: Authority-to-Construct Permit#1203 – 2012 Annual Report on Air Emissions.

[25] Public Involvement Plan for Corrective Measure Activities. Attachment B to the Consent Decree in Albuquerque v. Sparton Technology, Inc., No. CV 07 0206 (D.N.M.),

[26] Letter dated August 30, 2012 from Mr. John E. Kieling of NMED and Mr. Chuck Hendrickson of USEPA to Mr. Joseph Lerczac of Sparton, Re: Approval, 2011 Annual Report, Sparton Technology, Inc., EPA ID NO. NMD083212332.

[27] Letter dated February 3, 2012 from John E. Kieling of NMED and Chuck Hendrickson of USEPA to Joseph S. Lerczak of Sparton, Re: Approval, 2010 Fact Sheet with Revisions, Sparton Technology Inc., EPA ID No.:NMD083212332.

approved Fact Sheet was distributed to the property owners located above the plume and adjacent to the off-site treatment plant water discharge pipeline on October 8, 2012.

Section 6
Groundwater Model

A numerical model of the aquifer system underlying the Sparton site and its vicinity was developed in 2000, after a full year of operation of the current remedial systems, to simulate groundwater flow and contaminant (TCE) migration in the aquifer system. In the years that followed the model was improved by yearly updates and several major modifications. The last such major modification was made in 2009 as described in the 2008 Annual Report (SSP&A, 2009a) and in the 2009 report on the Evaluation of Alternative Systems for Aquifer Restoration (SSP&A, 2009b), hereafter "Alternatives Report."

During the preparation of the 2009 through 2011 Annual Reports, the model, as modified in 2009, has been used to simulate water level and TCE concentration data collected during each year, without the need of any major modifications. Based on this, Sparton recently proposed to USEPA and NMED that these simulations be performed once every three years, rather than annually, to provide a larger data base for assessing model reliability. The agencies agreed to this proposed change and the parties entered into a formal agreement, which was signed by all three parties by June 3, 2013.[28]

Pursuant this agreement, the next re-evaluation of the model will be conducted in early 2015 and will be described in the 2014 Annual Report. This year, the groundwater model, as described in the 2011 Annual Report, was solely used to calculate the area of origin of the groundwater pumped from CW-1 and CW-2 during 2012, and the 2012 capture zones of these wells. The 2012 pumping rates of the wells were used in these calculations. The approach used in making these calculations is briefly discussed below.

6.1 Origin of the Pumped Water and Capture Analysis

Particle tracking analysis was used to determine the aquifer area where the water extracted at CW-1 between 1999 and 2012 was located at the start of extraction in 1998 and where the water extracted at CW-2 between 2002 and 2012 was located at the start of extraction in January 2002 (the "areas of origin"). This particle tracking analysis was carried out using the MODPATH computer code (Pollock 1994, 2008); particles were released on a twenty foot grid at the top of each model layer throughout the model domain, and keeping track of those particles that discharged at CW-1 and CW-2. The results of this analysis are discussed in Section 5 and are shown on Figure 5.26 in both map [Figure 5.26 (a)] and cross-section view [Figure 5.26 (b)]. The outlines of the areas of origin of the water pumped during different time periods [Figure

[28] Second Agreement to Modify Schedules for the completion of the Work under the March 3, 2000 Consent Decree, Agreement signed by John E. Kieling for NMED and by Chuck Hendrickson for USEPA on June 3, 2013, and by Tony Hurst for Sparton on May 24, 2013, in the United States Court for the District of New Mexico, The City of Albuquerque and the Board of County Commissioners of the County of Bernalillo, Plaintiffs v. Sparton Technology, Inc., Defendant, Civil Action No: CIV 97 0206 LH/JHG consolidated with CIV 97 0208 JC/RLP, CIV 97 0210 M/DJS, and CIV 97 0981 LH/JHG.

5.26 (a)] represent the outer boundary of the envelope of starting locations of particles that discharged at each of the wells during that period.

The capture zone of wells CW-1 and CW-2 were estimated using the particle-tracking method in the PATH3D code. It was assumed that both the off-site and the source containment wells are operating continuously at their current pumping rates and that 2012 water level conditions prevail.

Section 7
Conclusions and Future Plans

7.1 Summary and Conclusions

Sparton's former Coors Road Plant is located at 9621 Coors Boulevard NW, Albuquerque, New Mexico. The Site is at an elevation of about 5,050 ft MSL; the land slopes towards the Rio Grande on the east and rises to elevations of 5,150-5,200 ft MSL within a short distance to the west of the Site. The upper 1,500 ft of the fill deposits underlying the Site consist primarily of sand and gravel with minor amounts of silt and clay. The water table beneath the Site is at an elevation of 4,975-4,985 ft MSL and slopes towards the northwest to an elevation of about 4,960 ft MSL within about one-half mile of the Site. At an elevation of about 4,800 ft MSL a 2- to 3-foot clay layer, referred to as the 4,800-foot clay unit, has been identified.

Investigations conducted at and around the Site in the 1980s revealed that soils beneath the Site and groundwater beneath and downgradient from the Site were contaminated. The primary contaminants were VOCs, specifically TCE, DCE, and TCA, and chromium. Remedial investigations that followed indicated that groundwater contamination was limited to the aquifer above the 4800-foot clay; current measures for groundwater remediation were, therefore, designed to address contamination within this depth interval.

Under the terms of a Consent Decree entered on March 3, 2000, Sparton agreed to implement a number of remedial measures. These remedial measures consisted of: (1) the installation and operation of an off-site containment system; (2) the installation and operation of a source containment system; and (3) the operation of an on-site, 400-cfm SVE system for an aggregate period of one year. The goals of these remedial measures are: (a) to control hydraulically the migration of the off-site plume; (b) to control hydraulically any potential source areas that may be continuing to contribute to groundwater contamination at the on-site area; (c) to reduce contaminant concentrations in vadose-zone soils in the on-site area and thereby reduce the likelihood that these soils remain a source of groundwater contamination; and (d) in the long-term, restore the groundwater to beneficial use.

The installation of the off-site containment system began in late 1998 and was completed in early May 1999. The system consisted of: (1) a containment well near the leading edge of the plume, designed to pump at a rate of about 225 gpm, (2) an off-site treatment system, (3) an infiltration gallery in the Arroyo de las Calabacillas, and (4) associated conveyance and monitoring components. The off-site containment well began operating on December 31, 1998; except for brief interruptions for maintenance activities or due to power outages, the well has operated continuously since that date. Based on an evaluation of the performance of the system and of alternative groundwater extraction systems, conducted in 2009, Sparton recommended and the regulatory agencies approved the increase of the pumping rate of this well to about 300 gpm to accelerate aquifer restoration; this rate increase was implemented on November 3, 2010. The year 2012 was the fourteenth full year of operation of this well.

The source containment system was installed during 2001 and began operating on January 3, 2002. This system consisted of: (1) a containment well immediately downgradient from the site, designed to pump at a rate of about 50 gpm, (2) an on-site treatment system, (3) six[29] on-site infiltration ponds, and (4) associated conveyance and monitoring components. The year 2012 was the eleventh year of operation of this well.

The 400-cfm SVE system was installed in the Spring of 2000 and began operating on April 10, 2000. The system operated for a total of about 372 days until June 15, 2001 and thus met the length-of-operation requirements of the Consent Decree. Monitoring conducted in the Fall of 2001 indicated that the system had also met its performance goals, and the system was dismantled in May 2002.

During 2012, considerable progress was made towards achieving the goals of the remedial measures:

- The off-site containment well continued to operate during the year at an average discharge rate of 287 gpm and maintained hydraulic containment of the off-site plume. The pumped water was treated and returned to the aquifer through the infiltration gallery. The concentrations of constituents of concern in the treated water met all the requirements of the Discharge Permit for the site.
- The source containment well continued to operate during the year at an average rate of 42 gpm, and to contain potential on-site source areas. The pumped water was treated and returned to the aquifer through the infiltration ponds. The concentrations of constituents of concern in the treated water met all the requirements of the Discharge Permit for the site.
- Groundwater monitoring was conducted as specified in the Groundwater Monitoring Program Plan (Monitoring Plan [Attachment A to the Consent Decree]) and the State of New Mexico Groundwater Discharge Permit DP-1184 (Discharge Permit). Water levels in all accessible wells and/or piezometers were measured quarterly. Samples were collected for water-quality analyses from monitoring wells at the frequency specified in the Monitoring Plan and analyzed for VOCs and total chromium.
- Samples were obtained from the influent and effluent of the treatment plants for the off-site and source containment systems, and the infiltration gallery and infiltration pond monitoring wells at the frequency specified in the Discharge Permit. All samples were analyzed for VOCs, total chromium, iron, and manganese.

[29] The performance of the six on-site infiltration ponds between 2002 and 2004 indicated that four ponds are more than adequate for handling the water pumped by the source containment well. With the approval of the regulatory agencies, Sparton backfilled two of the six ponds in 2005 to put the land to other beneficial use.

- The groundwater flow model that was developed in previous years was used to calculate the area of origin of the water pumped by the off-site and source containment wells during 2012 and the capture zones of these wells.[30]

The extent of groundwater contamination during 2012, as defined by the extent of the TCE plume, was essentially the same as during 2011. Of 57 wells sampled both in November 2011 and 2012, the 2012 concentrations of TCE were lower than in 2011 in 13 wells, higher in 14 wells, and remained the same in 30 wells (all but three below detection limits). Well MW-60, at 840 μg/L, continued to be the most contaminated off-site well. The corresponding results for DCE were 6 wells with lower, 10 wells with higher, and 41 wells with the same (all below detection limits) concentrations. The TCA plume ceased to exist in 2003, and this condition continued through 2012; the highest concentration of TCA during 2012 was 2.7 μg/L (also in well MW-60), significantly below the maximum allowable concentration of 60 μg/L set for groundwater by the NMWQCC.

Changes in concentrations observed in monitoring wells since the implementation of the current remedial measures indicate that contaminant concentrations decreased significantly both in the on-site and off-site area. Data from 56 wells that were sampled both during 2012 and before, or soon after, the start of the remedial operations indicate that TCE concentrations decreased in 30 wells, increased in 5 and remained unchanged in 21 (all but two below detection limits). Of the five wells where current concentrations are higher than they were prior to the start of the current remedial operations, the highest increase (290 μg/L) was at the off-site containment well CW-1. The concentrations of contaminants in the water pumped from CW-1 rapidly increased after the start of its operation and have remained high for several years before starting a declining trend in the mid-2000s. The high concentrations in this well and in well MW-60 indicated that areas of high concentration existed upgradient from both of these wells; however, most of the groundwater upgradient from these wells has been captured by CW-1 and concentrations both in CW-1 and MW-60 are declining and are expected to continue to decline.

Two of the three monitoring wells completed below the 4800-foot clay (in the Deep Flow Zone or the DFZ), well MW-67 and well MW-79, which was installed in 2006 to address the continuing presence of contaminants in the third DFZ monitoring well MW-71R, continued to be free of any site-related contaminants throughout 2011. Well MW-71R continued to be contaminated; however, TCE concentrations in the well declined from 210 μg/L in August 2003 to 51 μg/L in May 2009. After that, the TCE concentrations in the well began increasing again reaching 91 μg/L in May 2011 and then declining to 58 μg/L by November 2011. The same pattern repeated in 2012 with TCE concentrations in the well increasing to 77 μg/L in August 2012 and then declining to 56 μg/L by November 2012. The off-site and source containment wells operated at a combined average rate of about 330 gpm during 2012. A total of about 173 million gallons of water were pumped from the wells. The total volume of water pumped since the beginning of the current remedial operations on December 1998 is about 1.96 billion

[30] In previous Annual Reports, this model was updated using data from the current year. However, under the terms of an agreement between USEPA, NMED, and Sparton entered on June 3, 2013, hereafter such model updates will be conducted once every three years with the next update to be included in the 2014 Annual Report.

gallons and represents 173 percent of the initial volume of contaminated groundwater (pore volume).

A total of about 320 kg (700 lbs) of contaminants consisting of about 290 kg (630 lbs) of TCE, 32 kg (70 lbs) of DCE, and 1.0 kg (2.2 lbs) of TCA were removed from the aquifer by the two containment wells during 2012. The total mass that was removed since the beginning of the of the current remedial operations through the end of 2012 is 6,910 kg (15,260 lbs) consisting of 6,450 kg (14,230 lbs) of TCE, 440 kg (980 lbs) of DCE, and 19 kg (42 lbs) of TCA. This represents about 88 percent of the total dissolved contaminant mass currently estimated to have been present in the aquifer prior to the testing and operation of the off-site containment well.

The containment systems were shut down several times during 2012 for routine maintenance activities, due to power and monitoring system failures, or due to the failure of other components of the systems. The downtime for these shutdowns ranged from 4 minutes to 7 days. The longer shutdowns, including the 7 day shutdown of the source containment system, were for repairs of leaks in air strippers; power failures at the treatment buildings were also responsible for frequent shutdowns that sometime lasted more than a day. Evaluation of migration rates in the aquifer indicates that the systems could be down for significantly much longer periods without affecting the capture of the contaminant plume.

7.2 Future Plans

The off-site and source containment systems will continue to operate during 2013; their pumping rates will be closely monitored to maintain them as close as possible to their current design pumping rates (300 gpm for the off-site containment well and 50 gpm for the source containment well). Data collection will continue in accordance with the Monitoring Plan and the Discharge Permit, and as necessary for the evaluation of the performance of the remedial systems.

Monitoring wells MW-7, MW-9, and MW-54, whose water level was below the bottom of the screen during all or some of the 2012 measurement rounds, will be evaluated to assess whether data from these wells can be relied upon, or whether they should be abandoned or replaced. An evaluation of the system maintenance and operation processes will be conducted to assess whether there are actions that must be taken to improve the performance of both systems and reduce shutdown frequencies and durations. An evaluation will also be conducted of the chemistry of CW-2 to determine whether the scaling of the pipeline to the air stripper can be prevented.

After approval of this report, a Fact Sheet for 2012 will be prepared and submitted to the regulatory agencies for approval before distribution to the property owners located above the plume and adjacent to the off-site treatment plant water discharge pipeline. The USEPA and the NMED will continue to be kept informed of any significant milestones or changes in remedial system operations. The goal of the systems will continue to be the return of the contaminated groundwater to beneficial use.

Section 8
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FIGURES

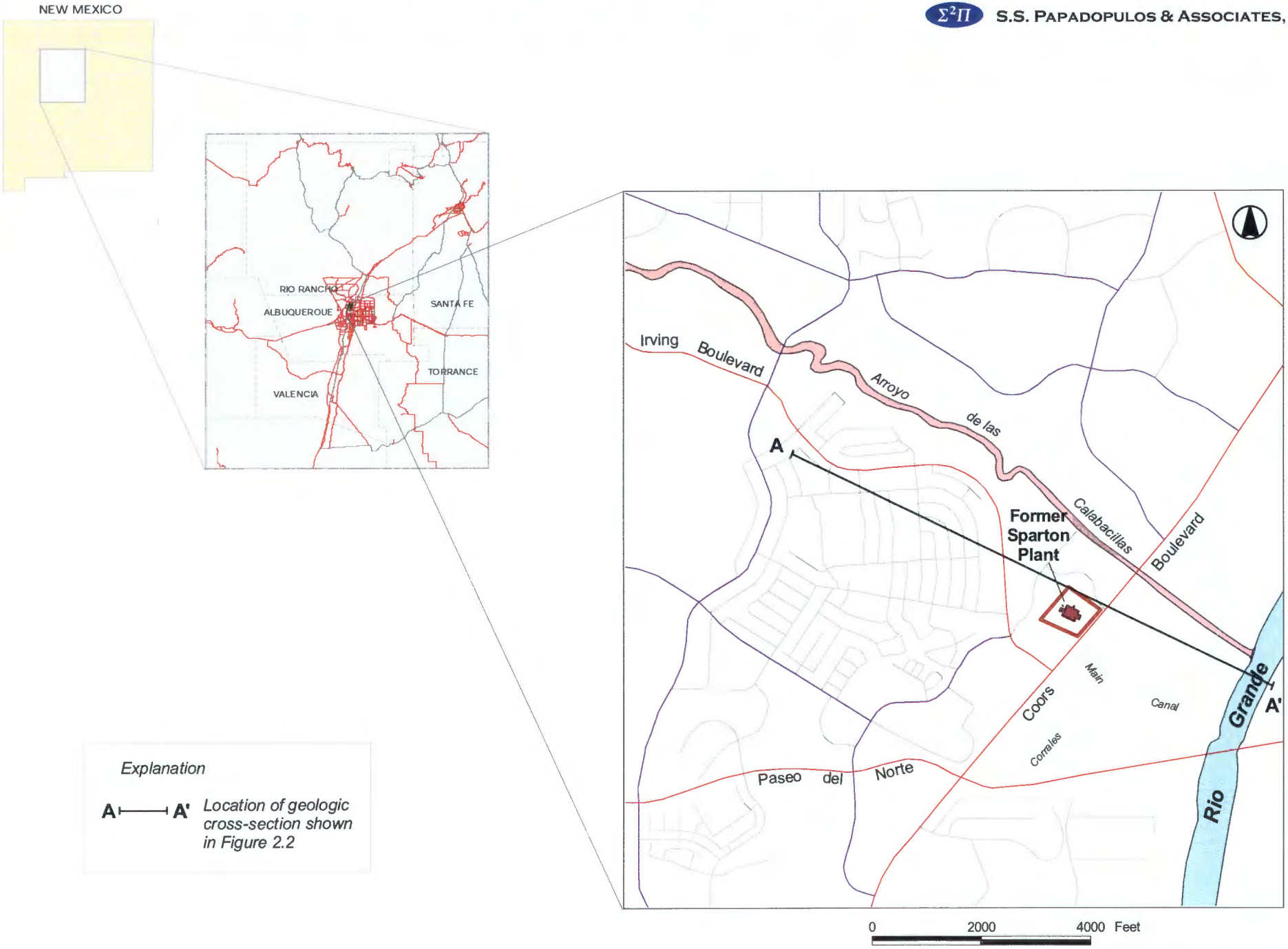


Figure 1.1 Location of the Former Sparton Coors Road Plant

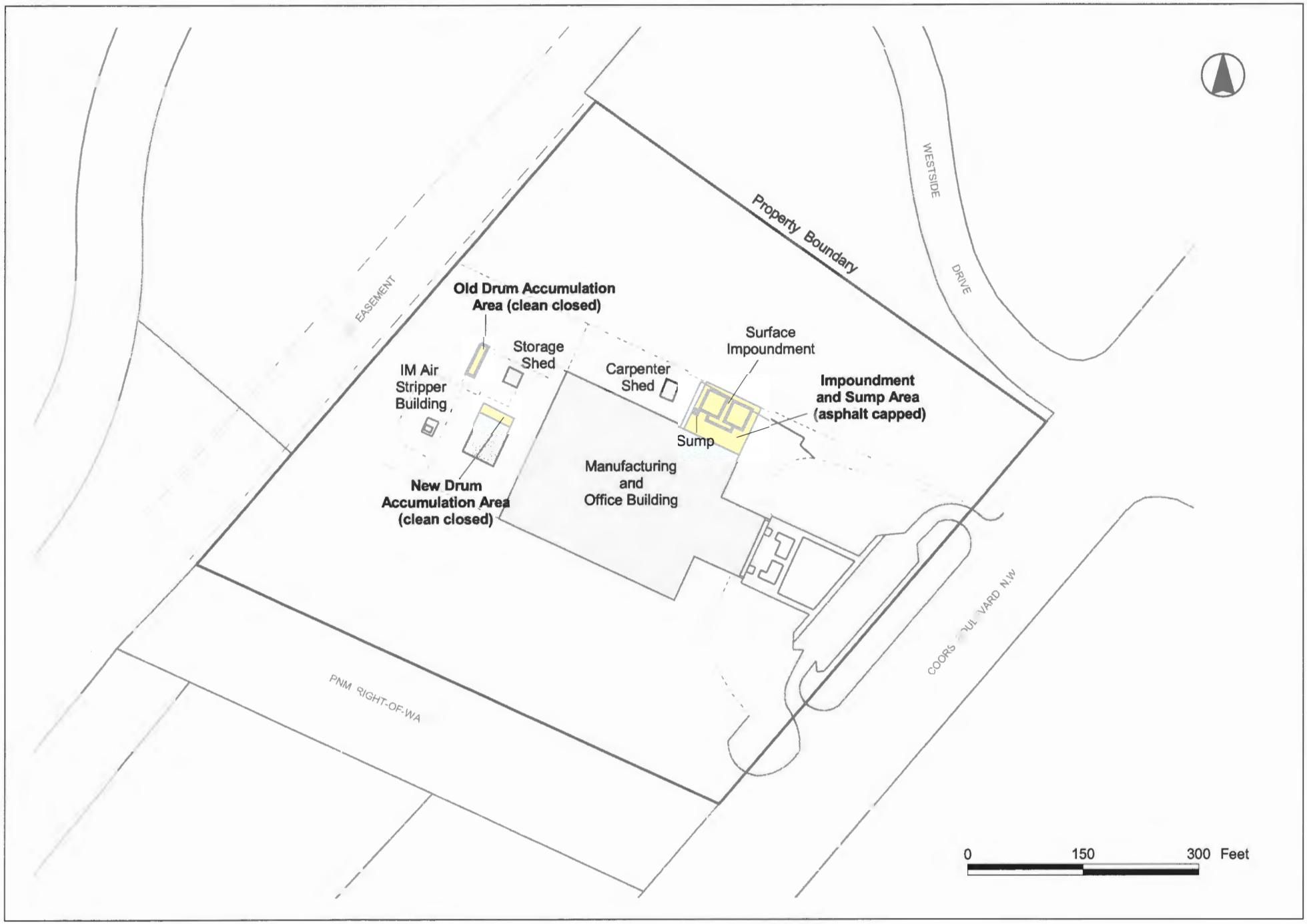
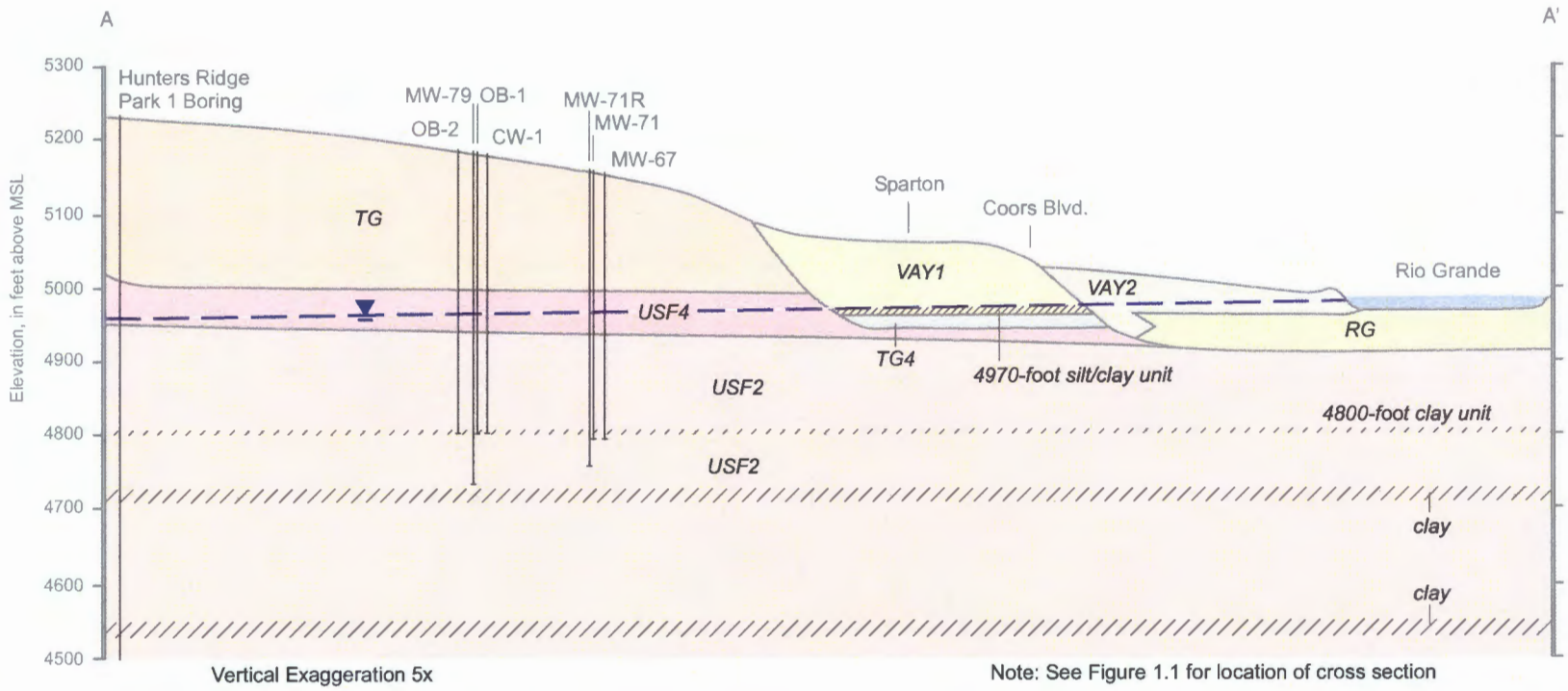


Figure 2.1 The Former Sparton Coors Road Plant



Explanation

RG	Holocene channel and flood plain deposits	*TG*	Middle Pleistocene undifferentiated deposits
VAY2	Holocene arroyo fan and terrace deposits	*USF4*	Pliocene Upper Santa Fe Group Western Basin fluvial facies
VAY1	Late Pleistocene arroyo fan and terrace deposits	*USF2*	Pliocene Upper Santa Fe Group Rio Grande facies
TG4	Late Pleistocene channel and flood plain deposits, upper portion is the 4970-foot silt/clay unit		

Figure 2.2 Geologic Cross Section Showing Shallow Deposits

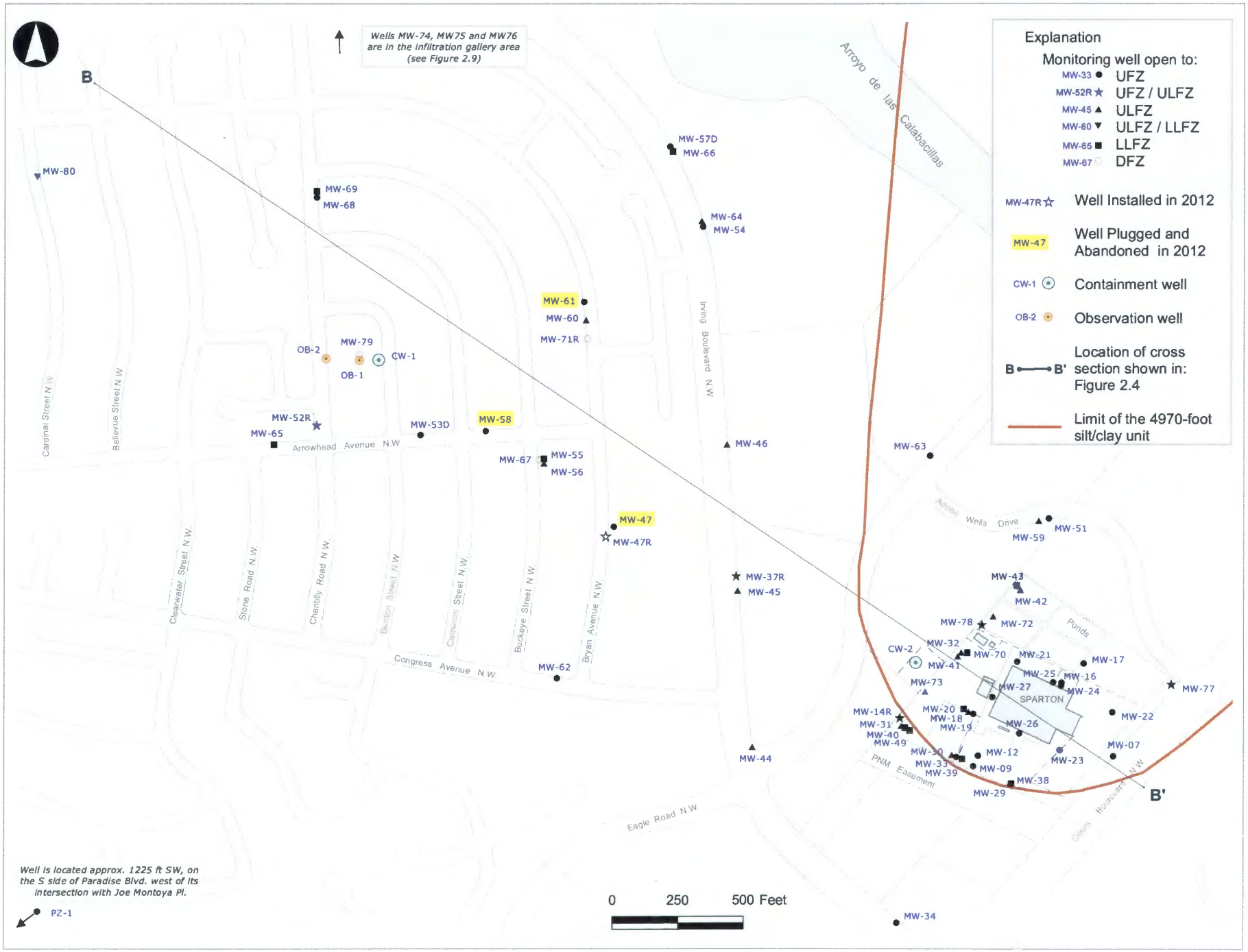


Figure 2.3 Location of Existing Wells

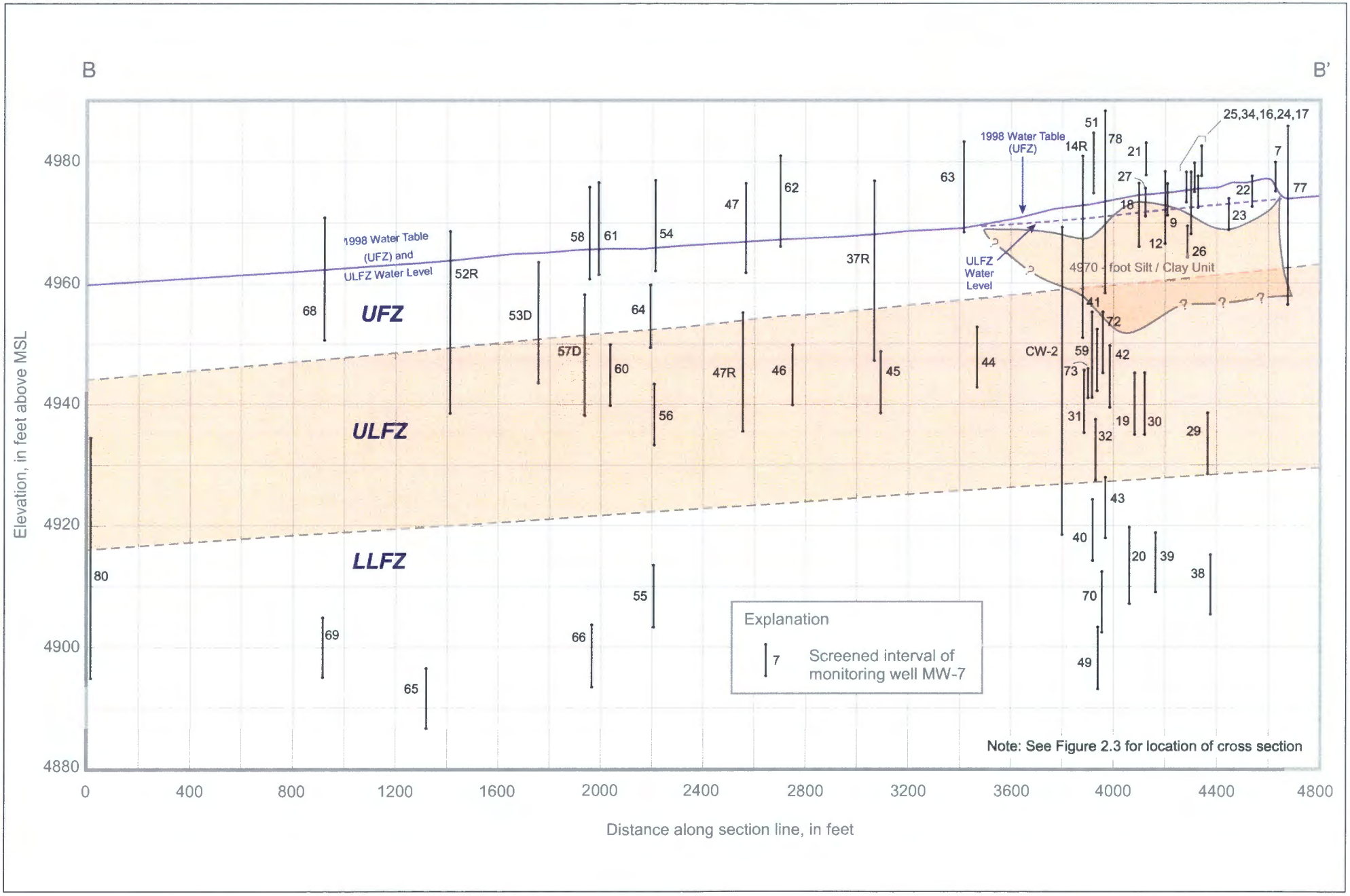


Figure 2.4 Schematic Cross-Section Showing Screened Interval of Monitoring Wells and Relation to Flow Zones

