SEPTEMBER 2015

On-Post
Quarterly Groundwater Monitoring Report

Prepared For

Department of the Army
Camp Stanley Storage Activity
Boerne, Texas

December 2015

EXECUTIVE SUMMARY

- Samples were collected from all five wells scheduled for monitoring in September 2015.
- Following an extremely active springtime precipitation season resulting in abnormally high measured rainfall, the aquifer experienced a significant drop from June 16 to September 24, 2015. The weather station (WS) at Area of Concern (AOC)-65 (WS AOC-65) recorded 3.66 inches of rainfall, and the B-3 weather station recorded 6.76 inches of precipitation for the same time period. At both weather stations (AOC-65 and B-3) the total rainfall for the months of July and August was less than 1 inch. The majority of the quarterly rainfall fell in the last few weeks in June, with no one rain event greater than 1 inch.
- At CSSA, the Middle Trinity aquifers' average groundwater elevation in September 2015 decreased 119.17 feet from the elevations measured in June 2015. The average depth to water in the wells was 214.31 feet below top of casing (BTOC) or 1,027.23 feet above mean sea level (MSL). As such, the Trinity-Glen Rose Groundwater Conservation District (TGRGCD) moved from year round conservation to Stage 1 Moderate Drought conditions on August 13, 2015. For the adjacent Edwards aquifer, the San Antonio Water System (SAWS) moved from Stage 2 restrictions to year round conservation on June 10, 2015. This marked the first time since 2011 that the San Antonio area hasn't been under some type of water restrictions. However as drought conditions returned, SAWS returned to Stage 1 restrictions on July 31, 2015, and then Stage 2 restrictions on September 1, 2015.
- The maximum contaminant level (MCL) was exceeded in monitoring well CS-MW36-LGR for tetrachloroethene (PCE) and trichloroethene (TCE) in September 2015.
- No wells sampled had metal detections above their corresponding MCL, action level (AL), or secondary standard (SS) in September 2015.
- Thirty-nine of 46 Westbay zones were sampled in September 2015; 7 zones were not sampled because they were dry. In WB01 several zones reported historic highs as well as first time detections for *cis*-1,2-dichloroethene (DCE) and *trans*-1,2-DCE. WB02 did not have as many fluctuations in contamination as the other three Westbays but zone -LGR-05 did have its first detection of *cis*-1,2-DCE. The PCE and TCE concentrations in WB03 tripled since last quarter in zone -UGR-01. WB04 has 6 zones with historic high PCE concentrations: -LGR-01, -LGR-03, -BS-01, -BS-02, -CC-01, -CC-03. On the other hand the PCE concentration in WB04-LGR-11 decreased significantly from 444 micrograms per liter (µg/L) in March 2015 to 1.5 µg/L in September 2015.
- The data quality objectives (DQOs) and the long term monitoring optimization (LTMO) reports are currently under review and will be submitted to the Texas Commission on Environmental Quality (TCEQ) and United States Environmental Protection Agency (USEPA) for approval.

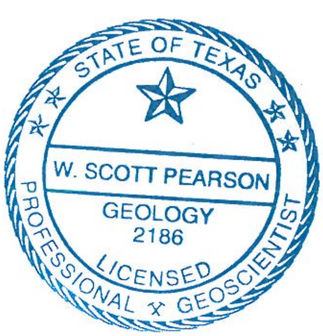
GEOSCIENTIST CERTIFICATION

SEPTEMBER 2015 ON-POST QUARTERLY GROUNDWATER MONITORING REPORT

FOR

DEPARTMENT OF THE ARMY
CAMP STANLEY STORAGE ACTIVITY
BOERNE, TEXAS

I, W. Scott Pearson, Professional Geologist (P.G.), hereby certify that the September 2015 On-Post Quarterly 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 CSSA Environmental Office, laboratory data provided by APPL Laboratories, and field data obtained during groundwater monitoring conducted at the site in September 2015, 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

