FINAL

2009 ANNUAL GROUNDWATER REPORT

Prepared For

Department of the Army
Camp Stanley Storage Activity
Boerne, Texas

June 2010

GEOSCIENTIST CERTIFICATION

2009 Annual Groundwater Monitoring Report

For

Department of the Army

Camp Stanley Storage Activity

Boerne, Texas

I, W. Scott Pearson, P.G., hereby certify that the 2009 Annual Groundwater Monitoring Report for the Camp Stanley Storage Activity installation in Boerne, Texas accurately represents the site conditions of the subject area. This certification is limited only to geoscientific products contained in the subject report and is made on the basis of written and oral information provided by the Camp Stanley Storage Activity Environmental Office, laboratory data provided by APPL, and field data obtained during groundwater monitoring conducted at the site in 2009, and is true and accurate to the best of my knowledge and belief.

W. Scott Pearson, P.G.
State of Texas
Geology License No. 2186

6-14-2010

Date

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ACRONYMS AND ABBREVIATIONS

µg/L	Microgram per liter
1,1-DCE	1,1-dichloroethene
AACOG	Alamo Area Council of Governments
AFCEE	Air Force Center for Engineering and the Environment
AL	Action Level
AOC	Area of Concern
APPL	Agriculture and Priority Pollutants Laboratories, Inc.
BACT	Bacteriological
Bexar Met	Bexar Metropolitan Water District
BS	Bexar Shale
CC	Cow Creek
cis-1,2-DCE	*cis*-1,2-dichloroethene
COC	Contaminants of concern
CSSA	Camp Stanley Storage Activity
DQO	Data Quality Objectives
GAC	Granular activated carbon
GPM	Gallons per minute
GUI	Groundwater Under the Influence (of Surface Water)
LGR	Lower Glen Rose
LTMO	Long Term Monitoring Optimization
MCL	Maximum contaminant limits
MDL	Method detection limit
MPA	Microscopic Particulate Analysis
MSL	Mean sea level
NWS	National Weather Service
Order	RCRA 3008(h) Administrative Order on Consent
PCE	Tetrachloroethene
Plan	CSSA Off-post Monitoring Program and Response Plan
QAPP	Quality Assurance Program Plan
RCRA	Resource Conservation Recovery Act
RL	Reporting limit
SAWS	San Antonio Water Systems
SCADA	Supervisory Control and Data Acquisition
SS	Secondary standard
STL	Severn Trent Laboratories
SWMU	Solid Waste Management Units
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TO	Task Order
trans-1,2-DCE	*trans*-1,2-dichloroethene

UGR	Upper Glen Rose
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WS-N	Weather station north
WS-S	Weather station south

EXECUTIVE SUMMARY

This report provides an evaluation of results from groundwater monitoring conducted in 2009 at Camp Stanley Storage Activity (CSSA). Groundwater monitoring was performed on-post and off-post during the months of March, June, September, and December 2009. The CSSA groundwater monitoring program objectives are to determine groundwater flow direction and elevations, determine groundwater contaminant concentrations for characterization purposes, and identify meteorological and seasonal variations in physical and chemical properties. This report describes the physical and chemical characteristics of the groundwater monitoring results and changes occurring to the program during 2009.

- As the 2008 drought continued, the first eight months of 2009 were extremely dry, with only 9.5 inches of rainfall through August 2009. However, more than 20 inches of rainfall was received between September and December. This resulted in an annual rainfall of 29.61 inches, slightly below the normal annual rainfall for the region.

- During 2008, aquifer levels declined to the primary Lower Glen Rose (LGR) production interval and remained fairly static until the recharge events of the last quarter of the year. Correspondingly, by December 2009, water levels rose approximately 100 feet on average.

- A total of 105 samples were collected from 46 on-post wells. Contaminant concentrations above drinking water standards were detected at 8 on-post wells. Five wells (CS-MW16-LGR, CS-MW16-CC, CS-4, CS-D, and CS-MW1-LGR) exceeded drinking water standards for volatile organic compounds (VOCs) and three wells (CS-9, CS-MW1-LGR, and CS-MW9-BS) exceeded drinking water standards for metals.

- A total of 105 samples were collected from 37 Westbay zones. VOC concentrations above drinking water standards were detected in a total of 19 zones at all four Westbay locations.

- A total of 109 samples were collected from 44 off-post wells. VOC concentrations above drinking water standards were detected at 3 off-post wells (OFR-3, RFR-10, and I10-4). OFR-3 and RFR-10 had GAC units installed in 2001 and I10-4 is not currently being used as a drinking water source. Analysis of post-GAC samples continued to show that all VOCs are being removed and that the treatment continues to be effective. Off-post wells were not sampled for metals content.

1.0 INTRODUCTION

This report provides an evaluation of results from groundwater monitoring conducted in 2009 at CSSA. Groundwater monitoring was performed on-post and off-post during the months of March, June, September, and December 2009. All wells considered for sampling in 2009 are shown on **Figure 1.1.** This report describes the physical and chemical characteristics of the groundwater monitoring results and changes occurring to the program during 2009.

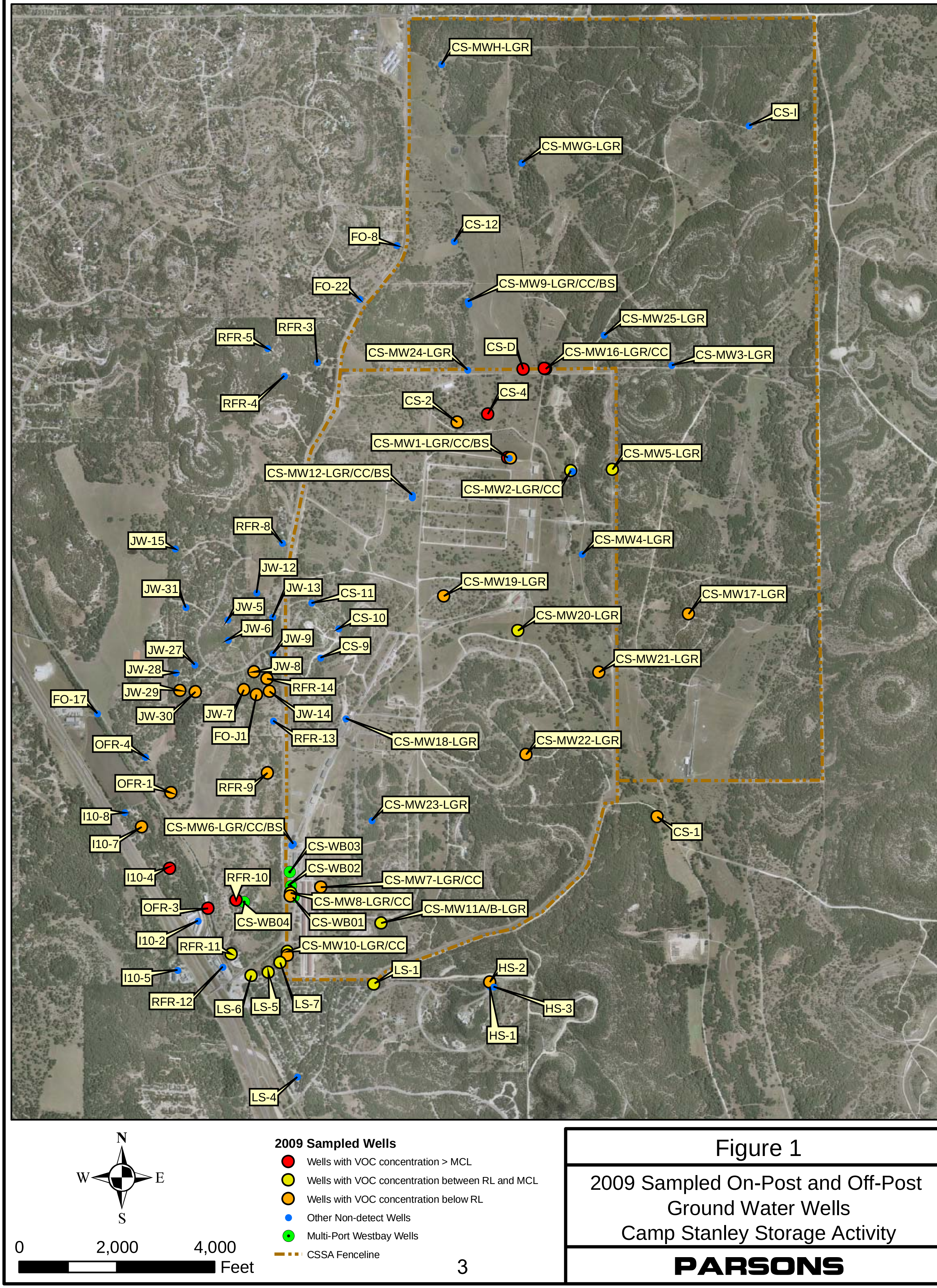
Groundwater monitoring conducted in 2009 was scoped under the U.S. Army Corps of Engineers (USACE) Fort Worth District (CESWF), Contract W9126G-07-D-0028, Task Order DO11. This contract was funded through December 2009.

1.1 On-Post Groundwater Monitoring

The current objectives of Camp Stanley Storage Activity's (CSSA) on-post groundwater monitoring program are to monitor groundwater flow direction trends and elevations, determine groundwater contaminant concentrations for characterization purposes, and identify meteorological and seasonal variations in physical and chemical properties of the groundwater. The objectives incorporate and comply with the Resource Conservation Recovery Act (RCRA) 3008(h) Administrative Order on Consent (the Order) issued by the United States Environmental Protection Agency (USEPA) on May 5, 1999.

On-post groundwater monitoring was initiated in 1992 in response to volatile organic compound (VOC) contamination detected in CSSA drinking water supply well CS-MW16-LGR (formerly named "Well 16") and continued periodically until the current CSSA quarterly groundwater monitoring program for on-post wells was initiated in December 1999.

The CSSA groundwater monitoring program follows the provisions of the Final Data Quality Objectives (DQO) for the Groundwater Monitoring Program (Parsons 2006) in **Appendix A**, as well as the recommendations of the *Three-Tiered Long Term Monitoring Network Optimization Evaluation* (Parsons 2005). The latter document provides recommendations for sampling based on the Long Term Monitoring Optimization (LTMO) study performed for the CSSA groundwater monitoring program. The LTMO sampling frequencies were implemented on-post in December 2005, as approved by the Texas Commission on Environmental Quality (TCEQ) and USEPA. The ongoing groundwater monitoring program complies with the CSSA Quality Assurance Program Plan (QAPP) (CSSA 2002) and the Sampling and Analysis Plans and Work Plans prepared for each groundwater monitoring task order. The sampling conducted in 2009 was conducted in compliance with the applicable CSSA QAPP, DQOs, and Work Plans.



2009 Sampled Wells

- Wells with VOC concentration > MCL
- Wells with VOC concentration between RL and MCL
- Wells with VOC concentration below RL
- Other Non-detect Wells
- Multi-Port Westbay Wells
- CSSA Fenceline

Figure 1

2009 Sampled On-Post and Off-Post Ground Water Wells
Camp Stanley Storage Activity

PARSONS

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A comprehensive summary of the results from the 2009 on-post groundwater sampling events is presented in **Appendix B**. **Appendices C** and **D** present Westbay analytical results in tabular and graphical format, respectively. Abbreviated tables showing only the detected compounds are included in the groundwater results discussions in Section 2.2.1 of this report. **Appendix E** presents the CSSA Drought Contingency Plan trigger levels, and **Appendix F** includes the potentiometric groundwater maps.

The laboratory data packages and associated data validation reports for 2009 were submitted to CSSA separately from this report.

1.2 Off-Post Groundwater Monitoring

The primary objective of the off-post groundwater monitoring program is to determine whether concentrations of VOCs detected in off-post public and private drinking water wells exceed safe drinking water standards. A secondary objective of the off-post groundwater monitoring program is to determine the lateral and vertical extent of the contaminant plumes associated with past releases near Area of Concern (AOC)-65 or from Solid Waste Management Units (SWMU) B-3 and O-1. A third objective of the off-post groundwater monitoring program is to assess whether there are apparent trends in contaminant levels (decreasing or increasing) over time in the sampled wells.

CSSA was required by the Order to identify and locate both privately and publicly owned groundwater wells within ¼-mile of CSSA. The *Offsite Well Survey Report* (Parsons 2001) was submitted to fulfill this requirement. This survey is scheduled to be updated in 2010 to capture any new wells that have been added in the area and to extend the ¼-mile to ½-mile of CSSA. Additional background information regarding off-post private and public water supply wells is located in the CSSA Environmental Encyclopedia, Volume 5 Groundwater (CSSA 2007). Some off-post wells were initially sampled in 1995 and quarterly sampling of off-post wells began in 2001 in accordance with the *Off-Post Monitoring Program and Response Plan* (the Plan) (CSSA 2002a).

Under the Plan, the following criteria are used to determine the action levels for detected VOCs and to determine which off-post wells are sampled:

- If VOC contaminant levels are ≥90 percent of the maximum contaminant levels (MCL) for tetrachloroethene [PCE] and trichloroethene [TCE]) (≥4.5 micrograms per liter [µg/L] based on preliminary data received from the laboratory, and the well is used as a potable water source, the well will be taken offline, bottled water will be supplied within 24 hours after receipt of the data, and a confirmation sample will be collected from the well within 14 days of receipt of the final validated analytical report. If the confirmation sample confirms contaminants of concern (COC) are at or above 90 percent of the MCLs, the well will be evaluated, and either installation of an appropriate method for wellhead treatment or connection to an alternative water source will be performed.
- If VOC contaminant levels are ≥80 but ≤90 percent of the MCL (>4.0 and ≤ 4.5

µg/L for PCE and TCE) during any single monitoring event based on preliminary data from the laboratory, and the well is used as a potable water source, it will be monitored monthly. If the monthly follow-up sampling confirms that COCs are ≥80 but ≤90 percent of the MCL, it will continue to be sampled monthly until the VOC levels fall below the 80 percent value.

- If any COC is detected at levels greater than or equal to the analytical method detection limit (MDL) (historically 0.06 µg/L for PCE and 0.05 µg/L for TCE), and <80 percent of the MCL, the well will be sampled on a quarterly basis. This sampling will be conducted concurrently with on-post sampling events and will be used to develop historical trends in the area. Quarterly sampling will continue for a minimum of 1 year, after which the sampling frequency will be reviewed and may be decreased.

- If COCs are not detected during the initial sampling event (*i.e.*, no VOC contaminant levels above the MDL), further sampling of the well will be reconsidered. A well with no detectable VOCs may be removed from the sampling list. However, if analytical data suggest future plume migration could negatively influence the well, it will be re-sampled as needed. The well owner, USEPA, and TCEQ will be apprised of any re-sampling decisions regarding the non-detect wells.

- For wells where a wellhead treatment system has been installed, post-treatment samples will be collected and analyzed after initial system start-up and at 6-month intervals to confirm the system is effectively removing VOCs.

A comprehensive summary of the results from the 2009 off-post groundwater sampling events is presented in **Appendix G**. Abbreviated tables showing only the detected compounds are included in the groundwater results discussions in Section 2.2.2 of this report. **Appendix H** summarizes pre- and post-granular activated carbon (GAC) filtration system sampling results.

The cumulative historical results from both on- and off-post groundwater monitoring are presented in summary tables located in the *Introduction to the On-Post and Off-Post Quarterly Groundwater Monitoring Program* (Tables 6 through 9), CSSA Environmental Encyclopedia, Volume 5 Groundwater (CSSA 2007).

2.0 GROUNDWATER MONITORING RESULTS

2.1 Physical Characteristics

2.1.1 Water Level Measurements

Water level measurements were recorded prior to sampling during the March, June, September, and December 2009 events. Water level measurements made at all monitoring wells and drinking water wells listed in **Table 2.1,** a total of 47 wells. Water levels were measured by either e-line indicator or collected from a permanently installed transducer.

Water level elevations and quarterly elevations are summarized in **Table 2.1.** The average groundwater elevation measurements for each of the Lower Glen Rose (LGR), Bexar Shale (BS), and Cow Creek (CC) formations are provided in **Table 2.2**. The averages were calculated using groundwater elevations from wells screened in only one of the three formations. Water elevations from 8 wells completed with open boreholes over multiple formations were not used. As shown in **Table 2.1**, overall groundwater levels in the Middle Trinity Aquifer increased approximately 90.48 feet from January through December 2009. Since December 2008, water levels decreased nearly 11 feet through August 2009. However, rain began to fall more frequently in mid September and has continued through the first part of 2010. After suffering an average 10.76 foot loss in aquifer elevation for the first eight months, the average elevation change from September 2009 to December 2009 increased approximately 101.24 feet. Approximately 15 inches of rain fell in the final quarter of the year, this is equal to the total rainfall received the entire first 3 quarters of the year. The total amount of precipitation that fell in 2009 was 29.61 inches, as measured by the CSSA southern weather station. During the 2008 drought only 13.69 inches of precipitation was received.

Based on 2009 quarterly aquifer level measurements, **Figure 2.1** shows the relationships of the water level in each portion of the aquifer at CSSA cluster wells (CS-MW1, CS-MW2, CS-MW6, CS-MW7, CS-MW8, CS-MW9, CS-MW10, and CS-MW12). The general trend in **Figure 2.1** shows that at an individual location, the head in the LGR well is typically greater than in the CC well. The amount of dissimilarity between water levels within a cluster is a good indicator to the degree of hydraulic separation between the formational units. Theoretically, intervals that are well connected hydraulically will have the same or very similar groundwater elevation.

Under more favorable hydrologic conditions, the groundwater elevation in the BS typically falls between the LGR and CC elevations, as seen in December 2009. However, as the drought continued in the first three quarters of 2009, the BS groundwater elevation is generally higher than both of its counterparts. This phenomenon has been observed before in the cluster wells, and is attributed to the low draining potential of the less permeable BS matrix during continual aquifer declines. Conversely, during recharge events the groundwater BS wells will lag behind the LGR and CC wells, and seems to be typical for the area.

Table 2.1
Summary of Groundwater Elevations and Changes, 2009

Well ID	TOC elevation (ft MSL)	March 2009 Elevations	June 2009 Elevations	September 2009 Elevations	December 2009 Elevations	Groundwater Elevation Change: March minus December 08	June minus March	September minus June	December minus September	Formations Screened: LGR	BS	CC
CS-1+ #	**1169.27**	**875.20**	**888.61**	**883.37**	**1001.17**	**54.54**	**13.41**	**-5.24**	**117.80**	**ALL**		
CS-2	**1237.59**	**979.92**	**979.99**	**979.64**	**1045.29**	**-0.08**	**0.07**	**-0.35**	**65.65**	**?**	**?**	
CS-3	1240.17	978.00	977.39	973.94	1048.72	0.22	-0.61	-3.45	74.78	**X**		
CS-4	**1229.28**	**977.14**	**976.70**	**NA**	**NA**	**0.11**	**-0.44**	**NA**	**NA**	**?**	**?**	
CS-9	**1325.31**	**938.21**	**939.71**	**934.96**	**1044.91**	**-5.00**	**1.50**	**-4.75**	**109.95**	**ALL**		
CS-10+ #	**1331.51**	**898.00**	**932.43**	**903.51**	**1045.51**	**-26.56**	**34.43**	**-28.92**	**142.00**	**ALL**		
CS-11	**1332.49**	**946.88**	**946.67**	**NA**	**NA**	**-5.83**	**-0.21**	**NA**	**NA**	**ALL**		
CS-12 #*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**ALL**		
CS-D	1236.03	980.66	980.58	977.24	1049.13	-0.47	-0.08	-3.34	71.89	**X**		
CS-MWG-LGR	1328.14	1033.44	1028.30	1019.64	1062.19	-1.85	-5.14	-8.66	42.55	**X**		
CS-MWH-LGR	1319.19	1018.84	1015.77	1007.21	1051.23	3.40	-3.07	-8.56	44.02	**X**		
CS-I	1315.20	1015.99	1011.31	1005.90	1056.05	2.06	-4.68	-5.41	50.15		**X**	
CS-MW1-LGR+	1220.73	980.40	976.98	973.26	1060.93	3.22	-3.42	-3.72	87.67			**X**
CS-MW1-BS+	1221.09	980.54	979.29	975.35	1023.76	-0.91	-1.25	-3.94	48.41	**X**		
CS-MW1-CC+	1221.39	940.28	936.69	926.57	1024.59	-19.46	-3.59	-10.12	98.02			
CS-MW2-LGR	1237.08	953.90	977.00	972.58	1063.48	-23.54	23.10	-4.42	90.90	**X**		
CS-MW2-CC	1240.11	936.48	932.22	923.54	1012.01	-16.20	-4.26	-8.68	88.47	**X**		
CS-MW3-LGR	1334.14	986.03	985.47	982.22	1048.34	-0.64	-0.56	-3.25	66.12	**X**		
CS-MW4-LGR*	1209.71	968.81	974.44	963.27	1131.91	-3.52	5.63	-11.17	168.64	**X**		
CS-MW5-LGR	1340.24	973.50	972.99	968.90	1056.44	-0.14	-0.51	-4.09	87.54		**X**	
CS-MW6-LGR+	1232.25	927.28	941.28	923.19	1055.60	-4.96	14.00	-18.09	132.41			**X**
CS-MW6-BS+	1232.67	946.89	942.91	936.76	1044.67	-31.20	-3.98	-6.15	107.91	**X**		
CS-MW6-CC+	1233.21	910.03	911.19	900.01	1041.56	-6.78	1.16	-11.18	141.55			**X**
CS-MW7-LGR	1202.27	916.07	925.74	911.81	1048.88	-4.81	9.67	-13.93	137.07	**X**		
CS-MW7-CC	1201.84	901.22	902.38	891.68	1041.04	-6.32	1.16	-10.70	149.36			**X**
CS-MW8-LGR	1208.35	919.30	932.84	914.57	1055.35	-5.93	13.54	-18.27	140.78	**X**		
CS-MW8-CC**	1206.13	903.00	904.15	893.19	1041.53	-6.33	1.15	-10.96	148.34		**X**	
CS-MW9-LGR+	1257.27	992.61	991.29	979.97	1044.67	0.49	-1.32	-11.32	64.70			**X**
CS-MW9-BS+	1256.73	992.83	992.23	987.99	1046.03	-0.38	-0.60	-4.24	58.04	**X**		
CS-MW9-CC+	1255.95	966.30	964.19	946.05	1023.64	-2.80	-2.11	-18.14	77.59			**X**
CS-MW10-LGR+	1189.53	888.93	891.91	881.55	1047.93	-5.40	2.98	-10.36	166.38	**X**		
CS-MW10-CC+	1190.04	882.57	883.07	875.06	1039.64	-4.62	0.50	-8.01	164.58	**X**		
CS-MW11A-LGR	1204.03	886.53	887.08	878.10	1030.28	-6.88	0.55	-8.98	152.18	**X**		
CS-MW11B-LGR	1203.52	dry	dry	dry	999.37	NA	NA	NA	NA		**X**	
CS-MW12-LGR+	1259.07	969.77	969.66	965.48	1051.12	-0.72	-0.11	-4.18	85.64			**X**
CS-MW12-BS+	1258.37	973.18	972.25	968.18	1047.46	-1.09	-0.93	-4.07	79.28	**X**		
CS-MW12-CC+	1257.31	953.62	952.01	938.21	1033.12	-10.15	-1.61	-13.80	94.91			**X**
CS-MW16-LGR+ #	1244.60	961.06	957.85	962.20	1026.40	3.61	-3.21	4.35	64.20	**X**		
CS-MW16-CC+ #	1244.51	872.93	863.72	856.31	968.01	-87.67	-9.21	-7.41	111.70	**X**		
CS-MW17-LGR	1257.01	937.43	938.40	937.76	1049.96	0.47	0.97	-0.64	112.20	**X**		
CS-MW18-LGR*	1283.61	937.24	938.77	933.29	1047.31	-2.15	1.53	-5.48	114.02	**X**		
CS-MW19-LGR	1255.53	949.97	952.03	947.81	1065.73	-2.21	2.06	-4.22	117.92	**X**		
CS-MW20-LGR	1209.42	950.18	952.65	947.73	1073.02	-2.34	2.47	-4.92	125.29	**X**		
CS-MW21-LGR*	1184.53	934.28	935.30	934.05	1050.98	-0.26	1.02	-1.25	116.93	**X**		
CS-MW22-LGR	1280.49	907.62	906.79	905.64	1042.19	-3.17	-0.83	-1.15	136.55	**X**		
CS-MW23-LGR	1258.20	913.16	917.56	910.30	1039.60	-3.04	4.40	-7.26	129.30	**X**		
CS-MW24-LGR*	1253.90	977.27	980.73	977.30	1045.55	-2.84	3.46	-3.43	68.25	**X**		
CS-MW25-LGR	1293.01	993.81	993.01	989.41	1047.16	-0.98	-0.80	-3.60	57.75	**X**		
FO-20	NA	1048.80	1047.62	1028.00	1078.33	6.48	-1.18	-19.62	50.33	**ALL**		
Average groundwater elevation change:						**-4.25**	**1.25**	**-7.76**	**101.24**			
Average groundwater elevation change since December 2008:						**90.48**						

Notes:
Average groundwater elevation change is calculated from wells screened in only one formation.
Bold wells: CS-1, CS-2, CS-4, CS-9, CS-10, CS-11, and CS-12 are open boreholes across more than one of the formations and are not included in average groundwater elevation calculations. CS-1, CS-9, CS-10 and CS-11 are current and former drinking water wells.
*Wells equipped with a transducer
** Well equipped with a USGS monitored transducer
+ Wells equipped with a SCADA transducer
# well is pumping
NA = Data not available
?=Exact screening information unknown for this well.
All measurements given in feet.

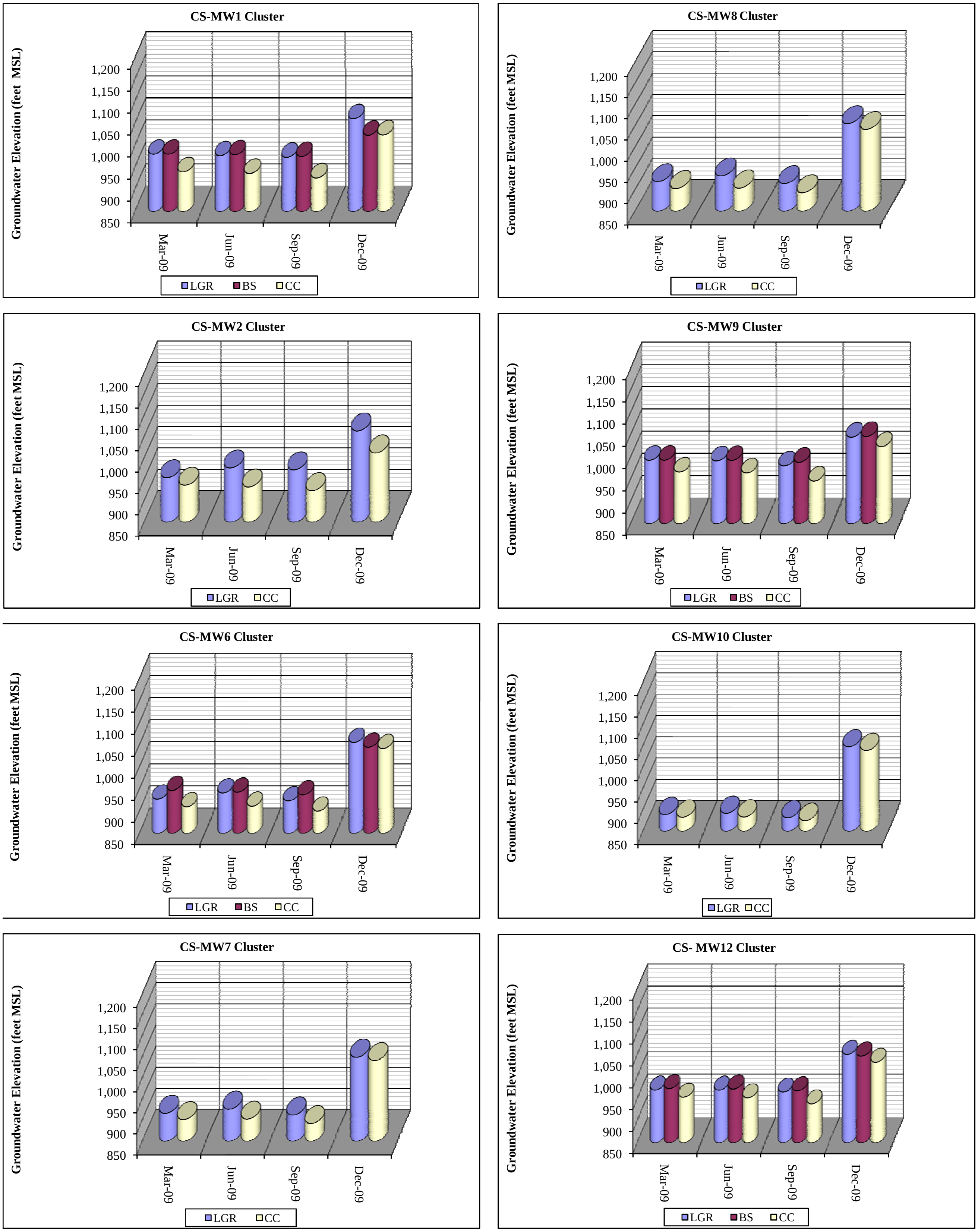
Table 2.2
Summary of Groundwater Elevation by Formation, 2009

Well ID	TOC elevation (ft MSL)	2009 Groundwater Elevations March	June	September	December	Formations Screened LGR	BS	CC
CS-1+ #	**1169.27**	**875.20**	**888.61**	**883.37**	**1001.17**	**ALL**		
CS-2	**1237.59**	**979.92**	**979.99**	**979.64**	**1045.29**	**?**	**?**	
CS-3	1240.17	978.00	977.39	973.94	1048.72	X		
CS-4	**1229.28**	**977.14**	**976.70**	**NA**	**NA**	**?**	**?**	
CS-9	**1325.31**	**938.21**	**939.71**	**934.96**	**1044.91**	**ALL**		
CS-10+ #	**1331.51**	**898.00**	**932.43**	**903.51**	**1045.51**	**ALL**		
CS-11	**1332.49**	**946.88**	**946.67**	**NA**	**NA**	**ALL**		
CS-12 #*	**NA**	**NA**	**NA**	**NA**	**NA**	**ALL**		
CS-D	1236.03	980.66	980.58	977.24	1049.13	X		
CS-MWG-LGR	1328.14	1033.44	1028.30	1019.64	1062.19	X		
CS-MWH-LGR	1319.19	1018.84	1015.77	1007.21	1051.23	X		
CS-I	1315.20	1015.99	1011.31	1005.90	1056.05	X		
CS-MW1-LGR+	1220.73	980.40	976.98	973.26	1060.93	X		
CS-MW1-BS+	1221.09	980.54	979.29	975.35	1023.76		X	
CS-MW1-CC+	1221.39	940.28	936.69	926.57	1024.59			X
CS-MW2-LGR	1237.08	953.90	977.00	972.58	1063.48	X		
CS-MW2-CC	1240.11	936.48	932.22	923.54	1012.01			
CS-MW3-LGR	1334.14	986.03	985.47	982.22	1048.34	X		
CS-MW4-LGR*	1209.71	968.81	974.44	963.27	1131.91	X		
CS-MW5-LGR	1340.24	973.50	972.99	968.90	1056.44	X		
CS-MW6-LGR+	1232.25	927.28	941.28	923.19	1055.60	X		
CS-MW6-BS+	1232.67	946.89	942.91	936.76	1044.67		X	
CS-MW6-CC+	1233.21	910.03	911.19	900.01	1041.56			X
CS-MW7-LGR	1202.27	916.07	925.74	911.81	1048.88	X		
CS-MW7-CC	1201.84	901.22	902.38	891.68	1041.04			X
CS-MW8-LGR	1208.35	919.30	932.84	914.57	1055.35	X		
CS-MW8-CC**	1206.13	903.00	904.15	893.19	1041.53			X
CS-MW9-LGR+	1257.27	992.61	991.29	979.97	1044.67	X		
CS-MW9-BS+	1256.73	992.83	992.23	987.99	1046.03		X	
CS-MW9-CC+	1255.95	966.30	964.19	946.05	1023.64			X
CS-MW10-LGR+	1189.53	888.93	891.91	881.55	1047.93	X		
CS-MW10-CC+	1190.04	882.57	883.07	875.06	1039.64			X
CS-MW11A-LGR	1204.03	886.53	887.08	878.10	1030.28	X		
CS-MW11B-LGR	1203.52	dry	dry	dry	999.37	X		
CS-MW12-LGR+	1259.07	969.77	969.66	965.48	1051.12	X		
CS-MW12-BS+	1258.37	973.18	972.25	968.18	1047.46		X	
CS-MW12-CC+	1257.31	953.62	952.01	938.21	1033.12			X
CS-MW16-LGR+ #	1244.60	961.06	957.85	962.20	1026.40	X		
CS-MW16-CC+ #	1244.51	872.93	863.72	856.31	968.01			X
CS-MW17-LGR	1257.01	937.43	938.40	937.76	1049.96	X		
CS-MW18-LGR*	1283.61	937.24	938.77	933.29	1047.31	X		
CS-MW19-LGR	1255.53	949.97	952.03	947.81	1065.73	X		
CS-MW20-LGR	1209.42	950.18	952.65	947.73	1073.02	X		
CS-MW21-LGR*	1184.53	934.28	935.30	934.05	1050.98	X		
CS-MW22-LGR	1280.49	907.62	906.79	905.64	1042.19	X		
CS-MW23-LGR	1258.20	913.16	917.56	910.30	1039.60	X		
CS-MW24-LGR*	1253.90	977.27	980.73	977.30	1045.55	X		
CS-MW25-LGR	1293.01	993.81	993.01	989.41	1047.16	X		
FO-20	NA	1048.80	1047.62	1028.00	1078.33	ALL		
Average groundwater elevation by formation, each event:	**LGR:**	**957.48**	**959.75**	**953.49**	**1051.77**	**Average groundwater elevation by formation all of 2009:**		**980.62**
	BS:	**973.36**	**971.67**	**967.07**	**1040.48**			**988.15**
	CC:	**916.24**	**914.68**	**903.39**	**1026.64**			**940.24**

Notes:
Average groundwater elevation change is calculated from wells screened in only one formation

Bold wells: CS-1, CS-2, CS-4, CS-9, CS-10, and CS-11 are open boreholes across more than one of the formations and are not included in average groundwater elevation calculations. CS-1, CS-9, CS-10 and CS-11 are current and former drinking water wells.
*Wells equipped with a transducer
** Well equipped with a USGS monitored transducer
+ Wells equipped with a SCADA transducer
NA = Data not available
?=Exact screening information unknown for this well.
All measurements given in feet.

Figure 2.1
Comparison of Groundwater Elevations within Well Clusters



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2.1.2 Weather Station and Transducer Data

Of the 49 wells listed on **Table 2.1,** 24 are equipped with transducers to continuously log groundwater levels, 18 are providing telemetry directly to the Supervisory Control and Data Acquisition (SCADA) system. Two weather stations are in place at CSSA, WS-N adjacent to well CS-MW16-LGR in the north-central region of CSSA, and WS-S in the southwest corner of CSSA adjacent to AOC-65. Both weather stations record meteorological data, including precipitation, wind speed, wind direction, temperature, etc. The data are recorded to evaluate whether trends in rainfall and groundwater recharge are apparent.

Continuous aquifer level data (January 2009 through December 31, 2009) collected from 5 wells specifically screened within the LGR and BS are presented on **Figure 2.2** as well as the corresponding daily precipitation values. The wells presented in this figure are equipped with transducers set to record water level measurements on a daily basis with increased monitoring during significant rain events. Additional LGR, BS, and CC wells are also equipped with transducers, however minimal data was collected in 2009 due to SCADA outages or equipment failure. Failed and obsolete equipment is scheduled to be replaced with as part of the new task order for 2010. Both CS-MW16-LGR and CS-MW16-CC are omitted from this graphic since they are actively pumping wells for the Bioreactor system, and therefore do not reflect static aquifer conditions.

Weather Station South (WS-S) reported 83 rainfall events with a total precipitation of 29.61 inches in 2009. The data recorded by Weather Station North (WS-N) is incomplete due to a system outage in September and in November it was sent in for calibration. Rainfall events during 2009 were sporadic, with 12 rain events of one inch or more per day compared to 2008 when only 4 rain events were one inch or more. A majority of the rain fell between September and December 2009, at total of 20.10 inches. This is doubled the total rainfall for previous 8 months.

Based upon historical data, 2009 rainfall totals ended slightly below average for the year, 29.61 inches. For comparison, the 2000 to 2008 annual precipitation for the San Antonio, Texas area averaged 32.39 inches, as recorded by the weather station operated by the National Weather Service (NWS). The month with the highest rainfall total was October, with 9.60 inches of rain at CSSA. The record all time high precipitation in San Antonio for October was set in 1998 with 18.07 inches of rain as reported by the NWS. The drought that began in September 2007 quickly rebounded with the late precipitation totals in 2009.

Table 2.3 shows the total precipitation received each quarter, average groundwater elevations in each formation, the average groundwater elevation change in each formation, the approximate gradient, and approximate gradient flow direction for all monitoring events. As in the past, the groundwater elevations indicate recharge of the LGR formation immediately after precipitation.

Figure 2-2, Selected Wells Groundwater Elevations vs Precipitation Data

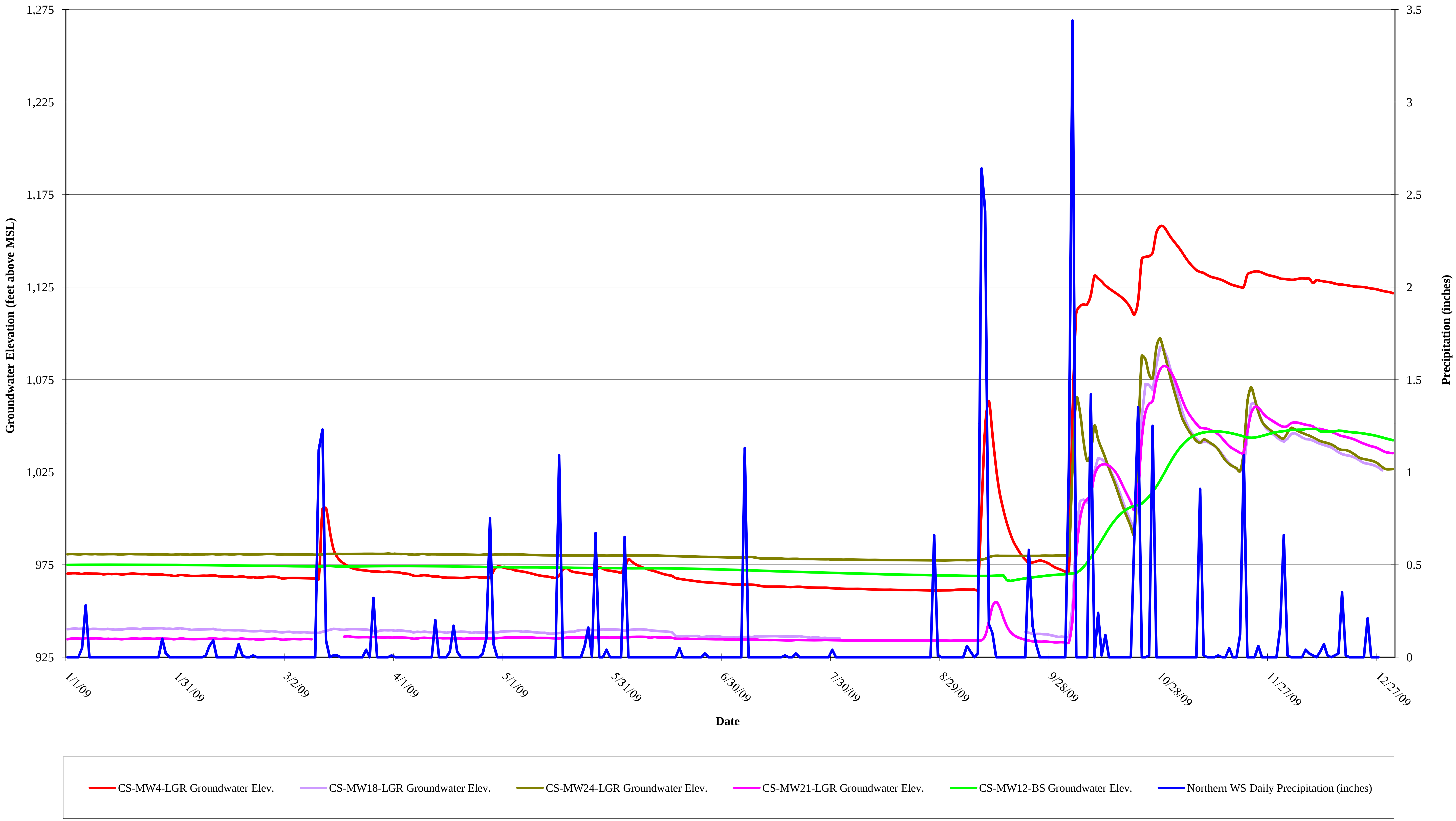

Table 2.3
Precipitation, Groundwater Elevation and Gradient

Quarterly Report (Month, year)	Quarterly precipitation (inches) North WS	Quarterly precipitation (inches) South WS	Average GW elevation Change (feet)	CS-MW16-LGR GW Elevation Change (feet)	Average GW Elevation			Approximate gradient (ft/ft)	Approximate gradient flow direction
					Lower Glen Rose	Bexar Shale	Cow Creek		
September-99	7.52	--	-188.4	-136.82	979.80	--	--	0.007	Southwest
December-99	2.84	--	-4.9	-8.13	973.10	--	--	0.004	Southwest
March-00	3.58	--	-9.3	-1.28	970.94	--	--	0.009	South-southeast
June-00	11.1	--	11.77	0.29	976.27	--	--	0.006	Southeast
September-00	1.96	--	-6.34	-13.28	967.03	--	--	0.006	Southeast
December-00	14.48	--	122.99	142.19	1118.59	--	--	0.005	South-southeast
March-01	10.13	--	53.19	48.07	1157.20	--	--	0.0125	Southeast
June-01	6.58	--	-47.5	-48.04	1104.00	1106.85	1093.89	0.007	Southeast
September-01	14.73	--	23.96	13.44	1140.55	1098.18	1095.75	0.0067	Southeast
December-01	10.16	--	15.46	28.21	1149.68	1131.36	1125.63	0.0092	Southeast
March-02	2.25	--	-70.97	-74.03	1077.91	1064.46	1059.27	0.0086	Southeast
June-02	4.46	--	-48.29	-53.41	1030.51	1022.51	994.02	0.0137	South-southeast
September-02	30.98	--	104.5	113.27	1130.87	1129.21	1098.34	0.017	South-southeast
December-02	12.91	--	19.48	33.89	1143.98	1148.26	1133.11	0.0061	South-southeast
March-03	6.22	6.68	-8.47	-10.11	1135.18	1140.52	1122.95	0.012	South-southeast
June-03	4.67	4.64	-41.08	-37.1	1097.87	1095.36	1069.02	0.0022	South-southwest
September-03	8.05	10.28	-52.85	-52.21	1046.77	1060.39	1025.61	0.0045	South-southwest
December-03	2.79	2.92	-32.85	-38.68	1011.38	1029.39	1002.07	0.0095	South-southwest
March-04	6.35	5.93	22.89	34.07	1043.68	1026.20	1017.98	0.0046	South-southwest
June-04	12.95	12.33	71.91	84.31	1121.80	1101.85	1074.56	0.0012	South-southwest
September-04	14.3	14.57	-8.05	-19.31	1106.43	1110.17	1074.96	0.003	South-southeast
December-04	21.04	23.12	63.07	74.82	1173.98	1159.46	1135.16	0.004	South-southeast
March-05	7.38	6.48	-6.47	-7.67	1168.46	1151.60	1127.58	0.00436	South-southeast
June-05	NA	5.29	-45.93	-53.66	1119.19	1125.27	1082.40	0.0041	South-southeast
September-05	NA	5.93	-61.24	-62.95	1054.88	1077.87	1033.65	0.0068	South-southwest
December-05	NA	2.41	-57.9	-63.86	994.23	1023.45	980.25	0.0054	South-southwest
March-06	2.52	1.11	-24.81	-7.16	974.10	990.23	948.80	0.0084	South-southwest
June-06	7.65	11.18	-9.46	-3.57	966.16	983.47	933.59	0.0104	South-southwest
September-06	3.42	3.12	-6.66	-1.42	961.07	979.78	922.34	0.0099	South
December-06	4.68	5.9	2.48	0.75	958.87	979.73	933.37	0.0099	South
March-07	9.83		14.53	-0.11	969.87	992.53	958.06	0.0079	South
June-07	11.99		182.09	185.13	1162.17	1119.36	1128.32	0.0016	Southeast
September-07	29.4		15.56	5.46	1168.77	1168.14	1154.47	0.0019	South
December-07	1.95		-70.45	-76.43	1095.68	1101.19	1088.93	0.0052	South-southeast
March-08	2.17	2.31	-42.45	*-134.42	1050.23	1053.76	1047.78	0.0072	South
June-08	1.9	2.69	-51.71	*-3.57	1002.44	1015.93	966.67	0.0047	South
September-08	6.06	6.95	-27.49	*22.67	976.18	991.62	953.41	0.0058	South
December-08	1.69	1.74	-15.48	*-27.30	961.10	981.76	934.26	0.0080	South-southeast
March-09	2.58	3.16	-4.25	*3.61	957.48	973.36	916.24	0.0073	South-southeast
June-09	3.77	4.41	1.25	*-3.21	959.75	971.67	914.68	0.0059	South-southeast
September-09	NA	7.41	-7.76	*4.35	953.49	967.07	903.39	0.0054	South-southeast
December-09	NA	14.63	101.24	*64.20	1051.77	1040.48	1026.64	0.000018	South

GW = groundwater, ft MSL = feet above mean sea level, ft/ft = feet per foot
NA = Data not available due to weather station outage.
* Well is pumping constantly to the B-3 Bioreactor
2007 precipitation data was combined to fill in data gaps due to multiple weather station outages during SCADA installation.

J:\746\746545_746546\01000 GW Mon\2009 Annual GW Report\Table 2-3 summary of elevation changes.xls

Previously in 2008, the aquifer showed a steady and dramatic decline in aquifer water levels until mid-June 2008. At that time, the decline notably “flat lines” and remains relatively stable for the remainder of 2008. In 2009, the “flat line” condition of the aquifer was maintained for an additional 9 months through September 2009. The interesting feature of the 2008 and 2009 hydrographs is the “pseudo-equilibrium” the aquifer achieves once the water table has eventually declined into the primary “production interval” of the LGR. This section of the aquifer has a significantly higher capacity for groundwater storage and therefore is less susceptible to regional decline than the overlying (and less permeable) strata. However, with continued drought conditions the storage capacity of the production interval was also being exceeded, as noted by the diminished yield and long recovery times from the CSSA production wells.

By October 2009, the persistent drought cycle was broken by a very active precipitation cycle that began in mid-September. Aquifer levels rebounded by more than 120 feet in most wells in October 2009, but have slowly receded for remainder of 2009. However, continued rainfall throughout December 2009 helped keep the aquifer level more than 75 feet (on average) above its previous drought stage level.

2.1.3 Potentiometric Data

The groundwater gradient/potentiometric surface figures presented **Appendix F** incorporate measured groundwater elevations from the LGR, BS, and CC screened wells. The drought conditions which began in September 2007 quickly rebounded at the end of 2009. As shown in **Appendix F**, water levels at CSSA can vary greatly. This variability is associated with several factors:

- Differences in well completion depths and formations screened;
- Differences in recharge rates due to increased secondary porosity associated with the Salado Creek area;
- Differences in recharge rates due to increased secondary porosity associated with local fault zones;
- Pumping from on- and off-post public and private water supply wells; and
- Locations of major faults or fractures.

