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ENVIRONMENTAL & WATER-RESOURCE CONSULTANTS

June 24, 2016

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Subject: **Sparton Technology, Inc: Former Coors Road Plant Remedial Program 2015 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 2015, and evaluations of these data to assess the performance of the systems.

We certify under penalty of law that this document and all attachments were prepared under our direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon our 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 our knowledge and belief, true, accurate, and complete. We further certify, to the best of our knowledge and belief, that this document is consistent with the applicable requirements of the Consent Decree entered among 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. We are 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 us.

Sincerely,

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Sparton Technology, Inc.
Former Coors Road Plant
Remedial Program

2015 Annual Report

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

June 24, 2016

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Sparton Technology, Inc.
Former Coors Road Plant
Remedial Program

2015 Annual Report

Prepared for:

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Schaumburg, Illinois

Prepared by:

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

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List of Acronyms

µg/L	Micrograms per liter
COA	City of Albuquerque
Cr	Chromium
DCE	1,1-Dichloroethylene
DFZ	Deep Flow Zone below the 4800 — foot clay
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
kg	Kilogram
lbs	Pounds
LFZ	Lower Flow Zone (ULFZ and LLFZ)
LLFZ	Lower Lower Flow Zone
MCL	Maximum Contaminant Level
Metric	Metric Corporation
mg/L	Milligrams per liter
MSL	Mean Sea Level
ND	Not Detected
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
O/S	On-Site
RFI	RCRA Facility Investigation
rpm	Revolutions per minute
Sparton	Sparton Technology, Inc.
SSP&A	S.S. Papadopulos & Associates, Inc.
SVE	Soil Vapor Extraction

List of Acronyms
(Continued)

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.

These investigations also indicated that groundwater contamination was primarily within a sandy unit that lies above a 2-4 feet (ft) thick clay unit referred to as the 4,800-ft clay unit. This unit was encountered in every deep well installed during site investigations and in the U.S. Geological Survey (USGS) Hunter Ridge Park 1 Boring about 0.5 mile north of the site. The saturated thickness of the sands above the clay unit is about 160 ft. 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 is referred to as the 4,970-ft silt/clay unit. Depending on the depth of their screened interval, wells installed at the site and its vicinity during site investigations, or later, have been referred to as Upper Flow Zone (UFZ) wells if screened across, or within 15 ft of, the water table, Upper Lower Flow Zone (ULFZ) wells if screened 15-45 ft below the water table, Lower Lower Flow Zone (LLFZ) wells if screened more than 45 ft below the water table, and Deep Flow Zone (DFZ) wells if screened below the 4,800-ft clay. The USGS boring also indicates a 15-ft thick clay unit below the DFZ between elevations of 4,705 and 4,720 ft MSL. At the on-site area, the 4,970-ft silt/clay unit separates the UFZ from the ULFZ. Well locations are shown in Figure 1.2 and their screened interval in relation to these flow zones is shown in Figure 1.3.

On March 3, 2000, the United States Environmental Protection Agency (USEPA), the State of New Mexico Environment Department (NMED), the County of San Bernalillo, the City of Albuquerque (COA) and Sparton entered into a Consent Decree that set the terms for addressing soil and groundwater contamination. Under the terms of this Consent Decree, Sparton is currently operating an off-site and a source containment system to address groundwater contamination.[1] The off-site containment system consists of a containment well, CW-1, that fully penetrates the saturated portion of the sand unit above the 4,800-ft clay, a treatment building with an air stripper to treat the pumped water, a pipeline to the nearby Arroyo de las Calabacillas, and an infiltration gallery in the arroyo for returning the treated water to the aquifer (see Figure 1.4). The source containment system also consists of a containment well, CW-2, with a 50-ft screen

[1] Under the terms of the Consent Decree, Sparton also operated a Soil Vapor Extraction (SVE) system to address on-site soil contamination; this system was operated for a total of about 372 days between April 10, 2000 and June 15, 2001 and was dismantled in May 2002 after data indicated that the requirements and performance goals of the Consent Decree were met (Chandler and Metric Corp., 2001).

across the upper part of the sand unit, an on-site treatment building with an air stripper and a chromium removal unit[2] to treat the pumped water, and pipelines to two on-site ponds[3] for returning the treated water to the aquifer (see Figure 1.5).

Prior to the implementation of the remedial measures discussed above, the predominant contaminants at the off-site areas were VOCs, primarily TCE followed by DCE and TCA. In past Annual Reports the initial horizontal extent of these three contaminants was presented in plume maps prepared using November 1998 data from monitoring wells that existed at that time. At the on-site area, these plume maps did not distinguish between shallow wells completed above the 4970-ft silt/clay and deeper wells completed below the 4970-ft silt/clay. As a result of the increased chromium concentrations at the on-site area, which led to the installation of the chromium removal unit, the USEPA and NMED requested Sparton to include in this and future Annual Reports maps showing the extent of the chromium plume.[4] In preparing such a plume map, it became apparent that a distinction should be made between plume extent above and below the 4970-ft silt/clay unit. This distinction was, therefore, made not only in preparing chromium plume maps but also in revising TCE, DCE, and TCA plume maps.

The extent of the initial TCE plume above the 4970-ft silt/clay unit (hereafter the on-site plume) is shown in Figure 1.6 and that of the plume below the 4970-ft silt/clay and at the off-site areas (hereafter the regional plume) is shown in Figure 1.7. The corresponding initial DCE plumes are shown in Figures 1.8 and 1.9, and the initial TCA plumes are shown in Figures 1.10 and 1.11. Dissolved chromium concentrations, or total chromium concentrations wherever dissolved chromium data were not available, were used in determining the initial extent of the chromium plumes. The extent of the initial on-site chromium plume is shown in Figure 1.12 and that of the regional chromium plume is shown in Figure 1.13.

Based on the horizontal (see Figures 1.6 and 1.7) and the vertical extent of the 1998 TCE plume [see Appendix B to both the 1999 and the 2000 Annual Reports (S.S. Papadopulos & Associates, Inc. [SSP&A], 2001a; 2001b)] and a porosity of 0.3, the initial pore volume of the plume was estimated to be approximately 150 million cubic ft (ft^3), or 1.13 billion gallons, or 3,450 acre-ft.

Based on trends in the monthly mass removal rates by the off-site and source containment systems and the mass of VOCs removed as of the end of 2015, the initial dissolved VOC mass within the aquifer underlying the site and its vicinity is currently estimated to be about 8,600 kilograms (kg) or 18,960 pounds (lbs) consisting of about 7,900 kg (17,420 lbs) of TCE, about

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[2] The original treatment system consisted only of the air stripped; a chromium removal unit was added in early 2014 to address increased chromium concentrations in the influent.

[3] The original design consisted of six infiltration ponds. Based on performance data from these ponds, two ponds were backfilled in late 2005 and another two in early 2014 with the approval of the regulatory agencies.

[4] Letter dated February 5, 2016 from Chuck Hendrickson of USEPA and Dave Cobrain of NMED to Ernesto Martinez of Sparton, re: Approval with Modifications, Request for Approval of Changes to Reporting Requirements and to Sampling Methodology, Sparton Technology, Inc., Former Coors Road Plant Remedial Program, IPE ID No. NMD083212332.

670 kg (1,480 lbs) of DCE, and about 25 kg (55 lbs) of TCA.[5] Available data are not adequate for estimating the initial mass of dissolved chromium.

The off-site containment well began operating on December 31, 1998 and is currently operating at an average pumping rate of about 300 gallons per minute (gpm). The year 2015 constitutes the 17th year of operation of the off-site containment system. The source containment system began operating at an average rate of about 50 gpm on January 3, 2002. Thus, the year 2015 constitutes the 14th year of operation of this system. As discussed in the 2013 Annual Report (SSP&A, 2014), the source containment system was shut down on November 15, 2013 to implement corrective measures for addressing increased chromium concentrations in the pumped water. These corrective measures, which consisted of the addition of a chromium removal unit to the treatment system and of modifications to the plumbing to accommodate this unit, were implemented in early 2014, and the source containment system resumed operations on April 23, 2014.

Between the beginning of the current remedial operations in December 1998 and the end of May 2011, Metric Corporation (Metric) of Albuquerque and then of Los Lunas, New Mexico was responsible for the operation of the remedial systems, the collection of monitoring and system performance data, and for other field activities. After the passing away of Gary Richardson of Metric in May of 2011, SSP&A was responsible for these activities between June 1, 2011 and July 31, 2014. Since August 1, 2014 these activities are conducted by OCCAM/EC (formerly Easterling Consultants, LLC) of Albuquerque, New Mexico.

The objectives of the containment systems are:

- To contain and capture contaminated groundwater in the off-site area;
- To contain and capture most of the contaminated groundwater leaving the on-site area;
- To treat the captured water and return it to the aquifer; and
- Achieve ground water standards to the extent required by the terms of the Consent Decree (2000).

The purpose of this 2015 Annual Report is to:

- Discuss problems encountered during the 2015 operation of the systems;
- Present the data collected during 2015 from operating and monitoring systems; and
- Evaluate the performance of the systems with respect to meeting the above cited objectives, and the requirements of the site‘s permits.

This report was prepared by SSP&A on behalf of Sparton. Issues related to the year-2015 operation of the off-site and source containment systems are discussed in Section 2. Data collected to evaluate system performance and to satisfy permit or other requirements are presented in Section 3. Section 4 presents evaluations of the data with respect to the performance and the goals of the remedial systems. A summary and conclusions of the report and a discussion of

[5] This estimated initial VOC mass does not include VOCs that were removed from groundwater by SVE systems that were operated at the on-site area.

future plans are presented in Section 5. Section 6 lists previous reports and documents pertinent to site investigations and activities, including references cited in this report.

Section 2
System Operations

2.1 Monitoring Well System

During 2015, water levels were measured in and samples were collected from all monitoring wells. Water levels were measured quarterly and samples were collected from each well at the frequency specified either in the Groundwater Monitoring Program Plan[6] (Monitoring Plan) or in the State of New Mexico Groundwater Discharge Permit DP-1184 (Discharge Permit).

The completion flow zone, location coordinates, and measuring point elevation of all existing wells are presented on Table 2.1; their diameters and screened intervals are summarized on Table 2.2.

2.2 Containment Systems

2.2.1 Off-Site Containment System

The total hours of operation and the downtime for the Off-Site Containment System during the year are summarized on Table 2.3.

2.2.2 Source Containment System

The totals hours of operation and downtime for the Source Containment System during the year are summarized on Table 2.4.

2.3 Problems and Responses

To prevent the recurrence of chromium exceedances in the effluent from the source containment air stripper, that had occurred in November 2014 and which were attributed to the accumulation of chromium containing sediment in the air stripper, a bag filter was installed on the discharge line from the air stripper on April 1, 2015.

Due to chromium exceedances observed in 2013, pond monitoring well MW-17 had been put on a monthly sampling schedule. During 2014, the well could not be sampled until June, because of low water levels caused by the cessation of pond discharge. Monthly sampling since that date indicated that total chromium concentrations in the well exceeded the NMWQCC standard throughout the remainder of 2014. This condition continued during the first four months of 2015. Dissolved chromium concentrations in all these monthly samples, however, were below the NMWQCC standard: this suggested that chromium containing sediments accumulated in the well could be the cause of the observed higher total chromium concentrations in the samples from the well. To evaluate this possibility, a series of experiments with sampling methodology were conducted between February and May 2015. The results of these experiments, which were reported to the Ground Water Quality Bureau of NMED (see Appendix), indicated that the higher total chromium concentrations in samples from the well were indeed due to the suspension of

[6] Attachment A to the Consent Decree.

chromium containing sediments at the bottom of the well, as a result of purging that preceded the sampling of the well. Therefore, these concentrations are higher than those of dissolved chromium which are obtained from filtered samples.

Two shutdowns that lasted more than a day occurred at the off-site containment system and both of these shutdowns were related to the air stripper. The system was shut down for about 27.5 hours on November 22 and 23 to replace the booster pump at the stripper sump. The system was also shut down for about eight days, between December 15 and 23, to clean sediment buildup at the air stripper and to replace three of the gaskets. The source containment system also had two shutdowns longer than a day. The system was shut down for slightly over a day on March 3 and 4 to replace the blower motor, and for about 30 hours on August 17 and 18 due to power outage.

Other problems that were addressed during 2015 were routine maintenance items such as, for example, roof repairs at both the off-site and source containment treatment buildings, and the repair of the communication system for the infiltration gallery piezometer.

Future plans in the 2014 Annual Report (SSP&A, 2015) included the plugging and replacement of on-site monitoring wells MW-7 and MW-9 which did not have sufficient water for reliable water-level measurements and sampling. These plans were abandoned during 2015 due to rising water levels that made the potential future use of these wells viable. Also abandoned because of these rising water levels were plans to evaluate potential alternatives to the discharge ponds.

Section 3
Monitoring Results – 2015

The following data were collected in 2015 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.

3.1 Monitoring Wells

3.1.1 Water Levels

Water levels during 2015 were measured quarterly, in February, May, August and November. During each round of measurements, the depth to water was measured in all monitoring wells, the off-site and source containment wells, the two observation wells near CW-1 (see Figure 1.2), and the piezometer installed in the infiltration gallery. The corresponding elevations of the water levels during each of the four measurement rounds, calculated from these data, are summarized on Table 3.1. Selected monitoring well hydrographs are presented in Figure 3.1. As these hydrographs indicate, until several years ago, regional water-levels had been declining. This declining trend was attributed to groundwater production from deeper aquifers and a reduction in the extent of irrigated lands in the vicinity of the Site. Since about 2013, however, water-levels have reversed this trend and have been rising primarily due to a reduction in groundwater pumping through surface water use from the San Juan-Chama Drinking Water Project (Powell and McKean, 2014); recent improvements at the Arroyo de las Calabacillas and resulting increases in recharge may also have contributed to these water-level rises.

3.1.2 Water Quality

All monitoring wells at the site were sampled at the frequency specified in the Monitoring Plan and the Discharge Permit. The samples from wells in the Monitoring Plan were analyzed for VOCs and for total chromium, and occasionally for dissolved chromium; the samples from the infiltration gallery and pond monitoring wells were analyzed for VOCs and total chromium, iron, and manganese as required by the Discharge Permit, and also occasionally for dissolved chromium, iron, and manganese. In addition, seven on-site monitoring wells (MW-14R, MW-19, MW-30, MW 31, MW-41, MW-72, and MW-73), which are normally sampled only during the Fourth Quarter, were sampled during the first three quarters of 2015; the samples from these quarterly sampling events were analyzed for total and dissolved chromium to provide data for the evaluation of chromium conditions at the on-site area. Also, in addition to the quarterly sampling events for VOCs, chromium, iron, and manganese, pond monitoring well MW-17 was sampled in January, March, April, June, and December for total and dissolved chromium analyses.

The results of the analysis of the samples collected from the groundwater monitoring program wells during all sampling events conducted in 2015, and for all of the analyzed constituents, are presented in Table 3.2. The results of the analysis of the samples collected from the infiltration gallery and pond monitoring wells during all sampling events conducted in 2015 are presented in Table 3.3. Concentrations of TCE, DCE, TCA and of chromium that exceed the more stringent of their Maximum Contaminant Levels (MCLs) for drinking water or their maximum allowable concentrations in groundwater set by NMWQCC are highlighted on Tables 3.2 and 3.3.

3.2 Containment Systems

3.2.1 Flow Rates

The volumes of groundwater pumped by the off-site and source containment wells during 2015 and the corresponding flow rates are summarized on Table 3.4.

3.2.2 Influent and Effluent Quality

Concentrations of TCE, DCE, TCA, and of total chromium, iron, and manganese in monthly influent and effluent samples collected from the off-site containment system during 2015 are summarized on Table 3.5. The concentrations of the same constituents in monthly influent and effluent samples collected from the source containment system during 2015 are summarized on Table 3.6. Concentrations of TCE, DCE, TCA and of chromium that exceed the more stringent of their MCLs for drinking water or their maximum allowable concentrations in groundwater set by NMWQCC are highlighted on Tables 3.5 and 3.6.

After the installation of the chromium removal unit in 2014, samples for chromium analysis were collected from the influent to the tanks, between the tanks, the effluent from the second tank, and the effluent from the air stripper that discharges into the ponds; this sampling was conducted at different frequencies, initially semi-weekly and then weekly. During 2015, weekly sampling continued until September 15, except that sampling of the mid-point between the two tanks (mid-tank sample) was discontinued after May 11; the first sampling after September 15 was conducted during the next tank exchange, which occurred on September 28, and thereafter sampling from the three points was performed every three weeks just before the scheduled tank exchange. The chromium concentrations in these samples, including the monthly influent and effluent samples collected from the source containment system during 2015, and the flow rates and other data from the treatment plant during 2015 are summarized on Table 3.7. Chromium concentrations that exceed the NMWQCC standard of 50 μg/L are highlighted on Table 3.7.

Section 4
Evaluation of Operations – 2015

As stated in the Introduction (Section 1), the objectives of the off-site and source containment systems are:

- To contain and capture contaminated groundwater in the off-site area;
- To contain and capture most of the contaminated groundwater leaving the on-site area;
- To treat the captured water and return it to the aquifer; and
- Achieve ground water standards to the extent required by the terms of the Consent Decree (2000).

This section presents evaluations of the performance of the off-site and source containment systems, based on data collected during 2015, with respect to their meeting the above-stated objectives.

4.1 Hydraulic Containment

4.1.1 Water Levels and Capture Zones

The water-level elevation data presented in Table 3.1 were used to evaluate the performance of both the off-site and source containment wells with respect to providing hydraulic containment for the regional plumes 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 2015 are shown in Figures 4.1 through 4.12. The quarterly on-site water tables are shown in Figures 4.1, 4.4, 4.7, and 4.10; also shown on these figures are the capture zone of the source containment well in UFZ/ULFZ and the extent of the on-site TCE plume. The quarterly water levels and the capture zones of the off-site and source containment wells within the UFZ/ULFZ are shown in Figures 4.2, 4.5, 4.8, and 4.11, and those within the LLFZ are shown in Figures 4.3, 4.6, 4.9, and 4.12; also shown on these figures is the extent of the regional TCE plume. The extent of the TCE plumes shown in Figures 4.1 through 4.9 is based on last year‘s (November 2014) water-quality data from monitoring wells, and that of those shown on the water-level maps for November 2015 (Figures 4.10 through 4.12) are based on the November 2015 water-quality data.

The on-site TCE plume lies along the southern limit of the 4970-ft silt/clay unit; the configuration of the on-site water table (Figures 4.1, 4.4, 4.7, and 4.10) indicates that groundwater from the plume area discharges into the regional aquifer over the edge of the 4970-ft silt/clay unit, mostly within the capture zone of the source containment well in the UFZ/ULFZ; vertical leakage of contaminated water across the sit/clay unit is also mostly within the capture zone of the source containment well. The water levels in the UFZ/ULFZ (Figures 4.2, 4.5, 4.8, and 4.11) and in the LLFZ (Figures 4.3, 4.6, 4.9, and 4.12) show that at a pumping rate that averaged about 280 gpm during 2015, the capture zone of the off-site containment well CW-1 extends beyond the November 2014 or November 2015 extent of the regional TCE plume and provides an ample safety margin to the hydraulic containment of this plume. These water levels also indicate that at an average pumping rate of about 50 gpm for the year, the source containment well CW-2 continued to capture contaminated groundwater leaving the on-site area.

The direction of groundwater flow and the hydraulic gradient in the DFZ during each quarterly round of the 2015 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 4.13. During 2015 the direction of groundwater flow in the DFZ ranged from W 14.2° N in February to W 23.1° N in August, and the hydraulic gradient from 0.00221 in February to 0.00374 in August. The average direction of groundwater flow in the DFZ during 2015 was W 20.9° N with an average hydraulic gradient of 0.00327.

4.1.2 Effects of Containment Well Shutdown on Capture

The containment systems are occasionally shut down for maintenance and repairs, and sometimes due to power or equipment failures (see Tables 2.3 and 2.4). Most shutdowns are of a relatively short duration, but as discussed in Section 2.3, shutdowns during 2015 included an eight-day shutdown of the off-site containment system due to major clean-up and overhaul of the air stripper.

The capture zone of 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 be 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 this well during a shutdown of limited duration. Under non-pumping conditions, the hydraulic gradient near the leading edge of the plume is about 0.003. The aquifer above the 4800-ft clay has a hydraulic conductivity of 25 feet per day (ft/d) and a porosity of about 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 feet per year (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 several hundred feet (see for example Figures 4.2 and 4.3 or 4.11 and 4.12). 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.

4.2 Groundwater Quality in Monitoring Wells

4.2.1 Concentration Trends

Plots showing temporal changes in the concentrations of TCE, DCE, TCA, and dissolved chromium, or total chromium when data on dissolved chromium were not available, were prepared for a number of on-site and off-site monitoring wells to demonstrate long-term water-quality changes at the Sparton site. Plots for on-site wells completed above the 4970-ft silt/clay unit are shown in Figure 4.14; plots for on-site wells completed below the silt/clay unit and for off-site wells are shown in Figure 4.15.

With the exception of a few wells, in general, VOC concentrations in both on-site and off-site wells have a decreasing trend. Significant decreases in VOC concentrations occurred in most on-site wells completed above the 4970-ft silt/clay unit between 1998 and the mid-2000s (see plots for wells MW-16, MW-23, MW-25, and MW-26 in Figure 4.14). This is primarily due to the operation of soil vapor extraction (SVE) systems at the site during short periods in 1998 and 1999, and again for about a year between April 2000 and June 2001, and to the flushing effects of the water infiltrating from the infiltration ponds of the source containment system since the start of the system operation in 2002. Wells along the southern limit of the 4970-ft silt/clay unit (see plots for wells MW-07 and MW-12 in Figure 4.14), however, have also a declining trend but do not appear to have been significantly affected by the SVE operations or the infiltration ponds; this is attributed to the presence of a low permeability zone that somewhat isolates the sands above the southern limit of the 4970-ft silt/clay unit from those to the north of this zone.

The VOC concentration trends in on-site wells completed below the 4970-ft silt/clay unit are illustrated by the plots for wells MW-19, MW-42, and MW-72 shown in Figure 4.15. Prior to the start of the source containment system, well MW-19 had a declining trend, and in fact VOC concentrations in this well had declined below the regulatory standards by 2000; however, after the start of the source containment system in 2002, VOC concentrations in the well sharply increased until 2004, primarily due to increased vertical leakage, and then resumed a declining trend. Most other on-site wells completed below the 4970-ft silt/clay unit, except MW-72, have a declining trend similar to that of MW-42, or are free of any VOCs. Well MW-72 had high concentrations of VOCs when it was installed in early 1995, but after a few years concentrations began declining; this declining trend continued until 2008 when VOC concentration started increasing again.

The VOC concentration in most off-site wells are declining (see plots for wells MW-55, and MW-60 in Figure 4.15), although there are some wells were concentrations have not significantly changed during the last several years (see plot for well MW-37/37R in Figure 4.15). Well MW-60 continued to be the off-site well with the highest VOC concentrations, as it has been the case since the beginning of remedial operations; however, concentrations in this well have been declining since the mid-2000s and TCE concentrations in the well have declined from 18,000 micrograms per liter (µg/L) in November 2004 to 380 µg/L in November 2015.

Chromium concentrations in most monitoring wells completed above the 4970-ft silt/clay unit have been high, mostly above the NMWQCC standard of 50 µg/L, and remained high (see for example wells MW-16, MW-23, MW-25, and MW-26 in Figure 4.14); an increase occurred soon after the start of the source containment system due to the rise of the water levels in the sands above the 4970-ft silt/clay unit and the resulting mobilization of chromium that was present in the previously unsaturated zone above the former water table. A second, similar increase occurred during the last several years due to rising regional water levels (see Figure 3.1). Wells along the southern limit of the 4970-ft silt/clay unit (see plots for wells MW-07 and MW-12 in Figure 4.14), which are isolated as discussed above, were not affected by the higher chromium concentrations in the sands north of the low permeability zone.

Chromium concentrations in on-site monitoring wells completed below the 4970-ft silt/clay (see plots for wells MW-19, MW-42, and MW-72 in Figure 4.15) also began rising after the start of the source containment system; this is attributed to increases in the leakage through the 4,970-ft silt/clay unit that resulted from steeper downward gradients; these steeper gradients were caused by the rise in water levels above the 4970-ft silt/clay unit due to infiltration from the ponds and the decline of water levels below this unit due to pumping from well CW-2. Concentrations rose and remained relatively steady in some wells (MW-42), rose and then began declining in some (MW-19), and maintained a rising trend in others (MW-72). Wells in the off-site area (see plots for wells MW-37/37R, MW-55, and MW-60 in Figure 4.15) also display varying trends.

Of the three monitoring wells completed in the DFZ, wells MW-67 and MW-79 have been clean since their installation in 1996 and 2006, respectively. The third 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 contamination.[7] 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. Concentrations of TCE in the well during quarterly sampling events in 2015 declined from 57 µg/L in February to 40 µg/L in November.

4.2.2 <u>Concentration Distribution and Plume Extent</u>

In past Annual Reports, the extent of groundwater contamination near the end of the year was illustrated by presenting isoconcentration maps for TCE and DCE based on the Fourth Quarter water-quality data for that year.[8] As stated in Section 1, because of the increased chromium concentrations that led to the installation of the chromium removal unit at the source containment system, the USEPA and NMED requested Sparton also to include isoconcentration maps for chromium in this and future Annual Reports (see footnote 4 on page 1-2). These maps were prepared using the Fourth Quarter 2015 data presented in Tables 3.2 and 3.3 and the concentrations of these compounds in the CW-1 and CW-2 influent samples from the November monthly sampling events (see Tables 3.5 and 3.6). Also, as mentioned in Section 1, a distinction was made between the extent of these compounds above the 4970-ft silt/clay unit (on-site plumes) and that below this unit and in the off-site areas (regional plumes).

The horizontal extent of the on-site TCE plume is shown in Figure 4.16 and that of the regional TCE plume is shown in Figure 4.17.[9] The concentration of DCE in wells completed above the 4970-ft silt/clay unit is shown in Figure 4.18; note that an on-site DCE plume does not currently exist and that the only well that has a concentration above the detection limit of 1 µg/L is MW-26 at 1.5 µg/L. The extent of the regional DCE plume is shown in Figure 4.19. The only wells in

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[7] 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.

[8] Until and including the 2008 Annual Report an isoconcentration map for TCA was also included in the Annual Reports. Because TCA concentrations since 2003 have been below regulatory standards, this practice was discontinued, with the approval of the agencies, starting with the 2009 Annual Report.

[9] At well cluster locations, the concentrations shown in Figures 4.17, 4.19 and 4.21 are those for the well with the highest concentration.

which TCA was detected above the detection limit of 1 μg/L in November 2015 were monitoring wells MW-46, at 1.3 μg/L, and MW-52R, at 1.1 and 1.2 μg/L, respectively, in duplicate samples.

The extent of the on-site chromium plume is shown in Figure 4.20 and that of the regional chromium plume is shown in Figure 4.21. These chromium isoconcentration maps were prepared using measured dissolved chromium concentrations except for wells where only total chromium data were available; these wells are identified in Figures 4.20 and 4.21. In the figure showing the on-site plume (Figure 4.20), only one well, MW-77, is lacking dissolved chromium data; the total chromium concentration in this well is less than the detection limit and thus it has no effect on the extent of the on-site plume or on the distribution of chromium concentrations within the plume. In the figure showing the regional plume (Figure 4.21), most of the wells that lack dissolved chromium data are in the off-site area. Except for one well, MW-62, total chromium concentrations in these off-site wells are below the NMWQCC standard of 50 μg/L for chromium in groundwater; thus they do not affect the extent of main the regional plume associated with the site. At MW-62, a total chromium concentration of 120 μg/L led to the depiction of a small plume around this well which most probably does not exist, but reflects the presence of chromium containing sediments in the well. For example, the February sample from this well which was analyzed both for total and dissolved chromium (see Table 3.2), had total and dissolved chromium concentrations of 57 μg/L and less than the detection limit of 6 μg/L, respectively. Within the main regional plume area, the only well with total rather than dissolved chromium is containment well CW-2 in which, given the continuous pumping of the well, the dissolved chromium concentration is not expected to be different than the measured total chromium concentration.

4.2.2.1 Changes in Concentrations

A total of 55 monitoring wells and the influent from the two containment wells were sampled in November 2015. Of these 57 wells, 40 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, and the remaining 10 are wells that were installed in later years. Changes between the TCE, DCE, and chromium concentrations measured in these wells in November 2015 and those measured in November 1998, or during the first sampling event after their installation, are summarized on Table 4.1.

Thirty-one of the 57 wells listed on Table 4.1 are wells, or their replacements/deepened versions, which were used for defining both the initial plumes (Figures 1.6 through 1.13) and the November 2015 plumes; another 8 are wells that were used to define either the initial or the November 2015 plumes. Twelve of these 39 wells are wells completed above the 4970-ft silt/clay and the remaining 27 are wells completed below the 4970-ft silt/clay unit or in the off-site area. To show the distribution of concentration changes that occurred since the implementation of the off-site and source containment systems, changes in the TCE, DCE, and chromium concentrations in the 12 wells completed above the 4970-ft silt/clay unit are presented in Figures 4.22, 4.24, and 4.26, and those in the remaining 27 wells are presented in Figures 4.23, 4.25, and 4.27.

As this table and figures indicate, current VOC concentrations in most, if not all, wells are much lower than those that existed prior to the start of the current remedial operations. The only wells where a significant increase in VOC concentrations occurred are the off-site containment well CW-1, on-site monitoring well MW-19, and off-site monitoring well MW-52R. Increases in

CW-1 were expected since this well has been drawing water from the entire plume area where higher concentrations existed and continue to exist. The increase in MW-19 is attributed to increased downward leakage through the 4,970-ft silt/clay unit and that in MW-52R is attributed to a separate DCE-dominated plume. Thus, with respect to VOCs considerable progress has been made towards aquifer restoration.

The changes in chromium concentrations, however, indicate significant increases, particularly in on-site wells completed both above and below the 4970-ft silt/clay unit. As discussed earlier (see Section 4.2.1), these increases in chromium concentrations are attributed to the mobilization of chromium that was present in the previously unsaturated zone above the former water table, and to increases in the leakage across the 4,970-ft silt/clay unit that resulted from steeper downward gradients. It should be also noted that most of the chromium concentration changes reported on Table 4.1 and shown in Figures 4.26 and 4.27 are based on total chromium concentrations which in some monitoring wells are affected by chromium containing sediments; while there is no doubt that chromium concentrations have increased, increases in the concentrations of the chromium dissolved in the groundwater that is migrating through the sands are expected to be considerably lower.

4.3 Containment Systems

4.3.1 Flow Rates

The volume of water pumped from the off-site containment well during 2015 was approximately 145 million gallons and that pumped from the source containment well was about 26 million gallons (see Table 3.4). The corresponding average annual pumping rates were 277 gpm and 49 gpm, respectively, and the average pumping rates during operating hours were about 286 gpm and 51 gpm, respectively. A plot of the volume of water pumped by each well during each month of 2015 and of the total monthly volume is presented in Figure 4.28. The total volume of water pumped by both wells during 2015 was about 171.3 million gallons, and corresponds to an average pumping rate of about 326 gpm for the year.