12-31-2015
Date

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ACRONYMS AND ABBREVIATIONS

µg/L	microgram per liter
1,1-DCE	1,1-dichloroethene
§3008(h) Order	RCRA 3008(h) Administrative Order on Consent
AL	Action Level
AOC	Area of Concern
APPL	Agriculture and Priority Pollutants Laboratories, Inc.
BS	Bexar Shale
BTOC	below top of casing
CC	Cow Creek
cis-1,2-DCE	*cis*-1,2-Dichloroethene
COC	constituents of concern
CSSA	Camp Stanley Storage Activity
DQO	Data Quality Objectives
HSP	Health and Safety Plan
ISCO	In-Situ Chemical Oxidation
LGR	Lower Glen Rose
LTMO	Long-Term Monitoring Optimization
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MSL	mean sea level
NA	Not Available
PCE	Tetrachloroethene
P.G.	Professional Geologist
Parsons	Parsons Government Services, Inc.
QAPP	Quality Assurance Project Plan
RL	Reporting Limit
SAP	Sampling and Analysis Plan
SAWS	San Antonio Water System
SS	Secondary Standard
SWMU	Solid Waste Management Units
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TGRGCD	Trinity-Glen Rose Groundwater Conservation District
trans-1,2-DCE	*trans*-1,2-Dichloroethene
UGR	Upper Glen Rose
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WS	Weather Station

SEPTEMBER 2015 GROUNDWATER MONITORING REPORT CAMP STANLEY STORAGE ACTIVITY, TEXAS

1.0 INTRODUCTION

This report presents results from the on-post quarterly sampling performed at Camp Stanley Storage Activity (CSSA) in September 2015. Laboratory analytical results are presented along with potentiometric contour maps. Results from all four 2015 quarterly monitoring events (March, June, September, and December) will be described in detail in the 2015 Annual Report. The Annual Report will also provide an interpretation of all analytical results and an evaluation of any temporal or spatial trends observed in the groundwater contaminant plume during investigations. For this specific quarter, groundwater monitoring was performed September 8 through 23, 2015.

Current objectives of the groundwater monitoring program 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. **Appendix A** identifies the data quality objectives (DQOs) for CSSA's groundwater monitoring program, along with an evaluation of whether each DQO was attained. The objectives listed in **Appendix A** also reference appropriate sections of the RCRA **§3008(h) Administrative Order on Consent** [§3008(h) Order].

The CSSA groundwater monitoring program follows the provisions of the groundwater monitoring program DQOs as well as the recommendations of the **Three-Tiered Long Term Monitoring Network Optimization (LTMO) Evaluation (Parsons Government Services, Inc. [Parsons], 2010)** which provided recommendations for sampling based on an LTMO study performed for the CSSA groundwater monitoring program. LTMO study sampling frequencies were implemented on-post in December 2005, as approved by the Texas Commission on Environmental Quality (TCEQ) and the United States Environmental Protection Agency (USEPA). The LTMO evaluation was updated in 2010 using groundwater data from monitoring conducted between 2005 and 2009. It has been approved by the TCEQ and USEPA and was implemented on- and off-post in June 2011. An update to the LTMO and DQOs has been drafted as part of the revision of the USEPA §3008(h) Order. The proposed changes/updates will be submitted to the TCEQ and USEPA for their approval in January 2016. These changes will be briefed to the public in the 2016 Annual Fact Sheet.

2.0 POST-WIDE FLOW DIRECTION AND GRADIENT

After record rainfall through May 2015, the San Antonio Water System (SAWS) restrictions were lifted on June 10, 2015. The Trinity-Glen Rose Groundwater Conservation District (TGRGCD) also lifted water restrictions to year round conservation. San Antonio and the surrounding areas have been under some form of water restrictions since 2011 because of the prolonged drought. However as drought conditions returned over the summer months, SAWS returned to Stage 1 restrictions on July 31, 2015, and then Stage 2 restrictions on September 1, 2015. The Trinity-Glen Rose Groundwater Conservation District (TGRGCD) also reinstated water restrictions to Stage 1 on August 13, 2015.

The 30-year precipitation normal for the San Antonio area is 8.05 inches of rainfall for the three-month period of July through September. Over the 3-month period of record, the weather station (WS) at Area of Concern (AOC)-65 (WS AOC-65) recorded 3.66 inches of rainfall, and the B-3 weather station recorded 6.76 inches of precipitation for the same time period. The rainfall was sporadic with a majority of the rain falling at the end of June (2.98 inches). No events had greater than one inch of rain, with the largest rainfall event 0.61 inches on June 21st. The months of July and August recorded less than 1 inch of rainfall total. All of Central Texas experienced a significant decline in precipitation after area-wide flooding events in May resulted in significant recoveries in both aquifer and surface impoundment (lake) storage.