2.1.4 Post-wide Flow Direction and Gradient

An overall average 2009 calculated LGR groundwater gradient is to the south-southeast at 0.0046 ft/ft. Depending which quadrant of the post the measurement is taken, the groundwater gradient varied seasonally from 0.000018 ft/ft (December 2009) to 0.0073 ft/ft (March 2009). General groundwater flow directions and average gradients calculated during past monitoring events are provided in **Table 2.3** for comparison.

Lower Glen Rose

The 2009 potentiometric surface maps for LGR-screened wells **(Appendix F.1, E.4, E.7 & E.10)** exhibited a wide range of groundwater elevations. Groundwater elevations are generally higher in the northern and central portions of CSSA, and decrease to the south. This is consistent with the natural dip of the formations and the greater fault displacement in the southern portion of CSSA. The removal of well CS-G from the gridding process negates mounding effect is present at well CS-G that disrupts the normal southerly and easterly components of the North Pasture. This well, along with CS-D, CS-2, and CS-4 are not fully penetrating into the LGR and therefore is not considered within this map.

The drought of 2008 continued through September 2009 as evidenced by the hydrographs and LGR potentiometric maps. The most notable feature of these maps (**E.1, E.4, and E.7**) is the lack of the groundwater mound that typically occurs in the central portion of post at CS-MW4-LGR. Another important fact is that the average LGR aquifer level (see **Table 2.2**) fluctuated less than 7 feet over the course of 9 months (January – September 2009), and less then 8 feet since December 2008. This would suggest the aquifer can maintain a regional baseflow in the production interval of the LGR for a prolonged duration without significant precipitation. However, the effect of the drought clearly impacted the overall productivity of the CSSA supply wells and the available groundwater is a finite resource.

The predominant features of the December 2009 potentiometric map (**E.10**) is the dramatic rise in the aquifer water table and the re-emergence of the CS-MW4-LGR mounding effect in the central portion of CSSA. Historical ground water elevations and gradients are provided in Table 2.3. Groundwater elevations increased between 50 and 150 feet across the base (from North to South) in December 2009. For example, the difference at CS-MWH-LGR between September and December 2009 was an increase of groundwater elevation of 44 feet. For the same time period, the groundwater elevation increase at CS-MW11A-LGR was 152 feet. As another example, the hydraulic head differential between CS-MWH-LGR and CS-MW21-LGR was 99.16 feet in March 2009. Whereas, the differential between the same wells in December 2009 was 0.25 feet, resulting in the extremely shallow groundwater gradient given in Table 2.3 for that monitoring event. Historical data seems to suggest that steeper hydraulic gradients are typically associated with depressed aquifer levels during droughts.

The other notable feature in the December 2009 LGR potentiometric map is the return of the groundwater mounding in the vicinity of CS-MW4-LGR. Well CS-MW4-LGR in the central portion of CSSA consistently has the highest groundwater elevation of LGR screened wells. This elevation was approximately 60 to 70 feet higher than the nearest comparable wells (CS-MW2-LGR and CS-MW20-LGR). Unlike the general trend at CSSA, groundwater flow appears to radiate outward from CS-MW4-LGR. Historical data has shown that this mounding effect can either be muted or completely removed under distressed aquifer levels. Presumably this region has a strong hydraulic connection to significant perched water either associated with Salado Creek or the hillsides to the east.

The groundwater drawdown due to the periodic pumping of CS-16-LGR and CS-EXW01-LGR (Bioreactor System) is reoccurring feature in the central portion of the post. Depending on the current pumping rates at the time of measurement, groundwater in the vicinity of the Bioreactor may be depressed by as much as 23 feet (June 2009). Groundwater in the inner cantonment also shows a drawdown effect from the pumping of water supply well CS-10, and is most notable in March 2009 (**Figure E.1**). Finally, a significant cone-of-depression is evident in the North Pasture on the December 2009 potentiometric map (**Figure E.10**). This drawdown is the result of the pumping of future supply well CS-12 in support of SWMU B-3 Bioreactor Flood Test activities.

Bexar Shale

Currently, groundwater head information is limited to four data points (CS-MW1-BS, CS-MW6-BS, CS-MW9-BS, and CS-MW12-BS). Given the paucity of well control, at best, the BS groundwater maps should be considered qualitative. The BS appears to have very limited groundwater that is likely associated with fracturing. Fractured bedrock such as this often results in discordant water levels between neighboring points. The appropriateness of preparing potentiometric surface maps for the BS is debatable, but these maps have been generated for completeness. Potentiometric maps for the Bexar Shale in 2009 are presented in **Appendix F.2, E.5, E.8 & E.11**.

In typical fashion, the 2009 potentiometric surface maps for BS-screened wells exhibited groundwater flow in multiple directions throughout 2009. The March, June, and September 2009 measurements (**Figures E.2, E.5, and E.8**) indicate a predominately southwesterly flow radiating from well CS-MW9-BS. The maps for each of these quarters are remarkably similar, and the fluctuation in groundwater elevation is less than 7 feet over the 9-month period. However, the precipitation events in the last quarter of the year resulted in the groundwater elevation increasing by almost 100 feet in the BS. The apparent BS groundwater direction in December 2009 was easterly from CS-MW12-BS towards CS-MW1-BS.

Cow Creek

As with the BS, the postwide monitoring of the CC groundwater is limited due to the small number of wells completed only in the CC. Four of the nine CC wells are concentrated in the vicinity of AOC-65. The 2009 potentiometric surface maps for CC-screened wells (**Appendix F.3 E.6, E.9, & E.12**) exhibited a southern flow in all quarters except December 2009, which was more of an easterly direction. The average CC groundwater elevation decreased approximately 13 feet between January and September 2009. During the last quarter of 2009, the average CC groundwater elevation increased approximately 123 feet in response to the significant precipitation events at the end of the year.

Throughout 2009, the effects of periodic pumping of CS-MW16-CC influenced groundwater gradients significantly in the CC interval near the Bioreactor. Prior studies have shown measurable pumping influence within the CC at distances of more than 2,000 feet from a CC pumping well.

2.2 Chemical Characteristics

2.2.1 On-Post Analytical Results

The LTMO study implemented in December 2005 determines the frequency that on-post wells are sampled. An overview of sampling frequencies for on-post wells only is given in **Table 2.4.** Eighty-nine on-post samples were scheduled to be collected in 2009 (24 in March, 15 in June, 39 in September, and 11 in December). Eighteen of the 89 samples could not be collected due to a pump outage in well CS-I and low water levels in monitoring wells CS-MW11B-LGR, CS-MW17-LGR, CS-MW18-LGR, CS-4, CS-D, CS-MW10-LGR, CS-MW2-CC, CS-MW4-LGR, CS-MW6-CC, CS-MW7-CC, CS-MW8-CC, CS-MW9-CC, CS-MW10-CC, and CS-MW12-CC. Thirty-three additional samples were collected in December 2009 to provide a complete set of data for the annual snapshot event. The wells were sampled using either dedicated low-flow pumps, high capacity submersible pumps, or dedicated solar-powered submersible pump. Samples were collected after field parameters (pH, temperature, conductivity) stabilized during well purging. Field parameters were recorded in the field logbook for each sampling event.

Groundwater samples were submitted to Agriculture & Priority Pollutants Laboratories, Inc. (APPL) of Clovis, California for analysis. The analytical program for on-post monitoring wells includes short-list VOC analysis and metals. The short list of VOC analytes included: 1,1-DCE, *cis*-1,2-DCE, *trans*-1,2-DCE, PCE, TCE, and vinyl chloride.

Under the provisions of the groundwater monitoring LTMO study and DQOs, the analytical metals list was modified in the July 2008 meeting with the regulators to include chromium, cadmium, mercury and lead. This change was a result of previous analytical results and past investigations of CSSA metal COC sources. All on-post monitoring wells are sampled for the 4 previous mentioned metals. To meet drinking water compliance requirements, drinking water wells are sampled for additional metals arsenic, barium, copper, and zinc.

Table 2-4
On-Post Wells to be Sampled

Count	Well ID	*Mar-09*	*Jun-09*	*Sep-09*	*Dec-09*	*Sampling Frequency*
1	CS-MW1-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
2	CS-MW1-BS	not sampled	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
3	CS-MW1-CC	not sampled	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
4	CS-MW2-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
5	CS-MW2-CC	not sampled	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
6	CS-MW3-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
7	CS-MW4-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
8	CS-MW5-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
9	CS-MW6-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
10	CS-MW6-BS	not sampled	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
11	CS-MW6-CC	not sampled	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
12	CS-MW7-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
13	CS-MW7-CC	not sampled	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
14	CS-MW8-LGR	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	Every 9 months*
15	CS-MW8-CC	not sampled	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
16	CS-MW9-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
17	CS-MW9-BS	not sampled	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
18	CS-MW9-CC	not sampled	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
19	CS-MW10-LGR	not sampled	not sampled, water level below pump	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	Every 9 months*
20	CS-MW10-CC	not sampled	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
21	CS-MW11A-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
22	CS-MW11B-LGR	not sampled, well is dry	not sampled, well is dry	not sampled, well is dry	not sampled, well is dry	Semi-annual
23	CS-MW12-LGR	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	Every 9 months*
24	CS-MW12-BS	not sampled	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
25	CS-MW12-CC	not sampled	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
26	CS-MW16-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
27	CS-MW16-CC	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
28	CW-MW17-LGR	not sampled, water level below pump	not sampled	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	Every 9 months*
29	CS-MW18-LGR	not sampled, water level below pump	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
30	CS-MW19-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
31	CS-1	not sampled	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Quarterly
32	CS-2	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	Every 9 months*
33	CS-4	not sampled, water level below pump	not sampled	not sampled, water level below pump	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
34	CS-9	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Quarterly
35	CS-10	not sampled	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Quarterly
36	CS-11	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	not sampled	pump removed
37	CS-12	not sampled	not sampled	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Quarterly
38	CS-D	not sampled, water level below pump	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Semi-annual
39	CS-MWG-LGR	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	Every 9 months*
40	CS-MWH-LGR	not sampled	not sampled	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Biennial
41	CS-I	VOCs & metals (Cr, Cd, Hg, Pb)	not sampled	not sampled	not sampled, pump outage	Every 9 months*
42	CS-MW20-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Quarterly**
43	CS-MW21-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Quarterly**
44	CS-MW22-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Quarterly**
45	CS-MW23-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Quarterly**
46	CS-MW24-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Quarterly**
47	CS-MW25-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	VOCs & metals (Cr, Cd, Hg, Pb)	Quarterly**
48	CS-WB01-LGR	VOC's (UGR, LGR, CC zones)	not sampled	VOC's (UGR & LGR zones only)	not sampled	UGR & LGR zones = Semi-annual, CC zones = Bienniel
49	CS-WB02-LGR	VOC's (UGR, LGR, CC zones)	not sampled	VOC's (UGR & LGR zones only)	not sampled	UGR & LGR zones = Semi-annual, CC zones = Bienniel
50	CS-WB03-LGR	VOC's (UGR, LGR, CC zones)	not sampled	VOC's (UGR & LGR zones only)	not sampled	UGR & LGR zones = Semi-annual, CC zones = Bienniel
51	CS-WB04-LGR	VOC's (UGR, LGR, CC zones)	not sampled	VOC's (UGR & LGR zones only)	not sampled	UGR & LGR zones = Semi-annual, CC zones = Bienniel

*Wells recommended for annual sampling frequency in the LTMO are scheduled every nine months (every third quarter) to gather seasonal data.

**Quarterly until LTMO Update Study can recommend a frequency.

Snapshot event, attempt to sample all wells

Each sample is evaluated against either being qualitatively detected in trace amounts above the method detection limit (MDL [F-flagged data]), quantitatively detected above the laboratory reporting limit (RL), or in exceedance of regulatory maximum contaminant level (MCL) or action level (AL) standards. It is important to note that the RL value is significantly less than the promulgated groundwater standard criteria, and therefore the occurrence of a constituent above the RL does not necessarily indicate that there is an immediate concern, especially with the naturally occurring inorganics (metals) in groundwater. The only exception to this generalization is lead, where the RL (0.025 mg/L) is greater than the AL (0.015 mg/L).

Parsons data packages containing the analytical results from the 2009 events are described in the quarterly reports for March, June, and September. The data collected in December is included in this annual report. Data validation was conducted, a summary report is submitted to CSSA, and all data packages from the 2009 groundwater sampling events were reviewed and approved. All detected concentrations of VOCs and metals are presented in **Table 2.5**. Full analytical results are presented in **Appendix B**. Cumulative analytical results can be found in the CSSA Environmental Encyclopedia in Tables 6 and 7 of the *Introduction to the On-Post and Off-Post Quarterly Groundwater Monitoring Program*, Volume 5 Groundwater (CSSA 2007).

Wells not sampled in 2009 were: CS-I scheduled in December 2009 but was not sampled due to a pump outage. The pump was replaced in October 2008 and went out again in December 2009. Monitoring wells CS-MW11B-LGR, CS-MW17-LGR, CS-MW18-LGR, CS-4 and CS-D were not sampled in March; CS-MW10-LGR in June; CS-MW2-CC, CS-MW4-LGR, CS-MW6-CC, CS-MW7-CC, CS-MW8-CC, CS-MW9-CC, CS-MW10-CC, CS-MW11B-LGR, CS-MW12-CC, CS-MW18-LGR, and CS-4 in September; CS-MW11B-LGR in December, all due to low water levels. See **Table 2.4** for the Overview of On-Post Sampling in 2009.

2.2.1.1 On-Post Monitoring Wells with COC Detections above the MCL

Some wells sampled had concentrations detected that exceeded MCLs. The MCLs for some COCs were exceeded in wells CS-4, CS-MW16-LGR, CS-MW16-CC, CS-D, CS-MW1-LGR, and CS-MW9-BS in 2009. The respective comparison criteria (MCLs, SS, or AL) for each compound are included in **Table 2.5**. The detected concentrations are summarized as follows:

- **CS-4** – This well was sampled once in 2009. PCE and TCE concentrations were above their MCLs in December 2009. *Cis*-1,2-DCE and *trans*-1,2-DCE were below their respective MCLs. No metals were detected in this well in 2009. This is the first time since June 2004 that this well has exceeded an MCL. The well was re-sampled in January 2010, and all results were below the MCL at that time.

Table 2-5
2009 On-post Groundwater VOCs and Metals Analytical Results, Detections Only

Well ID	Sample Date	Dichloro-ethene, 1,1 (ug/L)	Dichloro-ethene, *cis* -1,2 (ug/L)	Dichloro-ethene, *trans* -1,2 (ug/L)	Tetra-chloroethene (ug/L)	Tri-chloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temp. (deg C)	Specific Conductivity (uS/cm)
Comparison Criteria	**MDL**	**0.12**	**0.07**	**0.08**	**0.06**	**0.05**	**0.08**			
	RL	**1.2**	**1.2**	**0.6**	**1.4**	**1**	**1.1**			
	MCL	**7**	**70**	**100**	**5**	**5**	**2**	Field Measurements		
CS-1	6/11/2009	--	--	--	--	**0.47F**	--	7.21	23.70	0.511
	9/16/2009	--	--	--	--	**0.37F**	--	6.84	22.20	0.499
	12/14/2009	--	--	--	--	**0.19F**	--	8.55	21.90	0.606
CS-2	6/9/2009	--	--	--	--	--	--	6.90	21.40	0.569
	12/9/2009	--	--	--	**0.17F**	**0.18F**	--	7.42	20.50	0.822
CS-4	12/9/2009	--	**65.09J**	**0.73J**	**43.44**	**86.89**	--	7.88	20.50	0.592
CS-9	6/11/2009	--	--	--	--	--	--	7.21	22.10	0.634
	9/16/2009	--	--	--	--	--	--	6.86	21.50	0.603
	12/14/2009	--	--	--	--	--	--	8.20	21.70	0.615
CS-10	6/11/2009	--	--	--	--	--	--	6.84	24.10	0.603
	9/14/2009	--	--	--	--	--	--	6.14	23.30	0.577
Duplicate	9/14/2009	--	--	--	--	--	--	6.14	23.30	0.577
	12/14/2009	--	--	--	--	--	--	7.72	21.40	0.597
CS-11	6/9/2009	--	--	--	--	--	--	7.08	24.70	0.530
CS-12	9/14/2009	--	--	--	--	--	--	NA	NA	NA
	12/14/2009	--	--	--	--	--	--	7.20	21.90	0.549
Duplicate	12/14/2009	--	--	--	--	--	--	7.20	21.90	0.549
CS-MW16-LGR	3/12/2009	--	**127.17**	**0.13F**	**193.36**	**161.07**	--	7.10	21.70	0.544
	9/9/2009	--	**152.57***	**0.48F**	**176.82**	**177.44***	--	7.03	23.20	0.547
	12/14/2009	--	**143.48**	**0.26F**	**151.77**	**161.53**	--	7.62	22.30	0.563
Duplicate	12/14/2009	--	**140.7**	--	**149.91**	**163.82**	--	7.62	22.30	0.563
CS-MW16-CC	3/12/2009	**0.39F**	**37.79**	**2.09**	**11.15**	**53.28**	--	7.24	22.90	0.642
	9/9/2009	**0.63F**	**43.17**	**5.33**	**7.17**	**51.93**	--	7.34	23.16	0.625
	12/14/2009	--	**36.54**	**4.43**	**4.54**	**47.71**	--	7.19	23.00	0.673
CS-D	9/15/2009	--	**65.81**	**1.37**	**68.94**	**87.11**	--	7.39	22.60	0.511
	12/9/2009	--	**102.36J**	**1.39J**	**92.84**	**126.54**	--	7.51	20.30	0.540
Duplicate	12/9/2009	--	**96.64J**	**1.76J**	**90.16**	**120.57**	--	7.51	20.30	0.540
CS-MWG-LGR	6/9/2009	--	--	--	--	--	--	7.13	21.20	0.433
	12/16/2009	--	--	--	--	--	--	8.34	17.70	0.466
CS-MWH-LGR	9/14/2009	--	--	--	--	--	--	7.38	21.40	0.477
	12/7/2009	--	--	--	--	--	--	6.27	21.90	0.504
CS-I	3/16/2009	--	--	--	--	--	--	7.44	22.50	0.560
CS-MW1-LGR	3/17/2009	--	**15.16**	**0.43F**	**11.63**	**27.99**	--	7.19	25.90	0.551
	9/9/2009	--	**18.37**	**0.37F**	**13.71**	**34.44**	--	6.75	21.70	0.493
	12/10/2009	--	**21.98**	**0.55F**	**13.76**	**31.57**	--	8.16	20.70	0.525
CS-MW1-BS	9/9/2009	--	**0.45F**	--	--	--	--	7.64	22.00	0.482
	12/10/2009	--	**0.62F**	--	--	**0.16F**	--	9.02	20.90	0.520
CS-MW1-CC	9/9/2009	--	--	--	--	--	--	7.16	22.84	0.696
	12/10/2009	--	--	--	--	--	--	8.83	20.10	0.736
CS-MW2-LGR	3/17/2009	--	**0.51F**	--	**0.45F**	**0.18F**	--	11.30	21.70	0.922
	9/10/2009	--	**1.18F**	--	--	--	--	10.71	21.77	0.533
	12/10/2009	--	**1.67**	--	--	**0.20F**	--	9.66	20.70	0.468
CS-MW2-CC	12/10/2009	--	--	--	--	--	--	9.11	20.70	0.754
Duplicate	12/10/2009	--	--	--	--	--	--	9.11	20.70	0.754
CS-MW3-LGR	3/16/2009	--	--	--	--	--	--	7.47	22.40	0.473
Duplicate	3/16/2009	--	--	--	--	--	--	7.47	22.40	0.473
	9/14/2009	--	--	--	--	--	--	7.78	22.20	0.484
	12/16/2009	--	--	--	--	--	--	8.92	19.40	0.475
CS-MW4-LGR	3/17/2009	--	--	--	--	--	--	7.58	23.40	0.479
	12/9/2009	--	--	--	--	--	--	8.30	21.00	0.640
CS-MW5-LGR	3/17/2009	--	**0.99F**	--	--	**0.94F**	--	7.36	21.60	0.493
	9/10/2009	--	**1.73**	--	**0.99F**	**1.25**	--	6.84	22.27	0.524
	12/9/2009	--	**1.10F**	--	**0.80F**	**1.12**	--	8.59	20.40	0.524
CS-MW6-LGR	3/18/2009	--	--	--	--	--	--	7.12	21.90	0.538
	9/10/2009	--	--	--	--	--	--	6.99	22.59	0.558
	12/15/2009	--	--	--	--	--	--	8.03	21.60	0.577
CS-MW6-BS	9/10/2009	--	--	--	--	--	--	8.24	23.04	0.655
	12/15/2009	--	--	--	--	--	--	8.99	21.40	0.751
CS-MW6-CC	12/15/2009	--	--	--	--	--	--	8.45	21.70	0.788
CS-MW7-LGR	3/12/2009	--	--	--	--	--	--	7.61	19.60	0.499
	9/11/2009	--	--	--	**0.49F**	--	--	6.84	21.73	0.661
Duplicate	9/11/2009	--	--	--	**0.46F**	--	--	6.84	21.73	0.661
	12/8/2009	--	--	--	**0.37F**	--	--	7.07	21.00	0.659
CS-MW7-CC	12/8/2009	--	--	--	--	--	--	7.48	21.40	0.814
CS-MW8-LGR	6/11/2009	--	--	--	**1.26F**	--	--	7.12	22.20	0.663
	12/8/2009	--	--	--	**2.6**	**0.17F**	--	6.89	21.50	0.675
CS-MW8-CC	12/8/2009	--	--	--	**0.37F**	**0.19F**	--	9.02	20.90	0.830

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Table 2-5 (cont.)
2009 On-post Groundwater VOCs and Metals Analytical Results, Detections Only

Well ID	Sample Date	Dichloro-ethene, 1,1 (ug/L)	Dichloro-ethene, *cis* -1,2 (ug/L)	Dichloro-ethene, *trans* -1,2 (ug/L)	Tetra-chloroethene (ug/L)	Tri-chloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temp. (deg C)	Specific Conductivity (uS/cm)
CS-MW9-LGR	3/16/2009	--	--	--	--	--	--	7.13	21.40	0.536
	9/14/2009	--	--	--	--	--	--	6.88	21.60	0.565
	12/16/2009	--	--	--	--	--	--	8.24	20.20	0.578
CS-MW9-BS	9/14/2009	--	--	--	--	--	--	7.09	21.40	0.586
	12/16/2009	--	--	--	--	--	--	8.24	20.20	0.578
CS-MW9-CC	12/16/2009	--	--	--	--	--	--	7.65	20.60	0.698
CS-MW10-LGR	12/8/2009	--	--	--	**2.15**	**0.70F**	--	7.45	21.10	0.604
CS-MW10-CC	12/8/2009	--	--	--	--	**0.18F**	--	8.67	21.20	0.820
CS-MW11A-LGR	3/12/2009	--	--	--	**0.43F**	--	--	7.19	20.30	0.545
	9/15/2009	--	--	--	**1.61**	--	--	7.17	21.60	0.560
	12/8/2009	--	--	--	**1.42**	**0.20F**	--	8.02	20.10	0.594
CS-MW12-LGR	6/11/2009	--	--	--	--	--	--	7.60	22.80	0.558
Duplicate	6/11/2009	--	--	--	--	--	--	7.60	22.80	0.558
	12/11/2009	--	--	--	--	--	--	8.36	21.00	0.552
CS-MW12-BS	9/16/2009	--	--	--	--	--	--	8.96	23.00	0.418
	12/11/2009	--	--	--	--	--	--	9.14	20.50	0.423
CS-MW12-CC	12/11/2009	--	--	--	--	--	--	8.37	21.40	0.742
CS-MW17-LGR	12/16/2009	--	--	--	**0.37F**	--	--	7.99	20.50	0.644
CS-MW18-LGR	12/17/2009	--	--	--	--	--	--	7.33	21.40	0.550
CS-MW19-LGR	3/16/2009	--	--	--	**0.56F**	--	--	7.36	21.70	0.519
	9/11/2009	--	--	--	**0.69F**	--	--	6.81	21.92	0.623
	12/17/2009	--	--	--	**0.59F**	--	--	6.85	21.00	0.628
CS-MW20-LGR	3/18/2009	--	--	--	**0.97F**	--	--	6.94	21.00	0.565
	6/10/2009	--	--	--	**2.09**	--	--	7.22	22.00	0.613
	9/16/2009	--	--	--	**1.63**	--	--	7.43	22.40	0.588
Duplicate	9/16/2009	--	--	--	**1.30F**	--	--	7.43	22.40	0.588
	12/10/2009	--	--	--	**2.34**	**0.17F**	--	7.27	21.20	0.617
CS-MW21-LGR	3/18/2009	--	--	--	--	--	--	7.11	21.20	0.519
Duplicate	3/18/2009	--	--	--	--	--	--	7.11	21.20	0.519
	6/10/2009	--	--	--	--	--	--	7.33	22.30	0.556
	9/15/2009	--	--	--	--	--	--	6.97	22.10	0.534
	12/10/2009	--	--	--	--	**0.15F**	--	7.94	21.00	0.564
CS-MW22-LGR	3/18/2009	--	--	--	--	--	--	7.21	20.40	0.535
	6/10/2009	--	--	--	--	--	--	7.21	21.80	0.576
	9/15/2009	--	--	--	--	--	--	6.99	21.80	0.536
	12/10/2009	--	--	--	--	**0.28F**	--	8.48	19.90	0.575
CS-MW23-LGR	3/12/2009	--	--	--	--	--	--	7.82	19.90	0.479
	6/10/2009	--	--	--	--	--	--	7.00	21.90	0.530
	9/15/2009	--	--	--	--	--	--	7.20	21.60	0.496
	12/8/2009	--	--	--	--	--	--	7.35	21.20	0.532
CS-MW24-LGR	3/12/2009	--	--	--	--	--	--	7.27	20.30	0.508
	6/9/2009	--	--	--	--	--	--	7.00	22.30	0.523
Duplicate	6/9/2009	--	--	--	--	--	--	7.00	22.30	0.523
	9/10/2009	--	--	--	--	--	--	7.35	21.74	0.555
	12/9/2009	--	--	--	--	--	--	7.68	21.20	0.555
CS-MW25-LGR	3/16/2009	--	--	--	--	--	--	7.36	22.20	0.475
	6/9/2009	--	--	--	--	--	--	7.40	21.80	0.467
	9/14/2009	--	--	--	--	--	--	7.49	22.20	0.471
	12/16/2009	--	--	--	--	--	--	8.56	20.20	0.492

All samples analyzed by Apple Laboratories using method SW8260B.
MDL = method detection limit
RL = reporting limit
MCL = maximum contaminant level

Table 2.5 (cont.)
2009 On-post Groundwater VOCs and Metals Analytical Results, Detections Only

Well ID	Sample	Date	Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Mercury (mg/L)	Zinc (mg/L)
Comparison Criteria		MDL	0.0002	0.0003	0.0005	0.001	0.003	0.0019	0.0001	0.008
		RL	0.03	0.005	0.007	0.01	0.01	0.025	0.001	0.05
		MCL	0.01	2.0	0.005	0.1	1.3	0.015	0.002	5.0 (SS)
CS-1		6/11/2009	--	0.0356	--	--	--	0.0143F	0.0002F	0.423
		9/16/2009	--	0.0297	--	--	0.009F	0.0028F	--	0.274
		12/14/2009	--	0.0387	--	--	--	--	--	0.187
CS-2		6/9/2009	NA	NA	--	0.015	NA	0.0027F	--	NA
		12/9/2009	NA	NA	--	--	NA	--	--	NA
CS-4		12/9/2009	NA	NA	--	--	NA	--	--	NA
CS-9		6/11/2009	--	0.0455	--	0.002F	0.012	0.0215F	0.0105	2.54
		9/16/2009	--	0.0391	--	--	0.013	0.0296	0.0082	2.718
		12/14/2009	--	0.0376	--	0.002F	0.004F	0.0106F	0.0008F	2.535
CS-10		6/11/2009	--	0.0452	--	--	--	0.0032F	0.0002F	0.288
		9/14/2009	--	0.037	--	--	0.004F	--	--	0.169
	Duplicate	9/14/2009	--	0.039	--	--	--	--	--	0.167
		12/14/2009	0.0004F	0.0419	--	--	--	--	--	1.325
CS-11		6/9/2009	NA	NA	--	--	NA	--	0.0002F	NA
CS-12		9/14/2009	--	0.029	--	--	0.012	0.0045F	--	0.266
		12/14/2009	0.0012F	0.0323	--	--	0.014J	--	--	0.223
	Duplicate	12/14/2009	0.0013F	0.0328	--	--	0.011J	--	--	0.228
CS-MW16-LGR		3/12/2009	NA	NA	--	--	NA	--	--	NA
		9/9/2009	NA	NA	--	--	NA	--	--	NA
		12/14/2009	NA	NA	--	--	NA	--	--	NA
	Duplicate	12/14/2009	NA	NA	--	--	NA	--	--	NA
CS-MW16-CC		3/12/2009	NA	NA	--	--	NA	--	--	NA
		9/9/2009	NA	NA	--	--	NA	--	--	NA
		12/14/2009	NA	NA	--	--	NA	--	--	NA
CS-D		9/15/2009	NA	NA	--	--	NA	0.0056F	--	NA
		12/9/2009	NA	NA	--	--	NA	--	--	NA
	Duplicate	12/9/2009	NA	NA	--	--	NA	--	--	NA
CS-MWG-LGR		6/9/2009	NA	NA	--	--	NA	0.0025F	--	NA
		12/16/2009	NA	NA	--	--	NA	--	--	NA
CS-MWH-LGR		9/14/2009	NA	NA	--	--	NA	0.0038F	--	NA
		12/7/2009	NA	NA	--	--	NA	0.0082F	--	NA
CS-I		3/16/2009	NA	NA	--	--	NA	--	--	NA
CS-MW1-LGR		3/17/2009	NA	NA	--	0.102	NA	--	--	NA
		9/9/2009	NA	NA	--	0.003F	NA	--	--	NA
		12/10/2009	NA	NA	--	--	NA	--	--	NA
CS-MW1-BS		9/9/2009	NA	NA	--	--	NA	--	--	NA
		12/10/2009	NA	NA	--	0.012	NA	--	--	NA
CS-MW1-CC		9/9/2009	NA	NA	--	--	NA	--	--	NA
		12/10/2009	NA	NA	--	--	NA	--	--	NA
CS-MW2-LGR		3/17/2009	NA	NA	--	--	NA	--	--	NA
		9/10/2009	NA	NA	--	--	NA	--	--	NA
		12/10/2009	NA	NA	--	--	NA	--	--	NA
CS-MW2-CC		12/10/2009	NA	NA	--	--	NA	--	--	NA
	Duplicate	12/10/2009	NA	NA	--	--	NA	--	--	NA
CS-MW3-LGR		3/16/2009	NA	NA	--	--	NA	--	--	NA
	Duplicate	3/16/2009	NA	NA	--	--	NA	--	--	NA
		9/14/2009	NA	NA	--	0.002F	NA	--	--	NA
		12/16/2009	NA	NA	--	0.002F	NA	--	--	NA
CS-MW4-LGR		3/17/2009	NA	NA	--	0.003F	NA	--	--	NA
		12/9/2009	NA	NA	--	--	NA	--	--	NA
CS-MW5-LGR		3/17/2009	NA	NA	--	--	NA	--	--	NA
		9/10/2009	NA	NA	--	--	NA	--	--	NA
		12/9/2009	NA	NA	--	0.003F	NA	--	--	NA
CS-MW6-LGR		3/18/2009	NA	NA	--	0.002F	NA	--	--	NA
		9/10/2009	NA	NA	--	0.004F	NA	--	--	NA
		12/15/2009	NA	NA	--	--	NA	--	--	NA
CS-MW6-BS		9/10/2009	NA	NA	--	0.003F	NA	--	--	NA
		12/15/2009	NA	NA	--	--	NA	--	--	NA
CS-MW6-CC		12/15/2009	NA	NA	--	--	NA	--	--	NA
CS-MW7-LGR		3/12/2009	NA	NA	--	0.005F	NA	--	--	NA
		9/11/2009	NA	NA	--	0.002F	NA	--	--	NA
	Duplicate	9/11/2009	NA	NA	--	0.002F	NA	--	--	NA
		12/8/2009	NA	NA	--	0.002F	NA	--	--	NA
CS-MW7-CC		12/8/2009	NA	NA	--	--	NA	--	--	NA
CS-MW8-LGR		6/11/2009	NA	NA	--	--	NA	0.0023F	--	NA
		12/8/2009	NA	NA	--	--	NA	--	--	NA
CS-MW8-CC		12/8/2009	NA	NA	--	--	NA	--	--	NA
CS-MW9-LGR		3/16/2009	NA	NA	--	--	NA	--	--	NA
		9/14/2009	NA	NA	--	--	NA	--	--	NA
		12/16/2009	NA	NA	--	0.003F	NA	--	--	NA

Table 2.5 (cont.)
2009 On-post Groundwater VOCs and Metals Analytical Results, Detections Only

Well ID	Sample	Date	Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Mercury (mg/L)	Zinc (mg/L)
CS-MW9-BS		9/14/2009	NA	NA	--	**0.003F**	NA	**0.0302**	--	NA
		12/16/2009	NA	NA	--	--	NA	**0.0130F**	--	NA
CS-MW9-CC		12/16/2009	NA	NA	--	--	NA	--	--	NA
CS-MW10-LGR		12/8/2009	NA	NA	--	**0.003F**	NA	--	--	NA
CS-MW10-CC		12/8/2009	NA	NA	--	--	NA	--	--	NA
CS-MW11A-LGR		3/12/2009	NA	NA	--	**0.006F**	NA	--	--	NA
		9/15/2009	NA	NA	--	--	NA	--	--	NA
		12/8/2009	NA	NA	--	**0.004F**	NA	--	--	NA
CS-MW12-LGR		6/11/2009	NA	NA	--	**0.002F**	NA	--	--	NA
	Duplicate	6/11/2009	NA	NA	--	**0.002F**	NA	--	--	NA
		12/11/2009	NA	NA	--	--	NA	--	--	NA
CS-MW12-BS		9/16/2009	NA	NA	--	--	NA	--	--	NA
		12/11/2009	NA	NA	--	--	NA	--	--	NA
CS-MW12-CC		12/11/2009	NA	NA	--	--	NA	--	--	NA
CS-MW17-LGR		12/16/2009	NA	NA	--	**0.006F**	NA	--	--	NA
CS-MW18-LGR		12/17/2009	NA	NA	--	--	NA	--	--	NA
CS-MW19-LGR		3/16/2009	NA	NA	--	**0.002F**	NA	--	--	NA
		9/11/2009	NA	NA	--	--	NA	--	--	NA
		12/17/2009	NA	NA	--	--	NA	--	--	NA
CS-MW20-LGR		3/18/2009	NA	NA	--	--	NA	--	--	NA
		6/10/2009	NA	NA	--	--	NA	**0.0021F**	--	NA
		9/16/2009	NA	NA	--	--	NA	--	--	NA
	Duplicate	9/16/2009	NA	NA	--	--	NA	--	--	NA
		12/10/2009	NA	NA	--	--	NA	--	--	NA
CS-MW21-LGR		3/18/2009	NA	NA	--	--	NA	--	--	NA
	Duplicate	3/18/2009	NA	NA	--	--	NA	--	--	NA
		6/10/2009	NA	NA	--	--	NA	--	--	NA
		9/15/2009	NA	NA	--	--	NA	--	--	NA
		12/10/2009	NA	NA	--	--	NA	--	--	NA
CS-MW22-LGR		3/18/2009	NA	NA	--	**0.005F**	NA	**0.0077F**	--	NA
		6/10/2009	NA	NA	--	**0.005F**	NA	**0.0088F**	**0.0002F**	NA
		9/15/2009	NA	NA	--	--	NA	**0.0030F**	--	NA
		12/10/2009	NA	NA	--	--	NA	--	--	NA
CS-MW23-LGR		3/12/2009	NA	NA	--	--	NA	--	--	NA
		6/10/2009	NA	NA	--	**0.002F**	NA	**0.0023F**	**0.0002F**	NA
		9/15/2009	NA	NA	--	--	NA	--	--	NA
		12/8/2009	NA	NA	--	--	NA	--	--	NA
CS-MW24-LGR		3/12/2009	NA	NA	--	--	NA	--	--	NA
		6/9/2009	NA	NA	--	--	NA	--	--	NA
	Duplicate	6/9/2009	NA	NA	--	--	NA	--	--	NA
		9/10/2009	NA	NA	--	--	NA	--	--	NA
		12/9/2009	NA	NA	--	--	NA	--	--	NA
CS-MW25-LGR		3/16/2009	NA	NA	--	**0.002F**	NA	**0.0020F**	--	NA
		6/9/2009	NA	NA	--	**0.004F**	NA	**0.0023F**	--	NA
		9/14/2009	NA	NA	--	--	NA	--	--	NA
		12/16/2009	NA	NA	--	**0.002F**	NA	--	--	NA

All samples analyzed by Apple Labs. Using method SW8260B.

Bold (red) Value > or = MCL
Bold (blue) MCL > Value > or = RL
Bold RL > Value > MDL

- **CS-MW16-LGR** – This well was sampled three times in 2009. Concentrations of PCE, TCE, and *cis*-1,2-DCE exceeded their MCLs during the March, September, and December sampling events. *Trans*-1,2-DCE was detected below the MCL in March, September, and December 2009. No metals were detected in the well in 2009. The pump in well CS-MW16-LGR was engaged April 24, 2007 to pump water onto the SWMU B-3 Bioreactor. The well has been cycling continuously since the bioreactor injection was initiated in 2007. In 2009 the pumping rate averaged about 8.37 gpm with a range of 6.02 gpm to 16.87 gpm. The pumping rate was adjusted throughout the year to maximize the cycle lengths and the amount of water extracted from this well.
- **CS-MW16-CC** – This well was sampled three times in 2009. Concentrations of PCE exceeded their respective MCLs in March, June, and September 2009. Concentrations of TCE exceeded their respective MCLs in March and September 2009. *Cis*-1,2-DCE and *trans*-1,2-DCE were below their respective MCLs but above the RL in March, September, and December 2009. 1,1-DCE was also detected but below the MCL in March and September 2009. No metals were detected in this well in 2009. The pump in well CS-MW16-CC was engaged April 24, 2007 to pump water onto the SWMU B-3 Bioreactor. The well has been cycling continuously along with CS-MW16-LGR since the bioreactor injection began in 2007. In 2009 the pumping rate averaged about 14.65 gpm with a range of 7.92 to 18.18 gpm.
- **CS-D** – This well was sampled twice in 2009. Concentrations of PCE and TCE exceeded their MCLs in September and December 2009. Concentrations of *cis*-1,2-DCE exceeded the MCL in December 2009. *Trans*-1,2-DCE was detected below its MCL. Lead was detected in 2009, below respective MCLs and RLs.
- **CS-MW1-LGR** – This well was sampled three times in 2009. PCE and TCE concentrations were above their MCLs in March, September, and December 2009. *Cis*-1,2-DCE and *trans*-1,2-DCE were detected below their MCLs in March, September, and December 2009. Chromium was detected above the MCL in March and below the MCL in September 2009.
- **CS-MW9-BS** – This well was sampled twice in 2009. No VOCs were detected in this well in 2009. However, lead was above the AL in September 2009. Follow up sampling in December 2009 found lead below the AL.

2.2.1.2 On-Post Monitoring Wells with COC Detections below the MCL

Groundwater monitoring results included wells where COCs were detected at levels below the applicable MCLs, or ALs but above method reporting limits (RLs). These included wells CS-2, CS-MWG-LGR, CS-MWH-LGR, CS-MW1-BS, CS-MW2-LGR, CS-MW3-LGR, CS-MW4-LGR, CS-MW5-LGR, CS-MW6-LGR, CS-MW6-BS, CS-MW7-LGR, CS-MW8-LGR, CS-MW8-CC, CS-MW9-LGR, CS-MW10-LGR, CS-MW10-CC, CS-MW11A-LGR, CS-MW12-LGR, CS-MW17-LGR, CS-MW19-LGR, CS-MW20-LGR, CS-MW21-LGR, CS-MW22-LGR, CS-MW23-LGR, and CS-MW25-LGR. The detections below the MCLs/ALs but above RLs are summarized as follows:

- **CS-2** – Concentrations of PCE and TCE were detected below the RL in December 2009. Lead was also detected below the RL and chromium below the MCL in June 2009.
- **CS-MWG-LGR** – No VOCs were detected in this well in 2009. Lead was reported below the RL in June 2009.
- **CS-MWH-LGR** – No VOCs were detected in this well in 2009. Concentrations of lead were below the RL in September and December 2009.
- **CS-MW1-BS** – Concentrations of *cis*-1,2-DCE and TCE were detected below their respective RLs in 2009. Chromium was detected below the MCL in December 2009.
- **CS-MW2-LGR** – Concentrations of *cis*-1,2-DCE, PCE, and TCE were detected below their MCLs in 2009. No metals were detected in 2009. The pH at the time of sampling was 11.30, 10.71, and 9.66 respectively, for the March, September, and December 2009 sampling events. This well was upgraded in September 2002, the pH has been unusually high every since. Grout contamination from the CC twin well (CS-MW2-CC) installed in 2002 is suspected to have played a role in the elevated pH measurements now present in CS-MW2-LGR or buried munitions debris with caustic in the vicinity may also factor in to the high pH levels.
- **CS-MW3-LGR** – No VOCs were detected in this well in 2009. However, chromium was reported below the RL in September and December 2009.
- **CS-MW4-LGR** – No VOCs were detected in this well in 2009. Concentrations of chromium were below the RL in March 2009.
- **CS-MW5-LGR** – Concentrations of PCE, TCE, and *cis*-1,2-DCE were detected below their MCLs in March, September, and December 2009. Low levels of chromium were also detected below the RL in December 2009.
- **CS-MW6-LGR** - No VOCs were reported in this well in 2009. Low levels of chromium were present in March and September 2009.
- **CS-MW6-BS** – No VOCs were detected in the well in 2009. Concentrations of chromium were detected in September 2009, below the RL.
- **CS-MW7-LGR** – PCE was detected below the RL in September and December 2009. Low (less than RL) levels of chromium were also detected in March, September, and December.
- **CS-MW8-LGR** – Concentrations of PCE and TCE were detected below the MCL in 2009. Lead was also detected in this well below the RL in June 2009.
- **CS-MW8-CC** – Low levels of PCE and TCE were detected in December 2009. No metals were detected in this well in December 2009.
- **CS-MW9-LGR** – No VOCs were reported in this well in 2009. Low levels of chromium were present in December 2009 below the RL.

- **CS-MW10-LGR** – Below the MCL concentrations of PCE and TCE were detected in December 2009. Also reported below the RL was chromium.
- **CS-MW10-CC** – Concentrations of TCE were detected below the MCL and RL in December 2009. No metals were detected in this well in 2009.
- **CS-MW11A-LGR** – Concentrations of PCE and TCE were detected below the MCL in 2009. In March and December 2009, chromium was reported below the RL.
- **CS-MW12-LGR** - No VOCs were reported in this well in 2009. However, chromium was reported below the RL in June 2009.
- **CS-MW17-LGR** – Concentrations of PCE were reported in this well in December 2009. Chromium was also detected below the RL.
- **CS-MW19-LGR** – Concentrations of PCE were below the RL in March, September, and December 2009. Also in March 2009, chromium was reported below the RL.
- **CS-MW20-LGR** – Concentrations of PCE were detected below the MCL in March, June, September, and December 2009. TCE was also detected below the RL in December 2009. In June 2009, lead was detected below the RL.
- **CS-MW21-LGR** – Low levels of TCE below the RL were detected in December 2009, no other VOCs were detected in 2009. Metals were not detected in this well in 2009.
- **CS-MW22-LGR** – Low levels of TCE below the RL were detected in December 2009. Concentrations of chromium and lead were below the RL in March 2009. Then in June 2009 chromium, lead and mercury were detected below the RL. By September 2009 only lead was present below the RL and in December 2009 no metals were detected.
- **CS-MW23-LGR** - No VOCs were reported in this well in 2009. However chromium, lead, and mercury concentrations were detected in June 2009, all below their applicable RLs.
- **CS-MW25-LGR** - No VOCs were reported in this well in 2009. However chromium and lead concentrations were reported in March and June 2009, below their RLs. In September no metals were detected but in December chromium was present below the RL.

2.2.1.3 On-Post Monitoring Wells with No COC Detections

Of the 42 monitoring wells sampled in 2009, 32 wells reported COC detections. Wells CS-I, CS-MW1-CC, CS-MW2-CC, CS-MW6-CC, CS-MW7-CC, CS-MW9-CC, CS-MW12-BS, CS-MW12-CC, CS-MW18-LGR, and CS-MW24-LGR reported no VOC or metals detections. Well CS-MW11B-LGR was not sampled due to water levels remaining below the pump during the scheduled sampling events. Details on the RL, MDLs, field duplicates, MCLs, *etc.*, are described in the tables of detections (**Table 2.5**) and in **Appendix B**.

2.2.1.4 Drinking Water Supply Well Results

Two current, former, and projected CSSA drinking water supply wells CS-1, CS-10, CS-9, and CS-12, respectively were analyzed for VOCs and the 9 CSSA metals in 2009. In addition, a second former drinking water well (CS-11) was sampled for four metals. Under the LTMO study, the drinking water supply wells are scheduled to be sampled every nine months (**Table 2.4**). However, due to increased metals concentrations in well CS-9 after well rehabilitation the sampling frequency was increased quarterly monitoring. The pump was removed from former drinking water well CS-11 so it was sampled with a bailer in June 2009. This well will likely fall off the quarterly monitoring schedule due to ample sampling locations in this area. Future drinking water well CS-12 has yet to be connected into the CSSA water supply system. The detections are summarized as follows:

- **CS-1** – Concentrations of TCE were below the RL and MCL in June, September, and December 2009. Concentrations of barium and zinc were below their respective MCLs in June, September, and December 2009. Lead and mercury were below their respective MCLs/ALs and RLs in June 2009 while concentrations of copper and lead were below their respective MCLs/ALs and RLs in September 2009.
- **CS-9** – No VOCs were detected in this well in 2009. Concentrations of lead and mercury were above their AL/MCL in September 2009, mercury was also above the MCL in June 2009. Concentrations of barium, chromium, copper, and zinc were also detected above RLs but below their applicable MCLs in 2009.
- **CS-10** – No VOCs were detected in 2009. Arsenic, barium, copper, lead, mercury, and zinc were all detected in this well below the applicable MCL/SS/ALs in 2009.
- **CS-11** – This former drinking water well was sampled in June 2009 and no VOCs were detected. Mercury was detected below the RL in June 2009. This well has been offline and not being used in the CSSA water supply system due to bacterial contamination issues in the past. The pump has now been removed from this well and in the future will only be sampled on an as needed basis.
- **CS-12** – No VOCs were detected in this well in 2009. Arsenic, barium, copper, lead and zinc were detected in 2009, all below their applicable MCL/SS/ALs. CS-12 has been continuously pumping to SWMU B-3 Bioreactor Trench 6 since September 2009. Through December 2009, 9.9 million gallons of water from CS-12 had been injected into the bioreactor.

As of June 2007 the groundwater supply well CS-9 rehabilitation was completed. Initially, the investigation indicated debris (believed to be either old well casing, column pipe and/or an old broken pump) present in the bottom of the well borehole was the suspected source for the elevated lead and mercury detections noted after the initial well rehabilitation effort. The well was pressure-grouted to seal the debris in the bottom of the borehole. This was intended to eliminate contact with the water producing zones. The initial sampling indicated that metals levels were below MCLs. However, continued sampling in 2009 has shown that lead and mercury in excess of groundwater standards can still be present in the groundwater. Therefore, well CS-9 continues to be an inactive component of the CSSA distribution system.