The volume of water pumped during each year of the operation of the containment wells is summarized on Table 4.2, and a plot of the cumulative volume pumped by the wells since the beginning of their operation is presented in Figure 4.29. As shown on this table and figure, the total volume of water pumped by the off-site containment well since the beginning of its operation in December 1998 is about 2.17 billion gallons, and that pumped by the source containment well since the beginning of its operation in January 2002 is about 0.33 billion gallons; these volumes of pumped water correspond to 192 percent and 29 percent, respectively, of the initial plume pore volume. The total volume pumped from both wells since the beginning of remedial pumping is about 2.5 billion gallons, and corresponds to an average rate of 279 gpm over the 17 years of operation. This volume represents approximately 221 percent of the plume pore volume.

4.3.2 Influent and Effluent Quality

The concentrations of TCE, DCE, TCA, and of total chromium, iron, and manganese in the monthly samples of influent to and effluent from the off-site treatment system during 2015 were presented on Table 3.5; the corresponding concentrations in the monthly samples of influent to and effluent from the source treatment system were presented on Table 3.6. Plots of the TCE, DCE, and total chromium concentrations in the influent to both systems, prepared from these data, are presented in Figure 4.30. Except for the August 3 and December 30 effluent samples from the off-site system, which both had 1.2 µg/L of TCE, VOC concentrations in the effluents from both systems were below detection limits throughout the year. Chromium concentrations in the effluent from the off-site system were similar to those in the influent and below 10 µg/L, and those in the effluent from the source system remained below the NMWQCC standard of 50 µg/L throughout the year, except for a January 12 sample which had 50 µg/L of chromium (see Table 3.7).

4.3.3 Contaminant Mass Removal

The monthly and total mass of VOCs removed by the Off-Site and Source Containment Systems (TCE and DCE) during 2015, calculated from the monthly flow volumes reported on Table 3.4 and the influent concentrations reported on Table 3.5 and 3.6, are summarized on Table 4.3; also shown on this table is the total mass of VOCs removed by both systems.

A total of 186 kg (410 lbs) of VOCs, consisting of 165.6 kg (365 lbs) of TCE and 20.5 kg (45 lbs) of DCE were removed by the two containment wells during 2015. A plot of the TCE, DCE and total VOC mass removed by the two containment wells during each month of 2015 is presented in Figure 4.31. The total mass of VOCs removed by the two containment wells during each year of their operation is summarized on Table 4.4, and a plot of the cumulative TCE, DCE, and total VOC mass removed by the wells is presented in Figure 4.32. As shown on Table 4.4, the total VOC mass removed by the containment wells, since the beginning of the current remedial operations in December 1998, is about 7,590 kg (16,700 lbs), consisting of about 7,060 kg (15,600 lbs) of TCE, 515 kg (1,140 lbs) of DCE, and 20.4 kg (44.9 lbs) of TCA. This represents about 88 percent of the total dissolved VOC mass currently estimated to have been present in the aquifer prior to the testing and operation of the off-site containment system.

The monthly and total mass of chromium removed by the chromium removal unit at the source containment system, based on the monthly flow volumes (see Table 3.4) and the average monthly chromium concentrations in the influent to and effluent from the treatment system (calculated from the monthly sampling data presented on Table 3.6), are summarized on Table 4.5. As shown on this table, a total of about 6 kg (13 lbs) of chromium was removed during 2015. The total chromium removed by this removal unit, and by a removal unit that operated at the off-site containment system between December 15, 2000 and October 31, 2001, is about 11.6 kg (25.5 lbs), as summarized on Table 4.6.

4.4 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 State of New Mexico Groundwater Discharge Permit (DP-1184). This Discharge Permit was originally issued by the Groundwater Bureau of the NMED for a five-year period on June 23, 1998 and renewed for two more five-year periods on December 29, 2006 and on October 18, 2012.

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.

4.4.1 Off-Site Contaminant Systems

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 results of these sampling events during 2015 (see Tables 3.3, and 3.5) were reported to the NMED Groundwater Bureau in the 2015 Annual Monitoring Report for the permit submitted to the Bureau on January 29, 2015.[10]

Calculations of VOC emissions made in June 1999 indicated that the off-site air stripper was in in full compliance with the limits (0.32 pound per hour [lb/hr] or 1.37 tons/yr) specified in Registration No. NM/001/00462/967. 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.

No violation notices were received during 2015 for activities associated with the operation of the off-site containment system.

4.4.2 Source Containment Systems

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 quarterly data collected from these wells (see Table 3.3) and from the monthly and other sampling of the treatment system effluent (see Tables 3.6 and 3.7) were included in the 2015 Annual Monitoring Report for the permit.[10]

As shown on Table 3.3, chromium concentrations in pond monitoring well MW-17 exceeded the NMWQCC standard of 50 µg/L for chromium in groundwater during monthly sampling events of January through April; monthly sampling of the well was discontinued when both the May and June samples were below 50 µg/L. The chromium concentration in the well was again above 50 µg/L in November; however, a confirmation sample collected in December met the NMWQCC standard indicating that no further action was necessary. Effluent concentrations met the NMWQCC standard throughout 2015 except for a sample collected on January 12 which had a chromium concentration of 50 µg/L (see Table 3.7).

Emissions of VOCs from the source containment system air stripper during 2015 (0.00043 lb/hr or 0.00189 ton/yr) met the requirements of The Authority-to-Construct Permit No. 1203

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[10] Letter to Mr. Steven Huddleson of the Ground Water Quality Bureau, NMED from Stavros S. Papadopulos of SSP&A on the subject "2015 Annual Monitoring Report for Discharge Permit DP-1184."

and were reported to the Albuquerque Environmental Health Department, Air Quality Division in the 2015 Annual Report on Air Emissions which was submitted on March 3, 2016[11].

No violation notices were received during 2015 for activities associated with the operation of the source containment system.

4.5 Contacts

Under the terms of the Consent Decree[12] 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. After the approval of the 2014 Annual Report on August 28, 2015[13] Sparton prepared a Draft 2015 Fact Sheet and submitted it to the USEPA/NMED for approval on September 3, 2015[14]. Agency approval was received on October 16, 2015,[15] and the 2015 Fact Sheet, dated October 16, 2015, was distributed to property owners located above the plume and adjacent to the off-site treatment plant water discharge pipeline within the next few days.

[11] Letters to Regan Everman, Health Scientist, Air Quality Division, Environmental Health Department, City of Albuquerque, from Stavros S. Papadopulos of SSP&A on the subject "Authority-to-Construct Permit #1203 – 2015 Annual Report on Air Emissions".

[12] 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.).

[13] Letter from Mr. Dave Cobrain of NMED and Mr. Chuck Hendrickson of USEPA to Mr. Ernesto Martinez of Sparton, Re: Approval, 2014 Annual Report, Sparton Technology, Inc., EPA ID NO. NMD083212332.

[14] Email from Alex Spiliotopoulos of SSP&A to Chuck Hendrickson of USEPA and Dave Cobrain and Brian Salem of NMED, on the subject of "Sparton Technology Remedial Program – Draft 2015 Fact Sheet".

[15] Letter from Mr. Dave Cobrain of NMED and Mr. Chuck Hendrickson of USEPA to Mr. Ernesto Martinez of Sparton, Re: Approval, 2015 Fact Sheet, Sparton Technology, Inc., EPA ID NO. NMD083212332.

Section 5
Conclusions and Future Plans

5.1 Summary and Conclusions

During 2015, considerable progress was made towards achieving the goals of the remedial measures:

- The off-site containment well operated 96.9 percent of the time available in 2015 at an average rate of 277 gpm and maintained hydraulic containment of the off-site plume.
- The concentrations of constituents of concern in the water treated at the off-site containment system met the requirements of the Discharge Permit for the site.
- The source containment well operated 97.2 percent of the time available in 2015 at an average rate of 49 gpm, and the well contained most of contaminated groundwater leaving the on-site area.
- Except for one occasion, the concentrations of constituents of concern in the water treated at the source containment system met the requirements of the Discharge Permit for the site.
- The treated water from both systems was returned to the aquifer through the infiltration gallery in the Arroyo de las Calabacillas and the on-site infiltration ponds.
- Groundwater monitoring was conducted as specified in the Monitoring Plan and the Discharge Permit.
- Samples were obtained monthly from the influent and effluent of the treatment plants for the off-site and source containment systems and analyzed for VOCs, and total chromium, iron, and manganese as specified in the 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 (some for dissolved also).
- Samples were obtained from the infiltration gallery and infiltration pond monitoring wells at the frequency specified in the Discharge Permit. All samples were analyzed for VOCs, and total chromium, iron, and manganese (some for dissolved also).
- Changes in contaminant concentrations observed in monitoring wells since the implementation of the current remedial measures indicate that VOC concentrations decreased significantly both at the on-site and off-site area, and that chromium concentrations increased, primarily at the on-site area.
- A total of about 171.3 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 2.5 billion gallons and represents 221 percent of the initial volume of contaminated groundwater (pore volume).

- A total of about 186 kg (410 lbs) of VOCs were removed from the aquifer by the two containment wells during 2015. The total VOC mass that was removed since the beginning of the of the current remedial operations through the end of 2015 is about 7,590 kg (16,700 lbs), and represents about 88 percent of the total dissolved VOC mass estimated to have been initially present in groundwater.

5.2 Future Plans

The off-site and source containment systems will continue to operate during 2016 at pumping rates as close as possible to their current design pumping rates of 300 gpm and 50 gpm, respectively.

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.

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 6
List of Reports and Documents

Black & Veatch, 1997, *Report on Soil Gas Characterization and Vapor Extraction System Pilot Testing*, Report prepared for Sparton Technology, Inc. June.

Bexfield, L.M., and S. K. Anderholm, 2002, *Estimated Water-Level Declines in the Santa Fe Group Aquifer System in the Albuquerque Area*, Central New Mexico, Predevelopment to 2002: U.S. Geological Survey Water-Resources Investigations Report 02-4233.

Chandler, P.L., Jr., 2000, *Vadose Zone Investigation and Implementation Workplan,* Attachment E to the Consent Decree, City of Albuquerque and The Board of County Commissioners of the County of Bernalillo v. Sparton Technology, Inc. U.S. District Court for the District of New Mexico, Civil Action No. CIV 97 0206, March 3.

Chandler, P.L., Jr. and Metric Corporation, 2001, *Sparton Technology, Inc., Coors Road Plant Remedial Program*, Final Report on the On-Site Soil Vapor Extraction System. Report prepared for Sparton Technology, Inc. in association with S.S. Papadopulos & Associates, Inc., November 29.

Consent Decree, 2000, *City of Albuquerque and the Board of County Commissioners of the County of Bernalillo v. Sparton Technology, Inc.*, U.S. District Court for the District of New Mexico. CIV 97 0206, March 3.

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Harding Lawson Associates, 1985, *Hydrogeologic Characterization and Remedial Investigation*, Sparton Technology, Inc., 9261 Coors Road Northwest, Albuquerque, New Mexico, Report prepared for Sparton Technology, March 13.

Harding Lawson Associates, 1992, *RCRA Facility Investigation*, Report revised by HDR Engineering, Inc. in conjunction with Metric Corporation, Report prepared for Sparton Technology, Inc., May 1.

Hawley, J.W., 1996, *Hydrogeologic Framework of Potential Recharge Areas in the Albuquerque Basin*, Central New Mexico, New Mexico Bureau of Mines and Mineral Resources, Open-File Report 402D, Chapter 1.

HDR Engineering Inc., 1997, *Revised Final Corrective Measure Study*, Report revised by Black & Veatch. Report prepared for Sparton Technology, Inc., March 14.

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FIGURES

Figure 1.1: Location of the Former Sparton Coors Road Plant

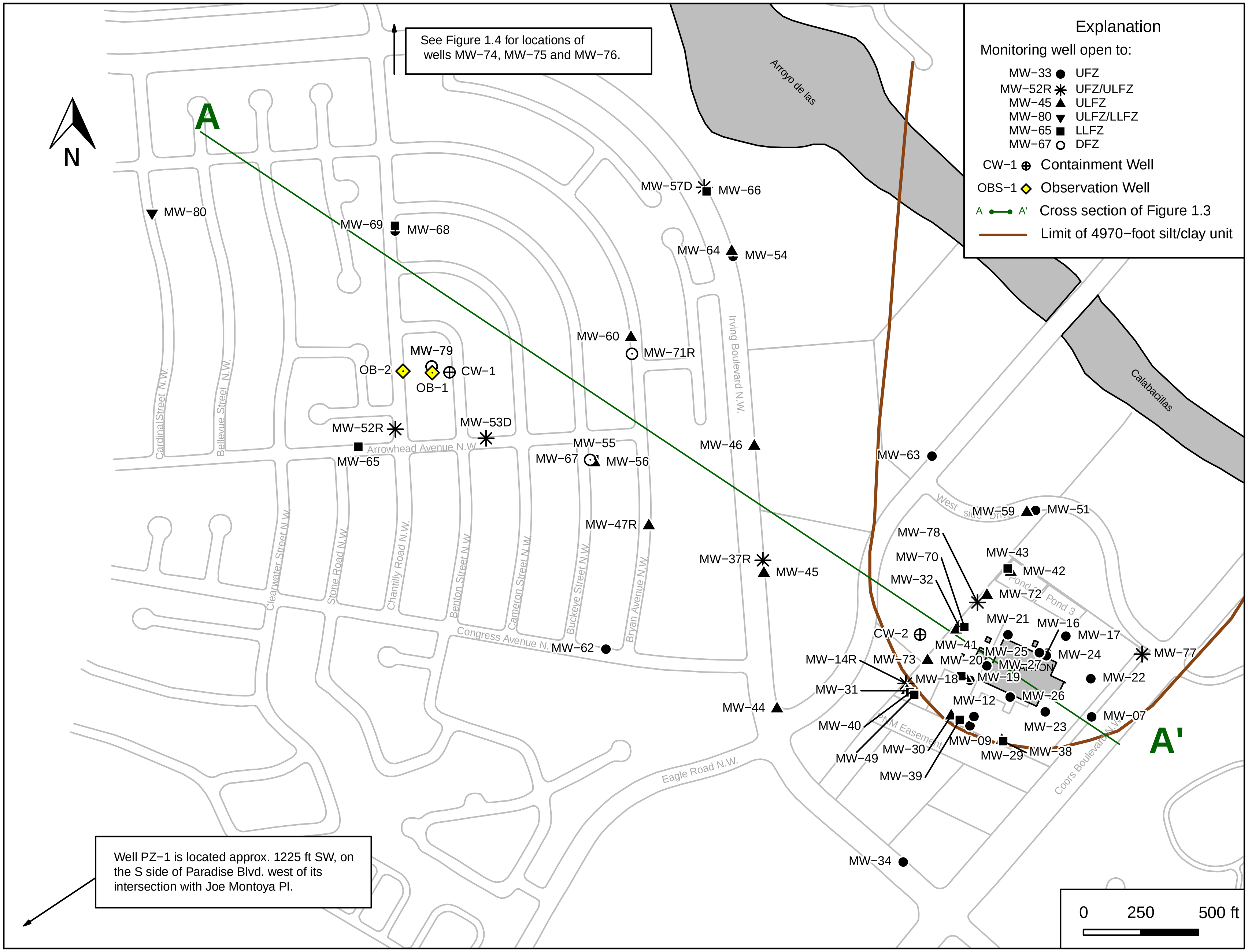


Figure 1.2: Location of Existing Wells

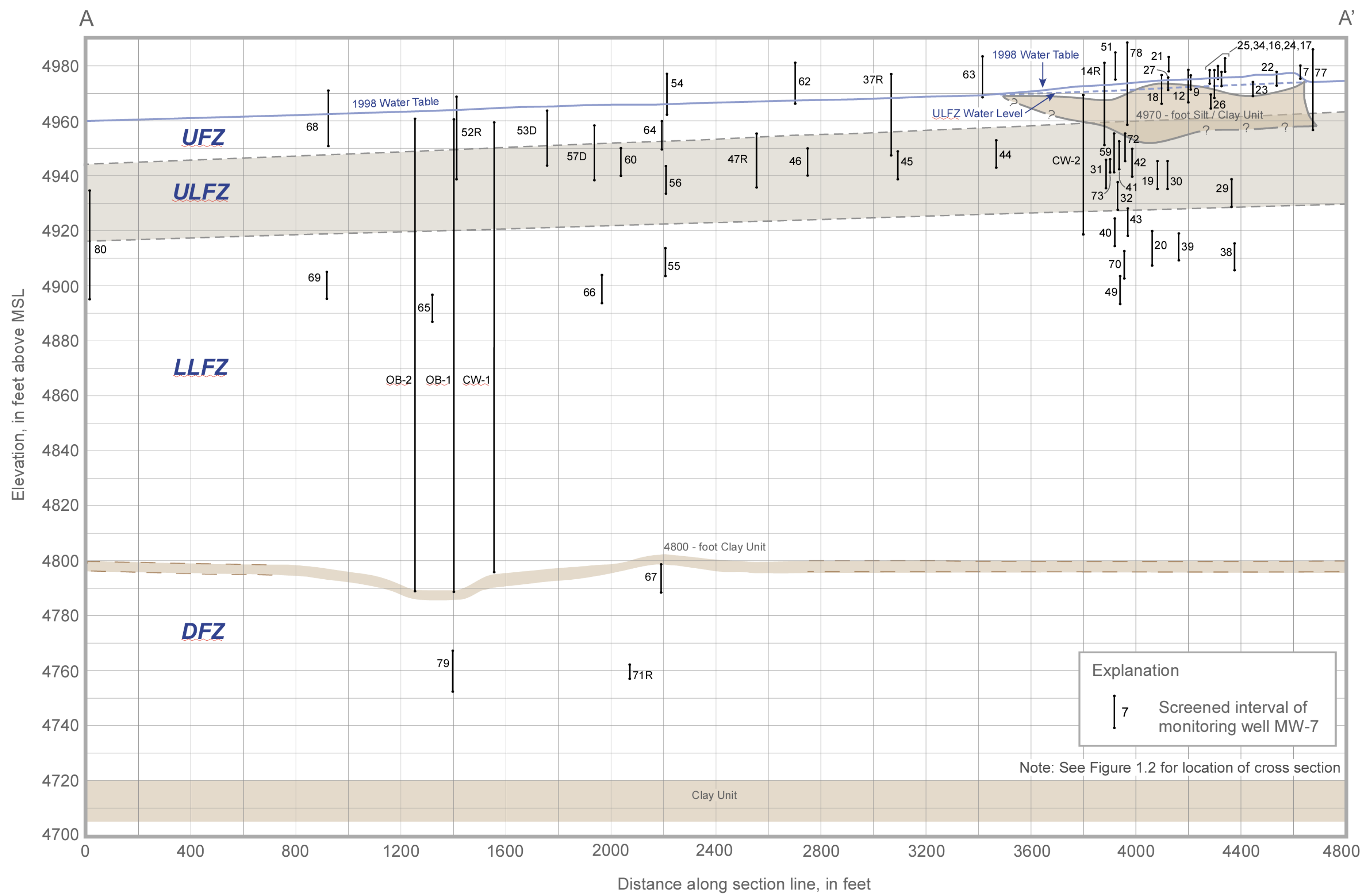


Figure 1.3: Schematic Cross-Section Showing Screened Interval of Wells and Relation to Flow Zones