Fifty-five water level measurements were recorded on September 15, 2015 from on-post monitoring wells completed in the Lower Glen Rose (LGR), Bexar Shale (BS), and Cow Creek (CC) formational members of the Middle Trinity Aquifer (**Tables 2.1 and 2.2**). The groundwater potentiometric surface maps illustrating groundwater elevations from the LGR, BS, and CC zones in September 2015 are shown in **Figures 2.1, 2.2, and 2.3**, respectively.

The September 2015 potentiometric surface map for LGR-screened wells **(Figure 2.1)** exhibited a wide range of groundwater elevations, from a minimum of 922.61 feet above mean sea level (MSL) at B3-EXW04 to a maximum of 1101.78 feet above MSL at CS-MW4-LGR. Groundwater elevations are generally higher in the northern and central portions of CSSA, and decrease to the southwest and southeast. As measured in all non-pumping LGR wells (MW-series), the average groundwater elevation in September 2015 decreased 132.75 feet from the elevations measured in June 2015. This significant decline in aquifer elevation is somewhat atypical, and generally follows large aquifer gains during abundant precipitation cycles such as previously seen in 2004, 2007, and 2010 in CSSA monitoring wells (**Figure 2.4**). This 3-month decline is the largest 3-month reduction in average groundwater elevation since the inception of the MW program in December 2002. Previously, the greatest reduction in average aquifer level occurred between September and December 2010 (-88.13 feet). This follows the historical trend that greater aquifer level loss quickly follows the larger aquifer gains.

Well CS-MW4-LGR, located in the central portion of CSSA, typically has one of the highest groundwater elevations of LGR-screened wells. Under average and above-average aquifer elevations, the groundwater level is 20 to 30 feet higher than the nearest comparable wells (CS-MW2-LGR and CS-MW5-LGR), creating a pronounced groundwater mound in the central portion of the facility. In September 2015 this mounding effect was observable as the elevation in CS-MW4-LGR was 62 feet and 64 feet higher than CS-MW2-LGR and