As a result of the prolonged drought of 2008, CSSA revised the "trigger levels" for their postwide Drought Contingency Plan. The proposed trigger levels are now based solely on the pumping level of production well CS-10. This is a revision to the previous averaging of water levels from multiple monitoring wells throughout the facility. The plan is based upon performance and known production capacity of well CS-10, which is the primary provider of potable water for the facility. The Drought Contingency Plan triggers are included in **Appendix E**.

2.2.1.5 Westbay®-equipped Well Results

Eight wells equipped with the Westbay multi-port interval sampling equipment have been installed at CSSA. Four wells (CS-WB05, CS-WB06, CS-WB07, and CS-WB08) are sampled as part of the SWMU B-3 bioreactor treatability study and are not addressed in this report. The remaining four wells (CS-WB01, CS-WB02, CS-WB03, and CS-WB04) are part of the basewide groundwater monitoring program and are included in this report. Under the provisions of the groundwater monitoring DQOs and the LTMO study, the schedule for sampling the UGR and LGR zones in the four Westbay-equipped wells is semi-annual (twice per year). The schedule for sampling the BS and CC zones in Westbay well CS-WB04 is biennial (every two years). Samples were collected from UGR and LGR zones with water during the March and September 2009 events and samples were collected from the BS and CC zones in March 2009. Samples were analyzed for PCE, TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, 1,1-DCE, vinyl chloride and analyzed by APPL. Per DQOs, the Westbay data are used for screening purposes only. No quality assurance/quality control samples were collected with the Westbay samples in 2009. All intervals with detections of COCs are presented in **Table 2.6**. Full analytical results are presented in **Appendix C**. **Appendix D** illustrates the historical changes in contaminant concentrations for each Westbay zone.

Due to a decrease in groundwater elevations, certain zones (CS-WB01-UGR-01, CS-WB02-UGR-01, CS-WB02-LGR-01, CS-WB02-LGR-02, CS-WB02-LGR-09, CS-WB03-LGR-01, CS-WB03-LGR-02, CS-WB04-UGR-01 and CS-WB04-LGR-02) could not be sampled in March or September because they were dry. Zone CS-WB03-UGR-01 was not sampled in March because it was dry. Zone CS-WB04-LGR-05 was not sampled due to a non-operational sampling port. The remaining 37 zones contained water and were sampled. The Westbay-equipped wells are sampled using Westbay Instruments, Inc., equipment and sampling methods.

Table 2.6
2009 Westbay® Groundwater COCs Analytical Results, Detections Only

Well ID	Date	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	TCE	PCE	Vinyl Chloride
Comparison Criteria	MDL	0.3	0.16	0.19	0.16	0.15	0.23
	RL	1.2	1.2	0.6	1.0	1.4	1.1
	MCL	7.0	70	100	5.0	5.0	2.0
CS-WB01-UGR-01	16-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	2-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB01-LGR-01	16-Mar-09	--	--	--	0.26J	6.4	--
	02-Sep-09	--	--	--	0.26J	5.1	--
CS-WB01-LGR-02	16-Mar-09	--	--	--	4.2	11	--
	02-Sep-09	--	--	--	3.7	11	--
CS-WB01-LGR-03	16-Mar-09	--	--	--	9.4	2.8	--
	02-Sep-09	--	--	--	8.2	3.1	--
CS-WB01-LGR-04	16-Mar-09	--	--	--	0.24J	--	--
	02-Sep-09	--	--	--	0.26J	0.53J	--
CS-WB01-LGR-05	16-Mar-09	--	--	--	0.25J	--	--
	02-Sep-09	--	--	--	--	0.31J	--
CS-WB01-LGR-06	16-Mar-09	--	--	--	0.62J	--	--
	02-Sep-09	--	--	--	0.33J	0.36J	--
CS-WB01-LGR-07	16-Mar-09	--	--	--	12	15	--
	02-Sep-09	--	--	--	17	22	--
CS-WB01-LGR-08	16-Mar-09	--	--	--	1.6	--	--
	02-Sep-09	--	--	--	3.5	1.4	--
CS-WB01-LGR-09	16-Mar-09	--	0.37J	--	20	18	--
	02-Sep-09	--	0.44J	--	25	19	--
CS-WB02-UGR-01	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB02-LGR-01	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	NA
CS-WB02-LGR-02	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB02-LGR-03	11-Mar-09	--	--	--	4.4	9.8	--
	03-Sep-09	--	--	--	5.7	10	--
CS-WB02-LGR-04	11-Mar-09	--	--	--	13	3.3	--
	03-Sep-09	--	--	--	17	4.7	--
CS-WB02-LGR-05	11-Mar-09	--	--	--	5.0	0.22J	--
	03-Sep-09	--	--	--	5.0	1.6	--
CS-WB02-LGR-06	11-Mar-09	--	--	--	4.3	--	--
	03-Sep-09	--	--	--	4.5	1.2J	--
CS-WB02-LGR-07	11-Mar-09	--	--	--	1.2	0.49J	--
	03-Sep-09	--	--	--	0.85J	0.89J	--
CS-WB02-LGR-08	11-Mar-09	--	0.16J	--	2.1	2.6	--
	03-Sep-09	--	--	--	2.0	2.5	--
CS-WB02-LGR-09	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB03-UGR-01	10-Mar-09	--	--	--	56J*	1,700*	--
	4-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB03-LGR-01	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	4-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB03-LGR-02	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	4-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry

Table 2.6 (cont.)
2009 Westbay® Groundwater COCs Analytical Results, Detections Only

Well ID	Date	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	TCE	PCE	Vinyl Chloride
Comparison Criteria	MDL	0.3	0.16	0.19	0.16	0.15	0.23
	RL	1.2	1.2	0.6	1.0	1.4	1.1
	MCL	7.0	70	100	5.0	5.0	2.0
CS-WB03-LGR-03	10-Mar-09	--	**0.21J**	--	**7.7**	**18**	--
	04-Sep-09	--	**0.34J**	--	**12**	**29**	--
CS-WB03-LGR-04	10-Mar-09	--	--	--	**7.7**	**19**	--
	04-Sep-09	--	--	--	**10**	**25**	--
CS-WB03-LGR-05	10-Mar-09	--	--	--	**5.9**	**16**	--
	04-Sep-09	--	--	--	**9.4**	**30**	--
CS-WB03-LGR-06	10-Mar-09	--	--	--	**1.2**	**8.9**	--
	04-Sep-09	--	--	--	**1.1**	**8.4**	--
CS-WB03-LGR-07	10-Mar-09	--	--	--	**2.6**	**7.2**	--
	04-Sep-09	--	--	--	**2.1**	**9.3**	--
CS-WB03-LGR-08	10-Mar-09	--	--	--	**1.0**	**8.2**	--
	04-Sep-09	--	--	--	**1.3**	**10**	--
CS-WB03-LGR-09	10-Mar-09	--	--	--	**3.5**	**12**	--
	04-Sep-09	--	--	--	**4.0**	**19**	--
CS-WB04-UGR-01	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB04-LGR-01	10-Mar-09	--	--	--	--	**0.42J**	--
	03-Sep-09	--	--	--	**0.20J**	**0.86J**	--
CS-WB04-LGR-02	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB04-LGR-03	10-Mar-09	--	--	--	--	**0.17J**	--
	03-Sep-09	--	--	--	--	**0.27J**	--
CS-WB04-LGR-04	10-Mar-09	--	--	--	**0.25J**	**0.23J**	--
	03-Sep-09	--	--	--	--	--	--
CS-WB04-LGR-06	10-Mar-09	--	**2.5**	**0.31J**	**13**	**12**	--
	03-Sep-09	--	**4**	**0.65**	**20**	**33**	--
CS-WB04-LGR-07	10-Mar-09	--	**2.1**	--	**10**	**7.0**	--
	03-Sep-09	--	**3.6**	--	**14**	**19**	--
CS-WB04-LGR-08	10-Mar-09	--	--	--	**0.70J**	**0.29J**	--
	03-Sep-09	--	--	--	**1.1**	**0.62J**	--
CS-WB04-LGR-09	10-Mar-09	--	--	--	**7.0**	**9.3**	--
	03-Sep-09	--	--	--	**9.1**	**9.9**	--
CS-WB04-LGR10	10-Mar-09	--	--	--	**0.69J**	**1.0J**	--
	03-Sep-09	--	--	--	**0.93J**	**1.2J**	--
CS-WB04-LGR-11	10-Mar-09	--	--	--	--	--	--
	03-Sep-09	--	--	--	--	**0.33J**	--
CS-WB04-BS-01	10-Mar-09	--	--	--	--	--	--
CS-WB04-BS-02	10-Mar-09	--	--	--	**0.18J**	--	--
CS-WB04-CC-01	10-Mar-09	--	**0.37J**	--	**0.22J**	--	--
CS-WB04-CC-02	10-Mar-09	--	--	--	--	--	--
CS-WB04-CC-03	10-Mar-09	--	--	--	**0.20J**	--	--

Data Qualifiers

J-The analyte was positively identified; the quantitation is an estimation.

* dilution of 100 run for this sample.

All values are reported in µg/L.

BOLD	= Above the MDL.
BOLD (blue)	= Above the RL.
BOLD (red)	= Above the MCL.

The following Westbay intervals reported detections of PCE and/or TCE above the MCL in 2009.

	Westbay Location			
	CS-WB01	**CS-WB02**	**CS-WB03**	**CS-WB04**
Westbay Zone	LGR-01	LGR-03	UGR-01	LGR-06
	LGR-02	LGR-04	LGR-03	LGR-07
	LGR-03	LGR-05	LGR-04	LGR-09
	LGR-07		LGR-05	
	LGR-09		LGR-06	
			LGR-07	
			LGR-08	
			LGR-09	

Figures 2.3, 2.4, 2.5, and **2.6** present the vertical distribution of the VOC plume within the multi-port wells for the most pervasive contaminants, PCE and TCE. The contaminant conditions in the profiles occurred during a below-average saturation in the aquifer, where the post had received less than 15 inches of rainfall through September 2009. The following discussion presents general observations that have been noted since the inception of Westbay monitoring at AOC-65.

In 2009, the VOC plume originating from AOC-65 is generally similar in concentration and distribution as in prior years. Near the source area (CS-WB03 and –WB02), the solvent contamination is persistent throughout the entire thickness of the LGR, with the greatest concentrations near the land surface. As the plume disperses to the south and west, the contaminants seem to preferentially migrate in stratified lobes (LGR-01, -02, and -03), (LGR-06 and -07) and LGR-09. As in prior years, the BS and CC zones at CS-WB04 generally have little to no contamination present. The contention is that the trace contamination in the BS and CC at CS-WB04 is the result of the vertical mixing of contaminated LGR water within the nearby RFR-10 wellbore under a naturally downward vertical gradient.

CS-WB03 is located closest to the Building 90 source area, and consistently records the highest concentrations of contaminants (**Appendix D.3**). The uppermost zones (CS-WB03-UGR-01, and -LGR-01) are typically dry and only have water after significant rain. Because of frequent droughts and set sampling schedules, these zones have been sampled only a handful of times. In the midst of the 2009 drought, approximately 1.5 inches of rain fell at CSSA in March 2009. This modest rainfall was enough to temporarily saturate WB03-UGR-01 and allow sample collection. When groundwater is present in these zones,

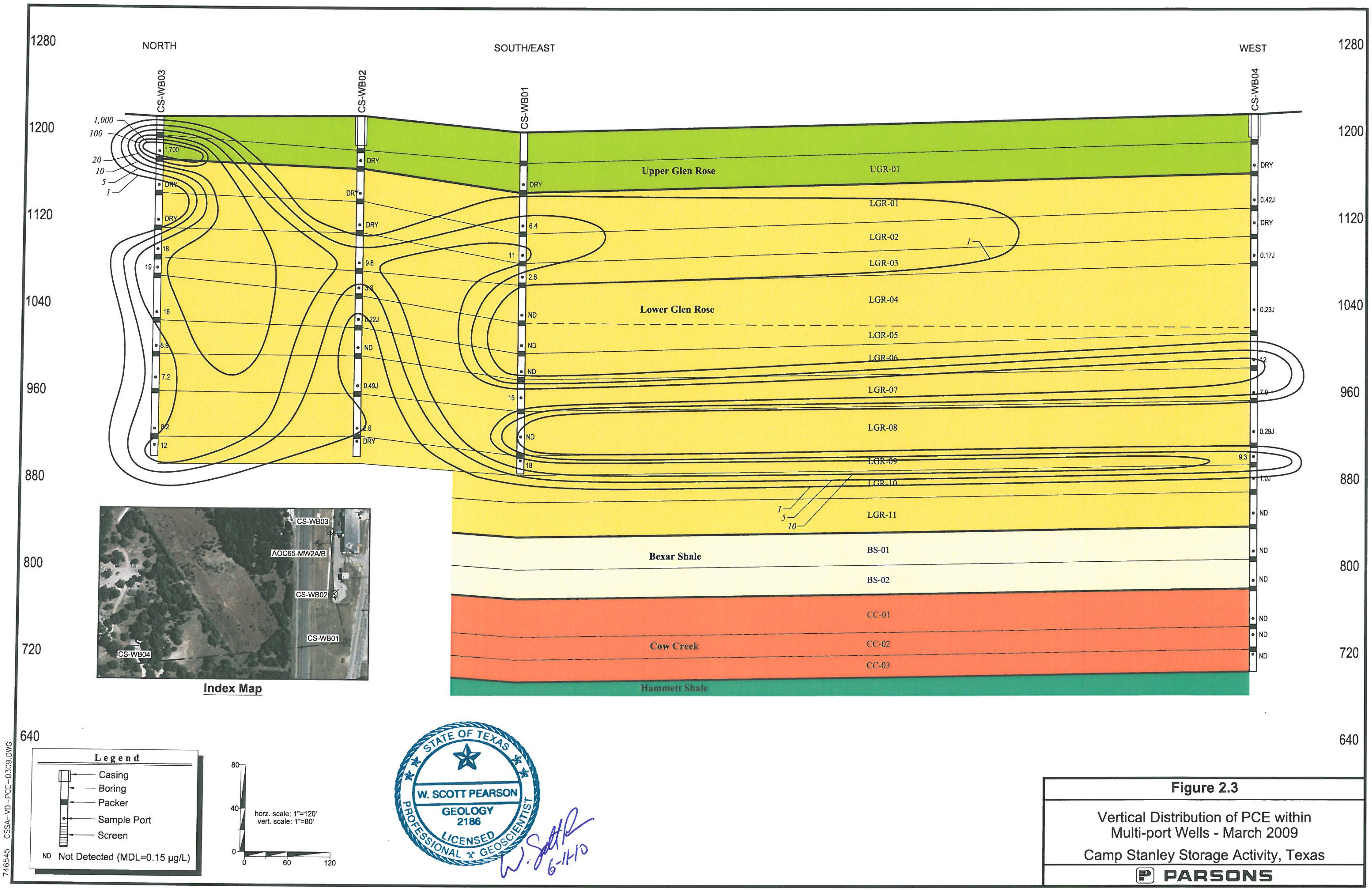


Figure 2.3

Vertical Distribution of PCE within Multi-port Wells - March 2009

Camp Stanley Storage Activity, Texas

PARSONS

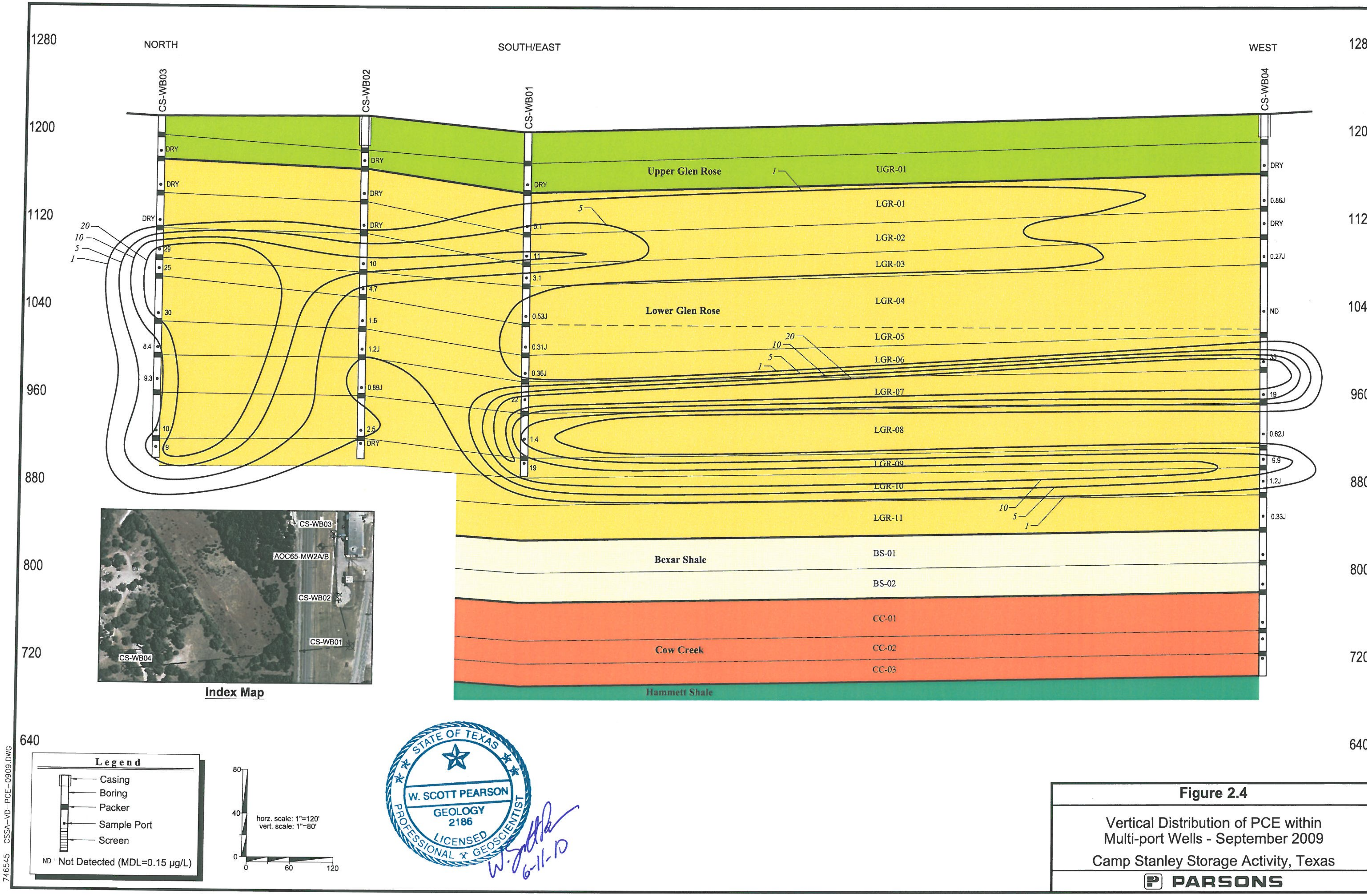


Figure 2.4

Vertical Distribution of PCE within Multi-port Wells - September 2009

Camp Stanley Storage Activity, Texas

PARSONS

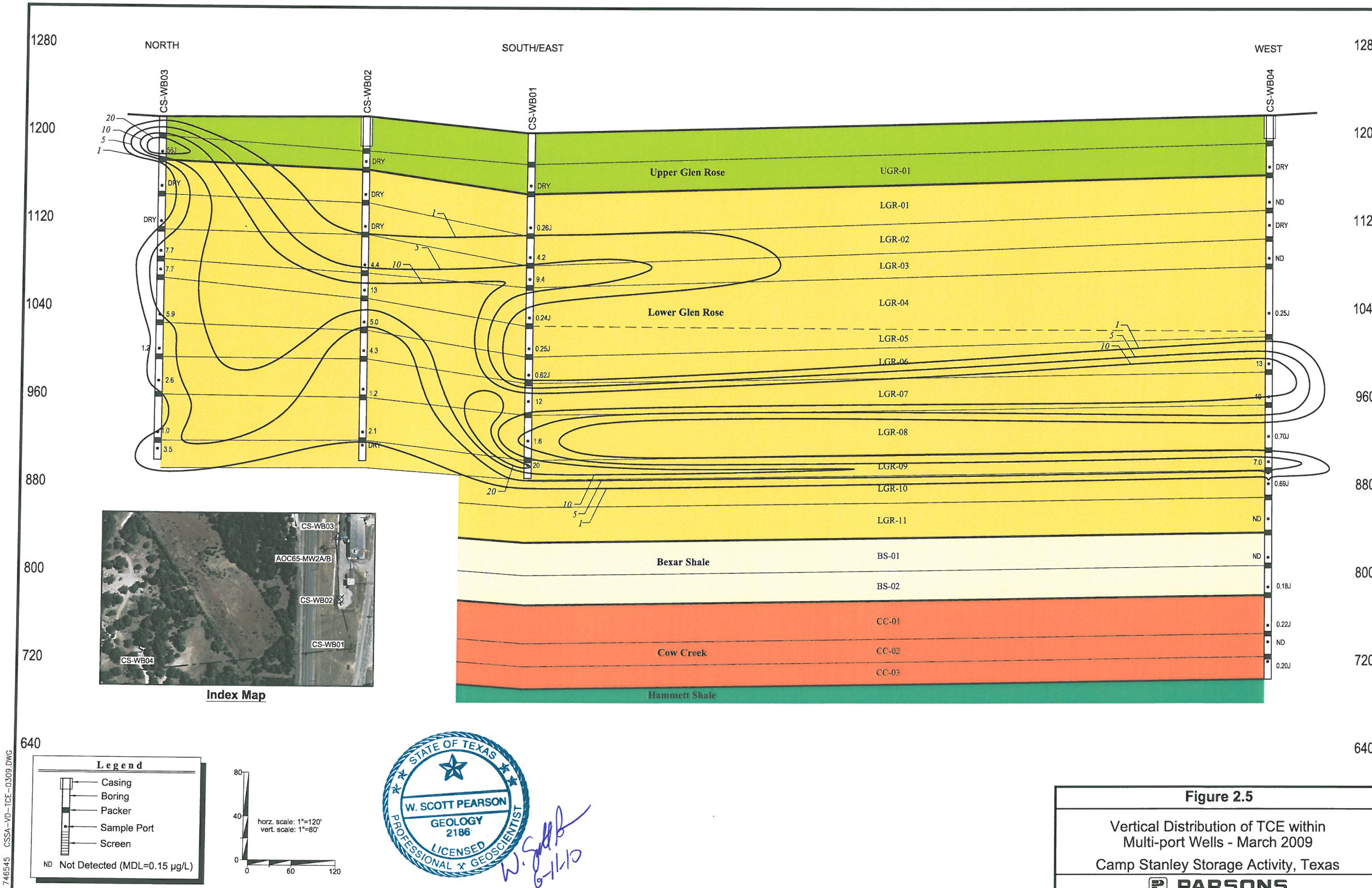


Figure 2.5

Vertical Distribution of TCE within Multi-port Wells - March 2009

Camp Stanley Storage Activity, Texas

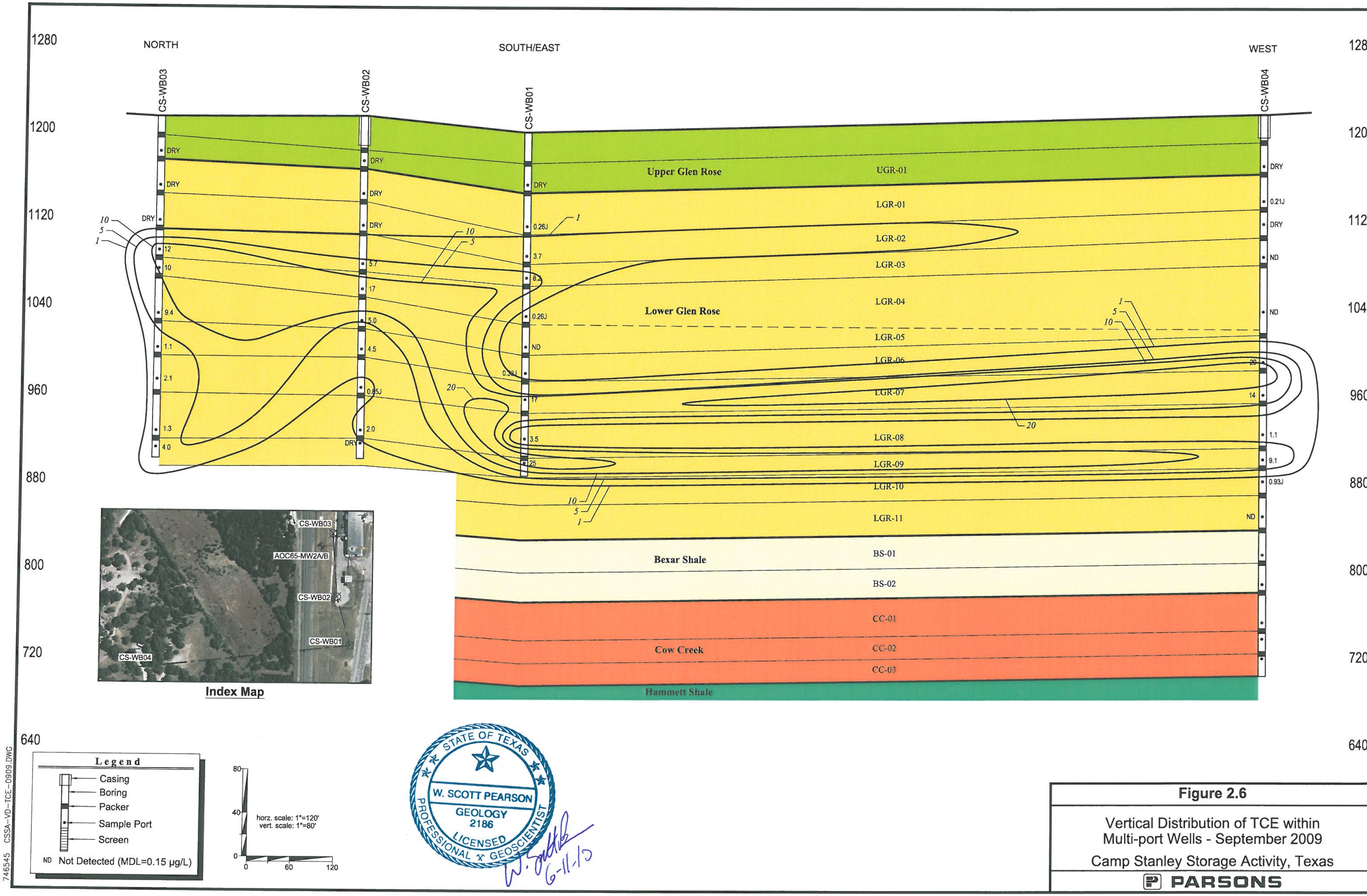


Figure 2.6

Vertical Distribution of TCE within Multi-port Wells - September 2009

Camp Stanley Storage Activity, Texas

However, the results indicate that a persistent source still exists, and that periodic flushing by intense rainfall, suspected plumbing and air condition condensation leaks from Building 90 can mobilize these perched contaminants that are probably otherwise bound to the matrix during the rest of the year. WB01-UGR, WB02-UGR, and WB04-UGR zones were all dry during the 2009 sampling events, this is further indication that something more than just rainfall is mobilizing the high concentrations of contaminants to the WB03-UGR-01 zone. In lower zones at CS-WB03 typically range between 10 µg/L and 40 µg/L of PCE, with significantly lesser amounts of TCE being reported. In general, the 2009 results found in CS-WB03 are consistent with those results from prior years.

CS-WB02 was installed nearly 300 feet south of CS-WB03 and the Building 90 source area. Compared to CS-WB03 and CS-WB01, relatively equal levels of PCE and TCE are present throughout the CS-WB02 vertical profile. Historically, PCE and TCE concentrations range between 15 µg/L to less than 5 µg/L in any given CS-WB02 monitoring interval (**Appendix D.2**). In 2009, zones UGR-01, LGR-01, LGR-02, and LGR-09 were dry for both sampling events.

Multi-port well CS-WB01 is located approximately 500 ft south of CS-WB03 and the Building 90 source area. Once again, for the zones that are normally saturated, historical PCE and TCE are present at concentrations less than 35 µg/L. Since mid-2005, there has been a steady trend of increasing contaminant concentrations in zones CS-WB02-LGR02, -LGR07, and -LGR09. The 2009 data continue to show a subtle increasing trend in concentrations. These increases correspond with increases observed in several upgradient CS-WB02 zones, and may be associated with a "flushing" event in which a slug of contaminated groundwater is moving downgradient away from the source zone (**Appendix D.1**). At CS-WB01, the trend has been that TCE concentrations generally exceed PCE for most zones. The zone with the relatively highest concentration is LGR09. The results of CS-WB01 indicate that the contamination becomes preferentially stratified such that greater contamination is found above and below zones LGR-04 and -05, to the south and west.

Off-post at CS-WB04, trace detections of less than 1 µg/L PCE are generally reported in the LGR-01, LGR-02, LGR-04, and LGR-08 zones. Since September 2006, TCE has been reported above the MCL in zones LGR-06 and LGR-07 at concentrations less than 16 µg/L and even lesser detections of PCE. However in 2009, the concentration of PCE in both LGR-06 and LGR-07 has more than doubled since September 2008 while the TCE concentrations slightly increased (**Appendix D.4**). Since 2008, PCE in LGR-06 has increased from 6.5 µg/L to 33 µg/L while the LGR-07 PCE concentration has increased from 6 µg/L to 19 µg/L.

Historically, the off-post zone with the most persistent contamination is CS-WB04-LGR-09. Nearly equivalent levels of PCE and TCE are found at concentrations that generally range above the MCL between 8 µg/L and 14 µg/L. Below this depth, any solvent contamination in the remainder of the LGR, BS, and CC are at concentrations less than 1.5 µg/L. Since the wellbore has stabilized, only isolated minimal detections of PCE have been reported in the LGR-11 zone, and the BS zones have essentially been contaminant-free, except for a single occurrence of *cis*-1,2-DCE (0.25 µg/L) in October 2007 and PCE (0.18 µg/L) in March 2009. *Cis*-1,2-DCE is consistently reported in interval CC-01, otherwise isolated PCE detections below 1.50 µg/L have detected in either CC-02 or CC-03. Recent detections of TCE in several zones appear to be the result of the MDL being lowered from 0.6 µg/L to 0.16 µg/L in 2007.

2.2.2 Off-Post Analytical Results

The LTMO study implemented on-post has not been applied to sampling frequencies for off-post monitoring performed by CSSA. The frequencies for sampling an off-post well are determined by compliance with the Plan and project DQOs. An overview of sampling frequencies for off-post wells is given in **Table 2.7**. Forty-four off-post wells were sampled during the 2009 quarterly monitoring events, and their locations are illustrated on **Figure 1.1**. Off-post wells sampled during the quarterly monitoring events were selected based on previous sampling results and proximity to both the CSSA boundary and wells with detections of PCE and TCE. Public and private supply wells located west and south of CSSA were selected for these events. Samples were also collected from the off-post well granular activated carbon (GAC) filtration systems after treatment during the March and September events.

Off-post wells sampled in 2009 include (see **Figure 1.1** for well locations):

- Four public supply wells in the Fair Oaks area (FO-8, FO-J1, FO-17, and FO-22).
- Three public wells in the Hidden Springs Estates subdivision (HS-1, HS-2 & HS-3).
- Three wells used by the general public (I10-2, I10-5 & I10-8) and two privately-owned wells in the Interstate I-10 area (I10-4 & I10-7).
- Fourteen privately-owned wells in the Jackson Woods subdivision (JW-5, JW-6, JW-7, JW-8, JW-9, JW-12, JW-13, JW-14, JW-15, JW-27, JW-28, JW-29, JW-30, and JW-31).
- Five wells in the Leon Springs Villa area (two public supply wells removed from service: LS-1, and LS-4; and three privately-owned wells: LS-5, LS-6, and LS-7).
- Privately-owned wells on Old Fredericksburg Road (OFR-1, OFR-3, & OFR-4).
- Ten privately-owned wells in the Ralph Fair Road area (RFR-3, RFR-4, RFR-5, RFR-8, RFR-9, RFR-10, RFR-11, RFR-12, RFR-13, and RFR-14).

All wells were sampled from a tap located as close to the wellhead as possible. Most taps were installed by CSSA to obtain a representative groundwater sample before pressurization, storage, or the water supply distribution system. Water was purged to engage the well pump prior to sample collection. Conductivity, pH, and temperature readings were recorded to confirm adequate purging while the well was pumping. Purging measurements were recorded in the field logbook for each sampling event.

Table 2.7
2009 Off-Post Groundwater Sampling Rationale

Well ID	2009 Mar	2009 June	2009 Sept	2009 Dec	Sampling Frequency:
DOM-2	NS	NS	NA	NA	main electricity has been disconnected
FO-8		NS	NS	NS	As needed, once annually
FO-17	NS		NS	NS	As needed, once annually
FO-22		NS	NS	NS	As needed, once annually
FO-J1					Qtrly, 1 year thru Dec. 10
HS-1					Qtrly
HS-2					Qtrly, 1 year thru June 10
HS-3	NS		NS	NS	As needed, once annually
I10-2		NS	NS	NS	As needed, once annually
I10-4					Quarterly, 1 year thru Dec. 10
I10-5		NS	NS	NS	As needed, once annually
I10-7					Qtrly, 1 year thru Dec. 10
I10-8	NS	NS	NS		As needed, once annually
JW-5		NS	NS	NS	As needed, once annually
JW-6	NS		NS	NS	As needed, once annually
JW-7					Qtrly, 1 year thru Dec. 10
JW-8					Qtrly, 1 year thru Dec. 10
JW-9		NS	NS	NS	As needed, once annually
JW-12			NA	NA	Access agreement expired, owner won't call back
JW-13	NS		NS	NS	As needed, once annually
JW-14					Qtrly, due to location
JW-15		NS	NS	NS	As needed, once annually
JW-27		NS	NS	NS	As needed, once annually
JW-28					Qtrly, due to location
JW-29					Qtrly, due to location
JW-30					Qtrly, due to location
LS-1					QED low flow pump installed, well offline
LS-2	NS	NS	NS	NS	Well is offline, to be plugged soon
LS-3	NS	NS	NS	NS	Well is offline, to be plugged soon
LS-4					QED low flow pump installed, well offline
LS-5					Qtrly, 1 year thru Dec. 10
LS-6					Qtrly, 1 year thru Dec. 10
LS-6-A2		NS		NS	Biannually (Mar & Sept)
LS-7					Qtrly, 1 year thru Dec. 10
LS-7-A2		NS		NS	Biannually (Mar & Sept)
OFR-1					Qtrly, 1 year thru Dec. 10
OFR-3					Qtrly, 1 year thru Dec. 10
OFR-3-A2		NS		NS	Biannually (Mar & Sept)
OFR-4		NS	NS	NS	As needed, once annually
RFR-3	NS	NS	NS		As needed, once annually
RFR-4	NS	NS	NS		As needed, once annually
RFR-5	NS	NS	NS		As needed, once annually
RFR-8	NS		NS	NS	As needed, once annually
RFR-9	NS	NS			Qtrly, 1 year thru Sept. 10
RFR-10					Qtrly, 1 year thru Dec. 10
RFR-10-A2		NS		NS	Biannually (Mar & Sept)
RFR-10-B2		NS		NS	Biannually (Mar & Sept)
RFR-11					Qtrly, 1 year thru Dec. 10
RFR-11-A2		NS		NS	Biannually (Mar & Sept)
RFR-12		NS	NS	NS	As needed, once annually
RFR-13	NS		NS	NS	As needed, once annually
RFR-14					Qtrly, 1 year thru Sept. 10

	VOCs detected are greater than 90% of the MCL. Sample monthly; quarterly after GAC installation.
	VOCs detected are greater than 80% of the MCL. The well will be placed on a monthly sampling schedule until GAC installation then quarterly sampling after GAC installation.
	VOCs detected are less than 80% of the MCL (<4.0 ppb and >0.06 ppb for PCE & <4.0 ppb >0.05 ppb for TCE). After four quarters of stable results the well can be removed from quarterly sampling.
	This well has a GAC filtration unit installed by CSSA. Post GAC samples are collected every six months. A1 - after GAC canister #1 A2 - after GAC canister #2
NS	Not sampled for that event.
	No VOCs detected. Sample on an as needed basis.
NA	Not applicable, samples can no longer be collected from this locaiton due to reason stated.

The use of wells LS-1, LS-2, LS-3, and LS-4 in the Bexar Metropolitan (Bexar Met) water system has been discontinued due to purchase of this water system by the San Antonio Water System (SAWS). These wells are still owned by Bexar Met but have been taken offline and are no longer used to supply water to residents. The local residences are now supplied with drinking water from the SAWS system which is sourced elsewhere. The GAC system used for wells LS-2 and LS-3 was traded from CSSA to Bexar Met for access to sampling of wells LS-1 and LS-4. Low flow QED bladder pumps have been installed within LS-1 and LS-4 for obtaining groundwater samples. The monitoring of these two wells will continue on a quarterly basis. Wells HS-1, HS-2, HS-3, and HS-4 previously owned by Bexar Met have been taken over by SAWS and are still included in the quarterly monitoring program.

All groundwater samples were submitted to APPL for analysis. Groundwater samples were analyzed for the short list of VOCs using SW-846 Method 8260B. As a result of the LTMO study findings and revised DQOs, the VOC list includes: *cis*-1,2-DCE, *trans*-1,2-DCE, 1,1-DCE, PCE, TCE, and vinyl chloride. Off-post wells were not analyzed for metals.

The data packages containing the analytical results for the 2009 sampling events were reviewed and verified according to the guidelines outlined in the CSSA QAPP. After the data packages were received by Parsons, quarterly data verification reports were submitted to CSSA.

Based on historical detections, the lateral extent of VOC contamination extends approximately 0.5 mile beyond the south and west boundaries of CSSA (well I10-7 to the west and LS-4 to the south). Information such as well depth, pump depth, and other pertinent data necessary to properly characterize the vertical extent of migration is not readily available for most off-post wells. However, the typical well construction for the area is open borehole completions that penetrate the full thickness of the Middle Trinity aquifer (Lower Glen Rose Limestone, Bexar Shale, and Cow Creek Limestone).

Concentrations of VOCs detected in 2009 are presented in **Table 2.8**. Full analytical results from the 2009 sampling events are presented in **Appendix G**. Concentration trends are illustrated on **Figure 2.7** for wells LS-6, LS-7, OFR-3, RFR-10, and RFR-11 for PCE and TCE. These wells were selected because they have had detections of PCE and TCE that approach and/or exceed MCLs. **Figure 2.7** also includes precipitation data from the weather stations located at CSSA, WS-N and WS-S. **Figure 2.8** shows PCE and TCE concentrations with monthly water usage at each off-post well. The off-post GAC systems are equipped with flow meters that track the gallons pumped.

Table 2.8
2009 Off-Post Groundwater COCs Analytical Results, Detections Only

Well ID	Sample Date	1,1-Dichloro-ethene (ug/L)	*cis*-1,2-Dichloro-ethene (ug/L)	*trans*-1,2-Dichloro-ethene (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temperature (°C)	Specific Conductivity (mS/cm)
Comparison Criteria	MDL	0.12	0.07	0.08	0.06	0.05	0.08			
	RL	1.2	1.2	0.6	1.4	1.0	1.1			
	MCL	7	70	100	5	5	2	Field Measurements		
FO-8	3/4/2009	--	--	--	--	--	--	7.34	22.10	0.490
FO-17	6/2/2009	--	--	--	--	--	--	6.55	22.20	0.603
FO-22	3/4/2009	--	--	--	--	--	--	7.28	22.60	0.532
FO-J1	3/5/2009	--	--	--	**0.39F**	--	--	7.30	21.60	0.533
Duplicate	3/5/2009	--	--	--	**0.46F**	--	--	7.30	21.60	0.533
	6/3/2009	--	--	--	**0.57F**	--	--	6.86	21.80	0.561
	9/1/2009	--	--	--	**0.43F**	--	--	6.88	21.70	0.557
	12/1/2009	--	--	--	**0.24F**	--	--	6.62	21.60	0.677
HS-1	3/3/2009	--	--	--	--	--	--	7.26	23.70	0.543
	6/3/2009	--	--	--	--	--	--	6.77	22.90	0.603
	9/2/2009	--	--	--	--	--	--	6.58	23.80	0.595
	12/2/2009	--	--	--	--	--	--	6.63	22.80	0.700
HS-2	3/3/2009	--	--	--	--	--	--	7.26	23.70	0.543
	6/3/2009	--	--	--	**0.23F**	--	--	6.65	24.10	0.571
	9/2/2009	--	--	--	--	--	--	6.84	24.30	0.560
	12/2/2009	--	--	--	--	--	--	6.60	22.30	0.720
HS-3	6/3/2009	--	--	--	--	--	--	6.56	24.00	0.604
I10-2	3/3/2009	--	--	--	--	--	--	7.24	22.10	0.541
I10-4	3/3/2009	--	--	--	**6.71**	**2.17**	--	7.10	20.80	0.675
	6/1/2009	--	--	--	**6.48**	**2.7**	--	6.98	24.10	0.755
	9/1/2009	--	--	--	**6.9**	**2.47**	--	7.10	22.50	0.757
	12/2/2009	--	--	--	**7.36**	**2.72**	--	7.45	17.80	0.627
I10-5	3/4/2009	--	--	--	--	--	--	7.26	23.60	0.616
I10-7	3/3/2009	--	--	--	--	--	--	7.16	22.00	0.556
Duplicate	3/3/2009	--	--	--	--	--	--	7.16	22.00	0.556
	6/2/2009	--	--	--	--	--	--	6.64	22.60	0.599
Duplicate	6/2/2009	--	--	--	--	--	--	6.64	22.60	0.599
	9/1/2009	--	--	--	--	--	--	6.96	21.90	0.564
Duplicate	9/1/2009	--	--	--	--	--	--	6.96	21.90	0.564
	12/3/2009	--	--	--	--	**0.17F**	--	5.61	22.20	0.570
Duplicate	12/3/2009	--	--	--	--	--	--	5.61	22.20	0.570
I10-8	12/2/2009	--	--	--	--	--	--	6.60	21.90	0.566
JW-5	3/5/2009	--	--	--	--	--	--	7.14	20.00	0.504
Duplicate	3/5/2009	--	--	--	--	--	--	7.14	20.00	0.504
JW-6	6/2/2009	--	--	--	--	--	--	6.27	22.60	0.560
JW-7	3/3/2009	--	--	--	--	--	--	7.15	21.00	0.495
	6/2/2009	--	--	--	**0.48F**	--	--	6.72	21.10	0.551
	9/15/2009	--	--	--	**0.66F**	--	--	6.50	21.10	0.503
	12/14/2009	--	--	--	**0.46F**	--	--	7.04	21.10	0.548
JW-8	3/3/2009	--	--	--	--	--	--	7.12	21.10	0.501
	6/3/2009	--	--	--	**0.37F**	--	--	6.71	22.60	0.569
	9/4/2009	--	--	--	**0.48F**	--	--	7.00	21.40	0.513
	12/1/2009	--	--	--	**0.36F**	--	--	6.35	21.40	0.566
JW-9	3/3/2009	--	--	--	--	--	--	7.20	22.00	0.514
JW-12	3/9/2009	--	--	--	--	--	--	6.97	21.70	0.596
	6/5/2009	--	--	--	--	--	--	6.52	21.80	0.644
JW-13	6/5/2009	--	--	--	--	--	--	6.86	21.80	0.557
JW-14	3/5/2009	--	--	--	**0.15F**	--	--	7.30	22.30	0.528
	6/3/2009	--	--	--	**0.19F**	--	--	6.86	22.50	0.577
	9/1/2009	--	--	--	--	--	--	6.74	22.30	0.560
	12/1/2009	--	--	--	--	--	--	6.82	21.70	0.547
JW-15	3/4/2009	--	--	--	--	--	--	7.07	21.70	0.595
JW-27	3/4/2009	--	--	--	--	--	--	7.14	21.20	0.579
Duplicate	3/4/2009	--	--	--	--	--	--	7.14	21.20	0.579
JW-28	3/4/2009	--	--	--	--	--	--	7.07	21.70	0.595
	6/2/2009	--	--	--	--	--	--	6.39	22.00	0.646
	9/2/2009	--	--	--	--	--	--	6.46	21.90	0.584
	12/3/2009	--	--	--	--	--	--	6.63	21.50	0.632

Table 2.8 (cont.)
2009 Off-Post Groundwater COCs Analytical Results, Detections Only

Well ID	Sample Date	1,1-Dichloro-ethene (ug/L)	*cis*-1,2-Dichloro-ethene (ug/L)	*trans*-1,2-Dichloro-ethene (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temperature (°C)	Specific Conductivity (mS/cm)
Comparison	MDL	0.12	0.07	0.08	0.06	0.05	0.08			
JW-29	3/4/2009	--	--	--	0.12F	--	--	7.11	20.40	0.566
	6/10/2009	--	--	--	--	--	--	6.41	23.30	0.614
Duplicate	6/10/2009	--	--	--	--	--	--	6.41	23.30	0.614
	9/2/2009	--	--	--	--	--	--	5.48	22.10	0.584
Duplicate	9/2/2009	--	--	--	--	--	--	5.48	22.10	0.584
	12/2/2009	--	--	--	--	--	--	7.34	21.10	0.627
JW-30	3/4/2009	--	--	--	--	--	--	7.19	20.80	0.532
	6/2/2009	--	--	--	--	--	--	6.70	22.00	0.595
	9/1/2009	--	--	--	0.21F	--	--	6.92	21.10	0.578
	12/2/2009	--	--	--	--	--	--	6.85	21.00	0.614
JW-31	12/1/2009	--	--	--	--	--	--	7.10	13.50	0.583
Duplicate	12/1/2009	--	--	--	--	--	--	7.10	13.50	0.583
LS-1	3/5/2009	--	--	--	0.86F	0.32F	--	7.26	22.20	0.586
	6/4/2009	--	--	--	0.85F	--	--	6.69	21.30	0.581
Duplicate	6/4/2009	--	--	--	0.76F	0.20F	--	6.69	21.30	0.581
	9/1/2009	--	--	--	0.64F	0.18F	--	7.02	21.80	0.614
	12/2/2009	--	2.55	--	1.30F	0.63F	--	7.31	20.20	0.737
LS-4	3/5/2009	--	--	--	--	--	--	7.37	21.70	0.736
	6/4/2009	--	--	--	--	--	--	6.58	21.70	0.775
	9/1/2009	--	--	--	--	--	--	7.22	22.70	0.828
	12/2/2009	--	--	--	--	--	--	7.64	20.20	0.744
LS-5	3/3/2009	--	--	--	--	2.04	--	7.12	21.60	0.637
	6/1/2009	--	--	--	0.80F	2.64	--	7.08	22.40	0.680
	8/31/2009	--	--	--	0.96F	2.72	--	7.25	21.70	0.674
	11/30/2009	--	--	--	0.88F	2.82	--	6.96	22.10	0.659
LS-6	3/2/2009	--	--	--	1.09F	0.53F	--	7.00	21.79	0.642
	6/1/2009	--	--	--	0.93F	1.33	--	6.98	22.30	0.652
	8/31/2009	--	--	--	0.99F	1.46	--	7.27	22.00	0.645
	11/30/2009	--	--	--	1.19F	1.43	--	6.90	22.30	0.667
LS-6-A2	3/2/2009	--	--	--	--	--	--	NA	NA	NA
	8/31/2009	--	--	--	--	--	--	6.84	28.50	0.641
LS-7	3/2/2009	--	--	--	1.99	0.10F	--	7.19	22.68	0.655
	6/1/2009	--	--	--	1.87	0.72F	--	6.98	22.30	0.652
	8/31/2009	--	--	--	2.31	0.87F	--	7.65	22.80	0.671
	11/30/2009	--	--	--	2.07	0.66F	--	6.88	22.50	0.690
LS-7-A2	3/2/2009	--	--	--	--	--	--	NA	NA	NA
	8/31/2009	--	--	--	--	--	--	7.53	22.50	0.665
OFR-1	3/5/2009	--	--	--	0.32F	--	--	7.23	21.80	0.551
	6/3/2009	--	--	--	0.33F	--	--	6.46	21.80	0.599
	9/1/2009	--	--	--	0.25F	--	--	6.38	21.80	0.583
	12/1/2009	--	--	--	0.35F	--	--	6.29	21.00	0.575
OFR-3	3/2/2009	--	--	--	5.86	3.52	--	7.10	22.58	0.594
	6/1/2009	--	--	--	5.98	3.21	--	7.11	22.30	0.613
	8/31/2009	--	--	--	0.84F	0.91F	--	7.27	23.10	0.578
	11/30/2009	--	--	--	4.77	2.51	--	7.02	22.20	0.601
OFR-3-A2	3/2/2009	--	--	--	--	--	--	NA	NA	NA
	8/31/2009	--	--	--	--	--	--	6.99	26.60	0.595
OFR-4	3/5/2009	--	--	--	--	--	--	7.11	22.30	0.518
RFR-3	12/3/2009	--	--	--	--	--	--	5.86	21.80	0.543
RFR-4	12/3/2009	--	--	--	--	--	--	6.33	20.90	0.695
Duplicate	12/3/2009	--	--	--	--	--	--	6.33	20.90	0.695
RFR-5	12/3/2009	--	--	--	--	--	--	7.18	21.30	0.548
RFR-8	6/3/2009	--	--	--	--	--	--	6.86	22.80	0.557
RFR-9	9/4/2009	--	--	--	0.20F	--	--	7.36	22.10	0.499
Duplicate	9/4/2009	--	--	--	--	--	--	7.36	22.10	0.499
	12/21/2009	--	--	--	--	--	--	6.44	22.90	0.500
RFR-10	3/2/2009	--	--	--	8.16	2.34	--	7.08	22.51	0.640
	6/1/2009	--	--	--	8.78	2.65	--	7.04	22.30	0.644
	8/31/2009	--	--	--	5.24	1.21	--	7.21	22.20	0.614
	11/30/2009	--	0.25F	--	19.5	8.84	--	7.03	22.40	0.646

