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Final
2011 Annual Groundwater Monitoring Report

Former Unocal Chemical Distribution Facility
2100 East 37th Street North
Wichita, Kansas 67219

Prepared for
Chevron Environmental Management Company (EMC)
6101 Bollinger Canyon Road
BR1X-Room 5384
San Ramon, California 94583

February 24, 2012

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MAR 27 2012

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Project Number: 41010111

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Acronyms and Abbreviations

%	percent
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
BTOC	below top of casing
ºC	degrees Celsius
Cl	chloride
CO_2	carbon dioxide
COC	constituent of concern
cVOC	chlorinated volatile organic compound
DCA	dichloroethane
DCE	dichloroethene
Dhb	*Dehalobacter* sp.
Dhc	*Dehalococcoides* sp.
DO	dissolved oxygen
DTW	depth to water
DVR	data validation report
EMC	Environmental Management Company
EPA	U.S. Environmental Protection Agency
ft	foot or feet
GW	groundwater
H_3PO_4	phosphoric acid
HCl	hydrochloric acid
HRC®	Hydrogen Release Compound
HRC-X®	Hydrogen Release Compound (eXtended Formula)
ID	identification
IDW	investigation-derived waste
IM	interim measure
KDHE	Kansas Department of Health and Environment
LCS	laboratory control sample
µg/L	micrograms per liter
mL	milliliter
MDL	method detection limit
MEE	methane, ethane, ethene
mg/L	milligrams per liter
MIP	membrane interface probe
M&M	Monitoring and Maintenance
MNA	monitored natural attenuation
MS	matrix spike
MSD	matrix spike duplicate
MSL	above mean sea level
MTBE	methyl tert-butyl ether
mV	millivolt
MW	monitoring well
NA	new trend or not available

Acronyms and Abbreviations (Continued)

NAPL	non-aqueous phase liquid
NELAC	National Environmental Laboratory Accreditation Conference
NI	not installed
NO_3	nitrate
NOAA	National Oceanic and Atmospheric Administration
ORP	oxidation-reduction potential
P or PZ	piezometer
PCE	tetrachloroethene
PMW	Pinsker monitoring well
QA	quality assurance
QC	quality control
R	former recovery well
RSK	Risk-Based Standards for Kansas
SAP	Sampling and Analysis Plan
SM	Standard Method
SO_4	sulfate
TCA	trichloroethane
TCE	trichloroethene
TOC	top of casing or total organic carbon
TW	test well
Unocal	Unocal Chemical Distribution Facility
URS	URS Corporation
USD	Unified School District
VFA	volatile fatty acid
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 Introduction

On behalf of Chevron Environmental Management Company (EMC), URS Corporation (URS) conducted the 2011 Annual Groundwater (GW) Monitoring Event from June 20 to 27, 2011 at the former Unocal Chemical Distribution Facility (Unocal), located at 2100 East 37th Street North in Wichita, Kansas.

The property is located in the southeast corner of the southwest quarter of Section 27, Township 26 South, Range 1 East. Operations at the former facility included receiving bulk shipments of liquid chemicals (primarily industrial solvents); temporarily storing these chemicals in above ground storage tanks; and filling orders for both drummed and bulk shipments. All facility structures, including an above ground chemical storage tank farm and the warehouse building, have been removed. A 7-foot (ft) tall chain-link fence with a locked gate secures the Unocal property. The groundwater treatment building and all monitoring and former recovery wells are also secured with locks.

The 2011 Annual GW Monitoring Event (hereafter referred to as the June 2011 Event) consisted of measuring groundwater levels and collecting groundwater samples from monitoring wells and former recovery wells. Results from this monitoring event were used for the following purposes:

1) To determine the lateral extent of the volatile organic compounds (VOCs) in groundwater;

2) To evaluate the reduction of primary VOCs in the on-site portion of Plumelet A. Monitoring in this area consists of the quarterly interim measure (IM) monitoring program that was described in the Chevron EMC letter to the Kansas Department of Health and Environment (KDHE) dated February 11, 2010 (URS, February 2010);

3) To evaluate the current status of the off-site portions of Plumelets A and B on the Coleman Facility (formerly referred to as the Enhanced Reductive Dechlorination Pilot Test);

4) To evaluate the current status of the on-site portions of Plumelets B and C related to the phytoremediation IM; and

5) To evaluate the reduction of primary VOCs for Plumelets D, E, and F. Monitoring in this area consists of the quarterly monitoring program for monitored natural attenuation (MNA) that was described in the ***Final Revision 1 Feasibility Study Report*** (URS, June 2009) and discussed in subsequent correspondence with the KDHE.

This report presents the results of the June 2011 Event and includes additional information that KDHE requested in a letter dated April 3, 2007 (KDHE, April 2007).

1.1 Report Organization

The organization of the June 2011 Event report is as follows:

Section 2.0 – Describes details regarding the water level measurements, sample collection and analysis, and quality assurance (QA)/quality control (QC) procedures that were followed for the June 2011 Event. Section 2.0 includes a summary of groundwater monitoring activities (Table 1) and a tabulation of water level measurements that were used to develop the groundwater potentiometric surface maps for the June 2011 Event (Table 2).

Section 3.0 – Includes a brief discussion of historical data trends. Table 3 provides the VOC concentrations in groundwater through June 2011. A summary of the Mann-Kendall Tests are provided in Table 4.

Section 4.0 – Includes a discussion of the on-site Plumelet A monitoring results pertaining to the Injection IM. Results from the fifth monitoring round in March 2011 (hereafter referred to as the March 2011 Event) are also included in this report and are discussed in Section 4.0. The VOC results that exceed the KDHE Tier 2 Risk-Based Standards for Kansas (RSK) residential levels at the on-site Plumelet A monitoring wells are included in Table 5. Other results associated with the on-site Plumelet A monitoring, such as volatile fatty acids (VFAs), dissolved gases, dissolved oxygen (DO), and oxidation-reduction potential (ORP) are included in Table 6.

Section 5.0 – Includes a discussion of the results associated with the off-site Plumelets A and B. The VOC results that exceed the KDHE Tier 2 RSK residential levels for the off-site Plumelets A and B monitoring wells in June 2011 are included in Table 7. Other results associated with the off-site Plumelets A and B monitoring, such as carbon dioxide (CO_2), DO, and ORP are included in Table 8.

Section 6.0 – Includes a discussion of the results associated with the on-site Plumelets B and C. Table 9 provides a phytoremedial growth summary for hybrid willow (*Salix alba*). The plantation was planted in April 2010. The VOC results that exceed the KDHE Tier 2 RSK

residential levels at the on-site Plumelets B and C monitoring wells in June 2011 are included in Table 10.

Section 7.0 – Includes a discussion of the results associated with the quarterly MNA monitoring of Plumelets D, E, and F. The VOC results exceeding the KDHE Tier 2 RSK residential levels at the MNA wells are included in Table 11. The results of the natural attenuation parameters, dissolved gases, and field parameters are included in Table 12.

Section 8.0 – Includes references used in the report.

This document contains a large number of maps to illustrate the features and data discussed in the report. Figure 1 is a site map that shows the location of wells sampled during the June 2011 Event. Figures 2 and 3 provide potentiometric surface maps for the site-wide area and the former Unocal site, respectively. Figures 4 through 7 are site-wide maps that show concentration contours for individual chloroethene compounds in groundwater based on the June 2011 results. Figure 8 is a site-wide map that displays the June 2011 results for petroleum hydrocarbons. Figure 9 displays the June 2011 analytical results in data boxes for wells associated with the Plumelet A Injection IM. Figures 10 through 13 are maps of Plumelets B and C that show concentration contours for individual chloroethene compounds in groundwater based on the June 2011 results. Figure 14 displays VOC results for wells used for MNA. The entire set of site maps display the historical extents of contamination observed in the individual plumelet areas that are based on previous groundwater results that exceeded the KDHE Tier 2 RSK residential levels for individual constituents of concern (COCs). It is readily apparent from cursory examination of the groundwater maps that the present extents of COC exceedances are much smaller than the historical extents for each plumelet.

2.0 Annual Groundwater Monitoring Activities

The June 2011 Event was conducted in accordance with ***Consent Order No. 91-E-206 between Unocal and the KDHE***, dated March 23, 1992 (KDHE, March 1992), and the ***Final Revision 2 Sampling and Analysis Plan*** (SAP) (URS, July 2008) (hereafter referred to as the ***SAP***), which was approved by the KDHE on July 15, 2008 (KDHE, July 2008). The primary objective of the ***SAP*** was to establish procedures to collect and report groundwater data that accurately represent groundwater flow and contaminant concentration trends. The ***SAP*** identified 28 wells that represent the "core" monitoring well network for the facility. Each year, a letter is prepared prior to the Annual GW Monitoring Event detailing changes and additions to the groundwater monitoring schedule, any additional proposed environmental sampling activities, or other work to be conducted as part of the annual event.

For the June 2011 Event, Chevron EMC collected samples from the 28 core wells and 31 additional monitoring and former recovery wells. The June 2011 Event was coordinated with the Unified School District (USD) 259; split samples were collected by USD for wells that lie on the USD property. All samples collected from wells for the June 2011 Event were analyzed for VOCs by U.S. Environmental Protection Agency (EPA) Method SW8260B. The results were used to establish the lateral extent of VOCs in the groundwater as of June 2011. Samples were also collected for: VFAs, dissolved gases, and CO_2 in on-site Plumelet A wells; CO_2 in off-site Plumelets A and B wells; and a full-suite of MNA parameters, dissolved gases, and CO_2 in Plumelets D, E and F. The results were used to evaluate the remedial progress for the IMs that were performed at the plumelets. Table 1 summarizes the wells and laboratory analyses included in the June 2011 Event. Figure 1 presents the well locations.

2.1 Sampling and Analytical Procedures

The June 2011 Event consisted of measuring groundwater elevations, measuring water quality parameters from monitoring wells and former recovery wells, and collecting groundwater samples for laboratory analyses . The groundwater well gauging and sample locations are shown on Figure 1. Water level measurements were taken at 96 wells; depth to water (DTW) was measured to the nearest 0.01 ft from the top of the well casing using a Solinst oil/water interface probe. Field observations and measurements made during gauging activities in June 2011 were recorded on the synoptic water level form (see Appendix A). Field observations and measurements of the groundwater levels during the March 2011 Event are also included in Appendix A.

Groundwater samples were collected from 59 wells in accordance with the procedures in the ***SAP*** (URS, July 2008); 10 of these wells were former recovery wells. The samples were

collected from wells on the former Unocal, Coleman, USD 259, and Hillmann (Pinsker) properties. The following location identifier prefixes are used to identify the various wells:

- MW - monitoring wells on the Unocal or Coleman properties;
- USD - monitoring wells on the USD property;
- PMW - monitoring wells on the Hillmann (Pinsker) property;
- P and PZ - piezometers;
- R - former recovery wells; and
- TW - test wells.

The wells were purged and the samples were collected using one of the following methods:

1) Low-flow purging via peristaltic pump or dedicated submersible pump, then collecting the sample;

2) Purging three well volumes via peristaltic pump or dedicated submersible pump, then collecting the sample; or

3) Purging the well completely dry (for low yielding wells) via peristaltic pump or dedicated submersible pump, then collecting the sample after some period of recovery.

For all wells, dedicated tubing was used to prevent potential cross-contamination among wells and to eliminate the need to decontaminate tubing. After the sample was collected, the tubing was removed from the well and discarded.

Low-flow purging via peristaltic pump or submersible pump was the preferred purging method. If proper drawdown was maintained (i.e., drawdown was less than 0.5 ft) during low-flow purging, a sample was collected once the water quality parameters stabilized in accordance with the ***SAP*** (URS, July 2008). If drawdown was greater than 0.5 ft during purging, the well was sampled after three well volumes were removed. Water quality parameters (i.e., temperature, specific conductivity, pH, ORP, and turbidity) were measured using a Horiba U-52 water quality meter and flow-through cell. DO was measured using a downhole YSI Professional Optical DO meter. At former recovery wells where samples were collected from the adjacent 1-inch diameter former recovery well piezometer, the optical DO meter could not fit down the well

casing alongside the tubing. In these circumstances, the DO was measured with a Horiba U-52 water quality meter mounted in a flow through cell.

When collecting a sample with a peristaltic pump, the "straw method" was used in accordance with the ***SAP*** (URS, July 2008). The purpose of this sampling technique is to prevent the loss of VOCs while the water sample is being collected. The "straw method" consists of filling the tubing using the peristaltic pump, disconnecting from the pump (while retaining a siphon), and removing the tubing from the well. The groundwater sample was either drained through the tubing into the sample vial or was pumped in reverse direction out of the tubing into the sample vial. This process was repeated until a sufficient volume of groundwater was obtained to fill all volatile organic analysis (VOA) containers.

Low-flow purging prior to sampling was employed for the majority of wells sampled during the June 2011 Event. The three well volume purge method was used at 23 of the 59 monitoring wells, including MW-4, MW-5, MW-8, MW-25 through MW-28, P-2, P-13D, P-15D, PMW-4, PMW-5, PMW-7, PMW-8, R-2, R-3, TW-2A, TW-4, USD-1 through USD-4, and USD-MW-3. Wells that went dry before three well volumes had been purged were allowed to recharge, and then a sample was collected with the purging device. Seven of the 59 monitoring wells were purged dry during the June 2011 Event, including P-9, P-13S, P-14S, P-15S, P-17S, P-18, and P-19. Field observations and measurements made during purging and sampling activities in June 2011 were recorded on monitoring well purge forms (see Appendix A). The field observations and measurement forms for the March 2011 Event are also included in Appendix A.

Sample containers were provided by the analytical laboratories. Table 1 summarizes the sample containers and preservatives used during the June 2011 Event. Following sample collection, labels were attached to the sample containers, which were then inserted into sealable plastic bags. The packaged samples were placed on ice to maintain sample temperature below 4 degrees Celsius (ºC) and shipped via overnight courier to the analytical laboratory using proper chain-of-custody procedures, in accordance with the ***SAP*** (URS, July 2008).

All laboratory analyses, with the exception of the VFAs, were conducted by Lancaster Laboratories in Lancaster, Pennsylvania, a KDHE-certified laboratory. The VFAs were analyzed by Microseeps, Inc. in Pittsburg, Pennsylvania, a National Environmental Laboratory Accreditation Conference (NELAC)-certified laboratory. The data validation report (DVR) and laboratory analytical reports for the June 2011 Event are provided in Appendices B and C, respectively. The data validation report and laboratory analytical reports for the March 2011 Event are also included in Appendices B and C. The VOC analytical results for the June 2011 Event are presented in Table 3.

Decontamination of non-dedicated sampling equipment (i.e., oil/water interface probe) was performed prior to and after each use in accordance with the ***SAP***. Decontamination consisted of an Alconox®/potable water wash followed by a distilled water rinse. Dedicated Proactive™ Tempest Twister submersible pumps were used at six monitoring wells: MW-5, P-13D, P-14D, P-15D, P-16D, and P-17D. After use, the dedicated submersible pumps were rinsed thoroughly with distilled water to remove any residue or debris and placed within dedicated and labeled storage containers.

Investigation-derived waste (IDW) generated from well sampling activities included purge water and decontamination water. IDW was stored in 55-gallon drums that were removed by Clean Harbors of Wichita, Kansas on September 7, 2011.

2.2 Groundwater Level Measurements

On June 20, 2011, a synoptic water level survey was conducted as part of the June 2011 Event to determine the potentiometric surface. During this time, visual observations of the integrity of the wells were recorded.

Table 2 summarizes the historical groundwater elevation data from previous gauging events. In addition to the June 2011 Event, three well gauging events occurred since the 2010 Annual GW Monitoring Event (hereafter referred to as the June 2010 Event). Select wells were gauged during the three events in February 2011, March 2011, and May 2011. In June 2011, 96 wells and piezometers were gauged. Depth to groundwater in June 2011 ranged from 1.52 ft below top of casing (BTOC) at MW-8 to 21.15 ft BTOC at PMW-20. The groundwater elevations ranged from 1317.63 ft above sea level (MSL) at MW-22 to 1337.87 ft MSL at PMW-4. Non-aqueous phase liquid (NAPL) was not detected in any of the wells during the well gauging activities.

A potentiometric surface was generated based on groundwater levels measured in 92 wells and piezometers. All of these wells and piezometers had previously been surveyed to the same vertical datum (North American Vertical Datum 1988). The top of casing (TOC) elevation for USD-MW-18 was provided by USD, but the vertical datum was not known. Since the initial potentiometric surface generated by including USD-MW-18 looked suspect, that well was not included in the final potentiometric surface. Figures 2 and 3 illustrate the site-wide potentiometric surface and the potentiometric surface for the former Unocal site, respectively. The groundwater well elevations relative to MSL, the groundwater flow direction, and the locations of the gauged wells are presented in Figures 2 and 3. It should be noted that the former groundwater extraction system is no longer operational; therefore, the potentiometric surface represents static conditions. As shown on Figure 2, the site-wide groundwater flow direction is generally to the south, southwest, and west, which is consistent with the previous monitoring

events. Figure 3, drawn with half-foot contours, illustrate slight variations in the potentiometric surface in the northwest portion of the former Unocal site and portions of the USD property.

During the June 2011 Event, artesian conditions were not observed in the seven monitoring wells located on the Coleman property (MW-8, R-2, R-3, R-4, R-8, TW-4, and PZ-1) where groundwater had surfaced under non-pumping conditions from July 2008 to June 2010. After the first observation of artesian hydrologic conditions during the 2008 Annual GW Monitoring Event, a letter was issued to KDHE (URS, September 2008) that described the artesian conditions, previous communication with Coleman, and a proposed observation schedule for this area. Since September 2008, URS has been inspecting this area on a monthly basis. Observations from the inspections are reported to the Coleman representative and the KDHE following each monthly inspection.

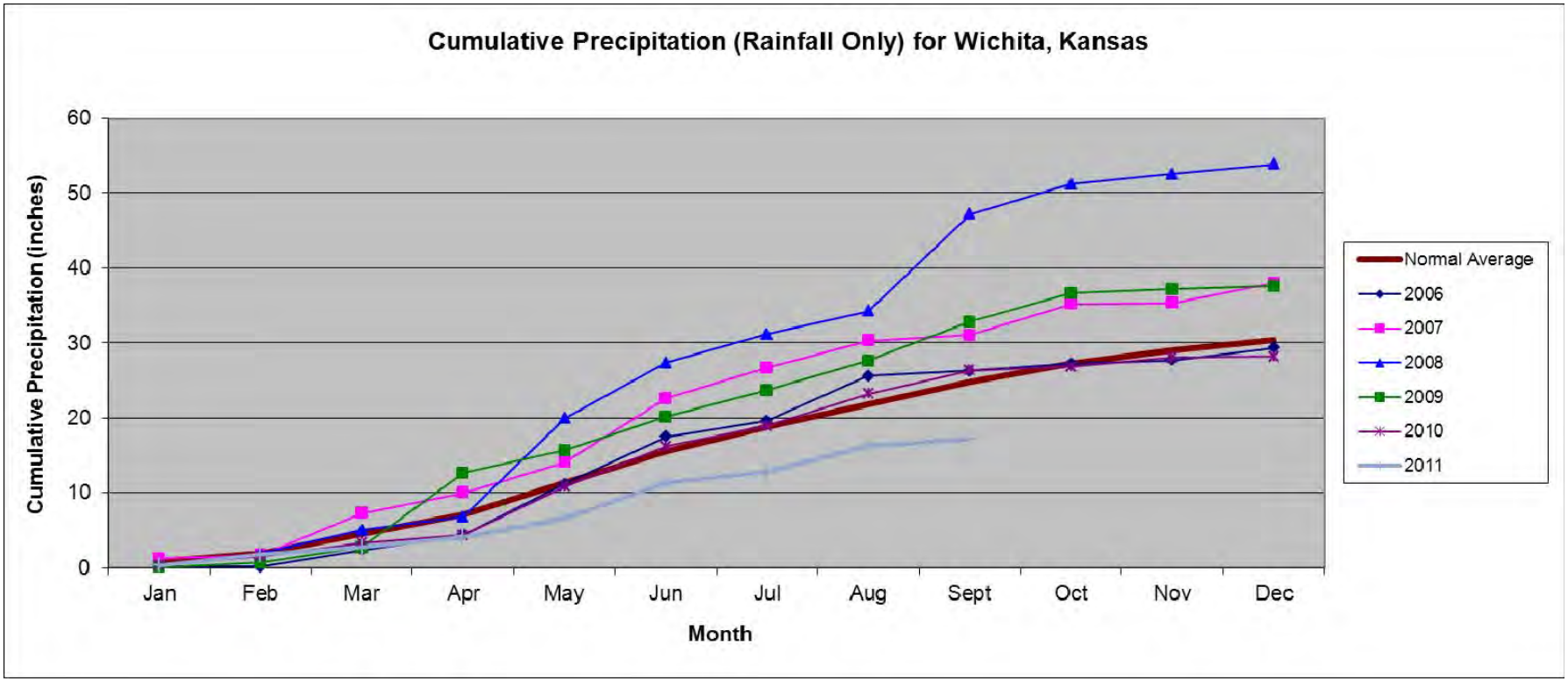
Visual observations during the June 2011 Event indicated that the network of monitoring wells, piezometers, and former recovery wells on the former Unocal, Coleman, USD 259, and Hillmann (Pinsker) properties was generally in good condition, with the following exceptions:

- A crack in the well pad at R-4 was observed. Due to its location on the corner, it is believed that a heavy truck drove over the edge of the well pad during road construction at the Coleman property;
- Missing or damaged bolts were observed at wells MW-2, P-2, P-3, PMW-2, PMW-6, TW-4, USD-2, and USD-MW-18;
- A well vault lid was missing at USD-13. Although the well casing at USD-13 was secured with a well plug, the outside of the well's inner casing was exposed to the atmosphere;
- The well plugs at MW-5 and MW-23 were either damaged or did not fit securely on the well. An attempt was made to replace the well plug at MW-5; however, the replacement plug interfered with the closing of the well vault lid. The well plug at MW-23 was successfully replaced; and
- The well casing at MW-12S is damaged, therefore, a Solinst oil/water interface probe was not able to be lowered into the well; therefore, MW-12S was not gauged during the June 2011 Event.

Across the entire study area, the groundwater elevations ranged from 1,322 to 1,345 ft MSL in 2008, 1,321 to 1,345 ft MSL in 2009, from 1,321.24 to 1,347.01 ft MSL in 2010, and from 1317.63 to 1337.87 ft MSL in 2011. Due to successive years of heavy rainfall, the groundwater

elevations for the 2008 through 2010 events were significantly higher than the groundwater elevations in 2007, which ranged from 1,316.58 to 1,337.40 ft MSL. During the June 2011 Event, groundwater elevations were observed to be similar to the groundwater elevations in 2007.

Precipitation totals (rainfall only) for the 2007, 2008, and 2009 calendar years were above the average yearly rainfall total of 30.38 inches for Wichita, Kansas. In 2007, the total precipitation was 37.97 inches. In 2008, a precipitation record was set for Wichita with 53.82 inches of rainfall. In 2009, the total precipitation was 37.54 inches. These above average precipitation totals have contributed to the relatively high groundwater levels experienced at the site in past years, including those observed during the June 2010 Event. Due to the lower rainfall totals in 2010 and 2011; however, groundwater elevations observed in June 2011 were lower than those observed during the June 2010 Event. The rainfall total of 28.17 inches for 2010 is less than the average yearly rainfall total of 30.38 inches. In addition, the rainfall total of 12.79 inches from January to July 2011 is lower than the historical average total of 18.86 inches and the rainfall totals for the same seasonal period for the previous five years. A chart comparing annual cumulative precipitation to the normal average is presented below.



Note: Precipitation data includes only rainfall data obtained from National Oceanic and Atmospheric Administration (NOAA), National Weather Service: http://www.crh.noaa.gov/ict/climate/f6form.php.

Normal precipitation values obtained from the NOAA, National Weather Service: http://www.crh.noaa.gov/ict/scripts/displayNormals.php.

2.3 Quality Assurance/Quality Control Procedures

Field and laboratory QA/QC procedures, described in the ***SAP*** (URS, July 2008), were followed during the June 2011 Event. The DVR for the June 2011 Event is included as Appendix B, while the laboratory analytical reports are included as Appendix C. The DVR and laboratory analytical reports for the March 2011 Event are also included in Appendices B and C, respectively, since they have not previously been submitted to KDHE. Laboratory QA/QC samples included surrogates, method blanks, laboratory control samples (LCSs), matrix spikes (MSs), and matrix spike duplicates (MSDs). The laboratory data for both events are considered acceptable and useable.

Field equipment was calibrated daily in accordance with manufacturer's guidelines and non-dedicated sampling/gauging equipment was decontaminated prior to use in each well. The field data are considered acceptable.

2.4 Proposed Wells to be Abandoned and/or Plugged and Abandoned

As part of the June 2011 Event activities, available information on the following wells were reviewed to determine whether these wells could be abandoned and/or plugged and abandoned:

- R-9 and MW-11: These wells, located on the Coleman property, could not be found during multiple annual field events due to Coleman performing previous site construction/maintenance in these areas. R-9 is located in a parking area that has been recovered, while MW-11 is located adjacent to a drainage area that was modified. Chevron EMC is requesting permission from Coleman and KDHE to formally abandon R-9 and MW-11 and to remove them from Chevron's well inventory.

- MW-12S: This well has a bent casing and cannot be gauged or sampled. Chevron EMC is requesting permission from KDHE to plug and abandon MW-12S and to formally remove it from Chevron's well inventory.

- P-3: This well is located on the Coleman property, approximately 500 ft south of the downgradient portion of Plumelet A. This well is in the vicinity of P-4. Chevron EMC is proposing to use P-4 as a background well and to plug and abandon P-3, which is no longer needed. Chevron EMC is requesting permission from Coleman and KDHE to plug and abandon P-3 and to formally remove it from Chevron's well inventory.

- PZ-2: This well is located on the Coleman property, approximately 75 ft south of Plumelet A. This well is in the immediate vicinity of R-8. Chevron EMC is proposing to use R-8 for future gauging and/or sampling events (as needed) and to plug and abandon PZ-2, which is no longer needed. Chevron EMC is requesting permission from Coleman and KDHE to plug and abandon PZ-2 and to formally remove it from Chevron's well inventory.

- PZ-1: This well is located on the Coleman property, approximately 35 ft northwest of Plumelet B. This well is located immediately downgradient of R-3. Chevron EMC is proposing to use R-3 for future gauging and/or sampling events (as needed) and to plug and abandon PZ-1, which is no longer needed. Chevron EMC is requesting permission from Coleman and KDHE to plug and abandon PZ-1 and to formally remove it from Chevron's well inventory.

- MW-7: This well is located on the Coleman property, approximately 525 ft west of the downgradient portion of Plumelet F. This well is located near a low spot in the driveway and has historically been covered with stormwater following rainfall events. Since this well is not needed for plumelet delineation purposes, Chevron EMC is requesting permission from Coleman and KDHE to plug and abandon MW-7 and to formally remove it from Chevron's well inventory.

3.0 Contaminant Trends Over Time

The historical and current analytical data (included in Appendix D) were statistically analyzed using the Mann-Kendall test to evaluate general trends for analytes at each well from 1998 to 2011. The majority of the active remedial actions implemented throughout the study area took place during this period of time. The results for these statistical tests are shown in Table 4. Since relevant trends are presented for specific IM areas later in this report, trends for specific wells in each plumelet are not included in this section.

The Mann-Kendall analysis is performed annually as a screening tool to evaluate whether concentration trends are changing over time, but the Mann-Kendall analysis alone does not provide enough information to explicitly state that a trend exists. Therefore, the Mann-Kendall analysis should be used in conjunction with the overall knowledge of the specific plumelets (as discussed in Sections 4.0 through 7.0).

Wells with moderate to significant impacts were selected for testing because those wells had an adequate number of detections over time to evaluate trends. Wells with fewer detections or no contamination (primarily found outside of the plumelets) did not exhibit an adequate number of detections over time to perform the Mann-Kendall Test. Moreover, the concentration trends in these wells were considered less meaningful with regard to understanding the transport and degradation mechanisms that have occurred.

Overall, the majority of COCs detected throughout the contaminant plumes show downward trends in concentration over time. However, certain analytes displayed increasing concentrations (upward trend) during the historical monitoring period. The list below shows each analyte that exhibited an upward trend in June 2011 along with the location of the well and the previous trends observed for that analyte. Further discussion of these trends is provided in the relevant section (Sections 4.0 through 7.0), except for the background wells MW-2 and USD-MW-14. Note that methyl tert-butyl ether (MTBE) was found in low concentrations (less than 6 milligrams per liter [mg/L]) in both background wells but was significantly below the KDHE Tier 2 RSK residential level of 133 mg/L.

Well	Location	Analyte	Previous Trend (2009)	Previous Trend (2010)	Current Trend (2011)
On-Site Plumelet A					
P-5	Shallow Well in Plumelet A Source Area	Acetic Acid Butyric Acid Pentanoic Acid	Not Evaluated Not Evaluated Not Evaluated	Not Evaluated Not Evaluated Not Evaluated	Upward Upward Upward
P-11	Deep Well in Plumelet A Source Area	Butyric Acid Pentanoic Acid Vinyl Chloride	Not Evaluated Not Evaluated No Trend	Not Evaluated Not Evaluated No Trend	Upward Upward Upward

Well	Location	Analyte	Previous Trend (2009)	Previous Trend (2010)	Current Trend (2011)
On-Site Plumelet A (Continued)					
P-6	Deep Well Immediately Downgradient of Source Area	1,1-DCA Chloroethane	No Trend No Trend	No Trend No Trend	Upward Upward
P-12	Deep Boundary Well	Chloroethane Naphthalene Toluene Xylenes	No Trend No Trend No Trend No Trend	No Trend No Trend No Trend No Trend	Upward Upward Upward Upward
Off-Site Plumelets A and B					
TW-3	Midgradient, Plumelet A	1,2-Dichlorobenzene	No Trend	Undetermined	Upward
R-2	Midgradient, Plumelet B	CO_2	Undetermined	Upward	Upward
TW-4	Midgradient, Plumelet B	1,2-Dichlorobenzene	No Trend	No Trend	Upward
R-4	Downgradient from Interceptor B, Plumelet B	Methane MTBE	Upward Undetermined	Upward Upward	Upward Upward
R-5	Downgradient from Interceptor B, Plumelet A	*cis*-1,2-DCE Methane Methylene Chloride TCE *trans*-1,2-DCE	Upward Upward Downward Undetermined Undetermined	Upward Upward Undetermined Upward Undetermined	Upward Upward Upward Upward Upward
R-6	Downgradient from Interceptor B, Plumelet A	1,1-DCA 1,2-Dichlorobenzene *cis*-1,2-DCE Methane	Undetermined Undetermined Undetermined Undetermined	Undetermined Upward Undetermined Upward	Upward Upward Upward Upward
MW-18	Downgradient from Interceptor A, Plumelet A	Carbon Disulfide *cis*-1,2-DCE Ethane Methane Toluene *trans*-1,2-DCE Vinyl Chloride	No Trend Undetermined Upward Upward Undetermined Upward Upward	Upward Upward Upward Upward Undetermined Upward Upward	Upward Upward Upward Upward Upward Upward Upward
MW-20	Downgradient from Interceptor A, Plumelet A	Methane	Undetermined	Upward	Upward
R-10	Downgradient from Interceptor A, Plumelet A	Ethane Methane	Upward Upward	Upward Upward	Upward Upward
R-12	Downgradient from Interceptor A, Plumelet B	1,1-DCE 1,2-Dichlorobenzene 1,2-DCA Benzene CO_2 Ethane Methane *trans*-1,2-DCE Vinyl Chloride	Downward Upward Downward Downward Upward Undetermined Upward Downward Undetermined	Downward Upward Downward Downward Upward Upward Upward Undetermined Undetermined	Upward Upward Upward Upward Upward Upward Upward Upward Upward
On-Site Plumelets B and C					
MW-4	--	TCE	No Trend	No Trend	Upward
Off-Site Plumelets D, E, and F					
MW-5	--	1,1-DCA	Undetermined	Undetermined	Upward
USD-1	Midgradient, Plumelet E	Chloroform	No Trend	Undetermined	Upward
USD-2	Midgradient, Plumelet F	Chloroform	No Trend	No Trend	Upward
PMW-5	Midgradient, Plumelet F	PCE	No Trend	No Trend	Upward
TW-2A	Downgradient, Plumelet F	1,2-Dichlorobenzene	Undetermined	Upward	Upward
Background Wells					
USD-MW-14	Northeast of Site	MTBE	No Trend	No Trend	Upward
MW-2	Onsite between Plumelets A and B	MTBE	No Trend	No Trend	Upward

CO_2 - Carbon dioxide.
DCA - Dichloroethane.
DCE - Dichloroethene.
MTBE - Methyl tert-butyl ether.
PCE - Tetrachloroethene.
TCE - Trichloroethene.

Generally speaking, it appears that most of the upward trends observed are associated with the onset of reducing conditions and reductive dechlorination processes in groundwater, as follows:

- Increasing concentrations of degradation products associated with reductive dechlorination of tetrachloroethene (PCE) and trichloroethene (TCE), including *cis*-1,2-dichloroethene (DCE), *trans*-1,2-DCE, and vinyl chloride;
- Increasing concentrations of 1,1-dichloroethane (DCA), 1,2-DCA, chloroethane, and ethane, which are produced during the reductive dechlorination of chlorinated ethanes;
- Indicators of reducing conditions, such as CO_2 and methane; and
- VFA parameters that are the result of injections that have occurred in the vicinity of Plumelet A.

A variety of additional constituents do not fall into these categories, such as the upwards trends of 1,2-dichlorobenzene and petroleum hydrocarbons in certain wells.

4.0 On-Site Plumelet A Monitoring Results

This section provides the results and conclusions from groundwater monitoring for the Injection IM that was performed at the Plumelet A source area. Four quarters of post-injection monitoring were required by KDHE to monitor the effects of the injected materials on groundwater concentrations. Along with those data for the four quarters of post-injection monitoring, the 2011 Annual Event is presented as a fifth event. Additionally, pre-injection groundwater data is provided for comparison.

4.1 Plumelet A Monitoring

In December 2009, an IM was performed in the vicinity of the on-site portion of Plumelet A. The objective of this IM was to:

- Lower chlorinated solvent concentrations to below KDHE Tier 2 RSK residential levels via enhanced and natural attenuation in the P-5 source area; and
- Reduce the potential for off-site migration of contaminants in that area.

The IM consisted of an injection of a combination of Hydrogen Release Compound (eXtended formula) (HRC-X®) and glycerol into the saturated zone of Plumelet A. The glycerol was injected to initiate an immediate reductive dechlorination effect on groundwater in Plumelet A; the HRC-X® was expected to take longer to initiate, but would be effective for three to five years. Implementation of the injections is described in the ***Documentation of Injection Interim Measure Activities*** letter to KDHE (URS, February 2010). KDHE approved this document with comments in a response letter dated March 4, 2010 (KDHE, March 2010).

In accordance with the approved monitoring plan, quarterly events were performed to monitor the effect from the injection of HRC-X® and glycerol at Plumelet A from March 2010 to June 2011. The monitoring rounds are described as follows:

- Round 1 – May 2009 Annual Event: Pre-injection monitoring.
- Round 2 – March 2010: 1st Post-injection monitoring.
- Round 3 – June 2010 Annual Event: 2nd Post-injection monitoring.
- Round 4 – November 2010: 3rd Post-injection monitoring.
- Round 5 – March 2011: 4th Post-injection monitoring.
- Round 6 – June 2011 Annual Event: 5th Post-injection monitoring.

For rounds one through four, groundwater results and DVRs were presented in previous reports specific to those rounds. A separate report for Round 5 was not previously submitted to KDHE.

For the fifth and sixth rounds of monitoring, samples were collected from 17 monitoring wells: P-1, P-2, P-5, P-6, P-9, P-10, P-11, P-12, TW-3, P-13S through P-16S and P-13D through P-16D (TW-3 is located downgradient of the treatment area). Figure 1 presents the well locations. The samples were analyzed by Lancaster Laboratories, in Lancaster, Pennsylvania, for VOCs by EPA Method SW8260B and dissolved gases (methane, ethane, ethene [MEE], and CO_2) by EPA Method SW8015Mod. Additionally, samples were analyzed by Microseeps, Inc., in Pittsburg, Pennsylvania for VFAs by an ion chromatography method. The collective results for all analyses were used to evaluate the effectiveness of the HRC-X®/glycerol injections on stimulating reductive dechlorination. Table 1 summarizes the wells and analyses used as part of the monitoring of on-site Plumelet A.

During the fifth and sixth rounds of groundwater monitoring, eleven VOCs were found to exceed their KDHE Tier 2 RSK residential levels:

- PCE;
- TCE;
- *cis*-1,2-DCE;
- *trans*-1,2-DCE;
- 1,1-DCE;
- Vinyl chloride;
- Methylene chloride;
- 1,1,1-trichloroethane (TCA);
- 1,1-DCA;
- Naphthalene; and
- 1,2,4-Trimethylbenzene.

The results from the May 2009 Annual Event through the June 2011 Annual Event (Rounds 1 through 6) were evaluated to ascertain the effects of the IM injection over time. Table 5 presents the results for all VOCs that exceeded KDHE Tier 2 RSK residential levels during at least one of the six monitoring events. Figure 9 shows the location of the current monitoring wells relative to the injection rows and presents analytical results for the baseline (May 2009) and five post-injection events.

Results for VFAs, dissolved gases (MEE and CO_2), and field parameters (DO and ORP) collected from Plumelet A are included in Table 6. Data for selected analytes for Plumelet A wells are shown on Figure 9.

According to information provided by Regenesis, HRC-X® is a sorbitol-based polylactate compound that upon introduction to the groundwater releases lactic acid into the groundwater. This lactic acid is metabolized by native microorganisms, with the primary path being conversion of lactic acid to pyruvic acid and, in turn, the pyruvic acid to acetic acid. Two additional VFAs, butyric acid and propionic acid, are also produced. Glycerol degrades rapidly, and was expected to initiate reductive dechlorination before the HRC-X® became effective. The

injections appear to have initiated changes in the groundwater chemistry, including the production of VFAs, an overall decrease in ORP, production of dissolved gases, and the biochemical transformation of chlorinated ethenes (reductive dechlorination). Major decreases in contaminant concentrations have been observed during the study period.

4.2 Evaluation of Plumelet A IM Monitoring Results

As requested by KDHE, the analytical data collected for the Plumelet A IM were evaluated to determine the effectiveness of the IM and a path forward for this area.

4.2.1 Analytical Results for Wells with COC Trends

For wells with sufficient analytical data and moderate to high concentration levels (P-2, P-5, P-6, P-9 through P-12, and TW-3), the Mann-Kendall results (Table 4) and graphs showing concentration trends over time were prepared. These wells follow the "centerline" of Plumelet A from the more contaminated portions downgradient and are grouped in pairs of shallow and deep wells. The following discussion for each well pair is focused on the physical location of the pair relative to the rows of injection points, beginning with the wells near the central portion of the area of injection. Concentration trend plots were also prepared for select wells. These trend plots are included in Appendix E. Figures 4 through 8 are concentration contour maps for individual COCs (chlorinated ethenes) and petroleum hydrocarbons in Plumelet A. Figure 9 presents analytical results for wells in the Plumelet A IM area.

Wells P-5 and P-11 (between second and third injection rows)

The well pair P-5 (shallow well) and P-11 (deep well) are located between the second and third injection rows within the Plumelet A IM area (Figure 9). During the IM monitoring period, VOC concentrations in P-11 were generally higher than the VOC concentrations in P-5, which is indicative of chlorinated solvents sinking and accumulating in the lower portion of the aquifer.

For P-5 and P-11, a general downward trend in the PCE and TCE concentrations has been observed over time, as shown on the trend plots in Appendix E. Since the May 2009 Event, PCE and TCE concentrations at P-5 have decreased approximately three orders of magnitude. Since the May 2009 Event, the PCE concentrations at P-11 have decreased approximately three orders of magnitude while, TCE concentration at P-11 have decreased approximately two orders of magnitude.

For both P-5 and P-11, as an initial drop in PCE and TCE concentrations was observed, a corresponding increase in concentrations of reductive products occurred, most notably *cis*-1,2-DCE and vinyl chloride. Concentrations of *cis*-1,2-DCE, *trans*-1,2-DCE, 1,1-DCE in P-5 and P-11 have generally increased and then subsequently decreased since the injections. The

increase and/or increase and subsequent decrease of concentrations of *cis*-1,2-DCE, *trans*-1,2-DCE, 1,1-DCE, and vinyl chloride can be attributed to the dechlorination of PCE and TCE and in turn dechlorination of DCE compounds to vinyl chloride. Ethene, the end product for reductive dechlorination of chlorinated ethenes, has been observed in both wells indicating that vinyl chloride is being degraded.

P-5 and P-11 samples have exhibited the greatest concentrations of VFAs for the wells tested during the monitoring period (Table 6 and Figure 9). In June 2011, the sample collected from P-5 contained acetic acid, lactic acid, and propionic acid concentrations of 350 mg/L, 200 mg/L and 240 mg/L, respectively, while the P-11 sample contained acetic acid and propionic acid concentrations of 380 mg/L and 300 mg/L, respectively. These high VFA concentrations indicate that sufficient electron donors are present to promote ongoing reductive dechlorination. Lactic acid was not detected in P-11 during the June 2011 Event. The ORP in both of these wells remained negative during the monitoring period, which is an indicator that the injected products initiated and maintained a reducing environment in the saturated zone.

Based on the Mann-Kendall analysis (presented in Section 3.0), both of these wells exhibit upward trends for various VFAs, while the analysis for P-11 also shows an upward trend for vinyl chloride. Increased concentrations of VFAs in these wells indicate that the products injected in this area as part of the IM are still working to enhance dechlorination activities.

Wells P-2, P-6, and P-10 (between third and fourth injection rows)

The well pair P-2 (deep) and P-6 (shallow) and the sidegradient well P-10 are located between the third and fourth injection rows within the Plumelet A IM area. During the IM monitoring period, VOC concentrations in P-2 (deeper well) were generally higher than the VOC concentrations in P-6, which is likely due to chlorinated solvents typically accumulating along the bedrock (i.e., at the bottom of the aquifer). The concentrations of daughter products *cis*-1,2-DCE and vinyl chloride are higher than concentrations of PCE and TCE in both wells prior to the injections, indicating that these compounds have lingered since the 1999 pilot test injections.

PCE was not detected in P-2 during any of the IM monitoring events. For P-6, general downward trends in the PCE and TCE concentrations have been observed over time. After the injection event, *cis*-1,2-DCE and vinyl chloride concentrations dropped at P-6, and all constituents were below the KDHE Tier 2 RSK residential levels during the latest event (June 2011). The results indicate that complete dechlorination is achievable with the injection method and the injection products selected. By November 2010, based on low COC concentrations and the presence of ethene, it appeared that P-2 was moving toward complete dechlorination. However, concentrations of *cis*-1,2-DCE and vinyl chloride rebounded after that event. Future

monitoring will determine whether concentrations of these constituents decline to below the KDHE Tier 2 RSK residential levels.

Since the May 2009 Event, PCE concentrations at the sidegradient well P-10 have decreased while TCE and *cis*-1,2-DCE slightly increased; vinyl chloride concentrations have not changed over the last several rounds.

Concentrations of lactic acid in P-2, P-6, and P-10 have generally increased or increased and then subsequently decreased during the monitoring period. While VFAs are present in all three wells during the June 2011 Event, the magnitude of these constituents is less than 2 mg/L, except for acetic acid and propionic acid in P-2 (230 mg/L and 17 mg/L, respectively). The ORP in all three wells was negative throughout the monitoring period, which is an indicator that a reducing environment is being maintained in the subsurface.

Based on the Mann-Kendall analysis (presented in Section 3.0), P-6 is the only well exhibiting upward trends (1,1-DCA and chloroethane). Both of these analytes are daughter products of 1,1,1-TCA dechlorination. While 1,1,1-TCA was never detected at significant concentrations in P-6, concentrations that exceed the KDHE Tier 2 RSK residential level have been observed in upgradient well P-11.

Wells P-9, P-12, and TW-3 (downgradient from fourth injection row)

The well pair P-9 (shallow well) and P-12 (deep well) are located immediately downgradient of the center of the fourth injection row within the Plumelet A IM area. Well P-12 is located near the south boundary of the former Unocal site. TW-3 is located on the Coleman property further downgradient of the fourth injection row. These wells, along with P-13S/D and P-14S/D, are used to determine if groundwater exceeding KDHE Tier 2 RSK residential levels is present at the southern site boundary.

During the IM monitoring period, VOC concentrations in P-12 (deeper well) were generally higher than the VOC concentrations in P-9. Other than a minor spike in concentrations in P-12 during the March 2011 event, both P-9 and P-12 sample results exhibited consistent declines in contaminant concentrations through the study period. Reductive dechlorination at both wells appeared to have stalled prior to injection, having accumulated *cis*-1,2-DCE and vinyl chloride at relatively high concentrations. The injections greatly reduced the concentrations of these constituents; at the end of the study period, only vinyl chloride exceeded the KDHE Tier 2 RSK residential level at P-12 (18 micrograms per liter [μg/L]).

Concentrations of lactic acid, acetic acid, and propionic acid in P-9 and P-12 have decreased during the monitoring period. While VFAs are present in both wells, the magnitude of these

constituents is less than 2 mg/L, except for acetic acid and propionic acid in P-12 (32 mg/L and 5.5 mg/L, respectively). The ORP in both wells was negative throughout the monitoring period, which is an indicator that a reducing environment has been maintained in the subsurface.

At TW-3, located downgradient of the injection area on the Coleman property, VOC concentrations have not significantly changed throughout the evaluation period. It is assumed that groundwater near TW-3 has not been affected by the IM injections.

Based on the Mann-Kendall analysis (presented in Section 3.0), the only upward trends noted are for constituents detected at P-12. These analytes include chloroethane, naphthalene, toluene, and xylene. Only naphthalene exceeded the KDHE Tier 2 RSK residential level during the last three rounds of monitoring.

4.2.2 Analytical Results for Remaining Wells

The remaining wells (P-1, P-13D through P-16D, and P-13S through P-16S) had insufficient analytical data for Mann-Kendall trend analysis and graphs to determine concentration trends over time. However, a brief discussion of the COC results for each set of wells is presented below:

Well P-1

Only one minor PCE detection was noted at P-1, located sidegradient to the injections. VFA analysis shows detectable levels of acetic acid and lactic acid.

Wells P-16S and P-16D

P-16S and P-16D are located upgradient of the first injection row. Since these wells are relatively new, samples have only been collected during the last two monitoring rounds. The only exceedances noted was for 1,1-DCE at P-16D in both events.

Detectable levels of acetic acid, lactic acid, and propionic acid are present in P-16S and P16D. The ORP in in both wells was negative during the monitoring period, which is an indicator that a reducing environment is present in the subsurface.

Wells P-15S and P-15D

P-15S and P-15D are new wells located between the first and second injection rows. Due to the high concentrations of COCs in P-15S and P-15D, these wells are thought to be located in the Plumelet A source area. For the June 2011 Event, PCE, TCE, *cis*-1,2-DCE, and vinyl chloride concentrations in both wells exceeded their respective KDHE Tier 2 RSK residential levels. Additionally, *trans*-1,2-DCE concentrations in P-15D and 1,1-DCE concentrations in P-15S exceeded their respective KDHE Tier 2 RSK residential levels.

Significant concentrations of acetic acid and propionic acid were detected in P-15S and P15D. The ORP in in both wells was negative throughout the monitoring period, which is an indicator that a reducing environment has been established and is presently being maintained in the subsurface.

Wells P-13S, P-13D, P-14S, and P-14D

The well pairs P-13S and P-13D and P-14S and P-14D are located immediately downgradient of the fourth injection row within the Plumelet A IM area. The P-13S/13D well pair are considered boundary wells for the eastern portion of Plumelet A. These wells, along with P-9, P-12, and P-14S/14D, serve as fence line sentinel wells. The VOC concentrations in both P-13S and P-13D were below the KDHE Tier 2 RSK residential levels. The ORP in both wells was negative during the monitoring period, which is an indicator that a reducing environment has been established in the subsurface. The presence of VFAs in these wells indicates that electron donor compounds have migrated at least 15 ft downgradient of the fourth injection row.

For well P-14D, PCE (March 2011 only) and TCE concentrations exceeded the KDHE RSK Tier 2 residential levels. For well P-14S, *cis*-1,2-DCE and vinyl chloride concentrations (June 2011 only) exceeded their KDHE RSK Tier 2 residential levels. Most VFAs were detected in P-14S and P-14D with significant concentrations of acetic acid and propionic acid being observed. The ORP in both wells was negative throughout the monitoring period, which is an indicator that a reducing environment has been established and maintained in the subsurface.

4.2.3 Reductive Dechlorination End Products

Concentrations of dissolved gases (MEE and CO_2) are present at all of the wells in Plumelet A with varying concentrations. Ethene, the non-toxic daughter compound produced by reductive dechlorination, was detected in 11 of 17 wells included in the Plumelet A IM monitoring program. This is a positive indication that indigenous *Dehalococcoides* sp. (*Dhc*) bacteria that are capable of degrading vinyl chloride are present in site groundwater.

4.3 Conclusions of Plumelet A IM Monitoring

Based on the evaluation of these results, the following conclusions were drawn:

1) With the exception of P-10, PCE and TCE concentrations in wells present since the pre-injection monitoring period have decreased significantly. The decreases in PCE and TCE over time and the presence of ethane and ethene demonstrate that reductive dechlorination is occurring at most wells in Plumelet A. The trends observed at the P-5 and P-6 wells indicate that the objective of lowering chlorinated solvent concentrations to below KDHE Tier 2 RSK residential levels

via biostimulation and natural attenuation processes is being accomplished over time. Increased concentrations of the degradation products *cis*-1,2-DCE and vinyl chloride are not unexpected; however, these concentrations should continue to decrease over time.

2) Varying concentrations of VFAs were observed in all of the wells. Overall, the most prevalent VFAs were acetic acid and propionic acid. i-Hexanoic acid was the least detected VFA, only being detected in a few of the wells. The significant amount of VFAs remaining in many of the wells demonstrate the continued effectiveness of the injected products; therefore, biochemical conditions that favor reductive dechlorination of chlorinated ethenes should be maintained for some time; and

3) As anticipated, the HRC-X® injected in December 2009 has yet to have an effect on monitored constituents at TW-3 owing to the distance downgradient. At TW-3, the PCE and TCE concentrations have generally remained unchanged.

5.0 Off-Site Plumelets A and B Monitoring Results

This section presents analytical results for the portions of Plumelets A and B that are present on the Coleman Property. In 2006, injections were performed as a pilot test on the Coleman Property to reduce concentrations in the midgradient and downgradient portions of each plumelet. The monitoring results for the 2006 Pilot Test conducted on the Coleman property through July 2008 were presented in the ***Final Enhanced Reductive Dechlorination Pilot Test Results Report*** (URS, March 2009). This section provides a current summary of analytical results, based on samples collected and analyzed subsequent to that report. Long-term trends (since 2006) for some of the wells used for monitoring the previous pilot test are graphically illustrated in this section.

5.1 Summary of Previous Pilot Test and Related Groundwater Monitoring Results

On August 30, 2006, the operation of the former groundwater recovery system was discontinued. In December 2006, this system was "replaced" with two in situ reductive dechlorination biobarrier pilot test systems: 1) a downgradient biobarrier (Biobarrier A) comprised of an injected Regenesis product - Hydrogen Release Compound (HRC®); and 2) an upgradient biobarrier (Biobarrier B) comprised of an injected DBI Remediation Product - CAP18-ME™. The composition and behavior of these products and implementation plans for the pilot test were described in the ***Enhanced Reductive Dechlorination Pilot Test Implementation Workplan*** (URS, October 2006). HRC® was injected in the downgradient biobarrier, approximately 35 ft upgradient of six extraction wells oriented north-south, adjacent to the Coleman Company warehouse. CAP18-ME™ was injected in the upgradient biobarrier, approximately 35 ft upgradient of five extraction wells oriented northwest to southeast on the Coleman property. Both biobarriers were constructed by injecting the bioamendments into the saturated zone using direct push techniques. Figures 4 through 7 show the locations of biobarriers and concentrations of individual chlorinated ethenes.

During the pilot test period, groundwater monitoring was conducted via seven distinct sampling events between January 2007 and July 2008. A comprehensive review of the results from these seven events was provided in the ***Final Enhanced Reductive Dechlorination Pilot Test Results Report*** (URS, March 2009). This report was finalized in March 2009 after KDHE review, comment, and acceptance. This report concluded that the injection of HRC® in the downgradient biobarrier (Interceptor A) provided significant reductions in contaminant mass for the primary COCs (PCE and TCE) during the performance monitoring period. Monitoring wells within 65 ft downgradient of Biobarrier A met the pilot test goal of COC concentration reduction to below

50 μg/L for PCE and TCE. However, only slight effects on groundwater geochemistry occurred after injection of CAP18-ME™ in the upgradient Biobarrier B.

Based on a review of the data through June 2010, the ***2010 Annual GW Monitoring Report*** (URS, January 2011) concluded that the injection of HRC® in the downgradient Biobarrier A provided significant reductions in contaminant mass for COCs PCE and TCE; however, the 2009 and 2010 results for wells MW-18, R-10, and R-11 indicate that several primary COC concentrations had increased downgradient of Biobarrier A. This trend has continued in 2011. The injection of CAP18-ME™ at Biobarrier B has not resulted in a significant reduction of any COCs present.

5.2 Pilot Test Performance Monitoring

During the June 2011 Event, wells associated with Biobarriers A and B were monitored for chlorinated solvents, CO_2, and field parameters (including DO and ORP). As presented in the ***Final Enhanced Reductive Dechlorination Pilot Test Results Report*** (URS, March 2009), the goals for continued monitoring are to:

1) Determine whether concentrations of PCE and TCE remain below or near KDHE Tier 2 RSK residential levels in wells downgradient of Biobarrier A;
2) Monitor *cis*-1,2-DCE and vinyl chloride concentrations at wells MW-18, R-10, and MW-20 located within Plumelet A downgradient from Biobarrier A;
3) Monitor *cis*-1,2-DCE and vinyl chloride concentrations at well R-12 located within Plumelet B downgradient from the Biobarrier A; and
4) Monitor chlorinated ethene concentrations in wells R-4 and R-5 to determine if any effect from the Biobarrier B is evident;
5) Evaluate monitoring results for ORP, CO_2, dissolved gases, and the primary COCs for wells located in the pilot test areas.

The VOC analytical results for the June 2011 Event are presented in Table 3. VOC results that exceed the KDHE Tier 2 RSK residential levels at the pilot test monitoring wells from January 2007 through June 2011 (11 events performed after the December 2006 Pilot Test Injection Event) are shown in Table 7. Figures 4 through 7 show the groundwater concentrations of PCE, TCE, *cis*-1,2-DCE, and vinyl chloride, respectively, as measured in June 2011.

Results for dissolved gases and field parameters (DO and ORP) for January 2007 through June 2011 are included in Table 8. Groundwater samples collected from the pilot test monitoring wells were not analyzed for dissolved gases (MEE), or VFAs during the June 2011 Event

because most previous results for these parameters were non-detect or very low and concentrations not expected to increase.

5.3 Biobarrier Pilot Test Results and Discussion

While both chlorinated ethenes and ethanes are present in Plumelets A and B, the primary focus is on PCE and other chlorinated ethenes. With the exception of 1,1-DCA, PCE and its degradation compounds are the only COCs that consistently exceed their KDHE Tier 2 RSK residential levels in the downgradient portions of the plumelets. Therefore, this discussion focuses on changes in chlorinated ethene concentrations over time since the December 2006 Pilot Test Injection Event. Other COCs are mentioned if they exceed the KDHE Tier 2 RSK residential levels or if they are relevant to the discussion.

5.3.1 Biobarrier A (HRC® Injection)

Sample results from wells located near Biobarrier A were evaluated based on their location relative to the biobarrier (upgradient, sidegradient, or downgradient) and to their location relative to Plumelets A and B. Therefore, the wells were grouped for discussion in the following manner:

- Wells located sidegradient to Biobarrier A (MW-8 and R-7);
- Wells located downgradient of Biobarrier A within Plumelet A (MW-18, R-10, and MW-20); and
- Wells located downgradient of Biobarrier A within Plumelet B (R-11, R-12, and MW-21).

A discussion of the results for each group is provided below.

5.3.1.1 Sidegradient Wells (MW-8 and R-7)

Well MW-8 is located to the north (sidegradient) of both Plumelets A and B. Well R-7 is located downgradient of the south end of Biobarrier A within the southern portion of Plumelet A. Concentrations in MW-8 were detected in June 2011 at very low levels (0.1 J [estimated value at the detection limit] mg/L) for two primary chlorinated ethenes. These are the only VOC detections at this location since 2007; all other VOCs were non-detect (refer to Table 7). At former recovery well R-7, the concentrations of PCE, TCE, and *cis*-1,2-DCE in June 2011 were two to five times higher than all previous post-injection monitoring events. PCE and TCE exceeded the KDHE Tier 2 RSK residential levels with a concentration of 12 μg/L each. All other detected constituents are below their respective KDHE Tier 2 RSK residential levels, consistent with the last several events.

The Mann-Kendall analysis concluded that both wells have overall downward trends for all VOC analytes. However, the recent increase in PCE, TCE, and *cis*-1,2-DCE exhibited at R-7 between December 2009 and June 2011 is not captured as an increasing trend since the data set for this analysis extends back to 1998, when overall site concentrations were magnitudes greater than they were after the December 2006 Pilot Test. The reason for the recent increases in chlorinated ethene concentrations is not clear.

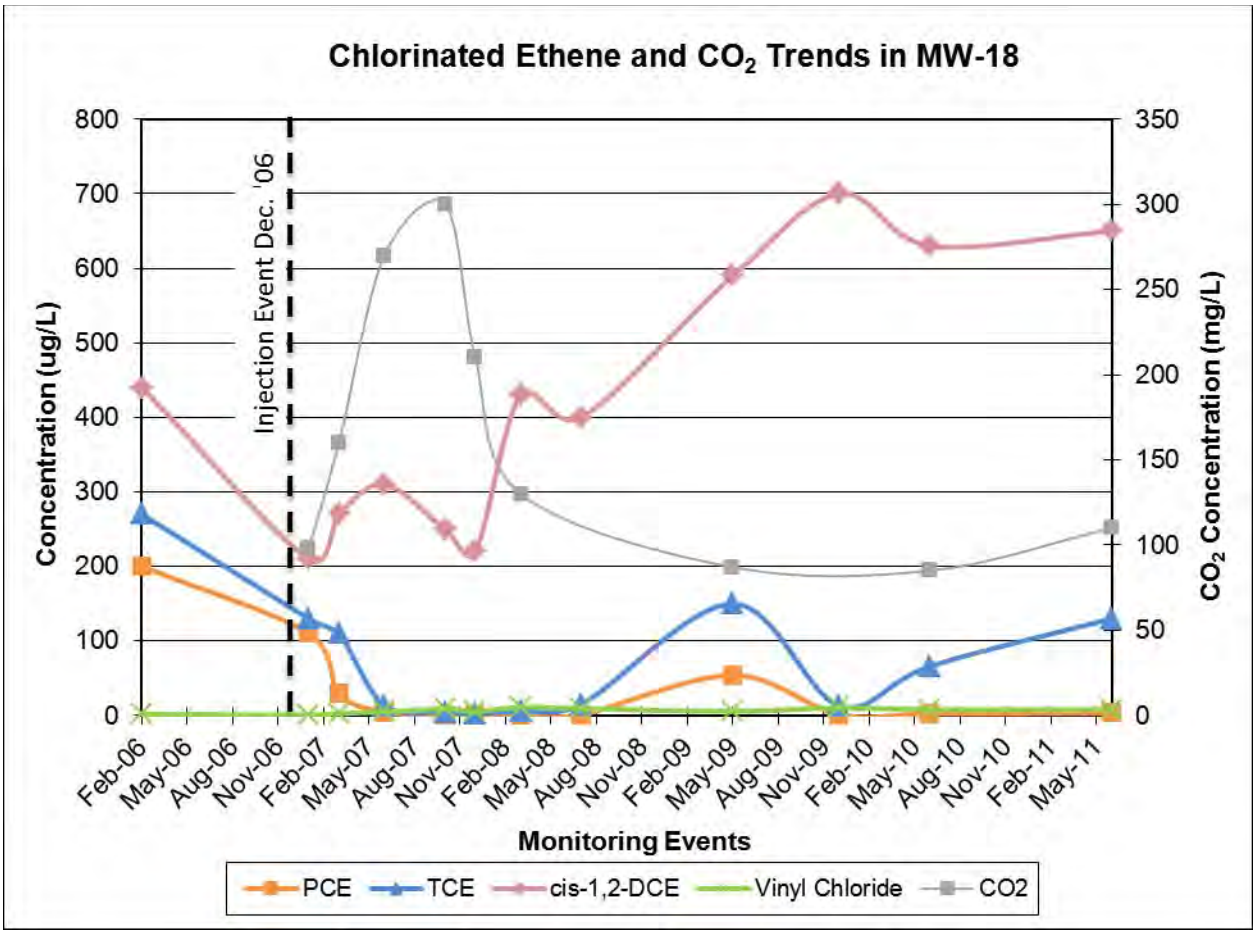
5.3.1.2 Downgradient Wells within Plumelet A (MW-18, R-10, and MW-20)

MW-18 and R-10 are located in Plumelet A, approximately 35 ft downgradient of Biobarrier A. MW-20 is located downgradient of MW-18, approximately 120 ft from the biobarrier. In June 2011, as in previous post-injection monitoring events, all three wells had chlorinated ethene concentrations that exceeded the KDHE Tier 2 RSK residential levels. Following the installation of the biobarrier in December 2006, concentrations in all three wells experienced a period of declining concentrations (until late 2007 through late 2009, depending on location and analyte), especially with regard to PCE and TCE. These declines have been followed by a gradual rebound to concentrations near the pre-injection levels. Vinyl chloride appears to have been stable (MW-18) or slowly increasing (MW-20 and R-10) throughout the post-injection monitoring period.

Specific details regarding recent concentration trends over time in the Plumelet A downgradient wells are provided below.

Well MW-18

During the June 2011 Event, PCE remained below the pilot test goal (50 μg/L) and the KDHE Tier 2 RSK residential level (5 μg/L) at MW-18. TCE increased to its January 2007 level in June 2011 (130 μg/L). The *cis*-1,2-DCE concentrations have increased gradually since December 2007 and in June 2011, was near its December 2009 high (700 μg/L) at 650 μg/L. Vinyl chloride concentrations also increased during the post-injection period but have been stable (between 5.6 μg/L and 11 μg/L) since October 2007. The trends for the chlorinated ethene concentrations in MW-18 over the time of the pilot test are shown in the graph below.



The data in Table 8 show that CO_2 concentrations have declined from a post-injection high of 300 mg/L to 85 mg/L in June 2010 and 110 mg/L in June 2011. ORP was high prior to the HRC® injection, decreasing to a minimum of -256 millivolt (mV) in October 2007 and increasing gradually since then to low, positive values beginning in May 2009. The rise in ORP and the decline of CO_2 indicate that the effect of the HRC® injection is weakening at MW-18.

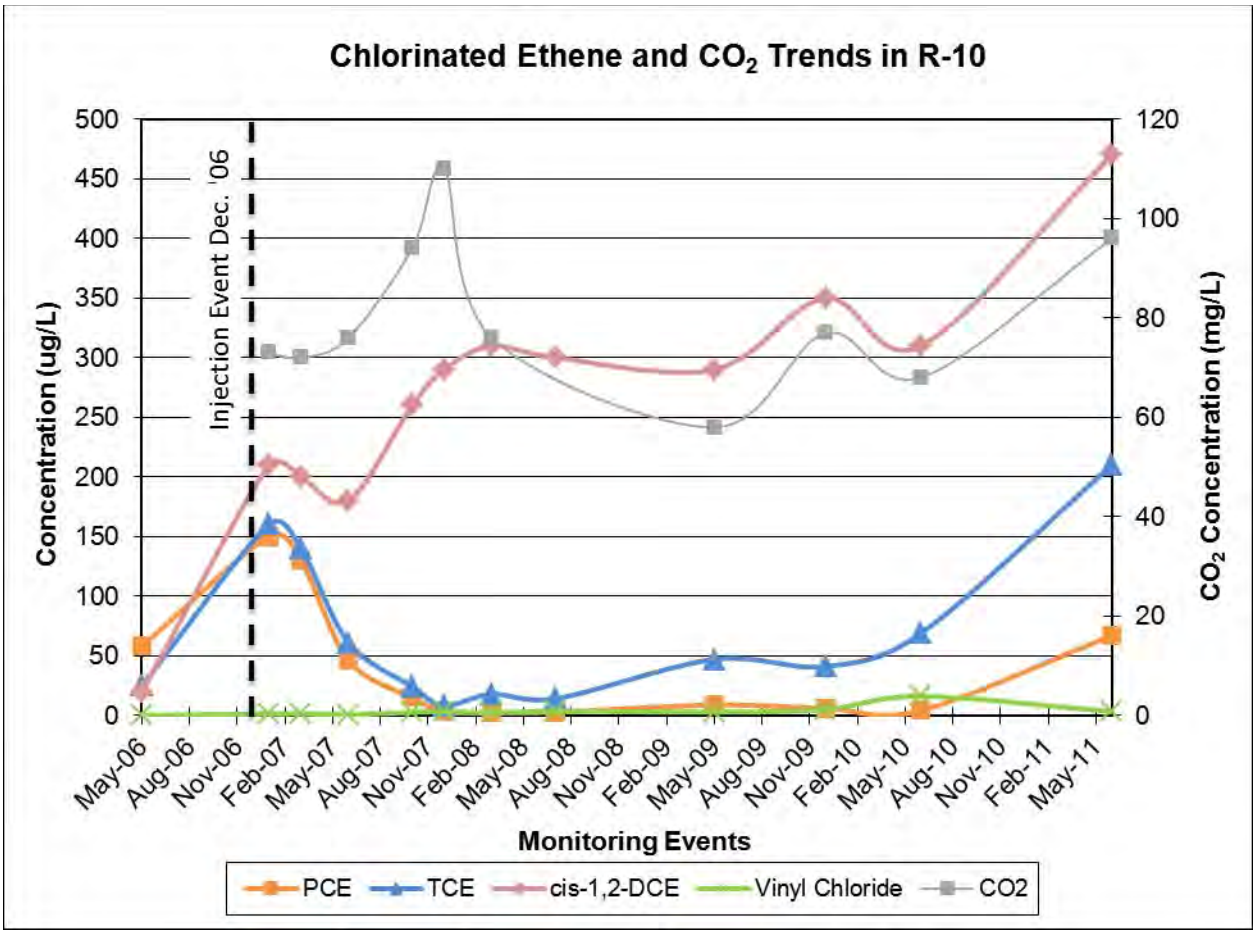
The Mann-Kendall analysis identified upward trends for *cis*-1,2-DCE, *trans*-1,2-DCE, and vinyl chloride. This trend is expected since these compounds are reductive dechlorination by-products of PCE and TCE. The *trans*-1,2-DCE concentrations are well below the KDHE Tier 2 RSK residential level of 100 μg/L.

TCE levels decreased following the injection until mid-2008, and have increased erratically since then. The Mann-Kendall analysis indicated an undetermined trend for TCE.

The Mann-Kendall trends for methane and ethane remain upward, yet samples have not been collected for these two dissolved gases since December 2009, and therefore the analysis for these parameters is unchanged since 2009.

Well R-10

Former recovery well R-10, which is located near MW-18, shows the expected downward concentration trends for PCE and TCE post-HRC® injection. Those concentrations reached minimums approximately one year after the HRC® injection and remained stable through the following year (longer for PCE). The PCE concentration rose to 67 μg/L in June 2011, up from 4.2 JL μg/L the previous year and well above the KDHE Tier 2 RSK residential level for PCE (5 μg/L). For TCE, a discernable increase was noted in May 2009, followed by a more precipitous rise beginning in June 2010. In June 2011, the TCE concentration (210 μg/L) was higher than the level observed in January 2007 (160 μg/L) shortly after biobarrier was installed. Both PCE and TCE concentrations currently exceed the pilot test goal (50 μg/L). The *cis*-1,2-DCE concentrations have increased more or less steadily following the injection of HRC® and have exceeded the KDHE Tier 2 RSK residential level for the entire monitoring period. Vinyl chloride, which peaked at 16 JL μg/L in June 2010, decreased to levels in June 2011 (3.3 μg/L) which are consistent with those exhibited throughout the monitoring period. The CO_2 concentration peaked in December 2007 and then decreased slightly and remained stable for the next two and half years. The CO_2 concentration in June 2011 (96 mg/L) is about 25 percent (%) higher than the previously stable level. The trends for the chlorinated ethene and CO_2 concentrations in R-10 over the time of the pilot test are shown in the graph below.



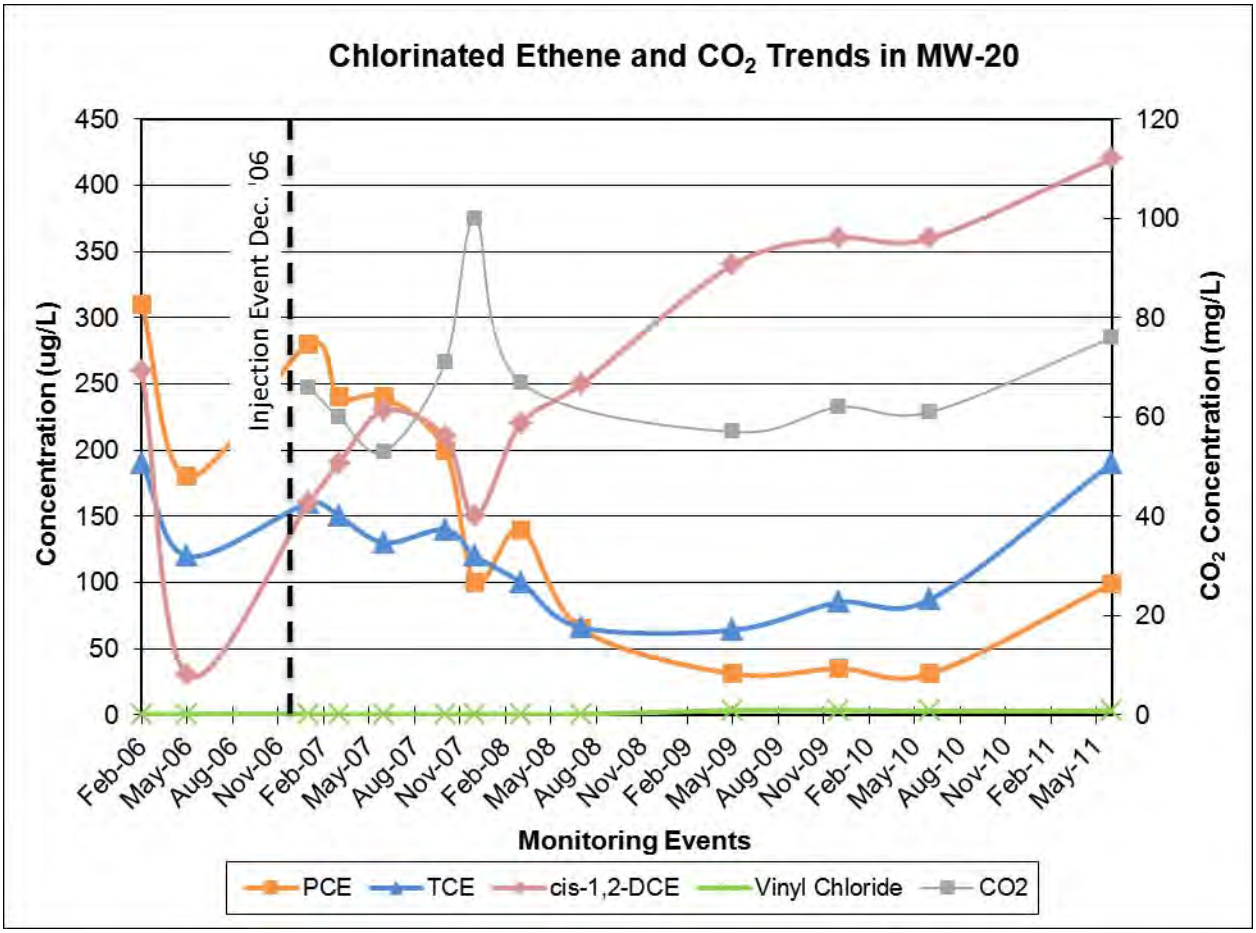
Results of the Mann-Kendall analysis identify methane and ethane as the only analytes with upward trends at R-10. However, dissolved gases have not been sampled since 2009, so the trend analysis results for these two analytes is unchanged since that time. The majority of other constituents maintain a downward trend for the data set that includes all results obtained beginning in September 1998.

Well MW-20

MW-20 is located near the downgradient extent of Plumelet A, 120 ft downgradient from the Biobarrier A injections. Despite the much longer distance from the biobarrier, the trends for chlorinated ethene and CO_2 concentrations are similar to well R-10. PCE concentration declined for about three and a half years following injection while TCE concentrations declined for about two and a half years. Following the period of declining concentrations, the PCE and TCE levels remained constant through June 2010. An increase in PCE and TCE was observed during the June 2011 Event. The concentration of PCE rose from 31 JL µg/L in June 2010 to 99 µg/L in June 2011 while TCE rose from 87 JL µg/L in June 2010 to 190 µg/L in June 2011. The concentration of *cis*-1,2-DCE has generally increased gradually since the biobarrier was

installed. Following the injection of HRC®, vinyl chloride remained below or near the detection limit until May 2009 and then increased to around 3 µg/L and remained stable since then. With the exception of vinyl chloride, the concentrations of PCE, TCE, and *cis*-1,2-DCE are approaching or exceed (*cis*-1,2-DCE) their pre-injection levels. The trends for chlorinated ethene and CO_2 concentrations in MW-20 over the time of the pilot test are shown in the graph below.

ORP values and DO levels have been in the positive range (except for the -28 mV ORP value in July 2008). The CO_2 concentration peaked at 100 mg/L one year after HRC® was injected and then decreased to a level near that observed immediately after injections (66 mg/L).



The Mann-Kendall analysis results for MW-20 indicate downward trends for all of the chlorinated ethene compounds; however, this trend is misleading since the data set extends back to September 1998 when concentrations were magnitudes greater than at the time of injection in December 2006. The steady increase in *cis*-1,2-DCE from the pre-injection timeframe through June 2011 indicates that reductive dechlorination is continuing to occur at this location. However, because ethene was not detected, there are no data to provide conclusive evidence that

cis-1,2-DCE and vinyl chloride are degrading. The recent increases in PCE and TCE concentrations since 2010 suggest that the effect of the HRC® injection may be dissipating at this location.

Methane is the only analyte that shows an upward trend using the Mann-Kendal statistical test. However, this dissolved gas has not been sampled since May 2009, and therefore the trend for this analyte is unchanged since 2009.

5.3.1.3 Downgradient Wells within Plumelet B (R-11, R-12, and MW-21)

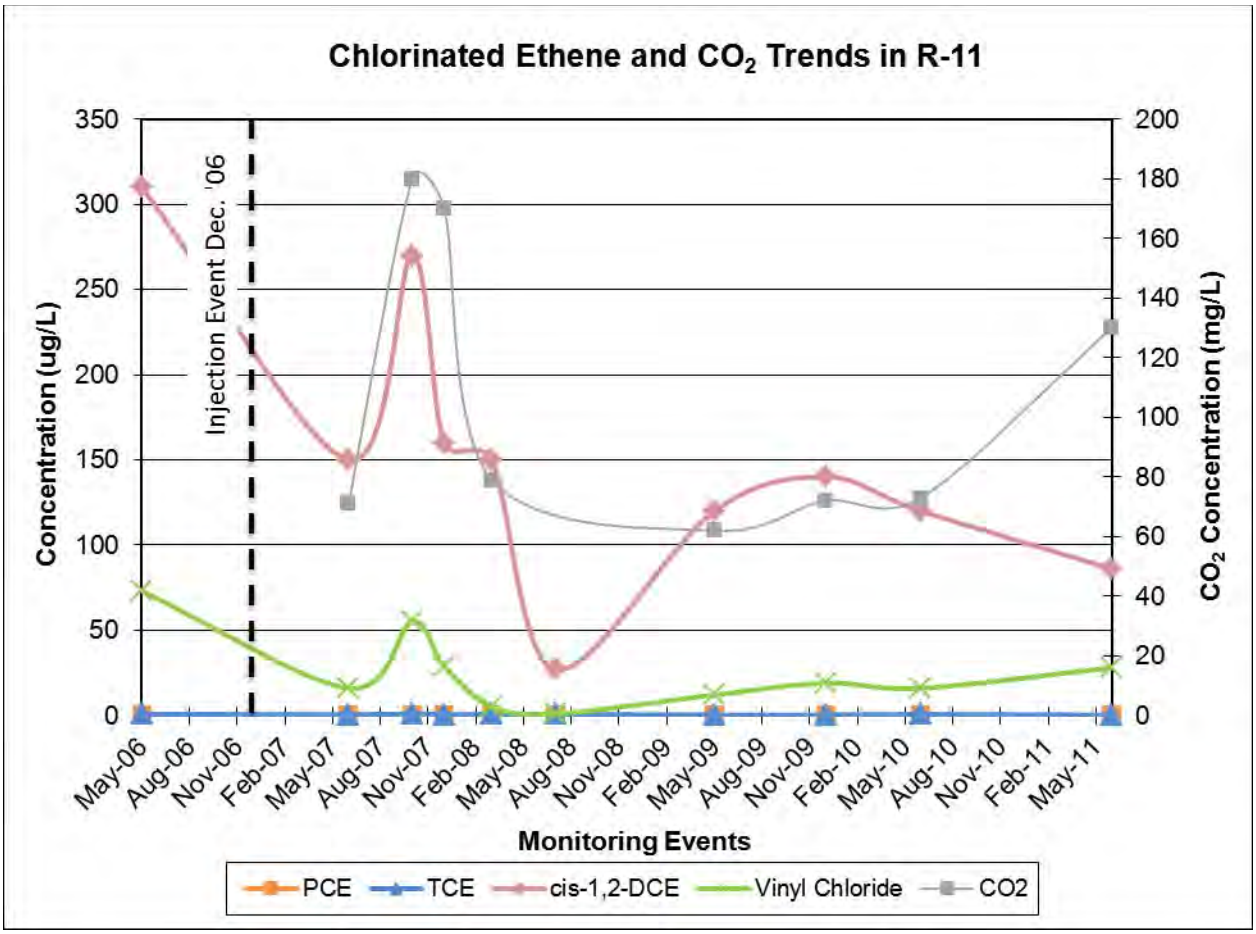
R-11 and R-12 are located within Plumelet B, approximately 35 ft downgradient of Biobarrier A, while MW-21 is located downgradient of R-11 approximately 65 ft from Biobarrier A. For these three wells, the concentrations of PCE and TCE prior to the pilot test injection were relatively low compared to wells within Plumelet A. The *cis*-1,2-DCE and vinyl chloride concentrations were relatively high compared to the Plumelet A wells because the presence of benzene, toluene, ethylbenzene, and xylene (BTEX) constituents in Plumelet B provided an electron source that fueled reductive processes in that area.

Specific details regarding recent COC concentrations over time in the Plumelet B downgradient wells are provided below.

Well R-11

The groundwater at R-11 is characterized by low levels of PCE and TCE with relatively stable, higher levels of *cis*-1,2-DCE, vinyl chloride, and 1,1-DCA, all of which exceeded the KDHE Tier 2 RSK residential levels in June 2011. Time trends for chlorinated ethene and CO_2 concentrations are shown in the figure below. Low concentrations below KDHE RSK Tier 2 residential levels of 1,2-DCA, 1,1-DCE, and benzene are also present at R-11).

The CO_2 concentrations have been fairly consistent since a spike occurred a year after HRC® injections; however, the CO_2 concentration almost doubled from 73 JL mg/L in June 2010 to 130 mg/L in June 2011. ORP has remained between -43 mV and -109 mV throughout the post-injection monitoring period.