Table 2.1
Measured Groundwater Elevation
September 2015

Well ID:	TOC elevation (ft MSL)	Depth to Groundwater (ft BTOC)	Groundwater Elevation (ft MSL)	Formations Screened LGR	BS	CC	Date
CS-1	1169.27	167.10	1002.17	X			9/15/2015
CS-2	**1237.59**	**222.25**	**1015.34**	X	?		9/15/2015
CS-3	1240.17	221.28	1018.89	X			9/15/2015
CS-4	1229.28	210.50	1018.78	X			9/15/2015
CS-10	**1331.51**	**310.00**	**1021.51**	ALL			9/15/2015
CS-12	**1274.09**	**254.90**	**1019.19**	ALL			9/15/2015
CS-13	**1193.26**	**175.25**	**1018.01**	ALL			9/15/2015
CS-D	1236.03	219.42	1016.61	X			9/15/2015
CS-MWG-LGR	1328.14	284.29	1043.85	X			9/15/2015
CS-MWH-LGR	1319.19	300.10	1019.09	X			9/15/2015
CS-I	1315.20	272.65	1042.55	X			9/15/2015
CS-MW1-LGR	1220.73	189.28	1031.45	X			9/15/2015
CS-MW1-BS	1221.09	175.42	1045.67		X		9/15/2015
CS-MW1-CC	1221.39	219.41	1001.98			X	9/15/2015
CS-MW2-LGR	1237.08	197.32	1039.76	X			9/15/2015
CS-MW2-CC	1240.11	229.41	1010.70			X	9/15/2015
CS-MW3-LGR	1334.14	302.44	1031.70	X			9/15/2015
CS-MW4-LGR	1209.71	107.93	1101.78	X			9/15/2015
CS-MW5-LGR	1340.24	302.47	1037.77	X			9/15/2015
CS-MW6-LGR	1232.25	203.55	1028.70	X			9/15/2015
CS-MW6-BS	1232.67	141.46	1091.21		X		9/15/2015
CS-MW6-CC	1233.21	207.22	1025.99			X	9/15/2015
CS-MW7-LGR	1202.27	182.50	1019.77	X			9/15/2015
CS-MW7-CC	1201.84	182.05	1019.79			X	9/15/2015
CS-MW8-LGR	1208.35	183.07	1025.28	X			9/15/2015
CS-MW8-CC	1206.13	185.00	1021.13			X	9/15/2015
CS-MW9-LGR	1257.27	238.13	1019.14	X			9/15/2015
CS-MW9-BS	1256.73	221.82	1034.91		X		9/15/2015
CS-MW9-CC	1255.95	250.03	1005.92			X	9/15/2015
CS-MW10-LGR	1189.53	182.60	1006.93	X			9/15/2015
CS-MW10-CC	1190.04	188.55	1001.49			X	9/15/2015
CS-MW11A-LGR	1204.03	191.74	1012.29	X			9/15/2015
CS-MW11B-LGR	1203.52	186.11	1017.41	X			9/15/2015
CS-MW12-LGR	1259.07	234.98	1024.09	X			9/15/2015
CS-MW12-BS	1258.37	209.00	1049.37		X		9/15/2015
CS-MW12-CC	1257.31	248.73	1008.58			X	9/15/2015
CS-MW16-LGR	1244.60	223.36	1021.24	X			9/15/2015
CS-MW16-CC*	1244.51	340.21	904.30			X	9/15/2015
B3-EXW01	1245.26	240.20	1005.06	X			9/15/2015
B3-EXW02*	1249.66	311.50	938.16	X			9/15/2015
B3-EXW03*	1235.11	261.90	973.21	X			9/15/2015
B3-EXW04*	1228.46	305.85	922.61	X			9/15/2015
B3-EXW05	1279.46	253.70	1025.76	X			9/15/2015
CS-MW17-LGR	1257.01	227.95	1029.06	X			9/15/2015
CS-MW18-LGR	1283.61	261.80	1021.81	X			9/15/2015
CS-MW19-LGR	1255.53	213.45	1042.08	X			9/15/2015
CS-MW20-LGR	1209.42	158.47	1050.95	X			9/15/2015
CS-MW21-LGR	1184.53	153.78	1030.75	X			9/15/2015
CS-MW22-LGR	1280.49	257.97	1022.52	X			9/15/2015
CS-MW23-LGR	1258.20	238.40	1019.80	X			9/15/2015
CS-MW24-LGR	1253.90	237.98	1015.92	X			9/15/2015
CS-MW25-LGR	1293.01	263.95	1029.06	X			9/15/2015
CS-MW35-LGR	1186.97	177.35	1009.62	X			9/15/2015
CS-MW36-LGR	1218.74	191.90	1026.84	X			9/15/2015
FO-20	**1045.25**	**NA**	**1045.25**	ALL			9/15/2015
Number of wells screened in each formation.				**38**	**4**	**9**	
Average groundwater elevation in each formation given in feet (non pumping wells).				**1027.92**	**1055.29**	**1011.95**	

Notes:

Bold wells: CS-2, CS-9, CS-10, CS-12, CS-13, and FO-20 are open boreholes across more than one formational u

? = Exact screening information unknown for this well.

Shaded wells are routinely pumped for either domestic, livestock, or environmental remediation purposes, and therefore are not used in calculating statistics.

CS-1, CS-9, CS-10, CS-12, and CS-13 are current, inactive, or future drinking water wells.

CS-MW16-LGR, CS-MW16-CC, B3-EXW01 through B3-EXW05 pumps are cycling continuously to feed the B-3 Bioreactor.

* = submersible pump running at time of water level measurement.

Formational average groundwater elevation is calculated from non-pumping wells screened in only one format

All measurements given in feet.