Table 2.8 (cont.)
2009 Off-Post Groundwater COCs Analytical Results, Detections Only

Well ID	Sample Date	1,1-Dichloro-ethene (ug/L)	*cis*-1,2-Dichloro-ethene (ug/L)	*trans*-1,2-Dichloro-ethene (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temperature (°C)	Specific Conductivity (mS/cm)
Comparison	**MDL**	**0.12**	**0.07**	**0.08**	**0.06**	**0.05**	**0.08**			
RFR-10-A2	3/2/2009	--	--	--	--	--	--	NA	NA	NA
	8/31/2009	--	--	--	--	--	--	7.10	26.10	0.655
RFR-10-B2	3/2/2009	--	--	--	--	--	--	NA	NA	NA
	8/31/2009	--	--	--	--	--	--	7.08	25.80	0.644
RFR-11	3/2/2009	--	--	--	**0.50F**	**1.39**	--	7.11	23.79	0.591
	6/1/2009	--	--	--	**0.49F**	**1.45**	--	7.13	24.60	0.615
	8/31/2009	--	--	--	**0.39F**	**1.97**	--	7.18	26.60	0.589
	11/30/2009	--	--	--	**1.08F**	**1.61**	--	6.96	22.70	0.636
RFR-11-A2	3/2/2009	--	--	--	--	--	--	NA	NA	NA
	8/31/2009	--	--	--	--	--	--	7.10	26.90	0.623
RFR-12	3/3/2009	--	--	--	--	--	--	7.22	22.60	0.545
RFR-13	6/3/2009	--	--	--	--	--	--	6.74	23.70	0.557
RFR-14	3/5/2009	--	--	--	**0.25F**	--	--	7.28	21.30	0.515
	6/3/2009	--	--	--	**0.24F**	--	--	6.54	24.60	0.658
	9/2/2009	--	--	--	**0.28F**	--	--	6.68	23.40	0.534
	12/3/2009	--	--	--	--	--	--	7.61	10.80	0.578

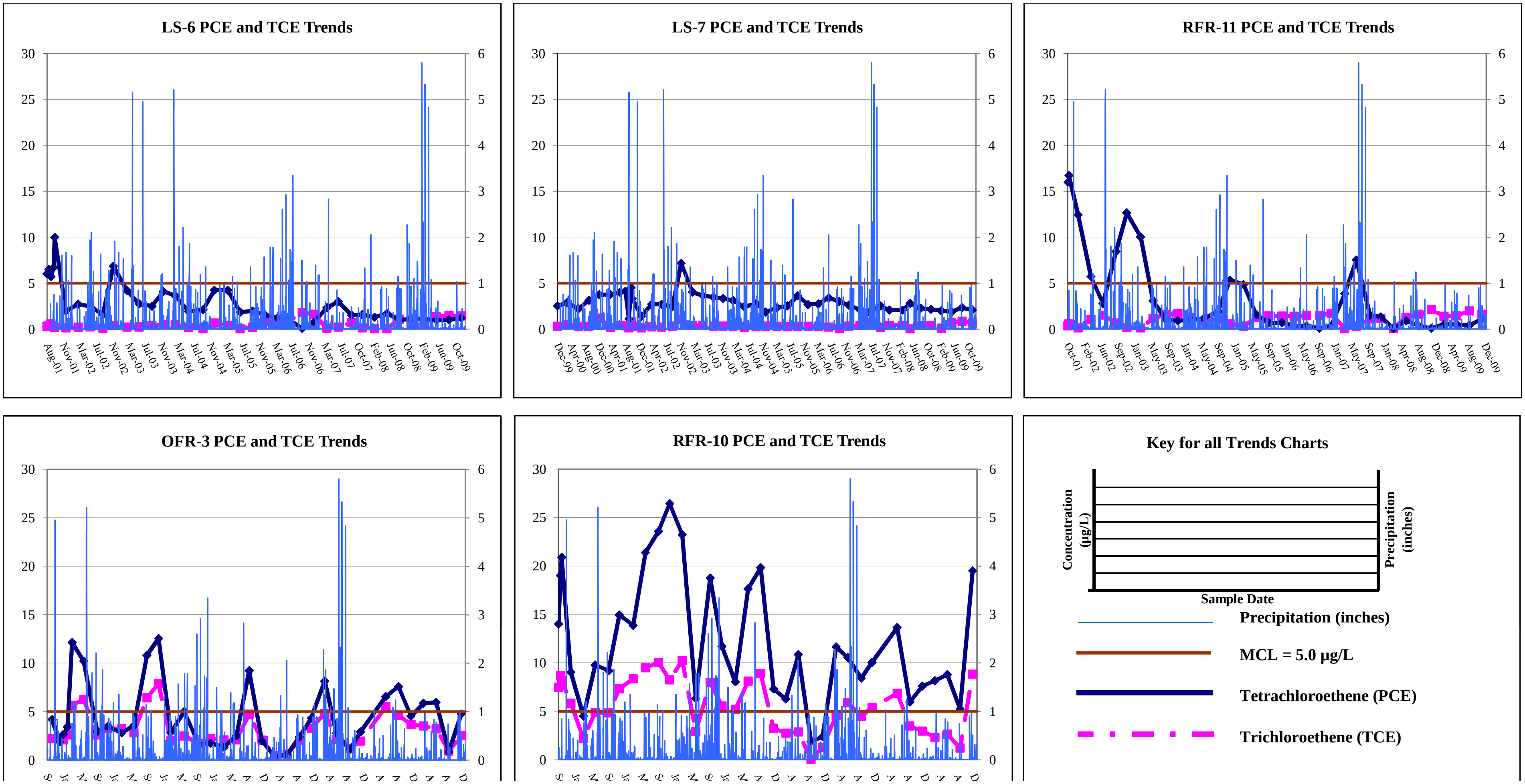
*80 ppb MCL is for total trihalomethanes: bromoform, chloroform, dibromochloromethane and dichlorodifluoromethane

BOLD (red)	Value > or = MCL
BOLD (blue)	MCL > Value > or = RL
BOLD	RL > Value > MDL

All samples analyzed by Agriculture & Priority Pollutants Laboratories (APPL) using method SW8260B.

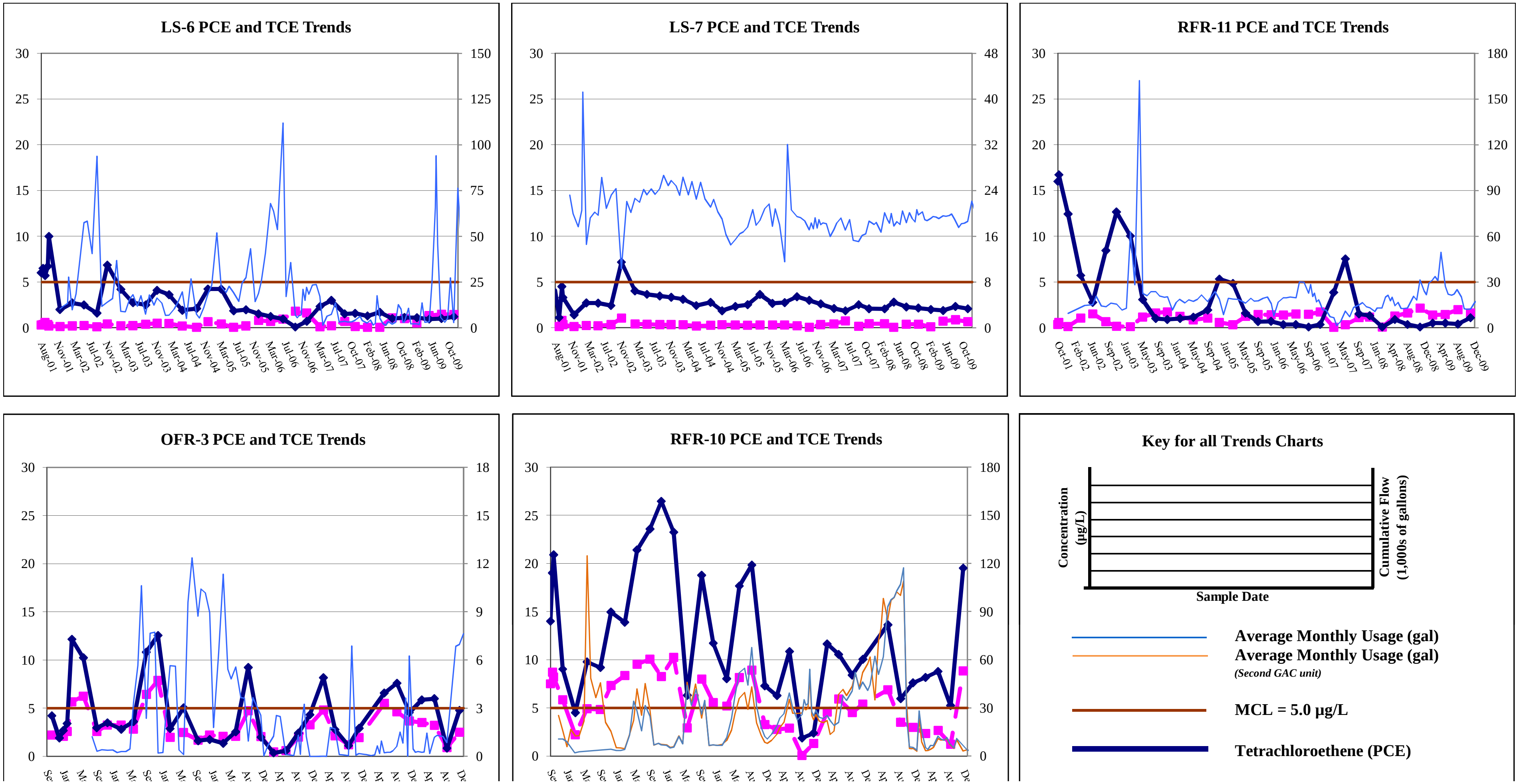
Notes:
- ug/L = micrograms per liter
-B = Analyte was found in sample as well as associated blank.
- F = The analyte was positively identified but the associated numerical value is below the RL.
- J = The analyte was positively identified below quantitation limits; the quantitation is an estimate.
- R = The data are unusable with deficiencies in the ability to analyze the sample and meet QC criteria.
- U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection.
- NA = Not analyzed for this parameter.
- All VOCs analyzed by method SW 8260B

Figure 2.7, PCE and TCE Concentration Trends and Precipitation



J:\746\746545_746546\01000 GW Mon\2009 Annual GW Report\Figure 2-7 & 2-8 GAC flows.xls

Figure 2.8, PCE and TCE Concentration Trends and Monthly Water Usage



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2.2.2.1 Off-Post Wells with COC Detections above the MCL

All off-post drinking water wells that historically exceeded MCLs have already been equipped with GAC filtration systems. These wells, and the date the filtration system was installed, are listed in **Table 2.9**. CSSA maintains these GAC filtration systems and will continue to do so.

During 2009, wells I10-4, OFR-3, and RFR-10 had concentrations exceeding the MCL. Well RFR-10 concentrations exceeded the MCL for PCE during March, June, September, and December. TCE exceeded the MCL in December in 2009. PCE exceeded the MCL in March and June 2009 in well OFR-3. An evaluation of concentration trends through 2009 are included in **Figures 2.7 and 2.8**.

Table 2.9 GAC Filtration Systems Installed

Well	Date Installed
LS-6	August 2001
LS-7	August 2001
OFR-3	April 2002
RFR-10	October 2001
RFR-11	October 2001

Well I10-4 fell off the sampling schedule in June 2007 due to pending sale of the property and information from the well owner that the well would be plugged and abandoned in the near future. In December 2008, after following up on the status of the plug and abandon report, it was discovered that the well was still intact. After speaking to the well owner, an access agreement was signed and an agreement was reached to not plug the well so it could remain in the CSSA quarterly groundwater monitoring program. Although the electricity and pump have been removed from the well, samples can be collected using a bailer sampling device. PCE was above the MCL in all four quarters in 2009, normally a GAC filtration system would have been installed on this well. However, since the well is not being used as a drinking water source a GAC unit will not installed at this time. If at any point the status of the well changes appropriate action will be taken to ensure that the land owner receives drinking water that meets EPA drinking water standards.

2.2.2.2 GAC Filtration Systems

Semi-annual post-GAC confirmation samples are collected from all wells equipped with GAC filtration systems (**Appendix H**). The samples confirm that the GAC filtration systems are working effectively and that VOCs are reduced to concentrations below the applicable drinking water MCLs.

To date, no COCs have been detected above RLs in the GAC-filtered samples. These samples were collected during the March and September 2009 events in accordance with project DQOs. See **Appendix H** for pre- and post-GAC sample comparisons.

Regular GAC maintenance/inspection occurs every 3 weeks. This task includes changing pre-filters and troubleshooting problems occurring with the systems. On May 18, 2009 and January 11, 2010 the carbon in the GAC filtration systems (LS-6, LS-7, OFR-3, RFR-10, and RFR-11) was changed out.

2.2.2.3 Off-Post Wells with COC Detections below the MCL

Detections from all wells sampled off-post are presented in **Table 2.8** and complete historical results are included in **Appendix G**. The groundwater monitoring results include wells where COCs were detected at levels below applicable MCLs. These detections occurred in wells LS-1, LS-5, LS-6, LS-7 and RFR-11. The detections below the MCL and above the RL are summarized as follows:

- **LS-1** – Concentrations of *cis*-1,2-DCE exceeded the RL in December 2009, PCE and TCE were also detected below the RL.
- **LS-5** –Concentration of TCE exceeded the RL in March, June, September, and December 2009. TCE levels steadily increased over the year and ranged from 2.04 to 2.82 µg/L. PCE was also detected below the RL during these sampling events.
- **LS-6** – Concentrations of TCE exceeded the RL in June, September, and December 2009. PCE was also detected below the RL during all four events in 2009.
- **LS-7** – Concentrations of PCE exceeded the RL from all samples in 2009. TCE was reported below the RL in all sampling events in 2009 also.
- **RFR-11** - Concentration of TCE exceeded the RL in all samples in 2009. PCE was also detected below the RL in all samples in 2009.

2.2.2.4 Off-Post Wells with COC Detections below the Reporting Limits

The off-post results include detections in wells for which the analyte is identified, but at a level below the RL. These results are assigned an “F” flag under the CSSA QAPP. In 2009, this included wells FO-J1, HS-2, I10-7, JW-7, JW-8, JW-14, JW-29, JW-30, OFR-1, RFR-9, and RFR-14. The detections below the reporting limit are summarized as follows:

- **FO-J1** – Concentrations of PCE detected below the RL in all samples in 2009.
- **HS-2** – Concentrations of PCE detected below the RL in June 2009.
- **I10-7** – Concentrations of PCE detected below the RL in December 2009.
- **JW-7** – Concentrations of PCE detected below the RL in June, September, and December 2009.

- **JW-8** – Concentrations of PCE detected below the RL in June, September, and December 2009.
- **JW-14** – Concentrations of PCE detected in March and June 2009.
- **JW-29** - Concentrations of PCE detected below the RL in March 2009.
- **JW-30** – Concentrations of PCE detected below the RL in September.
- **OFR-1** – Concentrations of PCE detected below the RL in all samples collected in 2009.
- **RFR-9** – Concentrations of PCE detected below the RL in September 2009 but did not show up in the field duplicate.
- **RFR-14** – Concentrations of PCE detected below the RL in March, June, and September 2009.

2.2.3 Isoconcentration Mapping

2.2.3.1 PCE, TCE, and cis-1,2-DCE

In prior annual reports, the maximum concentration detected during any quarterly event in the LGR wells (on-post and off-post) were contoured into isoconcentration contour maps for PCE, TCE, and *cis*-1,2-DCE. The reasoning for creating these "composite" maps was a result of the LTMO sampling frequency enacted in 2005. No single quarterly event included all wells sampled at the same time. Therefore, for 2009 a "snapshot" event from all wells (on-post and off-post) was collected in December 2009.

To better represent the plume source areas, data from deepest LGR zone of the Westbay wells were also composited into the isoconcentration maps. The LGR-09 zone from Westbay wells CS-WB01 through CS-WB04 were sampled in September 2009 and are included in the maps to help delineate Plume 2. The LGR04 zone of Westbay wells CS-WB05 through CS-WB08 were sampled in October 2009, and assist in delineating the central portion of Plume 1. These isoconcentration maps are provided in **Figures 2.9, 2.10, and 2.11** to illustrate the extent of contamination as measured from analytical results and inferred from those results.

The 2009 extent of COCs above 1.0 µg/L for each of PCE, TCE and *cis*-1,2-DCE can be determined by reviewing the figures. PCE concentrations above 1.0 µg/L are detected on-post in wells CS-4, CS-MW16-LGR, CS-D, CS-MW1-LGR, CS-MW8-LGR, CS-MW10-LGR, CS-MW11A-LGR, and CS-MW20-LGR. Additionally, the LGR-09 zone from CS-WB01 and CS-WB03 and the LGR-04 zones from CS-WB05 through CS-WB08 are all above 1.0 µg/L PCE (**Figure 2.9**). Off-post detections of PCE above 1.0 µg/L include I10-4, LS-1, LS-6, LS-7, OFR-3, RFR-10, RFR-11 and CS-WB04-LGR-09.

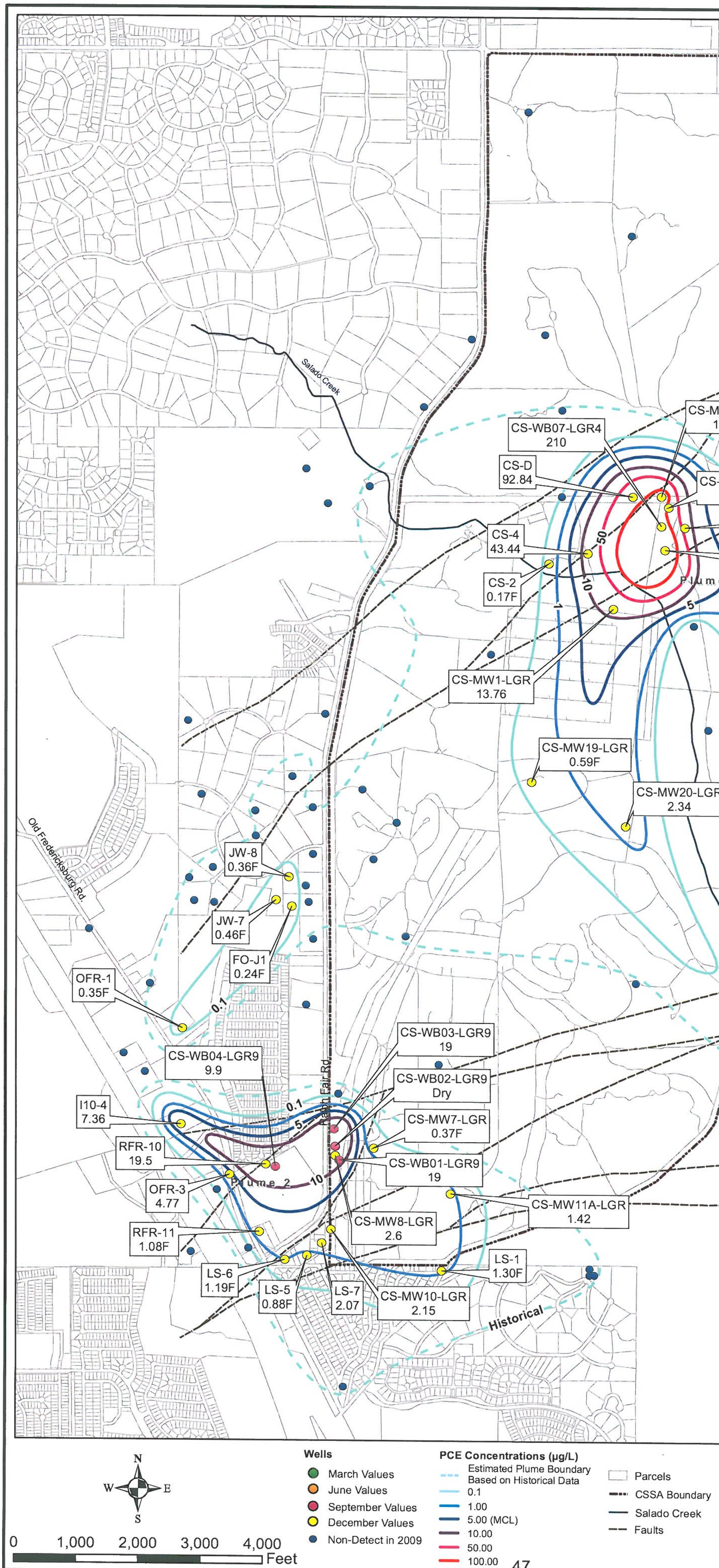

Figure 2.9

PCE Concentrations for LGR Wells, Sept. - Dec. 2009

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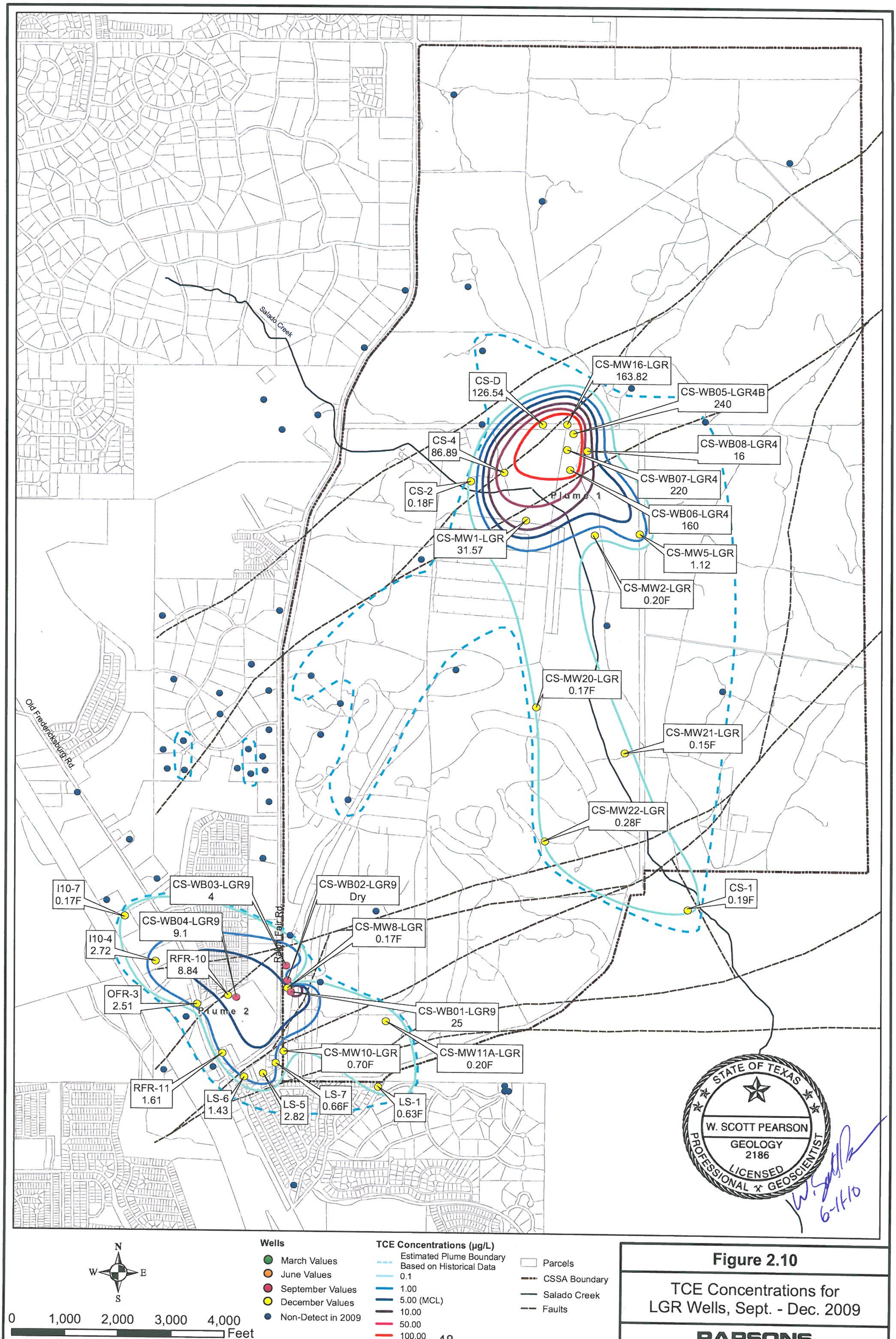


Figure 2.10

TCE Concentrations for LGR Wells, Sept. - Dec. 2009

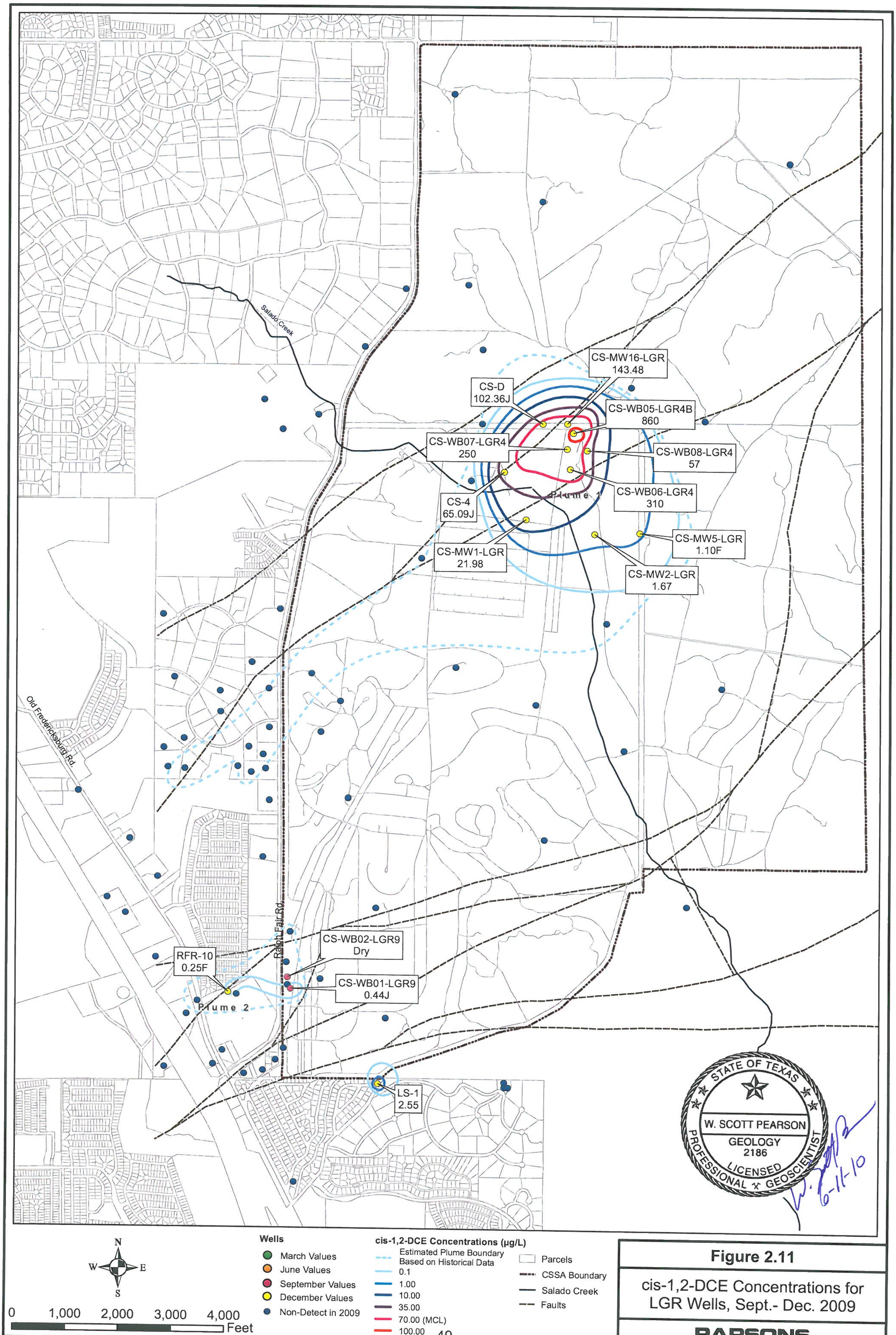


Figure 2.11

cis-1,2-DCE Concentrations for LGR Wells, Sept.- Dec. 2009

TCE follows a similar pattern, and has been detected above 1.0 µg/L in Plume 1 wells CS-4, CS-D, CS-MW16-LGR, CS-MW16-CC, CS-MW5-LGR, and CS-MW1-LGR. Additionally, the LGR-04 zones from CS-WB05 through CS-WB08 are all above 1.0 µg/L TCE (**Figure 2.10**). Except for CS-WB01-LGR-09, on-post wells within Plume 2 were not above 1.0 µg/L TCE during 2009. Rather, the primary occurrence of TCE above this concentration is located off-post in private wells I10-4, OFR-3, RFR-10, RFR-11, LS-5, LS-6, and CS-WB04-LGR-09.

Cis-1,2-DCE was detected off-post above 1.0 µg/L in well LS-1, and was also detected above 1.0 µg/L in on-post wells CS-D, CS-MW16-LGR, CS-MW1-LGR, CS-MW2-LGR, CS-MW5-LGR and the LGR-04 zones of CS-WB05 through CS-WB08 (**Figure 2.11**).

Isoconcentration maps have also been prepared based on analytical data collected in 2006, 2007, and 2008. Those isoconcentration maps are available for review in the CSSA Environmental Encyclopedia, Volume 5 Groundwater, (CSSA 2007) in the *2006, 2007, and 2008 Annual Groundwater Reports*. In general, the plume extent and geometry is consistent with 2008 data. The major difference between 2009 mapping and previous events is the inclusion of multi-port data from CS-WB01 through CS-WB-08. The inclusion of these datapoints has refined the center of Plume 1 and extends the center of Plume 2 eastward toward the expected source area.

Finally, the maximum annual concentrations detected near the plume centers are generally higher than 2008. See **Table 2.10** for comparison of the 2008 and 2009 data near the plume centers. In particular, well CS-4 showed a dramatic increase in concentration (43.44 µg/L PCE) in December 2009 on the western margin of the Plume 1 center. This well is generally below the MCLs for all COCs, and has not been above the MCL since June 2004. The well was re-sampled in February 2010, and the concentrations had returned to their pre-December 2009 levels below the MCLs for PCE, TCE, and *cis*-1,2-DCE.

The December 2009 results are unusual for CS-4 and do raise some questions. The former agricultural well is only 252 feet deep, is cased to 200 ft, and is located adjacent to a projected fault that runs NE to SW. This well is shallower than the typical LGR well completed into the production zone. Because of its shallow nature and open borehole construction, the well is able to receive perched waters that are typically cased off in a normal LGR monitoring well. Clearly the borehole received a slug of contaminated water in the December 2009 timeframe. It is unclear if the slug originated from a precipitation event or was generated from the Bioreactor Flood Test that was conducted between September 2009 and February 2010.

Table 2.10 Comparison of 2008 & 2009 PCE, TCE, and *cis*-1,2-DCE Max. Levels

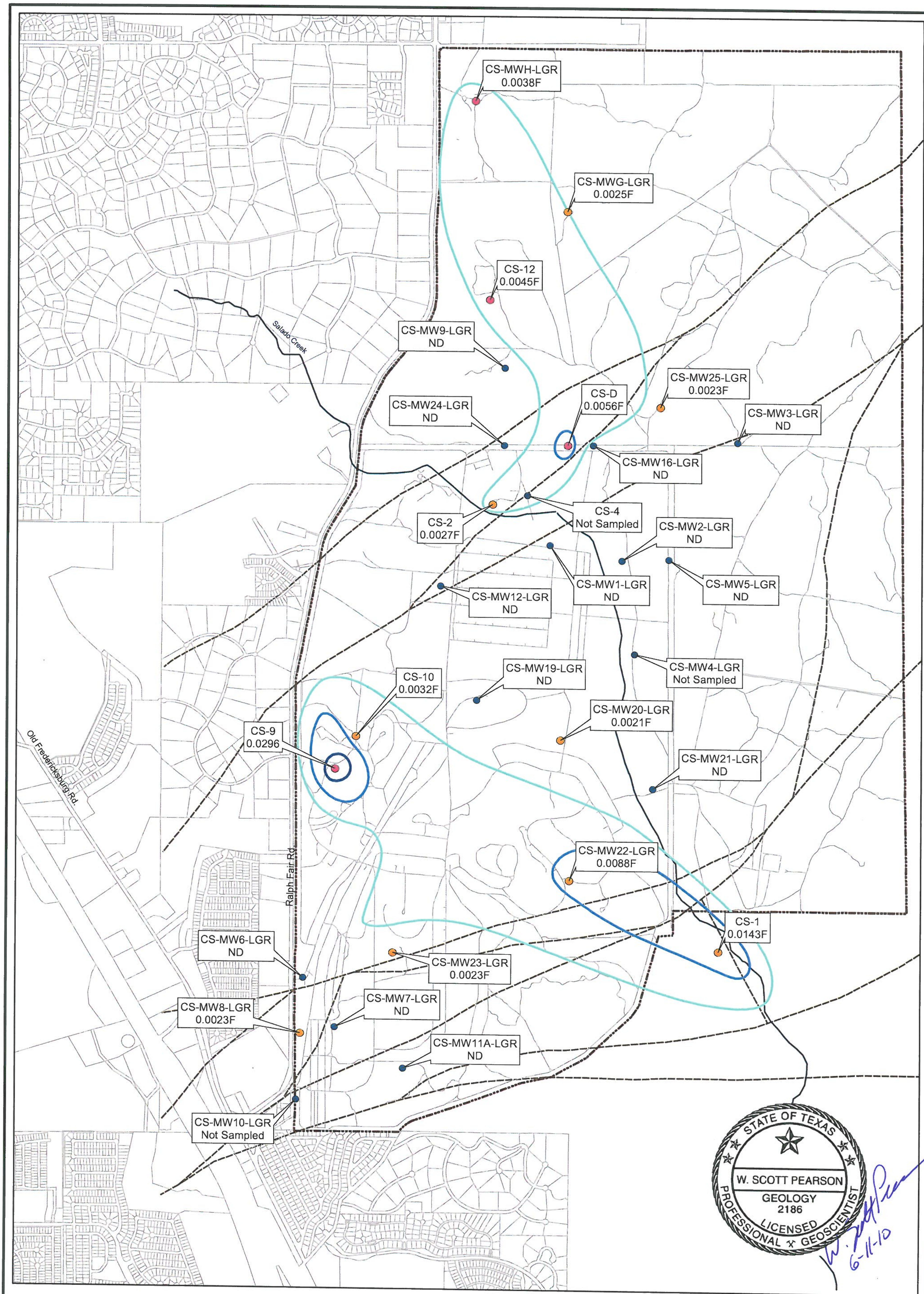
	PCE		TCE		*cis*-1,2-DCE	
	2008	*2009*	*2008*	*2009*	*2008*	*2009*
B-3 Plume 1						
CS-MW16-LGR	173	193.36	202.1	177.44	179.2	152.57
CS-D	131.9	92.84	157.9	126.54	137.5	102.36
CS-MW1-LGR	12.87	13.76	29.33	34.44	16.3	21.98
CS-4	1.36	43.44	1.61	86.89	0.25	65.09
AOC-65 Plume 2						
RFR-10	13.63	19.5	6.87	8.84	0.46	0.25
OFR-3	7.59	5.98	5.5	3.52	0.11	ND
I10-4	5.92	7.36	2.24	2.72	ND	ND

2.2.3.2 Lead

Lead has primarily been a COC associated with soil clean-up efforts at CSSA. However, CSSA also routinely monitors for lead in groundwater. While there is not a federally-mandated MCL for lead, the occurrence of lead in groundwater is regulated by an "Action Level" (AL) which requires systems to apply a treatment technique to control the corrosiveness of their water. If more than 10% of tap water samples exceed the AL, water systems must take steps to mitigate the exposure to lead. For lead, the AL is 0.015 mg/L.

Figure 2.12 presents a map depicting the distribution of lead in LGR groundwater below CSSA. Because of the LMTO process excludes wells from certain events; this composite map represents the highest concentration detected in a well from either the June or September quarterly groundwater events. These quarters were selected because they represent the widest distribution of lead in on-post groundwater (14 wells). All on-post wells were sampled for lead in December 2009 during the "snapshot" event. However, only 3 of the 44 on-post wells sampled resulted in detection of lead.

While no background concentration for lead in groundwater has been established for CSSA or the Middle Trinity aquifer, the laboratory (APPL) can positively identify the presence of lead to concentrations of 0.0019 mg/L (MDL). **Figure 2.12** shows that most of the affected LGR wells have lead concentrations between the MDL and 0.005 mg/L. Compared to the 2008 composite lead isoconcentration map, significantly fewer wells had detections of lead in 2009, and at generally decreased concentrations. In 2009, the areas of lead above 0.0025 mg/L generally occur in the North Pasture and South-Central Inner Cantonment. Only one well, CS-9, with a lead concentration of 0.0296 mg/L exceeded the prescribed AL.



N
W E
S

0 1,000 2,000 3,000 4,000 Feet

Wells
- March Values
- June Values
- September Values
- December Values
- Non-Detect in 2009

Lead Concentrations (mg/L)
- 0.0025
- 0.005
- 0.015 (Action Level)

- Parcels
- CSSA Boundary
- Salado Creek
- Faults

Figure 2.12

Lead Concentrations for LGR Wells, Sept. - Dec. 2009

PARSONS

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It is worth noting that the CSSA QAPP requires a RL of 0.025 mg/L. In this particular case, the associated AL for lead (0.015 mg/L) is less than the CSSA QAPP RL of 0.025 mg/L. This means that all results less than the RL are qualitatively identified but the resulting value is less than the quantitation limit, including those that exceed the AL up to 0.025 mg/L.

In the CS-9 vicinity, the lead is thought to be from an old pump that was found in the bottom of this well. The source of lead in the other areas is currently unknown. However, it has been recognized by the regulatory agencies that well construction or pumping well components/materials (pumps, pipe, etc.) can contribute to the presence of lead within a well.

3.0 CS-12 SUPPLY WELL

3.1 Background

After the drought of 2006, CSSA funded the installation of a new water supply well (CS-12) for the facility. Ideally, the new well will produce enough groundwater to sustain the entire daily demand of the post, if needed. Based on a prior technical evaluation, CSSA opted for a location in the North Pasture, which is essentially undeveloped acreage that serves as "safety fan" for projectile testing that occurs in the East Pasture. Because past waste management practices two solvent groundwater contamination plumes (containing VOCs PCE, TCE, and DCE) have been identified within the Middle Trinity aquifer beneath the facility. Plume 1 is located in the north central portion of the Inner Cantonment and Plume 2 is located near the southwest corner of the post. CS-12 was placed upgradient of both known groundwater plumes and is not expected to be impacted by past solvent releases. In addition, the well location meets all regulatory requirements in terms of sanitary and floodplain safety.

In January 2008, a test well (TW-1) was constructed at the proposed location in the North Pasture of CSSA. TW-1 was 460 feet deep, penetrating the full thickness of the Middle Trinity aquifer. During a pumping test, TW-1 was pumped steadily at 85.4 gallons per minute (gpm) over a 46.5-hour period. Groundwater results from the test well indicate that groundwater quality meets the standards required for interim approval. The anticipated production of TW-1 more than exceeds the average daily facility consumption of 36,000 gallons per day.

On November 21, 2008, Parsons submitted an Engineering Report containing plans and specifications for the construction of CS-12 to the TCEQ, and those plans were approved on December 29, 2008. The approval of those plans allowed the test well to overdrilled and converted into fully-functional supply well with disinfection systems.

The new supply well was drilled in February 2009. As an additional step in the construction process, "acidizing", was undertaken to further develop and enhance the water-bearing strata penetrated by the well following the receipt of approval from the TCEQ. Following the acidizing process, the well was developed and the pump was set. Construction of the proposed supply well CS-12 was completed in March 2009.

The next step was to disinfect the borehole with sodium hypochlorite (bleach) and collect samples for microbial indicators. The microbial indicators are Total Coliforms and *E. Coli*, which can indicate that a groundwater source has been contaminated by a sanitary source such as sewer system, septic tank, or livestock. The test analysis is collectively referred to as a BACT analysis. Three consecutive daily samples must be free of the indicator microbes to be permitted as a public supply well.

3.2 Well Development and Disinfection

Between March 24 and May 5, 2009 four attempts of disinfection and BACT sampling were undertaken. Samples were analyzed for BACT contaminants using the SM9222B method. All four attempts to disinfect the well resulted in a failure to remove Total Coliform and *E. Coli* from the well. Analytical results from the sampling events are summarized in **Table 3.1**.

3.3 Remedial Action and Monitoring

Representatives from TCEQ, CSSA, and Parsons met on June 4, 2009 to discuss options for rehabilitating the well, or engineered solutions for additional disinfection and treatment as a public water supply. Based upon the input received during the meeting, CSSA opted to implement a long-term pumping program from CS-12 as an extended development technique. As suggested by the TCEQ, CSSA also collected Microscopic Particulate Analysis (MPA) samples to assist in the determination if the local aquifer was "groundwater under the influence (GUI) of surface water. Additional BACT samples were also obtained to monitor the progress of the well. At the time the initiative was started in August 2009, the Middle Trinity aquifer and the Central Texas region was under severe drought. Beginning in September 2009 the drought cycle was broken by several significant precipitation events between September 2009 and March 2010. **Figure 3.1** depicts the CS-12 hydrograph, sampling events, and local daily precipitation.

CSSA followed the protocol of collecting samples under both drought and recharge conditions. On August 19, 2009, samples were collected for MPA and BACT analyses under a "drought" condition. The samples passed both the MPA and BACT testing. The MPA results were free of *Cryptosporidium* and *Giardia*. Only Nematodes and Rotifers were reported in the sample, and the result was scored a "Low Risk" per the EPA *Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water using Microscopic Particulate Analysis* (EPA, 1992). No coliform growth was found in BACT samples collected during the same event.

In support of an un-related environmental pilot study, a long-term pumping action was initiated at CS-12. Between September 14, 2009 and February 11, 2010, approximately 13 million gallons of groundwater was pumped from CS-12 to a Bioreactor remediation system nearly 4,000 feet to the southeast. A follow-up BACT sample on September 17, 2009 confirmed the lack of presence of Coliform in the well during this pumping event.

Samples were collected at the conclusion of the four-month purging period to assess if CS-12 had remained free of microbial contaminants. By mid-January the aquifer was beginning to recover from the prolonged drought. Between January 13-18, 2010 an additional 2.54 inches of precipitation was received and the aquifer was notably recharging in response to the rainfall. A MPA sample was collected on January 19, 2010 as the aquifer was visibly rebounding to the precipitation event. The results were free of *Cryptosporidium* and *Giardia*, and only Nematodes were present in the sample. As before the result was given a "Low Risk" score. The findings seemed conclusive that the aquifer is not under the direct influence of surface water.