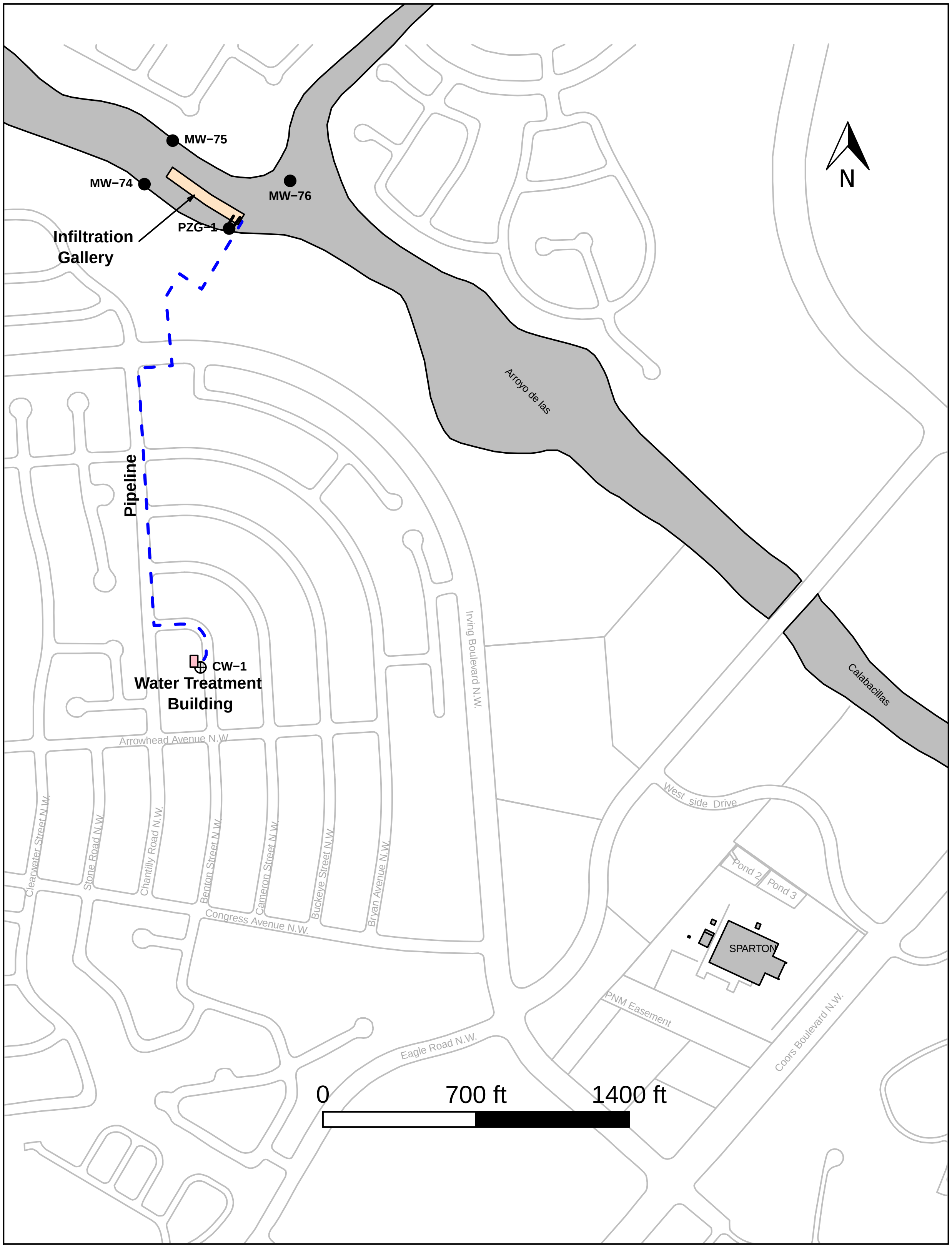


Figure 1.4: Layout of the Off-Site Containment System

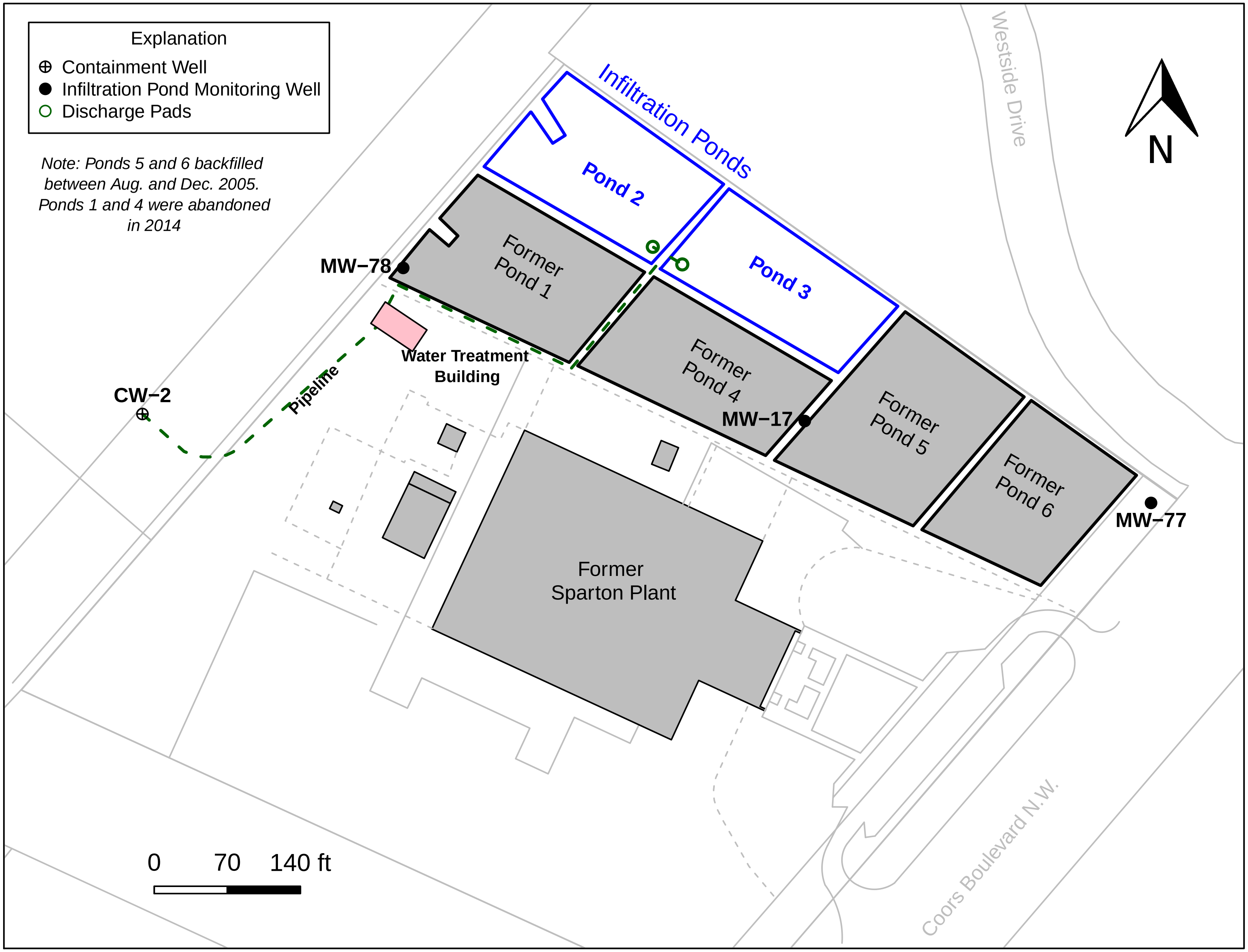


Figure 1.5: Layout of the Source Containment System

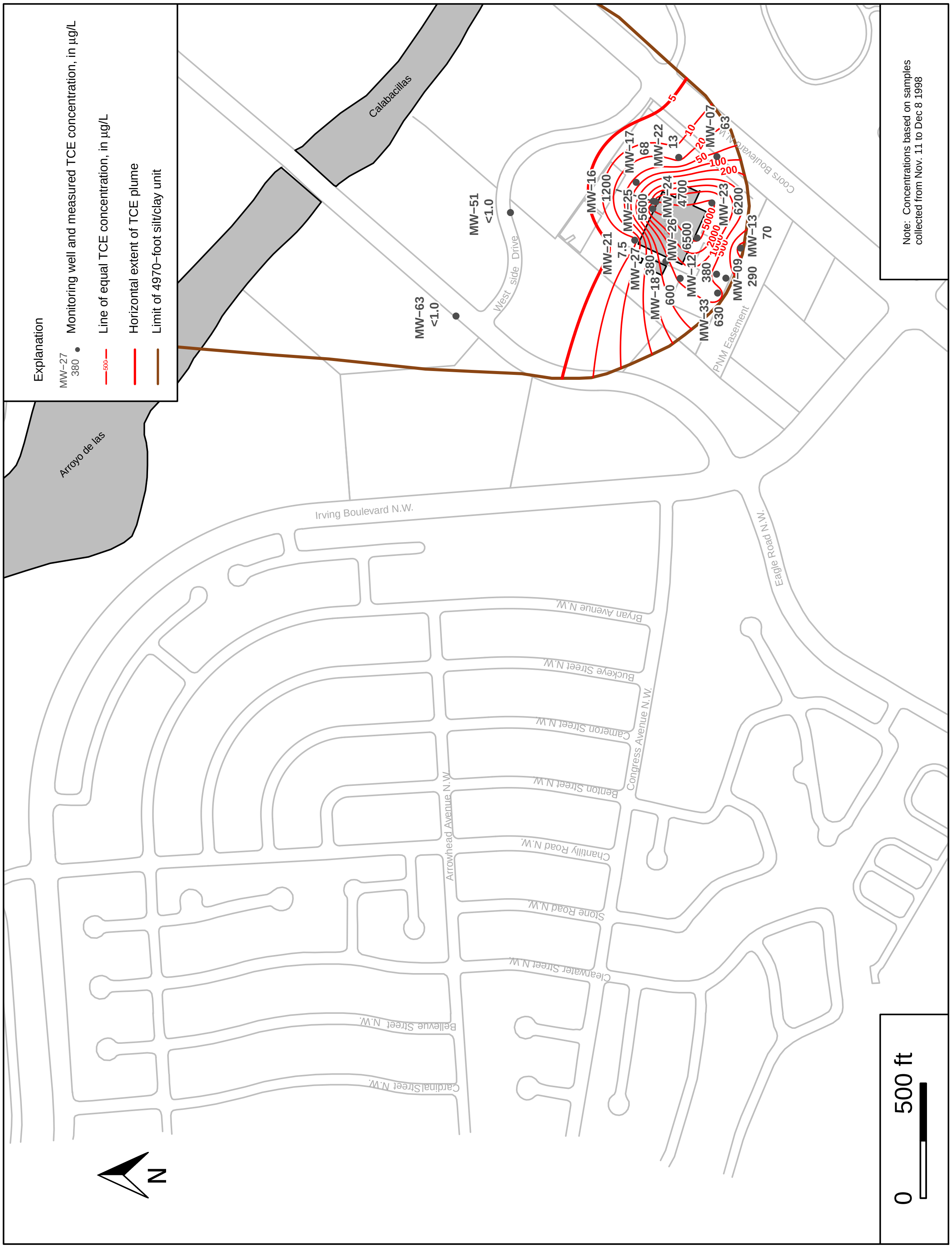


Figure 1.6: Horizontal Extent of the Initial On-Site TCE Plume

Figure 1.7: Horizontal Extent of the Initial Regional TCE Plume

Figure 1.8: Horizontal Extent of the Initial On-Site DCE Plume

Figure 1.9: Horizontal Extent of the Initial Regional DCE Plume

Figure 1.10: Horizontal Extent of the Initial On-Site TCA Plume

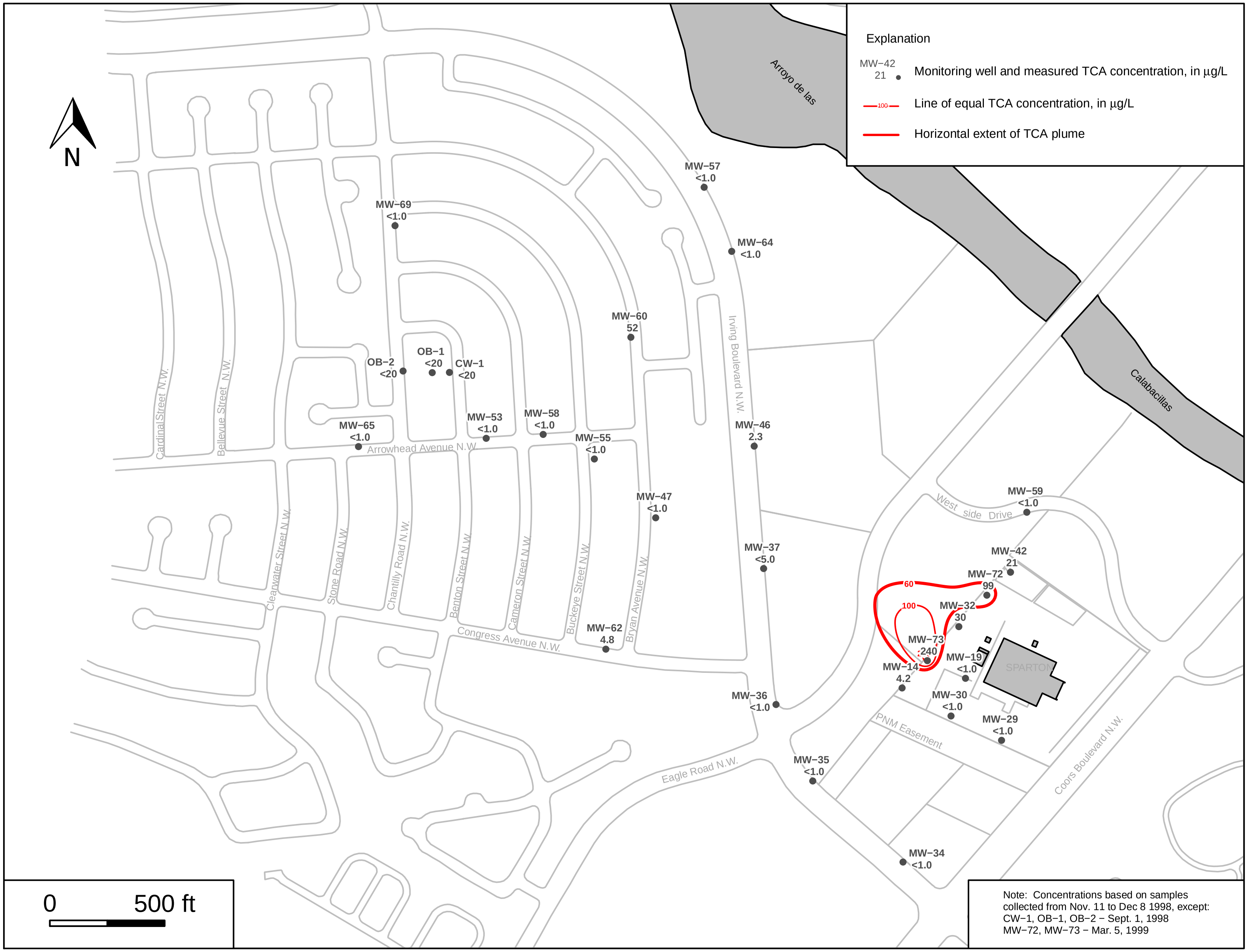


Figure 1.11: Horizontal Extent of the Initial Regional TCA Plume

Figure 1.12: Horizontal Extent of the Initial On-Site Chromium Plume

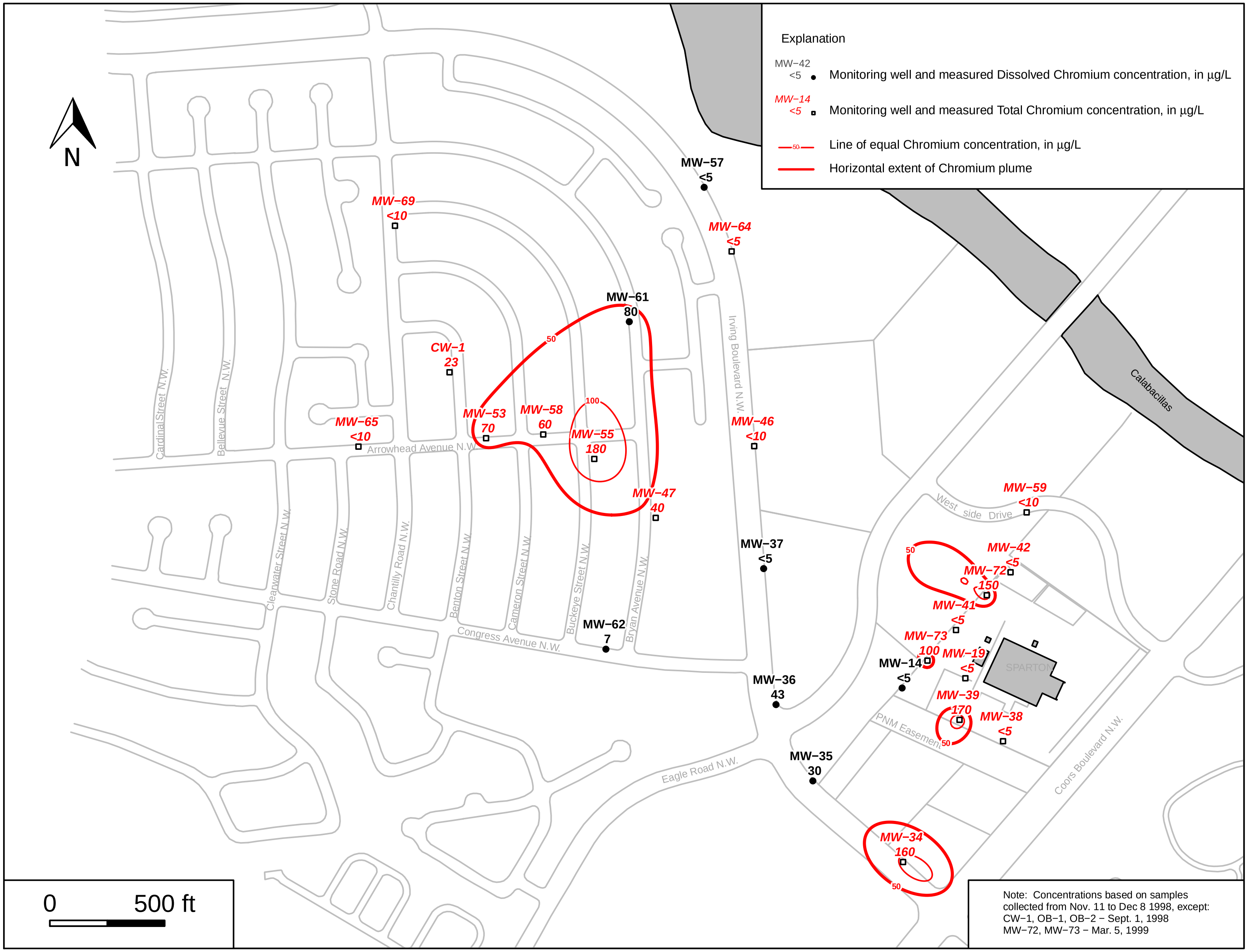


Figure 1.13: Horizontal Extent of the Initial Regional Chromium Plume

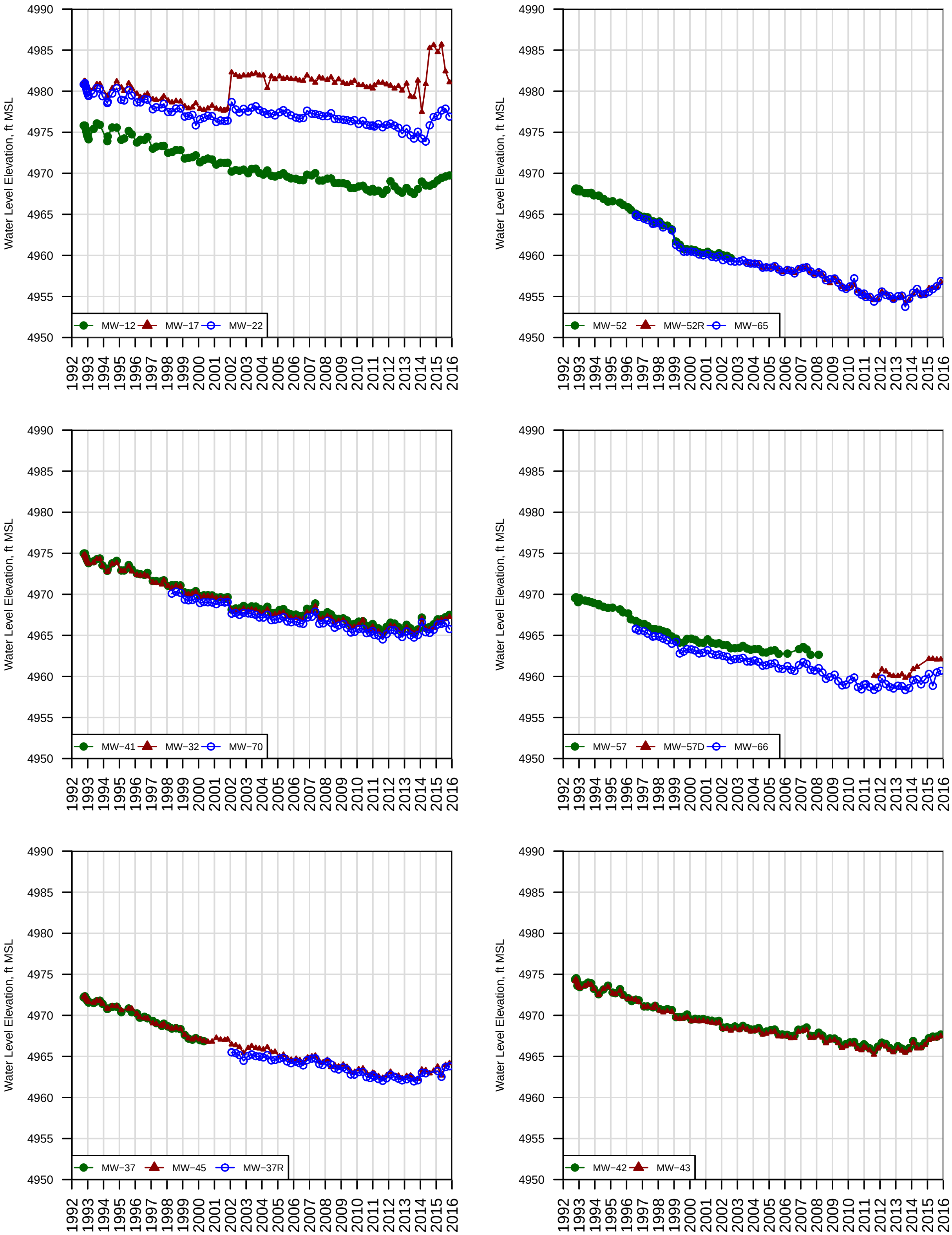


Figure 3.1: Monitoring Well Hydrographs

Figure 4.1: Elevation of the On-Site Water Table - February 2015

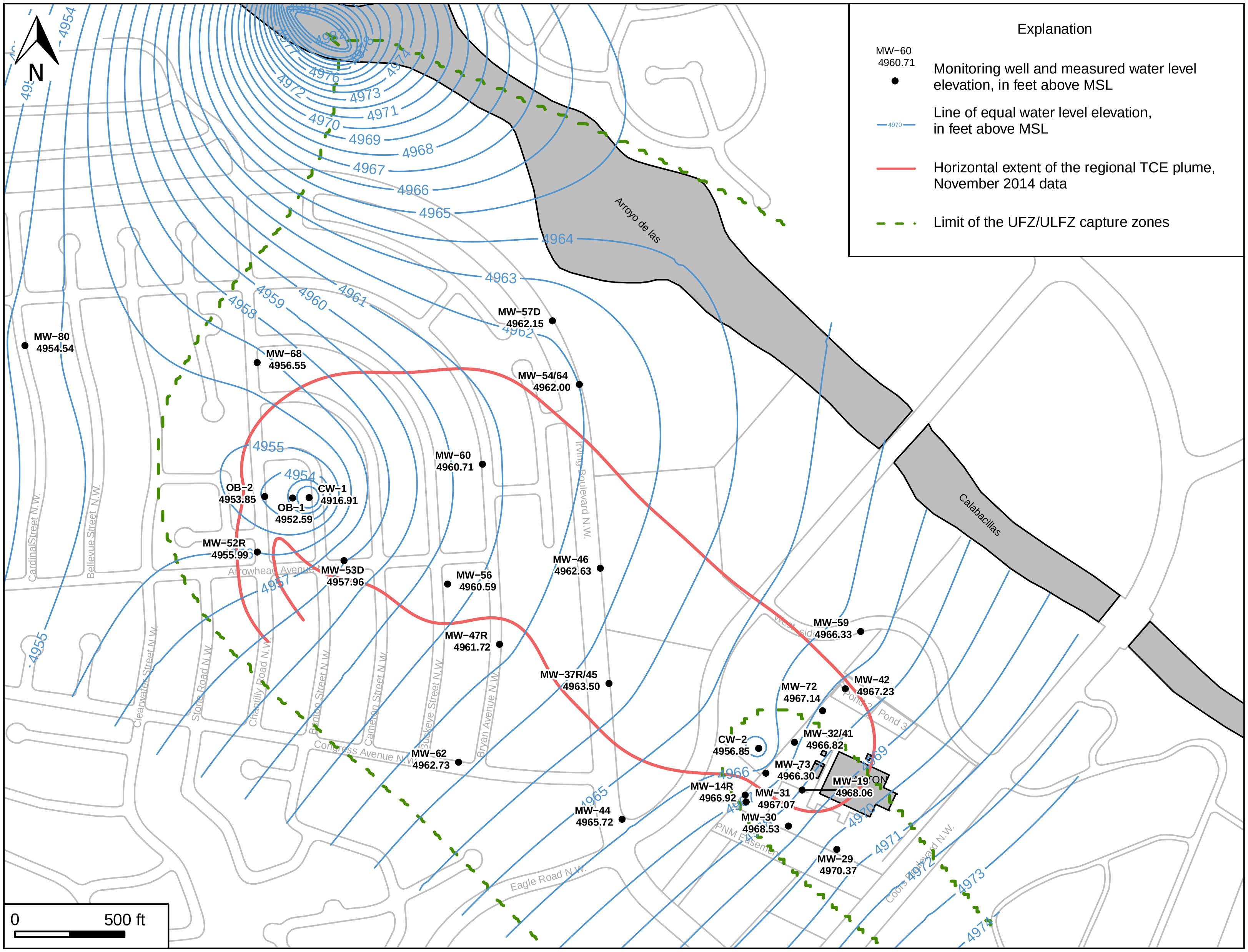


Figure 4.2: Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - February 2015

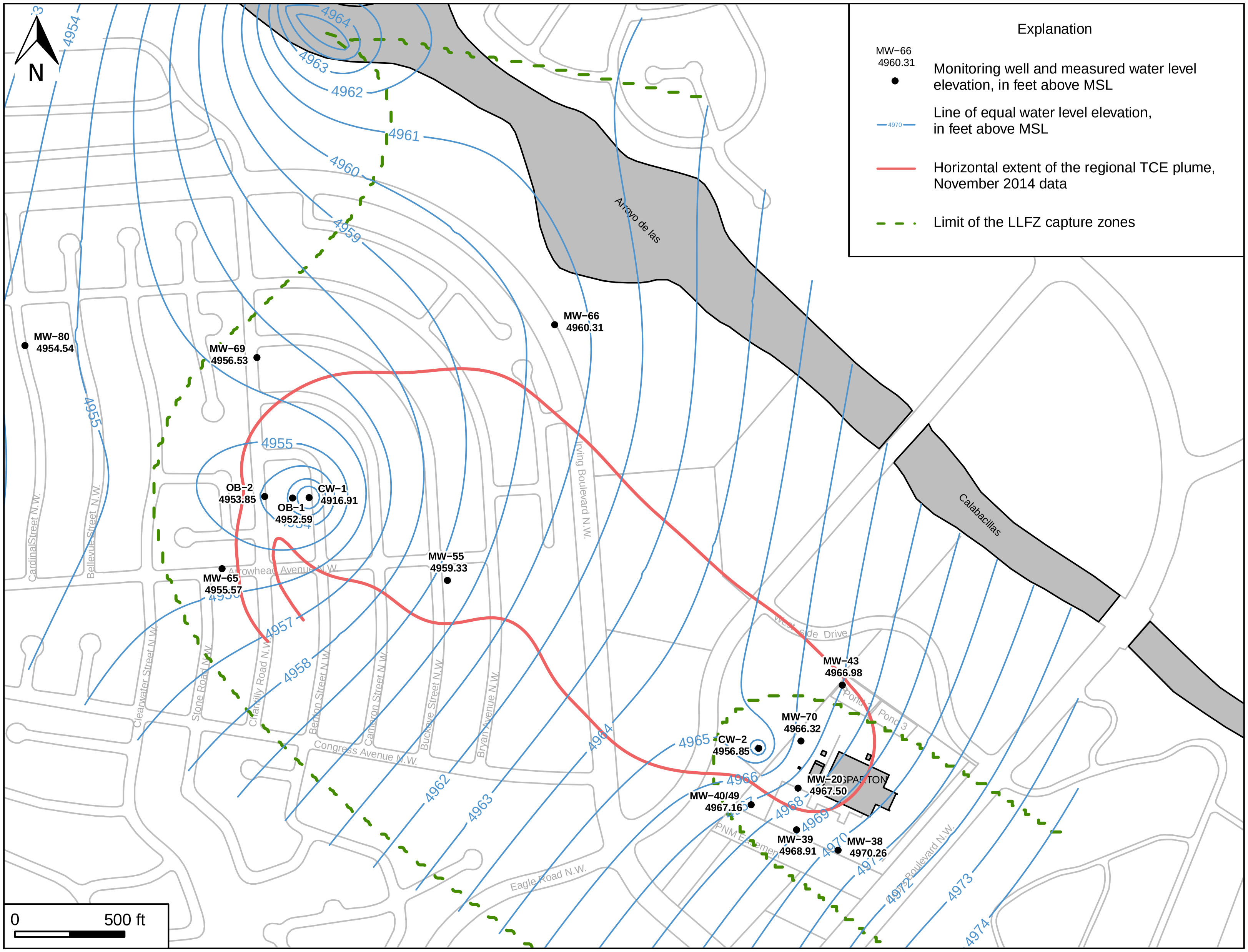


Figure 4.3: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - February 2015

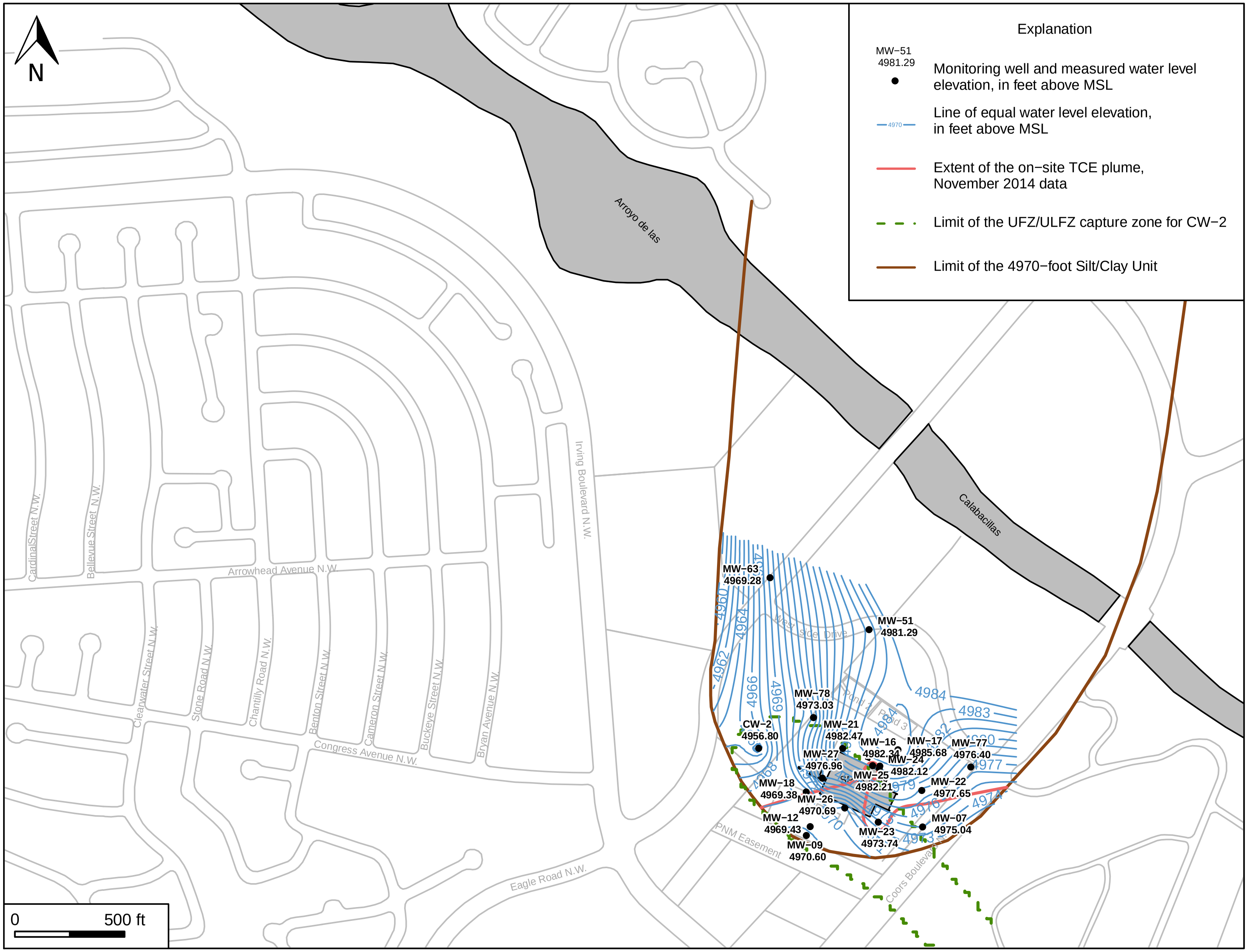


Figure 4.4: Elevation of the On-Site Water Table - May 2015