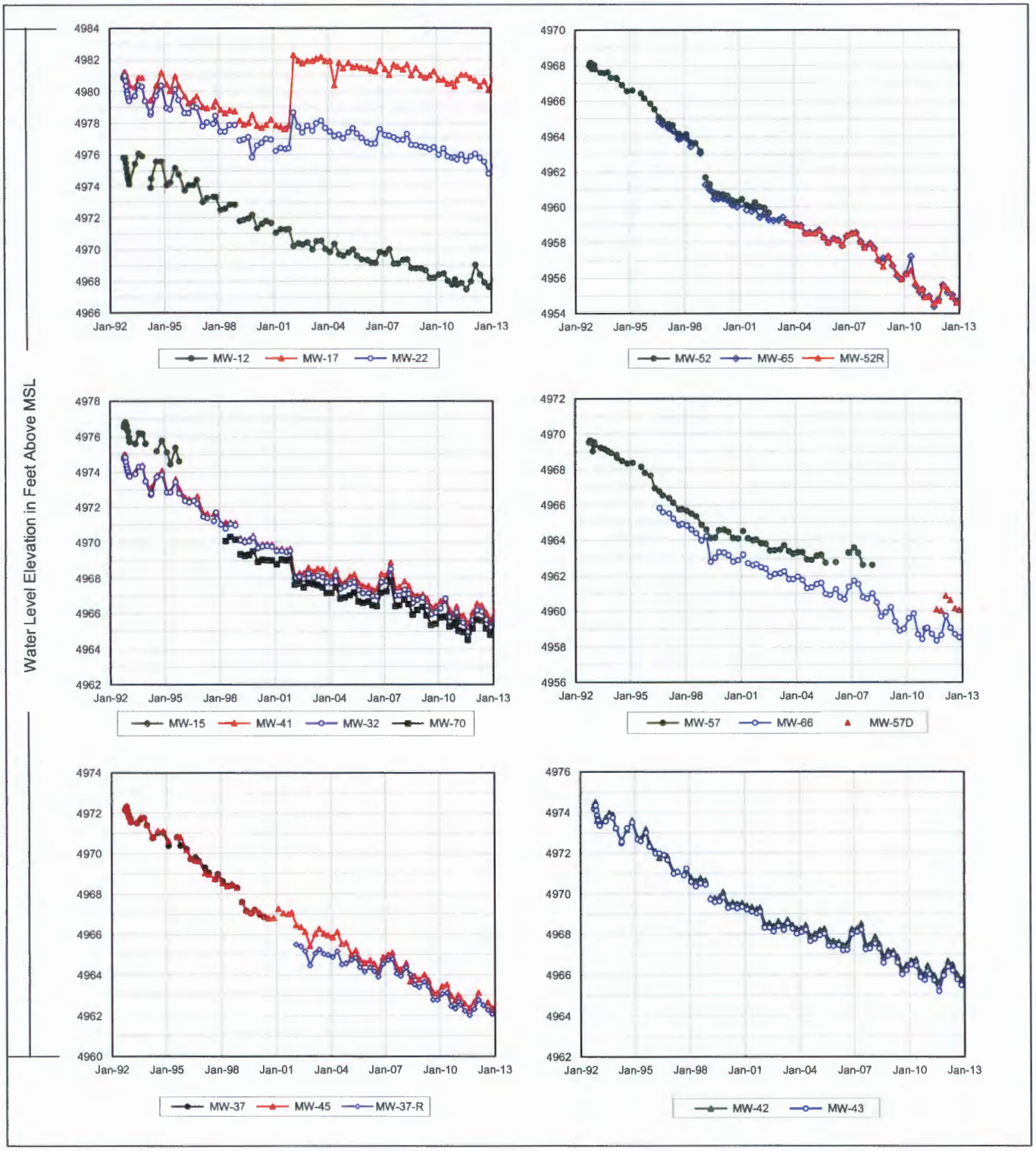


Figure 2.5 Monitoring Well Hydrographs

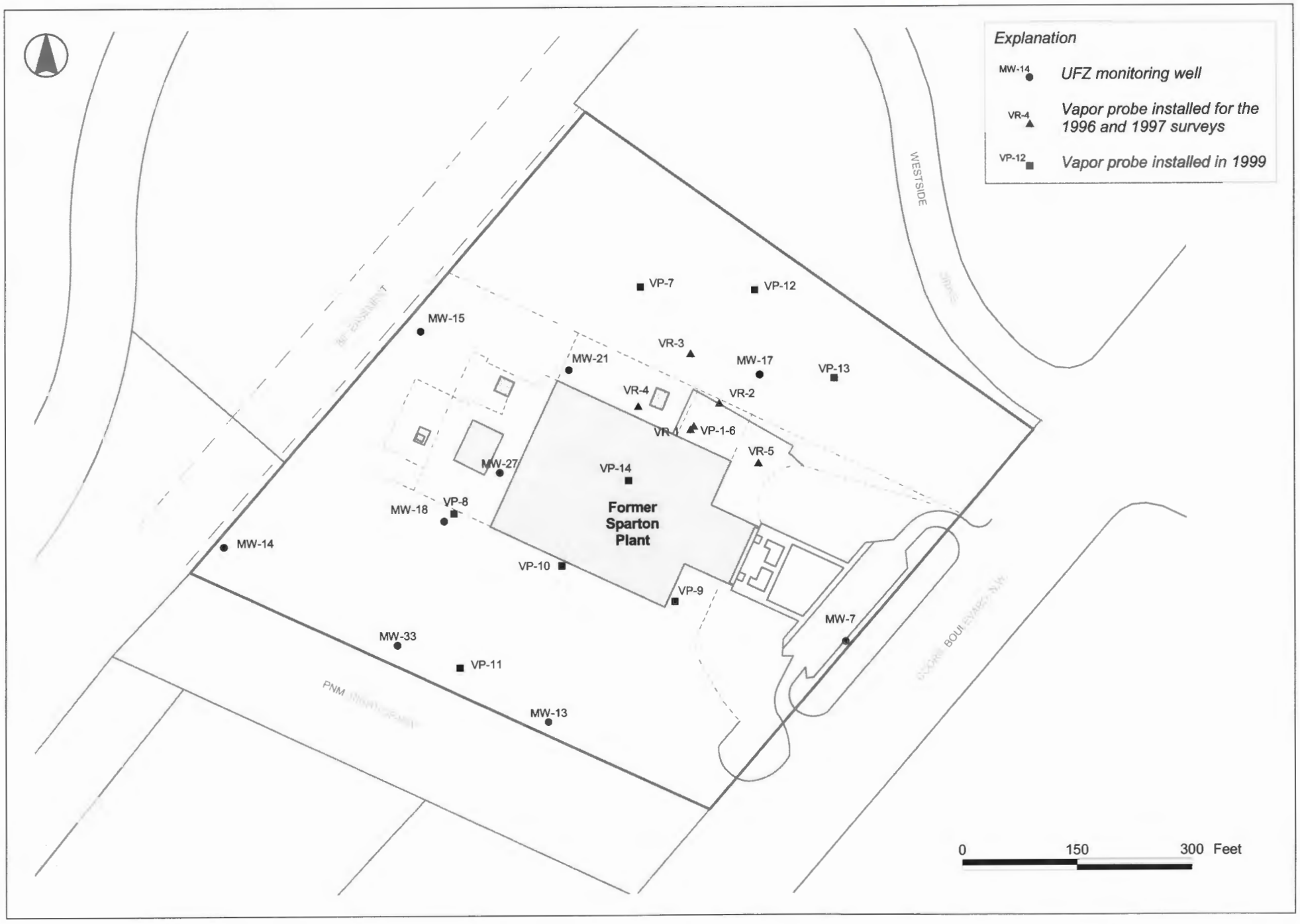


Figure 2.6 Location of Vapor Probes and On-Site Monitoring Wells Used in Vadose Zone Characterizations

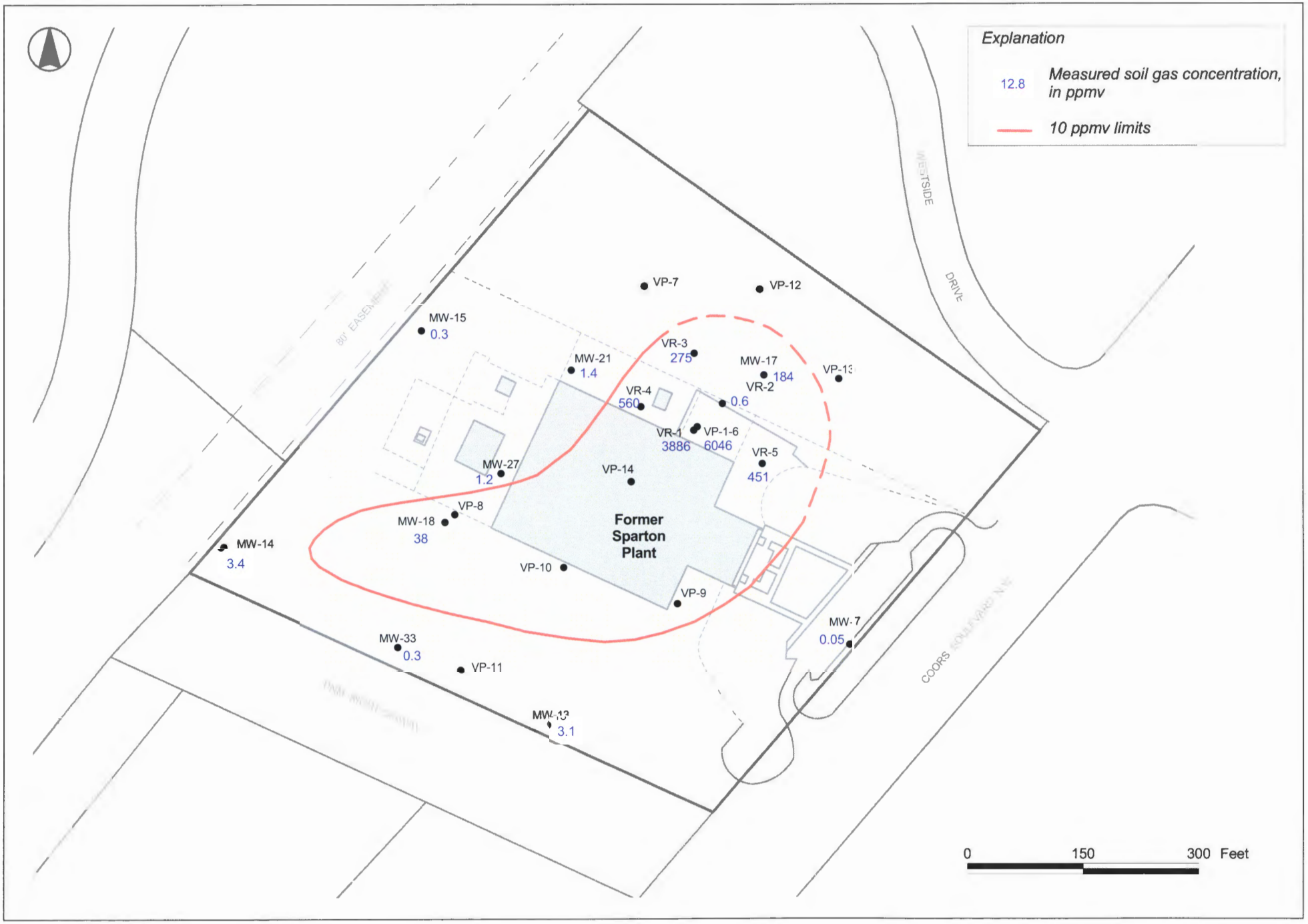


Figure 2.7 TCE Concentrations in Soil Gas - April 1996 - February 1997 Survey

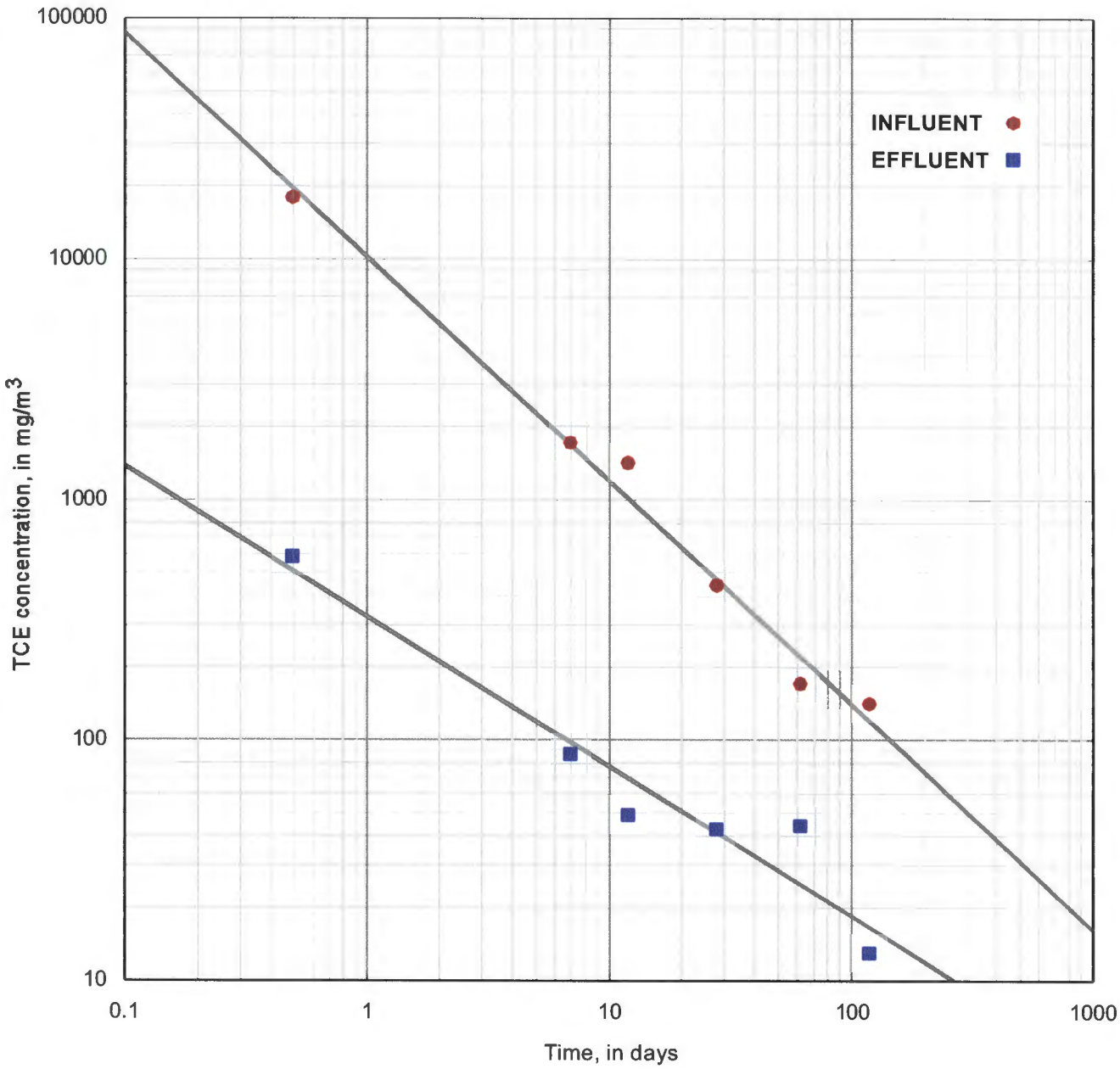


Figure 2.8 Influent and Effluent Concentrations - SVE Operation
April 8 - October 20, 1998

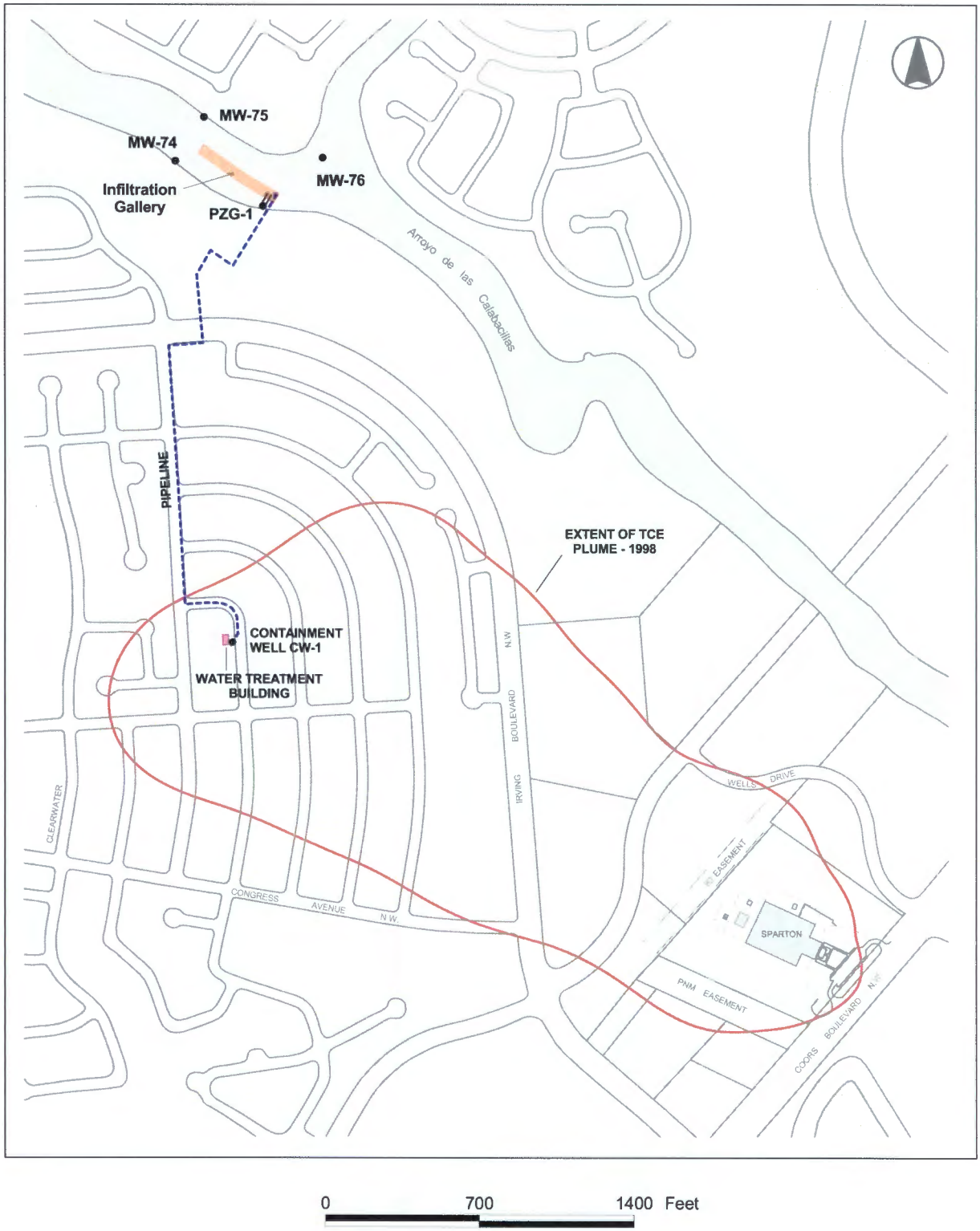


Figure 2.9 Layout of the Off-Site Containment System Components

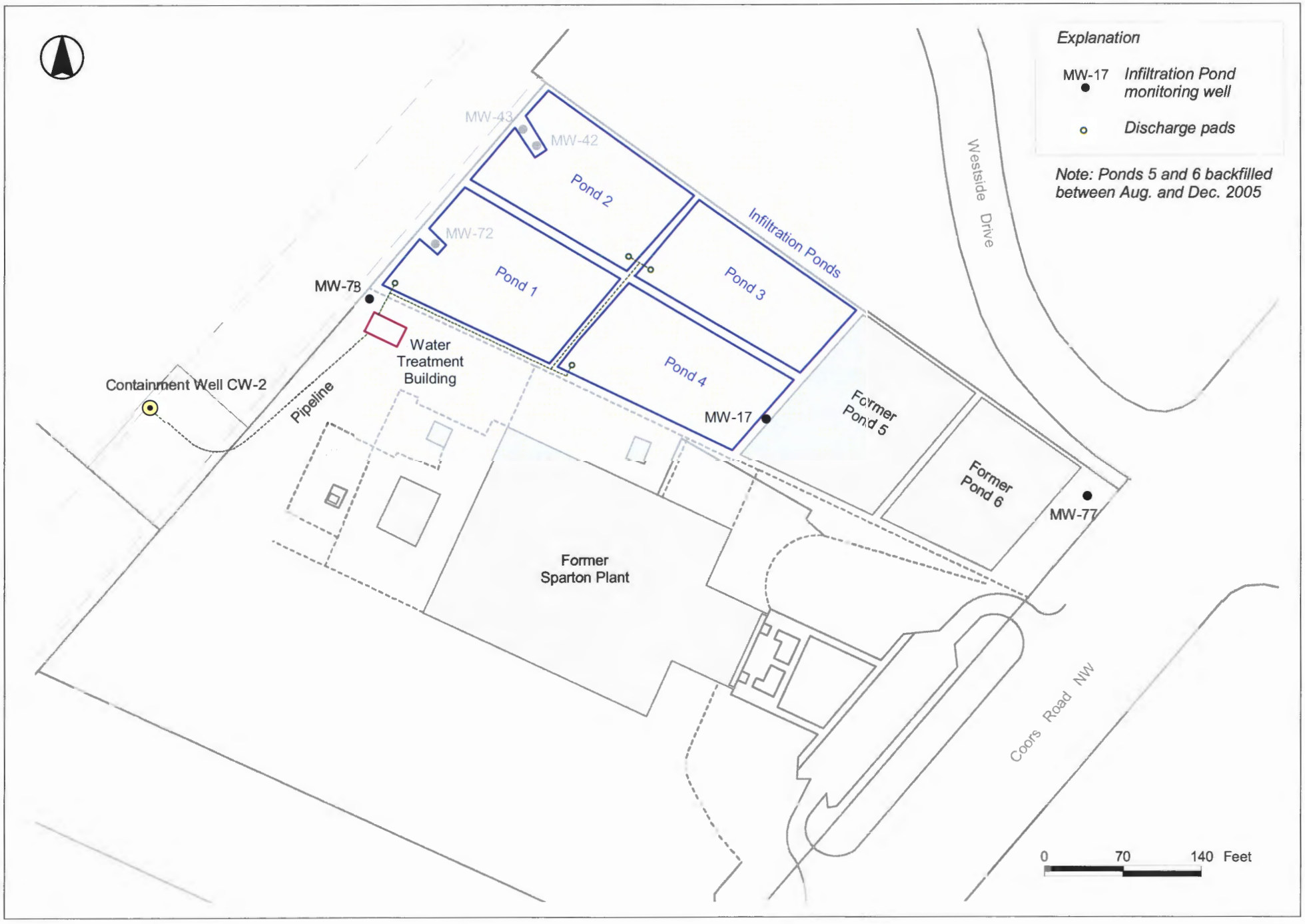


Figure 2.10 Layout of the Source Containment System Components

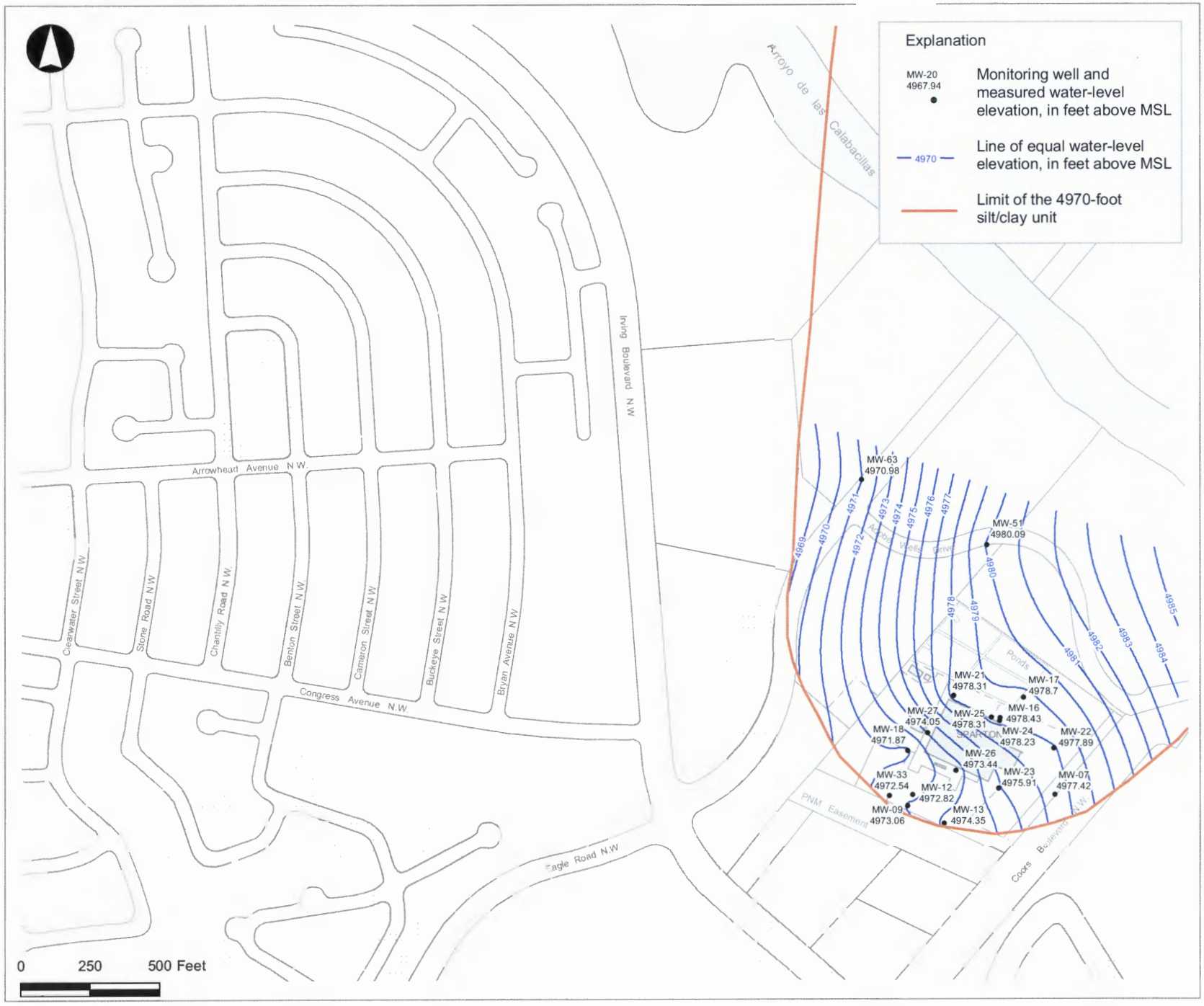


Figure 2.11 Elevation of the On-Site Water Table - November 1998

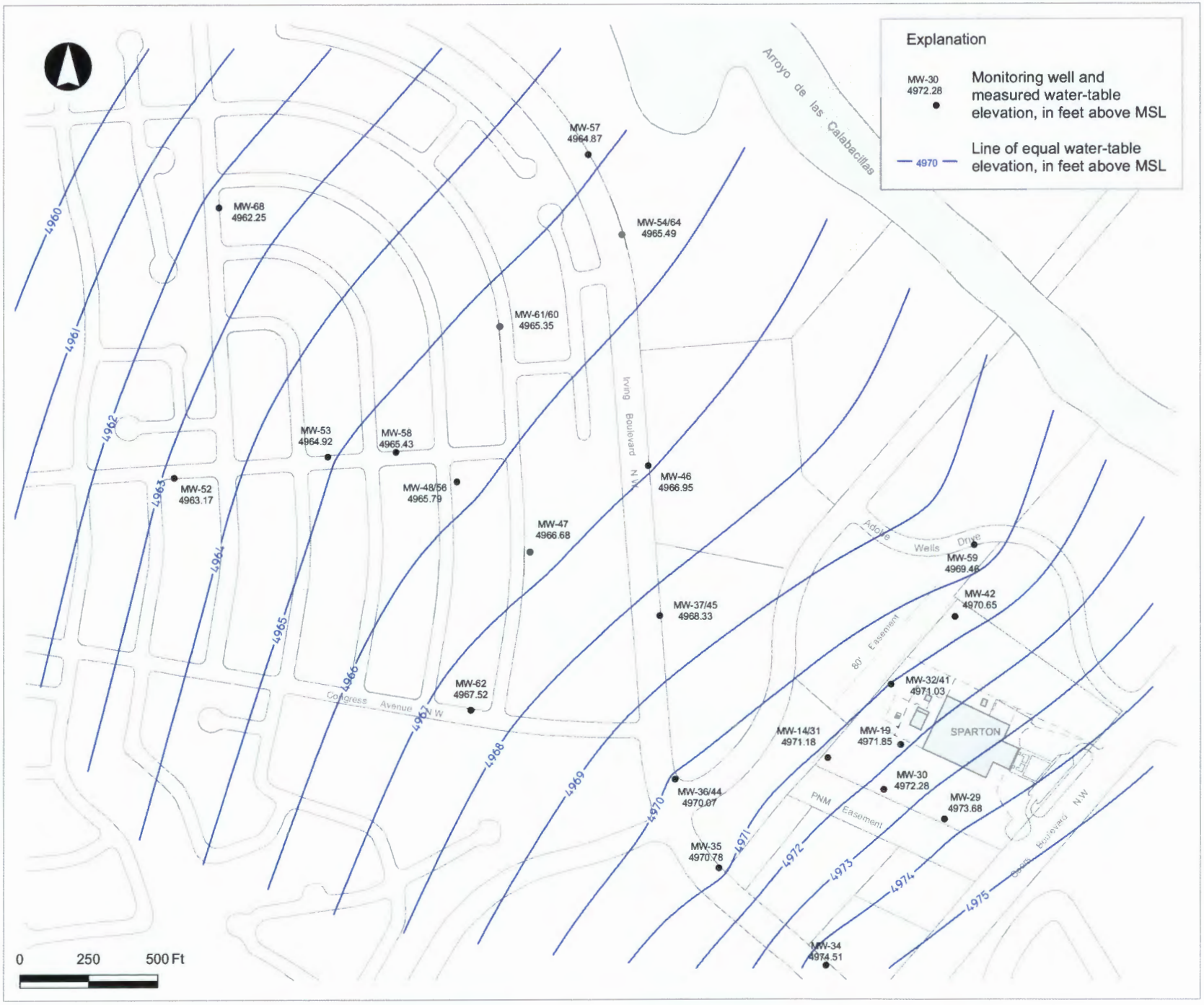


Figure 2.12 Elevation of the Water Levels in the UFZ/ULFZ - November 1998

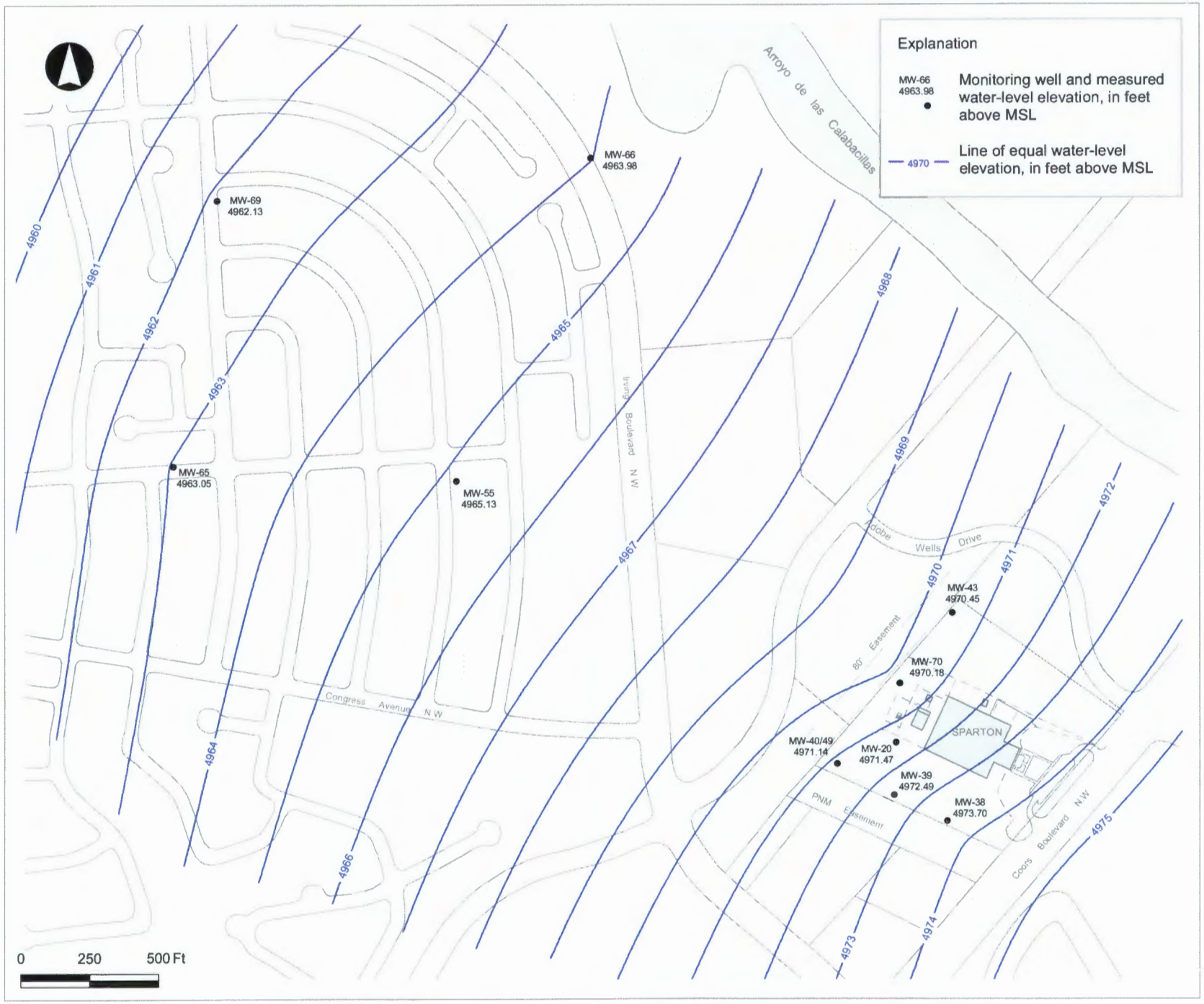


Figure 2.13 Elevation of the Water Levels in the LLFZ - November 1998

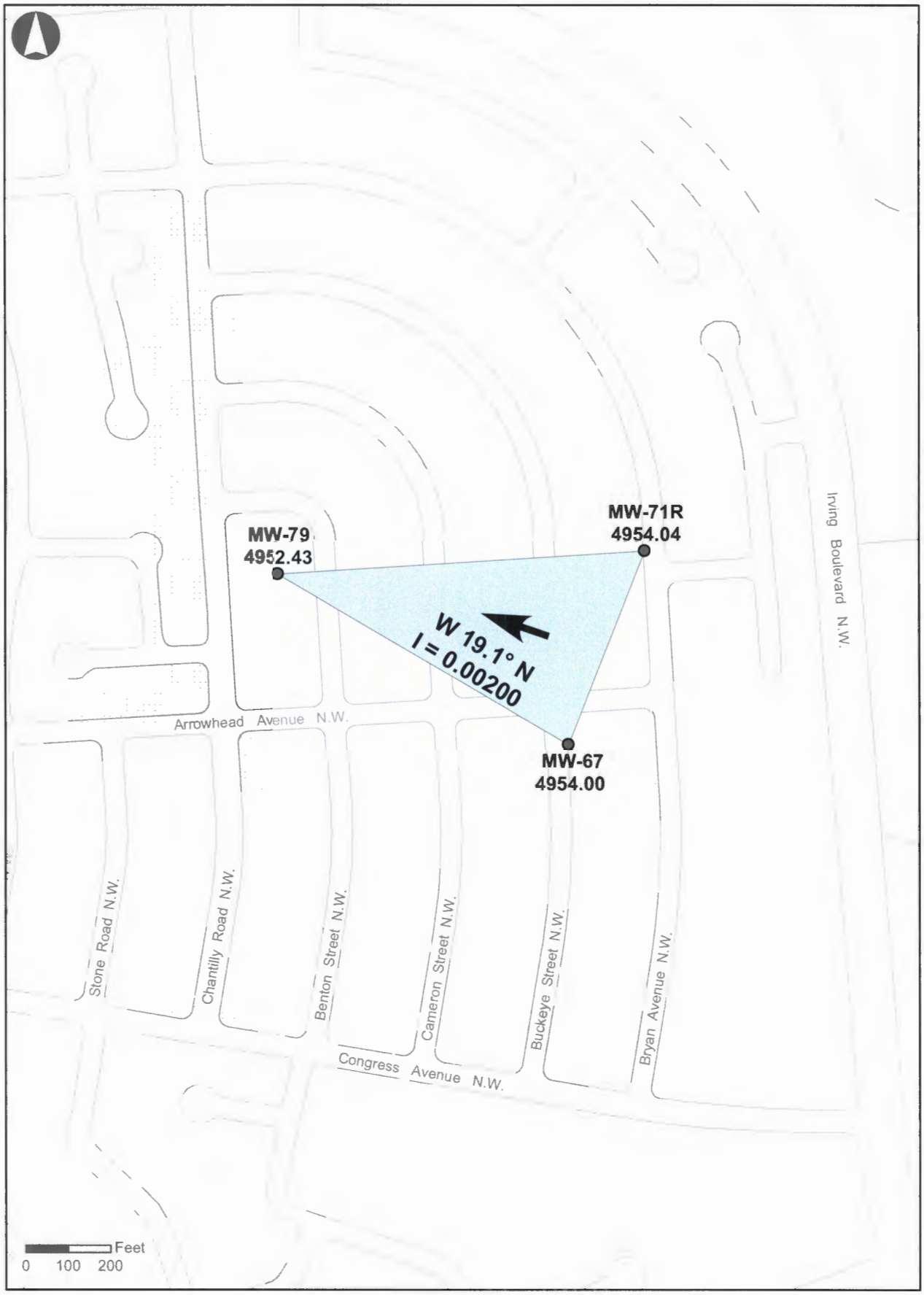


Figure 2.14 Average Direction of Groundwater Flow and Average Hydraulic Gradient in the DFZ (2006 - 2008)