NA = Data not available

Table 2.2
Change in Groundwater Elevation from Previous Quarter
September 2015

Well ID	June 2015 Elevations	Sept. 2015 Elevations	GW elevation change (June minus Sept.)	Formations Screened LGR	BS	CC
CS-1	1037.49	1002.17	**-35.32**	X		
CS-2	**1187.80**	**1015.34**	**-172.46**	X	?	
CS-3	1178.14	1018.89	-159.25	X		
CS-4	1175.42	1018.78	-156.64	X		
CS-10	**1164.61**	**1021.51**	-143.10		ALL	
CS-12	**1122.69**	**1019.19**	-103.50		ALL	
CS-13	**1108.48**	**1018.01**	**-90.47**		ALL	
CS-D	1164.55	1016.61	-147.94	X		
CS-MWG-LGR	1138.50	1043.85	-94.65	X		
CS-MWH-LGR	1157.21	1019.09	-138.12	X		
CS-I	1149.40	1042.55	-106.85	X		
CS-MW1-LGR	1168.48	1031.45	-137.03	X		
CS-MW1-BS	1041.73	1045.67	3.94		X	
CS-MW1-CC	1084.70	1001.98	-82.72			X
CS-MW2-LGR	1147.14	1039.76	-107.38	X		
CS-MW2-CC	1044.09	1010.70	-33.39			X
CS-MW3-LGR	1138.42	1031.70	-106.72	X		
CS-MW4-LGR	1183.06	1101.78	-81.28	X		
CS-MW5-LGR	1138.52	1037.77	-100.75	X		
CS-MW6-LGR	1163.96	1028.70	-135.26	X		
CS-MW6-BS	1129.85	1091.21	-38.64		X	
CS-MW6-CC	1130.37	1025.99	-104.38			X
CS-MW7-LGR	1163.95	1019.77	-144.18	X		
CS-MW7-CC	1136.44	1019.79	-116.65			X
CS-MW8-LGR	1161.15	1025.28	-135.87	X		
CS-MW8-CC	1135.13	1021.13	-114.00			X
CS-MW9-LGR	1177.86	1019.14	-158.72	X		
CS-MW9-BS	1156.21	1034.91	-121.30		X	
CS-MW9-CC	1123.46	1005.92	-117.54			X
CS-MW10-LGR	1152.43	1006.93	-145.50	X		
CS-MW10-CC	1149.35	1001.49	-147.86			X
CS-MW11A-LGR	1157.10	1012.29	-144.81	X		
CS-MW11B-LGR	1061.08	1017.41	-43.67	X		
CS-MW12-LGR	1176.01	1024.09	-151.92	X		
CS-MW12-BS	1107.99	1049.37	-58.62		X	
CS-MW12-CC	1116.75	1008.58	-108.17			X
CS-MW16-LGR	1154.65	1021.24	-133.41	X		
CS-MW16-CC*	1075.62	904.30	-171.32			X
B3-EXW01	978.86	1005.06	26.20	X		
B3-EXW02*	1129.36	938.16	-191.20	X		
B3-EXW03*	1186.41	973.21	-213.20	X		
B3-EXW04*	1190.06	922.61	-267.45	X		
B3-EXW05	1128.16	1025.76	-102.40	X		
CS-MW17-LGR	1150.73	1029.06	-121.67	X		
CS-MW18-LGR	1169.26	1021.81	-147.45	X		
CS-MW19-LGR	1173.93	1042.08	-131.85	X		
CS-MW20-LGR	1171.03	1050.95	-120.08	X		
CS-MW21-LGR	1157.21	1030.75	-126.46	X		
CS-MW22-LGR	1158.46	1022.52	-135.94	X		
CS-MW23-LGR	1167.90	1019.80	-148.10	X		
CS-MW24-LGR	1181.90	1015.92	-165.98	X		
CS-MW25-LGR	1149.39	1029.06	-120.33	X		
CS-MW35-LGR	1154.44	1009.62	-144.82	X		
CS-MW36-LGR	1162.06	1026.84	-135.22	X		
FO-20	**1170.12**	**1045.25**	**-124.87**		ALL	
Average groundwater elevation change (all wells minus pumping wells)			**-119.17**			
Average groundwater elevation change in each formation (non pumping wells)				**-135.05**	**-53.66**	**-103.09**

Notes:

Bold wells: CS-2, CS-9, CS-10, CS-12, CS-13, and FO-20 are open boreholes across more than one formational unit.

? = Exact screening information unknown for this well.

Shaded wells are routinely pumped for either domestic, livestock, or environmental remediation purposes, and therefore are not used in calculating statistics.