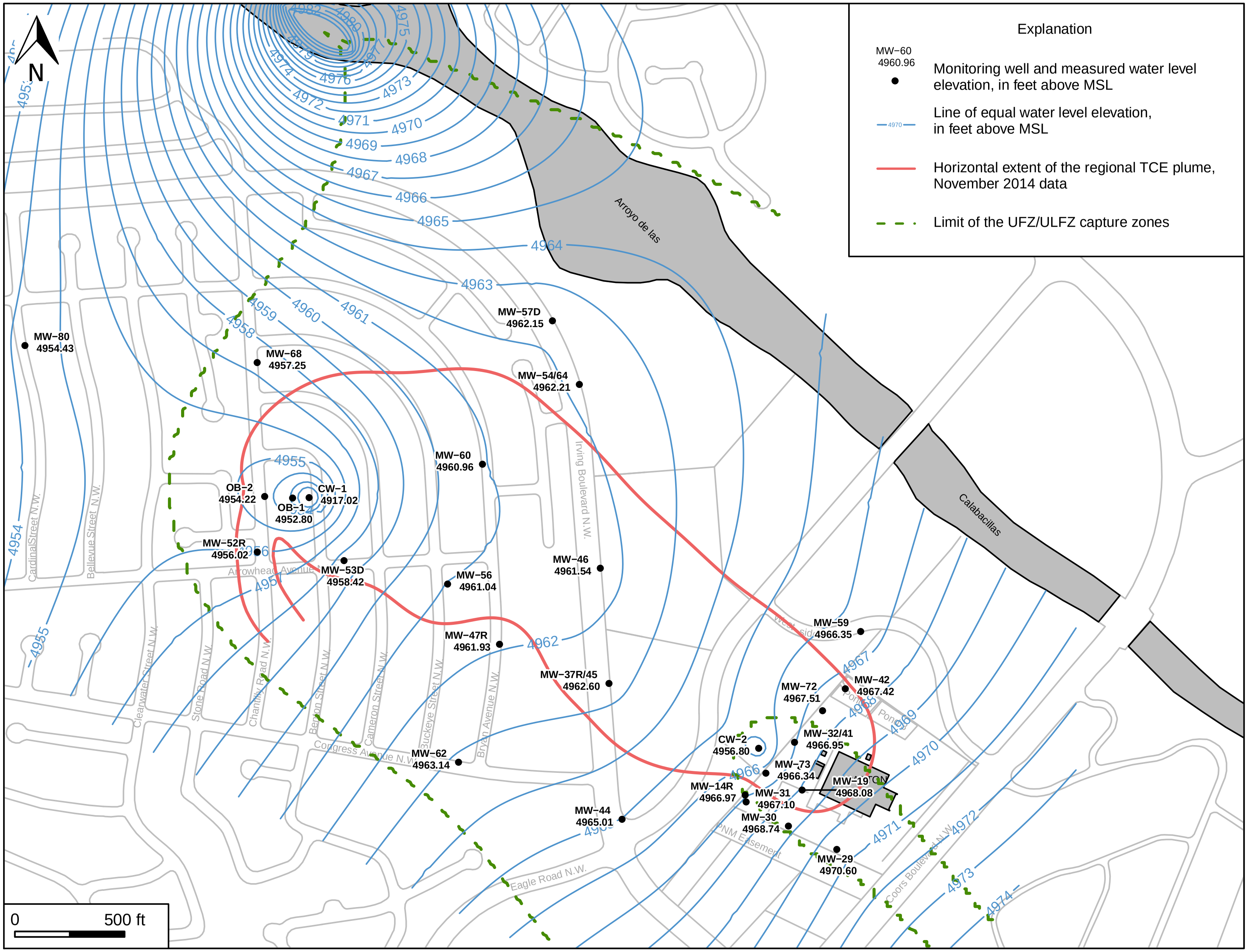


Figure 4.5: Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - May 2015

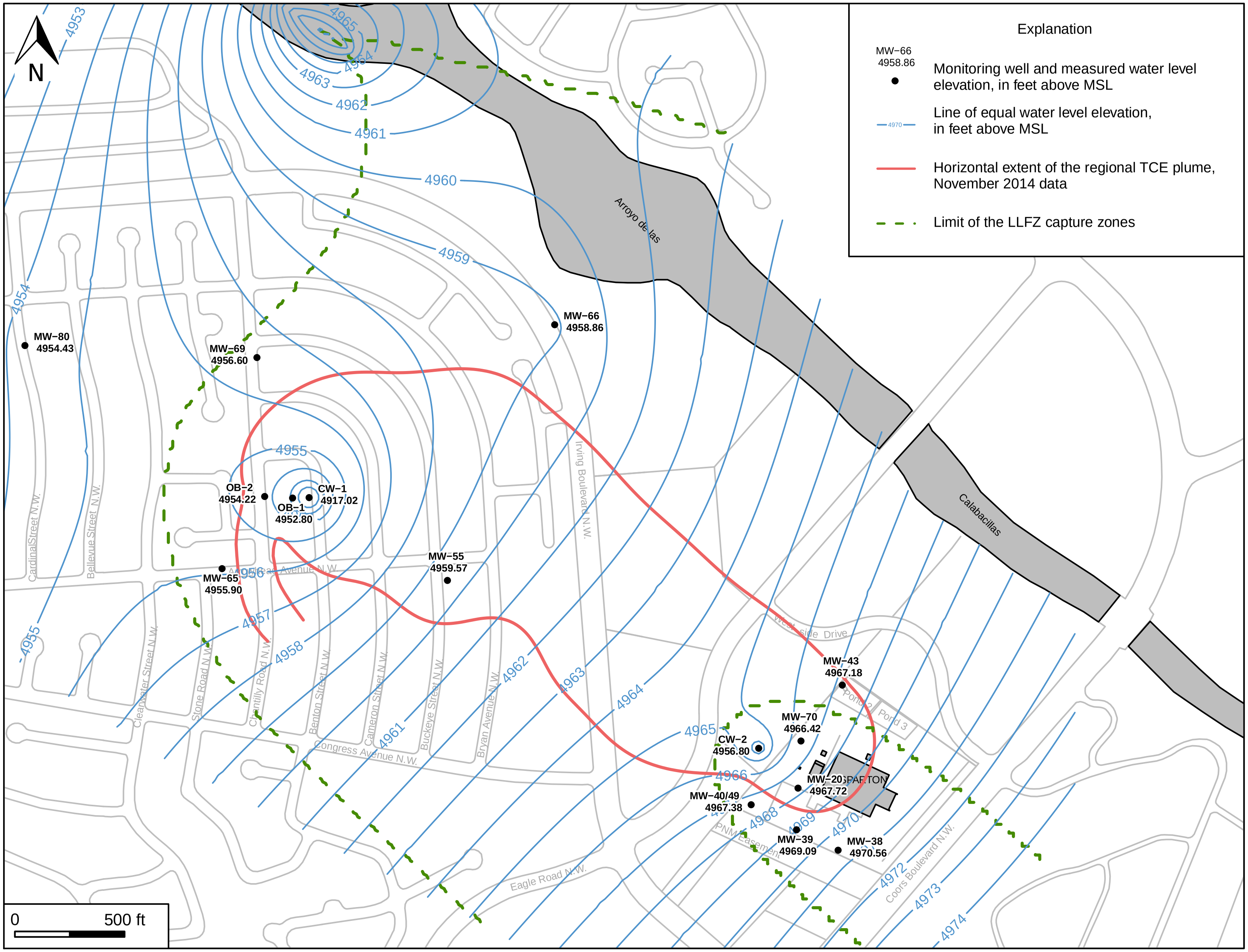


Figure 4.6: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - May 2015

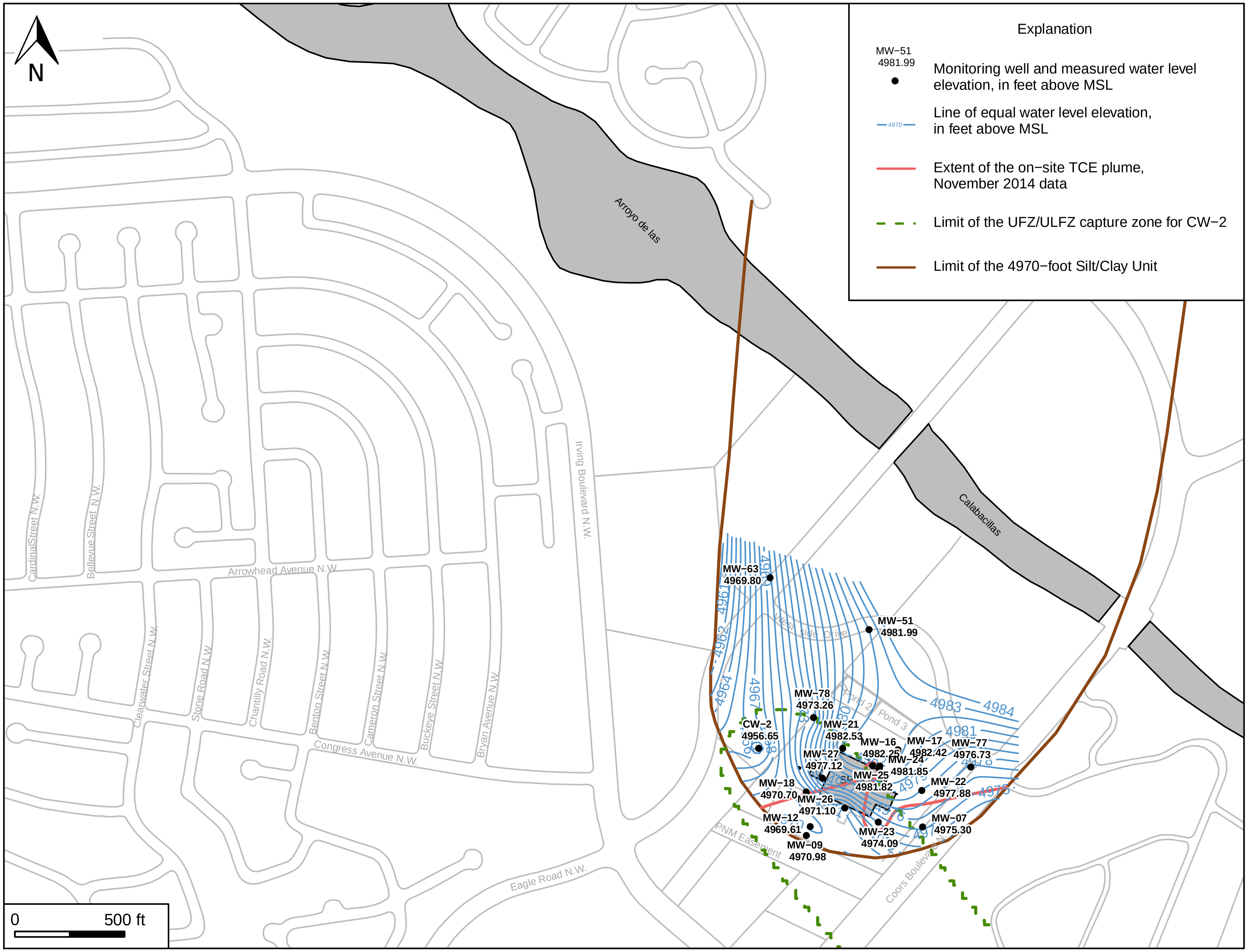


Figure 4.7: Elevation of the On-Site Water Table - August 2015

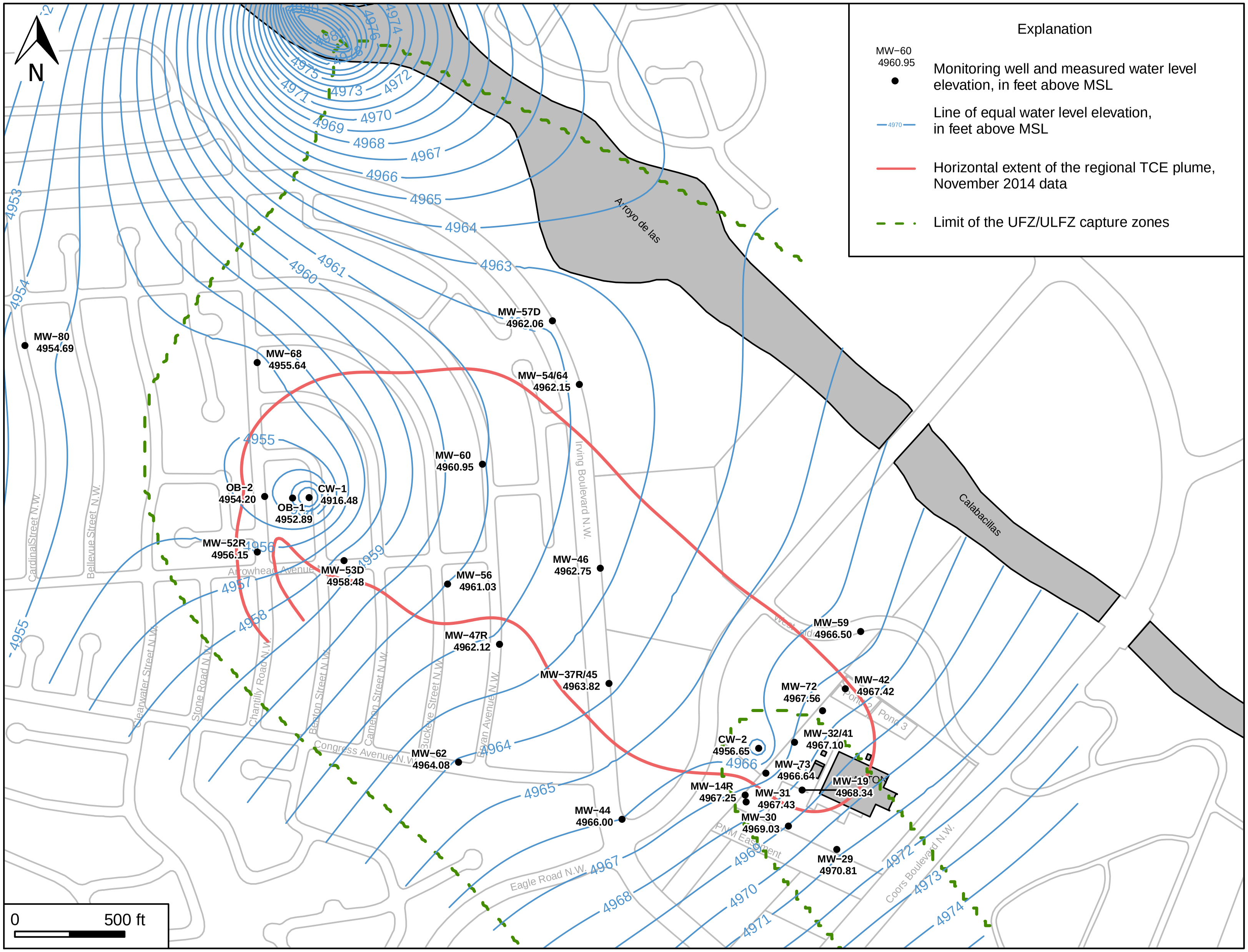


Figure 4.8: Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - August 2015

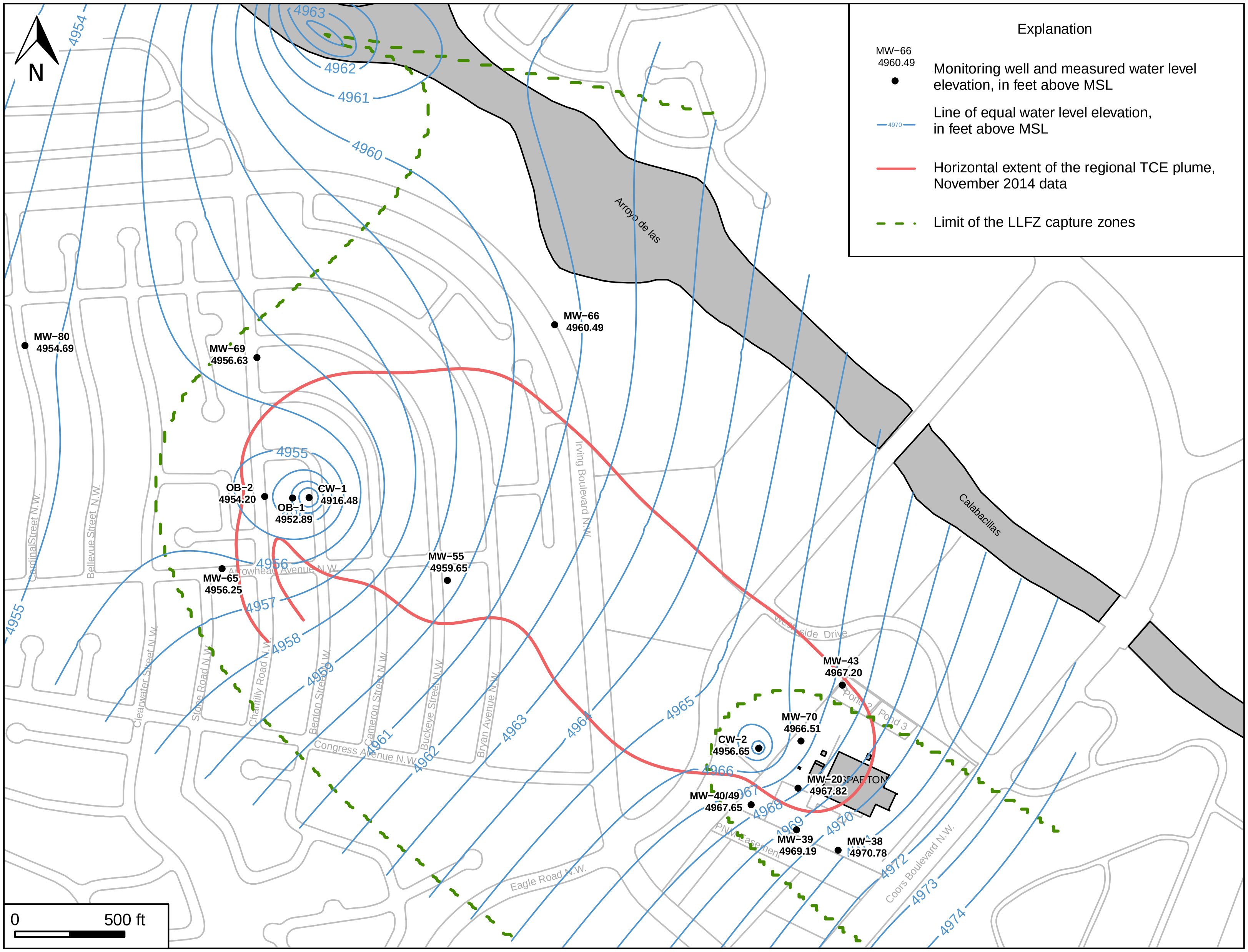


Figure 4.9: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - August 2015

Figure 4.10: Elevation of the On-Site Water Table - November 2015

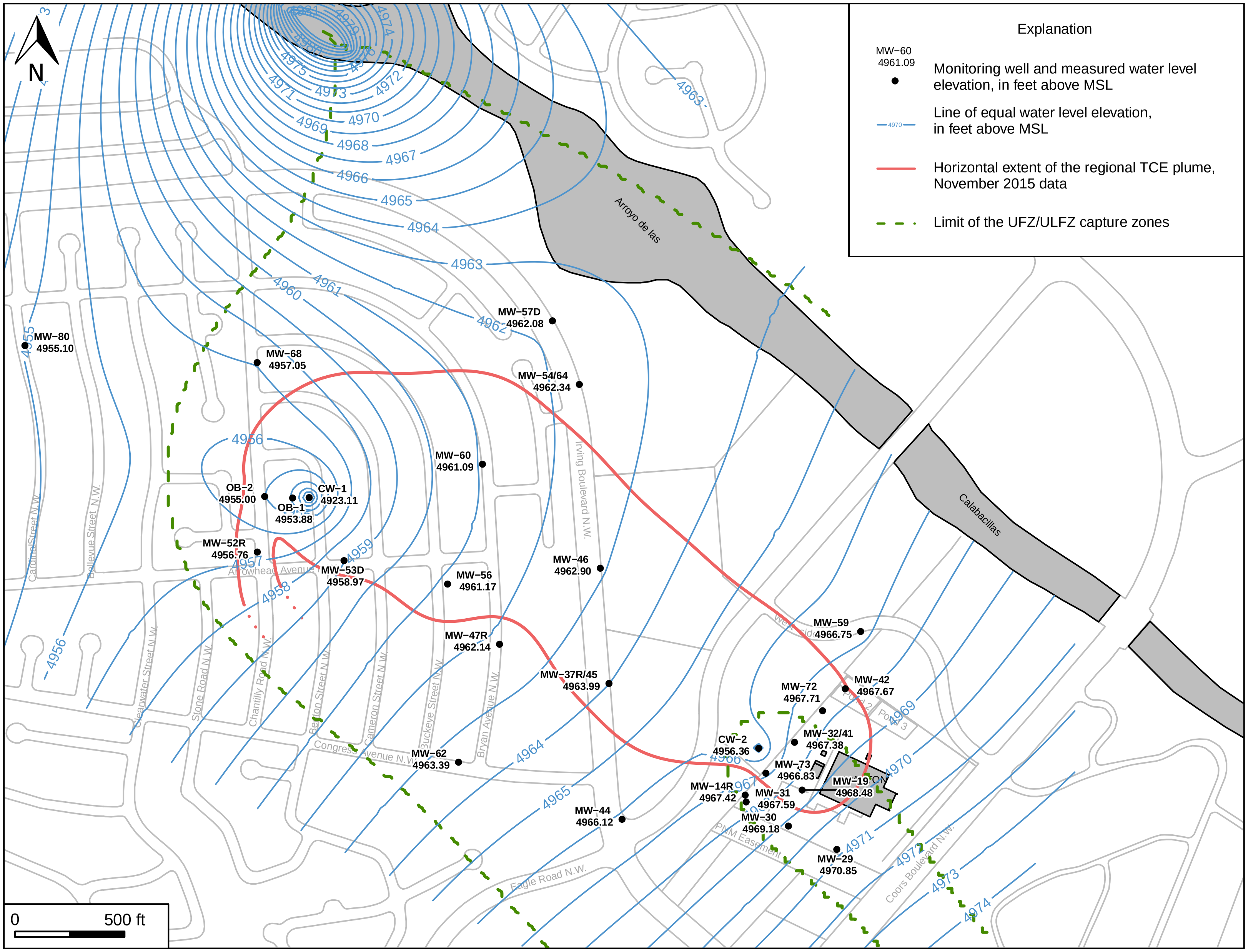


Figure 4.11: Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - November 2015

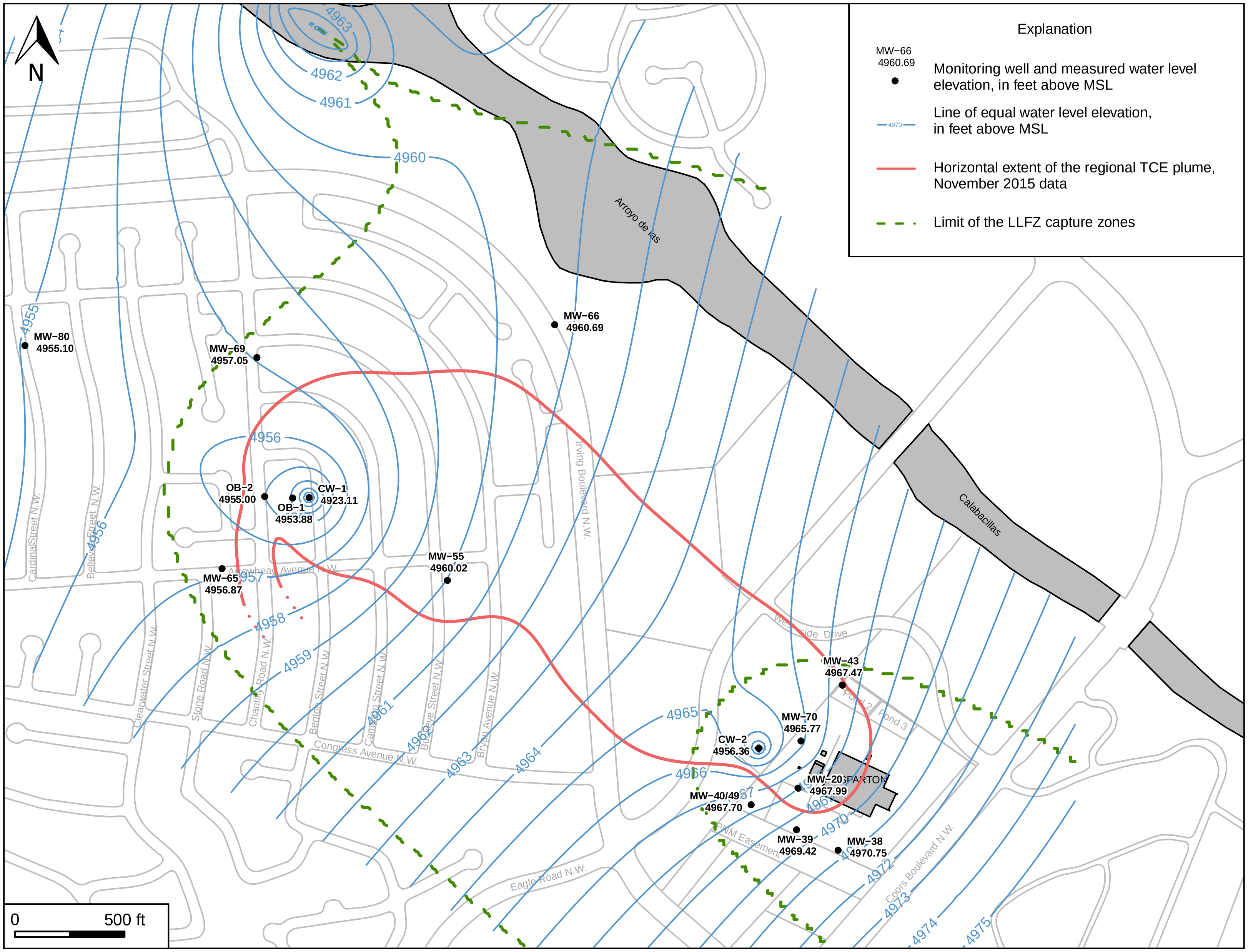


Figure 4.12: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - November 2015

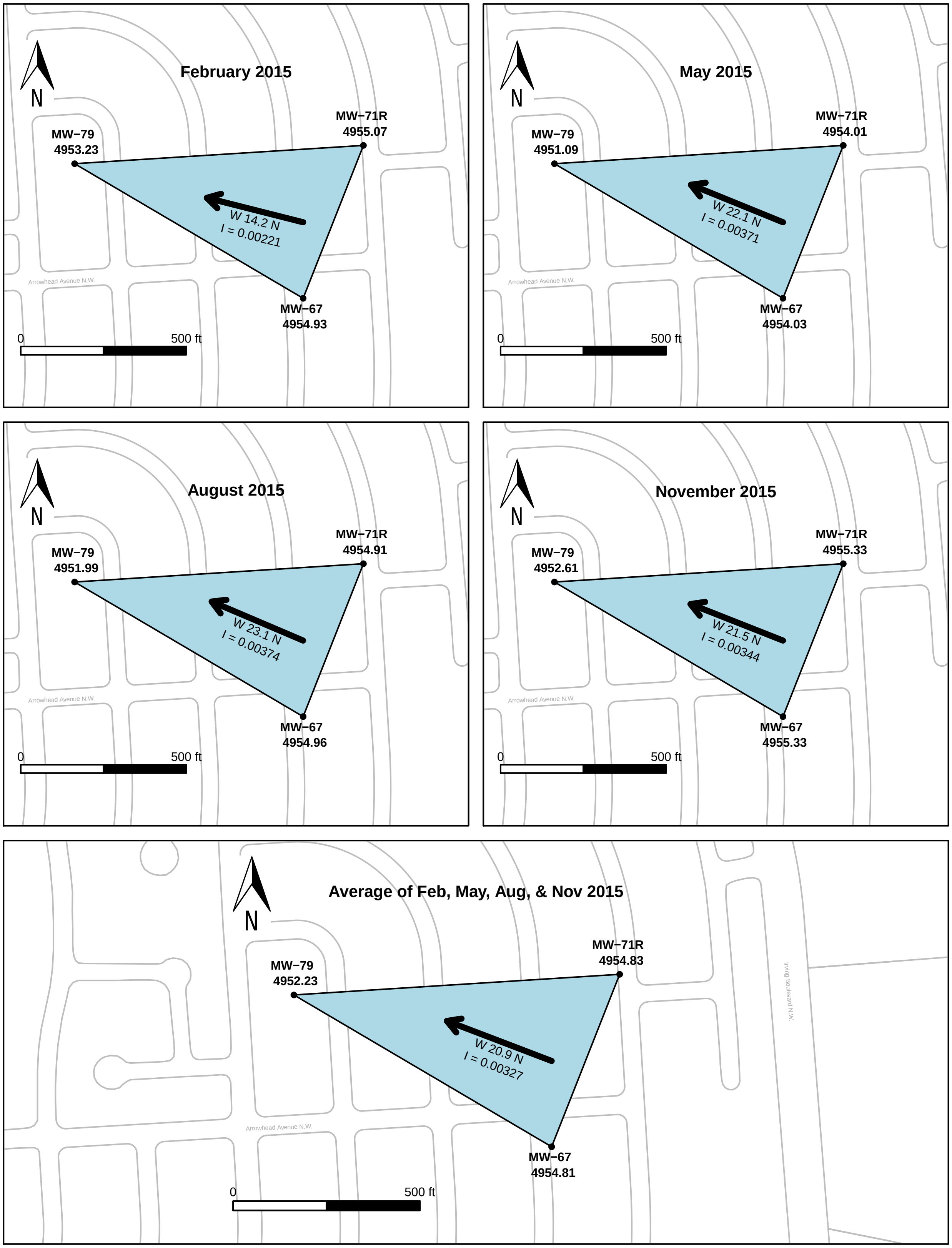


Figure 4.13: Groundwater Flow Direction and Hydraulic Gradient in the DFZ - 2015

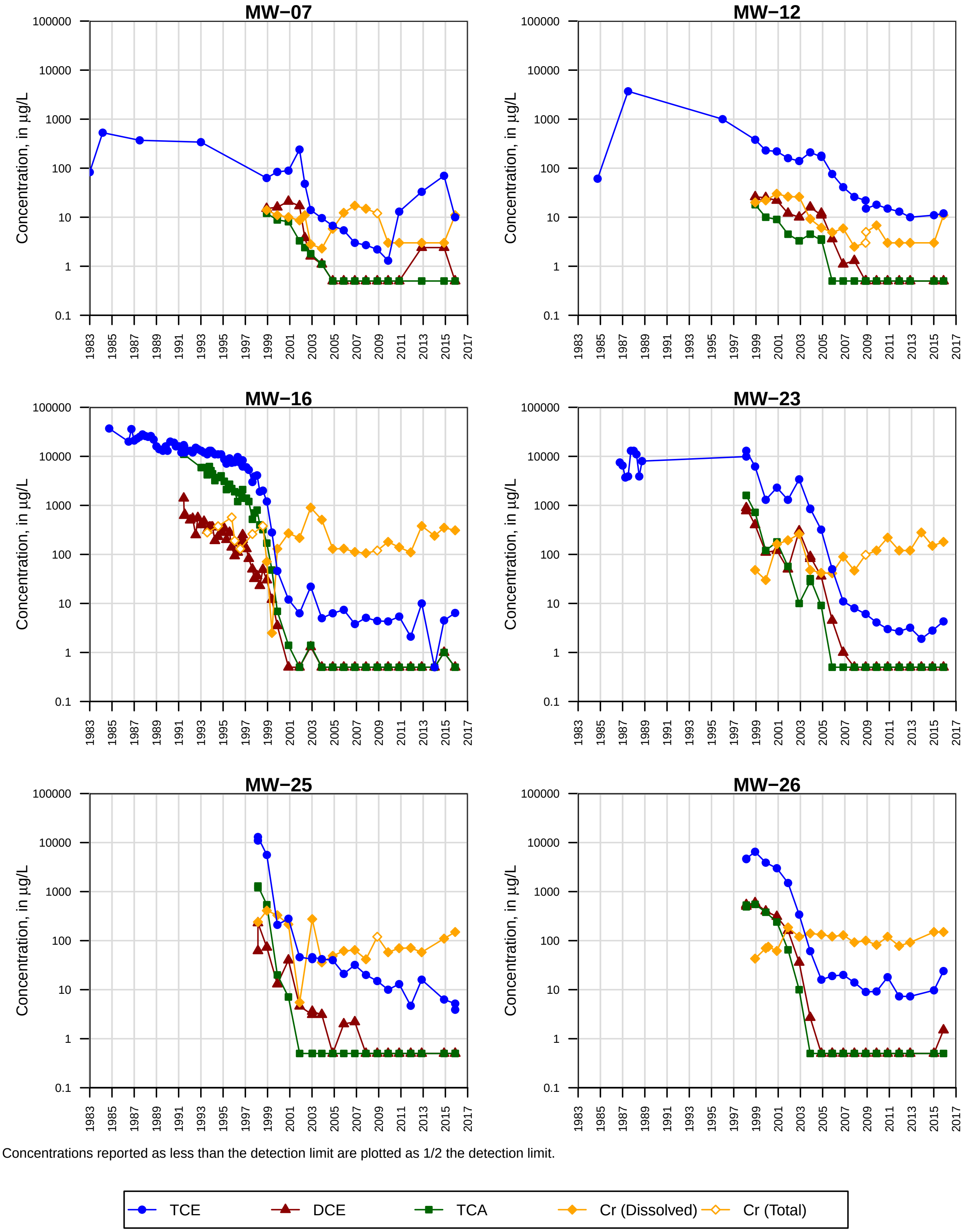
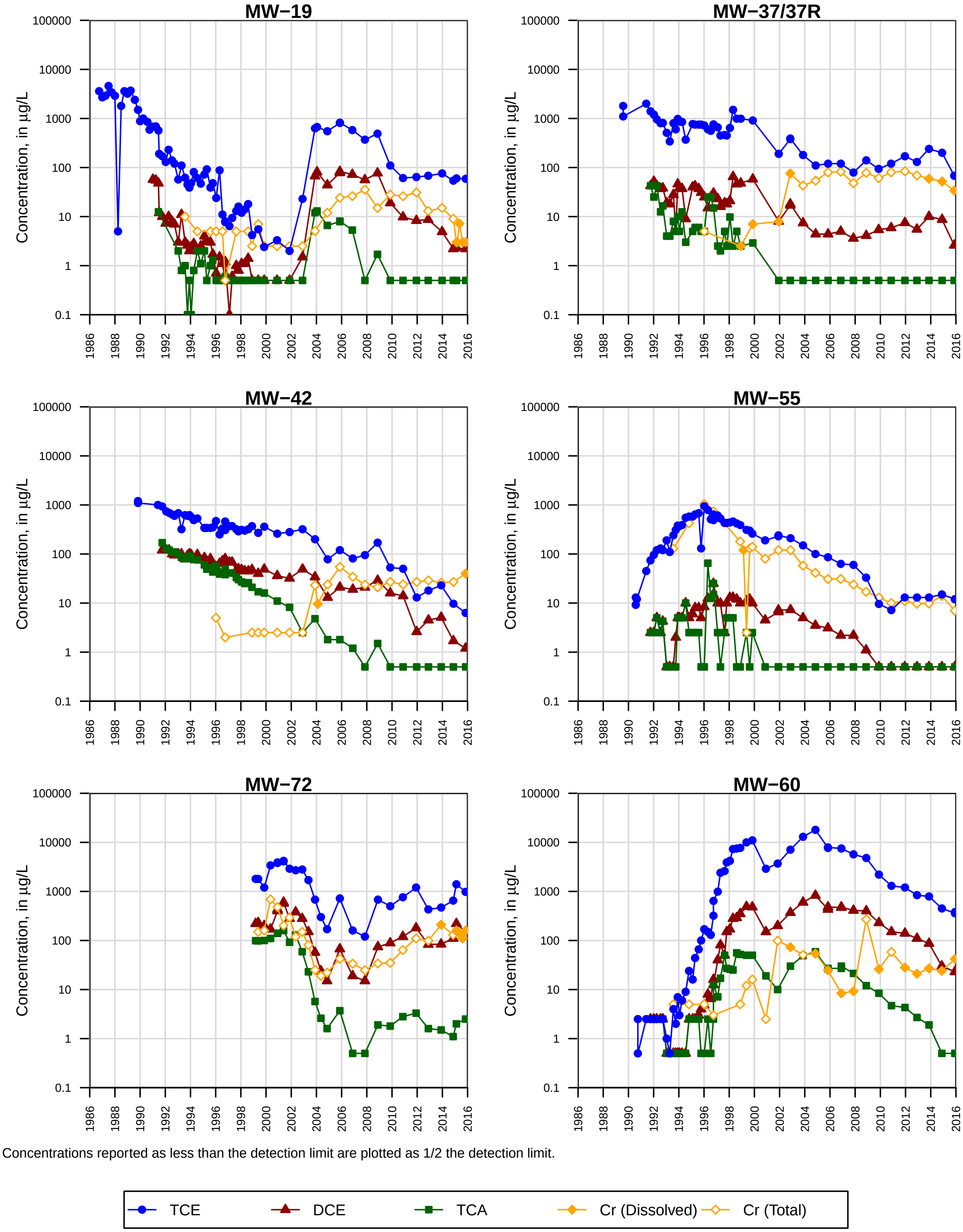


Figure 4.14: Contaminant Concentration Trends in On-Site Wells Completed Above the 4970-ft Silt/Clay



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

Figure 4.15: Contaminant Concentration Trends in On-Site Wells Completed Below the 4970-ft Silt/Clay and in Off-Site Wells