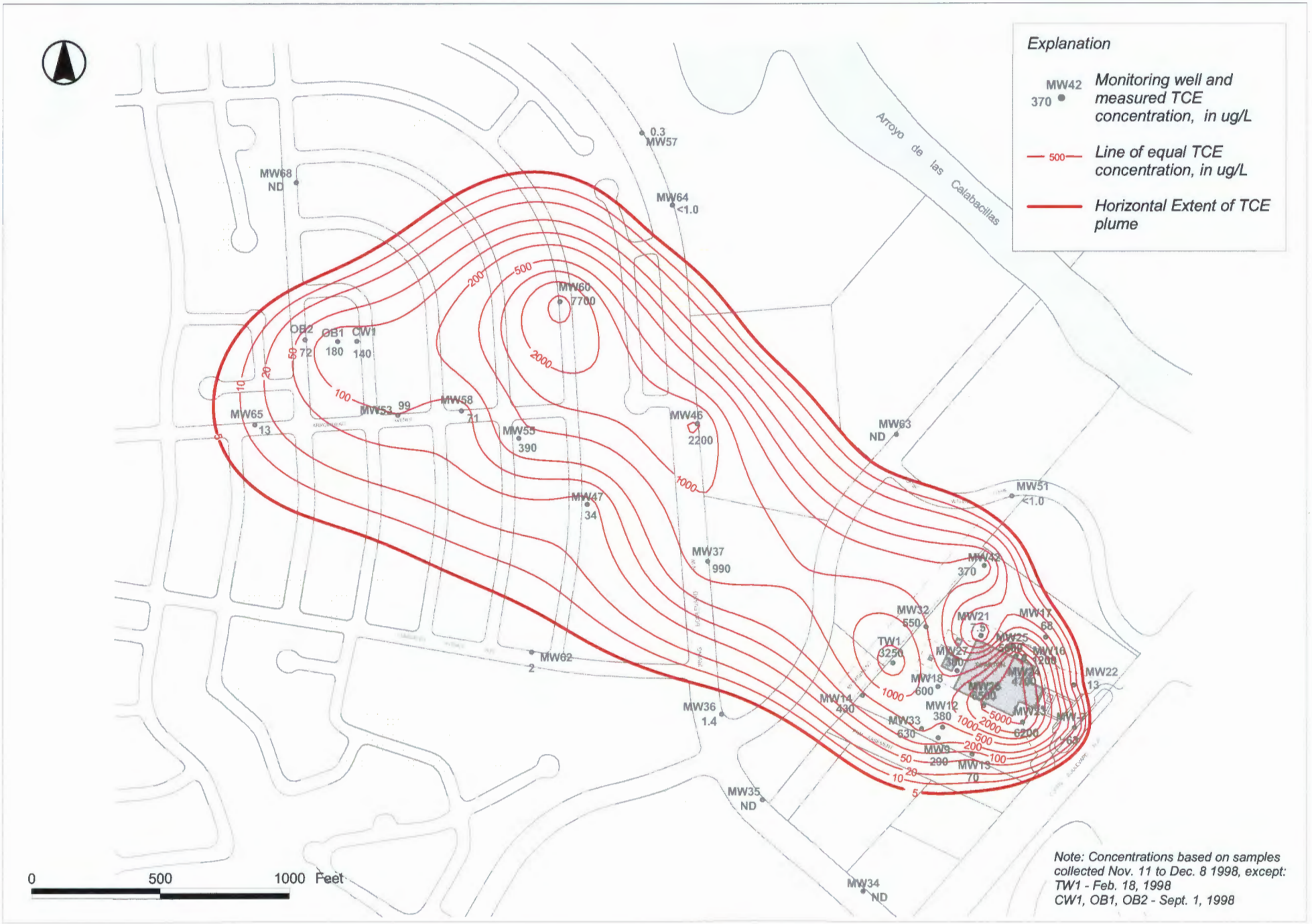


Figure 2.15 Horizontal Extent of TCE Plume - November 1998

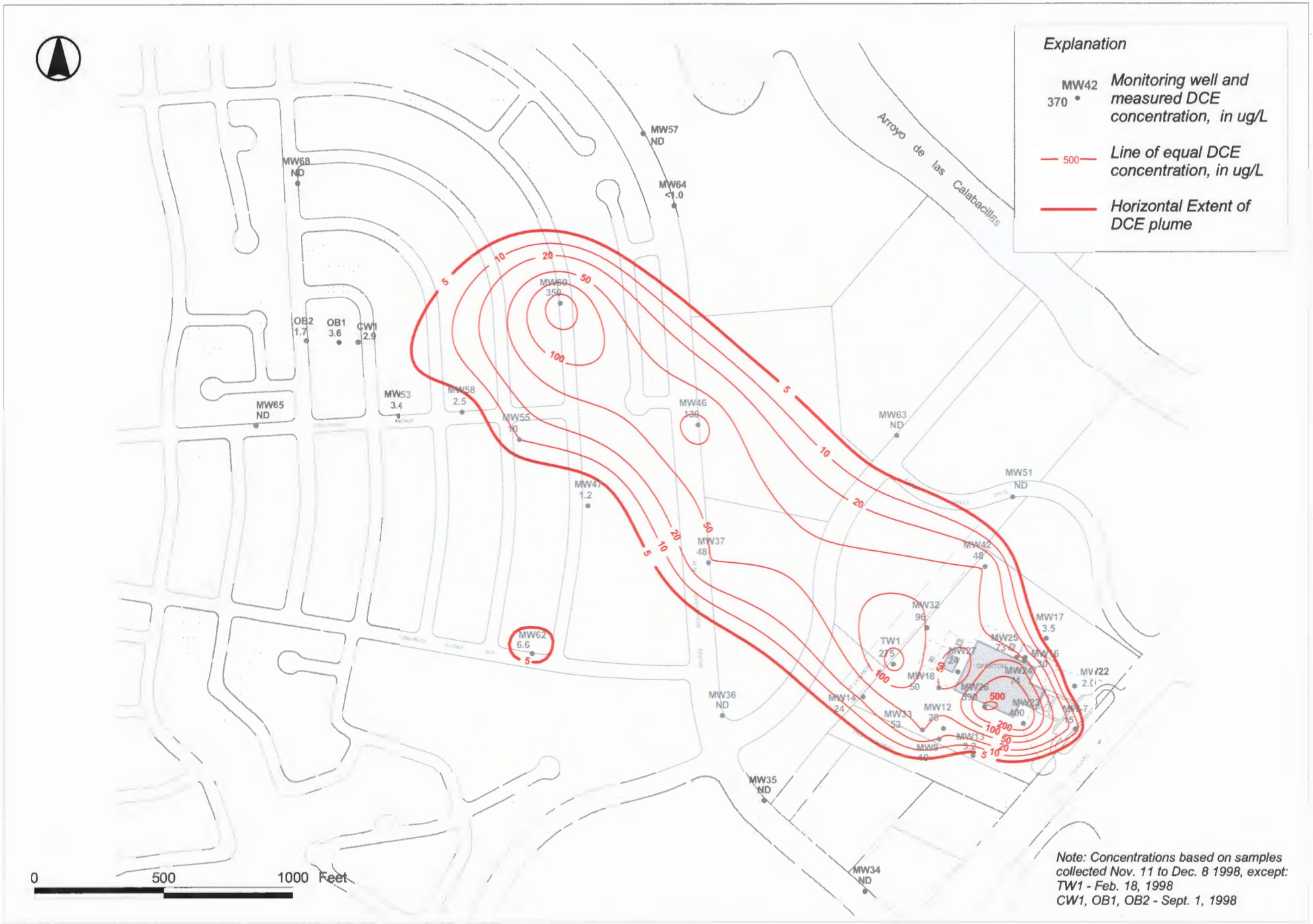


Figure 2.16 Horizontal Extent of DCE Plume - November 1998

Figure 2.17 Horizontal Extent of TCA Plume - November 1998

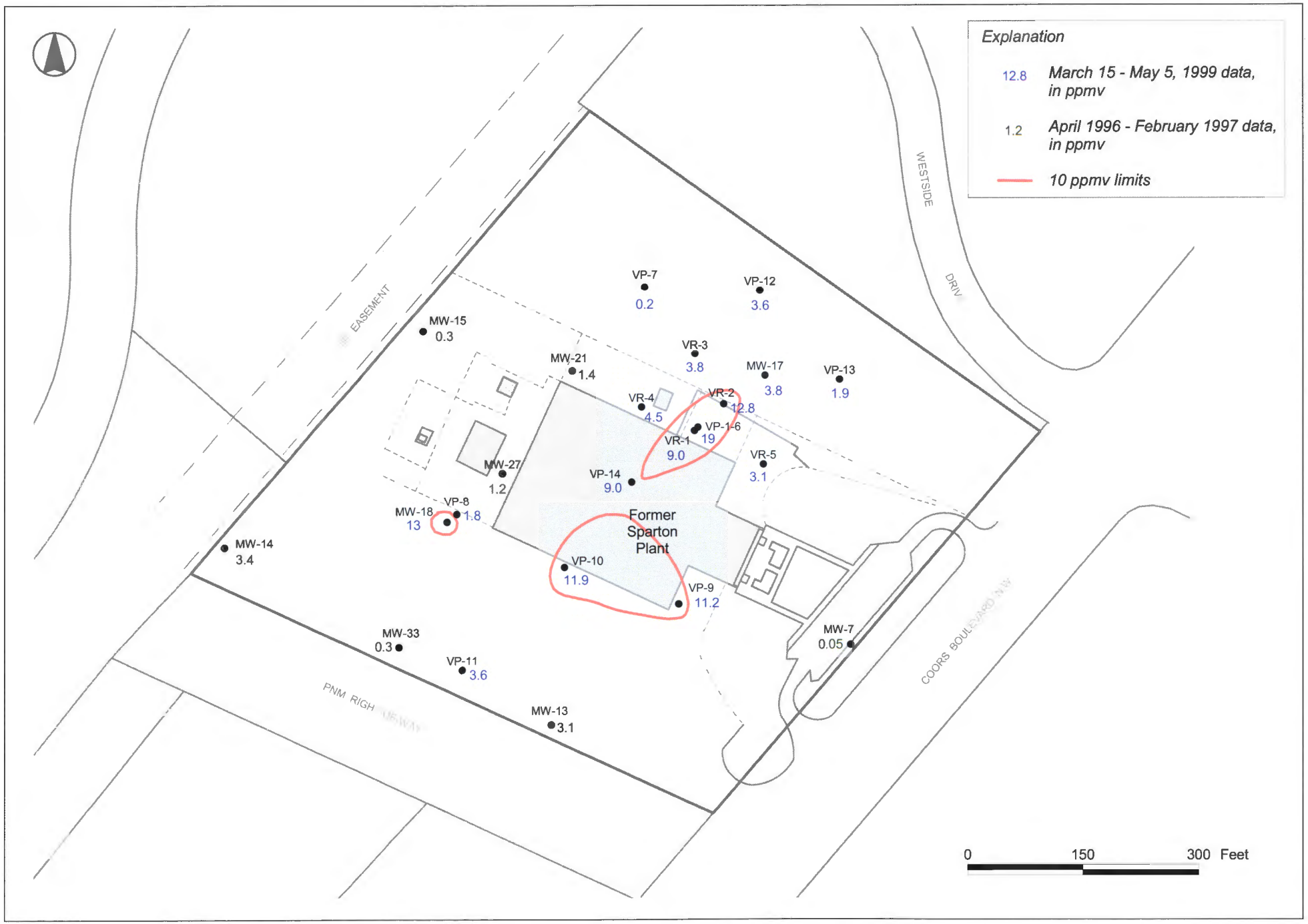


Figure 2.18 TCE Soil Gas Concentrations Prior to the 1999 Resumption of SVE System Operations

Figure 5.1 Elevation of the On-Site Water Table - February 13-14, 2012

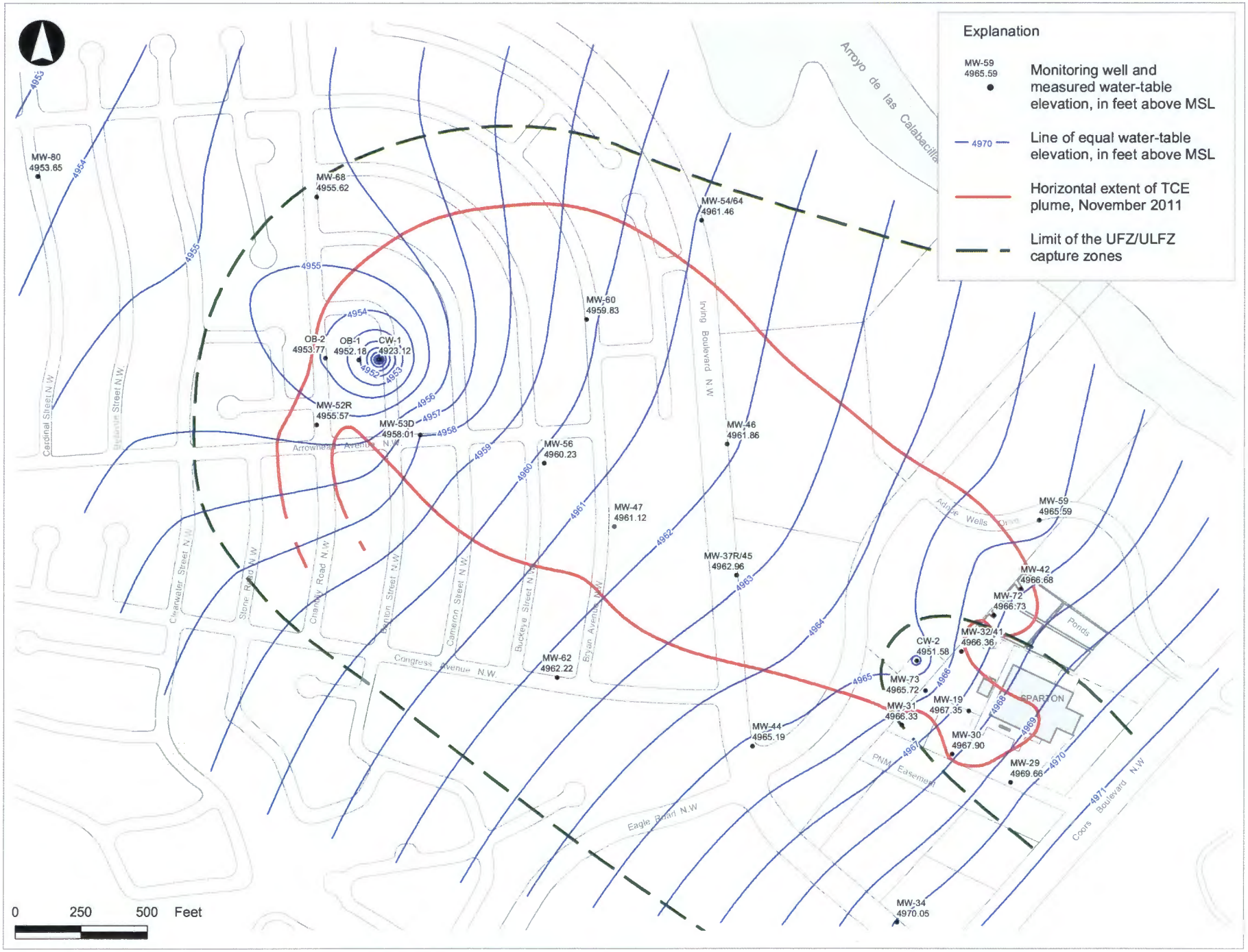


Figure 5.2 Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - February 13-14, 2012

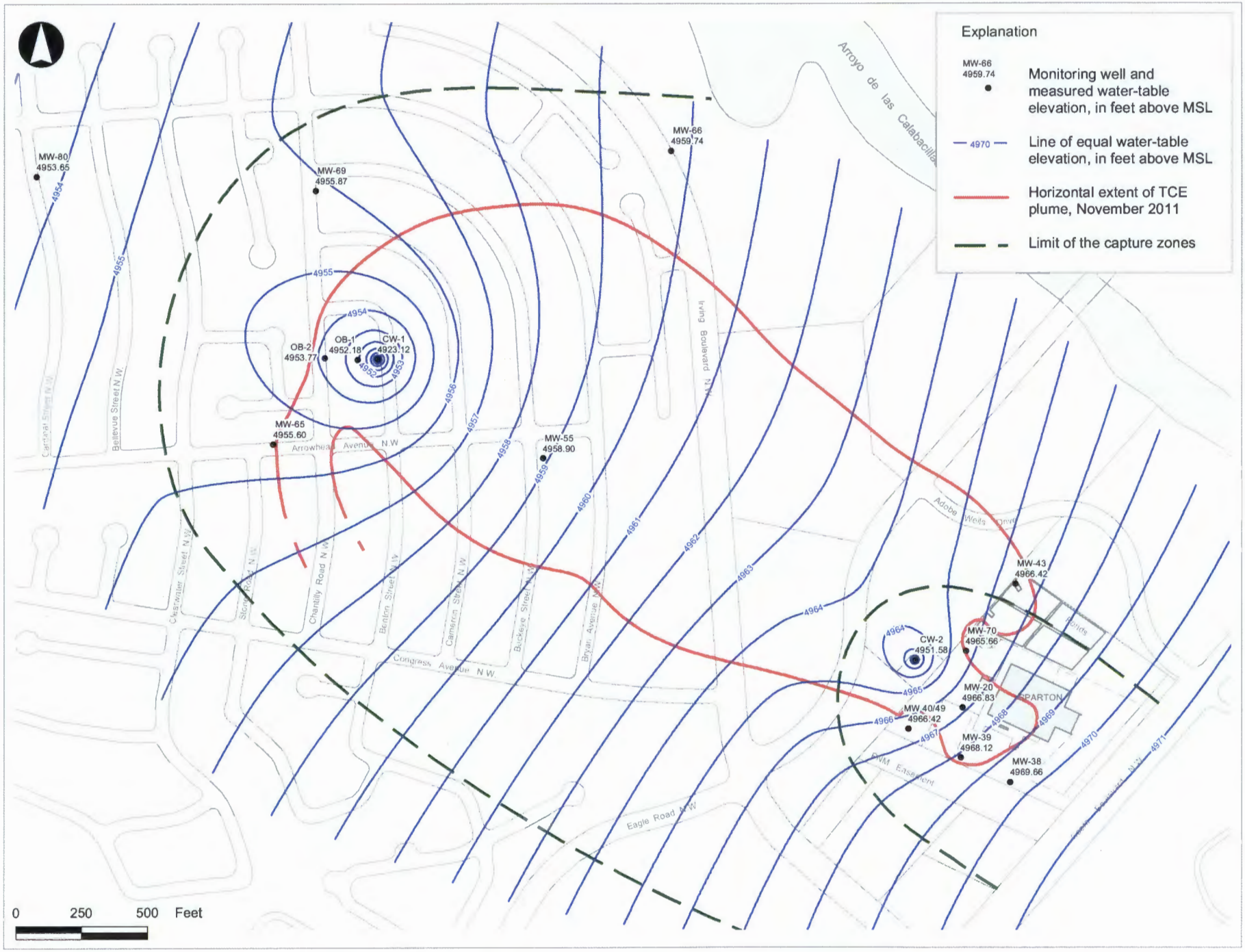


Figure 5.3 Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - February 13-14, 2012

Figure 5.4 Elevation of the On-Site Water Table - May 16-17, 2012

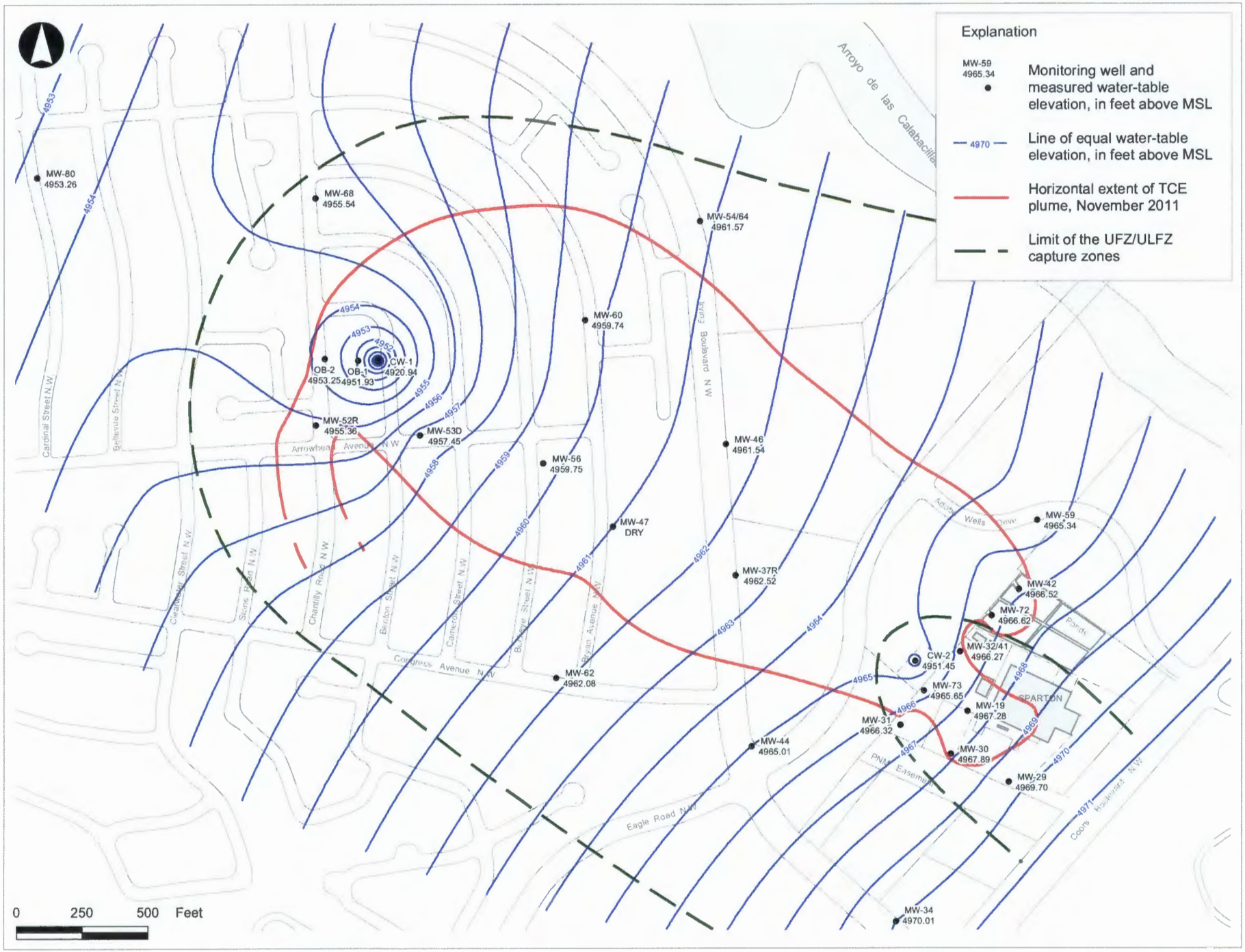


Figure 5.5 Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - May 16-17, 2012

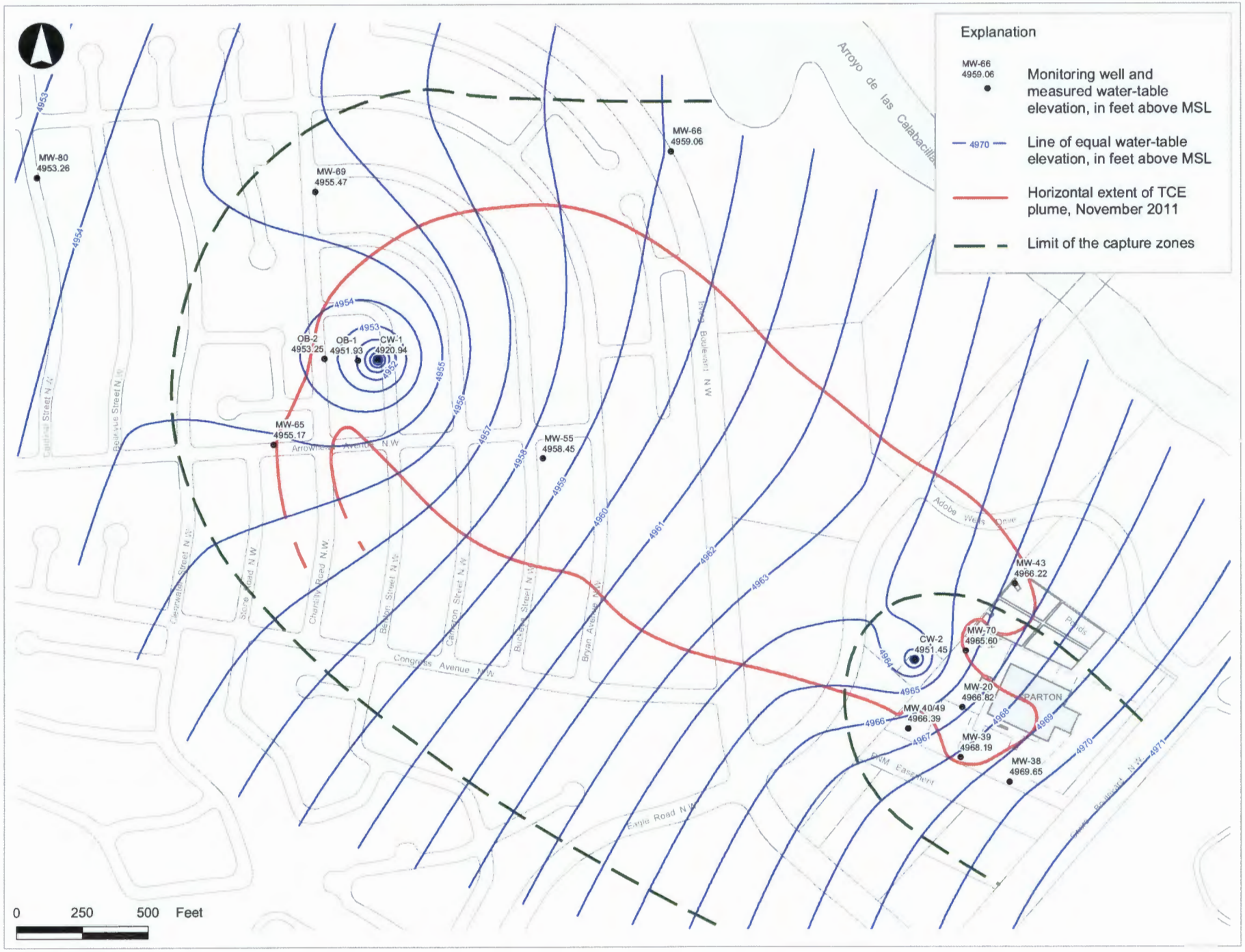


Figure 5.6 Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - May 16-17, 2012

Figure 5.7 Elevation of the On-Site Water Table - August 14-15, 2012

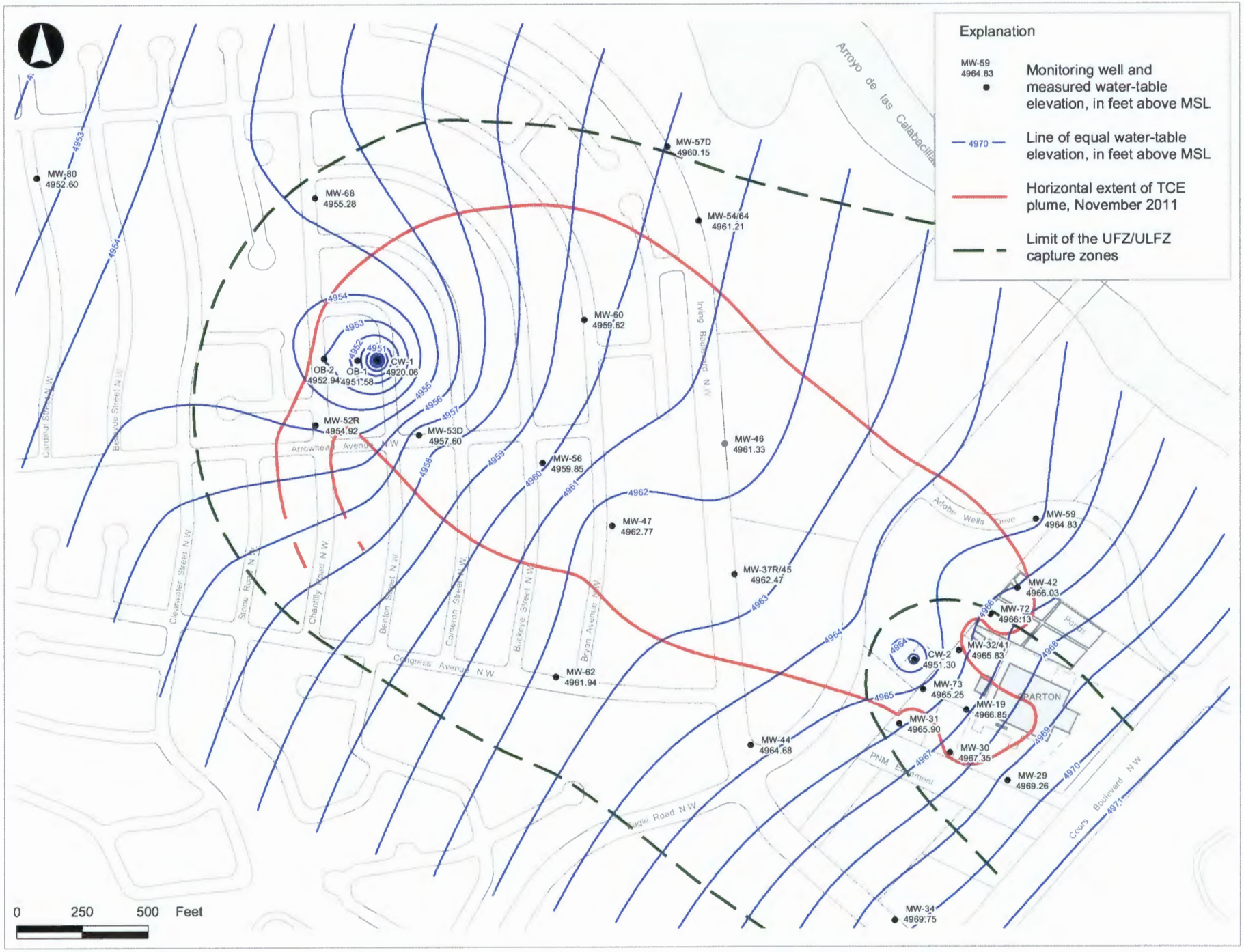


Figure 5.8 Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - August 14-15, 2012