CS-1, CS-9, CS-10, CS-12, and CS-13 are current, inactive, or future drinking water wells.

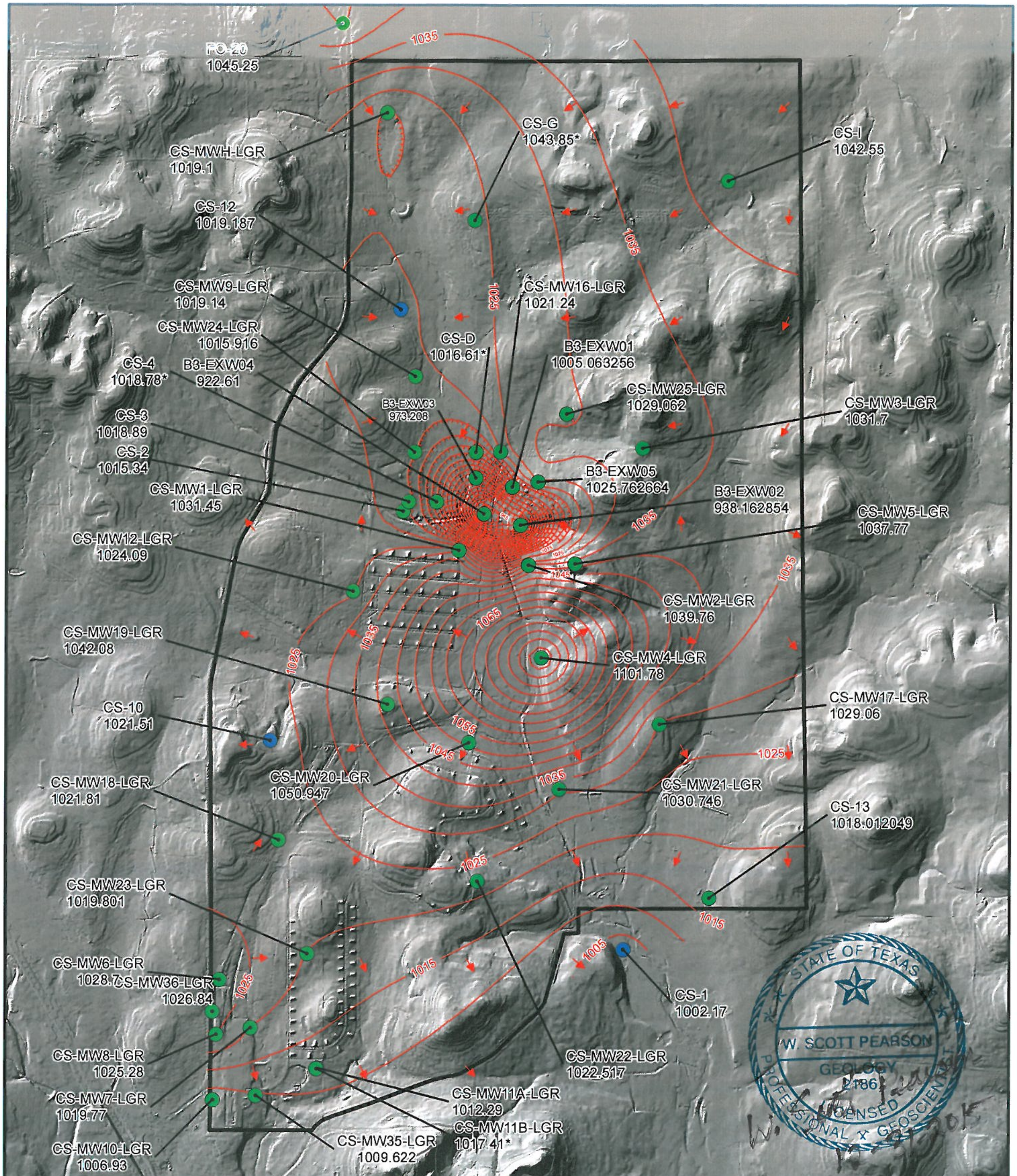
CS-MW16-LGR, CS-MW16-CC, B3-EXW01 through B3-EXW05 pumps are cycling continuously to feed the B-3 Bioreactor.

* = submersible pump running at time of water level measurement.