Table 3.1
CS-12 Bacteriological Sampling Summary
January 2008-January 2010
Camp Stanley Storage Activity-Boerne, Texas

PARAMETERS	Date	1/31/2008	2/1/2008	4/30/2008		February 2009	March 2009	3/18/2009	3/23/2009	3/24/2009	3/25/2009	3/26/2009	3/30/2009	4/1/2009	4/2/2009	4/3/2009	4/10/2009
	Lab	San Antonio Testing	San Antonio Testing	San Antonio Testing	San Antonio Testing					San Antonio Testing	San Antonio Testing	San Antonio Testing		San Antonio Testing	San Antonio Testing	San Antonio Testing	
	Method	SM9223	SM9223	SM9223	SM9223					SM9223	SM9223	SM9223		SM9223	SM9223	SM9223	
	Time	14:00	10:45	9:45	14:45					14:30	14:05	14:45		16:00	16:00	15:00	
		Pumping Test (Not Chlorinated)		Confirmation Samples						1st Attempt				2nd Attempt			
Total Coliform		Not Found	Found	Not Found	Not Found					Not Found	Found	Found		Found	Found	Found	
E-Coli		Not Found	Not Found	Not Found	Not Found					Not Found	Found	Found		Not Found	Not Found	Not Found	
Giardia																	
Cryptosporidium						Convert Test Well	Acidization, Well Development, and Set Pump	Chlorinate	Chlorinate				Chlorinate				Chlorinate
Rotifers																	
Nematodes																	
All Others																	
Approx.Water Level:		191'	191'	~215'	~215'					~265'	~265'	~265'		~270'	~270'	~270'	
Static / Pumping		Static	Static	Static	Static					Static	Static	Static		Static	Static	Static	

PARAMETERS	Date	4/15/2009	4/15/2009	4/16/2009	4/17/2009	4/24/2009	4/24/2009	4/24/2009	4/24/2009	4/27/2009	4/29/2009	4/30/2009	5/1/2009	5/5/2009	8/19/2009	8/20/2009	8/20/2009	9/17/2009	1/6/2010	1/19/2010	1/19/2010	1/20/2010	1/21/2010
	Lab	San Antonio Testing	Bexar Met. Health District	San Antonio Testing	San Antonio Testing	San Antonio Testing		San Antonio Testing	San Antonio Testing		San Antonio Testing	San Antonio Testing	San Antonio Testing	San Antonio Testing	CH Diagnostic	San Antonio Testing	San Antonio Testing	San Antonio Testing	San Antonio Testing	CH Diagnostic	San Antonio Testing	San Antonio Testing	San Antonio Testing
	Method	SM9223	SM9223	SM9223	SM9223	SM9222B		SM9222B	SM9222B		SM9223	SM9223	SM9223	SM9222B	SM9222B	SM9222B	4/1/1925	SM9222B	SM9222B	SM9222B	SM9223	SM9223	SM9223
	Time	15:30	Split Sample	11:30	11:30	9:14		11:19	14:40		16:00	16:00	16:00	9:55	18:55	10:45	10:45	10:00	15:13	14:30	15:00	14:15	14:20
		3rd Attempt				Switch Sampling Personnel					4th Attempt				Long-Term Development								
Total Coliform		Found	Found	Found	Found	Found (5,100 CFU/100ml)		Found (5,600 CFU/100ml)	Found (7,800 CFU/100ml)		Not Found	Found	Found	(<1 CFU/100ml) No Growth Confirmation		(<1 CFU/100ml) No Growth Confirmation	Not Found	(<1 CFU/100ml) No Growth Confirmation	(<1 CFU/100ml) No Growth Confirmation		Not Found	Not Found	Not Found
E-Coli		Not Found	Not Found	Not Found	Not Found	NA		NA	NA		Not Found	Not Found	Not Found	No Growth Confirmation		No Growth Confirmation	Not Found	No Growth Confirmation	No Growth Confirmation		Not Found	Not Found	Not Found
Giardia															0					0			
Cryptosporidium							Lower Pump to 453'			Chlorinate					0					0			
Rotifers															1/100 Gal					ND			
Nematodes															25/100 Gal					1/100 Gal			
All Others															ND								
Approx.Water Level:		~270'	~270'	~270'	~270'	~270'		~270'	~270'		~270'	~270'	~270'	~270'	~270'	~270'	~270'	`342'	`338'	~324'	~324'	~320'	~316'
Static / Pumping		Static	Static	Static	Static	Static		Static	Static		Static	Static	Static	Static	Static	Static	Static	Pumping	Pumping	Pumping	Pumping	Pumping	Pumping

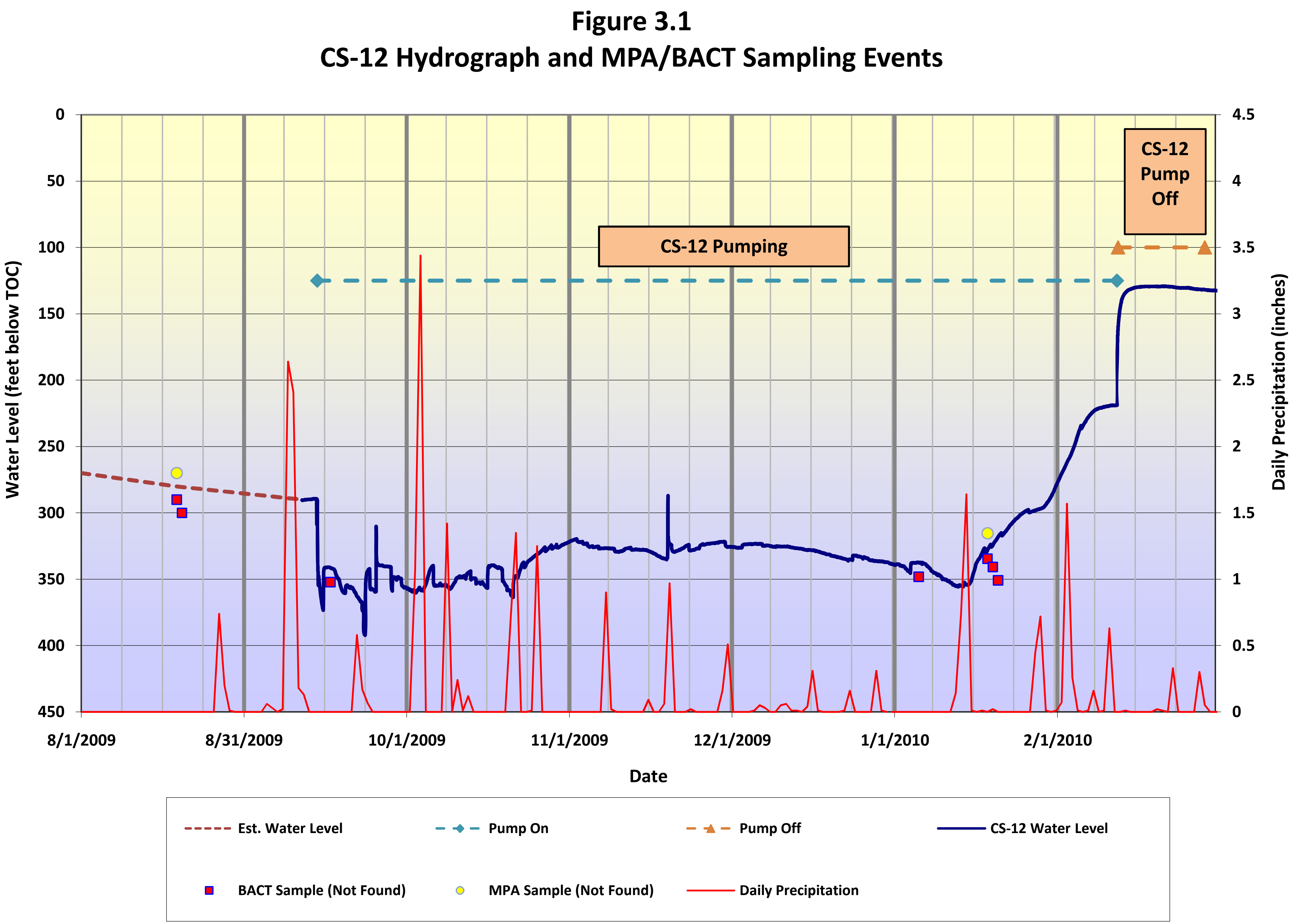
Figure 3.1
CS-12 Hydrograph and MPA/BACT Sampling Events
CS-12 Pumping
CS-12 Pump Off
Water Level (feet below TOC)
Daily Precipitation (inches)
0
50
100
150
200
250
300
350
400
450
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
8/1/2009
8/31/2009
10/1/2009
11/1/2009
12/1/2009
1/1/2010
2/1/2010
Date
Est. Water Level
Pump On
Pump Off
CS-12 Water Level
BACT Sample (Not Found)
MPA Sample (Not Found)
Daily Precipitation

Consistent with the requirements of 30 TAC Chapter 290, Subchapter D "*Rules and Regulations for Public Water Systems"*, three daily consecutive samples for BACT were collected between January 19-21, 2010. All BACT sampling results were reported as "Not Found" for total coliforms and *E. Coli*.

During the long-term pumping event, the well was able to maintain at least 55 gpm under severe drought conditions. However, once the aquifer was recharged, the well easily maintained 85 gpm with less than 100 feet of drawdown. Under this recharged aquifer condition, it is not unreasonable to assume that the well could maintain greater than 100 gpm if allowed to achieve the maximum sustainable drawdown.

3.4 Future Activities

Based on microbiological sampling results since August 2009, there is no further indication of Coliform contamination at CS-12. MPA results indicate "Low Risk" of groundwater under the influence (GUI) of surface water per EPA Consensus Method. Finally, the well passed the requirement for three consecutive days free of Coliform detections. Therefore, CSSA intends to construct the CS-12 facilities as previously approved by the TCEQ in January 2009. In April 2010, CSSA requested concurrence from the TCEQ to move forward with the planned construction of the well facility. TCEQ approved the request on May 12, 2010. However, as a result of past BACT detections, CS-12 will be subjected to monthly Coliform analysis for the service life of the well due to the history of the presence of Coliform.

4.0 GROUNDWATER MONITORING PROGRAM CHANGES

4.1 Access Agreements Obtained in 2009

Access agreements are signed by off-post well owners to grant permission to CSSA to collect groundwater samples from each well. Most access agreements were signed for a 3-year term. In September 2007 CSSA mailed out new right-of-entry agreements to owners to solicit new access agreements. Most of the agreements will expire by the end of 2010. New five year agreements are currently being drafted and will be mailed to the selected well owners in the near future.

Currently all access agreements are up-to-date with the exception of I10-7. The well owner was contacted via telephone and verbal permission to sample this well was given while either a new access agreement is received or the initial agreement is located.

A new access agreement was obtained from the well owner of JW-31. This well was added to the sampling program in 2009 due to interest expressed from the well owners who attended the public meeting held in November 2009.

The access agreement for JW-12 expired in 2009. Several attempts to contact the well owner by mail and phone have been made on numerous occasions. A final phone call attempt from CSSA's Lt. Colonel Shirley returned no results.

4.2 Wells Added to or Removed From Program

Sampling of well DOM-2 has been terminated due to the main electricity being disconnected. The well owner was contacted and explained that the electricity was disconnected for safety reasons. The property that the well sits on is for sale and the house is old and dilapidated.

The well owners of JW-26 and JW-32 have declined access in the past and are not sampled as part of the groundwater monitoring program. Well DOM-2 was removed from the sampling program due to the main power termination. Well owners of JW-12 have refused to return phone calls or the access agreement mailed out in 2009. Wells LS-2 and LS-3 were removed from service in 2007 and will be plugged and abandoned in the near future. Wells RFR-6, RFR-7, and OFR-2 were plugged and abandoned in 2006 as part of the new Centex home development.

5.0 PUBLIC MEETINGS

Two public meetings were held on November 17 & 19, 2009 at Fair Oaks Ranch Elementary and Leon Springs Elementary Schools, respectively. Each meeting presented poster displays of the current projects underway at CSSA, and was staffed by Parsons, Portage, CSSA, SAWS, and regulatory personnel to answer questions and address concerns.

The first meeting was held at the Fair Oaks Elementary School on November 17, 2009. A total of six residents, one public official, and one television reporter attended the meeting. The new residents at JW-31 were informed of the groundwater program and asked to be added to the monitoring program. Several residential owners currently utilizing well water near CSSA inquired about the possibility of being connected to SAWS. Finally, a couple residents from the Fair Oaks and Lost Creek subdivisions were curious/concerned if the CSSA groundwater plume could be affecting their public water supply systems.

A second public meeting was held at Leon Springs Elementary School on November 19, 2009. The meeting attendees included two local residents, one local public official, and one newspaper reporter. One Hidden Springs resident was concerned if the public water supply serving his home was contaminated by the CSSA groundwater plumes. Another resident found the fact sheets to be confusing and offered suggestions for improvement. The public official was from the Alamo Area Council of Governments (AACOG), and was inquiring if the CSSA groundwater plumes posed a threat to the Edwards Aquifer. He was also concerned about the types of munitions that were stored at CSSA and if they could also pose a threat to the environment. Finally, a reporter from the San Antonio Express-News interviewed several presenters about the environmental activities at CSSA. To date, no article about the public meeting or the environmental activities presented has been published in the newspaper.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation of the on- and off-post groundwater monitoring program data collected in 2009, the following conclusions and recommendations can be made:

- On-post wells CS-MW16-LGR, CS-MW16-CC, CS-D, CS-4, and CS-MW1-LGR all exceeded VOC MCLs in 2009 and should remain on the sampling schedule in the future.
- The December 2009 results at CS-4 above the MCL (86.89 µg/L of TCE) is somewhat unexpected and is a concern. Prior to that sampling event, concentrations in excess of the MCL where not anticipated in that location. By February 2010 the concentrations had returned to below MCLs. There is speculation that the isolated occurrence of above MCL concentrations was a result of the Flood Test being performed at the B-3 Bioreactor. However, consideration should be given to increase the sampling frequency from its current annual schedule. An effort to determine how and when this condition occurs should be undertaken. This would include an increased sampling frequency (currently annual) that should correspond with precipitation events or above-average aquifer levels.
- CS-9, CS-MW1-LGR, and CS-MW9-BS all exceeded MCLs for chromium, lead, or mercury in 2009, and should remain on the sampling schedule in the future. Wells CS-MW20-LGR and CS-MW21-LGR through 25-LGR should also be continued to be monitored for continued decreasing trends in lead concentration.
- Continue with the initiative to collect a "snapshot" event from all on- and off-post wells. The current recommendation is to collect a snapshot event every 9 months so that the changes in the plume can be monitored seasonally.
- Nineteen Westbay intervals had detections above the MCL in 2009. These intervals should remain on the semi-annual sampling schedule in the future as recommended in the LTMO study.
- The Westbay wells at AOC-65 continue to indicate the strong presence of contamination near the source area (CS-WB03). Significant contamination above the MCLs continues to exist near-surface and in the lower-yielding upper strata of aquifer. In most cases throughout the post, VOC contamination in the main portion of aquifer remains at concentrations below the MCLs. An investigation into the source of the UGR water near Building 90 is recommended.
- Wells OFR-3 and RFR-10 exceeded the MCL for PCE and TCE in 2009 off-post. These wells, along with wells LS-6 and LS-7, are equipped with a GAC filtration system and should remain on the quarterly sampling schedule in the future. The GAC filtration systems will continue to be maintained by CSSA.
- TCE concentrations at LS-5 continue to increase and are now 50 percent of the MCL. Considering this well is surrounded by wells that currently (LS-6 and LS-7) or

formerly (LS-2 and LS-3) treated with GAC units, it may be prudent to install a treatment unit at this location.

- Off-post well I10-4 continues to increase in PCE concentration above the MCL. Since December 2006, the PCE concentration has steadily increased from a trace detection (<1 µg/L) to more than 7 µg/L in December 2009. The groundwater concentration has been in excess of the MCL since December 2008. However the well is not equipped with a GAC unit because this well is not currently being used as drinking water. In the future if this well is put back into service it will require installation of a GAC unit. Locating a well to sample west of IH-10 and I10-4 would be helpful in monitoring the progression of Plume 2 towards the west.
- If additional private/or public wells are installed to the west and southwest of CSSA, CSSA will attempt to add them to future sampling events. A new well survey to capture all wells within ½ mile of the post is scheduled in 2010.
- Off-post wells with detections of VOCs below the MCL will continue to be sampled in accordance with DQO requirements. Depending on concurrence by regulatory agencies, the sampling frequency may be reduced following one year of consistent detection levels.
- For future sampling events, off-post wells where no VOCs were detected will be sampled as needed, depending on historical detections.
- Production well CS-9 continues to have lead and mercury issues above regulatory standards. Therefore, CS-9 will remain inactive as a public water supply well.
- The housing and treatment facilities for well CS-12 should be complete in 2010. Upon final approval from the TCEQ the well will be able to provide potable water to CSSA. Five months of continuous pumping demonstrated the well can maintain at least 55 gpm under drought conditions, and more than 85 gpm under plentiful conditions. Because of the prior history with coliform detections, monthly BACT sampling will be required for the service life of the well.

7.0 REFERENCES

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APPENDIX A

ON- AND OFF-POST EVALUATION OF DATA QUALITY OBJECTIVES ATTAINMENT

Appendix A. On-Post Evaluation of Data Quality Objectives Attainment

Activity	Objectives	Action	Objective Attained?	Recommendations
Field Sampling	Conduct field sampling in accordance with procedures defined in the project work plan, SAP, QAPP, and HSP.	All sampling was conducted in accordance with the procedures described in the project plans.	Yes.	NA
Characterization of Environmental Setting (Hydrogeology)	Prepare water-level contour and/or potentiometric maps for each formation of the Middle Trinity Aquifer (3.5.3).	Potentiometric surface maps were prepared based on water levels measured in each of CSSA's wells screened in three formations in 2009.	To the extent possible with data available. Due to the limited data available and the fact that wells are completed across multiple water-bearing units, potentiometric maps should only be used for regional water flow direction, not local. Ongoing pumping in the CSSA area likely affects the natural groundwater flow direction.	As additional wells are installed screened in distinct formations, future evaluations will eliminate reliance on wells screened across multiple formations.
	Describe the flow system, including the vertical and horizontal components of flow (2.1.9).	Potentiometric maps were created using 2009 water level data, and horizontal flow direction was tentatively identified. Insufficient data are currently available to determine vertical component of flow.	As described above, due to the lack of aquifer-specific water level information, potentiometric surface maps should only be used as an estimate of regional flow direction.	Same as above.
	Define formation(s) in the Middle Trinity Aquifer are impacted by the VOC contaminants (2.1.3).	Quarterly groundwater monitoring provides information on Middle Trinity Aquifer impacts. Monitoring wells equipped with Westbay® - multi-port samplers are sampled semiannually and will be sampled again during the March 2010 event.	Yes.	Continue sampling.

Activity	Objectives	Action	Objective Attained?	Recommendations
	Identify any temporal changes in hydraulic gradients due to seasonal influences (2.1.5).	Downloaded data from continuous-reading transducer in wells: CS-1, CS-10, CS-MW1-LGR, CS-MW4-LGR, CS-MW12-BS, CS-MW16-LGR, CS-MW16-CC, CS-MW18-LGR, CS-MW21-LGR, and CS-MW24-LGR. Data was also downloaded from the northern and southern continuous-reading weather stations WS-N and WS-S. Water levels will be graphed at these wells against precipitation through 2009 and included in the annual groundwater report.	Yes.	Continue collection of transducer data and possibly install transducers in other cluster wells.
Contamination Characterization (Ground Water Contamination)	Characterize the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the Facility (3.1.2).	Samples for laboratory analysis were collected from 46 of 47 CSSA wells. Of the 89 samples scheduled to be collected in 2009 19 samples: CS-MW11B-LGR (x3), CS-MW17-LGR, CS-MW18-LGR (x2), CS-4 (x2), CS-D, CS-MW10-LGR, CS-MW2-CC, CS-MW4-LGR, CS-MW6-CC, CS-MW7-CC, CS-MW8-CC, CS-MW9-CC, CS-MW10-CC, CS-MW12-CC, and CS-I were not sampled due to pump outages and the water levels falling below the dedicated low-flow pump. In December 33 additional wells were sampled to gather data for the annual snapshot event.	The horizontal and vertical extent of groundwater contamination is continuously monitored.	Continue groundwater monitoring and construct additional wells as necessary.
	Determine the horizontal and vertical concentration profiles of all constituents of concern (COCs) in the groundwater that are measured by USEPA-approved procedures (3.1.2). COCs are those chemicals that have been detected in groundwater in the past and their daughter (breakdown) products.	Groundwater samples were collected from wells not listed above. Samples were analyzed for the selected VOCs using USEPA method SW8260B and metals (As, Ba, Cd, Cr, Cu, Pb, Hg, Ni, Zn). Analyses were conducted in accordance with the AFCEE QAPP and approved variances. All RLs were below MCLs, as listed below:	Yes.	Continue sampling.

Activity	Objectives	Action	Objective Attained?	Recommendations
		ANALYTE **RL (UG/L)** **MCL (UG/L)** Chloroform 0.4 100 Chloromethane 1.3 -- Dibromochloromethane 0.5 100 1,1-DCE 1.2 7 *cis*-1,2-DCE 1.2 70 *trans*-1,2-DCE 0.6 100 Methylene Chloride 2 5 PCE 1.4 5 TCE 1.0 5		
		ANALYTE **RL (UG/L)** **MCL (UG/L)** Barium 5 2000 Chromium 10 100 Copper 10 1300 Nickel 10 100 Zinc 10 11000 Arsenic 5 50 Cadmium 1 3 Lead 2 15 Mercury 1 2		
Contamination Characterization (Ground Water Contamination) (Continued)	Meet AFCEE QAPP quality assurance requirements.	Samples were analyzed in accordance with the CSSA QAPP and approved variances. Parsons chemists verified all data, and AFCEE approval was obtained.	Yes.	NA
		All data flagged with a "U," "J," "M," and "F" are usable for characterizing contamination. All "R" flagged data are considered unusable.	Yes.	NA

Activity	Objectives	Action	Objective Attained?	Recommendations
		Previously, an MDL study for arsenic, cadmium, and lead was not performed within a year of the analyses, as required by the AFCEE QAPP.	The laboratory performed new MDL studies in February 2001 for these metals and the new MDL values were found to be almost identical to the previous MDLs and all met the associated AFCEE QAPP requirements. MDLs for these three metals are well below MCLs. In addition, the laboratory performed daily calibrations and RL verifications for these metals, both of which demonstrate the laboratory's ability to detect and quantitate these metals at RL levels. These daily analyses also indicate that concentrations above the laboratory RL for these compounds were not affected by the expired MDL study.	Use results for groundwater characterization purposes.
Remediation	Determine goals and create cost-effective and technologically appropriate methods for remediation (2.2.1).	Continued data collection will provide analytical results for accomplishing this objective.	Ongoing.	Continue sampling and evaluation, including quarterly groundwater monitoring teleconferences to address remediation.
	Determine placement of new wells for monitoring (2.3.1, 3.6)	Sampling frequency and sample locations to be monitored (including any new wells) will be based on trend data from monitoring event(s) (3.1.5).	Ongoing.	Continue quarterly groundwater teleconferences to discuss sampling frequency and placement of new monitor wells.
Project schedule/ Reporting	Produce a quarterly monitoring project schedule as a road map for sampling, analysis, validation, verification, reviews, and reports.	Prepare schedules and sampling guidelines prior to each quarterly sampling event.	Yes.	Continue sampling schedule preparation each quarter.

Appendix A Off-Post Evaluation of Data Quality Objectives Attainment

Activity	Objectives	Action	Objective Attained?	Recommendations
Field Sampling	Conduct field sampling in accordance with procedures defined in the project work plan, SAP, QAPP, and HSP.	All sampling was conducted in accordance with the procedures described in the project plans.	Yes	NA
Contamination Characterization (Groundwater Contamination)	Determine the potential extent of off-post contamination (§2.3.1 of the DQOs for the Groundwater Contamination Investigation, revised November 2003).	Samples for laboratory analysis were collected from selected off-post public and private wells, which are located within a ½ mile radius of CSSA.	Partially	Replace wells where no VOCs were detected with wells that may be identified in the future, located to the west and southwest of AOC-65 to provide better definition of plume 2. Continue sampling of wells to the west of plume 1 (Fair Oaks and Jackson Woods) to confirm any detections possibly related to plume 1.
	Meet CSSA QAPP quality assurance requirements.	Samples were analyzed in accordance with the CSSA QAPP, and approved variances. A chemist verified all data.	Yes	NA
		All data flagged with a "U", "M", and "J" are usable for characterizing contamination.	Yes	NA

Activity	Objectives	Action	Objective Attained?	Recommendations
	Evaluate CSSA monitoring program and expand as necessary (§2.3.1 of the DQOs for the Groundwater Contamination Investigation, revised November 2003). Determine locations of future monitoring locations.	Evaluation of data collected is ongoing and is reported in this quarterly groundwater report and will be reported in future quarterly groundwater reports. Additional information covering the CSSA monitoring program is available in Volume 5, CSSA Environmental Encyclopedia.	Yes	Continue data evaluation and quarterly teleconferences for evaluation of the monitoring program. Each teleconference/planning session covers expansion of the quarterly monitoring program, if necessary.
Project schedule/ Reporting	The quarterly monitoring project schedule shall provide a schedule for sampling, analysis, validation, verification, reviews, and reports for monitoring events off-post.	A schedule for sampling, analysis, validation, and verification and data review and reports is provided in this quarterly groundwater report and will be reported in future quarterly groundwater reports. Additional information covering the CSSA monitoring program is available in Volume 5, CSSA Environmental Encyclopedia.	Yes	Continue quarterly reporting to include a schedule for sampling, analysis, validation, and verification and data review and data reports.

Activity	Objectives	Action	Objective Attained?	Recommendations
Remediation	Evaluate the effectiveness of GACs (§3.2.3) and install as needed (§3.2.5 both of the DQOs for the Groundwater Contamination Investigation, revised November 2003).	Perform maintenance as needed. Install new GACs as needed.	Yes	Maintenance to the off-post GAC systems to be continued by Parsons' personnel approximately every 3 weeks. Semi annual (or as needed) maintenance to the off-post GAC systems by additional subcontractors to continue. Evaluations of future sampling results for installation of new GAC systems will occur as needed.

APPENDIX B

2009 QUARTERLY ON-POST GROUNDWATER ANALYTICAL RESULTS

Appendix B
Groundwater VOC Analytical Results, 2009

Well Number	Sample Date	Dichloro-ethene, 1,1 (ug/L)	Dichloro-ethene, *cis* -1,2 (ug/L)	Dichloro-ethene, *trans* -1,2 (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temp. (deg. C)	Specific Conductivity (mS/cm)
								Field Measurements		
CS-1	6/11/2009	0.12U	0.07U	0.08U	0.06U	**0.47F**	0.08U	7.21	23.70	0.511
	9/16/2009	0.12U	0.07U	0.08U	0.06U	**0.37F**	0.08U	6.84	22.20	0.499
	12/14/2009	0.12U	0.07U	0.08U	0.06U	**0.19F**	0.08U	8.55	21.90	0.606
CS-2	6/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.90	21.40	0.569
	12/9/2009	0.12U	0.07U	0.08U	**0.17F**	**0.18F**	0.08U	7.42	20.50	0.822
CS-4	12/9/2009	0.12U	**65.09J**	**0.73J**	**43.44**	**86.89**	0.08U	7.88	20.50	0.592
CS-9	6/11/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.21	22.10	0.634
	9/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.86	21.50	0.603
	12/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.20	21.70	0.615
CS-10	6/11/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.84	24.10	0.603
	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.14	23.30	0.577
Duplicate	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.14	23.30	0.577
	12/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.72	21.40	0.597
CS-11	6/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.08	24.70	0.530
CS-12	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	NA	NA	NA
	12/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.20	21.90	0.549
Duplicate	12/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.20	21.90	0.549
CS-MW16-LGR	3/12/2009	0.12U	**127.17**	**0.13F**	**193.36**	**161.07**	0.08U	7.10	21.70	0.544
	9/9/2009	0.12U	**152.57***	**0.48F**	**176.82**	**177.44***	0.08U	7.03	23.20	0.547
	12/14/2009	0.12U	**143.48**	**0.26F**	**151.77**	**161.53**	0.08U	7.62	22.30	0.563
Duplicate	12/14/2009	0.12U	**140.7**	0.08U	**149.91**	**163.82**	0.08U	7.62	22.30	0.563
CS-MW16-CC	3/12/2009	**0.39F**	**37.79**	**2.09**	**11.15**	**53.28**	0.08U	7.24	22.90	0.642
	9/9/2009	**0.63F**	**43.17**	**5.33**	**7.17**	**51.93**	0.08U	7.34	23.16	0.625
	12/14/2009	0.12U	**36.54**	**4.43**	**4.54**	**47.71**	0.08U	7.19	23.00	0.673
CS-D	9/15/2009	0.12U	**65.81**	**1.37**	**68.94**	**87.11**	0.08U	7.39	22.60	0.511
	12/9/2009	0.12U	**102.36J**	**1.39J**	**92.84**	**126.54**	0.08U	7.51	20.30	0.540
Duplicate	12/9/2009	0.12U	**96.64J**	**1.76J**	**90.16**	**120.57**	0.08U	7.51	20.30	0.540
CS-MWG-LGR	6/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.13	21.20	0.433
	12/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.34	17.70	0.466
CS-MWH-LGR	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.38	21.40	0.477
	12/7/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.27	21.90	0.504
CS-I	3/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.44	22.50	0.560
CS-MW1-LGR	3/17/2009	0.12U	**15.16**	**0.43F**	**11.63**	**27.99**	0.08U	7.19	25.90	0.551
	9/9/2009	0.12U	**18.37**	**0.37F**	**13.71**	**34.44**	0.08U	6.75	21.70	0.493
	12/10/2009	0.12U	**21.98**	**0.55F**	**13.76**	**31.57**	0.08U	8.16	20.70	0.525
CS-MW1-BS	9/9/2009	0.12U	**0.45F**	0.08U	0.06U	0.05U	0.08U	7.64	22.00	0.482
	12/10/2009	0.12U	**0.62F**	0.08U	0.06U	**0.16F**	0.08U	9.02	20.90	0.520
CS-MW1-CC	9/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.16	22.84	0.696
	12/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.83	20.10	0.736
CS-MW2-LGR	3/17/2009	0.12U	**0.51F**	0.08U	**0.45F**	**0.18F**	0.08U	11.30	21.70	0.922
	9/10/2009	0.12U	**1.18F**	0.08U	0.06U	0.05U	0.08U	10.71	21.77	0.533
	12/10/2009	0.12U	**1.67**	0.08U	0.06U	**0.20F**	0.08U	9.66	20.70	0.468
CS-MW2-CC	12/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	9.11	20.70	0.754
Duplicate	12/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	9.11	20.70	0.754
CS-MW3-LGR	3/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.47	22.40	0.473
Duplicate	3/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.47	22.40	0.473
	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.78	22.20	0.484
	12/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.92	19.40	0.475

Appendix B
Groundwater VOC Analytical Results, 2009

Well Number	Sample Date	Dichloro-ethene, 1,1 (ug/L)	Dichloro-ethene, *cis* -1,2 (ug/L)	Dichloro-ethene, *trans* -1,2 (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temp. (deg. C)	Specific Conductivity (mS/cm)
								Field Measurements		
CS-MW4-LGR	3/17/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.58	23.40	0.479
	12/9/2009	0.12U	0.07U	0.08U	0.06U	**0.17F**	0.08U	8.30	21.00	0.640
CS-MW5-LGR	3/17/2009	0.12U	**0.99F**	0.08U	0.06U	**0.94F**	0.08U	7.36	21.60	0.493
	9/10/2009	0.12U	**1.73**	0.08U	**0.99F**	**1.25**	0.08U	6.84	22.27	0.524
	12/9/2009	0.12U	**1.10F**	0.08U	**0.80F**	**1.12**	0.08U	8.59	20.40	0.524
CS-MW6-LGR	3/18/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.12	21.90	0.538
	9/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.99	22.59	0.558
	12/15/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.03	21.60	0.577
CS-MW6-BS	9/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.24	23.04	0.655
	12/15/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.99	21.40	0.751
CS-MW6-CC	12/15/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.45	21.70	0.788
CS-MW7-LGR	3/12/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.61	19.60	0.499
	9/11/2009	0.12U	0.07U	0.08U	**0.49F**	0.05U	0.08U	6.84	21.73	0.661
Duplicate	9/11/2009	0.12U	0.07U	0.08U	**0.46F**	0.05U	0.08U	6.84	21.73	0.661
	12/8/2009	0.12U	0.07U	0.08U	**0.37F**	0.05U	0.08U	7.07	21.00	0.659
CS-MW7-CC	12/8/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.48	21.40	0.814
CS-MW8-LGR	6/11/2009	0.12U	0.07U	0.08U	**1.26F**	0.05U	0.08U	7.12	22.20	0.663
	12/8/2009	0.12U	0.07U	0.08U	**2.6**	**0.17F**	0.08U	6.89	21.50	0.675
CS-MW8-CC	12/8/2009	0.12U	0.07U	0.08U	**0.37F**	**0.19F**	0.08U	9.02	20.90	0.830
CS-MW9-LGR	3/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.13	21.40	0.536
	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.88	21.60	0.565
	12/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.24	20.20	0.578
CS-MW9-BS	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.09	21.40	0.586
	12/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.24	20.20	0.578
CS-MW9-CC	12/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.65	20.60	0.698
CS-MW10-LGR	12/8/2009	0.12U	0.07U	0.08U	**2.15**	**0.70F**	0.08U	7.45	21.10	0.604
CS-MW10-CC	12/8/2009	0.12U	0.07U	0.08U	0.06U	**0.18F**	0.08U	8.67	21.20	0.820
CS-MW11A-LGR	3/12/2009	0.12U	0.07U	0.08U	**0.43F**	0.05U	0.08U	7.19	20.30	0.545
	9/15/2009	0.12U	0.07U	0.08U	**1.61**	0.05U	0.08U	7.17	21.60	0.560
	12/8/2009	0.12U	0.07U	0.08U	**1.42**	**0.20F**	0.08U	8.02	20.10	0.594
CS-MW12-LGR	6/11/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.60	22.80	0.558
Duplicate	6/11/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.60	22.80	0.558
	12/11/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.36	21.00	0.552
CS-MW12-BS	9/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.96	23.00	0.418
	12/11/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	9.14	20.50	0.423
CS-MW12-CC	12/11/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.37	21.40	0.742
CS-MW17-LGR	12/16/2009	0.12U	0.07U	0.08U	**0.37F**	0.05U	0.08U	7.99	20.50	0.644
CS-MW18-LGR	12/17/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.33	21.40	0.550
CS-MW19-LGR	3/16/2009	0.12U	0.07U	0.08U	**0.56F**	0.05U	0.08U	7.36	21.70	0.519
	9/11/2009	0.12U	0.07U	0.08U	**0.69F**	0.05U	0.08U	6.81	21.92	0.623
	12/17/2009	0.12U	0.07U	0.08U	**0.59F**	0.05U	0.08U	6.85	21.00	0.628
CS-MW20-LGR	3/18/2009	0.12U	0.07U	0.08U	**0.97F**	0.05U	0.08U	6.94	21.00	0.565
	6/10/2009	0.12U	0.07U	0.08U	**2.09**	0.05U	0.08U	7.22	22.00	0.613
	9/16/2009	0.12U	0.07U	0.08U	**1.63**	0.05U	0.08U	7.43	22.40	0.588
Duplicate	9/16/2009	0.12U	0.07U	0.08U	**1.30F**	0.05U	0.08U	7.43	22.40	0.588
	12/10/2009	0.12U	0.07U	0.08U	**2.34**	**0.17F**	0.08U	7.27	21.20	0.617

Appendix B
Groundwater VOC Analytical Results, 2009

Well Number	Sample Date	Dichloro-ethene, 1,1 (ug/L)	Dichloro-ethene, *cis*-1,2 (ug/L)	Dichloro-ethene, *trans*-1,2 (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temp. (deg. C)	Specific Conductivity (mS/cm)
								Field Measurements		
CS-MW21-LGR	3/18/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.11	21.20	0.519
Duplicate	3/18/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.11	21.20	0.519
	6/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.33	22.30	0.556
	9/15/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.97	22.10	0.534
	12/10/2009	0.12U	0.07U	0.08U	0.06U	**0.15F**	0.08U	7.94	21.00	0.564
CS-MW22-LGR	3/18/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.21	20.40	0.535
	6/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.21	21.80	0.576
	9/15/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.99	21.80	0.536
	12/10/2009	0.12U	0.07U	0.08U	0.06U	**0.28F**	0.08U	8.48	19.90	0.575
CS-MW23-LGR	3/12/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.82	19.90	0.479
	6/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.00	21.90	0.530
	9/15/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.20	21.60	0.496
	12/8/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.35	21.20	0.532
CS-MW24-LGR	3/12/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.27	20.30	0.508
	6/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.00	22.30	0.523
Duplicate	6/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.00	22.30	0.523
	9/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.35	21.74	0.555
	12/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.68	21.20	0.555
CS-MW25-LGR	3/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.36	22.20	0.475
	6/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.40	21.80	0.467
	9/14/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.49	22.20	0.471
	12/16/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	8.56	20.20	0.492

Bold	Value > or = MCL
Bold	MCL > Value > or = RL
Bold	RL > Value > MDL

Notes:
- ug/L = micrograms per liter
- mg/L = miligrams per liter
- AL = action level
- SS = secondary standard
- RL = reporting limit
- MCL = maximum contaminant level
- MDL = method detection limit
- VOCs analyzed using laboratory method SW8260B.
- F = The analyte was positively identified but the associated numerical value is below the RL.
- U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection.
- NA = Not analyzed for this parameter.

All samples analyzed by Agriculture & Priority Pollutants Laboratories (APPL), Inc. of Clovis, CA

Appendix B
Groundwater Metals Analytical Results, 2009

Well ID	Sample Date	Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Mercury (mg/L)	Zinc (mg/L)
CS-1	6/11/2009	0.0002U	**0.0356**	0.0005U	0.001U	0.003U	**0.0143F**	**0.0002F**	**0.423**
	9/16/2009	0.0002U	**0.0297**	0.0005U	0.001U	**0.009F**	**0.0028F**	0.0001U	**0.274**
	12/14/2009	0.0002U	**0.0387**	0.0005U	0.001U	0.003U	0.0019U	0.0001U	**0.187**
CS-2	6/9/2009	NA	NA	0.0005U	**0.015**	NA	**0.0027F**	0.0001U	NA
	12/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-4	12/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-9	6/11/2009	0.0002U	**0.0455**	0.0005U	**0.002F**	**0.012**	**0.0215F**	**0.0105**	**2.54**
	9/16/2009	0.0002U	**0.0391**	0.0005U	0.001U	**0.013**	**0.0296**	**0.0082**	**2.718**
	12/14/2009	0.0002U	**0.0376**	0.0005U	**0.002F**	**0.004F**	**0.0106F**	**0.0008F**	**2.535**
CS-10	6/11/2009	0.0002U	**0.0452**	0.0005U	0.001U	0.003U	**0.0032F**	**0.0002F**	**0.288**
	9/14/2009	0.0002U	**0.037**	0.0005U	0.001U	**0.004F**	0.0019U	0.0001U	**0.169**
Duplicate	9/14/2009	0.0002U	**0.039**	0.0005U	0.001U	0.003U	0.0019U	0.0001U	**0.167**
	12/14/2009	**0.0004F**	**0.0419**	0.0005U	0.001U	0.003U	0.0019U	0.0001U	**1.325**
CS-11	6/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	**0.0002F**	NA
CS-12	9/14/2009	0.0002U	**0.029**	0.0005U	0.001U	**0.012**	**0.0045F**	0.0001U	**0.266**
	12/14/2009	**0.0012F**	**0.0323**	0.0005U	0.001U	**0.014J**	0.0019U	0.0001U	**0.223**
Duplicate	12/14/2009	**0.0013F**	**0.0328**	0.0005U	0.001U	**0.011J**	0.0019U	0.0001U	**0.228**
CS-MW16-LGR	3/12/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/14/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
Duplicate	12/14/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW16-CC	3/12/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/14/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-D	9/15/2009	NA	NA	0.0005U	0.001U	NA	**0.0056F**	0.0001U	NA
	12/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
Duplicate	12/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MWG-LGR	6/9/2009	NA	NA	0.0005U	0.001U	NA	**0.0025F**	0.0001U	NA
	12/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MWH-LGR	9/14/2009	NA	NA	0.0005U	0.001U	NA	**0.0038F**	0.0001U	NA
	12/7/2009	NA	NA	0.0005U	0.001U	NA	**0.0082F**	0.0001U	NA
CS-I	3/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW1-LGR	3/17/2009	NA	NA	0.0005U	**0.102**	NA	0.0019U	0.0001U	NA
	9/9/2009	NA	NA	0.0005U	**0.003F**	NA	0.0019U	0.0001U	NA
	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW1-BS	9/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/10/2009	NA	NA	0.0005U	**0.012**	NA	0.0019U	0.0001U	NA
CS-MW1-CC	9/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW2-LGR	3/17/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW2-CC	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
Duplicate	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW3-LGR	3/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
Duplicate	3/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/14/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
	12/16/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
CS-MW4-LGR	3/17/2009	NA	NA	0.0005U	**0.003F**	NA	0.0019U	0.0001U	NA
	12/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW5-LGR	3/17/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/9/2009	NA	NA	0.0005U	**0.003F**	NA	0.0019U	0.0001U	NA
CS-MW6-LGR	3/18/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
	9/10/2009	NA	NA	0.0005U	**0.004F**	NA	0.0019U	0.0001U	NA
	12/15/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW6-BS	9/10/2009	NA	NA	0.0005U	**0.003F**	NA	0.0019U	0.0001U	NA
	12/15/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW6-CC	12/15/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW7-LGR	3/12/2009	NA	NA	0.0005U	**0.005F**	NA	0.0019U	0.0001U	NA
	9/11/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
Duplicate	9/11/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
	12/8/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
CS-MW7-CC	12/8/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW8-LGR	6/11/2009	NA	NA	0.0005U	0.001U	NA	**0.0023F**	0.0001U	NA
	12/8/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW8-CC	12/8/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW9-LGR	3/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/14/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/16/2009	NA	NA	0.0005U	**0.003F**	NA	0.0019U	0.0001U	NA
CS-MW9-BS	9/14/2009	NA	NA	0.0005U	**0.003F**	NA	**0.0302**	0.0001U	NA
	12/16/2009	NA	NA	0.0005U	0.001U	NA	**0.0130F**	0.0001U	NA
CS-MW9-CC	12/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW10-LGR	12/8/2009	NA	NA	0.0005U	**0.003F**	NA	0.0019U	0.0001U	NA
CS-MW10-CC	12/8/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW11A-LGR	3/12/2009	NA	NA	0.0005U	**0.006F**	NA	0.0019U	0.0001U	NA
	9/15/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/8/2009	NA	NA	0.0005U	**0.004F**	NA	0.0019U	0.0001U	NA
CS-MW12-LGR	6/11/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
Duplicate	6/11/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
	12/11/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW12-BS	9/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/11/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW12-CC	12/11/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW17-LGR	12/16/2009	NA	NA	0.0005U	**0.006F**	NA	0.0019U	0.0001U	NA
CS-MW18-LGR	12/17/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW19-LGR	3/16/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
	9/11/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/17/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW20-LGR	3/18/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	6/10/2009	NA	NA	0.0005U	0.001U	NA	**0.0021F**	0.0001U	NA
	9/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
Duplicate	9/16/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA

Appendix B
Groundwater Metals Analytical Results, 2009

Well ID	Sample Date	Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Mercury (mg/L)	Zinc (mg/L)
CS-MW21-LGR	3/18/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
Duplicate	3/18/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	6/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/15/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW22-LGR	3/18/2009	NA	NA	0.0005U	**0.005F**	NA	**0.0077F**	0.0001U	NA
	6/10/2009	NA	NA	0.0005U	**0.005F**	NA	**0.0088F**	**0.0002F**	NA
	9/15/2009	NA	NA	0.0005U	0.001U	NA	**0.0030F**	0.0001U	NA
	12/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW23-LGR	3/12/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	6/10/2009	NA	NA	0.0005U	**0.002F**	NA	**0.0023F**	**0.0002F**	NA
	9/15/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/8/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW24-LGR	3/12/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	6/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
Duplicate	6/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	9/10/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/9/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
CS-MW25-LGR	3/16/2009	NA	NA	0.0005U	**0.002F**	NA	**0.0020F**	0.0001U	NA
	6/9/2009	NA	NA	0.0005U	**0.004F**	NA	**0.0023F**	0.0001U	NA
	9/14/2009	NA	NA	0.0005U	0.001U	NA	0.0019U	0.0001U	NA
	12/16/2009	NA	NA	0.0005U	**0.002F**	NA	0.0019U	0.0001U	NA
Comparison Criteria	**MCL/AL/SS**	**0.01**	**2.0**	**0.005**	**0.1**	**1.3**	**0.015**	**0.002**	**5.0 (SS)**
	RL	**0.03**	**0.005**	**0.007**	**0.01**	**0.01**	**0.025**	**0.001**	**0.05**
	MDL	**0.0002**	**0.0003**	**0.0005**	**0.001**	**0.003**	**0.0019**	**0.0001**	**0.008**

Bold	Value > or = MCL
Bold	MCL > Value > or = RL
Bold	RL > Value > MDL

Notes:
- mg/L = miligrams per liter
- AL = action level
- SS = secondary standard
- RL = reporting limit
- MCL = maximum contaminant level
- MDL = method detection limit
- VOCs analyzed using laboratory method SW8260B.
- F = The analyte was positively identified but the associated numerical value is below the RL.
- U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection.
- NA = Not analyzed for this parameter.
- All samples analyzed by Agriculture & Priority Pollutants Laboratories (APPL), Inc. of Clovis, CA

APPENDIX C

2009 WESTBAY® ANALYTICAL RESULTS

Appendix C
2009 Westbay Analytical Results

Well ID	Date	cis-1,2-DCE	PCE	trans-1,2-DCE	TCE	Vinyl Chloride	1,1-DCE
	MCL	**70**	**5.0**	**100**	**5.0**	**2.0**	**7.0**
CS-WB01-UGR-01	16-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	2-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB01-LGR-01	16-Mar-09	<0.16	**6.4**	<0.19	**0.26J**	<0.23	<0.30
	02-Sep-09	<0.16	**5.1**	<0.19	**0.26J**	<0.23	<0.30
CS-WB01-LGR-02	16-Mar-09	<0.16	**11**	<0.19	**4.2**	<0.23	<0.30
	02-Sep-09	<0.16	**11**	<0.19	**3.7**	<0.23	<0.30
CS-WB01-LGR-03	16-Mar-09	<0.16	**2.8**	<0.19	**9.4**	<0.23	<0.30
	02-Sep-09	<0.16	**3.1**	<0.19	**8.2**	<0.23	<0.30
CS-WB01-LGR-04	16-Mar-09	<0.16	<0.15	<0.19	**0.24J**	<0.23	<0.30
	02-Sep-09	<0.16	**0.53J**	<0.19	**0.26J**	<0.23	<0.30
CS-WB01-LGR-05	16-Mar-09	<0.16	<0.15	<0.19	**0.25J**	<0.23	<0.30
	02-Sep-09	<0.16	**0.31J**	<0.19	<0.16	<0.23	<0.30
CS-WB01-LGR-06	16-Mar-09	<0.16	<0.15	<0.19	**0.62J**	<0.23	<0.30
	02-Sep-09	<0.16	**0.36J**	<0.19	**0.33J**	<0.23	<0.30
CS-WB01-LGR-07	16-Mar-09	<0.16	**15**	<0.19	**12**	<0.23	<0.30
	02-Sep-09	<0.16	**22**	<0.19	**17**	<0.23	<0.30
CS-WB01-LGR-08	16-Mar-09	<0.16	<0.15	<0.19	**1.6**	<0.23	<0.30
	02-Sep-09	<0.16	**1.4**	<0.19	**3.5**	<0.23	<0.30
CS-WB01-LGR-09	16-Mar-09	**0.37J**	**18**	<0.19	**20**	<0.23	<0.30
	02-Sep-09	**0.44J**	**19**	<0.19	**25**	<0.23	<0.30
CS-WB02-UGR-01	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB02-LGR-01	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	NA	NA
CS-WB02-LGR-02	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB02-LGR-03	11-Mar-09	<0.16	**9.8**	<0.19	**4.4**	<0.23	<0.30
	03-Sep-09	<0.16	**10**	<0.19	**5.7**	<0.23	<0.30
CS-WB02-LGR-04	11-Mar-09	<0.16	**3.3**	<0.19	**13**	<0.23	<0.30
	03-Sep-09	<0.16	**4.7**	<0.19	**17**	<0.23	<0.30
CS-WB02-LGR-05	11-Mar-09	<0.16	**0.22J**	<0.19	**5.0**	<0.23	<0.30
	03-Sep-09	<0.16	**1.6**	<0.19	**5.0**	<0.23	<0.30
CS-WB02-LGR-06	11-Mar-09	<0.16	<0.15	<0.19	**4.3**	<0.23	<0.30
	03-Sep-09	<0.16	**1.2J**	<0.19	**4.5**	<0.23	<0.30
CS-WB02-LGR-07	11-Mar-09	<0.16	**0.49J**	<0.19	**1.2**	<0.23	<0.30
	03-Sep-09	<0.16	**0.89J**	<0.19	**0.85J**	<0.23	<0.30
CS-WB02-LGR-08	11-Mar-09	**0.16J**	**2.6**	<0.19	**2.1**	<0.23	<0.30
	03-Sep-09	<0.16	**2.5**	<0.19	**2.0**	<0.23	<0.30
CS-WB02-LGR-09	11-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB03-UGR-01	10-Mar-09	<16*	**1,700***	<19*	**56J***	<23*	<30*
	4-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB03-LGR-01	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	4-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB03-LGR-02	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	4-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB03-LGR-03	10-Mar-09	**0.21J**	**18**	<0.19	**7.7**	<0.23	<0.30
	04-Sep-09	**0.34J**	**29**	<0.19	**12**	<0.23	<0.30
CS-WB03-LGR-04	10-Mar-09	<0.16	**19**	<0.19	**7.7**	<0.23	<0.30
	04-Sep-09	<0.16	**25**	<0.19	**10**	<0.23	<0.30
CS-WB03-LGR-05	10-Mar-09	<0.16	**16**	<0.19	**5.9**	<0.23	<0.30
	04-Sep-09	<0.16	**30**	<0.19	**9.4**	<0.23	<0.30
CS-WB03-LGR-06	10-Mar-09	<0.16	**8.9**	<0.19	**1.2**	<0.23	<0.30
	04-Sep-09	<0.16	**8.4**	<0.19	**1.1**	<0.23	<0.30
CS-WB03-LGR-07	10-Mar-09	<0.16	**7.2**	<0.19	**2.6**	<0.23	<0.30
	04-Sep-09	<0.16	**9.3**	<0.19	**2.1**	<0.23	<0.30
CS-WB03-LGR-08	10-Mar-09	<0.16	**8.2**	<0.19	**1.0**	<0.23	<0.30
	04-Sep-09	<0.16	**10**	<0.19	**1.3**	<0.23	<0.30
CS-WB03-LGR-09	10-Mar-09	<0.16	**12**	<0.19	**3.5**	<0.23	<0.30
	04-Sep-09	<0.16	**19**	<0.19	**4.0**	<0.23	<0.30

Appendix C
2009 Westbay Analytical Results

CS-WB04-UGR-01	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB04-LGR-01	10-Mar-09	<0.16	**0.42J**	<0.19	<0.16	<0.23	<0.30
	03-Sep-09	<0.16	**0.86J**	<0.19	**0.20J**	<0.23	<0.30
CS-WB04-LGR-02	10-Mar-09	Dry	Dry	Dry	Dry	Dry	Dry
	3-Sep-09	Dry	Dry	Dry	Dry	Dry	Dry
CS-WB04-LGR-03	10-Mar-09	<0.16	**0.17J**	<0.19	<0.16	<0.23	<0.30
	03-Sep-09	<0.16	**0.27J**	<0.19	<0.16	<0.23	<0.30
CS-WB04-LGR-04	10-Mar-09	<0.16	**0.23J**	<0.19	**0.25J**	<0.23	<0.30
	03-Sep-09	<0.16	<0.15	<0.19	<0.16	<0.23	<0.30
CS-WB04-LGR-06	10-Mar-09	**2.5**	**12**	**0.31J**	**13**	<0.23	<0.30
	03-Sep-09	**4**	**33**	**0.65**	**20**	<0.23	<0.30
CS-WB04-LGR-07	10-Mar-09	**2.1**	**7.0**	<0.19	**10**	<0.23	<0.30
	03-Sep-09	**3.6**	**19**	<0.19	**14**	<0.23	<0.30
CS-WB04-LGR-08	10-Mar-09	<0.16	**0.29J**	<0.19	**0.70J**	<0.23	<0.30
	03-Sep-09	<0.16	**0.62J**	<0.19	**1.1**	<0.23	<0.30
CS-WB04-LGR-09	10-Mar-09	<0.16	**9.3**	<0.19	**7.0**	<0.23	<0.30
	03-Sep-09	<0.16	**9.9**	<0.19	**9.1**	<0.23	<0.30
CS-WB04-LGR10	10-Mar-09	<0.16	**1.0J**	<0.19	**0.69J**	<0.23	<0.30
	03-Sep-09	<0.16	**1.2J**	<0.19	**0.93J**	<0.23	<0.30
CS-WB04-LGR-11	10-Mar-09	<0.16	<0.15	<0.19	<0.16	<0.23	<0.30
	03-Sep-09	<0.16	**0.33J**	<0.19	<0.16	<0.23	<0.30
CS-WB04-BS-01	10-Mar-09	<0.16	<0.15	<0.19	<0.16	<0.23	<0.30
CS-WB04-BS-02	10-Mar-09	<0.16	<0.15	<0.19	**0.18J**	<0.23	<0.30
CS-WB04-CC-01	10-Mar-09	**0.37J**	<0.15	<0.19	**0.22J**	<0.23	<0.30
CS-WB04-CC-02	10-Mar-09	<0.16	<0.15	<0.19	<0.16	<0.23	<0.30
CS-WB04-CC-03	10-Mar-09	<0.16	<0.15	<0.19	**0.20J**	<0.23	<0.30

BOLD = Above the MDL.
BOLD = Above the RL.
BOLD = Above the MCL.