The Mann-Kendall analysis indicates downward trends for all of the chlorinated ethenes, with the exception of *trans*-1,2-DCE and vinyl chloride having undetermined trends. However, the data set used in performing this analysis extends back to 1998, when overall site concentrations were magnitudes greater than they were around the time of injection in December 2006. Therefore, the statistical test probably does not accurately identify post-injection trends.

The low concentrations of PCE and TCE and higher concentrations of *cis*-1,2-DCE and vinyl chloride suggests that reductive dechlorination has occurred at R-11. However, the absence of ethene suggests that the process has stalled. Other than the early spike in CO_2, the *cis*-1,2-DCE and vinyl chloride concentrations, and the persistent reducing conditions, the December 2006 HRC® injections appear to have had little effect on contaminant degradation.

Well R-12

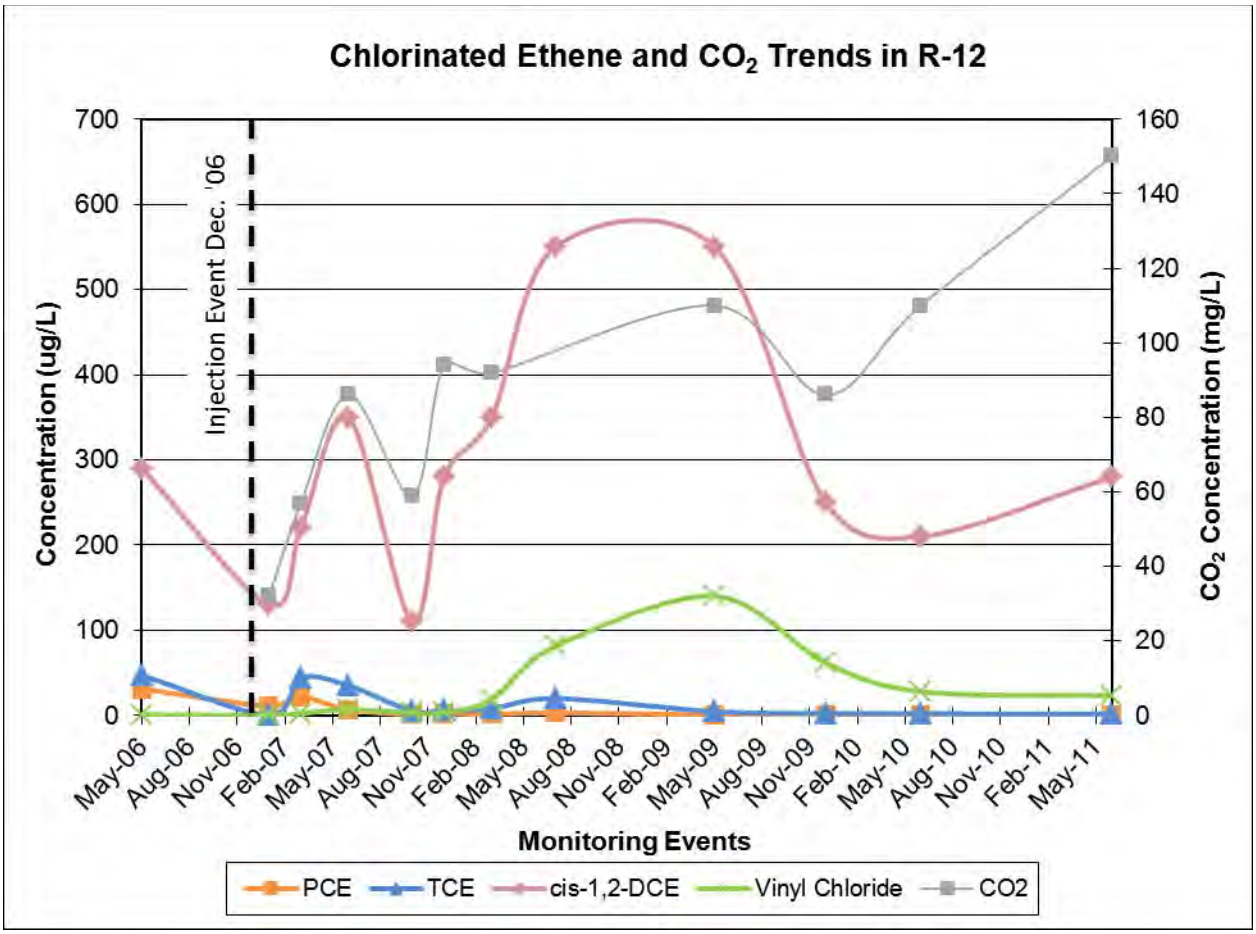
This former recovery well is located near the northern end and downgradient of Biobarrier A. The chloroethene and CO_2 trends (shown on the figure below) are somewhat similar to well R-11, except the *cis*-1,2-DCE and vinyl chloride spikes occurred later, and CO_2 levels continue to rise. PCE and TCE were initially above the KDHE Tier 2 RSK residential levels but both

have remained below those levels between May 2009 and June 2011 (no rebound). The *cis*-1,2-DCE concentration declined from a high of 550 μg/L in May 2009 and has remained below 300 μg/L. Vinyl chloride concentrations have been above the KDHE Tier 2 RSK residential level since March 2007, but declined sharply after peaking at 140 μg/L in May 2009. Additionally, 1,1-DCA has remained above the KDHE Tier 2 RSK residential level (25 μg/L) throughout the monitoring period. The trends for the chlorinated ethene concentrations in R-12 over time are shown in the graph below.

ORP values have remained negative since June 2007, ranging between -1 mV and -113 mV.

The Mann-Kendall analysis indicates upward trends for five chlorinated VOCs (cVOCs) (1,1-DCE, 1,2-dichlorobenzene, 1,2-DCA, vinyl chloride, and trans-1,2-DCE) as well as benzene. The upward trend for 1,2-dichlorobenzene is attributed to the lack of detections prior to March 2008. However, all detections, including the June 2011 detection of 2.7 μg/L, are far below the KDHE Tier 2 RSK residential level of 600 μg/L. Similarly, 1,1-DCE, 1,2-DCA, and *trans*-1,2-DCE have remained below the KDHE Tier 2 RSK residential levels throughout the monitoring period. Note that although vinyl chloride has recently declined from its peak concentration of 140 μg/L in June 2009, the upward trend indicated by the Mann-Kendall test is based on a sample set of 13 detections.

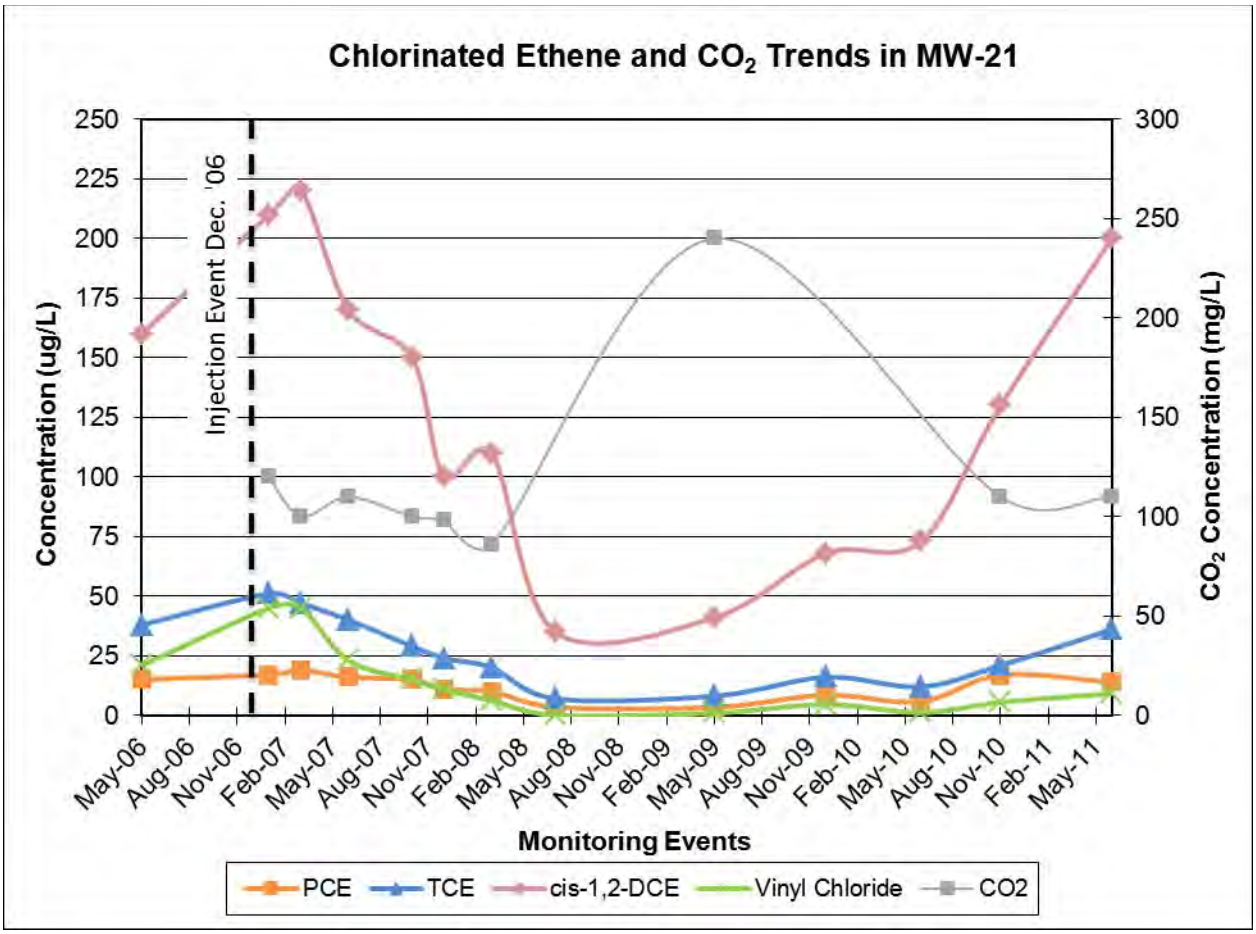
The Mann-Kendall test also indicated that CO_2, methane, and ethane have increasing trends. Methane concentrations in that well have risen over time from non-detect to 0.89 mg/L (May 2009), while CO_2 concentrations have increased from 32 mg/L (January 2007) to 150 mg/L (June 2011). Note that the upward trends for ethane and methane in R-12 is attributed to limited data, since these gases were only detected a few times and have not been analyzed since May 2009.



Well MW-21

MW-21 is located on the intersection axis at Plumelets A and B, about 65 ft downgradient of Biobarrier A. Overall, it appears that the effects of the HRC® injections has been exhausted at MW-21, with the maximum effects occurring during the initial two years.

The concentrations of all chlorinated ethenes declined for about two years following the HRC® injections. The concentrations of PCE, *cis*-1,2-DCE, and vinyl chloride fell below their KDHE Tier 2 RSK residential levels during this time. This was followed by about two years of stable to slightly increasing chloroethene concentrations. Since May 2009, the levels of all four chloroethenes have increased and all except vinyl chloride have rebounded to pre-injection levels. The trends for the chlorinated ethene concentrations in MW-21 over the time of the pilot test are shown in the graph below. 1,1-DCA has remained above the KDHE Tier 2 RSK residential level throughout the monitoring period.



The Mann-Kendall analysis indicates downward trends for all the chlorinated ethenes, with the exception of *trans*-1,2-DCE which has an undetermined trend. Since the data set used in performing this analysis extends back to 1998, when overall site concentrations were magnitudes greater than they were around the time of injection in December 2006, any recent changes in concentrations due to the presumed waning effect of the HRC® injections are not identified by the Mann-Kendall test.

5.3.2 Biobarrier B (CAP18-ME™ Injection)

For this report, the sample results from wells monitored for the Biobarrier B were not evaluated extensively, as the biobarrier appears to have not significantly reduced contaminant concentrations. Monitoring results for former recovery well R-5, the primary well used to evaluate the performance of Biobarrier B, do not indicate that reductive dechlorination has been enhanced over the monitoring period. In fact, chloroethene concentrations have increased above pre-injection levels. PCE, TCE, and *cis*-1,2-DCE were present at concentrations above the

KDHE Tier 2 RSK residential levels throughout the monitoring period, and vinyl chloride and 1,1-DCE exceeded those levels during most sampling events. In contract, former recovery well R-6, although not extensively contaminated initially, has undergone reductive dechlorination over the monitoring period. Initially, R-6 contained exceedance concentrations of PCE and TCE only; however, since the June 2010 Event, the PCE and TCE concentrations have fallen below the KDHE Tier 2 RSK residential levels while *cis*-1,2-DCE and vinyl chloride concentrations currently exceed those levels. The data is presented in Table 7.

5.4 Pilot Test Conclusions and Future Considerations

The injection of HRC® in Biobarrier A has provided significant reductions in contaminant concentrations in downgradient wells, although recent upticks suggest that the time-frame for the effectiveness of the HRC® injection may be coming to an end. The injection of CAP18-ME™ in Biobarrier B has had little effect on downgradient contaminant concentrations, other than the dechlorination recently observed in R-6. On that basis, use of CAP18-ME™ for biostimulation is not recommended for the site.

Other issues that the June 2011 Event has helped to clarify include:

1) The direct-push technique used to inject HRC® and the site lithologic conditions allowed successful delivery and distribution of the electron donor product;
2) Groundwater conditions at the site are hospitable to the accelerated growth of indigenous bacteria via biostimulation;
3) The residual effects of the December 2006 HRC® injections are diminishing in many wells located downgradient and sidegradient to Biobarrier A;
4) Stable or increasing levels of *cis*-1,2-DCE and vinyl chloride may indicate that reductive dechlorination reactions may have stalled at that stage; and
5) Chloroethane concentrations have not decreased over the monitoring period.

It has been established in the bioremediation literature that a fairly large number of facultative aerobic bacteria are capable of dechlorinating PCE and TCE to *cis*-1,2-DCE under moderately low reducing conditions, assuming that competing electron acceptors, such as nitrate and sulfate, have undergone prior reduction. However, the final steps in the reductive dechlorination process for chloroethenes are favored by sulfate-reducing or slightly methanogenic conditions. The optimal ORP range for the reactions to occur is approximately -150 mV to -300 mV. The “right” bacteria also are required for reductive dechlorination of chloroethenes, especially for the complete degradation of *cis*-1,2-DCE and vinyl chloride to ethene. These compounds may tend to accumulate without further degradation if the correct strains of *Dhc* are not present. In other words, even though favorable geochemical conditions for reductive dechlorination may exist, if

the specific strains of *Dhc* that can completely transform PCE to ethene are not present, complete degradation of chloroethenes is unlikely.

Similarly, the degradation of chloroethanes, such as 1,1-DCA, requires the “right” bacteria. *Dehalobacter* sp. (*Dhb*) has been identified recently as bacteria that support the degradation of 1,1,2-TCA and 1,1-DCA. Furthermore, the presence of 1,1,2-TCA has been shown to inhibit the biodegradation abilities of *Dhc*. Luckily, these two bacteria strains are known to work synergistically, providing complete degradation of both chlorinated ethenes and ethanes.

6.0 Monitoring Results for Phytoremediation Plots Located in On-Site Plumelets B and C

In accordance with recommendations stated in the ***Final Revision 1 Feasibility Study Report*** (URS, June 2009) and subsequent correspondence with KDHE, Chevron EMC implemented phytoremediation as an IM for groundwater within the on-site portions of Plumelets B and C. In April 2010, two stands of deep-rooted willow trees were planted in these portions of the site (Plots B and C in Plumelets B and C, respectively). Installation activities are described in the ***Documentation of Phytoremediation Interim Measure Activities*** letter dated September 16, 2010 (URS, September 2010).

The objectives of the Phytoremediation IM are to:

- Reduce the potential for off-site migration of contaminants from Plumelets B and C by planting two stands of deep-rooted willow trees to serve as groundwater hydraulic barriers; and
- Reduce chlorinated solvent concentrations to below KDHE Tier 2 RSK residential levels via phytoremedial processes (rhizodegradation and phytovolatilization) and natural attenuation.

Phytoremediation plantations were installed in April 2010 at Plumelets B and C where the bedrock surface is relatively shallow (approximately 20 ft below ground surface [bgs]). When the tree stands reach the stage of growth called "canopy closure" (anticipated in 2012 or 2013), the quantity of water removed during the growing season from the shallow, unconfined saturated zone via transpiration will lower the water table sufficiently to create a hydraulic impediment to off-site contaminant migration. In addition, dissolved-phase COCs in groundwater will be removed or degraded by various phytoremediation processes, including biodegradation by microbes in the root-zone of the trees *(rhizodegradation*) and plant uptake followed by volatilization (*phytovolatilization*). Rhizodegradation is considered the dominate mechanism for removal of BTEX and cVOCs, although a portion of the cVOCs will be phytovolatilized and eventually undergo photodegradation in the atmosphere.

To establish the plantations, hardwood willow cuttings (*Salix alba*) were planted in a rooting matrix installed within an 8-inch borehole. Long willow "poles" (approximately 8 ft long) were planted 7.5 ft deep within the borehole/rooting matrix. The bottoms of the poles were installed very close to the groundwater surface at the time of planting. For Plot B, linear rows of trees were spaced 10 ft apart, and the trees within the rows were planted on 10-ft centers. For Plot C, linear rows were spaced 12 ft apart in the north-south direction, and the trees within the rows

were planted on 10-ft centers. Thirty-six (36) trees were planted in Plot B and 64 trees were planted in Plot C. Tree placements in Plots B and C are depicted on Figures 10 through 13, which also show the PCE, TCE, *cis*-1,2-DCE, and vinyl chloride plumes, respectively.

As described in the ***Phytoremediation Interim Measure Workplan*** (URS, March 2010), an irrigation system is not required for the plantations because the saplings' deep root systems allow them to obtain water directly from the saturated zone. This phenomenon is evidenced by the continued growth during recent periods of lower than normal rainfall.

6.1 Phytoremediation Tree Plantation Growth Summary

Since planting occurred, the phytoremediation plots have been monitored on a regular basis to evaluate the growth and health of the willow trees. On a monthly basis (except during dormant winter months), each tree is observed and measured and the information is recorded on an inspection form. Observations include the color and condition of the leaves and the presence of weeds and pests. Measurements include the tree's current height and rough trunk diameter.

Table 9 provides a summary of height growth through August 2011. The average tree height in June 2010 was 2.23 ft. By the end of the first growing season in December 2010, the average tree height had increased to 4.25 ft. Ten trees (four in Plot B and six in Plot C) exhibited little to no growth during 2010 and were subsequently replaced in April 2011. The shaded cells in Table 9 indicate the 10 replanted trees. Ten percent mortality is typical for year one phytoremediation stands, so the tree loss observed (10%) is close to the industry norm.

Although the 2011 cumulative precipitation for Wichita is below average, the trees have grown steadily during the first five months of the 2011 growing season. Between April and August 2011, the average tree height rose from 4.52 ft to 7.57 ft, an average increase of 3.05 ft. The average height increase in 2011 is greater than that observed for the same period last year. During the August 2011 inspection, 33 trees exhibited new leaf growth, whereas only 3 trees were noted as having brown leaves and appeared in poor condition.

A more comprehensive growth summary for the 2011 growing season will be prepared as a separate document. This summary will include the information described above, plus additional information, such as plan view maps that indicate tree height for each plot.

6.2 Groundwater Results for Phytoremediation Plots B and C

The ***Phytoremediation Interim Measure Monitoring and Maintenance*** (M&M) ***Plan*** (URS, August 2011) stated that annual groundwater quality monitoring will be performed using the existing monitoring well network to determine COC concentrations within and/or adjacent to the

tree stands. Since the willow trees are immature, the data collected during both the 2010 and 2011 Annual Events represents baseline conditions for future evaluations of the effectiveness of the trees to remove or degrade COCs.

In June 2010, samples were collected from wells MW-2, MW-4, MW-17S, MW-26, MW-27, MW-28, and R-1. In June 2011, samples were collected from these same wells with the addition of newly installed monitoring wells P-17S, P-17D, P-18, and P-19. Table 10 presents the VOC analytical results for both monitoring events. Values that exceed the KDHE Tier 2 RSK residential levels are shaded in the table.

With the one exception of 5.3 μg/L TCE at MW-4 in June 2011, groundwater samples collected from downgradient wells P-17S, P-17D, and MW-4 and side gradient well MW-2 did not exceed KDHE Tier 2 RSK residential levels. The June 2011 TCE result at MW-4 slightly exceeds the screening value of 5 μg/L. Newly installed well P-18 had exceedances of ten VOCs while newly installed well P-19 has exceedances for PCE, TCE, *cis*-1,2-DCE, and vinyl chloride. The other five wells exhibited similar numbers of COC exceedances for both the June 2010 and June 2011 events. Relative changes in COC concentrations over that time period are not presented since these results are considered baseline data to be used for future evaluations of the phytoremediation IM effectiveness.

Historical groundwater data and analytical results for the June 2010 and June 2011 monitoring events were used to prepare the COC isoconcentration maps for on-site Plumelets B and C. Figures 10 through 13 depict the revised extents of the PCE, TCE, *cis*-1,2-DCE, and vinyl chloride concentrations for Plumelets B and C, respectively. These figures depict the historical outline of the Plumelets established during the ***Final Revision 0 Remedial Investigation Report*** (URS, November 2007), along with the current interpretation of the extent of COC exceedances for each plumelet. The following data were used to prepare these maps:

- Data collected at thirty membrane interface probe (MIP) points in July 2007, including seven groundwater grab samples collected in the vicinity of on-site Plumelets B and C. Analytical results for the MIP groundwater grab samples were presented previously in the ***Results of the MIP Investigation*** letter dated September 28, 2007 (URS, September 2007).

- Data for groundwater grab samples collected in April 2010 during the installation of the 3-inch boreholes prior to planting the willow trees; these samples were collected at two locations in Plot B and seven locations in Plot C. The results were presented previously in the ***Documentation of Phytoremediation Interim Measure Activities*** letter dated September 16, 2010 (URS, September 2010).

The compiled data indicate that COC concentrations in Plumelet C are higher and this plumelet is slightly larger in areal extent than previously thought. Based on the COC distribution, it appears that Plumelet C may have merged with Plumelet F.

The following additional observations regarding the revised COC isoconcentration maps are noted:

- A plume of non-chlorinated hydrocarbons (petroleum hydrocarbons depicted on Figure 8) that exceeds the KDHE Tier 2 RSK residential levels extends across the two phytoremediation plots, spanning from the western side of Plot C to the east-central portion of Plot B;
- Groundwater at MW-26, located inside Plot C, contains high levels of chlorinated and non-chlorinated hydrocarbons.
- The concentrations of cVOCs present in Plot C are several orders of magnitude higher than those in Plot B, where only cis-1,2-DCE, 1,1-DCE, and vinyl chloride slightly exceed their KDHE Tier 2 RSK residential levels.

Although the understanding of site conditions has changed since the IM was conceived, it appears that phytoremediation remains an appropriate remedy for Plumelet C. A beneficial outcome of the revised understanding of groundwater conditions is that the significantly different COC concentrations between the two plots will allow an evaluation of phytoremediation effectiveness for the full range of COC concentrations observed across the entire site.

6.3 Monitoring and Maintenance Activities for the Phytoremediation Plots

The Phytoremediation IM M&M Plan was delivered to KDHE on August 12, 2011. The Phytoremediation IM M&M Plan describes both M&M activities already performed and those planned for future years.

7.0 Monitored Natural Attenuation Results for Plumelets D, E, and F

In accordance with recommendations stated in the ***Final Revision 1 Feasibility Study Report*** (URS, June 2009) and subsequent correspondence with KDHE, natural attenuation parameters will be monitored at Plumelets D, E, and F on a quarterly basis for one year to demonstrate the effectiveness of MNA as the selected remedy for these plumelets. Descriptions of the COC and geochemical patterns within each plumelet were presented in the ***Final 2010 Annual Groundwater Monitoring Report*** (URS, January 2011). The 2010 Annual Event conducted in June 2010 was the first of four quarterly sampling events planned. The November 2010 and March 2011 MNA sampling events served as the second and third quarterly events, respectively. Results for the 2011 Annual Event conducted in June 2011, the fourth and final quarterly MNA sampling event, are presented below.

Samples were collected from the following 12 wells: MW-5 and USD-4 (Plumelet D), PMW-4, PMW-7, USD-1, and USD-MW-3 (Plumelet E), and MW-25, TW-2A, PMW-5, PMW-8, USD-2, and USD-3 (Plumelet F). Figure 14 shows the well locations. The groundwater samples collected were analyzed by Lancaster Laboratories, a KDHE-certified laboratory, for the following analytes:

- VOCs by EPA Method SW8260B;
- Geochemical parameters, including alkalinity (to pH 4.5 and to pH 8.3) using EPA Standard Method (SM) 2320B; anions (chloride, nitrate, and sulfate) using EPA Method E300.0; and total organic carbon (TOC) using SM5310C; and
- CO_2 and dissolved gases (MEE) using EPA Method SW8015BMod.

Additionally, DO, ORP, pH, and ferrous iron were measured in the field at the time of sample collection.

Table 11 presents analytical data for each cVOC that exceeded KDHE Tier 2 RSK residential levels in at least one sample during any of the quarterly events. The cVOC results for the earlier 2009 Annual Event are also included in the table. During the evaluation period, PCE, TCE, *cis*-1,2-DCE, vinyl chloride, and methylene chloride were found to exceed their KDHE Tier 2 RSK residential levels. Methylene chloride was detected only in the June 2010 event and is considered to be a laboratory artifact.

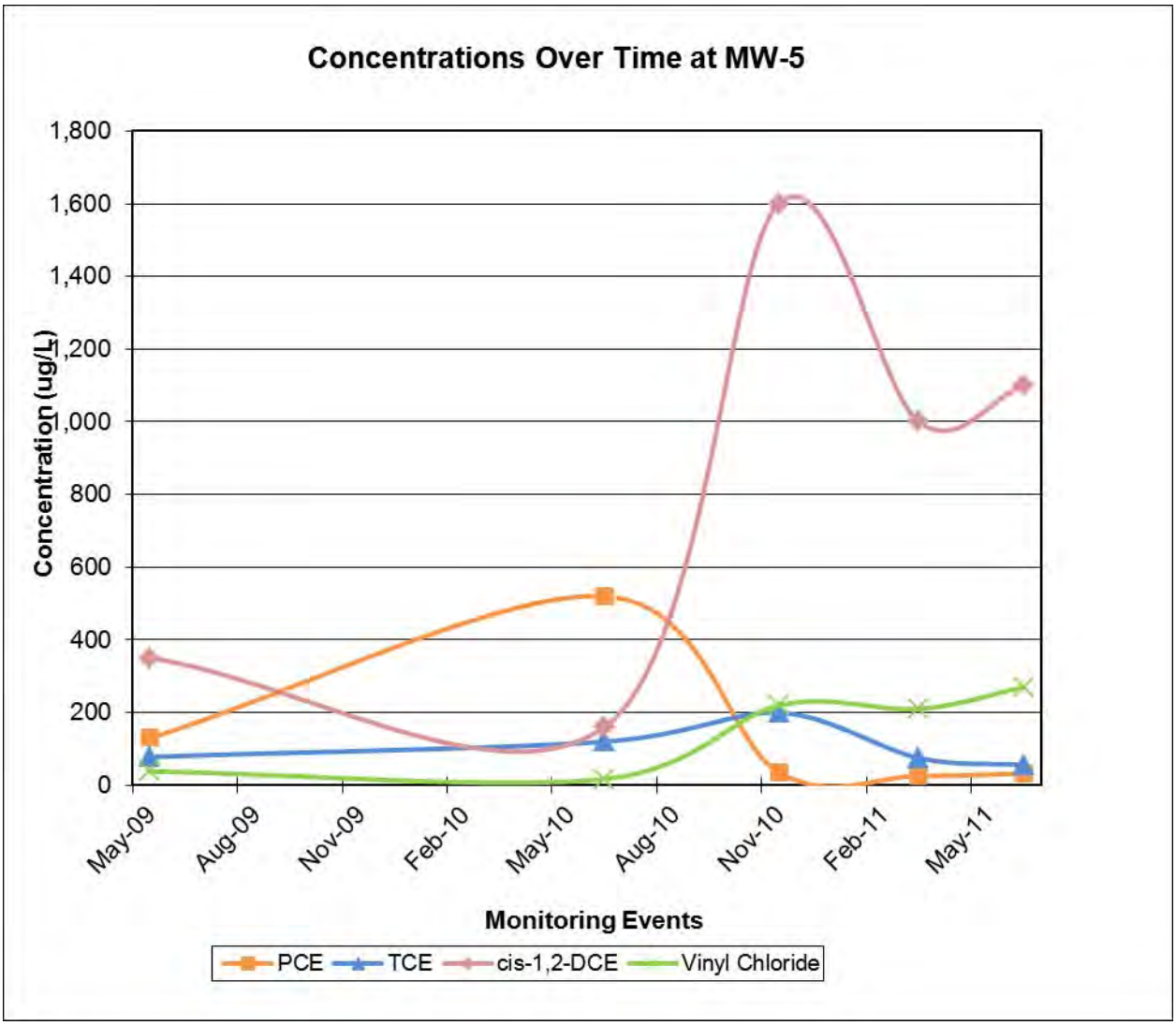
Analytical results for the five monitoring events (May 2009, June 2010, November 2010, March 2011, and June 2011) were used to evaluate cVOC trends over time. The ***2010 Annual Groundwater Monitoring Report*** (URS, January 2011) discusses historical trends for each well

that has a significant amount of data. Figure 14 shows the location of the current monitoring wells and the VOC exceedances for the five monitoring events.

Table 12 presents the results for geochemical parameters that were measured during the June 2010, November 2010, March 2011, and June 2011 monitoring events to evaluate MNA effectiveness for Plumelets D, E, and F. Some geochemical parameters were not detected for most or all sampling events. These include alkalinity to pH 8.3, MEE (detected only at MW-5), and ferrous iron (detected only twice at MW-5). In addition, the variation in pH throughout the study area was small and within the range favorable for microbial growth.

7.1 Evaluation of Plumelet D

Most of Plumelet D lies north of the center of the northern site boundary (see Figure 14). Historically, this plumelet has contained PCE and petroleum hydrocarbon (i.e., fuel constituents). Over time, PCE has partially dechlorinated to TCE, *cis*-1,2-DCE, and vinyl chloride and the petroleum hydrocarbon concentrations have dropped to non-detect or near non-detect concentrations. Well MW-5 is the primary well used to monitor MNA effectiveness for Plumelet D during the evaluation period. Well USD-4 is used to evaluate the off-site portion of Plumelet D. The PCE concentrations in MW-5 have generally decreased since the May 2009 Event, while the TCE and *cis*-1,2-DCE concentrations first increased and then decreased since that time. The vinyl chloride concentrations have increased by an order of magnitude since the May 2009 Event. The diagram below shows the chlorinated ethene concentration trends over time during the evaluation period. It should be noted that PCE and TCE concentrations were lower in the years immediately prior to May 2009.



Although BTEX concentrations have fluctuated over time, they followed a generally downward trend from the mid-1990s until 2006, when a spike in the concentrations of ethylbenzene, toluene, and xylenes was observed. In June 2011, no BTEX concentrations exceeded their KDHE Tier 2 RSK residential levels at MW-5. It is likely that these petroleum hydrocarbons have promoted reductive dechlorination of chlorinated ethenes by serving as electron donors.

Only one chlorinated ethene exceedance was observed at USD-4 during the evaluation period (a PCE concentration of 8.0 µg/L in May 2009).

The results for certain geochemical parameters (CO_2, alkalinity, nitrate, sulfate, ORP, pH, ferrous iron, and TOC) were used to evaluate natural attenuation processes in Plumelet D. The following trends were observed:

- CO_2 is the end mineralization product of both chlorinated and non-chlorinated hydrocarbons (and other organic materials); therefore, it provides a general indication of the level of microbial activity. At MW-5, CO_2 levels have historically been more than double the background concentration and higher than the other Plumelet D, E and F wells;

- Alkalinity levels are elevated in MW-5 compared to other wells within Plumelets D, E, and F. Because alkalinity is a function of CO_2 levels, increased alkalinity is often an indication of increased microbial activity;

- Nitrate has not been detected at MW-5, although it was observed at all other wells in Plumelets D, E, and F, except TW-2A in Plumelet F. Nitrate is an electron acceptor that must be reduced before any significant reductive dechlorination can occur. The lack of nitrate at MW-5 indicates that petroleum hydrocarbons have served as electron donors in this area;

- Historical sulfate concentrations in the Plumelet D, E, and F wells range from 92.5 mg/L to 2,840 mg/L (Table 12). In June 2011, sulfate at MW-5 was 887 mg/L, which is in the lower third of the historical range of the plumelets, and has been declining since November 2010. Initial stages of reductive dechlorination at MW-5 do not appear inhibited at the current sulfate concentration. As sulfate concentrations continue to decline, increased reductive dechlorination is expected.

- The values of the field parameters ORP, pH, and ferrous iron at MW-5 indicate that the groundwater conditions in Plumelet D are different (more reduced) compared to the other plumelets. MW-5 is the only well where negative ORP values were observed; the pH is slightly depressed compared to the other wells (typical for reductive processes); and ferrous iron was detected in two of the events, indicating that iron oxyhydroxides are dissolving in the reducing environment;

- MW-5 is the only MNA well where ethane and ethene, daughter products of reductive dechlorination of vinyl chloride, were detected. Ethane may also be a daughter product of reductive dechlorination of chlorinated ethanes (e.g., 1,1,1-TCA), since low concentrations of chlorinated ethanes have been detected at MW-5 in the past;

- TOC levels at MW-5 declined from 3.5 mg/L to 1.8 mg/L over the one year monitoring period. TOC is an indicator of the presence of electron donor compounds in groundwater; and

- Methane was detected at MW-5 during each monitoring event. Only one other well in Plumelets D, E, and F had a detection of methane (0.006 mg/L in Plumelet E well USD-1). The presence of methane may indicate that methanogenesis is occurring under strongly reducing conditions, at least in localized regions in the saturated zone. Methane also forms from the degradation of chlorinated methanes, such as carbon tetrachloride or chloroform.

In summary, the field and laboratory analytical data indicate that geochemical conditions are sufficiently conditioned in Plumelet D to promote the initial stages of reductive dechlorination (i.e., sulfate reduction and degradation of PCE and TCE). As sulfate concentrations decline further via reduction to sulfide, increased reductive dechlorination is expected. It should become clear during future MNA monitoring whether the remaining electron donors in groundwater are sufficient to promote complete dechlorination of the remaining cVOCs.

7.2 Evaluation of Plumelet E

Plumelet E is located northwest of the northwest corner of the site. No direct connection to any of the on-site plumes has been discovered. Wells USD-1 and USD-MW-3 were used to monitor the effectiveness of MNA at Plumelet E over time. Historically, these wells have contained mostly PCE (at levels below 100 μg/L), with minor detections of TCE and carbon tetrachloride. TCE or other PCE degradation compounds have not been detected in significant quantities in Plumelet E.

In both wells, PCE was the only VOC to exceed its KDHE Tier 2 RSK residential level during the evaluation period. The PCE concentrations at USD-1 have decreased steadily from 100 μg/L to 39 μg/L over the monitoring period, while TCE declined from 3.6 μg/L to 1.6 μg/L. At well USD-MW-3, the PCE concentration remained constant from May 2009 to March 2011 and then decreased by half (from 15 μg/L to 7.5 μg/L) in June 2011. Other than low levels of TCE in USD-1, PCE degradation products remained at or near their analytical detection limits in both wells.

Regarding geochemical conditions, ORP values for all Plumelet E wells remained positive, indicating that oxidation/reduction conditions are not conducive to reductive dechlorination in Plumelet E groundwater. Additionally, significant concentrations of competitor electron acceptors nitrate and sulfate are present. The alkalinity values, ferrous iron, nitrate, and CO_2

concentrations observed during the monitoring period were similar to the values observed in background wells in June 2010. TOC levels are low, in the 1 mg/L to 3 mg/L range in both wells.

In summary, although contaminant concentrations in Plumelet E are relatively low, field and laboratory analytical results indicate that significant biological activity is not occurring. Lacking the presence of a suitable electron donor, the geochemical conditions are likely to remain unfavorable (too oxidizing) for significant reductive dechlorination processes to occur. However, PCE is the only cVOC that exceeds the KDHE Tier 2 RSK residential level, and its concentration is gradually declining in both wells.

7.3 Evaluation of Plumelet F

Plumelet F is located to the west and southwest of the western site boundary, generally following the groundwater gradient in a southwesterly direction. As mentioned in Section 6.2, Plumelets C and F may have merged over time. This interpretation was made based on the VOC results for groundwater grab samples collected in April 2010 from tree boreholes in the phytoremediation plots (reported in the ***Documentation of Phytoremediation Interim Measure Activities*** letter [URS, September 2010]). The VOC results for the grab samples from some of the Plot C boreholes are very similar to those for Plumelet F wells USD-2 and USD-3; however, there is insufficient historical evidence to determine if they are from the same source.

Historically, this plumelet contained primarily TCE with lower concentrations of PCE. During the MNA monitoring period, the degradation product *cis*-1,2-DCE was detected at moderately high concentrations (up to 1,000 μg/L), but vinyl chloride was not detected. Trace amounts of chlorinated ethanes have been detected, both historically and currently. Other than sporadic, minor detections, petroleum hydrocarbons that could serve as potential electron donors have not been observed.

Wells USD-2 and USD-3 were used to evaluate the effectiveness of natural attenuation in the more contaminated upgradient portion of Plumelet F, while wells PMW-5, PMW-8, TW-2A, and MW-25 were used to evaluate the downgradient portion.

Although the PCE and TCE concentrations in upgradient wells USD-2 and USD-3 have fluctuated over the MNA monitoring period, their concentrations have declined in both wells. Well USD-3 displays the greatest reductions: from 150 μg/L to 47 μg/L for PCE, from 1,100 μg/L to 230 μg/L for TCE, and from 1,000 μg/L to 450 μg/L for *cis*-1,2-DCE. *Cis*-1,2-DCE concentrations remained relatively stable in well USD-2 and vinyl chloride was not detected in either well, as mentioned earlier.

The concentrations of chlorinated ethenes have remained relatively low and stable in the four downgradient Plumelet F wells.

Regarding geochemical parameters in the upgradient wells, the ORP values have remained slightly positive, in the 100 mV range in both USD-2 and USD-3. Nitrate concentrations are very low in both wells. However, much higher sulfate levels have been observed in well USD-2 compared to well USD-3. In June 2011, the sulfate concentrations in wells USD-2 and USD-3 were 1,320 mg/L and 292 mg/L, respectively. Ferrous iron and the MEE dissolved gases were not detected and TOC levels were very low in both wells. The alkalinity values, nitrate concentrations, and CO_2 concentrations observed are similar to the values present in background wells monitored in June 2010.

In summary, it appears that the initial stages of reductive dechlorination are occurring, especially in well USD-3 which has lower sulfate levels. However, lacking the presence of a suitable electron donor, the geochemical conditions are likely to remain unfavorable (too oxidizing) for significant reductive dechlorination processes to occur.

7.4 Conclusions from MNA Monitoring Results

7.4.1 Plumelet D

In Plumelet D well MW-5, there is evidence that natural attenuation has occurred based on the overall reduction in contaminant concentrations over time. The Plumelet D study area exhibits characteristics that indicate biological activity (due to the presence of hydrocarbons and chlorinated constituents), such as negative ORP, lack of nitrate, reduced sulfate, elevated CO_2 and alkalinity, and lower ratios of PCE and TCE to cis-1,2-DCE and vinyl chloride. Based on these results, MNA was determined to be an appropriate remedial action for Plumelet D. Additionally, since the presence of hydrocarbons may be the limiting factor in this area, similar to other areas at the site, dechlorination at Plumelet D could be enhanced through injected amendments, if necessary, in the future.

7.4.2 Plumelet E

It appears that Plumelet E is generally stable in terms of extent, but fluctuations of primary contaminant concentrations occur within individual wells. Biological activity is not pronounced.

7.4.3 Plumelet F

It appears that Plumelet F is generally stable in terms of extent, but fluctuations of primary contaminant concentrations occur within individual wells. Biological activity is not pronounced.

8.0 References

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TABLES

Table 1. Monitoring Summary - June 2011

Monitoring Task	Parameter	Analyses	Containers/Preservative	Total Number of Wells	Well IDs
On-Site Plumelet A Monitoring	VOCs	EPA Method SW8260B	VOA vials - No head space; 4ºC; HCl (pH<2)	17	P-1 P-2 P-5 P-6 P-9 P-10 P-11 P-12 P-13D P-13S P-14D P-14S P-15D P-15S P-16D P-16S TW-3
	Volatile Fatty Acids[1]	Laboratory Method	VOA vials - No head space; 4ºC; Benzylalkonium Chloride		
	Dissolved Gases - Methane, Ethane, Ethene	EPA Method SW8015BM	VOA vials - No head space; 4ºC; HCl (pH<2)		
	CO_2	EPA Method SW8015BM	VOA vials - No head space; 4ºC		
Off-Site Plumelets A and B Monitoring	VOCs	EPA Method SW8015BM	VOA vials - No head space; 4ºC; HCl (pH<2)	16	MW-8 MW-9 MW-18 MW-20 MW-21 MW-22 R-2 R-3 R-4 R-5 R-6 R-7 R-10 R-11 R-12 TW-4
	CO_2	EPA Method SW8015BM	VOA vials - No head space; 4ºC		
On-Site Plumelets B and C Monitoring	VOCs	EPA Method SW8260B	VOA vials - No head space; 4ºC; HCl (pH<2)	11	MW-2 MW-4 MW-17S MW-26 MW-27 MW-28 P-17D P-17S P-18 P-19 R-1
Plumelets D, E, and F Monitoring	VOCs (SW8260B)	EPA Method SW8260B	VOA vials - No head space; 4ºC; HCl (pH<2)	12	MW-5 MW-25 PMW-4 PMW-5 PMW-7 PMW-8 TW-2A USD-1 USD-2 USD-3 USD-4 USD-MW-3
	NO_3, SO_4, Cl	EPA 300.0	500 mL plastic; 4ºC		
	pH, DO, ORP	YSI Optical DO Probe/ Horiba U-52 Water Quality Meter	Field parameter		
	Ferrous Iron	Hach Test Kit	Field parameter		
	TOC	Laboratory Method SM20 5310C	120 mL amber glass; 4ºC; H_3PO_4 (pH<2)		
	Alkalinity	Laboratory Method SM20 2320B	500 mL plastic; 4ºC		
	Dissolved Gases - Methane, Ethane, Ethene	EPA Method SW8015BM	VOA vials - No head space; 4ºC; HCl (pH<2)		
	CO_2	EPA Method SW8015BM	VOA vials - No head space; 4ºC		

Table 1. Monitoring Summary - June 2011 (Continued)

Monitoring Task	Parameter	Analyses	Containers/Preservative	Total Number of Wells	Well IDs
Other	VOCs	EPA Method SW8260B	VOA vials - No head space; 4ºC; HCl (pH<2)	3	MW-24 TW-1 USD-MW-14

[1] Volatile fatty acids include acetic acid, butyric acid, hexanoic acid, i-hexanoic acid, i-pentanoic acid, lactic acid, pentanoic acid, propionic acid, and pyruvic acid.
°C - Degrees Celsius.
Cl - Chloride.
CO_2 - Carbon dioxide.
DO - Dissolved oxygen.
EPA - U.S. Environmental Protection Agency.
H_3PO_4 - Phosphoric acid.
HCl - Hydrochloric acid.
ID - Identification.
mL - Milliliter.
NO_3 - Nitrate.
ORP - Oxidation-reduction potential.
SO_4 - Sulfate.
TOC - Total organic carbon.
VOA - Volatile organic analysis.
VOC - Volatile organic compound.

Table 2. Historical Groundwater Elevations through June 2011

Well ID	TOC Elevation ft MSL	DTW 5/06[a] ft BTOC	GW Elevation 5/06[a] ft MSL	DTW 6/06 ft BTOC	GW Elevation 6/06 ft MSL	DTW 3/07 ft BTOC	GW Elevation 3/07 ft MSL	DTW 7/08 ft BTOC	GW Elevation 7/08 ft MSL	DTW 5/09 ft BTOC	GW Elevation 5/09 ft MSL	DTW 6/10 ft BTOC	GW Elevation 6/10 ft MSL	DTW 2/11 ft BTOC	GW Elevation 2/11 ft MSL	DTW 3/11 ft BTOC	GW Elevation 3/11 ft MSL	DTW 5/11 ft BTOC	GW Elevation 5/11 ft MSL	DTW 6/11 ft BTOC	GW Elevation 6/11 ft MSL
BPZ-1	1352.06	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.42	1335.64	16.45	1335.61	16.65	1335.41	16.51	1335.55
BPZ-2	1352.62	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	17.10	1335.52	16.80	1335.82	17.36	1335.26	17.08	1335.54
BPZ-3	1351.75	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.34	1335.41	16.09	1335.66	16.64	1335.11	16.31	1335.44
BPZ-4	1352.04	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.84	1335.20	16.58	1335.46	17.12	1334.92	16.81	1335.23
BPZ-5	1352.36	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	17.02	1335.34	16.74	1335.62	17.32	1335.04	16.98	1335.38
CPZ-2	1352.50	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.51	1335.99	16.20	1336.30	16.66	1335.84	16.28	1336.22
CPZ-3	1352.20	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.16	1336.04	15.91	1336.29	16.33	1335.87	15.92	1336.28
CPZ-4	1351.95	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.39	1335.56	15.85	1336.10	16.36	1335.59	15.95	1336.00
CPZ-5	1351.85	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	15.26	1336.59	14.87	1336.98	15.38	1336.47	14.81	1337.04
CPZ-6	1352.12	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	15.49	1336.63	15.09	1337.03	15.49	1336.63	15.25	1336.87
CPZ-7	1352.09	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.41	1335.68	16.03	1336.06	16.52	1335.57	16.12	1335.97
MW-1D	1348.37	7.84	1340.53	8.30	1340.07	11.75	1336.62	3.60	1344.77	2.91	1345.46	--	--	11.09	1337.28	10.72	1337.65	11.28	1337.09	10.91	1337.46
MW-1S	1348.25	8.09	1340.16	7.84	1340.41	10.85	1337.40	3.29	1344.96	2.84	1345.41	--	--	10.92	1337.33	10.88	1337.37	10.99	1337.26	10.91	1337.34
MW-2	1348.86	10.51	1338.35	10.84	1338.02	14.30	1334.56	5.42	1343.44	5.71	1343.15	3.65	1345.21	13.78	1335.08	--	--	--	--	13.76	1335.10
MW-4	1350.38	12.68	1337.70	14.70	1335.68	15.35	1335.03	9.17	1341.21	6.29	1344.09	8.79	1341.59	15.06	1336.20	14.84	1336.42	15.47	1335.79	14.74	1335.64
MW-5	1348.72	10.04	1338.68	8.07	1340.65	13.29	1335.43	4.63	1344.09	3.83	1344.89	2.90	1345.82	10.65	1338.07	12.21	1336.51	--	--	12.44	1336.28
MW-6	1349.58	10.62	1338.96	10.67	1338.91	14.20	1335.38	6.04	1343.54	5.52	1344.06	3.78	1345.80	13.57	1336.01	--	--	--	--	13.63	1335.95
MW-7	1339.92	6.03	1333.89	5.68	1334.24	7.42	1332.50	>TOC	*	4.22	1335.70	--	--	8.08	1331.84	--	--	--	--	4.50	1335.42
MW-8	1327.91	2.58	1325.33	2.21	1325.70	3.38	1324.53	>TOC	*	0.75	1327.16	--	--	3.09	1324.82	--	--	--	--	1.52	1326.39
MW-9	1331.36	10.12	1321.24	8.89	1322.47	9.72	1321.64	5.39	1325.97	5.38	1325.98	4.85	1326.51	8.91	1322.45	--	--	--	--	9.15	1322.21
MW-10	1338.43	12.09	1326.34	11.55	1326.88	12.83	1325.60	7.16	1331.27	6.20	1332.23	5.53	1332.90	12.09	1326.34	--	--	--	--	12.39	1326.04
MW-11	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-12D	1348.32	17.94	1330.38	17.62	1330.70	19.60	1328.72	--	--	--	--	10.91	1337.41	19.11	1329.21	--	--	--	--	19.39	1328.93
MW-12S	1348.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-13	1347.77	12.88	1334.89	12.93	1334.84	15.88	1331.89	8.14	1339.63	7.36	1340.41	5.35	1342.42	15.46	1332.31	--	--	--	--	15.15	1332.62
MW-17	1349.18	14.63	1334.55	24.79	1324.39	15.45	1333.73	12.71	1336.47	11.87	1337.31	11.87	1337.31	14.09	1335.02	14.38	1334.73	14.74	1334.37	14.89	1334.29
MW-17S	1351.32	NI	NI	NI	NI	NI	NI	NI	NI	7.90	1343.42	6.09	1345.23	15.95	1335.37	15.66	1335.66	16.26	1335.06	15.92	1335.40
MW-18	1331.10	11.06	1320.04	8.59	1322.51	10.01	1321.09	4.64	1326.46	4.69	1326.41	3.93	1327.17	8.39	1322.71	--	--	--	--	8.51	1322.59
MW-19	1331.85	12.78	1319.07	11.26	1320.59	--	--	7.16	1324.69	7.28	1324.57	--	--	--	--	--	--	--	--	11.12	1320.73
MW-20	1331.89	12.81	1319.08	11.24	1320.65	11.70	1320.19	6.90	1324.99	7.02	1324.87	7.03	1324.86	--	--	--	--	--	--	10.81	1321.08
MW-21	1332.01	12.11	1319.90	10.62	1321.39	10.92	1321.09	6.00	1326.01	6.10	1325.91	5.52	1326.49	9.81	1322.20	--	--	--	--	9.88	1322.13
MW-22	1327.78	10.93	1316.85	10.30	1317.48	10.82	1316.96	--	--	6.15	1321.63	6.54	1321.24	10.32	1317.46	--	--	--	--	10.15	1317.63
MW-23	1327.38	8.34	1319.04	7.91	1319.47	10.80	1316.58	4.40	1322.98	4.59	1322.79	4.88	1322.50	8.15	1319.23	--	--	--	--	8.15	1319.23
MW-24	1346.38	--	--	--	--	--	--	6.49	1339.89	6.58	1339.80	7.30	1339.08	13.17	1333.21	--	--	13.49	1332.89	13.25	1333.13
MW-25	1344.25	--	--	--	--	--	--	7.11	1337.14	9.06	1335.19	10.18	1334.07	13.44	1330.81	12.90	1331.35	--	--	12.14	1332.11
MW-26	1352.20	NI	--	NI	NI	NI	NI	NI	NI	6.88	1345.32	6.22	1345.98	15.52	1336.68	15.00	1337.20	15.47	1336.73	15.06	1337.14
MW-27	1352.51	NI	--	NI	NI	NI	NI	NI	NI	7.71	1344.80	9.99	1342.52	15.82	1336.69	15.48	1337.03	15.94	1336.57	15.85	1336.66
MW-28	1352.16	NI	--	NI	NI	NI	NI	NI	NI	10.53	1341.63	6.26	1345.90	15.32	1336.84	14.99	1337.17	15.38	1336.78	14.81	1337.35
P-1	1348.19	9.41	1338.78	9.78	1338.41	13.25	1334.94	5.08	1343.11	4.54	1343.65	--	--	12.70	1335.49	12.44	1335.75	12.99	1335.20	12.68	1335.51
P-2	1348.18	9.43	1338.75	9.88	1338.30	13.38	1334.80	5.12	1343.06	4.71	1343.47	--	--	12.65	1335.53	12.36	1335.82	12.92	1335.26	12.48	1335.70
P-3	1327.28	4.11	1323.17	3.98	1323.30	5.02	1322.26	1.26	1326.02	1.18	1326.10	0.39	1326.89	4.26	1323.02	--	--	--	--	4.83	1322.45
P-4	1326.13	3.85	1322.28	3.67	1322.46	5.20	1320.93	1.31	1324.82	1.16	1324.97	0.94	1325.19	3.94	1322.19	--	--	--	--	4.47	1321.66
P-5	1349.69	--	--	--	--	14.65	1335.04	6.41	1343.28	5.96	1343.73	3.08	1346.61	13.92	1335.77	13.60	1336.09	14.16	1335.53	13.78	1335.91
P-6	1349.47	--	--	--	--	14.55	1334.92	6.29	1343.18	5.87	1343.60	2.81	1346.66	13.79	1335.68	13.49	1335.98	14.01	1335.46	13.62	1335.85
P-7	1349.44	--	--	--	--	14.70	1334.74	6.37	1343.07	5.93	1343.51	2.98	1346.46	13.92	1335.52	13.62	1335.82	14.15	1335.29	13.74	1335.70
P-8	1349.42	--	--	--	--	14.70	1334.72	6.39	1343.03	5.97	1343.45	3.12	1346.30	14.04	1335.38	13.76	1335.66	14.31	1335.11	13.89	1335.53
P-9	1349.60	--	--	--	--	--	--	6.67	1342.93	6.22	1343.38	3.32	1346.28	14.36	1335.24	14.08	1335.52	14.61	1334.99	14.16	1335.44
P-10	1349.62	--	--	--	--	--	--	6.52	1343.10	6.08	1343.54	3.51	1346.11	14.15	1335.47	13.82	1335.80	14.41	1335.21	14.04	1335.58

Table 2. Historical Groundwater Elevations through June 2011 (Continued)

Well ID	TOC Elevation ft MSL	DTW 5/06[a] ft BTOC	GW Elevation 5/06[a] ft MSL	DTW 6/06 ft BTOC	GW Elevation 6/06 ft MSL	DTW 3/07 ft BTOC	GW Elevation 3/07 ft MSL	DTW 7/08 ft BTOC	GW Elevation 7/08 ft MSL	DTW 5/09 ft BTOC	GW Elevation 5/09 ft MSL	DTW 6/10 ft BTOC	GW Elevation 6/10 ft MSL	DTW 2/11 ft BTOC	GW Elevation 2/11 ft MSL	DTW 3/11 ft BTOC	GW Elevation 3/11 ft MSL	DTW 5/11 ft BTOC	GW Elevation 5/11 ft MSL	DTW 6/11 ft BTOC	GW Elevation 6/11 ft MSL
P-11	1351.45	NI	NI	NI	NI	NI	NI	NI	NI	7.81	1343.64	4.98	1346.47	15.79	1335.66	15.50	1335.95	16.01	1335.44	15.65	1335.80
P-12	1351.23	NI	NI	NI	NI	NI	NI	NI	NI	8.00	1343.23	5.41	1345.82	16.19	1335.04	15.91	1335.32	16.48	1334.75	15.98	1335.25
P-13D	1351.77	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.59	1335.18	16.54	1335.23	16.84	1334.93	16.29	1335.48
P-13S	1351.76	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.49	1335.27	16.20	1335.56	16.69	1335.07	16.31	1335.45
P-14D	1351.58	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.58	1335.00	16.32	1335.26	16.88	1334.70	16.48	1335.10
P-14S	1351.21	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.17	1335.04	15.91	1335.30	16.48	1334.73	16.11	1335.10
P-15D	1351.69	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	15.86	1335.83	15.58	1336.11	16.12	1335.57	15.80	1335.89
P-15S	1351.77	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	15.73	1336.04	15.41	1336.36	15.91	1335.86	15.71	1336.06
P-16D	1351.66	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	15.39	1336.27	15.08	1336.58	15.60	1336.06	15.32	1336.34
P-16S	1351.42	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	15.07	1336.35	14.77	1336.65	15.30	1336.12	15.01	1336.41
P-17D	1351.81	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.72	1335.09	16.45	1335.36	17.00	1334.81	16.68	1335.13
P-17S	1351.87	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.76	1335.11	16.50	1335.37	17.09	1334.78	16.74	1335.13
P-18	1351.77	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	16.45	1335.32	16.41	1335.36	16.98	1334.79	16.22	1335.55
P-19	1351.78	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	15.19	1336.59	15.01	1336.77	15.41	1336.37	15.14	1336.64
PMW-2	1343.63	--	--	19.46	1324.17	20.50	1323.13	14.60	1329.03	15.02	1328.61	13.39	1330.24	20.91	1322.72	--	--	--	--	21.06	1322.57
PMW-3	1343.96[b]	--	--	15.50	1328.46	15.40	1328.56	12.19	1331.77	11.89	1332.07	12.35	1331.61	15.89	1328.07	--	--	--	--	15.04	1328.92
PMW-4	1344.47	--	--	7.88	1336.59	9.58	1334.89	2.61	1341.86	3.64	1340.83	0.98	1343.49	8.81	1335.66	--	--	--	--	6.60	1337.87
PMW-5	1344.46	--	--	8.07	1336.39	11.06	1333.4	4.02	1340.44	4.28	1340.18	4.70	1339.76	7.75	1336.71	8.62	1335.84	8.00	1336.46	6.96	1337.50
PMW-6	1341.20	--	--	8.63	1332.57	10.20	1331	6.07	1335.13	7.51	1333.69	7.24	1333.96	10.67	1330.53	9.95	1331.25	10.84	1330.36	9.21	1331.99
PMW-7	1344.76	--	--	--	--	--	--	3.61	1341.15	4.44	1340.32	4.69	1340.07	8.95	1335.81	8.35	1336.41	8.78	1335.98	7.68	1337.08
PMW-8	1345.11	--	--	--	--	--	--	5.55	1339.56	6.91	1338.20	7.61	1337.50	10.24	1334.87	9.69	1335.42	10.16	1334.95	9.20	1335.91
PMW-17	1341.25	--	--	14.57	1326.68	18.00	1323.25	11.86	1329.39	12.94	1328.31	12.30	1328.95	16.31	1324.94	15.55	1325.70	--	--	14.57	1326.68
PMW-20	1342.31	--	--	19.79	1322.52	20.75	1321.56	15.01	1327.30	15.67	1326.64	14.18	1328.13	20.84	1321.47	--	--	--	--	21.15	1321.16
PZ-1	1333.78	4.09	1329.69	3.86	1329.92	6.45	1327.33	>TOC	*	>TOC	*	>TOC	*	4.06	1329.72	--	--	4.67	1329.11	4.46	1329.32
PZ-2	1328.59	7.70	1320.89	5.75	1322.84	6.50	1322.09	1.95	1326.64	1.92	1326.67	1.36	1327.23	5.68	1322.91	--	--	--	--	5.91	1322.68
R-1	1350.78	22.18	1328.60	11.82	1338.96	15.32	1335.46	7.19	1343.59	6.67	1344.11	4.76	1346.02	14.64	1336.14	--	--	--	--	14.70	1336.08
R-2	1336.42	4.31	1332.11	4.20	1332.22	5.73	1330.69	>TOC	*	>TOC	*	>TOC	*	5.41	1331.01	--	--	6.11	1330.31	5.84	1330.58
R-3	1336.12	5.31	1330.81	4.69	1331.43	4.65	1331.47	>TOC	*	>TOC	*	>TOC	*	6.10	1330.02	--	--	6.60	1329.52	6.41	1329.71
R-4	1336.18	6.40	1329.78	5.19	1330.99	7.10	1329.08	>TOC	*	>TOC	*	>TOC	*	6.45	1329.73	--	--	6.83	1329.35	6.60	1329.58
R-5	1338.90	14.61	1324.29	8.44	1330.46	10.30	1328.60	3.09	1335.81	2.49	1336.41	2.85	1336.05	9.69	1329.21	--	--	--	--	9.94	1328.96
R-6	1345.36	16.80	1328.56	15.13	1330.23	17.00	1328.36	9.73	1335.63	9.11	1336.25	9.25	1336.11	16.40	1328.96	--	--	--	--	16.52	1328.84
R-7	1331.24	16.07	1315.17	8.69	1322.55	9.38	1321.86	4.80	1326.44	4.79	1326.45	4.22	1327.02	8.58	1322.66	--	--	--	--	8.72	1322.52
R-8	1327.45	6.39	1321.06	4.36	1323.09	5.08	1322.37	0.23	1327.22	0.30	1327.15	>TOC	*	4.25	1323.20	--	--	4.67	1322.78	4.48	1322.97
R-9	1328.07	5.08	1322.99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-10	1331.83	19.70	1312.13	9.48	1322.35	10.01	1321.82	5.43	1326.40	5.48	1326.35	4.80	1327.03	9.22	1322.61	--	--	--	--	9.32	1322.51
R-11	1331.72	9.94	1321.78	9.14	1322.58	9.48	1322.24	5.32	1326.40	5.51	1326.21	4.30	1327.42	8.83	1322.89	--	--	--	--	9.02	1322.70
R-12	1330.85	7.98	1322.87	7.56	1323.29	7.78	1323.07	3.80	1327.05	4.11	1326.74	3.21	1327.64	7.12	1323.73	--	--	--	--	7.27	1323.58
TW-1	1347.51	10.89	1336.62	11.11	1336.4	13.96	1333.55	6.59	1340.92	6.49	1341.02	6.85	1340.66	13.85	1333.66	--	--	14.18	1333.33	13.82	1333.69
TW-2A	1344.41	8.60	1335.81	8.26	1336.15	8.82	1335.59	5.59	1338.82	6.49	1337.92	7.51	1336.90	9.06	1335.35	8.52	1335.89	9.15	1335.26	8.20	1336.21
TW-3	1347.77	10.65	1337.12	11.01	1336.76	14.31	1333.46	6.03	1341.74	5.65	1342.12	4.79	1342.98	13.92	1333.85	13.70	1334.07	14.20	1333.57	13.72	1334.05
TW-4	1336.52	4.14	1332.38	4.01	1332.51	5.76	1330.76	>TOC	*	>TOC	*	>TOC	*	5.39	1331.13	--	--	6.04	1330.48	5.83	1330.69
USD-1	1345.65	9.02	1336.63	--	--	10.31	1335.34	4.48	1341.17	4.06	1341.59	5.17	1340.48	10.15	1335.50	9.43	1336.22	--	--	9.04	1336.61
USD-2	1346.60	8.80	1337.80	--	--	11.00	1335.6	4.65	1341.95	5.26	1341.34	5.34	1341.26	10.78	1335.82	10.18	1336.42	--	--	9.92	1336.68
USD-3	1347.06	7.76	1339.30	--	--	11.06	1336.00	5.06	1342.00	6.16	1340.90	5.87	1341.19	10.72	1336.34	10.31	1336.75	--	--	10.06	1337.00
USD-4	1346.73	--	--	--	--	--	--	2.44	1344.29	3.10	1343.63	3.49	1343.24	10.86	1335.87	10.07	1336.66	--	--	10.00	1336.73
USD-13	1331.07	--	--	--	--	10.96	1320.11	5.03	1326.04	5.58	1325.49	6.10	1324.97	10.69	1320.38	10.67	1320.40	--	--	10.83	1320.24
USD-MW-3[c]	1346.07	7.71	1338.36	--	--	10.73	1335.34	2.86	1343.21	2.70	1343.37	2.74	1343.33	10.72	1335.35	9.80	1336.27	--	--	9.63	1336.44
USD-MW-14[c]	1350.02	9.18	1340.84	--	--	13.06	1336.96	4.92	1345.10	4.07	1345.95	3.01	1347.01	12.38	1337.64	--	--	--	--	12.25	1337.77

Table 2. Historical Groundwater Elevations through June 2011 (Continued)

Well ID	TOC Elevation	DTW 5/06[a]	GW Elevation 5/06[a]	DTW 6/06	GW Elevation 6/06	DTW 3/07	GW Elevation 3/07	DTW 7/08	GW Elevation 7/08	DTW 5/09	GW Elevation 5/09	DTW 6/10	GW Elevation 6/10	DTW 2/11	GW Elevation 2/11	DTW 3/11	GW Elevation 3/11	DTW 5/11	GW Elevation 5/11	DTW 6/11	GW Elevation 6/11
	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL	ft BTOC	ft MSL
USD-MW-15[c]	1344.81[b]	--	--	--	--	--	--	--	--	4.67	1340.14	5.16	1339.65	10.83	1333.98	--	--	--	--	10.82	1333.99
USD-MW-16[c]	1350.03	13.88	1336.15	--	--	14.50	1335.53	13.76	1336.27	10.31	1339.72	10.09	1339.94	11.25	1338.78	--	--	--	--	13.70	1336.33
USD-MW-18	1345.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.90	1335.91

[a] These water level gauging events were conducted under pumping conditions.
[b] The top of casing (TOC) elevation is approximate.
[c] Alternate well identifications (IDs) are MW-3, MW-14, MW-15, and MW-16.
>TOC - Artesian conditions were observed.
-- Not measured.
* Groundwater elevation was not determined because artesian conditions were observed.
BTOC - Below top of casing.
DTW - Depth to water.
ft - Feet.
GW - Groundwater.
MSL - Mean sea level.
NA - Not available.
NI - Not installed.

Table 3. VOC Concentrations in Groundwater - June 2011

Analyte	Well ID / KDHE Tier 2 RSK Residential Level [a]	MW-2	MW-4	MW-5	MW-8	MW-9	MW-17S	MW-18	MW-20	MW-21	MW-22	MW-24
1,1,1-Trichloroethane	200	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	<0.2
1,1,2-Trichloroethane	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	<0.2
1,1-Dichloroethane	25	<0.1	**0.9**	<1.0	<0.1	<0.1	**110**	**11**	**15**	**65**	<0.1	**7.4**
1,1-Dichloroethene	7	<0.1	<0.1	**2.8 J**	<0.1	<0.1	**7.1**	**5**	**5.4**	**2.1**	<0.1	<0.2
1,2,4-Trimethylbenzene	8.44	<0.1	<0.1	<1.0	<0.1	<0.1	**130**	<1.0	<0.5	<0.1	<0.1	**3.7**
1,2-Dichlorobenzene	600	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	**0.7**	<0.1	**10**
1,2-Dichloroethane	5	<0.1	**0.7**	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	**0.7**	<0.1	<0.2
1,3,5-Trimethylbenzene	44	<0.1	<0.1	<1.0	<0.1	<0.1	**32**	<1.0	<0.5	<0.1	<0.1	**9.2**
2-Butanone	4,920	<1.0	<1.0	<10	<1.0	<1.0	<5.0	<10	<5.0	<1.0	<1.0	<2.0
4-Methyl-2-Pentanone	1,020	<1.0	<1.0	<10	<1.0	<1.0	<5.0	<10	<5.0	<1.0	<1.0	<2.0
Acetone	11,500	<3.0	<3.0	<30	<3.0	<3.0	<15	<30	<15	<3.0	<3.0	<6.0
Benzene	5	<0.1	<0.1	**2.3 J**	<0.1	<0.1	**19**	<1.0	<0.5	**0.3 J**	<0.1	**30**
Bromoform	80	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	<0.2
Carbon Disulfide	716	<0.4	<0.4	<4.0	<0.4	<0.4	<2.0	<4.0	<2.0	<0.4	<0.4	<0.8
Carbon Tetrachloride	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	<0.2
Chlorobenzene	100	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	**0.3 J**
Chloroethane	14,000	<0.1	<0.1	<1.0	<0.1	<0.1	**2 J**	<1.0	<0.5	<0.1	<0.1	**27**
Chloroform	80	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	<0.2
cis-1,2-Dichloroethene	70	**1.5**	**33**	**1,100**	**0.1 J**	<0.1	**150**	**650**	**420**	**200**	<0.1	**9.2**
Ethylbenzene	700	<0.1	<0.1	<1.0	<0.1	<0.1	**330**	<1.0	<0.5	<0.1	<0.1	**44**
Isopropylbenzene	451	**1.5**	<0.1	<1.0	<0.1	<0.1	**22**	<1.0	<0.5	<0.1	<0.1	**39**
Methyl Tertiary Butyl Ether	133	**3.5**	<0.1	<1.0	<0.1	<0.1	**1.1 J**	<1.0	<0.5	**0.1 J**	<0.1	**0.2 J**
Methylene Chloride	5	<0.2	<0.2	<2.0	<0.2	<0.2	**2.2 J**	<2.0	<1.0	<0.2	<0.2	**1 J**
Naphthalene	1.11	**0.2 J**	<0.1	<1.0	<0.1	<0.1	**42**	<1.0	<0.5	<0.1	<0.1	**140**
n-Butylbenzene	33.8	**1.6**	<0.1	<1.0	<0.1	<0.1	**27**	<1.0	<0.5	<0.1	<0.1	**7.5**
Styrene	100	<0.1	<0.1	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	<0.2
Tetrachloroethene	5	<0.1	**3.8**	**32**	<0.1	<0.1	<0.5	**2.1 J**	**99**	**14**	**0.3 J**	<0.2
Toluene	1,000	<0.1	<0.1	<1.0	<0.1	<0.1	**220**	<1.0	<0.5	<0.1	<0.1	**0.4 J**
trans-1,2-Dichloroethene	100	<0.1	**0.5 J**	**4.9 J**	<0.1	<0.1	**1 J**	**2.4 J**	**7.4 J**	**1.2**	<0.1	**2.8**
Trichloroethene	5	<0.1	**5.3**	**56**	<0.1	<0.1	<0.5	**130**	**190**	**36**	<0.1	**0.3 J**
Trichlorofluoromethane	1,090	<0.1	**0.1 J**	<1.0	<0.1	<0.1	<0.5	<1.0	<0.5	<0.1	<0.1	<0.2
Vinyl Acetate	406	<0.2	<0.2	<2.0	<0.2	<0.2	<1.0	<2.0	<1.0	<0.2	<0.2	<0.4
Vinyl Chloride	2	**0.3 J**	<0.1	**270**	**0.1 J**	<0.1	**73**	**7.5**	**3**	**9.2**	<0.1	**27**
Xylenes (Total)	10,000	<0.1	<0.1	<1.0	<0.1	<0.1	**310**	<1.0	<0.5	<0.1	<0.1	**18**

Table 3. VOC Concentrations in Groundwater - June 2011 (Continued)

Analyte	Well ID	MW-25	MW-26	MW-27	MW-28	P-1	P-2	P-5	P-6	P-9	P-10	P-11	P-12	P-13D
	KDHE Tier 2 RSK Residential Level [a]													
1,1,1-Trichloroethane	200	<0.1	**150 J**	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	**12 J**	<0.1	<0.1
1,1,2-Trichloroethane	5	<0.1	**56 J**	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	**0.2 J**	<0.1
1,1-Dichloroethane	25	**0.2 J**	**120 J**	**2.5**	**11**	<0.1	**16**	**4.8**	**15**	**11**	<0.5	**5.5 J**	**13**	**0.2 J**
1,1-Dichloroethene	7	<0.1	**2,700**	<0.1	**2.4 J**	<0.1	<1.0	<0.1	<0.1	<0.1	**0.7 J**	<5.0	<0.1	<0.1
1,2,4-Trimethylbenzene	8.44	<0.1	**140 J**	**1.1**	<1.0	<0.1	<1.0	**1**	**0.3 J**	**0.6**	<0.5	**10 J**	**0.4 J**	<0.1
1,2-Dichlorobenzene	600	<0.1	**110 J**	<0.1	<1.0	<0.1	<1.0	**0.7**	**0.5**	**0.6**	<0.5	<5.0	**0.2 J**	**0.3 J**
1,2-Dichloroethane	5	<0.1	**5,100**	<0.1	**7**	<0.1	<1.0	**0.2 J**	**0.4 J**	**0.3 J**	<0.5	<5.0	**1.1**	**0.2 J**
1,3,5-Trimethylbenzene	44	<0.1	<50	<0.1	<1.0	<0.1	<1.0	**0.3 J**	**0.1 J**	**0.2 J**	<0.5	<5.0	**0.1 J**	<0.1
2-Butanone	4,920	<1.0	<500	<1.0	<10	<1.0	**83**	**39 J**	<1.0	<1.0	<5.0	<50	**21**	**210**
4-Methyl-2-Pentanone	1,020	<1.0	<500	<1.0	<10	<1.0	<10	<1.0	<1.0	<1.0	<5.0	<50	<1.0	<1.0
Acetone	11,500	<3.0	<1,500	<3.0	<30	<3.0	<30	**32 J**	<3.0	<3.0	<15	**170 J**	**4.3 J**	**22**
Benzene	5	<0.1	**760**	**0.8**	<1.0	<0.1	<1.0	**0.1 J**	**0.2 J**	**0.2 J**	<0.5	<5.0	**0.5 J**	<0.1
Bromoform	80	<0.1	<50	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	<0.1	<0.1
Carbon Disulfide	716	<0.4	<200	<0.4	<4.0	<0.4	<4.0	<0.4	<0.4	<0.4	<2.0	<20	**0.5**	**0.7**
Carbon Tetrachloride	5	<0.1	<50	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	<0.1	<0.1
Chlorobenzene	100	<0.1	<50	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	<0.1	<0.1
Chloroethane	14,000	<0.1	<50	**0.2 J**	<1.0	<0.1	**2.9 J**	**4.7**	**18**	**2.7**	<0.5	<5.0	**2.3**	<0.1
Chloroform	80	<0.1	<50	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	<0.1	<0.1
cis-1,2-Dichloroethene	70	**6.7**	**33,000**	**55**	**530**	<0.1	**410**	**13 J**	**3.8**	**0.6**	**140**	**2,800**	**18**	**1.2**
Ethylbenzene	700	<0.1	**1,700**	**12**	<1.0	<0.1	**2.2 J**	**1.1**	**1.1**	**1.3**	<0.5	**5.1 J**	**1.2**	<0.1
Isopropylbenzene	451	<0.1	<50	**5.4**	<1.0	<0.1	**1.4 J**	**0.6**	**1.3**	**1.3**	<0.5	<5.0	**0.6**	<0.1
Methyl Tertiary Butyl Ether	133	<0.1	<50	<0.1	<1.0	**0.4 J**	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	<0.1	<0.1
Methylene Chloride	5	<0.2	**740**	<0.2	<2.0	<0.2	<2.0	<0.2	<0.2	<0.2	<1.0	**13 J**	<0.2	<0.2
Naphthalene	1.11	<0.1	**67 J**	**0.6**	<1.0	<0.1	**4.6 J**	**1.2**	**0.9**	**2.5**	<0.5	<5.0	**1.2**	<0.1
n-Butylbenzene	33.8	<0.1	<50	**0.2 J**	<1.0	<0.1	<1.0	**0.4 J**	**0.1 J**	**0.2 J**	<0.5	<5.0	**0.1 J**	<0.1
Styrene	100	<0.1	<50	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	<0.1	<0.1
Tetrachloroethene	5	**0.5**	**3,500**	<0.1	**20**	<0.1	<1.0	**6.7**	**0.2 J**	<0.1	**5.3**	**54**	**0.1 J**	<0.1
Toluene	1,000	<0.1	**8,100**	<0.1	<1.0	<0.1	**1.7 J**	**0.7**	**1**	**1.1**	<0.5	**16 J**	**1.2**	<0.1
trans-1,2-Dichloroethene	100	<0.1	**220 J**	**0.4 J**	**4.4 J**	<0.1	**73**	**51**	**6.1**	**1.2**	**1 J**	**29**	**24**	<0.1
Trichloroethene	5	**11**	**1,800**	**75**	**37**	<0.1	<1.0	**3.2**	**0.4 J**	<0.1	**34**	**82**	**2.7**	**0.1 J**
Trichlorofluoromethane	1,090	<0.1	<50	<0.1	<1.0	<0.1	<1.0	<0.1	<0.1	<0.1	<0.5	<5.0	<0.1	<0.1
Vinyl Acetate	406	<0.2	<100	<0.2	<2.0	<0.2	<2.0	<0.2	<0.2	<0.2	<1.0	<10	<0.2	<0.2
Vinyl Chloride	2	<0.1	**910**	**22**	<1.0	<0.1	**320**	**14**	**1**	**0.5**	**2.5**	**2,400**	**18**	**0.4 J**
Xylenes (Total)	10,000	<0.1	**1,400**	**4.1**	<1.0	<0.1	**2.8 J**	**2.3**	**2.4**	**2.5**	<0.5	**5.4 J**	**1.7**	<0.1

Table 3. VOC Concentrations in Groundwater - June 2011 (Continued)

Analyte	Well ID / KDHE Tier 2 RSK Residential Level [a]	P-13S	P-14D	P-14S	P-15D	P-15S	P-16D	P-16S	P-17D	P-17S	P-18	P-19	PMW-4
1,1,1-Trichloroethane	200	<0.1	<0.1	<1.0	<50	<10	**39**	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1
1,1,2-Trichloroethane	5	<0.1	<0.1	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1
1,1-Dichloroethane	25	**0.8**	**2**	<1.0	<50	<10	**2.2**	<0.1	**0.6 J**	**0.1 J**	**67**	**14**	<0.1
1,1-Dichloroethene	7	<0.1	**0.5**	<1.0	<50	**13 J**	**97**	**0.4 J**	<0.2	<0.1	**12**	**2.1 J**	<0.1
1,2,4-Trimethylbenzene	8.44	<0.1	**2.8**	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	**190**	<1.0	<0.1
1,2-Dichlorobenzene	600	**0.6**	**0.1 J**	<1.0	<50	<10	**0.3 J**	**0.2 J**	<0.2	<0.1	**0.7 J**	<1.0	<0.1
1,2-Dichloroethane	5	<0.1	**0.5**	<1.0	<50	<10	**0.8**	**0.2 J**	<0.2	<0.1	**2.2 J**	**1.7 J**	<0.1
1,3,5-Trimethylbenzene	44	<0.1	**0.5 J**	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	**53**	<1.0	<0.1
2-Butanone	4,920	<1.0	**6.2**	**790**	<500	**3,700**	<1.0	<1.0	<2.0	<1.0	<5.0	<10	<1.0
4-Methyl-2-Pentanone	1,020	<1.0	<1.0	<10	<500	<100	<1.0	<1.0	<2.0	<1.0	<5.0	<10	<1.0
Acetone	11,500	**4.1 J**	**16**	**170**	<1,500	**340 J**	<3.0	<3.0	**61**	**43**	<15	<30	<3.0
Benzene	5	<0.1	**0.2 J**	<1.0	<50	<10	<0.1	<0.1	**0.2 J**	<0.1	**24**	<1.0	<0.1
Bromoform	80	<0.1	<0.1	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1
Carbon Disulfide	716	<0.4	**0.7**	<4.0	<200	<40	<0.4	<0.4	<0.8	<0.4	<2.0	<4.0	<0.4
Carbon Tetrachloride	5	<0.1	<0.1	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1
Chlorobenzene	100	<0.1	<0.1	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1
Chloroethane	14,000	**0.2 J**	**4.9**	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	**2.4 J**	<1.0	<0.1
Chloroform	80	<0.1	<0.1	<1.0	<50	<10	**0.2 J**	<0.1	**0.7 J**	<0.1	<0.5	<1.0	<0.1
cis-1,2-Dichloroethene	70	**0.7**	**6.2**	**480**	**18,000**	**13,000**	**2.7**	**0.6**	**0.8 J**	**0.1 J**	**960**	**590**	<0.1
Ethylbenzene	700	<0.1	**0.8**	<1.0	<50	<10	<0.1	<0.1	<0.2	**0.1 J**	**320**	<1.0	<0.1
Isopropylbenzene	451	<0.1	**0.3 J**	<1.0	<50	<10	<0.1	<0.1	**7.5**	**2.3**	**10**	<1.0	<0.1
Methyl Tertiary Butyl Ether	133	<0.1	**0.2 J**	<1.0	<50	<10	<0.1	**0.1 J**	**4.9**	**3.8**	<0.5	<1.0	<0.1
Methylene Chloride	5	<0.2	<0.2	<2.0	<100	<20	<0.2	<0.2	**0.8 J**	<0.2	**1 B**	<2.0	<0.2
Naphthalene	1.11	<0.1	**0.9**	<1.0	<50	<10	<0.1	<0.1	**0.2 J**	<0.1	**95**	<1.0	<0.1
n-Butylbenzene	33.8	<0.1	**0.4 J**	<1.0	<50	<10	<0.1	<0.1	**5.5**	**2.4**	**2.5 J**	<1.0	<0.1
Styrene	100	<0.1	<0.1	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1
Tetrachloroethene	5	**0.1 J**	**4.5**	<1.0	**1,100**	**36 J**	**0.6**	**0.1 J**	<0.2	<0.1	**33**	**20**	**2**
Toluene	1,000	<0.1	**1**	**18**	<50	<10	<0.1	<0.1	<0.2	**8.4**	**79**	<1.0	<0.1
trans-1,2-Dichloroethene	100	<0.1	**44**	<1.0	**180 J**	**42 J**	<0.1	<0.1	<0.2	<0.1	**5**	**5.7**	<0.1
Trichloroethene	5	<0.1	**12**	<1.0	**380**	**11 J**	**2.8**	**0.1 J**	<0.2	<0.1	**6.2**	**140**	<0.1
Trichlorofluoromethane	1,090	<0.1	<0.1	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1
Vinyl Acetate	406	<0.2	<0.2	<2.0	<100	<20	<0.2	<0.2	<0.4	<0.2	<1.0	<2.0	<0.2
Vinyl Chloride	2	**1.2**	**2**	**3.8 J**	**3,200**	**740**	**2**	**0.5 J**	**0.9 J**	<0.1	**350**	**7**	<0.1
Xylenes (Total)	10,000	<0.1	**2**	<1.0	<50	<10	<0.1	<0.1	<0.2	<0.1	**280**	<1.0	<0.1

Table 3. VOC Concentrations in Groundwater - June 2011 (Continued)

Analyte	Well ID	PMW-5	PMW-7	PMW-8	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-10	R-11	R-12
	KDHE Tier 2 RSK Residential Level [a]													
1,1,1-Trichloroethane	200	<0.1	<0.1	<0.1	**25**	<0.1	<0.1	<0.1	**1.3 J**	<0.2	<0.1	<0.5	<0.1	<0.5
1,1,2-Trichloroethane	5	<0.1	<0.1	**0.2 J**	<2.0	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
1,1-Dichloroethane	25	**4.6**	<0.1	**1**	**50**	**0.9**	**19**	**7.2**	**4.5 J**	**9.3**	**2.3**	**12**	**63**	**100**
1,1-Dichloroethene	7	**1**	<0.1	**1.3**	**64**	<0.1	<0.1	**0.1 J**	**9.9**	**1.5**	**0.6**	**4.6**	**1**	**1.6 J**
1,2,4-Trimethylbenzene	8.44	<0.1	<0.1	<0.1	**8.1 J**	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
1,2-Dichlorobenzene	600	<0.1	<0.1	<0.1	<2.0	<0.1	**5.1**	<0.1	<1.0	**0.4 J**	<0.1	<0.5	**0.8**	**2.7**
1,2-Dichloroethane	5	**0.6**	<0.1	**0.3 J**	**3.7 J**	<0.1	**1.4**	<0.1	<1.0	**0.2 J**	<0.1	<0.5	**0.5**	**1.4 J**
1,3,5-Trimethylbenzene	44	<0.1	<0.1	<0.1	<2.0	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
2-Butanone	4,920	<1.0	<1.0	<1.0	<20	<1.0	<1.0	<1.0	<10	<2.0	<1.0	<5.0	<1.0	<5.0
4-Methyl-2-Pentanone	1,020	<1.0	<1.0	<1.0	<20	<1.0	<1.0	<1.0	<10	<2.0	<1.0	<5.0	<1.0	<5.0
Acetone	11,500	<3.0	<3.0	<3.0	<60	<3.0	<3.0	<3.0	<30	<6.0	<3.0	<15	**3.1 J**	<15
Benzene	5	<0.1	<0.1	<0.1	**5 J**	<0.1	**9.5**	**0.2 J**	<1.0	<0.2	<0.1	<0.5	**0.4 J**	**0.8 J**
Bromoform	80	<0.1	<0.1	<0.1	<2.0	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Carbon Disulfide	716	<0.4	<0.4	<0.4	<8.0	<0.4	<0.4	<0.4	<4.0	<0.8	<0.4	<2.0	<0.4	<2.0
Carbon Tetrachloride	5	<0.1	<0.1	<0.1	<2.0	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Chlorobenzene	100	<0.1	<0.1	<0.1	<2.0	<0.1	**0.3 J**	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Chloroethane	14,000	<0.1	<0.1	<0.1	**5.2 J**	<0.1	**17**	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Chloroform	80	**0.2 J**	<0.1	**0.3 J**	<2.0	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
cis-1,2-Dichloroethene	70	**180**	<0.1	**60**	**1,700**	**8.7**	<0.1	**22**	**1,100**	**110**	**31**	**470**	**86**	**280**
Ethylbenzene	700	<0.1	<0.1	<0.1	**140**	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Isopropylbenzene	451	<0.1	<0.1	<0.1	**13**	<0.1	**2.3**	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Methyl Tertiary Butyl Ether	133	<0.1	<0.1	<0.1	**2.2 J**	<0.1	<0.1	**0.3 J**	<1.0	<0.2	<0.1	<0.5	**0.1 J**	<0.5
Methylene Chloride	5	<0.2	<0.2	<0.2	**4.2 J**	<0.2	<0.2	<0.2	<2.0	<0.4	<0.2	<1.0	<0.2	**1.2 B**
Naphthalene	1.11	<0.1	<0.1	<0.1	**12**	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
n-Butylbenzene	33.8	<0.1	<0.1	<0.1	**2.1 J**	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Styrene	100	<0.1	<0.1	<0.1	<2.0	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Tetrachloroethene	5	**7.7**	**0.2 J**	**23**	**4.5 J**	**0.4 J**	<0.1	**0.1 J**	**520**	**0.3 J**	**12**	**67**	<0.1	<0.5
Toluene	1,000	<0.1	<0.1	<0.1	**18**	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
trans-1,2-Dichloroethene	100	**1.6**	<0.1	**0.7**	**26**	<0.1	**0.8**	**0.2 J**	**16**	**0.4 J**	<0.1	**2.8**	**0.8**	**1.3 J**
Trichloroethene	5	**16**	<0.1	**130**	**17**	**1.4**	<0.1	**0.4 J**	**570**	**0.7 J**	**12**	**210**	**0.1 J**	**1.8 J**
Trichlorofluoromethane	1,090	<0.1	<0.1	<0.1	<2.0	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5
Vinyl Acetate	406	<0.2	<0.2	<0.2	<4.0	<0.2	<0.2	<0.2	<2.0	<0.4	<0.2	<1.0	<0.2	<1.0
Vinyl Chloride	2	<0.1	<0.1	**0.1 J**	**770**	**1.3**	<0.1	**3.9**	**11**	**2.9**	<0.1	**3.3**	**28**	**23**
Xylenes (Total)	10,000	<0.1	<0.1	<0.1	**12**	<0.1	<0.1	<0.1	<1.0	<0.2	<0.1	<0.5	<0.1	<0.5

Table 3. VOC Concentrations in Groundwater - June 2011 (Continued)

Analyte	Well ID	TW-1	TW-2A	TW-3	TW-4	USD-1	USD-2	USD-3	USD-4	USD-MW-3	USD-MW-14
	KDHE Tier 2 RSK Residential Level [a]										
1,1,1-Trichloroethane	200	<0.2	<0.1	**1**	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
1,1,2-Trichloroethane	5	<0.2	**0.3 J**	<0.1	<0.5	<0.1	**0.4 J**	**0.3 J**	<0.1	<0.1	<0.5
1,1-Dichloroethane	25	**3**	**0.6**	**9**	**16**	<0.1	**1.1**	**4.6**	<0.1	<0.1	<0.5
1,1-Dichloroethene	7	<0.2	**1.8**	**0.5 J**	<0.5	<0.1	**5.9**	**3.6**	<0.1	<0.1	<0.5
1,2,4-Trimethylbenzene	8.44	**3.5**	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	**20**
1,2-Dichlorobenzene	600	<0.2	**0.6**	**1.7**	**13**	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
1,2-Dichloroethane	5	<0.2	**0.6**	**0.2 J**	<0.5	<0.1	**0.4 J**	**1.5**	<0.1	<0.1	<0.5
1,3,5-Trimethylbenzene	44	**4.4**	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	**1.6 J**
2-Butanone	4,920	<2.0	<1.0	<1.0	<5.0	<1.0	<1.0	<2.0	<1.0	<1.0	<5
4-Methyl-2-Pentanone	1,020	<2.0	<1.0	<1.0	<5.0	<1.0	<1.0	<2.0	<1.0	<1.0	<5.0
Acetone	11,500	<6.0	<3.0	<3.0	<15	<3.0	<3.0	<6.0	<3.0	<3.0	<15
Benzene	5	**13**	<0.1	**0.3 J**	**24**	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
Bromoform	80	<0.2	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
Carbon Disulfide	716	<0.8	<0.4	<0.4	<2.0	<0.4	<0.4	<0.8	<0.4	<0.4	<2
Carbon Tetrachloride	5	<0.2	<0.1	<0.1	<0.5	**2.1**	**1.3**	<0.2	<0.1	**1.1**	<0.5
Chlorobenzene	100	<0.2	**0.1 J**	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
Chloroethane	14,000	**17**	<0.1	<0.1	**26**	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
Chloroform	80	<0.2	<0.1	<0.1	**0.9 J**	**0.5 J**	**0.4 J**	<0.2	<0.1	**0.2 J**	<0.5
cis-1,2-Dichloroethene	70	**1.7**	**47**	**20**	**1.5 J**	**0.2 J**	**130**	**450**	**0.1 J**	<0.1	<0.5
Ethylbenzene	700	**2.7**	<0.1	<0.1	**1 J**	<0.1	<0.1	<0.2	<0.1	<0.1	**1.3 J**
Isopropylbenzene	451	**16**	<0.1	<0.1	**40**	<0.1	<0.1	<0.2	<0.1	<0.1	**12**
Methyl Tertiary Butyl Ether	133	**1.2**	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	**5.4**
Methylene Chloride	5	**0.7 J**	<0.2	<0.2	<1.0	<0.2	<0.2	<0.4	<0.2	<0.2	**1.1 J**
Naphthalene	1.11	**34**	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	**4.9**
n-Butylbenzene	33.8	**5.4 J**	<0.1	<0.1	**1.1 J**	<0.1	<0.1	<0.2	<0.1	<0.1	**2.5**
Styrene	100	<0.2	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
Tetrachloroethene	5	<0.2	**7**	**13**	<0.5	**39**	**58**	**47**	**3.6 J**	**7.5**	<0.5
Toluene	1,000	**0.5 J**	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
trans-1,2-Dichloroethene	100	**0.8 J**	**1**	<0.1	**1.1 J**	<0.1	**2.2**	**3.6**	<0.1	<0.1	<0.5
Trichloroethene	5	<0.2	**73**	**4.9**	<0.5	**1.6**	**240**	**230**	**0.3 J**	**0.3 J**	<0.5
Trichlorofluoromethane	1,090	<0.2	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
Vinyl Acetate	406	<0.4	<0.2	<0.2	<1.0	<0.2	<0.2	<0.4	<0.2	<0.2	<1.0
Vinyl Chloride	2	**3.2**	**0.4 J**	**22**	**4.1**	<0.1	<0.1	<0.2	<0.1	<0.1	<0.5
Xylenes (Total)	10,000	**17**	<0.1	<0.1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	**3.2**

Table 3. VOC Concentrations in Groundwater - June 2011 (Continued)

[a] Source: Risk-Based Standards for Kansas (RSK), RSK Manual-5th Version, Kansas Department of Health and Environment (KDHE), Bureau of Environmental Remediation, October 2010.
Sample concentration is similar to that found in an associated blank.
All units are presented in micrograms per liter (µg/L).
< Less than method detection limit (MDL).
Bold values were detected.
Shaded values are above the KDHE Tier 2 RSK Residential Levels.
Volatile organic compounds (VOCs) were analyzed by Lancaster Laboratories by U.S. Environmental Protection Agency (EPA) Method SW8260B.
B - Sample concentration is similar to that found in an associated blank.
ID - Identification.
J - The analyte was positively identified, the quantitation is an estimation.