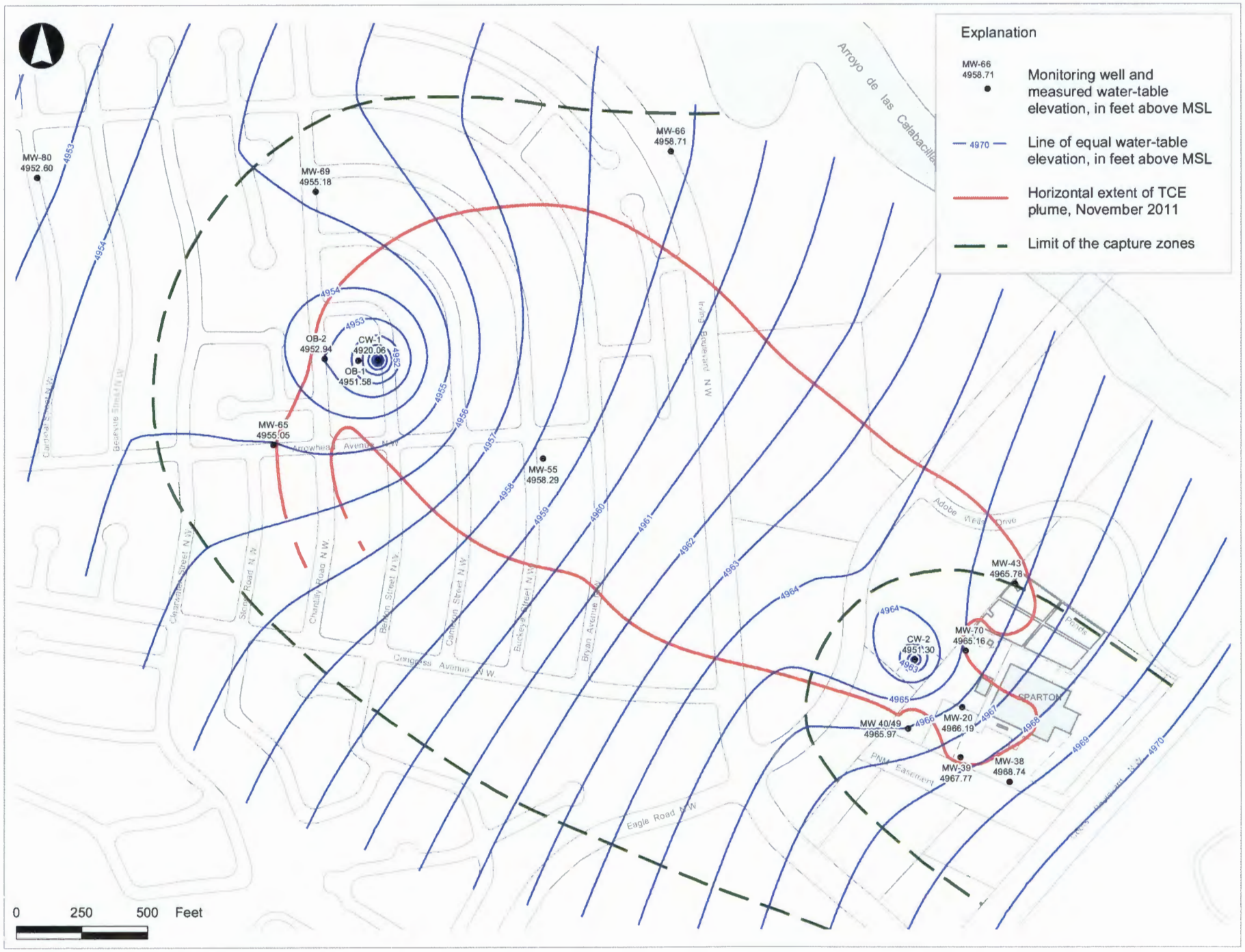


Figure 5.9 Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - August 14-15, 2012

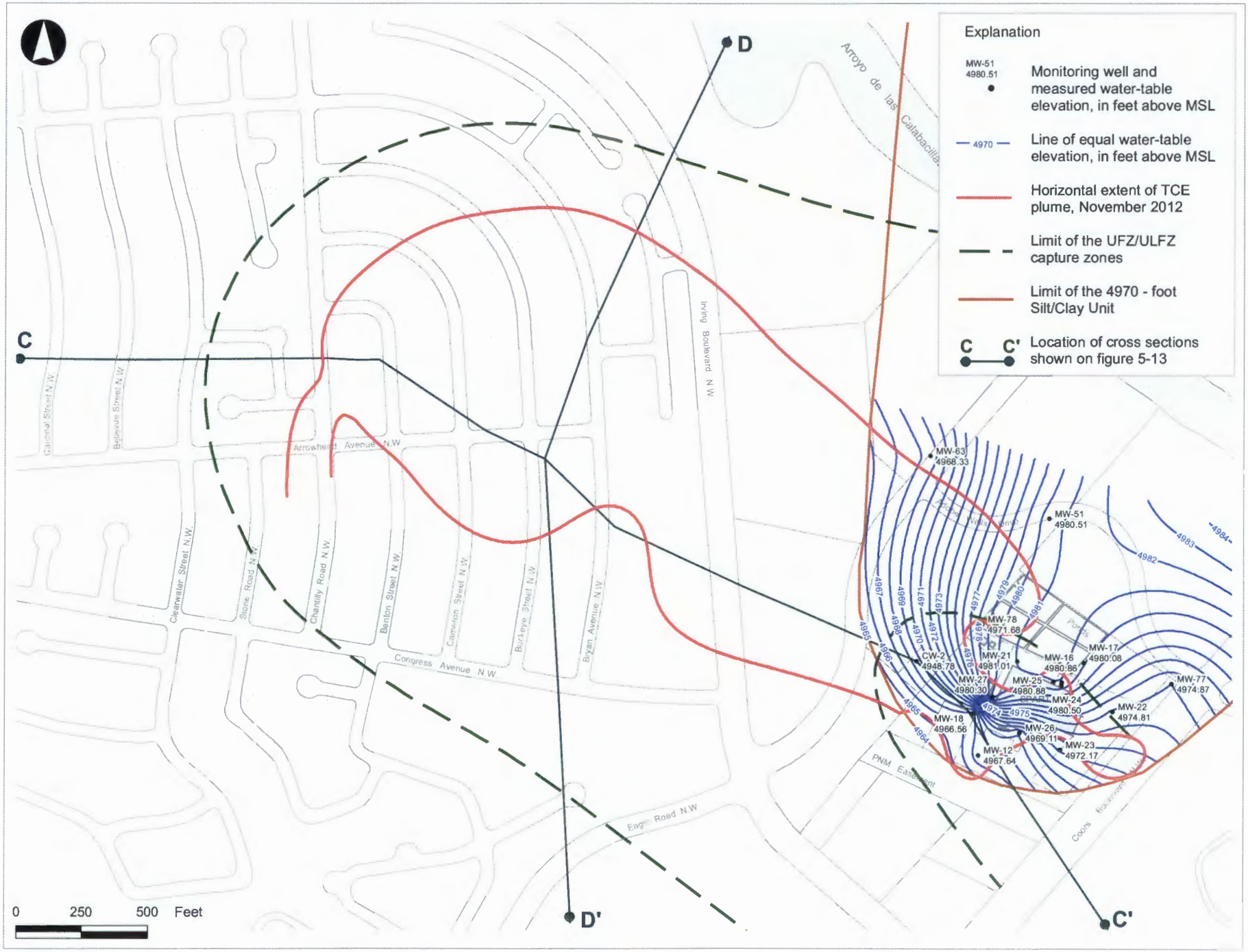


Figure 5.10 Elevation of the On-Site Water Table - November 6-8, 2012

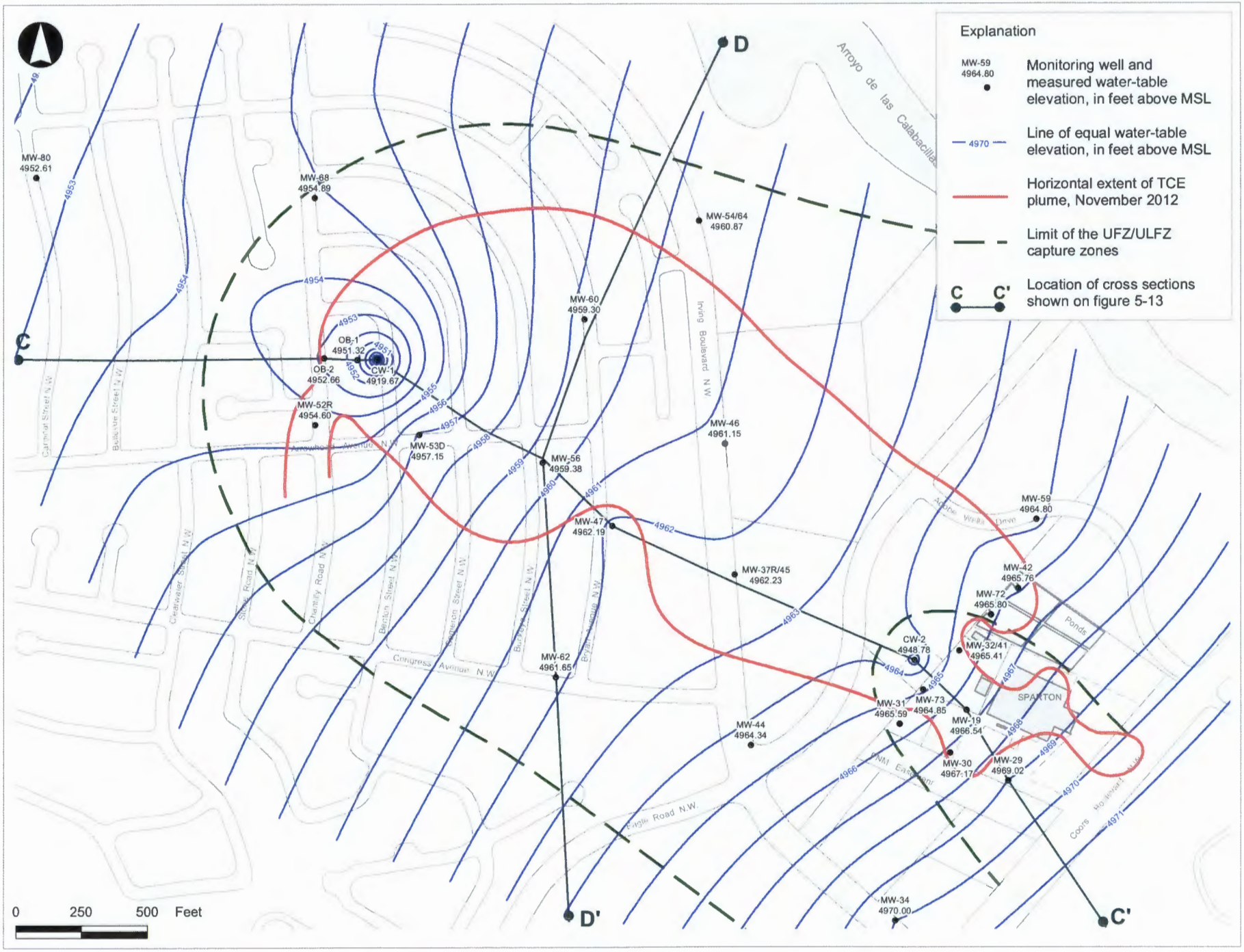


Figure 5.11 Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ-ULFZ - Nov 6-8, 2012

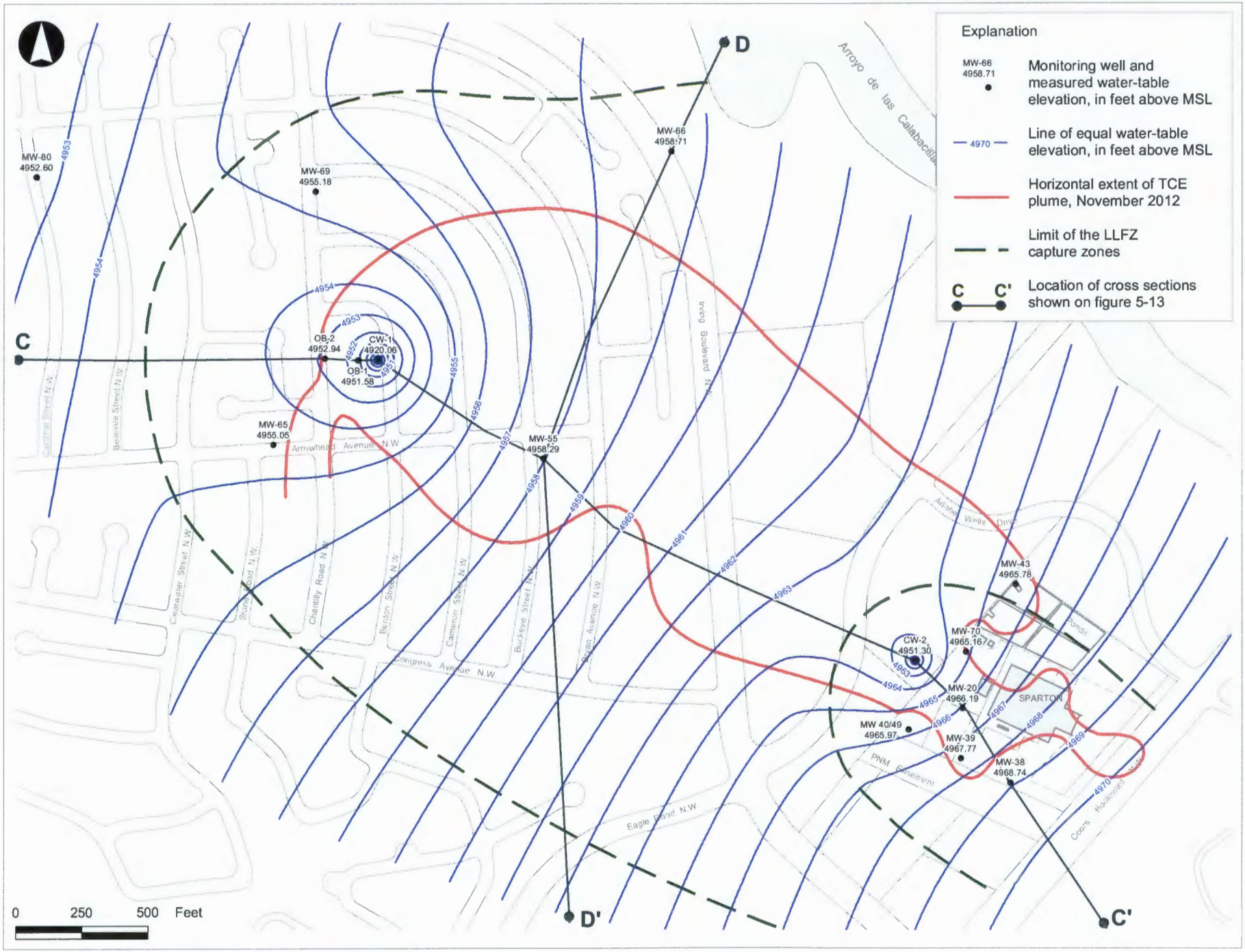
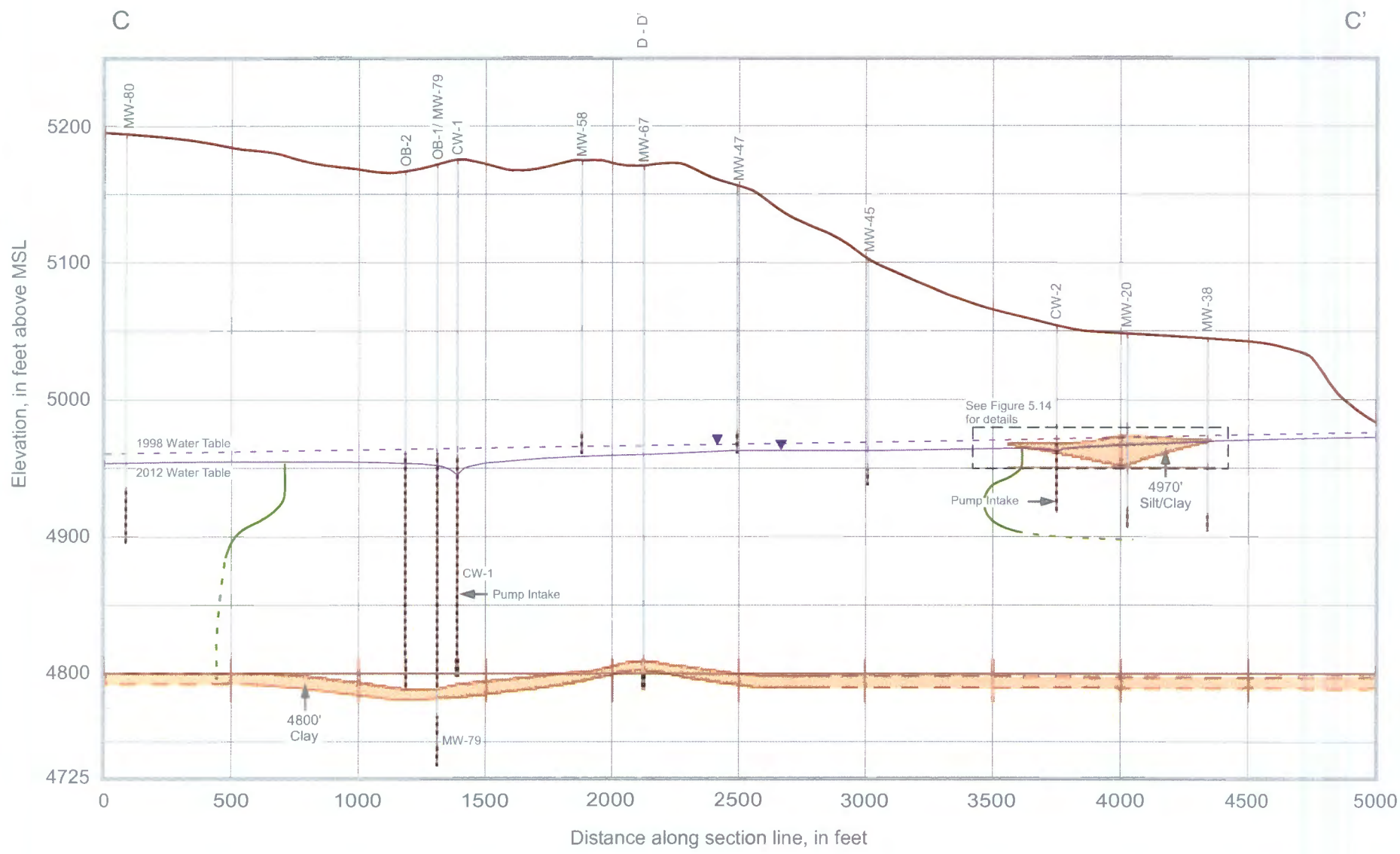
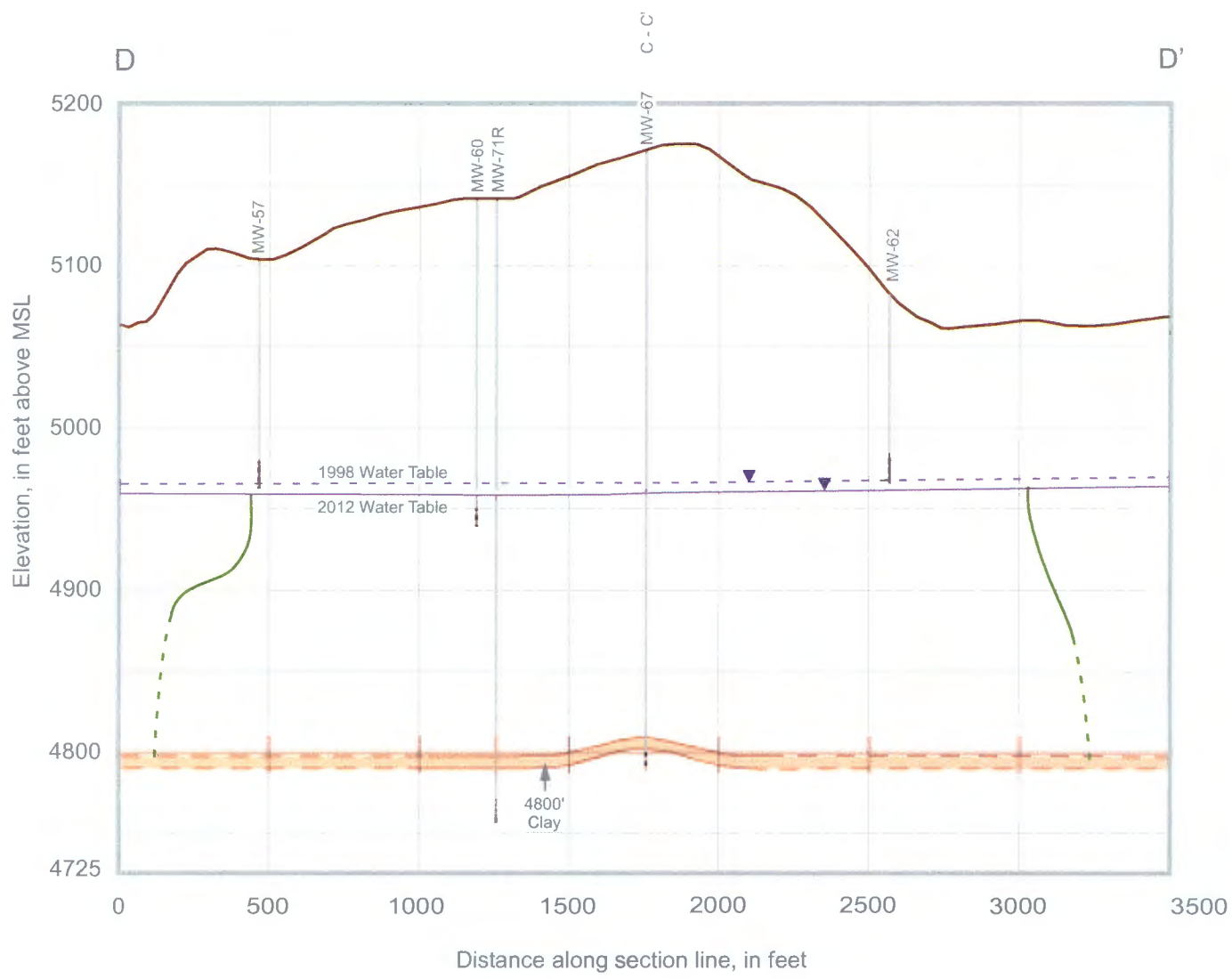


Figure 5.12 Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - Nov 6-8, 2012





Well Boring

Screened Interval

Water Table or ULFZ Potentiometric surface where confined by 4970-ft Clay/Silt unit

1998

2012

Limits of the 2012 Capture Zones

Locations of Cross Sections are shown on Figures 5.10-5.12

Figure 5.13 Schematic Cross-Sections Showing November 1998 and 2012 Water Levels and Containment Well Capture Zones

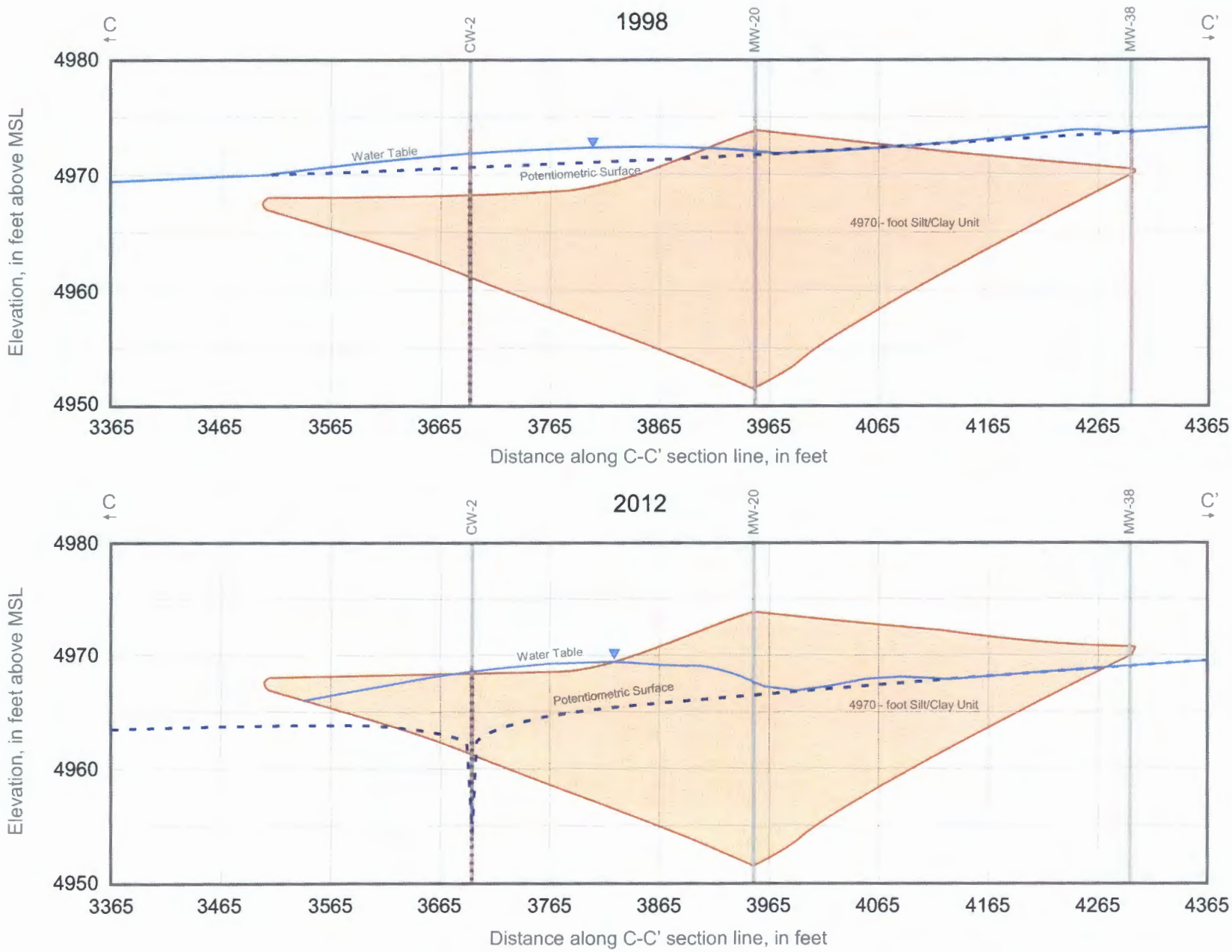


Figure 5.14 Details of Water Level Conditions at the Area Underlain by the 4970 - foot Silt/Clay Unit

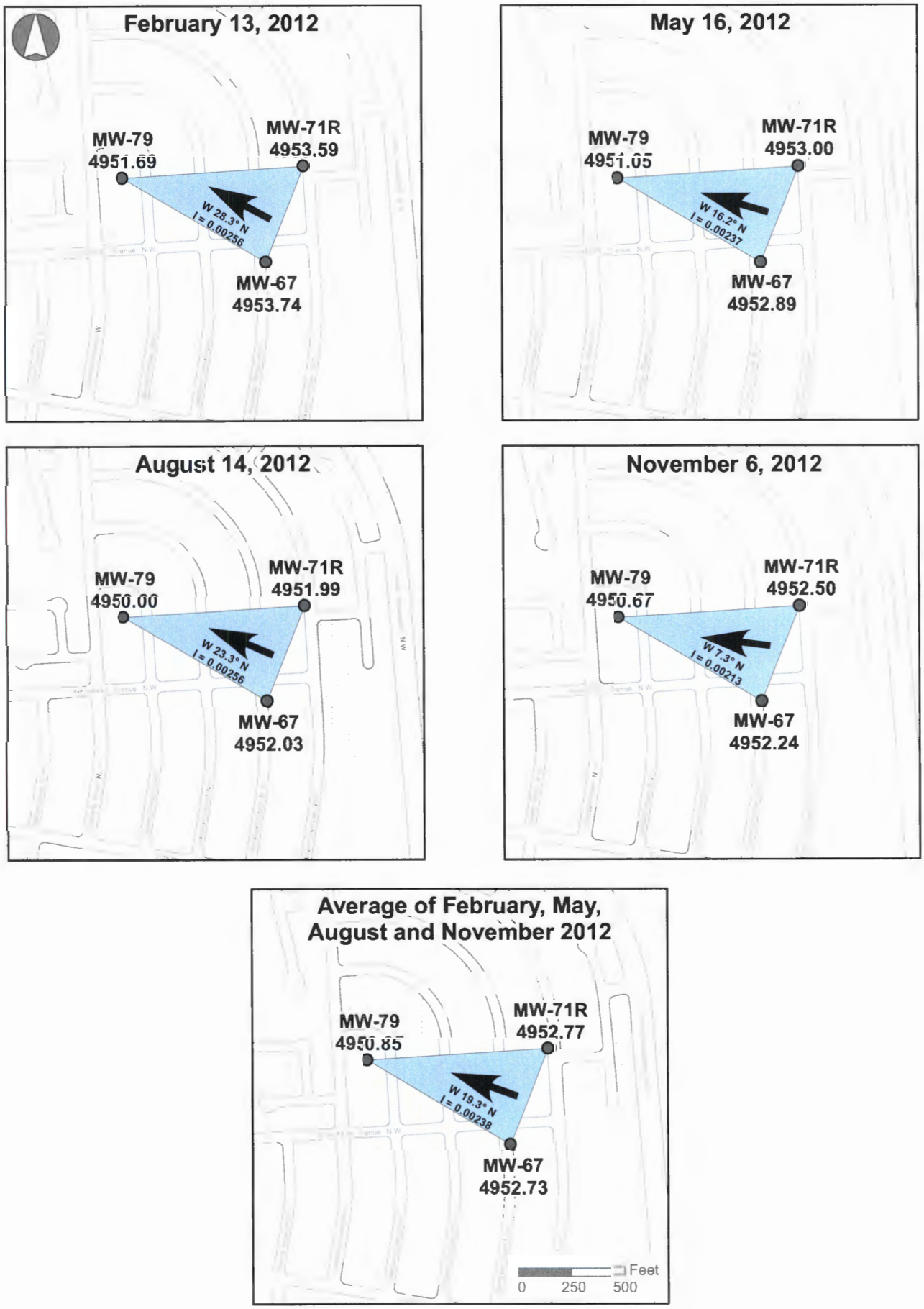
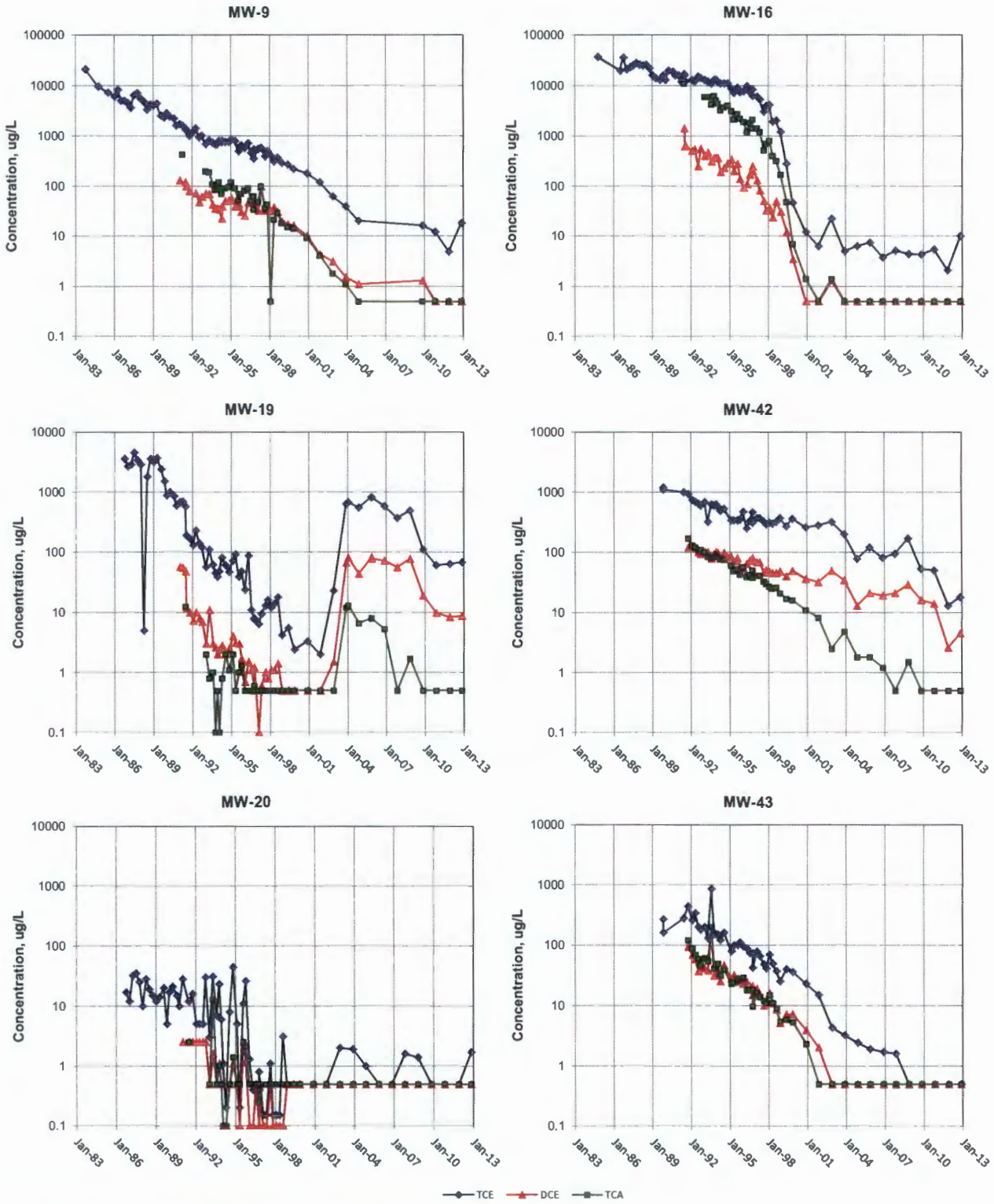
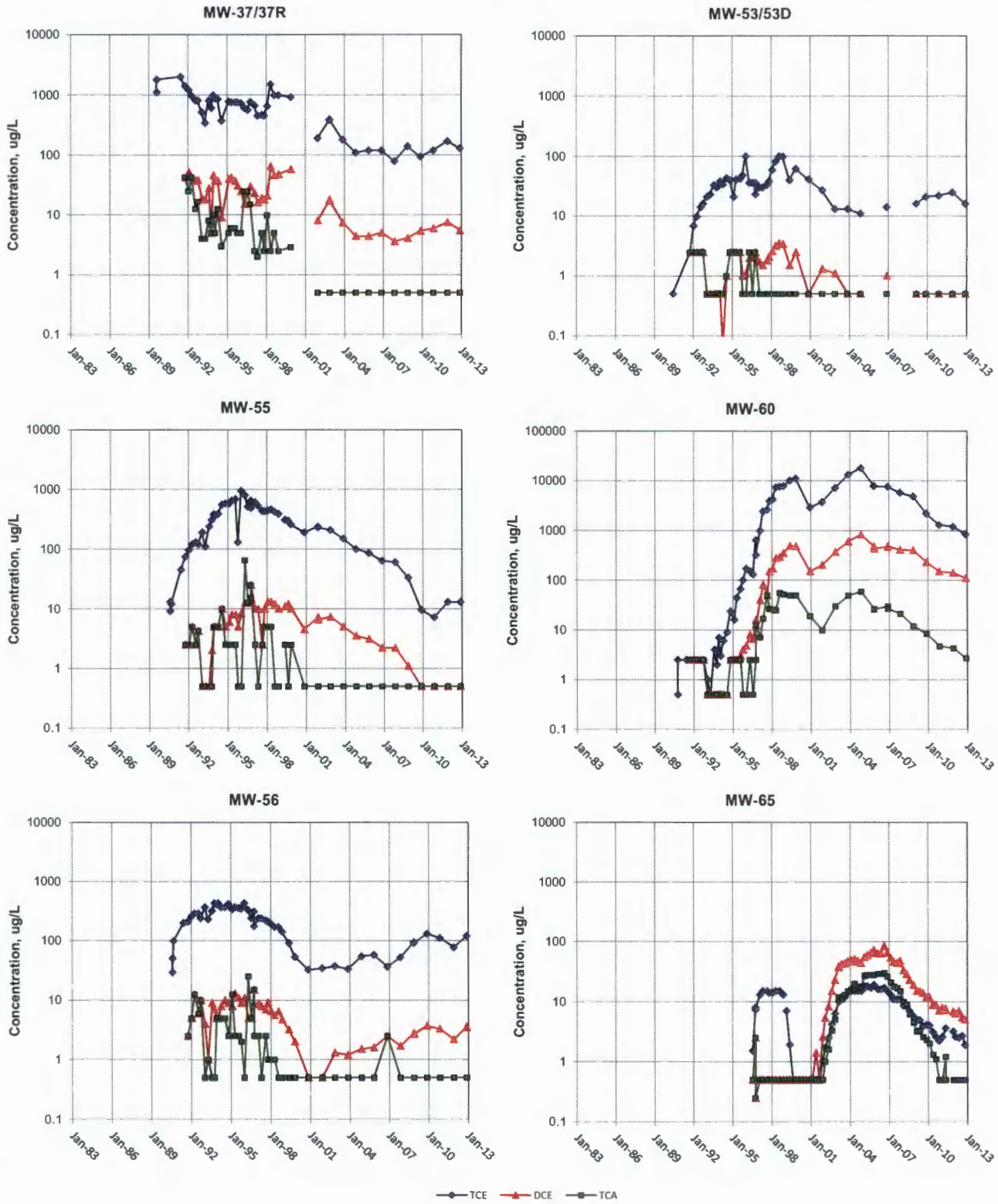