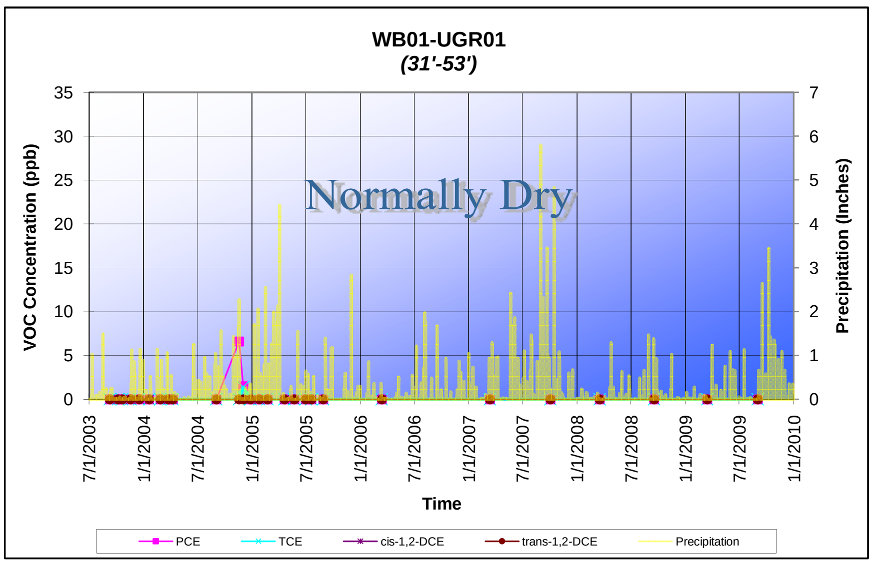
Notes:
- ug/L = micrograms per liter
- MCL = maximum contaminant level
- VOCs analyzed using laboratory method SW8260B.
- J = The analyte was positively identified; the quantitation is an estimation.
- All data analyzed as screening data.
- All samples analyzed by Agriculture & Priority Pollutants Laboratories (APPL), Inc. of Clovis, CA

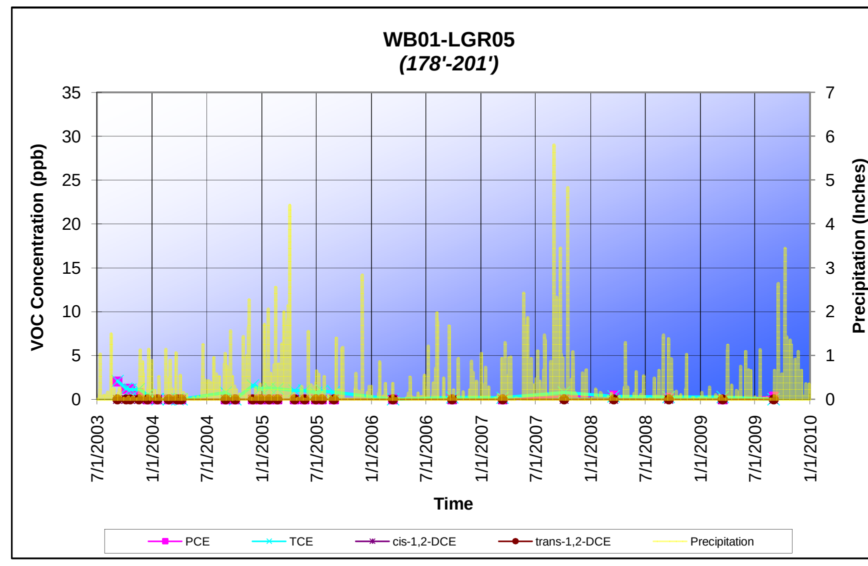
APPENDIX D

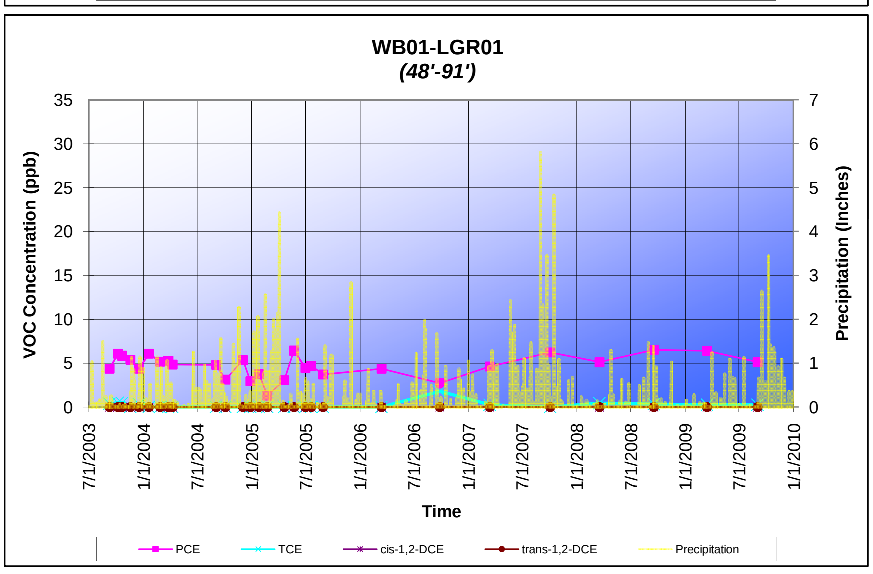
CUMULATIVE WESTBAY ANALYTICAL GRAPHS

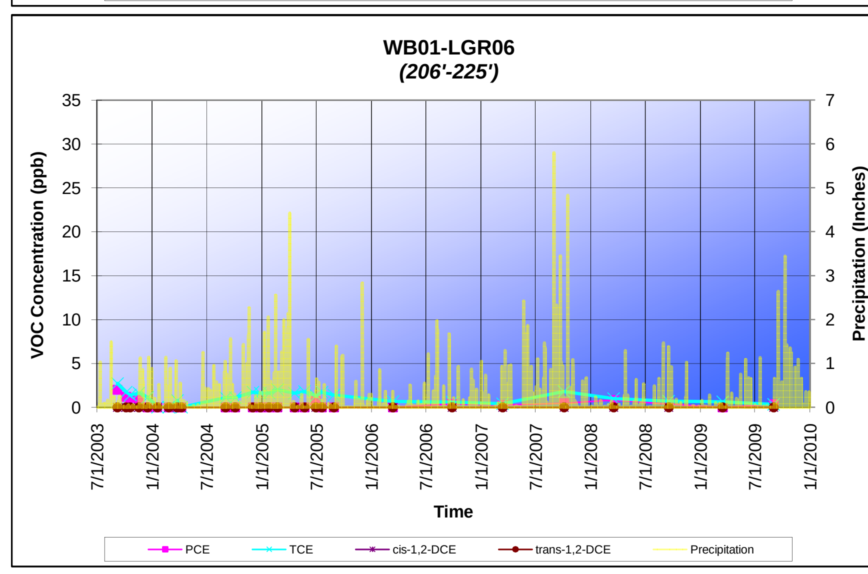
Appendix D.1

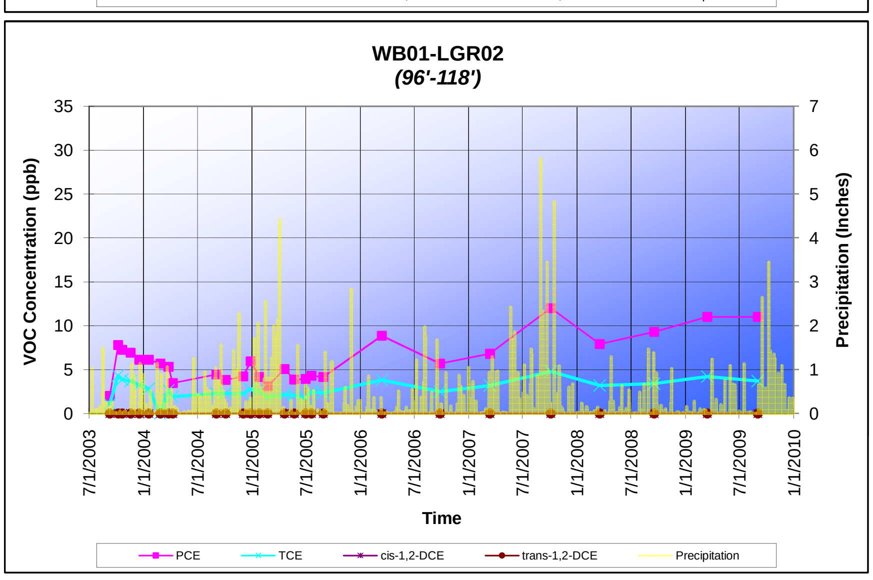
CS-WB01
Combined Concentration Data
Camp Stanley Storage Activity

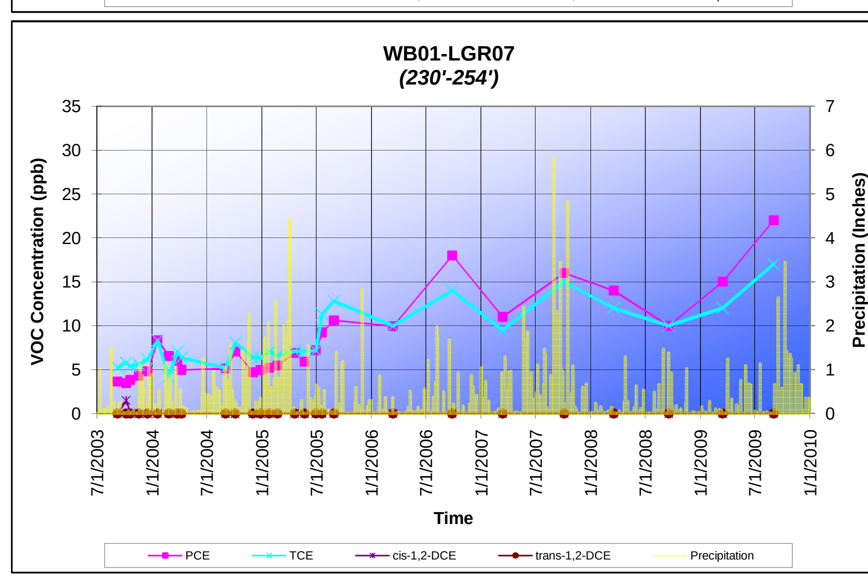


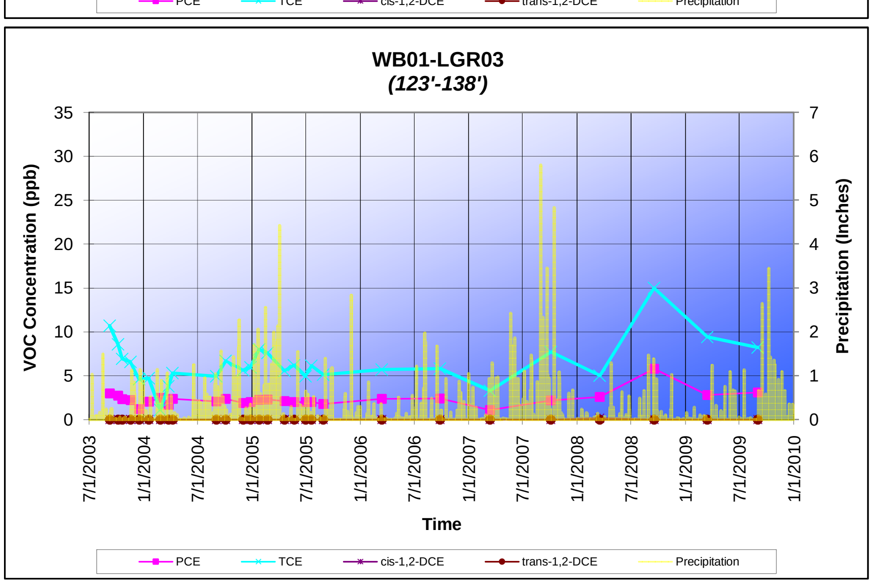


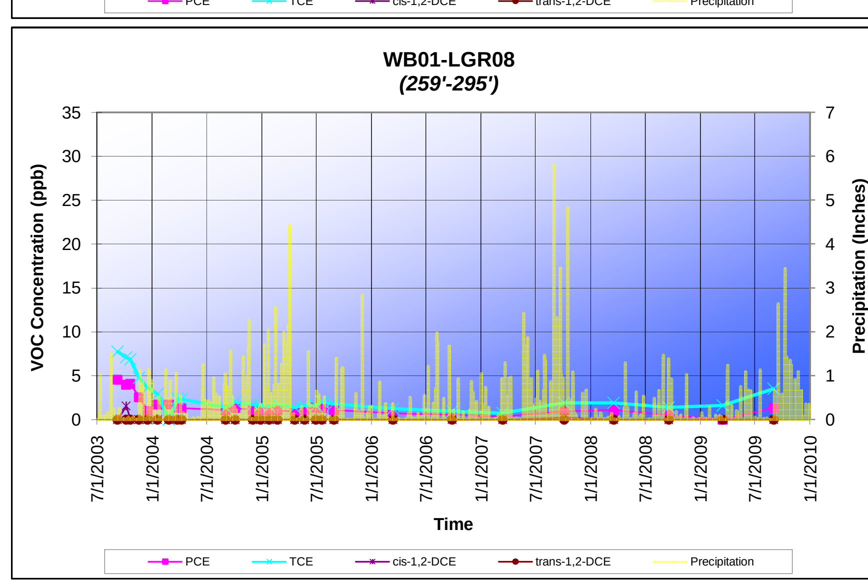


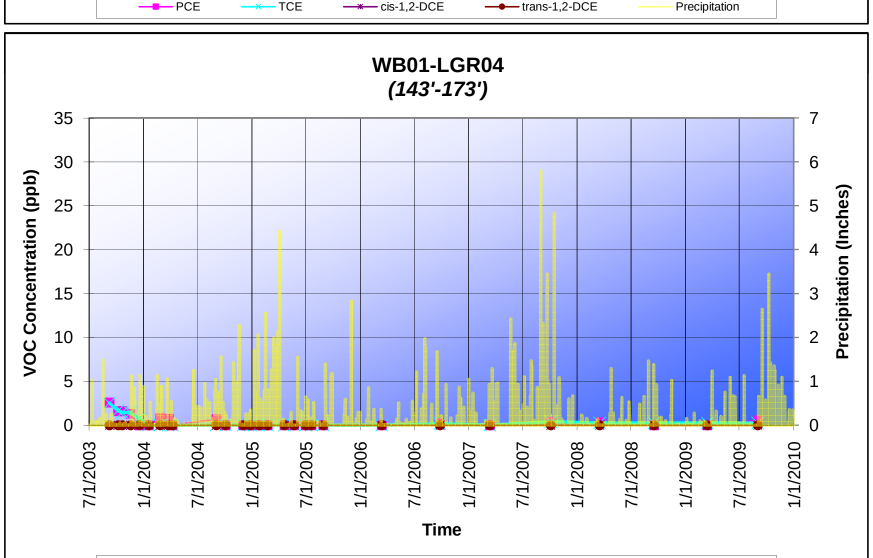


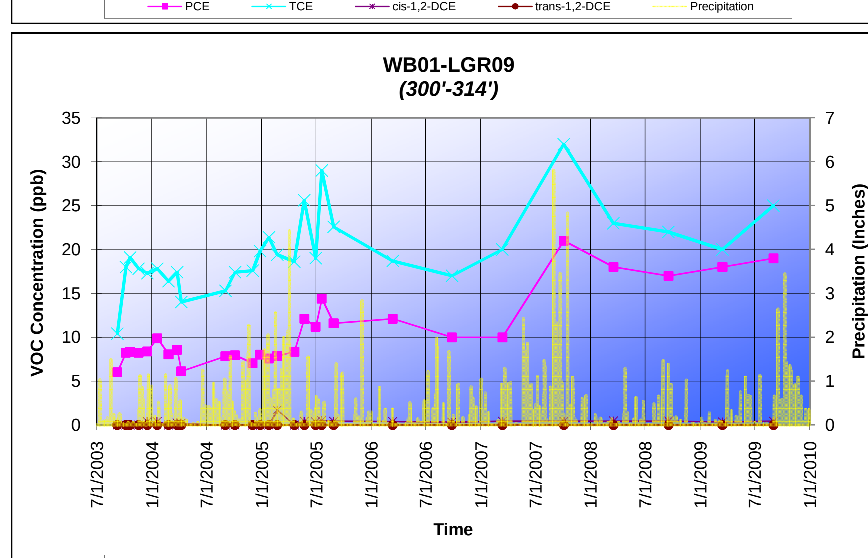






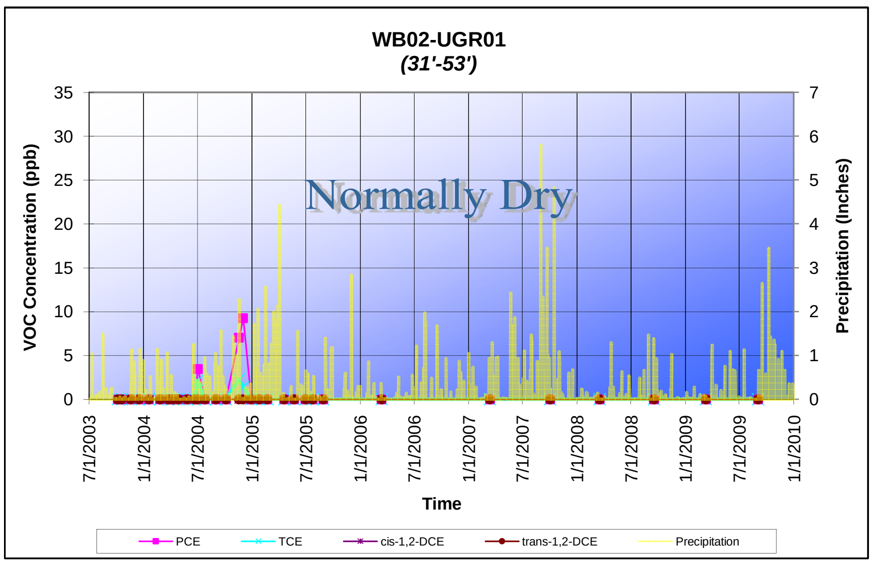


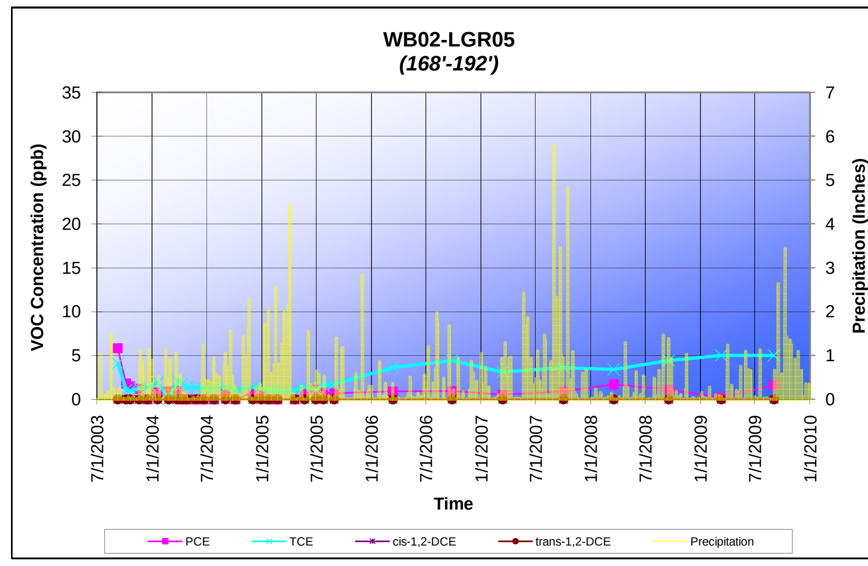


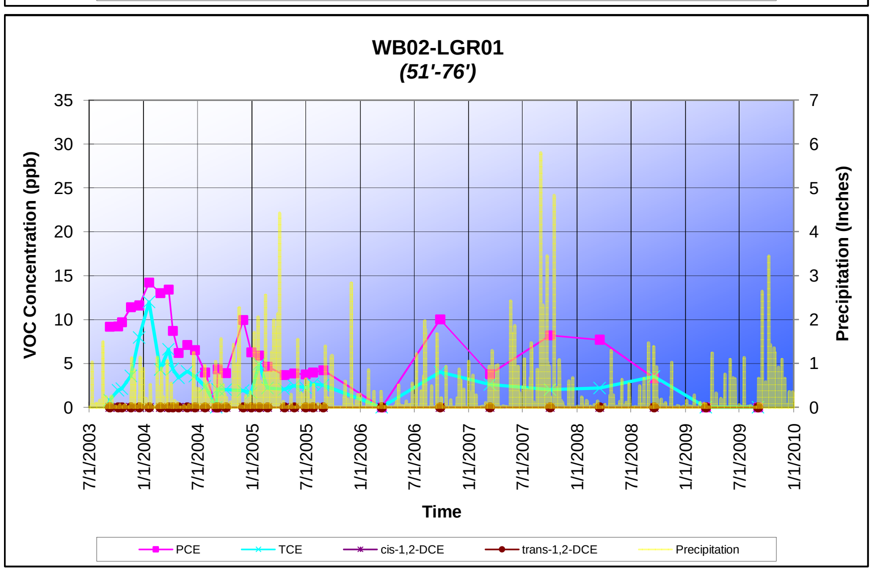


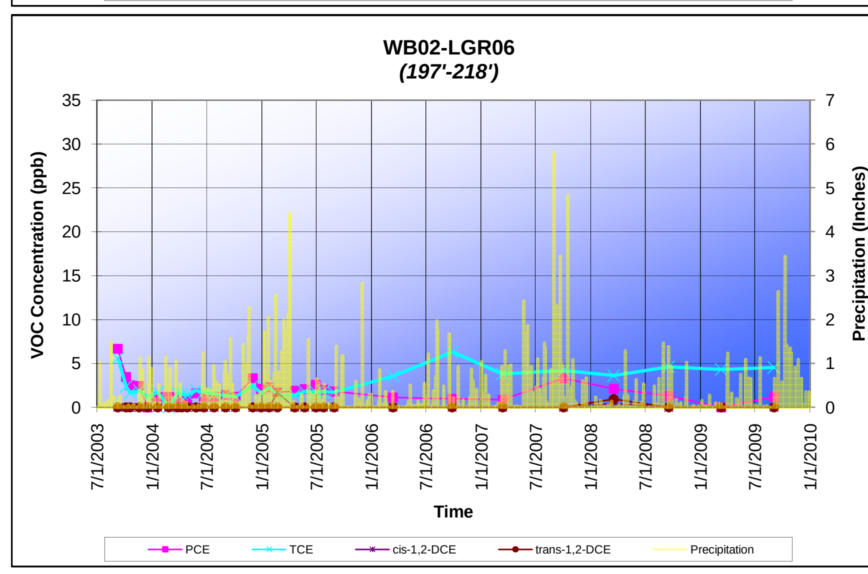
Appendix D.2

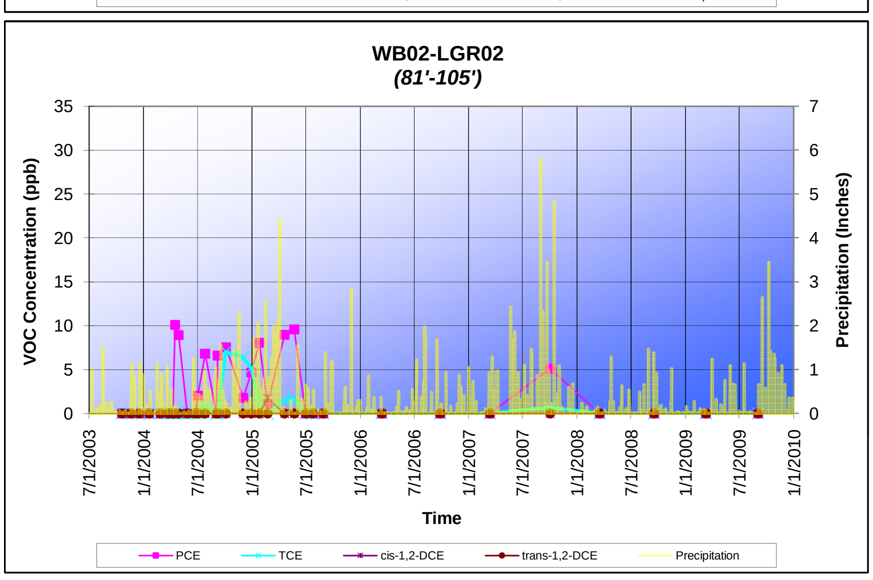
CS-WB02
Combined Concentration Data
Camp Stanley Storage Activity

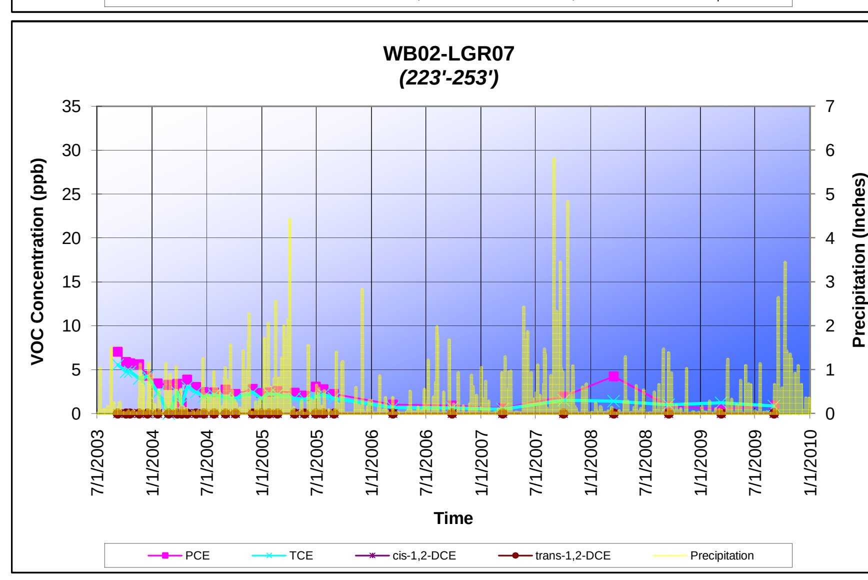


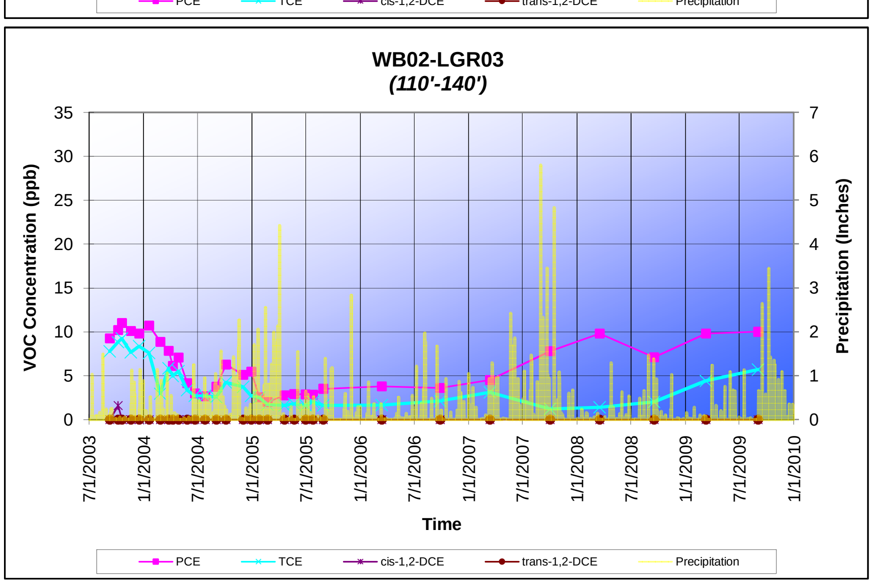


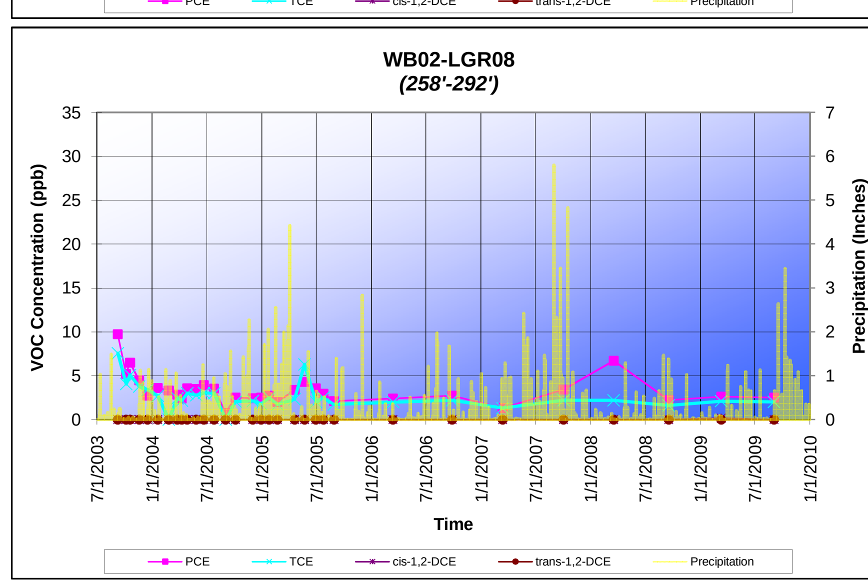


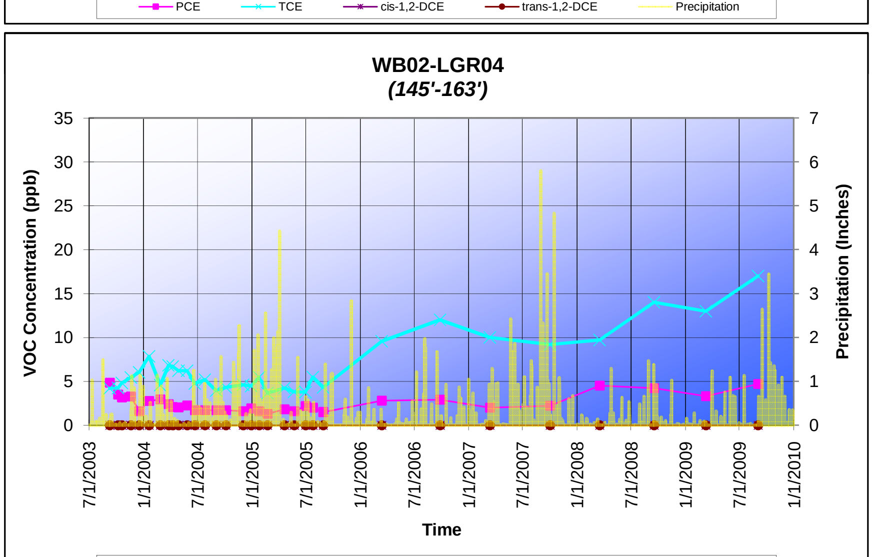


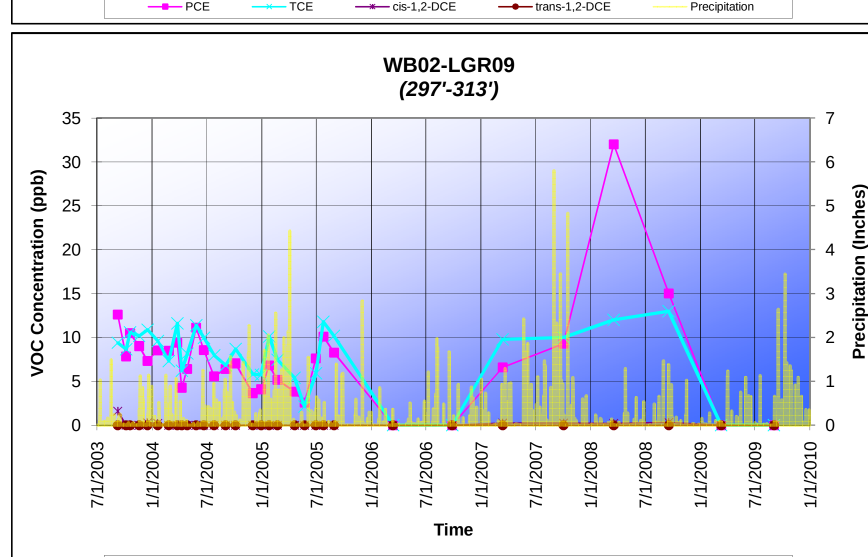






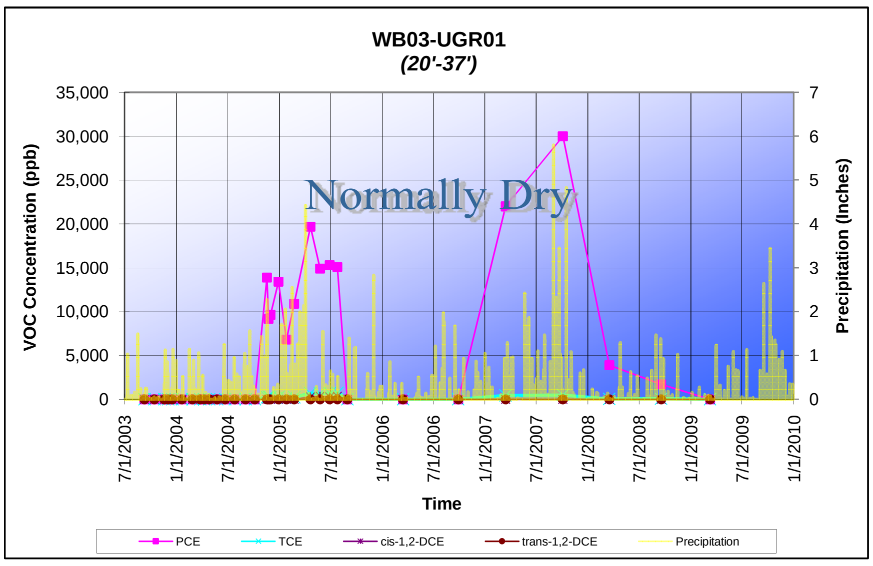


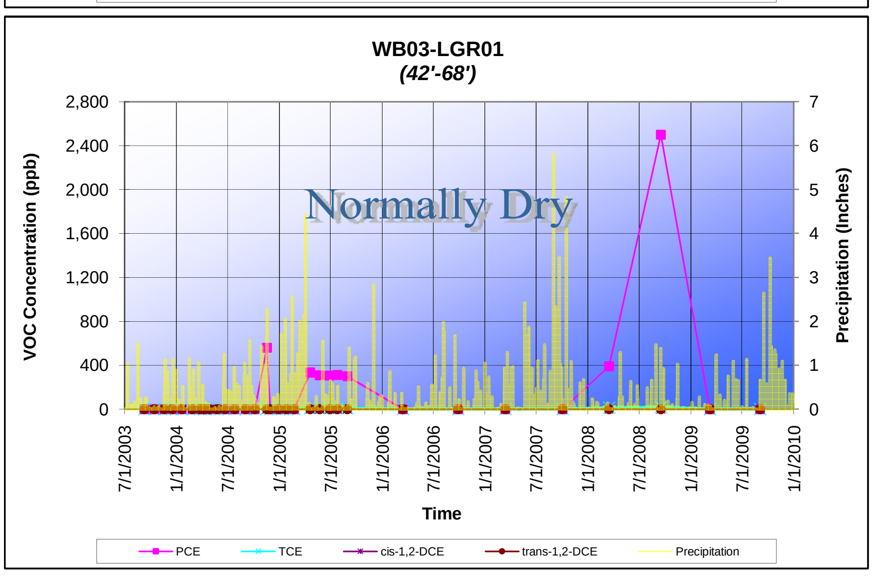


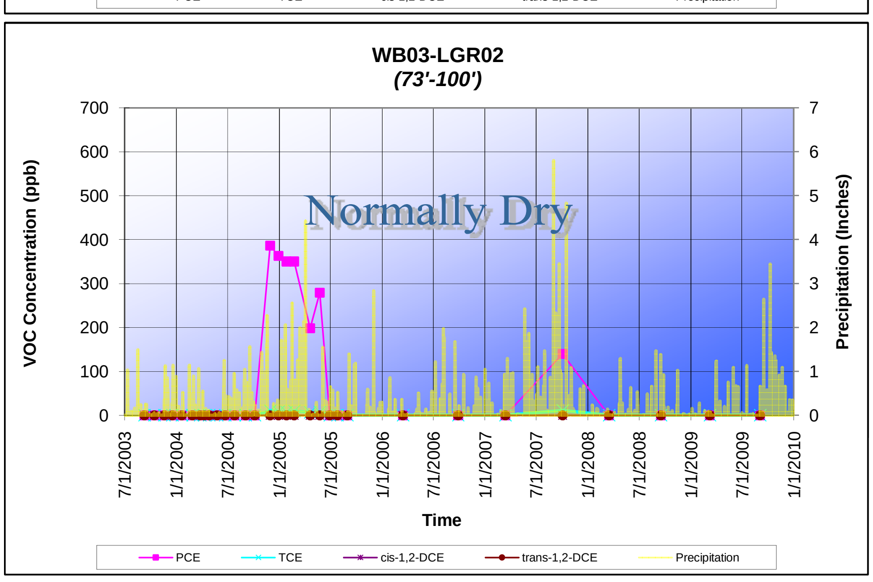


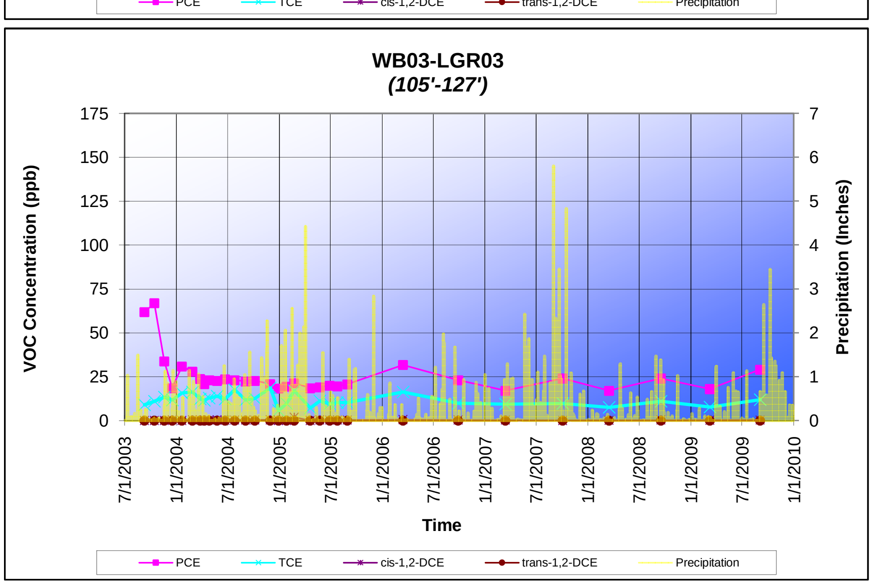
Appendix D.3

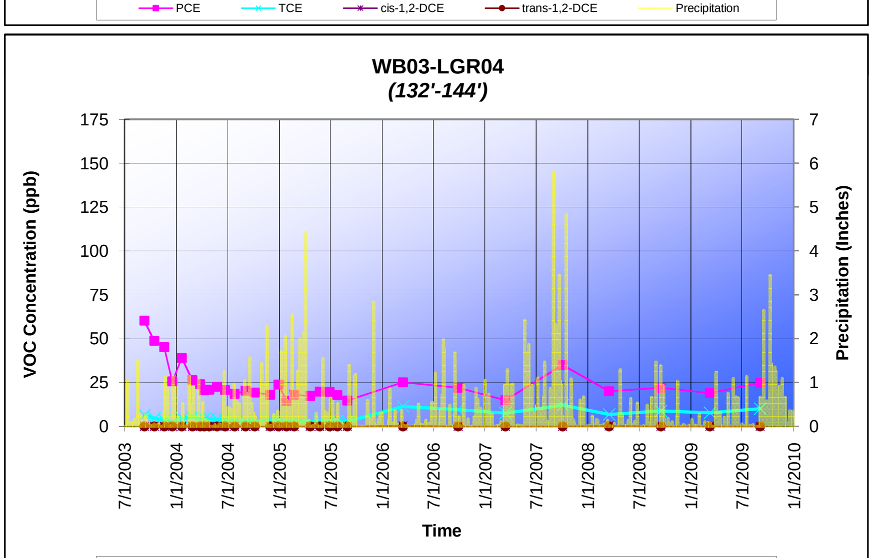
CS-WB03
Combined Concentration Data
Camp Stanley Storage Activity