Figure 4.16: Horizontal Extent of the On-Site TCE Plume - November 2015

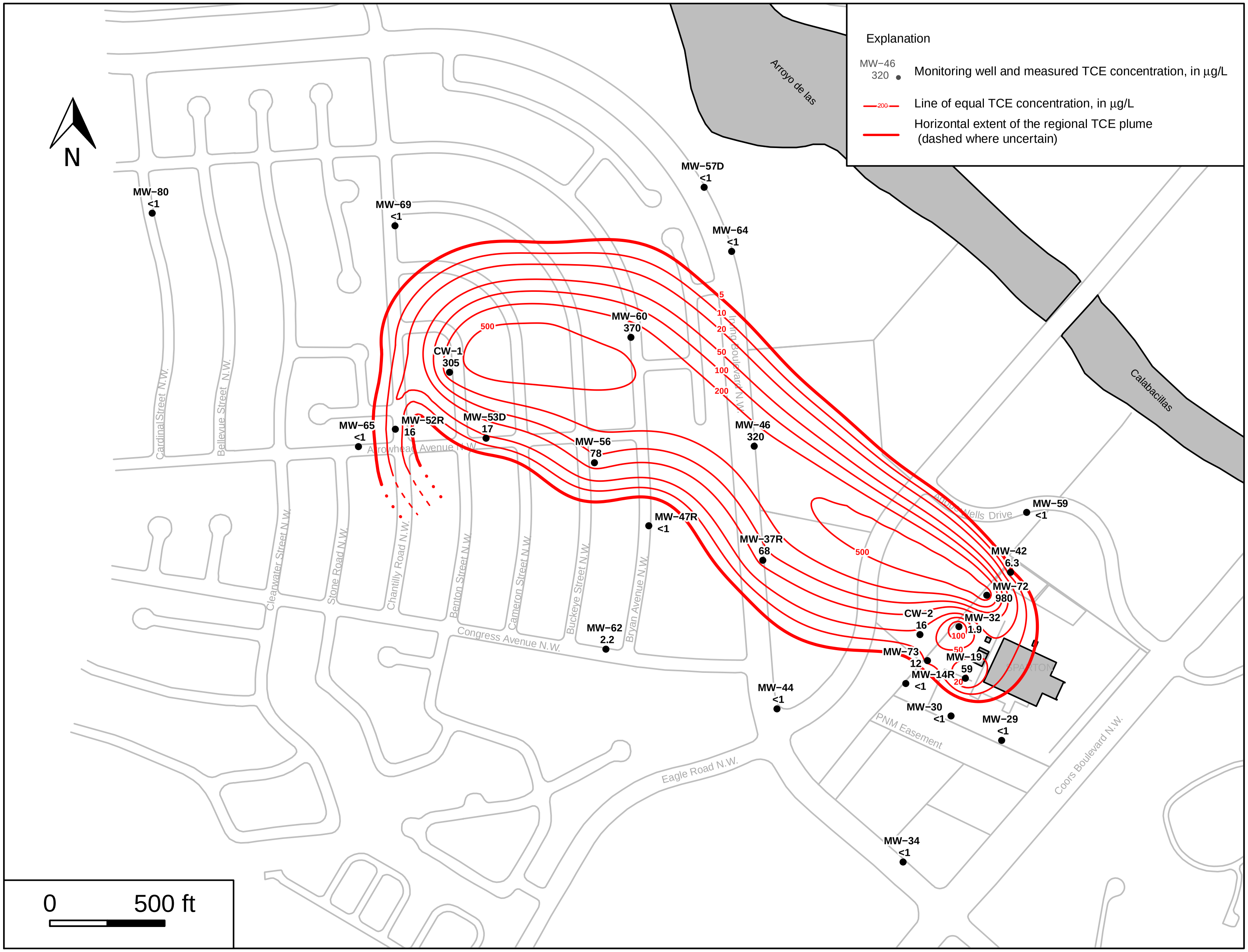


Figure 4.17: Horizontal Extent of the Regional TCE Plume - November 2015

Figure 4.18: On-Site DCE Concentrations - November 2015

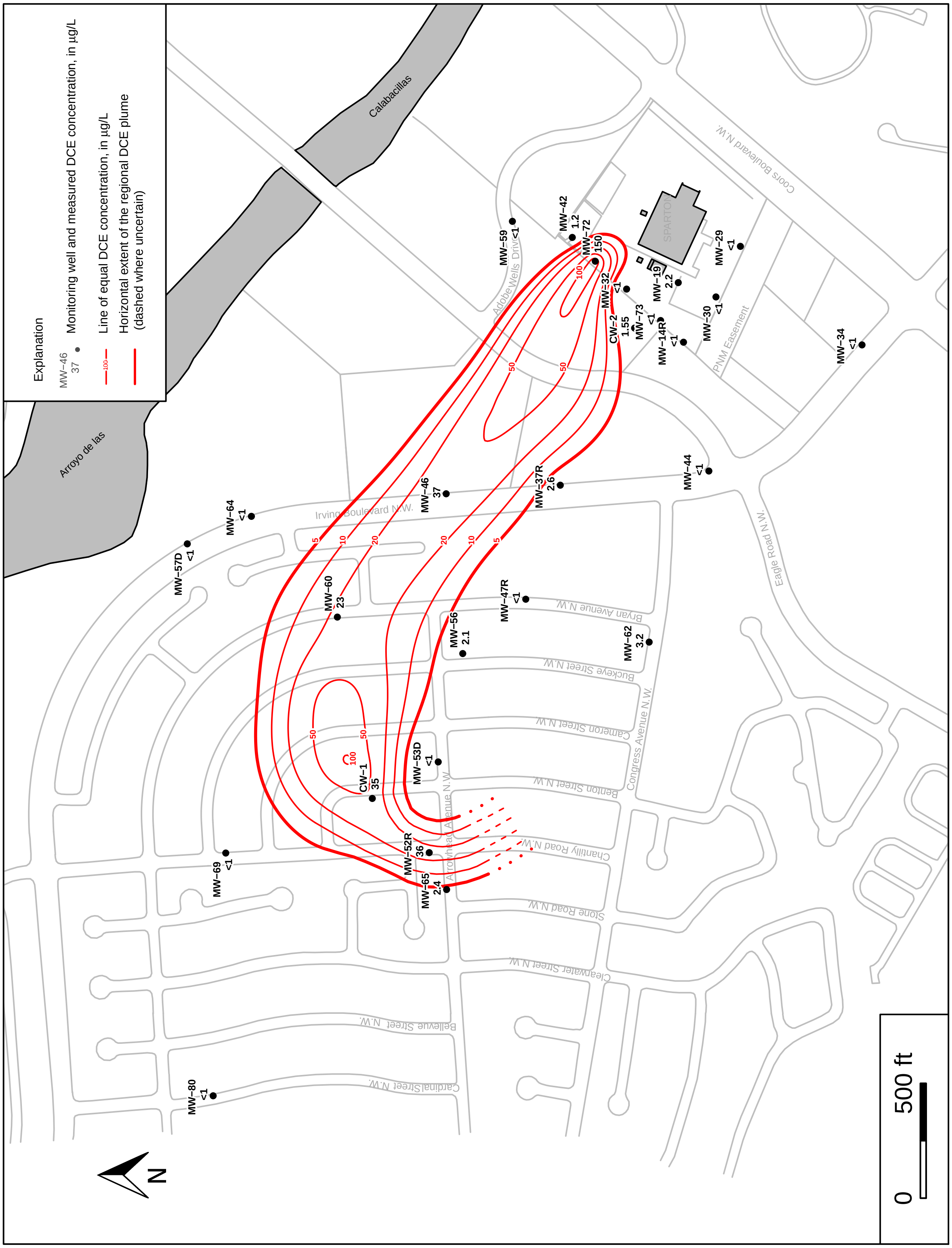


Figure 4.19: Horizontal Extent of the Regional DCE Plume - November 2015

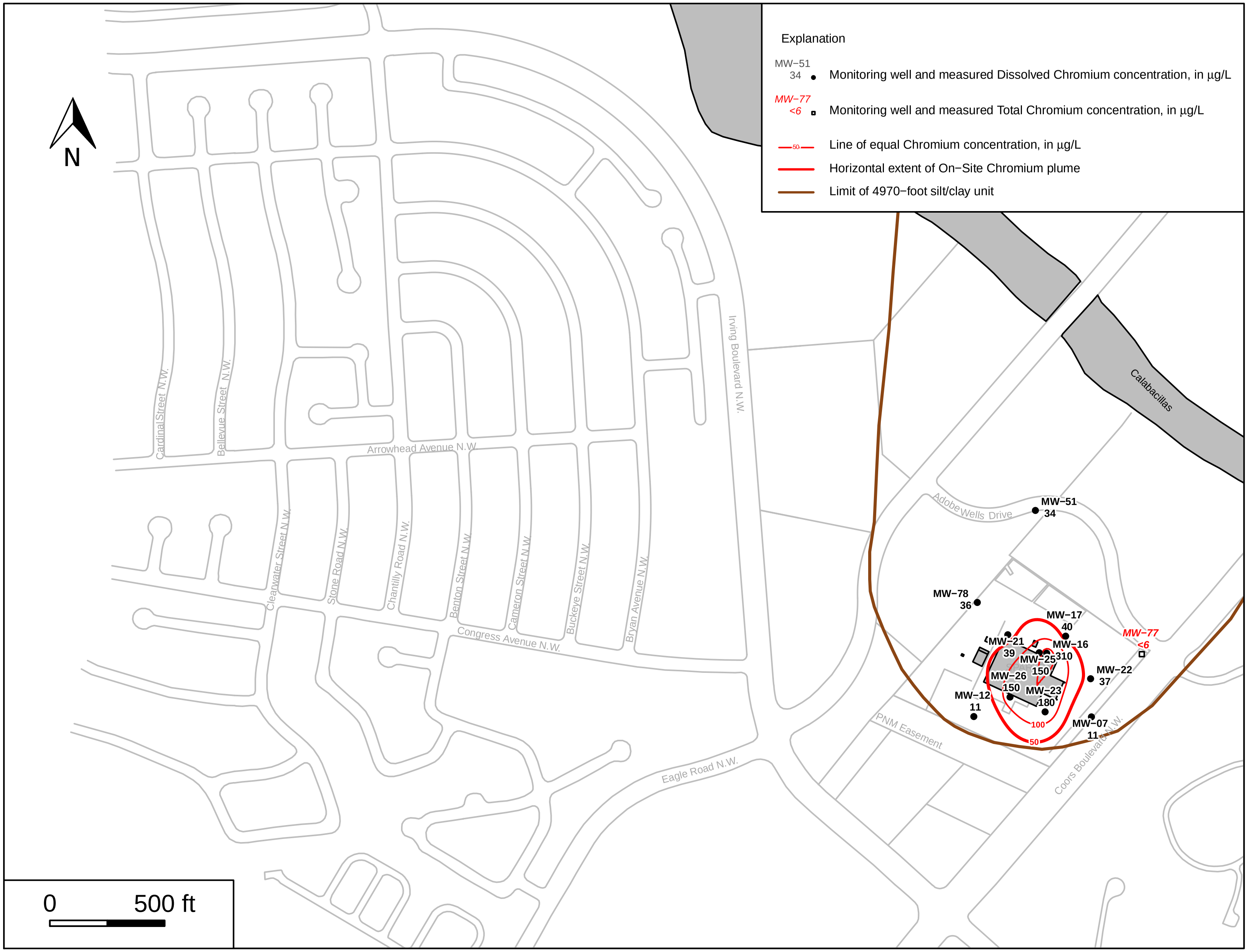


Figure 4.20: Horizontal Extent of the On-Site Chromium Plume - November 2015

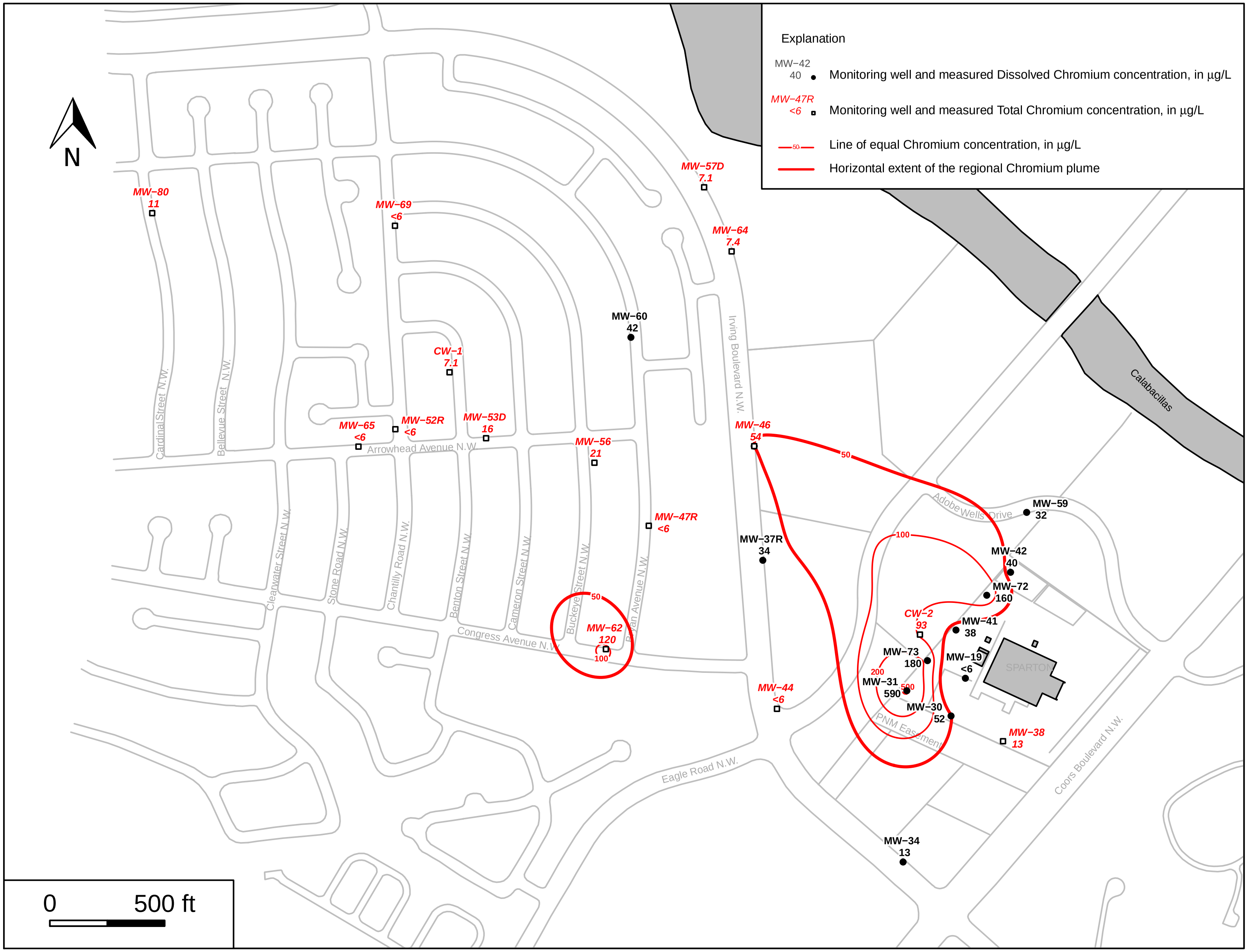


Figure 4.21: Horizontal Extent of the Regional Chromium Plume - November 2015

Figure 4.22: Changes in TCE Concentrations at Wells Completed Above the 4970-ft Silt/Clay Unit November 1998 to November 2015

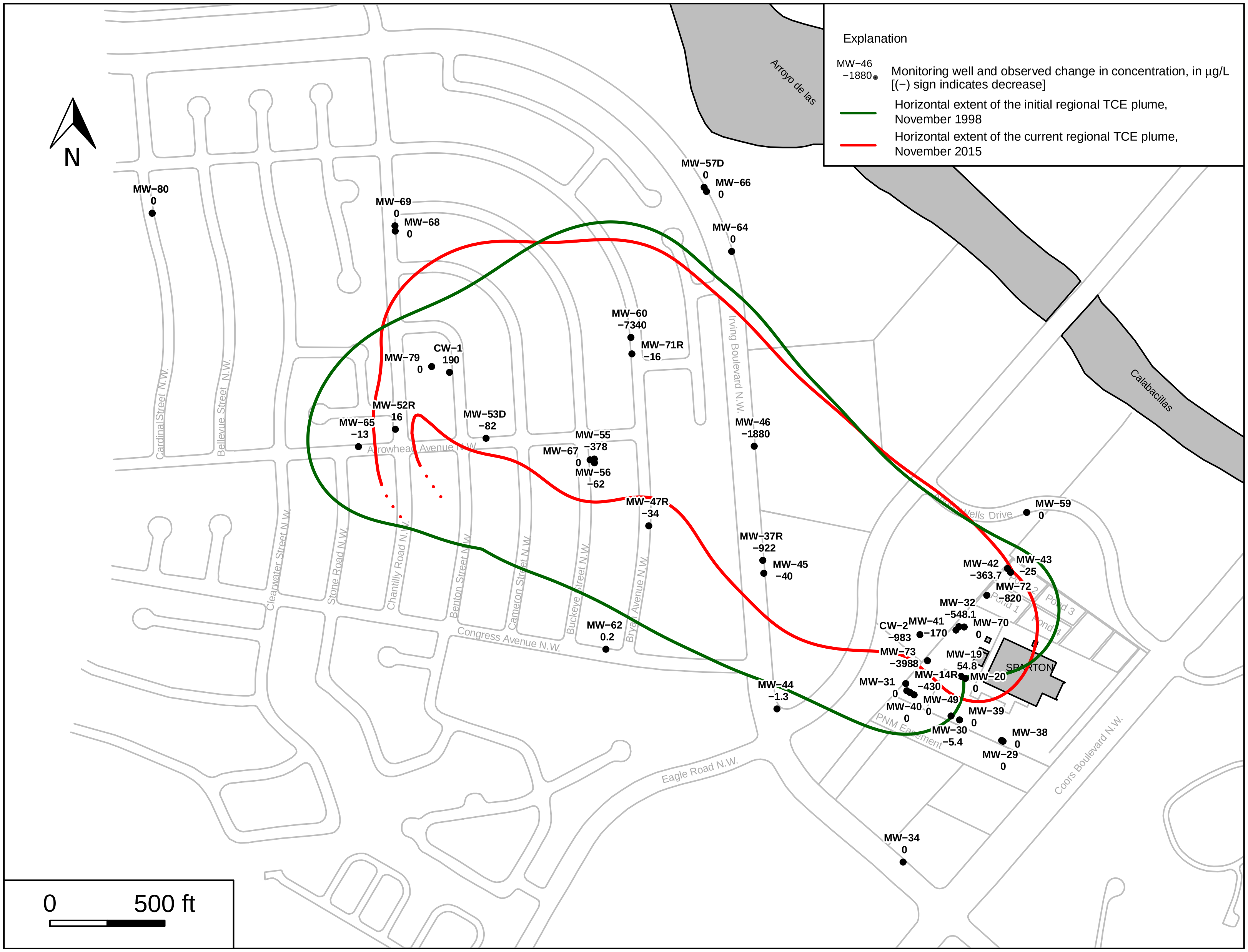


Figure 4.23: Changes in TCE Concentrations at Wells Completed Below the 4970-ft Silt/Clay Unit and in the Off-Site Area November 1998 to November 2015

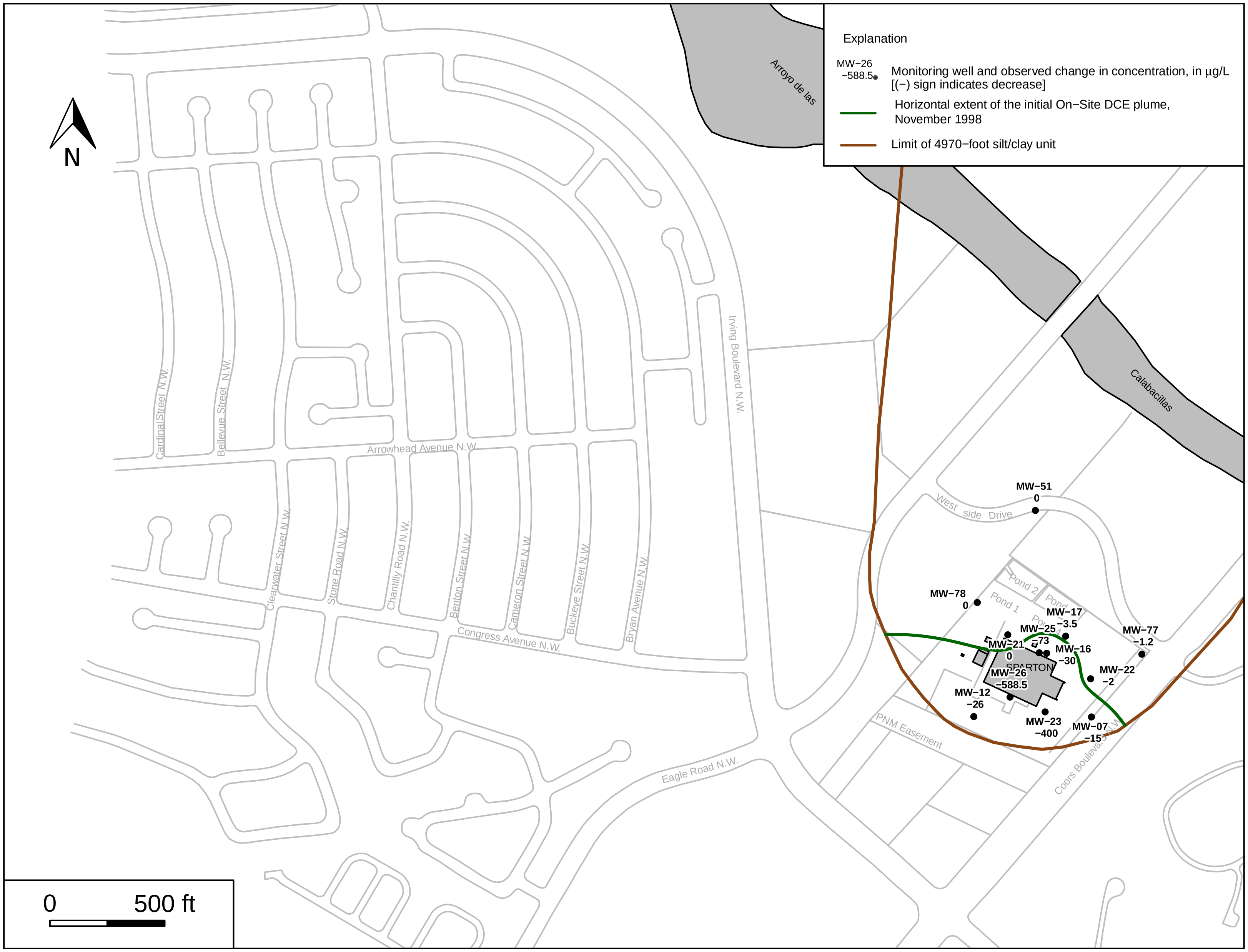


Figure 4.24: Changes in DCE Concentrations at Wells Completed Above the 4970-ft Silt/Clay Unit
November 1998 to November 2015

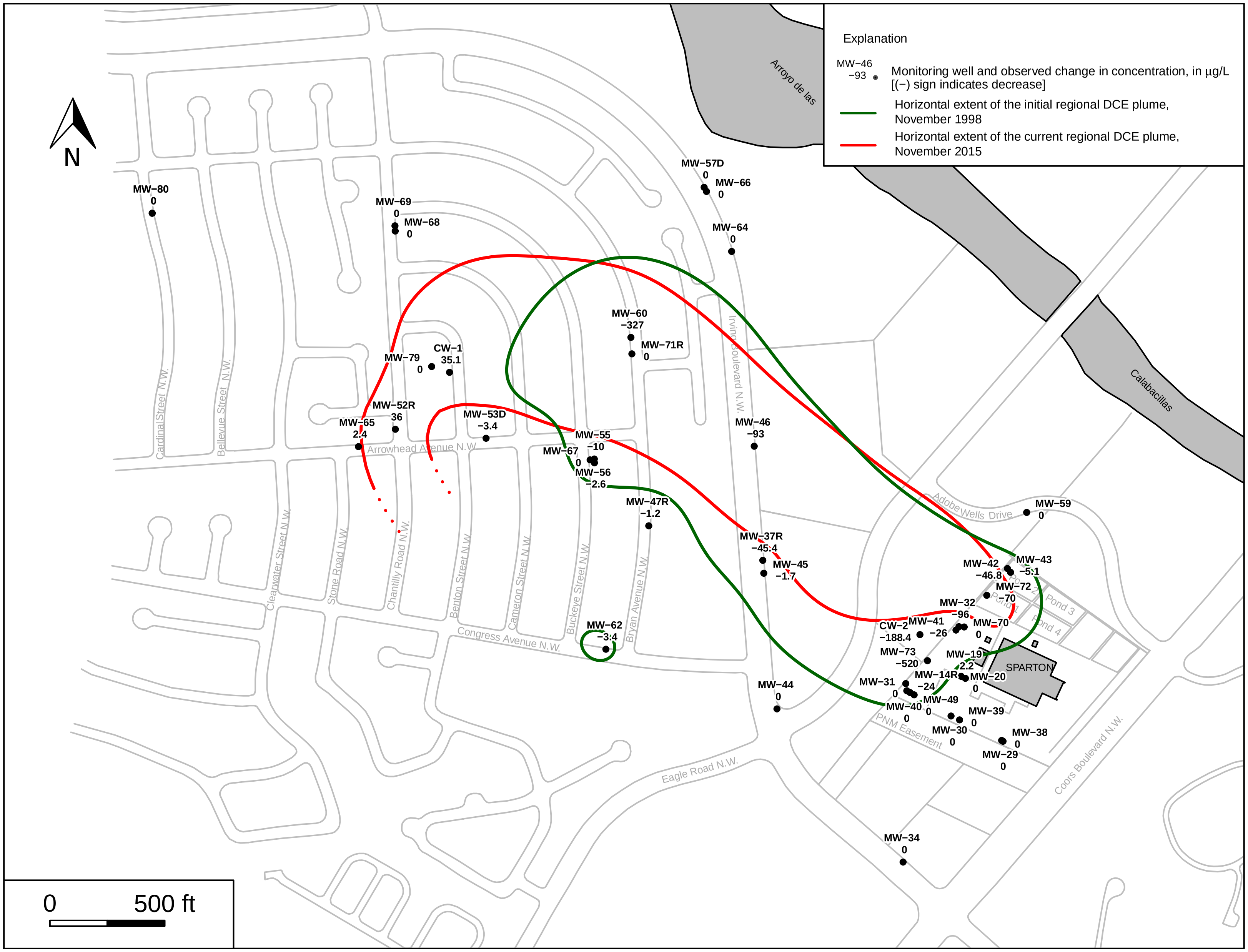


Figure 4.25: Changes in DCE Concentrations at Wells Completed Below the 4970-ft Silt/Clay Unit and in the Off-Site Area November 1998 to November 2015

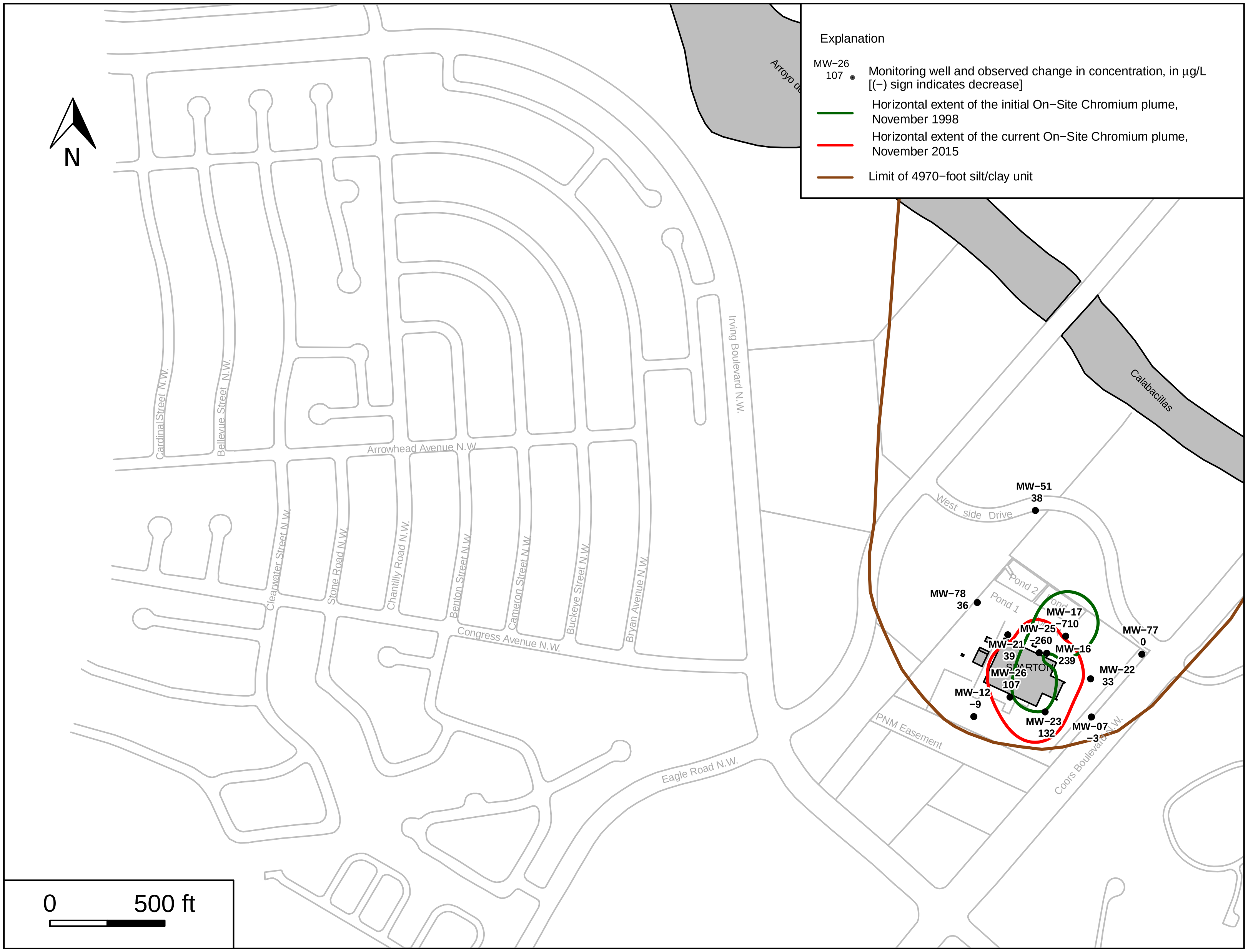


Figure 4.26: Changes in Chromium Concentrations at Wells Completed Above the 4970-ft Silt/Clay Unit
November 1998 to November 2015