Table 4. Summary of Results from Mann-Kendall Test - June 2011

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
On-Site Plumelet A					
P-1	1,2,4-Trimethylbenzene	1	8	0.236	Undetermined
P-1	1,2-Dichloroethane	1	8	0.072	Undetermined
P-1	1,3,5-Trimethylbenzene	1	8	0.236	Undetermined
P-1	Acetic acid	5	5	0.242	Undetermined
P-1	Acetone (2-Propanone)	1	8	0.236	Undetermined
P-1	Methyl tert-butyl ether (MTBE)	7	8	0.317	Undetermined
P-1	Methylene chloride (Dichloromethane)	1	8	0.114	Undetermined
P-1	Naphthalene	2	8	0.114	Undetermined
P-1	Tetrachloroethene	3	8	0.054	Undetermined
P-1	Trichloroethene	2	8	0.072	Undetermined
P-1	Xylenes (total)	1	8	0.236	Undetermined
P-1	cis-1,2-Dichloroethene	3	8	0.072	Undetermined
P-2	1,1,1-Trichloroethane	6	8	0.0028	Downward
P-2	1,1-Dichloroethane	5	8	0.236	Undetermined
P-2	1,1-Dichloroethene	5	8	0.0116	Downward
P-2	1,2,4-Trimethylbenzene	1	8	0.199	Undetermined
P-2	1,2-Dichloroethane	1	8	0.199	Undetermined
P-2	2-Butanone (MEK)	2	8	0.054	Undetermined
P-2	Acetic acid	5	5	0.117	Undetermined
P-2	Chloroethane (Ethyl chloride)	2	8	0.452	Undetermined
P-2	Ethylbenzene	2	8	0.36	Undetermined
P-2	Isopropylbenzene (Cumene)	2	8	0.548	Undetermined
P-2	Methylene chloride (Dichloromethane)	2	8	0.274	Undetermined
P-2	Naphthalene	3	8	0.36	Undetermined
P-2	Propionicacid	5	5	0.242	Undetermined
P-2	Tetrachloroethene	3	8	0.0071	Downward
P-2	Toluene	2	8	0.548	Undetermined
P-2	Trichloroethene	4	8	0.005	Downward
P-2	Vinyl chloride (Chloroethene)	8	8	0.199	Undetermined
P-2	Xylenes (total)	2	8	0.138	Undetermined
P-2	cis-1,2-Dichloroethene	8	8	0.031	Downward
P-2	n-Butylbenzene	1	8	0.199	Undetermined
P-2	trans-1,2-Dichloroethene	8	8	0.031	Downward
P-5	1,1,1-Trichloroethane	10	11	0.014636255	Downward
P-5	1,1-Dichloroethane	4	11	0.434781275	Undetermined
P-5	1,1-Dichloroethene	7	11	0.017500545	Downward
P-5	1,2,4-Trimethylbenzene	3	11	0.024567548	Downward
P-5	1,2-Dichlorobenzene	2	8	0.114	Undetermined
P-5	1,2-Dichloroethane	2	11	0.006557027	Downward
P-5	1,3,5-Trimethylbenzene	2	11	0.08477159	Undetermined
P-5	2-Butanone (MEK)	2	11	0.274660052	Undetermined
P-5	Acetic acid	5	5	0.042	Upward
P-5	Acetone (2-Propanone)	2	11	0.334434971	Undetermined
P-5	Benzene	2	11	0.008109984	Downward
P-5	Butyricacid	5	5	0.042	Upward
P-5	Carbon disulfide	1	11	0.287177277	Undetermined
P-5	Chloroethane (Ethyl chloride)	2	11	0.463732561	Undetermined
P-5	Ethylbenzene	2	11	0.133065077	Undetermined
P-5	Isopropylbenzene (Cumene)	2	11	0.151445193	Undetermined
P-5	Lacticacid	5	5	0.117	Undetermined
P-5	Methylene chloride (Dichloromethane)	3	11	0.015141691	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
On-Site Plumelet A (Continued)					
P-5	Naphthalene	4	11	0.035431389	Downward
P-5	Pentanoicacid	5	5	0.042	Upward
P-5	Propionicacid	5	5	0.242	Undetermined
P-5	Tetrachloroethene	10	11	0.000922861	Downward
P-5	Toluene	4	11	0.054846615	Undetermined
P-5	Trichloroethene	10	11	0.000922861	Downward
P-5	Vinyl chloride (Chloroethene)	11	11	0.175100695	Undetermined
P-5	Xylenes (total)	2	11	0.151445193	Undetermined
P-5	cis-1,2-Dichloroethene	11	11	0.080562475	Undetermined
P-5	n-Butylbenzene	2	11	0.027955677	Downward
P-5	trans-1,2-Dichloroethene	10	11	0.12073846	Undetermined
P-6	1,1,1-Trichloroethane	3	6	0.186	Undetermined
P-6	1,1-Dichloroethane	5	6	0.028	Upward
P-6	1,1-Dichloroethene	1	6	0.102	Undetermined
P-6	1,2,4-Trimethylbenzene	3	6	0.298	Undetermined
P-6	1,2-Dichlorobenzene	2	5	0.18	Undetermined
P-6	1,2-Dichloroethane	2	6	0.5	Undetermined
P-6	1,3,5-Trimethylbenzene	1	6	0.43	Undetermined
P-6	2-Butanone (MEK)	2	6	0.298	Undetermined
P-6	4-Methyl-2-pentanone (MIBK)	1	6	0.5	Undetermined
P-6	Acetic acid	5	5	0.408	Undetermined
P-6	Acetone (2-Propanone)	2	6	0.43	Undetermined
P-6	Benzene	2	6	0.43	Undetermined
P-6	Carbon disulfide	1	6	0.235	Undetermined
P-6	Chloroethane (Ethyl chloride)	3	6	0.018	Upward
P-6	Ethylbenzene	3	6	0.577	Undetermined
P-6	I-pentanoicacid	4	5	0.408	Undetermined
P-6	Isopropylbenzene (Cumene)	3	6	0.577	Undetermined
P-6	Methylene chloride (Dichloromethane)	1	6	0.43	Undetermined
P-6	Naphthalene	3	6	0.298	Undetermined
P-6	Propionicacid	5	5	0.325	Undetermined
P-6	Pyruvicacid	3	5	0.592	Undetermined
P-6	Tetrachloroethene	6	6	0.136	Undetermined
P-6	Toluene	3	6	0.577	Undetermined
P-6	Tribromomethane (Bromoform)	1	6	0.235	Undetermined
P-6	Trichloroethene	6	6	0.068	Undetermined
P-6	Vinyl chloride (Chloroethene)	6	6	0.068	Undetermined
P-6	Xylenes (total)	3	6	0.577	Undetermined
P-6	cis-1,2-Dichloroethene	6	6	0.068	Undetermined
P-6	n-Butylbenzene	2	6	0.298	Undetermined
P-6	trans-1,2-Dichloroethene	6	6	0.136	Undetermined
P-9	1,1,1-Trichloroethane	4	7	0.281	Undetermined
P-9	1,1-Dichloroethane	7	7	0.052	Undetermined
P-9	1,1-Dichloroethene	3	7	0.094	Undetermined
P-9	1,2,4-Trimethylbenzene	2	7	0.236	Undetermined
P-9	1,2-Dichlorobenzene	4	7	0.334	Undetermined
P-9	1,2-Dichloroethane	2	7	0.334	Undetermined
P-9	1,3,5-Trimethylbenzene	1	7	0.5	Undetermined
P-9	2-Butanone (MEK)	1	7	0.281	Undetermined
P-9	Acetic acid	5	5	0.042	Downward
P-9	Acetone (2-Propanone)	4	7	0.334	Undetermined

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
On-Site Plumelet A (Continued)					
P-9	Benzene	2	7	0.443	Undetermined
P-9	Butyricacid	4	5	0.117	Undetermined
P-9	Carbon disulfide	1	7	0.191	Undetermined
P-9	Chlorobenzene	1	7	0.191	Undetermined
P-9	Chloroethane (Ethyl chloride)	7	7	0.386	Undetermined
P-9	Chloroform	1	7	0.191	Undetermined
P-9	Ethylbenzene	2	7	0.155	Undetermined
P-9	Isopropylbenzene (Cumene)	2	7	0.155	Undetermined
P-9	Methylene chloride (Dichloromethane)	1	7	0.068	Undetermined
P-9	Naphthalene	3	7	0.236	Undetermined
P-9	Propionicacid	5	5	0.042	Downward
P-9	Pyruvicacid	3	5	0.025	Downward
P-9	Tetrachloroethene	4	7	0.094	Undetermined
P-9	Toluene	4	7	0.236	Undetermined
P-9	Trichloroethene	4	7	0.094	Undetermined
P-9	Vinyl chloride (Chloroethene)	7	7	0.119	Undetermined
P-9	Xylenes (total)	2	7	0.155	Undetermined
P-9	cis-1,2-Dichloroethene	7	7	0.119	Undetermined
P-9	n-Butylbenzene	1	7	0.5	Undetermined
P-9	trans-1,2-Dichloroethene	7	7	0.119	Undetermined
P-10	1,1,1-Trichloroethane	4	6	0.018	Downward
P-10	1,1-Dichloroethane	3	6	0.298	Undetermined
P-10	1,1-Dichloroethene	4	6	0.5	Undetermined
P-10	Methyl tert-butyl ether (MTBE)	1	6	0.36	Undetermined
P-10	Methylene chloride (Dichloromethane)	2	6	0.298	Undetermined
P-10	Naphthalene	1	6	0.235	Undetermined
P-10	Tetrachloroethene	6	6	0.0014	Downward
P-10	Toluene	1	6	0.5	Undetermined
P-10	Trichloroethene	6	6	0.068	Undetermined
P-10	Vinyl chloride (Chloroethene)	3	6	0.43	Undetermined
P-10	cis-1,2-Dichloroethene	6	6	0.5	Undetermined
P-10	trans-1,2-Dichloroethene	5	6	0.235	Undetermined
P-11	1,1,1-Trichloroethane	5	5	0.117	Undetermined
P-11	1,1,2-Trichloroethane	1	5	0.117	Undetermined
P-11	1,1-Dichloroethane	3	5	0.08	Undetermined
P-11	1,1-Dichloroethene	4	5	0.242	Undetermined
P-11	1,2,4-Trimethylbenzene	2	5	0.408	Undetermined
P-11	1,2-Dichloroethane	1	5	0.18	Undetermined
P-11	2-Butanone (MEK)	1	5	0.5	Undetermined
P-11	Acetic acid	5	5	0.408	Undetermined
P-11	Acetone (2-Propanone)	2	5	0.408	Undetermined
P-11	Butyricacid	5	5	0.042	Upward
P-11	Chloroethane (Ethyl chloride)	1	5	0.18	Undetermined
P-11	Ethylbenzene	2	5	0.325	Undetermined
P-11	Methylene chloride (Dichloromethane)	2	5	0.408	Undetermined
P-11	Naphthalene	1	5	0.18	Undetermined
P-11	Pentanoicacid	5	5	0.042	Upward
P-11	Propionicacid	5	5	0.08	Undetermined
P-11	Pyruvicacid	5	5	0.08	Undetermined
P-11	Tetrachloroethene	5	5	0.117	Undetermined
P-11	Toluene	2	5	0.08	Undetermined

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
On-Site Plumelet A (Continued)					
P-11	Trichloroethene	5	5	0.242	Undetermined
P-11	Vinyl chloride (Chloroethene)	5	5	0.0083	Upward
P-11	Xylenes (total)	2	5	0.5	Undetermined
P-11	cis-1,2-Dichloroethene	5	5	0.408	Undetermined
P-11	trans-1,2-Dichloroethene	5	5	0.408	Undetermined
P-12	1,1,1-Trichloroethane	4	5	0.0083	Downward
P-12	1,1,2-Trichloroethane	2	5	0.592	Undetermined
P-12	1,1-Dichloroethane	5	5	0.18	Undetermined
P-12	1,1-Dichloroethene	3	5	0.08	Undetermined
P-12	1,2,4-Trimethylbenzene	4	5	0.5	Undetermined
P-12	1,2-Dichlorobenzene	4	5	0.025	Downward
P-12	1,2-Dichloroethane	4	5	0.242	Undetermined
P-12	1,3,5-Trimethylbenzene	2	5	0.5	Undetermined
P-12	2-Butanone (MEK)	3	5	0.408	Undetermined
P-12	Acetic acid	5	5	0.117	Undetermined
P-12	Acetone (2-Propanone)	4	5	0.117	Undetermined
P-12	Benzene	4	5	0.408	Undetermined
P-12	Butyricacid	5	5	0.117	Undetermined
P-12	Carbon disulfide	1	5	0.5	Undetermined
P-12	Chloroethane (Ethyl chloride)	4	5	0.042	Upward
P-12	Ethylbenzene	4	5	0.408	Undetermined
P-12	Isopropylbenzene (Cumene)	4	5	0.408	Undetermined
P-12	Naphthalene	4	5	0.042	Upward
P-12	Pentanoicacid	5	5	0.242	Undetermined
P-12	Propionicacid	5	5	0.025	Downward
P-12	Pyruvicacid	5	5	0.117	Undetermined
P-12	Tetrachloroethene	3	5	0.5	Undetermined
P-12	Toluene	4	5	0.025	Upward
P-12	Trichloroethene	4	5	0.592	Undetermined
P-12	Vinyl chloride (Chloroethene)	5	5	0.117	Undetermined
P-12	Xylenes (total)	4	5	0.042	Upward
P-12	cis-1,2-Dichloroethene	5	5	0.117	Undetermined
P-12	n-Butylbenzene	4	5	0.325	Undetermined
P-12	trans-1,2-Dichloroethene	5	5	0.0083	Downward
Off-Site Plumelets A and B					
MW-8	Co_2 By Headspace	5	5	0.5	Undetermined
MW-8	Methylene chloride (Dichloromethane)	1	18	8.53993E-05	Downward
MW-8	Tetrachloroethene	2	18	4.42824E-05	Downward
MW-8	Toluene	1	18	0.001783874	Downward
MW-8	Trichloroethene	2	18	4.42824E-05	Downward
MW-8	Vinyl chloride (Chloroethene)	3	18	0.000179932	Downward
MW-8	Xylenes (total)	1	18	0.000119282	Downward
MW-8	cis-1,2-Dichloroethene	3	18	0.000179932	Downward
MW-8	trans-1,2-Dichloroethene	2	18	4.42824E-05	Downward
MW-9	2-Butanone (MEK)	1	8	0.274	Undetermined
MW-9	Acetone (2-Propanone)	1	8	0.114	Undetermined
MW-9	Methylene chloride (Dichloromethane)	1	8	0.0028	Downward
MW-9	Toluene	2	8	0.168	Undetermined
MW-9	Xylenes (total)	1	8	0.0071	Downward
MW-18	1,1,2-Trichloroethane	2	12	0.470562923	Undetermined
MW-18	1,1-Dichloroethane	12	12	8.11378E-05	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B					
MW-18	1,1-Dichloroethene	12	12	0.167954297	Undetermined
MW-18	1,2-Dichlorobenzene	3	10	0.332	Undetermined
MW-18	1,2-Dichloroethane	6	12	0.00116093	Downward
MW-18	2-Butanone (MEK)	1	12	0.06928425	Undetermined
MW-18	Acetic acid	4	6	0.136	Undetermined
MW-18	Acetone (2-Propanone)	2	12	0.06928425	Undetermined
MW-18	Benzene	3	12	0.168499015	Undetermined
MW-18	Carbon disulfide	1	12	0.007053954	Upward
MW-18	Chloroethane (Ethyl chloride)	3	12	0.175320778	Undetermined
MW-18	Co_2 By Headspace	9	9	0.13	Undetermined
MW-18	Ethane	7	9	0.017	Upward
MW-18	Ethylbenzene	1	12	0.06928425	Undetermined
MW-18	Methane	8	9	0.022	Upward
MW-18	Methylene chloride (Dichloromethane)	2	12	0.12594231	Undetermined
MW-18	Tetrachloroethene	12	12	0.108003059	Undetermined
MW-18	Toluene	1	12	0.044691389	Upward
MW-18	Trichloroethene	12	12	0.418125263	Undetermined
MW-18	Vinyl chloride (Chloroethene)	12	12	0.016762083	Upward
MW-18	cis-1,2-Dichloroethene	12	12	0.008196658	Upward
MW-18	trans-1,2-Dichloroethene	12	12	0.01182111	Upward
MW-19	1,1-Dichloroethane	1	12	0.049132318	Downward
MW-19	Acetone (2-Propanone)	1	12	0.005239694	Downward
MW-19	Carbon disulfide	1	12	0.301258044	Undetermined
MW-19	Methylene chloride (Dichloromethane)	1	12	0.006986955	Downward
MW-19	Tetrachloroethene	12	12	0.444721278	Undetermined
MW-19	Trichloroethene	8	12	0.415863765	Undetermined
MW-19	cis-1,2-Dichloroethene	4	12	0.108749834	Undetermined
MW-20	1,1,1-Trichloroethane	3	22	0.001719258	Downward
MW-20	1,1,2-Trichloroethane	16	22	1.39E-07	Downward
MW-20	1,1-Dichloroethane	22	22	1.87E-09	Downward
MW-20	1,1-Dichloroethene	22	22	0.000086738	Downward
MW-20	1,2-Dichlorobenzene	2	10	0.332	Undetermined
MW-20	1,2-Dichloroethane	18	22	8.32E-09	Downward
MW-20	Acetic acid	4	6	0.068	Undetermined
MW-20	Benzene	2	22	0.001008695	Downward
MW-20	Chloroethane (Ethyl chloride)	12	22	2.02E-06	Downward
MW-20	Chloroform	1	13	0.182628924	Undetermined
MW-20	Co_2 By Headspace	10	10	0.364	Undetermined
MW-20	Ethane	2	9	0.11	Undetermined
MW-20	Methane	3	9	0.017	Upward
MW-20	Methylene chloride (Dichloromethane)	2	22	0.345263577	Undetermined
MW-20	Tetrachloroethene	22	22	1.15E-08	Downward
MW-20	Toluene	1	22	0.003634479	Downward
MW-20	Trichloroethene	22	22	5.15E-06	Downward
MW-20	Vinyl chloride (Chloroethene)	8	22	0.20072779	Undetermined
MW-20	Xylenes (total)	1	22	0.001641871	Downward
MW-20	cis-1,2-Dichloroethene	22	22	0.005992014	Downward
MW-20	trans-1,2-Dichloroethene	18	22	0.07075459	Undetermined
MW-21	1,1,2-Trichloroethane	3	18	2.57949E-05	Downward
MW-21	1,1-Dichloroethane	18	18	7.40E-07	Downward
MW-21	1,1-Dichloroethene	18	18	1.75491E-05	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B (Continued)					
MW-21	1,2-Dichlorobenzene	10	10	0.014	Downward
MW-21	1,2-Dichloroethane	18	18	9.63E-07	Downward
MW-21	2-Butanone (MEK)	3	18	0.023562652	Downward
MW-21	Acetic acid	3	6	0.102	Undetermined
MW-21	Acetone (2-Propanone)	1	18	0.00026759	Downward
MW-21	Benzene	12	18	7.96293E-05	Downward
MW-21	Carbon disulfide	1	18	0.012431403	Downward
MW-21	Chloroethane (Ethyl chloride)	4	18	3.50651E-05	Downward
MW-21	Chloroform	3	13	0.021007628	Downward
MW-21	Co_2 By Headspace	8	8	0.36	Undetermined
MW-21	Ethane	8	9	0.012	Downward
MW-21	Methane	8	9	0.0063	Downward
MW-21	Methyl tert-butyl ether (MTBE)	1	13	0.018023818	Downward
MW-21	Methylene chloride (Dichloromethane)	4	18	0.001157589	Downward
MW-21	Tetrachloroethene	18	18	2.25E-06	Downward
MW-21	Toluene	3	18	8.94032E-05	Downward
MW-21	Trichloroethene	18	18	1.10619E-05	Downward
MW-21	Vinyl chloride (Chloroethene)	17	18	4.61E-06	Downward
MW-21	cis-1,2-Dichloroethene	18	18	3.44555E-05	Downward
MW-21	trans-1,2-Dichloroethene	13	18	0.055220284	Undetermined
MW-22	2-Butanone (MEK)	2	17	0.232355264	Undetermined
MW-22	Methylene chloride (Dichloromethane)	2	17	6.26826E-05	Downward
MW-22	Naphthalene	2	17	0.000108187	Downward
MW-22	Tetrachloroethene	4	17	0.005114075	Downward
MW-22	Toluene	2	17	0.009059989	Downward
MW-22	Xylenes (total)	2	17	0.000320497	Downward
R-2	1,1,1-Trichloroethane	1	21	4.59384E-05	Downward
R-2	1,1-Dichloroethane	21	21	0.000401355	Downward
R-2	1,1-Dichloroethene	7	21	4.83855E-05	Downward
R-2	1,2,4-Trimethylbenzene	1	21	7.96086E-05	Downward
R-2	1,2-Dichlorobenzene	2	8	0.452	Undetermined
R-2	1,2-Dichloroethane	8	21	0.000390868	Downward
R-2	1,3,5-Trimethylbenzene	1	21	7.96086E-05	Downward
R-2	2-Butanone (MEK)	1	21	0.009133381	Downward
R-2	Acetic acid	2	5	0.5	Undetermined
R-2	Acetone (2-Propanone)	1	21	2.15972E-05	Downward
R-2	Benzene	3	21	0.001335025	Downward
R-2	Carbon disulfide	1	21	0.017807861	Downward
R-2	Chlorobenzene	1	21	0.000104121	Downward
R-2	Chloroethane (Ethyl chloride)	3	21	2.35226E-05	Downward
R-2	Chloroform	1	11	0.5	Undetermined
R-2	Co_2 By Headspace	9	9	0.0091	Upward
R-2	Ethylbenzene	2	21	0.000166996	Downward
R-2	Methane	5	7	0.236	Undetermined
R-2	Methylene chloride (Dichloromethane)	1	21	1.07717E-05	Downward
R-2	Naphthalene	3	21	7.95504E-05	Downward
R-2	Tetrachloroethene	21	21	0.00009744	Downward
R-2	Toluene	2	21	0.00006618	Downward
R-2	Trichloroethene	20	21	0.000444992	Downward
R-2	Vinyl chloride (Chloroethene)	16	21	0.123449872	Undetermined
R-2	Xylenes (total)	2	21	0.000166996	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B (Continued)					
R-2	cis-1,2-Dichloroethene	21	21	0.001134061	Downward
R-2	trans-1,2-Dichloroethene	11	21	0.006797312	Downward
R-3	1,1,1-Trichloroethane	2	22	0.001345058	Downward
R-3	1,1,2-Trichloroethane	2	22	0.001345058	Downward
R-3	1,1-Dichloroethane	22	22	0.000317711	Downward
R-3	1,1-Dichloroethene	8	22	0.008601201	Downward
R-3	1,2,4-Trimethylbenzene	11	22	1.15947E-05	Downward
R-3	1,2-Dichlorobenzene	10	10	0.216	Undetermined
R-3	1,2-Dichloroethane	19	22	0.007478452	Downward
R-3	1,3,5-Trimethylbenzene	11	22	7.78E-06	Downward
R-3	2-Butanone (MEK)	5	22	0.089928222	Undetermined
R-3	4-Methyl-2-pentanone (MIBK)	2	22	0.045071085	Downward
R-3	Acetic acid	5	5	0.025	Downward
R-3	Acetone (2-Propanone)	3	22	0.000427489	Downward
R-3	Benzene	22	22	0.00013482	Downward
R-3	Carbon disulfide	5	22	0.110172046	Undetermined
R-3	Carbon tetrachloride	2	22	0.002745403	Downward
R-3	Chlorobenzene	6	22	0.02966587	Downward
R-3	Chloroethane (Ethyl chloride)	21	22	7.79335E-05	Downward
R-3	Chloroform	2	11	0.134058894	Undetermined
R-3	Co_2 By Headspace	9	9	0.42	Undetermined
R-3	Ethane	8	8	0.089	Undetermined
R-3	Ethene	8	8	0.36	Undetermined
R-3	Ethylbenzene	13	22	3.23E-06	Downward
R-3	Isopropylbenzene (Cumene)	18	22	0.000106836	Downward
R-3	Methane	8	8	0.36	Undetermined
R-3	Methyl tert-butyl ether (MTBE)	2	11	0.158251296	Undetermined
R-3	Methylene chloride (Dichloromethane)	6	22	0.056371341	Undetermined
R-3	Naphthalene	14	22	1.61403E-05	Downward
R-3	Styrene	2	22	0.002745403	Downward
R-3	Tetrachloroethene	4	22	0.000946555	Downward
R-3	Toluene	15	22	6.24E-06	Downward
R-3	Tribromomethane (Bromoform)	2	10	0.127	Undetermined
R-3	Trichloroethene	9	22	0.007564813	Downward
R-3	Trichlorofluoromethane	2	11	0.134058894	Undetermined
R-3	Vinyl acetate	2	11	0.134058894	Undetermined
R-3	Vinyl chloride (Chloroethene)	20	22	0.000531002	Downward
R-3	Xylenes (total)	14	22	8.69E-06	Downward
R-3	cis-1,2-Dichloroethene	21	22	0.206659962	Undetermined
R-3	n-Butylbenzene	11	22	9.18013E-05	Downward
R-3	trans-1,2-Dichloroethene	14	22	0.077450347	Undetermined
R-4	1,1,1-Trichloroethane	5	20	9.35612E-05	Downward
R-4	1,1-Dichloroethane	20	20	3.08E-06	Downward
R-4	1,1-Dichloroethene	17	20	1.48575E-05	Downward
R-4	1,2,4-Trimethylbenzene	4	20	2.33E-06	Downward
R-4	1,2-Dichloroethane	3	20	1.28499E-05	Downward
R-4	1,3,5-Trimethylbenzene	3	20	3.65E-06	Downward
R-4	2-Butanone (MEK)	4	20	0.307086927	Undetermined
R-4	Acetone (2-Propanone)	3	20	2.38489E-05	Downward
R-4	Benzene	18	20	7.44E-06	Downward
R-4	Carbon disulfide	1	20	0.013031189	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B (Continued)					
R-4	Chloroethane (Ethyl chloride)	8	20	0.000116794	Downward
R-4	Co_2 By Headspace	7	7	0.094	Undetermined
R-4	Ethane	6	6	0.136	Undetermined
R-4	Ethene	6	6	0.298	Undetermined
R-4	Ethylbenzene	7	20	6.13E-07	Downward
R-4	Isopropylbenzene (Cumene)	8	20	0.0001863	Downward
R-4	Methane	6	6	0.0083	Upward
R-4	Methyl tert-butyl ether (MTBE)	9	10	0.023	Upward
R-4	Methylene chloride (Dichloromethane)	4	20	0.02443828	Downward
R-4	Naphthalene	8	20	1.93363E-05	Downward
R-4	Tetrachloroethene	18	20	3.17E-06	Downward
R-4	Toluene	3	20	3.23583E-05	Downward
R-4	Trichloroethene	19	20	1.89088E-05	Downward
R-4	Vinyl chloride (Chloroethene)	20	20	1.47E-06	Downward
R-4	Xylenes (total)	4	20	1.96E-06	Downward
R-4	cis-1,2-Dichloroethene	20	20	4.03E-07	Downward
R-4	n-Butylbenzene	2	20	2.99009E-05	Downward
R-4	trans-1,2-Dichloroethene	13	20	2.98202E-05	Downward
R-5	1,1,1-Trichloroethane	22	23	0.001952142	Downward
R-5	1,1,2-Trichloroethane	4	23	0.089297411	Undetermined
R-5	1,1-Dichloroethane	23	23	2.36E-06	Downward
R-5	1,1-Dichloroethene	23	23	0.007401983	Downward
R-5	1,2,4-Trimethylbenzene	2	23	0.008060408	Downward
R-5	1,2-Dichlorobenzene	1	10	0.364	Undetermined
R-5	1,2-Dichloroethane	11	23	0.000631414	Downward
R-5	1,3,5-Trimethylbenzene	2	23	0.007450892	Downward
R-5	Acetic acid	6	7	0.068	Undetermined
R-5	Benzene	1	23	0.196139547	Undetermined
R-5	Chloroethane (Ethyl chloride)	1	23	0.006441667	Downward
R-5	Co_2 By Headspace	9	9	0.54	Undetermined
R-5	Ethylbenzene	2	23	0.164511049	Undetermined
R-5	Methane	5	8	0.0006	Upward
R-5	Methylene chloride (Dichloromethane)	2	23	0.001681102	Upward
R-5	Naphthalene	3	23	0.131064828	Undetermined
R-5	Tetrachloroethene	23	23	0.478888202	Undetermined
R-5	Trichloroethene	23	23	1.97505E-05	Upward
R-5	Vinyl chloride (Chloroethene)	21	23	0.5	Undetermined
R-5	Xylenes (total)	2	23	0.164511049	Undetermined
R-5	cis-1,2-Dichloroethene	23	23	1.11E-07	Upward
R-5	n-Butylbenzene	1	23	0.196139547	Undetermined
R-5	trans-1,2-Dichloroethene	16	22	0.001451627	Upward
R-6	1,1,1-Trichloroethane	7	19	0.002712137	Downward
R-6	1,1,2-Trichloroethane	5	19	1.74739E-05	Downward
R-6	1,1-Dichloroethane	15	19	0.015796502	Upward
R-6	1,1-Dichloroethene	12	19	0.07201895	Undetermined
R-6	1,2,4-Trimethylbenzene	2	19	0.002995212	Downward
R-6	1,2-Dichlorobenzene	7	8	0.005	Upward
R-6	1,2-Dichloroethane	10	19	0.001551777	Downward
R-6	Acetone (2-Propanone)	2	19	0.001588291	Downward
R-6	Benzene	1	19	0.001980986	Downward
R-6	Chloroethane (Ethyl chloride)	1	19	0.000415053	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B (Continued)					
R-6	Co_2 By Headspace	7	7	0.236	Undetermined
R-6	Ethylbenzene	3	19	0.003797076	Downward
R-6	Methane	6	6	0.028	Upward
R-6	Methylene chloride (Dichloromethane)	2	19	0.000272765	Downward
R-6	Naphthalene	3	19	0.000887712	Downward
R-6	Tetrachloroethene	19	19	0.037101706	Downward
R-6	Toluene	3	19	0.001032493	Downward
R-6	Trichloroethene	17	19	0.299231171	Undetermined
R-6	Vinyl chloride (Chloroethene)	11	19	0.279486622	Undetermined
R-6	Xylenes (total)	3	19	0.0009018	Downward
R-6	cis-1,2-Dichloroethene	17	19	0.002262414	Upward
R-6	trans-1,2-Dichloroethene	10	18	0.042007492	Downward
R-7	1,1-Dichloroethane	17	19	0.00019893	Downward
R-7	1,1-Dichloroethene	14	19	1.21764E-05	Downward
R-7	1,2-Dichloroethane	3	19	2.41531E-05	Downward
R-7	Chloroethane (Ethyl chloride)	2	19	9.17365E-05	Downward
R-7	Co_2 By Headspace	5	5	0.408	Undetermined
R-7	Ethylbenzene	1	19	9.28413E-05	Downward
R-7	Methane	4	5	0.325	Undetermined
R-7	Methylene chloride (Dichloromethane)	2	19	0.00002707	Downward
R-7	Naphthalene	2	19	3.59704E-05	Downward
R-7	Tetrachloroethene	19	19	4.36923E-05	Downward
R-7	Toluene	1	19	8.09051E-05	Downward
R-7	Trichloroethene	19	19	0.000917783	Downward
R-7	Vinyl chloride (Chloroethene)	1	19	0.000229051	Downward
R-7	Xylenes (total)	1	19	9.28413E-05	Downward
R-7	cis-1,2-Dichloroethene	19	19	0.001832859	Downward
R-7	trans-1,2-Dichloroethene	8	19	7.41783E-05	Downward
R-8	Ethylbenzene	1	12	0.015804397	Downward
R-8	Naphthalene	2	12	0.005369608	Downward
R-8	Tetrachloroethene	5	12	0.001702618	Downward
R-8	Trichloroethene	3	12	0.001526821	Downward
R-8	Xylenes (total)	1	12	0.015804397	Downward
R-8	cis-1,2-Dichloroethene	2	12	0.02664088	Downward
R-10	1,1,1-Trichloroethane	3	22	0.000304721	Downward
R-10	1,1,2-Trichloroethane	3	22	0.000253486	Downward
R-10	1,1-Dichloroethane	22	22	5.92E-06	Downward
R-10	1,1-Dichloroethene	22	22	0.067135513	Undetermined
R-10	1,2-Dichlorobenzene	2	9	0.238	Undetermined
R-10	1,2-Dichloroethane	14	22	2.06E-06	Downward
R-10	Acetic acid	3	6	0.186	Undetermined
R-10	Benzene	2	22	0.001413877	Downward
R-10	Carbon disulfide	2	22	0.107437782	Undetermined
R-10	Chloroethane (Ethyl chloride)	10	22	0.000105185	Downward
R-10	Chloroform	1	12	0.088845989	Undetermined
R-10	Co_2 By Headspace	10	10	0.332	Undetermined
R-10	Ethane	6	9	0.0063	Upward
R-10	Ethylbenzene	1	22	0.001368877	Downward
R-10	Methane	9	9	0.0063	Upward
R-10	Methylene chloride (Dichloromethane)	4	22	0.153293388	Undetermined
R-10	Naphthalene	1	22	0.00085307	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B (Continued)					
R-10	Tetrachloroethene	22	22	2.74284E-05	Downward
R-10	Toluene	2	22	0.001223996	Downward
R-10	Trichloroethene	22	22	0.025708566	Downward
R-10	Vinyl chloride (Chloroethene)	18	22	0.43257629	Undetermined
R-10	Xylenes (total)	1	22	0.001368877	Downward
R-10	cis-1,2-Dichloroethene	22	22	0.147918252	Undetermined
R-10	trans-1,2-Dichloroethene	13	21	0.12981487	Undetermined
R-11	1,1-Dichloroethane	20	20	2.35226E-05	Downward
R-11	1,1-Dichloroethene	20	20	1.52482E-05	Downward
R-11	1,2-Dichlorobenzene	9	9	0.06	Undetermined
R-11	1,2-Dichloroethane	19	20	1.91331E-05	Downward
R-11	2-Butanone (MEK)	2	20	0.014431651	Downward
R-11	Acetone (2-Propanone)	4	20	0.000033039	Downward
R-11	Benzene	12	20	0.048878243	Downward
R-11	Carbon tetrachloride	1	20	0.000072208	Downward
R-11	Chlorobenzene	3	20	6.30E-06	Downward
R-11	Chloroethane (Ethyl chloride)	11	20	2.71593E-05	Downward
R-11	Chloroform	1	10	0.045	Downward
R-11	Co_2 By Headspace	8	8	0.452	Undetermined
R-11	Ethane	7	7	0.236	Undetermined
R-11	Ethylbenzene	1	20	0.000072208	Downward
R-11	Isopropylbenzene (Cumene)	1	20	1.63104E-05	Downward
R-11	Methane	7	7	0.119	Undetermined
R-11	Methyl tert-butyl ether (MTBE)	1	10	0.5	Undetermined
R-11	Methylene chloride (Dichloromethane)	3	20	0.000113477	Downward
R-11	Naphthalene	1	20	3.94468E-05	Downward
R-11	Styrene	1	20	0.000072208	Downward
R-11	Tetrachloroethene	12	20	7.89E-06	Downward
R-11	Toluene	2	20	0.000174559	Downward
R-11	Trichloroethene	19	20	1.36057E-05	Downward
R-11	Vinyl chloride (Chloroethene)	17	20	0.208160602	Undetermined
R-11	cis-1,2-Dichloroethene	19	20	0.000309092	Downward
R-11	trans-1,2-Dichloroethene	12	19	0.311140591	Undetermined
R-12	1,1-Dichloroethane	15	15	0.227935534	Undetermined
R-12	1,1-Dichloroethene	13	15	0.020851667	Upward
R-12	1,2,4-Trimethylbenzene	1	15	0.262291531	Undetermined
R-12	1,2-Dichlorobenzene	6	9	0.0091	Upward
R-12	1,2-Dichloroethane	14	15	0.041065889	Upward
R-12	Acetic acid	3	6	0.298	Undetermined
R-12	Benzene	6	15	0.039430145	Upward
R-12	Chloroethane (Ethyl chloride)	5	15	0.362618821	Undetermined
R-12	Co_2 By Headspace	10	10	0.0011	Upward
R-12	Ethane	3	9	0.017	Upward
R-12	Methane	5	9	0.0029	Upward
R-12	Methylene chloride (Dichloromethane)	5	15	0.275984614	Undetermined
R-12	Tetrachloroethene	13	15	4.35586E-05	Downward
R-12	Trichloroethene	14	15	0.001492735	Downward
R-12	Vinyl chloride (Chloroethene)	13	15	0.002733947	Upward
R-12	cis-1,2-Dichloroethene	15	15	0.199225928	Undetermined
R-12	trans-1,2-Dichloroethene	13	15	0.003693492	Upward
TW-1	1,1-Dichloroethane	12	12	0.016762083	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B (Continued)					
TW-1	1,1-Dichloroethene	1	12	0.114277394	Undetermined
TW-1	1,2,4-Trimethylbenzene	11	12	0.043235564	Downward
TW-1	1,2-Dichlorobenzene	5	6	0.018	Downward
TW-1	1,2-Dichloroethane	6	12	0.360492431	Undetermined
TW-1	1,3,5-Trimethylbenzene	10	12	0.084614284	Undetermined
TW-1	2-Butanone (MEK)	3	12	0.133052549	Undetermined
TW-1	Acetone (2-Propanone)	2	12	0.07603904	Undetermined
TW-1	Benzene	12	12	0.445330174	Undetermined
TW-1	Chloroethane (Ethyl chloride)	11	12	0.391682182	Undetermined
TW-1	Ethylbenzene	12	12	0.023372471	Downward
TW-1	Isopropylbenzene (Cumene)	11	12	0.049509916	Downward
TW-1	Methyl tert-butyl ether (MTBE)	4	7	0.562	Undetermined
TW-1	Methylene chloride (Dichloromethane)	2	12	0.5	Undetermined
TW-1	Naphthalene	12	12	0.057378367	Undetermined
TW-1	Tetrachloroethene	1	12	0.068453897	Undetermined
TW-1	Toluene	12	12	0.073970462	Undetermined
TW-1	Trichloroethene	2	12	0.060359788	Undetermined
TW-1	Vinyl chloride (Chloroethene)	10	12	0.5	Undetermined
TW-1	Xylenes (total)	12	12	0.096308137	Undetermined
TW-1	cis-1,2-Dichloroethene	8	12	0.149541912	Undetermined
TW-1	n-Butylbenzene	10	12	0.065247158	Undetermined
TW-1	trans-1,2-Dichloroethene	7	12	0.087367912	Undetermined
TW-3	1,1,1-Trichloroethane	9	17	0.447865659	Undetermined
TW-3	1,1-Dichloroethane	16	17	0.098236303	Undetermined
TW-3	1,1-Dichloroethene	14	17	0.005516267	Downward
TW-3	1,2,4-Trimethylbenzene	1	17	0.002408331	Downward
TW-3	1,2-Dichlorobenzene	6	7	0.035	Upward
TW-3	1,2-Dichloroethane	6	17	0.008746795	Downward
TW-3	Acetone (2-Propanone)	1	17	0.000316574	Downward
TW-3	Benzene	8	17	0.003928836	Downward
TW-3	Ethylbenzene	1	17	0.002408331	Downward
TW-3	Methyl tert-butyl ether (MTBE)	1	8	0.072	Undetermined
TW-3	Methylene chloride (Dichloromethane)	2	17	0.000951912	Downward
TW-3	Naphthalene	3	17	0.001374473	Downward
TW-3	Styrene	1	17	0.000110352	Downward
TW-3	Tetrachloroethene	17	17	0.00092781	Downward
TW-3	Toluene	2	17	0.00269855	Downward
TW-3	Trichloroethene	17	17	0.5	Undetermined
TW-3	Vinyl chloride (Chloroethene)	16	17	0.006686897	Downward
TW-3	Xylenes (total)	3	17	0.004045539	Downward
TW-3	cis-1,2-Dichloroethene	17	17	0.016023004	Downward
TW-3	trans-1,2-Dichloroethene	6	17	0.000254014	Downward
TW-4	1,1-Dichloroethane	9	9	0.075	Undetermined
TW-4	1,1-Dichloroethene	1	9	0.343	Undetermined
TW-4	1,2,4-Trimethylbenzene	6	9	0.000072	Downward
TW-4	1,2-Dichlorobenzene	9	9	0.03	Upward
TW-4	1,2-Dichloroethane	8	9	0.00012	Downward
TW-4	1,3,5-Trimethylbenzene	6	9	0.000072	Downward
TW-4	2-Butanone (MEK)	3	9	0.54	Undetermined
TW-4	4-Methyl-2-pentanone (MIBK)	1	9	0.343	Undetermined
TW-4	Acetic acid	5	5	0.0083	Downward

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets A and B (Continued)					
TW-4	Benzene	9	9	0.002	Downward
TW-4	Carbon disulfide	1	9	0.09	Undetermined
TW-4	Chlorobenzene	2	9	0.306	Undetermined
TW-4	Chloroethane (Ethyl chloride)	9	9	0.00085	Downward
TW-4	Chloroform	1	9	0.46	Undetermined
TW-4	Co_2 By Headspace	7	7	0.068	Undetermined
TW-4	Ethane	6	6	0.0083	Downward
TW-4	Ethene	6	6	0.235	Undetermined
TW-4	Ethylbenzene	9	9	2.80E-06	Downward
TW-4	Isopropylbenzene (Cumene)	9	9	0.049	Downward
TW-4	Methane	6	6	0.102	Undetermined
TW-4	Methylene chloride (Dichloromethane)	6	9	0.306	Undetermined
TW-4	Naphthalene	7	9	0.0012	Downward
TW-4	Toluene	8	9	0.00043	Downward
TW-4	Trichloroethene	4	9	0.54	Undetermined
TW-4	Vinyl chloride (Chloroethene)	9	9	0.343	Undetermined
TW-4	Xylenes (total)	7	9	0.00012	Downward
TW-4	cis-1,2-Dichloroethene	9	9	0.54	Undetermined
TW-4	n-Butylbenzene	9	9	0.00085	Downward
TW-4	trans-1,2-Dichloroethene	7	9	0.381	Undetermined
On-Site Plumelets B and C					
MW-4	1,1-Dichloroethane	9	15	0.29983891	Undetermined
MW-4	1,1-Dichloroethene	1	15	5.80315E-05	Downward
MW-4	1,2-Dichloroethane	7	15	0.164840989	Undetermined
MW-4	Methylene chloride (Dichloromethane)	2	15	0.002815067	Downward
MW-4	Naphthalene	1	15	0.000253619	Downward
MW-4	Tetrachloroethene	9	15	0.007815503	Upward
MW-4	Trichloroethene	13	15	0.061190183	Undetermined
MW-4	Trichlorofluoromethane	1	7	0.236	Undetermined
MW-4	Vinyl chloride (Chloroethene)	7	15	0.000163746	Downward
MW-4	cis-1,2-Dichloroethene	15	15	0.046229798	Downward
MW-4	trans-1,2-Dichloroethene	9	15	0.479099313	Undetermined
MW-17	1,1-Dichloroethane	1	12	0.004145271	Downward
MW-17	1,2,4-Trimethylbenzene	1	12	0.019716897	Downward
MW-17	2-Butanone (MEK)	1	12	0.381403305	Undetermined
MW-17	Acetone (2-Propanone)	1	12	0.324492447	Undetermined
MW-17	Benzene	1	12	0.206304464	Undetermined
MW-17	Carbon disulfide	1	12	0.5	Undetermined
MW-17	Ethylbenzene	2	12	0.019716897	Downward
MW-17	Methylene chloride (Dichloromethane)	1	12	0.006986955	Downward
MW-17	Naphthalene	3	12	0.013565468	Downward
MW-17	Xylenes (total)	1	12	0.019716897	Downward
R-1	1,1,1-Trichloroethane	16	16	0.00955067	Downward
R-1	1,1,2-Trichloroethane	3	16	0.086523119	Undetermined
R-1	1,1-Dichloroethane	16	16	0.410767827	Undetermined
R-1	1,1-Dichloroethene	15	16	0.057168946	Undetermined
R-1	1,2,4-Trimethylbenzene	15	16	0.003424556	Downward
R-1	1,2-Dichloroethane	6	16	0.423254898	Undetermined
R-1	1,3,5-Trimethylbenzene	11	16	0.001617784	Downward
R-1	2-Butanone (MEK)	7	16	0.003293826	Downward
R-1	4-Methyl-2-pentanone (MIBK)	4	16	0.391985829	Undetermined

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
On-Site Plumelets B and C (Continued)					
R-1	Acetone (2-Propanone)	4	16	0.058599747	Undetermined
R-1	Benzene	15	16	0.293936655	Undetermined
R-1	Carbon disulfide	1	16	0.462757985	Undetermined
R-1	Chloroethane (Ethyl chloride)	5	16	0.198055609	Undetermined
R-1	Ethylbenzene	16	16	0.005062932	Downward
R-1	Isopropylbenzene (Cumene)	15	16	0.195193154	Undetermined
R-1	Methyl tert-butyl ether (MTBE)	4	7	0.334	Undetermined
R-1	Methylene chloride (Dichloromethane)	14	16	0.011781921	Downward
R-1	Naphthalene	15	16	0.00127852	Downward
R-1	Styrene	9	16	0.001876952	Downward
R-1	Tetrachloroethene	13	16	0.001961014	Downward
R-1	Toluene	16	16	0.000587435	Downward
R-1	Trichloroethene	15	16	0.003949831	Downward
R-1	Vinyl chloride (Chloroethene)	16	16	0.376320991	Undetermined
R-1	Xylenes (total)	16	16	0.000263412	Downward
R-1	cis-1,2-Dichloroethene	16	16	0.376320991	Undetermined
R-1	n-Butylbenzene	10	16	0.135573808	Undetermined
R-1	trans-1,2-Dichloroethene	10	16	0.5	Undetermined
Off-Site Plumelets D, E, and F					
MW-5	1,1-Dichloroethane	8	15	0.013747119	Upward
MW-5	1,1-Dichloroethene	15	15	0.002657838	Downward
MW-5	1,2,4-Trimethylbenzene	9	15	0.309339306	Undetermined
MW-5	1,3,5-Trimethylbenzene	4	15	0.057675367	Undetermined
MW-5	2-Butanone (MEK)	2	15	0.122578093	Undetermined
MW-5	Benzene	12	15	0.051756686	Undetermined
MW-5	Carbon disulfide	1	15	0.206600294	Undetermined
MW-5	Chloroethane (Ethyl chloride)	5	15	0.011693059	Downward
MW-5	Ethylbenzene	13	15	0.382984072	Undetermined
MW-5	Isopropylbenzene (Cumene)	7	15	0.378965343	Undetermined
MW-5	Methylene chloride (Dichloromethane)	2	15	0.095215132	Undetermined
MW-5	Naphthalene	6	15	0.5	Undetermined
MW-5	Tetrachloroethene	15	15	0.037412304	Downward
MW-5	Toluene	11	15	0.292867607	Undetermined
MW-5	Trichloroethene	15	15	9.75619E-05	Downward
MW-5	Vinyl chloride (Chloroethene)	15	15	0.041443466	Downward
MW-5	Xylenes (total)	12	14	0.330707959	Undetermined
MW-5	cis-1,2-Dichloroethene	15	15	0.327426819	Undetermined
MW-5	trans-1,2-Dichloroethene	12	15	0.38326265	Undetermined
MW-25	1,1-Dichloroethane	5	5	0.117	Undetermined
MW-25	Methylene chloride (Dichloromethane)	1	5	0.242	Undetermined
MW-25	Tetrachloroethene	5	5	0.18	Undetermined
MW-25	Trichloroethene	5	5	0.408	Undetermined
MW-25	cis-1,2-Dichloroethene	5	5	0.042	Downward
MW-25	trans-1,2-Dichloroethene	2	5	0.5	Undetermined
PMW-4	Methylene chloride (Dichloromethane)	1	6	0.5	Undetermined
PMW-4	Tetrachloroethene	5	6	0.5	Undetermined
PMW-5	1,1-Dichloroethane	6	6	0.068	Undetermined
PMW-5	1,1-Dichloroethene	6	6	0.36	Undetermined
PMW-5	1,2-Dichloroethane	6	6	0.028	Downward
PMW-5	Chloroform	3	6	0.028	Downward
PMW-5	Methylene chloride (Dichloromethane)	2	6	0.298	Undetermined

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets D, E, and F (Continued)					
PMW-5	Tetrachloroethene	6	6	0.0014	Upward
PMW-5	Trichloroethene	6	6	0.43	Undetermined
PMW-5	cis-1,2-Dichloroethene	6	6	0.048	Downward
PMW-5	trans-1,2-Dichloroethene	6	6	0.36	Undetermined
TW-2A	1,1,2-Trichloroethane	6	15	0.008800484	Downward
TW-2A	1,1-Dichloroethane	8	15	0.456876453	Undetermined
TW-2A	1,1-Dichloroethene	15	15	0.224147835	Undetermined
TW-2A	1,2,4-Trimethylbenzene	1	15	0.000357117	Downward
TW-2A	1,2-Dichlorobenzene	6	7	0.025	Upward
TW-2A	1,2-Dichloroethane	8	15	0.255820904	Undetermined
TW-2A	Acetone (2-Propanone)	1	15	0.000730031	Downward
TW-2A	Benzene	2	15	0.000216198	Downward
TW-2A	Chlorobenzene	2	15	0.003607841	Downward
TW-2A	Methylene chloride (Dichloromethane)	2	15	0.000106812	Downward
TW-2A	Naphthalene	1	15	0.000162182	Downward
TW-2A	Tetrachloroethene	15	15	0.327823593	Undetermined
TW-2A	Toluene	2	15	0.000238617	Downward
TW-2A	Trichloroethene	15	15	0.199806148	Undetermined
TW-2A	Vinyl chloride (Chloroethene)	7	15	0.024154698	Downward
TW-2A	Xylenes (total)	1	15	0.000357117	Downward
TW-2A	cis-1,2-Dichloroethene	15	15	0.198447189	Undetermined
TW-2A	trans-1,2-Dichloroethene	11	15	0.290210183	Undetermined
USD-1	1,1-Dichloroethene	1	10	0.036	Downward
USD-1	Carbon tetrachloride	10	10	0.168	Undetermined
USD-1	Chloroform	7	8	0.0116	Upward
USD-1	Methylene chloride (Dichloromethane)	1	10	0.014	Downward
USD-1	Tetrachloroethene	10	10	0.146	Undetermined
USD-1	Trichloroethene	10	10	0.19	Undetermined
USD-1	cis-1,2-Dichloroethene	6	10	0.364	Undetermined
USD-2	1,1,2-Trichloroethane	4	10	0.146	Undetermined
USD-2	1,1-Dichloroethane	8	10	0.216	Undetermined
USD-2	1,1-Dichloroethene	10	10	0.431	Undetermined
USD-2	1,2-Dichloroethane	4	10	0.5	Undetermined
USD-2	Benzene	1	10	0.0011	Downward
USD-2	Carbon tetrachloride	6	10	0.066	Undetermined
USD-2	Chloroform	2	8	0.024	Upward
USD-2	Methylene chloride (Dichloromethane)	3	10	0.466	Undetermined
USD-2	Naphthalene	1	10	0.054	Undetermined
USD-2	Tetrachloroethene	10	10	0.0083	Downward
USD-2	Toluene	1	10	0.054	Undetermined
USD-2	Trichloroethene	10	10	0.0023	Downward
USD-2	Xylenes (total)	1	10	0.023	Downward
USD-2	cis-1,2-Dichloroethene	10	10	0.0023	Downward
USD-2	trans-1,2-Dichloroethene	9	10	0.054	Undetermined
USD-3	1,1,2-Trichloroethane	5	10	0.332	Undetermined
USD-3	1,1-Dichloroethane	9	10	0.466	Undetermined
USD-3	1,1-Dichloroethene	10	10	0.216	Undetermined
USD-3	1,2-Dichloroethane	9	10	0.332	Undetermined
USD-3	Acetone (2-Propanone)	1	10	0.466	Undetermined
USD-3	Benzene	1	10	0.242	Undetermined
USD-3	Carbon tetrachloride	1	10	0.216	Undetermined

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Off-Site Plumelets D, E, and F (Continued)					
USD-3	Chloroform	1	8	0.452	Undetermined
USD-3	Methylene chloride (Dichloromethane)	3	10	0.466	Undetermined
USD-3	Tetrachloroethene	10	10	0.216	Undetermined
USD-3	Trichloroethene	10	10	0.364	Undetermined
USD-3	Vinyl chloride (Chloroethene)	1	10	0.127	Undetermined
USD-3	cis-1,2-Dichloroethene	10	10	0.431	Undetermined
USD-3	trans-1,2-Dichloroethene	10	10	0.0011	Downward
USD-13	1,1,1-Trichloroethane	2	5	0.5	Undetermined
USD-13	1,1,2-Trichloroethane	2	5	0.5	Undetermined
USD-13	1,1-Dichloroethane	5	5	0.408	Undetermined
USD-13	1,1-Dichloroethene	2	5	0.5	Undetermined
USD-13	1,2,4-Trimethylbenzene	2	5	0.592	Undetermined
USD-13	1,2-Dichlorobenzene	2	5	0.5	Undetermined
USD-13	1,2-Dichloroethane	2	5	0.5	Undetermined
USD-13	1,3,5-Trimethylbenzene	2	5	0.592	Undetermined
USD-13	2-Butanone (MEK)	2	5	0.325	Undetermined
USD-13	4-Methyl-2-pentanone (MIBK)	2	5	0.242	Undetermined
USD-13	Acetone (2-Propanone)	2	5	0.242	Undetermined
USD-13	Benzene	2	5	0.592	Undetermined
USD-13	Carbon disulfide	2	5	0.325	Undetermined
USD-13	Carbon tetrachloride	2	5	0.5	Undetermined
USD-13	Chlorobenzene	3	5	0.5	Undetermined
USD-13	Chloroethane (Ethyl chloride)	2	5	0.5	Undetermined
USD-13	Chloroform	2	5	0.5	Undetermined
USD-13	Ethylbenzene	2	5	0.5	Undetermined
USD-13	Isopropylbenzene (Cumene)	2	5	0.592	Undetermined
USD-13	Methyl tert-butyl ether (MTBE)	2	5	0.5	Undetermined
USD-13	Methylene chloride (Dichloromethane)	3	5	0.592	Undetermined
USD-13	Naphthalene	2	5	0.5	Undetermined
USD-13	Styrene	2	5	0.592	Undetermined
USD-13	Tetrachloroethene	5	5	0.408	Undetermined
USD-13	Toluene	3	5	0.325	Undetermined
USD-13	Tribromomethane (Bromoform)	2	5	0.592	Undetermined
USD-13	Trichloroethene	5	5	0.408	Undetermined
USD-13	Trichlorofluoromethane	2	5	0.592	Undetermined
USD-13	Vinyl chloride (Chloroethene)	2	5	0.5	Undetermined
USD-13	Xylenes (total)	2	5	0.5	Undetermined
USD-13	cis-1,2-Dichloroethene	5	5	0.117	Undetermined
USD-13	n-Butylbenzene	2	5	0.592	Undetermined
USD-13	trans-1,2-Dichloroethene	2	5	0.5	Undetermined
USD-MW-3	Carbon tetrachloride	11	15	0.104695622	Undetermined
USD-MW-3	Chloroform	5	8	0.406	Undetermined
USD-MW-3	Methylene chloride (Dichloromethane)	1	17	0.000110352	Downward
USD-MW-3	Tetrachloroethene	15	17	0.48311647	Undetermined
USD-MW-3	Trichloroethene	9	17	0.001546271	Downward
USD-MW-3	cis-1,2-Dichloroethene	2	17	0.000103875	Downward
Background					
MW-1D	1,2,4-Trimethylbenzene	1	8	0.317	Undetermined
MW-1D	Acetone (2-Propanone)	1	8	0.236	Undetermined
MW-1D	Ethylbenzene	1	8	0.317	Undetermined
MW-1D	Isopropylbenzene (Cumene)	1	8	0.317	Undetermined

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Background (Continued)					
MW-1D	Xylenes (total)	1	8	0.317	Undetermined
MW-1S	1,1-Dichloroethane	2	10	0.168	Undetermined
MW-1S	1,2,4-Trimethylbenzene	2	10	0.398	Undetermined
MW-1S	1,3,5-Trimethylbenzene	1	10	0.364	Undetermined
MW-1S	Ethylbenzene	5	10	0.242	Undetermined
MW-1S	Isopropylbenzene (Cumene)	3	10	0.093	Undetermined
MW-1S	Naphthalene	2	10	0.216	Undetermined
MW-1S	Styrene	1	10	0.127	Undetermined
MW-1S	Tetrachloroethene	4	10	0.271	Undetermined
MW-1S	Toluene	3	10	0.466	Undetermined
MW-1S	Trichloroethene	3	10	0.242	Undetermined
MW-1S	Vinyl chloride (Chloroethene)	5	10	0.466	Undetermined
MW-1S	Xylenes (total)	4	10	0.364	Undetermined
MW-1S	cis-1,2-Dichloroethene	10	10	0.533	Undetermined
MW-1S	n-Butylbenzene	1	10	0.364	Undetermined
MW-1S	trans-1,2-Dichloroethene	1	10	0.364	Undetermined
MW-2	1,2,4-Trimethylbenzene	1	7	0.068	Undetermined
MW-2	1,3,5-Trimethylbenzene	2	7	0.068	Undetermined
MW-2	Acetone (2-Propanone)	4	7	0.386	Undetermined
MW-2	Carbon disulfide	2	7	0.5	Undetermined
MW-2	Ethylbenzene	5	7	0.0008	Downward
MW-2	Isopropylbenzene (Cumene)	7	7	0.035	Downward
MW-2	Methyl tert-butyl ether (MTBE)	6	6	0.0083	Upward
MW-2	Methylene chloride (Dichloromethane)	1	7	0.119	Undetermined
MW-2	Naphthalene	3	6	0.235	Undetermined
MW-2	Vinyl chloride (Chloroethene)	5	7	0.015	Downward
MW-2	Xylenes (total)	4	7	0.087	Undetermined
MW-2	cis-1,2-Dichloroethene	7	7	0.015	Downward
MW-2	n-Butylbenzene	5	7	0.386	Undetermined
MW-7	1,2-Dichloroethane	1	10	0.127	Undetermined
MW-7	2-Butanone (MEK)	1	10	0.533	Undetermined
MW-7	4-Methyl-2-pentanone (MIBK)	1	10	0.216	Undetermined
MW-7	Acetone (2-Propanone)	1	10	0.108	Undetermined
MW-7	Methylene chloride (Dichloromethane)	1	10	0.127	Undetermined
MW-7	Trichloroethene	2	10	0.045	Downward
MW-7	cis-1,2-Dichloroethene	5	10	0.271	Undetermined
MW-12D	Acetone (2-Propanone)	1	5	0.18	Undetermined
MW-12S	Methylene chloride (Dichloromethane)	1	9	0.238	Undetermined
MW-13	Naphthalene	2	11	0.114688739	Undetermined
MW-13	Tetrachloroethene	1	11	0.050650791	Undetermined
MW-13	Trichloroethene	3	11	0.420609621	Undetermined
MW-13	cis-1,2-Dichloroethene	3	11	0.420609621	Undetermined
USD-MW-14	1,2,4-Trimethylbenzene	15	15	0.037056348	Downward
USD-MW-14	1,3,5-Trimethylbenzene	15	15	0.097818494	Undetermined
USD-MW-14	Acetone (2-Propanone)	2	13	0.446886604	Undetermined
USD-MW-14	Chloroethane (Ethyl chloride)	3	13	0.000675896	Downward
USD-MW-14	Chloroform	1	6	0.186	Undetermined
USD-MW-14	Ethylbenzene	15	15	0.040562488	Downward
USD-MW-14	Isopropylbenzene (Cumene)	15	15	0.240771581	Undetermined
USD-MW-14	Methyl tert-butyl ether (MTBE)	5	6	0.0014	Upward
USD-MW-14	Methylene chloride (Dichloromethane)	2	15	0.16817331	Undetermined

Table 4. Summary of Results from Mann-Kendall Test - June 2011 (Continued)

Well ID	Analyte	Number of Detected Results	Number of Samples	p-value for Mann-Kendall Test	Conclusion of Mann-Kendall Test
Background (Continued)					
USD-MW-14	Naphthalene	13	15	0.049190175	Downward
USD-MW-14	Toluene	4	15	0.169199073	Undetermined
USD-MW-14	Xylenes (total)	15	15	0.009936155	Downward
USD-MW-14	n-Butylbenzene	10	15	0.238337673	Undetermined
USD-MW-15	1,2,4-Trimethylbenzene	1	11	0.357310674	Undetermined
USD-MW-15	Chloroethane (Ethyl chloride)	1	9	0.075	Undetermined
USD-MW-15	Ethylbenzene	1	11	0.5	Undetermined
USD-MW-15	Isopropylbenzene (Cumene)	1	11	0.5	Undetermined
USD-MW-15	Methylene chloride (Dichloromethane)	1	11	0.5	Undetermined
USD-MW-15	Naphthalene	3	11	0.334434971	Undetermined
USD-MW-15	Toluene	1	11	0.5	Undetermined
USD-MW-15	Trichloroethene	1	11	0.077364462	Undetermined
USD-MW-15	Vinyl chloride (Chloroethene)	1	11	0.357310674	Undetermined
USD-MW-15	Xylenes (total)	1	11	0.5	Undetermined
USD-MW-15	cis-1,2-Dichloroethene	1	11	0.5	Undetermined
USD-MW-15	n-Butylbenzene	1	11	0.5	Undetermined
USD-MW-16	Methylene chloride (Dichloromethane)	1	5	0.025	Downward

ID - Identification.

Table 5. VOC Exceedances at On-Site Plumelet A Wells through June 2011

Analyte	KDHE Tier 2 RSK Residential Level[a]	P-1						P-2						P-5						P-6					
		5/09	3/10	6/10	11/10	3/11	6/11	5/09	3/10	6/10	11/10	3/11	6/11	5/09	3/10	6/10	11/10	3/11	6/11	5/09	3/10	6/10	11/10	3/11	6/11
Tetrachloroethene	5	--	<0.1	**0.1 J**	<0.1	<0.1	<0.1	<5.0	<10	<5.0	<0.1	<1.0	<1.0	**3,600**	**13 J**	<10	**6.7**	**8.5**	**6.7**	**23 J**	**45 J**	**5.2 J**	**25**	**0.3 J**	**0.2 J**
Trichloroethene	5	--	<0.1	<0.1	<0.1	<0.1	<0.1	**25**	<10	<5.0	**0.3 J**	<1.0	<1.0	**1,300**	**200**	<10	**8.6**	**3.0**	**3.2**	**230**	**110**	**21 J**	**12**	**0.7**	**0.4 J**
cis-1,2-Dichloroethene	70	--	<0.1	<0.1	<0.1	<0.1	<0.1	**4,800**	**16,000**	**1,200**	**7.0**	**420**	**410**	**1,100**	**6,800**	**4,900**	**190**	**45**	**13 J**	**8,700**	**3,400**	**2,300**	**71**	**6.5**	**3.8**
trans-1,2-Dichloroethene	100	--	<0.1	<0.1	<0.1	<0.1	<0.1	**160**	**430**	**80**	**50**	**130**	**73**	**16 J**	**150**	**330**	**82**	**89**	**51**	**270**	**150**	**210**	**54**	**22**	**6.1**
1,1-Dichloroethene	7	--	<0.1	<0.1	<0.1	<0.1	<0.1	**10 J**	**42 J**	<5.0	<0.1	<1.0	<1.0	<5.0	**11 J**	<10	<0.5	<0.1	<0.1	**8.7 J**	<10	<5.0	**0.1 J**	<0.1	<0.1
Vinyl Chloride	2	--	<0.1	<0.1	<0.1	<0.1	<0.1	**980**	**3,100**	**460 JH**	**6.2**	**130**	**320**	**17 J**	**94**	**1,800 JH**	**45**	**12**	**14**	**1,000**	**950**	**770 JH**	**58**	**2.0**	**1**
Methylene Chloride	5	--	<0.2	<0.2	<0.2	<0.2	<0.2	<10	<20	**13 J**	<0.2	<2.0	<2.0	<10	<20	<20	<1.0	<0.2	<0.2	<10	<20	**12 J**	<0.2	<0.2	<0.2
1,1,1-Trichloroethane	200	--	<0.1	<0.1	<0.1	<0.1	<0.1	**20 J**	**70**	<5.0	**0.2 J**	**1.6 J**	<1.0	**25 J**	**20 J**	**31 J**	**1.1 J**	**0.1 J**	<0.1	**21 J**	<10	**8.5 J**	**0.1 J**	<0.1	<0.1
1,1-Dichloroethane	25	--	<0.1	<0.1	<0.1	<0.1	<0.1	<5.0	**13 J**	<5.0	**14**	**27**	**16**	<5.0	<10	**12 J**	**8.4**	**9.4**	**4.8**	**11 J**	<10	**12 J**	**15**	**13**	**15**
Naphthalene	1.11	--	<0.1	<0.1	<0.1	<0.1	<0.1	<5.0	<10	<5.0	**2.9**	**13**	**4.6 J**	<5.0	<10	<10	**0.8 J**	**1.1**	**1.2**	<5.0	<10	<5.0	**2.2**	**0.5**	**0.9**
1,2,4-Trimethylbenzene	8.44	--	<0.1	<0.1	<0.1	<0.1	<0.1	<5.0	<10	<5.0	**0.5 J**	**1.1 J**	<1.0	<5.0	<10	<10	**2.9**	**0.7**	**1.0**	<5.0	<10	<5.0	**0.3 J**	**0.1 J**	**0.3 J**

Analyte	KDHE Tier 2 RSK Residential Level[a]	P-9						P-10						P-11						P-12					
		5/09	3/10	6/10	11/10	3/11	6/11	5/09	3/10	6/10	11/10	3/11	6/11	5/09	3/10	6/10	11/10	3/11	6/11	5/09	3/10	6/10	11/10	3/11	6/11
Tetrachloroethene	5	**40 J**	**3.4**	**1.4 J**	<0.1	<0.1	<0.1	**100**	--	--	**2.0**	**9.9**	**5.3**	**14,000**	**410**	**560**	**30 J**	**12**	**54**	**1.3 J**	<0.1	<0.1	<0.1	**6.4**	**0.1 J**
Trichloroethene	5	**120**	**8.1**	**0.9**	**0.1 J**	<0.1	<0.1	**11**	--	--	**5.3**	**29**	**34**	**3,900**	**140**	**6,500**	**1,100**	**210**	**82**	**10**	**0.3 J**	<0.1	0.7	**15**	**2.7**
cis-1,2-Dichloroethene	70	**1,200**	**100**	**16**	**3.0**	**0.3 J**	**0.6**	**2.9**	--	--	**40**	**94**	**140**	**2,900**	**15,000**	**19,000**	**19,000**	**3,500**	**2,800**	**4,300**	**150**	**7.3**	**29**	**130**	**18**
trans-1,2-Dichloroethene	100	**33**	**32**	**23**	**2.7**	**1.3**	**1.2**	<0.1	--	--	**0.3 J**	**1.0**	**1 J**	**49 J**	**210**	**460**	**510**	**90**	**29**	**200**	**140**	**72**	**51**	**36**	**24**
1,1-Dichloroethene	7	**2.0 J**	**0.2 J**	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	**0.2 J**	**0.5**	**0.7 J**	**42 J**	**63**	**75 J**	**67**	**4.4 J**	<5.0	**9.4**	**0.9**	<0.1	**0.2 J**	**0.5**	<0.1
Vinyl Chloride	2	**220**	**54**	**8.6 JH**	**1.3**	**0.2 J**	**0.5**	<0.1	--	--	**2.8**	**3.0**	**2.5**	**160**	**170**	**650 JH**	**2,800**	**1,600**	**2,400**	**1,600**	**72**	**9.0 JH**	**24**	**43**	**18**
Methylene Chloride	5	<2.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	--	<0.2	<0.2	<1.0	<40	<20	**42 J**	<20	<4.0	**13 J**	<2.0	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,1-Trichloroethane	200	**1.1 J**	**1.1**	**0.5 J**	<0.1	<0.1	<0.1	**0.3 J**	--	--	<0.1	<0.1	<0.5	**160**	**82**	**180**	**210**	**22**	**12 J**	**2.6 J**	**1.9**	**0.9**	<0.1	**0.1 J**	<0.1
1,1-Dichloroethane	25	**3.3 J**	**4.5**	**2.3**	**7.3**	**11**	**11**	<0.1	--	--	<0.1	**0.3 J**	<0.5	<20	**14 J**	<20	**20 J**	**8.7 J**	**5.5 J**	**9.8**	**12**	**14**	**13**	**13**	**13**
Naphthalene	1.11	<1.0	<0.1	<0.1	**0.5**	**1.1**	**2.5**	<0.1	--	--	<0.1	<0.1	<0.5	<20	<10	<20	<10	**6.7 J**	<5.0	<1.0	**0.8**	**1.0**	**1.2**	**1.9**	**1.2**
1,2,4-Trimethylbenzene	8.44	<1.0	<0.1	<0.1	**0.1 J**	**0.3 J**	**0.6**	<0.1	--	--	<0.1	<0.1	<0.5	<20	<10	<20	<10	**10**	**10 J**	<1.0	**0.4 J**	0.3 J	**0.4 J**	**0.9**	**0.4 J**

Analyte	KDHE Tier 2 RSK Residential Level[a]	P-13D		P-13S		P-14D		P-14S		P-15D		P-15S		P-16D		P-16S		TW-3					
		3/11	6/11	3/11	6/11	3/11	6/11	3/11	6/11	3/11	6/11	3/11	6/11	3/11	6/11	3/11	6/11	5/09	3/10	6/10	11/10	3/11	6/11
Tetrachloroethene	5	**0.3 J**	<0.1	**0.3 J**	**0.1 J**	**5.4**	**4.5**	**1.0**	<1.0	**830**	**1,100**	**77**	**36 J**	**0.7**	**0.6**	**0.1 J**	**0.1 J**	**11**	--	**14 JL**	**9.5**	**14**	**13**
Trichloroethene	5	**0.2 B**	**0.1 J**	**0.3 J**	<0.1	**6.1**	**12**	**0.7**	<1.0	**2,400**	**380**	**8.7**	**11 J**	**2.6**	**2.8**	**0.3 J**	**0.1 J**	**4.2**	--	**4.9 JL**	**4.8**	**5.6**	**4.9**
cis-1,2-Dichloroethene	70	**1.3**	**1.2**	**1.7**	**0.7**	**6.1**	**6.2**	**22**	**480**	**31,000**	**18,000**	**590**	**13,000**	**2.5**	**2.7**	**1.1**	**0.6**	**33**	--	**60 JL**	**48**	**32**	**20**
trans-1,2-Dichloroethene	100	<0.1	<0.1	<0.1	<0.1	**6.1**	**44**	**0.1 J**	<1.0	**480**	**180 J**	**6.4**	**42 J**	<0.1	<0.1	<0.1	<0.1	**0.1 J**	--	**0.2 JL**	**0.3 J**	**0.2 J**	<0.1
1,1-Dichloroethene	7	<0.1	<0.1	<0.1	<0.1	**0.4 J**	**0.5**	**0.3 J**	<1.0	**43 J**	<50	**0.8 J**	**13 J**	**86**	**97**	**0.4 J**	**0.4 J**	**1.5**	--	**1.7 JL**	**1.1**	**0.8**	**0.5 J**
Vinyl Chloride	2	**0.3 J**	**0.4 J**	**0.2 J**	**1.2**	**1.6**	**2**	**0.4 J**	**3.8 J**	**1,700**	**3,200**	**30**	**740**	**1.5**	**2**	**0.2 J**	**0.5 J**	**29**	--	**48 JL**	**33**	**29**	**22**
Methylene Chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2.0	<40	<100	<1.0	<20	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.2	<0.2	<0.2	<0.2
1,1,1-Trichloroethane	200	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.0	**23 J**	<50	**0.6 J**	<10	**39**	**39**	<0.1	<0.1	**3.2**	--	**2.1 JL**	**1.4**	**2.0**	**1.0**
1,1-Dichloroethane	25	**0.2 J**	**0.2 J**	**0.3 J**	**0.8**	**0.5**	**2**	<0.1	<1.0	<20	<50	<0.5	<10	**2.5**	**2.2**	<0.1	<0.1	**13**	--	**11 JL**	**11**	**13**	**9.0**
Naphthalene	1.11	<0.1	<0.1	<0.1	<0.1	<0.1	**0.9**	<0.1	<1.0	<20	<50	<0.5	<10	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1
1,2,4-Trimethylbenzene	8.44	<0.1	<0.1	<0.1	<0.1	**0.1 J**	**2.8**	<0.1	<1.0	**43 J**	<50	**1.7 J**	<10	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1

[a] Source: Risk-Based Standards for Kansas (RSK), RSK Manual-5th Version, Kansas Department of Health and Environment (KDHE), Bureau of Environmental Remediation, October 2010.
Note: The May 2009 results are prior to injection activities.
All units are presented in micrograms per liter (µg/L).
< Less than method detection limit (MDL).
-- Not measured.
Bold values were detected.
Shaded values are above the KDHE Tier 2 RSK Residential Levels.
Volatile organic compounds (VOCs) were analyzed by Lancaster Laboratories by U. S. Environmental Protection Agency (EPA) Method SW8260B.
B - Sample concentration is similar to that found in an associated blank.
H - The result is biased high.
J - The analyte was positively identified, the quantitation is an estimation.
L - The result is biased low.