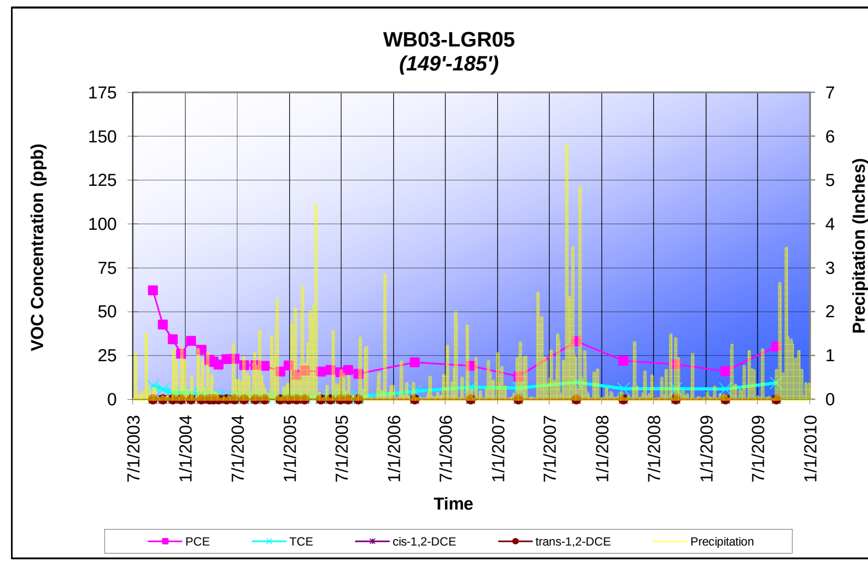


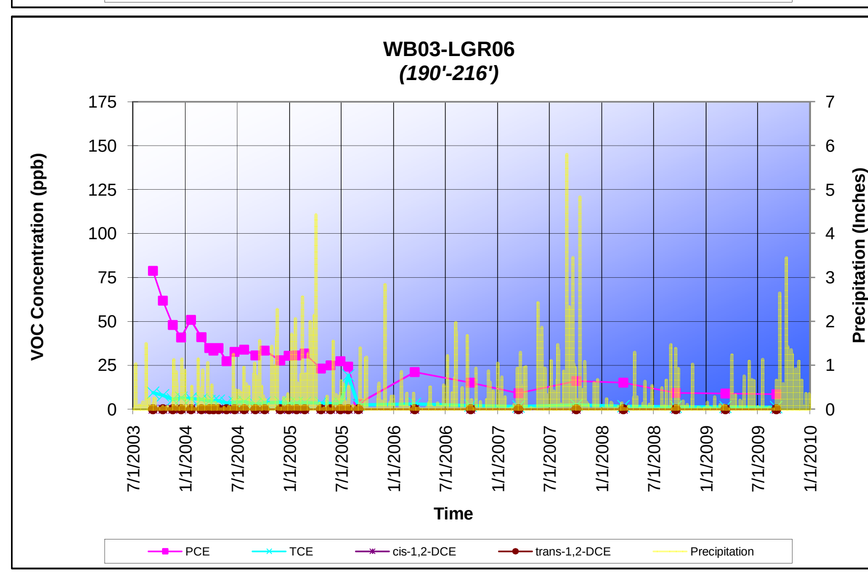


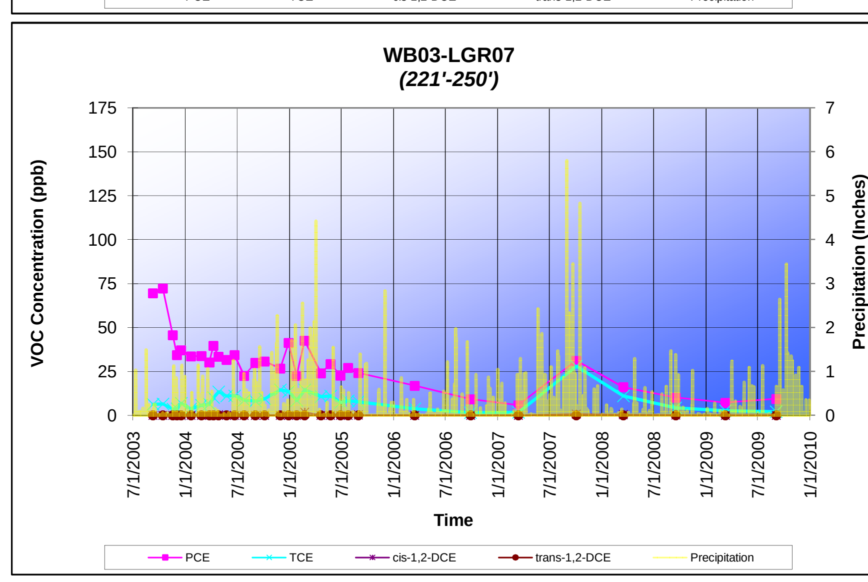


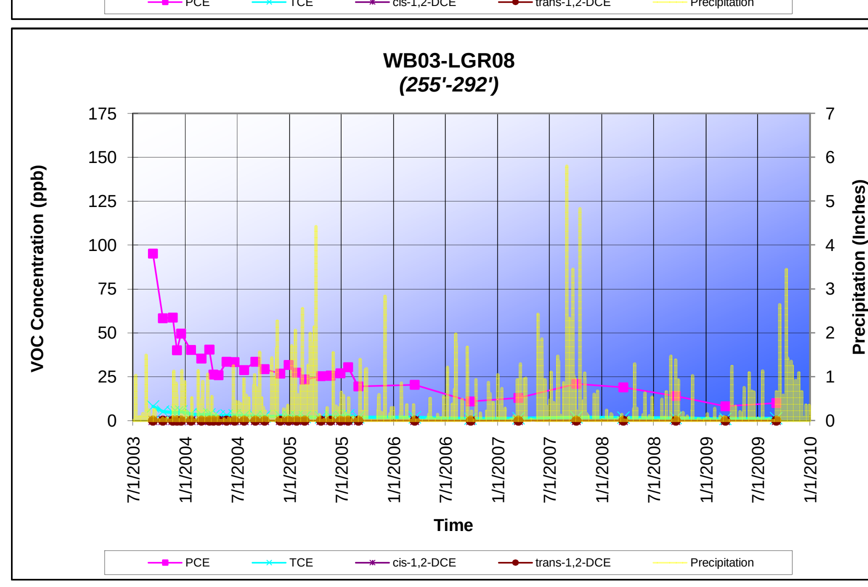


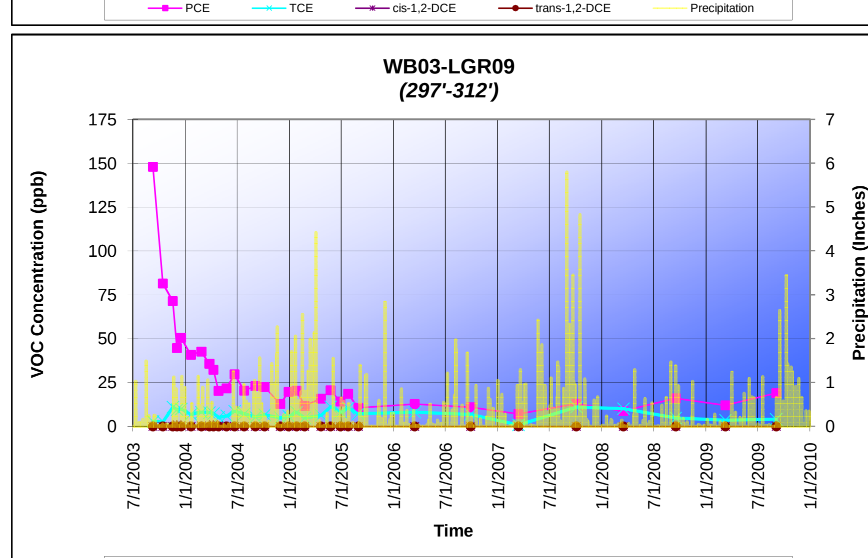












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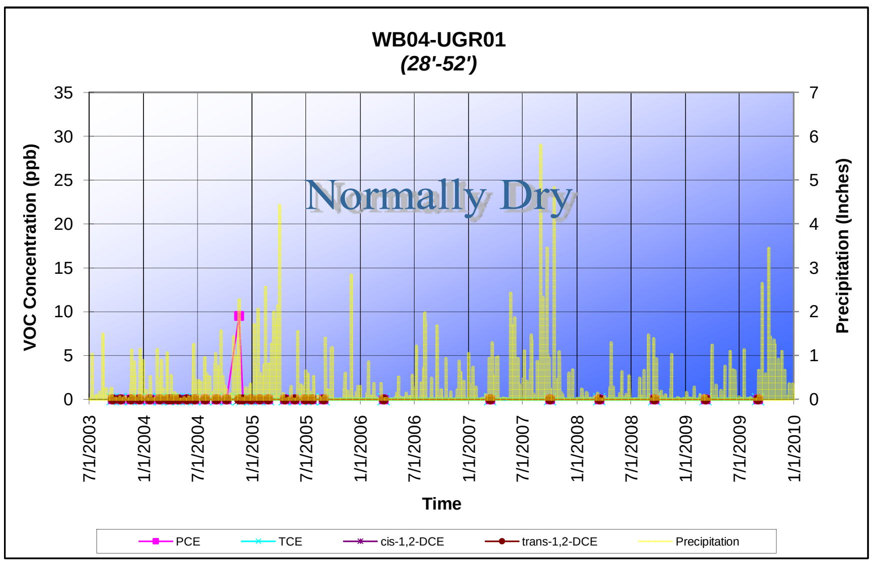
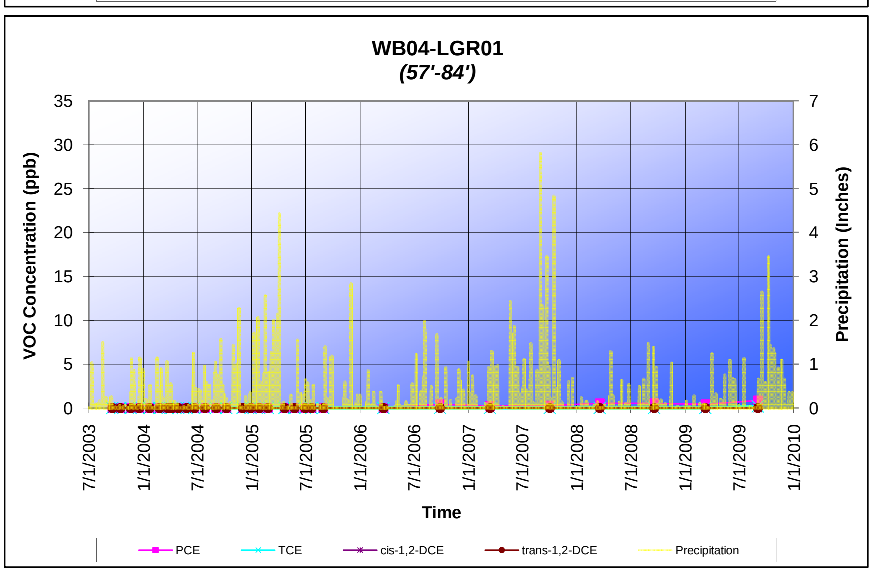
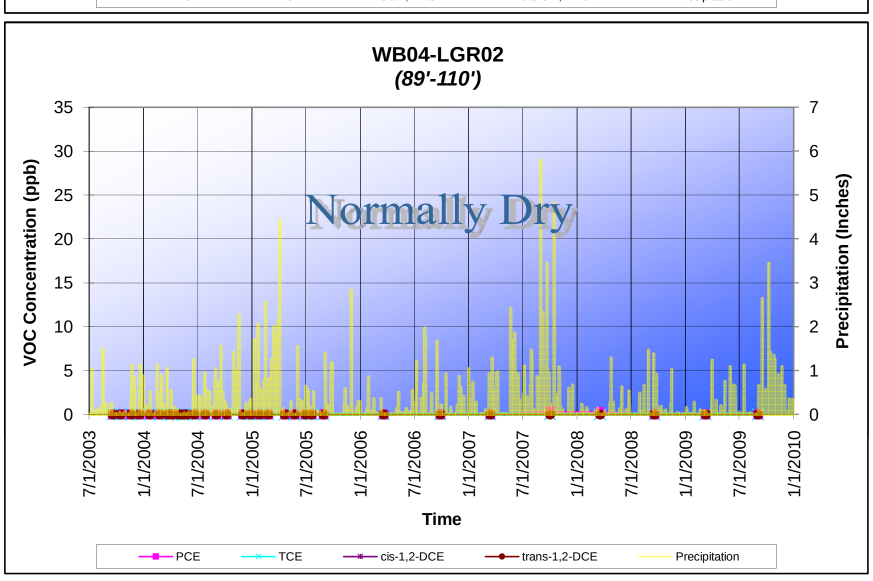
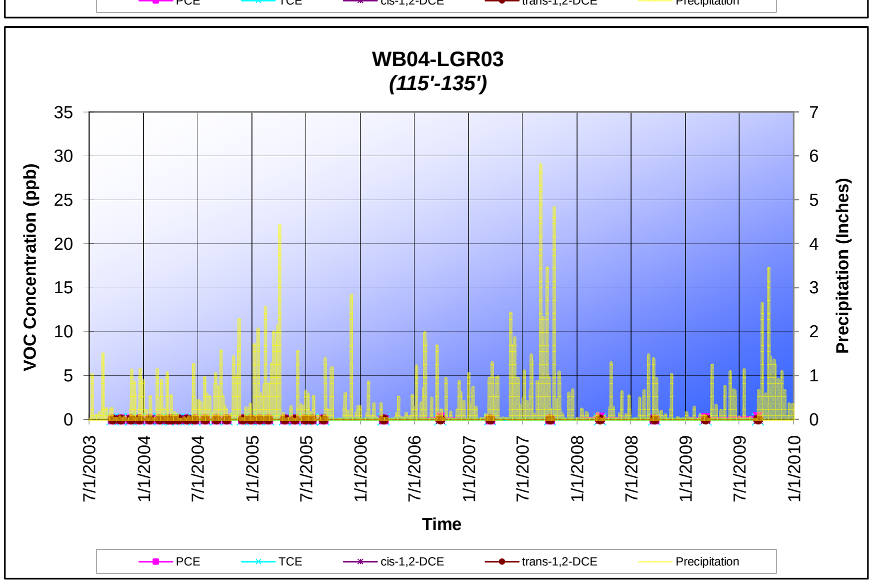
Appendix D.4

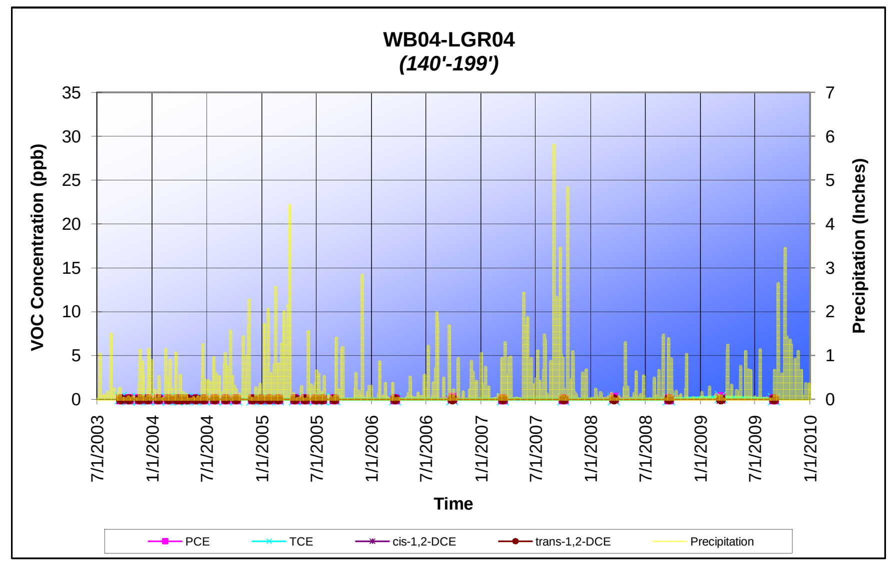
CS-WB04
Combined Concentration Data
Camp Stanley Storage Activity

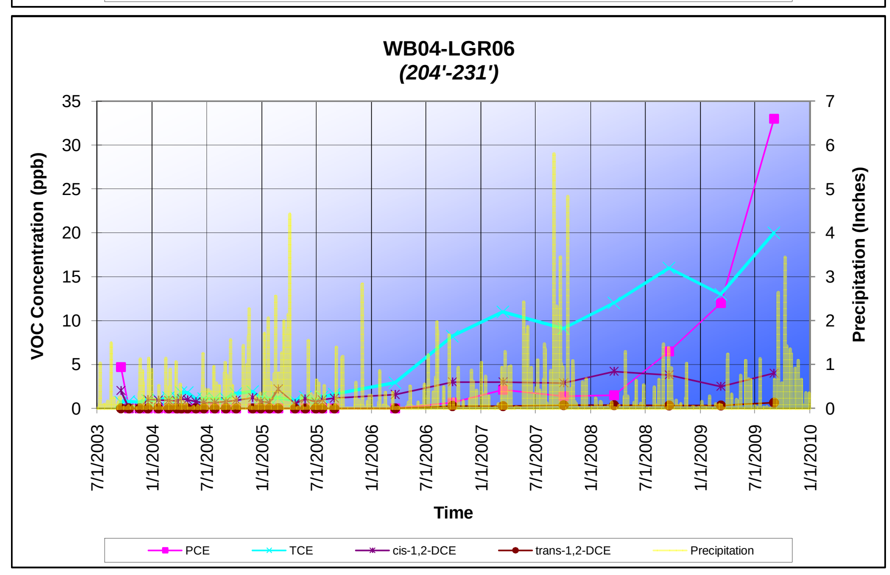


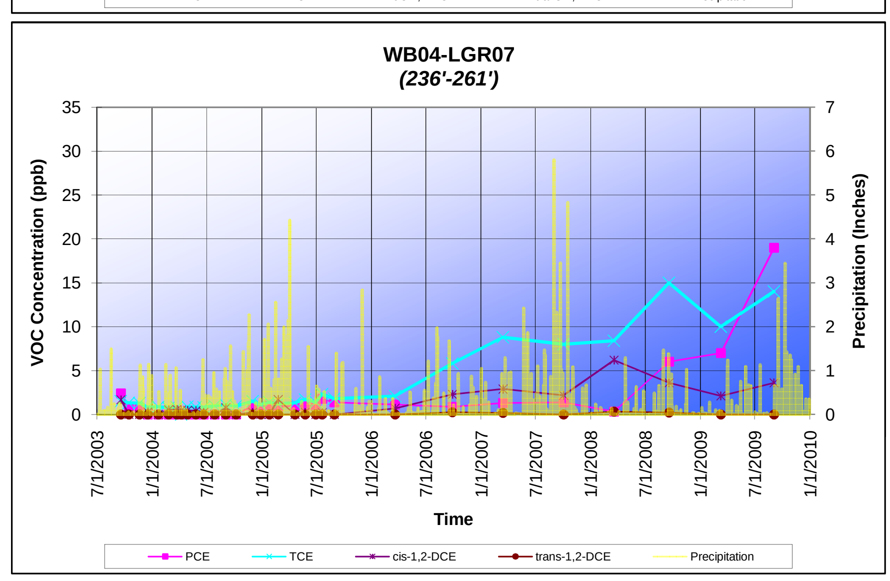


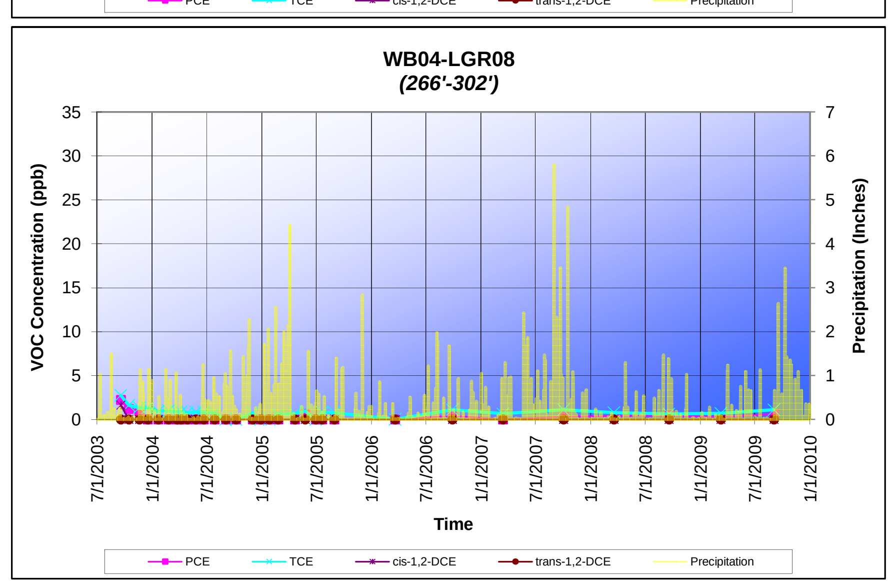






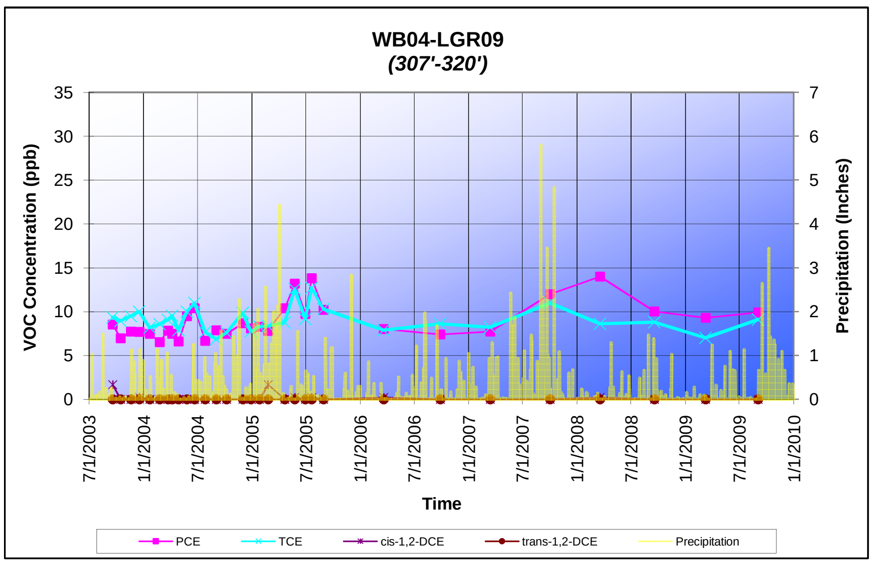


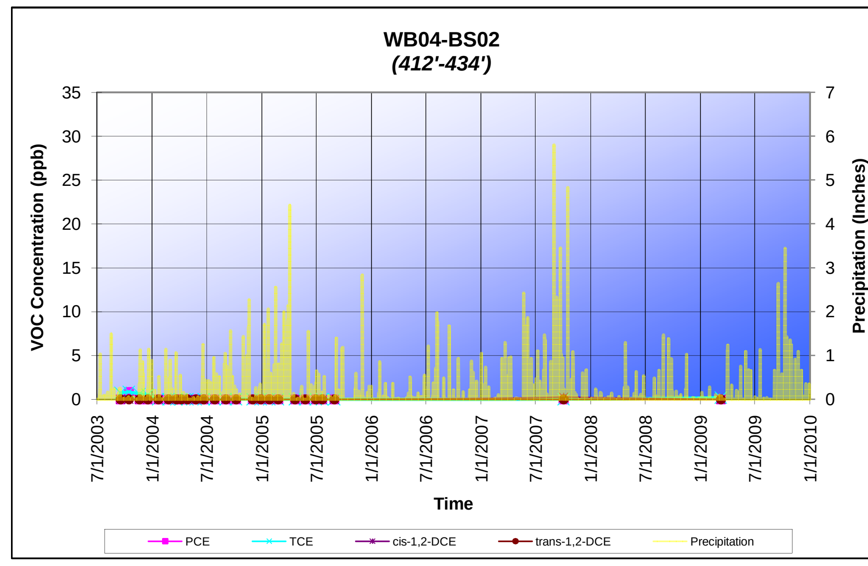


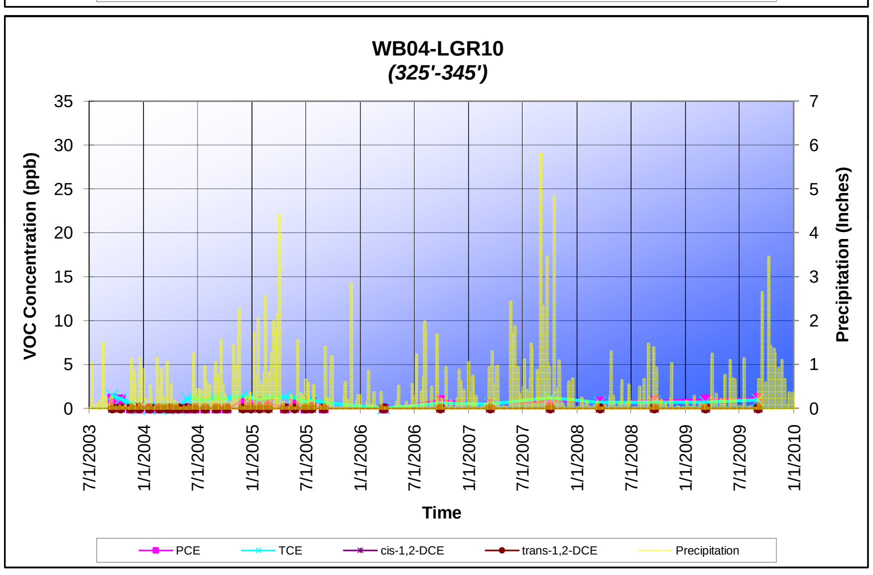


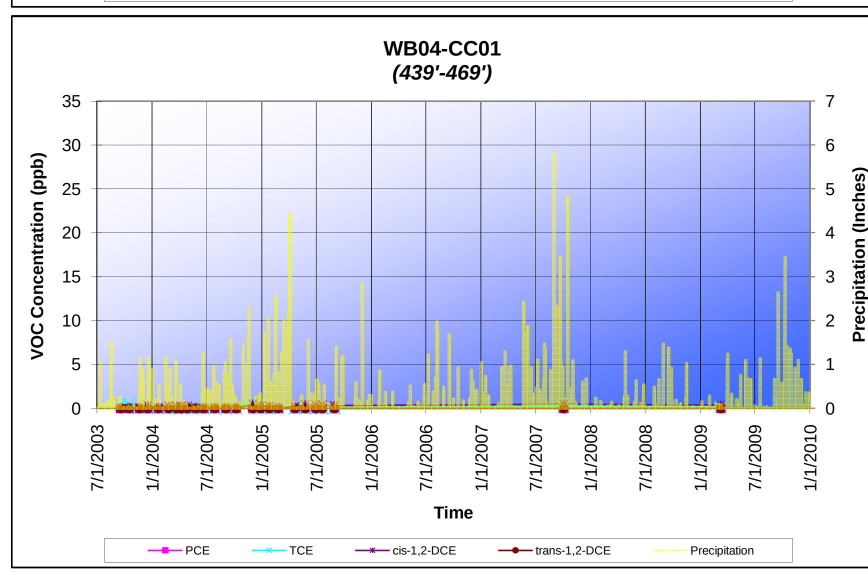
Appendix D.4

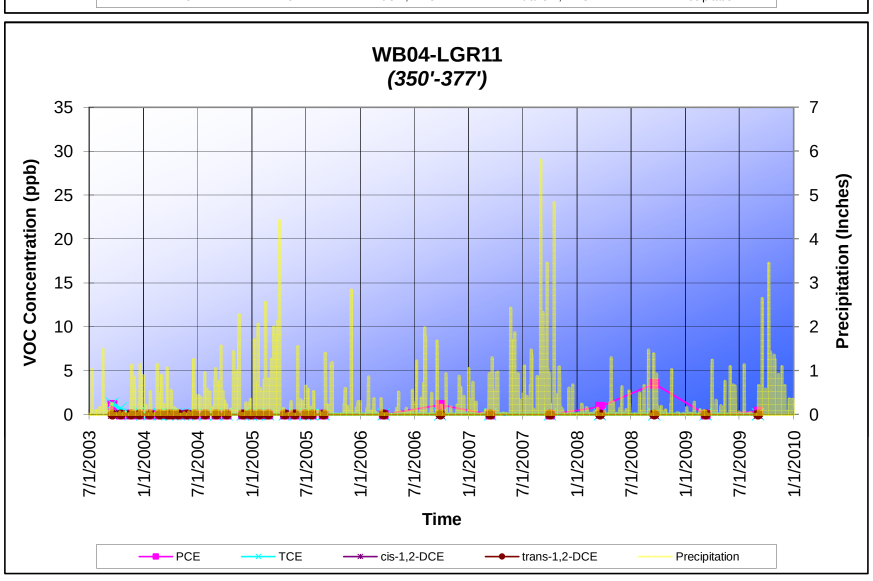
CS-WB04
Combined Concentration Data
Camp Stanley Storage Activity

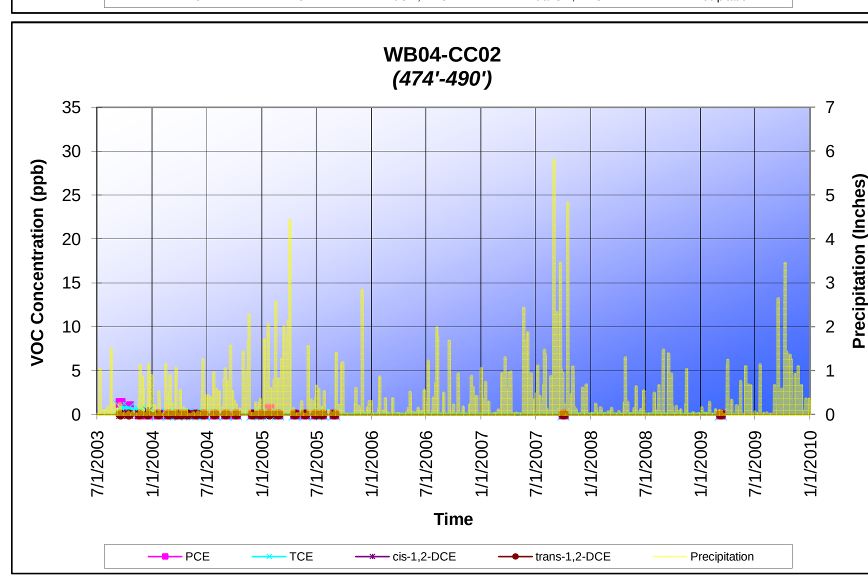


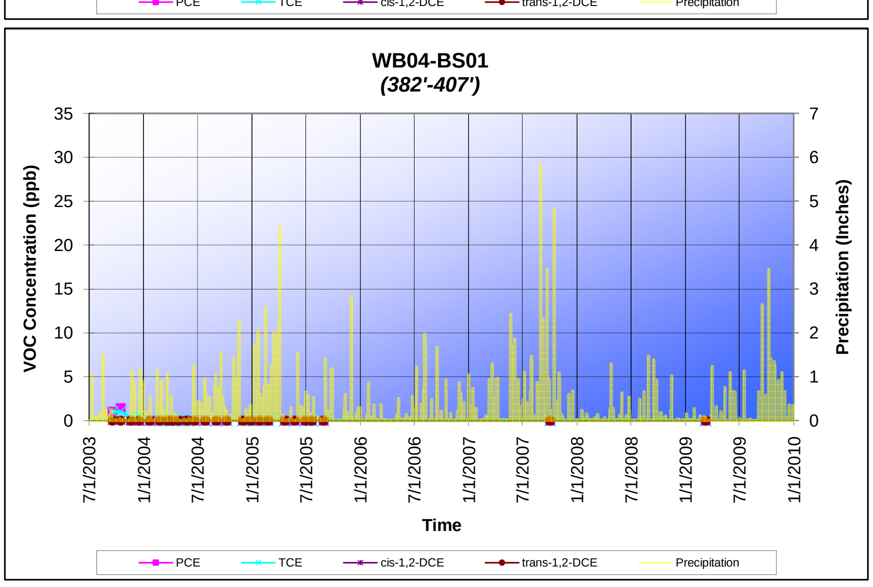


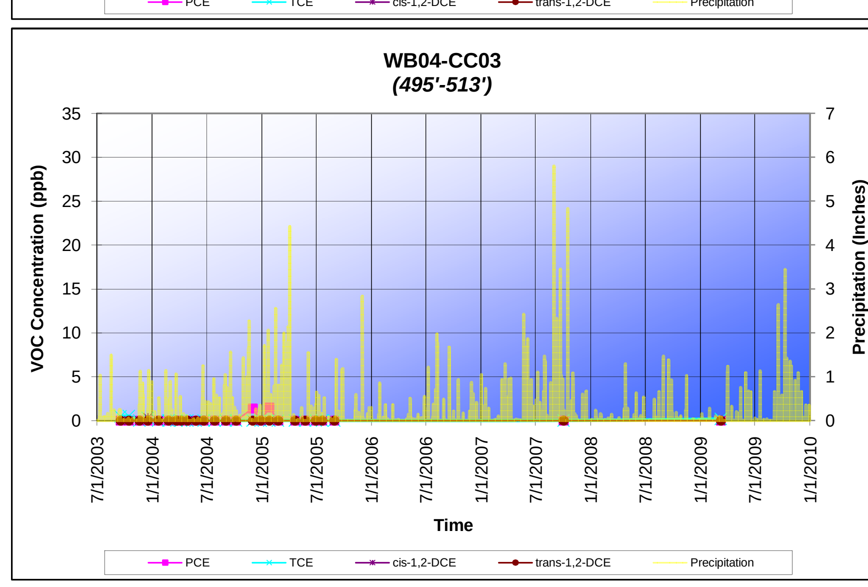












APPENDIX E

DROUGHT CONTINGENCY PLAN TRIGGERS

CSSA Drought Contingency Plan

Triggering Conditions	***Stage***	***Restrictions***
CS-9 water level > 300 ft bgl.	1) ***Mild*** Water Shortage	Voluntary Restrictions • Discontinue flushing water mains as practical/prudent. • No landscape watering between 1000 to 2000 hours • No car washing at homes (except during watering times), use CSSA car wash that recycles water. • CSSA Car Wash to be operated in water recycling mode. • Water customers encouraged to practice water conservation and minimize or discontinue non-essential water use. • Construction contractors required to quantify water use.
CS-10 Ambient water level > 330 ft bgl.	2) ***Moderate*** Water Shortage	Mandatory Restrictions • All of Stage 1 restrictions apply and • Sprinkler watering reduced to 15 minutes per segment, 2 days/week. • Hand water allowed before 1000 and after 2000. • No water use for ornamental outdoor fountains. • Water for construction work allowed under special permit. • Construction contractors limited to 90% of documented water use.
CS-10 Ambient water level > 360 ft bgl.	3) ***Severe*** Water Shortage	Mandatory Restrictions • All of Stage 1 & 2 restrictions apply and • Sprinkler watering reduced to 15 minutes per segment, 1 day/week. • Hand water allowed before 0700 and after 2100. • Construction contractors limited to 80% of documented water use.
CS-10 Ambient water level > 391 ft bgl.	4) ***Critical*** Water Shortage	Mandatory Restrictions • All of Stage 1, 2 & 3 restrictions apply and • Sprinkler watering reduced to 7 minutes per segment, 1 day/week. • Hand water of ornamental plants, shrubs, & trees allowed between 0700 and 1100. No hand held watering of turf or grass. • Construction contractors limited to 50% of documented water use
CS-10 Drawdown water level > 475 ft bgl. or major water line break, pump malfunction, etc.	5) ***Emergency*** Water Shortage	Mandatory Restrictions • All of Stage 1, 2, 3, & 4 restrictions apply and • No sprinkler use. No hand watering. • Use of water for construction projects considered on case by case basis. • CSSA Installation Manager, Branch Managers, and post residents to meet within 48 hours to consider and adopt rules restricting non-discretionary and discretionary water use.

APPENDIX F

POTENTIOMETRIC MAPS FOR MARCH, JUNE, SEPTEMBER, DECEMBER 2009

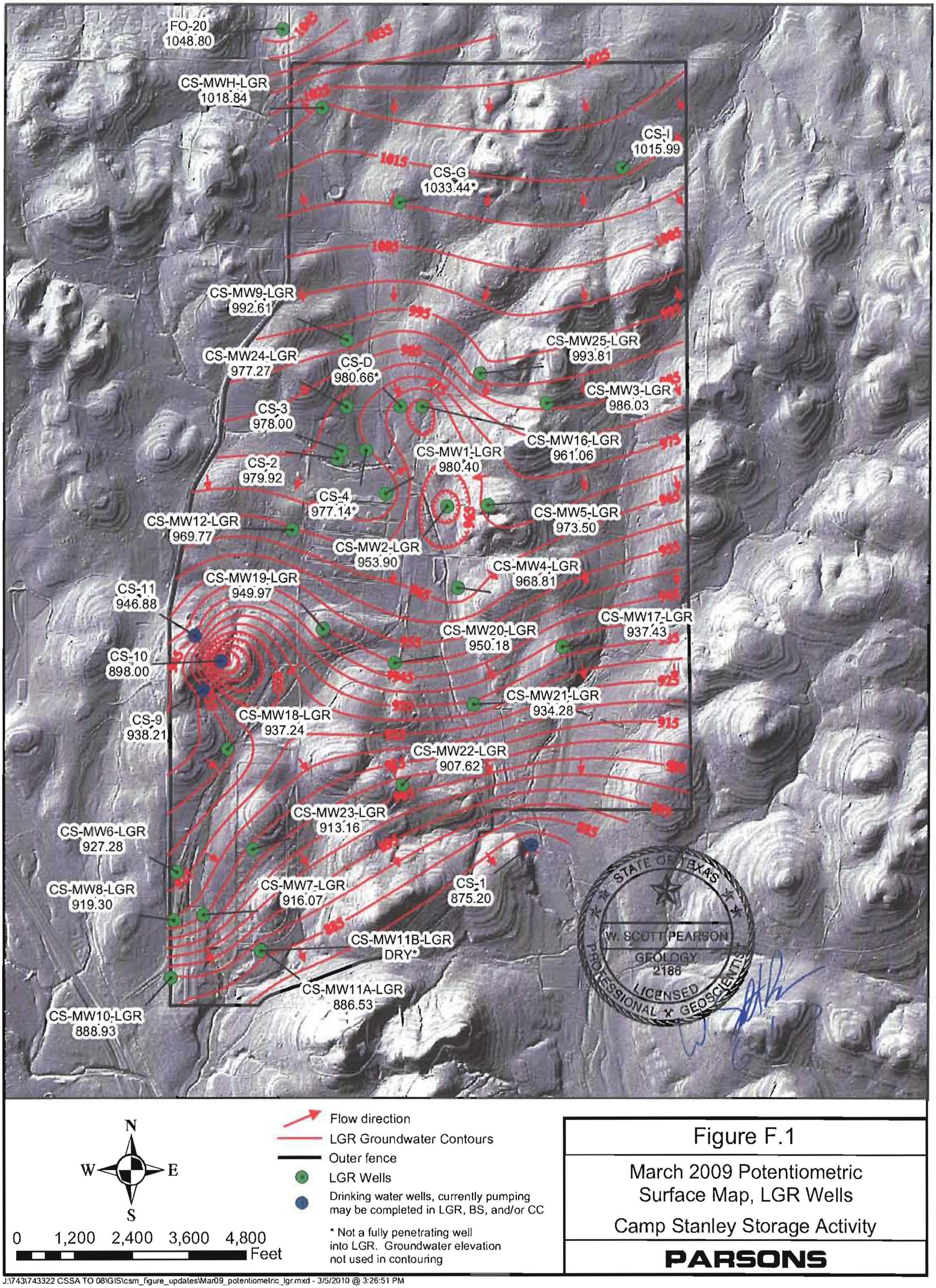


Figure F.1

March 2009 Potentiometric Surface Map, LGR Wells

Camp Stanley Storage Activity

PARSONS

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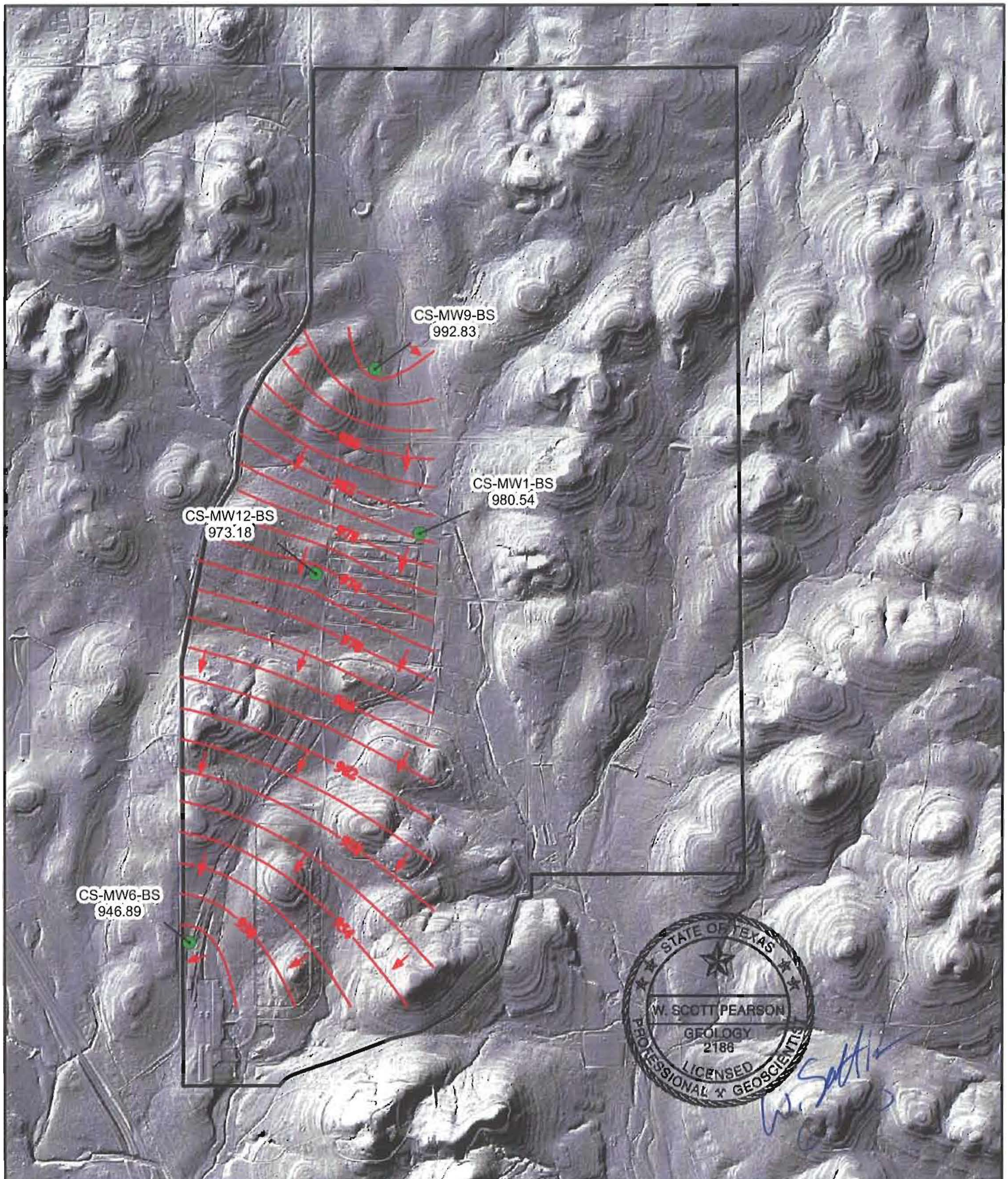

N
W E
S

0 1,200 2,400 3,600 4,800 Feet

Flow direction
BS Groundwater Contours
Outer fence
BS Wells

Figure F.2

March 2009 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

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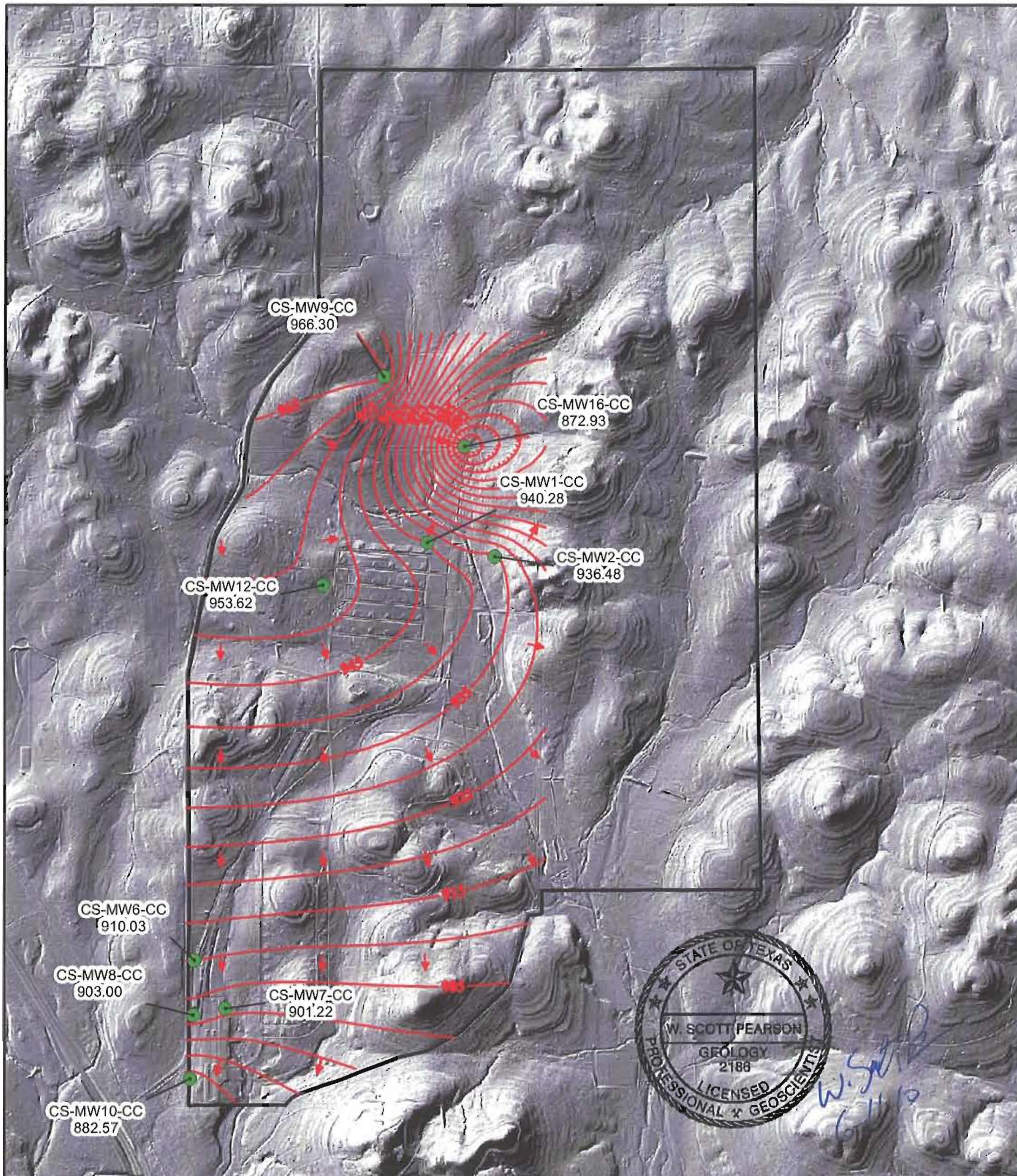

N
W E
S

0 1,200 2,400 3,600 4,800
Feet

Flow direction
CC Groundwater Contours
Outer fence
CC Wells

Figure F.3

March 2009 Potentiometric Surface Map, CC Wells

Camp Stanley Storage Activity

PARSONS

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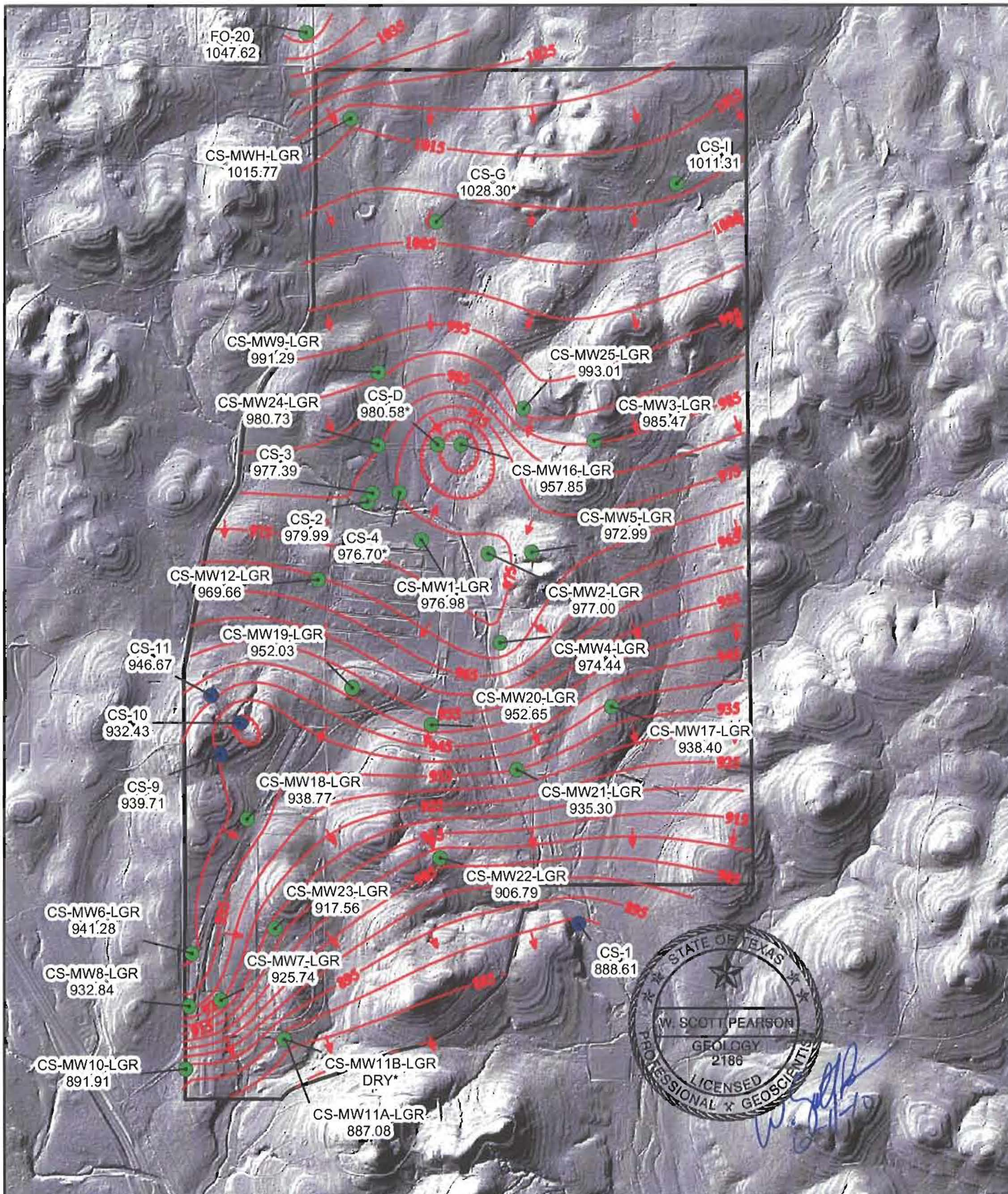