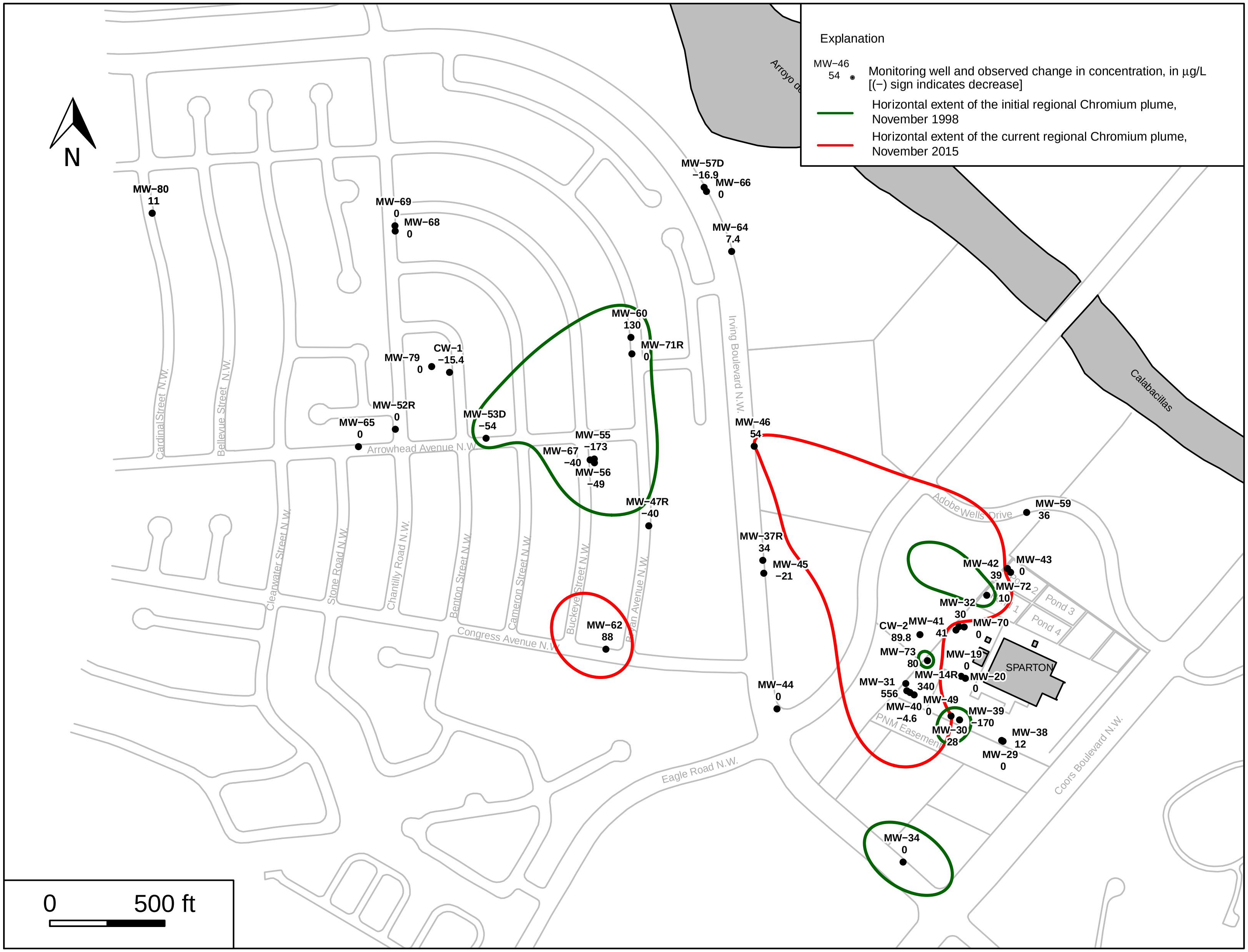


Figure 4.27: Changes in Chromium Concentrations at Wells Completed Below the 4970-ft Silt/Clay Unit and in the Off-Site Area November 1998 to November 2015

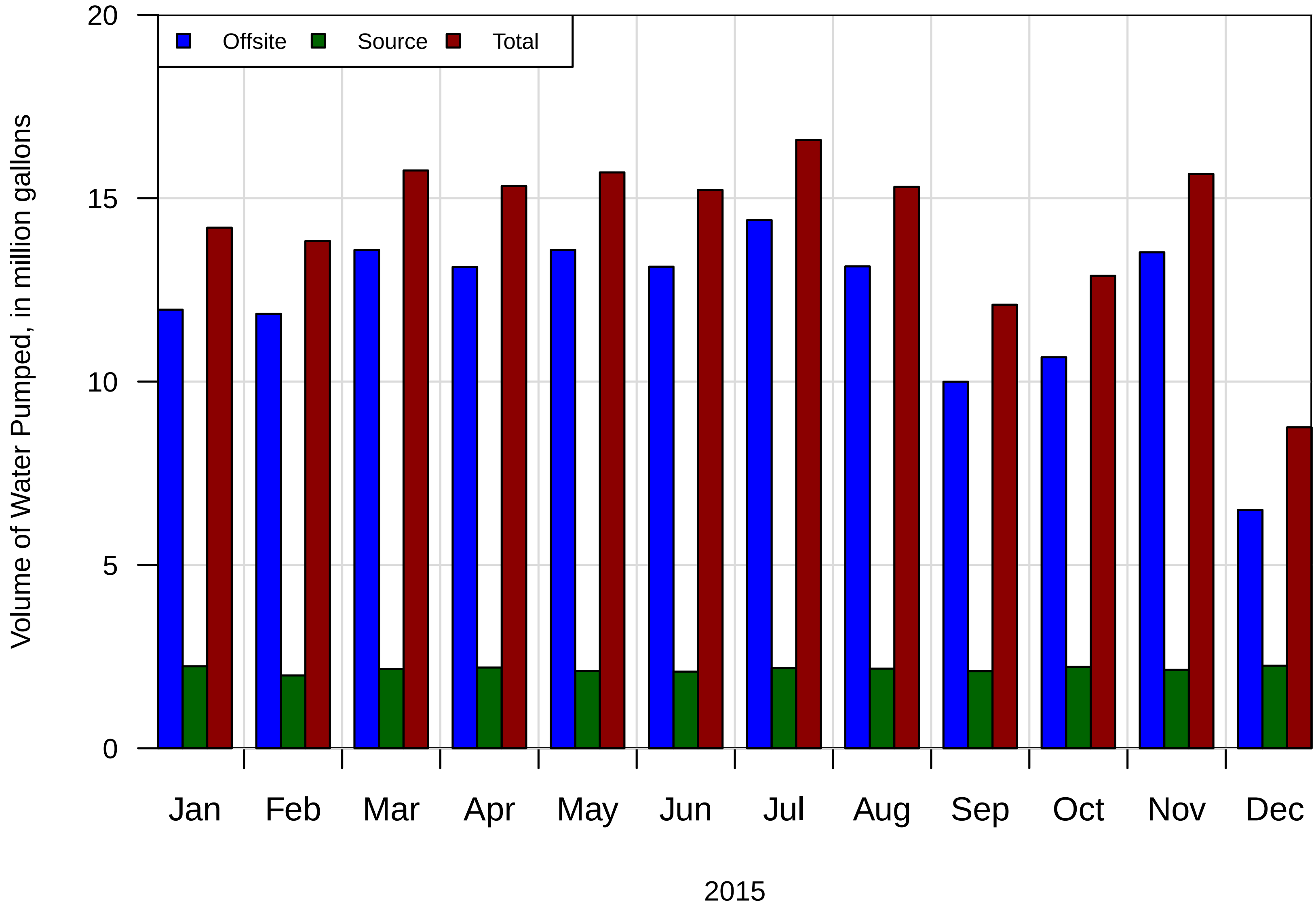


Figure 4.28: Monthly Volume of Water Pumped by the Containment Wells - 2015

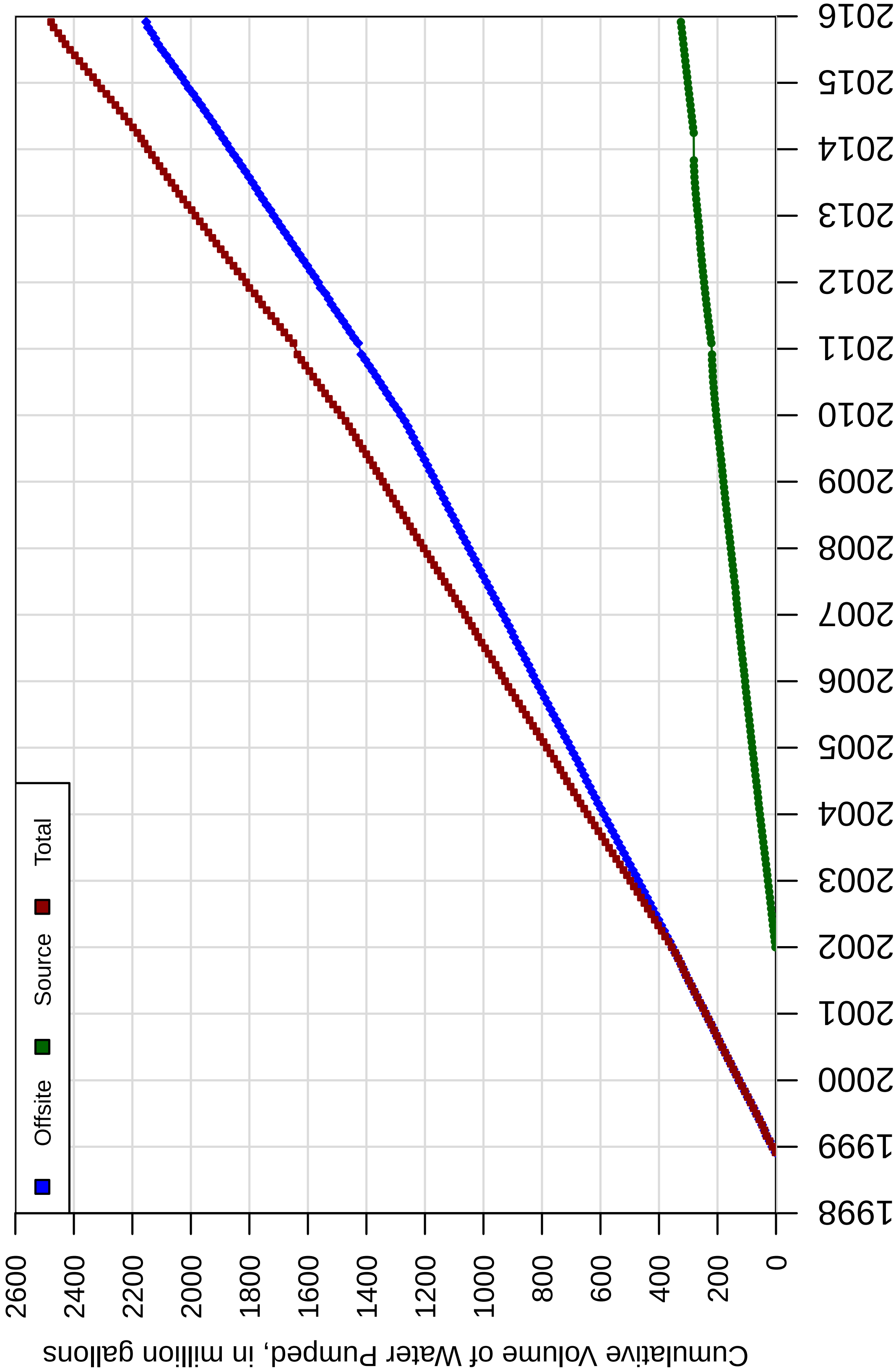


Figure 4.29: Cumulative Volume of Water Pumped by the Containment Wells

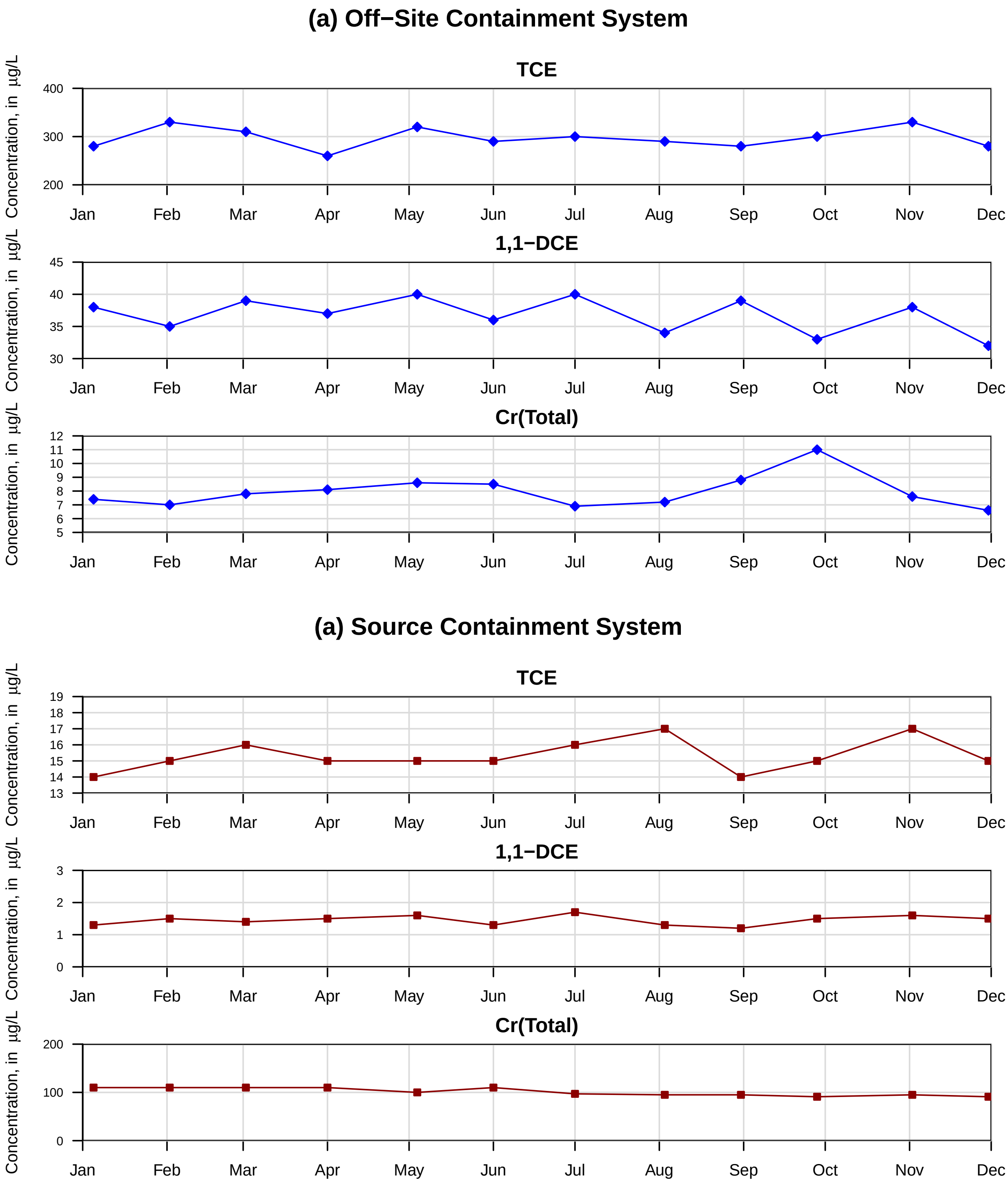


Figure 4.30: Off-Site and Source Containment Systems - TCE, DCE, and Total Chromium Concentrations in the Influent - 2015

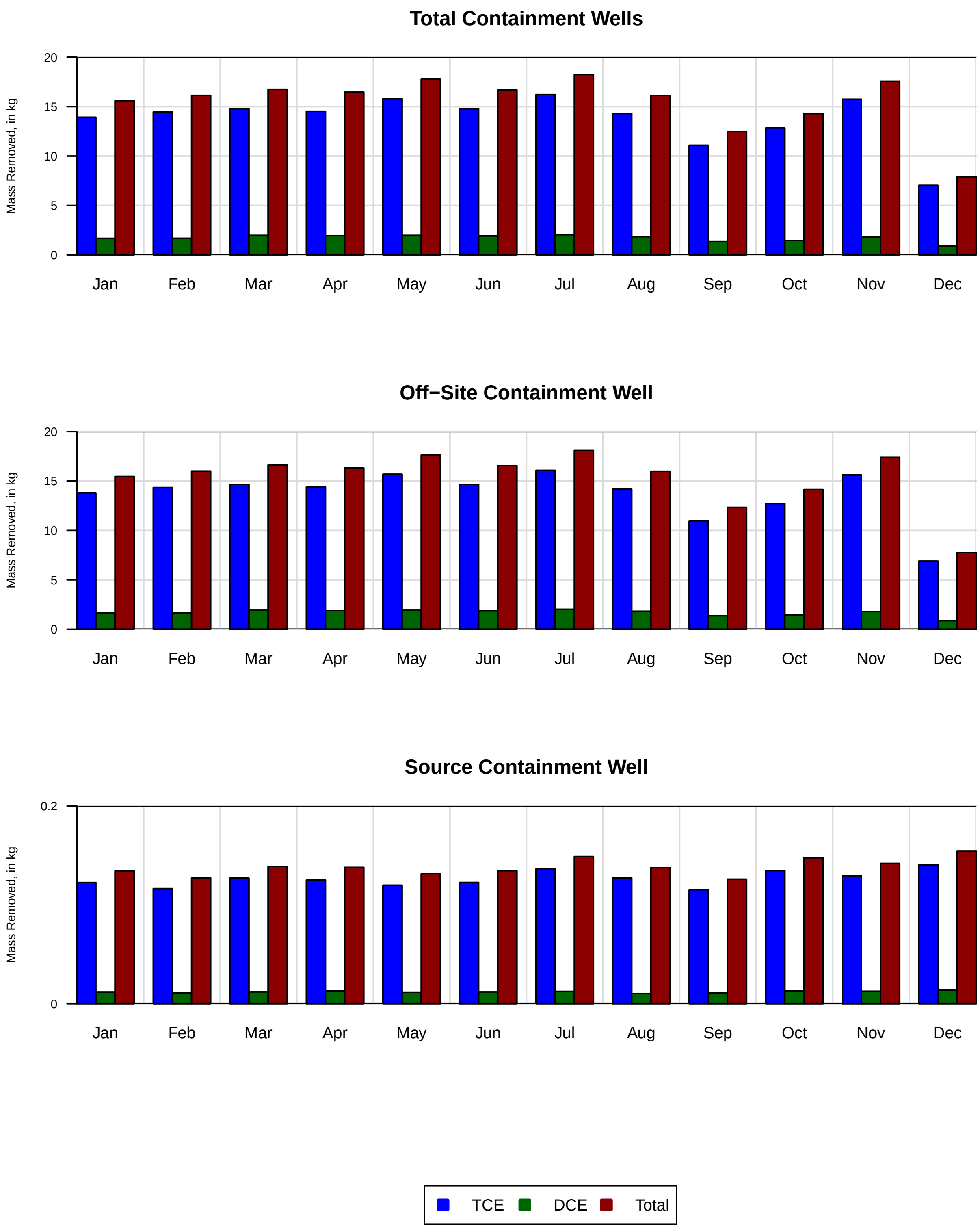


Figure 4.31: Monthly Contaminant Mass Removal by the Containment Wells - 2015

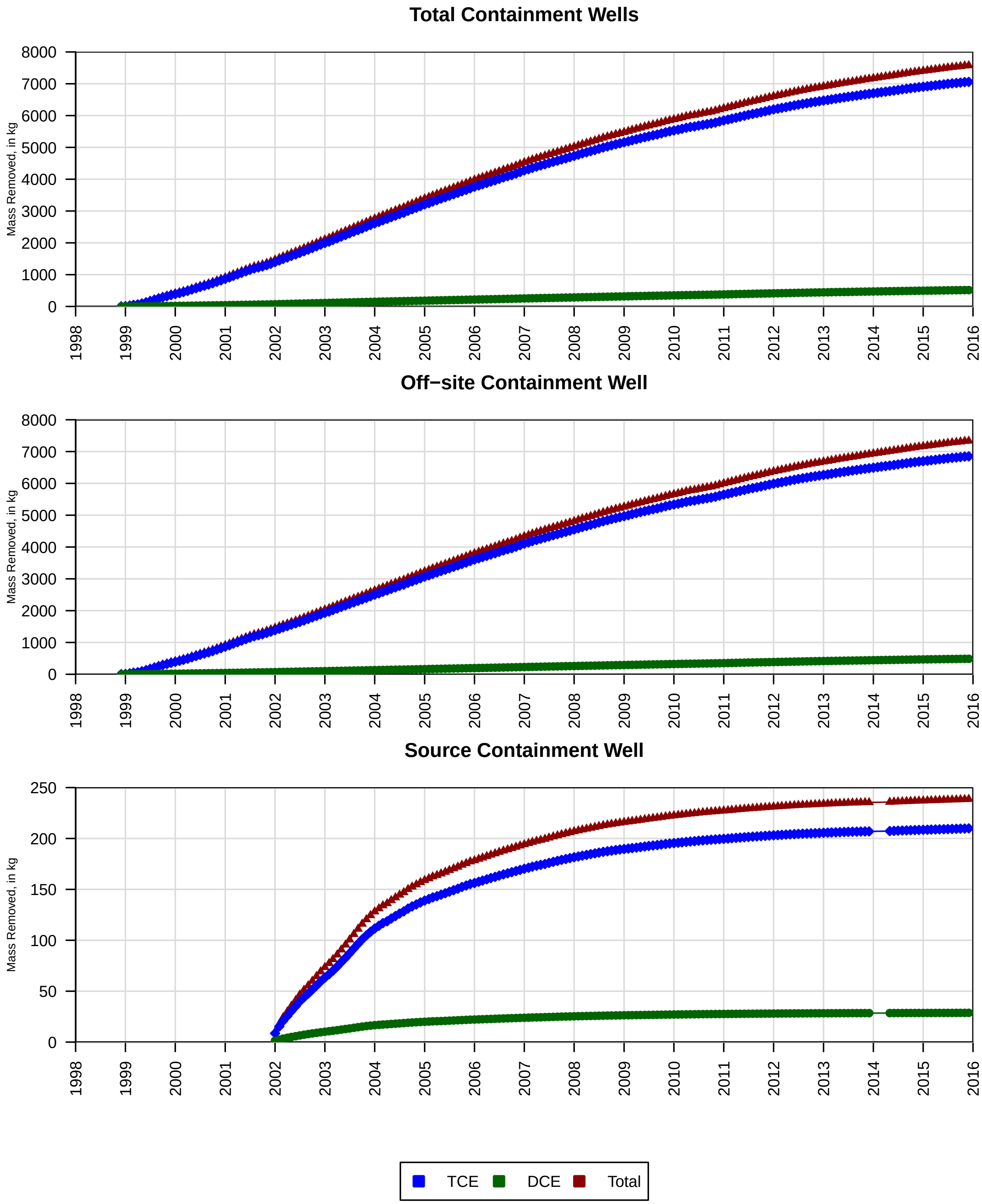


Figure 4.32: Cumulative Contaminant Mass Removal by the Containment Wells

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	5045.68
MW-07	UFZ	377535.41	1524101.14	5043.48
MW-09	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	5046.40
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
MW-37R	UFZ/ULFZ	376104.50	1524782.90	5093.15
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
MW-45	ULFZ	376108.80	1524726.75	5089.50
MW-46	ULFZ	376067.09	1525279.84	5118.86
MW-47R	ULFZ	375607.91	1524933.31	5115.17

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.

Well ID	Flow Zone[a]	Easting[b]	Northing[b]	Elevation[c]
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
MW-55	LLFZ	375370.70	1525224.15	5143.45
MW-56	ULFZ	375371.31	1525207.68	5141.45
MW-57D	UFZ/ULFZ	375849.02	1526406.98	5103.62
MW-59	ULFZ	377253.38	1524991.51	5060.65
MW-60	ULFZ	375530.19	1525753.61	5134.40
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
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-79	DFZ	374662.64	1525626.72	5168.50
MW-80	ULFZ/LLFZ	373445.75	1526294.35	5203.31
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
PZG-1	Infilt. Gall.	374871.43	1527608.14	5090.90

b New Mexico "Modified State Plane" coordinates, in feet.
c In feet above Mean Sea Level (ft MSL).

Table 2.2: Well Screen Data

Well ID[a]	Flow Zone	Diameter (in)	Elevation (ft above MSL) Ground Surface	Elevation (ft above MSL) Top of Screen	Elevation (ft above MSL) Bottom of Screen	Depth below Ground Surface (ft) Top of Screen	Depth below Ground Surface (ft) Bottom of Screen	Screen Length (ft)
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
MW-07	UFZ	2	5043.0	4979.7	4974.7	63.3	68.3	5.0
MW-09	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	5042.8	4944.8	4934.8	98.0	108.0	10.0
MW-20	LLFZ	4	5042.8	4919.2	4906.8	123.5	135.9	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	2	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-47R	ULFZ	4	5115.2	4955.2	4935.2	160.0	180.0	20.0
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	206.0	205.0	20.0
MW-54	UFZ	4	5097.2	4976.8	4961.8	120.4	135.4	10.0
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/ULFZ	4	5103.1	4958.1	4938.1	145.0	165.0	20.0
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-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	5156.4	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

Table 2.2 (cont.): 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-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	4	5045.5	4985.8	4955.8	59.7	89.6	30.0
MW-78	UFZ/ULFZ	4	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	35.0
MW-79	DFZ	6	5166.7	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
OB-1	UFZ/LFZ	4	5166.2	4960.3	4789.8	205.9	376.4	170.0
OB-2	UFZ/LFZ	4	5164.8	4960.3	4789.7	204.5	375.1	171.0
PZ-1	UFZ	2	5141.3	4961.5	4951.3	179.8	190.0	10.2

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.

Table 2.3: Operation and Downtime of the Off-Site Containment System - 2015

(a) Operation

Available Hours	8,760 hrs
Total Operating Hours	8,486 hrs
Percent of Operating to Available Hours	96.87%
Total Downtime Hours	274.12 hrs
Range of Downtime Hours	0.3 - 192.5 hrs

(b) Downtime

Date of Downtime				Duration	Cause
From		To			
01/20/2015	09:45	01/20/2015	13:30	3.75 hrs	Stripper cleaning activities
01/21/2015	09:25	01/21/2015	13:14	3.81 hrs	Stripper cleaning activities
01/22/2015	09:27	01/22/2015	11:38	2.18 hrs	Stripper cleaning activities
01/28/2015	15:15	01/28/2015	17:20	2.08 hrs	Seal maintenance activities
06/08/2015	14:37	06/08/2015	14:55	18 min	Routine maintenance
08/26/2015	04:20	08/26/2015	04:42	22 min	Routine sump maintenance
09/20/2015	16:56	09/21/2015	12:56	20 hrs	Power outage
11/22/2015	08:53	11/23/2015	12:22	27.48 hrs	Replace air stripper sump pump
12/02/2015	10:31	12/03/2015	08:11	21.66 hrs	Power outage
12/15/2015	09:30	12/23/2015	10:00	192.5 hrs	Stripper cleaning and gasket replacement

Table 2.4: Operation and Downtime of the Source Containment System - 2015

(a) Operation

Available Hours	8,760 hrs
Total Operating Hours	8,516 hrs
Percent of Operating to Available Hours	97.21%
Total Downtime Hours	244.12 hrs
Range of Downtime Hours	0.05 - 30.33 hrs

(b) Downtime

Date of Downtime				Duration	Cause
From		To			
01/12/2015	09:22	01/12/2015	09:36	14 min	Filter replacement
01/19/2015	08:52	01/19/2015	09:10	18 min	Tank exchange
01/30/2015	10:00	01/30/2015	10:14	14 min	Filter replacement
02/09/2015	08:55	02/09/2015	09:19	24 min	Tank exchange
02/17/2015	08:52	02/17/2015	12:19	3.45 hrs	Stripper maintenance and sediment sampling
02/19/2015	10:35	02/19/2015	10:49	14 min	Filter replacement
02/23/2015	09:20	02/23/2015	15:05	5.75 hrs	Filter replacement
03/02/2015	09:05	03/02/2015	09:27	22 min	Stripper/tank leak maintenance
03/02/2015	09:10	03/02/2015	09:40	30 min	Building Power
03/03/2015	09:53	03/04/2015	10:03	24.16 hrs	Blower motor replacement
03/04/2015	12:00	03/04/2015	14:02	2.03 hrs	Stripper/tank leak maintenance
03/05/2015	08:10	03/05/2015	16:20	8.16 hrs	Building Power
03/05/2015	08:40	03/05/2015	16:12	7.53 hrs	Stripper/tank leak maintenance
03/10/2015	11:30	03/10/2015	14:30	3 hrs	Stripper/tank leak maintenance
03/13/2015	08:41	03/13/2015	09:48	1.11 hrs	Filter replacement
03/23/2015	08:53	03/23/2015	09:20	27 min	Tank exchange and filter replacement
04/01/2015	10:50	04/01/2015	13:40	2.83 hrs	Building Power
04/01/2015	11:40	04/01/2015	15:00	3.33 hrs	Effluent and tank filters exchange
04/13/2015	08:10	04/13/2015	08:20	10 min	Building Power
04/13/2015	09:08	04/13/2015	09:28	20 min	Effluent filter replacement
04/24/2015	08:41	04/24/2015	08:51	10 min	Tank exchange and filter replacement
05/01/2015	11:30	05/01/2015	12:00	30 min	Building Power
05/01/2015	12:35	05/01/2015	12:55	20 min	Effluent and tank filters exchange
05/04/2015	09:15	05/04/2015	09:35	20 min	Tank exchange
05/04/2015	13:30	05/05/2015	08:30	18.99 hrs	Building Power
05/05/2015	07:30	05/05/2015	09:50	2.33 hrs	Fuse replacement
05/15/2015	08:20	05/15/2015	08:30	10 min	Building Power
05/15/2015	09:12	05/15/2015	09:25	13 min	Sampling point installation
05/18/2015	10:13	05/18/2015	10:20	7 min	Filter replacement
05/26/2015	08:00	05/26/2015	08:10	10 min	Building Power
05/26/2015	09:50	05/26/2015	10:00	10 min	Tank exchange
05/27/2015	12:20	05/28/2015	09:20	21 hrs	Building Power
05/28/2015	07:00	05/28/2015	10:30	3.5 hrs	Alarm reset and filter exchange
06/04/2015	13:24	06/04/2015	13:27	3 min	Sump level excursion
06/08/2015	09:18	06/08/2015	09:22	4 min	Filter replacement
06/15/2015	08:20	06/15/2015	08:30	10 min	Building Power
06/15/2015	09:08	06/15/2015	09:25	17 min	Tank exchange

Table 2.4 (cont.): Operation and Downtime of the Source Containment System - 2015

(b) Downtime (cont.)