Table 6. Volatile Fatty Acids, Dissolved Gases, and Field Parameters at On-Site Plumelet A Wells through June 2011

	P-1						P-2						P-5						P-6					
Analyte	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**
Volatile Fatty Acids (mg/L)																								
Acetic Acid	--	**0.034 JB**	**0.028 J**	**0.42 B**	**0.035 J**	**0.050 J**	--	**28**	**3.0**	**13**	**89 J**	**230**	--	**1.3**	**130**	**270**	**680 J**	**350**	--	**6.6**	**22**	**140**	**0.30 J**	**1.1**
Butyric Acid	--	<0.070	<0.050	<0.050	<0.004	<0.004	--	**0.12**	**0.57**	<0.050	**1.5 J**	**1.7**	--	**1.0**	**140**	**150**	**940 J**	**400**	--	**0.052 J**	<0.050	**1.0**	**0.14 J**	**0.1**
Hexanoic Acid	--	<0.10	<0.050	<0.050	<0.006	<0.006	--	<0.10	<0.050	<0.050	<0.006	<0.006	--	<0.10	**1.8**	**9.2**	**93 J**	**69**	--	<0.10	<0.050	<0.050	<0.006	<0.006
i-Hexanoic Acid	--	<0.10	<0.050	<0.050	<0.006	<0.006	--	<0.10	<0.050	<0.050	<0.006	<0.006	--	<0.10	<0.50	**0.38**	<0.6	**1.5**	--	<0.10	<0.050	<0.050	<0.006	<0.006
i-Pentanoic Acid	--	<0.070	<0.15	<0.15	<0.044	<0.044	--	**0.057 J**	<0.15	<0.15	**0.17 J**	**0.56**	--	<0.070	<1.5	<1.5	**18 J**	**6.5**	--	**0.034 J**	**0.053 J**	**0.30**	<0.044	**0.085 J**
Lactic Acid	--	**0.13 B**	**0.058 J**	<0.10	**0.21 J**	**0.28**	--	<1.0	**0.13**	**1.0 J**	**1.4 J**	<0.1	--	**0.30**	**69**	**24**	**610 J**	**200**	--	<0.10	<0.10	<10	**0.72 J**	**0.39**
Pentanoic Acid	--	<0.070	<0.070	<0.070	<0.012	<0.012	--	**0.076 B**	**0.13**	<0.070	**0.36 J**	**0.27**	--	**0.088**	**6.8**	**16**	**69 J**	**44**	--	<0.070	<0.070	**0.16**	<0.012	<0.012
Propionic Acid	--	**0.013 JB**	**0.035 J**	<0.050	<0.007	<0.007	--	**16**	**1.1**	**2.4**	**13 J**	**17**	--	**1.3**	**250**	**200**	**530 J**	**240**	--	**0.33**	**1.1**	**17**	**0.13 J**	**0.13**
Pyruvic Acid	--	<0.070	<0.15	<0.15	<0.033	<0.033	--	**0.17**	<0.15	<0.15	**0.37 J**	**0.52**	--	<0.070	**6.9**	**9.1**	**68 J**	**15**	--	**0.039 J**	<0.15	**0.42**	<0.033	**0.074 J**
Dissolved Gases (mg/L)																								
Carbon dioxide	--	--	**94**	**140**	**100**	**150**	--	--	**77**	**220**	**580**	**710**	--	--	**710**	**830**	**930**	**570**	--	--	**190**	**340**	**230**	**370**
Methane	--	--	**0.016**	**0.022**	**1.4**	**3.4**	--	--	**1.1**	**5.7**	**7.7**	**5.4**	--	--	**1.7**	**3.3**	**6.9**	**6.1**	--	--	**3.8**	**7.3**	**7.8**	**4.3**
Ethane	--	--	<0.0010	<0.0010	<0.0010	<0.0010	--	--	**0.021**	**0.53**	**1.1**	**0.35**	--	--	**0.03**	**0.010**	**0.22**	**0.096 J**	--	--	**0.096**	**0.99**	**0.86**	**0.43**
Ethene	--	--	<0.0010	<0.0010	<0.0010	<0.0010	--	--	**0.63**	**2.3**	**4.4**	**1.3**	--	--	**1.2**	**0.44**	**0.14**	**0.095**	--	--	**1.9**	**0.63**	**0.022**	**0.0080**
Field Parameters																								
Dissolved Oxygen (mg/L)*	--	2.4	<0.5	5.22	<0.5	<0.5	0.9	4.2	<0.5	0.77	<0.5	<0.5	1.1	3.3	<0.5	0.80	<0.5	<0.5	1.2	4.2	<0.5	0.56	<0.5	<0.5
ORP (mV)	--	-5	-81	-47	-124	-143	-108	-163	-79	-85	-113	-135	64	-85	-97	-75	-90	-116	-89	-135	-107	-80	-118	-111

	P-9						P-10						P-11						P-12					
Analyte	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**
Volatile Fatty Acids (mg/L)																								
Acetic Acid	--	**93**	**31**	**18**	**0.22 J**	**0.99**	--	--	--	**0.34 B**	**0.17 J**	**0.17**	--	**400**	**170**	**210**	**300 J**	**380**	--	**150**	**240**	**62**	**66 J**	**32**
Butyric Acid	--	**59**	**1.8**	**0.27**	<0.004	**0.53**	--	--	--	<0.050	<0.004	**0.14**	--	**12**	**19**	**17**	**21 J**	**34**	--	**24**	**17**	**0.80**	**1.5 J**	**1.1**
Hexanoic Acid	--	**2.9**	**0.18**	<0.050	<0.006	<0.006	--	--	--	<0.050	<0.006	<0.006	--	<0.10	**0.90**	<0.50	**0.16 J**	**1.6**	--	**1.5**	**1.4**	<0.050	**0.30 J**	<0.006
i-Hexanoic Acid	--	<0.10	<0.050	<0.050	<0.006	<0.006	--	--	--	<0.050	<0.006	<0.006	--	<0.10	<0.050	<0.50	**0.25 J**	**1.5**	--	**0.27**	<0.50	<0.050	<0.006	<0.006
i-Pentanoic Acid	--	**0.58**	<0.15	**0.079 J**	<0.044	<0.044	--	--	--	<0.15	<0.044	<0.044	--	**0.33 J**	<0.15	**0.70 J**	**1.0 J**	**1.6**	--	<0.70	**1.1**	**0.095 J**	**0.11 J**	**0.13 J**
Lactic Acid	--	**10 J**	<0.10	<0.10	<0.01	**0.50**	--	--	--	<0.10	<0.01	**0.34**	--	**19**	<0.10	**4.7**	**10 J**	<0.1	--	**8.2 J**	<10	<1.0	**1.7 J**	<0.10
Pentanoic Acid	--	**4.8**	**0.62**	<0.070	<0.012	<0.012	--	--	--	<0.070	<0.012	<0.070	--	**1.1**	**5.6**	**10**	**14 J**	**12**	--	**3.7**	**9.5**	**0.23**	**0.36 J**	**0.29**
Propionic Acid	--	**87**	**10**	**4.8**	**0.089 J**	**0.42**	--	--	--	<0.050	**0.16 J**	**0.085**	--	**210**	**170**	**210**	**280 J**	**300**	--	**190**	**160**	**14**	**14 J**	**5.5**
Pyruvic Acid	--	**1.1**	**0.23**	**0.21**	<0.033	<0.033	--	--	--	<0.15	<0.033	<0.033	--	**2.2**	**1.6**	**2.8**	**3.4 J**	**3.4**	--	**0.99**	**3.8**	**0.36**	**0.41 J**	**0.20**
Dissolved Gases (mg/L)																								
Carbon dioxide	--	--	**88**	**310**	**270**	**370**	--	--	--	**260**	**200**	**310**	--	--	**230**	**350**	**330**	**370**	--	--	**470**	**210**	**170**	**210**
Methane	--	--	**1.1 J**	**3.4**	**6.7**	**4.8**	--	--	--	**5.2**	**8.3**	**6.0**	--	--	**0.70**	**0.95 JL**	**6.5**	**3.6**	--	--	**7.7**	**8.7**	**9.8**	**8.2**
Ethane	--	--	**0.0071**	**0.27**	**0.35**	**0.44**	--	--	--	<0.0010	**0.044**	**0.10**	--	--	**0.0027 J**	**0.0052 JL**	<0.0010	<0.0010	--	--	**0.043**	**0.86**	**0.86**	**0.60**
Ethene	--	--	**0.29**	**0.012**	<0.0035	<0.0050	--	--	--	<0.0010	<0.0020	**0.0053**	--	--	**0.10**	**2.0 JL**	**4.8**	**2.6**	--	--	**3.1**	**0.71**	**1.0**	**0.75**
Field Parameters																								
Dissolved Oxygen (mg/L)*	0.7	2.7	0.71	3.23	<0.5	<0.5	1.8	--	--	0.83	<0.5	<0.5	2.1	6.2	<0.5	0.62	<0.5	<0.5	0.9	4.6	<0.5	1.02	<0.5	<0.5
ORP (mV)	-44	-118	23	-84	-182	-155	77	--	--	-81	-79	-237	67	-164	-94	-65	-82	-119	-58	-134	-72	-81	-128	-304

Table 6. Volatile Fatty Acids, Dissolved Gases, and Field Parameters at On-Site Plumelet A Wells through June 2011 (Continued)

	P-13D		P-13S		P-14D		P-14S		P-15D		P-15S		P-16D		P-16S		TW-3					
Analyte	**3/11**	**6/11**	**3/11**	**6/11**	**3/11**	**6/11**	**3/11**	**6/11**	**3/11**	**6/11**	**3/11**	**6/11**	**3/11**	**6/11**	**3/11**	**6/11**	**5/09**	**3/10**	**6/10**	**11/10**	**3/11**	**6/11**
Volatile Fatty Acids (mg/L)																						
Acetic Acid	**82 J**	**76**	**0.20 J**	**0.68**	**12 J**	**22**	**180 J**	**48**	**140 J**	**140**	**510 J**	**270**	**0.16 J**	**0.11**	**0.10 J**	**0.13**	--	--	**0.042 J**	**0.44 B**	**0.10 J**	**0.25**
Butyric Acid	**29 J**	**29**	**0.10 J**	**0.10**	**0.92 J**	**0.20**	**17 J**	**1.7**	**15 J**	**5.0**	**79 J**	**25**	**0.12 J**	<0.004	<0.004	<0.004	--	--	**0.051**	<0.050	**0.11 J**	<0.004
Hexanoic Acid	**2.7 J**	**1.9 JL**	<0.006	**0.16 JL**	**0.083 J**	**0.16 JL**	**2.3 J**	**0.16 JL**	**0.49 J**	<0.006	**5.0 J**	**3.0**	<0.006	<0.006	<0.006	<0.006	--	--	<0.050	<0.050	<0.006	<0.006
i-Hexanoic Acid	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	**0.26 J**	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	--	--	<0.050	<0.050	<0.006	<0.006
i-Pentanoic Acid	**1.4 J**	<0.044	<0.044	<0.044	<0.044	**0.11 J**	**1.6 J**	**0.38**	**0.93 J**	**0.44**	**4.1 J**	**1.4 J**	<0.044	<0.044	<0.044	<0.044	--	--	<0.15	<0.15	<0.044	<0.044
Lactic Acid	**4.0 J**	**0.77 J**	<0.01	**0.30**	<0.01	**0.90**	<0.1	**0.32 J**	**11 J**	<0.01	**3.5 J**	**0.053 J**	**0.58 J**	**0.28**	<0.01	**0.30**	--	--	<0.10	**0.30**	<0.01	**0.42**
Pentanoic Acid	**4.9 J**	**7.1**	<0.012	<0.012	**0.60 J**	<0.012	**12 J**	**0.85**	**5.5 J**	**3.7**	**43 J**	**15**	<0.012	<0.012	<0.012	<0.012	--	--	<0.070	<0.070	<0.012	<0.012
Propionic Acid	**82 J**	**120**	**0.15 J**	**0.44**	**7.1 J**	**2.3**	**150 J**	**44**	**150 J**	**110**	**800 J**	**360**	**0.16 J**	**0.077**	**0.11 J**	**0.13**	--	--	**0.12**	**0.17**	**0.20 J**	**0.17**
Pyruvic Acid	**1.9 J**	**1.4 J**	<0.033	<0.033	**0.11 J**	**0.095 J**	**3.2 J**	**0.71**	**2.0 J**	**1.1**	**15 J**	**2.9**	<0.033	<0.033	<0.033	<0.033	--	--	<0.15	<0.15	<0.033	<0.033
Dissolved Gases (mg/L)																						
Carbon dioxide	**170**	**240**	**63**	**200**	**580**	**400 J**	**610**	**810**	**290**	**360**	**260**	**610**	**120**	**140**	**94**	**130**	--	--	**61 JL**	**91**	**95**	**95**
Methane	**7.6**	**14**	**0.0057 J**	**1.0**	**10**	**15**	**8.3**	**5.3**	**5.7**	**8.9**	**0.85**	**1.7**	**0.027**	**0.061**	**0.041**	**0.074**	--	--	**0.064 JL**	**0.045**	**0.38**	**1.1**
Ethane	<0.0010	<0.0010	<0.0010	<0.0010	**0.017**	**0.29**	<0.0010	<0.0010	<0.0010	<0.0010	**0.0082**	**0.014**	<0.0010	<0.0010	<0.0010	<0.0010	--	--	<0.0010	<0.0010	<0.0010	<0.0010
Ethene	<0.0010	<0.0050	<0.0010	**0.0018 J**	**0.0012 J**	**0.035**	**0.0016 J**	**0.0079**	**0.69**	**1.0**	**0.054**	**0.32**	<0.0010	<0.0010	<0.0010	<0.0010	--	--	<0.0010	<0.0010	**0.0014 J**	<0.0010
Field Parameters																						
Dissolved Oxygen (mg/L)*	<0.5	<0.5	--	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	0.5	<0.5	<0.5	<0.5	<0.5	1.12	--	<0.5	0.74	<0.5	<0.5
ORP (mV)	-89	-211	--	-140	-20	-94	-81	-140	-104	-262	--	-160	2	-39	-48	-35	82	--	9	53	32	143

< Less than limit of quantitation (for Volatile Fatty Acids) or method detection limit (MDL). For dissolved oxygen (DO) values less than 0.5 milligrams per liter (mg/L), anaerobic conditions are present.
-- Not measured.
*DO values are reported as the YSI DO probe values.
Bold values were detected.
Volatile fatty acids were analyzed by Microseeps Laboratory by a standard laboratory method.
B - Sample concentration is similar to that found in an associated blank.
J - The analyte was positively identified, the quantitation is an estimation.
L - The result is biased low.
mV - Millivolt.
ORP - Oxidation-reduction potential.

Table 7. VOC Exceedances at Off-Site Plumelets A and B through June 2011

Analyte	KDHE Tier 2 RSK Residential Level [a]	MW-8 Sidegradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11	MW-9 Sidegradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
Trichloroethene	5	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
cis-1,2-Dichloroethene	70	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1 J**	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
1,1-Dichloroethene	7	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
Vinyl chloride	2	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1 J**	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
Methylene chloride	5	--	--	<0.2	--	--	<0.2	**0.2 BJ**	<0.2	<0.2	<0.2	<0.2	--	--	--	--	--	--	**0.2 BJ**	<0.2	--	<0.2	<0.2
1,1-Dichloroethane	25	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
1,2-Dichloroethane	5	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
Benzene	5	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
Naphthalene	1.11	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
1,2,4-Trimethylbenzene	8.44	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1
1,3,5-Trimethylbenzene	44	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1

Analyte	KDHE Tier 2 RSK Residential Level [a]	MW-18 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11	MW-20 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	**110**	**29**	**4.4**	**0.6**	**0.8**	**0.3**	**1.2 J**	**54**	**0.9 J**	**2.1 JL**	**2.1 J**	**280**	**240**	**240**	**200**	**100**	**140**	**65**	**31**	**35**	**31 JL**	**99**
Trichloroethene	5	**130**	**110**	**13**	**4.6**	**2.9**	**5.9**	**15**	**150**	**13**	**66 JL**	**130**	**160**	**150**	**130**	**140**	**120**	**100**	**66**	**64**	**85**	**87 JL**	**190**
cis-1,2-Dichloroethene	70	**210**	**270**	**310**	**250**	**220**	**430**	**400**	**590**	**700**	**630 JL**	**650**	**160**	**190**	**230**	**210**	**150**	**220**	**250**	**340**	**360**	**360 JL**	**420**
1,1-Dichloroethene	7	**2.8**	**2.9**	**2.4 J**	**2.3**	**2.2**	**4.2**	**3.2 J**	**5.6**	**5.9**	**5.0 JL**	**5.0**	**5.1**	**3.9**	**3.8**	**5.5**	**3.4**	**3.5**	**2 J**	**3.2**	**3.8**	**4.0 UJL**	**5.4**
Vinyl chloride	2	**0.6 J**	**2.5**	**4.8**	**8.5**	**5.7**	**11**	**9.1**	**5.6**	**10**	**7.8 JL**	**7.5**	<0.5	<0.2	<0.5	**0.2**	<0.5	**0.2**	<0.5	**3.3**	**3.5**	**2.7 JL**	**3.0**
Methylene chloride	5	<1.0	<0.4	**1.6 J**	<0.2	<1.0	<0.4	**2.7 BJ**	<1.0	<1.0	<1.0	<2.0	<1.0	<0.4	<1.0	<0.2	<1.0	<0.2	**1.5 BJ**	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	25	**52**	**45**	**43**	**34**	**16**	**31**	**28**	**19**	**20**	**15 JL**	**11**	**43**	**34**	**46**	**35**	**31**	**28**	**29**	**21**	**15**	**14 JL**	**15**
1,2-Dichloroethane	5	**0.9 J**	**0.8 J**	**0.7 J**	**0.7**	<0.5	**0.7**	<1.0	<0.5	<0.5	<0.5	<1.0	**1.1 J**	**0.9 J**	**1.2 J**	**1**	**0.6**	**0.7**	**0.9 J**	<0.5	<0.5	<0.5	<0.5
Benzene	5	<0.5	<0.2	<0.5	**0.3**	<0.5	**0.4**	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	<0.2	<0.5	**0.1**	<0.5	**0.1**	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	1.11	<0.5	<0.2	<0.5	<0.1	<0.5	<0.2	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	<0.2	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trimethylbenzene	8.44	<0.5	<0.2	<0.5	<0.1	<0.5	<0.2	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	<0.2	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-Trimethylbenzene	44	<0.5	<0.2	<0.5	<0.1	<0.5	<0.2	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	<0.2	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5

Analyte	KDHE Tier 2 RSK Residential Level [a]	MW-21 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10 (11/10)[b]	6/11	MW-22 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	**17**	**19**	**16**	**15**	**11**	**10**	**3.5**	**3.4 J**	**8.5**	**5.8 JL (17)**	**14**	--	--	--	--	--	--	<0.1	**0.1 J**	**0.3 J**	**0.2 J**	**0.3 J**
Trichloroethene	5	**51**	**47**	**40**	**29**	**24**	**20**	**7.0**	**8.1 J**	**16**	**12 JL (21)**	**36**	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
cis-1,2-Dichloroethene	70	**210**	**220**	**170**	**150**	**100**	**110**	**35**	**41**	**68**	**73 JL (130)**	**200**	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
1,1-Dichloroethene	7	**2.5 J**	**2.5**	**1.9**	**2**	**1.6**	**1.2**	**0.4 J**	**0.5 J**	**1.0**	**0.6 JL (1.6)**	**2.1**	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Vinyl chloride	2	**45**	**45**	**23**	**15**	**11**	**6.2**	<0.1	**1.0**	**4.6**	**1.2 JL (5.5)**	**9.2**	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Methylene chloride	5	**1.1 J**	<0.4	**0.5 J**	<0.2	<1.0	<0.2	**0.2 BJ**	<0.2	<0.2	<0.2 (<0.2)	<0.2	--	--	--	--	--	--	**0.2 BJ**	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethane	25	**210**	**160**	**140**	**120**	**100**	**78**	**29**	**31**	**29**	**23 JL (34)**	**65**	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloroethane	5	**3.0**	**2.5**	**2.0**	**1.5**	**1.1**	**1.1**	**0.4 J**	**0.3 J**	**0.4 J**	**0.3 JL (0.4 J)**	**0.7**	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene	5	**0.6 J**	**0.6 J**	**0.4 J**	**0.3**	<0.5	**0.2**	<0.1	<0.1	**0.2 J**	**0.1 JL (0.2 J)**	**0.3 J**	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	1.11	<0.5	<0.2	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1 (<0.1)	<0.1	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
1,2,4-Trimethylbenzene	8.44	<0.5	<0.2	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1 (<0.1)	<0.1	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
1,3,5-Trimethylbenzene	44	<0.5	<0.2	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1 (<0.1)	<0.1	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1

Table 7. VOC Exceedances at Off-Site Plumelets A and B through June 2011 (Continued)

Analyte	KDHE Tier 2 RSK Residential Level [a]	R-2 Sidegradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11	R-3 Sidegradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	0.8	1.0	0.5 J	0.3	0.3	1.7	--	0.5	--	1.6 JL	0.4 J	--	--	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1
Trichloroethene	5	<0.1	2.4	2.7	0.9	1.0	7.2	--	1.6	--	5.5 JL	1.4	--	--	<0.2	<0.1	0.4	0.8	<0.1	<0.1	--	<0.1	<0.1
cis-1,2-Dichloroethene	70	7.7	12	17	6.1	5.8	25	--	17	--	80 JL	8.7	--	--	46	140	91	80	5.2	0.5	--	0.1 JL	<0.1
1,1-Dichloroethene	7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	--	0.2 JL	<0.1	--	--	<0.2	6.9	0.3	0.2	<0.1	<0.1	--	<0.1	<0.1
Vinyl chloride	2	1.2	0.6	2.6	0.8	0.9	0.6	--	1.1	--	12 JL	1.3	--	--	11	56	28	51	10 JL	1.2	--	0.4 JL	<0.1
Methylene chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.2	--	<0.2	<0.2	--	--	1.0 B	<0.2	<0.2	0.2	0.3 BJ	<0.2	--	<0.2	<0.2
1,1-Dichloroethane	25	1.0	1.1	1.7	0.7	0.6	3.6	--	1.6	--	9.5 JL	0.9	--	--	17	39	25	38	25	14	--	11 JL	19
1,2-Dichloroethane	5	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	--	<0.1	--	0.4 JL	<0.1	--	--	<0.2	0.6	0.4	0.8	0.7	1.0	--	0.7 JL	1.4
Benzene	5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	--	0.6 JL	<0.1	--	--	3.8	1.6	0.6	0.4	2.2	2.1 J	--	1.2 JL	9.5
Naphthalene	1.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	--	<0.1	<0.1	--	--	0.3 J	0.2 JH	0.3	<0.1	<0.1	0.3 J	--	<0.1	<0.1
1,2,4-Trimethylbenzene	8.44	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	--	<0.1	<0.1	--	--	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1
1,3,5-Trimethylbenzene	44	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	--	<0.1	<0.1	--	--	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1

Analyte	KDHE Tier 2 RSK Residential Level [a]	R-4 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11	R-5 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	--	--	1.8	0.2	0.8	2.2	0.2 J	<0.1	--	<0.1	0.1 J	550	570	420	820	660	700	360	770	880	440 JL	520
Trichloroethene	5	--	--	3.9	0.3	3.5	4.5	9.7	1.1	--	<0.1	0.4 J	210	250	190	360	280	270	210	510	660	510 JL	570
cis-1,2-Dichloroethene	70	--	--	50	41	34	21	54	35	--	16 JL	22	310	370	240	550	620	500	340	560	860	880 JL	1100
1,1-Dichloroethene	7	--	--	0.2 J	0.1	0.2	0.3	0.3 J	0.2 J	--	<0.1	0.1 J	10	11	6.8	12	12	9.7	5.1	8.6	12	9.0 JL	9.9
Vinyl chloride	2	--	--	11	12	14	12	17 JL	10	--	3.8 JL	3.9	1.2 J	2.2 J	2.2 J	4.8	1.4	1.7	<1.0	2.7 J	7.2	5.8 JL	11
Methylene chloride	5	--	--	1.1 B	<0.2	<0.2	0.7	0.2 BJ	<0.2	--	<0.2	<0.2	<1.0	<1.0	2.0 BJ	<2.0	<2.0	<2.0	2.8 BJ	<2.0	<1.0	<2.0	<2.0
1,1-Dichloroethane	25	--	--	24	21	23	30	8.4	6.2	--	6.4 JL	7.2	18	14	7.0	9.3	6.9	7.0	5.2	4 J	4.0	3.4 JL	4.5 J
1,2-Dichloroethane	5	--	--	<0.2	<0.1	<0.1	<0.1	0.2 J	<0.1	--	<0.1	<0.1	0.8 J	0.7 J	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0
Benzene	5	--	--	0.6 J	0.4	0.6	1.5	0.4 J	0.2 J	--	0.2 JL	0.2 J	<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0
Naphthalene	1.11	--	--	<0.2	<0.1	0.4	0.5	<0.1	<0.1	--	<0.1	<0.1	<0.5	<0.5	<0.5	<1.0	<1.0	5.1	<1.0	<1.0	<0.5	<1.0	<1.0
1,2,4-Trimethylbenzene	8.44	--	--	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0
1,3,5-Trimethylbenzene	44	--	--	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0

Analyte	KDHE Tier 2 RSK Residential Level [a]	R-6 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11	R-7 Sidegradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	--	--	60	47	46	52	23	24	--	0.8 JL	0.3 J	--	--	2.3	--	--	0.2	0.1 J	1.4	5.9	3.4 JL	12
Trichloroethene	5	--	--	7.9	11	12	16	15	17	--	4.4 JL	0.7 J	--	--	4.6	--	--	0.7	1.0	0.7	2.3	3.5 JL	12
cis-1,2-Dichloroethene	70	--	--	22	54	42	46	44	54	--	100 JL	110	--	--	8.9	--	--	13	8.5	1.8	7.4	8.1 JL	31
1,1-Dichloroethene	7	--	--	0.5	1.4	1.3	1.3	0.9	0.7	--	0.7 JL	1.5	--	--	0.2 J	--	--	0.2	0.1 J	<0.1	0.1 J	<0.1	0.6
Vinyl chloride	2	--	--	0.3 J	0.7	0.7	0.5	0.8	0.8	--	1.2 JL	2.9	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methylene chloride	5	--	--	<0.2	<0.2	<0.2	<0.2	0.2 BJ	<0.2	--	<0.2	<0.4	--	--	<0.2	--	--	<0.2	0.2 BJ	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethane	25	--	--	3.7	6.3	5.9	5.7	5.4	6.4	--	5.0 JL	9.3	--	--	0.9	--	--	0.8	0.5	0.1 J	0.5 J	0.4 JL	2.3
1,2-Dichloroethane	5	--	--	0.1 J	0.3	0.2	0.2	0.2 J	0.2 J	--	0.2 JL	0.2 J	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene	5	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.2	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	1.11	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.2	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2,4-Trimethylbenzene	8.44	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.2	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,3,5-Trimethylbenzene	44	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.2	--	--	<0.1	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table 7. VOC Exceedances at Off-Site Plumelets A and B through June 2011 (Continued)

Analyte	KDHE Tier 2 RSK Residential Level [a]	R-10 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11	R-11 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	**150**	**130**	**46**	**15**	**3.4**	**2.5**	**2.8 J**	**8.7**	**5.9**	**4.2 JL**	**67**	--	--	<0.2	<0.1	<0.5	<0.1	**0.1 J**	<0.1	<0.1	<0.1	<0.1
Trichloroethene	5	**160**	**140**	**61**	**24**	**8.0**	**18**	**14**	**47**	**41**	**69 JL**	**210**	--	--	**0.5 J**	**0.9**	<0.5	**0.6**	**0.6**	**0.2 J**	**0.2 J**	**0.6 JL**	**0.1 J**
cis-1,2-Dichloroethene	70	**210**	**200**	**180**	**260**	**290**	**310**	**300**	**290**	**350**	**310 JL**	**470**	--	--	**150**	**270**	**160**	**150**	**27**	**120**	**140**	**120 JL**	**86**
1,1-Dichloroethene	7	**3.4**	**3.3**	**2.0**	**2.8**	**3.0**	**3.2**	**2.3 J**	**3.2**	**4.5**	**3.4 JL**	**4.6**	--	--	**1.2**	**3.7**	**2.0**	**1.2**	**0.4 J**	**1.0**	**1.8**	**1.6 JL**	**1.0**
Vinyl chloride	2	**1.2 J**	**1.4**	**0.6 J**	**2.6**	**3.0**	**2.3**	**3.5 JL**	**2.8**	**5.0**	**16 JL**	**3.3**	--	--	**16**	**55**	**29**	**4.9**	**0.9**	**12**	**19**	**16 JL**	**28**
Methylene chloride	5	<1.0	<0.4	**0.5 J**	<0.2	<1.0	<0.2	**1.4 BJ**	<0.4	<0.4	**1.1 JL**	<1.0	--	--	**0.4 J**	**0.2 B**	<1.0	<0.2	**0.2 BJ**	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethane	25	**34**	**29**	**20**	**23**	**19**	**14**	**10**	**10**	**12**	**10 JL**	**12**	--	--	**110**	**210**	**110**	**110**	**24**	**100**	**100**	**97 JL**	**63**
1,2-Dichloroethane	5	**0.6 J**	**0.5 J**	**0.3 J**	**0.4**	<0.5	**0.3**	<0.5	**0.4 J**	<0.2	<0.5	<0.5	--	--	**1.7**	**3.9**	**2.2**	**1.6**	**0.4 J**	**1.6**	**1.4**	**1.4 JL**	**0.5**
Benzene	5	<0.5	<0.2	<0.2	**0.1**	<0.5	**0.2**	<0.5	<0.2	<0.2	<0.5	<0.5	--	--	**0.4 J**	**1.0**	**0.7**	**0.5**	**0.1 J**	**0.4 J**	**0.4 J**	**0.4 JL**	**0.4 J**
Naphthalene	1.11	<0.5	<0.2	<0.2	<0.1	<0.5	<0.1	<0.5	<0.2	<0.2	<0.5	<0.5	--	--	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2,4-Trimethylbenzene	8.44	<0.5	<0.2	<0.2	<0.1	<0.5	<0.1	<0.5	<0.2	<0.2	<0.5	<0.5	--	--	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,3,5-Trimethylbenzene	44	<0.5	<0.2	<0.2	<0.1	<0.5	<0.1	<0.5	<0.2	<0.2	<0.5	<0.5	--	--	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Analyte	KDHE Tier 2 RSK Residential Level [a]	R-12 Downgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11	TW-4 Upgradient 1/07	3/07	6/07	10/07	12/07	3/08	7/08	5/09	12/09	6/10	6/11
Tetrachloroethene	5	**11**	**22**	**6.5**	**1.2**	**1.6**	**1.6**	**3.1**	**0.6 J**	**0.6 J**	<0.5	<0.5	--	--	<1.0	<0.5	<0.5	<0.5	<0.5	<0.5	--	<0.1	<0.5
Trichloroethene	5	<0.1	**44**	**35**	**4.9**	**5.7**	**8.1**	**20**	**4.6**	**2.5 J**	**2.0 JL**	**1.8 J**	--	--	<1.0	**0.9**	<0.5	<0.5	<0.5	**2.4 J**	--	**1.4 JL**	<0.5
cis-1,2-Dichloroethene	70	**130**	**220**	**350**	**110**	**280**	**350**	**550**	**550**	**250**	**210 JL**	**280**	--	--	**1.6 J**	**5.2**	**1.4**	**6.3**	**1.1 J**	**25**	--	**17 JL**	**1.5 J**
1,1-Dichloroethene	7	**0.3 J**	**0.6 J**	**0.8 J**	**0.4**	**1.0**	**1.5**	**2.2 J**	**2.5 J**	**1.5 J**	**1.2 JL**	**1.6 J**	--	--	<1.0	<0.5	<0.5	<0.5	<0.5	<0.5	--	**0.1 JL**	<0.5
Vinyl chloride	2	**0.3 J**	**2.3**	**7.0**	**2.8**	**3.4**	**19**	**81**	**140**	**62**	**28 JL**	**23**	--	--	**4.6 J**	**9.7**	**3.6**	**21**	**2.3 JL**	**36**	--	**20 JL**	**4.1**
Methylene chloride	5	**0.6 B**	<0.4	**1.1 BJ**	<0.2	<1.0	<0.2	**1.9 BJ**	<1.0	<1.0	<1.0	**1.2 B**	--	--	**6.6**	**1.3 B**	**1.4 B**	**4.3**	**2.4 BJ**	**1.8 J**	--	<0.2	<1.0
1,1-Dichloroethane	25	**43**	**59**	**100**	**30**	**75**	**88**	**190**	**220**	**100**	**77 JL**	**100**	--	--	**31**	**23**	**15**	**23**	**9.4**	**27**	--	**23 JL**	**16**
1,2-Dichloroethane	5	**0.5 J**	**1. J**	**1.3 J**	**0.4**	**1.1**	**1.6**	**3.3**	**3.6**	**1.8 J**	**1.3 JL**	**1.4 J**	--	--	**5.4**	**5.3**	**3.9**	**4.3**	**2.9**	**3.0**	--	**2.6 JL**	<0.5
Benzene	5	<0.1	<0.2	<0.5	<0.1	<0.5	**0.5**	**1.1 J**	**1.8 J**	**1.0 J**	**0.7 JL**	**0.8 J**	--	--	**69**	**62**	**52**	**40**	**22**	**23**	--	**22 JL**	**24**
Naphthalene	1.11	<0.1	<0.2	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	**430**	**350**	**310**	**240**	**83**	<0.5	--	**0.1 JL**	<0.5
1,2,4-Trimethylbenzene	8.44	**0.1 J**	<0.2	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	**69**	**8.3**	**2.7**	**1.1**	**1.0 J**	<0.5	--	<0.1	<0.5
1,3,5-Trimethylbenzene	44	<0.1	<0.2	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	**130**	**73**	**31**	**6.3**	**4.2**	<0.5	--	<0.1	<0.5

[a] Source: Risk-Based Standards for Kansas (RSK), RSK Manual-5th Version, Kansas Department of Health and Environment (KDHE), Bureau of Environmental Remediation, October 2010.
[b] In November 2010, an additional sample was collected from monitoring well MW-21. The value within the parentheses indicates the value measured or detected in November 2010.
All units are presented in micrograms per liter (µg/L).
< Less than method detection limit (MDL).
-- Not measured.
Bold values were detected.
B - Sample concentration is similar to that found in an associated blank.
H - The result is biased high.
J - The analyte was positively identified, the quantitation is an estimation.
L - The result is biased low.

Table 8. Dissolved Gases and Field Parameters at Off-Site Plumelets A and B through June 2011

	MW-8											MW-9										
	Sidegradient											Sidegradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	--	--	**33**	--	--	**37**	--	**27**	**27**	--	**39**	--	--	--	--	--	--	--	--	--	--	--
Methane	--	--	<0.002	--	--	<0.002	--	<0.005	<0.005	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethane	--	--	<0.001	--	--	<0.001	--	<0.001	<0.001	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethene	--	--	<0.001	--	--	<0.001	--	<0.001	<0.001	--	--	--	--	--	--	--	--	--	--	--	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	--	--	<0.5	--	--	2.98	0.91	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	1.84	0.91	--	1.08	<0.5
ORP (mV)	--	--	-39	--	--	-17	-77	40	9	-13	-36	--	--	--	--	--	--	92	40	--	197	111

	MW-18											MW-20										
	Downgradient											Downgradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	**98**	**160**	**270**	**300**	**210**	**130**	--	**87**	--	**85 JL**	**110**	**66**	**60**	**53**	**71**	**100**	**67**	--	**57**	**62**	**61 JL**	**76**
Methane	<0.002	**0.026**	**0.19**	**0.58**	**2.3**	**4.7**	**3.5**	**0.88**	**0.77**	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.0021 J**	**0.83**	**0.96**	--	--
Ethane	<0.001	<0.001	**0.003 J**	**0.0027 J**	**0.0032 J**	**0.015**	**0.01**	**0.0079**	**0.0073**	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.004 J**	**0.0037 J**	--	--
Ethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	<0.5	2.55	<0.5	0.93	2.55	0.83	1.38	0.57	<0.5	<0.5	<0.5	1.18	2.91	1.04	2.15	2.61	2.18	0.79	0.80	3.48	<0.5	<0.5
ORP (mV)	85	71	67	-256	-53	-20	-58	23	17	-8	11	94	159	167	137	77	44	-28	94	111	46	79

	MW-21											MW-22										
	Downgradient											Downgradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10 (11/10)[a]**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	**120**	**100**	**110**	**100**	**98**	**86**	--	**240**	--	**-- (110)**	**110**	--	--	--	--	--	--	--	--	**40**	--	--
Methane	**0.75**	**0.59**	**0.42**	**0.15**	**0.21**	**0.18**	<0.002	**0.056 J**	**0.17**	--	--	--	--	--	--	--	--	--	--	<0.005	--	--
Ethane	**0.016**	**0.017**	**0.0069**	**0.0041 J**	**0.0057**	**0.004 J**	<0.001	**0.0015 J**	**0.0042 J**	--	--	--	--	--	--	--	--	--	--	<0.001	--	--
Ethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	--	--	--	--	--	<0.001	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	<0.5	2.00	<0.5	1.22	1.36	0.56	2.75	3.10	<0.5	1.41 (10.01)[b]	<0.5	--	--	--	--	--	--	5.0	3.14	3.43	3.74	3.02
ORP (mV)	-9	17	77	57	59	-11	-4	68	-9	16 (19)	37	--	--	--	--	--	--	123	82	174	181	142

	R-2											R-3										
	Sidegradient											Sidegradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	**11**	**11**	**15**	**19**	**14**	**18**	**23**	**12**	--	**46 JL**	**150**	--	--	**90**	**120**	**94**	**98**	--	**89 J**	--	**93 JL**	**130**
Methane	<0.002	**0.0026 J**	**0.0032 J**	**0.0031 J**	**0.003 J**	**0.0027 J**	<0.002	**0.0063 J**	--	--	--	--	--	**1.9**	**0.28**	**0.13**	**0.059**	**1.4**	**0.84**	--	--	--
Ethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	**0.093**	**0.025**	**0.0076**	**0.0031**	**0.018**	**0.021**	--	--	--
Ethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	**0.0037 J**	**0.011**	**0.012**	**0.019**	**0.01**	**0.0024 J**	--	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	7.21	2.70	<0.5	1.05	1.46	0.58	--	0.62	--	0.5	--	--	--	<0.5	0.89	1.95	<0.5	0.56	0.83	--	0.55	--
ORP (mV)	150	86	-12	14	-11	35	--	5	--	-33	11	--	--	-163	-199	-133	-151	-130	-76	--	-84	-119

Table 8. Dissolved Gases and Field Parameters at Off-Site Plumelets A and B through June 2011 (Continued)

	R-4											R-5										
	Downgradient											Downgradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	--	--	**110**	**150**	**140**	**130**	--	**120**	--	**110 JL**	**110**	**98**	**92**	**81**	**130**	**130**	**120**	--	**80**	--	**94 JL**	**120**
Methane	--	--	**1.6**	**2.4**	**2.2**	**4.3**	**5.6**	**7.6**	--	--	--	<0.002	<0.002	<0.002	**0.0023 J**	**0.0035 J**	**0.06**	**1.1**	**3.2**	--	--	--
Ethane	--	--	**0.011**	**0.0099**	**0.014**	**0.032**	**0.026**	**0.016**	--	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--
Ethene	--	--	**0.0043 J**	**0.0033**	**0.0024**	**0.0024**	**0.0058**	**0.0062**	--	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	--	--	<0.5	1.07	1.56	<0.5	0.99	<0.5	--	1.27	--	<0.5	2.52	<0.5	1.04	<0.5	<0.5	0.78	0.50	<0.5	0.58	--
ORP (mV)	--	--	-179	-179	-160	-131	-140	-132	--	-137	-127	-113	45	29	-45	29	163	-19	67	52	20	81

	R-6											R-7										
	Downgradient											Sidegradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	--	--	**88**	**110**	**120**	**110**	--	**110**	--	**100 JL**	**130**	--	--	**78**	--	--	**50**	--	**32**	--	**36 JL**	**69**
Methane	--	--	**0.0044 J**	**0.33**	**0.59**	**1**	**4.5**	**0.67**	--	--	--	--	--	**0.02**	--	--	**0.45**	**0.54**	**0.02**	<0.005	--	--
Ethane	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	<0.001	--	--	<0.001	<0.001	<0.001	<0.001	--	--
Ethene	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	<0.001	--	--	<0.001	<0.001	<0.001	<0.001	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	--	--	<0.5	1.13	<0.5	<0.5	1.25	0.63	--	1.17	--	--	--	<0.5	--	--	<0.5	1.12	0.58	<0.5	0.92	--
ORP (mV)	--	--	99	92	80	146	74	22	--	-111	-41	--	--	-147	--	--	-142	-139	-30	-107	-116	-77

	R-10											R-11										
	Downgradient											Downgradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	**73**	**72**	**76**	**94**	**110**	**76**	--	**58**	**77**	**68 JL**	**96**	--	--	**71**	**180**	**170**	**79**	--	**62**	**72**	**73 JL**	**130**
Methane	**0.018**	**0.024**	**0.016**	**0.16**	**0.8**	**0.61**	**2.0**	**1.2**	**0.87**	--	--	--	--	**0.22**	**0.91**	**1**	**0.093**	**0.83**	**0.13**	**0.083**	--	--
Ethane	<0.001	<0.001	<0.001	**0.0014 J**	**0.0033 J**	**0.0017 J**	**0.0033 J**	**0.0034 J**	**0.0023**	--	--	--	--	**0.0047 J**	**0.022**	**0.025**	**0.0024 J**	**0.015**	**0.004 J**	**0.004 J**	--	--
Ethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	<0.5	2.48	<0.5	1.31	1.59	0.54	1.07	0.74	<0.5	3.45	--	--	--	<0.5	1.02	1.55	0.53	1.46	1.37	11.22	1.01	--
ORP (mV)	-18	58	29	-45	-20	-14	-71	-6	-34	-95	-1	--	--	-109	-93	-72	-93	-104	-43	-54	-68	-47

	R-12											TW-4										
	Downgradient											Upgradient										
Analyte	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**	**1/07**	**3/07**	**6/07**	**10/07**	**12/07**	**3/08**	**7/08**	**5/09**	**12/09**	**6/10**	**6/11**
Dissolved Gases (mg/L)																						
Carbon Dioxide	**32**	**57**	**86**	**59**	**94**	**92**	--	**110**	**86**	**110 JL**	**150**	--	--	**610**	**200**	**220**	**180**	--	**470**	--	**120 JL**	**160**
Methane	<0.002	<0.002	<0.002	<0.002	**0.0032 J**	**0.35**	**0.75**	**0.89**	**0.72**	--	--	--	--	**12**	**9.9**	**12**	**12**	**9.5**	**8.8**	--	--	--
Ethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.0015 J**	**0.022**	**0.031**	--	--	--	--	**0.81 J**	**0.59 J**	**0.68 J**	**0.47**	**0.29**	**0.18**	--	--	--
Ethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	--	--	--	**0.024**	**0.025**	**0.027**	**0.036**	**0.012**	**0.028**	--	--	--
Field Parameters																						
Dissolved Oxygen (mg/L)	1.64	2.17	<0.5	1.05	1.65	<0.5	1.09	1.17	<0.5	3.33	--	--	--	<0.5	1.01	1.46	0.81	0.62	0.75	--	0.52	--
ORP (mV)	-7	23	-43	-59	-43	-1	-46	-4	-53	-81	-113	--	--	-198	-237	-145	-156	-182	-120	--	-100	-154

Table 8. Dissolved Gases and Field Parameters at Off-Site Plumelets A and B through June 2011 (Continued)

[a] In November 2010, an additional sample was collected from monitoring well MW-21. The value within the parentheses indicates the value measured or detected in November 2010.
[b] The well was purged and sampled with a bailer. A water sample was placed in a sample cup to be measured for dissolved oxygen (DO) with the YSI Professional Optical DO meter. The DO is biased high due to exposure to ambient air.
< Less than method detection limit (MDL). For DO values less than 0.5 milligrams per liter (mg/L), anaerobic conditions are present.
-- Not measured.
Bold values were detected.
Dissolved gases were analyzed by Lancaster Laboratories by U. S. Environmental Protection Agency (EPA) Method SW8015B Mod.
J - The analyte was positively identified, the quantitation is an estimation.
L - The result is biased low.
mV - Millivolts.
ORP - Oxidation-reduction potential.

Table 9. Phytoremediation Growth Summary for On-Site Plumelets B and C through August 2011

Tree	2010 Monthly Height (ft)							2011 Monthly Height (ft)					Total Height Change During 2010 First Growing Season (ft)	Total Height Change through August 2011 (ft) [a]	Replaced in April 2011?
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Apr	May	Jun	Jul	Aug	June to December 2010		
Plot B															
B-1	2.7	3.9	4.5	5.5	5.9	5.7	5.7	6.0	6.0	7.2	9.2	10.2	3	7.5	N
B-2	1.6	2.8	3.7	4.6	4.8	5.0	5.0	5.0	5.4	5.8	6.6	7.0	3.4	5.4	N
B-3	1.7	2.3	3.2	3.9	4.2	4.0	4.0	4.3	4.4	5.8	7.0	7.8	2.3	6.1	N
B-4	2.4	2.6	2.5	2.4	2.4	2.4	0.0	1.2	1.0	1.2	3.0	3.6	-2.4	2.4	Y
B-5	1.65	2.8	3.9	4.9	5.0	5.1	5.1	4.8	5.2	6.8	8.4	9.8	3.45	8.15	N
B-6	1.5	2.2	3.6	3.6	2.2	2.4	2.2	2.5	2.6	3.6	5.0	5.0	0.7	3.5	N
B-7	1.4	1.7	1.5	1.7	1.2	1.3	1.1	1.6	2.2	4.0	5.8	6.8	-0.3	5.4	N
B-8	4.6	4.8	5.4	5.9	5.9	5.5	5.5	5.6	5.7	5.8	5.8	6.0	0.9	1.4	N
B-9	3.8	3.9	4.5	5.0	5.0	5.2	5.2	5.2	5.2	6.0	7.6	8.4	1.4	4.6	N
B-10	1.9	1.9	2.4	2.6	2.8	3.0	3.0	3.4	3.6	5.2	7.0	7.8	1.1	5.9	N
B-11	4.2	5.2	6.0	6.8	6.9	7.0	7.0	7.2	7.4	7.9	8.6	9.0	2.8	4.8	N
B-12	1.9	2.4	3.1	4.0	4.3	4.4	4.2	4.6	5.2	6.8	8.2	8.4	2.3	6.5	N
B-13	1.9	2.5	3.7	4.4	4.8	4.5	4.6	4.8	5.4	6.6	7.6	7.8	2.7	5.9	N
B-14	1.4	2.3	3.7	4.0	4.2	4.0	4.1	4.2	4.5	5.4	6.6	6.8	2.7	5.4	N
B-15	3.8	4.2	4.9	5.3	5.4	5.4	5.4	5.4	5.7	6.0	7.0	7.4	1.6	3.6	N
B-16	2.8	3.4	4.3	4.3	4.6	4.6	4.6	4.6	4.8	5.4	7.8	8.2	1.8	5.4	N
B-17	2.3	3.0	3.9	4.1	4.3	4.2	4.2	4.3	4.5	4.8	6.4	7.6	1.9	5.3	N
B-18	1.4	1.4	0.0	0.0	0.0	0.0	0.0	1.9	1.9	2.0	2.8	2.8	-1.4	0.9	Y
B-19	3.0	3.9	4.6	5.5	6.3	5.6	5.6	5.9	6.3	7.6	8.6	10.2	2.6	7.2	N
B-20	5.0	5.5	6.0	6.7	6.7	6.7	6.7	6.9	7.0	7.6	8.4	8.6	1.7	3.6	N
B-21	3.8	4.3	5.0	5.3	5.3	5.3	5.3	5.4	5.8	6.6	7.2	7.3	1.5	3.5	N
B-22	3.4	3.9	4.5	5.3	5.0	5.2	5.2	5.4	5.8	7.0	7.6	8.2	1.8	4.8	N
B-23	3.95	4.2	5.2	5.7	5.7	5.7	5.7	5.8	6.1	6.7	7.7	8.4	1.75	4.45	N
B-24	4.0	4.4	4.7	5.7	5.7	5.8	5.8	5.8	6.0	6.4	7.9	8.4	1.8	4.4	N
B-25	1.3	2.3	3.8	4.9	3.9	3.9	3.9	4.2	4.3	5.4	7.9	8.5	2.6	7.2	N
B-26	2.8	3.5	4.3	4.5	4.0	4.6	4.6	4.4	4.6	5.8	7.2	7.9	1.8	5.1	N
B-27	1.7	1.9	2.2	2.2	1.7	1.9	1.9	2.2	2.1	2.3	2.4	2.2	0.2	0.0	Y
B-28	3.2	4.0	5.0	5.6	5.9	5.8	5.8	6.2	6.4	7.0	9.2	9.6	2.6	6.4	N
B-29	1.6	1.9	2.7	3.7	4.3	4.4	4.4	4.8	5.2	7.2	9.8	10.2	2.8	8.6	N
B-30	4.7	5.1	5.3	5.9	5.5	5.9	5.9	6.0	6.2	7.0	8.2	9.5	1.2	4.8	N
B-31	1.8	3.0	3.3	4.3	4.3	4.2	4.2	4.4	4.6	5.4	6.4	6.6	2.4	4.8	N
B-32	3.1	4.1	5.3	5.5	5.5	5.7	5.7	5.7	5.9	6.8	7.8	8.4	2.6	5.3	N
B-33	2.0	2.1	2.6	2.6	2.6	2.6	2.6	1.6	1.8	1.6	1.9	1.8	0.6	0.2	Y
B-34	2.2	3.1	4.2	4.4	4.4	4.6	4.6	4.4	4.8	5.2	6.8	7.2	2.4	5.0	N
B-35	1.7	2.9	3.5	3.9	3.9	4.0	4.0	3.6	4.0	4.6	6.2	7.2	2.3	5.5	N
B-36	1.5	2.0	2.6	2.9	1.3	1.5	1.5	1.4	1.7	3.0	5.8	6.6	0.0	5.1	N
Plot C															
C-1	1.7	2.5	4.1	4.8	5.0	5.1	5.1	4.8	5.2	5.4	6.0	6.2	3.4	4.5	N
C-2	4.2	4.9	5.8	6.3	6.3	6.5	6.5	6.4	6.6	7.0	7.2	7.5	2.3	3.3	N
C-3	1.5	2.8	4.0	1.8	2.8	2.8	2.8	2.9	3.3	4.8	5.6	6.0	1.3	4.5	N
C-4	0.7	2.0	4.0	4.6	4.5	4.5	4.5	4.6	4.7	5.6	5.5	5.8	3.8	5.1	N
C-5	1.9	3.3	4.6	5.4	5.4	5.4	5.2	5.2	5.5	5.9	6.0	6.0	3.3	4.1	N
C-6	1.9	3.2	5.0	6.0	6.8	6.9	6.9	6.8	7.4	8.0	9.6	10.0	5	8.1	N
C-7	2.8	3.2	4.1	5.0	5.1	5.1	5.1	5.3	5.7	7.0	8.0	8.4	2.3	5.6	N
C-8	0.7	0.5	0.7	0.0	0.0	0.0	0.0	3.0	2.8	2.8	3.9	4.6	-0.7	1.6	Y
C-9	1.5	0.7	1.7	2.1	0.9	0.8	1.0	1.4	2.0	3.8	5.3	5.3	-0.5	3.8	N
C-10	2.4	3.4	4.3	4.8	1.3	1.3	1.3	1.8	2.4	4.5	5.8	6.2	-1.1	3.8	N
C-11	1.3	2.1	3.1	3.2	0.0	0.3	0.3	0.2	0.8	2.8	5.8	3.8	-1.0	2.5	N
C-12	3.5	4.7	6.0	6.3	6.4	6.5	6.5	6.5	6.8	7.0	7.0	7.0	3.0	3.5	N
C-13	2.0	3.3	4.6	5.0	5.2	5.3	5.3	5.3	5.4	5.8	6.2	6.4	3.3	4.4	N
C-14	2.7	2.6	4.5	5.1	5.1	5.2	5.2	5.2	5.4	5.6	5.8	5.8	2.5	3.1	N
C-15	1.7	3.0	4.7	5.1	5.1	5.3	5.3	5.2	5.3	5.6	6.4	6.4	3.6	4.7	N

Table 9. Phytoremediation Growth Summary for On-Site Plumelets B and C through August 2011 (Continued)

Tree	2010 Monthly Height (ft)							2011 Monthly Height (ft)					Total Height Change During 2010 First Growing Season (ft)	Total Height Change through August 2011 (ft) [a]	Replaced in April 2011?
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Apr	May	Jun	Jul	Aug	June 2010 to December 2010		
Plot C (Continued)															
C-16	1.7	2.2	3.1	3.5	1.3	1.3	1.3	2.4	2.2	2.6	4.0	4.4	-0.4	2.0	Y
C-17	1.3	2.9	4.3	5.1	6.1	6.2	6.2	6.4	6.8	7.2	8.8	9.6	4.9	8.3	N
C-18	2.0	2.6	3.9	3.8	1.7	1.7	1.7	2.0	3.0	5.0	6.0	6.3	-0.3	4.3	N
C-19	3.1	4.2	5.4	4.8	5.0	5.1	5.1	5.3	5.6	6.7	7.4	8.1	2.0	5.0	N
C-20	1.7	2.6	4.0	4.7	4.7	2.3	2.3	2.4	3.0	5.0	6.4	6.4	0.6	4.7	N
C-21	1.3	1.3	0.0	0.0	0.0	0.0	0.0	1.0	0.8	1.8	3.7	4.2	-1.3	3.2	Y
C-22	2.9	4.0	5.3	6.1	6.3	6.2	6.4	6.2	6.6	7.5	8.8	9.2	3.5	6.3	N
C-23	2.0	3.8	5.3	5.6	5.8	5.8	5.8	6.0	6.0	6.6	7.3	7.6	3.8	5.6	N
C-24	1.9	3.6	4.4	4.9	5.0	5.0	5.0	4.9	5.0	5.5	6.0	6.4	3.1	4.5	N
C-25	1.8	3.3	4.7	4.9	4.9	4.8	4.8	4.8	4.9	4.6	6.1	6.6	3.0	4.8	N
C-26	2.5	3.2	4.4	4.9	4.9	5.0	5.0	5.2	5.7	5.5	8.2	8.6	2.5	6.1	N
C-27	2.0	2.9	4.5	5.3	5.4	5.4	5.4	5.8	6.0	5.6	9.0	9.8	3.4	7.8	N
C-28	2.1	2.8	4.4	5.3	5.6	5.7	5.7	5.8	6.0	6.5	9.0	9.2	3.6	7.1	N
C-29	1.3	1.6	3.1	3.9	5.0	5.0	5.0	5.1	5.3	6.2	7.2	7.9	3.7	6.6	N
C-30	3.1	3.9	4.8	5.5	5.6	5.7	5.7	5.6	6.0	7.0	8.4	8.2	2.6	5.1	N
C-31	1.6	2.8	3.5	3.9	3.9	2.9	2.9	3.4	3.9	4.9	6.5	7.2	1.3	5.6	N
C-32	2.8	3.9	5.8	5.7	2.0	2.1	2.1	2.8	3.8	5.8	6.9	8.2	-0.7	5.4	N
C-33	1.3	2.4	4.1	4.6	4.9	4.9	4.9	5.0	5.1	5.8	6.4	6.6	3.6	5.3	N
C-34	2.8	4.0	4.8	5.1	5.1	5.2	5.2	5.3	5.4	5.6	5.8	5.4	2.4	2.6	N
C-35	2.9	3.1	4.0	4.6	4.7	4.8	4.8	4.9	5.0	5.6	6.2	6.4	1.9	3.5	N
C-36	1.4	2.9	4.7	5.3	4.5	4.5	4.5	5.1	5.6	6.9	8.2	9.2	3.1	7.8	N
C-37	2.3	2.5	2.4	2.5	2.3	2.3	2.3	2.4	2.4	2.0	4.6	4.8	0.0	2.4	Y
C-38	2.3	3.1	3.4	4.4	4.7	4.6	4.6	4.8	5.2	6.0	6.8	7.2	2.3	4.9	N
C-39	2.3	3.2	4.5	5.1	5.2	5.0	5.1	5.4	5.8	6.4	7.4	7.8	2.8	5.5	N
C-40	2.0	3.2	5.0	6.0	6.4	6.5	6.5	6.8	7.0	8.0	9.6	10.2	4.5	8.2	N
C-41	1.5	2.3	3.8	4.0	1.2	1.4	1.4	2.2	2.6	4.6	6.3	7.0	-0.1	5.5	N
C-42	1.2	2.6	3.3	3.8	1.1	0.9	1.0	1.6	2.4	4.4	6.4	7.7	-0.2	6.5	N
C-43	2.0	3.1	4.7	5.2	5.3	4.8	4.8	4.9	5.6	6.4	7.2	7.8	2.8	5.8	N
C-44	1.5	2.8	4.8	5.5	5.5	4.7	4.7	5.2	5.8	7.4	8.2	8.4	3.2	6.9	N
C-45	1.8	3.0	4.5	5.2	5.2	5.5	5.5	5.4	6.0	7.0	8.8	9.0	3.7	7.2	N
C-46	1.7	0.5	0.3	0.5	0.5	0.5	0.5	1.6	1.6	1.9	4.4	5.2	-1.2	3.6	Y
C-47	1.5	2.7	4.1	4.6	4.6	4.6	4.6	4.8	4.9	5.6	6.6	6.8	3.1	5.3	N
C-48	0.9	2.3	3.7	3.9	1.3	1.4	1.4	2.0	2.9	4.8	6.7	6.9	0.5	6.0	N
C-49	2.1	2.8	4.3	4.9	4.9	5.0	5.0	5.2	5.3	5.6	6.6	7.6	2.9	5.5	N
C-50	2.8	3.9	4.9	5.2	5.3	5.3	5.3	5.4	5.6	6.6	8.7	9.8	2.5	7.0	N
C-51	2.7	3.0	4.4	5.2	5.4	5.3	5.3	6.0	6.4	8.2	11.0	11.6	2.6	8.9	N
C-52	2.5	3.7	4.9	5.3	5.3	5.2	5.3	5.4	5.8	7.4	9.9	11.3	2.8	8.8	N
C-53	1.7	2.9	4.5	5.2	5.3	5.2	5.2	5.4	5.8	7.0	9.0	9.3	3.5	7.6	N
C-54	3.0	4.0	5.2	5.8	5.7	6.0	6.0	5.8	5.9	6.8	8.0	8.5	3.0	5.5	N
C-55	2.3	3.7	4.9	6.0	7.3	+7.4	+7.5	8.2	8.6	9.6	12.3	12.4	5.2	10.1	N
C-56	1.9	3.1	4.6	5.2	5.3	5.9	5.9	6.0	6.6	8.0	10.6	12.2	4.0	10.3	N
C-57	1.7	2.9	4.7	5.6	5.6	5.7	5.7	6.0	6.4	7.9	11.0	11.4	4.0	9.7	N
C-58	1.3	1.7	1.2	1.3	0.8	0.0	0.0	1.8	1.9	1.6	4.4	6.0	-1.3	4.2	Y
C-59	1.6	2.3	4.1	4.7	5.0	4.7	4.7	5.1	5.4	6.2	7.6	8.2	3.1	6.6	N
C-60	1.7	2.5	3.7	1.8	1.1	1.0	1.2	2.0	2.6	4.6	6.6	7.0	-0.5	5.3	N
C-61	2.3	2.9	4.2	5.4	6.3	5.8	5.9	6.4	6.8	7.4	9.3	9.4	3.6	7.1	N
C-62	2.5	3.2	3.9	4.5	4.5	4.6	4.6	4.4	4.8	6.0	7.2	7.8	2.1	5.3	N
C-63	2.1	2.9	3.9	4.8	5.0	4.9	4.9	5.2	5.4	6.6	8.2	9.0	2.8	6.9	N
C-64	1.9	2.8	3.5	4.7	5.1	5.1	5.1	5.4	5.7	6.6	8.0	8.6	3.2	6.7	N
Average	**2.23**	**3.01**	**4.01**	**4.47**	**4.29**	**4.27**	**4.25**	**4.52**	**4.82**	**5.70**	**7.09**	**7.57**	**2.02**	**5.32**	

[a] For trees that were replanted in April 2011, total height change is measured from the replanting date in April 2011 to August 2011.
Shading indicates the trees that did not survive the first year growing season.
ft – Feet.

N - No.
Y - Yes.

Table 10. VOC Exceedances at On-Site Plumelets B and C Wells - June 2010 and June 2011

Analyte	KDHE Tier 2 RSK Residential Level [a]	MW-2		MW-4		MW-17S		MW-26		MW-27
		6/10	6/11	6/10	6/11	6/10	6/11	6/10	6/11	6/10
Tetrachloroethene	5	<0.1	<0.1	**4.7**	**3.8**	<0.1	<0.5	**9,500**	**3,500**	<0.1
Trichloroethene	5	<0.1	<0.1	**4.2**	**5.3**	<0.1	<0.5	**7,200**	**1,800**	**14**
cis-1,2-Dichloroethene	70	**0.2 J**	**1.5**	**26**	**33**	**2.0**	**150**	**22,000**	**33,000**	**12**
trans-1,2-Dichloroethene	100	<0.1	<0.1	**0.6**	**0.5 J**	**0.6**	**1 J**	**92**	**220 J**	**0.4 J**
1,1-Dichloroethene	7	<0.1	<0.1	<0.1	<0.1	<0.1	**7.1**	**1,900**	**2,700**	<0.1
Vinyl Chloride	2	<0.1	**0.3 J**	<0.1	<0.1	**4.3**	**73**	**400**	**910**	**4.4**
Methylene Chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2	**2.2 J**	**1,500**	**740**	<0.2
1,1,2-Trichloroethane	5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	**41 J**	**56 J**	<0.1
1,1-Dichloroethane	25	<0.1	<0.1	**0.6**	**0.9**	**30**	**110**	**120**	**120 J**	**1.9**
1,2-Dichloroethane	5	<0.1	<0.1	**0.4 J**	**0.7**	**0.6**	<0.5	**4,800**	**5,100**	<0.1
Benzene	5	<0.1	<0.1	<0.1	<0.1	**5.3**	**19**	**720**	**760**	**0.5**
Ethylbenzene	700	<0.1	<0.1	<0.1	<0.1	**270**	**330**	**2,400**	**1,700**	**140**
Naphthalene	1.11	<0.1	**0.2 J**	<0.1	<0.1	**39**	**42**	**88**	**67 J**	**19**
Styrene	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	**530**	<50	<0.1
Toluene	1,000	<0.1	<0.1	<0.1	<0.1	**6.5**	**220**	**25,000**	**8,100**	**0.1 J**
1,2,4-Trimethylbenzene	8.44	<0.1	<0.1	<0.1	<0.1	**92**	**130**	**330**	**140 J**	**25**
1,3,5-Trimethylbenzene	44	<0.1	<0.1	<0.1	<0.1	**22**	**32**	**87**	<50	**3.0**

Analyte	KDHE Tier 2 RSK Residential Level [a]	MW-27 (Continued)	MW-28		P-17D	P-17S	P-18	P-19	R-1	
		6/11	6/10	6/11	6/11	6/11	6/11	6/11	6/10	6/11
Tetrachloroethene	5	<0.1	**34**	**20**	<0.2	<0.1	**33**	**20**	**0.4 J**	**4.5 J**
Trichloroethene	5	**75**	**36**	**37**	<0.2	<0.1	**6.2**	**140**	**4.5**	**17**
cis-1,2-Dichloroethene	70	**55**	**1,800**	**530**	**0.8 J**	**0.1 J**	**960**	**590**	**88**	**1,700**
trans-1,2-Dichloroethene	100	**0.4 J**	**16**	**4.4 J**	<0.2	<0.1	**5.0**	**5.7**	**1.2**	**26**
1,1-Dichloroethene	7	<0.1	**6.3 J**	**2.4 J**	<0.2	<0.1	**12**	**2.1 J**	**5.6**	**64**
Vinyl Chloride	2	**22**	**680**	<1.0	**0.9 J**	<0.1	**350**	**7.0**	**25 JH**	**770**
Methylene Chloride	5	<0.2	<4.0	<2.0	**0.8 J**	<0.2	**1.0 B**	<2.0	**0.3 J**	**4.2 J**
1,1,2-Trichloroethane	5	<0.1	<2.0	<1.0	<0.2	<0.1	<0.5	<1.0	<0.1	<2.0
1,1-Dichloroethane	25	**2.5**	**21**	**11**	**0.6 J**	**0.1 J**	**67**	**14**	**4.0**	**50**
1,2-Dichloroethane	5	<0.1	**11**	**7.0**	<0.2	<0.1	**2.2 J**	**1.7 J**	**0.2 J**	**3.7 J**
Benzene	5	**0.8**	**9.9 J**	<1.0	**0.2 J**	<0.1	**24**	<1.0	**0.4 J**	**5 J**
Ethylbenzene	700	**12**	<2.0	<1.0	<0.2	**0.1 J**	**320**	<1.0	**8.2**	**140**
Naphthalene	1.11	**0.6**	<2.0	<1.0	**0.2 J**	<0.1	**95**	<1.0	**1.2**	**12**
Styrene	100	<0.1	<2.0	<0.1	<0.2	<0.1	<0.5	<1.0	<0.1	<2.0
Toluene	1,000	<0.1	<2.0	<1.0	<0.2	**8.4**	**79**	<1.0	**0.3 J**	**18**
1,2,4-Trimethylbenzene	8.44	**1.1**	<2.0	<1.0	<0.2	<0.1	**190**	<1.0	**0.3 J**	**8.1 J**
1,3,5-Trimethylbenzene	44	<0.1	<2.0	<1.0	<0.2	<0.1	**53**	<1.0	<0.1	<2.0

[a] Source: Risk-Based Standards for Kansas (RSK), RSK Manual-5th Version, Kansas Department of Health and Environment (KDHE), Bureau of Environmental Remediation, October 2010.
All units are presented in micrograms per liter (µg/L).
< Less than method detection limit (MDL).
Bold values were detected.
Shaded values are above the KDHE Tier 2 RSK Residential Levels.
Volatile organic compounds (VOCs) were analyzed by Lancaster Laboratories by U. S. Environmental Protection Agency (EPA) Method SW8260B.
B - Sample concentration is similar to that found in an associated blank.
H - The result is biased high.
J - The analyte was positively identified, the quantitation is an estimation.

Table 11. Chlorinated VOC Exceedances at MNA Wells through June 2011

Analyte	KDHE Tier 2 RSK Residential Level[a]	BACKGROUND										PLUMELET D										PLUMELET E									
		MW-10					USD-MW-15					MW-5					USD-4					PMW-4					PMW-7				
		5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11
Tetrachloroethene	5	--	<0.1	--	--	--	--	<0.1	--	--	--	**130**	**520 J**	**35 JL**	**26**	**32**	**8**	**1.7**	--	--	**3.6 J**	**0.4 J**	<0.1	--	--	**2.0**	**0.3 J**	**0.1 J**	--	--	**0.2 J**
Trichloroethene	5	--	<0.1	--	--	--	--	<0.1	--	--	--	**78**	**120**	**200**	**75**	**56**	**0.6**	<0.1	--	--	**0.3 J**	<0.1	<0.1	--	--	<0.1	<0.1	<0.1	--	--	<0.1
cis-1,2-Dichloroethene	70	--	<0.1	--	--	--	--	<0.1	--	--	--	**350**	**160**	**1,600**	**1,000**	**1,100**	**0.2 J**	<0.1	--	--	**0.1 J**	<0.1	<0.1	--	--	<0.1	<0.1	<0.1	--	--	<0.1
Vinyl Chloride	2	--	<0.1	--	--	--	--	<0.1	--	--	--	**38**	**17**	**220**	**210**	**270**	<0.1	<0.1	--	--	<0.1	<0.1	<0.1	--	--	<0.1	<0.1	<0.1	--	--	<0.1
Methylene Chloride	5	--	<0.2	--	--	--	--	<0.2	--	--	--	<1.0	<1.0	<1.0	<1.0	<2.0	<0.2	<0.2	--	--	<0.2	<0.2	<0.2	--	--	<0.2	<0.2	<0.1	--	--	<0.2

Analyte	KDHE Tier 2 RSK Residential Level[a]	PLUMELET E										PLUMELET F																			
		USD-1					USD-MW-3					MW-25					PMW-5					PMW-8					TW-2A				
		5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11
Tetrachloroethene	5	**100**	**62**	**56 JL**	**49**	**39**	**15**	**15**	**13 JL**	**13**	**7.5**	**0.8**	**1.0**	**0.7**	**0.8**	**0.5**	**6.8**	**7.0**	--	--	**7.7**	**31**	**27**	--	--	**23**	**7.1**	**9.0**	**7.4**	**6.6**	**7.0**
Trichloroethene	5	**3.6**	**2.4**	**2.1**	**1.7**	**1.6**	**0.3 J**	**0.3 J**	**0.2 J**	**0.3 J**	**0.3 J**	**6.7**	**13**	**17**	**15**	**11**	**16**	**16**	--	--	**16**	**130**	**120**	--	--	**130**	**74**	**78**	**75**	**66**	**73**
cis-1,2-Dichloroethene	70	**0.5 J**	**0.4 J**	**0.3 J**	**0.2 J**	**0.2 J**	<0.1	<0.1	<0.1	<0.1	<0.1	**16**	**12**	**6.5**	**7.6**	**6.7**	**220**	**230**	--	--	**180**	**51**	**51**	--	--	**60**	**45**	**47**	**42**	**43**	**47**
Vinyl Chloride	2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	--	--	<0.1	<0.1	<0.1	--	--	**0.1 J**	**0.3 J**	**0.4 J**	**0.3 J**	**0.3 J**	**0.4 J**
Methylene Chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1.0	<1.0	--	--	<0.2	<0.2	<0.2	--	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Analyte	KDHE Tier 2 RSK Residential Level[a]	PLUMELET F									
		USD-2					USD-3				
		5/09	6/10	11/10	3/11	6/11	5/09	6/10	11/10	3/11	6/11
Tetrachloroethene	5	**70**	**80**	**85**	**52**	**58**	**150**	**71 J**	**120 JL**	**61**	**47**
Trichloroethene	5	**320**	**150**	**170**	**170**	**240**	**1,100**	**320 J**	**710**	**330**	**230**
cis-1,2-Dichloroethene	70	**150**	**95**	**100**	**98**	**130**	**1,000**	**380**	**630**	**500**	**450**
Vinyl Chloride	2	<0.5	<0.5	<0.5	<0.1	<0.1	<1.0	<1.0	<1.0	<0.5	<0.2
Methylene Chloride	5	<1.0	**6.8**	<1.0	<0.2	<0.2	<2.0	**6.8 J**	<2.0	<1.0	<0.4

[a] Source: Risk-Based Standards for Kansas (RSK), RSK Manual-5th Version, Kansas Department of Health and Environment (KDHE), Bureau of Environmental Remediation, October 2010.
All units are presented in micrograms per liter (µg/L).
< Less than method detection limit (MDL).
-- Not measured.
Bold values were detected.
Shaded values are above the KDHE Tier 2 RSK Residential Levels.
Volatile organic compounds (VOCs) were analyzed by Lancaster Laboratories by U.S. Environmental Protection Agency (EPA) Method SW8260B.
J - The analyte was positively identified, the quantitation is an estimation.
L - The result is biased low.
MNA - Monitored natural attenuation.