Figure 5.15 Groundwater Flow Direction and Hydraulic Gradient in the DFZ - 2012



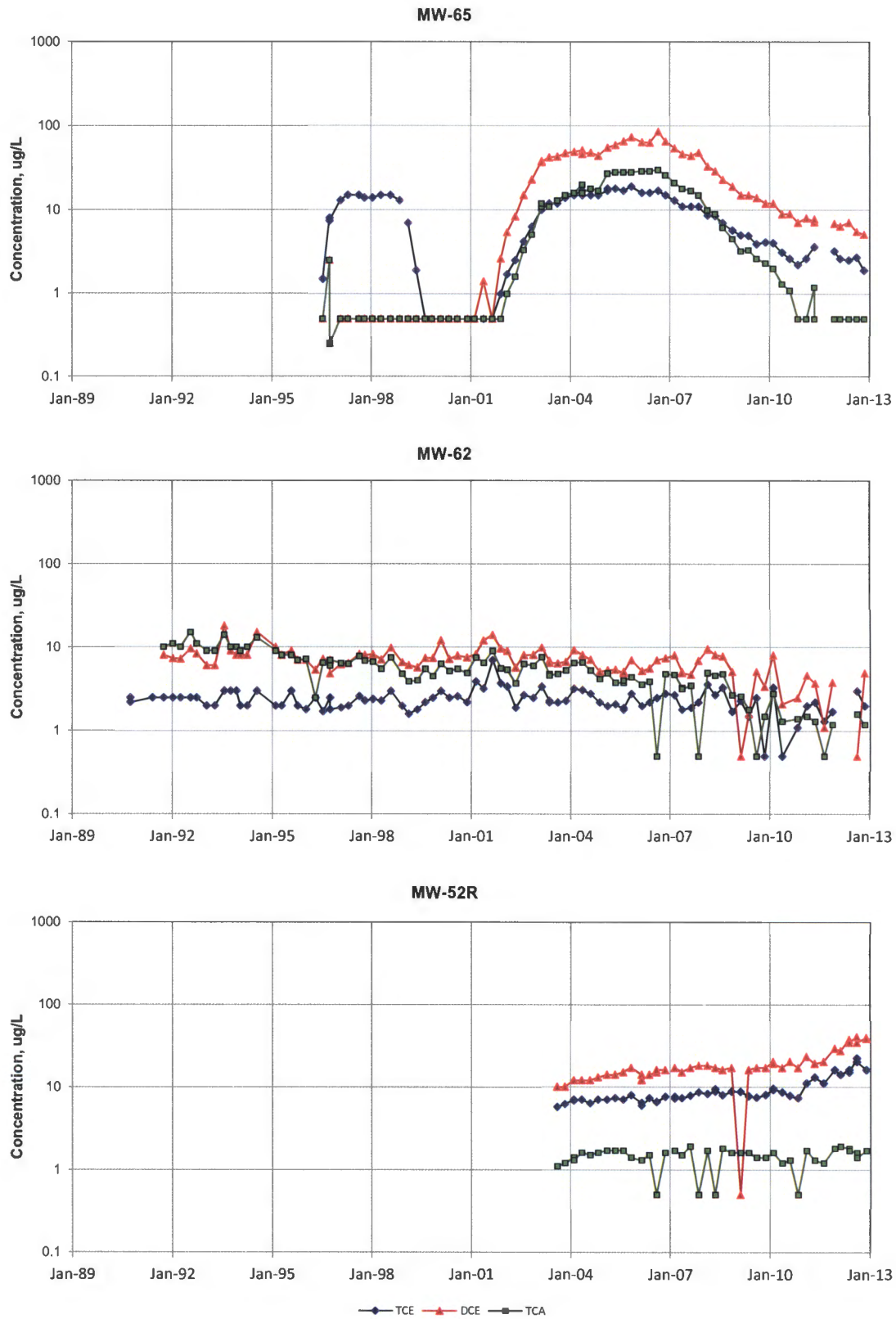
Note : Concentrations reported as less than the detection limit are plotted as 1/2 the detection limit.

Figure 5.16 Contaminant Concentration Trends in On-Site Monitoring Wells



Note : Concentrations reported as less than the detection limit are plotted as 1/2 the detection limit.

Figure 5.17 Contaminant Concentration Trends in Off-Site Monitoring Wells



Note : Concentrations reported as less than the detection limit are plotted as 1/2 the detection limit.

Figure 5.18 Concentration Trends in Monitoring Wells with DCE Dominated Contamination

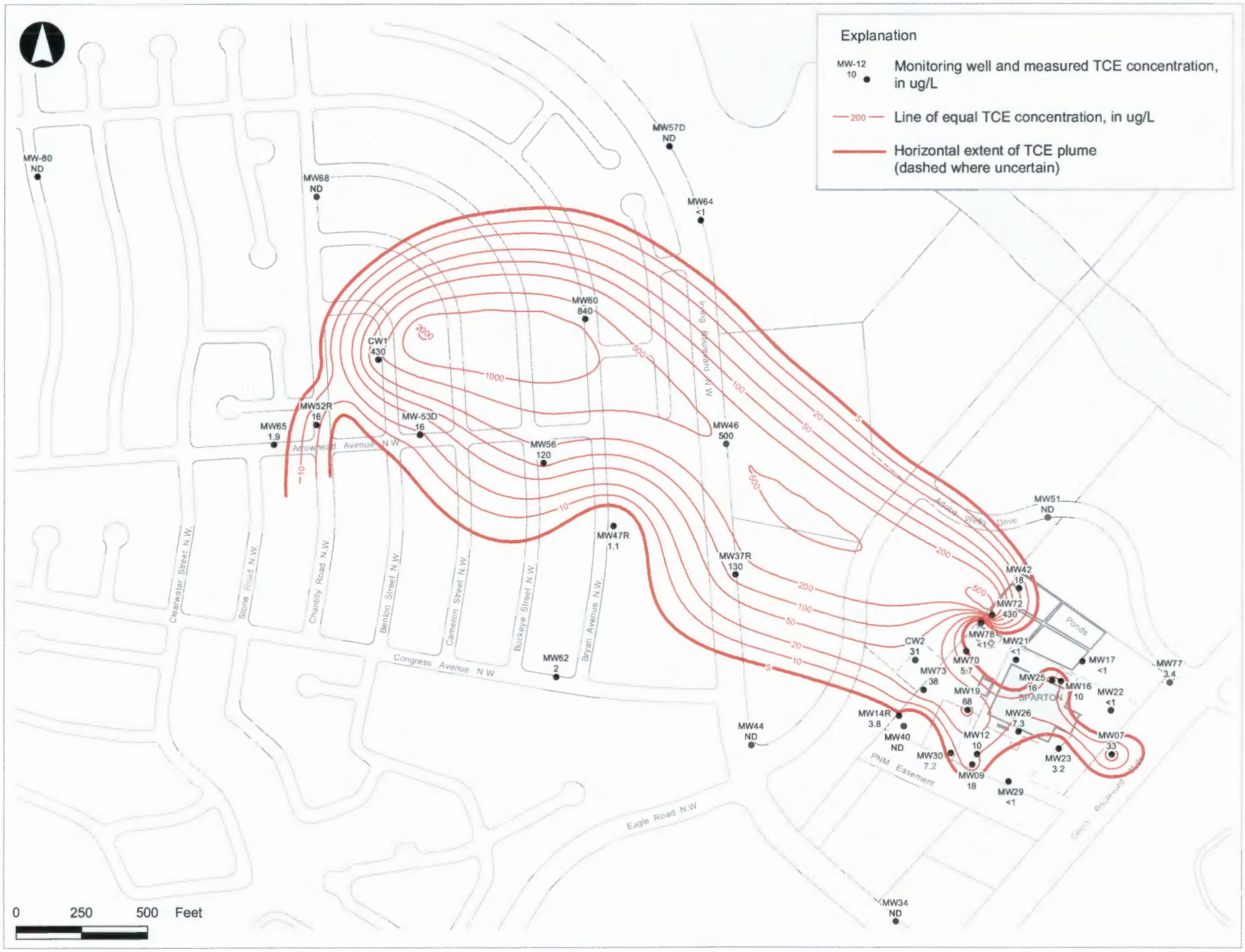


Figure 5.19 Horizontal Extent of TCE Plume - November 2012

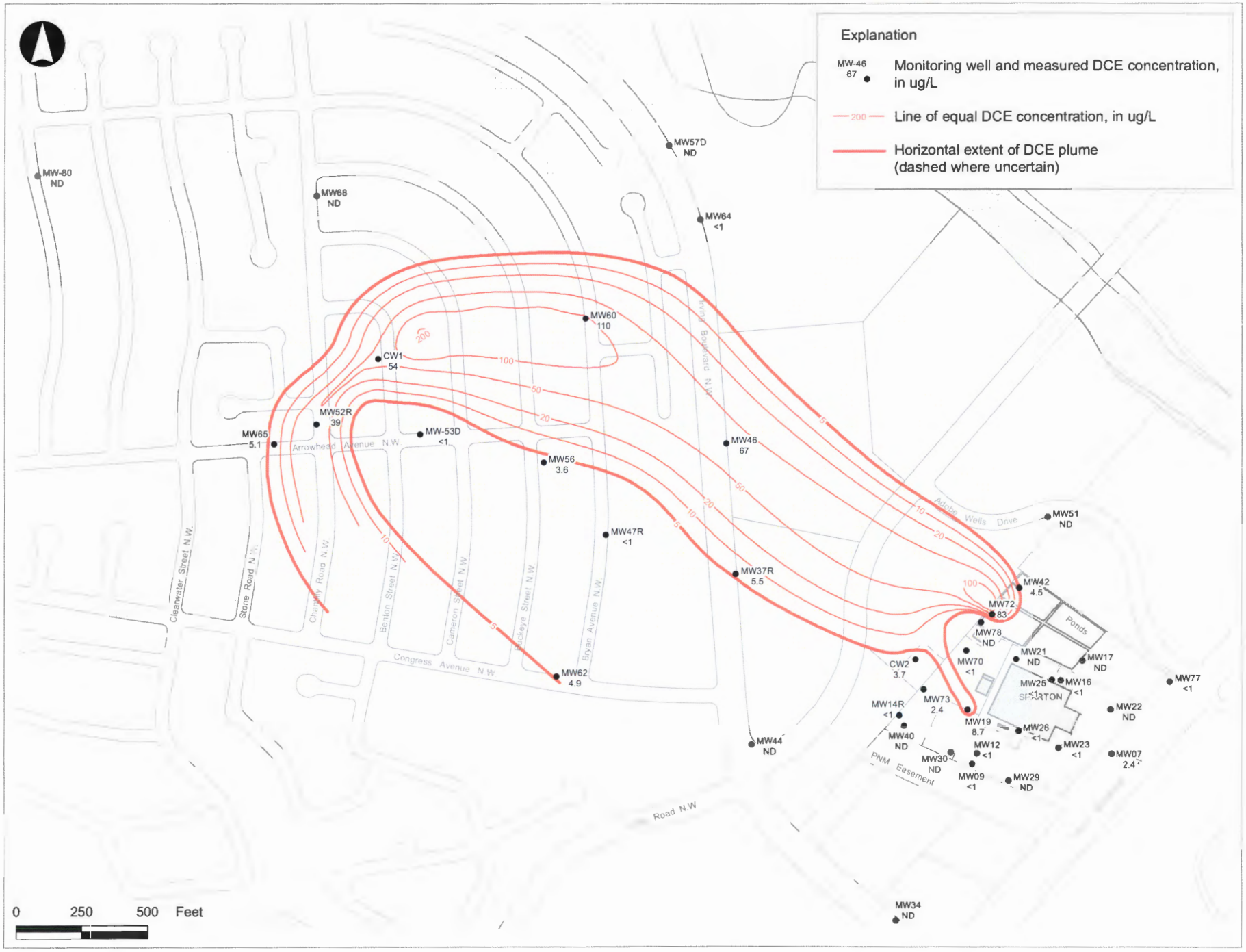


Figure 5.20 Horizontal Extent of DCE Plume - November 2012

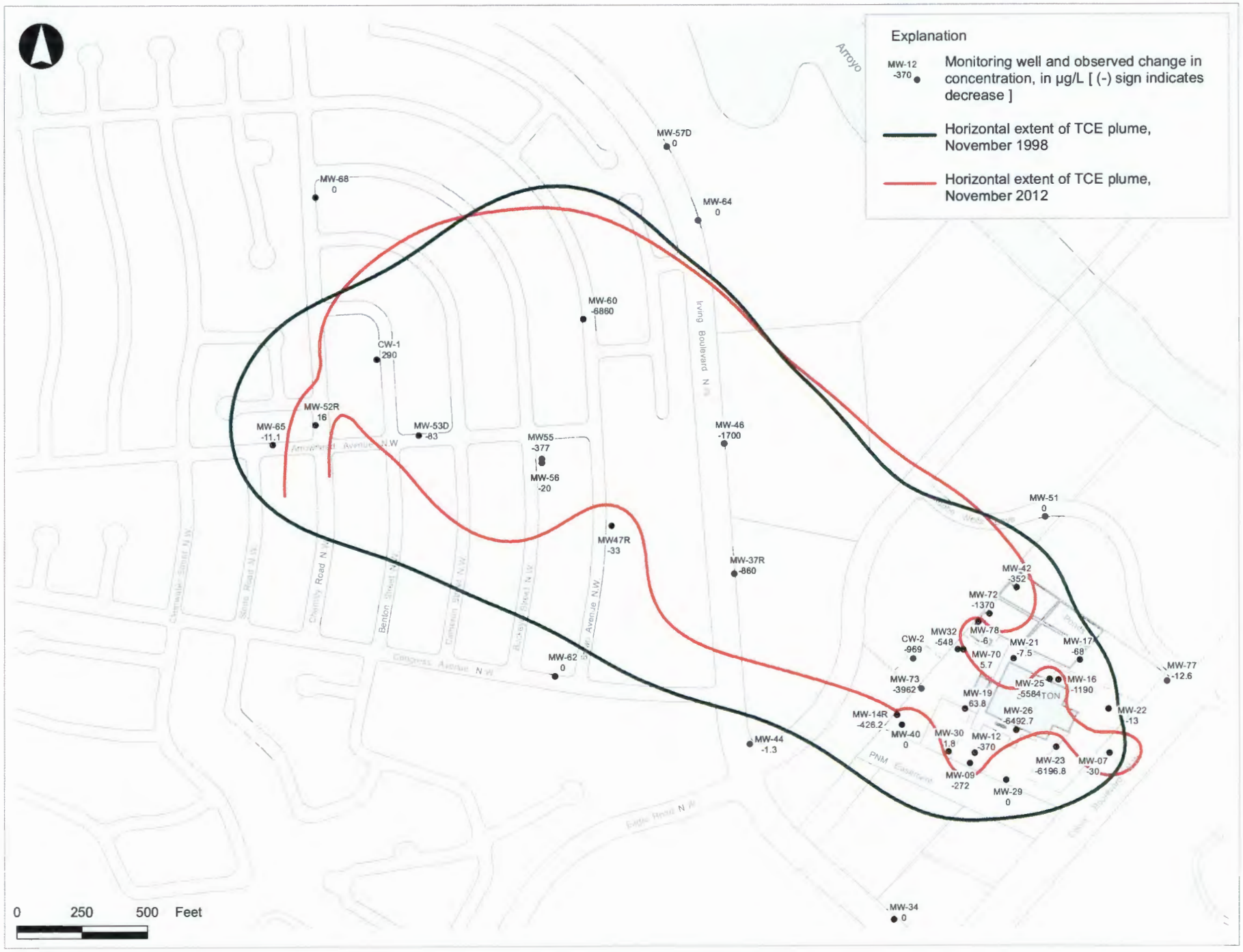


Figure 5.21 Changes in TCE Concentrations at Wells used for Plume Definition - November 1998 to November 2012

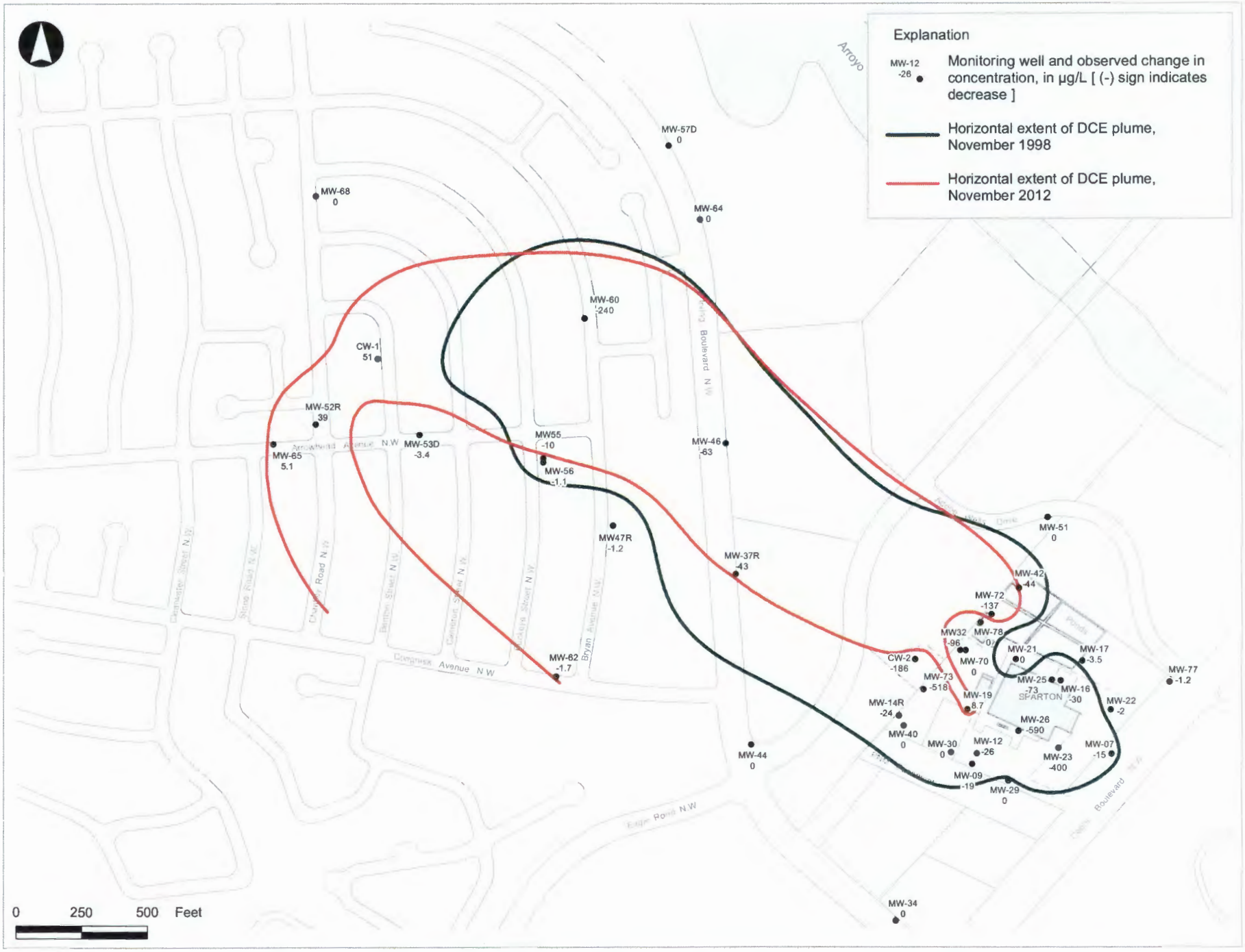


Figure 5.22 Changes in DCE Concentrations at Wells used for Plume Definition - November 1998 to November 2012