N
W E
S

0 1,200 2,400 3,600 4,800 Feet

Flow direction
LGR Groundwater Contours
Outer fence
LGR Wells and groundwater elevation (ft above msl)
Drinking water wells (may be completed in LGR, BS, and/or CC)
* Not a fully penetrating well into LGR. Groundwater elevation not used in contouring

Figure F.4

June 2009 Potentiometric Surface Map, LGR Wells

Camp Stanley Storage Activity

PARSONS

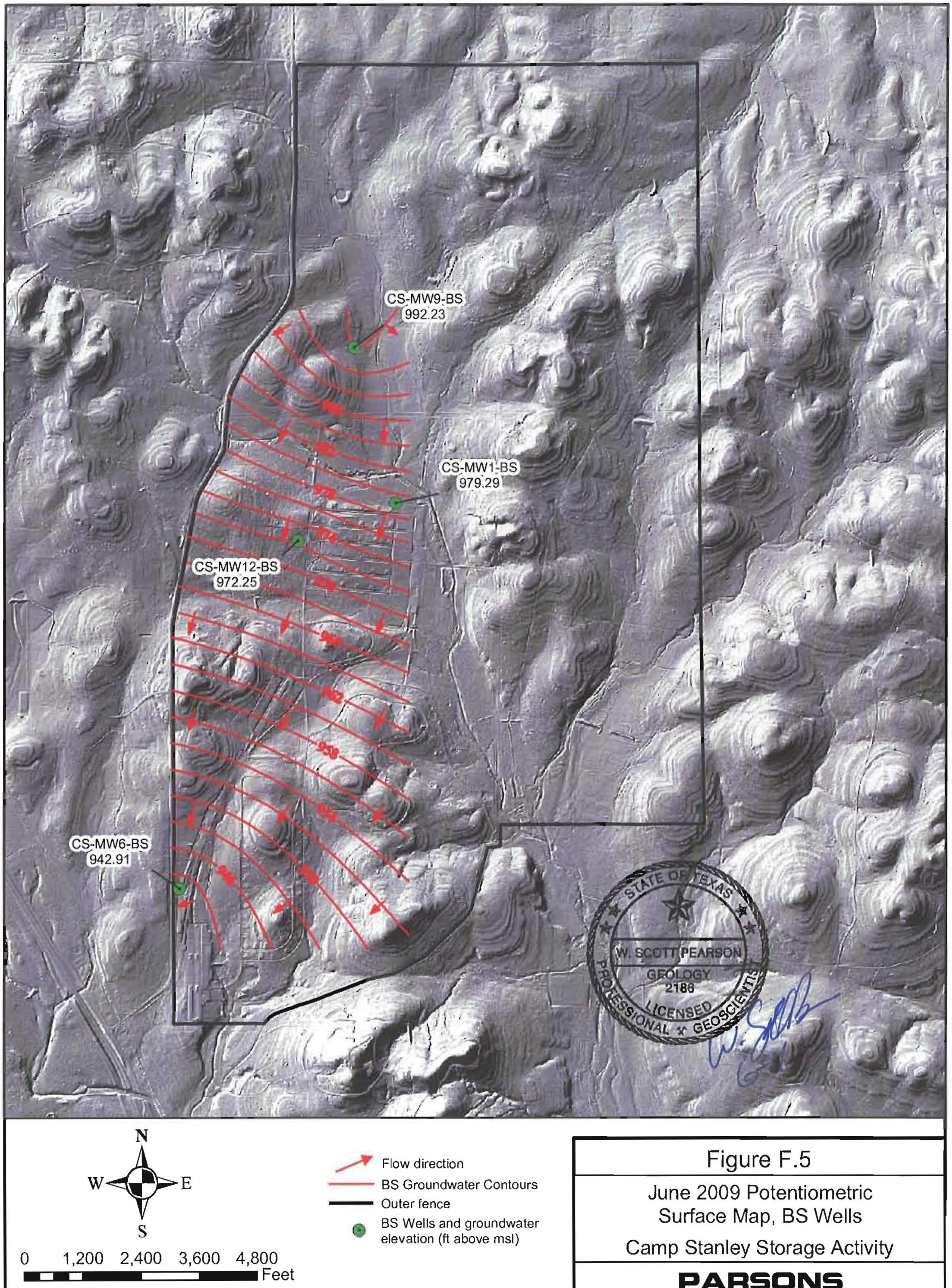

Figure F.5

June 2009 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

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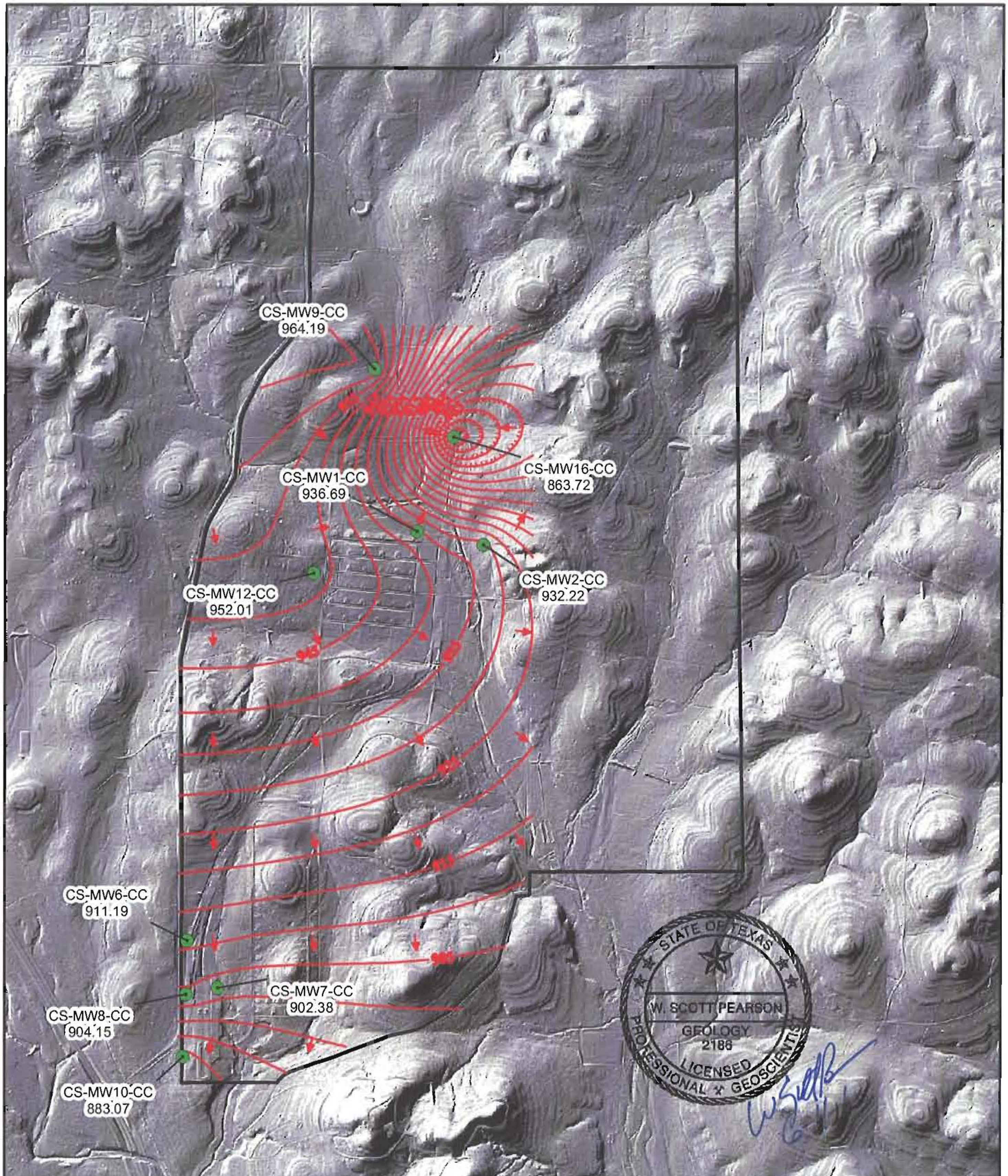

N
W E
S

0 1,200 2,400 3,600 4,800
Feet

- Flow direction
- CC Groundwater Contours
- Outer fence
- CC Wells and groundwater elevation (ft above msl)

Figure F.6

June 2009 Potentiometric Surface Map, CC Wells

Camp Stanley Storage Activity

PARSONS

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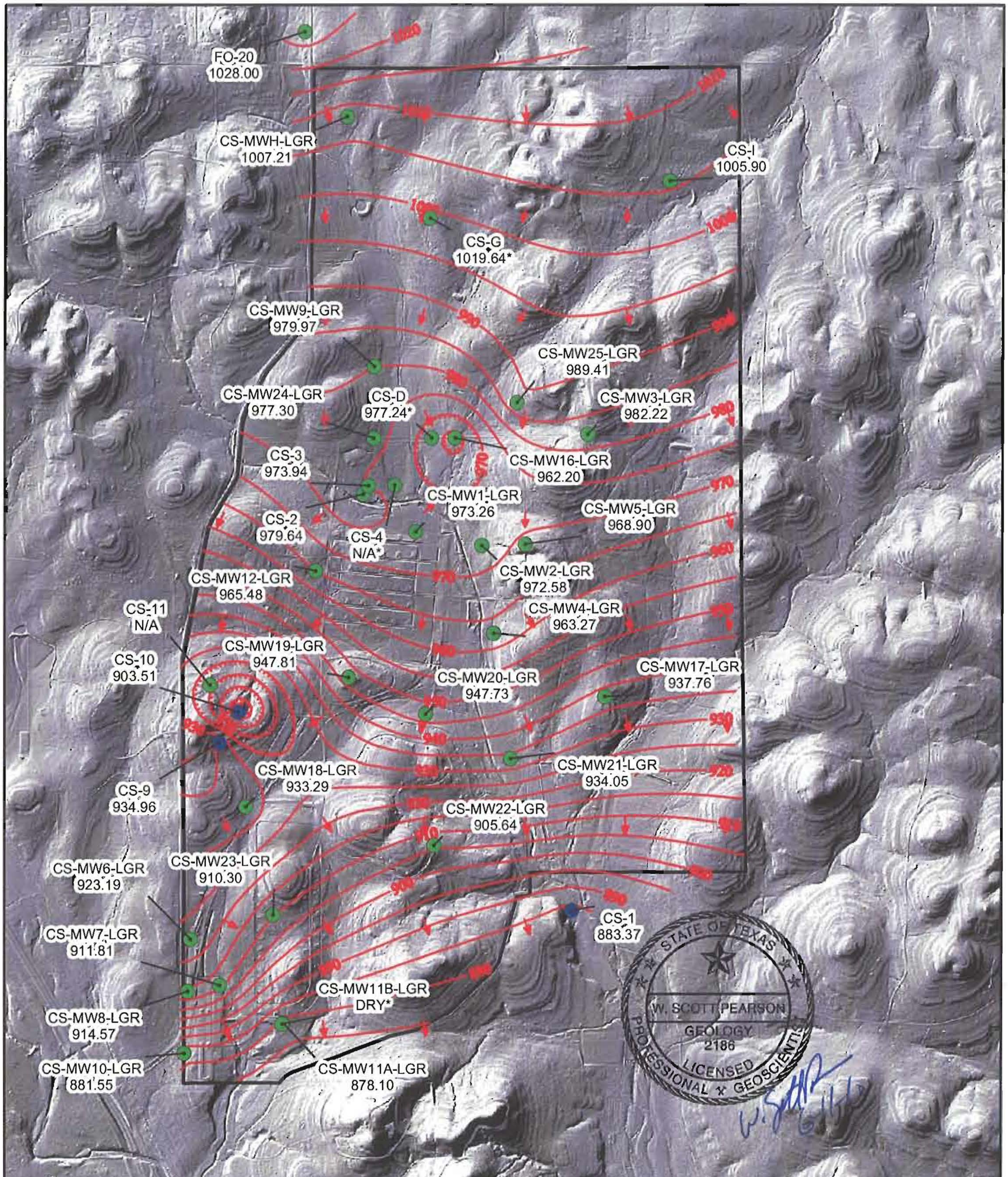

N

W E

S

0 1,200 2,400 3,600 4,800 Feet

Flow direction

LGR Groundwater Contours

Outer fence

LGR Wells and groundwater elevation (ft above msl)

Drinking water wells (may be completed in LGR, BS, and/or CC)

* Not a fully penetrating well into LGR. Groundwater elevation not used in contouring

Figure F.7

September 2009 Potentiometric Surface Map, LGR Wells

Camp Stanley Storage Activity

PARSONS

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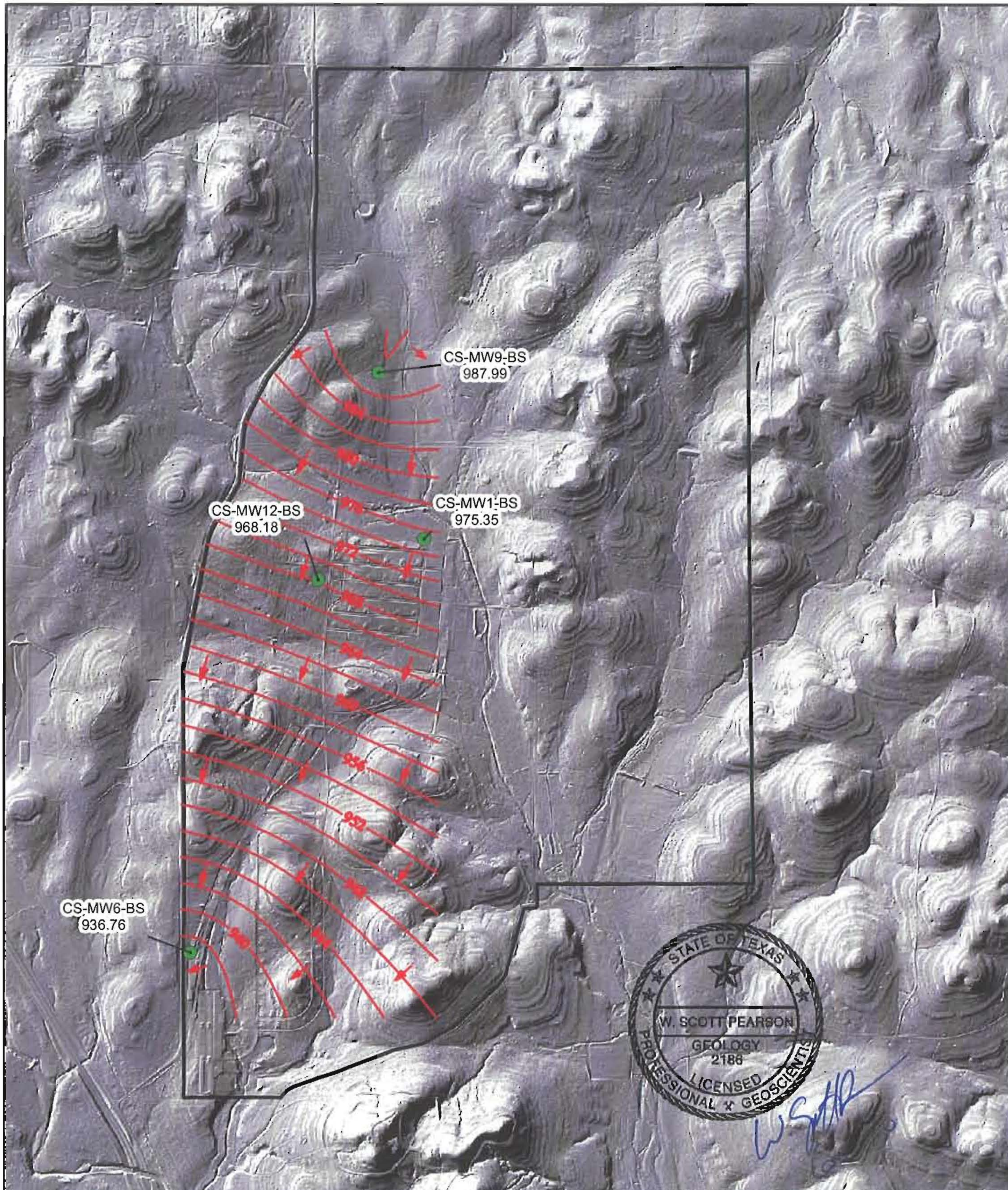

N
W E
S

0 1,200 2,400 3,600 4,800
Feet

Flow direction
BS Groundwater Contours
Outer fence
BS Wells and groundwater elevation (ft above msl)

Figure F.8

September 2009 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

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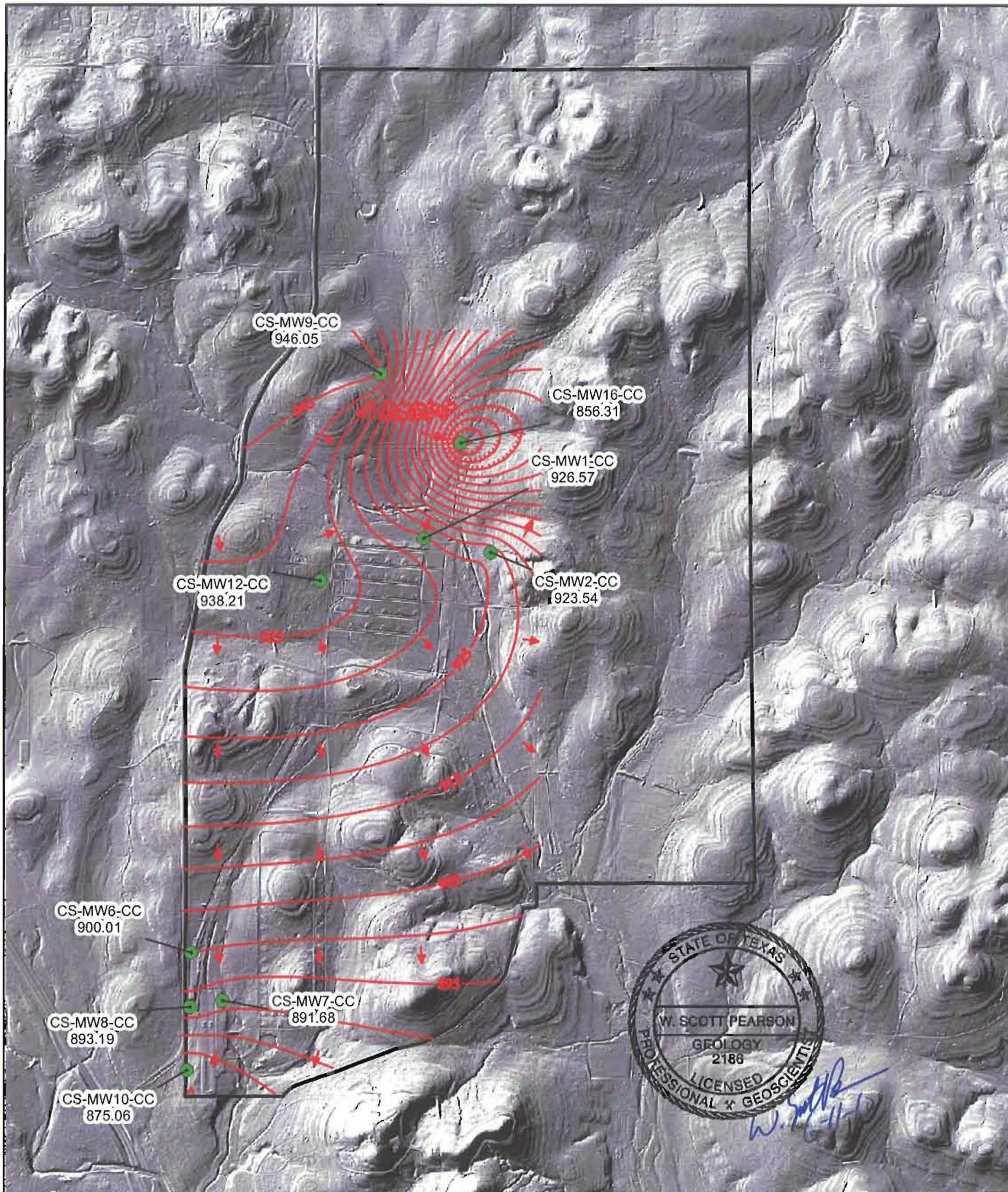

N
W E
S

0 1,200 2,400 3,600 4,800
Feet

Flow direction
CC Groundwater Contours
Outer fence
CC Wells and groundwater elevation (ft above msl)

Figure F.9

September 2009 Potentiometric Surface Map, CC Wells

Camp Stanley Storage Activity

PARSONS

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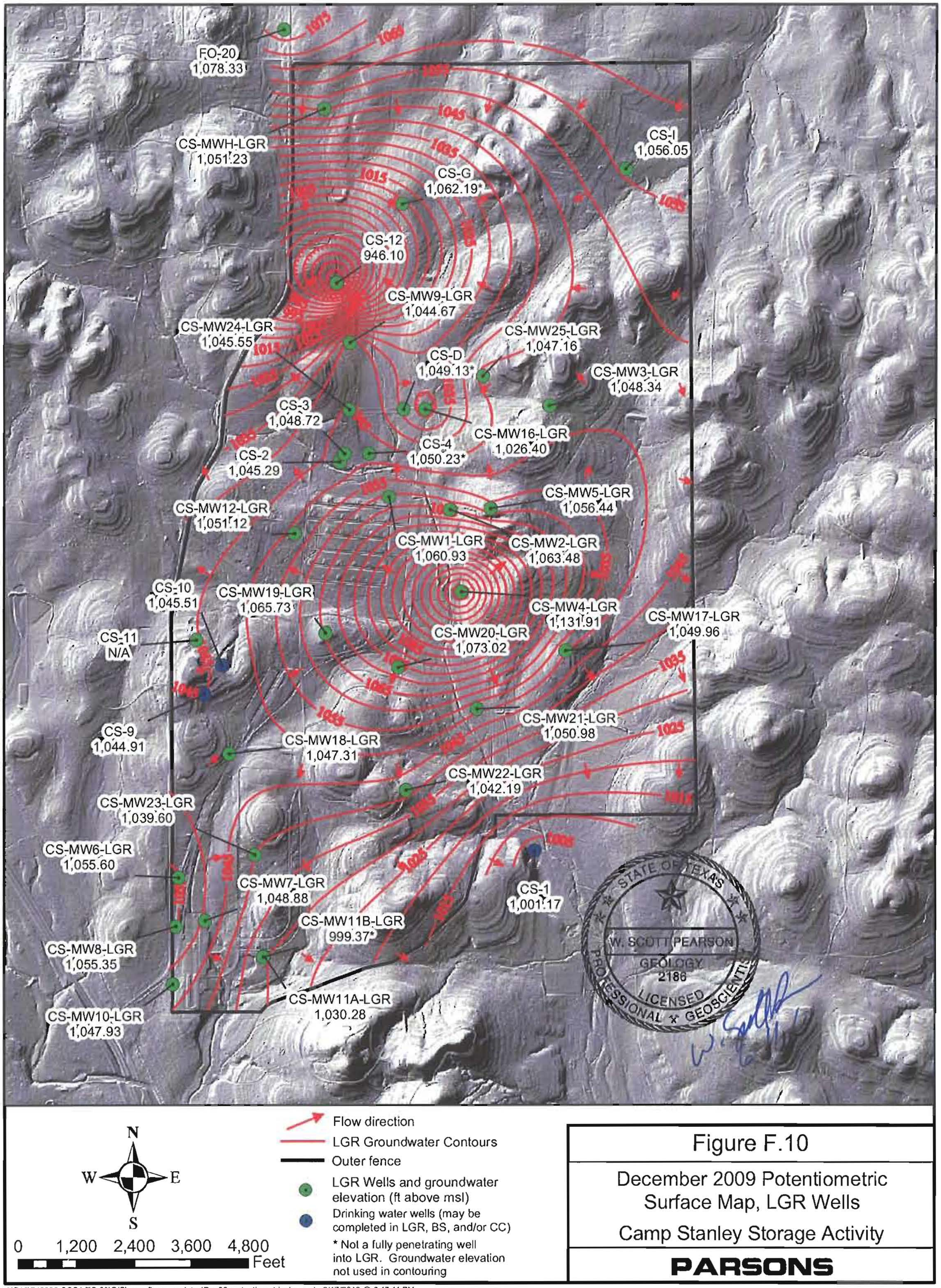

Figure F.10

December 2009 Potentiometric Surface Map, LGR Wells

Camp Stanley Storage Activity

PARSONS

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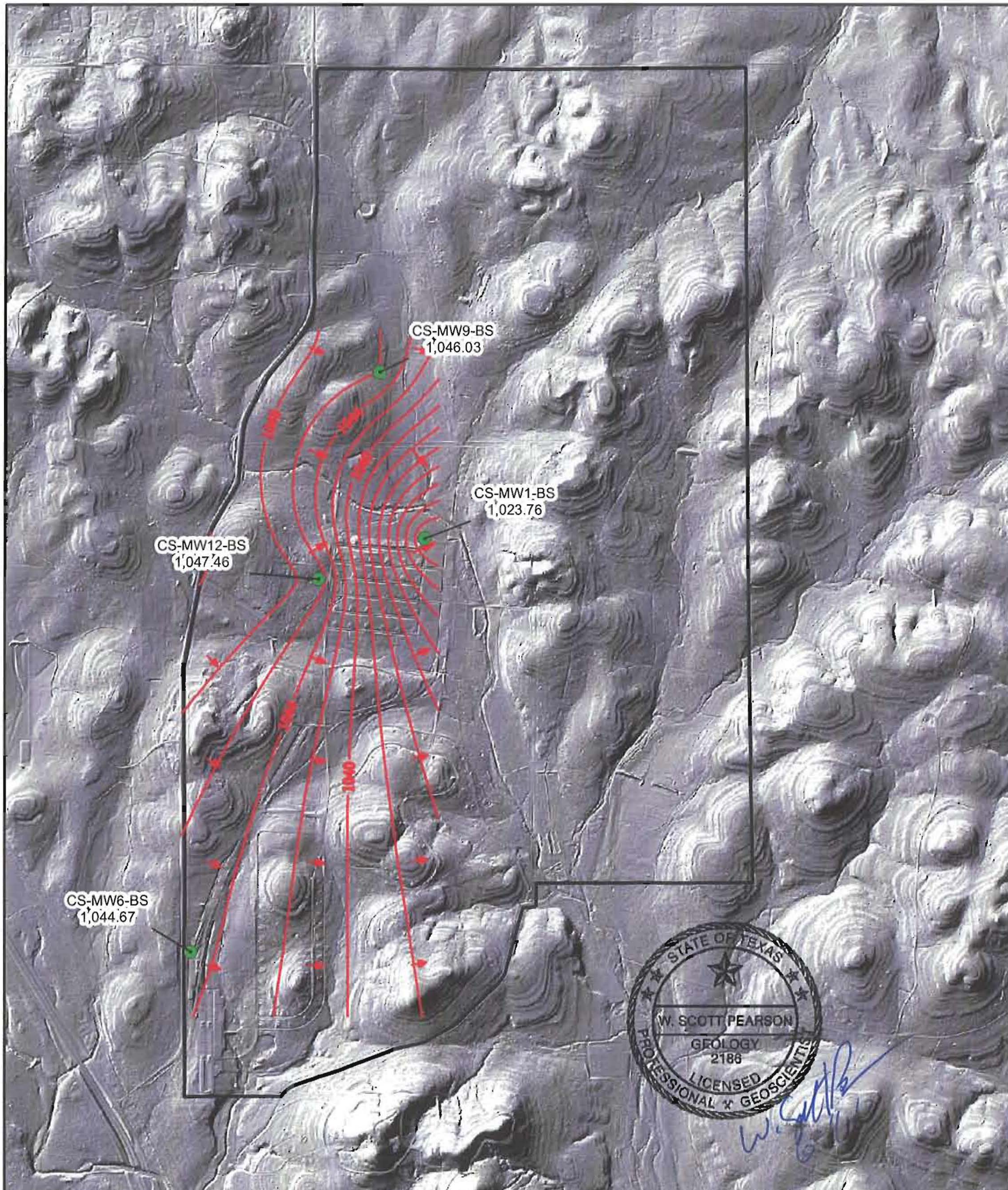

N
W E
S

0 1,200 2,400 3,600 4,800
Feet

Flow direction
BS Groundwater Contours
Outer fence
BS Wells and groundwater elevation (ft above msl)

Figure F.11

December 2009 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

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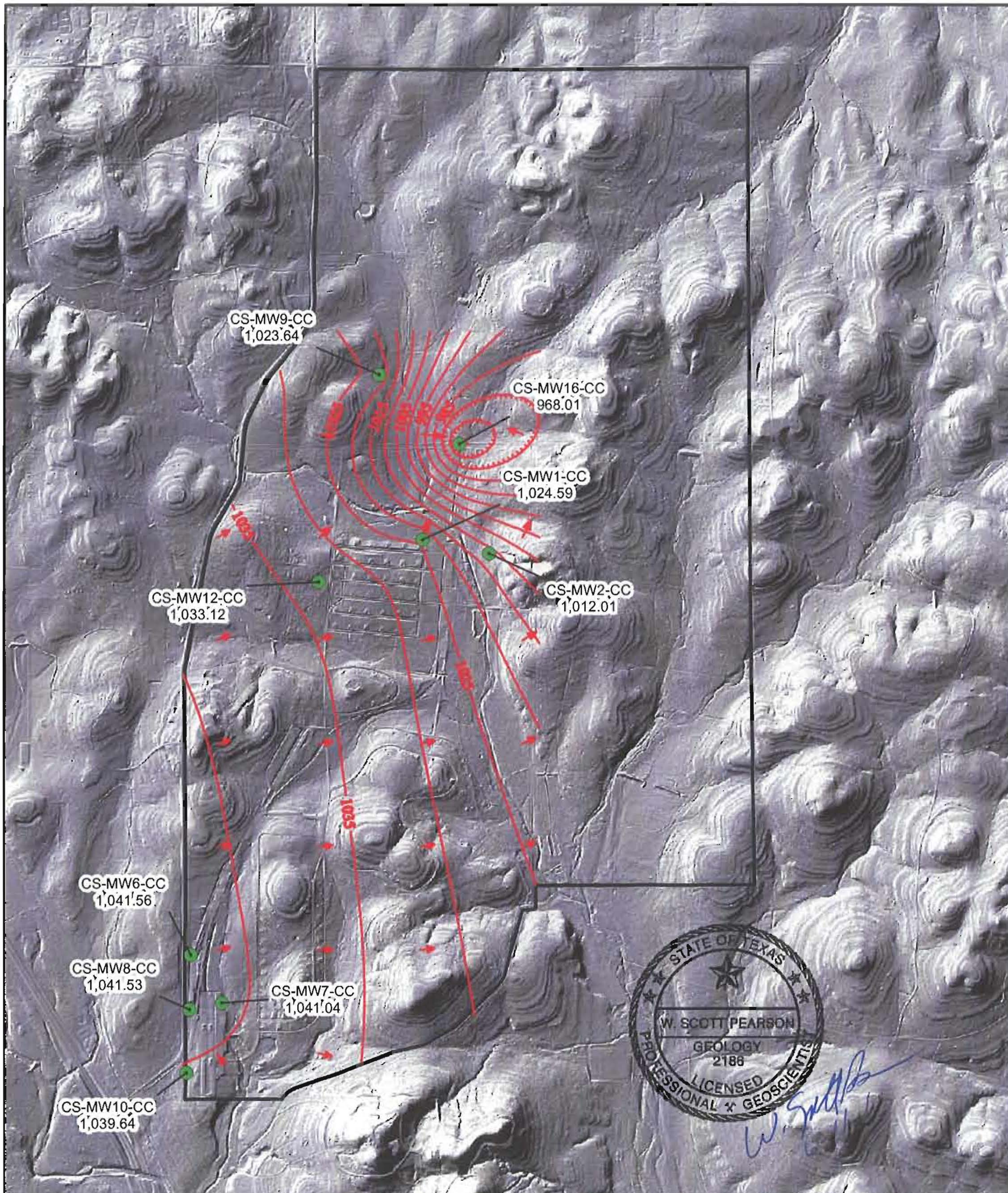

N
W E
S

0 1,200 2,400 3,600 4,800
Feet

Flow direction
CC Groundwater Contours
Outer fence
CC Wells and groundwater elevation (ft above msl)

Figure F.12

December 2009 Potentiometric Surface Map, CC Wells

Camp Stanley Storage Activity

PARSONS

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APPENDIX G

2009 QUARTERLY OFF-POST GROUNDWATER ANALYTICAL RESULTS

Appendix G
Groundwater VOC Analytical Results for Off-post Public Private Water Wells, 2009
Camp Stanley Storage Activity, Texas

Well ID	Sample Date	1,1-Dichloro-ethene (ug/L)	*cis*-1,2-Dichloro-ethene (ug/L)	*trans*-1,2-Dichloro-ethene (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temperature (°C)	Specific Conductivity (mS/cm)
	MCL	**7**	**70**	**100**	**5**	**5**	**2**	**Field Measurements**		
FO-8	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.34	22.10	0.490
FO-17	6/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.55	22.20	0.603
FO-22	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.28	22.60	0.532
FO-J1	3/5/2009	0.12U	0.07U	0.08U	**0.39F**	0.05U	0.08U	7.30	21.60	0.533
Duplicate	3/5/2009	0.12U	0.07U	0.08U	**0.46F**	0.05U	0.08U	7.30	21.60	0.533
	6/3/2009	0.12U	0.07U	0.08U	**0.57F**	0.05U	0.08U	6.86	21.80	0.561
	9/1/2009	0.12U	0.07U	0.08U	**0.43F**	0.05U	0.08U	6.88	21.70	0.557
	12/1/2009	0.12U	0.07U	0.08U	**0.24F**	0.05U	0.08U	6.62	21.60	0.677
HS-1	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.26	23.70	0.543
	6/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.77	22.90	0.603
	9/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.58	23.80	0.595
	12/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.63	22.80	0.700
HS-2	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.26	23.70	0.543
	6/3/2009	0.12U	0.07U	0.08U	**0.23F**	0.05U	0.08U	6.65	24.10	0.571
	9/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.84	24.30	0.560
	12/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.60	22.30	0.720
HS-3	6/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.56	24.00	0.604
I10-2	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.24	22.10	0.541
I10-4	3/3/2009	0.12U	0.07U	0.08U	**6.71**	**2.17**	0.08U	7.10	20.80	0.675
	6/1/2009	0.12U	0.07U	0.08U	**6.48**	**2.7**	0.08U	6.98	24.10	0.755
	9/1/2009	0.12U	0.07U	0.08U	**6.9**	**2.47**	0.08U	7.10	22.50	0.757
	12/2/2009	0.12U	0.07U	0.08U	**7.36**	**2.72**	0.08U	7.45	17.80	0.627
I10-5	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.26	23.60	0.616
I10-7	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.16	22.00	0.556
Duplicate	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.16	22.00	0.556
	6/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.64	22.60	0.599
Duplicate	6/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.64	22.60	0.599
	9/1/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.96	21.90	0.564
Duplicate	9/1/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.96	21.90	0.564
	12/3/2009	0.12U	0.07U	0.08U	0.06U	**0.17F**	0.08U	5.61	22.20	0.570
Duplicate	12/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	5.61	22.20	0.570
I10-8	12/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.60	21.90	0.566
JW-5	3/5/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.14	20.00	0.504
Duplicate	3/5/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.14	20.00	0.504
JW-6	6/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.27	22.60	0.560
JW-7	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.15	21.00	0.495
	6/2/2009	0.12U	0.07U	0.08U	**0.48F**	0.05U	0.08U	6.72	21.10	0.551
	9/15/2009	0.12U	0.07U	0.08U	**0.66F**	0.05U	0.08U	6.50	21.10	0.503
	12/14/2009	0.12U	0.07U	0.08U	**0.46F**	0.05U	0.08U	7.04	21.10	0.548
JW-8	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.12	21.10	0.501
	6/3/2009	0.12U	0.07U	0.08U	**0.37F**	0.05U	0.08U	6.71	22.60	0.569
	9/4/2009	0.12U	0.07U	0.08U	**0.48F**	0.05U	0.08U	7.00	21.40	0.513
	12/1/2009	0.12U	0.07U	0.08U	**0.36F**	0.05U	0.08U	6.35	21.40	0.566
JW-9	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.20	22.00	0.514
JW-12	3/9/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.97	21.70	0.596
	6/5/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.52	21.80	0.644
JW-13	6/5/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.86	21.80	0.557
JW-14	3/5/2009	0.12U	0.07U	0.08U	**0.15F**	0.05U	0.08U	7.30	22.30	0.528
	6/3/2009	0.12U	0.07U	0.08U	**0.19F**	0.05U	0.08U	6.86	22.50	0.577
	9/1/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.74	22.30	0.560
	12/1/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.82	21.70	0.547
JW-15	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.07	21.70	0.595
JW-27	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.14	21.20	0.579
Duplicate	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.14	21.20	0.579
JW-28	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.07	21.70	0.595
	6/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.39	22.00	0.646
	9/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.46	21.90	0.584
	12/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.63	21.50	0.632
JW-29	3/4/2009	0.12U	0.07U	0.08U	**0.12F**	0.05U	0.08U	7.11	20.40	0.566
	6/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.41	23.30	0.614
Duplicate	6/10/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.41	23.30	0.614
	9/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	5.48	22.10	0.584
Duplicate	9/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	5.48	22.10	0.584
	12/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.34	21.10	0.627
JW-30	3/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.19	20.80	0.532
	6/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.70	22.00	0.595
	9/1/2009	0.12U	0.07U	0.08U	**0.21F**	0.05U	0.08U	6.92	21.10	0.578
	12/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.85	21.00	0.614
JW-31	12/1/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.10	13.50	0.583
Duplicate	12/1/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.10	13.50	0.583
LS-1	3/5/2009	0.12U	0.07U	0.08U	**0.86F**	**0.32F**	0.08U	7.26	22.20	0.586
	6/4/2009	0.12U	0.07U	0.08U	**0.85F**	0.05U	0.08U	6.69	21.30	0.581
Duplicate	6/4/2009	0.12U	0.07U	0.08U	**0.76F**	**0.20F**	0.08U	6.69	21.30	0.581
	9/1/2009	0.12U	0.07U	0.08U	**0.64F**	**0.18F**	0.08U	7.02	21.80	0.614
	12/2/2009	0.12U	**2.55**	0.08U	**1.30F**	**0.63F**	0.08U	7.31	20.20	0.737
LS-4	3/5/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.37	21.70	0.736
	6/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.58	21.70	0.775
	9/1/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.22	22.70	0.828
	12/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.64	20.20	0.744

Appendix G
Groundwater VOC Analytical Results for Off-post Public Private Water Wells, 2009
Camp Stanley Storage Activity, Texas

Well ID	Sample Date	1,1-Dichloro-ethene (ug/L)	*cis*-1,2-Dichloro-ethene (ug/L)	*trans*-1,2-Dichloro-ethene (ug/L)	Tetra-chloroethene (ug/L)	Trichloroethene (ug/L)	Vinyl chloride (ug/L)	pH	Temperature (°C)	Specific Conductivity (mS/cm)
	MCL	7	70	100	5	5	2	Field Measurements		
LS-5	3/3/2009	0.12U	0.07U	0.08U	0.06U	**2.04**	0.08U	7.12	21.60	0.637
	6/1/2009	0.12U	0.07U	0.08U	**0.80F**	**2.64**	0.08U	7.08	22.40	0.680
	8/31/2009	0.12U	0.07U	0.08U	**0.96F**	**2.72**	0.08U	7.25	21.70	0.674
	11/30/2009	0.12U	0.07U	0.08U	**0.88F**	**2.82**	0.08U	6.96	22.10	0.659
LS-6	3/2/2009	0.12U	0.07U	0.08U	**1.09F**	**0.53F**	0.08U	7.00	21.79	0.642
	6/1/2009	0.12U	0.07U	0.08U	**0.93F**	**1.33**	0.08U	6.98	22.30	0.652
	8/31/2009	0.12U	0.07U	0.08U	**0.99F**	**1.46**	0.08U	7.27	22.00	0.645
	11/30/2009	0.12U	0.07U	0.08U	**1.19F**	**1.43**	0.08U	6.90	22.30	0.667
LS-6-A2	3/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	NA	NA	NA
	8/31/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.84	28.50	0.641
LS-7	3/2/2009	0.12U	0.07U	0.08U	**1.99**	**0.10F**	0.08U	7.19	22.68	0.655
	6/1/2009	0.12U	0.07U	0.08U	**1.87**	**0.72F**	0.08U	6.98	22.30	0.652
	8/31/2009	0.12U	0.07U	0.08U	**2.31**	**0.87F**	0.08U	7.65	22.80	0.671
	11/30/2009	0.12U	0.07U	0.08U	**2.07**	**0.66F**	0.08U	6.88	22.50	0.690
LS-7-A2	3/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	NA	NA	NA
	8/31/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.53	22.50	0.665
OFR-1	3/5/2009	0.12U	0.07U	0.08U	**0.32F**	0.05U	0.08U	7.23	21.80	0.551
	6/3/2009	0.12U	0.07U	0.08U	**0.33F**	0.05U	0.08U	6.46	21.80	0.599
	9/1/2009	0.12U	0.07U	0.08U	**0.25F**	0.05U	0.08U	6.38	21.80	0.583
	12/1/2009	0.12U	0.07U	0.08U	**0.35F**	0.05U	0.08U	6.29	21.00	0.575
OFR-3	3/2/2009	0.12U	0.07U	0.08U	**5.86**	**3.52**	0.08U	7.10	22.58	0.594
	6/1/2009	0.12U	0.07U	0.08U	**5.98**	**3.21**	0.08U	7.11	22.30	0.613
	8/31/2009	0.12U	0.07U	0.08U	**0.84F**	**0.91F**	0.08U	7.27	23.10	0.578
	11/30/2009	0.12U	0.07U	0.08U	**4.77**	**2.51**	0.08U	7.02	22.20	0.601
OFR-3-A2	3/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	NA	NA	NA
	8/31/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.99	26.60	0.595
OFR-4	3/5/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.11	22.30	0.518
RFR-3	12/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	5.86	21.80	0.543
RFR-4	12/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.33	20.90	0.695
Duplicate	12/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.33	20.90	0.695
RFR-5	12/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.18	21.30	0.548
RFR-8	6/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.86	22.80	0.557
RFR-9	9/4/2009	0.12U	0.07U	0.08U	**0.20F**	0.05U	0.08U	7.36	22.10	0.499
Duplicate	9/4/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.36	22.10	0.499
	12/21/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.44	22.90	0.500
RFR-10	3/2/2009	0.12U	0.07U	0.08U	**8.16**	**2.34**	0.08U	7.08	22.51	0.640
	6/1/2009	0.12U	0.07U	0.08U	**8.78**	**2.65**	0.08U	7.04	22.30	0.644
	8/31/2009	0.12U	0.07U	0.08U	**5.24**	**1.21**	0.08U	7.21	22.20	0.614
	11/30/2009	0.12U	**0.25F**	0.08U	**19.5**	**8.84**	0.08U	7.03	22.40	0.646
RFR-10-A2	3/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	NA	NA	NA
	8/31/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.10	26.10	0.655
RFR-10-B2	3/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	NA	NA	NA
	8/31/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.08	25.80	0.644
RFR-11	3/2/2009	0.12U	0.07U	0.08U	**0.50F**	**1.39**	0.08U	7.11	23.79	0.591
	6/1/2009	0.12U	0.07U	0.08U	**0.49F**	**1.45**	0.08U	7.13	24.60	0.615
	8/31/2009	0.12U	0.07U	0.08U	**0.39F**	**1.97**	0.08U	7.18	26.60	0.589
	11/30/2009	0.12U	0.07U	0.08U	**1.08F**	**1.61**	0.08U	6.96	22.70	0.636
RFR-11-A2	3/2/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	NA	NA	NA
	8/31/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.10	26.90	0.623
RFR-12	3/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.22	22.60	0.545
RFR-13	6/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	6.74	23.70	0.557
RFR-14	3/5/2009	0.12U	0.07U	0.08U	**0.25F**	0.05U	0.08U	7.28	21.30	0.515
	6/3/2009	0.12U	0.07U	0.08U	**0.24F**	0.05U	0.08U	6.54	24.60	0.658
	9/2/2009	0.12U	0.07U	0.08U	**0.28F**	0.05U	0.08U	6.68	23.40	0.534
	12/3/2009	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U	7.61	10.80	0.578

BOLD (shaded)	Value > or = MCL
BOLD (boxed)	MCL > Value > or = RL
BOLD	RL > Value > MDL

Notes:
- ug/L = micrograms per liter
- F = The analyte was positively identified but the associated numerical value is below the RL.
- J = The analyte was positively identified below quantitation limits; the quantitation is an estimate.
- U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection.
- NA = Not analyzed for this parameter.
- All VOCs analyzed by method SW 8260B
- All samples analyzed by Agriculture & Priority Pollutants Laboratories (APPL), Inc. of Clovis, CA
- MCL = maxmiium contaminant level

APPENDIX H

PRE- AND POST-GAC SAMPLE COMPARISONS FOR WELLS LS-6, LS-7, RFR-10, RFR-11 AND OFR-3

PRE- AND POST-GAC SAMPLE COMPARISONS FOR WELLS LS-6, LS-7, RFR-10, RFR-11 AND OFR-3

LS-6					LS-7				
	PCE (µg/L)		TCE (µg/L)			PCE (µg/L)		TCE (µg/L)	
Date	**Pre**	**Post**	**Pre**	**Post**	**Date**	**Pre**	**Post**	**Pre**	**Post**
3/2/2009	1.09F	ND	0.53F	ND	3/2/2009	1.99	ND	0.10F	ND
6/1/2009	0.93F	NA	1.33	NA	6/1/2009	1.87	NA	0.72F	NA
8/31/2009	0.99F	ND	1.46	ND	8/31/2009	2.31	ND	0.87F	ND
11/30/2009	1.19F	NA	1.43	NA	11/30/2009	2.07	NA	0.66F	NA

OFR-3					RFR-11				
	PCE (µg/L)		TCE (µg/L)			PCE (µg/L)		TCE (µg/L)	
Date	**Pre**	**Post**	**Pre**	**Post**	**Date**	**Pre**	**Post**	**Pre**	**Post**
3/2/2009	5.86	ND	3.52	ND	3/2/2009	0.50F	ND	1.39	ND
6/1/2009	5.98	NA	3.21	NA	6/1/2009	0.49F	NA	1.45	NA
8/31/2009	0.84F	ND	0.91F	ND	8/31/2009	0.39F	ND	1.97	ND
11/30/2009	4.77	NA	2.51	NA	11/30/2009	1.08F	NA	1.61	NA

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	PCE (µg/L)		TCE (µg/L)	
Date	**Pre**	**Post**	**Pre**	**Post**
3/2/2009	8.16	ND/ND	2.34	ND/ND
6/1/2009	8.78	NA/NA	2.65	NA/NA
8/31/2009	5.24	ND/ND	1.21	ND/ND
11/30/2009	19.5	NA/NA	8.84	NA/NA

NA – not applicable (post-GAC not sampled during this event) ND – indicates analyte was not detected at or above the MDL.