Table 12. Geochemical Parameters at MNA Wells through June 2011

	BACKGROUND								PLUMELET D								PLUMELET E			
	MW-10				USD-MW-15				MW-5				USD-4				PMW-4			
Analyte	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**
Natural Attenuation Parameters (mg/L)																				
Alkalinity to pH 4.5	**369**	--	--	--	**257**	--	--	--	**512**	**438**	**455**	**442**	**390**	--	--	**332**	**179**	--	--	**227**
Alkalinity to pH 8.3	<0.46	--	--	--	<0.46	--	--	--	<0.46	<0.46	<0.46	<0.46	<0.46	--	--	<0.46	<0.46	--	--	<0.46
Arsenic (Total)	**0.0011 J**	--	--	--	**0.0040**	--	--	--	**0.0063**	--	--	--	**0.0012 J**	--	--	--	**0.0051**	--	--	--
Arsenic (Dissolved)	<0.00095	--	--	--	<0.00095	--	--	--	**0.0037**	--	--	--	<0.00095	--	--	--	**0.0017 J**	--	--	--
Chloride	**8.3**	--	--	--	**31.4**	--	--	--	**23.4**	**27.6**	**43.1**	**42.9 JL**	**14.2**	--	--	**20.6 JL**	**30.0**	--	--	**221 JL**
Manganese (Total)	**0.0050**	--	--	--	**0.309**	--	--	--	**1.60**	--	--	--	**0.590**	--	--	--	**0.457**	--	--	--
Manganese (Dissolved)	<0.00017	--	--	--	**0.0024**	--	--	--	**1.43**	--	--	--	**0.0109**	--	--	--	**0.0970**	--	--	--
Nitrate	**4.7**	--	--	--	**0.52**	--	--	--	<0.25	<0.25	<0.25	<0.25	**1.2**	--	--	**1.5**	<0.25	--	--	**4.2**
Sulfate	**92.5**	--	--	--	**2,620**	--	--	--	**260**	**1,060 JH**	**972**	**887 JL**	**512**	--	--	**488 JL**	**156**	--	--	**2,000 JL**
Sulfide	<0.53	--	--	--	<0.53	--	--	--	<0.53	--	--	--	<2.1	--	--	--	<0.53	--	--	--
Total Organic Carbon	**0.94 J**	--	--	--	--	--	--	--	**3.5**	**2.0**	**2.7**	**1.8**	**1.4**	--	--	**0.95 J**	**8.1**	--	--	**3.2**
Dissolved Gases (mg/L)																				
Carbon Dioxide	**37**	--	--	--	**24**	--	--	--	**66 J**	**100**	**67**	**91**	**22**	--	--	**31**	**6.4 J**	--	--	**27**
Methane	<0.0050	--	--	--	<0.0050	--	--	--	**1.4**	**0.46**	**0.15**	**0.31**	<0.0050	--	--	<0.010	<0.0050	--	--	<0.010
Ethane	<0.0010	--	--	--	<0.0010	--	--	--	**0.011**	**0.0083**	**0.0024 J**	**0.0041 J**	<0.0010	--	--	<0.0010	<0.0010	--	--	<0.0010
Ethene	<0.0010	--	--	--	<0.0010	--	--	--	**0.0051**	**0.0071**	**0.0025 J**	**0.0046 J**	<0.0010	--	--	<0.0010	<0.0010	--	--	<0.0010
Field Parameters																				
pH	7.1	--	--	--	7.3	--	--	--	7.0	6.76	6.45	6.84	7.4	--	--	7.12	7.7	--	--	7.23
ORP (mV)	226	--	--	--	76	--	--	--	-43	-30	-19	-46	267	--	--	147	191	--	--	117
Ferrous Iron (mg/L)	0	--	--	--	0	--	--	--	0	1.5	1	0	0	--	--	0	0	--	--	0

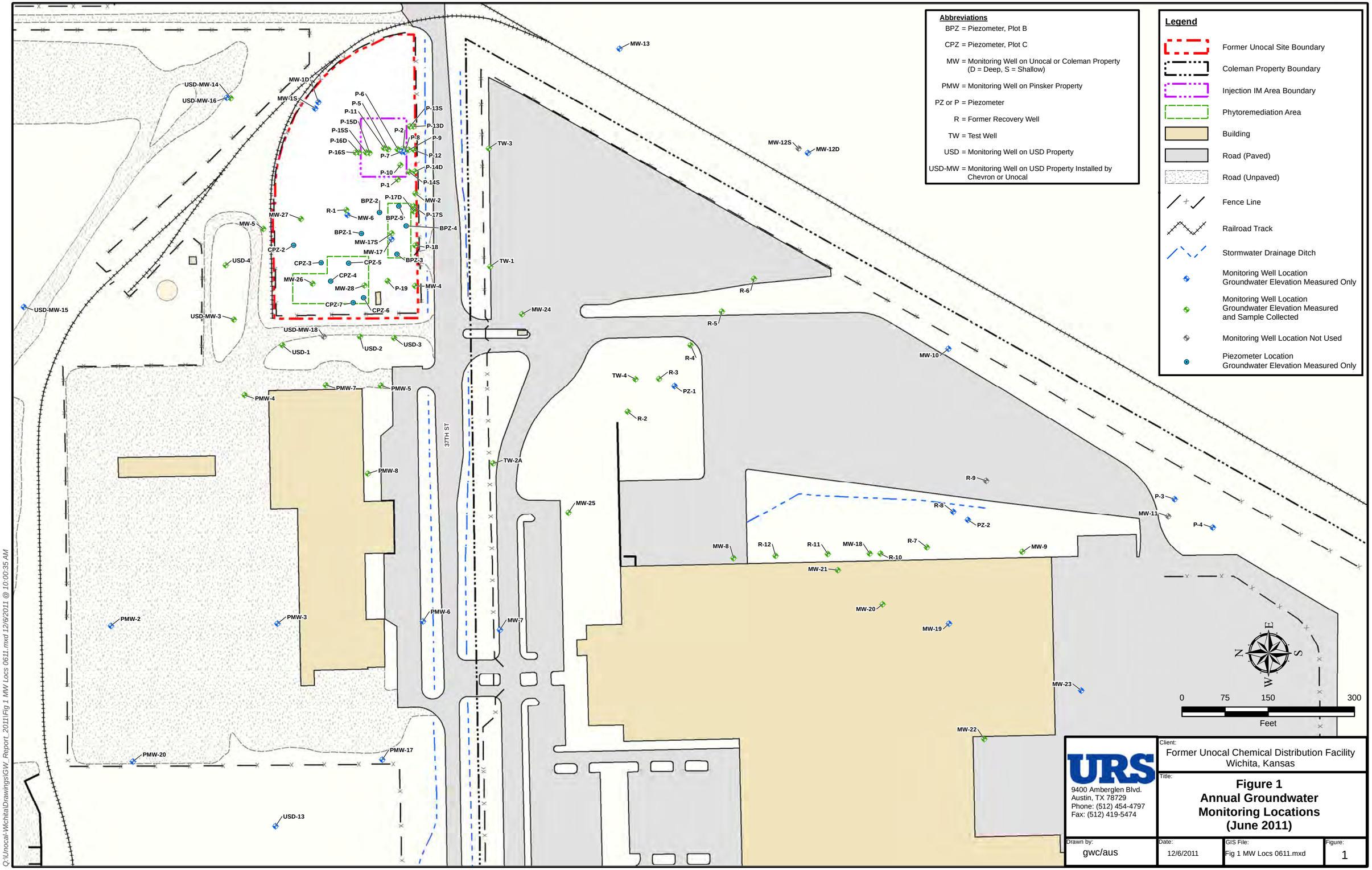
	PLUMELET E												PLUMELET F							
	PMW-7				USD-1				USD-MW-3				MW-25				PMW-5			
Analyte	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**
Natural Attenuation Parameters (mg/L)																				
Alkalinity to pH 4.5	**223**	--	--	**230**	**269**	**241**	**245**	**220**	**220**	**203**	**367**	**211**	**355**	**333**	**350**	**339**	**379**	--	--	**380**
Alkalinity to pH 8.3	<0.46	--	--	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	--	--	<0.46
Arsenic (Total)	**0.0019 J**	--	--	--	**0.0066**	--	--	--	**0.0011 J**	--	--	--	**0.0033**	--	--	--	**0.0065**	--	--	--
Arsenic (Dissolved)	<0.00095	--	--	--	**0.0021**	--	--	--	<0.00095	--	--	--	<0.00095	--	--	--	**0.001 J**	--	--	--
Chloride	**326**	--	--	**353**	**139**	**217**	**235**	**217 JL**	**692**	**724**	**50.5**	**650 JL**	**146**	**210**	**119**	**238**	**39.8**	--	--	**39.7 JL**
Manganese (Total)	**0.186**	--	--	--	**0.879**	--	--	--	**0.202**	--	--	--	**0.210**	--	--	--	**0.863**	--	--	--
Manganese (Dissolved)	**0.0017**	--	--	--	**0.131**	--	--	--	**0.00027 J**	--	--	--	**0.0080**	--	--	--	**0.0650**	--	--	--
Nitrate	**2.8**	--	--	**2.5**	**0.85**	**1.4**	**1.4**	**2.3**	**1.5**	**1.7**	**1.6**	**1.5**	**1.4**	**1.9**	**1.6**	**1.7**	**1.1**	--	--	**1.1**
Sulfate	**2,840**	--	--	**2,830**	**1,980**	**2,730 JH**	**2,410**	**2,190 JL**	**2,150**	**2,400 JH**	**390**	**1,980 JL**	**417**	**545**	**571**	**570**	**152**	--	--	**151 JL**
Sulfide	<2.1	--	--	--	<2.1	--	--	--	<0.53	--	--	--	<0.53	--	--	--	<2.1	--	--	--
Total Organic Carbon	**2.9**	--	--	**3.1**	**1.8**	**1.7**	**2.0**	**1.2**	**2.5**	**2.3**	**3.1**	**2.3**	**1.7**	**1.8**	**1.9**	**1.3**	**1.4**	--	--	**1.5**
Dissolved Gases (mg/L)																				
Carbon Dioxide	**19**	--	--	**26**	**22**	**19**	**16**	**27**	**13**	**17**	**14**	**24**	**38**	**38**	**27**	**42**	**27**	--	--	**42**
Methane	<0.0050	--	--	<0.010	**0.006 J**	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.0050	--	--	<0.010
Ethane	<0.0010	--	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	<0.0010
Ethene	<0.0010	--	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	<0.0010
Field Parameters																				
pH	7.3	--	--	6.77	7.3	7.26	7.21	7.03	7.3	7.06	7.30	7.19	7.1	7.64	7.15	6.81	7.3	--	--	6.8
ORP (mV)	253	--	--	151	212	6	49	162	254	90	59	141	186	41	43	154	232	--	--	169
Ferrous Iron (mg/L)	0	--	--	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	0

Table 12. Geochemical Parameters at MNA Wells through June 2011 (Continued)

	PLUMELET F															
	PMW-8				TW-2A				USD-2				USD-3			
Analyte	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**	**6/10**	**11/10**	**3/11**	**6/11**
Natural Attenuation Parameters (mg/L)																
Alkalinity to pH 4.5	**314**	--	--	**313**	**333**	**332**	**327**	**334**	**240**	**233**	**244**	**250**	**404**	**312**	**210**	**363**
Alkalinity to pH 8.3	<0.46	--	--	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
Arsenic (Total)	**0.0038**	--	--	--	**0.0083**	--	--	--	<0.00095	--	--	--	<0.00095	--	--	--
Arsenic (Dissolved)	<0.00095	--	--	--	<0.00095	--	--	--	<0.00095	--	--	--	<0.00095	--	--	--
Chloride	**125**	--	--	**111**	**66.1**	**70.9**	**96.0**	**72.0**	**308**	**280**	**192**	**202 JL**	**56.2**	**62.2**	**734**	**45.1 JL**
Manganese (Total)	**0.273**	--	--	--	**0.516**	--	--	--	**0.0108**	--	--	--	**0.0017**	--	--	--
Manganese (Dissolved)	**0.0007 J**	--	--	--	**0.0062**	--	--	--	**0.00019 J**	--	--	--	<0.00017	--	--	--
Nitrate	**2.7**	--	--	**3.0**	<0.25	<0.25	<0.25	<0.25	**1.7**	**1.5**	**1.2**	**1.4**	**1.2**	**1.5**	**2.2**	**1.6**
Sulfate	**810**	--	--	**861**	**587**	**536**	**685**	**545**	**1,580**	**2,040 JH**	**1,380**	**1,320 JL**	**441**	**584**	**2,390**	**292 JL**
Sulfide	<0.53	--	--	--	<2.1	--	--	--	<0.53	--	--	--	<0.53	--	--	--
Total Organic Carbon	**1.1**	--	--	**1.2**	**2.4**	**3.2**	**2.7**	**1.8**	--	**1.4**	**1.9**	**1.7**	--	**1.3**	**1.9**	**1.3**
Dissolved Gases (mg/L)																
Carbon Dioxide	**27**	--	--	**230**	**27**	**32**	**27**	**48**	**23**	**23**	**17**	**34**	**49 J**	**30**	**30**	**51**
Methane	<0.0050	--	--	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010
Ethane	<0.0010	--	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ethene	<0.0010	--	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Field Parameters																
pH	7.2	--	--	6.95	7.2	7.77	7.25	6.89	7.1	7.15	7.41	6.94	7.2	7.0	6.87	6.99
ORP (mV)	253	--	--	133	208	33	71	95	113	80	108	154	119	116	123	154
Ferrous Iron (mg/L)	0	--	--	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: Test America analyzed samples from the 2010 Annual Monitoring Event for pH and these lab values were used for June 2010. pH was measured in the field for November 2010, March 2011, and June 2011.
< - Less than method detection limit (MDL)
-- Not measured.
Bold values were detected.
H - The result is biased high.
J - The analyte was positively identified, the quantitation is an estimation.
L - The result is biased low.
mg/L - Milligrams per liter.
mV – Millivolt.
MNA - Monitored natural attenuation.
ORP - Oxidation-reduction potential.

FIGURES



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Title: **Figure 1 Annual Groundwater Monitoring Locations (June 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 1 MW Locs 0611.mxd	1

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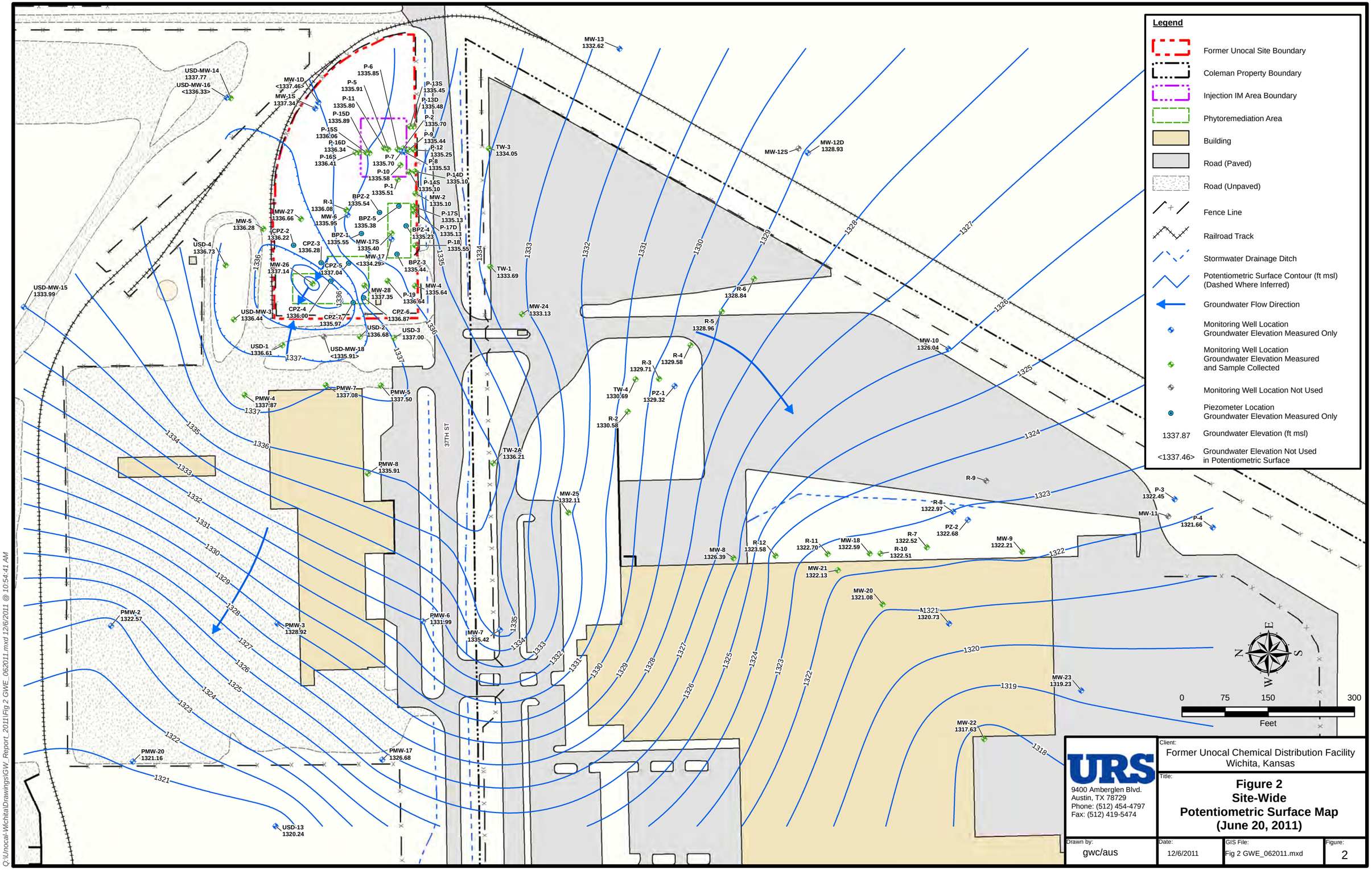

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Title: **Figure 2 Site-Wide Potentiometric Surface Map (June 20, 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 2 GWE_062011.mxd	2

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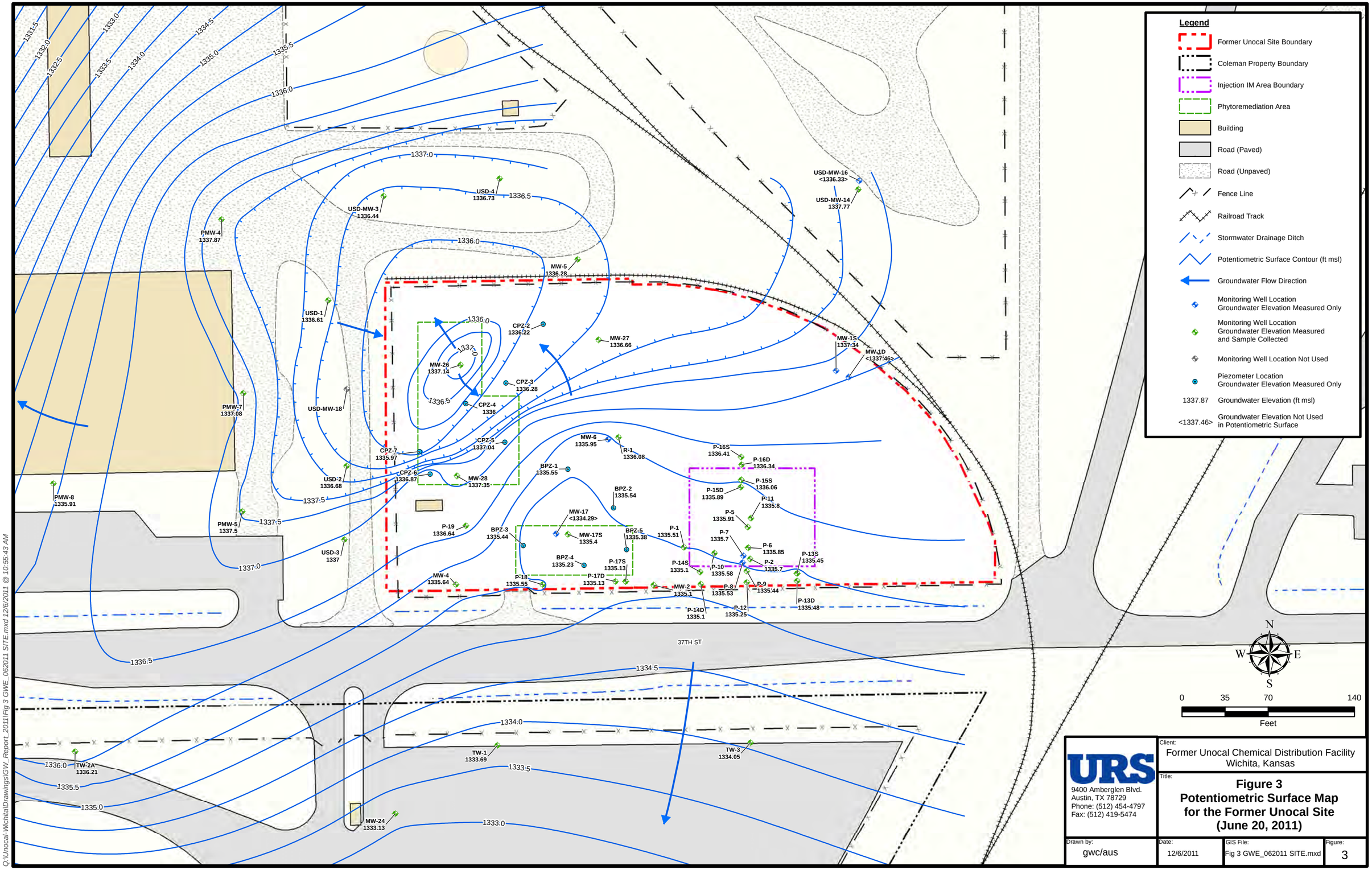

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Title: **Figure 3 Potentiometric Surface Map for the Former Unocal Site (June 20, 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 3 GWE_062011 SITE.mxd	3

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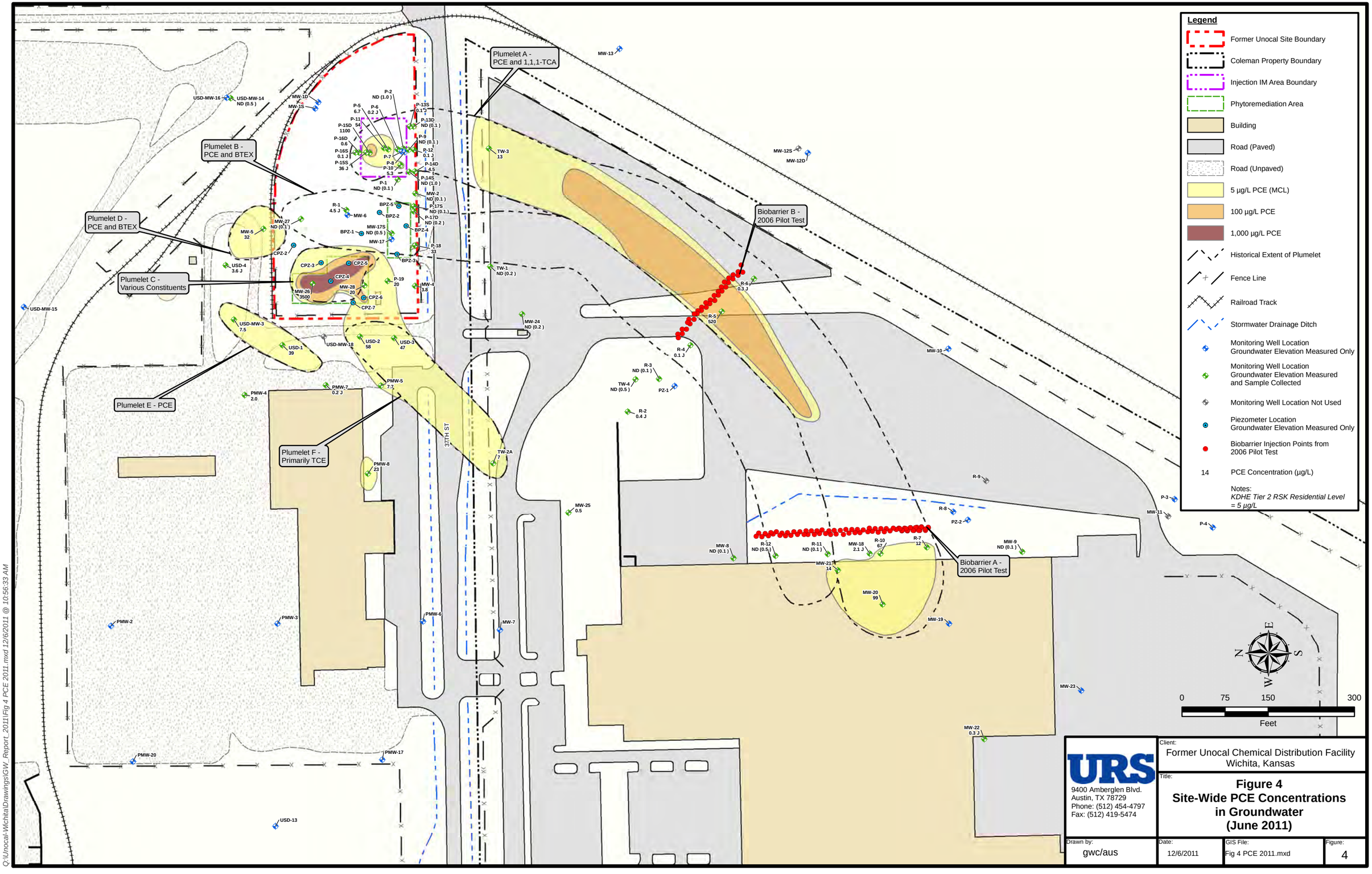

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Title: **Figure 4 Site-Wide PCE Concentrations in Groundwater (June 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 4 PCE 2011.mxd	4

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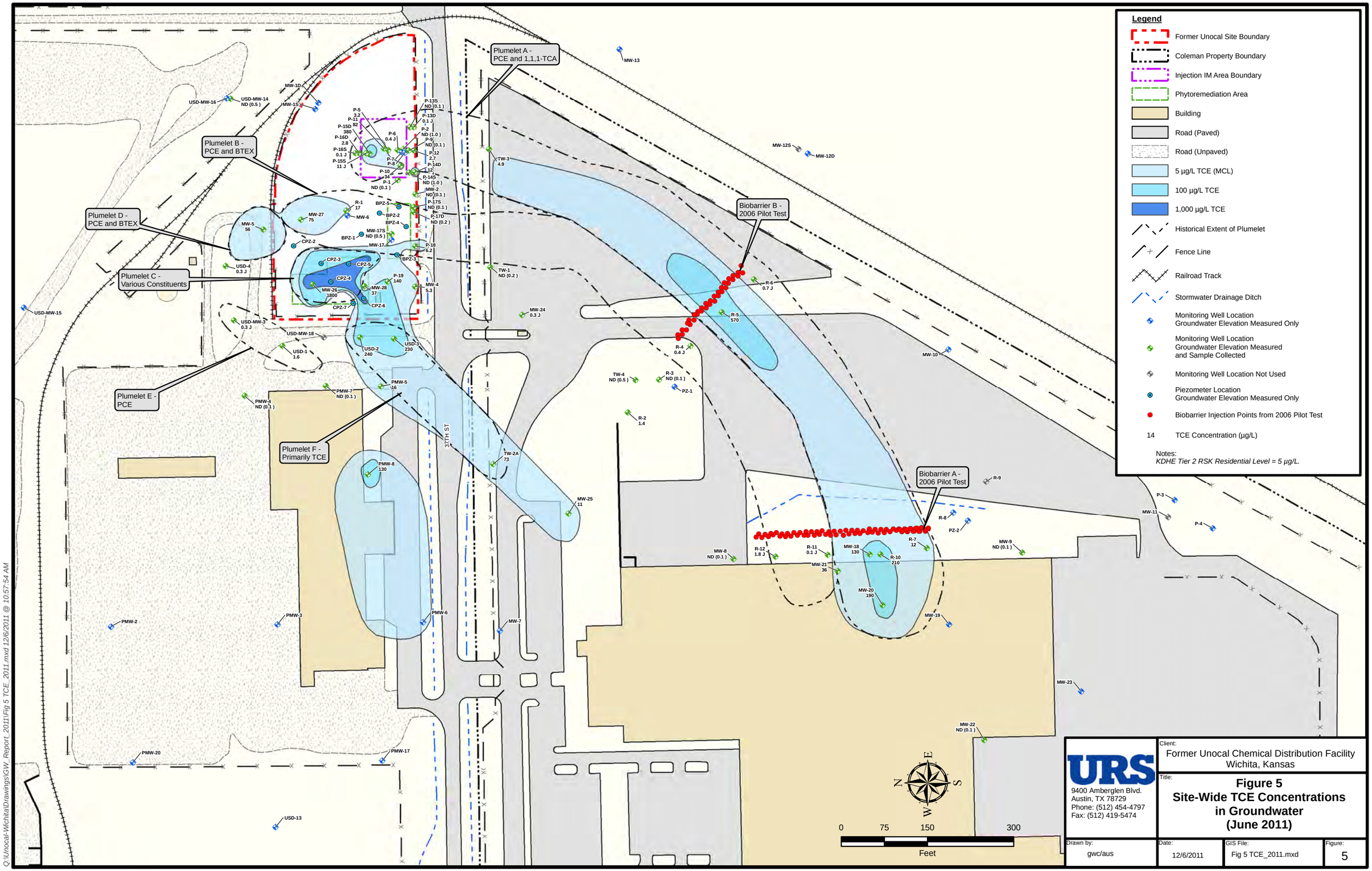

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Title: **Figure 5 Site-Wide TCE Concentrations in Groundwater (June 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 5 TCE_2011.mxd	5

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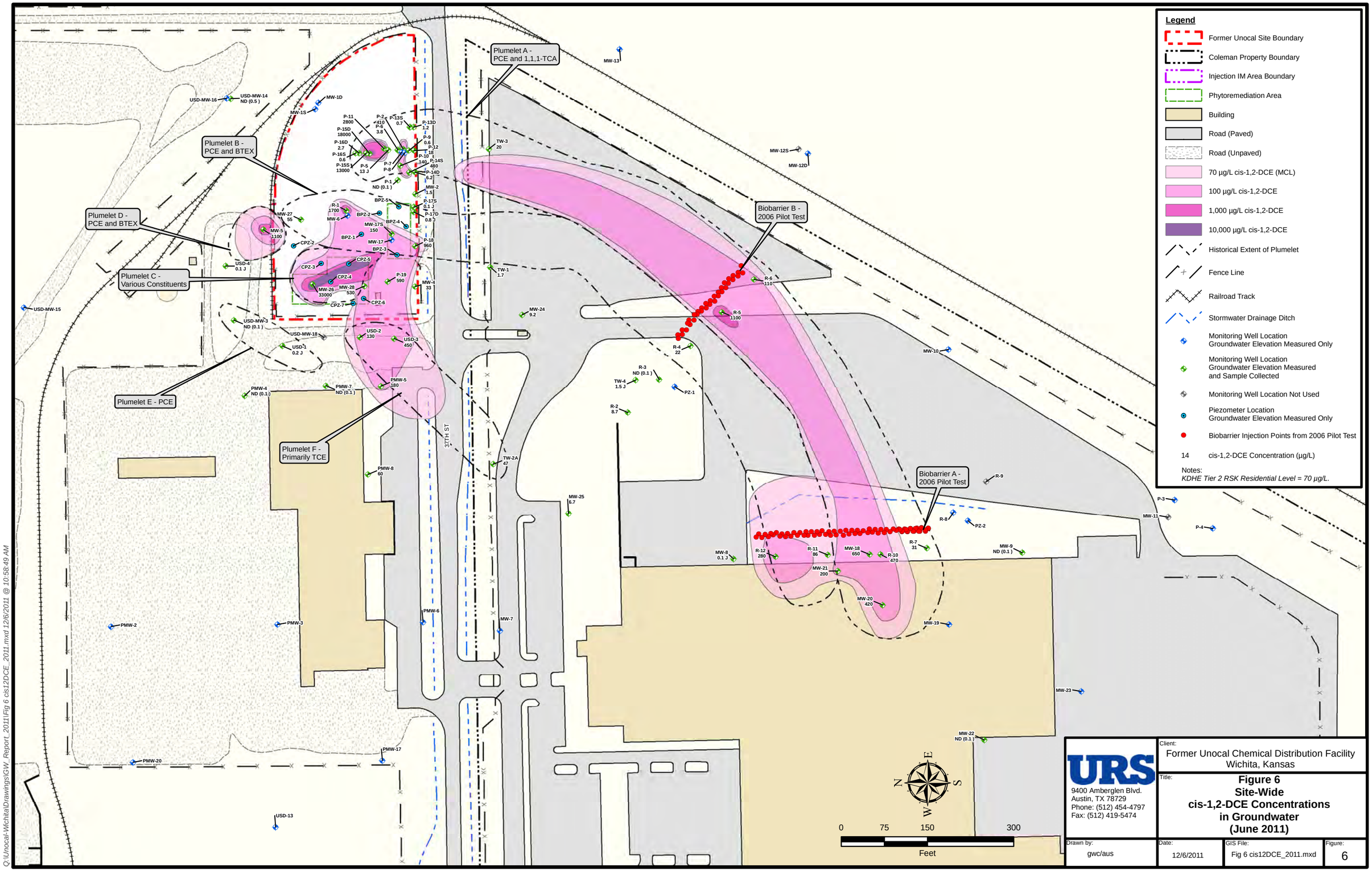

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Title: **Figure 6 Site-Wide cis-1,2-DCE Concentrations in Groundwater (June 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 6 cis12DCE_2011.mxd	6

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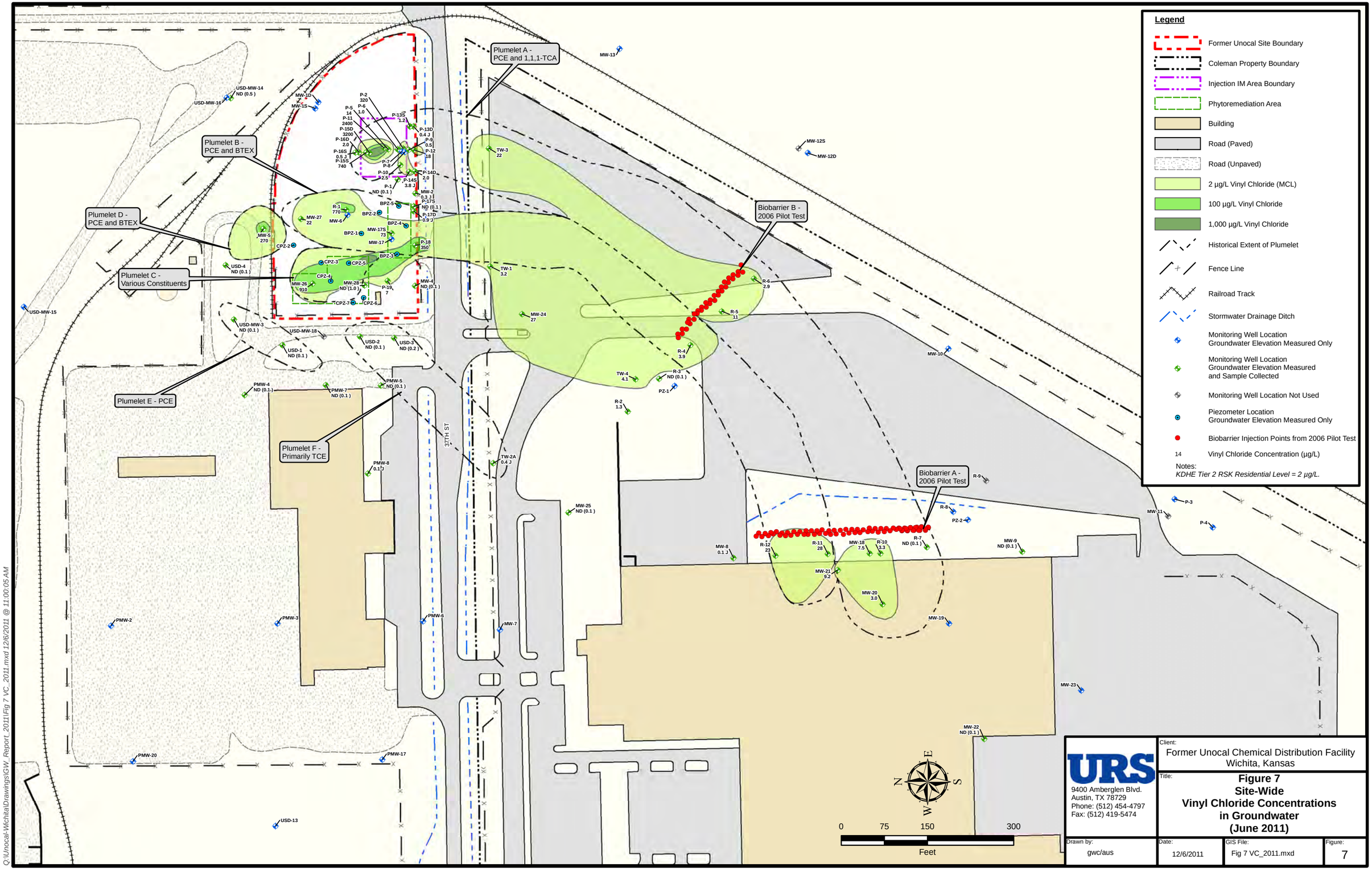

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Client: Former Unocal Chemical Distribution Facility Wichita, Kansas

Title: **Figure 7 Site-Wide Vinyl Chloride Concentrations in Groundwater (June 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 7 VC_2011.mxd	7

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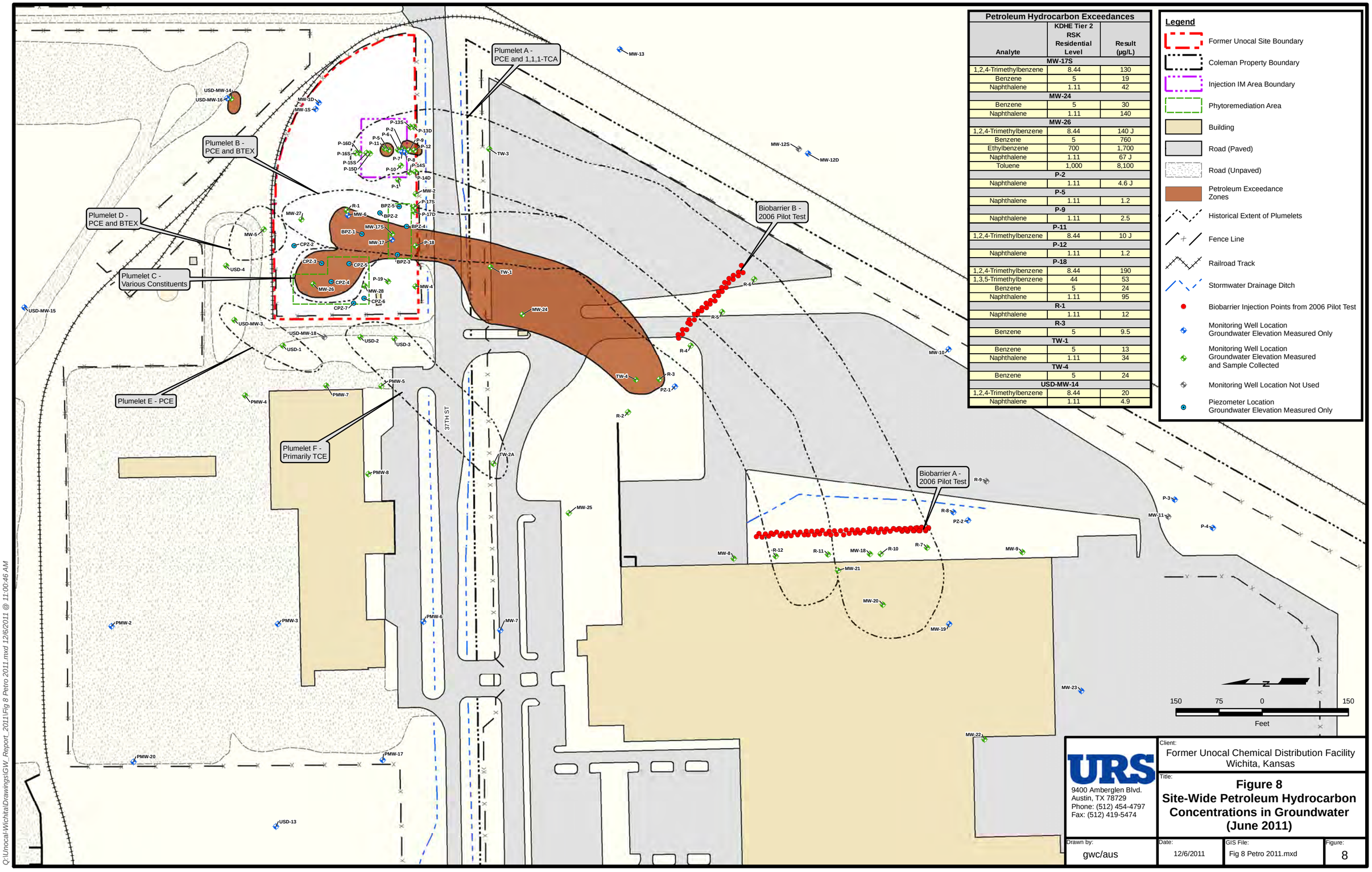
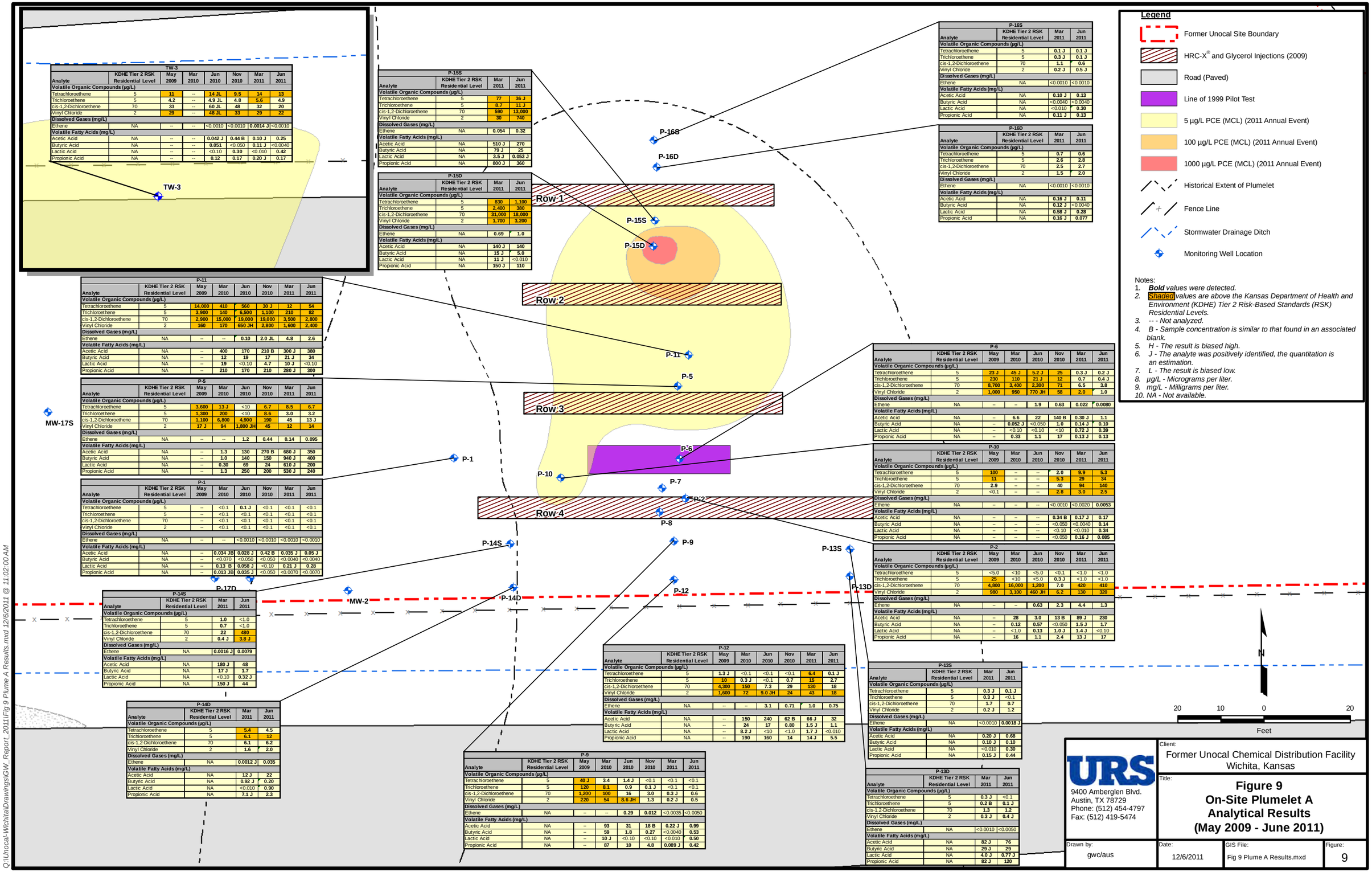


Petroleum Hydrocarbon Exceedances

Analyte	KDHE Tier 2 RSK Residential Level	Result (µg/L)
MW-17S		
1,2,4-Trimethylbenzene	8.44	130
Benzene	5	19
Naphthalene	1.11	42
MW-24		
Benzene	5	30
Naphthalene	1.11	140
MW-26		
1,2,4-Trimethylbenzene	8.44	140 J
Benzene	5	760
Ethylbenzene	700	1,700
Naphthalene	1.11	67 J
Toluene	1,000	8,100
P-2		
Naphthalene	1.11	4.6 J
P-5		
Naphthalene	1.11	1.2
P-9		
Naphthalene	1.11	2.5
P-11		
1,2,4-Trimethylbenzene	8.44	10 J
P-12		
Naphthalene	1.11	1.2
P-18		
1,2,4-Trimethylbenzene	8.44	190
1,3,5-Trimethylbenzene	44	53
Benzene	5	24
Naphthalene	1.11	95
R-1		
Naphthalene	1.11	12
R-3		
Benzene	5	9.5
TW-1		
Benzene	5	13
Naphthalene	1.11	34
TW-4		
Benzene	5	24
USD-MW-14		
1,2,4-Trimethylbenzene	8.44	20
Naphthalene	1.11	4.9



TW-3							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	**11**	--	**14 JL**	**9.5**	**14**	**13**
Trichloroethene	5	**4.2**	--	**4.9 JL**	**4.8**	**5.6**	**4.9**
cis-1,2-Dichloroethene	70	**33**	--	**60 JL**	**48**	**32**	**20**
Vinyl Chloride	2	**29**	--	**48 JL**	**33**	**29**	**22**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	<0.0010	<0.0010	**0.0014 J**	<0.0010
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	--	**0.042 J**	**0.44 B**	**0.10 J**	**0.25**
Butyric Acid	NA	--	--	**0.051**	<0.050	**0.11 J**	<0.0040
Lactic Acid	NA	--	--	<0.10	**0.30**	<0.010	**0.42**
Propionic Acid	NA	--	--	**0.12**	**0.17**	**0.20 J**	**0.17**

P-15S			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**77**	**36 J**
Trichloroethene	5	**8.7**	**11 J**
cis-1,2-Dichloroethene	70	**590**	**13,000**
Vinyl Chloride	2	**30**	**740**
Dissolved Gases (mg/L)			
Ethene	NA	**0.054**	**0.32**
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**510 J**	**270**
Butyric Acid	NA	**79 J**	**25**
Lactic Acid	NA	**3.5 J**	**0.053 J**
Propionic Acid	NA	**800 J**	**360**

P-15D			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**830**	**1,100**
Trichloroethene	5	**2,400**	**380**
cis-1,2-Dichloroethene	70	**31,000**	**18,000**
Vinyl Chloride	2	**1,700**	**3,200**
Dissolved Gases (mg/L)			
Ethene	NA	**0.69**	**1.0**
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**140 J**	**140**
Butyric Acid	NA	**15 J**	**5.0**
Lactic Acid	NA	**11 J**	<0.010
Propionic Acid	NA	**150 J**	**110**

P-16S			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**0.1 J**	**0.1 J**
Trichloroethene	5	**0.3 J**	**0.1 J**
cis-1,2-Dichloroethene	70	**1.1**	**0.6**
Vinyl Chloride	2	**0.2 J**	**0.5 J**
Dissolved Gases (mg/L)			
Ethene	NA	<0.0010	<0.0010
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**0.10 J**	**0.13**
Butyric Acid	NA	<0.0040	<0.0040
Lactic Acid	NA	<0.010	**0.30**
Propionic Acid	NA	**0.11 J**	**0.13**

P-16D			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**0.7**	**0.6**
Trichloroethene	5	**2.6**	**2.8**
cis-1,2-Dichloroethene	70	**2.5**	**2.7**
Vinyl Chloride	2	**1.5**	**2.0**
Dissolved Gases (mg/L)			
Ethene	NA	<0.0010	<0.0010
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**0.16 J**	**0.11**
Butyric Acid	NA	**0.12 J**	<0.0040
Lactic Acid	NA	**0.58 J**	**0.28**
Propionic Acid	NA	**0.16 J**	**0.077**

P-11							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	**14,000**	**410**	**560**	**30 J**	**12**	**54**
Trichloroethene	5	**3,900**	**140**	**6,500**	**1,100**	**210**	**82**
cis-1,2-Dichloroethene	70	**2,900**	**15,000**	**19,000**	**19,000**	**3,500**	**2,800**
Vinyl Chloride	2	**160**	**170**	**650 JH**	**2,800**	**1,600**	**2,400**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	**0.10**	**2.0 JL**	**4.8**	**2.6**
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	**400**	**170**	**210 B**	**300 J**	**380**
Butyric Acid	NA	--	**12**	**19**	**17**	**21 J**	**34**
Lactic Acid	NA	--	**19**	<0.10	**4.7**	**10 J**	<0.10
Propionic Acid	NA	--	**210**	**170**	**210**	**280 J**	**300**

P-5							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	**3,600**	**13 J**	<10	**6.7**	**8.5**	**6.7**
Trichloroethene	5	**1,300**	**200**	<10	**8.6**	**3.0**	**3.2**
cis-1,2-Dichloroethene	70	**1,100**	**6,800**	**4,900**	**190**	**45**	**13 J**
Vinyl Chloride	2	**17 J**	**94**	**1,800 JH**	**45**	**12**	**14**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	**1.2**	**0.44**	**0.14**	**0.095**
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	**1.3**	**130**	**270 B**	**680 J**	**350**
Butyric Acid	NA	--	**1.0**	**140**	**150**	**940 J**	**400**
Lactic Acid	NA	--	**0.30**	**69**	**24**	**610 J**	**200**
Propionic Acid	NA	--	**1.3**	**250**	**200**	**530 J**	**240**

P-1							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	--	<0.1	**0.1 J**	<0.1	<0.1	<0.1
Trichloroethene	5	--	<0.1	<0.1	<0.1	<0.1	<0.1
cis-1,2-Dichloroethene	70	--	<0.1	<0.1	<0.1	<0.1	<0.1
Vinyl Chloride	2	--	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Gases (mg/L)							
Ethene	NA	--	--	<0.0010	<0.0010	<0.0010	<0.0010
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	**0.034 JB**	**0.028 J**	**0.42 B**	**0.035 J**	**0.05 J**
Butyric Acid	NA	--	<0.070	<0.050	<0.050	<0.0040	<0.0040
Lactic Acid	NA	--	**0.13 B**	**0.058 J**	<0.10	**0.21 J**	**0.28**
Propionic Acid	NA	--	**0.013 JB**	**0.035 J**	<0.050	<0.0070	<0.0070

P-14S			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**1.0**	<1.0
Trichloroethene	5	**0.7**	<1.0
cis-1,2-Dichloroethene	70	**22**	**480**
Vinyl Chloride	2	**0.4 J**	**3.8 J**
Dissolved Gases (mg/L)			
Ethene	NA	**0.0016 J**	**0.0079**
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**180 J**	**48**
Butyric Acid	NA	**17 J**	**1.7**
Lactic Acid	NA	<0.10	**0.32 J**
Propionic Acid	NA	**150 J**	**44**

P-14D			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**5.4**	**4.5**
Trichloroethene	5	**6.1**	**12**
cis-1,2-Dichloroethene	70	**6.1**	**6.2**
Vinyl Chloride	2	**1.6**	**2.0**
Dissolved Gases (mg/L)			
Ethene	NA	**0.0012 J**	**0.035**
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**12 J**	**22**
Butyric Acid	NA	**0.92 J**	**0.20**
Lactic Acid	NA	<0.010	**0.90**
Propionic Acid	NA	**7.1 J**	**2.3**

P-12							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	**1.3 J**	<0.1	<0.1	<0.1	**6.4**	**0.1 J**
Trichloroethene	5	**10**	**0.3 J**	<0.1	**0.7**	**15**	**2.7**
cis-1,2-Dichloroethene	70	**4,300**	**150**	**7.3**	**29**	**130**	**18**
Vinyl Chloride	2	**1,600**	**72**	**9.0 JH**	**24**	**43**	**18**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	**3.1**	**0.71**	**1.0**	**0.75**
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	**150**	**240**	**62 B**	**66 J**	**32**
Butyric Acid	NA	--	**24**	**17**	**0.80**	**1.5 J**	**1.1**
Lactic Acid	NA	--	**8.2 J**	<10	<1.0	**1.7 J**	<0.010
Propionic Acid	NA	--	**190**	**160**	**14**	**14 J**	**5.5**

P-9							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	**40 J**	**3.4**	**1.4 J**	<0.1	<0.1	<0.1
Trichloroethene	5	**120**	**8.1**	**0.9**	**0.1 J**	<0.1	<0.1
cis-1,2-Dichloroethene	70	**1,200**	**100**	**16**	**3.0**	**0.3 J**	**0.6**
Vinyl Chloride	2	**220**	**54**	**8.6 JH**	**1.3**	**0.2 J**	**0.5**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	**0.29**	**0.012**	<0.0035	<0.0050
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	**93**	**31**	**18 B**	**0.22 J**	**0.99**
Butyric Acid	NA	--	**59**	**1.8**	**0.27**	<0.0040	**0.53**
Lactic Acid	NA	--	**10 J**	<0.10	<0.10	<0.010	**0.50**
Propionic Acid	NA	--	**87**	**10**	**4.8**	**0.089 J**	**0.42**

P-6							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	**23 J**	**45 J**	**5.2 J**	**25**	**0.3 J**	**0.2 J**
Trichloroethene	5	**230**	**110**	**21 J**	**12**	**0.7**	**0.4 J**
cis-1,2-Dichloroethene	70	**8,700**	**3,400**	**2,300**	**71**	**6.5**	**3.8**
Vinyl Chloride	2	**1,000**	**950**	**770 JH**	**58**	**2.0**	**1.0**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	**1.9**	**0.63**	**0.022**	**0.0080**
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	**6.6**	**22**	**140 B**	**0.30 J**	**1.1**
Butyric Acid	NA	--	**0.052 J**	<0.050	**1.0**	**0.14 J**	**0.10**
Lactic Acid	NA	--	<0.10	<0.10	<10	**0.72 J**	**0.39**
Propionic Acid	NA	--	**0.33**	**1.1**	**17**	**0.13 J**	**0.13**

P-10							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	**100**	--	--	**2.0**	**9.9**	**5.3**
Trichloroethene	5	**11**	--	--	**5.3**	**29**	**34**
cis-1,2-Dichloroethene	70	**2.9**	--	--	**40**	**94**	**140**
Vinyl Chloride	2	<0.1	--	--	**2.8**	**3.0**	**2.5**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	--	<0.0010	<0.0020	**0.0053**
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	--	--	**0.34 B**	**0.17 J**	**0.17**
Butyric Acid	NA	--	--	--	<0.050	<0.0040	**0.14**
Lactic Acid	NA	--	--	--	<0.10	<0.010	**0.34**
Propionic Acid	NA	--	--	--	<0.050	**0.16 J**	**0.085**

P-2							
Analyte	KDHE Tier 2 RSK Residential Level	May 2009	Mar 2010	Jun 2010	Nov 2010	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	<5.0	<10	<5.0	<0.1	<1.0	<1.0
Trichloroethene	5	**25**	<10	<5.0	**0.3 J**	<1.0	<1.0
cis-1,2-Dichloroethene	70	**4,800**	**16,000**	**1,200**	**7.0**	**420**	**410**
Vinyl Chloride	2	**980**	**3,100**	**460 JH**	**6.2**	**130**	**320**
Dissolved Gases (mg/L)							
Ethene	NA	--	--	**0.63**	**2.3**	**4.4**	**1.3**
Volatile Fatty Acids (mg/L)							
Acetic Acid	NA	--	**28**	**3.0**	**13 B**	**89 J**	**230**
Butyric Acid	NA	--	**0.12**	**0.57**	<0.050	**1.5 J**	**1.7**
Lactic Acid	NA	--	<1.0	**0.13**	**1.0 J**	**1.4 J**	<0.10
Propionic Acid	NA	--	**16**	**1.1**	**2.4**	**13 J**	**17**

P-13S			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**0.3 J**	**0.1 J**
Trichloroethene	5	**0.3 J**	<0.1
cis-1,2-Dichloroethene	70	**1.7**	**0.7**
Vinyl Chloride	2	**0.2 J**	**1.2**
Dissolved Gases (mg/L)			
Ethene	NA	<0.0010	**0.0018 J**
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**0.20 J**	**0.68**
Butyric Acid	NA	**0.10 J**	**0.10**
Lactic Acid	NA	<0.010	**0.30**
Propionic Acid	NA	**0.15 J**	**0.44**

P-13D			
Analyte	KDHE Tier 2 RSK Residential Level	Mar 2011	Jun 2011
Volatile Organic Compounds (µg/L)			
Tetrachloroethene	5	**0.3 J**	<0.1
Trichloroethene	5	**0.2 B**	**0.1 J**
cis-1,2-Dichloroethene	70	**1.3**	**1.2**
Vinyl Chloride	2	**0.3 J**	**0.4 J**
Dissolved Gases (mg/L)			
Ethene	NA	<0.0010	<0.0050
Volatile Fatty Acids (mg/L)			
Acetic Acid	NA	**82 J**	**76**
Butyric Acid	NA	**29 J**	**29**
Lactic Acid	NA	**4.0 J**	**0.77 J**
Propionic Acid	NA	**82 J**	**120**

Legend

- Former Unocal Site Boundary
- HRC-X® and Glycerol Injections (2009)
- Road (Paved)
- Line of 1999 Pilot Test
- 5 µg/L PCE (MCL) (2011 Annual Event)
- 100 µg/L PCE (MCL) (2011 Annual Event)
- 1000 µg/L PCE (MCL) (2011 Annual Event)
- Historical Extent of Plumelet
- Fence Line
- Stormwater Drainage Ditch
- Monitoring Well Location

Notes:

1. ***Bold*** *values were detected.*
2. *Shaded values are above the Kansas Department of Health and Environment (KDHE) Tier 2 Risk-Based Standards (RSK) Residential Levels.*
3. *-- - Not analyzed.*
4. *B - Sample concentration is similar to that found in an associated blank.*
5. *H - The result is biased high.*
6. *J - The analyte was positively identified, the quantitation is an estimation.*
7. *L - The result is biased low.*
8. *µg/L - Micrograms per liter.*
9. *mg/L - Milligrams per liter.*
10. *NA - Not available.*

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Title: **Figure 9 On-Site Plumelet A Analytical Results (May 2009 - June 2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 9 Plume A Results.mxd	9

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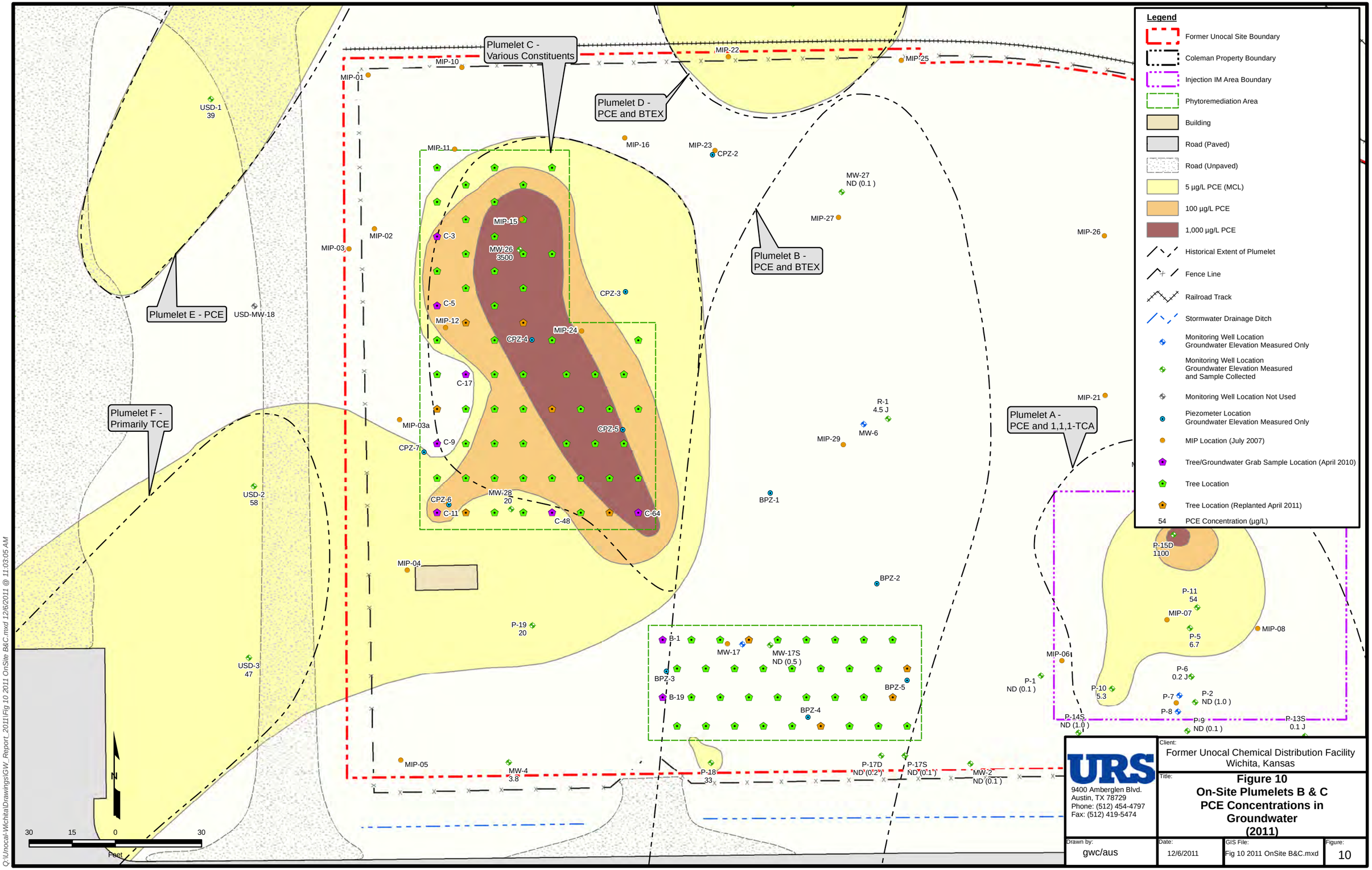

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Title: **Figure 10 On-Site Plumelets B & C PCE Concentrations in Groundwater (2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 10 2011 OnSite B&C.mxd	10

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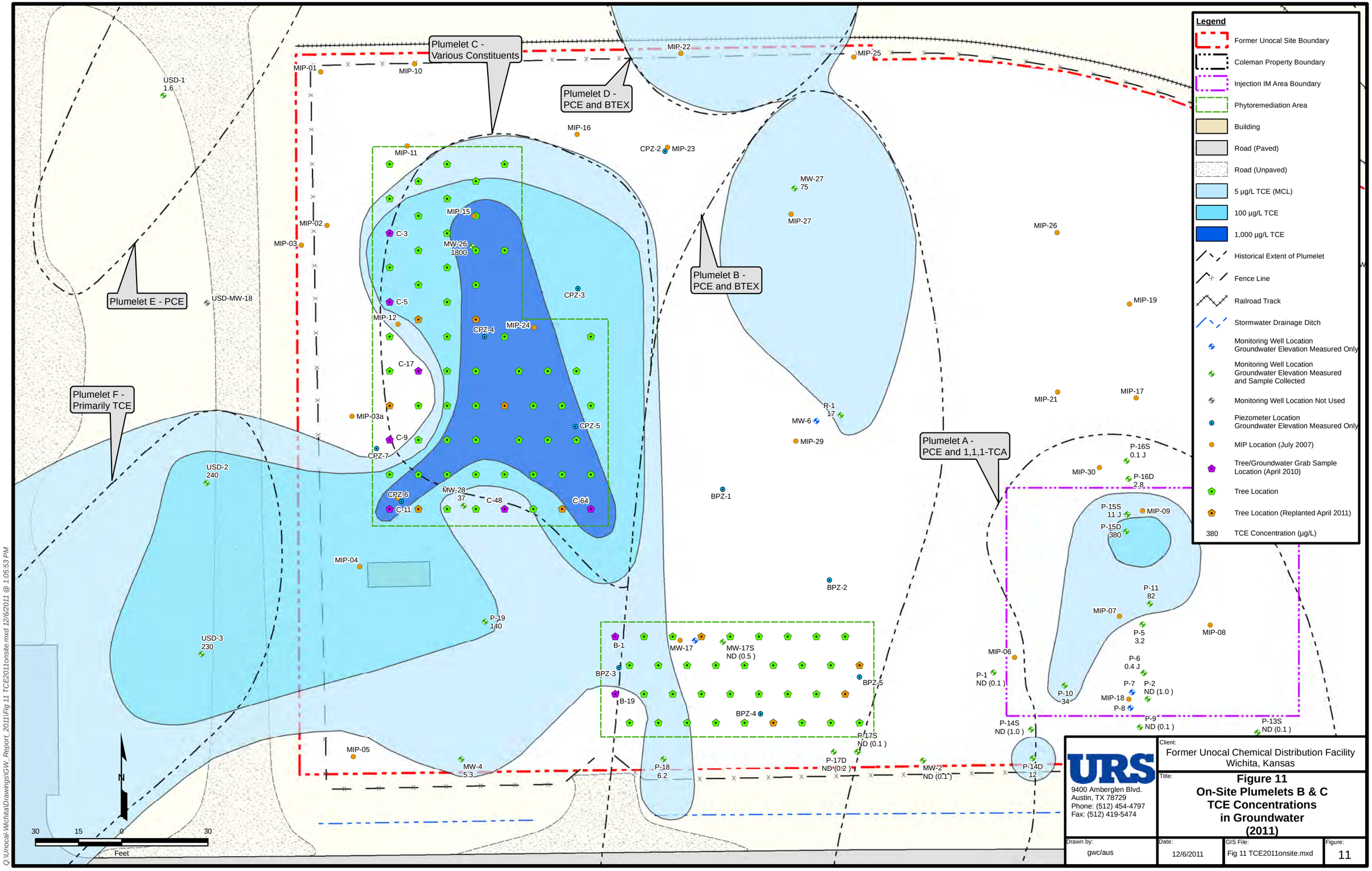

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Title: **Figure 11 On-Site Plumelets B & C TCE Concentrations in Groundwater (2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 11 TCE2011onsite.mxd	11

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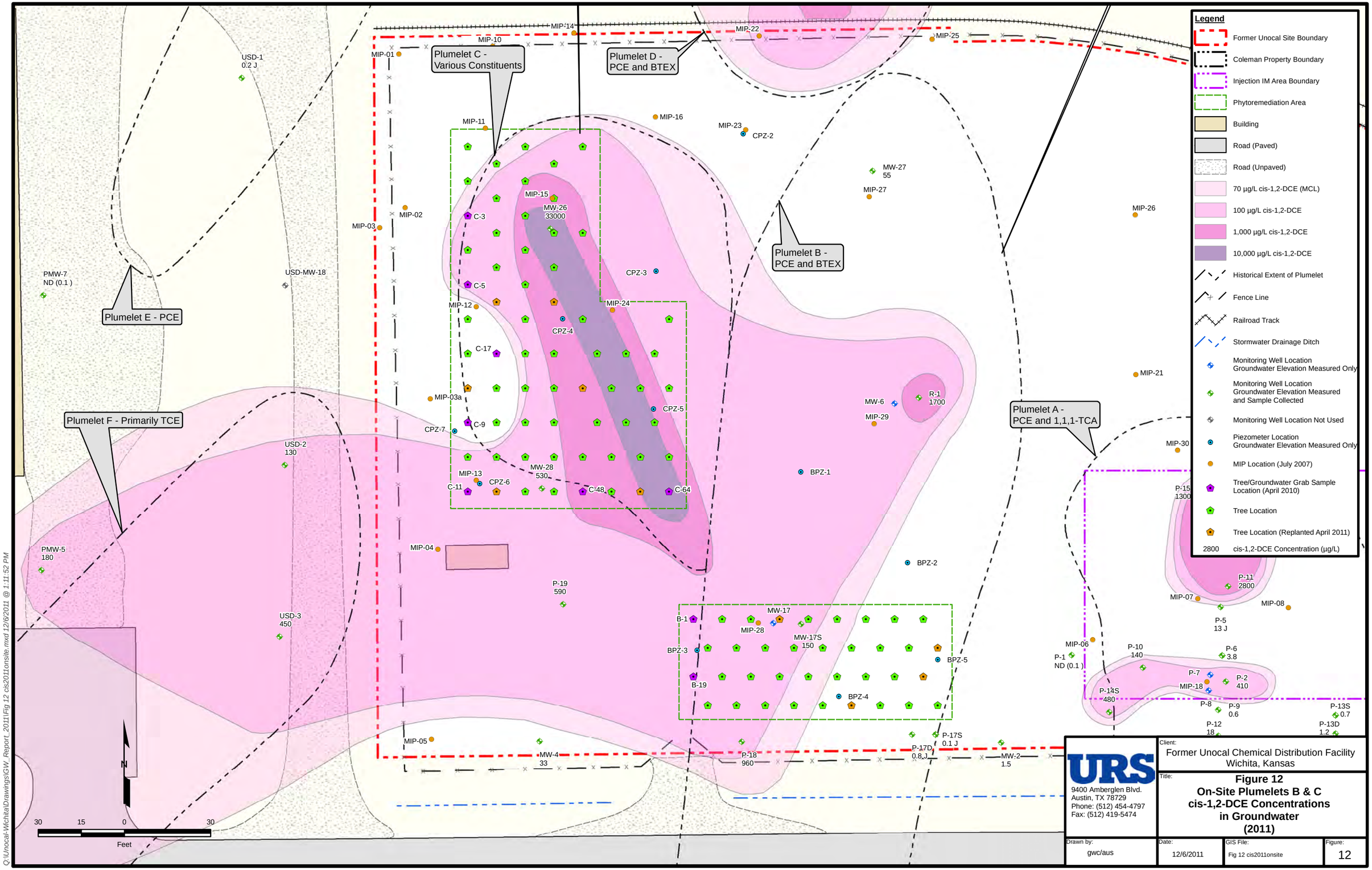

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Title: **Figure 12 On-Site Plumelets B & C cis-1,2-DCE Concentrations in Groundwater (2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 12 cis2011onsite	12

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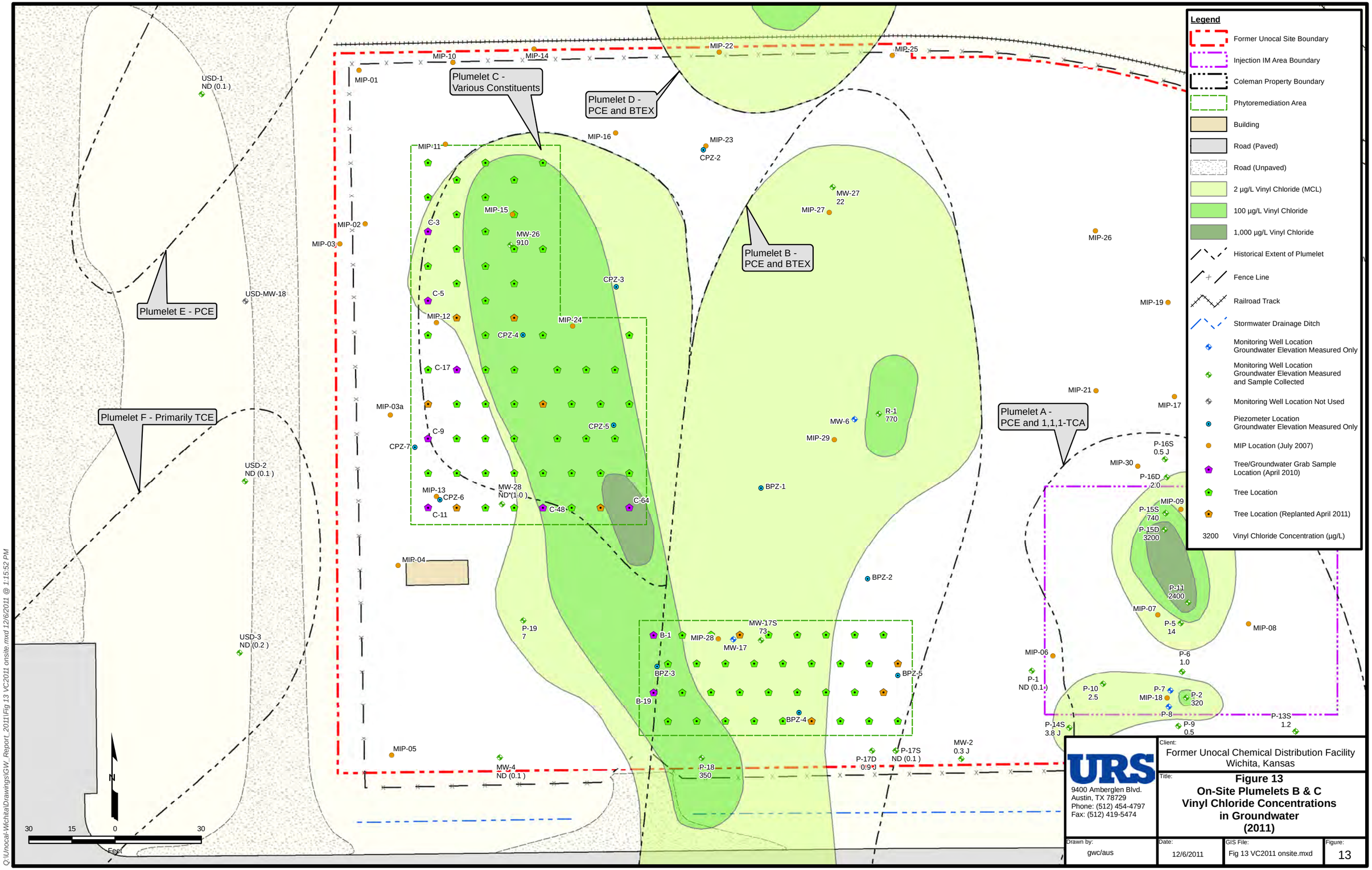

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Title: **Figure 13 On-Site Plumelets B & C Vinyl Chloride Concentrations in Groundwater (2011)**

Drawn by:	Date:	GIS File:	Figure:
gwc/aus	12/6/2011	Fig 13 VC2011 onsite.mxd	13

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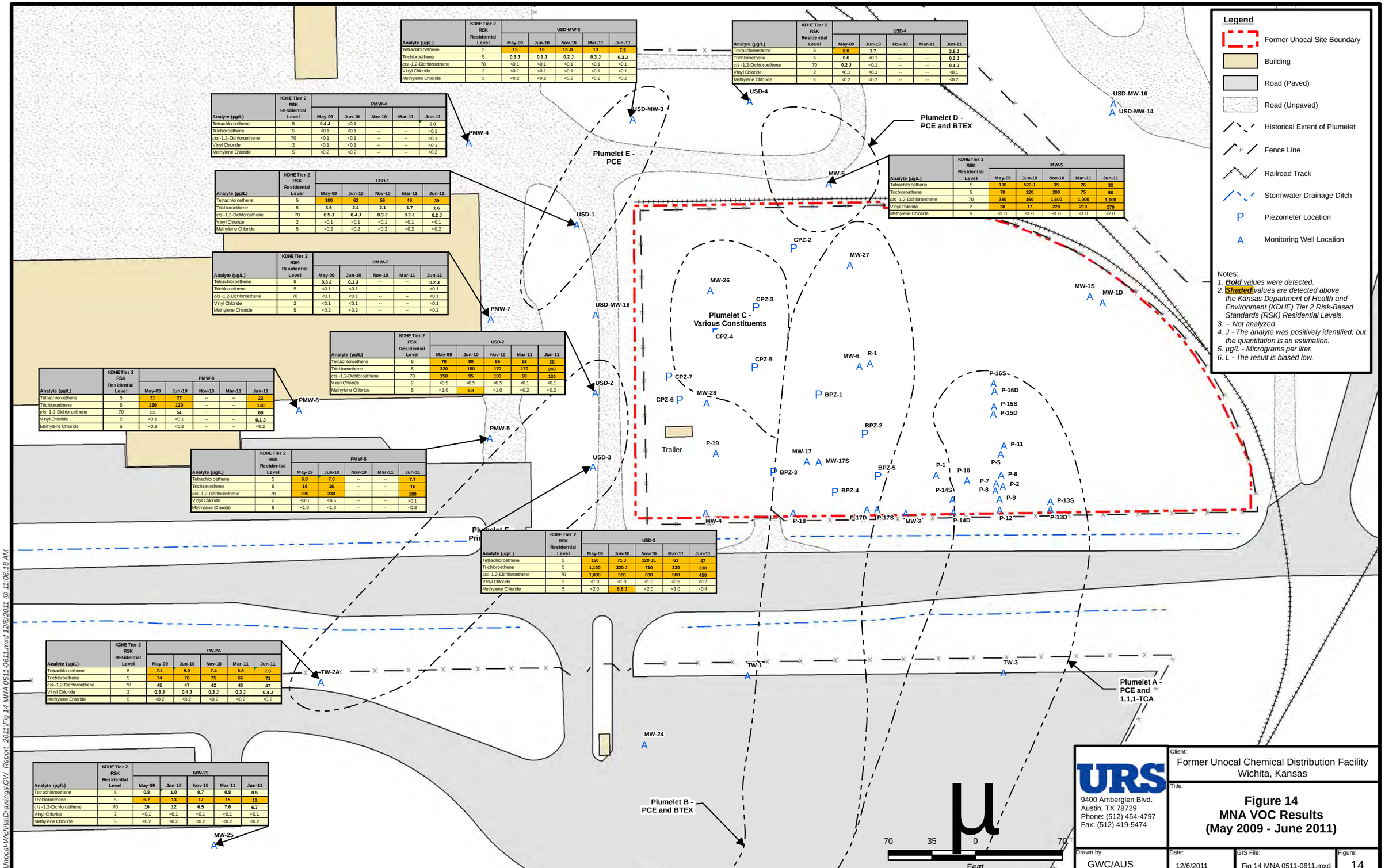

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	USD-MW-3 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**15**	**15**	**13 JL**	**13**	**7.5**
Trichloroethene	5	**0.3 J**	**0.1 J**	**0.2 J**	**0.3 J**	**0.3 J**
cis -1,2-Dichloroethene	70	<0.1	<0.1	<0.1	<0.1	<0.1
Vinyl Chloride	2	<0.1	<0.1	<0.1	<0.1	<0.1
Methylene Chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	USD-4 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**8.0**	**1.7**	--	--	**3.6 J**
Trichloroethene	5	**0.6**	<0.1	--	--	**0.3 J**
cis -1,2-Dichloroethene	70	**0.2 J**	<0.1	--	--	**0.1 J**
Vinyl Chloride	2	<0.1	<0.1	--	--	<0.1
Methylene Chloride	5	<0.2	<0.2	--	--	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	PMW-4 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**0.4 J**	<0.1	--	--	**2.0**
Trichloroethene	5	<0.1	<0.1	--	--	<0.1
cis -1,2-Dichloroethene	70	<0.1	<0.1	--	--	<0.1
Vinyl Chloride	2	<0.1	<0.1	--	--	<0.1
Methylene Chloride	5	<0.2	<0.2	--	--	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	MW-5 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**130**	**520 J**	**35**	**26**	**32**
Trichloroethene	5	**78**	**120**	**200**	**75**	**56**
cis -1,2-Dichloroethene	70	**350**	**160**	**1,600**	**1,000**	**1,100**
Vinyl Chloride	2	**38**	**17**	**220**	**210**	**270**
Methylene Chloride	5	<1.0	<1.0	<1.0	<1.0	<2.0

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	USD-1 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**100**	**62**	**56**	**49**	**39**
Trichloroethene	5	**3.6**	**2.4**	**2.1**	**1.7**	**1.6**
cis -1,2-Dichloroethene	70	**0.5 J**	**0.4 J**	**0.3 J**	**0.2 J**	**0.2 J**
Vinyl Chloride	2	<0.1	<0.1	<0.1	<0.1	<0.1
Methylene Chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	PMW-7 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**0.3 J**	**0.1 J**	--	--	**0.2 J**
Trichloroethene	5	<0.1	<0.1	--	--	<0.1
cis -1,2-Dichloroethene	70	<0.1	<0.1	--	--	<0.1
Vinyl Chloride	2	<0.1	<0.1	--	--	<0.1
Methylene Chloride	5	<0.2	<0.2	--	--	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	USD-2 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**70**	**80**	**85**	**52**	**58**
Trichloroethene	5	**320**	**150**	**170**	**170**	**240**
cis -1,2-Dichloroethene	70	**150**	**95**	**100**	**98**	**130**
Vinyl Chloride	2	<0.5	<0.5	<0.5	<0.1	<0.1
Methylene Chloride	5	<1.0	**6.8**	<1.0	<0.2	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	PMW-8 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**31**	**27**	--	--	**23**
Trichloroethene	5	**130**	**120**	--	--	**130**
cis -1,2-Dichloroethene	70	**51**	**51**	--	--	**60**
Vinyl Chloride	2	<0.1	<0.1	--	--	**0.1 J**
Methylene Chloride	5	<0.2	<0.2	--	--	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	PMW-5 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**6.8**	**7.0**	--	--	**7.7**
Trichloroethene	5	**16**	**16**	--	--	**16**
cis -1,2-Dichloroethene	70	**220**	**230**	--	--	**180**
Vinyl Chloride	2	<0.5	<0.5	--	--	<0.1
Methylene Chloride	5	<1.0	<1.0	--	--	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	USD-3 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**150**	**71 J**	**120 JL**	**61**	**47**
Trichloroethene	5	**1,100**	**320 J**	**710**	**330**	**230**
cis -1,2-Dichloroethene	70	**1,000**	**380**	**630**	**500**	**450**
Vinyl Chloride	2	<1.0	<1.0	<1.0	<0.5	<0.2
Methylene Chloride	5	<2.0	**6.8 J**	<2.0	<1.0	<0.4

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	TW-2A May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**7.1**	**9.0**	**7.4**	**6.6**	**7.0**
Trichloroethene	5	**74**	**78**	**75**	**66**	**73**
cis -1,2-Dichloroethene	70	**45**	**47**	**42**	**43**	**47**
Vinyl Chloride	2	**0.3 J**	**0.4 J**	**0.3 J**	**0.3 J**	**0.4 J**
Methylene Chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2