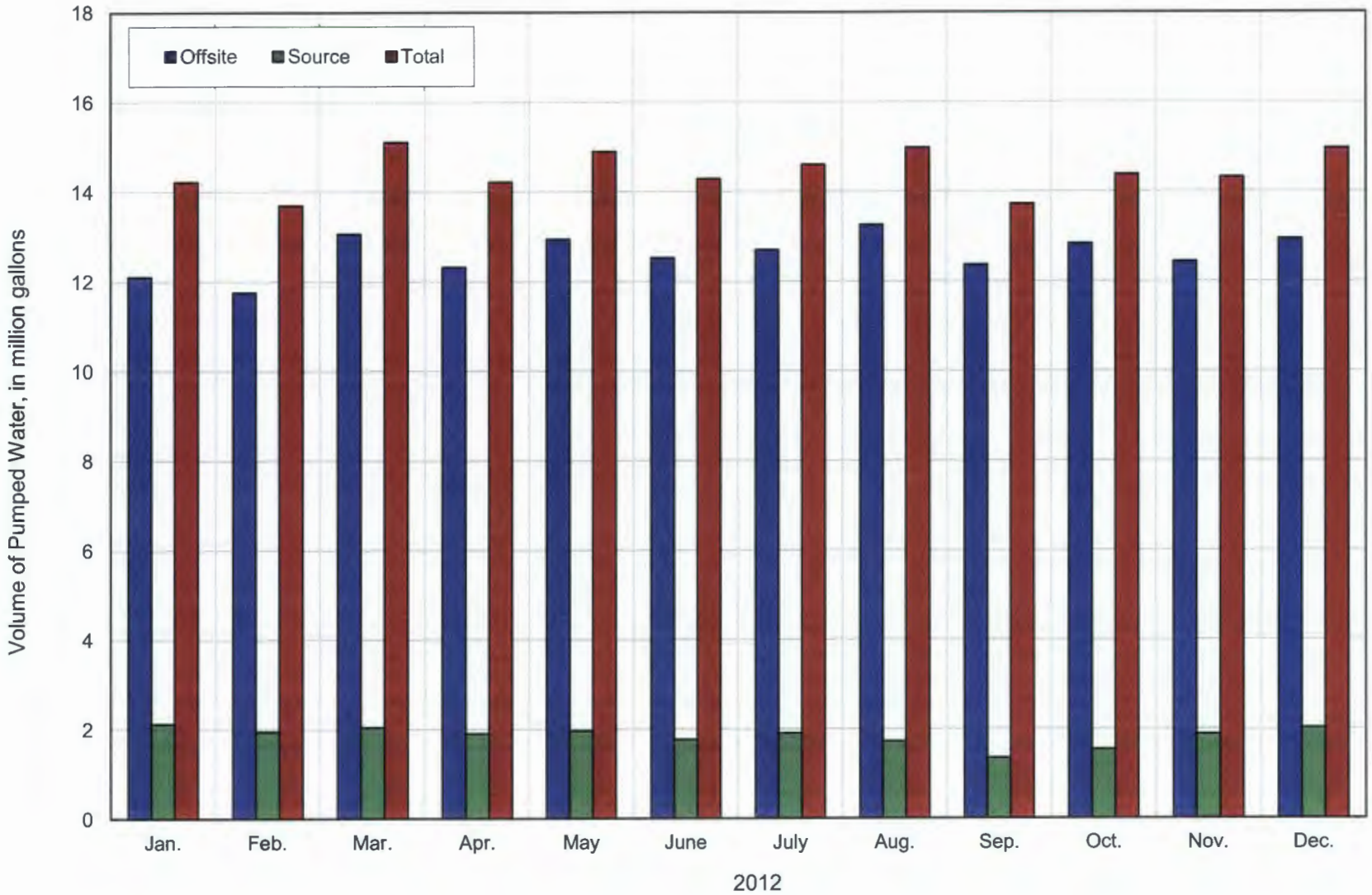


Figure 5.23 Monthly Volume of Water Pumped by the Containment Wells - 2012

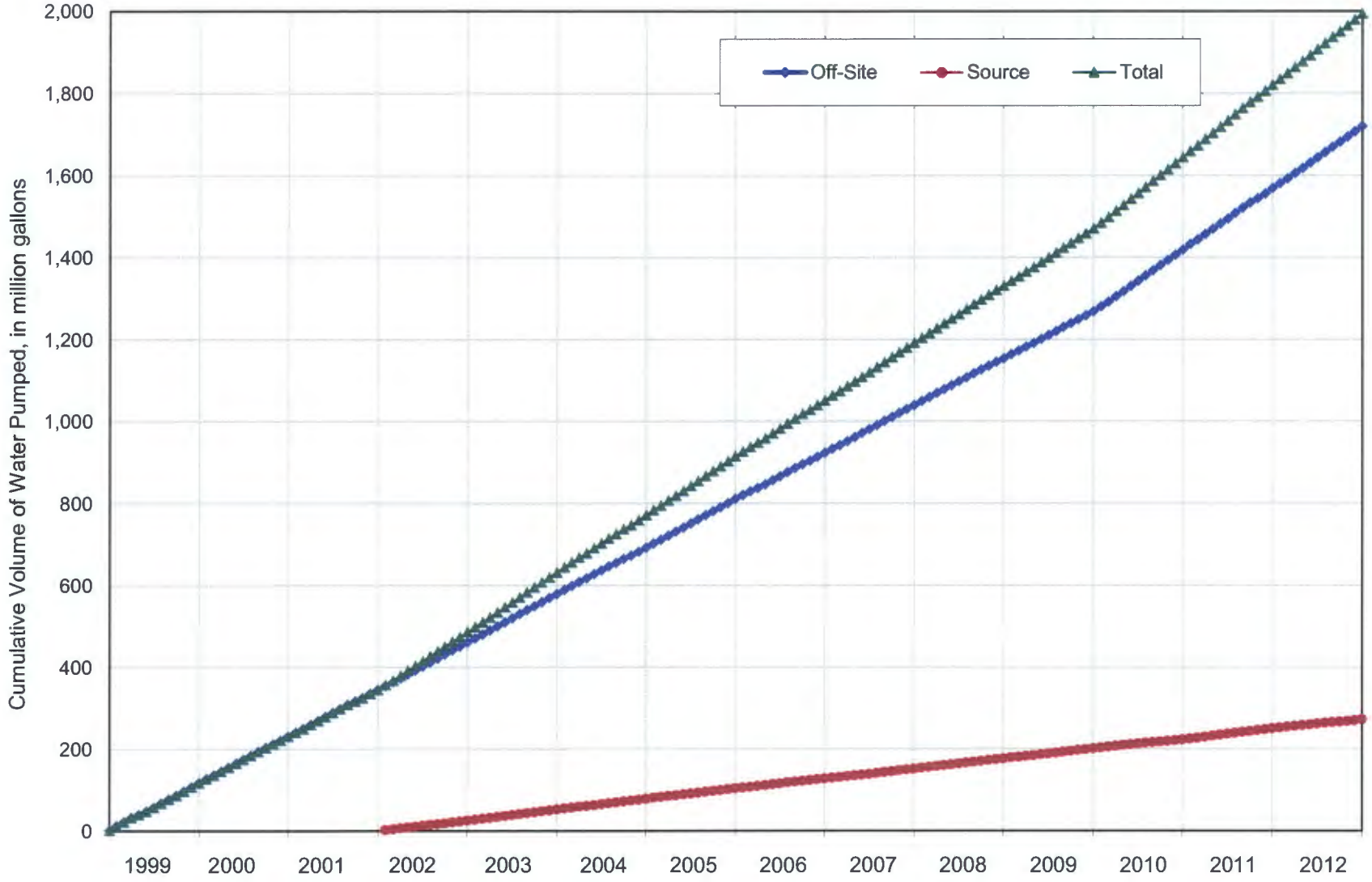


Figure 5.24 Cumulative Volume of Water Pumped by the Containment Wells

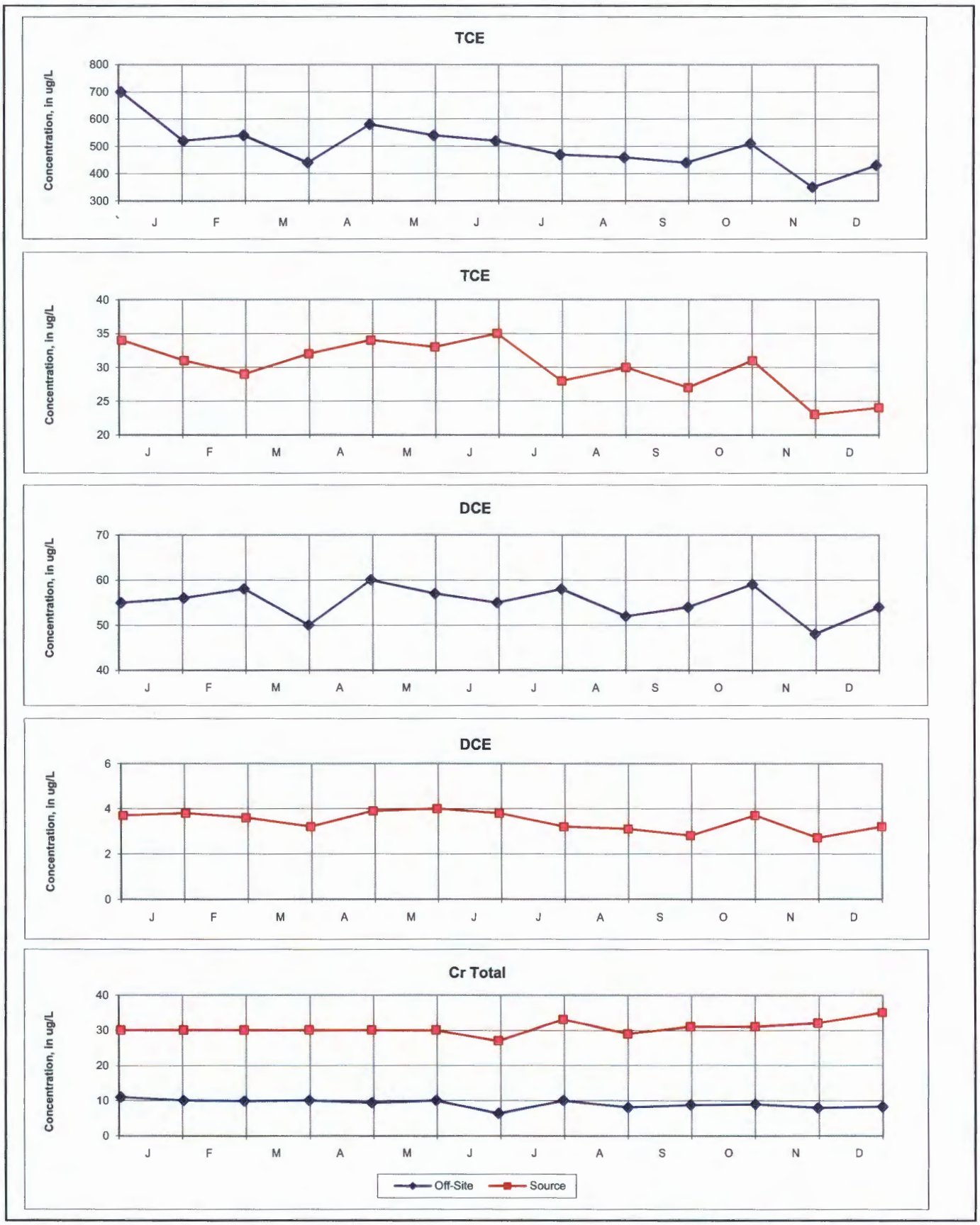
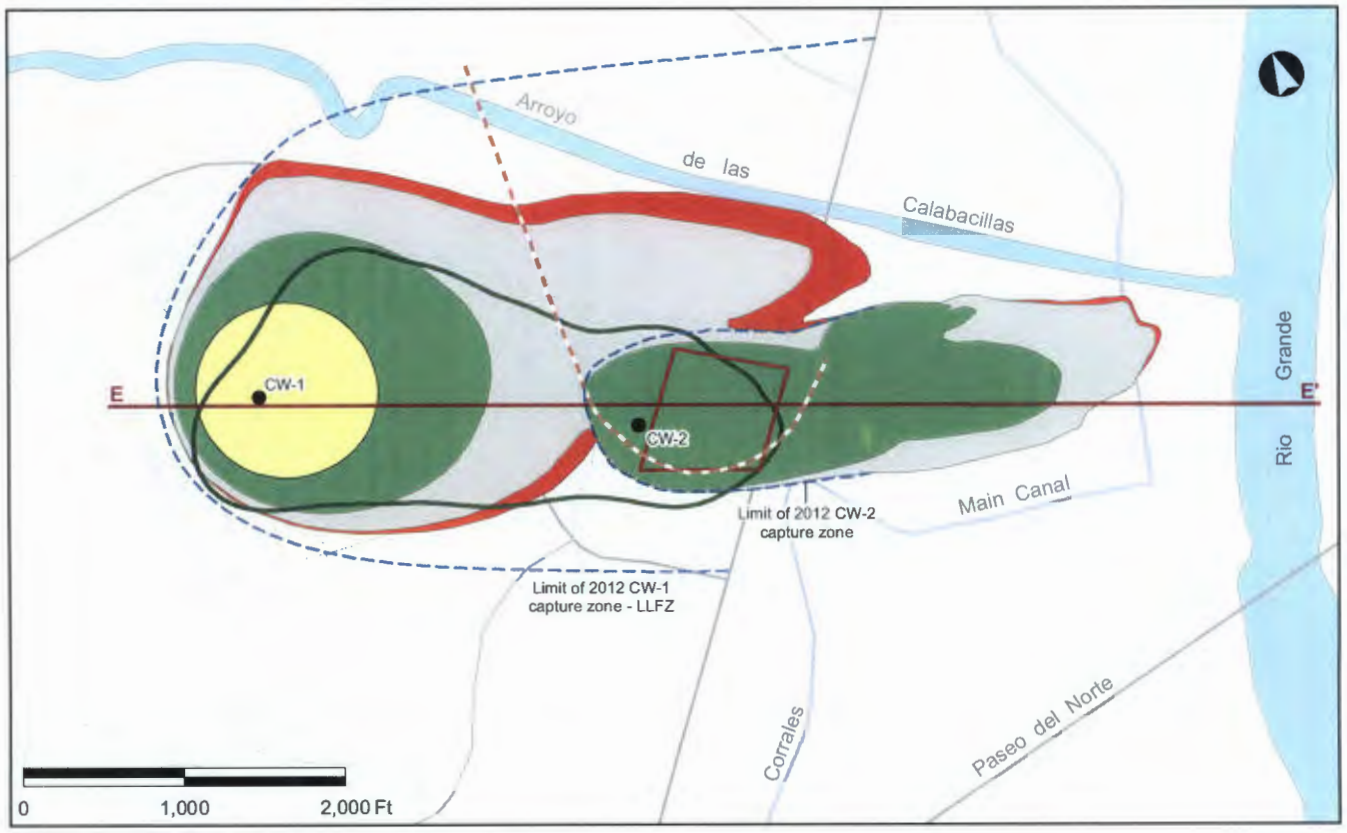
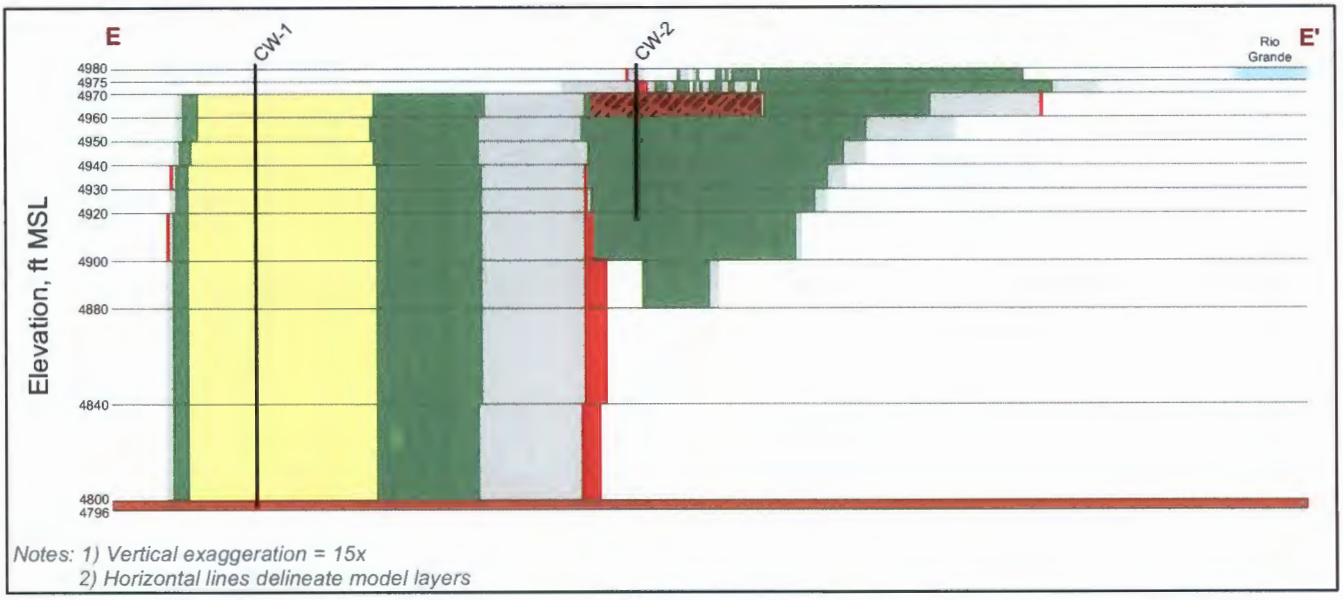


Figure 5.25 Off-Site and Source Containment Systems - TCE, DCE, and Total Chromium Concentrations in the Influent - 2012

a)



b)



Explanation

- Containment Well
- Horizontal extent of TCE plume, November 1998
- Limit of the 4970 - foot Silt/Clay Unit
- 4970 - foot Silt/Clay Unit

Area of origin (based on porosity of 0.3) of the water pumped during:

- 1999 - 2001
- 2002- 2006
- 2007 - 2011
- 2012
- 4800-foot clay

Figure 5.26 Areas of Origin of Water Pumped Since the Beginning of Remedial Operations

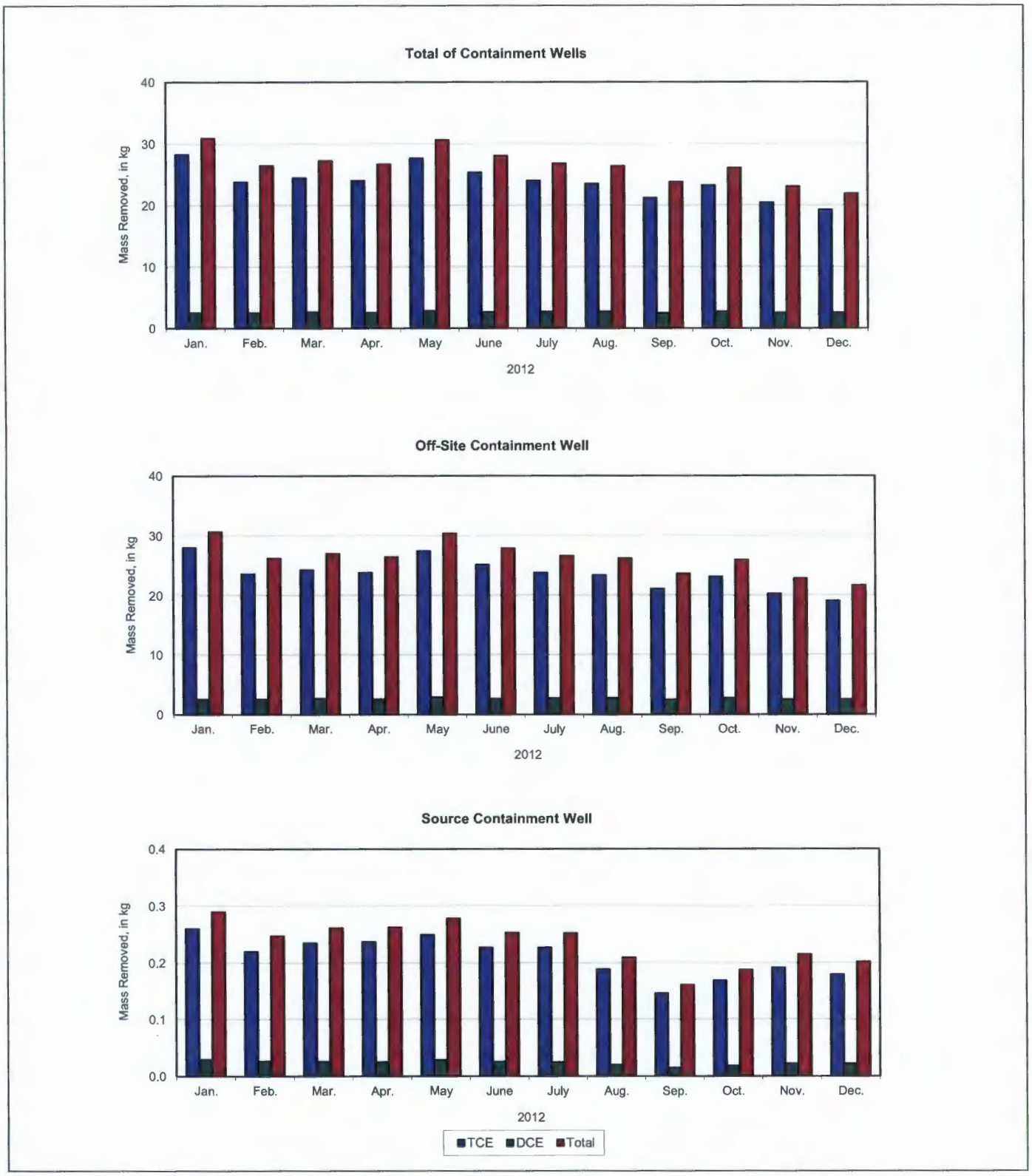


Figure 5.27 Monthly Contaminant Mass Removal by the Containment Wells - 2012

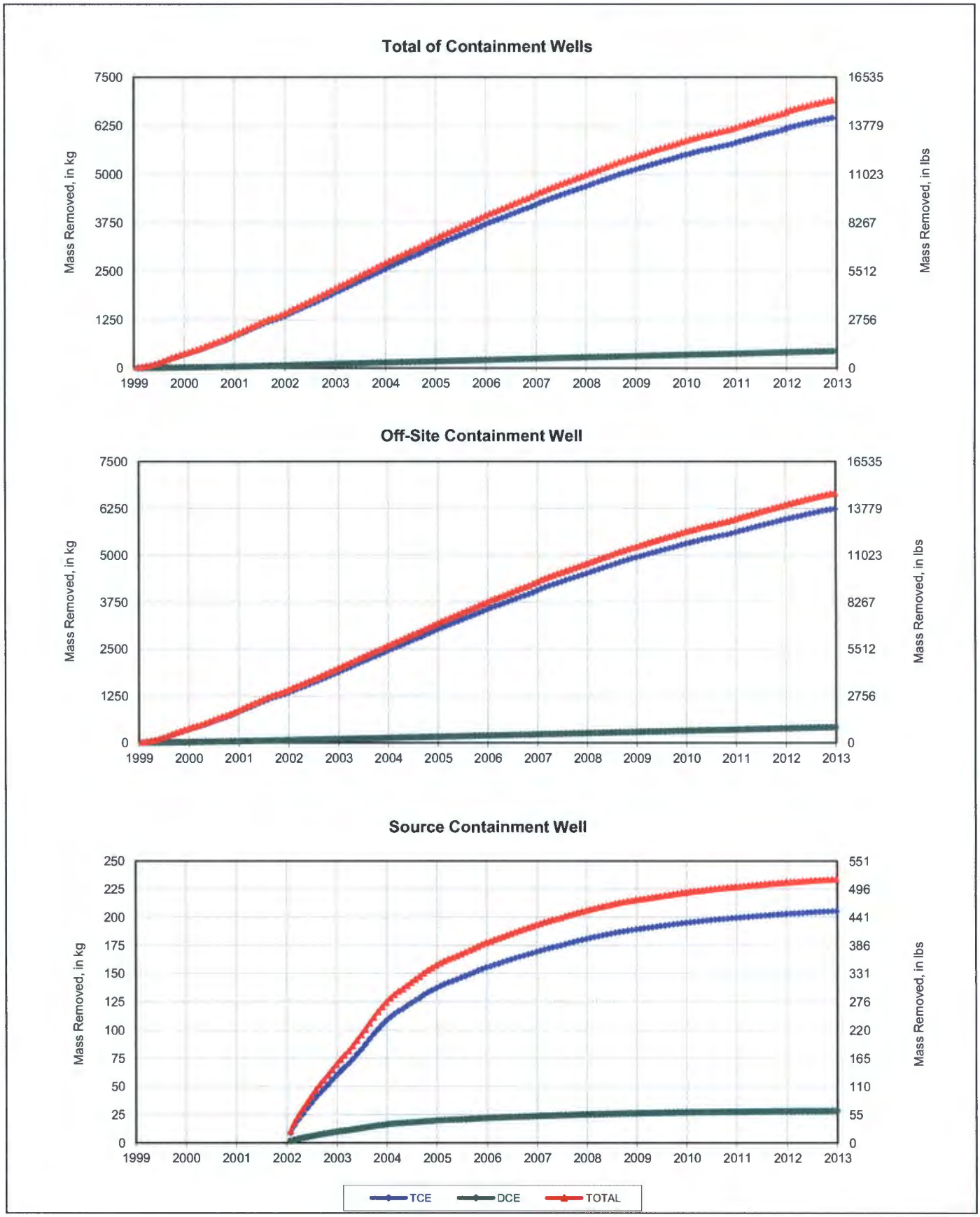


Figure 5.28 Cumulative Contaminant Mass Removal by the Containment Wells

TABLES

Table 2.1

Completion Flow Zone, Location Coordinates, and Measuring Point Elevation of Existing Wells

Well ID	Flow Zone[a]	Easting[b]	Northing[b]	Elevation[c]
CW-1	UFZ&LFZ	374740.43	1525601.48	5168.02
CW-2	UFZ-LLFZ	376788.70	1524459.40	5045.61
OB-1	UFZ&LFZ	374665.16	1525599.52	5169.10
OB-2	UFZ&LFZ	374537.98	1525606.65	5165.22
PZ-1	UFZ	372283.60	1523143.31	5147.36[e]
MW-7	UFZ	377535.41	1524101.14	5043.48
MW-9	UFZ	377005.75	1524062.25	5042.46
MW-12	UFZ	377023.27	1524102.56	5042.41
MW-14R	UFZ/ULFZ	376727.10	1524246.40	5040.92
MW-16	UFZ	377340.57	1524378.38	5047.50
MW-17	UFZ	377423.18	1524452.68	5049.28
MW-18	UFZ	377005.22	1524260.58	5043.38
MW-19	ULFZ	376986.52	1524269.27	5043.30
MW-20	LLFZ	376967.98	1524277.98	5043.20
MW-21	UFZ	377171.22	1524458.71	5045.78
MW-22	UFZ	377531.77	1524267.24	5044.73
MW-23	UFZ	377333.63	1524123.03	5045.74
MW-24	UFZ	377338.05	1524367.39	5048.70
MW-25	UFZ	377307.91	1524380.40	5046.17
MW-26	UFZ	377180.89	1524187.40	5045.37
MW-27	UFZ	377078.91	1524323.46	5046.04
MW-29	ULFZ	377144.48	1523998.74	5041.88
MW-30	ULFZ	376924.12	1524105.15	5042.12
MW-31	ULFZ	376731.49	1524215.04	5041.38
MW-32	ULFZ	376958.37	1524494.18	5045.29
MW-34	UFZ	376715.25	1523469.17	5034.33[d]
MW-37R	UFZ/ULFZ	376104.50	1524782.90	5093.15[d]
MW-38	LLFZ	377150.52	1523995.17	5041.70
MW-39	LLFZ	376961.13	1524088.17	5042.30
MW-40	LLFZ	376745.33	1524207.40	5041.44
MW-41	ULFZ	376945.67	1524479.28	5044.56
MW-42	ULFZ	377183.28	1524730.69	5057.33
MW-43	LLFZ	377169.66	1524747.27	5057.74
MW-44	ULFZ	376166.14	1524136.09	5058.63[d]
MW-45	ULFZ	376108.80	1524726.75	5089.50[d]

Well ID	Flow Zone[a]	Easting[b]	Northing[b]	Elevation[c]
MW-46	ULFZ	376067.09	1525279.84	5118.86[d]
MW-47[f]	UFZ	375638.14	1524967.74	5121.16
MW-47R[g]	ULFZ	375607.91	1524933.31	5115.17
MW-49	LLFZ	376763.40	1524197.32	5041.44
MW-51	UFZ	377291.45	1525000.02	5060.34
MW-52R	UFZ/ULFZ	374504.50	1525353.60	5156.37
MW-53D	UFZ/ULFZ	374899.50	1525314.41	5148.62
MW-54	UFZ	375974.55	1526106.27	5097.69[d]
MW-55	LLFZ	375370.70	1525224.15	5143.45
MW-56	ULFZ	375371.31	1525207.68	5141.45
MW-57D	UFZ	375849.02	1526406.98	5103.62[d]
MW-58[f]	UFZ	375148.43	1525330.73	5146.40
MW-59	ULFZ	377253.38	1524991.51	5060.65
MW-60	ULFZ	375530.19	1525753.61	5134.40
MW-61[f]	UFZ	375523.16	1525821.65	5134.74
MW-62	UFZ	375421.24	1524395.94	5073.69
MW-63	UFZ	376840.50	1525236.52	5063.10
MW-64	ULFZ	375968.81	1526127.81	5097.84
MW-65	LLFZ	374343.87	1525277.92	5156.45
MW-66	LLFZ	375859.24	1526389.09	5103.19[d]
MW-67	DFZ	375352.47	1525220.38	5142.21
MW-68	UFZ	374503.81	1526216.71	5168.54
MW-69	LLFZ	374502.80	1526239.55	5167.79
MW-70	LLFZ	376981.33	1524492.75	5046.74
MW-71R	DFZ	375534.49	1525681.93	5134.12
MW-72	ULFZ	377079.68	1524630.73	5056.25
MW-73	ULFZ	376821.45	1524346.08	5051.08
MW-74	UFZ/ULFZ	374484.30	1527810.76	5094.80
MW-75	UFZ/ULFZ	374613.33	1528009.97	5113.74
MW-76	UFZ/ULFZ	375150.41	1527826.10	5108.32
MW-77	UFZ/ULFZ	377754.90	1524374.20	5045.64
MW-78	UFZ/ULFZ	377038.50	1524599.30	5052.91
MW-79	DFZ	374662.64	1525626.72	5168.50
MW-80	ULFZ/LLFZ	373445.75	1526294.35	5203.31
PZG-1	Infilt. Gall.	374871.44	1527608.15	5090.90

[a] UFZ denotes the Upper Flow Zone; ULFZ and LLFZ denote the upper and lower, intervals of the Lower Flow Zone (LFZ); DFZ denotes a deeper flow zone separated from the Lower Flow Zone by a continuous clay layer that causes significant head differences between LFZ and DFZ.

[b] New Mexico "Modified State Plane" coordinates, in feet.

[c] In feet above mean sea level (MSL).

[d] Elevation effective February 1, 2005.

[e] Elevation effective March 12, 2008.

[f] Well plugged and abandoned in June 2012

[g] Well drilled in August 2012

Table 2.2

Well Screen Data

Well ID[a]	Flow Zone	Diameter (in)	Elevation (ft above MSL)			Depth below Ground Surface(ft)		Screen Length (ft)
			Ground Surface	Top of Screen	Bottom of Screen	Top of Screen	Bottom of Screen	
CW-1	UFZ&LFZ	8	5166.4	4957.5	4797.5	208.9	368.9	160.0
CW-2	UFZ-LLFZ	4	5048.5	4968.5	4918.5	80.0	130.0	50.0
OB-1	UFZ&LFZ	4	5166.2	4960.3	4789.8	205.9	376.4	170.5
OB-2	UFZ&LFZ	4	5164.8	4960.3	4789.7	204.5	375.1	170.6
PZ-1	UFZ	2	5141.3	4961.5	4951.3	179.8	190.0	10.2
MW-7	UFZ	2	5043.0	4979.7	4974.7	63.3	68.3	5.0
MW-9	UFZ	2	5042.4	4975.8	4970.8	66.6	71.6	5.0
MW-12	UFZ	4	5042.3	4978.2	4966.2	64.1	76.1	12.0
MW-14R	UFZ/ULFZ	2	5040.8	4980.5	4950.5	60.3	90.3	30.0
MW-16	UFZ	2	5046.2	4979.7	4974.7	66.5	71.5	5.0
MW-17	UFZ	2	5047.5	4982.3	4977.3	65.2	70.2	5.0
MW-18	UFZ	4	5042.9	4976.0	4966.0	66.9	76.9	10.0
MW-19	ULFZ	4	5042.9	4944.8	4934.8	98.1	108.1	10.0
MW-20	LLFZ	4	5042.8	4919.2	4906.8	123.6	136.0	12.4
MW-21	UFZ	2	5045.7	4982.8	4977.8	62.9	67.9	5.0
MW-22	UFZ	2	5044.6	4977.2	4972.2	67.4	72.4	5.0
MW-23	UFZ	4	5045.6	4973.8	4968.8	71.8	76.8	5.0
MW-24	UFZ	4	5046.2	4977.5	4972.5	68.7	73.7	5.0
MW-25	UFZ	4	5046.1	4977.9	4972.9	68.2	73.2	5.0
MW-26	UFZ	2	5045.4	4969.1	4964.1	76.3	81.3	5.0
MW-27	UFZ	2	5045.8	4975.4	4970.4	70.4	75.4	5.0
MW-29	ULFZ	4	5041.9	4938.3	4928.3	103.6	113.6	10.0
MW-30	ULFZ	4	5041.7	4944.8	4934.8	96.9	106.9	10.0
MW-31	ULFZ	4	5040.9	4945.2	4935.2	95.7	105.7	10.0
MW-32	ULFZ	4	5044.8	4937.3	4927.3	107.5	117.5	10.0
MW-34	UFZ	2	5034.4	4978.0	4968.0	56.4	66.4	10.0
MW-37R	UFZ/ULFZ	2	5093.0	4976.6	4946.6	116.4	146.4	30.0
MW-38	LLFZ	4	5041.6	4915.0	4905.0	126.6	136.6	10.0
MW-39	LLFZ	4	5042.2	4918.7	4908.7	123.5	133.5	10.0
MW-40	LLFZ	4	5040.0	4923.9	4913.9	116.1	126.1	10.0
MW-41	ULFZ	4	5044.1	4952.1	4942.1	92.0	102.0	10.0
MW-42	ULFZ	4	5054.8	4949.3	4939.3	105.5	115.5	10.0
MW-43	LLFZ	4	5055.2	4927.7	4917.7	127.5	137.5	10.0
MW-44	ULFZ	4	5058.8	4952.4	4942.4	106.4	116.4	10.0
MW-45	ULFZ	4	5090.1	4948.5	4938.5	141.6	151.6	10.0
MW-46	ULFZ	4	5118.5	4949.4	4939.4	169.1	179.1	10.0
MW-47[c]	UFZ	4	5120.7	4976.4	4961.4	144.3	159.3	15.0
MW-47R[b]	ULFZ	4	5115.2	4955.2	4935.2	160.0	180.0	20.0

Table 2.2

Well Screen Data

Well ID[a]	Flow Zone	Diameter (in)	Elevation (ft above MSL)			Depth below Ground Surface(ft)		Screen Length (ft)
			Ground Surface	Top of Screen	Bottom of Screen	Top of Screen	Bottom of Screen	
MW-49	LLFZ	4	5041.0	4903.2	4893.2	137.8	147.8	10.0
MW-51	UFZ	2	5059.9	4984.5	4974.5	75.4	85.4	10.0
MW-52R	UFZ/ULFZ	4	5156.2	4968.5	4938.5	187.0	217.0	30.0
MW-53D	UFZ/ULFZ	2	5148.6	4963.6	4943.6	185.0	205.0	20.0
MW-54	UFZ	4	5097.2	4976.8	4961.8	120.4	135.4	15.0
MW-55	LLFZ	4	5143.1	4913.1	4903.1	230.0	240.0	10.0
MW-56	ULFZ	4	5141.0	4942.9	4932.9	198.1	208.1	10.0
MW-57D	UFZ	4	5103.1	4958.1	4938.1	145.0	165.0	20.0
MW-58[c]	UFZ	4	5146.4	4975.4	4960.4	171.0	186.0	15.0
MW-59	ULFZ	4	5060.2	4954.9	4944.4	105.3	115.8	10.5
MW-60	ULFZ	4	5134.4	4949.5	4939.5	184.9	194.9	10.0
MW-61[c]	UFZ	4	5134.8	4976.2	4961.2	158.6	173.6	15.0
MW-62	UFZ	2	5073.7	4975.1	4960.1	98.6	113.6	15.0
MW-63	UFZ	2	5063.1	4983.1	4968.1	80.0	95.0	15.0
MW-64	ULFZ	4	5097.4	4959.3	4949.1	138.1	148.3	10.2
MW-65	LLFZ	4	5156.5	4896.4	4886.4	260.1	270.1	10.0
MW-66	LLFZ	4	5102.6	4903.3	4893.3	199.3	209.3	10.0
MW-67	DFZ	4	5142.2	4798.1	4788.1	344.1	354.1	10.0
MW-68	UFZ	4	5168.5	4970.5	4950.5	198.0	218.0	20.0
MW-69	LLFZ	4	5167.8	4904.7	4894.7	263.1	273.1	10.0
MW-70	LLFZ	2	5046.3	4912.1	4902.1	134.2	144.2	10.0
MW-71R	DFZ	4	5134.2	4761.5	4756.5	372.7	377.7	5.0
MW-72	ULFZ	2	5053.7	4955.0	4945.0	98.7	108.7	10.0
MW-73	ULFZ	2	5050.6	4945.5	4940.5	105.1	110.1	5.0
MW-74	UFZ/ULFZ	2	5092.4	4969.2	4939.2	123.2	153.2	30.0
MW-75	UFZ/ULFZ	2	5111.6	4971.2	4941.2	140.4	170.4	30.0
MW-76	UFZ/ULFZ	2	5105.5	4972.4	4942.4	133.1	163.1	30.0
MW-77	UFZ/ULFZ	2	5045.5	4985.9	4955.9	59.6	89.6	30.0
MW-78	UFZ/ULFZ	2	5050.5	4988.1	4958.1	62.4	92.4	30.0
MW-79	DFZ	6	5166.7	4767.7	4752.7	399.0	414.0	15.0
				4747.7	4732.7	419.0	434.0	15.0
MW-80	ULFZ/LLFZ	4	5203.3	4934.3	4894.3	269.0	309.0	40.0

[a] The letter R after the number in the Well ID indicates that the well is a new and deeper replacement well installed near the original well location; the letter D after the number in the Well ID indicates that the well has been deepened.

[b] Well replaced in August, 2012.

[c] Well plugged and abandoned in June 2012.

Table 2.3

Production History of the Former On-Site Groundwater Recovery System

Year	Volume of Recovered Water (gal)	Average Discharge Rate (gpm)
1988[a]	25,689	1.05
1989	737,142	1.40
1990	659,469	1.25
1991	556,300	1.06
1992	440,424	0.84
1993	379,519	0.72
1994	370,954	0.71
1995	399,716	0.76
1996	306,688	0.58
1997	170,900	0.33
1998	232,347	0.44
1999[b]	137,403	0.26
Total Recovered Volume (gal)	**4,416,550**	
Average Discharge Rate (gpm)		**0.77**

[a] System began operating on December 15, 1988.

[b] System operations were terminated on November 16, 1999.

Table 2.4

Water-Level Elevations - Fourth Quarter 1998[a]

Well ID	Flow Zone	Elevation (ft above MSL)
PW-1	UFZ	4973.59
PZ-1	UFZ	4956.59
MW-7	UFZ O/S [b]	4977.42
MW-9	UFZ O/S	4973.06
MW-12	UFZ O/S	4972.82
MW-13	UFZ O/S	4974.35
MW-14	UFZ	4971.12
MW-15	UFZ	Dry
MW-16	UFZ O/S	4978.43
MW-17	UFZ O/S	4978.70
MW-18	UFZ O/S	4971.87
MW-19	ULFZ	4971.85
MW-20	LLFZ	4971.47
MW-21	UFZ O/S	4978.31
MW-22	UFZ O/S	4977.89
MW-23	UFZ O/S	4975.91
MW-24	UFZ O/S	4978.23
MW-25	UFZ O/S	4978.31
MW-26	UFZ O/S	4973.44
MW-27	UFZ O/S	4974.05
MW-28	UFZ O/S	4971.09
MW-29	ULFZ	4973.68
MW-30	ULFZ	4972.28
MW-31	ULFZ	4971.23
MW-32	ULFZ [c]	4970.96
MW-33	UFZ O/S	4972.54
MW-34	UFZ	4974.51
MW-35	UFZ	4970.78
MW-36	UFZ	4970.03
MW-37	UFZ	4968.32
MW-38	LLFZ	4973.70
MW-39	LLFZ	4972.49

Well	Flow Zone	Elevation (ft above MSL)
MW-40	LLFZ	4971.25
MW-41	ULFZ	4971.09
MW-42	ULFZ	4970.65
MW-43	LLFZ	4970.45
MW-44	ULFZ	4970.11
MW-45	ULFZ	4968.33
MW-46	ULFZ	4966.95
MW-47	UFZ	4966.68
MW-48	UFZ	4965.81
MW-49	LLFZ [c]	4971.03
MW-50	UFZ	Dry
MW-51	UFZ O/S	4980.09
MW-52	UFZ	4963.17
MW-53	UFZ	4964.92
MW-54	UFZ	4965.56
MW-55	LLFZ	4965.13
MW-56	ULFZ	4965.76
MW-57	UFZ	4964.87
MW-58	UFZ	4965.43
MW-59	ULFZ	4969.46
MW-60	ULFZ	4965.33
MW-61	UFZ	4965.37
MW-62	UFZ	4967.52
MW-63	UFZ O/S	4970.98
MW-64	ULFZ	4965.41
MW-65	LLFZ	4963.05
MW-66	LLFZ	4963.98
MW-67	DFZ	4958.56
MW-68	UFZ	4962.25
MW-69	LLFZ	4962.13
MW-70	LLFZ [d]	4970.18
MW-71	DFZ	4958.51

[a] Water levels were measured on November 10, 1998, except for wells PW-1, MW-18, and MW-23 through MW-28 which were measured on November 25, 1998.

[b] UFZ O/S denotes UFZ wells, mostly on-site, which are screened above or within the 4970-foot silt/clay.

[c] Previously classified as LLFZ.

[d] Previously classified as 3rdFZ.