Date of Downtime				Duration	Cause
From		To			
06/15/2015	14:10	06/16/2015	07:40	17.49 hrs	Building Power
06/16/2015	04:02	06/16/2015	08:35	4.55 hrs	Sump level excursion and filter exchange
06/16/2015	09:00	06/16/2015	13:00	3.99 hrs	Building Power
06/16/2015	10:29	06/16/2015	13:08	2.65 hrs	Effluent filter bypass
06/19/2015	07:00	06/19/2015	07:20	20 min	Building Power
07/06/2015	06:50	07/06/2015	09:50	3 hrs	Building Power
07/06/2015	07:44	07/06/2015	10:42	2.96 hrs	Tank exchange and filter replacement
07/09/2015	15:50	07/10/2015	06:40	14.83 hrs	Building Power
07/27/2015	08:00	07/27/2015	08:20	20 min	Building Power
07/27/2015	08:54	07/27/2015	09:17	23 min	Tank exchange
08/17/2015	08:10	08/17/2015	08:30	20 min	Building Power
08/17/2015	09:05	08/17/2015	09:25	20 min	Tank exchange and filter replacement
08/17/2015	10:00	08/18/2015	16:20	30.33 hrs	Power outage
08/17/2015	12:40	08/18/2015	07:00	18.33 hrs	Building Power
09/08/2015	08:10	09/08/2015	08:40	29 min	Building Power
09/08/2015	09:04	09/08/2015	09:36	32 min	Tank exchange and filter replacement
09/20/2015	16:50	09/21/2015	11:00	18.16 hrs	Building Power
09/21/2015	05:46	09/21/2015	11:59	6.21 hrs	Power outage
09/28/2015	08:00	09/28/2015	08:20	20 min	Building Power
09/28/2015	08:53	09/28/2015	09:08	15 min	Tank exchange and filter replacement
10/19/2015	09:37	10/19/2015	09:49	12 min	Tank exchange and filter replacement
10/27/2015	07:48	10/27/2015	08:08	20 min	Facility demonstration
11/09/2015	08:47	11/09/2015	09:22	35 min	Tank exchange
12/02/2015	11:39	12/02/2015	15:08	3.48 hrs	Power outage
12/16/2015	14:29	12/16/2015	14:41	12 min	Inspection
12/18/2015	13:30	12/18/2015	14:00	30 min	Test the monitoring system

Table 3.1: Quarterly Water-Level Elevations - 2015

Well ID	Flow Zone	Elevation (feet above MSL) Feb. 3-5, 2015	May. 4-5, 2015	Aug. 4-5, 2015	Nov. 4-5, 2015
CW-1	UFZ/LFZ	4916.91	4917.02	4916.48	4923.11
CW-2	UFZ-LLFZ	4956.85	4956.80	4956.65	4956.36
MW-07	UFZ	4974.71	4975.04	4975.30	4975.13
MW-09	UFZ	4970.31	4970.60	4970.98	4971.13
MW-12	UFZ	4969.13	4969.43	4969.61	4969.74
MW-14R	UFZ/ULFZ	4966.92	4966.97	4967.25	4967.42
MW-16	UFZ	4981.56	4982.34	4982.25	4981.31
MW-17	UFZ	4984.77	4985.68	4982.42	4981.09
MW-18	UFZ	4968.28	4969.38	4970.70	4970.66
MW-19	ULFZ	4968.06	4968.08	4968.34	4968.48
MW-20	LLFZ	4967.50	4967.72	4967.82	4967.99
MW-21	UFZ	4982.19	4982.47	4982.53	4982.29
MW-22	UFZ	4977.00	4977.65	4977.88	4976.91
MW-23	UFZ	4973.44	4973.74	4974.09	4973.89
MW-24	UFZ	4981.61	4982.12	4981.85	4981.10
MW-25	UFZ	4981.74	4982.21	4981.82	4981.27
MW-26	UFZ	4970.56	4970.69	4971.10	4970.97
MW-27	UFZ	4976.57	4976.96	4977.12	4977.02
MW-29	ULFZ	4970.37	4970.60	4970.81	4970.85
MW-30	ULFZ	4968.53	4968.74	4969.03	4969.18
MW-31	ULFZ	4967.07	4967.10	4967.43	4967.59
MW-32	ULFZ	4966.70	4966.92	4966.99	4967.25
MW-34	UFZ	4970.48	4970.01	4971.78	4971.10
MW-37R	UFZ/ULFZ	4963.23	4962.52	4963.70	4963.81
MW-38	LLFZ	4970.26	4970.56	4970.78	4970.75
MW-39	LLFZ	4968.91	4969.09	4969.19	4969.42
MW-40	LLFZ	4967.12	4967.38	4967.48	4967.69
MW-41	ULFZ	4966.95	4966.98	4967.22	4967.51
MW-42	ULFZ	4967.23	4967.42	4967.42	4967.67
MW-43	LLFZ	4966.98	4967.18	4967.20	4967.47
MW-44	ULFZ	4965.72	4965.01	4966.00	4966.12
MW-45	ULFZ	4963.76	4962.67	4963.95	4964.17
MW-46	ULFZ	4962.63	4961.54	4962.75	4962.90
MW-47R	ULFZ	4961.72	4961.93	4962.12	4962.14

Well ID	Flow Zone	Elevation (feet above MSL) Feb. 3-5, 2015	May. 4-5, 2015	Aug. 4-5, 2015	Nov. 4-5, 2015
MW-49	LLFZ	4967.19	4967.39	4967.81	4967.70
MW-51	UFZ	4981.38	4981.29	4981.99	4982.39
MW-52R	UFZ/ULFZ	4955.99	4956.02	4956.15	4956.76
MW-53D	UFZ/ULFZ	4957.96	4958.42	4958.48	4958.97
MW-54	UFZ	4962.04	4962.28	4962.17	4962.43
MW-55	LLFZ	4959.33	4959.57	4959.65	4960.02
MW-56	ULFZ	4960.59	4961.04	4961.03	4961.17
MW-57D	UFZ/ULFZ	4962.15	4962.15	4962.06	4962.08
MW-59	ULFZ	4966.33	4966.35	4966.50	4966.75
MW-60	ULFZ	4960.71	4960.96	4960.95	4961.09
MW-62	UFZ	4962.73	4963.14	4964.08	4963.39
MW-63	UFZ	4979.22	4969.28	4969.80	4971.07
MW-64	ULFZ	4961.97	4962.14	4962.12	4962.26
MW-65	LLFZ	4955.57	4955.90	4956.25	4956.87
MW-66	LLFZ	4960.31	4958.86	4960.49	4960.69
MW-67	DFZ	4954.93	4954.03	4954.96	4955.33
MW-68	UFZ	4956.55	4957.25	4955.64	4957.05
MW-69	LLFZ	4956.53	4956.60	4956.63	4957.05
MW-70	LLFZ	4966.32	4966.42	4966.51	4965.77
MW-71R	DFZ	4955.07	4954.01	4954.91	4955.33
MW-72	ULFZ	4967.14	4967.51	4967.56	4967.71
MW-73	ULFZ	4966.30	4966.34	4966.64	4966.83
MW-74	UFZ/ULFZ	4960.40	4960.36	4960.63	4960.52
MW-75	UFZ/ULFZ	4966.46	4966.54	4965.71	4966.68
MW-76	UFZ/ULFZ	4967.43	4968.01	4966.29	4965.23
MW-77	UFZ/ULFZ	4976.20	4976.40	4976.73	4976.52
MW-78	UFZ/ULFZ	4972.61	4973.03	4973.26	4973.76
MW-79	DFZ	4953.23	4951.09	4951.99	4952.61
MW-80	ULFZ/LLFZ	4954.54	4954.43	4954.69	4955.10
OB-1	UFZ/LFZ	4952.59	4952.80	4952.89	4953.88
OB-2	UFZ/LFZ	4953.85	4954.22	4954.20	4955.00
PZ-1	UFZ	4953.04	4953.26	4953.41	4953.58
PZG-1	Infilt. Gall.	5067.90	5067.84	5067.94	5067.75

(yellow) Measured water level is below the bottom of screen

Table 3.2: Water-Quality Data from Groundwater Monitoring Program Wells - 2015

Well ID	Sample Date	TCE µg/L	1,1-DCE µg/L	1,1,1-TCA µg/L	Chromium Total µg/L	Chromium Dissolved µg/L	Additional Compounds[a]
MW-07	11/17/2015	10	<1	<1	37	11	
MW-09	01/16/2015	12	<1	<1	16	NA	
MW-12	01/07/2015	11	<1	<1	33	<6	
MW-12	11/18/2015	12	<1	<1	41	11	
MW-14R	02/12/2015	<1	<1	<1	280	NA	Bromodichloromethane: 6.2 Chloroform: 5.6
MW-14R	03/06/2015	NA	NA	NA	280	270	
MW-14R	05/07/2015	NA	NA	NA	200	200	
MW-14R	08/11/2015	NA	NA	NA	380	380	
MW-14R	11/06/2015	<1	<1	<1	330	340	Bromodichloromethane: 6.3 Chloroform: 6.5 Dibromochloromethane: 1.1
MW-16	11/18/2015	6.4	<1	<1	980	310	
MW-19	02/13/2015	60	2.3	<1	<6	NA	
MW-19	03/06/2015	NA	NA	NA	<6	<6	
MW-19	05/12/2015	NA	NA	NA	6.6	7.2	
MW-19	08/11/2015	NA	NA	NA	<6	<6	
MW-19	11/09/2015	59	2.2	<1	<6	<6	
MW-20	11/09/2015	<1	<1	<1	<6	NA	
MW-21	11/19/2015	<1	<1	<1	85	39	
MW-22	11/11/2015	<1	<1	<1	33	37	
MW-23	11/17/2015	4.3	<1	<1	260	180	
MW-25	11/19/2015	5.2	<1	<1	300	150	
MW-25	11/19/2015-DUP	3.9	<1	<1	250	150	
MW-26	01/07/2015	9.7	<1	<1	290	150	
MW-26	11/17/2015	24	1.5	<1	4600	150	
MW-29	11/11/2015	<1	<1	<1	<6	NA	

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2015

Well ID	Sample Date	TCE µg/L	1,1-DCE µg/L	1,1,1-TCA µg/L	Chromium Total µg/L	Chromium Dissolved µg/L	Additional Compounds[a]
MW-30	02/12/2015	<1	<1	<1	50	NA	Bromodichloromethane: 6.2 Chloroform: 5.8 Dibromochloromethane: 2.2
MW-30	03/06/2015	NA	NA	NA	49	46	
MW-30	05/06/2015	NA	NA	NA	31	31	
MW-30	08/11/2015	NA	NA	NA	27	22	
MW-30	11/09/2015	<1	<1	<1	53	52	Bromodichloromethane: 5.1 Chloroform: 7.1 Dibromochloromethane: 3.2
MW-31	02/12/2015	<1	<1	<1	280	NA	Bromodichloromethane: 6.4 Chloroform: 6.1 Dibromochloromethane: 3.7
MW-31	03/06/2015	NA	NA	NA	250	250	
MW-31	05/06/2015	NA	NA	NA	290	290	
MW-31	05/06/2015-DUP	NA	NA	NA	310	310	
MW-31	08/06/2015	NA	NA	NA	420	390	
MW-31	11/22/2015	<1	<1	<1	570	590	Bromodichloromethane: 6 Chloroform: 7.4 Dibromochloromethane: 1.6
MW-32	01/07/2015	3.2	<1	<1	21	NA	
MW-32	11/22/2015	1.9	<1	<1	30	9.2	
MW-34	01/07/2015	<1	<1	<1	820	<6	
MW-34	11/19/2015	<1	<1	<1	160	13	
MW-37R	11/13/2015	68	2.6	<1	34	34	
MW-38	11/20/2015	<1	<1	<1	12	NA	
MW-38	11/20/2015-DUP	<1	<1	<1	14	NA	
MW-39	11/20/2015	<1	<1	<1	<6	NA	

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2015

Well ID	Sample Date	TCE µg/L	1,1-DCE µg/L	1,1,1-TCA µg/L	Chromium Total µg/L	Chromium Dissolved µg/L	Additional Compounds[a]
MW-40	11/05/2015	<1	<1	<1	6.4	NA	Bromodichloromethane: 6.2 Chloroform: 5 Dibromochloromethane: 8.2
MW-41	01/06/2015	5	<1	<1	46	NA	
MW-41	02/13/2015	4	<1	<1	50	NA	
MW-41	03/06/2015	NA	NA	NA	49	45	
MW-41	05/11/2015	NA	NA	NA	46	45	
MW-41	08/10/2015	NA	NA	NA	42	40	
MW-41	11/05/2015	<1	<1	<1	41	38	
MW-42	11/05/2015	6.3	1.2	<1	39	40	
MW-43	11/05/2015	<1	<1	<1	<6	NA	
MW-44	11/13/2015	<1	<1	<1	<6	NA	
MW-45	12/03/2015	<1	<1	<1	19	17	
MW-46	11/22/2015	320	37	1.3	54	50	Chloroform: 1.7 Tetrachloroethene (PCE): 2.6
MW-47R	12/01/2015	<1	<1	<1	<6	NA	
MW-47R	12/01/2015-DUP	<1	<1	<1	<6	NA	
MW-49	11/11/2015	<1	<1	<1	<6	NA	
MW-51	11/12/2015	<1	<1	<1	38	34	
MW-52R	02/06/2015	16	40	1.5	<6	NA	
MW-52R	02/11/2015	15	34	1.5	<6	NA	
MW-52R	05/06/2015	18	38	1.5	<6	NA	
MW-52R	08/04/2015	17	34	1.2	<6	NA	
MW-52R	12/03/2015	16	36	1.2	<6	NA	
MW-52R	12/03/2015-DUP	16	36	1.1	<6	NA	
MW-53D	12/01/2015	17	<1	<1	16	NA	
MW-55	11/30/2015	12	<1	<1	7	NA	
MW-56	12/01/2015	78	2.1	<1	21	NA	
MW-57D	02/09/2015	<1	<1	<1	<6	NA	

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2015

Well ID	Sample Date	TCE μg/L	1,1-DCE μg/L	1,1,1-TCA μg/L	Chromium Total μg/L	Chromium Dissolved μg/L	Additional Compounds[a]
MW-57D	02/11/2015	<1	<1	<1	<6	<6	
MW-57D	05/06/2015	<1	<1	<1	<6	NA	
MW-57D	08/05/2015	<1	<1	<1	<6	NA	
MW-57D	11/22/2015	<1	<1	<1	7.1	NA	
MW-59	11/12/2015	<1	<1	<1	36	32	
MW-60	12/03/2015	360	23	<1	130	41	Chloroform: 2.1; PCE: 2.7
MW-60	12/03/2015-DUP	380	23	<1	120	43	Chloroform: 2.1; PCE: 2.7
MW-62	02/06/2015	2.5	4.5	<1	57	<6	Chloroform: 1.1
MW-62	05/11/2015	3.4	6.5	1	6.2	NA	
MW-62	08/06/2015	2.4	3.8	<1	29	NA	
MW-62	12/04/2015	2.2	3.2	<1	120	NA	
MW-64	11/22/2015	<1	<1	<1	7.4	NA	
MW-65	02/06/2015	<1	1.9	<1	<6	NA	
MW-65	05/07/2015	<1	2.1	<1	<6	NA	
MW-65	05/07/2015-DUP	<1	2.1	<1	<6	NA	
MW-65	08/06/2015	<1	1.7	<1	<6	NA	
MW-65	11/25/2015	<1	2.4	<1	<6	NA	
MW-66	01/07/2015	<1	<1	<1	<6	NA	
MW-66	02/09/2015	<1	<1	<1	<6	NA	
MW-66	02/09/2015-DUP	<1	<1	<1	<6	NA	
MW-66	05/07/2015	<1	<1	<1	<6	NA	
MW-66	08/05/2015	<1	<1	<1	<6	NA	
MW-66	11/19/2015	<1	<1	<1	<6	NA	
MW-67	05/07/2015	<1	<1	<1	<6	NA	
MW-67	11/23/2015	<1	<1	<1	<6	NA	
MW-68	02/05/2015	<1	<1	<1	<6	NA	
MW-68	05/08/2015	<1	<1	<1	<6	NA	
MW-68	08/05/2015	<1	<1	<1	<6	NA	
MW-68	11/18/2015	<1	<1	<1	<6	NA	

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2015

Well ID	Sample Date	TCE µg/L	1,1-DCE µg/L	1,1,1-TCA µg/L	Chromium Total µg/L	Chromium Dissolved µg/L	Additional Compounds[a]
MW-69	02/05/2015	<1	<1	<1	<6	NA	
MW-69	05/08/2015	<1	<1	<1	<6	NA	
MW-69	08/05/2015	<1	<1	<1	<6	NA	
MW-69	08/05/2015-DUP	<1	<1	<1	<6	NA	
MW-69	11/18/2015	<1	<1	<1	<6	NA	
MW-70	11/05/2015	<1	<1	<1	<6	NA	
MW-71R	02/09/2015	57	2.4	<1	<6	NA	
MW-71R	02/12/2015	NA	NA	NA	NA	<6	
MW-71R	05/08/2015	54	2.2	<1	<6	NA	
MW-71R	08/05/2015	49	1.7	<1	<6	NA	
MW-71R	11/25/2015	40	1.6	<1	<6	NA	
MW-72	02/11/2015	1400	220	2	160	NA	1,1,2-TCA: 2 Benzene: 2.5 Chlorobenzene: 1.1 Chloroform: 6.8 PCE: 14
MW-72	03/06/2015	NA	NA	NA	160	150	
MW-72	05/07/2015	NA	NA	NA	150	140	
MW-72	08/10/2015	NA	NA	NA	110	110	
MW-72	11/04/2015	980	150	<5	160	160	Tetrachloroethene (PCE): 11
MW-73	02/11/2015	12	<1	<1	370	360	Bromodichloromethane: 3 Chloroform: 2.8 Dibromochloromethane: 2.7
MW-73	03/06/2015	NA	NA	NA	350	330	
MW-73	05/07/2015	NA	NA	NA	260	250	
MW-73	08/10/2015	NA	NA	NA	200	210	
MW-73	11/06/2015	12	<1	<1	180	180	Bromodichloromethane: 3.5 Chloroform: 3.5 Dibromochloromethane: 2.9

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2015

Well ID	Sample Date	TCE µg/L	1,1-DCE µg/L	1,1,1-TCA µg/L	Chromium		Additional Compounds[a]
					Total µg/L	Dissolved µg/L	
MW-79	05/12/2015	<1	<1	<1	<6	NA	
MW-79	11/23/2015	<1	<1	<1	<6	NA	
MW-80	02/10/2015	<1	<1	<1	7.5	NA	
MW-80	05/13/2015	<1	<1	<1	9.4	NA	
MW-80	08/07/2015	<1	<1	<1	12	NA	
MW-80	11/25/2015	<1	<1	<1	11	NA	

(yellow) Concentration exceeds the more strigent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 µg/L for TCE and DCE, 60 µg/L for TCA and 50 µg/L for Total Chromium)
NA Not Analyzed
a Analyte concentrations are reported in µg/L

Table 3.3: Water-Quality Data from Infiltration Gallery and Pond Monitoring - 2015

Well ID	Sample Date	TCE µg/L	1,1-DCE µg/L	1,1,1-TCA µg/L	Cr (total) µg/L	Fe (total) µg/L	Mn (total) µg/L	Cr (diss) µg/L	Fe (diss) µg/L	Mn (diss) µg/L
MW-17	01/06/2015	NA	NA	NA	55	NA	NA	36	NA	NA
MW-17	02/16/2015	<1	<1	<1	67	NA	NA	40	NA	NA
MW-17	03/12/2015	NA	NA	NA	62	NA	NA	39	NA	NA
MW-17	04/07/2015	NA	NA	NA	52	NA	NA	39	NA	NA
MW-17	05/11/2015	<1	<1	<1	43	3500	120	36	<20	<2
MW-17	06/02/2015	<1	<1	<1	43	3100	84	36	<20	5
MW-17	08/04/2015	<1	<1	<1	42	2800	79	34	39	5.6
MW-17	11/18/2015	1.3	<1	<1	54	6400	210	40	<20	<2
MW-17	12/09/2015	1.3	<1	<1	43	2500	210	39	<20	<2
MW-74	02/11/2015	<1	<1	<1	7.4	<20	<2	NA	NA	NA
MW-74	05/08/2015	<1	<1	<1	7.5	<20	<2	NA	NA	NA
MW-74	08/03/2015	<1	<1	<1	7.7	<20	<2	NA	NA	NA
MW-74	11/03/2015	<1	<1	<1	6.3	<20	2.8	NA	NA	NA
MW-75	02/13/2015	<1	<1	<1	6.8	<20	<2	NA	NA	NA
MW-75	05/08/2015	<1	<1	<1	7.1	<20	<2	NA	NA	NA
MW-75	08/03/2015	<1	<1	<1	9.1	<20	<2	NA	NA	NA
MW-75	11/03/2015	<1	<1	<1	6.2	<20	<2	NA	NA	NA
MW-76	02/11/2015	<1	<1	<1	6.8	<20	<2	NA	NA	NA
MW-76	05/08/2015	<1	<1	<1	6.4	<20	<2	NA	NA	NA
MW-76	08/03/2015	<1	<1	<1	8.5	<20	<2	NA	NA	NA
MW-76	11/03/2015	<1	<1	<1	6.4	<20	<2	NA	NA	NA
MW-77	02/10/2015	1.2	<1	<1	9.6	<20	1700	8.7	NA	NA
MW-77	05/07/2015	4.1	<1	<1	19	36	1400	NA	NA	NA
MW-77	08/04/2015	2.9	<1	<1	9.1	32	670	7.8	<20	<2
MW-77	11/11/2015	2.8	<1	<1	<6	44	3000	NA	NA	NA
MW-78	02/10/2015	<1	<1	<1	39	60	13	40	NA	NA
MW-78	02/10/2015-DUP	<1	<1	<1	39	68	15	40	NA	NA
MW-78	05/07/2015	<1	<1	<1	36	650	51	36	<20	<2
MW-78	05/07/2015-DUP	<1	<1	<1	36	330	36	38	<20	<2
MW-78	08/04/2015	<1	<1	<1	39	130	11	41	<20	<2

Table 3.3 (cont.): Water-Quality Data from Infiltration Gallery and Pond Monitoring - 2015

Well ID	Sample Date	TCE µg/L	1,1-DCE µg/L	1,1,1-TCA µg/L	Cr (total) µg/LL	Fe (total) µg/L	Mn (total) µg/L	Cr (diss) µg/L	Fe (diss) µg/L	Mn (diss) µg/L
MW-78	08/04/2015-DUP	<1	<1	<1	42	100	8.8	40	<20	<2
MW-78	11/05/2015	<1	<1	<1	35	100	7.8	36	<20	<2

(yellow) Concentration exceeds the more strigent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 µg/L for TCE and DCE, 60 µg/L for TCA and 50 µg/L for Total Chromium)

NA Not Analyzed

Table 3.4: Containment System Flow Rates - 2015

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	11,961,108	268	2,233,765	50	14,194,874	318
Feb	11,845,484	294	1,985,148	49	13,830,632	343
Mar	13,589,460	304	2,165,804	49	15,755,264	353
Apr	13,125,895	304	2,202,505	51	15,328,400	355
May	13,592,035	304	2,110,795	47	15,702,830	352
Jun	13,132,178	304	2,090,691	48	15,222,869	352
Jul	14,402,061	323	2,186,430	49	16,588,491	372
Aug	13,138,923	294	2,170,980	49	15,309,903	343
Sep	9,995,970.9	231	2,099,823	49	12,095,794	280
Oct	10,661,380	239	2,222,395	50	12,883,775	289
Nov	13,523,455	313	2,137,603	49	15,661,058	363
Dec	6,499,802.1	146	2,250,046	50	8,749,848.5	196
Annual Total or Average	**145,467,752**	**277**	**25,855,986**	**49**	**171,323,738**	**326**

Table 3.5: Influent and Effluent Quality for the Off-Site Containment Well System - 2015

Sampling Date	Concentration (μg/L)											
	Influent						Effluent					
	TCE	DCE	TCA	Cr Total	Fe Total	Mn Total	TCE	DCE	TCA	Cr Total	Fe Total	Mn Total
01/05/2015	280	38	<1	7.4	240	<2	<1	<1	<1	7	<20	<2
02/02/2015	330	35	<1	7	34	<2	<1	<1	<1	6.6	<20	<2
03/02/2015	310	39	<1	7.8	36	<2	<1	<1	<1	7.2	<20	<2
04/01/2015	260	37	<1	8.1	<20	<2	<1	<1	<1	8.2	<20	<2
05/04/2015	320	40	<1	8.6	<20	<2	<1	<1	<1	6.3	<20	<2
06/01/2015	290	36	<1	8.5	24	<2	<1	<1	<1	7	<20	<2
07/01/2015	300	40	<1	6.9	220	<2	1	<1	<1	6.4	<20	<2
08/03/2015	290	34	<1	7.2	56	<2	1.2	<1	<1	7.7	<20	<2
08/31/2015	280	39	<1	8.8	NA	NA	<1	<1	<1	9.5	<20	<2
09/28/2015	300	33	<1	11	1000	<2	<1	<1	<1	8.4	<20	<2
11/02/2015	330	38	<1	7.6	430	<2	<1	<1	<1	6.2	<20	<2
11/30/2015	280	32	<1	6.6	97	<2	<1	<1	<1	<6	<20	<2
12/30/2015	280	38	<1	6.6	1300	<2	1.2	<1	<1	7.7	<20	<2

[yellow] Concentration exceeds the more strigent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 μg/L for TCE and DCE, 60 μg/L for TCA and 50 μg/L for Total Chromium)

NA Not Analyzed

Table 3.6: Influent and Effluent Quality for the Source Containment Well System - 2015

Sampling Date	Concentration (μg/L)											
	Influent						Effluent					
	TCE	DCE	TCA	Cr Total	Fe Total	Mn Total	TCE	DCE	TCA	Cr Total	Fe Total	Mn Total
01/05/2015	14	1.3	<1	110	<20	120	<1	<1	<1	46	<20	110
02/02/2015	15	1.5	NA	110	24	190	<1	<1	<1	41	<20	9.4
03/02/2015	16	1.4	<1	110	<20	23	<1	<1	<1	42	<20	110
04/01/2015	15	1.5	<1	110	<20	17	<1	<1	<1	43	<20	21
05/04/2015	15	1.6	<1	100	<20	12	<1	<1	<1	40	<20	46
06/01/2015	15	1.3	<1	110	<20	38	<1	<1	<1	34	34	14
07/01/2015	16	1.7	<1	97	<20	40	<1	<1	<1	37	730	14
08/03/2015	17	1.3	<1	95	120	430	<1	<1	<1	32	<20	30
08/31/2015	14	1.2	<1	95	<20	39	<1	<1	<1	38	<20	14
09/28/2015	15	1.5	<1	91	<20	69	<1	<1	<1	32	<20	10
11/02/2015	17	1.6	<1	95	65	280	<1	<1	<1	41	<20	25
11/30/2015	15	1.5	<1	91	34	70	<1	<1	<1	38	<20	32
12/30/2015	18	1.7	<1	92	<20	40	<1	<1	<1	41	<20	19

(Yellow) Concentration exceeds the more strigent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 μg/L for TCE and DCE, 60 μg/L for TCA and 50 μg/L for Total Chromium)

Table 3.7: Chromium Concentration, Flow Rate, and Other Data from Treatment Plant since Installation of Chromium Removal Unit

Date	Time	Chromium Concentration (μg/L)				Pumping Rate (gpm)		Comments
		Influent	Mid-Tank	Effluent from 2nd Tank	Effluent from Stripper	CW-2	Diverted Flow	
01/05/2015	11:36	110	NS	NS	46	53.2	35.3	
01/05/2015	11:36	110	9.5	<6	45	53.2	35.3	
01/12/2015	11:36	120	25	<6	50	51.9	35.2	
01/19/2015	09:47	120	56	<6	43	51.2	35.3	Tank Exchange No. 10
01/26/2015	09:36	120	<6	<6	42	52	35	
02/02/2015	09:00	110	NS	NS	41	51.2	35.4	
02/02/2015	09:00	110	12	<6	41	51.2	35.4	
02/02/2015	09:40	110	NS	NS	41			
02/02/2015	09:40	110	12	<6	41			
02/09/2015	08:45	120	42	<6	42	51.1	35.4	Tank Exchange No. 11
02/16/2015	08:49	120	<6	<6	39	48.8	35.5	
02/23/2015	09:21	110	15	<6	42	50	24.7	
03/02/2015	08:32	110	NS	NS	42	50.5	35.5	Tank Exchange No. 12
03/02/2015	08:32	110	58	<6	41	50.5	35.5	Tank Exchange No. 12
03/09/2015	08:56	110	<6	<6	42	46.39	35.43	
03/16/2015	08:48	110	10	<6	45	52.51	35.31	
03/23/2015	09:30	110	<6	<6	42	52.8	35.54	Tank Exchange No. 13
03/30/2015	08:34	100	<6	<6	37	56.9	35.6	
04/01/2015	08:45	110	NS	NS	43			
04/06/2015	08:52	99	<6	<6	37	50.93	35.31	
04/13/2015	08:06	100	22	<6	37	50.29	35.06	Tank Exchange No. 14
04/20/2015	09:25	99	<6	<6	35	51.11	36.62	
04/27/2015	09:19	95	<6	<6	36	51.8	35.43	
05/04/2015	09:05	100	NS	NS	40	51.85	35.36	Tank Exchange No. 15
05/04/2015	09:05	100	<6	7.5	42	51.85	35.36	Tank Exchange No. 15
05/04/2015	12:50	100	NS	NS	40			
05/04/2015	12:50	100	<6	7.5	42			
05/11/2015	08:43	94	NS	36	<6	51.9	35.3	
05/18/2015	10:36	100	NS	<6	34	50	35.4	
05/26/2015	08:41	92	NS	32	<6	49.2	35.06	Tank Exchange No. 16
06/01/2015	09:11	110	NS	<6	NS			
06/01/2015	09:11	NS	NS	NS	34			
06/08/2015	09:11	NS	NS	NS	35	48.65	35.19	
06/08/2015	09:11	110	NS	<6	NS	48.65	35.19	
06/15/2015	08:29	100	NS	<6	34	48.92	36.85	Tank Exchange No. 17
06/22/2015	08:20	98	NS	<6	38	50.21	36.02	
06/29/2015	08:20	96	NS	<6	37	50.41	36.26	
07/01/2015	09:00	97	NS	NS	37			
07/06/2015	08:00	NS	NS	NS	NS	50.81	36.38	Tank Exchange No. 18
07/13/2015	07:30	97	NS	<6	35	49.88	36.96	
07/20/2015	07:20	100	NS	<6	35	51.14	37.32	
07/27/2015	08:00	99	NS	<6	36	50.05	37.45	Tank Exchange No. 19
08/03/2015	09:55	95	NS	<6	32			
08/10/2015	09:00	95	NS	<6	34	49.18	35.9	
08/17/2015	08:10	96	NS	<6	36	49.9	36.38	Tank Exchange No. 20
08/24/2015	09:15	99	NS	<6	35			

Table 3.7 (cont.): Chromium Concentration, Flow Rate, and Other Data from Treatment Plant since Installation of Chromium Removal Unit

Date	Time	Chromium Concentration (μg/L)				Pumping Rate (gpm)		Comments
		Influent	Mid-Tank	Effluent from 2nd Tank	Effluent from Stripper	CW-2	Diverted Flow	
08/31/2015	09:45	95	NS	<6	38			
09/08/2015	08:20	90	NS	<6	35	49.84	35.31	Tank Exchange No. 21
09/15/2015	08:30	98	NS	<6	35	49.61	37.69	
09/28/2015	08:00	91	NS	<6	32	49.2	37.45	Tank Exchange No. 22
10/19/2015	08:50	97	NS	<6	45	50.93	37.95	Tank Exchange No. 23
11/02/2015	10:00	95	NS	<6	41			
11/09/2015	08:30	90	NS	<6	39	49.57	34.12	Tank Exchange No. 24
11/30/2015	10:00	91	NS	<6	38	50.55	37.93	Tank Exchange No. 25
12/21/2015	08:30	90	NS	<6	42	51.92	35.67	Tank Exchange No. 26

(pink) Monthly Sampling Event
(yellow) Concentration exceeds the more strigent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 μg/L for TCE and DCE, 60 μg/L for TCA and 50 μg/L for Total Chromium)
NS Not Sampled