Analyte (µg/L)	KDHE Tier 2 RSK Residential Level	MW-25 May-09	Jun-10	Nov-10	Mar-11	Jun-11
Tetrachloroethene	5	**0.8**	**1.0**	**0.7**	**0.8**	**0.5**
Trichloroethene	5	**6.7**	**13**	**17**	**15**	**11**
cis -1,2-Dichloroethene	70	**16**	**12**	**6.5**	**7.6**	**6.7**
Vinyl Chloride	2	<0.1	<0.1	<0.1	<0.1	<0.1
Methylene Chloride	5	<0.2	<0.2	<0.2	<0.2	<0.2

Legend

- Former Unocal Site Boundary
- Building
- Road (Paved)
- Road (Unpaved)
- Historical Extent of Plumelet
- Fence Line
- Railroad Track
- Stormwater Drainage Ditch
- P Piezometer Location
- A Monitoring Well Location

Notes:
1. ***Bold*** *values were detected.*
2. ***Shaded*** *values are detected above the Kansas Department of Health and Environment (KDHE) Tier 2 Risk-Based Standards (RSK) Residential Levels.*
3. *-- Not analyzed.*
4. *J - The analyte was positively identified, but the quantitation is an estimation.*
5. *µg/L - Micrograms per liter.*
6. *L - The result is biased low.*

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Client: Former Unocal Chemical Distribution Facility Wichita, Kansas

Title: **Figure 14 MNA VOC Results (May 2009 - June 2011)**

Drawn by:	Date:	GIS File:	Figure:
GWC/AUS	12/6/2011	Fig 14 MNA 0511-0611.mxd	14

Q:\Unocal-Wichita\Drawings\GW - Report - 2011\Fig 14 MNA 0511-0611.mxd 12/6/2011 @ 11:06:18 AM

APPENDIX A

Field Notes

A.1

March 2011

3 well Vol

Monitoring V. Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - MNA - Q3

Date: 3/23/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: MW-5

Initial Water Level (feet BTOC): 12.21 (on 3/21/11)

Well Diameter (inches): 4

Well Depth (feet bgs): ~27.4

Screen Interval (feet bgs): 4.8-24.8

Well Volume: 15.19' x 0.65 = 9.9 gal x 3 = 29.6 gal

Pump/Purging Device: Tempest/Twister Sub. pump

Pump Intake Depth (feet BTOC): Bottom of well

Sample Time: 0915

Analyses/Notes: VOCs, CO_2, MEE, SO_4, TOC, Cl, Alk

Time	Water Level (ft BTOC)	Purge Rate (gal/min) ~~(mL/min)~~	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0826	12.09	Pump on	-	-	-	-	-	-	-	Pump on.
0831	21.70	1.75	—							
0836	26.67	1.25	—	14.11	1.92	4.63/5.0	6.43	-66	66.4	Readings taken out of cup;
0846	26.70	—	~20	11.43	2.02	5.96/4.9	6.64	-61	42.6	YSI DO probe is downhole
0856	26.87	—	~25	11.11	1.37	7.41/4.9	6.60	-32	47.4	
0906	26.75	—	~30	11.58	1.68	7.51/4.8	6.45	-19	50.0	
0915	Collect	UN311-MW5-050				and	-051	(DUP)		Added ~10 drops of HCl
										to VOA vials

DO reading = Horiba/YSI

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.58	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring -MNA-Q3

Date: 3/23/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: MW-25

Initial Water Level (feet BTOC): 12.90 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~26

Screen Interval (feet bgs): 11.5-26.5

Well Volume: 13.1' x 0.16 = 2.1 gal x 3 = 6.3 gal

Pump/Purging Device: Bailer

Pump Intake Depth (feet BTOC): N/A

Sample Time: 1515

Analyses/Notes: VOCs, CO_2, MEE, SO_4, TOC, Cl, Alk

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) ~~(S/m)~~ +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
										DO Reading = Horiba/YSI
1453	12.91	Start bailing ~~Pump on~~	-	-	-	-	-	-	-	
1510	—	—	~7.0	—	—	—	—	—	—	
1515	Collect	UN311-MW25-050								
				17.65	0.949	9.97/3.1	7.15	43	260	Horiba reading out of closed loop flow thru cell. YSI DO probe downhole. Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Well head PID = 0.0 ppm
Bucket purge H_2O = 0.0 ppm

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/22/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-1

Initial Water Level (feet BTOC): 12.44 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~23.2

Screen Interval (feet bgs): 8-23

Well Volume: 10.76' x 0.61 = 6.6 L

Pump/Purging Device: Peristaltic Pump

Pump Intake Depth (feet BTOC): ~15.5

Sample Time: 0935

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Horiba/YSI DO reading Comments
0859	12.42	Pump on	-	-	-	-	-	-	-	Pump on
0904	12.50	175	0.88	16.09	1.24	1.20/-0.1	6.57	-77	190	Sl. cloudy, no odor
0909	12.50	175	1.75	16.35	1.24	0.97/-0.1	6.60	-101	166	DO meter is malfunctioning (YSI)
0914	12.51	175	2.63	16.63	1.23	0.89/-0.2	6.61	-105	144	
0919	12.51	175	3.50	16.55	1.24	0.73/-0.2	6.62	-109	109	
0924	12.51	175	4.38	16.70	1.24	0.70/-0.2	6.62	-112	105	
0929	12.51	175	5.25	16.87	1.24	0.67/-0.2	6.62	-124	85.0	
0935	Collect UN311-P1-040 and -041 (DUP)									Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 well volume

Well head PID = 0.0 ppm
Bucket = 0.0 ppm

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/22/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-2

Initial Water Level (feet BTOC): 12.36 (on 3/21/11

Well Diameter (inches): 2

Well Depth (feet bgs): ~23.2

Screen Interval (feet bgs): 8-23

Well Volume: 10.84' x 0.61 = 6.6 L x 3 = 19.9 L

Pump/Purging Device: Peristaltic Pump

Pump Intake Depth (feet BTOC): ~15.5

Sample Time: 1345

Analyses/Notes: VOCs, VFAs, CO_2, MEE

DO reading = Horiba/YSI

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1245	12.41	Pump on	-	-	-	-	-	-	-	Pump on
1250	13.04	160	0.8	21.84	1.54	0.53/-	6.44	-130	121	Lt.gry, no odor; YSI out of battery
1255	13.11	160	1.6	21.99	1.53	0.50/-	6.45	-131	118	
1300	13.17	160	2.4	21.91	1.53	0.46/-	6.45	-131	116	
1305	13.20	200	3.4	22.19	1.51	0.42/0.2	6.46	-122	87.8	
1310	13.25	250	4.65	22.41	1.49	0.40/0.2	6.45	-177	87.2	
1320	13.85	400	8.65	22.38	1.44	0.37/0.2	6.49	-112	103	
1330	14.40	550	14.15	22.23	1.43	0.29/0.2	6.62	-117	94.4	
1340	14.45	550	19.65	21.65	1.49	0.28/0.2	6.54	-113	95.0	
1345	Collect	UN311-P2-060								Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 well volume

Well head PID = 0.0 ppm
Bucket PID = 0.0 ppm

Monitoring V. Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/22/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-5

Initial Water Level (feet BTOC): 13.60 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~15.5

Screen Interval (feet bgs): 5-15

Well Volume: 1.9' x 0.61 = 1.2L x 3 = 3.6L

Pump/Purging Device: Peristaltic Pump

Pump Intake Depth (feet BTOC): Bottom of well

Sample Time: 1630

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) ~~+/- 10% or +/-~~ 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Do reading = Horiba/YSI Comments
1602	13.52	Pump on	-	-	-	-	-	-	-	Pump on
1605	14.27	150	0.45	23.43	3.01	0.34/0.1	5.88	-50	100	Gray, Sour odor, turbid
1608	14.35	150	0.90	23.12	2.84	0.36/0.2	5.96	-64	91.6	
1612	14.35	150	1.5 ~~1.35~~	22.24	2.67	0.34/0.2	6.08	-87	64.1	
1618	14.28	150	2.4	22.38	2.70	0.32/0.2	6.12	-96	45.2	
1621	14.29	150	2.85	22.55	2.76	0.29/0.2	6.12	-98	34.9	
1624	14.25	150	3.30	23.21	2.86	0.30/0.2	6.06	-93	38.7	
1627	14.27	150	3.75	23.41	2.89	0.24/0.1	6.04	-90	19.7	Added ~10 drops HCl to VOAs
1630	Collect	UN311-P5-060								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.18	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Wellhead PID = 0.0 ppm
Bucket = 0.0 ppm

Monitoring W. Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/22/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-6

Initial Water Level (feet BTOC): 13.49 (on 3/22/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~15.5

Screen Interval (feet bgs): 5-15

Well Volume: 2.01' x 0.6 l = 1.2 L

Pump/Purging Device: Peristaltic Pump

Pump Intake Depth (feet BTOC): Bottom of well

Sample Time: 1530

Analyses/Notes: VOCs, VFAs, CO_2, MEE

DO reading = Horiba/YSI

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1510	13.46	Pump on	-	-	-	-	-	-	-	Pump on
1513	14.46	225	0.68	24.64	1.49	0.37/0.2	6.49	-106	122	Sl. odor, cloudy, gray
1516	14.50	150	1.13	24.43	1.53	0.33/0.2	6.47	+12	136	
1519	14.51	150	1.58	24.38	1.54	0.33/0.2	6.45	-114	113	
1522	14.53	150	2.03	24.17	1.56	0.31/0.2	6.44	-116	79.3	
1525	14.53	150	2.48	24.12	1.59	0.32/0.2	6.44	-118	41.6	
1528	14.54	150	2.93	24.14	1.60	0.32/0.2	6.44	-118	22.7	
1530	Collect	UN31-P6-050								Added ~ 10 drops HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Well head PID = 0.0 ppm
Bucket PID = 0.0 ppm

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/22/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-9

Initial Water Level (feet BTOC): 14.08 (on 3/22/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~15.5, ~16.5' BTOC

Screen Interval (feet bgs): 5-15

Well Volume: 2.42' x 0.61 = 1.5 L

Pump/Purging Device: Peristaltic pump

Pump Intake Depth (feet BTOC): Bottom of well

Sample Time: 1430

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1408	14.13	Pump on	-	-	-	-	-	-	-	Pump on
1411	15.95	275	0.83	22.14	1.14	0.39/0.3	6.40	-88	126	
1414	16.33	150	1.28	21.70	1.16	0.38/0.2	6.37	-90	115	
1416	—	150	1.58	—	—	—	—	—	—	Well purged dry. Await recovery.
1430	Collect UN311-P9-060									Added ~10 drops HCl to VOAs
	Final reading:			24.36	0.437	5.28/0.2	4.95	-182	102	

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volume

Well head PID = 0.0 ppm
Bucket of purge water = 0.0 ppm

Monitoring V. Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/22/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-10

Initial Water Level (feet BTOC): 13.82 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~15.5, 16.55' BTOC

Screen Interval (feet bgs): 5-15

Well Volume: 2.73' × 0.61 = 1.7 L × 3 = 5.1 L

Pump/Purging Device: Peristaltic Pump

Pump Intake Depth (feet BTOC): ~~~10~~ ~15.55

Sample Time: 1100

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) ~~+/- 10% or~~ +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1013	13.91	Pump on	-	-	-	-	-	-	-	Pump on
1018	14.75	150	0.75	17.74	1.42	0.98/-0.1	6.43	-91	119	Sl. cloudy, no color, no odor
1023	14.91	100	1.25	17.69	1.43	0.71/-0.1	6.43	-96	105	
1028	14.91	100	1.75	17.81	1.43	0.65/-0.1	6.44	-98	106	
1033	14.91	100	2.25	18.37	1.44	0.50/-0.2	6.46	-108	117	
1038	14.91	100	2.75	18.47	1.45	0.49/-0.2	6.46	-108	116	
1043	15.00	100	3.25	18.97	1.45	0.45/-0.2	6.46	-109	105	
1048	14.96	100	3.75	19.11	1.45	2.32/-0.2	6.45	-96	112	Moved pump intake to bottom of well
1053	15.44	225	4.88	17.82	1.44	4.54/-0.2	6.44	-85	800	
1058	15.67	225	6.01	17.64	1.44	4.21/-0.2	6.41	-79	364	Purged 3 well volume
1100	Collect UN311-P10-040									Added ~10 drops of HCl to VOAs

DO readings: Horiba/YSI

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low flow

Monitoring V. Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring -Plumelet A-Q4

Date: 3/24/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-11

Initial Water Level (feet BTOC): 15.50 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~35

Screen Interval (feet bgs): 20-35

Well Volume: 19.5' x 0.61 = 11.9 L

Pump/Purging Device: Peristaltic Pump

Pump Intake Depth (feet BTOC): ~30.5

Sample Time: 1510

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1444	15.55	Pump on	-	-	-	-	-	-	-	DO reading = Horiba/YSI Pump on
1447	15.89	150	0.45	16.25	2.47	1.03/0.2	6.26	-66	397	
1450	15.91	150	0.90	15.89	2.52	0.76/0.2	6.23	-69	356	
1453	15.93	150	1.35	16.05	2.51	0.69/0.2	6.23	-71	350	
1456	15.93	150	1.80	16.08	2.48	0.61/0.2	6.23	-74	301	
1459	15.94	150	2.25	16.09	2.45	0.55/0.2	6.23	-77	176	
1502	15.95	150	2.7	16.00	2.43	0.53/0.2	6.24	-78	127	
1505	15.94	150	3.15	15.50	2.38	0.53/0.2	6.25	-82	80.4	
1510	Collect UN311-P11-050									Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low flow

Monitoring V Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring – Plumelet A - Q4

Date: 3/24/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-12

Initial Water Level (feet BTOC): 15.91 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~35

Screen Interval (feet bgs): 20-35

Well Volume: 19.09' x 0.61 = 11.6 L

Pump/Purging Device: Peristaltic pump

Pump Intake Depth (feet BTOC): ~ ~~24.5~~ 30.5 (including stick up height)

Sample Time: 1415

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments (DO reading = Horiba/YSI)
1343	16.15	Pump on	-	-	-	-	-	-	-	
1346	16.80	160	0.48	15.28	1.40	1.58/0.1	6.57	-118	715	Sl. cloudy; Possible that
1349	16.83	160	0.96	15.39	1.40	1.10/0.1	6.53	-119	300	turbidity meter isn't working.
1352	16.86	160	1.34	15.72	1.41	0.88/0.1	6.52	-121	143	Sl. cloudy, light gray, sulfur
1355	16.90	160	1.82	15.52	1.41	0.84/0.1	6.52	-122	125	odor
1358	16.85	150	2.27	15.38	1.43	0.75/0.1	6.52	-124	92.3	
1401	16.80	150	2.72	15.38	1.47	0.69/0.1	6.52	-125	84.7	
1404	16.78	150	3.17	15.55	1.50	0.66/0.1	6.51	-127	65.0	
1407	16.80	150	3.62	16.01	1.51	0.62/0.1	6.51	-127	61.3	
1410	16.81	150	4.07	15.99	1.52	0.60/0.1	6.51	-128	54.9	
1415	Collect	UN311-P12-050								Added ~10 drops of HCl to
										VOAs.

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Wellhead PID = 0.0 ppm
Bucket PID = 0.0 ppm

Lowflow

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/25/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-13D

Initial Water Level (feet BTOC): 16.54 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~33

Screen Interval (feet bgs): 22.75-32.75

Well Volume: 36-16.54 = 19.46' x 0.16 = 3.1 Gal

Pump/Purging Device: Tempest Pump (dedicated)

Pump Intake Depth (feet BTOC): ~31 (including ~3' stick up)

Sample Time: 1235

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments (DO reading = Horiba/YSI)
1154	16.45	Pump on	-	-	-	-	-	-	-	
1159	16.87	150	1.75	16.84	1.66	1.94/0.1	6.63	-77	High	Cloudy, Gray, Purge flow is spurting out water; No odor
1204	16.87	150	2.5	17.21	1.67	1.26/0.2	6.55	-76	High	Turbidity meter reads = 0.0 NTU. Not functioning properly
1207	17.08	350	3.55	18.11	1.67	0.60/0.2	6.47	-78	467	Flow rate is changing w/out controller change; Lower flow rate
1210	16.89	100	3.85	18.10	1.65	0.68/0.2	6.51	-84	High	Pump did not purge well. Turn up
1214	16.71	300	5.05	18.03	1.64	0.84/0.2	6.54	-86	High	Lowest rate possible w/out pump
1217	17.05	300	5.95	18.13	1.65	0.80/0.2	6.51	-83	High	shutting off.
1220	17.18	300	6.85	18.45	1.65	0.49/0.2	6.47	-83	>800	
1223	17.22	300	7.75	18.60	1.62	0.41/0.1	6.46	-85	724	
1226	17.28	300	8.65	18.78	1.59	0.31/0.1	6.46	-87	330	
1229	17.26	300	9.55	18.26	1.60	0.33/0.1	6.46	-89	270	
1235	Collect	UN311-P13D-010	and-011							Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Purged dry

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plume et A - Q4

Date: 3/25/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-13S

Initial Water Level (feet BTOC): 16.20 (on 3/21/11)

Well Diameter (inches): 1.5

Well Depth (feet bgs): ~22

Screen Interval (feet bgs): 6.75-21.75

Well Volume: 25 - ~~16.20~~ 22.87' = ~~8.8~~ 2.13' × 0.35 = ~~3.1 L~~ 0.75 L × 3 = ~~9.3 L~~ 2.2 L

Pump/Purging Device: ~~Peristaltic pump~~ Bailer (pencil)

Pump Intake Depth (feet BTOC): ~~~21 (including stickup ~3')~~ Bottom of well

Sample Time: 1600

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1120	22.87	Pump on	-	-	-	-	-	-	-	
1140	—	—	0.5	—	—	—	—	—	—	Well purged dry
1400	Return to check volume of water in well. Well has									
	very poor recovery. Start collecting sample.									
1600	Collect @ UN311-P13S-010									Added ~10 drops of HCl to
										VOAs.
										Only 2 VOAs collected
										for VOCs, 2 for CO_2,
										1 for MEE, 1½ for
										VFAs.
										Not enough water to
										collect field parameters

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Wellhead PID = 0.0 ppm
Bucket PID = 0.0 ppm

Low flow

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/25/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-14D

Initial Water Level (feet BTOC): 16.32 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~32

Screen Interval (feet bgs): 21.75-31.75

Well Volume: 35-16.32' = 18.68' x 0.61 = 11.4 L

Pump/Purging Device: Tempest Pump (submersible, dedicated)

Pump Intake Depth (feet BTOC): ~30 (including ~3' stick up)

Sample Time: 1100

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1028	16.47	Pump on	-	-	-	-	-	-	-	
1031	17.12	200	0.6	13.66	1.76	1.23/0.6	6.30	-11	0.0(?)	Cloudy, No odor; Turbidity
1034	17.28	200	1.2	13.70	1.79	0.72/0.5	6.22	-13	High	meter not functioning properly.
1037	17.27	250	1.95	13.89	1.79	0.88/0.6	6.22	-13	High	
1040	17.31	250	2.70	14.28	1.77	0.61/0.3	6.20	-12	High	
1043	17.21	250	3.45	14.28	1.77	0.61/0.4	6.20	-12	High	
1046	17.10	200	4.05	14.63	1.76	0.46/0.4	6.20	-15	>800	
1049	17.03	200	4.65	14.68	1.75	0.48/0.4	6.20	-15	>800	
1052	17.06	200	5.25	14.74	1.73	0.53/0.4	6.17	-17	626	
1055	17.14	200	5.85	14.84	1.71	0.58/0.4	6.19	-14	594	
1058	17.26	200	6.45	14.95	1.73	0.52/0.5	6.20	-20	478	
1100	Collect UN311-P14D-010									Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.58	9.88	15.44

Well head PID = 0.0 ppm
Bucket PID = 0.0 ppm

Purge dry

Monitoring W Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring – Plumelet A - Q4

Date: 3/25/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-145

Initial Water Level (feet BTOC): 15.91 (on 3/21/11)

Well Diameter (inches): 1.5

Well Depth (feet bgs): ~21

Screen Interval (feet bgs): 5.75-20.75

Well Volume: 24-15.91 = 8.09' x 0.35 = 2.8L x 3 = 8.5 L

Pump/Purging Device: Peristaltic pump

Pump Intake Depth (feet BTOC): ~22 (includes ~3' stick up)

Sample Time: 1000

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (S/m) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Do reading = Horiba / YSI Comments
0907	15.98	Pump on	-	-	-	-	-	-	-	
0910	17.73	160	0.48	10.03	1.75	1.64/0.2	6.03	-73	430	Sl. odor, H gray, sl. cloudy
0913	18.32	160	0.96	9.98	1.76	1.04/0.3	6.01	-77	444	
0916	18.85	160	1.44	9.81	1.76	0.77/0.2	6.01	-80	459	
0919	19.26	160	1.92	10.14	1.76	0.77/0.3	6.03	-82	476	
0922	19.62	160	2.40	11.06	1.74	0.85/0.3	6.04	-83	498	
0927	20.06	160	3.20	11.21	1.69	0.81/0.2	6.13	-91	624	
0932	20.57	160	4.0	10.86	1.64	0.62/0.3	6.23	-105	653	Lower pump intake @ ~23' BTOC
0937	21.07	160	4.8	11.08	1.72	0.75/0.2	6.12	-71	0.0	Cloudy
0942	22.35	150	5.25	11.30	1.75	0.89/0.2	6.12	-75	0.0	Lower pump intake @ ~24' BTOC
0947	Dry	150	5.7	12.12	1.83	0.87/0.1	6.10	-81	0.0	Well purged dry
1000	Collect	UN311-P145-010								Well recovered.
										Added ~10 drops of HCl to
										VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.81	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring W. Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A-Q4

Date: 3/24/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-15D

Initial Water Level (feet BTOC): 15.58 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~33

Screen Interval (feet bgs): 22.75-32.75

Well Volume: 17.42' x 0.61 = 15 L

Pump/Purging Device: Tempest Pump (dedicated)

Pump Intake Depth (feet BTOC): ~ 31

Sample Time: 1150

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
										DO readings = Horiba/YSI
1120	15.57	Pump on	-	-	-	-	-	-	-	Gray, Sl. odor (sulfur?), Cloudy
1123	16.06	300	0.9	7.97	1.99	1.11/0.3	6.45	-102	High	Pumping @ slowest rate possible
1126	16.06	300	1.8	8.52	1.98	1.56/0.3	6.42	-105	High	without pump shutting off
1129	15.97	200	2.4	8.69	1.99	0.75/0.3	6.41	-106	High	Turbidity meter appears to
1132	16.10	200	3.0	8.82	2.00	0.56/0.2	6.39	-106	High	not be functioning properly
1135	16.11	250	3.75	9.02	2.04	0.52/0.2	6.37	-107	High	
1138	16.13	250	4.5	9.50	2.08	0.50/0.2	6.35	-105	>800	
1141	16.08	250	5.25	9.67	2.06	0.47/0.2	6.36	-104	>800	
1144	16.10	250	6.0	9.72	2.06	0.45/0.2	6.33	-104	>800	
1150	Collect	UN311-P15D-013								Added ~10 drops of HCl to
										VOAs.

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Purge dry

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - Plumelet A - Q4

Date: 3/25/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-155

Initial Water Level (feet BTOC): 15.41 (on 3/21/11)

Well Diameter (inches): 1.5

Well Depth (feet bgs): ~22

Screen Interval (feet bgs): 6.75-21.75

Well Volume: 25 - 15.41 = 9.59' x 0.9 = 0.86 gal

Pump/Purging Device: Bailer

Pump Intake Depth (feet BTOC): ~~Bottom of well~~ (KN) N/A

Sample Time: 1400

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% ~~or +/-~~ 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0900	20.08	Pump on	-	-	-	-	-	-	-	
0847	—	—	0.75	—	—	—	—	—	—	Purged dry
1300	Return to collect sample. Lose bailer down well.									
1400	Collect UN311-P155-010									Added ~10 drops of HCl to VOAs
										Volume of water in well
										not sufficient to collect
										parameters.

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low flow

Monitoring W Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring -Plumelet A - Q4

Date: 3/24/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-16D

Initial Water Level (feet BTOC): 15.08 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~40

Screen Interval (feet bgs): 24.75-39.75

Well Volume: 24.92' x 0.61 = 15.2 L x 45.6 L

Pump/Purging Device: Tempest pump (submersible) - dedicated

Pump Intake Depth (feet BTOC): ~35

Sample Time: 0915

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (S/m) +/- 3% (mS/cm)	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments (DO readings = Horiba/YSI)
0828	15.10	Pump on	-	-	-	-	-	-	-	
0831	16.32	250	0.75	3.04	2.15	3.46/0.3	6.08	86	High	Cloudy, Brownish gray
0842	16.56	250	3.50	3.96	3.40	4.46/0.4	5.14	175	371	
0852	16.72	250	6.00	4.62	2.06	2.51/0.4	6.30	44	>800	
0904	16.76	250	9.00	5.27	1.99	1.64/0.4	6.53	3	205	
0907	16.76	250	9.75	5.30	1.99	1.54/0.4	6.53	2	183	
0910	16.72	250	10.5	5.34	1.97	1.45/0.4	6.54	2	143	
0913	16.77	250	11.25	5.37	1.98	1.40/0.4	6.55	2	98.6	
0915	Collect	UN311-P16D-010								Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low flow

Monitoring W Purging Form

Project: Unocal Wichita ~~Annual~~ Quarterly GW Monitoring – Plumelet A – Q4

Date: 3/24/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: P-165

Initial Water Level (feet BTOC): 14.77 (on 3/21/11)

Well Diameter (inches): 1.5

Well Depth (feet bgs): ~23

Screen Interval (feet bgs): 7.75–22.75

Well Volume: 8.23' x 0.35 = 2.9 L

Pump/Purging Device: Peristaltic pump

Pump Intake Depth (feet BTOC): ~ 16

Sample Time: 1020

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
										DO readings = Horiba/~~YSI~~ *YSI cannot fit downhole
0953	14.89	Pump on	-	-	-	-	-	-	-	
0956	15.08	200	0.6	5.68	1.50	2.27	6.87	-19	430	
0959	15.07	200	1.2	5.80	1.48	1.97	6.83	-25	340	
1002	15.07	200	1.8	5.97	1.47	1.58	6.78	-32	223	
1005	15.08	200	2.4	6.12	1.47	1.37	6.74	-38	174	
1008	15.10	200	3.0	6.28	1.46	1.22	6.72	-42	131	
1011	15.11	200	3.6	6.43	1.46	1.11	6.70	-45	101	
1014	15.12	200	4.2	6.52	1.46	1.06	6.69	-46	90.9	
1017	15.12	200	4.8	6.65	1.47	0.99	6.68	-48	72.0	
										YSI DO – final reading – lowered after probes/tubing removed = 0.5 mg/L
1020	Collect	UN311-P165-010								Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 well volume

3 well Vol

Monitoring V. Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring -MNA-Q3

Date: 3/23/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: TW-2A

Initial Water Level (feet BTOC): 8.52 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~24.2

Screen Interval (feet bgs): 10.3-19.9

Well Volume: 15.68' x 0.16 = 2.5 gal x 3 = 7.5 gal

Pump/Purging Device: Bailer

Pump Intake Depth (feet BTOC): N/A

Sample Time: 1610

Analyses/Notes: VOCs, CO_2, MEE, SO_4, TOC, Cl, Alk

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	DO reading = Horiba/YSI Comments
1549	8.61	Start bailing ~~Pump on~~	-	-	-	-	-	-	-	
1602	—	—	~8.0	—	—	—	—	—	—	
1610	Collect	UN311-TW2A-050								
				17.30	0.976	0.67/~~4.1~~ 0.6	7.25	71	464	Added ~10 drops of HCl to VOA vials
										Horiba reading collected out of closed loop flow thru cell.
										YSI DO Probe was downhole

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

low flow

low Flow

Monitoring Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring – Plumelet A-Q4

Date: 3/24/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: TW-3

Initial Water Level (feet BTOC): 13.70 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~21.4

Screen Interval (feet bgs): 15.3-19.5

Well Volume: 7.7' x 0.61 = 4.7L

Pump/Purging Device: Peristaltic pump

Pump Intake Depth (feet BTOC): ~19.4

Sample Time: 1625

Analyses/Notes: VOCs, VFAs, CO_2, MEE

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (S/m) (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1556	13.75	Pump on	-	-	-	-	-	-	-	DO readings = Horiba/YSI
1559	13.92	150	0.45	16.66	1.10	1.14/0.3	6.96	-3	159	
1602	13.95	150	0.90	16.61	1.10	0.95/0.2	6.97	5	114	
1605	13.95	150	1.35	16.46	1.10	0.67/0.2	6.95	20	56.0	
1608	13.95	150	1.80	16.31	1.10	0.65/0.2	6.94	23	54.2	
1611	13.96	150	2.25	16.13	1.10	0.61/0.2	6.98	28	44.8	
1614	13.97	150	2.70	16.19	1.10	0.57/0.2	7.02	30	41.5	
1617	1397	150	3.15	16.26	1.10	0.53/0.2	7.04	31	39.5	
1620	13.98	150	3.6	16.23	1.10	0.51/0.2	7.01	32	38.6	
1625	Collect	UN311-TW3-050								Added ~10 drops of HCl to VOAs

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 well Vol

Monitoring V Purging Form

Project: Unocal Wichita ~~Annual~~ Quarterly GW Monitoring -MNA-Q3

Date: 3/23/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: USD-1

Initial Water Level (feet BTOC): 9.43 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~21

Screen Interval (feet bgs): 6-21

Well Volume: 11.57' x 0.16 = 1.9 gal x3 = 5.6 gal

Pump/Purging Device: Bailer

Pump Intake Depth (feet BTOC): N/A

Sample Time: 1005

Analyses/Notes: VOCs, CO_2, MEE, SO_4, TOC, Cl, Alk

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ +/- 3% (mS/cm)	Dissolved Oxygen (% or mg/L) +/- 10% ~~or +/-~~ 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	DO reading = Horiba/YSI Comments
0953	9.46	Start bailing ~~Pump on~~		-	-	-	-	-	-	
1003	—	—	6.0	—	—	—	—	—	—	Purged 3 well volumes
1005	Collect	UN311-USD1-0501								
				12.46	2.31	6.89/7.1	7.21	49	618	Added ~10 drops of HCl to VOAs
										Horiba readings collected out of closed looped flow-thru cell.
										YSI DO probe was downhole

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Wellhead PID = 0.0ppm
Bucket PID = 0.0ppm

Low Flow very low rate

Monitoring Well Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - MNA - Q3

Date: 3/23/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: USD-2

Initial Water Level (feet BTOC): 10.18 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~20.7

Screen Interval (feet bgs): 6-21

Well Volume: 10.52' x 0.61 = 6.4 L x 3 = 19.3 L

Pump/Purging Device: Peristaltic pump

Pump Intake Depth (feet BTOC): ~ 13.5

Sample Time: 1215

Analyses/Notes: VOCs, CO_2, MEE, SO_4, TOC, Cl, Alk

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1138	10.34	Pump on	-	-	-	-	-	-	-	DO reading = Horiba/YSI
1142	10.67	200	0.8	15.81	3.28	4.75/6.1	7.50	63	84.0	
1148	10.71	150	1.7	16.68	2.11	3.78/6.1	7.59	72	55.2	
1151	10.76	100	2.0	17.02	2.32	3.68/6.1	7.62	70	42.7	
1154	10.76	100	2.4	17.24	2.46	3.61/6.1	7.46	86	32.9	
1158	10.77	100	2.7	17.44	2.48	3.56/6.1	7.33	101	32.9	
1201	10.78	100	3.0	17.66	2.30	3.51/6.1	7.31	109	34.7	
1204	10.79	100	3.3	17.94	2.31	3.35/6.1	7.35	114	32.8	
1207	10.79	100	3.6	18.14	2.28	3.33/6.1	7.38	112	35.9	
1210	10.81	100	3.9	18.35	2.29	3.25/5.8	7.41	108	39.2	
1215	Collect UN311-USD2-0531									Added ~10 drops of HCL in VOA vials

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 well volume

Wellhead PID = 0.0 ppm
Bucket PID = 0.0 ppm

Low Flow

Monitoring Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - MNA - Q3

Date: 3/23/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: USD-3

Initial Water Level (feet BTOC): 10.18 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~21

Screen Interval (feet bgs): 6-21

Well Volume: 10.82' x 0.61 = 6.6 L x 3 = 19.8 L

Pump/Purging Device: Peristaltic pump

Pump Intake Depth (feet BTOC): ~13.5, Bottom of well

Sample Time: 1400 (ms/cm)

Analyses/Notes: VOCs, CO_2, MEE, SO_4, TOC, Cl, Alk

DO reading = Horiba/YSI

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ +/- 3%	Dissolved Oxygen (% ~~or mg/L~~) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1308	10.47	Pump on	-	-	-	-	-	-	-	
1311	10.75	160	0.48	17.20	1.24	2.73/4.8	7.02	90	7.3	
1314	11.02	160	0.96	17.10	1.23	2.63/4.7	6.98	96	4.3	
1317	11.10	150	1.41	16.67	1.22	2.59/4.7	6.93	104	0.0	
1320	11.29	150	1.86	16.12	1.23	2.71/4.8	6.90	109	0.0	Attempt 3 well volumes
1330	12.30	500	6.86	15.98	1.25	2.69/4.6	6.86	116	1.0	lower pump intake to bottom
1340	13.89	525	12.11	15.76	1.25	2.48/4.6	6.84	121	42.7	
1350	15.19	525	17.36	15.99	1.29	2.66/4.1	6.86	123	6.6	
1355	15.56	525	~~1.48~~ ~20	16.15	1.33	2.67/4.1	6.87	123	10.1	
1400	Collect UN311-USD3-050									Added ~10 drops of HCl acid to VOA vials

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Purged dry

Monitoring Purging Form

Project: Unocal Wichita - ~~Annual~~ Quarterly GW Monitoring - MNA - Q3

Date: 3/23/11 Dry

Location: Wichita, Kansas

Field Personnel: Kim Nguyen; John O'Neal

Well Identification: USD-MW-3

Initial Water Level (feet BTOC): 9.80 (on 3/21/11)

Well Diameter (inches): 2

Well Depth (feet bgs): ~21.4

Screen Interval (feet bgs): 15-19.6

Well Volume: 11.6' x 0.16 = 1.9 gal x 3 = 5.6 gal

Pump/Purging Device: Bailer

Pump Intake Depth (feet BTOC): N/A

Sample Time: 1040

Analyses/Notes: VOCs, CO_2, MEE, SO_4, TOC, Cl, Alk

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity ~~(S/m)~~ (mS/cm) +/- 3%	Dissolved Oxygen (% or mg/L) +/- 10% or +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
										DO reading = Horiba/YSI
0930	—	Start bailing ~~Pump on~~		-	-	-	-	-	-	
0950	—	—	3.5	—	—	—	—	—	—	Well purged dry
1040	Collect	UN311-USD-MW3-050								Added ~10 drops of HCL to VOAs
				14.18	4.49	6.40/7.2	7.30	59	503	Horiba readings out of
										closed off flow-thru cell.
										YSI DO probe is downhole.
										A

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.85	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Project No. 41009535.01

TLE Qtrly Monitoring - Plume A, D, E, F Book No. 00393

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3/21/11
Partly Cloudy, High 81°F

Purpose: Water level survey; Well Development (continued)
- See Logbook #2 for well development notes

Crew: Kim Nguyen (KN); John O'Neal (JO - See Logbook #2)

Equipment: Solinst interface probe

1130 KN arrives on site. Conduct H&S meeting. Discuss w/ JO scope of work

1200 Conduct synoptic water level (WL) survey of select wells

Well ID	DTW (ft, BTOC)	Well ID	DTW (ft, BTOC)
BPZ-1	16.45	P-8	13.76
BPZ-2	16.80	P-9	14.08
BPZ-3	16.09	P-10	13.82
BPZ-4	16.58	P-11	15.50
BPZ-5	16.74	P-12	15.91
CPZ-2	16.20	P-13S	16.20
CPZ-3	15.91	P-13D	16.54
CPZ-4	15.85	P-14S	15.91
CPZ-5	14.87	P-14D	16.32
CPZ-6	15.09	P-15S	15.41
CPZ-7	16.03	P-15D	15.58
MW-4	14.84	P-16S	14.77
MW-5	12.21	P-16D	15.08
MW-17S	15.66	P-17S	16.50
MW-17D	14.38	P-17D	16.45
MW-25	12.90	P-18	16.41
MW-26	15.00	P-19	15.01
MW-27	15.48	PMW-5	8.62
MW-28	14.99	PMW-6	9.95
P-1	12.44	PMW-7	8.35
P-2	12.36	PMW-8	9.69
P-5	13.60	PMW-17	15.55
P-6	13.49	TW-2A	8.52
P-7	13.62	TW-3	13.79

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3/21/11 (cont.)

Well ID	DTW (ft, BTOC)	
USD-1	9.43	
USD-2	10.18	
USD-3	10.31	
USD-4	10.07	
USD-13	10.67	(No well vault)
USD-MW-3	9.80	
MW-1S	10.88	
MW-1D	10.72	

1645 Set up equipment for sampling tomorrow.
Purchase supplies @ Walmart.

KW

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3/22/11
Windy, Clear, High 86°F

Purpose: Purge and sample: P-1, P-10, P-2, P-9, P-6, P-5

Equipment: Solinst WL meter (interface probe); Geotech peri pump; dedicated/disposable tubing; Horiba U-52; YSI Optical DO probe; PID

Crew: Kim Nguyen (KN)

0715 Conduct tailgate H&S meeting.
0800 Calibrate Horiba and PID

Standard	Final Reading
pH = 4.0	= 3.98
Sp. Cond = ~~4.51~~ 4.49 (KN)	= 4.51
Turbidity = 0.0 NTU	= 0.0 NTU
PID = 100 ppm	= 100 ppm

Load truck. Decon DO probe using 3-step rinse.
0840 Set up on P-1.
0859 Pump on at P-1. YSI DO probe appears to not be functioning properly. Record Horiba DO values.
0935 Collect UN311-P1-040 / UN311-P1-041 (DUP). Decon WL meter and DO probe (down hole)
1000 Set up on P-10.
1013 Pump on P-10. YSI DO probe is still giving negative values. Called Farr West to report. Farr West will walk thru calibration after done using on P-10.
1100 Collect UN311-P10-040. Decon WL meter + DO probe.
1130 Break for lunch.
1215 Call Farr West about DO calibration. Farr West referred to technical support @ YSI - 937-767-7241
1230 Set up on P-2.
1245 Pump on at P-2
1345 Collect UN311-P2-060. Decon WL meter + DO probe
1355 Set up on P-9.
1408 Pump on at P-9.

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3/22/11 (cont.)

1416 Well goes dry. Await recovery before collecting sample.
1430 Collect UN311-P9-060. Decon WL meter and DO probe.
1455 Set up on P-6.
1510 Pump on P-6
1530 Collect UN311-P6-050. Decon WL meter and DO probe.
1550 Set up on P-5.
1602 Pump on P-5.
1630 Collect UN311-P5-060. Decon WL meter and DO probe.
1650 Conduct housekeeping. Decon Horiba. Dump purge water. Pack sample coolers.
1800 Ship @ Fedex
1810 Conduct LPO on J. O'Neal. (Well development @ MW-13D)
1830 Set up equipment and supplies for tomorrow.
1930 Leave site.

KN

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ed & Understood by me, Date 3/22/11 Invented by: Date
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3/23/11

Windy, clear, High 60

Purpose: Purge and sample: MW-5, USD-MW-3, USD-1, USD-
USD-3, MW-25, TW-2A

Equipment: Solinst interface probe; Geotech peristaltic pump; Tempest/Twister pump (dedicated @ MW-5); disposal and dedicated tubing; Horiba U-52; dedicated weighted bailes; YSI DO probe, PID

Crew: Kim Nguyen (KN)
Mike Gagné (MG w/ Golder Associates)

0700 Conduct H&S Meeting and UPO feedback session w/ Anna Kunkel

0720 Load up equipment and drive. Calibrate Horiba:

Standard	Final Reading
pH = 4.0	= 3.89
Sp. Cond = 4.49 mS/cm	= 4.46 mS/cm
Turb = 0.0 NTU	= 0.0 NTU

0800 Sign into USD office. Obtain badge. Meet Mike Gagné.

0815 Set up on MW-5

0826 Pump on MW-5. YSI probe is downhole.

0915 Collect UN311-MW5-050 Decon WL meter
UN311-MW5-051 (DUP)
and DO probe. * Splitting samples w/ Golder Associ

0930 Start bailing on USD-MW-3.

0950 Purge 3.5 gal. Well goes dry. Await recovery before sample.

0953 Start bailing on USD-1

1003 Purge 3 well volumes - > 5.6 gal = ~6.0 gal

1005 Collect UN311-USD1-050. Decon WL meter + DO probe

1008 Return to USD-MW-3. Well has recovered.

1040 Collect UN311-USD-MW3-050

1125 Set up on USD-2.

1138 Pump on USD-2

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Witnessed & Understood by me, | Date 3/23/11 | Invented by: | Date

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Page No. ____ 3/23/11 (cont.)

1215 Collect [UN311-USD2-053]. Decon WL meter + DO probe.
1250 Set up on USD-3
1308 Pump on USD-3
1400 Collect [UN311-USD3-050]. Decon WL meter + DO probe.
1435 Pick up add'l bottles from trailer
1445 Set up on MW-25.
1453 Start bailing. Purge 3 well volume = > 6.3 gal = ~7.0 gal.
1515 Collect [UN311-MW25-050]. Decon WL meter + DO probe.
1535 Set up on TW-2A.
1549 Start bailing. Purge 3 well volume = > 7.5 gal = ~8 gal.
1610 Collect [UN311-TW2A-050]. Decon WL meter + DO probe.
1625 Unload vehicle. Transfer purge water into drums. Pack coolers.
1730 Ship coolers @ Fedex. Purchase distilled water + drinking water.

* Lost rubber sleeve from DO probe.

KW

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sed & Understood by me,	Date	Invented by:	Date
	3/23/11	Recorded by:	

Project No. 41009535.01
TITLE Qtrly Monitoring - Plume A, D, E, F Book No. 00393

From Page No. ____

3/24/11
Clear, High 44°F

Purpose: Purge + Sample: P-16D, P-16S, P-15D, P-12, P-11, TW-3

Equipment: Solinst interface probe, Horiba U-52, YSI DO probe, Geotech peristaltic pump, disposable and dedicated tubing; dedicated Tempest/Twister pumps, PID

Crew: Kim Nguyen (KN)

0705 Conduct tailgate H&S meeting. Discuss scope of work
0730 Load equipment. Calibrate Horiba:

	Standard	Final Reading
pH	= 4.0	= 3.91
Sp. Cond	= 4.49 mS/cm	= 4.65 mS/cm
Turbidity	= 0.0 NTU	= 0.1 NTU

0800 Set up on P-16D. Use dedicated submersible pump.
0828 Pump on
0915 Collect [UN311-P16D-010]. Decon WL meter + DO probe
0945 Set up on P-16S. Well diameter is 1.5". YSI DO probe could not fit down hole w/ tubing + WL meter.
1020 Collect [UN311-P16S-010]. Decon WL meter. Noticed that another set of tubing was down hole (reason why YSI DO probe couldn't fit.) Run DO probe down hole after tubing removed.
1045 Set up on P-15D. Temperatures are very cold. Take break.
1120 Pump on P-15D.
1150 Collect [UN311-P15D-013] (MS/MSD). Decon WL meter + DO probe. Dump purge water.
1210 Break for lunch
1220 John O'Neal conducts LPO (Defensive Driving) on KN. while driving to lunch.
1315 Set up on P-12
1343 Pump on at P-12.
1415 Collect [UN311-P12-050]. Decon WL meter + DO probe.
1430 Set up on P-11.

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Witnessed & Understood by me,	Date	Invented by:	Date
	3/24/11	Recorded by:	

Project No. 41009535.01
Book No. 00393 TITLE Qtrly Monitoring - Plume A, D, E, F

n Page No. ____

3/24/11 (cont.)

1444 Pump on P-11.
1510 Collect UN311-P11-050. Decon WL meter + DO probe.
1545 Set up on TW-3. Place cones around work area.
1556 Pump on TW-3
1625 Collect UN311-TW3-050. Decon WL meter + DO probe.
1630 Unload truck. Pack coolers. Conduct housekeeping
1730 Ship coolers at Fedex
* Fair West shipped 4 new Horiba nipples to hotel for use tomorrow.

KN

To Page No. ____

ssed & Understood by me, | Date 3/24/11 | Invented by: | Date
Recorded by:

Project No. 41009535.01
TLE Qtrly Monitoring - Plume A, D, E, F Book No. 00393
om Page No. ____

3/25/11
High 60s F

Purpose: Purge + sample: P-15S, P-14S, P-14D, P-13D, P-13S
Conduct inventory of field trailer

Equipment: Solinst interface probe, Horiba U-53, PID, Geotech peristaltic pump; dedicated Tempest/Twister pumps; dedicated tubing; YSI DO probe.

Crew: Kim Nguyen (KN)

0710 Conduct daily H&S meeting. Leave for site. Load equipment. Calibrate Horiba.

Standard	Final Reading
pH = 4.0	= ~~4.1 - 4~~ 3.89 (KN)
Sp. Cond = ~~8~~ 4.49 mS/cm (KN)	= ~~0.43 S/~~ 4.63 mS/cm (KN)
Turb = 0.0 NTU	= 0.0 NTU

0800 Set up on P-15S. John O'Neal had pumped on well on day previous as part of re-development efforts. Water column - unsubstantial. Purge well dry w/ bailer. ≅ 0.75 gal
0900 Set up on P-14S
0907 Pump on at P-14S. Pump would sputter. Difficult to pump at depths.
0947 Well purged dry w/ ~5.7 L removed
1000 Collect [UN311-P14S-010] after well recovered. Decon WL meter and DO probe.
1020 Set up on P-14D.
1028 Pump on at P-14D.
1100 Collect [UN311-P14D-010]. Noticed that turbidity meter would read 0.0 NTU when water was very turbid.
1115 Set up on P-13S. John O'Neal had pumped on well on day previous as part of continued development efforts.
1140 Well purged dry w/ ~0.5 L removed.
1145 Set up on P-13D.
1154 Pump on at P-13D.
1235 Collect [UN311-P13D-010 and -011 (DUP)]. Decon WL meter and DO probe.

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tnessed & Understood by me,	Date	Invented by:	Date
	3/25/11	Recorded by:	

Project No. 41009535.01
Book No. 00393 TITLE Qtrly Monitoring-Plume A, D, E, F

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3/25/11 (cont.)

1300 Return to P-15S to collect sample. Bailer lost down well. Call John (already on road) to purchase tools to fish out bailer.

1330 Clean Harbors arrives onsite to pick up drums. In addition to drums from well install, an additional 6 drums (development in Feb 2011), 4 drums (GW from Quarterly GWM), and 1 drum (PPE) were added.

1345 John O'Neal fishes bailer out of P-15S.

1400 Collect [UN311-P15S-0107]. It took several trips to collect the full sample amount. Not enough water in well to collect field parameters.
Return to P-13S to check on recovery. P-13S has very poor recovery (~ 6 inches in pencil bailer winding down to ~ 1 inch of water in pencil bailer).

1600 Collect [UN311-P13S-0107]. Decon WL meter. It took multiple trips back to well to collect full sample volume.
* Suggestion for future * Sample P-13S early in week.

1615 Pack equipment and coolers. * Found rubber sleeve for DO probe. Called Lancaster Lab earlier to inform of Saturday delivery. Forgot to call Microseeps about Saturday delivery. John O'Neal will hold onto VFA samples until Monday to ship. VFA hold time = 14 days. Conduct housekeeping. Collect trash and recyclables. Move 10 empty drums to stage next to trailer (not on pallets). Clean Harbors leaves site.

1800 Ship coolers and equipment @ Fedex. Dump trash.

To Page No. ___

Witnessed & Understood by me	Date	Invented by:	Date
	3/25/11	Recorded by:	

A.2

June 2011

TEAM #1

Synoptic WL Survey - 2011 Annual GW Monitoring

Sample Order	MW ID	Top of Casing Elevation	Date	Time	DTW (ft, BTOC)	Comment	Field Crew
Boundary Wells							
6	MW-8	1327.91	6/20/11	1552	1.52	*Water meter vault cover	KN/AK
7	MW-9	1331.36	6/20/11	1600	9.15		KN/AK
1	MW-10	1338.43	6/20/11	1604	12.39		KN/AK
	MW-1D	1348.37					NH/JO
	MW-1S	1348.25					NH/JO
	MW-13	1347.77					NH/JO
	MW-12S	1348.46					NH/JO
	MW-12D	1348.32					NH/JO
	P-4	1326.13	6/20/11	1615	4.47		KN/AK
	P-3	1327.28	6/20/11	1611	4.83		KN/AK
	MW-11	--				Could not find	
	R-9A*	1328.07				Could not find	
	MW-23	1327.38	6/20/11	1632	8.15	J Plug was stretched out, needs to be replaced	KN/AK
23	MW-22	1327.78	6/20/11	1625	10.15		KN/AK
	MW-7	1339.92	6/20/11	1702	4.50		KN/AK
USD Wells							
	USD-13	1331.07	6/20/11	1401	10.83	Located northwest of the northern most tree, NO well vault lid	KN/AK
18	USD-MW-14 *NO bolts	1350.02	6/20/11	1347	12.25	Have metal "cages" on the well pad; Well cages are white and rusted at the bottom; Well cages are removable	KN/AK
19	USD-MW-15	1344.81	6/20/11	1355	10.82		KN/AK
20	*NO bolts USD-MW-16 *full of water-vault, capped out	1350.03	6/20/11	1348	13.70	Have metal "cages" on the well pad; Well cages are white and rusted at the bottom; Well cages are removable	KN/AK
33	USD-4	1346.73	6/20/11	1427	10.00		KN/AK
35	USD-MW-3	1346.07	6/20/11	1424	9.63		KN/AK
52	USD-1	1345.65	6/20/11	1419	9.04	*Full of water-vault, capped out	KN/AK
	USD-MW-18	??	6/20/11	1415	9.90	* TD = 22.91, 1 bolt only	KN/AK
54	USD-3	1347.06	6/20/11	1406	10.06	* Full of water-vault, capped out	KN/AK
53	USD-2	1346.6	6/20/11	1412	9.92	1 bolt only	KN/AK
48	MW-5	1348.72	6/20/11	1430	12.44		KN/AK
Hillmann Wells							
	PMW-6	1341.2	6/20/11	1521	9.21		KN / AK
	PMW-2	1343.63	6/20/11	1452	21.06	In line with the sand/gravel piles (against buidling wall)	KN / AK
	PMW-3	1343.96	6/20/11	1445	15.04	Located on the west side of the sand/gravel piles (against building wall)	KN / AK
	PMW-17	1341.25	6/20/11	1525	14.59		KN / AK
	PMW-20	1342.31	6/20/11	1459	21.15		KN / AK
11	PMW-4	1344.47	6/20/11	1436	6.60		KN / AK
22	PMW-7	1344.76	6/20/11	1513	7.68		KN / AK
45	PMW-5	1344.46	6/20/11	1509	6.96		KN / AK
49	PMW-8	1345.11	6/20/11	1518	9.20		KN / AK
Former Unocal Wells							
3	MW-2	1348.86					
2	MW-17S	1351.32					
	MW-17	1349.18					
5	MW-27	1352.51					
8	P-1	1348.19					
9	P-2	1348.18					
10	P-9	1349.6			NH/JO		
21	P-16S	1351.42					
26	P-6	1349.47					
24	P-13D	1351.77					
25	P-13S	1351.76					
28	P-16D	1351.66					
31	P-14S	1351.21					
41	P-14D	1351.58					
43	P-12	1351.23					
46	P-5	1349.69					
47	P-10	1349.62					
34	P-11	1351.45					
55	P-15S	1351.77					
57	P-15D	1351.69					
	MW-6	1349.58					
27	R-1A*	1350.78					
40	MW-4	1350.38					
	P-8	1349.42					

Sample Order	MW ID	Top of Casing Elevation	Date	Time	DTW (ft, BTOC)	Comment	Field Crew
	P-7	1349.44					
51	MW-28	1352.16					
58	MW-26	1352.2					
	P-17S	1351.87				NOTE: This is different from MW-17S	
	P-17D	1351.81					
	~~P-18~~	~~1351.77~~					
	P-19	1351.78			NH/JO		
	BPZ-1	1352.06					
	BPZ-2	1352.62					
	BPZ-3	1351.75					
	BPZ-4	1352.04					
	BPZ-5	1352.36					
	CPZ-2	1352.5					
	CPZ-3	1352.2					
	CPZ-4	1351.95					
	CPZ-5	1351.85					
	CPZ-6	1352.12					
	CPZ-7	1352.09					
Coleman Wells							
29	MW-25	1344.25	6/20/11	1658	12.14		KN/AK
44	TW-2A	1344.41					NH/JO
4	MW-24	1346.38	6/20/11	1653	13.25		KN/AK
16	TW-1	1347.51					
36	TW-3	1347.77					
32	R-2A*	1336.42					
17	TW-4	1336.52					
14	R-3A*	1336.12					
	PZ-1	1333.78					
15	R-4A*	1336.18					
56	R-5A*	1338.9					
30	R-6A*	1345.36					
	PZ-2	1328.59					
	R-8A*	1327.45					
	MW-19	1331.85	6/20/11	1739	11.12	~~Could not find; Coleman remodeled inside; All previous frames of reference are no longer in existence; Forklift operator moved boxes in area JO believed the well to be located~~	KN/AK
38	R-7A*	1331.24					
39	R-10A*	1331.83					
37	MW-18	1331.1					
42	MW-21	1332.01	6/20/11	1725	9.88	Location: There are two fire suppression systems (vertical red pipes) on the east wall of the Coleman building. The well is located directly west of the northern most fire suppression system.	KN/AK
12	R-11A*	1331.72					
13	R-12A*	1330.85					
50	MW-20	1331.89	6/20/11	1734	10.81	Location: Go to side exit door (on east side of Coleman building. There is a #15 on the door. Head west. Pass the 1st brown structure beam. It is located ~20 ft west of the structure beam.	KN/AK

see notes

CPZ-1 - Not installed, Remove from map

~~MW-20 → Bay 1431 3 ft east of center lane~~

Moved 1334 3 columns → no well

Moved 1336 4 columns → no well

From east wall (w/ Exit Door w/ #15) 3 skylights west, ~15 ft South of 3rd skylight. Also 15 ft South of I beam w/ yellow bottom

TEAM #2

Synoptic WL Survey - 2011 Annual GW Monitoring

Sample Order	MW ID	Top of Casing Elevation	Date	Time	DTW (ft, BTOC)	Comment	Field Crew
Boundary Wells							
6	MW-8	1327.91					
7	MW-9	1331.36					
1	MW-10	1338.43					
	MW-1D	1348.37	6/20/11	1404	10.91		NH/JO
	MW-1S	1348.25		1402	10.91		
	MW-13	1347.77		1545	15.15		
	MW-12S	1348.46		—	NM	Casing damaged	
	MW-12D	1348.32		1537	19.39		
	P-4	1326.13					
	P-3	1327.28					
	MW-11	--				Could not find	
	R-9A*	1328.07				Could not find	
	MW-23	1327.38					
23	MW-22	1327.78					
	MW-7	1339.92	6/20/11	1611	4.48		NH/JO
USD Wells							
	USD-13	1331.07				Located northwest of the northern most tree	
18	USD-MW-14	1350.02				Have metal "cages" on the well pad; Well cages are white and rusted at the bottom; Well cages are removable	
19	USD-MW-15	1344.81					
20	USD-MW-16	1350.03				Have metal "cages" on the well pad; Well cages are white and rusted at the bottom; Well cages are removable	
33	USD-4	1346.73					
35	USD-MW-3	1346.07					
52	USD-1	1345.65					
	USD-MW-18	??					
54	USD-3	1347.06					
53	USD-2	1346.6					
48	MW-5	1348.72					
Hillmann Wells							
	PMW-6	1341.2					
	PMW-2	1343.63				In line with the sand/gravel piles (against buidling wall)	
	PMW-3	1343.96				Located on the west side of the sand/gravel piles (against building wall)	
	PMW-17	1341.25					
	PMW-20	1342.31					
11	PMW-4	1344.47					
22	PMW-7	1344.76					
45	PMW-5	1344.46					
49	PMW-8	1345.11					
Former Unocal Wells							
3	MW-2	1348.86	6/20/11	1416	13.76		NH/JO
2	MW-17S	1351.32		1428	15.92		
	MW-17	1349.18		1429	14.89		
5	MW-27	1352.51		1446	15.85		
8	P-1	1348.19		1411	12.68		
9	P-2	1348.18		1345	12.48		
10	P-9	1349.6		1342	14.16		
21	P-16S	1351.42		1357	15.01		
26	P-6	1349.47		1347	13.62		
24	P-13D	1351.77		1338	16.29		
25	P-13S	1351.76		1339	16.31		
28	P-16D	1351.66		1356	15.32		
31	P-14S	1351.21		1409	16.11		
41	P-14D	1351.58		1408	16.48		
43	P-12	1351.23		1341	15.98		
46	P-5	1349.69		1349	13.78		
47	P-10	1349.62		1525	14.04		
34	P-11	1351.45		1351	15.65		
55	P-15S	1351.77		1355	15.71		
57	P-15D	1351.69		1354	15.80		
	MW-6	1349.58		1511	13.63		
27	R-1A*	1350.78		1513	14.70		
40	MW-4	1350.38		1519	14.74		
	P-8	1349.42		1344	13.89		

Sample Order	MW ID	Top of Casing Elevation	Date	Time	DTW (ft, BTOC)	Comment	Field Crew
	P-7	1349.44	6/20/11	1346	13.74		NH/JO
51	MW-28	1352.16		1456	14.81		
58	MW-26	1352.2		1453	15.06		
	P-17S	1351.87		1421	16.74	NOTE: This is different from MW-17S	
	P-17D	1351.81		1421	16.68		
	~~P-18~~	~~1351.77~~		~~1521~~	~~16.22~~		
	P-19	1351.78		1517	15.14		
	BPZ-1	1352.06		1505	16.51		
	BPZ-2	1352.62		1508	17.08		
	BPZ-3	1351.75		1426	16.31		
	BPZ-4	1352.04		1427	16.81		
	BPZ-5	1352.36		1418	16.98		
	CPZ-2	1352.5		1442	16.28		
	CPZ-3	1352.2		1450	15.92		
	CPZ-4	1351.95		1454	15.95		
	CPZ-5	1351.85		1457	14.81		
	CPZ-6	1352.12		1457	15.25		
	CPZ-7	1352.09		1458	16.12		
Coleman Wells							
29	MW-25	1344.25	6/20/11	—	—		KN/AK
44	TW-2A	1344.41		1603	8.20		NH/JO
4	MW-24	1346.38		—	—		KN/AK
16	TW-1	1347.51		1600	13.82		NH/JO
36	TW-3	1347.77		1557	13.72		
32	R-2A*	1336.42		1652	5.84		
17	TW-4	1336.52		1655	5.83		
14	R-3A*	1336.12		1657	6.41		
	PZ-1	1333.78		1659	4.46		
15	R-4A*	1336.18		1638	6.60		
56	R-5A*	1338.9		1630	9.94		
30	R-6A*	1345.36		1628	16.52		
	PZ-2	1328.59		1716	5.91		
	R-8A*	1327.45		1716	4.48		
	MW-19	1331.85		—	—	Could not find; Coleman remodeled inside; All previous frames of reference are no longer in existence; Forklift operator moved boxes in area JO believed the well to be located	KN/AK
38	R-7A*	1331.24		1719	8.72		NH/JO
39	R-10A*	1331.83		1722	9.32		
37	MW-18	1331.1		1724	8.51		
42	MW-21	1332.01		—	—	Location: There are two fire suppression systems (vertical red pipes) on the east wall of the Coleman building. The well is located directly west of the northern most fire suppression system.	KN/AK
12	R-11A*	1331.72		1725	9.02		NH/JO
13	R-12A*	1330.85		1727	7.27		
50	MW-20	1331.89		—	—	Location: Go to side exit door (on east side of Coleman building. There is a #15 on the door. Head west. Pass the 1st brown structure beam. It is located ~20 ft west of the structure beam.	KN/AK

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Date: 6/21/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen, Anna Kunkel

Well Identification: MW-2

Initial Water Level (feet BTOC): ~~14.73~~ AK 13.75

Well Diameter (inches): 2

Well Depth (feet bgs): 24.3'

Screen Interval (feet bgs): 18.0' - 22.6'

Well Volume:

Pump/Purging Device: Peripump

Pump Intake Depth (feet BTOC): ~21'

Sample Time: 1125

Analyses/Notes:

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
	13.75 AK										Wellhead PID = 0.0 ppm OBZ PID = 0.0 ppm Bucket PID = 0.1 ppm
1053	~~14.73~~	Pump on	-	-	-	-		-	-	-	
1056	14.05	250		17.24	1.36	3.11	0.02	6.84	-163	20.2	
1059	14.01	250		17.18	1.35	2.18	0.01	6.84	-172	19.9	
1102	14.02	250		17.07	1.35	1.70	0.01	6.81	-181	5.5	
1105	14.04	250		16.79	1.34	1.44	0.00	6.79	-178	6.2	
1108	14.04	250		16.95	1.35	1.23	0.00	6.75	-184	4.1	
1111	14.06	250		16.86	1.35	1.07	0.00	6.71	-183	5.0	
1114	14.06	250		16.74	1.35	0.94	0.00	6.69	-182	4.6	
1117	14.07	250		16.73	1.35	0.86	0.05	6.70	-183	4.4	
1120	14.07	250		16.69	1.35	0.80	0.04	6.69	-181	3.2	
1125	Collected sample			UN611 - MW2-040							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

3-well volume

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-4

Well Diameter (inches): 2"

Screen Interval (feet bgs): Unknown

Pump/Purging Device: Peristaltic Pump

Sample Time: 1425

Date: 6/24/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 14.62' BTOC

Well Depth (feet bgs): 22.70' BTOC

Well Volume: 1.29 gal ; 3-well volume = 14.18

Pump Intake Depth (feet BTOC): ~ 20' BTOC

Analyses/Notes: SW8260B WH = 0.4 ppm OBZ = 0.2 ppm PW = 0.2 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1316	14.62	Pump on	-	-	-	-	-	-	-	-	
1320	15.92	150	0.60	22.48	1.51	5.00	2.6	7.14	-28	30.1	
1323	17.65	400	1.80	18.49	1.52	2.83	2.6	7.18	-7	10.9	
1326	17.79	250	2.30	18.51	1.52	1.73	2.5	7.08	23	6.4	
1329	18.11	250	2.80	18.56	1.42	1.07	2.4	7.09	16	9.5	
1332	18.12	250	3.20	21.59	1.35	2.35	2.4	7.12	-14	15.8	
1337	18.15	250	4.45	23.47	1.35	4.69	2.4	7.24	-41	16.6	
1342	18.14	250	5.70	24.61	1.37	4.83	2.4	7.35	-62	17.5	
1347	18.18	250	6.95	25.35	1.39	4.84	2.4	7.41	-74	20.6	Appears pump cut off here
1352	18.21	250	8.2	26.26	1.40	5.08	2.4	7.51	-86	18.7	
1357	18.12	250	9.45	27.17	1.41	5.32	2.4	7.62	-86	19.5	
1402	Pump	off	-	-	-	-	-	-	-	-	
1404	Pump	ON	-	-	-	-	-	-	-	-	
1406	18.88	300	10.05	24.84	1.45	4.37	3.3	7.37	-18	22.2	
1409	19.55	300	10.95	20.12	1.49	4.34	3.0	7.16	-9	19.9	
1412	19.74	300	11.85	19.36	1.49	4.31	2.9	7.16	-9	13.0	
1416	20.40	300	13.05	19.07	1.50	3.77	2.7	7.04	-2	9.1	
1420	20.67	300	14.25	19.12	~~3.50~~ 1.51	3.59	2.6	7.00	0	7.6	
1425	Collected	sample	VN611-MW4-040								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-5

Well Diameter (inches): 4"

Screen Interval (feet bgs): 4.8 - 24.8' bgs

Pump/Purging Device: Dedicated Tempest Twister

Sample Time: 1325

Date: 6/22/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 12.59' BTOC

Well Depth (feet bgs): ~27.4' BTOC (3/23/11

Well Volume: 9.63 gal ; 3-well vol. = 28.87 gal

Pump Intake Depth (feet BTOC): ~27' BTOC

Analyses/Notes: See Sample Log WH = 0.4 ppm OBZ = 0.4 ppm PW = 0.1 ppm

Time	Water Level (ft BTOC)	gal/min Purge Rate ~~(mL/min)~~	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1235	12.59	Pump on	-	-	-	-		-	-	-	
1242	15.80	0.87	4.35	32.64	0.003	5.10	0.00	7.42	55	657	
1247	19.78	0.98	9.25	33.07	0.003	5.00	0.00	7.42	52	668	
1252	22.58	0.98	14.15	33.41	0.003	4.91	0.00	7.42	51	676	
1257	25.81	0.98	19.05	33.75	0.003	4.83	0.4	7.39	54	680	
1258	Well purged dry										
1312	Pump on, outlet hose not connected to flow-thru cell										
1312	20.85	600 mL	20.85	23.24	1.82	1.79	1.1	7.07	-45	13.8	
1317	20.77	600	21.6	17.71	1.97	0.38	0.8	6.90	-46	4.4	
1322	20.83	600	22.05	17.35	2.01	0.13	0.50	6.86	-45	2.5	
1323	20.81	600	22.5	17.38	2.04	0.00	0.4	6.84	-46	1.9	
1325	Collected sample UN6 11-MW5-063										Hach Fe^{2+} = 0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-8

Well Diameter (inches): 2"

Screen Interval (feet bgs): 7.6 - 17.6' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1125

Date: 6/21/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 1.69' BTOC

Well Depth (feet bgs): 19.6' BTOC (6/15/10)

Well Volume: 2.87 gal, 3 well vol. = 32.6 L

Pump Intake Depth (feet BTOC): ~14.5' BTOC

Analyses/Notes: SW8260B/CO_2 WH = 0.2 ppm OBZ = 0.2 ppm PW = 0.7 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1018	1.69	Pump on	-	-	-	-		-	-	-	
1021	2.21	200	0.6	22.94	6.26	0.09	0.04	5.55	24	21.1	
1024	2.49	200	1.2	22.54	1.35	4.17	0.03	5.48	39	12.1	
1027	2.49	200	1.8	20.07	5.75	0.00	0.03	5.55	26	5.4	
1030	2.49	200	2.4	22.31	6.35	0.00	0.03	5.56	20	5.9	
1033	2.55	200	3.0	21.53	6.61	0.00	0.03	5.43	14	5.7	Switched to 3-well
1038	4.30	1000	8.0	17.13	6.76	0.00	0.03	5.44	-8	4.6	volume method
1043	4.05	1000	13.0	18.25	6.74	0.00	0.05	5.48	-25	5.5	- Lowered flow rate
1048	3.75	500	15.5	18.09	6.76	0.00	0.05	5.48	-29	1.3	per A. Kunkel
1053	3.70	500	18.0	18.22	6.72	0.00	0.03	5.44	-29	3.2	
1058	4.25	500	20.5	17.58	6.76	0.00	0.03	5.44	-27	4.3	
1103	4.51	500	23.0	17.52	6.77	0.00	0.04	5.45	-30	2.8	
1108	4.61	500	25.5	17.51	6.75	0.00	0.05	5.46	-34	1.4	
1113	4.56	500	28.0	17.72	6.72	0.00	0.03	5.44	-34	8.2	
1118	4.68	500	30.5	17.57	6.71	0.00	0.05	5.43	-35	33.7	- False reading due
1123	4.73	500	33.0	17.68	6.70	0.00	0.03	5.43	-36	16.3	to surging the DO probe
1125	Collected sample			UN611-MW8-050							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-9

Well Diameter (inches): 2"

Screen Interval (feet bgs): 12.9 - 32.9' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1340

Date: 6/21/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): ~~13.15' BTOC~~ 10.31' BTOC

Well Depth (feet bgs): 35.5' (5/28/09)

Well Volume: 4.03 gal

Pump Intake Depth (feet BTOC): ~ 30' BTOC

Analyses/Notes: SW8260B WH = 0.2 ppm OBZ = 0.2 ppm PW = 0.2 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1304	10.31	Pump on	-	-	-	-		-	-	-	Solinst WLM appears to not
1307	10.41	200	0.6	24.51	2.46	6.91	0.07	5.63	7	10.7	function properly in steel
1310	10.41	200	1.2	24.91	1.85	7.02	0.04	5.58	32	8.1	cased wells.
1313	10.41	200	1.8	23.36	1.73	6.40	0.04	5.56	64	7.0	YSI 85 temp = 15.6°C
1316	10.41	200	2.4	22.56	1.78	6.32	0.04	5.54	76	7.1	
1319	10.49	200	3.0	21.36	1.77	5.99	0.17	5.53	84	6.3	
1322	10.40	200	3.6	20.38	1.80	5.36	0.16	5.55	95	6.4	
1325	10.41	200	4.2	20.48	1.80	5.11	0.26	5.50	100	7.0	
1328	10.43	200	4.8	20.40	1.80	4.83	0.28	5.50	102	7.1	
1331	10.43	200	5.4	21.39	1.76	1.93	0.16	5.48	108	6.4	
1334	10.43	200	6.0	22.52	1.71	1.81	0.16	5.51	108	6.8	
1337	10.44	200	6.6	22.36	1.71	1.73	0.15	5.51	111	7.2	
1340	Collected sample			UN611-	MW9-	040					

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-175

Well Diameter (inches): 2 inches

Screen Interval (feet bgs): 15' - 30'

Pump/Purging Device: Peripump

Sample Time: 1000

Date: 6/21/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 15.94

Well Depth (feet bgs): 30.0'

Well Volume:

Pump Intake Depth (feet BTOC): ~ 29'

Analyses/Notes: SW8260B ; ~~[illegible]~~

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0932	15.94	Pump on	-	-	-	-		-	-	-	
0935	16.14	175		17.69	1.61	1.83	0.20	6.83	-250	14.3	
0940	16.15	300		17.56	1.61	1.28	0.24	6.84	-256	8.8	
0943	16.15	300		17.34	1.60	1.09	0.35	6.83	-253	7.0	
0946	16.15	300		17.28	1.60	0.95	0.46	6.84	-256	7.8	
0949	16.17	300		17.20	1.60	0.87	0.43	6.81	-258	5.6	
0952	16.18	300		17.02	1.60	0.79	0.48	6.80	-239	5.0	
0955	16.18	300		17.08	1.59	0.87	0.46	6.81	-253	5.5	
0958	16.18	300		17.21	1.59	0.82	0.46	6.83	-258	3.9	
1000	Sample collected			UN611-MW175-040							

Wellhead PID = 0.2 ppm
OBZ PID = 0.1 ppm
Bucket PID = 0.3 ppm

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Page 1 of 1

*Note: 1) SAP says pump in mid screen; however looking for chlorinated solvents (sinkers)
2) Tubing in well when open; Tubing

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-18

Well Diameter (inches): 2"

Screen Interval (feet bgs): 4.1 - 18.6' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1525

Date: 6/23/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 8.52' BTOC

Well Depth (feet bgs): 21.4' bgs

Well Volume: 2.06 gal

Pump Intake Depth (feet BTOC): ~16' BTOC

Analyses/Notes: SW8260B / CO_2 WH = 0.2 ppm OBZ = 0.1 ppm PW = 0.2 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1500	8.52	Pump on	-	~~24.~~	-	-	-	-	-	-	
1503	8.96	150	0.45	24.42	1.50	0.27	0.00	6.57	21	43.2	
1506	8.96	150	0.90	24.01	1.46	0.03	0.00	6.48	16	28.8	
1509	8.97	150	1.35	23.63	1.45	0.01	0.00	6.50	13	22.6	
1512	8.97	150	1.80	22.77	1.46	0.00	0.00	6.48	11	20.7	
1515	8.97	150	2.25	22.58	1.45	0.00	0.00	6.47	10	16.1	
1518	8.97	150	2.70	22.45	1.47	0.08	0.00	6.46	10	9.4	
1521	8.98	150	3.15	21.72	1.49	0.06	0.00	6.45	11	8.1	
1525	Collected sample VN6 11 - MW18 - 063										
											Hach Fe^{2+} = 0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Location: From 15 door, go to 1st aisle and turn right, well is 3 bays in on right (# 1431)

[Low Flow]

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Date: 6/29/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen, Anna Kunkel

Well Identification: MW-20

Initial Water Level (feet BTOC): 10.87

Well Diameter (inches): 2"

Well Depth (feet bgs): ~24.5

Screen Interval (feet bgs): 6.7 - 21.7

Well Volume: 13.63 × 0.61 = 8.3 × 3 = 24.9 L or 6.54 gal

Pump/Purging Device: Peripump

Pump Intake Depth (feet BTOC): ~21 (3.5 ft off bottom)

Sample Time: 1225

Analyses/Notes: SW8260B and CO_2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen* (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.9 ppm OBZ PID = 0.3 ppm Bucket PID = 0.5 ppm
1157	10.87	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
1202	11.04	300	1.0 L	19.97	1.23	5.50[A]	-0.10	6.88	113	40.1	*YSI - see notes on MW-21
1207	11.05	300	2.5 L	19.64	1.21	0.75	-0.15	6.88	79	21.7	for notes regarding negative DO
1212	11.06	300	4.5 L	19.53	1.21	0.64	-0.17	6.88	78	12.5	[A] Air bubble in Horiba - removed/
1215	11.07	300	5.0 L	19.52	1.21	0.54	-0.17	6.80	82	11.9	dislodged by shaking
1218	11.09	300	6.25 L	19.49	1.20	0.48	-0.18	6.89	79	8.6	
1221	11.09	300	7.25 L	19.48	1.24	0.44	-0.17	6.88	79	7.0	
1224	11.09	300	8.25 L	19.47	1.20	0.41	-0.17	6.88	79	4.8	
1225	Collected samples			[UN611 - MW20 - 060]			and	[UN611 - MW20 - 061]			

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Well is located directly west of the northern most fire suppression system (vertical red pipes)

Monitoring Well Purging Form

Low Flow

Project: Unocal Wichita - 2011 Annual GW Monitoring

Date: 6/29/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen, Anna Kunkel

Well Identification: MW-21

Initial Water Level (feet BTOC): 9.92

Well Diameter (inches): 2"

Well Depth (feet bgs): ~22.1

Screen Interval (feet bgs): 10.3 - 20.3

Well Volume: 12.18' × 0.61 = 7.43 × 3 = 22.3 L or 5.8 gal

Pump/Purging Device: Peripump

Pump Intake Depth (feet BTOC): ~19.1 (3' off bottom)

Sample Time: 1135

Analyses/Notes: SW8260B and CO_2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.6 ppm OBZ PID = 0.1 ppm Bucket PID = 0.2 ppm
1052	9.92	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOA
1057	10.18	350	0.75 L	19.25	1.08	1.62	-0.24[A]	6.76	65	29.3	[A] YSI was removed from well &
1100	10.22	300	1.75 L	19.09	1.09	1.29	—	6.74	48	26.1	checked
1103	10.25	300	2.75 L	18.64	1.07	1.16	—	6.74	24	86.0	
1106	10.25	300	3.75 L[AC]	18.43	1.09	0.90	—[B]	6.72	26	59.5	[B] Check YSI in hole DO = -0.06
1109	10.28	300	4.75 L	18.47	1.11	0.82	—	6.71	30	44.9	↳ Recalibrated w/ yeast (2 pts -
1114	10.30	300	6.0 L	18.48	1.12	0.71	—	6.70	33	39.9	zero & 100% saturation)
1119	10.25	250	7.0 L	18.45	1.13	0.72	—	6.72	31	43.8	
1124	10.20	250	8.5 L	18.50	1.14	0.57	0.10	6.71	33	28.5	
1127	10.25	250	9.0 L	18.57	1.14	0.54	0.05	6.71	34	27.5	
1130	10.25	250	10.0 L	18.49	1.14	0.51	-0.09[C]	6.70	37	31.0	[C] YSI had negative DO.
1135	Collected sample			UN611-MW21-0620							Horiba DO value was low (in
											0.50s) and YSI has error/sensitivity
											of

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

| Low Flow |

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-22

Well Diameter (inches): 2"

Screen Interval (feet bgs): 8.7' - 23.7'

Pump/Purging Device: Peripump

Sample Time: 1025

Date: 6/29/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 10.12'

Well Depth (feet bgs): 25.0'

Well Volume: 14.88' x 0.61 = 9.1 x 3 = 27.3 L or 7.14 gal

Pump Intake Depth (feet BTOC): ~23'

Analyses/Notes: SW8260B

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.2 ppm OBZ PID = 0.2 ppm Bucket PID = 0.1 ppm
0949	10.12	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
0954	10.20	250	1.75 L	21.50	1.03	4.09	3.04	7.03	141	95.5	
0957	10.21	250	2.5 L	21.51	1.03	4.16	3.03	7.02	139	37.1	
1000	10.21	325	3.75 L	21.37	1.02	3.72	3.01	7.02	139	18.4	
1003	10.21	300	4.5 L	21.36	1.02	3.55	3.00	7.01	139	14.4	
1006	10.20	300	5.25 L	21.32	1.01	3.35	2.97	7.01	139	14.5	
1009	10.21	300	6.0 L	21.35	1.01	2.90	2.96	7.01	140	17.7	
1012	10.21	300	6.75 L	21.25	1.01	2.89	2.98	7.01	140	7.7	
1015	10.21	300	8.0 L	21.25	1.00	2.64	2.98	7.01	141	6.6	
1018	10.21	300	9.0 L	21.22	1.01	2.59	3.01	7.01	142	8.9	
1025	Collected sample			UN611-MW22-040							
1021	10.21	300	10.0 L	21.19	1.01	2.67	3.02	7.01	142	7.0	

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-24

Well Diameter (inches): 2"

Screen Interval (feet bgs): 11.5 - 26.5' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 0935

Date: 6/21/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 14.02' BTOC

Well Depth (feet bgs): ~27'

Well Volume: 2.04 gal.