Table 2.5

Water-Quality Data - Fourth Quarter 1998[a]

Well ID	Sampling Date	Concentration (µg/L)		
		TCE	DCE	TCA
CW-1	09/01/98	140	2.9	<20
OB-1	09/01/98	180	3.6	<20
OB-2	09/01/98	72	1.7	<20
PW-1	12/04/98	48	1.0	2.2
MW-7	12/01/98	63	15	12
MW-9	12/03/98	290	19	18
MW-12	12/07/98	380	26	18
MW-13	12/01/98	70	3.2	8.0
MW-14	12/01/98	430	24	4.2
MW-16	12/08/98	1200	30	170
MW-17	12/01/98	68	3.5	13
MW-18	12/02/98	600	50	42
MW-19	11/23/98	4.2	<1.0	<1.0
MW-20	11/23/98	<1.0	<1.0	<1.0
MW-21	12/02/98	7.5	<1.0	1.1
MW-22	11/19/98	13	2.0	4.6
MW-23	12/03/98	6200	400	720
MW-24	12/08/98	4700	74	480
MW-25	12/08/98	5600	73	540
MW-26	12/03/98	6500	590	550
MW-27	12/02/98	380	24	90
MW-29	11/19/98	<1.0	<1.0	<1.0
MW-30	11/23/98	5.4	<1.0	<1.0
MW-31	11/23/98	<1.0	<1.0	<1.0
MW-32	11/30/98	550	96	30
MW-33	12/02/98	630	53	28
MW-34	11/18/98	<1.0	<1.0	<1.0
MW-35	12/08/98	<1.0	<1.0	<1.0
MW-36	12/07/98	1.4	<1.0	<1.0
MW-37	12/03/98	990	48	<5
MW-38	11/19/98	<1.0	<1.0	<1.0
MW-39	11/23/98	<1.0	<1.0	<1.0
MW-40	11/30/98	<1.0	<1.0	<1.0
MW-41	11/19/98	170	26	<15
MW-42	11/19/98	370	48	21
MW-43	11/19/98	25	5.1	5.4
MW-44	11/18/98	1.3	<1.0	<1.0
MW-45	11/18/98	40	1.7	<1.0
MW-46	11/19/98	2200	130	2.3
MW-47	11/17/98	34	1.2	<1.0
MW-48	11/17/98	28	1.0	<1.0
MW-49	11/23/98	<1.0	<1.0	<1.0
MW-51	11/18/98	<1.0	<1.0	<1.0
MW-52	11/30/98	<1.0	<1.0	<1.0
MW-53	11/16/98	99	3.4	<1.0
MW-55	11/16/98	390	10	<1.0
MW-56	11/16/98	140	4.7	<1.0
MW-57	12/08/98	<1.0	<1.0	<1.0
MW-58	11/16/98	71	2.5	<1.0
MW-59	11/18/98	<1.0	<1.0	<1.0
MW-60	11/17/98	7700	350	52
MW-61	12/07/98	1000	54	11
MW-62	12/07/98	2.0	6.6	4.8
MW-63	12/02/98	<1.0	<1.0	<1.0
MW-64	11/17/98	<1.0	<1.0	<1.0
MW-65	11/16/98	13	<1.0	<1.0
MW-66	11/17/98	<1.0	<1.0	<1.0
MW-67	11/17/98	<1.0	<1.0	<1.0
MW-68	11/12/98	<1.0	<1.0	<1.0
MW-69	11/12/98	<1.0	<1.0	<1.0
MW-70	11/23/98	<1.0	<1.0	<1.0
MW-71	11/17/98	56	1.6	<1.0
TW-1	02/18/98	3100	280	180
	02/18/98	3400	270	170
TW-2	02/19/98	18	<1.0	<1.0
	02/19/98	16	<1.0	<1.0

[a] Includes February 18, 1998 data from temporary well TW-1/2 which was drilled at the current location of well MW-73, and September 1, 1998 data from the containment well CW-1 and observation wells OB-1 and OB-2.

Concentration exceeds MCLs based on the more stringent of the drinking water standards or the maximum allowable concentrations in groundwater set by the NMWQCC (5 mg/L for TCE and DCE, and 60 mg/L for TCA).

Table 3.1
Downtime in the Operation of the Containment Systems - 2012

(a) Off-Site Containment System

Date of Downtime		Duration	Cause
From	To	(hours)	
1/8/12 1:53	1/8/12 8:57	7.07	Building power outage
1/25/12 23:58	1/26/12 8:19	8.35	Air stripper sump overload
1/27/12 4:06	1/27/12 8:34	4.47	Air stripper sump overload
3/11/12 4:29	3/11/12 8:25	3.93	Air stripper sump overload
4/7/12 8:34	4/7/12 8:42	0.13	Building power outage
4/7/12 18:46	4/7/12 19:23	0.62	Building power outage
4/7/12 19:48	4/8/12 9:45	13.95	Building power outage
4/22/12 17:34	4/22/12 18:09	0.58	Building power outage
6/4/12 17:48	6/4/12 18:29	0.68	Building power outage
6/24/12 19:00	6/24/12 19:24	0.40	Building power outage
6/24/12 19:53	6/24/12 20:03	0.17	Reset Pump
6/24/12 20:23	6/24/12 20:27	0.07	Restart Pump
6/29/12 12:20	6/29/12 12:25	0.08	Air stripper sump overload
7/9/12 17:28	7/9/12 18:12	0.73	Building power outage
9/11/12 9:30	9/11/12 10:30	1.00	Inspection
9/24/12 9:30	9/24/12 15:30	6.00	Leak Repair
9/27/12 9:45	9/27/12 14:30	4.75	Leak Repair
10/4/12 9:45	10/4/12 12:24	2.65	Leak Repair
10/17/12 9:16	10/17/12 13:05	3.82	Leak Repair
11/2/12 12:30	11/2/12 16:15	3.75	Leak Repair
11/9/12 13:00	11/9/12 13:35	0.58	Leak Repair
Total Downtime		**63.78**	

(b) Source Containment System

Date of Downtime		Duration	Cause
From	To	(hours)	
2/14/12 6:48	2/14/12 8:23	1.58	Building power outage
4/6/12 18:32	4/6/12 19:08	0.60	Building power outage
4/23/12 4:02	4/23/12 8:06	4.07	Building power outage
6/30/12 4:02	6/30/12 8:00	3.97	Building power outage
7/1/12 4:20	7/1/12 12:20	8.00	Building power outage
7/9/12 17:14	7/9/12 18:34	1.33	Building power outage
7/10/12 13:38	7/10/12 15:52	2.23	Building power outage
7/10/12 16:10	7/10/12 16:15	0.08	Low Water Discharge
8/13/12 9:26	8/13/12 14:30	5.07	Clean Pipeline to Air Stripper
8/28/12 8:30	8/29/12 12:00	27.50	Clean Air Stripper
9/11/12 11:20	9/12/12 14:30	27.17	Building power outage
9/13/12 9:00	9/20/12 9:30	168.50	Air Stripper Leaks Repair
9/21/12 9:30	9/21/12 11:30	2.00	Leak Repair
10/4/12 11:52	10/4/12 14:52	3.00	Leak Repair
10/11/12 11:24	10/11/12 13:50	2.43	Leak Repair
10/12/12 13:40	10/12/12 15:30	1.83	Leak Repair
10/15/12 10:17	10/15/12 15:36	5.32	Leak Repair
10/22/12 8:57	10/22/12 15:57	7.00	Replace water meter
10/29/12 13:00	10/29/12 14:30	1.50	Pump Failed
10/29/12 15:30	10/29/12 16:00	0.50	Pump Failed
11/15/12 15:15	11/15/12 15:30	0.25	Debris removal from filters
11/16/12 13:07	11/16/12 15:48	2.68	Debris removal from filters
11/16/12 16:50	11/16/12 16:56	0.10	Debris removal from filters
11/16/12 16:58	11/16/12 17:10	0.20	Debris removal from filters
11/21/12 13:52	11/21/12 13:59	0.12	Air stripper sump overload
11/21/12 18:35	11/22/12 8:21	13.77	Air stripper sump overload
11/26/12 13:45	11/26/12 13:50	0.08	Air stripper sump overload
11/26/12 17:00	11/26/12 17:50	0.83	Air stripper sump overload
11/26/12 23:00	11/27/12 8:00	9.00	Air stripper sump overload
11/27/12 10:00	11/27/12 10:30	0.50	Air stripper sump overload
11/27/12 10:40	11/27/12 17:00	6.33	Clean pond water gages
Total Downtime		**307.55**	

Table 4.1
Quarterly Water-Level Elevations - 2012

Well ID	Flow Zone	Elevation (feet above MSL)			
		Feb. 13-14, 2012	May 16-17, 2012	Aug. 14-15, 2012	Nov. 6-8, 2012
CW-1	UFZ&LFZ	4923.12	4920.94	4920.06	4919.67
CW-2	UFZ&LFZ	4951.58	4951.45	4951.30	4948.78
OB-1	UFZ&LFZ	4952.18	4951.93	4951.58	4951.32
OB-2	UFZ&LFZ	4953.77	4953.25	4952.94	4952.66
PZ-1	UFZ	4952.36	4951.90	4950.86	4950.86
MW-7	UFZ O/S	4974.14	4973.98	4973.64	4973.34
MW-9	UFZ O/S	4969.26	4969.31	4969.37	4969.28
MW-12	UFZ O/S	4969.03	4968.41	4967.91	4967.64
MW-14R	UFZ/ULFZ	4966.19	4966.18	4965.77	4965.45
MW-16	UFZ O/S	4981.20	4980.74	4980.90	4980.86
MW-17	UFZ O/S	4980.68	4980.33	4980.63	4980.08
MW-18	UFZ O/S	4969.46	4967.59	4967.05	4966.56
MW-19	ULFZ	4967.35	4967.28	4966.85	4966.54
MW-20	LLFZ	4966.83	4966.82	4966.19	4966.09
MW-21	UFZ O/S	4981.85	4981.47	4981.07	4981.01
MW-22	UFZ O/S	4976.06	4975.81	4975.55	4974.81
MW-23	UFZ O/S	4973.08	4973.12	4972.66	4972.17
MW-24	UFZ O/S	4980.97	4980.49	4980.72	4980.50
MW-25	UFZ O/S	4981.29	4980.72	4980.87	4980.88
MW-26	UFZ O/S	4970.13	4969.94	4969.62	4969.11
MW-27	UFZ O/S	4980.73	4980.73	4980.19	4980.30
MW-29	ULFZ	4969.66	4969.70	4969.26	4969.02
MW-30	ULFZ	4967.90	4967.89	4967.35	4967.17
MW-31	ULFZ	4966.33	4966.32	4965.90	4965.59
MW-32	ULFZ	4966.17	4966.10	4965.65	4965.21
MW-34	UFZ	4970.05	4970.01	4969.75	4970.00
MW-37R	UFZ/ULFZ	4962.79	4962.52	4962.29	4962.09
MW-38	LLFZ	4969.66	4969.65	4968.74	4968.94
MW-39	LLFZ	4968.12	4968.19	4967.77	4967.44
MW-40	LLFZ	4966.39	4966.37	4965.95	4965.68
MW-41	ULFZ	4966.55	4966.44	4966.01	4965.61
MW-42	ULFZ	4966.68	4966.52	4966.03	4965.76
MW-43	LLFZ	4966.42	4966.22	4965.78	4965.51
MW-44	ULFZ	4965.19	4965.01	4964.68	4964.34
MW-45	ULFZ	4963.12	NM	4962.65	4962.36

Well ID	Flow Zone	Elevation (feet above MSL)			
		Feb. 13-14, 2012	May 16-17, 2012	Aug. 14-15, 2012	Nov. 6-8, 2012
MW-46	ULFZ	4961.86	4961.54	4961.33	4961.15
MW-47	UFZ	4961.12	DRY	P&A	P&A
MW-47R	UFZ/ULFZ	NI	NI	4962.77	4962.19
MW-49	LLFZ	4966.44	4966.40	4965.98	4965.79
MW-51	UFZ O/S	4981.10	4980.76	4980.65	4980.51
MW-52R	UFZ/ULFZ	4955.57	4955.36	4954.92	4954.60
MW-53D	UFZ/ULFZ	4958.01	4957.45	4957.60	4957.15
MW-54	UFZ	4961.83	4962.28	4961.78	4961.37
MW-55	LLFZ	4958.90	4958.45	4958.29	4957.97
MW-56	ULFZ	4960.23	4959.75	4959.85	4959.38
MW-57D	UFZ	4960.86	4960.61	4960.15	4960.06
MW-58	UFZ	4960.25	DRY	P&A	P&A
MW-59	ULFZ	4965.59	4965.34	4964.83	4964.80
MW-60	ULFZ	4959.83	4959.74	4959.62	4959.30
MW-61	UFZ	DRY	DRY	P&A	P&A
MW-62	UFZ	4962.22	4962.08	4961.94	4961.65
MW-63	UFZ O/S	4969.43	4968.78	4968.78	4968.33
MW-64	ULFZ	4961.08	4960.85	4960.63	4960.36
MW-65	LLFZ	4955.60	4955.17	4955.05	4954.69
MW-66	LLFZ	4959.74	4959.06	4958.71	4958.53
MW-67	DFZ	4953.74	4952.89	4952.03	4952.24
MW-68	UFZ	4955.62	4955.54	4955.28	4954.89
MW-69	LLFZ	4955.87	4955.47	4955.18	4955.30
MW-70	LLFZ	4965.66	4965.60	4965.16	4964.80
MW-71R	DFZ	4953.59	4953.00	4951.99	4952.50
MW-72	ULFZ	4966.73	4966.62	4966.13	4965.80
MW-73	ULFZ	4965.72	4965.65	4965.25	4964.85
MW-74	UFZ/ULFZ	4958.87	4958.97	4958.29	4957.98
MW-75	UFZ/ULFZ	4964.70	4964.92	4964.57	4964.29
MW-76	UFZ/ULFZ	4966.05	4966.38	4966.46	4965.57
MW-77	UFZ/ULFZ	4975.57	4975.55	4975.26	4974.87
MW-78	UFZ/ULFZ	4973.41	4972.87	4972.36	4971.68
MW-79	DFZ	4951.69	4951.05	4950.00	4950.67
MW-80	ULFZ/LLFZ	4953.65	4953.26	4952.60	4952.61
PZG-1	Infilt. Gall.	5067.60	5067.54	5067.68	5067.91

Measured water level is at or below bottom of screen.

P&A Well is plugged and abandoned.

NM Not measured

NI Not installed

Table 4.2

Water-Quality Data - Fourth Quarter 2012

Well ID	Sampling Date	Concentration (mg/L)		
		TCE	DCE	TCA
CW-1	11/1/2012	430	54	1.5
CW-2	11/1/2012	31	3.7	<1.0
MW-7	11/14/12	33	2.4	<1.0
MW-9	11/14/12	18	<1.0	<1.0
MW-12	11/15/12	10	<1.0	<1.0
MW-14R	11/19/12	3.8	<1.0	<1.0
MW-16	11/15/12	10	<1.0	<1.0
MW-17	11/13/12	<1.0	<1.0	<1.0
MW-18[a]		NS	NS	NS
MW-19	11/16/12	68	8.7	<1.0
MW-20	11/16/12	1.7	<1.0	<1.0
MW-21	11/13/12	<1.0	<1.0	<1.0
MW-22	11/19/12	<1.0	<1.0	<1.0
MW-23	11/14/12	3.2	<1.0	<1.0
MW-25	11/13/12	16	<1.0	<1.0
MW-26	11/15/12	7.3	<1.0	<1.0
MW-29	11/16/12	<1.0	<1.0	<1.0
MW-30	11/26/12	7.2	<1.0	<1.0
MW-31	11/19/12	<1.0	<1.0	<1.0
MW-32	11/16/12	2.1	<1.0	<1.0
MW-34	11/14/12	<1.0	<1.0	<1.0
MW-37R	11/26/12	130	5.5	<1.0
MW-38	11/23/12	<1.0	<1.0	<1.0
MW-39	11/21/12	<1.0	<1.0	<1.0
MW-40	11/26/12	<1.0	<1.0	<1.0
MW-41	11/16/12	<1.0	<1.0	<1.0
MW-42	11/23/12	18	4.5	<1.0
MW-43	11/26/12	<1.0	<1.0	<1.0
MW-44	11/28/12	<1.0	<1.0	<1.0
MW-45	12/4/12	<1.0	<1.0	<1.0

Well ID	Sampling Date	Concentration (mg/L)		
		TCE	DCE	TCA
MW-46	11/26/12	500	67	<1.0
MW-47R	11/07/12	1.1	<1.0	<1.0
MW-49	11/20/12	<1.0	<1.0	<1.0
MW-51	11/21/12	<1.0	<1.0	<1.0
MW-52R	11/28/12	16	39	1.7
MW-53D	12/04/12	16	<1.0	<1.0
MW-55	11/28/12	13	<1.0	<1.0
MW-56	11/29/12	120	3.6	<1.0
MW-57D	11/07/12	<1.0	<1.0	<1.0
MW-59	11/21/12	<1.0	<1.0	<1.0
MW-60	11/29/12	840	110	2.7
MW-62	11/13/12	2.0	4.9	1.2
MW-64	11/28/12	<1.0	<1.0	<1.0
MW-65	11/07/12	1.9	5.1	<1.0
MW-66	11/28/12	<1.0	<1.0	<1.0
MW-67	11/28/12	<1.0	<1.0	<1.0
MW-68	11/30/12	<1.0	<1.0	<1.0
MW-69	11/30/12	<1.0	<1.0	<1.0
MW-70	11/19/12	5.7	<1.0	<1.0
MW-71R	11/29/12	56	2.7	<1.0
MW-72	11/20/12	430	83	1.6
MW-73	11/21/12	38	2.4	<1.0
MW-74	11/12/12	<1.0	<1.0	<1.0
MW-75	11/12/12	<1.0	<1.0	<1.0
MW-76	11/12/12	<1.0	<1.0	<1.0
MW-77	11/12/12	3.4	<1.0	<1.0
MW-78	11/12/12	<1.0	<1.0	<1.0
MW-79	11/30/12	<1.0	<1.0	<1.0
MW-80	11/15/12	<1.0	<1.0	<1.0

[a] Well not sampled (NS) because it was dry or did not have sufficient water for sampling.

Concentration exceeds MCLs based on the more stringent of the drinking water standards or the maximum allowable concentrations in groundwater set by the NMWQCC (5 mg/L for TCE and DCE, and 60 mg/L for TCA).

Table 4.3

Flow Rates - 2012

Month	Off-Site Containment Well		Source Containment Well		Total	
	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)
Jan.	12,136,250	272	2,115,198	47	14,251,448	319
Feb.	11,754,871	281	1,938,721	46	13,693,591	328
Mar.	13,065,323	293	2,039,550	46	15,104,874	338
Apr.	12,317,947	285	1,896,765	44	14,214,712	329
May	12,935,843	290	1,960,982	44	14,896,825	334
June	12,522,492	290	1,761,300	41	14,283,792	331
July	12,695,239	284	1,904,712	43	14,599,951	327
Aug.	13,257,576	297	1,719,824	39	14,977,400	336
Sep.	12,367,302	286	1,349,530	31	13,716,832	318
Oct.	12,838,081	288	1,541,117	35	14,379,198	322
Nov.	12,433,121	288	1,881,450	44	14,314,571	331
Dec.	12,936,781	290	2,023,893	45	14,960,674	335
Total or Average	**151,260,826**	**287**	**22,133,042**	**42**	**173,393,868**	**329**

Table 4.4

Influent and Effluent Quality - 2012[a]

(a) Off-Site Containment System

Sampling Date	Concentration (µg/L)							
	Influent				Effluent			
	TCE	DCE	TCA	Cr Total	TCE	DCE	TCA	Cr Total
01/02/12	700	55	1.8	11	<1.0	<1.0	<1.0	12
02/01/12	520	56	1.9	10	<1.0	<1.0	<1.0	10
03/01/12	540	58	1.9	9.8	<1.0	<1.0	<1.0	9.1
04/01/12	440	50	2.0	10	1.1	<1.0	<1.0	10
05/01/12	580	60	1.9	9.3	<1.0	<1.0	<1.0	10
06/01/12	540	57	1.9	10	<1.0	<1.0	<1.0	10
07/01/12	520	55	1.5	6.3	<1.0	<1.0	<1.0	7.8
08/01/12	470	58	<5.0[b]	10	<1.0	<1.0	<1.0	<10[c]
09/01/12	460	52	1.7	8.0	<1.0	<1.0	<1.0	7.9
10/01/12	440	54	1.6	8.7	<1.0	<1.0	<1.0	9.2
11/01/12	510	59	1.5	8.9	<1.0	<1.0	<1.0	8.5
12/01/12	350	48	1.4	7.9	<1.0	<1.0	<1.0	8.4
01/01/13	430	54	1.5	8.2	<1.0	<1.0	<1.0	8.6

(b) Source Containment System

Sampling Date	Concentration (µg/L)							
	Influent				Effluent			
	TCE	DCE	TCA	Cr Total	TCE	DCE	TCA	Cr Total
01/02/12	34	3.7	<1.0	30	<1.0	<1.0	<1.0	28
02/01/12	31	3.8	<1.0	30	<1.0	<1.0	<1.0	28
03/01/12	29	3.6	<1.0	30	<1.0	<1.0	<1.0	30
04/01/12	32	3.2	<1.0	30	<1.0	<1.0	<1.0	31
05/01/12	34	3.9	<1.0	30	<1.0	<1.0	<1.0	31
06/01/12	33	4.0	<1.0	30	<1.0	<1.0	<1.0	31
07/01/12	35	3.8	<1.0	27	<1.0	<1.0	<1.0	28
08/01/12	28	3.2	<1.0	33	<1.0	<1.0	<1.0	31
09/01/12	30	3.1	<1.0	29	<1.0	<1.0	<1.0	29
10/01/12	27	2.8	<1.0	31	<1.0	<1.0	<1.0	32
11/01/12	31	3.7	<1.0	31	<1.0	<1.0	<1.0	31
12/01/12	23	2.7	<1.0	32	<1.0	<1.0	<1.0	30
01/01/13	24	3.2	<1.0	35	<1.0	<1.0	<1.0	34

[a] Data from January 1, 2013 has been included to show conditions at the end of the year.

[b] The August sample for TCA was analyzed using a detection limit of 5 µg/L. Given the reported TCA values throughout the year, a value of 1.5 µg/L was used for mass calculations for that month.

[c] The August sample for chromium was analyzed by ESC Lab Sciences which used a detection limit of 10 µg/L and reported the chromium concentration as "below detection limit".

Concentration exceeds MCLs based on the more stringent of the drinking water standards or the maximum allowable concentrations in groundwater set by the NMWQCC (5 mg/L for TCE and DCE, and 60 mg/L for TCA and 50 ug/L for total chromium).

Table 5.1

Concentration Changes in Monitoring Wells - 1998 to 2012

Well ID	Change in Concentration (mg/l) TCE	DCE
CW-1	290	51
CW-2[a]	-969	-186
MW-7	-30	-13
MW-9	-272	-19
MW-12	-370	-26
MW-14R[b]	-426	-24
MW-16	-1190	-30
MW-17	-68	-3.5
MW-19	64	8.7
MW-20	1.7	0
MW-21	-7.5	0
MW-22	-13	-2.0
MW-23	-6197	-400
MW-25	-5584	-73
MW-26	-6493	-590
MW-29	0	0
MW-30	1.8	0
MW-31	0	0
MW-32	-548	-96
MW-34	0	0
MW-37R[b]	-860	-43
MW-38	0	0
MW-39	0	0
MW-40	0	0
MW-41	-170	-26
MW-42	-352	-44
MW-43	-25	-5.1
MW-44	-1.3	0
MW-45	-40	-1.7

Well ID	Change in Concentration (mg/l) TCE	DCE
MW-46	-1700	-63
MW-47R[b]	-33	-1.2
MW-49	0	0
MW-51	0	0
MW-52R[b]	16	39
MW-53D[b]	-83	-3.4
MW-55	-377	-10
MW-56	-20	-1.1
MW-57D[b]	0	0
MW-59	0	0
MW-60	-6860	-240
MW-62	0	-1.7
MW-64	0	0
MW-65	-11	5.1
MW-66	0	0
MW-67	0	0
MW-68	0	0
MW-69	0	0
MW-70	5.7	0
MW-71R[b]	0	1.1
MW-72[a]	-1370	-137
MW-73[a]	-3962	-518
MW-74	0	0
MW-75	0	0
MW-76	0	0
MW-77[a]	-13	-1.2
MW-78[a]	-6.0	0
MW-79[a]	0	0
MW-80[a]	0	0

[a] Change from concentration in first available sample.

[b] Change from concentration in original well.

[c] "0" indicates concentration below detection limits during both sampling events.

Well used both in the original and the current plume definition

Well used either in the original or in the current plume definition

Table 5.2

Summary of Annual Flow Rates - 1998 to 2012

Year	Off-Site Containment Well		Source Containment Well		Total	
	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)
1998[a]	1,694,830				1,694,830	
1999	114,928,700	219			114,928,700	219
2000	114,094,054	216			114,094,054	216
2001	113,654,183	216			113,654,183	216
2002	116,359,389	221	25,403,490	49	141,762,879	270
2003	118,030,036	225	27,292,970	52	145,323,006	277
2004	113,574,939	215	26,105,202	50	139,680,141	265
2005	118,018,628	225	25,488,817	48	143,507,445	273
2006	112,213,088	213	24,133,264	46	136,346,352	259
2007	117,098,422	223	23,983,802	46	141,082,224	269
2008	114,692,635	218	25,432,013	48	140,124,648	266
2009	114,752,782	218	24,524,740	47	139,277,522	264
2010	114,720,233	218	22,062,857	42	136,783,090	260
2011	149,171,757	284	26,989,781	51	176,161,538	335
2012	151,260,826	287	22,133,042	42	173,393,868	329
Total or Average	**1,684,264,502**	**228**	**273,549,978**	**47**	**1,957,814,480**	**266**

[a] Volume pumped during the testing of the well in early December, and during the first day of operation on December 31, 1998.

Table 5.3
Contaminant Mass Removal - 2012

(a) Total

	Mass Removed	(kg)	(lbs)
2012	TCE	286	629
	DCE	31.8	70.2
	TCA	0.974	2.15
	Total	318	701

(b) Off-Site Containment Well

Month	Mass Removed						Total	
	TCE		DCE		TCA			
	(kg)	(lbs)	(kg)	(lbs)	(kg)	(lbs)	(kg)	(lbs)
Jan.	28.0	61.6	2.54	5.61	0.0848	0.187	30.6	67.4
Feb.	23.6	52.0	2.54	5.59	0.0845	0.186	26.2	57.8
Mar.	24.2	53.4	2.67	5.89	0.0964	0.213	27.0	59.5
Apr.	23.8	52.4	2.56	5.65	0.0909	0.200	26.4	58.3
May	27.4	60.5	2.86	6.32	0.0930	0.205	30.4	67.0
June	25.1	55.4	2.65	5.85	0.0806	0.178	27.9	61.4
July	23.8	52.4	2.72	5.99	0.0721	0.159	26.6	58.6
Aug.	23.3	51.4	2.76	6.09	0.0803	0.177	26.2	57.7
Sep.	21.1	46.4	2.48	5.47	0.0772	0.170	23.6	52.1
Oct.	23.1	50.9	2.75	6.05	0.0753	0.166	25.9	57.1
Nov.	20.2	44.6	2.52	5.55	0.0682	0.150	22.8	50.3
Dec.	19.1	42.1	2.50	5.51	0.0710	0.157	21.7	47.8
Total	**283**	**623**	**31.6**	**69.6**	**0.974**	**2.15**	**315**	**695**

(c) Source Containment Well

Month	Mass Removed				Total	
	TCE		DCE			
	(kg)	(lbs)	(kg)	(lbs)	(kg)	(lbs)
Jan.	0.260	0.57	0.030	0.066	0.29	0.64
Feb.	0.220	0.49	0.027	0.060	0.25	0.55
Mar.	0.235	0.52	0.026	0.058	0.26	0.58
Apr.	0.237	0.52	0.026	0.056	0.26	0.58
May	0.249	0.55	0.029	0.065	0.28	0.62
June	0.227	0.50	0.026	0.057	0.25	0.56
July	0.227	0.50	0.025	0.056	0.25	0.56
Aug.	0.189	0.42	0.021	0.045	0.21	0.47
Sep.	0.146	0.32	0.015	0.033	0.16	0.35
Oct.	0.169	0.37	0.019	0.042	0.19	0.41
Nov.	0.192	0.42	0.023	0.050	0.21	0.47
Dec.	0.180	0.40	0.023	0.050	0.20	0.45
Total	**2.53**	**5.58**	**0.289**	**0.638**	**2.82**	**6.22**

Table 5.4

Summary of Contaminant Mass Removal - 1998 to 2012

(a) Total

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
1998[a]	1.31	2.89	0.030	0.066	0.00	0.00	1.34	2.95
1999	358	789	16.2	35.7	0.00	0.00	374	825
2000	463	1,020	23.3	51.4	0.00	0.00	486	1,070
2001	519	1,140	26.6	58.6	0.00	0.00	546	1,200
2002	603	1331	40.6	89.4	3.66	8.07	647	1,426
2003	617	1,360	38.1	84.1	3.05	6.72	658	1,454
2004	596	1,310	35.3	77.7	2.42	5.34	634	1,403
2005	558	1,230	34.7	76.4	2.01	4.43	595	1,315
2006	513	1,130	34.3	75.5	1.66	3.67	549	1,215
2007	468	1,040	33.0	72.9	1.03	2.27	502	1,109
2008	433	955	32.5	71.8	1.08	2.39	467	1,031
2009	378	836	32.0	70.5	1.23	2.72	412	908
2010	309	682	29.2	64.4	0.967	2.13	339	749
2011	352	774	34.8	76.7	1.16	2.57	387	854
2012	285	629	31.8	70.2	0.974	2.15	318	701
Total	**6,450**	**14,230**	**442**	**975**	**19.2**	**42.5**	**6,910**	**15,260**

(b) Off-Site Containment Well

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
1998[a]	1.31	2.89	0.030	0.066	0.000	0.000	1.34	2.95
1999	358	789	16.2	35.7	0.000	0.000	374	825
2000	463	1,020	23.3	51.4	0.000	0.000	486	1,070
2001	519	1,140	26.6	58.6	0.000	0.000	546	1,200
2002	543	1,200	30.9	68.1	2.05	4.52	576	1,270
2003	568	1,250	31.6	69.7	2.06	4.54	602	1,330
2004	567	1,250	31.7	69.9	1.96	4.32	601	1,330
2005	540	1,190	32.4	71.4	1.79	3.95	574	1,270
2006	499	1,100	32.5	71.6	1.57	3.46	533	1,180
2007	456	1,010	31.6	69.7	1.03	2.27	489	1,080
2008	425	937	31.5	69.5	1.08	2.39	458	1,010
2009	372	821	31.2	68.8	1.23	2.72	405	892
2010	305	673	28.6	63.1	0.967	2.13	335	738
2011	348	766	34.4	75.8	1.16	2.57	383	845
2012	283	623	31.6	69.6	0.974	2.15	315	695
Total	**6,250**	**13,770**	**414**	**913**	**15.9**	**35.0**	**6,680**	**14,740**

(c) Source Containment Well

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
2002	59.6	131	9.66	21.3	1.61	3.55	70.9	156
2003	48.7	107	6.53	14.4	0.989	2.18	56.2	124
2004	29.0	63.9	3.55	7.83	0.464	1.02	33.1	72.8
2005	18.1	39.9	2.28	5.03	0.218	0.481	20.6	45.4
2006	13.8	30.4	1.76	3.88	0.093	0.206	15.7	34.5
2007	11.5	25.4	1.44	3.17	<0.05	<0.1	13.0	28.6
2008	8.42	18.6	1.04	2.29	<0.05	<0.1	9.51	21.0
2009	6.14	13.5	0.79	1.75	<0.05	<0.1	6.98	15.4
2010	4.30	9.50	0.57	1.26	<0.05	<0.1	4.87	10.7
2011	3.52	7.75	0.41	0.91	--	--	3.98	8.77
2012	2.53	5.58	0.29	0.64	--	--	2.82	6.22
Total	**206**	**453**	**28.3**	**62.5**	**3.37**	**7.44**	**238**	**523**

[a] Mass removed during the testing of the off-site well in early December, and during the first day of operation on December 31, 1998.