Table 4.1: Concentration Changes in Monitoring Wells - 1998 to 2015

Well ID	Change in Concentration (μg/L)		
	TCE	DCE	Cr
CW-1	190	35.1	-15.4[c]
CW-2[a]	-983	-188.4	89.8[c]
MW-07	-53	-15	-3
MW-12	-368	-26	-9
MW-14R[b]	-430	-24	340
MW-16	-1193.6	-30	239
MW-17	-66.7	-3.5	-710
MW-19	54.8	2.2	0[c]
MW-20	0	0	0[c]
MW-21	-7.5	0	39
MW-22	-13	-2	33[c]
MW-23	-6195.7	-400	132
MW-25	-5594.8	-73	-260
MW-26	-6476	-588.5	107
MW-29	0	0	0[c]
MW-30	-5.4	0	28[c]
MW-31	0	0	556[c]
MW-32	-548.1	-96	30[c]
MW-34	0	0	0[c]
MW-37R[b]	-922	-45.4	34
MW-38	0	0	12[c]
MW-39	0	0	-170[c]
MW-40	0	0	-4.6[c]
MW-41	-170	-26	41[c]
MW-42	-363.7	-46.8	39[c]
MW-43	-25	-5.1	0[c]
MW-44	-1.3	0	0[c]
MW-45	-40	-1.7	-21[c]
MW-46	-1880	-93	54[c]
MW-47R[b]	-34	-1.2	-40[c]
MW-49	0	0	0[c]
MW-51	0	0	38[c]
MW-52R[b]	16	36	0[c]
MW-53D[b]	-82	-3.4	-54[c]
MW-55	-378	-10	-173[c]
MW-56	-62	-2.6	-49[c]
MW-57D[b]	0	0	-16.9[c]
MW-59	0	0	36[c]
MW-60	-7340	-327	130[c]
MW-62	0.2	-3.4	88[c]
MW-64	0	0	7.4[c]
MW-65	-13	2.4	0[c]
MW-66	0	0	0[c]
MW-67	0	0	-40[c]
MW-68	0	0	0[c]
MW-69	0	0	0[c]
MW-70	0	0	0[c]
MW-71R[b]	-16	0	0[c]
MW-72[a]	-820	-70	10[c]
MW-73[a]	-3988	-520	80[c]
MW-74	0	0	-14.7[c]
MW-75	0	0	6.2[c]
MW-76	0	0	6.4[c]
MW-77[a]	-13.2	-1.2	0[c]
MW-78[a]	-6	0	36
MW-79[a]	0	0	0[c]
MW-80[a]	0	0	11[c]

a Change in concentration from first available sample
b Change in concentration from original well
c Change in concentration based on Total Chromium
0 "0" indicates concentration below detection limits during both sampling events
(yellow) Well used in both the initial and the current plume definition
(pink) Well used either in the initial and the current plume definition

Table 4.2: Containment System Flow Rates

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)
1998[a]	1,694,830				1,694,830	
1999	114,928,700	219			114,928,700	219
2000	114,094,054	217			114,094,054	216
2001	113,654,183	216			113,654,183	216
2002	116,359,389	221	25,403,490	48	141,762,879	270
2003	118,030,036	225	27,292,970	52	145,323,006	276
2004	113,574,939	216	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	24,133,213	46	136,346,301	259
2007	117,098,422	223	23,983,802	46	141,082,224	268
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	265
2010	147,736,408	281	16,484,367	31	164,220,775	312
2011	149,171,757	284	26,989,781	51	176,161,538	335
2012	151,260,826	288	22,133,042	42	173,393,868	329
2013	147,736,408	281	16,484,367	31	164,220,775	312
2014	154,714,117	294	18,593,801	35	173,307,918	330
2015	145,467,752	277	25,855,986	49	171,323,738	326
Total or Average	**2,165,198,954**	**242**	**328,905,590**	**37**	**2,494,104,545**	**279**

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

Table 4.3: VOC Mass Removal - 2015

(a) Total

Year	Mass Removed	kg	lbs
2015	TCE	165.55	364.98
	DCE	20.45	45.08
	Total	**186.00**	**410.05**

(c) Off-Site Containment System

Month	Mass Removed				Total	
	TCE		DCE			
	kg	lbs	kg	lbs	kg	lbs
Jan	13.8	30.4	1.65	3.64	15.5	34.1
Feb	14.3	31.6	1.66	3.66	16.0	35.3
Mar	14.7	32.3	1.95	4.31	16.6	36.6
Apr	14.4	31.8	1.91	4.22	16.3	36.0
May	15.7	34.6	1.96	4.31	17.6	38.9
Jun	14.7	32.3	1.89	4.16	16.6	36.5
Jul	16.1	35.5	2.02	4.45	18.1	39.9
Aug	14.2	31.3	1.82	4.00	16.0	35.3
Sep	11.0	24.2	1.36	3.00	12.3	27.2
Oct	12.7	28.0	1.43	3.16	14.1	31.2
Nov	15.6	34.4	1.79	3.95	17.4	38.4
Dec	6.9	15.2	0.86	1.90	7.8	17.1
Total	**164.0**	**361.6**	**20.30**	**44.76**	**184.3**	**406.4**

(c) Source Containment System

Month	Mass Removed				Total	
	TCE		DCE			
	kg	lbs	kg	lbs	kg	lbs
Jan	0.123	0.270	0.012	0.026	0.134	0.296
Feb	0.116	0.257	0.011	0.024	0.127	0.281
Mar	0.127	0.280	0.012	0.026	0.139	0.306
Apr	0.125	0.276	0.013	0.028	0.138	0.304
May	0.120	0.264	0.012	0.026	0.131	0.290
Jun	0.123	0.270	0.012	0.026	0.135	0.297
Jul	0.137	0.301	0.012	0.027	0.149	0.328
Aug	0.127	0.281	0.010	0.023	0.138	0.303
Sep	0.115	0.254	0.011	0.024	0.126	0.278
Oct	0.135	0.297	0.013	0.029	0.148	0.325
Nov	0.129	0.285	0.013	0.028	0.142	0.313
Dec	0.141	0.310	0.014	0.030	0.154	0.340
Total	**1.518**	**3.346**	**0.144**	**0.317**	**1.661**	**3.662**

Table 4.4: Summary of VOC Mass Removal - 1998 to 2015

(a) Total

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
1998[a]	1.31	2.88	0.03	0.0661	0	0	1.34	2.95
1999	358	788	16.2	35.7	0	0	374	824
2000	463	1,020	23.3	51.4	0	0	486	1,070
2001	519	1,140	26.6	58.7	0	0	546	1,200
2002	603	1,330	40.6	89.5	3.66	8.08	647	1,430
2003	617	1,360	38.2	84.1	3.05	6.73	658	1,450
2004	595	1,310	35.2	77.7	2.43	5.37	633	1,400
2005	558	1,230	34.6	76.4	2.01	4.43	594	1,310
2006	512	1,130	34.3	75.7	1.67	3.68	548	1,210
2007	468	1,030	32.9	72.6	1.04	2.29	502	1,110
2008	434	956	32.5	71.7	1.08	2.39	467	1,030
2009	378	833	31.9	70.4	1.23	2.71	411	906
2010	309	682	29.2	64.3	0.967	2.13	339	748
2011	351	774	34.8	76.7	1.16	2.56	387	854
2012	285	629	31.8	70.2	0.975	2.15	318	701
2013	233	513	27	59.6	0.736	1.62	260	574
2014	210	464	25.4	56.1	0.341	0.752	236	520
2015	166	365	20.4	45.1	NC	NC	186	410
Total	**7,060**	**15,600**	**515**	**1,140**	**20.4**	**44.9**	**7,590**	**16,700**

(b) Off-Site Containment System

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
1998[a]	1.31	2.88	0.03	0.0661	0	0	1.34	2.95
1999	358	788	16.2	35.7	0	0	374	824
2000	463	1,020	23.3	51.4	0	0	486	1,070
2001	519	1,140	26.6	58.7	0	0	546	1,200
2002	543	1,200	30.9	68.2	2.05	4.52	576	1,270
2003	568	1,250	31.6	69.7	2.06	4.55	602	1,330
2004	567	1,250	31.7	69.8	1.97	4.34	600	1,320
2005	540	1,190	32.4	71.3	1.79	3.95	574	1,270
2006	499	1,100	32.6	71.8	1.58	3.47	533	1,170
2007	456	1,010	31.5	69.4	1.04	2.29	489	1,080
2008	425	937	31.5	69.4	1.08	2.39	458	1,010
2009	372	820	31.2	68.7	1.23	2.71	404	892
2010	305	673	28.6	63.1	0.967	2.13	335	738
2011	348	766	34.4	75.8	1.16	2.56	383	845
2012	283	623	31.6	69.6	0.975	2.15	315	695
2013	231	509	26.8	59.2	0.736	1.62	259	570
2014	209	460	25.3	55.8	0.341	0.752	234	517
2015	164	362	20.3	44.8	NC	NC	185	407
Total	**6,850**	**15,100**	**486**	**1,070**	**17.3**	**38**	**7,350**	**16,200**

(c) Source Containment System

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	3.56	70.9	156
2003	48.7	107	6.53	14.4	0.989	2.18	56.2	124
2004	28.9	63.7	3.56	7.85	0.464	1.02	32.9	72.5
2005	18.1	39.9	2.28	5.03	0.218	0.481	20.6	45.4
2006	13.8	30.5	1.74	3.84	0.0933	0.206	15.7	34.6
2007	11.6	25.6	1.45	3.19	0.00368	0.00812	13	28.8
2008	8.42	18.6	1.04	2.29	NC	NC	9.46	20.9
2009	5.91	13	0.763	1.68	NC	NC	6.68	14.7
2010	4.3	9.48	0.573	1.26	NC	NC	4.87	10.7
2011	3.52	7.75	0.413	0.911	NC	NC	3.93	8.66
2012	2.53	5.58	0.289	0.638	NC	NC	2.82	6.22
2013	1.54	3.4	0.17	0.375	NC	NC	1.71	3.77
2014	1.44	3.17	0.13	0.287	NC	NC	1.57	3.46
2015	1.52	3.35	0.144	0.317	NC	NC	1.66	3.66
Total	**210**	**463**	**28.7**	**63.4**	**3.38**	**7.46**	**242**	**534**

a Volume pumped during the testing of the well in early December, and during the first day of operation on December 31, 1998
NC Not Calculated

Table 4.5: Chromium Mass Removal - 2015

Source Containment System

Month	Mass Removed	
	kg	lbs
Jan	0.562	1.240
Feb	0.515	1.135
Mar	0.553	1.220
Apr	0.529	1.167
May	0.543	1.198
Jun	0.538	1.186
Jul	0.509	1.122
Aug	0.493	1.087
Sep	0.461	1.016
Oct	0.475	1.048
Nov	0.433	0.954
Dec	0.443	0.976
Total	**6.056**	**13.350**

Table 4.6: Summary of Chromium Mass Removal - 1998 to 2015

(a) Total

Year	Mass Removed	
	kg	lbs
2000	0.028	0.062
2001	1.829	4.032
-	-	-
-	-	-
2014	3.647	8.041
2015	6.056	13.350
Total	**11.560**	**25.486**

(b) Off-Site Containment System

Year	Mass Removed	
	kg	lbs
2000	0.028	0.062
2001	1.829	4.032
Total	**1.857**	**4.094**

(c) Source Containment System

Year	Mass Removed	
	kg	lbs
2014	3.647	8.041
2015	6.056	13.350
Total	**9.703**	**21.392**

APPENDIX

Appendix

Copy of Letter to NMED on the Investigation of Chromium Exceedances in CW-2 Effluent and in Monitoring Well MW-17

Σ²Π

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

July 21, 2015

Mr. Steven Huddleson
Ground Water Quality Bureau
New Mexico Environment Department
P.O. Box 5469
Santa Fe, NM 87502

Subject: **Sparton Technology, Inc. Discharge Permit - DP-1184**
Investigation of Chromium Exceedances in CW-2 Effluent and in Monitoring Well MW-17

Dear Mr. Huddleson:

As we indicated in the 2014 Annual Monitoring Report[1] for Discharge Permit DP-1184, the chromium removal unit for the source containment system treatment plant began operating at on April 23, 2014. After the calibration of the chromium removal unit, which ended in late August 2014, chromium concentrations above the 0.050 mg/L New Mexico Water Quality Control Commission (NMWQCC) standard for groundwater were detected in the source containment system effluent on two occasions, on November 3 and November 17, 2014 (see Figure 1); also a chromium concentration of 0.050 mg/L was detected in the effluent from the system on January 12, 2015. These occasional exceedances were attributed to the possible accumulation of sediments containing chromium in the air stripper from the portion of the influent that is by-passing the chromium removal unit, which are introduced into the effluent from the air stripper; this occurs only occasionally because pumping of the effluent from the air stripper sump is cyclic rather than continuous.

A visual inspection of the air-stripper trays conducted in February 2015 to investigate this possibility indicated that sediment was accumulating in the air stripper. A sample obtained from the lowest tray of the air stripper during this inspection contained 0.27 mg/L of total chromium confirming that that this was indeed the cause of occasional exceedances. Instead of conducting further investigations aimed at determining the frequency at which the trays must be cleaned to avoid exceedances, Sparton approved the installation of a bag filter on the line that discharges the effluent from the air stripper into the ponds. This bag filter was installed in early April 2015 (see Figure 2 for a schematic of flow diagram through the treatment plant). The results of weekly pre- and post-filter samples (points G and H in Figure 2) that were collected for several weeks after the installation of the filter are summarized on Table 1. These results do not show any significant differences in chromium concentrations before or after filtering indicating that sediment content was not a factor during these sampling events. The installation of this filter, however, will assure that sediment-related exceedances in the effluent to the ponds do not occur in the future.

As we also indicated in the 2014 Annual Monitoring Report for DP-1184, chromium concentrations above the NMWQCC standard of 0.050 mg/L were also detected in pond monitoring well MW-17 since 2013 and pond monitoring well MW-78 during 2014. Well MW-78 was put on a monthly sampling

[1] Letter report dated January 10, 2015 to Mr. Steven Huddleson of NMED from Stavros S. Papadopulos of SSP&A on the subject: 2014 Annual Monitoring Report for Discharge Permit DP-1184.

schedule for chromium on July 2014; however, chromium concentrations in the well declined below the NMWQCC standard by September 2014 and monthly sampling of the well was discontinued in December 2014. Well MW-17 was put on a monthly sampling schedule for chromium in October 2013; however, the cessation of treated water discharge into the ponds after the shutdown of the source containment system on November 15, 2013 caused onsite water levels to decline. As a result, well MW-17 did not have sufficient water for sampling between December 2013 and May 2014. The water levels began rising a little after the resumption of system operations on April 23, 2014, and the first monthly sample obtained from the well after the start-up was that of June 2014. The well has been sampled monthly and the samples analyzed for both total and dissolved chromium since that time. The chromium data from these monthly sampling events are summarized on Table 2 and illustrated in Figure 3. As shown on this table and this figure, data collected between June 2014 and January 2015 indicated that during this period total chromium concentrations were above the NMWQCC standard of 0.050 mg/L, except for one occasion (October 6, 2014), and as high as 0.240 mg/L in November 2014. Note, however, that throughout this period, dissolved chromium concentrations in the samples from the well were always below the NMWQCC standard. This suggested the potential presence of sediments containing chromium in the well.

To investigate this possibility, a different approach was used for the February 2015 sampling of the well. Samples were collected under three different conditions using double check-valve bailers lowered to the mid-point of the saturated screen interval: (a) a relatively "undisturbed" sample was collected prior to purging the well; (b) a second sample was collected after purging the well, and (c) a third sample was collected a day after the purging of the well. The results of this sampling event, which are identified as Pre-Purge, Post-Purge, and Day After on Table 2 and included in Figure 3, indicated that the lowest total chromium concentration (0.045 mg/L) was in the "Pre-Purge" sample; the "Post-Purge" sample had the highest total chromium concentration (0.067 mg/L), and the "Day After" sample had a concentration of 0.050 mg/L. These results confirmed that the total chromium exceedances observed in this well were due to chromium-containing sediments accumulated in the well. It is also clear from these results that purging of the well agitates these sediments causing higher total chromium concentrations in samples collected after purging.

To determine whether well development would reduce or eliminate these effects of well sediment on total chromium concentrations, the well was developed in early March using a bailer to remove as much of the sediment as possible from the bottom of the well. The March monthly sampling of the well was conducted one week later using the same approach as that used for the February sampling event, and again analyzing the samples for both total and dissolved chromium. The results of this sampling event are also included on Table 2 and Figure 3. As in the February samples, the lowest total chromium concentration (0.047 mg/L) was in the "Pre-Purge" sample; again the "Post-Purge" sample had the highest total chromium concentration (0.062 mg/L), and the "Day After" sample had a concentration of 0.046 mg/L. These results indicate that while well redevelopment somewhat reduced the difference between the total and dissolved chromium concentrations, this difference was not significant.

The April sample from the well, collected after purging, had a total chromium concentration of 0.052 mg/L. Another experiment was conducted in May to evaluate how concentrations change with time after purging; samples were collected after purging the well, and then daily for the next three days without further purging (samples identified as Post-Purge, Day After, 2nd Day After, and 3rd Day After on Table 2). The "Post Purge" sample had a total chromium concentration of 0.043 mg/L, and the samples collected during the next three days had concentrations of 0.036, 0.036, and 0.033 mg/L, respectively.

Throughout these multi-sample events, dissolved chromium concentrations in all samples, regardless of when collected, were below the NMWQCC standard and remained fairly constant, about 0.040 mg/L during the February and March sampling events and about 0.035 mg/L during the May sampling event.

The results of these multi-sampling events indicate that total chromium concentrations in samples collected from MW-17, and possibly from other on-site wells, using the conventional approach of purging the well and collecting a sample immediately after purging, are affected by sediment containing chromium in the well and are not representative of chromium concentrations in the groundwater that is migrating through the site and to the off-site areas. It is possible that a more rigorous development of the well by licensed driller may further reduce the sediment accumulated in the well and hence the difference between the total and dissolved chromium concentrations, but the results from the May and the June 2015 (see Table 2) sampling events indicate that this may no longer be relevant. The total chromium concentration in both the Post-Purge May sample and in the June sample, which was collected by the conventional approach, was 0.043 mg/L. Based on two consecutive monthly sampling results, monthly sampling of MW-17 was discontinued effective July 2015.

Should you have any questions concerning the above, please do not hesitate to contact one of the undersigned.

Sincerely,

S.S. PAPADOPULOS & ASSOCIATES, INC.

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

Alex Spiliotopoulos, PhD
Senior Hydrogeologist

cc: Mr. Ernesto Martinez, Corporate EHS Manager and Secretary of Sparton Corporation
Mr. James B. Harris, Thompson & Knight LLP
Mr. Tony Hurst, Hurst Engineering Services
Mr. Charles Easterling, OCCAM|EC

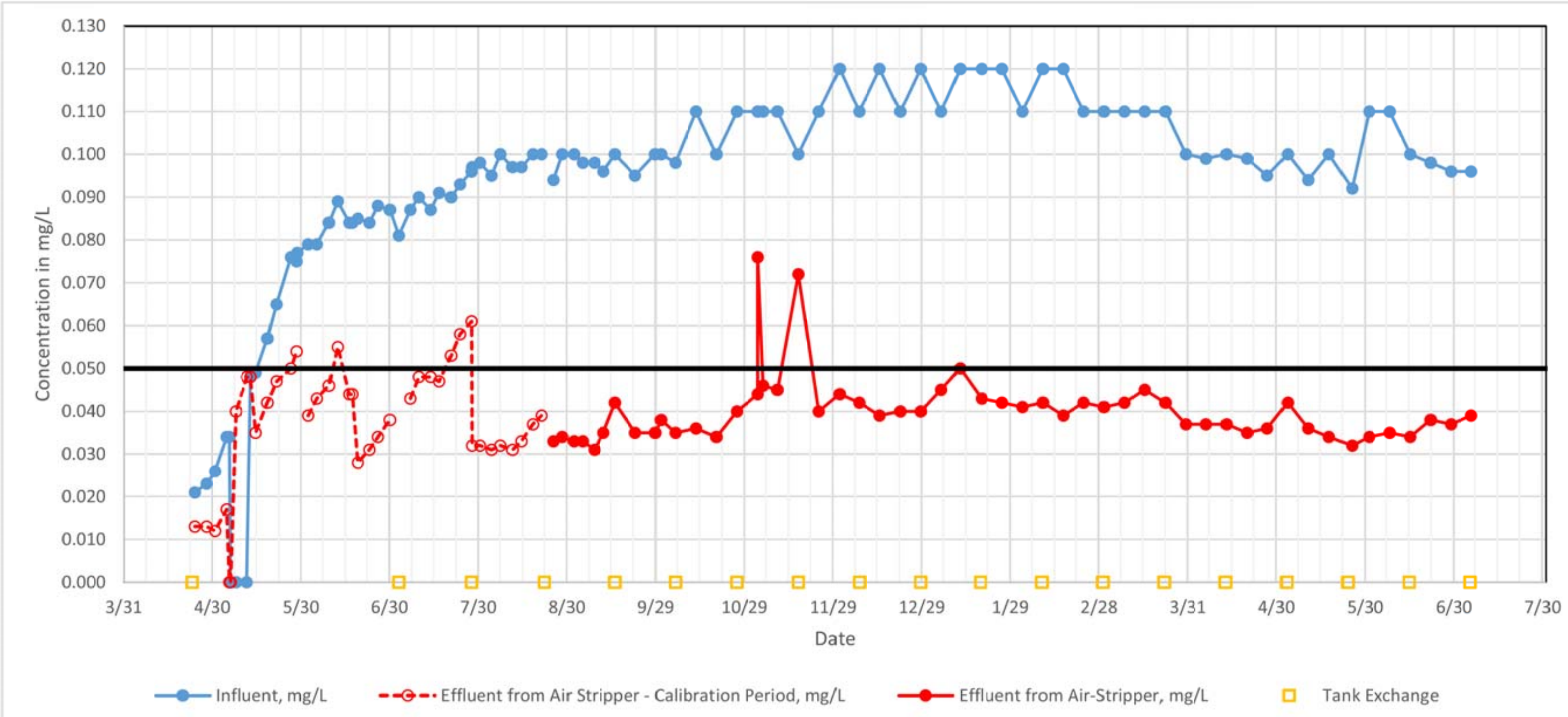


Figure 1: Total Chromium Concentrations in the Influent to and Effluent from the Source Containment System

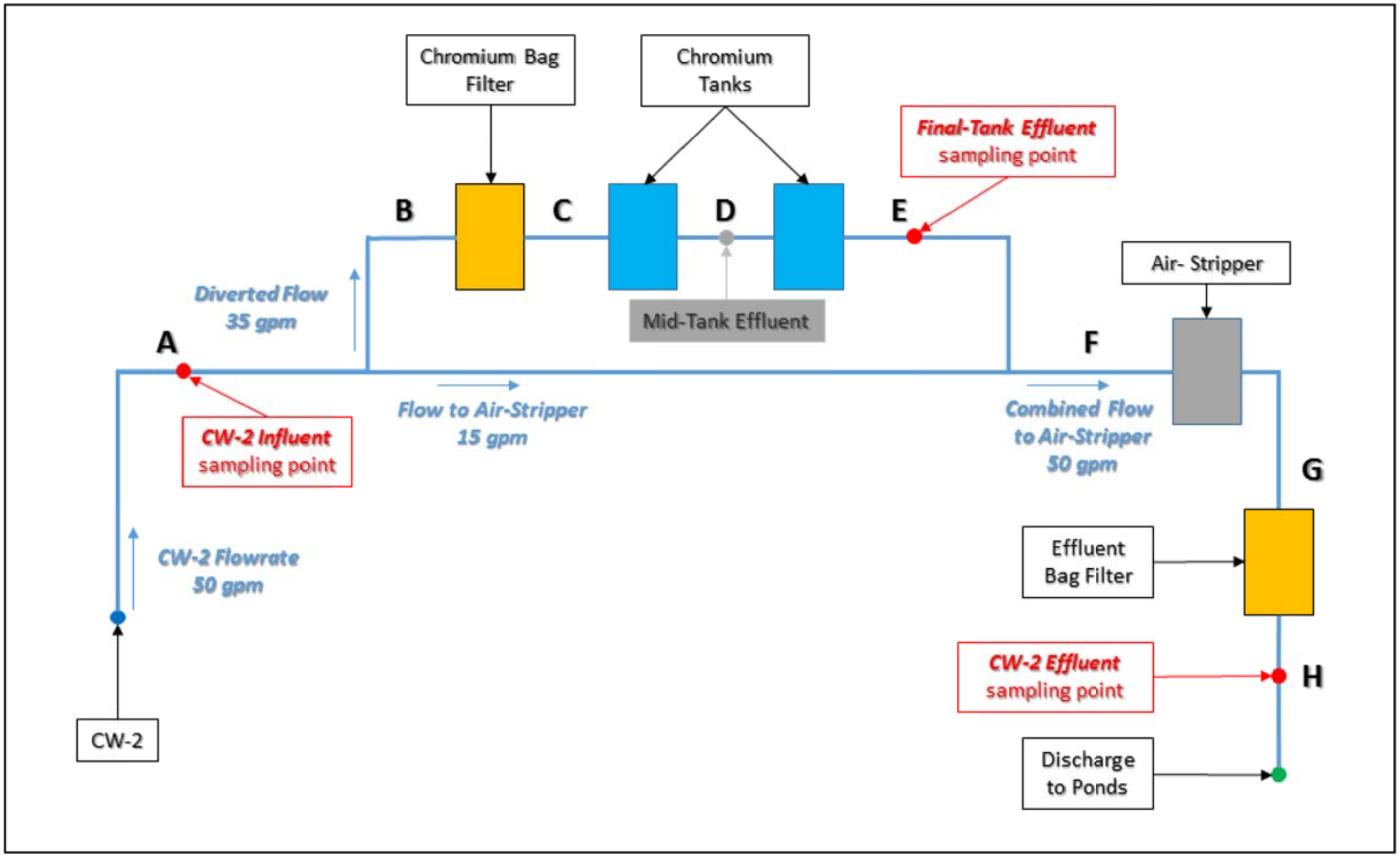


Figure 2: Schematic Flow Diagram through the Source Containment System Treatment Plant

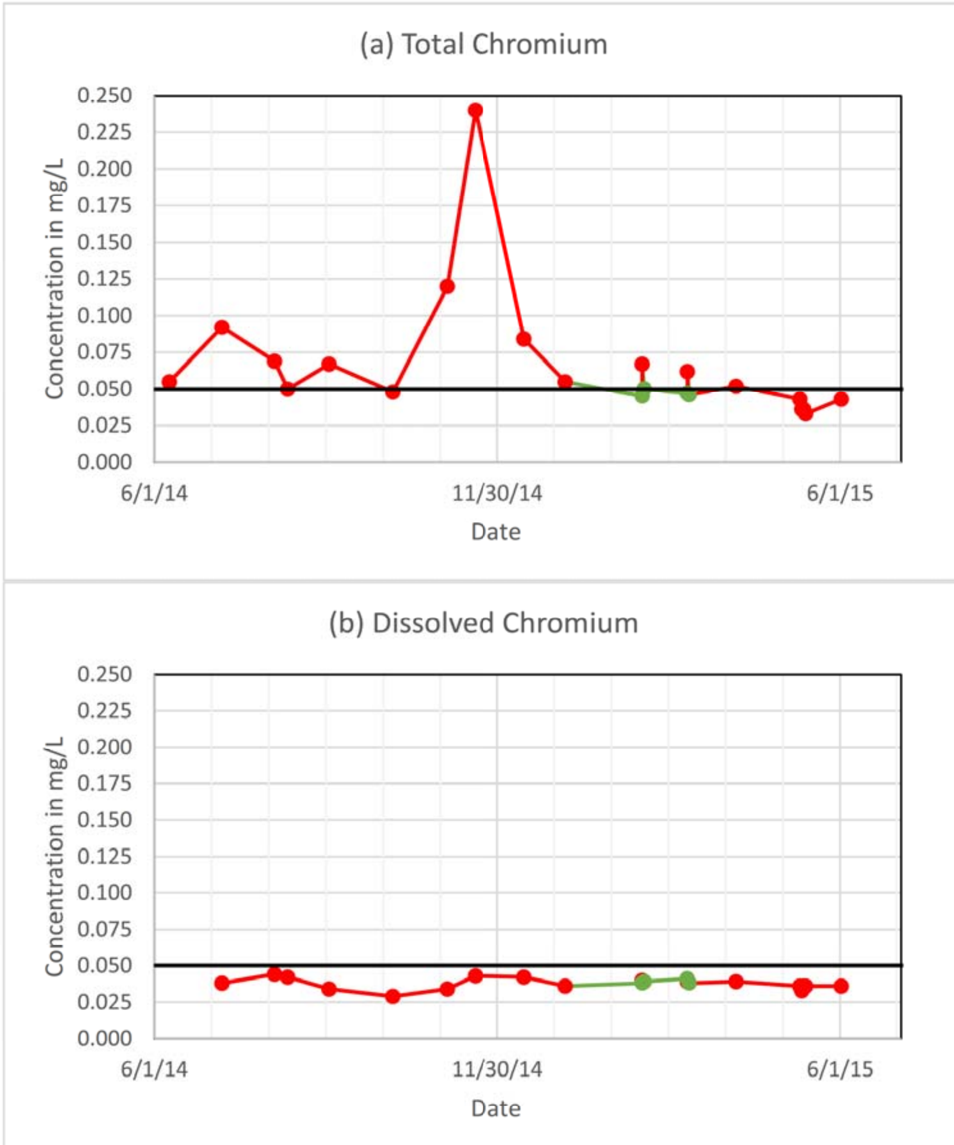


Figure 3: Total and Dissolved Chromium Concentrations in Pond Monitoring Well MW-17 – June 2014 to June 2015

Table 1: Chromium Concentrations in Weekly Pre- and Post-Filter Effluent Samples for the Source Containment System

Date	Concentrations, in mg/L	
	Pre-Filter	Post-Filter
04/20/15	0.032	0.035
04/27/15	0.035	0.036
05/04/15	0.037	0.042
05/11/15	0.037	0.036
05/18/15	0.032	0.034
05/26/15	0.034	0.032

Table 2: Total and Dissolved Chromium Concentrations in Pond Monitoring Well MW-17 during Monthly Sampling Events – June 2014 to June 2015

Date	Chromium Concentrations, in mg/L		Sampling Time
	Total	Dissolved	
06/09/14	0.055		Post-Purge
07/07/14	0.092	0.038	Post-Purge
08/04/14	0.069	0.044	Post-Purge
08/11/14	0.050	0.042	Post-Purge
09/02/14	0.067	0.034	Post-Purge
10/06/14	0.048	0.029	Post-Purge
11/04/14	0.120	0.034	Post-Purge
11/19/14	0.240	0.043	Post-Purge
12/15/14	0.084	0.042	Post-Purge
01/06/15	0.055	0.036	Post-Purge
02/16/15	0.045	0.038	Pre-Purge
02/16/15	0.067	0.040	Post-Purge
02/17/15	0.050	0.039	Day After
03/12/15	0.047	0.041	Pre-Purge
03/12/15	0.062	0.039	Post-Purge
03/13/15	0.046	0.038	Day After
04/07/15	0.052	0.039	Post-Purge
05/11/15	0.043	0.036	Post-Purge
05/12/15	0.036	0.033	Day After
05/13/15	0.036	0.036	2nd Day After
05/14/15	0.033	0.036	3rd Day After
06/02/15	0.043	0.036	Post-Purge