Pump Intake Depth (feet BTOC): ~5' above TD

Analyses/Notes: SW8260B WH = 0 ppm OBZ = 0 ppm PW = 0 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0904	14.02	Pump on	-	-	-	-	0.14	-	-	-	YSI 85 meter at
0907	13.59	200	0.6	20.62	2.01	0.50	0.11	4.89	-130	5.1	pump intake
0910	13.70	200	1.2	20.77	1.91	0.11	0.10	4.86	-113	4.3	
0913	13.78	200	1.8	21.27	1.95	0.00	0.06	5.30	-108	5.7	
0916	13.80	200	2.4	21.13	1.90	0.00	0.07	5.27	-127	4.5	
0919	13.78	200	3.0	21.83	1.88	0.00	0.07	5.25	-146	5.1	
0922	13.91	200	3.6	21.70	1.89	0.00	0.05	5.19	-155	5.1	
0925	13.89	200	4.2	22.03	1.83	0.00	0.04	4.65	-101	5.1	
0928	13.91	200	4.8	22.29	1.80	0.00	0.03	4.69	-69	4.5	
0931	13.93	200	5.4	22.54	1.83	0.00	0.04	4.73	-82	4.0	
0934	13.93	200	6.0	22.67	1.86	0.00	0.06	4.81	-80	2.8	
0935	Collected sample UN611-MW24-040										
0951	Reinstalled DO probe following membrane cap install/recalibration										
0954							0.08 @ 17.2°C				
0955							0.08 - 17.1				
0956				~			0.09 - 17.1				

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-25

Well Diameter (inches): 2"

Screen Interval (feet bgs): 11.5 - 26.5' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1125

Date: 6/23/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 12.05' BTOC

Well Depth (feet bgs): 26.00'

Well Volume: 2.23 gal.; 3-well vol. = 25 L

Pump Intake Depth (feet BTOC): ~ 5' above TD

Analyses/Notes: See Sample Log WH = 0.3 ppm OBZ = 0.2 ppm PW = 0.3 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1018	12.05	Pump on	-	-	-	-	-	-	-	-	
1023	12.45	120	0.60	18.84	2.46	4.91	5.2	6.74	145	32.9	
1026	12.65	120	1.2	18.40	2.45	4.65	5.2	6.71	148	18.3	
1029	12.83	120	1.8	18.40	2.49	4.57	5.1	6.66	152	19.0	
1034	13.28	300	3.3	18.55	2.44	5.34	5.2	6.68	150	14.9	
1039	13.80	500	5.8	16.64	2.40	5.22	5.2	6.70	150	15.2	Increased flow rate
1044	14.59	500	8.3	16.53	1.99	5.76	5.9	6.80	150	11.4	
1049	15.40	500	10.8	17.00	1.82	6.00	5.8	6.86	150	13.0	
1054	15.45	500	13.3	17.82	1.69	5.59	5.1	6.86	150	10.2	
1059	16.10	500	15.8	18.10	1.69	5.38	4.0	6.85	152	13.6	
1104	16.77	500	18.3	17.62	1.76	5.35	3.2	6.84	152	23.4	
1109	17.02	500	20.8	17.59	1.74	5.19	2.9	6.84	152	22.2	Hach Fe^{2+} = 0 mg/L
1119	18.01	500	25.8	17.00	1.98	4.82	3.0	6.81	154	32.7	
1125	Collected sample VN611-MW25-060										

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-26

Well Diameter (inches): 2"

Screen Interval (feet bgs): 5.0-20.0' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1545

Date: 6/21/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 15.13' BTOC

Well Depth (feet bgs): 20.0' BTOC (6/17/10)

Well Volume: 0.77, 3-well vol. = 2.33 gal

Pump Intake Depth (feet BTOC): ~15' BTOC

Analyses/Notes: SW8260B WH = 0.3 ppm OBZ = 0.4 ppm PW = 0.3 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1518	15.13	Pump on	-	-	-	-		-	-	-	
1522	15.58	200	0.8	27.81	5.62	3.36	0.17	5.32	-117	171	
1526	15.80	200	1.6	21.68	6.14	4.88	0.09	5.30	-130	52.7	
1529	16.53	500	3.1	20.17	6.18	3.84	0.07	5.29	-133	42.8	Switched to 3-well
1532	17.00	500	4.6	19.78	6.57	2.94	0.16	5.27	-133	85.3	vol. purge method
1535	17.49	500	6.1	19.07	6.20	2.25	0.19	5.28	-139	11.3	
1538	18.03	500	7.6	18.92	6.34	1.75	0.17	5.27	-152	8.0	
1541	18.51	500	9.1	18.93	6.36	1.48	0.21	5.27	-160	56.5	
1545	Collected	sample	UN611-MW26-040								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Date: 6/21/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen, Anna Kunkel

Well Identification: MW-27

Initial Water Level (feet BTOC): 15.85'

Well Diameter (inches): 2"

Well Depth (feet bgs): 25'

Screen Interval (feet bgs): 10' - 25'

Well Volume: 1.46 gal, Tot = 4.39 gal

Pump/Purging Device: Peripump

Pump Intake Depth (feet BTOC): ~24'

Sample Time: 1405

Analyses/Notes: SW8260B

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.1 ppm OBZ PID = 0.0 ppm Bucket PID = 0.0 ppm
1300	15.85'	Pump on	-	-	-	-		-	-	-	* No water observed; Reset tubing
~~1300~~											
1320	16.23	Pump on	—	—	—	—	—	—	—	—	Let well recover and take reading in 5 min.
1325	16.65	275	0.75	17.52	1.80	5.19	5.63	7.25	-80	113	Exceeded drawdown, change to
1330	17.22	275	1.5	17.35	1.68	6.05	5.42	7.23	-76	82.5	3 well volumes.
1335	17.55	325	2.0	17.39	1.60	5.73	5.20	7.22	-73	63.7	
1342	18.07	325	2.5	17.46	1.48	4.67	1.92	7.07	-87	11.5	
1347	18.37	325	3.0	17.16	1.44	3.24	0.72	7.05	-116	6.2	
1352	18.63	325	3.50	17.30	1.42	2.23	0.42	7.03	-138	4.1	
1357	18.99	325	4.0	17.48	1.42	1.91	0.38	7.08	-150	3.8	
1402	19.15	325	4.5	17.44	1.43	1.33	0.37	6.90	-161	5.2	
1405	Collected Sample				UN611-MW27-030						

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow to start
– switched to 3-well volum

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: MW-28

Well Diameter (inches): 2"

Screen Interval (feet bgs): 5.0-20.0' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1150

Date: 6/24/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 15.11' BTOC

Well Depth (feet bgs): 22.90' BTOC ~~20.0' bgs (6/17/2010)~~ NH 6/24/11

Well Volume: 0.78 gal, 3-well vol. = 8.89 L

Pump Intake Depth (feet BTOC): ~ 19.5' BTOC

Analyses/Notes: SW8260B WH = 0.0 ppm DBZ = 0.0 ppm PW = 0.0 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1100	15.11	Pump on	-	-	-	-	-	-	-	-	
1103	15.49	120	0.36	26.06	1.41	5.28	1.4	6.90	-91	40.3	
1106	15.49	120	0.72	24.97	1.31	5.60	1.4	6.94	-44	38.6	
1109	15.67	120	1.08	23.76	1.31	5.77	1.4	6.91	-26	33.2	
1112	16.00	120	1.44	23.08	1.31	5.93	2.2	6.94	-17	33.1	
1115	16.20	120	1.80	22.93	1.31	5.77	2.6	6.89	-15	37.0	
1118	16.27	120	2.16	22.92	1.29	5.24	3.3	6.89	-12	22.5	
1121	16.44	120	2.52	22.59	1.19	4.43	3.4	6.89	-8	14.8	Increased purge rate
1126	17.10	250	3.77	17.14	1.13	5.82	2.6	6.94	8	13.6	
1131	18.05	250	5.02	16.61	1.33	5.34	2.3	6.73	25	16.7	
1136	19.03	250	6.27	16.78	1.39	4.86	1.7	6.88	21	14.8	
1141	19.78	250	7.52	16.66	1.39	4.57	1.3	6.83	24	18.0	
1146	20.80	250	8.77	16.81	1.38	4.25	1.3	6.83	20	32.0	
1150	Collected	sample	VW611-MW28-040								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.48	5.56	9.88	15.44

Low Flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-1

Well Diameter (inches): 2"

Screen Interval (feet bgs): 8 - 23

Pump/Purging Device: Peri pump

Sample Time: 1400

Date: 6/26/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 12.76

Well Depth (feet bgs): 23.2'

Well Volume: 10.44 × 0.16 = 1.67 × 3 = 5.01 gal

Pump Intake Depth (feet BTOC): 1 ft from bottom

Analyses/Notes: SW8260B, SW8015BMod, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.1 ppm; DBZ PID = 0.0 ppm; Bucket PID = 0.0 ppm
1322	12.76	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOA
1327	12.83	200	~0.2 gal	26.86	1.18	1.49	-0.26	6.65	-121	0.0; Cloudy	
1330	12.84	200	~0.3 gal	24.01	1.22	1.17	-0.27	6.59	-129	0.0; Cloudy	
1333	12.84	225	~0.5 gal	23.30	1.21	0.98	-0.27	6.58	-133	0.0; Cloudy	
1336	12.83	225	~0.7 gal	22.84	1.21	0.82	-0.28	6.59	-138	286	
1339	12.83	225	~0.8 gal	23.24	1.20	0.71	-0.27	6.56	-139	110	
1342	12.83	150	~1.0 gal	23.85	1.20	0.63	-0.27	6.56	-140	94.8	
1345	12.83	150	~1.2 gal	24.46	1.20	0.58	-0.27	6.45	-134	75.5	
1348	12.83	150	~1.4 gal	24.65	1.20	0.55	-0.27	6.57	-143	68.2	
1351	12.82	150	~1.6 gal	25.13	1.20	0.54	-0.26	6.55	-143	81.9	
1354	12.82	150	~1.8 gal	24.86	1.21	0.49	-0.25	6.54	-143	53.5	
1400	Collected sample			UN611-P1-050							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-2

Well Diameter (inches): 2"

Screen Interval (feet bgs): 8-23

Pump/Purging Device: Peripump

Sample Time: 1005

Date: 6/27/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 12.69

Well Depth (feet bgs): ~23.2

Well Volume: 10.51 × 0.16 = 1.7 × 3 = 5.1 gal

Pump Intake Depth (feet BTOC): 1 ft off bottom

Analyses/Notes: SW8260B, SW8015BMod, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.1 ppm OBZ PID = 0.1 ppm Bucket PID = 0.2 ppm
~0918	12.69	Pump on	-	-	-	-		-	-	-	*Added ~0 HCl to VOA
0921	13.48	275	~0.2 gal	19.37	1.98	2.99	-0.38	6.40	-106	96.5	* Due to drawdown, purge 3
0924	13.89	500	~0.5 gal	16.54	2.08	2.04	-0.39 [A]	6.38	-115	69.7	well volumes
0927	14.18	500	~1.0 gal	16.27	1.86	1.34	—	6.34	-121	62.8	[A] YSI DO Probe - Recalibrated
0930	14.35	500	~1.5 gal	16.41	1.80	1.07	—	6.32	-125	67.1	to zero & 100% sat.
0933	14.48	500	~1.8 gal	16.54	1.78	0.89	—	6.30	-128	70.3	
0936	14.58	500	~2.5 gal	16.38	1.75	0.79	—	6.28	-129	67.1	
0939	14.60	500	~2.75 gal	16.42	1.73	0.69	-0.07 [B]	6.30	-131	50.4	[B] Due to low DO in well, YSI was left
0942	14.69	500	~3.25 gal	16.42	1.69	0.64	-0.14	6.30	-132	48.4	in place w/ negative #s.
0945	14.78	500	~3.6 gal	16.33	1.68	0.59	-0.18	6.28	-132	39.5	
0948	14.84	500	~4.0 gal	16.34	1.67	0.55	-0.18	6.33	-135	36.5	
0951	14.88	500	~4.4 gal	16.26	1.66	0.57	-0.20	6.31	-134	31.5	
0954	14.92	500	~4.75 gal	16.19	1.66	0.53	-0.20	6.29	-134	26.3	
0957	14.97	500	~5.15 gal	16.25	1.66	0.49	-0.20	6.29	-135	17.6	
1000	15.02	500	~5.5 gal	16.21	1.65	0.45	-0.21	6.27	-135	16.1	Note: Effervescente bubbles observed
1005	Collected sample			UN611-	P2-070						in some VOAs. Removed all bubbles possible.
											2nd purge w/ straw method produced darker/
											siltier water than 1st purge

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Page 1 of 1

950 IDWW-01

4.0 gal in bucket #1

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-5

Well Diameter (inches): 2"

Screen Interval (feet bgs): 5-15' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1050

Date: 6/27/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 13.98' BTOC

Well Depth (feet bgs): ~15.5' bgs

Well Volume:

Pump Intake Depth (feet BTOC): 6" above bottom of well

Analyses/Notes: SW8260B, MEE, CO_2, VFA

WH = 0.1 OBZ = 0.1

PW = 0.2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	~ Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1029	13.98	Pump on	-	-	-	-	-	-	-	-	
1032	14.37	100	0.30	21.58	3.17	0.53	0.0	5.93	-76	132	
1035	14.68	100	0.60	20.03	3.21	0.00	0.0	5.95	-91	68.3	
1038	14.78	250	1.35	18.39	2.77	0.00	0.0	6.17	-117	43.0	
1041	14.87	150	2.10	18.14	2.73	0.00	0.0	6.21	-120	39.2	
1046	14.96	150	2.85	18.08	2.74	0.00	0.0	6.16	-116	12.9	
1050	Collected		sample	UN611-P5-070							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-6

Well Diameter (inches): 2"

Screen Interval (feet bgs): 5 - 15.0' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1113

Date: 6/26/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 13.75' BTOC

Well Depth (feet bgs): 16.31' BTOC

Well Volume: 0.41 gal

Pump Intake Depth (feet BTOC): ~1' above bottom

Analyses/Notes: SW8260B, MEE, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											WH = 0.3 ppm DBZ = 0.2 ppm PW = 0.3 ppm
1047	13.75	Pump on	-	-	-	-	—	-	-	-	
1052	~~14.27~~ 14.53	120	0.6	26.63	1.56	0.00	0.0	6.42	-109	561	
1055	14.52	120	0.96	27.66	1.51	0.00	0.0	6.41	-108	482	
1058	14.59	120	1.32	27.84	1.49	0.00	0.0	6.36	-108	393	
1103	14.58	120	1.92	27.79	1.48	0.00	0.0	6.36	-110	355	
1108	14.78	120	2.52	27.76	1.49	0.00	0.0	6.33	-111	262	
1113	Collected	sample		VOBs	1-Pb-	060					

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Purged Dry

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-9

Well Diameter (inches): 2"

Screen Interval (feet bgs): 5-15

Pump/Purging Device: Peri pump

Sample Time: 0900

Date: 6/27/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 14.25'

Well Depth (feet bgs): ~15.5 ; ~16.5 ft BTOC

Well Volume: 2.25 × .61 = 1.4 × 3 = 4.2 L

Pump Intake Depth (feet BTOC): on well bottom

Analyses/Notes: SW8260B, SW8015BMod, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.1 ppm BZ PID = 0.1 ppm Bucket PID = 0.1 ppm
0824	14.25	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOA
0827	16.25	200	~1 L	19.67	1.25	3.81	-0.15	6.25	-155	10.6	* Slowest flow rate possible w/o pump turning off
0829	dry	—	~1 L	Allow well to recover and collect a sample							
0840	15.52	Water Level check									
0900	15.00	Collected sample			UNOH-P9-070						

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-10

Well Diameter (inches): 2"

Screen Interval (feet bgs): 5-15' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1350

Date: 6/27/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 14.26' BTOC

Well Depth (feet bgs): 16.55' BTOC (on 3/22/11)

Well Volume: 0.37 gal

Pump Intake Depth (feet BTOC): ~16' BTOC

Analyses/Notes: SW8260B, MEE, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	~ Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											WH = 0.2 ppm OBZ = 0.2 ppm PW =
1306	14.26	Pump on	-	-	-	-	~~0.0~~ 10+ 3/27/11	-	-	-	
1309	14.80	110	0.33	22.12	1.65	0.23	0.0	6.59	-252	19.0	
1312	15.20	110	0.66	19.20	1.49	0.00	0.0	6.38	-237	6.3	
1315	15.48	110	1.10	18.63	1.47	0.00	0.0	6.35	-234	0.4	
1320	15.60	110	1.54	18.81	1.45	0.00	0.0	6.31	-231	4.6	
1324	15.62	100	1.98	19.43	1.45	0.00	0.0	6.30	-233	2.0	
1328	15.62	100	2.28	20.05	1.45	0.00	0.0	6.31	-237	0.0	
1330	Well purged dry										
1350	Collected sample UN611-P10-050										DTW = 14.96' BTOC at 1350

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-11

Well Diameter (inches): 2"

Screen Interval (feet bgs): 20-35' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1415

Date: 6/26/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 15.75' BTOC

Well Depth (feet bgs): ~35' bgs

Well Volume: 3.56 gal

Pump Intake Depth (feet BTOC): ~7' above bottom

Analyses/Notes: SW8260B, MEE, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											WH = 0.5 ppm DBZ = 0.5 ppm PW = 0.2 ppm
1336	15.75	Pump on	-	-	-	-	-	-	-	-	
1339	16.31	150	0.45	30.20	2.55	0.42	0.0	6.31	-105	12.1	High temperature
1342	16.25	150	0.90	33.53	2.35	0.24	0.0	6.26	-105	12.9	readings on V-52.
1345	16.39	300	1.35	33.10	2.23	0.08	0.0	6.16	-106	12.1	YSI probe temp. has
1348	16.36	150	1.80	32.57	2.08	0.00	0.0	6.31	-115	12.8	read approx. 15°C
1351	16.31	150	2.25	32.59	2.06	0.06	0.0	6.25	-111	12.4	all day.
1354	16.32	150	2.70	33.13	1.94	0.01	0.0	6.29	-114	12.0	
1357	16.42	150	3.15	32.92	1.75	0.00	0.0	6.25	-111	11.8	
1400	16.43	150	3.60	32.55	1.68	0.00	0.0	6.30	-118	12.0	
1403	16.51	300	4.50	32.23	1.63	0.00	0.0	6.28	-115	11.9	
1406	16.44	150	4.95	31.90	1.60	0.00	0.0	6.26	-117	12.0	
1409	16.41	150	5.40	31.84	1.63	0.00	0.0	6.30	-119	11.8	
1415	Collected	sample		VN611-P11-060							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-12

Well Diameter (inches): 2"

Screen Interval (feet bgs): 20-35' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1210

Date: 6/27/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 16.21' BTOC

Well Depth (feet bgs): ~35

Well Volume: 3.00 gal.

Pump Intake Depth (feet BTOC): ~34' BTOC (1 foot Above TD)

Analyses/Notes: SW8260B, MEE, CO2, VFA

WH = 0.2 DBE = 0.2
PW = 0.3 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	~ Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1142	16.68	Pump on	-	-	-	-	-	-	-	-	
1145	16.99	200	~~1.00~~ 0.6	19.97	1.99	1.31	0.2	6.44	-182	236	
1148	17.20	200	~~0.60~~ 1.2	18.66	1.51	0.24	0.2	6.56	-259	144	
1151	17.36	200	1.80	18.38	1.54	0.00	0.0	6.60	-269	65.4	
1154	17.36	180	2.34	18.61	1.53	0.00	0.0	6.61	-275	68.1	
1157	17.46	180	2.88	18.49	1.54	0.00	0.3	6.63	-287	28.7	
1200	17.43	200	~~3.40~~ 3.48	18.49	1.54	0.00	0.0	6.64	-293	15.8	
1203	17.44	200	4.08	18.56	1.54	0.00	0.0	6.60	-298	16.3	
1206	17.47	200	4.68	18.40	1.56	0.00	0.0	6.59	-304	13.2	
1210	Collected	sample		VOA	1 - ~~P16~~ - 020						
					P12	(KN) 7/7/11					

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-13D

Well Diameter (inches): 2"

Screen Interval (feet bgs): 22.75 - 32.75

Pump/Purging Device: Submersible Pump

Sample Time: 1210

Date: 6/27/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 16.11

Well Depth (feet bgs): ~33; TD = ~36 ft BTOC

Well Volume: 19.89 × 0.16 = 3.2 × 3 = 9.6 gal

Pump Intake Depth (feet BTOC): ~1 ft off bottom

Analyses/Notes: SW8260B, SW8015BMod, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.1 ppm; OBZ PID = 0.1 ppm; Bucket PID = 0.1 ppm
1056	16.11	Pump on	-	-	-	-	-	-	-	-	*Added ~10 drops HCl to VOA
1101	17.68	375	~0.3 gal	21.65	1.48	2.74	-0.23	6.64	-129	68.0	* DO probe below sub pump in well
1106	18.65	525	~1 gal	19.00	1.49	2.09	-0.23	6.50	-133	77.8	*Cloudy, gray water → cleared up over time
1111	18.70	475	~2 gal	18.20	1.53	1.73	-0.23	6.49	-142	79.2	
1116	18.48	400	~2.6 gal	18.82	1.55	1.29	-0.23	6.43	-144	79.1	Due to drawdown, purge 3
1121	18.35	300	~3.3 gal	18.85	1.56	0.98	-0.23	6.49	-151	79.2	well volumes
1126	18.58	625	~3.8 gal	18.30	1.59	0.98	-0.23	6.53	-156	73.2	
1131	18.81	650	~4.5 gal	18.34	1.56	0.78	-0.23	6.52	-160	69.6	
1136	18.07	600	~5.3 gal	17.78	1.55	0.79	-0.23	6.52	-163	70.0	
1141	18.92	450	~6.5 gal	17.72	1.54	0.83	-0.23	6.53	-168	67.3	
1146	18.74	500	~7.2 gal	17.76	1.55	0.76	-0.23	6.47	-173	65.9	
1151	18.55	500	~8.0 gal	17.62	1.57	0.92	-0.23	6.47	-183	65.9	
1156	18.34	375	~9.0 gal	17.74	1.58	0.82	-0.23	6.47	-198	64.2	
1201	18.45	350	~9.5 gal	17.83	1.58	0.79	-0.23	6.53	-205	62.4	
1206	18.44	350	~10.0 gal	17.75	1.58	0.75	-0.23	6.49	-211	61.1	
1210	Collected sample			UN611-P13D-020							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Page 1 of 1

45gal in bucket #1

Purged Dry

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P135

Well Diameter (inches): 1.5"

Screen Interval (feet bgs): 6.75 - 21.75

Pump/Purging Device: Peripump

Sample Time: 1030

Date: 6/26/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 16.11

Well Depth (feet bgs): ~22

Well Volume: 8.89 × 0.09 = 0.8 × 3 = 2.4 gal

Pump Intake Depth (feet BTOC): 1 ft off bottom (~21 ft bgs)

Analyses/Notes: SW8260B, SW8015BMOD, CO_2, VFA

Wellhead PID = 0.0 ppm
OBZ PID = 0.0 ppm
Bucket PID = ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0843	16.11	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOA
0848	17.40	150	0.3L	26.93	1.27	1.41	-0.14[A]	6.46	-151	6.2	[A] YSI was ~~calibrated~~ checked w/ zero pt & calibrated
0851	18.15	150	0.75L	24.67	1.30	1.46	-0.15	6.47	-161	6.2	to 100% sat prior to placing in well
0854	18.80	150	~0.5gal	24.61	1.28	1.39	-0.20	6.45	-166	6.6	*Used smaller tubing at this
0857	19.61	150	~0.7gal	23.55	1.29	1.42	-0.19	6.45	-168	5.9	well
0900	20.50	150	~0.9gal	21.45	1.27	1.41	-0.18	6.37	-150	101[B]	[B] Moved Horiba before measurement
0903	21.28	150	~1.1gal	22.22	1.26	1.23	-0.19	6.30	-123	935	
0906	21.59	150	~1.3gal	22.43	1.28	1.18	-0.20	6.41	-130	79.5	
0909	22.25	150	~1.5gal	22.42	1.30	1.13	-0.19	6.39	-130	69.6	
0912	22.89	150	~1.7gal	22.41	1.31	1.07	-0.12	6.37	-128	51.3	*Lowered tubing/DO probe to bottom
0915	23.50	150	~1.8gal	22.19	1.33	1.04	-0.19	6.38	-136	56.3	
0918	24.18	150	~[illegible]gal	22.27	1.33	0.96	-0.19	6.44	-147	97.9	
0921	dry	150	~2.0gal	21.66	1.34	0.78	-0.18	6.40	-140	104	
0922	pump turned off; Let well recover then collect sample; Purged ~2.0gal										
6/27/11											
0815	23.09	Allow well to recover more before sampling									
1027	22.96	Determined that there was enough water to collect sample									
1030	Collected sample JN6 11 - P135 - 020										

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-14D

Well Diameter (inches): 2"

Screen Interval (feet bgs): 21.75 - 31.75' bgs

Pump/Purging Device: Dedicated Tempest Twister

Sample Time: 0940

Date: 6/27/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 16.60' BTOC

Well Depth (feet bgs): ~32' bgs

Well Volume: 2.94 gal

Pump Intake Depth (feet BTOC): ~30' BTOC

Analyses/Notes: SW8260, MEE, CO_2, VFA

WH = 0.2 ppm OBZ = 0.1 ppm

PW = 0.1 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	~ Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0911	16.60	Pump on	-	-	-	-	-	-	-	-	
0914	17.43	120	0.36	18.23	1.67	0.30	0.0	6.33	-79	800	Error
0919	17.58	120	0.96	18.32	1.65	0.00	0.0	6.32	-88	244	
0924	17.48	140	1.66	18.75	1.65	0.00	0.0	6.29	-93	118	
0929	17.57	140	2.36	18.84	1.65	0.00	0.0	6.28	-95	45.1	
0934	17.60	140	3.06	18.89	1.65	0.00	0.0	6.20	-94	36.8	
0940	Collected sample			VN611 - P14D - 020							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-145

Well Diameter (inches): 1.5"

Screen Interval (feet bgs): 5.75 - 20.75' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1645

Date: 6/26/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 16.23' BTOC

Well Depth (feet bgs): 23.85' BTOC

Well Volume: 0.69 gal

Pump Intake Depth (feet BTOC): ~ 22' BTOC

Analyses/Notes: SW8260B, MEE, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0916	16.23	Pump on	-	-	-	-	-	-	-	-	WH = 0.3 ppm OBZ = 0.2 ppm PW = 0.2 ppm
0920	17.16	150	0.60	25.88	2.26	0.35	0.0	6.33	-126	105	
0923	18.89	150	1.05	22.73	1.60	0.00	0.0	6.32	-133	140	
0926	19.70	150	1.50	22.38	1.45	0.00	0.0	6.32	-136	125	
0929	20.71	150	1.95	22.37	1.42	0.00	0.0	6.31	-139	149	
0932	21.40	150	2.40	22.57	1.52	0.00	0.0	6.23	-140	202	
0935	Well purged dry - approx. 2.75 L purged										
1638	Re-set up on P-145										
1645	Collected sample UN611-P145-020										

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Date: 6/27/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen, Anna Kunkel

Well Identification: P-15D

Initial Water Level (feet BTOC): 15.88

Well Diameter (inches): 2"

Well Depth (feet bgs): ~33

Screen Interval (feet bgs): 22.75 - 32.75

Well Volume: 20.12 × .16 = 3.2 × 3 = 9.7 gal

Pump/Purging Device: Submersible pump (dedicated)

Pump Intake Depth (feet BTOC): ~1 ft off bottom

Sample Time: 1430

Analyses/Notes: SW8260B, SW8015BMod, CO_2, VFAs

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.5 ppm; OBZ PID = 0.1 ppm; Bucket PID = 2.5 ppm
1335	15.88	Pump on	-	-	-	-		-	-	-	* Added ~10 drops HCl to VOA
1340	16.77	350	~0.3 gal	21.77	1.69	2.48	-0.20	6.40	-230	0.0; Cloudy	* Water is cloudy & gray
1345	16.98	325	~0.6 gal	20.10	1.75	3.86^	-0.21	6.39	-255	0.0; Cloudy	
1352	18.08	700	~2.25 gal	17.10	1.78	1.04	-0.22	6.39	-268	457	* Due to drawdown, purge 3 well volumes
1357	18.59	1050	~3.5 gal	17.23	1.76	0.69	-0.23	6.37	-268	>1000	
1402	18.54	600	~4.25 gal	17.28	1.77	0.58	-0.23	6.19	-257	429	^ Bubble in horiba
1407	18.83	750	~5.75 gal	16.82	1.77	1.31	-0.23	6.33	-263	132	
1412	18.90	700	~6.75 gal	16.89	1.77	0.97	-0.23	6.29	-258	268	
1417	18.94	700	~7.75 gal	16.74	1.77	0.86	-0.23	6.23	-255	119	
1422	18.89	725	~9.0 gal	16.71	1.76	0.76	-0.23	6.22	-252	97.9	
1427	19.31	700	~10.0 gal	16.54	1.76	0.59	-0.23	6.32	-262	66.3	
1430	Collected sample			UN611-P15D-023							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

4.5 L in bucket #1

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-155

Well Diameter (inches): 1.5"

Screen Interval (feet bgs): 6.75 - 21.75' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 6/27/11 0820

Date: 6/26/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 15.70' BTOC

Well Depth (feet bgs): ~25' bgs

Well Volume: 0.84 gal

Pump Intake Depth (feet BTOC):

Analyses/Notes: SW8260B, MEE, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	~ Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											WH = 0.1 ppm OBZ = 0 ppm PW =
0838	~~08~~ 15.70	Pump on	-	-	-	-	-	-	-	-	
0840	16.64	150	0.3	23.50	2.79	0.98	1.7	6.36	-115	0.0	
0843	17.54	150	0.75	21.49	2.45	0.77	1.4	6.55	-139	800	Purge water does not
0846	18.73	150	1.20	21.19	2.31	0.84	1.3	6.59	-147	431	appear turbid.
0849	19.79	140	1.65	21.26	2.19	0.53	1.1	6.69	-158	240	
0852	20.64	140	2.07	21.21	2.14	0.24	1.0	6.71	-163	163	
0855	21.66	140	2.49	21.33	2.07	0.00	0.9	6.63	-166	92.0	
0858	21.82	140	2.91	22.83	2.06	0.37	0.5	6.52	-160	79.4	
0859	Well purged dry. Lowered pump intake approx. 6" above										
	bottom of well in order to evacuate remainder of water in well.										
6/27/11 0820	Collected sample VN 611 - P155 - 020 following 24 hour recharge										

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-16D

Well Diameter (inches): 2"

Screen Interval (feet bgs): 24.75 - 39.75' bgs

Pump/Purging Device: Dedicated Tempest Twister

Sample Time: 1550

Date: 6/26/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 15.54' BTOC

Well Depth (feet bgs): ~40' bgs

Well Volume: 4.4 gal

Pump Intake Depth (feet BTOC): ~ 35' BTOC

Analyses/Notes: SW8260B, MEE, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1459	15.54	Pump on	-	-	-	-	-	-	-	-	WH = 0.0 ppm OBZ = 0.0 ppm PW = 0.0 ppm
1504	16.77	200	0.80	23.39	1.54	0.32	0.0	6.74	-35	0.0	
1507	17.06	200	1.40	23.20	1.51	0.00	0.0	6.75	-27	0.0	
1510	16.80	110	1.73	23.90	1.48	0.00	0.0	6.77	-25	0.0	
1513	Pump off			~~24.85~~	—	—	—	~~6.57~~	—	—	
1518	16.74	110	2.17	25.03	1.42	0.00	0.0	6.75	-24	648	
1521	16.45	110	2.61	24.83	1.43	0.00	0.0	6.66	-20	535	
1524	16.29	110	3.05	25.83	1.44	0.00	0.0	6.64	-21	321	
1527	16.21	110	3.49	26.82	1.44	0.00	0.0	6.73	-27	359	
1530	16.30	110	3.82	27.46	1.42	0.00	0.0	6.71	-26	283	
1533	16.34	110	4.15	27.24	1.37	0.00	0.0	6.75	-25	261	
1536	16.59	110	4.48	26.01	1.34	0.00	0.0	6.76	-24	242	
1541	16.35	110	5.03	26.08	1.38	0.00	0.0	6.66	-22	223	
1544	16.42	110	5.36	26.95	1.36	0.00	0.0	6.65	-20	125	
1550	Collected	sample	VN611-P16D-020								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

RESAMPLE Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-16D

Well Diameter (inches): 2"

Screen Interval (feet bgs): 24.75 - 39.75' bgs

Pump/Purging Device: Dedicated Tempest Twister

Sample Time: 1530

Date: 6/27/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 15.70' BTOC

Well Depth (feet bgs): ~ 40' bgs

Well Volume: 4.36 gal

Pump Intake Depth (feet BTOC): ~35'

Analyses/Notes: SW8260B, MEE, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1446	15.70	Pump on	-	-	-	-	-	-	-	-	
1450	16.88	600	2.4	20.83	1.54	1.14	0.0	6.54	-52	649	
1455	16.56	200	3.4	21.37	1.51	2.28	0.0	6.59	-49	482	
1500	17.11	200	4.4	19.15	1.47	0.00	0.0	6.54	-41	409	
1505	17.42	220	5.5	19.16	1.45	0.00	0.0	6.53	-40	336	
1510	17.43	220	6.6	19.61	1.47	0.00	0.0	6.53	-40	278	
1515	17.28	220	7.7	19.73	1.46	0.00	0.0	6.54	-40	210	
1521	17.41	200	8.7	20.09	1.47	0.00	0.0	6.54	-39	147	
1530	Collected	sample	VN6	11-P16D	-020						

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-165

Well Diameter (inches): 1.5"

Screen Interval (feet bgs): 7.75 - 22.75' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1007

Date: 6/26/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 15.22' BTOC

Well Depth (feet bgs): ~23' bgs

Well Volume: 0.97 gal

Pump Intake Depth (feet BTOC): ~ 4.5' above bottom

Analyses/Notes: SW8260B, MEE, CO2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0949	15.22	Pump on	-	-	-	-	~~0~~	-	-	-	WH = 0.1 ppm OBZ = 0.2 ppm PW = 0.1 ppm
0952	15.56	150	0.45	27.17	1.29	1.13	0.0	6.50	-67	721	
0958	15.53	150	~~0.90~~ 1.05	26.84	1.13	0.20	0.0	6.68	-39	770	
0959	15.53	150	1.50	26.71	1.11	0.00	0.0	6.71	-37	691	
1002	15.55	150	1.95	26.58	1.10	0.01	0.0	6.71	-36	437	
1005	15.57	150	2.30	26.84	1.10	0.02	0.0	6.67	-35	224	
1007	Collected	sample	VN611 - P165 - 020								Purge water is clear out of outlet hose. Will clean probe following sample collection.

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 well volume*
due to parameters

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Date: 6/26/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen, Anna Kunkel

Well Identification: P-17D

Initial Water Level (feet BTOC): 16.78

Well Diameter (inches): 2"

Well Depth (feet bgs): 28'

Screen Interval (feet bgs): 17.75 - 27.75

Well Volume: 14.22 x .16 = 2.3 gal x 3 = 6.9 gal

Pump/Purging Device: Submersible Pump (Dedicated)

Pump Intake Depth (feet BTOC): 1 ft off bottom

Sample Time: 1100

Analyses/Notes: SW8260B

Wellhead PID = 0.1 ppm
OBZ PID = 0.1 ppm
Bucket PID = 0.1 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
948	16.78	Pump on	-	-	-	-	—	-	-	-	*Added ~10 drops HCl to VOA
953	16.85	150	0.3 L	22.97	1.35	6.94[B]	-0.24[A]	6.61	-103	0.0; But cloudy	[A] Recalibrated YSI to 100% saturation
956	16.96	400	~0.5 gal	23.67	1.28	1.97	-0.25	6.70	-116	0.0; Clearer	YSI probe put beneath sub pump
959	16.92	325	~0.75 gal	24.42	1.27	1.38	-0.26	6.66	-123	0.0; Cloudy, but more clear	[B] Moved Horiba up & down
1002	16.92	275	~1.0 gal	24.61	1.26	1.05	-0.26	6.69	-128	0.0; Cloudy	
1005	16.92	250	~1.25 gal	24.56	1.25	0.88	-0.27	6.67	-132	0.0; Cloudy	
1008	16.95	275	~1.5 gal	24.25	1.26	0.77	-0.27	6.66	-139	663	
1011	16.92	275	~2.0 gal	24.14	1.26	0.68	-0.27	6.65	-146	554	
1014	16.95	350	~2.5 gal	24.09	1.26	0.61	-0.27	6.68	-152	324	
1017	17.04	375	~2.8 gal	24.02	1.27	0.54	-0.27	6.66	-156	168	
1020	16.94	300	~3.3 gal	23.83	1.24	0.47	-0.27	6.67	-162	84.2	
1023	17.04	300	~3.5 gal	23.98	1.26	0.44	-0.27	6.67	-164	90.6[C]	[C] Emptied out Horiba to help stabilize turbidity
1033	17.07	450	~4.0 gal	21.94	1.33	1.15	-0.28	6.65	-121	34.3	
1036	17.05	425	~4.5 gal	20.48	1.35	1.13	-0.28	6.65	-140	21.6	
1039	17.02	350	~5.0 gal	20.59	1.34	6.14[D]	-0.28	6.67	-141	22.2	[D] Air bubbles entering Horiba from line;
1043	17.02	425	~5.25 gal	20.95	1.30	4.87	-0.28	6.64	-133	13.6	
1046	17.19	425	~5.75 gal	20.03	1.33	3.51	-0.28	6.63	-137	14.3	
1049	17.02	425	~6.0 gal	19.82	1.31	3.50	-0.28	6.64	-154	12.8	
1052	17.12	500	~6.50 gal	19.75	1.34	4.95	-0.27	6.64	-152	13.0	
1055	17.15	500	~7.0 gal	19.45	1.33	5.30	-0.27	6.61	-151	9.2	

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

1100 Collected sample UN611-P17D-010

3.5 gal in bucket #

[3 Well Volumes/Purge Dry]

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-175

Well Diameter (inches): 1.5"

Screen Interval (feet bgs): 6.75 – 16.75'

Pump/Purging Device: Peripump / Bailer

Sample Time: 0825

Date: 6/24/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 16.70' – 3 = 13.70

Well Depth (feet bgs): 17'

Well Volume: 3.3 × 0.35 = 1.16 × 3 = 3.48 L

Pump Intake Depth (feet BTOC): 1 ft off bottom

Analyses/Notes: SW 8260B

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.1 ppm OBZ PID = 0.1 ppm Bucket PID = 0.1 ppm
1442	16.70	Pump on	-	-	-	-		-	-	-	
1448	—	200	1 L	22.50	1.30	5.05	-0.20	6.86	-6	777	
1450	Well	went	dry!								
1520	Water level = 18.70 ft BTOC; Due to super slow recovery, parameters could not be determined for this well. 1.75 gal of water purged, Will purge 3 well volumes (~3.5 L) using a bailer										
1600	Stopped bailing; Total volume removed => 2.75 L Did not collect sample; Will purge dry tomorrow (Saturday) and let recover to collect sample on Sunday										
6/25/11	KN										
0845	16.84	Purge with bailer									
0900	Well	went dry. Purged additional 2 L.									
6/26/11	AK, KN										
0820	16.85	Collect sample w/ bailer									
0825	Collected sample	UN611-P175-010									
0830	Stabilized DO w/ YSI = 0.41 mg/L										
		P135 → has ~9 ft water in it on 6/24/11; Try to low flow on Sunday w/ small tubing									
		P155 → has ~9 ft water in it on 6/24/11;									

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-18

Well Diameter (inches): ~~2"~~ 1.5"

Screen Interval (feet bgs): 9.75 - 19.75' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1515

Date: 6/24/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 16.42' BTOC

Well Depth (feet bgs): ~~24.77' BTOC~~ 23.27' BTOC

Well Volume: ~~0.53~~ gal 0.62 gal ; 7 L

Pump Intake Depth (feet BTOC): ~18.5' BTOC

Analyses/Notes: SW8260B WH = 0 ppm PW = 0 ppm OBZ = 0 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1443	16.42	Pump on	-	-	-	-	–	-	-	-	
1445	17.90	300	0.60	21.31	0.841	0.29	0.00	6.79	-68	258	Decreased purge rate
1448	19.40	150	1.05	21.28	0.809	0.34	0.00	6.78	-66	236	
1451	19.93	150	1.50	20.75	0.755	0.45	0.00	6.66	-25	253	
1454	20.59	120	1.86	20.69	0.769	0.28	0.00	6.63	-39	226	
1457	21.24	120	2.22	21.66	0.801	0.11	0.00	6.64	-61	218	
1500	21.45	120	2.58	20.50	0.909	0.18	2.38	6.48	-65	281	Well is DRY
1515	Collected	sample	UN6	11 - P18	- 010						Allowed to recharge
											~15 minutes

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.16	0.35	0.61	1.40	2.48	5.56	9.88	15.44

[Purged Dry]

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: P-19

Well Diameter (inches): 1.5

Screen Interval (feet bgs): 9.25 - 19.25

Pump/Purging Device: Peripump

Sample Time: 1605

Date: 6/26/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 15.0

Well Depth (feet bgs): 19.5 ; 22.78 ft BTOC

Well Volume: 7.5 × 0.09 = 0.675 × 3 = 2.03 gal

Pump Intake Depth (feet BTOC): 1 ft off bottom

Analyses/Notes: SW8260B

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.1 ppm OBZ PID = 0.1 ppm Bucket PID = 0.1 ppm
1127	15.0	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOA
1130	15.73	150	~0.2 L	27.77	1.01	1.98	0.94	6.82	18	99.3	
1133	16.40	150	~0.25 gal	26.22	1.01	1.50	0.93	6.78	43	112	
1136	17.35	175	~0.4 gal	25.93	1.00	1.27	0.94	6.70	58	100	
1139	18.75	175	~0.5 gal	25.30	1.02	1.23	0.93	6.67	64	136	*Lowered pumpintake/DO probe
1142	19.71	175	~0.7 gal	24.93	1.03	1.18	0.81	6.65	71	220	to bottom of well
1145	21.09	175	~0.8 gal	21.97	1.07	1.26	0.98	6.74	75	0.0; Cloudy	*Looks like chocolate milk
1148	21.88	175	~1.0 gal	21.79	1.06	1.23	0.83	6.70	80	0.0; Clearer	
1151	22.52	175	~1.3 gal	21.85	1.05	1.16	0.71	6.73	81	0.0; Clearer	
1153	Dry; Wait for well to recover and sample (total volume purged = 1.5 gal)										
1558	Set upon P-19; WL = 21.52 ft BTOC										
1605	Collected sample [UNC11-P19-010]										

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: PMW-4

Well Diameter (inches): 2"

Screen Interval (feet bgs): 13.0-23.0' BTOC

Pump/Purging Device: Peristaltic Pump

Sample Time: 1625

Date: 6/22/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 6.74' BTOC

Well Depth (feet bgs): ~23' BTOC (6/15/10)

Well Volume: 2.60 gal; 3-well vol. = 29.56 L

Pump Intake Depth (feet BTOC): ~18' BTOC

Analyses/Notes: See Sample Log WH = PW = OBZ =

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1515	6.74	Pump on	-	-	-	-		-	-	-	
1520	8.24	150	0.75	27.45	3.20	3.47	1.8	7.32	105	9.8	
1523	9.15	150	1.20	23.96	3.39	1.74	1.7	7.30	111	9.3	
1526	10.05	300	1.65	20.20	3.51	1.66	1.7	7.28	118	25.5	Increased purge rate
1529	11.30	500	2.55	18.59	3.57	1.53	1.7	7.29	118	54.1	
1534	12.89	500	5.05	18.23	3.52	1.36	1.7	7.25	120	8.5	
1539	13.20	500	7.55	17.71	2.92	1.64	3.1	7.31	118	3.4	
1544	13.37	500	10.05	17.71	2.57	3.16	4.4	7.28	118	5.1	
1549	14.20	500	12.55	17.43	3.10	2.88	3.3	7.23	120	4.4	
1555	14.52	500	15.05	17.38	3.49	2.26	2.6	7.27	118	5.2	
1600	14.86	500	17.55	17.38	3.55	1.77	2.4	7.25	119	7.0	
1610	17.15	500	22.55	17.21	3.58	0.95	2.0	7.26	119	9.2	
1620	18.84	500	27.55	17.23	3.58	0.50	1.2	7.26	118	12.4	
1624	19.89	500	29.55	17.77	3.52	0.47	0.9	7.23	117	14.9	
1625	Collected sample UN611-PMWA-046										Hach Fe^{2+} = 0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: PMW-5

Well Diameter (inches): 2

Screen Interval (feet bgs): 13.0' - 23.0'

Pump/Purging Device: Peripump

Sample Time: 1715

Date: 6/22/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 6.82

Well Depth (feet bgs): ~23

Well Volume: 16.18 × 0.16 = 2.6 gal × 3 = 7.8 gal

Pump Intake Depth (feet BTOC): ~22

Analyses/Notes: SW8260B, SW8015BMod, CO_2, Alkalinity, TOC, E300

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.0 ppm OBZ PID = 0.0 ppm Bucket PID = 0.0 ppm
1610	6.82	Pump on	-	-	-	-		-	-	-	*Added ~10 drops of HCl to VOA
1615	9.69	800	1 gal	17.70	1.10	3.70	3.28	7.12	134	97.1	* Due to immediate drawdown,
1620	11.35	360	1.5 gal	18.52	1.10	3.02	3.29	7.09	140	48.1	purged 3 well volumes
1625	11.94	360	2.0 gal	18.44	1.10	2.96	3.30	7.05	144	33.1	
1630	12.81	360	2.5 gal	18.28	1.10	2.86	3.31	7.01	150	22.6	
1635	13.07	200	3.0 gal	18.34	1.09	2.77	3.31	6.95	155	9.0	
1640	13.04	200→360	3.5 gal	19.44	1.09	2.49	3.32	6.95	156	5.0	
1645	13.07	360	4.0 gal	18.43	1.07	3.25	3.32	6.93	149	0.0	
1650	13.08	550	5.0 gal	17.73	1.07	2.97	3.36	6.88	159	0.0	
1655	13.10	550	5.75 gal	17.43	1.09	2.81	3.19	6.88	161	0.0	
1700	13.10	550	6.5 gal	17.66	1.09	2.80	3.31	6.84	164	0.0	
1705	13.41	550	7.25 gal	17.34	1.09	2.80	3.34	6.82	167	0.0	
1710	13.83	550	8.0 gal	17.40	1.09	2.81	3.40	6.80	169	5.4	
1715	Collected sample.				UN611-PMW5-040						Fe = 0.0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: PMW-7

Well Diameter (inches): 2"

Screen Interval (feet bgs): 4.5 - 19.5' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 0935

Date: 6/23/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 7.87' BTOC

Well Depth (feet bgs): ~ 20' (6/15/10)

Well Volume: 1.94 gal, 3-well vol. = 22 L

Pump Intake Depth (feet BTOC): ~ 16.5' BTOC

Analyses/Notes: See Sample Log WH = 0.4 ppm OBZ = 0.3 ppm PW = 0.4 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0840	7.87	Pump on	-	-	-	-	-	-	-	-	
0843	8.20	300	0.9	19.41	5.25	6.01	4.4	6.45	135	99.3	Decreased purge rate
0846	8.41	210	1.53	20.36	5.05	4.85	4.4	6.69	140	33.2	
0849	8.88	210	2.16	20.01	5.05	5.08	4.4	6.75	142	25.6	
0852	9.27	500	3.66	19.72	4.99	4.79	5.0	6.75	144	53.0	Switched to 3-well volumes
0857	10.22	500	6.16	20.37	4.86	5.34	5.43	6.20	142	9.6	KAN pulled YSI Pro ODO
0902	11.00	500	8.66	19.39	5.00	6.45	–	6.79	146	25.0	to recalibrate.
0907	11.66	500	11.16	19.12	5.03	6.58	–	6.79	149	12.7	
0912	11.90	500	13.66	19.30	5.05	6.48	5.5	6.78	149	30.7	
0917	12.54	500	16.16	19.08	5.05	6.24	4.8	6.78	148	17.3	
0922	13.14	500	18.66	19.02	5.05	6.05	4.8	6.80	147	17.3	
0927	14.16	500	21.16	19.11	5.05	5.83	4.6	6.76	150	16.6	
0932	14.59	500	23.66	19.34	5.02	5.72	4.2	6.77	151	12.5	
0935	Collected sample			VN611-PMW7-040							Hach Fe^{2+} = 0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: PMW-8

Well Diameter (inches): 2

Screen Interval (feet bgs): 18.5 - 33.5'

Pump/Purging Device: Peripump

Sample Time: 0950

Date: 6/23/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 8.72'

Well Depth (feet bgs): ~34'

Well Volume: 25.28 × 0.16 = 4.04 × 3 = 12.12 gal

Pump Intake Depth (feet BTOC): ~32'

Analyses/Notes: SW8260B, SW8015BMod, CO_2, TOC, Alkalinity, E300

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.0 ppm OBZ PID = 0.0 ppm Bucket PID = 0.0 ppm
0830	8.72	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
0835	10.25	400	0.4	17.56	2.40	2.63	-0.01[A]	6.99	105	111	*Due to drawdown, purged
0840	11.13	400→500	1 gal	17.29	2.16	2.55	—	7.01	122	45.2	3 well volumes
0845	11.78	500→625	1.6 gal	17.04	2.12	2.55	—	7.00	132	10.6	[A] Recalibrated DO meter
0850	12.33	625→700	2.25	17.02	2.11	2.50	—	6.99	137	5.3	
0855	13.07	700	3.25	17.12	2.21	2.46	2.64	6.97	108	42.4	
0905	14.00	700	4.9	17.16	2.11	2.57	2.67	7.01	128	3.6	
0915	15.03	800	7.0	17.10	2.10	2.62	2.80	6.99	132	1.1	
0925	15.57	800	9.0	17.18	2.09	2.72	2.79	7.02	132	0.1	
0935	15.85	800	11.0	17.14	2.08	2.80	2.69	6.99	131	1.7	
0940	15.95	800	12.0	17.18	2.09	2.76	2.71	6.97	132	0.2	
0945	16.02	800	13.0	17.18	2.08	2.76	2.74	6.95	133	0.9	
0950	Collected sample			UN611-PMW8-040							Fe = 0.0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

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At 900 transferred 4 gal to another bucket
At 920 transfered 4 gal to another bucket

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-1

Well Diameter (inches): 1"

Screen Interval (feet bgs): 7.5 - 22.5' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1030

Date: 6/24/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 14.68' BTOC

Well Depth (feet bgs): ~22.5'

Well Volume: 0.31 gal

Pump Intake Depth (feet BTOC): ~5' above bottom

Analyses/Notes: SW8260B WH = 0.2 ppm OBZ = 0.2 ppm PW = 0.0 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1002	14.68	Pump on	-	-	-	-	-	-	-	-	
1005	14.81	120	0.36	25.27	1.53	0.31	-	6.84	-113	212	Lots of sediment
1008	14.88	120	0.72	24.12	1.52	0.00	-	6.81	-127	184	in sampling/purge tube
1011	14.91	120	1.08	23.75	1.54	0.00	-	6.77	-130	174	
1014	14.95	120	1.44	23.52	1.54	0.00	-	6.78	-133	173	
1017	14.96	150	1.80	23.35	1.54	0.00	-	6.75	-134	146	
1020	15.00	150	2.25	23.04	1.55	0.00	-	6.78	-136	139	
1023	15.02	150	2.70	23.16	1.54	0.00	-	6.77	-136	130	
1026	15.09	150	3.15	23.12	1.54	0.00	-	6.77	-137	120	
1030	Collected	sample		UN 611-R1-040							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-2

Well Diameter (inches): 1"

Screen Interval (feet bgs): 7.7 - 22.7' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1430

Date: 6/23/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 5.89' BTOC

Well Depth (feet bgs): ~22.7' bgs

Well Volume: 0.67 gal ; 3-well vol. = 7.6 L

Pump Intake Depth (feet BTOC): ~5' above TD

Analyses/Notes: SW8260B/ CO_2 WH = 0.2 ppm OB = 0.1 ppm PW = 0.2 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1355	5.89	Pump on	-	-	-	-	—	-	-	-	
1400	6.09	150	0.75	20.86	3.22	1.12	~~6.1~~ kN	7.05	13	6.6	
1403	6.20	150	1.20	19.27	3.29	0.08	~~6.0~~ kN	6.98	-32	2.4	
1406	6.39	150	1.65	18.33	3.32	0.00	~~5.9~~ kN	6.97	9	1.2	
1409	6.52	150	2.10	18.83	3.27	0.00	~~5.7~~ kN	6.94	10	0.6	
1412	6.57	300	3.00	17.14	3.32	0.00	~~5.7~~ kN	6.97	6	1.5	Increased purge rate
1415	6.57	300	3.90	16.58	3.33	0.00	~~5.8~~ kN	6.96	6	0.5	
1418	6.72	300	4.80	16.48	3.31	0.00	~~5.9~~ kN	6.93	7	1.5	
1424	6.79	300	6.60	17.00	3.28	0.00	~~5.9~~ kN	6.90	9	1.8	
1427	6.90	300	7.50	16.61	3.30	0.00	~~5.8~~ kN	6.88	11	2.9	
1430	Collected	sample	UNB	11-R2-	040						
											Hach Fe^{2+} = 0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-3

Well Diameter (inches): 1" piezometer

Screen Interval (feet bgs): 8.6' – 18.6'

Pump/Purging Device: Peripump

Sample Time: 1400

Date: 6/23/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 6.51

Well Depth (feet bgs): ~18.6

Well Volume: 12.09 × 0.65 = 1.81 L × 3 = 5.43 L

Pump Intake Depth (feet BTOC): ~17.6

Analyses/Notes: SW8260B and CO_2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.4 ppm OBZ PID = 0.1 ppm Bucket PID = 0.2 ppm
1326	6.51	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
1331	6.89	300	1.5 L	28.05	1.29	1.19	—	6.66	-95	52.6	*Observed black sediment/
1334	6.93	150	1.75 L	27.47	1.31	1.10	—	6.69	-100	38.3	flakes in the gw
1337	7.04	150	2.25 L	26.94	1.32	0.95	—	6.69	-104	27.2	
1340	7.05	150	2.75 L	26.62	1.31	0.79	—	6.68	-108	21.5	
1343	7.07	150	3.5 L	26.53	1.31	0.73	—	6.69	-110	12.6	
1346	7.15	150	4.0 L	26.49	1.31	0.67	—	6.68	-112	11.6	*Due to drawdown, purge
1349	7.23	150	4.5 L	26.56	1.30	0.58	—	6.69	-114	7.6	3 well volumes
1352	7.28	150	5.0 L	26.70	1.29	0.53	—	6.69	-116	5.5	
1355	7.32	150	5.75 L	26.74	1.28	0.49	—	6.70	-119	5.2	
1400	Collected sample				UN611-R3-060						*When doing straw
											method, black flakes
											were in tubing. Tried
											to purge most out
											but some got in the
											sample.

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-4

Well Diameter (inches): 1" Piezometer

Screen Interval (feet bgs): 8.3' - 23.3'

Pump/Purging Device: Peripump

Sample Time: 1500

Date: 6/23/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 6.69

Well Depth (feet bgs): 23.3'

Well Volume: 16.61 × .15 = 2.49 L × 3 = 7.47 L

Pump Intake Depth (feet BTOC): 22.3

Analyses/Notes: SW8260B and CO_2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.2 ppm OBZ PID = 0.2 ppm Bucket PID = 0.2 ppm
1430	6.69	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
1435	6.80	250	0.5L	21.45	1.50	1.30	—	6.87	-126	85.0	Orange filings in purge water
1438	6.80	250	1.25L	20.04	1.51	1.07	—	6.84	-129	21.4	YSI can't fit down 1" drawdown tube
1441	6.81	250	2.0L	19.63	1.51	0.90	—	6.81	-130	9.7	
1444	6.83	250	3.0L	19.26	1.50	0.80	—	6.81	-131	5.2	
1447	6.84	250	4.0L	19.07	1.50	0.72	—	6.80	-131	3.6	*When doing straw method,
1450	6.84	250	4.75L	19.06	1.50	0.65	—	6.78	-130	3.7	2nd & 3rd purges produced
1453	6.85	250	5.5L	18.94	1.49	0.59	—	6.76	-129	3.3	GW that had brown particulate
1456	6.85	250	6.25L	18.85	1.48	0.52	—	6.74	-127	2.7	matter and had a tan tint.
1500	Collected sample										Original purge GW in sample
											was much clearer

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low Flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-5

Well Diameter (inches): 1" peristaltic

Screen Interval (feet bgs): 8.5 - 23.5

Pump/Purging Device: Peri pump

Sample Time: 0905

Date: 6/29/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 9.94

Well Depth (feet bgs): ~23.5

Well Volume: 13.56' × 0.15 = 2.03 × 3 = 6.1 L

Pump Intake Depth (feet BTOC): ~22.5

Analyses/Notes: 5W8260B and CO_2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.0 ppm OBZ PID = 0.0 ppm Bucket PID = 0.1 ppm
841	9.94	Pump on	-	-	-	-		-	-	-	*Added ~10 drops of HCl to VOAs
846	10.02	250	1 L	17.53	1.22	2.04	—	6.70	126	1.4	* YSI DO probe did not fit
849	10.04	250	2 L	16.86	1.18	1.50	—	6.70	105	0.0	down 1" well
852	10.06	250	2.75 L	16.72	1.15	1.22	—	6.71	95	0.0	
855	10.07	325	4 L	16.80	1.14	1.03	—	6.71	86	0.7	
858	10.06	250	5 L	16.88	1.14	0.90	—	6.68	83	0.0	
901	10.08	250	5.75 L	16.91	1.14	0.85	—	6.71	82	0.0	
904	10.08	250	6.5 L	16.92	1.14	0.79	—	6.71	81	0.0	
905	Collected sample			UN611-R5-060							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-6

Well Diameter (inches): 1"

Screen Interval (feet bgs): 9.0-29.0' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1435

Date: 6/21/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 16.56' BTOC

Well Depth (feet bgs): 29.0' BTOC (6/18/10

Well Volume: 0.50 gal

Pump Intake Depth (feet BTOC): ~24.0' BTOC

Analyses/Notes: SW8260B/ CO_2 WH = 0.4 ppm OBZ = 0.4 ppm PW = 0.3 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1405	16.56	Pump on	-	-	-	-	–	-	-	-	NM = YSI 85 DO meter
1410	16.57	150	1.5	26.91	1.69	0.09	NM	5.33	-30	8.6	will not fit in 1" well
1413	16.79	150	1.95	24.65	1.75	0.00	–	5.30	-37	6.4	
1416	16.61	150	2.4	25.22	1.73	0.00	–	5.30	-42	5.3	
1419	16.61	150	2.85	25.21	1.69	0.20	–	5.08	-46	5.8	
1422	16.59	150	3.3	21.50	1.83	0.00	–	5.21	-42	4.7	
1426	16.62	150	3.90	20.68	1.83	0.00	–	5.16	-40	2.3	
1429	16.59	150	4.35	20.92	1.83	0.00	–	5.13	-42	2.9	
1432	16.60	150	4.80	21.08	1.83	0.00	–	5.12	-41	2.9	
1435	Collected	sample	UNb11-R-6-060								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

LOW FLOW

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-7

Well Diameter (inches): 1"

Screen Interval (feet bgs): 10.0-25.0' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1655

Date: 6/23/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 8.79' BTOC

Well Depth (feet bgs): 25.0' bgs

Well Volume: 0.65 gal.

Pump Intake Depth (feet BTOC): ~20.0' BTOC

Analyses/Notes: SW8260 B/ CO_2 WH = 0.3 ppm OBZ = 0.3 ppm PW = 0.2 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1615	8.79	Pump on	-	21.85	1.03	6.28	~~7.1~~ KW	6.71	-58	16.0	DO Measured using
1618	8.82	120	0.36	21.91	1.02	5.85	~~7.2~~ KW	6.71	-59	16.7	LISA Hach
1621	8.81	120	0.72	21.96	1.02	5.61	~~7.2~~ KW	6.72	-62	16.0	
1624	8.81	120	1.08	21.89	1.02	5.45	~~7.1~~ KW	6.72	-64	16.6	
1627	8.81	120	1.44	21.66	1.03	5.29	~~7.1~~ KW	6.73	-67	16.1	
1630	8.81	120	1.80	21.30	1.05	5.13	~~7.1~~ KW	6.75	-69	16.8	
1633	8.81	120	2.26	21.33	1.04	4.84	~~7.2~~ KW	6.80	-75	17.6	
1636	8.81	120	2.62	21.42	1.04	4.45	~~7.2~~ KW	6.71	-71	17.9	
1639	8.81	120	2.98	21.29	1.04	3.78	~~7.3~~ KW	6.70	-72	18.9	
1642	8.81	120	3.34	21.20	1.05	3.53	~~7.3~~ KW	6.71	-72	18.8	
1645	8.81	120	3.70	20.96	1.05	3.28	~~7.3~~ KW	6.73	-75	18.9	Hach Fe^{2+} = 0.4 mg/L
1648	8.81	120	4.06	20.72	1.04	3.11	~~7.3~~ KW	6.75	-78	18.6	
1651	8.81	120	4.42	20.93	1.04	2.97	~~7.4~~ KW	6.75	-77	19.4	
1654	8.81	120	4.78	20.58	1.04	2.92	~~7.4~~ KW	6.74	-77	19.1	
1655	Collected	sample	VN611-R7-060								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-10

Well Diameter (inches): 1"

Screen Interval (feet bgs): 6.5 - 21.5' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 0920

Date: 6/24/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 9.38' BTOC

Well Depth (feet bgs): 21.5' bgs (6/18/10)

Well Volume: 0.48 gal

Pump Intake Depth (feet BTOC): ~16.5' BTOC

Analyses/Notes: SW8260B/CO_2 WH = 0.2 ppm DBZ = 0.2 ppm PW = 0.2 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
0850 ~~0845~~	9.38	Pump on	-	-	-	-		-	-	-	
~~0848~~	~~9.51~~			~~26.33~~							NH 6/24/11
0853	9.38	Pump on	–	–	–	–	–	–	–	–	
0856	9.51	150	0.45	22.27	1.51	0.42	–	6.65	78	0.2	
0859	9.51	150	0.90	21.08	1.56	0.09	–	6.71	39	1.8	
0902	9.51	150	1.35	19.49	1.62	0.26	–	6.74	24	0.0	
0905	9.51	150	1.80	19.25	1.63	0.06	–	6.71	17	0.0	
0908	9.51	150	2.25	19.16	1.63	0.00	–	6.70	11	0.0	
0911	9.51	150	2.70	19.16	1.63	0.00	–	6.72	6	0.0	
0914	9.52	150	3.15	19.13	1.63	0.00	–	6.69	6	0.0	
0917	9.51	150	3.60	19.07	1.63	0.00	–	6.73	-1	0.0	
0920	Collected		Sample VN611-R10-060								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

[Low Flow]

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R11

Well Diameter (inches): 1" piezometer

Screen Interval (feet bgs): 9.1' – 19.1'

Pump/Purging Device: Peripump

Sample Time: 1110

Date: 6/23/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): ~~10.42~~ 9.12

Well Depth (feet bgs): 19.1'

Well Volume: 8.98 × 0.16 = 1.44 gal × 3 = 4.32 gal

Pump Intake Depth (feet BTOC): ~ 18'

Analyses/Notes: SW8260B, CO_2

Time	Water Level (ft BTOC) 9.12	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.5 ppm; OBZ PID = 0.5 ppm; Bucket PID = 0.5 ppm (Background Level)
1042	~~10.42~~	Pump on	-	-	-	-		-	-	-	*Added ~10 drops of HCl in VOA
1045	9.22	150	0.5	24.08	1.29	2.40	—	6.76	-11	5.3	* YSI ProODO did not fit down 1" piezometer
1048	9.24	150	0.75	22.90	1.28	1.57	—	6.73	-24	3.6	
1051	9.30	150	1.0	21.86	1.29	1.25	—	6.74	-32	4.0	
1054	9.33	150	1.5	21.40	1.29	1.06	—	6.74	-37	4.0	
1057	9.38	200	2.0	20.95	1.30	0.93	—	6.73	-40	3.6	
1100	9.41	200	2.75	20.71	1.30	0.82	—	6.73	-43	3.5	
1103	9.47	200	3.5	20.62	1.30	0.71	—	6.73	-45	3.7	
1106	9.53	200	4.25	20.56	1.29	0.65	—	6.73	-47	3.7	
1110	Collected Sample										

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

[Low Flow]

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: R-12

Well Diameter (inches): 1"

Screen Interval (feet bgs): 6.9' - 16.9'

Pump/Purging Device: Peri pump

Sample Time: 1200

Date: 6/23/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 7.35

Well Depth (feet bgs): 16.9'

Well Volume:

Pump Intake Depth (feet BTOC): ~16'

Analyses/Notes: SW8260B and CO_2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID= 0.5 ppm OBZ PID= 0.5 ppm Bucket PID= 0.5 ppm
1128	7.35	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
1131	7.45	300	0.75	21.61	2.24	2.36	—	6.45	-37	2.3	
1134	7.46	250	1.25	20.51	2.27	2.08	—	6.50	-48	1.8	
1137	7.47	250	1.75	20.14	2.30	1.57	—	6.50	-55	1.7	
1140	7.49	250	2.0L	19.87	2.30	1.21	—	6.50	-71	2.0	
1143	7.51	250	2.5L	19.30	2.33	1.09	—	6.49	-86	2.1	
1146	7.52	250	3.0L	19.68	2.30	0.91	—	6.49	-99	2.3	
1149	7.54	250	3.5L	19.52	2.29	0.85	—	6.49	-104	2.3	
1152	7.55	250	4.0L	19.31	2.28	0.77	—	6.49	-111	2.3	
1155	7.56	250	4.75L	19.14	2.28	0.70	—	6.48	-113	2.4	
1200	Collected sample			UN6 11-R12-060							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: TW-1

Well Diameter (inches): 2"

Screen Interval (feet bgs): 21.9 - 26.2

Pump/Purging Device: Peripump

Sample Time: 1530

Date: 6/21/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 13.87

Well Depth (feet bgs): ~27.4

Well Volume:

Pump Intake Depth (feet BTOC): ~26

Analyses/Notes:

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.0 ppm OBZ PID = 0.0 ppm Bucket PID = 0.0 ppm
1454	13.87	Pump on	-	-	-	-		-	-	-	*When turned on, pumped air into well
1457	14.09	300	0.25	18.74	1.05	4.55	12.23	6.62	-126	37.0	
1500	14.10	300	0.5	18.20	1.06	2.97	11.78	6.69	-138	19.9	
1503	14.10	300	0.75	17.63	1.11	2.19	11.09	6.67	-144	12.5	*Moved PSI probe up & down in GW
1506	14.10	300	1 gal	17.52	1.12	1.80	0.03	6.59	-143	20.8	
1509	14.10	300	1.25	17.47	1.16	1.50	0.10	6.66	-150	10.1	
1512	14.10	300	1.5	17.69	1.17	1.16	0.07	6.64	-152	14.9	
1515	14.10	300	1.75	17.58	1.21	1.03	0.03	6.63	-154	13.8	
1518	14.10	300	2.0	17.67	1.23	0.87	0.08	6.60	-151	8.6	
1521	14.10	325	2.25	17.46	1.24	0.79	0.10	6.57	-150	8.3	
1524	14.11	325	2.6	17.41	1.24	0.72	0.13	6.59	-151	7.4	AK
1530	Collected	Sample		UN611-TW1-040			&	UN611-TW1-041			

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Page _____ of _____

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: TW-2A

Well Diameter (inches): 2"

Screen Interval (feet bgs): 10.3 - 19.9' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1255

Date: 6/23/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 8.41' BTOC

Well Depth (feet bgs): ~ 24.2'

Well Volume: 2.52 gal ; 3-well vol. = 28.7 L

Pump Intake Depth (feet BTOC): ~ 19.5' BTOC

Analyses/Notes: See Sample Log WH = 0.3 OBZ = 0.2 ppm PW = 0.4 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1154	8.41	Pump on	-	-	-	-	–	-	-	-	
1158	9.28	150	0.60	24.96	1.41	0.18	0.1	6.92	142	95.8	
1203	10.29	500	3.1	19.40	1.45	0.00	0.1	6.90	137	34.2	Increased flow rate
1208	–	500	5.6	19.25	1.38	0.47	0.0	6.90	130	20.6	
1213	11.30	500	8.1	19.03	1.38	0.67	0.0	6.90	125	18.0	
1218	–	500	10.6	19.05	1.39	0.77	0.0	6.89	123	15.2	
1223	13.00	500	13.1	19.05	1.43	0.58	0.0	6.89	120	15.8	
1228	–	500	15.6	19.06	1.45	0.42	0.0	6.89	118	17.0	
1233	13.98	500	18.1	19.16	1.48	0.35	0.0	6.89	116	16.7	
1238	–	500	20.6	19.18	1.48	0.28	0.0	6.88	113	17.8	
1243	14.32	500	23.1	19.21	1.49	0.17	0.0	6.90	110	21.2	
1248	–	500	25.6	19.18	1.49	0.05	0.0	6.91	104	21.2	Hach Fe^{2+} = 0 mg/L
1253	15.32	500	28.1	19.48	1.48	0.00	0.0	6.89	95	22.1	
1255	Collected	sample	VN611-TW2A-060								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: TW-3

Well Diameter (inches): 2"

Screen Interval (feet bgs): 15.3 - 19.5

Pump/Purging Device: Peristaltic pump

Sample Time: 1530

Date: 6/26/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 13.86

Well Depth (feet bgs): ~21.4

Well Volume: 7.54 × 0.16 = 1.2 × 3 = 3.6 gal

Pump Intake Depth (feet BTOC): 2.5 ft off the bottom (~19 ft bgs)

Analyses/Notes: SW8260B, SW8150B Mod, CO_2, VFA

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.1 ppm; ~~O2~~ PID = 0.1 ppm; Bucket PID = 0.1 ppm
1500	13.86	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
1504	14.02	170	~0.1 gal	33.11	0.955	1.51	-0.14	6.82	252	29.3	
1507	14.07	170	~0.3 gal	26.88	1.00	1.10	-0.17	6.69	232	26.2	
1510	14.08	225	~0.4 gal	25.55	0.994	0.90	-0.19	6.66	209	22.1	
1513	14.10	225	~0.6 gal	23.82	0.998	0.79	-0.23	6.74	183	22.1	
1516	14.13	225	~0.8 gal	23.22	0.989	0.70	-0.23	6.64	162	21.0	
1519	14.15	225	~1.0 gal	22.85	0.988	0.65	-0.24	6.73	143	21.5	
1522	14.14	225	~1.2 gal	22.51	0.987	0.60	-0.22	6.62	145	20.9	
1525	14.17	225	~1.4 gal	22.33	0.987	0.57	-0.21	6.59	143	20.0	
1530	Collected sample			UNW011 -		TW3 -	060				

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

[3 Well Volumes]

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: TW-4

Well Diameter (inches): 2"

Screen Interval (feet bgs): 12.3 – 16.5

Pump/Purging Device: Peripump

Sample Time: 1620

Date: 6/23/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 5.90

Well Depth (feet bgs): ~17.8

Well Volume: 11.9 × 0.16 = 1.9 gal × 3 = 5.7 gal

Pump Intake Depth (feet BTOC): 15.8

Analyses/Notes: SW8260B and CO_2

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 2.3 ppm DBZ PID = 0.4 ppm Bucket PID = 0.8 ppm
1525	5.90	Pump on	-	-	-	-		-	-	-	*Added ~10 drops HCl to VOAs
1530	7.09	350→250	0.75 gal	17.91	1.40	0.93	—[A]	6.64	-86	20.4	[A] Batteries died; Replaced & recalibrated w/ 100% DO
1540	6.55	250	1.25 gal	18.33	1.39	0.59	—	6.57	-101	8.1	*Due to drawdown, purged 3
1542	6.91	450	2 gal	16.87	1.37	0.48	—	6.58	-105	10.2	well volumes
1547	7.08	500	2.5 gal	16.27	1.38	0.42	0.30	6.51	-106	15.1	
1552	7.32	600	3.25 gal	16.30	1.37	0.37	0.01	6.49	-111	3.7	
1557	7.39	600	4.0 gal	16.15	1.37	0.34	-0.04[B]	6.43	-112	2.2	[B] Recalibrate w/ zero DO & 100% DO
1602	7.46	600	4.5 gal	16.14	1.37	0.30	—	6.60	-130	4.5	
1607	7.48	600	5.3 gal	16.16	1.36	0.28	—	6.59	-139	0.9	
1612	7.48	600	6.5 gal	16.23	1.36	0.26	—[C]	6.52	-154	4.7	[C] YSI still reading -DO ∴ will need another zero solution
1620	Collected sample			UN611-TW4-060							

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Page _____ of _____

At 1558, moved 4 gal to another bucket

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: USD-1

Well Diameter (inches): 2"

Screen Interval (feet bgs): 6'-21'

Pump/Purging Device: Peri pump

Sample Time: 1210

Date: 6/22/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 9.15

Well Depth (feet bgs): ~21'

Well Volume: 11.85 x 0.16 = 1.9 gal x 3 = 5.7 gal

Pump Intake Depth (feet BTOC): ~20'

Analyses/Notes: SW8260B, SW8015Mod, CO_2, TOC, Alkalinity, E300

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments: Wellhead PID = 0.1 ppm; OBZ PID = 0.1 ppm; Bucket PID = 0.1 ppm
1121	9.15	Pump on	-	-	-	-		-	-	-	*Added ~10 drops of HCl to VOA
1124	10.13	300	0.42 gal	20.87	3.89	7.26	7.70	7.10	130	80.1	*Due to drawdown, purge
1129	10.75	300	1 gal	18.00	4.00	6.25	7.71	7.09	145	33.1	3 well volumes
1134	11.21	350	1.5 gal	17.47	3.92	5.99	7.72	7.08	150	19.4	
1139	11.97	350	2 gal	16.88	3.97	5.95	7.72	7.09	153	37.1	
1144	12.53	350	2.5 gal	16.45	3.96	6.34	7.71	7.06	157	20.3	
1149	13.03	375	3 gal	16.54	3.96	6.26	7.70	7.05	159	17.1	
1154	13.45	375	3.75 gal	16.88	3.94	6.52	7.69	7.03	158	12.0	
1159	13.96	375	4.5 gal	16.73	3.95	6.27	7.68	7.00	162	8.4	
1204	14.77	375	5.25 gal	16.68	4.00	6.14	7.68	7.04	161	10.7	
1209	15.82	375	6.00 gal	16.87	4.01	6.00	7.61	7.03	162	46.7	
1210	Collected samples				UN611-USD1-060	and		UN611-USD1-061			Fe = 0.0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: USD-2

Well Diameter (inches): 2

Screen Interval (feet bgs): 6-21

Pump/Purging Device: Peri pump

Sample Time: 1335

Date: 6/22/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 10.13

Well Depth (feet bgs): ~20.7

Well Volume: 10.57 × 0.16 = 1.69 gal × 3 = 5.07 gal

Pump Intake Depth (feet BTOC): ~20.0

Analyses/Notes: SW8260B, SW8015Mod, CO_2, TOC, Alkalinity, E300

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Well head PID = 0.0 ppm OBZ PID = 0.0 ppm Bucket PID = 0.0 ppm
1252	10.13	Pump on	-	-	-	-		-	-	-	*Added ~10 drops of HCl of VOA
1255	10.43	250	0.75 L	23.51	2.66	4.73	2.82	7.04	119	27.8	
1258	10.60	250	0.5 gal	21.75	2.64	3.95	2.85	7.00	134	16.7	
1301	10.70	250	1.0 gal	20.82	2.67	3.46	2.85	7.03	138	16.3	*Due to drawdown, purge
1306	11.25	500	1.5 gal	19.76	2.63	3.06	2.74	7.01	146	13.8	for 3 well volumes,
1311	11.60	500	2.0 gal	19.39	2.73	2.78	2.41	6.96	150	12.7	
1316	11.95	500	2.75 gal	19.43	2.77	2.60	2.35	6.91	154	12.7	
1321	12.20	600	3.75 gal	18.95	2.80	2.43	2.40	6.96	151	11.7	
1326	12.37	600	4.75 gal	18.97	2.79	2.52	2.46	6.95	153	10.5	
1331	12.57	600	5.5 gal	19.10	2.78	2.63	2.58	6.94	154	9.4	
1335	Collected sample			LN611-USD2-060							Fe = 0.0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: USD-3

Well Diameter (inches): 2"

Screen Interval (feet bgs): 6'-21'

Pump/Purging Device: Peri pump

Sample Time: 1545

Date: 6/22/11

Field Personnel: Kim Nguyen, Anna Kunkel

Initial Water Level (feet BTOC): 10.14

Well Depth (feet bgs): ~21'

Well Volume: 10.86 x 0.16 = 1.74 gal x 3 = 5.22 gal

Pump Intake Depth (feet BTOC): ~20'

Analyses/Notes: SW8260B, SW8015BMod, CO_2, TOC, Alkalinity, E300

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.0 ppm OBZ PID = 0.0 ppm Bucket PID = 0.1 ppm
1458	10.14	Pump on	-	-	-	-		-	-	-	* Added ~10 drops of HCl to VOAs
1503	10.65	300	0.3 gal	20.30	1.26	7.60	4.35	6.95	127	1.1	* Due to drawdown, purge
1508	11.13	300	0.75 gal	19.02	1.25	6.34	4.35	6.94	140	0.0	3 well volumes
1513	11.66	400	1.4 gal	17.66	1.25	6.46	4.33	6.90	146	0.0	
1518	12.45	500	2.25 gal	17.33	1.28	6.09	4.32	6.89	148	0.0	
1523	13.18	500	2.9 gal	17.10	1.29	5.76	4.30	6.81	155	0.3	
1528	13.88	500	3.75 gal	17.12	1.27	5.66	4.27	6.82	157	1.1	
1533	14.61	500	4.5 gal	16.85	1.28	5.14	4.19	6.80	159	2.9	
1538	15.25	500	5.0 gal	16.89	1.31	4.76	4.07	6.97	152	1.7	
1543	15.86	500	6.0 gal	17.03	1.33	4.55	3.60	6.99	154	2.5	
1545	Collected sample			UN611-USD3-060							Fe = 0.0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

3 Well Volumes

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Date: 6/22/11

Location: Wichita, Kansas

Field Personnel: Kim Nguyen, Anna Kunkel

Well Identification: USD-4

Initial Water Level (feet BTOC): 10.09

Well Diameter (inches): 2"

Well Depth (feet bgs): 23 / 7.9 AK

Screen Interval (feet bgs): 10.5 - 22.5

Well Volume: 12.91' x 0.61 = 7.9 L x 3 = 23.7 L

Pump/Purging Device: Peripump

Pump Intake Depth (feet BTOC): ~1 ft off bottom ; ~ 22

Sample Time: 1040

Analyses/Notes: SW8260B, SW8015Mod, CO_2, TOC, alkalinity, E300

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
											Wellhead PID = 0.0 ppm; [redacted] PID = 0.0 ppm; [redacted] PID = 0.0 ppm
935	10.09	Pump on	-	-	-	-		-	-	-	* Added ~10 drops of HCl to VOA
940	10.75	200	-	17.83	1.39	6.96	4.08	7.15	131	23.3	* Used YSI Pro ODO, instead of YSI 85 for DO measurements
945	11.30	360	~2.5	16.67	1.39	6.54	4.07	7.18	127	13.8	
950	11.89	375	~4.2	16.31	1.39	6.04	4.06	7.17	124	14.7	* Due to drawdown, purged 3 well volumes
955	12.55	450	~6.5	16.25	1.39	5.64	4.05	7.18	127	20.0	
1000	13.23	450	~9.0	16.06	1.34	5.58	4.05	7.16	136	37.0	
1005	13.78	450	~11.0	16.17	1.43	5.13	4.06	7.12	137	33.3	
1010	14.21	450	~13.25	16.30	1.45	4.93	4.04	7.10	140	23.5	
1015	14.93	500	~15.0	16.32	1.46	4.71	4.21	7.17	139	25.5	
1020	15.34	500	~17.5	16.65	1.47	4.83	4.27	7.09	143	21.3	
1025	15.91	500	~20.0	16.21	1.50	4.88	4.25	7.16	140	9.8	
1030	16.32	500	~22.0	16.22	1.51	4.81	4.23	7.15	142	9.3	
1035	16.68	500	~24.0	16.39	1.51	6.11	4.00	7.12	147	9.9	
1040	Collected samples			UN611-USD4-040			and UN611-USD4-041				Fe = 0.0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

* 13 L into orange bucket

3-well volume

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: USD-MW-3

Well Diameter (inches): 2"

Screen Interval (feet bgs): 15.0 - 19.6' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1135

Date: 6/22/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 9.82' BTOC

Well Depth (feet bgs): ~21.4 (3/23/11)

Well Volume: 1.85 gal, 3-well vol. = 5.56 gal, 21 L

Pump Intake Depth (feet BTOC): ~ 17.5' BTOC

Analyses/Notes: See Sample Log WH = 0 ppm OBZ = 0 ppm PW = 0.1 ppm

Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
1039	9.82	Pump on	-	-	-	-		-	-	-	
1042	10.98	200	0.6	20.01	4.74	6.12	8.2	7.20	55	18.5	
1045	12.15	200	1.2	19.08	4.83	6.14	8.2	7.21	96	11.5	
1048	13.21	200	1.8	18.80	4.85	6.02	8.2	7.21	105	11.1	
1051	13.58	200	2.4	18.69	4.86	6.05	8.2	7.19	114	64.4	
1055	14.34	200	3.2	18.74	4.85	6.02	8.2	7.19	119	63.2	
1058	15.28	500	4.7	17.31	4.92	6.52	8.2	7.18	125	9.5	Increased purge rate
1103	15.79	500	7.2	16.75	4.92	6.45	8.2	7.18	127	14.1	
1108	17.08	500	9.7	16.79	4.92	6.11	8.1	7.17	133	10.8	
1113	17.98	500	12.2	16.90	4.81	6.12	7.2	7.19	135	10.8	
1118	18.96	500	14.7	16.99	4.81	5.88	7.3	7.19	140	17.8	
1121	19.58	500	16.2	17.11	4.85	5.78	8.4	7.19	141	21.7	
1124	~~500~~ Well purged dry										
1135	Collected sample UW6112 USD-MW3-060										Hach Fe^{2+} = 0 mg/L

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Low-flow

Monitoring Well Purging Form

Project: Unocal Wichita - 2011 Annual GW Monitoring

Location: Wichita, Kansas

Well Identification: USD-MW-14

Well Diameter (inches): 2"

Screen Interval (feet bgs): 11.3 - 25.1' bgs

Pump/Purging Device: Peristaltic Pump

Sample Time: 1010

Date: 6/22/11

Field Personnel: John O'Neal, Nathan Henry

Initial Water Level (feet BTOC): 12.30' BTOC

Well Depth (feet bgs): ~27.8 (6/16/10)

Well Volume: 2.48 gal.