APPENDIX A

Appendix A

Data on Abandoned, Replaced, or Deepened Wells

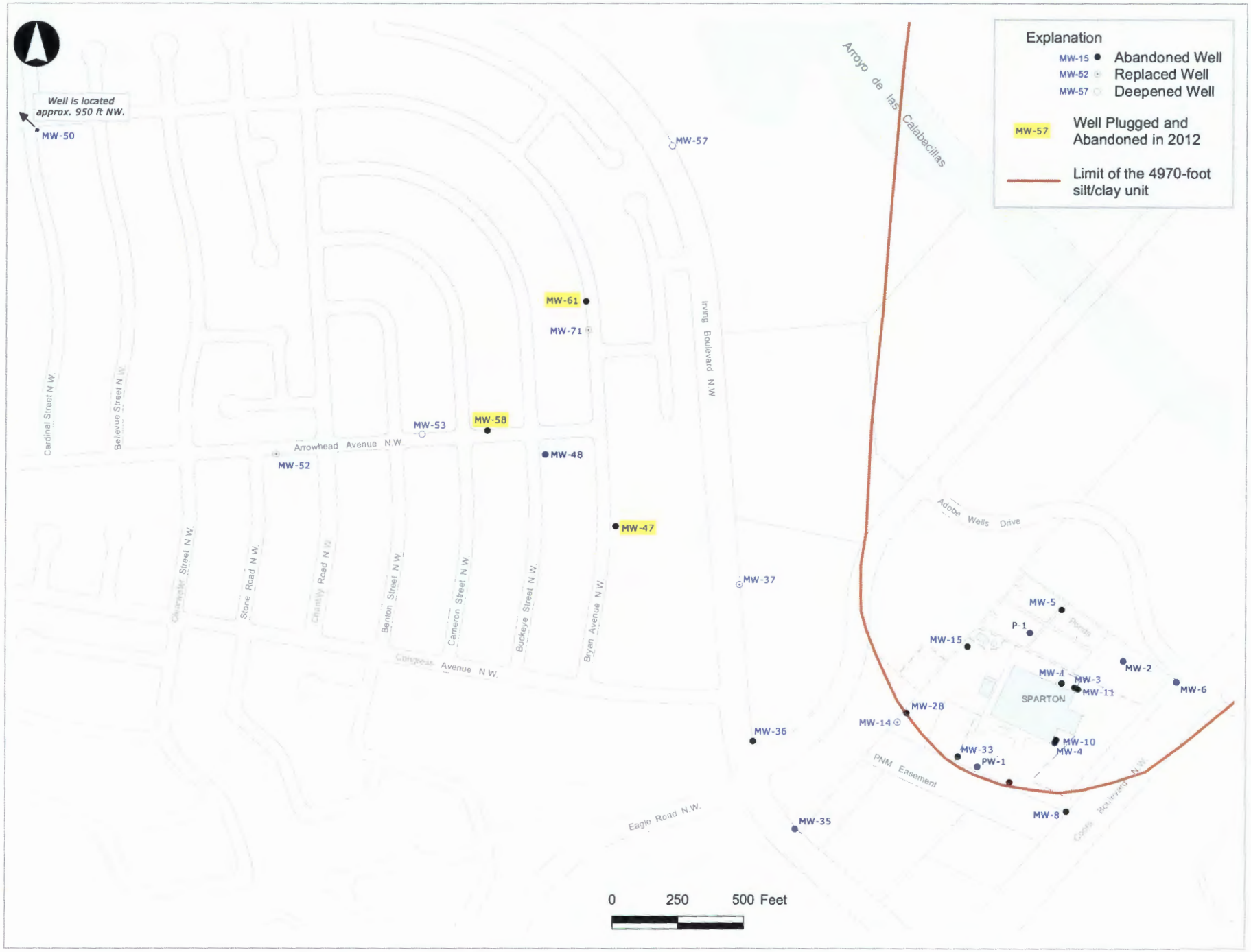


Figure A-1 Location of Abandoned, Replaced, or Deepened Wells

Table A-1: Completion Flow Zone, Location Coordinates, and Measuring Point Elevations for Abandoned, Replaced, or Deepened Wells

Table A-1

Completion Flow Zone, Location Coordinates, and Measuring Point Elevations for Abandoned, Replaced, or Deepened Wells

Well ID	Flow Zone	Easting	Northing	Elevation	Remark
MW-1	UFZ	377333.82	1524375.09	5047.84	P&A
MW-2	UFZ	377567.16	1524459.46	5050.26	P&A
MW-3	UFZ	377381.22	1524358.94	5047.22	P&A
MW-4	UFZ	377307.78	1524150.61	5047.61	P&A
MW-5	UFZ	377333.30	1524654.26	5054.52	P&A
MW-6	UFZ	377767.16	1524379.78	5046.39	P&A
MW-8	UFZ	377351.53	1523889.67	5042.62	P&A
MW-10	LLFZ	377312.93	1524159.79	5046.80	P&A
MW-11	LLFZ	377394.44	1524351.71	5046.31	P&A
MW-13	UFZ	377137.23	1523998.34	5041.98	P&A
MW-14	UFZ	376711.05	1524226.84	5043.04	Replaced
MW-15	UFZ	376976.13	1524514.13	5047.49	P&A
MW-28	UFZ	376745.76	1524262.70	5041.31	P&A
MW-33	UFZ	376940.80	1524097.74	5042.20	P&A
MW-35	UFZ	376322.45	1523822.39	5042.50	P&A
MW-36	UFZ	376161.85	1524154.66	5059.46	P&A
MW-37	UFZ	376108.17	1524746.78	5090.85	Replaced
MW-47[a]	UFZ	375638.14	1524967.74	5121.16	Replaced
MW-48	UFZ	375369.75	1525239.86	5143.44	P&A
MW-50	UFZ	372810.17	1527180.09	5211.51	P&A
MW-52	UFZ	374343.43	1525239.45	5156.79	Replaced
MW-53	UFZ	374899.50	1525314.41	5148.62	Deepened
MW-57	UFZ	375849.02	1526406.98	5103.54	Deepened
MW-58[a]	UFZ	375148.43	1525330.73	5146.40	P&A
MW-61[a]	UFZ	375523.16	1525821.65	5134.74	P&A
MW-71	DFZ	375530.63	1525711.81	5134.59	Replaced
P-1	UFZ	377213.50	1524565.70	5048.80	P&A
PW-1	UFZ	377014.90	1524058.50	5144.20	P&A

[a] Well plugged and abandoned in June 2012

Table A-2: Screen Data for Abandoned, Replaced, or Deepened Wells

Table A-2

Screen Data for Abandoned, Replaced, or Deepened Wells

Well ID	Flow Zone	Diameter (in)	Elevation (ft above MSL)			Depth below Ground (ft)		Screen Length (ft)	Remark
			Ground Surface	Top of Screen	Bottom of Screen	Top of Screen	Bottom of Screen		
MW-1	UFZ		5046.1	4977.1	4957.1	69.0	89.0	20.0	P&A
MW-2	UFZ		5048.6	4979.6	4959.6	69.0	89.0	20.0	P&A
MW-3	UFZ		5045.5	4980.5	4960.5	65.0	85.0	20.0	P&A
MW-4	UFZ		5045.9	4975.9	4955.9	70.0	90.0	20.0	P&A
MW-5	UFZ	2	5052.3	4984.3	4974.3	68.0	78.0	10.0	P&A
MW-6	UFZ	2	5044.6	4983.1	4978.1	61.5	66.5	5.0	P&A
MW-8	UFZ	2	5040.4	4982.4	4977.4	58.0	63.0	5.0	P&A
MW-10	UFZ	2	5045.3	4910.3	4905.3	135.0	140.0	5.0	P&A
MW-11	UFZ	2	5044.4	4910.4	4905.4	134.0	139.0	5.0	P&A
MW-13	UFZ	2	5041.9	4981.5	4971.6	60.4	70.3	9.9	P&A
MW-14	UFZ		5040.4	4979.4	4913.4	61.0	127.0	66.0	Replaced
MW-15	UFZ		5045.6	4985.6	4921.1	60.0	124.5	65.0	P&A
MW-28	UFZ	2	5040.9	4975.9	4970.9	65.0	70.0	5.0	P&A
MW-33	UFZ	2	5042.1	4980.1	4969.1	62.0	73.0	11.0	P&A
MW-35	UFZ	2	5042.5	4979.3	4969.3	63.2	73.2	10.0	P&A
MW-36	UFZ	2	5059.3	4977.0	4967.0	82.3	92.3	10.0	P&A
MW-37	UFZ	2	5091.7	4976.7	4966.7	115.0	125.0	10.0	Replaced
MW-47[a]	UFZ	4	5120.7	4976.4	4961.4	144.3	159.3	15.0	Replaced
MW-48	UFZ	4	5143.0	4976.9	4961.9	166.1	181.1	15.0	P&A
MW-50	UFZ	4	5210.8	4975.8	4960.8	235.0	250.0	15.0	P&A
MW-52	UFZ	4	5165.4	4974.6	4959.4	190.8	206.0	15.2	Replaced
MW-53	UFZ	2	5164.0	4974.0	4960.0	190.0	204.0	14.0	Deepened
MW-57	UFZ	4	5103.1	4977.1	4962.1	126.0	141.0	15.0	Deepened
MW-58[a]	UFZ	4	5146.4	4975.4	4960.4	171.0	186.0	15.0	P&A
MW-61[a]	UFZ	4	5134.8	4976.2	4961.2	158.6	173.6	15.0	P&A
MW-71	DFZ	4	5134.1	4786.1	4781.1	348.0	353.0	5.0	Replaced
P-1	UFZ		5048.8	4978.8	4958.8	70.0	90.0	10.0	P&A
PW-1	UFZ		5042.9	4982.9	4905.9	60.0	137.0	77.0	P&A

[a] Well plugged and abandoned in June 2012

APPENDIX B

Appendix B

2012 Groundwater Quality Data

B-1: Groundwater Monitoring Program Wells 2012 Analytical Results

B-2: Infiltration Gallery and Pond Monitoring Wells 2012 Analytical Results

B-1: Groundwater Monitoring Program Wells 2012 Analytical Results

Appendix B-1
Grounwater Monitoring Program Wells
2012 Analytical Results[a]

	Sample Date	TCE ug/L	1,1-DCE ug/L	1,1,1-TCA ug/L	Cr Total, mg/L Unfiltered	Cr Total, mg/L Filtered	Other
MW-7	11/14/12	33	2.4	<1.0	0.016	<0.006	
MW-9	11/14/12	18	<1.0	<1.0	<0.006	<0.006	
MW-12	11/15/12	10	<1.0	<1.0	0.0062	<0.006	
MW-14R	11/19/12	3.8	<1.0	<1.0	0.79	NA	Chloroform 6.0; Bromodicloromethane 3.9; Dibromochloromethane 3.9
MW-16	11/15/12	10	<1.0	<1.0	0.56	0.38	
MW-18	NS						
MW-19	11/16/12	68	8.7	<1.0	0.013	NA	
MW-20	11/16/12	1.7	<1.0	<1.0	<0.006	NA	
MW-21	11/13/12	<1.0	<1.0	<1.0	0.55	0.031	
MW-22	11/19/12	<1.0	<1.0	<1.0	0.034	NA	
MW-23	11/14/12	3.2	<1.0	<1.0	0.32	0.12	
MW-25	11/13/12	16	<1.0	<1.0	0.10	0.058	
MW-26	11/15/12	7.3	<1.0	<1.0	0.25	0.092	
MW-29	11/16/12	<1,0	<1.0	<1.0	<0.006	NA	
MW-30	11/26/12	7.2	<1.0	<1.0	0.15	NA	Chloroform 1.1; Bromodichloromethane 1.1
MW-31	11/19/12	<1.0	<1.0	<1.0	0.13	NA	Chloroform 3.3; Bromodichloromethane 2.8; Bromoform 1.1; Dbclm 3.3
MW-32	11/16/12	2.1	<1.0	<1.0	0.018	NA	
MW-34	11/14/12	<1.0	<1.0	<1.0	1.80	<0.006	Chloroform 2.6; Bromodichloromethanev 2.6; Dbcm 1.2
MW-37R	11/26/12	130	5.5	<1.0	0.069	NA	
MW-38	11/23/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-39	11/11/12	<1.0	<1.0	<1.0	0.028	NA	
MW-40	11/26/12	<1.0	<1.0	<1.0	<0.010	NA	
MW-41	11/16/12	<1.0	<1.0	<1.0	0.027	NA	
MW-42	11/23/12	18	4.5	<1.0	0.029	NA	
MW-43	11/26/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-44	11/28/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-45	12/04/12	<1.0	<1.0	<1.0	0.016	NA	
MW-46	11/26/12	500	67	<1.0	0.056	NA	PCE:3.1 Chloroform 2.3
MW-47R	11/07/12	1.1	<1.0	<1.0	<0.006	NA	
MW-49	11/20/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-51	11/21/12	<1.0	<1.0	<1.0	0.028	NA	

Appendix B-1
Grounwater Monitoring Program Wells
2012 Analytical Results[a]

	Sample Date	TCE ug/L	1,1-DCE ug/L	1,1,1-TCA ug/L	Cr Total, mg/L Unfiltered	Cr Total, mg/L Filtered	Other
MW-52R	02/17/12	14	27	1.9	<0.006	NA	
	05/22/12	16	37	1.8	<0.006	NA	1,2 DCA 1.7
	05/22/12	15	34	1.7	<0.006	NA	1,2 DCA 1.5
	08/16/12	22	40	1.6	<0.006	NA	
	08/16/12	20	34	1.4	<0.006	NA	
	11/28/12	16	39	1.7	<0.006	NA	
	11/28/12	16	38	1.7	<0.006	NA	
MW-53D	12/04/12	16	<1.0	<1.0	0.025	0.024	
MW-55	11/28/12	13	<1.0	<1.0	0.0097	NA	
MW-56	11/29/12	120	3.6	<1.0	0.020	NA	
	11/29/12	120	3.5	<1.0	0.020	NA	
MW-57D	02/22/12	<1.0	<1.0	<1.0	<0.006	NA	
	05/22/12	<1.0	<1.0	<1.0	<0.006	<0.006	
	08/21/12	<1.0	<1.0	<1.0	<0.006	<0.006	Fe(Total) <0.02; Mn(Total) 0.0022
	11/07/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-59	11/21/12	<1.0	<1.0	<1.0	0.027	NA	
MW-60	11/29/12	840	110	2.7	0.14	0.021	1-1 DCA 1.1, PCE 9.4, Chloroform 2.5
MW-62	02/21/12	2.6	5.5	2.0	0.0080	<0.006	Fe(Dis) 0.020; Mn(Dis) 0.0031
	05/19/12	2.0	4.5	1.3	0.010	0.0060	
	08/22/12	3.0	<1.0	1.6	0.086	<0.006	Fe(Total) 0.85; Mn(Total) 0.086; Fe(Dis)<0.02; Mn(Dis) <0.0020
	11/13/12	2.0	4.9	1.2	0.015	<0.006	
MW-64	11/28/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-65	02/17/12	2.6	6.4	<1.0	<0.006	NA	
	05/22/12	2.5	7.1	<1.0	<0.006	NA	
	08/17/12	2.7	5.5	<1.0	<0.006	NA	
	11/07/12	1.9	5.1	<1.0	<0.006	NA	
MW-66	02/18/12	<1.0	<1.0	<1.0	<0.006	NA	
	02/18/12	<1.0	<1.0	<1.0	<0.006	NA	
	05/22/12	<1.0	<1.0	<1.0	<0.006	NA	
	08/21/12	<1.0	<1.0	<1.0	<0.006	NA	
	11/28/12	<1.0	<1.0	<1.0	<0.006	NA	
	11/28/12	<1.0	<1.0	<1.0	<0.006	NA	

Appendix B-1
Grounwater Monitoring Program Wells
2012 Analytical Results[a]

	Sample Date	TCE ug/L	1,1-DCE ug/L	1,1,1-TCA ug/L	Cr Total, mg/L Unfiltered	Cr Total, mg/L Filtered	Other
MW-67	05/23/12	<1.0	<1.0	<1.0	<0.006	NA	
	11/28/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-68	02/17/12	<1.0	<1.0	<1.0	<0.006	NA	
	05/19/12	<1.0	<1.0	<1.0	<0.006	NA	
	08/16/12	<1.0	<1.0	<1.0	<0.006	NA	
	11/30/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-69	02/17/12	<1.0	<1.0	<1.0	<0.006	NA	
	05/19/12	<1.0	<1.0	<1.0	<0.006	NA	Toluene 3.2; 4-Methyl-2-pentanone 11; 2-Butanone 30
	08/16/12	<1.0	<1.0	<1.0	<0.006	NA	
	11/30/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-70	11/19/12	5.7	<1.0	<1.0	<0.006	NA	
MW-71R	02/22/12	59	1.8	<1.0	<0.006	NA	
	05/22/12	72	2.2	<1.0	<0.006	NA	
	08/22/12	77	2.3	<1.0	<0.006	NA	
	11/29/12	56	2.7	<1.0	<0.006	NA	
MW-72	11/20/12	430	83	1.6	0.099	NA	Chloroform 1.8
MW-73	11/21/12	38	2.4	<1.0	0.057	0.058	
MW-79	05/25/12	<1.0	<1.0	<1.0	<0.006	NA	
	11/30/12	<1.0	<1.0	<1.0	<0.006	NA	
MW-80	02/21/12	<1.0	<1.0	<1.0	<0.006	NA	
	05/23/12	<1.0	<1.0	<1.0	<0.006	NA	
	08/20/12	<1.0	<1.0	<1.0	<0.006	NA	
	11/15/12	<1.0	<1.0	<1.0	<0.006	NA	

[a] VOCs by EPA Method 8260

NA Not analyzed

NS Well not sampled (NS) due to be dry or not have sufficient water for sampling

Concentration exceeds MCLs based on the more stringent of the drinking water standards or the maximum allowable concentrations in groundwater set by the NMWQCC (5 mg/L for TCE and DCE, and 60 mg/L for TCA and 50 ug/L for total chromium).

B-2: Infiltration Gallery and Pond Monitoring Wells 2012 Analytical Results

Appendix B-2
Infiltration Gallery and Pond Monitoring Wells
2012 Analytical Results[a]

	Sample Date	TCE ug/L	1,1-DCE ug/L	1,1,1-TCA ug/L	Cr (total) mg/L	Fe (total) mg/L	Mn (total) mg/L	Cr (diss) mg/L	Fe (diss) mg/L	Mn (diss) mg/L
MW-17	02/21/12	1.6	<1.0	<1.0	0.037	4.0	0.15	0.029	<0.020	<0.0020
	05/19/12	<1.0	<1.0	<1.0	0.031			0.029		
	08/22/12	<1.0	<1.0	<1.0	0.034	1.3	0.054	0.031	<0.020	<0.0020
	11/13/12	<1.0	<1.0	<1.0	0.038	2.4	0.13	0.032	<0.020	<0.0020
MW-74	02/18/12	<1.0	<1.0	<1.0	0.0094	0.028	<0.0020			
	05/21/12	<1.0	<1.0	<1.0	0.0077	<0.020	0.0023			
	08/17/12	<1.0	<1.0	<1.0	0.010	0.025	0.004			
	11/12/12	<1.0	<1.0	<1.0	0.0090	<0.020	<0.0020			
MW-75	02/18/12	<1.0	<1.0	<1.0	0.0095	<0.050	<0.0020			
	05/21/12	<1.0	<1.0	<1.0	0.0084	<0.020	<0.0020			
	08/17/12	<1.0	<1.0	<1.0	0.0094	<0.020	<0.0020			
	11/12/12	<1.0	<1.0	<1.0	0.0085	<0.020	<0.0020			
MW-76	02/18/12	<1.0	<1.0	<1.0	0.0093	0.037	<0.0020			
	05/21/12	<1.0	<1.0	<1.0	0.0086	<0.020	<0.0020			
	08/17/12	1.2	<1.0	<1.0	0.0090	<0.020	<0.0020			
	11/12/12	<1.0	<1.0	<1.0	0.0082	<0.020	<0.0020			
MW-77	02/18/12	1.7	<1.0	<1.0	<0.006	0.24	7.1	<0.006	<0.020	0.38
	05/23/12	1.1	<1.0	<1.0	<0.012	0.38	10.0	<0.006	<0.020	0.19
	05/23/12	1.1	<1.0	<1.0	<0.012	0.33	9.0	<0.006	<0.020	0.27
	08/17/12	1.0	<1.0	<1.0	<0.006			<0.006		
	11/12/12	3.4	<1.0	<1.0	<0.006	0.27	1.1	<0.006	<0.020	0.57
MW-78	02/22/12	<1.0	<1.0	<1.0	0.027	0.50	0.036	0.029	<0.020	<0.0020
	05/24/12	<1.0	<1.0	<1.0	0.026	0.069	0.006	0.029	<0.020	<0.0020
	08/23/12	<1.0	<1.0	<1.0	0.029			0.030		
	08/23/12	<1.0	<1.0	<1.0	0.029			0.030		
	11/12/12	<1.0	<1.0	<1.0	0.028	0.57	0.043	0.029	<0.020	0.004

[a] VOCs by EPA Method 8260

APPENDIX C

Appendix C

2012 Flow Rate Data from Containment Well

C-1: Off-Site Containment Well

C-2: Source Containment Well

C-1: Off-Site Containment Well

Appendix C-1
Off-Site Containment Well
2012 Flow Rate Data

Date	Time	Instantaneous Discharge (gpm)	Totalizer Reading (gallons)	Average Discharge (gpm)	Total Volume (gallons)a
12/30/2011	9:08	291.0	175,439,800		1,531,159,000
				291	
1/2/2012	10:42	291.8	176,726,000		1,532,445,600
				277	
1/9/2012	9:48	293.1	179,504,100		1,383,654,300
				291	
1/16/2012	8:45	291.3	182,423,840		1,386,574,040
				292	
1/23/2012	8:23	290.6	185,365,700		1,389,515,900
				188	
1/27/2012	8:46	272.0	186,455,500		1,390,605,700
				270	
2/1/2012	10:43	269.3	188,429,000		1,392,579,200
				269	
2/9/2012	10:48	278.3	191,532,000		1,395,682,200
				240	
2/17/2012	8:50	292.2	194,268,900		1,398,419,100
				337	
2/23/2012	11:30	287.9	197,231,400		1,401,381,600
				296	
3/1/2012	9:40	298.5	200,182,100		1,404,332,300
				255	
3/8/2012	10:40	298.5	202,765,000		1,406,915,200
				336	
3/14/2012	9:15	290.4	205,640,100		1,409,790,300
				290	
3/19/2012	10:18	291.7	207,749,200		1,411,899,400
				294	
3/27/2012	8:03	294.0	211,100,800		1,415,251,000
				294	
4/2/2012	10:30	293.0	213,684,400		1,417,834,600
				267	
4/9/2012	9:47	290.6	216,367,200		1,420,517,400
				291	
4/16/2012	9:47	296.7	219,300,800		1,423,451,000
				289	
4/23/2012	8:53	290.4	222,202,100		1,426,352,300
				290	
5/1/2012	8:26	291.4	225,540,100		1,429,690,300

Appendix C-1
Off-Site Containment Well
2012 Flow Rate Data

Date	Time	Instantaneous Discharge (gpm)	Totalizer Reading (gallons)	Average Discharge (gpm)	Total Volume (gallons)a
				289	
5/8/2012	8:10	290.0	228,451,600		1,432,601,800
				290	
5/14/2012	10:39	291.8	231,004,700		1,435,154,900
				290	
5/21/2012	8:08	288.7	233,881,360		1,438,031,560
				289	
5/28/2012	8:17	293.5	236,800,500		1,440,950,700
				291	
6/1/2012	10:08	290.4	238,506,200		1,442,656,400
				289	
6/8/2012	8:43	289.7	241,397,200		1,445,547,400
				290	
6/15/2012	9:12	287.1	244,333,100		1,448,483,300
				290	
6/22/2012	7:56	298.5	247,238,600		1,451,388,800
				289	
6/29/2012	12:00	292.7	250,223,800		1,454,374,000
				291	
7/2/2012	12:00	293.3	251,480,300		1,455,630,500
				291	
7/9/2012	8:17	291.8	254,352,800		1,458,503,000
				290	
7/16/2012	9:08	293.1	257,290,500		1,461,440,700
				291	
7/23/2012	8:16	294.9	260,208,200		1,464,358,400
				268	
8/1/2012	8:43	288.3	263,687,400		1,467,837,600
				325	
8/7/2012	9:37	294.1	266,516,100		1,470,666,300
				291	
8/13/2012	9:00	291.3	269,016,200		1,473,166,400
				289	
8/20/2012	9:32	291.0	271,934,200		1,476,084,400
				292	
8/27/2012	9:50	290.1	274,885,800		1,479,036,000
				290	
9/1/2012	8:54	291.4	276,959,900		1,481,110,100
				290	

Appendix C-1
Off-Site Containment Well
2012 Flow Rate Data

Date	Time	Instantaneous Discharge (gpm)	Totalizer Reading (gallons)	Average Discharge (gpm)	Total Volume (gallons)a
9/7/2012	9:12	288.3	279,470,300		1,483,620,500
				287	
9/13/2012	9:37	291.8	281,959,500		1,486,109,700
				291	
9/20/2012	10:41	292.7	284,909,400		1,489,059,600
				282	
9/27/2012	9:25	289.8	287,730,500		1,491,880,700
				278	
10/1/2012	12:30	290.1	289,380,300		1,493,530,500
				286	
10/8/2012	9:53	293.1	292,218,700		1,496,368,900
				290	
10/15/2012	9:38	292.3	295,140,500		1,499,290,700
				284	
10/22/2012	8:08	291.3	297,974,700		1,502,124,900
				290	
10/29/2012	8:30	290.9	300,905,900		1,505,056,100
				290	
11/1/2012	8:57	290.8	302,165,900		1,506,316,100
				364	
11/4/2012	8:54	291.0	303,738,800		1,507,889,000
				253	
11/12/2012	8:45	290.6	306,652,600		1,510,802,800
				290	
11/19/2012	8:18	291.8	309,572,900		1,513,723,100
				290	
11/26/2012	8:21		312,500,400		1,516,650,600
				290	
12/3/2012	8:40	291.1	315,429,500		1,519,579,700
				290	
12/10/2012	12:30	290.6	318,422,700		1,522,572,900
				408	
12/15/2012	10:00	290.6	321,301,500		1,525,451,700
				225	
12/24/2012	9:33		324,215,100		1,528,365,300
				289	
1/1/2013	11:25	291.9	327,578,200		1,531,728,400

[a] Total pumpage since December 31, 1998

C-2: Source Containment Well

Appendix C-2
Source Containment Well
2012 Flow Data

Date	Time	Instantaneous Discharge (gpm)	Totalizer Reading (gallons)	Average Discharge (gpm)	Total Volume (gallons)
12/30/2011	9:50	62.82	67,185,700		251,412,719
				47.9	
1/2/2012	11:42	61.81	67,397,800		251,624,819
				47.7	
1/9/2012	10:04	63.50	67,874,100		252,101,119
				47.8	
1/16/2012	9:35	63.28	68,354,760		252,581,779
				47.0	
1/23/2012	9:45	62.19	68,828,500		253,055,519
				47.1	
1/27/2012	9:48	64.15	69,100,000		253,327,019
				47.0	
2/1/2012	12:00	63.38	69,444,300		253,671,319
				46.8	
2/9/2012	11:10	63.68	69,981,300		254,208,319
				46.2	
2/16/2012	9:10	63.37	70,441,500		254,668,519
				46.3	
2/23/2012	11:50	66.02	70,915,800		255,142,819
				46.3	
3/1/2012	10:57	65.52	71,379,600		255,606,619
				57.1	
3/8/2012	9:21	65.04	71,949,667		256,176,686
				32.9	
3/14/2012	9:40	64.59	72,234,700		256,461,719
				45.8	
3/19/2012	10:50	64.94	72,567,500		256,794,519
				45.4	
3/27/2012	8:56	66.09	73,085,900		257,312,919
				45.4	
4/2/2012	11:33	65.81	73,485,700		257,712,719
				45.0	
4/9/2012	10:55	65.10	73,937,400		258,164,419
				44.9	
4/16/2012	10:10	66.00	74,388,200		258,615,219
				41.3	
4/23/2012	7:46	68.00	74,798,500		259,025,519
				44.1	
5/1/2012	9:45	67.53	75,311,300		259,538,319
				44.5	
5/8/2012	8:00	66.43	75,755,600		259,982,619
				43.8	
5/14/2012	11:00	69.14	76,142,000		260,369,019

Appendix C-2
Source Containment Well
2012 Flow Data

Date	Time	Instantaneous Discharge (gpm)	Totalizer Reading (gallons)	Average Discharge (gpm)	Total Volume (gallons)
				43.9	
5/21/2012	8:50	68.44	76,578,700		260,805,719
				43.7	
5/28/2012	8:33	69.50	77,018,300		261,245,319
				43.5	
6/1/2012	11:25	68.44	77,276,300		261,503,319
				43.3	
6/8/2012	9:04	68.53	77,706,700		261,933,719
				43.1	
6/15/2012	9:57	71.35	78,143,000		262,370,019
				42.8	
6/22/2012	8:20	69.65	78,570,200		262,797,219
				35.1	
7/2/2012	12:55	71.68	79,085,600		263,312,619
				42.2	
7/9/2012	9:35	71.68	79,502,700		263,729,719
				41.0	
7/16/2012	9:43	71.71	79,916,000		264,143,019
				41.8	
7/23/2012	9:25	72.09	80,336,300		264,563,319
				46.9	
7/31/2012	10:00	72.85	80,877,800		265,104,819
				41.3	
8/6/2012	10:24	74.44	81,235,900		265,462,919
				35.2	
8/13/2012	9:40	72.59	81,589,100		265,816,119
				40.8	
8/20/2012	9:25	72.49	82,000,200		266,227,219
				38.9	
8/24/2012	13:50	66.15	82,234,700		266,461,719
				43.9	
8/27/2012	10:24	68.13	82,415,100		266,642,119
				20.1	
8/29/2012	12:00	68.13	82,474,800		266,701,819
				43.8	
9/1/2012	10:00	68.38	82,658,600		266,885,619
				43.9	
9/7/2012	9:40	69.13	83,036,600		267,263,619
				16.4	
9/20/2012	11:02	68.81	83,345,300		267,572,319
				42.4	
9/27/2012	10:10	68.56	83,770,400		267,997,419
				41.1	
10/1/2012	13:17	69.03	84,014,600		268,241,619
				36.1	
10/9/2012	12:10	69.03	84,428,600		268,655,619
				48.6	

Appendix C-2
Source Containment Well
2012 Flow Data

Date	Time	Instantaneous Discharge (gpm)	Totalizer Reading (gallons)	Average Discharge (gpm)	Total Volume (gallons)
10/15/2012	10:02	69.75	84,842,200		269,069,219
				5.6	
10/22/2012	8:30		84,898,500		269,125,519
				44.8	
10/29/2012	11:28	63.03	459,500		269,585,019
				45.4	
11/1/2012	10:32	65.99	653,200		269,778,719
				46.9	
11/5/2012	9:34	66.33	920,500		270,046,019
				54.0	
11/11/2012	9:31	66.28	1,386,900		270,512,419
				39.5	
11/19/2012	9:10	63.44	1,841,300		270,966,819
				39.7	
12/3/2012	9:30	63.53	2,643,000		271,768,519
				46.0	
12/10/2012	12:53	63.59	3,116,300		272,241,819
				45.8	
12/17/2012	10:50	63.53	3,572,800		272,698,319
	.			45.8	
12/24/2012	9:49	64.03	4,031,400		273,156,919
				45.6	
1/1/2013	13:00	64.44	4,565,400		273,690,919

Flow meter replace on October 22, 2012

APPENDIX D

Appendix D

2012 Influent/Effluent Quality Data

D-1: Off-Site Treatment System 2012 Analytical Results

D-2: Source Treatment System 2012 Analytical Results

D-1: Off-Site Treatment System 2012 Analytical Results

Appendix D-1

Off-Site Treatment System
2012 Analytical Results[a]

Sample Date	Influent						Effluent					
	TCE (ug/l)	1,1DCE (ug/l)	1,1,1TCA (ug/l)	Cr(total) (mg/l)	Fe(total) (mg/l)	Mn(total) (mg/l)	TCE (ug/l)	1,1DCE (ug/l)	1,1,1TCA (ug/l)	Cr(total) (mg/l)	Fe(total) (mg/l)	Mn(total) (mg/l)
01/02/12	700	55	1.8	0.0110	<0.020	<0.0020	<1.0	<1.0	<1.0	0.0120	0.0530	<0.0020
02/01/12	520	56	1.9	0.0100	0.1200	<0.0020	<1.0	<1.0	<1.0	0.0100	<0.020	<0.0020
03/01/12	540	58	1.9	0.0098	0.0510	<0.0020	<1.0	<1.0	<1.0	0.0091	<0.020	<0.0020
04/01/12	440	50	2.0	0.0100	<0.020	<0.0020	1.1	<1.0	<1.0	0.0100	<0.020	<0.0020
05/01/12	580	60	1.9	0.0093	<0.020	<0.0020	<1.0	<1.0	<1.0	0.0099	<0.020	<0.0020
06/01/12	540	57	1.9	0.0100	<0.020	<0.0020	<1.0	<1.0	<1.0	0.0096	<0.020	<0.0020
07/01/12	520	55	1.5	0.0063	0.2200	<0.0020	<1.0	<1.0	<1.0	0.0078	<0.020	<0.0020
08/01/12	470	58	1.5	0.0100	<0.10	<0.010	<1.0	<1.0	<1.0	<0.010	<0.10	<0.010
09/01/12	460	52	1.7	0.0080	<0.10	<0.010	<1.0	<1.0	<1.0	0.0079	<0.10	<0.010
10/01/12	440	54	1.6	0.0087	<0.020	<0.0020	<1.0	<1.0	<1.0	0.0092	<0.020	<0.0020
11/01/12	510	59	1.5	0.0089	<0.020	<0.0020	<1.0	<1.0	<1.0	0.0085	<0.020	<0.0020
12/01/12	350	48	1.4	0.0079	0.0880	<0.0020	<1.0	<1.0	<1.0	0.0084	<0.020	<0.0020
01/01/13	430	54	1.5	0.0082	<0.050	<0.0020	<1.0	<1.0	<1.0	0.0086	<0.050	<0.0020

[a] Data from January 1, 2013 has been included to show conditions at the end of the year.

Concentration exceeds MCLs based on the more stringent of the drinking water standards or the maximum allowable concentrations in groundwater set by the NMWQCC (5 mg/L for TCE and DCE, and 60 mg/L for TCA).

D-2: Source Treatment System 2012 Analytical Results

Appendix D-2

Source Treatment System
2012 Analytical Results[a]

Sample Date	Influent						Effluent					
	TCE (ug/l)	1,1DCE (ug/l)	1,1,1TCA (ug/l)	Cr(total) (mg/l)	Fe(total) (mg/l)	Mn(total) (mg/l)	TCE (ug/l)	1,1DCE (ug/l)	1,1,1TCA (ug/l)	Cr(total) (mg/l)	Fe(total) (mg/l)	Mn(total) (mg/l)
01/02/12	34	3.7	<1.0	0.030	<0.020	0.440	<1.0	<1.0	<1.0	0.028	<0.020	0.047
02/01/12	31	3.8	<1.0	0.030	0.0	0.260	<1.0	<1.0	<1.0	0.028	<0.020	0.061
03/01/12	29	3.6	<1.0	0.030	0.0	0.160	<1.0	<1.0	<1.0	0.030	<0.020	0.040
04/01/12	32	3.2	<1.0	0.030	<0.020	0.390	<1.0	<1.0	<1.0	0.031	<0.020	0.060
05/01/12	34	3.9	<1.0	0.030	<0.020	0.098	<1.0	<1.0	<1.0	0.031	<0.020	0.040
06/01/12	33	4.0	<1.0	0.030	<0.020	0.860	<1.0	<1.0	<1.0	0.031	<0.020	0.037
07/01/12	35	3.8	<1.0	0.027	<0.020	0.590	<1.0	<1.0	<1.0	0.028	<0.020	0.760
08/01/12	28	3.2	<1.0	0.033	<0.10	0.140	<1.0	<1.0	<1.0	0.031	<0.1	0.190
09/01/12	30	3.1	<1.0	0.029	0.0	0.790	<1.0	<1.0	<1.0	0.029	<0.020	0.090
10/01/12	27	2.8	<1.0	0.031	<0.020	0.120	<1.0	<1.0	<1.0	0.032	<0.020	0.071
11/01/12	31	3.7	<1.0	0.031	<0.020	0.078	<1.0	<1.0	<1.0	0.031	<0.020	0.052
12/01/12	23	2.7	<1.0	0.032	0.0	0.490	<1.0	<1.0	<1.0	0.030	<0.020	0.045
01/01/13	24	3.2	<1.0	0.035	<0.050	0.170	<1.0	<1.0	<1.0	0.034	<0.050	0.044

[a] Data from January 1, 2013 has been included to show conditions at the end of the year.

Concentration exceeds MCLs based on the more stringent of the drinking water standards or the maximum allowable concentrations in groundwater set by the NMWQCC (5 mg/L for TCE and DCE, and 60 mg/L for TCA and 50 ug/L for total chromium).