Pump Intake Depth (feet BTOC): ~5' above TD

Analyses/Notes: SW8260B WH = 0.3 ppm OBZ = 0.1 ppm PW = 0.2 ppm

	Time	Water Level (ft BTOC)	Purge Rate (mL/min)	Volume Purged (L or gal)	Temperature (°C) +/- 1°C	Specific Conductivity (mS/cm) +/- 3%	Horiba Dissolved Oxygen (mg/L) +/- 0.2 mg/L	YSI Dissolved Oxygen (mg/L) +/- 0.2 mg/L	pH (SU) +/- 0.2	Oxidation-Reduction Potential (mV) +/- 20 mV	Turbidity (NTU) +/- 10% or +/- 1 NTU	Comments
	0944	12.30	Pump on	-	-	-	-		-	-	-	YSI Pro ODO
0950	~~1000~~	12.35	200	1.2	20.49	1.18	2.24	0.00	6.78	-106	6.2	
0953	~~1003~~ AH 6/22/11	12.40	200	1.8	18.67	1.19	0.62	0.00	6.80	-112	6.2	
0956	~~1006~~	12.39	200	2.4	18.60	1.19	0.36	0.00	6.76	-113	5.9	
~~1000~~	1000	12.40	200	3.0	18.49	1.21	0.24	0.00	6.75	-113	4.7	
	1003	12.40	200	3.6	18.20	1.22	0.14	0.00	6.76	-114	6.8	
	1006	12.41	200	4.2	18.49	1.22	0.06	0.00	6.78	-117	5.9	
	1010	Collected	sample	VN611 - USD-MW14-040								

Well Diameter (in)	1	1.5	2	3	4	6	8	10
Volume (gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume (L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Project No. 41010111.02

TLE 2011 Annual GWM Event

Book No. 00492

om Page No. ____

Purpose: Synoptic Water Level Survey
Personnel: Nathan Henry (NWH), John P. O'Neal (JPO)
Anna Kunkel (AK), and Kim Nguyen (KAN)

1300 Tailgate health & safety meeting conducted by KAN.
Load all equipment
1335 Began synoptic water level survey. Early Bird Lawn Care on-site. Modified gauging JLA accordingly
1528 Completed gauging Unocal wells Off-site to Coleman facility.
1745 Both teams completed gauging activities at Coleman.
1755 Unloaded equipment at site trailer
1810 All VRS personnel off-site.

To Page No. ____

essed & Understood by me,

Date Mon.

Invented by:

Date

Recorded by:

Project No. 41010111.02
Book No. 00492 TITLE 2011 Annual GWM Event

m Page No. ____

Purpose = Begin groundwater sampling
Personnel: William Henry (WNH), John P. O'Neal (JPO)

0700 Arrived on-site. Loaded equipment. Tailgate HRS meeting conducted by Kim Nguyen.
0754 JPO calibrates Horiba U-52
pH 4.0 Cond 4.09 NTU 0.0 10.37 mg/l DO 0.0-121.7
0815 JPO calibrated PID using 100 ppm Isobutylene = 100.5 ppm
0845 Set up on MW-24, WNH calibrates YSI 85
DO = 87.7%, 8.21 mg/L @ 22.7°C
0935 Collected sample UN611-MW24-040
0942 WNH replaced/installed membrane cap on YSI 85 and recalibrated instrument
DO = 8.49 mg/L @ 21.1°C
0951 Reinstalled probe down MW-24. Measurements recorded on purge form.
1004 Set up on MW-8
1018 Pump on
1033 Switched to 3-well volume purge method due to well drawing down at lowest sustainable rate.
1125 Collected sample UN611-MW8-050
1200 Left site for lunch
1250 Set up on MW-9
1304 Pump on
1340 Collected sample UN611-MW9-040
1355 Set up on R-6
1405 Pump on
1435 Collected sample UN611-R6-060
1508 Set up on MW-26
1518 Pump on
1545 Collected sample UN611-MW26-040
1600 JPO unloaded equipment, WNH assisted KAN with packing coolers.
1656 All URS personnel off-site.

To Page No. ____

nessed & Understood by me, | Date Tue. 6/21/11 | Invented by: | Date
Recorded by:

Project No. 41010111.02

TITLE 2011 Annual GWM Event

Book No. 00492

From Page No. ____

Purpose: Groundwater Sampling (VSD Wells)
Personnel: Nathan Henry (WNH), John P. O'Neal (JPO)

0710 Arrived on-site. Began loading equipment in trucks.
0721 JPO calibrates U-52 Horiba
pH 4 = 4.0 S.U.
Conductivity = 4.48 mS/cm
Turbidity = 0.1 NTU
D.O. = 9.16 mg/L
D.O. % = 109.1 %

0747 WNH calibrated YSI 85
DO % = 100.2% @ 21.9°C
DO = 8.76 mg/L

0847 JPO and WNH signed in at VSD. Obtained Visitor's badges. Met w/ Mark Sandfort (Golder Assoc.)
0900 Calibrated YSI Pro ODO
Pre-cal: Post-cal:
DO (Zero) 3%, 0.2 mg/L @ 26.2°C 0%, 0 mg/L
Cross-check in DI water = 7.3 mg/L @ 24.7°C
DO (Sat. Air) 87% 97%
0930 Set up on MW-14
0944 Pump on
1010 Collected sample UN611-VSD-MW14-040, split samples w/ Golder
1028 Set up on MW-3
1039 Pump on
1135 Collected sample UN611-VSD-MW3-060, split samples
1220 Set up on MW-5
1235 Pump on
1258 Well purged dry.
1312 Outlet hose not connected to flow-thru cell. Hooked up flow-thru cell and restarted pump in order to record field parameters.
1325 Collected sample UN611-VSD-MW5-063

To Page No. ____

Witnessed & Understood by me, | Date Wed. | Invented by: | Date

Project No. 41010111.02

Book No. 00492 TITLE 2011 Annual GWM Event

m Page No. ____

(continued)

1504 Set up on PMW-4

1515 Pump on

1625 Collected sample VN611-PMW4-040

1705 Unloaded equipment and began preparing sample coolers and tomorrows HCl VOAs.

1843 All URS personnel off-site to Fedex for sample shipment.

To Page No. ____

nessed & Understood by me,	Date Wed. 6/22/11	Invented by:	Date
		Recorded by:	

TITLE 2011 Annual GWM Event

Project No. 41010111.02
Book No: 00492

From Page No. ____

Purpose: Annual Groundwater Sampling
Personnel: Nathan Henry (NNH), John P. O'Neal (JPO)

0710 Arrived on-site. Began loading sampling equipment/instruments.
0720 Kim Nguyen calibrated YSI Pro ODO units (See logbook A00709)
0725 JPO calibrates Horiba U-52 and PID

Horiba U-52
pH - 4.0 S.U.
Conductivity - 4.46 mS/cm
Turbidity - 0.3 NTU
DO - 8.88 mg/L
DO % - 105.0

PID - Isobutylene (100 ppm
100.5 ppm

0755 Health & Safety Tailgate Meeting conducted by Kim Nguyen. Topics discussed include: Personal decontamination prior to eating or drinking, High-Visibility vests, and covering purge buckets with lids.

0825 Set up on PMW-7
0840 Pump on
0935 Collected sample UN611-PMW7-040
1007 Set up on MW-25
1018 Pump on
1125 Collected sample UN611-MW25-060
1149 Set up on TW-2A
1154 Pump on
1255 Collected sample UN611-TW2A-060
1320 Off-site for lunch
1332 Dumped purgewater at Unocal
1344 Set up on R-2
1430 Collected sample UN611-R2-040
1452 Set up on MW-18

To Page No. ____

Witnessed & Understood by me,	Date Thu. 6/23/11	Invented by:	Date
		Recorded by:	

Project No. 41010111.02
Book No. 00492 TITLE 2011 Annual GWM Event

Page No. ____

(continued)

1500 Pump on
1525 Collected sample VN611-MW18-063
1610 Set up on R-7
1615 Pump on
1655 Collected sample VN611-R7-060
1735 Unloaded equipment at site trailer
1815 WNH and DPO off-site to deliver samples to Fedex

To Page No. ____

ssed & Understood by me, | Date thu. 1/23/12 | Invented by: | Date | Recorded by:

Project No. 41010111.02
TITLE 2011 Annual GWM Event
Book No. 00492

From Page No. ____

Purpose: Annual Groundwater Sampling
Personnel: Nathan Henry (WNH), John P. O'Neal (JPO)

0710 Arrived on-site. Loaded sampling equipment/instruments.
0730 JPO calibrated Horiba U-52
pH = 4.01 S.U.
Conductivity = 4.49 mS/cm
Turbidity = 0.1 NTU
DO = 8.97 mg/L
DO(%) = 107.7 %
Temp = 22.71°C

0745 JPO calibrates PID Mini RAE 300
Cal gas = 100 ppm Isobutylene
PID = 100.5 ppm

0755 Health and safety meeting conducted by Kim Nguyen. Topics discussed included: Stop Work Authority, possible lightning/thunderstorms late afternoon, biological hazards, take frequent breaks.

0818 Set up on R-10
0853 Pump on
0920 Collected sample VN11-R10-060
0946 Set up on R-1. YSI Pro ODO calibrated by K. Nguyen (see logbook A00709)
Pump on at R-1
Collected sample VN611-R1-040
1055 Set up on MW-28
1100 Pump on
1150 Collected sample VN611-MW28-040

1210 Break for lunch on-site.

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(continued)

1310 Set up on MW-4
1316 Pump on
1425 Collected sample UN611-MW4-040

1433 Set up on P-18
1443 Pump on, well purged dry, 3-well vol. method
1515 Collected sample UN611-P18-010

1540 Unloaded sampling equipment in site trailer.

1640 JPO and WNH off-site.

WH

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Task: Phytro O&M Activities, Weed removal
Personnel: Nathan Henry, John P. O'Neal, Kim Nguyen, and Anna Kunkel

0920 WNH and JPO arrive on-site. Health & Safety Tailgate meeting conducted by K. Nguyen. Topics discussed include: body positioning and proper gloves for the task.

0935 WNH/JPO begin weed removal activities within plot C.

1315 All URS personnel off-site to Fedex to ship site files to Austin. WNH conducts LPO during drive to Fedex.

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Witnessed & Understood by me, | Date Sat. 6/25/11 | Invented by: | Date

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Task: Groundwater Sampling
Personnel: Nathan Henry (WNH), John P. O'Neal (JPO)

0705 WNH and JPO arrive on-site. Begin loading sampling equipment/instruments
0720 JPO calibrates Horiba U-52 and PID MiniRAE 3000

Horiba U-52	MiniRAE 3000
pH = 4.01 S.U.	102.2 ppm
Conductivity = 4.48 mS/cm	Cal gas = 100 ppm Isobutene
Turbidity = Ø NTU	
DO = 8.45 mg/L	
DO(%) = 109.0%	
Temp = 27.05°C	

0800 H&S meeting conducted by K. Nguyen. Topics discussed included: Heat stress/frequent breaks, slips/trips/falls, biological hazards.

0825 Set up on P-155
0859 Well purged dry following purging of approx. 3 liters. Will allow to recharge prior to sampling.
0913 Set up on P-145
0935 Well purged dry at lowest sustainable purge rate.
0943 Set up on P-165
1007 Collected sample UN611-P165-020

1042 Set up on P-6
1113 Collected sample UN611-P6-060

1328 Set up on P-11
1415 Collected sample UN611-P11-060

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(continued)

1443 Set up on P-16D

1550 Collected sample VN611-P16D-020

1616 Set up on P-15S to sample following recharge
DTW = 21.77' BTOC

1625 ~~Collected sample~~ Insufficient recharge. Will collect sample tomorrow

1638 Set up on P-14S
DTW = 16.18' BTOC

1645 VN611-P14S-020 sample collected

1700 Unloaded equipment and conducted housekeeping.

1800 All VRS personnel off-site. Defensive Driving LPO conducted.

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Task: Complete groundwater sampling activities on Unocal
Personnel: Nathan Henry (WNH), John O'Neal (JPO)

0715 WNH and JPO arrive on-site. Load equipment
0728 Horiba U-52 calibrated by JPO:
pH - 4.01 SU
Conductivity - 4.5 mS/cm
Turbidity - 0.0 NTU
DO - 8.28 mg/L
Temp - 28.42°C

0800 Tailgate H&S meeting conducted by Kim Nguyen.

0815 Set up on P155
DTW = 20.10' BTOC
0820 Collected sample UN611-P155-020

0850 Set up on P-14D
0940 Collected sample UN611-P14D-020/021, field duplicate

1022 Set up on P-5
1050 Collected samples UN611-P5-070/071, field duplicate

1130 Set up on P-12
1210 Collected sample UN611-P12-060

1255 Set up on P-10
1350 Collected sample UN611-P10-050

1425 Set up on P-16D in order to resample monitor well. Well sample may have been collected through flow-thru cell on previous days sampling event.
1530 Collected sample UN611-P16D-020
1545 Began unloading equipment in site trailer.

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(continued)

1545 Deconned all rental equipment. Packaged rental equipment for return shipment. Conducted housekeeping and organized Site Trailer

1600 K. Nguyen, A. Kunkel, and WWH packed sample coolers for shipment to Lancaster and MCS.

1620 JPD and WWH close PPE drum

1715 All URS personnel off-site to Fedex. Shipping samples and rental equipment.

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nessed & Understood by me, | Date Mon, 1/23/12 | Invented by: | Recorded by: | Date

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Task = Mobile Mini pickup
Personnel = Nathan Henry, John P. O'Neal, Anna Kunkel, and Kim Nguyen.

0800 JPO and NWH arrive on-site.
0812 Rec'd phone call from Tow Service regarding Mobile Mini pickup. Driver should arrive in approximately 30 minutes.
0855 Tow Service arrived on-site.
0930 Nathan Henry, K. Nguyen, and A. Kunkel offsite to return to Austin. JPO remains on-site

JPO

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ssed & Understood by me,	Date Tue. 1/28/11	Invented by:	Date
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Purpose: Mob to site, gauge all groundwater wells
Personnel: John O'Neal, Anna Kunkel, Nathan Henry, Kim Nguyen
Equipment: Solinst Water Level Interface
Weather: Windy, Warm, Some Rain

7:00 am Nate & Anna board plane in Austin
7:35 am Kim boards plane in Austin
* John drove in on Sunday
11:00 Kim, Nate, Anna arrive in Wichita
1:30 Meet John at site, Checked equipment/supplies
~~1:45~~ 2:00 AK Kim, Nate, Anna went to Lunch; Kim called Pine about tubing
2:45 Back onsite
3:00 H&S tailgate - reviewed JSAs
3:30 Kim & Anna left for USD, John & Nate onsite for gauging (see J&N notes)
* Mowing contractors arrived at site; J&N stop work to assess hazards of working near mowers
3:40 Kim - LPSA at USD-MW-14 & USD-MW-16 & Checked for poison ivy, Shin high grass surrounding well
1335 Kim & Anna check in at USD, proceed to USD-MW-14 & USD-MW-16
↳ See gauging log form

530 Completed USD & Hillman wells; Signed out of USD; Moved on to boundary wells
535 Entered Coleman property
702 Completed gauging of boundary wells; Checked in w/ J&N Gauge wells inside Coleman building
745 Completed gauging of wells inside Coleman building; When came outside, rain and lightning was observed; Since all wells gauged, meet at Unocal site in Minimobile; Unloaded equipment
810 Left site for the day.

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6/21/11 Project No. _____
Book No. 00709 TITLE Groundwater Sampling

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Purpose: Begin annual groundwater sampling event
Personnel: Kim Nguyen, Anna Kunkel, John O'Neal, Nathan Henry
Equipment: Peristaltic pump, Horiba, YSI 85, PID
Weather: Clear, Cool, High ~85

:00 Arrive onsite, Begin preping for day
:20 Daily Tailgate mtg; Reviewed JLAs; Discussed yesterday's LPO
:00 John O'Neal Calibrate ~~YSI~~ Horiba for Team #1;
~~YSI~~ Horiba pH = 4.0, Cond = 4.49, NTU = 0.0, DO = 9.42 mg/L
:20 KN calibrated PID
↳ KN talked to Derek Peacock (URS PM) about using YSI 85 instead of DO only meter
:45 Set up on MW-175 (stickup); Replaced YSI membrane
Recalibrated YSI DO = 8.10 @ 25.6°C
932 Started pump at MW-175 (see purge form)
000 Sample collected [UN611-MW175-040]; Removed tubing from well
30 Set up on MW-2 (flushmount)
* Note: MW-2 concrete base has eroded & well vault is wobbly
53 Started pump at MW-2 (see purge form)
25 Sample collected [UN611-MW2-040]
45 Left site for lunch, Performed LPO on driving
245 Back on site, Set up on MW-27 (stickup)
300 Started pumping on MW-27, No water observed - Fixed problem
320 Started pumping on MW-27 again (see purge form) (3 Well Volumes)
405 Sample collected [UN611-MW27-030]
415 Checked in with Nate & John, DO probes don't fit down 1" wells
435 Set up on TW-1
454 Started pump at TW-1 (flushmount) (see purge form)
530 Collected Samples [UN611-TW1-040] and [UN611-TW1-041]
543 Left Coleman site; Went to Former Unocal Site to pack samples and unload equipment; All waste drums are labeled (either Empty or Non-hazardous waste)
655 Left site for FedEx, drop off samples

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TITLE Groundwater Sampling

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Purpose: Continue annual groundwater sampling event (USD)
Personnel: Nathan Henry, Anna Kunkel, John O'Neal, Kim Nguyen; Mark Stanford (Golder)
Equipment: Peristaltic Pump, Horiba, PID, YSI ProODO
Weather: Clear, Cool, High ~89

7:00 Arrive onsite, Begin prepping for day
7:15 Calibrated PID to 100.0 ppm
7:30 KN calibrate Horiba for Team #1
Horiba pH = 4.0, Cond = 4.49 mS/cm, Turb = 0.0 NTU
8:00 Health & Safety Tailgate; JLAs; Reviewed JPO; Reviewed tasks for the day
8:20 Left site to pick up new optical DO meters
8:25 Completed LPO feedback session w/ Derek Peacock; Arrive at hotel & picked up equipment
8:45 Back on site; Calibrated DO for zero % solution and 100% DO saturation; Mark Sanford (USD) arrived at USD
9:15 Went to USD to check in and get badges
9:25 Set up on USD-4 (flush mount)
9:35 Turned on pump at USD-4 (see purge form)
10:40 Collected samples UN611-USD4-040 and UN611-USD4-041
11:00 Set up on USD-1 (flush mount)
11 21 Started pumping at USD-1 (see purge form)
1210 Collected samples UN611-USD1-060 and UN611-USD1-061
1245 Set up on USD-2 (flush mount)
1252 Started pumping at USD-2 (see purge form)
1335 Collected sample UN611-USD2-060
1400 Left site w/ Mark to go grab lunch
1445 Back on site
1450 Set up on USD-3 (flush mount)
1458 Started pumping at USD-3 (see purge form)
1545 Collected sample UN611-USD3-060
1600 Set up on PMW-5 (flush mount)
1610 Started pumping at PMW-5 (see purge form)
1715 Collected sample UN611-PMW5-040
1730 Back onsite; Packed sample coolers; Put away equipment
Picked up ice for samples
1840 Left site for FedEx; Drop off samples; Return YSI 85

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Purpose: Continue annual groundwater sampling event (Hillman / Coleman)
Personnel: Kim Nguyen, Anna Kunkel, John O'Neal, Nathan Henry, Chris Carey (KDHE)
Equipment: Peripump, Horiba, YSI ProODO, Solinst Water Level
Weather: Clear, Warm, High ~ 90

6:45 Left hotel, picked up ice
7:05 Arrive onsite, Started prepping for day
PID calibrated (99.5 ppm)
YSI ProODO calibrated - Team #1 Temp = 22.1°C, DO = 95.7%, DO = 8.35 mg/L
Team #2 Temp DO = 88%
Horiba calibrated - pH = 4.00 ; Cond = 4.49 mS/cm ; Turb = 0.1 NTU ; DO = 9.48 mg
750 Health & Safety tailgate meeting ; JLAs
820 Set up on PMW-8 (flush mount)
830 Turned on pump at PMW-8 (see purge form)
950 Collected samples [UN611-PMW8-040]
1015 Put gw waste in drums, Set up on ~~PMW8~~ R-11 (recovery well)
↳ Forgot smaller tubing, returned to site to get it
1042 Turned on pump at R-11 (see purge form); Chris Carey (KDHE) and Coleman on
1110 Collected sample [UN611-R11-060]; Split samples w/ Chris
1125 Set up on R-12 (recovery well)
1128 Turned on pump at R-12 (see purge form)
1200 Collected sample [UN611-R12-060]; Split samples w/ Chris
1215 Checked in w/ JO & NM, Dropped off waste at Former Unocal, Went to lunch w/ Chris
1315 Back onsite (Coleman) w/ Chris ; Set up on R-3 (recovery we
1326 Turned on pump at R-3 (see purge form)
1400 Collected sample [UN611-R3-060]; Split samples w/ Chris
1410 Chris Carey (KDHE) left site
1420 Set up on R-4 (recovery well)
1430 Turned on pump at R-4 (see purge form)
1500 Collected sample [UN611-R4-060]
1515 Set up on TW-4 (flush mount)
1525 Turned on pump at TW-4 (see purge form)
~~1530~~ ↳ YSI ProODO ran out of batteries; When changed was calibrated to 100% DO %. Probe was placed in well & gave negative DO readings; Probe was recalibrated w/ Ø solution and 100% DO %; Probe was placed back in well and gave negative DO readings; Will try to locate new Ø solution for tomorrow.

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6/23/11 (continued)

1620 Collected sample UN611-TW4-060

1630 Few sprinkles, Crew keeping eye on weather; Team #1 back onsite to pack samples and unload equipment

1710 Headed to Dillons to pick up ice; Called Derek about drum of CA-Fe-301Z (Remediation Services Company) - Derek will look into disposal.

1725 Back onsite, JO & NH onsite too, Pack samples / Unload equipment

1820 Left site for hotel, KN pick up supplies.

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6/24/11 Project No. Book No. 00709 TITLE Groundwater Sampling

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Purpose: Continue annual groundwater sampling event (Coleman)
Personnel: Kim Nguyen, Anna Kunkel, Nathan Henry, John O'Neal
Equipment: Peripump, Horiba, Solinst Water Level,
Weather: Clear, Warm/Hot, High ~95

6:50 Left hotel
7:05 Arrive at site; Observed 2 golden retriever type dogs onsite → they escaped through hole dug under fence → fix hole tomorrow; Started prepping for day
7:30 Calibrated equipment
PID - 99.2
Horiba - pH = 4.04; Spec Cond = 2.24 mS/cm; Turb = 0.0 NTU
YSI Pro ODO - KN made yeast solution (Carlos at YSI recommended as zero solution)
750 Health and Safety mtg; JLA; Weather
830 Drove to Coleman, set up on R-5 (recovery well)
↳ Recalibrated Horiba due to low conductivity prior to purging
840 Horiba - pH = 4.01; Spec Cond = 4.48 mS/cm; Turb = 0.0
841 Turned pump on at R-5 (see purge form)
855 YSI Calibration: Team #1 100% saturation = 95.0% @ 26.0°C, 721.5 mmHg
Zero pt check only = 0.0 mg/L
Team #2 100% saturation = 95% @ 28.6°C, 28.390 in Hg
Zero pt check only = 0.2 mg/L
Yeast solution: yeast ~3-5g, 300 mL of warm water, little bit of sugar
905 Collected sample UN611-R5-060
930 Conducted LPO feedback session w/ Derek Peacock; Discussed collecting IDW sample for RSC drum
940 Set up on MW-22 (flush mount)
949 Turned pump on at MW-22 (see purge form)
1025 Collected sample UN611-MW22-040
1035 Set up on MW-21 (flush mount, inside Coleman building, near Wall 15)
1052 Turned pump on at MW-21 (see purge form)
1135 Collected sample UN611-MW21-060
1145 Set up on MW-20 (flush mount, inside Coleman building, near 1st aisle)
1157 Turned pump on at MW-20 (see purge form)
1225 Collected samples UN611-MW20-060 and UN611-MW20-061
1255 Left Coleman site, Put waste in drums
1310 Left for lunch (Team #1 only)
1410 Stopped by site & checked in w/ JO & NH; Left to go get ice

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6/24/11 (continued)
1425 Back onsite, Set up on P-175 (Stickup)
1442 Turned on pump at P-175
1600 Stopped work on P-175; Will purge dry tomorrow and collect sample on Sunday; Started packing coolers
1640 Left site; Drop off samples at FedEx

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0 6/25/11 Project No. Book No. 00709 TITLE Trailer Cleaning & ~~Groundwater~~ Phyto Maintenance

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Purpose: Purge well P-175, trailer cleaning; Phyto maintenance (weed pulling)
Personnel: Anna Kunkel, Kim Nguyen, John O'Neal, Nathan Henry
Equipment: Bailer
Weather: Clear, Hot, High ~97

820 Left hotel
830 Health and safety tailgate; JLAs
845 KN set upon P175 - bail dry (see purge form
AK began weeding
915 JO & NH arrive onsite; Team #2 health and safety meeting w/ KN
930 JO & NH begin weeding; KN cleans submersible pumps for use tomorrow; AK clean out file cabinet in trailer
1140 JO lead phyto inspection discussion - told procedure for measuring trees and filling out form
1230 Completed weeding (all)
1315 Left site; Went to FedEx to scan MSDS and ship boxes to URS Austin.

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TITLE Groundwater Sampling

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Purpose: Continue annual groundwater sampling event (Unocal)
Personnel: Kim Nguyen, Anna Kunkel, John O'Neal, Nathan Henry
Equipment: Peripump, Submersible pump (P17D), Solinst Water Level, Horiba, YSI ProODO
Weather: Clear, Hot, High ~ 99

700 Left hotel, picked up ice/water
720 Arrived at site; Loaded up equipment
735 Calibrated equipment
Horiba - pH = 3.99; Sp. Cond = 4.50; Turb = 0.2 NTU; DO = 8.19
YSI - Team #1 zero pt (yeast) = 0.04 mg/L; Team #2 zero pt (yeast) = 0.10 mg/L
PID - 100.0 ppm
YSI - Team #1 26.5°C, 718.9 mmHg, 94.6 DO%, 7.61 DO mg/L
Team #2 26.4°C, 28.301 inHg, 94% DO, 7.6 mg/L
800 Health & safety mtg; JLAs; LPO for Team #2
820 Set up on P17S; Use bailer
825 Collected sample UN611 - P17S - 010 (see purge form)
835 Set up on P13S (stick up)
843 Pump turned on (see purge form)
922 Well purged dry before 3 well volumes (Purged ~ 2.0 gal); Let well recover and then collect sample
931 Set up on P17D (stick up)
948 Turned on pump (see purge form)
1100 Collected sample UN611 - P17D - 010; Purged 3 well volumes and parameters (DO) did not stabilize
1115 Set up on P19 (stickup); performed LPO on KN setting up equipment
1127 Pump turned on at P19 (see purge form)
↳ Also discussed LPO findings internally
1153 Well purged dry before 3 well volumes (Purged ~ 1.5 gal); Let well recover and then collect sample
1205 Left site for lunch, Picked up lunch
1310 Back onsite; Team #2 onsite too; Told team #2 about 1st aide kit
Set up on P-1 (flush mount)
1322 Pump turned on at P1 (see purge form)
1400 Collected sample UN611 - P1 - 050
1445 Set up on TW-3 (flush mount)
1500 Pump turned on at TW-3 (see purge form)

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6/26/11 (Continued)
1530 Collected sample UN611 - TW3 - 060
1550 Left Coleman site; Returned to Unocal
1558 Checked P-19; WL = 21.52 ft (see purge form)
1605 Collected sample UN611 - P19 - 010
1615 Unloaded waste and equipment; Packed samples on ice
1650 AK Left site to get ice
1710 AK: 30 back on site w/ice; Pack samples on ice
1740 Left site for hotel

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TITLE Groundwater Sampling

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Purpose: Continue annual groundwater sampling event (Unocal)
Personnel: Kim Nguyen, Anna Kunkel, John O'Neal, Nathan Henry
Equipment: Peripump, Submersible pump, Horiba, YSI-ProODO
Weather: ~~Clear~~ Cloudy, Warm, High ~92, Windy!

6:50 Left hotel for site
7:05 Arrive at site; Close all BPZ/CPZ wells; Load up equipment
7:30 Calibrated equipment
Horiba- pH=4.0; Spec Cond=4.51 mS/cm; Turbidity=0.0 NTU; DO=8.27 mg/L
PID- 99.9 ppm
YSI- Team#1: 0.0 mg/L → zero pt check w/ yeast; Calibrated to zero pt.
26.5°C, 719.3 mmHg, DO=94.7%, DO=7.60 mg/L
Team#2: 0.0 mg/L → zero pt check w/ yeast
26.6°C, 28.312 in Hg, DO=95%, DO=7.60 mg/L
7:50 Health and safety tailgate; JSAs; LPOs
8:12 Set up on P-13S; WL=23.09', TD=~25 ft; Allow more recovery before sampling
8:15 Set up on P-9 (small stickup)
8:24 Pump turned on at P-9 (see purge form)
8:29 Well purged dry (Total volume ~1L); Allow for well to recover and then sample
9:00 Collected sample UN611-P9-070
9:15 Set up on P-2 (flush mount)
9:18 Pump turned on at P-2 (see purge form)
9:50 KN collected sample of IDW-purged gw → UN611-IDWW-01
10:05 Collected sample UN611-P2-070
10:27 Set up on P-13S; WL=22.96
10:30 Collected sample UN611-P13S-020
10:45 Set up on P-13D (stick up)
10:56 Pump turned on at P13D (see purge form)
12:10 Collected sample UN611-P13D-020
1240 Team #1 left for lunch
1325 Team #1 back onsite; Set up on P15D (stickup)
1335 Pump turned on at P15D (see purge form)
1430 Collected sample UN611-P15D-023
1445 Unpacked equipment; Organized trailer
1515 Triple AAA came and picked up port-a-potty
1540 Team #1 left site to get ice
1600 Team #1 back onsite

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6/27/11 Project No. Book No. 00709 TITLE Groundwater Sampling

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6/27/11 (continued)

1735 Finished packing coolers/equipment; Mini-mobile is empty; Trailer is organized; Left former Unocal site;

1740 Tried to replace MW-5 J-plug but did not fit

Waste summary –

4½ Drums full of purged gw
↳ Drum that was sampled (IDWW-01) was marked w/ orange circle and labeled

5 Empty drums

1 Drum (empty) missing bunghole (metal)
↳ Talk to CRA about either disposing of drum or providing bunghole

1 Drum full of PPE (not sampled)

1 Drum ¾ full of CA-FE-3012 in trailer (plastic)
↳ Talk to CRA about providing bunghole & disposing of drum and contents.

Phyto summary –

25 bags of cypress mulch
↳ JO indicated planning a remulch event before the end of summer?

Need to talk to Tree Top about herbicide

Field supplies – Need for next event

Medium gloves (completely out)

Pencil bailers only (1 case needed)

HAST updated 2011 – Copy left onsite

Site trash pickup? (Particle board, wooden stakes, pallets, etc.)

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APPENDIX B

Data Validation Reports

B.1

March 2011

Appendix B.1

Groundwater Samples - Former Unocal-Wichita, Kansas - March 2011

This data validation report (DVR) describes the data quality for the water samples collected in March 2011 for the Fourth Quarter Plumelet A Interim Measure (IM) Monitoring Event from the former Unocal Chemical Distribution Facility (Unocal) site in Wichita, Kansas, owned by Chevron Environmental Management Company (EMC). A summary of sample identifications (IDs) and analyses requested is presented in Table 1.

The primary purpose of this sampling effort was to monitor the lateral extent of impacted groundwater for movement, expansion, and/or change in chemical concentrations.

Sample IDs, dates sampled, and methods used for analyses are provided in Table 1. The purpose of this DVR was to confirm that the analyses were performed according to method protocols and to assess the quality of the reported laboratory data. The results indicate that all of the data are acceptable and useable.

Sample results that were detected between the method detection limits (MDLs) and the reporting limits (RLs) were qualified with "J" as estimated, since these concentrations were below the lowest standards. Samples that required further qualification and other anomalies are discussed in the DVR. Some samples were diluted due to sample matrix, resulting in elevated RLs and MDLs.

Table 1
Sample Distribution for 4th Quarter Plumelet A Monitoring

Sample ID (UN311-)	Lancaster Laboratory Sample ID	Sample Date	VOCs SW8260B	Headspace Volatiles SW8015BM	Carbon Dioxide SW8015B	Microseeps Laboratory Sample ID	Volatile Fatty Acids
P1-040	6237299	3/22/11	1	1	1	10980001	2
P2-060	6237301	3/22/11	1	1	1	10980003	2
P5-060	6237304	3/22/11	1	1	1	1098006	2
P6-050	6237303	3/22/11	1	1	1	1098005	2
P9-060	6237302	3/22/11	1	1	1	1098004	2
P10-040	6237300	3/22/11	1	1	1	10980002	2
P11-050	6239234	3/24/11	1	1	1	10980011	2
P12-050	6239233	3/24/11	1	1	1	10980010	2
TW3-050	6239235	3/24/11	1	1	1	10980012	2
P13S-010	6240827	3/25/11	1	1	1	10980017	2
P13D-010	6240824	3/25/11	1	1	1	10980016	2
P14S-010	6240822	3/25/11	1	1	1	10980014	2
P14D-010	6240823	3/25/11	1	1	1	10980015	2
P15S-010	6240826	3/25/11	1	1	1	10980013	2
P15D-010	624082	3/25/11	1	1	1	10980009	2
P16S-010	6239229	3/24/11	1	1	1	10980008	2
P16D-010	6239228	3/24/11	1	1	1	10980007	2
Field Duplicates							
P1-041	6237305	3/22/11	1	--	--	--	--
P13D-011	6240825	3/25/11	1	--	--	--	--
Trip Blanks							
TB01	6237306	3/22/11	1	--	--	--	--
TB03	6239236	3/24/11	1	--	--	--	--
TB04	6240828	3/25/11	1	--	--	--	--

A sample ID ending in -0x1 is a duplicate of the sample ending in -0x0.
A sample ID ending in -0x3 indicates a client-specified matrix spike/matrix spike duplicate (MS/MSD).
1 - Analyzed by Lancaster Laboratories.
2 - Analyzed by Microseeps Laboratory.
-- Not collected.
ID - Identification.
SW - U.S. Environmental Protection Agency (EPA) SW-846 Method.
VOC - Volatile organic compound.

Volatile Organic Compounds by EPA Method SW8260B

Samples were analyzed for client-specified volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method SW8260B. The quality control (QC) tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), surrogate spike results, and field duplicate results. All of the QC results met acceptance criteria except for those discussed below. Some samples were diluted due to sample matrix, resulting in elevated RLs and MDLs. The QC results indicate that the data are usable for the intended purposes. Qualified data are discussed below.

Blanks

Method blanks and trip blanks were analyzed with the volatiles samples. Trichloroethene in samples P13D-010 (0.2 micrograms per liter [µg/L]) and P13D-011 (0.2 µg/L) were qualified with a "B" as similar to the trip blank concentration of 0.1 µg/L. No other samples were similar to blank concentrations.

Headspace Volatiles by EPA Method SW8015BM

Samples were analyzed for headspace volatiles including ethane, ethene, and methane by the EPA Method SW8015BM. The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, surrogates, LCSs, MS/MSDs, and field duplicate results. The QC results indicate that the data are usable for the intended purposes. None of the results required qualification.

Carbon Dioxide by EPA Method SW8015B

Samples were analyzed for carbon dioxide by EPA Method SW8015B. The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, LCSs, MS/MSDs, and field duplicate results. The QC results indicate that the data are usable for the intended purposes. None of the results required qualification.

Volatile Fatty Acids

Samples were analyzed for volatile fatty acids by laboratory standard operating procedure (SOP). The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, LCSs, and MS/MSDs. The samples were received one week into the two week holding time. Consequently, all of the samples were analyzed past the recommended holding time and have been qualified with a "J" as estimated.

Definitions of Validation Data Qualifiers

B	Sample result is within five times method blank result.
J	Estimated: The analyte was detected and positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
JH	Estimated result; biased high.
JL	Matrix spike or surrogate recoveries indicate that the result may be biased low. See data validation report for details.
ND	Not detected. No instrument response was recorded for the analyte.
U	Not detected: Analysis for the analyte was performed, but the analyte was not detected above the level of the associated value.
UJ	Not Detected. Estimated value.
UJL	Not detected: Analysis for the analyte was performed, but the analyte was not detected and may be biased low.

B.2

June 2011

Appendix B.2

Groundwater Samples - Former Unocal-Wichita, Kansas - June 2011

This data validation report (DVR) describes the data quality for the water samples collected in June 2011 for the 2011 Annual Groundwater Monitoring Event from the former Unocal Chemical Distribution Facility (Unocal) site in Wichita, Kansas, owned by Chevron Environmental Management Company (EMC). A summary of sample identifications (IDs) and analyses requested is presented in Table 1.

The primary purpose of this sampling effort was to monitor the lateral extent of impacted groundwater for movement, expansion, and/or change in chemical concentrations. Sample IDs, dates sampled, and methods used for analyses are provided in Table 1. The purpose of this DVR was to confirm that the analyses were performed according to method protocols and to assess the quality of the reported laboratory data. The results indicate that all of the data are acceptable and useable.

Sample results that were detected between the method detection limits (MDLs) and the reporting limits (RLs) were qualified with "J" as estimated, since these concentrations were below the lowest standards. Samples that required further qualification and other anomalies are discussed in the DVR. Some samples were diluted due to sample matrix, resulting in elevated RLs and MDLs.

Table 1
Sample Distribution

Sample ID	Lancaster Laboratory Sample ID	Sample Date	VOCs SW8260B	Headspace Volatiles SW8015BM	Carbon Dioxide SW8015B	Anions EPA 300.0	TOC SM5310C	Alkalinity SM2320B	Microseeps Laboratory ID	Volatile Fatty Acids
UN611-MW2-040	6324057	6/21/2011	1	--	--	--	--	--	--	--
UN611-MW8-050	6324058	6/21/2011	1	--	1	--	--	--	--	--
UN611-MW9-040	6324059	6/21/2011	1	--	--	--	--	--	--	--
UN611-MW17S-040	6324060	6/21/2011	1	--	--	--	--	--	--	--
UN611-MW24-040	6324061	6/21/2011	1	--	--	--	--	--	--	--
UN611-MW26-040	6324062	6/21/2011	1	--	--	--	--	--	--	--
UN611-MW27-030	6324063	6/21/2011	1	--	--	--	--	--	--	--
UN611-R6-060	6324064	6/21/2011	1	--	1	--	--	--	--	--
UN611-TW1-040	6324065	6/21/2011	1	--	--	--	--	--	--	--
UN611-TW1-041	6324066	6/21/2011	1	--	--	--	--	--	--	--
UN611-PMW4-040	6325690	6/22/2011	1	1	1	1	1	1	--	--
UN611-MW5-063	6325691	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD1-060	6325695	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD1-061	6325696	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD2-060	6325697	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD3-060	6325698	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD4-040	6325699	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD4-041	6325700	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD-MW3-060	6325701	6/22/2011	1	1	1	1	1	1	--	--
UN611-USD-MW14-040	6325702	6/22/2011	1	--	--	--	--	--	--	--
UN611-PMW5-040	6325703	6/22/2011	1	1	1	1	1	1	--	--
UN611-MW18-063	6327528	6/22/2011	1	1	--	--	--	--	--	--
UN611-MW25-060	6327531	6/22/2011	1	1	1	1	1	1	--	--
UN611-PMW7-040	6327532	6/22/2011	1	1	1	1	1	1	--	--
UN611-PMW8-040	6327533	6/22/2011	1	1	1	1	1	1	--	--
UN611-R3-060	6327534	6/22/2011	1	--	1	--	--	--	--	--
UN611-R4-060	6327535	6/22/2011	1	--	1	--	--	--	--	--
UN611-R7-060	6327536	6/22/2011	1	--	1	--	--	--	--	--
UN611-P11-060	6327537	6/22/2011	1	--	1	--	--	--	--	--
UN611-R12-060	6327538	6/22/2011	1	--	1	--	--	--	--	--
UN611-TW2A-060	6327539	6/22/2011	1	1	1	1	1	1	--	--

Table 1
Sample Distribution (Continued)

Sample ID	Lancaster Laboratory Sample ID	Sample Date	VOCs SW8260B	Headspace Volatiles SW8015BM	Carbon Dioxide SW8015B	Anions EPA 300.0	TOC SM5310C	Alkalinity SM2320B	Microseeps Laboratory ID	Volatile Fatty Acids
UN611-TW4-060	6327540	6/22/2011	1	--	1	--	--	--	--	--
UN611-R2-040	6327542	6/22/2011	1	--	1	--	--	--	--	--
UN611-MW4-040	6328527	6/23/2011	1	--	--	--	--	--	--	--
UN611-MW20-060	6328528	6/23/2011	1	--	1	--	--	--	--	--
UN611-MW20-061	6328529	6/23/2011	1	--	1	--	--	--	--	--
UN611-MW21-060	6328530	6/23/2011	1	--	1	--	--	--	--	--
UN611-MW22-040	6328531	6/23/2011	1	--	--	--	--	--	--	--
UN611-MW28-040	6328532	6/23/2011	1	--	--	--	--	--	--	--
UN611-P18-010	6328533	6/23/2011	1	--	--	--	--	--	--	--
UN611-R1-040	6328534	6/23/2011	1	--	--	--	--	--	--	--
UN611-R5-060	6328535	6/23/2011	1	--	1	--	--	--	--	--
UN611-R10-060	6328536	6/23/2011	1	--	1	--	--	--	--	--
UN611-R11-060	6327537	6/23/2011	1	--	1	--	--	--	--	--
UN611-R12-060	6327538	6/23/2011	1	--	1	--	--	--	--	--
UN611-TW2A-060	6327539	6/23/2011	1	1	1	1	1	1	--	--
UN611-TW4-060	6327540	6/23/2011	1	--	1	--	--	--	--	--
UN611-R2-040	6327542	6/23/2011	1	--	1	--	--	--	--	--
UN611-MW4-040	6328527	6/24/2011	1	--	--	--	--	--	--	--
UN611-MW20-060	6328528	6/24/2011	1	--	1	--	--	--	--	--
UN611-MW20-061	6328529	6/24/2011	1	--	1	--	--	--	--	--
UN611-MW21-060	6328530	6/24/2011	1	--	1	--	--	--	--	--
UN611-MW22-040	6328531	6/24/2011	1	--	--	--	--	--	--	--
UN611-MW28-040	6328532	6/24/2011	1	--	--	--	--	--	--	--
UN611-P18-010	6328533	6/24/2011	1	--	--	--	--	--	--	--
UN611-R1-040	6328534	6/24/2011	1	--	--	--	--	--	--	--
UN611-R5-060	6328535	6/24/2011	1	--	1	--	--	--	--	--
UN611-R10-060	6328536	6/24/2011	1	--	1	--	--	--	--	--
UN611-P1-050	6330107	6/26/2011	1	1	1	--	--	--	17160001	2
UN611-P6-060	6330108	6/26/2011	1	1	1	--	--	--	17160002	2
UN611-P11-060	6330109	6/26/2011	1	1	1	--	--	--	17160003	2
UN611-P14S-020	6330110	6/26/2011	1	1	1	--	--	--	17160004	2

Table 1
Sample Distribution (Continued)

Sample ID	Lancaster Laboratory Sample ID	Sample Date	VOCs SW8260B	Headspace Volatiles SW8015BM	Carbon Dioxide SW8015B	Anions EPA 300.0	TOC SM5310C	Alkalinity SM2320B	Microseeps Laboratory ID	Volatile Fatty Acids
UN611-P16S-020	6330111	6/26/2011	1	1	1	--	--	--	17160005	2
UN611-P17D-010	6330112	6/26/2011	1	--	--	--	--	--	--	--
UN611-P17S-010	6330113	6/26/2011	1	--	--	--	--	--	--	--
UN611-P19-010	6330114	6/26/2011	1	--	--	--	--	--	--	--
UN611-TW3-060	6330115	6/26/2011	1	1	1	--	--	--	17160006	2
UN611-P2-070	6330118	6/27/2011	1	1	1	--	--	--	17160007	2
UN611-P5-070	6330119	6/27/2011	1	1	1	--	--	--	17160008	2
UN611-P5-071	6330120	6/27/2011	1	1	1	--	--	--	--	--
UN611-P9-070	6330121	6/27/2011	1	1	1	--	--	--	17160009	2
UN611-P10-050	6330122	6/27/2011	1	1	1	--	--	--	17160010	2
UN611-P12-060	6330123	6/27/2011	1	1	1	--	--	--	17160011	2
UN611-P13D-020	6330124	6/27/2011	1	1	1	--	--	--	17160012	2
UN611-P13S-020	6330125	6/27/2011	1	1	1	--	--	--	17160013	2
UN611-P14D-020	6330126	6/27/2011	1	1	1	--	--	--	17160014	2
UN611-P14D-021	6330127	6/27/2011	1	1	1	--	--	--	--	--
UN611-P15D-023	6330128	6/27/2011	1	1	1	--	--	--	17160015	2
UN611-P15S-020	6330131	6/27/2011	1	1	1	--	--	--	17160016	2
UN611-P16D-020	6330132	6/27/2011	1	1	1	--	--	--	17160017	2
Trip Blanks										
UN611-TB01	6324067	6/21/2011	1	--	--	--	--	--	--	--
UN611-TB02	6325704	6/22/2011	1	--	--	--	--	--	--	--
UN611-TB03	6325705	6/22/2011	1	--	--	--	--	--	--	--
UN611-TB04	6327541	6/23/2011	1	--	--	--	--	--	--	--
UN611-TB05	6328537	6/24/2011	1	--	--	--	--	--	--	--
UN611-TB06	6330116	6/27/2011	1	--	--	--	--	--	--	--

A sample identification (ID) ending in -0x1 is a duplicate of the sample ending in -0x0.
A sample ID ending in -0x3 indicates a client-specified matrix spike/matrix spike duplicate (MS/MSD).
1 - Analyzed by Lancaster Laboratories. Samples with more than one ID were submitted for total and dissolved metals analysis. The second laboratory ID is for filtered samples.
2 - Analyzed by Microseeps Laboratory.
-- Not collected.
EPA - U.S. Environmental Protection Agency.
SM - Standard Methods of Water and Waste Water.
SW - EPA SW-846 Method.
TOC - Total organic carbon.
VOC - Volatile organic compound.

Volatile Organic Compounds by EPA Method SW8260B

Samples were analyzed for client-specified volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method SW8260B. The quality control (QC) tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), surrogate spike results, and field duplicate results. All of the QC results met acceptance criteria except for those discussed below. Some samples were diluted due to sample matrix, resulting in elevated RLs and MDLs. The QC results indicate that the data are usable for the intended purposes. Qualified data are discussed below.

Blanks

Method blanks, equipment blanks and trip blanks were analyzed. Because the samples collected on June 26 and 27, 2011 were shipped together, only one trip blank was shipped at this time. Methylene chloride was detected in trip blank, UN611-TB04, at 0.3 microgram per liter (µg/L). Methylene chloride in two samples, UN611-R12-060 and UN611-P18-010, were qualified with a "B" as similar to the blank concentration. No other qualifications were necessary.

Field Duplicates

Field duplicates were collected at a 10 percent (%) frequency. Sample duplicate results that were greater than 25% relative percent difference (RPD) were qualified as estimated. Qualified data are presented in Table 2.

Table 2
Volatile Organic Compound Results Qualified Due to Field Duplicate Recoveries

Sample ID	Compound	Result (µg/L)	Qualifier	FD RPD (%)	Acceptance Criteria (%)	Reason
UN611-TW1-040/041	n-Butylbenzene	5.4/8.4	J	43	25	The FD variability was above acceptance criteria.
UN611-P5-070/071	Acetone	32/93		98		
	2-Butanone	39/110		95		
	cis-1,2-Dichloroethene	13/17		27		
UN611-MW20-060/061	trans-1,2-Dichloroethene	7.4/3.2		79		
UN611-USD4-040/041	Tetrachloroethene	3.6/5.5		39		

J - Estimated result.
% - Percent.
µg/L - Micrograms per liter.
FD - Field duplicate.
ID - Identification.
MS/MSD - Matrix spike/matrix spike duplicate.
RPD - Relative percent difference.

Headspace Volatiles by EPA Method SW8015BM

Samples were analyzed for headspace volatiles including ethane, ethene, and methane by the EPA Method SW8015BM. The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, surrogates, LCSs, MS/MSDs, and field duplicate results. The QC results indicate that the data are usable for the intended purposes. Qualified results are discussed below.

Field Duplicates

Field duplicates were collected at a 10% frequency. Sample duplicate results that were greater than 25% RPD were qualified as estimated. The RPD for ethane in sample pair UN611-P5-070/071 was 42%. The results for ethane were qualified with a "J" as estimated.

Carbon Dioxide by EPA Method SW8015B

Samples were analyzed for carbon dioxide by EPA Method SW8015B. The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, LCSs, MS/MSDs, and field duplicate results. The QC results indicate that the data are usable for the intended purposes. Qualified data are presented below.

Field Duplicates

Field duplicates were collected at a 10% frequency. Sample duplicate results that were greater than 25% RPD were qualified as estimated. The RPD for carbon dioxide in sample pair UN611-14D-020/021 was 28%. The results for carbon dioxide were qualified with a "J" as estimated.

Anions by EPA Method 300.0

Samples were analyzed for sulfate, chloride, and nitrate by EPA Method 300.0. The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, LCSs, MSs, and field duplicate results. The QC results indicate that the data are usable for the intended purposes. Qualified results are discussed below.

Matrix Spikes

MS/MSD samples were prepared and analyzed. Recoveries and RPDs that were above the acceptance criteria and not detected in the samples were not qualified since this indicates a high bias or variability. Most of the recoveries and RPDs were within acceptance criteria. If the MS recoveries were not within acceptance criteria, the samples collected that day and in the same analytical batch were qualified. If the spiked amount was insignificant (less than four times the

amount of the parent sample), precision and accuracy were not evaluated. Qualified data are presented in Table 3.

Table 3
Anion Results Qualified Due to Matrix Spike Recoveries

Sample ID	Compound	Result (mg/L)	Qualifier	MS Recoveries (%)	Acceptance Criteria (%)	Reason
PMW4-040	Chloride	221	JL	87	90-110	The MS recovery was below acceptance criteria.
MW5-063		42.9				
USD1-060		217				
USD1-061		206				
USD2-060		202				
USD3-060		45.1				
USD4-040		20.6				
USD-MW3-060		650				
PMW5-040		39.7				
PMW4-040	Nitrate	4.2		78		
USD1-060		2.3				
USD-061		2.3				
USD2-060		1.4				
USD3-060		1.6				
USD4-040		1.5				
USD-MW3-060		1.5				
PMW5-040		1.1				
MW5-063		ND	UJL			
PMW4-040	Sulfate	2,000	JL	74		
MW5-063		887				
USD1-060		2,190				
USD-061		2,200				
USD2-060		1,320				
USD3-060		292				
USD4-040		488				
USD-MW3-060		1,980				
PMW5-040		151				

JL - Estimated result. Biased low.
UJL - Not detected: analysis for the analyte was performed, but the analyte was not detected and may be biased low.
% - Percent.
mg/L - Milligrams per liter.
ID - Identification.
MS - Matrix spike.

Total Organic Carbon by SM5310C

Samples were analyzed for total organic carbon (TOC) by Standard Methods (SM) Method 5310C. The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, LCSs, MSs, and field duplicate results. The QC results indicate that the data are usable for the intended purposes. No results were qualified.

Alkalinity by SM2320B

Samples were analyzed for alkalinity by SM2320B. The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, LCSs, MSs, and field duplicate results. All of the QC results met acceptance criteria and are usable for the intended purposes.

Volatile Fatty Acids

Samples were analyzed for volatile fatty acids by laboratory standard operating procedure (SOP). The QC tests that were submitted with the report and evaluated included holding times, preservation, RLs, MDLs, blanks, LCSs, and MS/MSDs. All of the QC results met acceptance criteria and are usable for the intended purposes. Qualified results are discussed below.

Laboratory Control Samples

LCS samples were prepared and analyzed. Recoveries that were below the acceptance criteria have been qualified as biased low. Qualified data are presented in Table 4.

Table 4
Volatile Fatty Acid Results Qualified Due to Laboratory Control Sample Recoveries

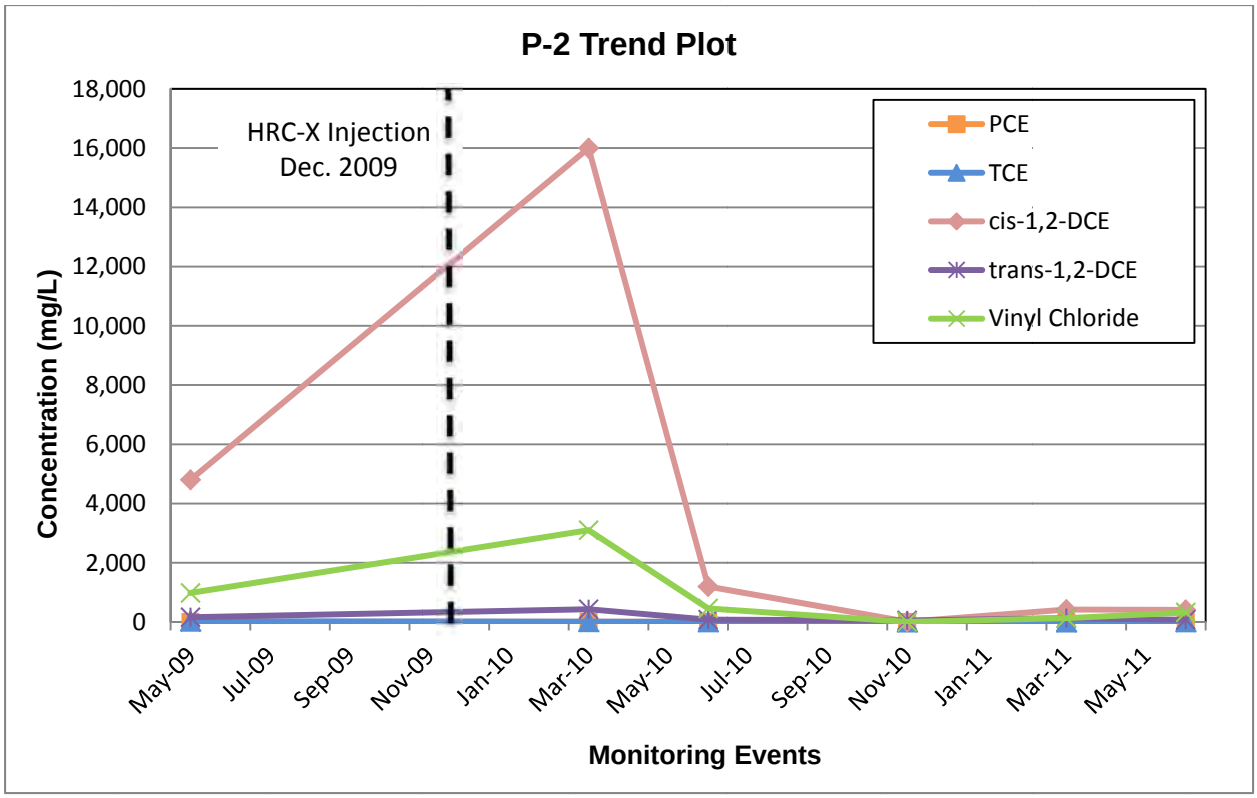
Sample ID	Compound	Result (mg/L)	Qualifier	LCS Recoveries (%)	Acceptance Criteria (%)	Reason
UN611-P1-050 UN611-P6-060 UN611-P14S-020 UN611-P16S-020 UN611-TW3-060, UN611-P2-070 UN611-P9-070 UN611-P10-050 UN611-P12-060 UN611-P13D-020, UN611-P13S-020 UN611-P14D-020 UN611-P15D-023 UN611-P16D-020	i-Hexanoic Acid	ND	UJL	65	70-130	The LCS recovery was below acceptance criteria.
UN611-P1-050 UN611-P6-060 UN611-P16S-020 UN611-TW3-060, UN611-P2-070 UN611-P9-070 UN611-P10-050 UN611-P12-060 UN611-P15D-023 UN611-P16D-020	Hexanoic Acid	ND	UJL	61		
UN611-P13D-020 UN611-P13S-020 UN611-P14S-020 UN611-P14D-020	Hexanoic Acid	1.9 0.16 0.16 0.16	JL			

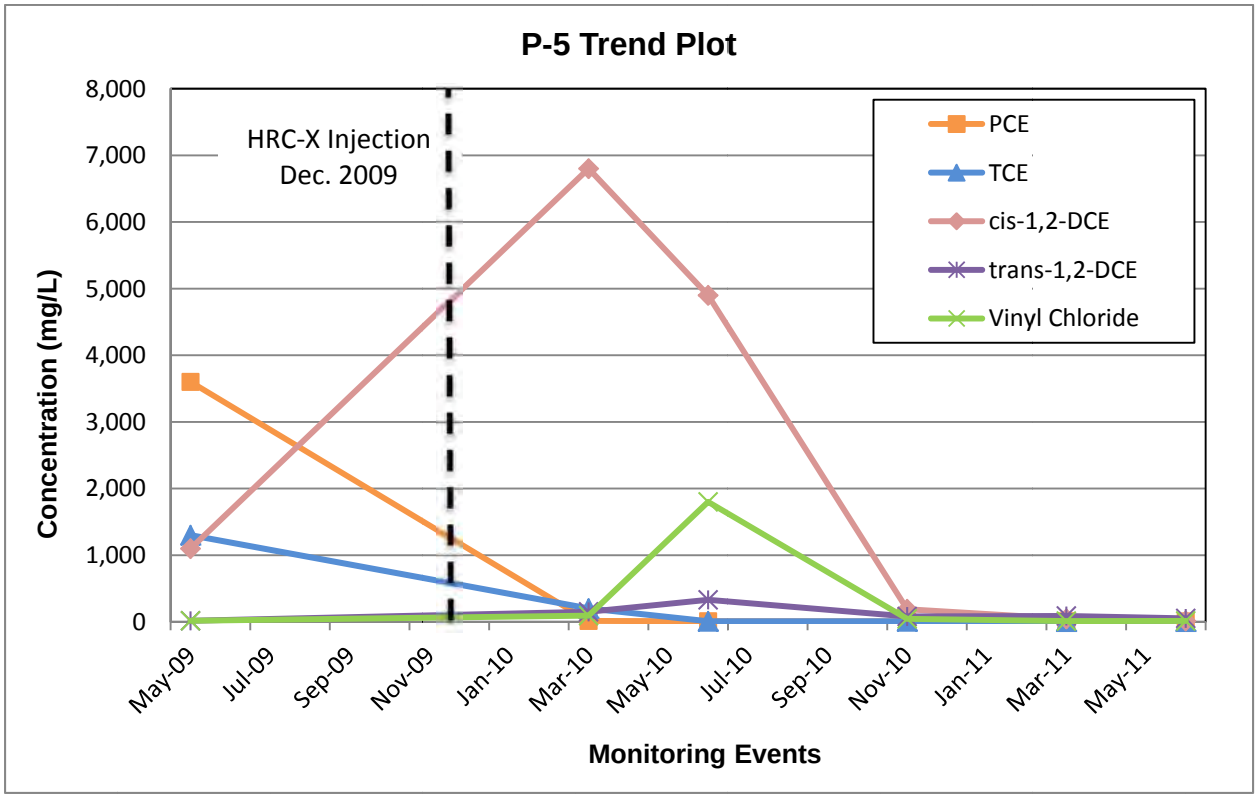
JL - Estimated result. Biased low.
UJL - Not detected: analysis for the analyte was performed, but the analyte was not detected and may be biased low..
% - Percent.
mg/L - Milligrams per liter.
ID - Identification.
LCS - Laboratory control sample.
ND - Not detected.

APPENDIX E

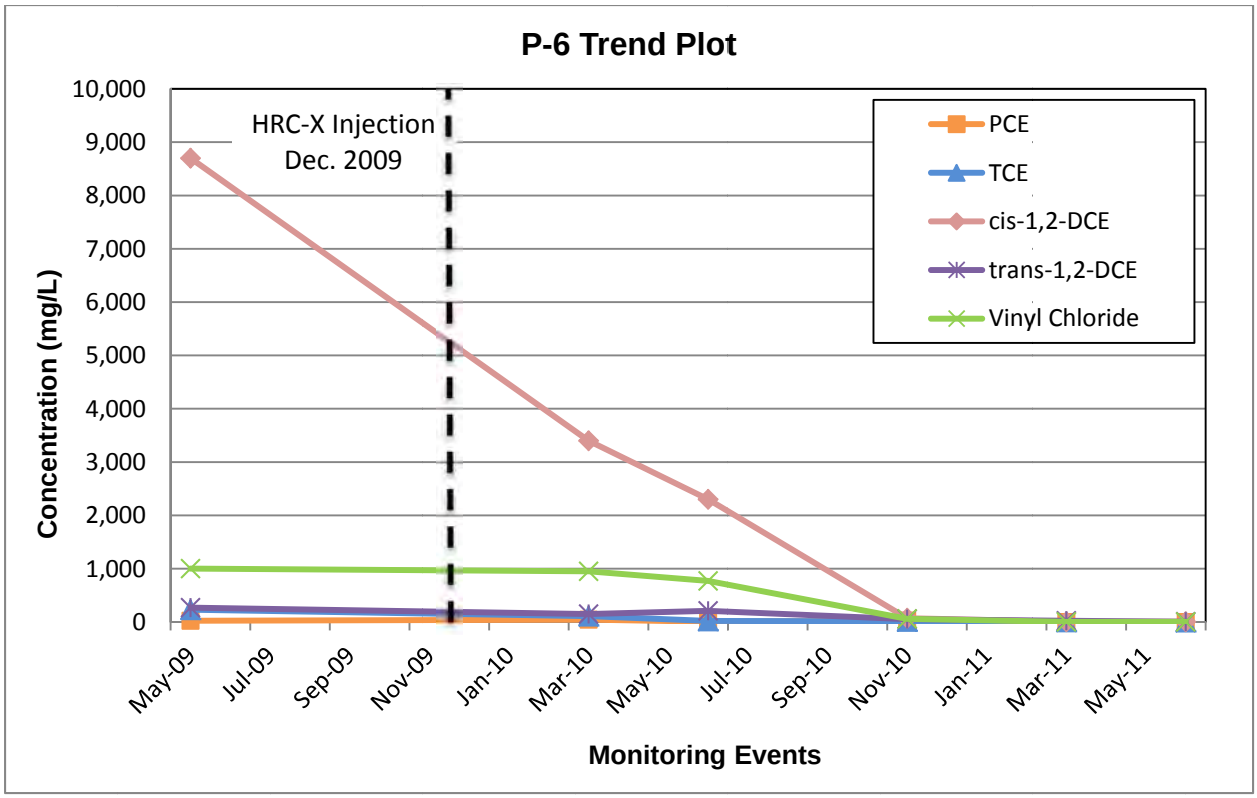
Trend Plots

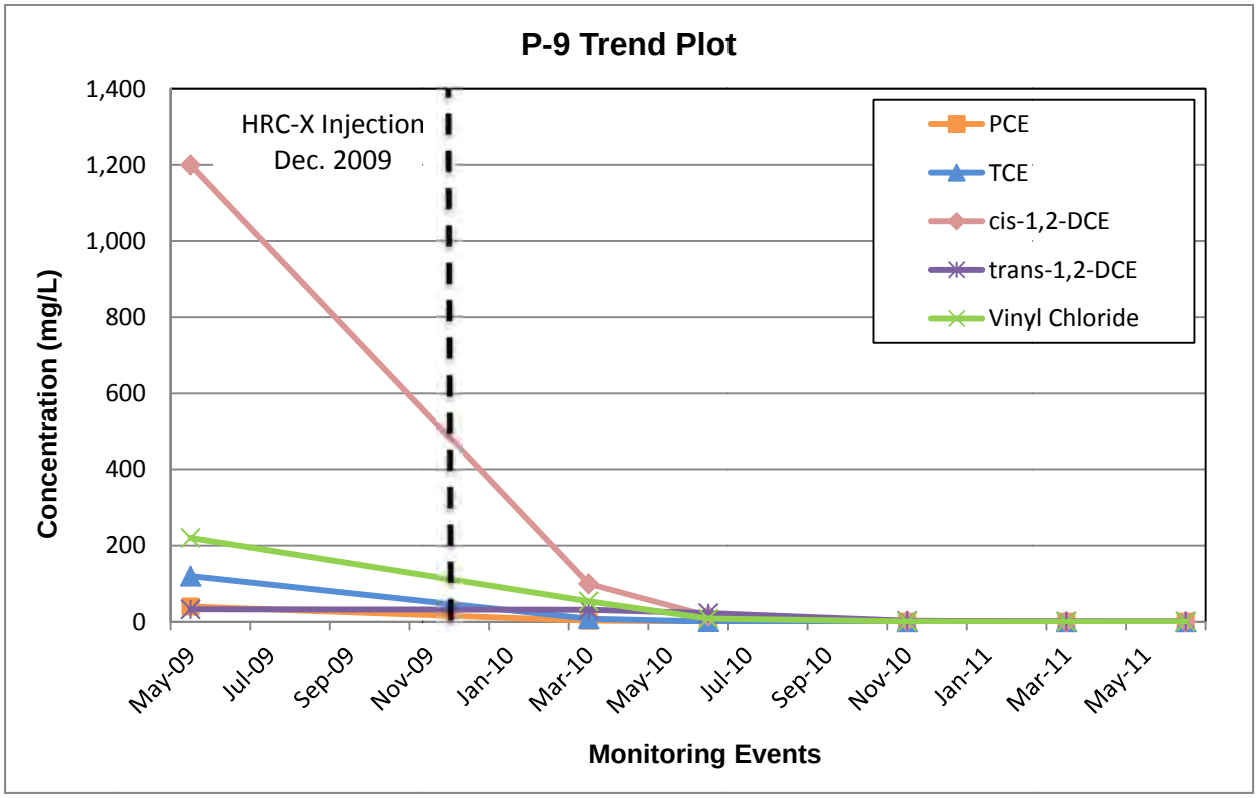
Appendix E - Trend Plots



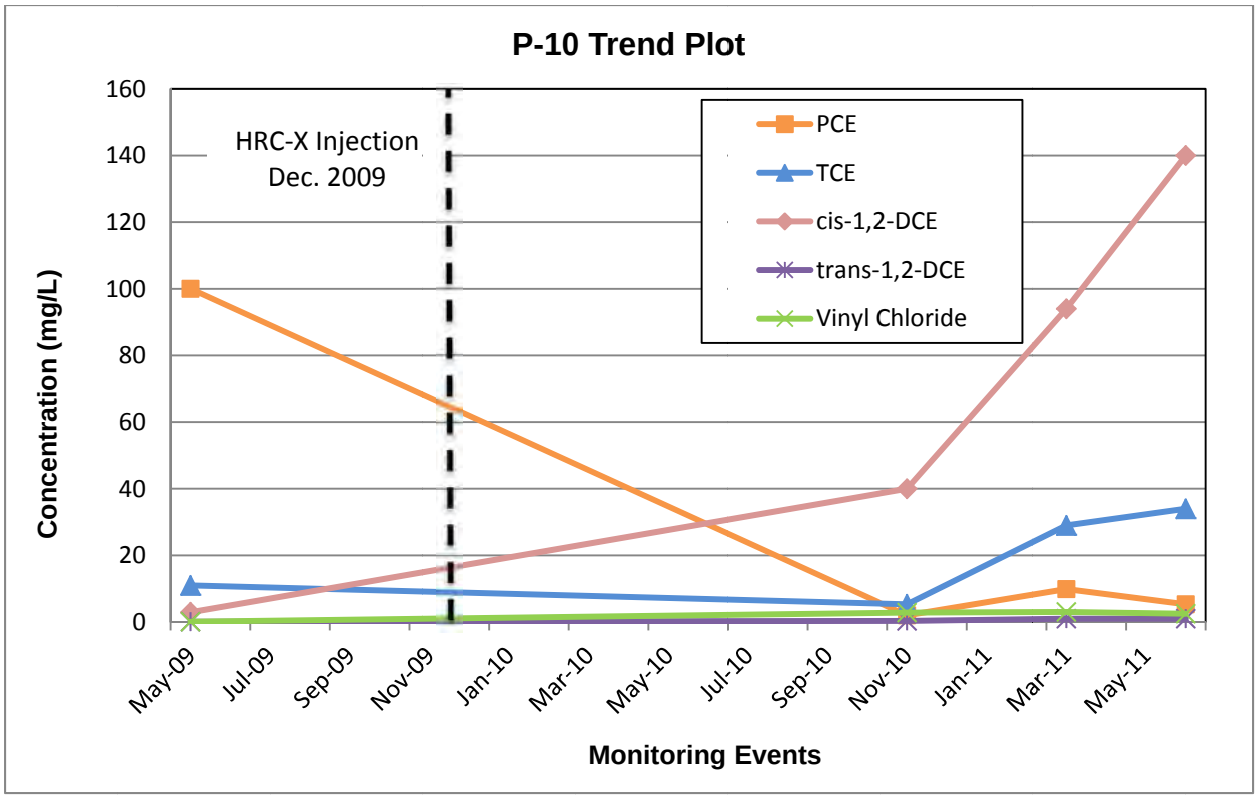


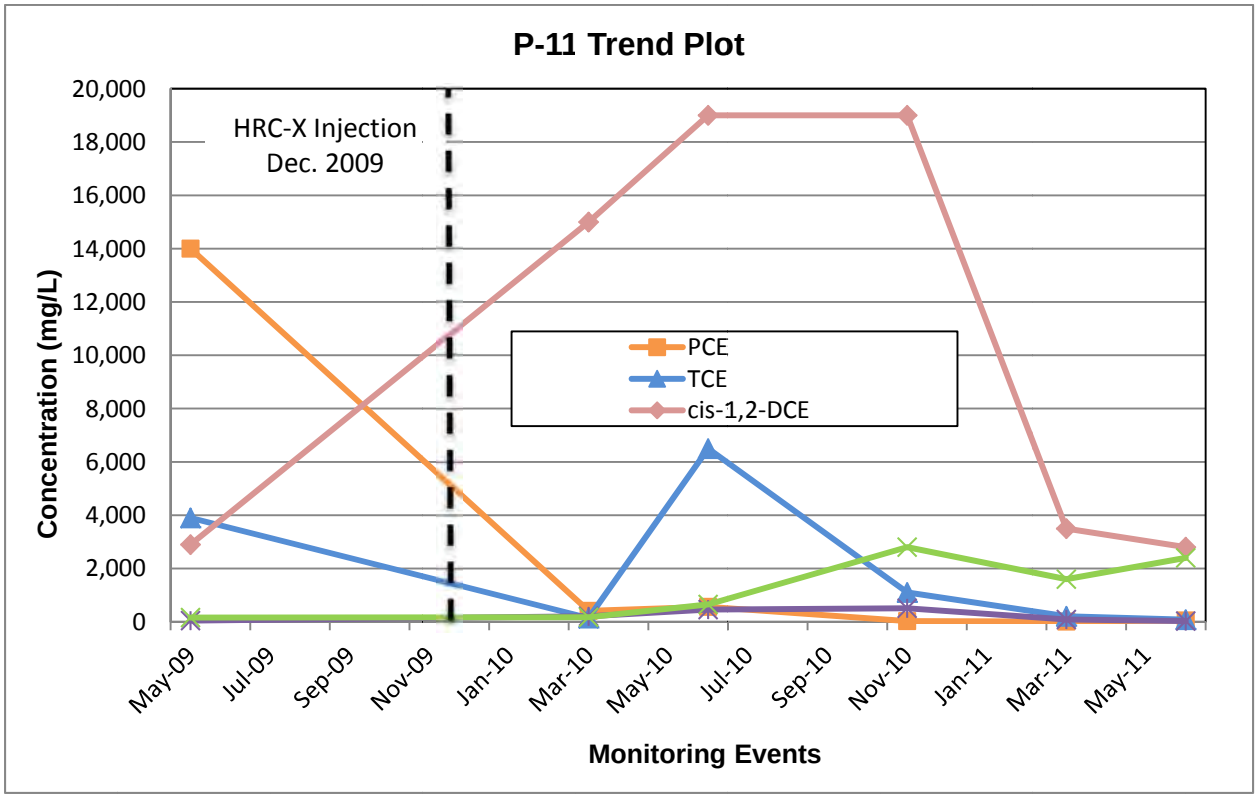
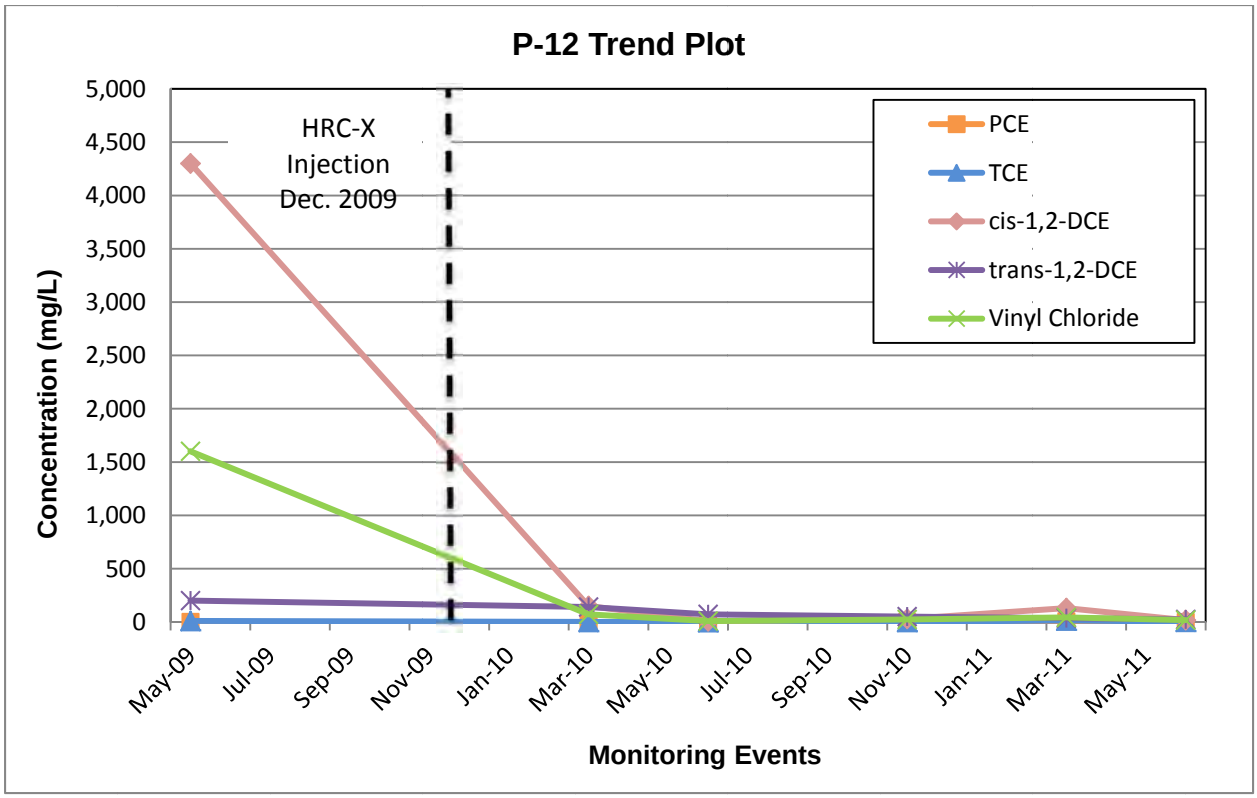
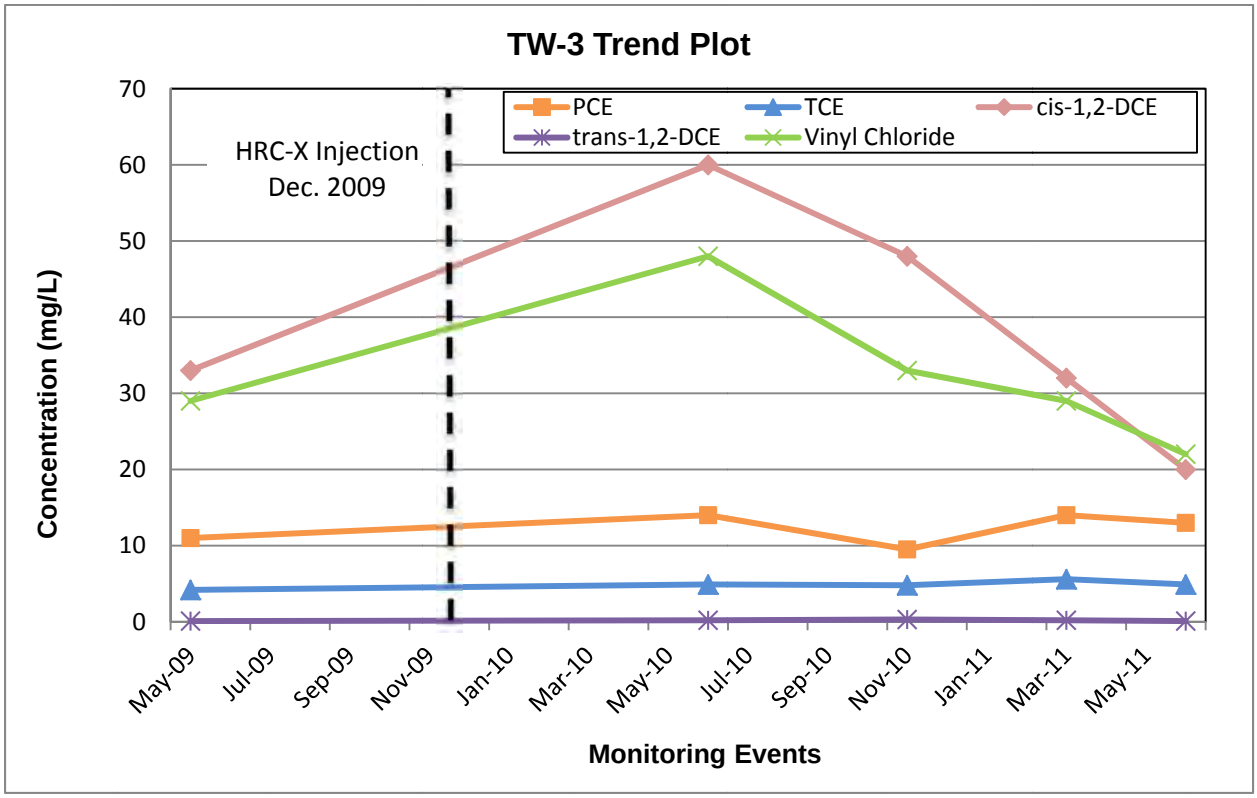
Appendix E - Trend Plots (Continued)





Appendix E - Trend Plots (Continued)





Appendix E - Trend Plots (Continued)