Formational average groundwater elevation change is calculated from non-pumping wells screened in only one formation.

All measurements given in feet.

NA = Data not available



N
W E
S

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

Flow direction

Outer fence

LGR Groundwater Contours

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 2.1

September 2015 Potentiometric Surface Map, LGR Wells

Camp Stanley Storage Activity

PARSONS

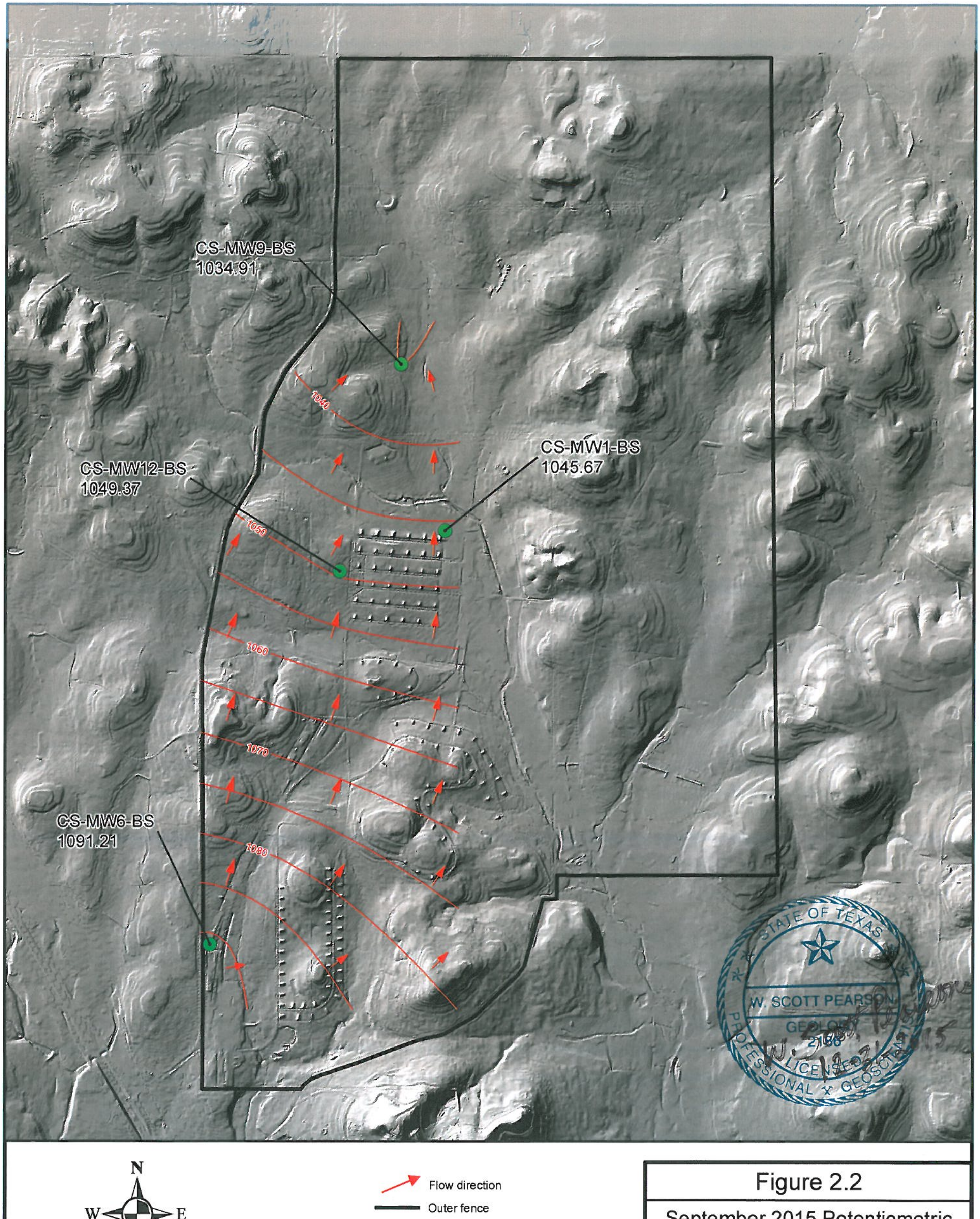


Figure 2.2

September 2015 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

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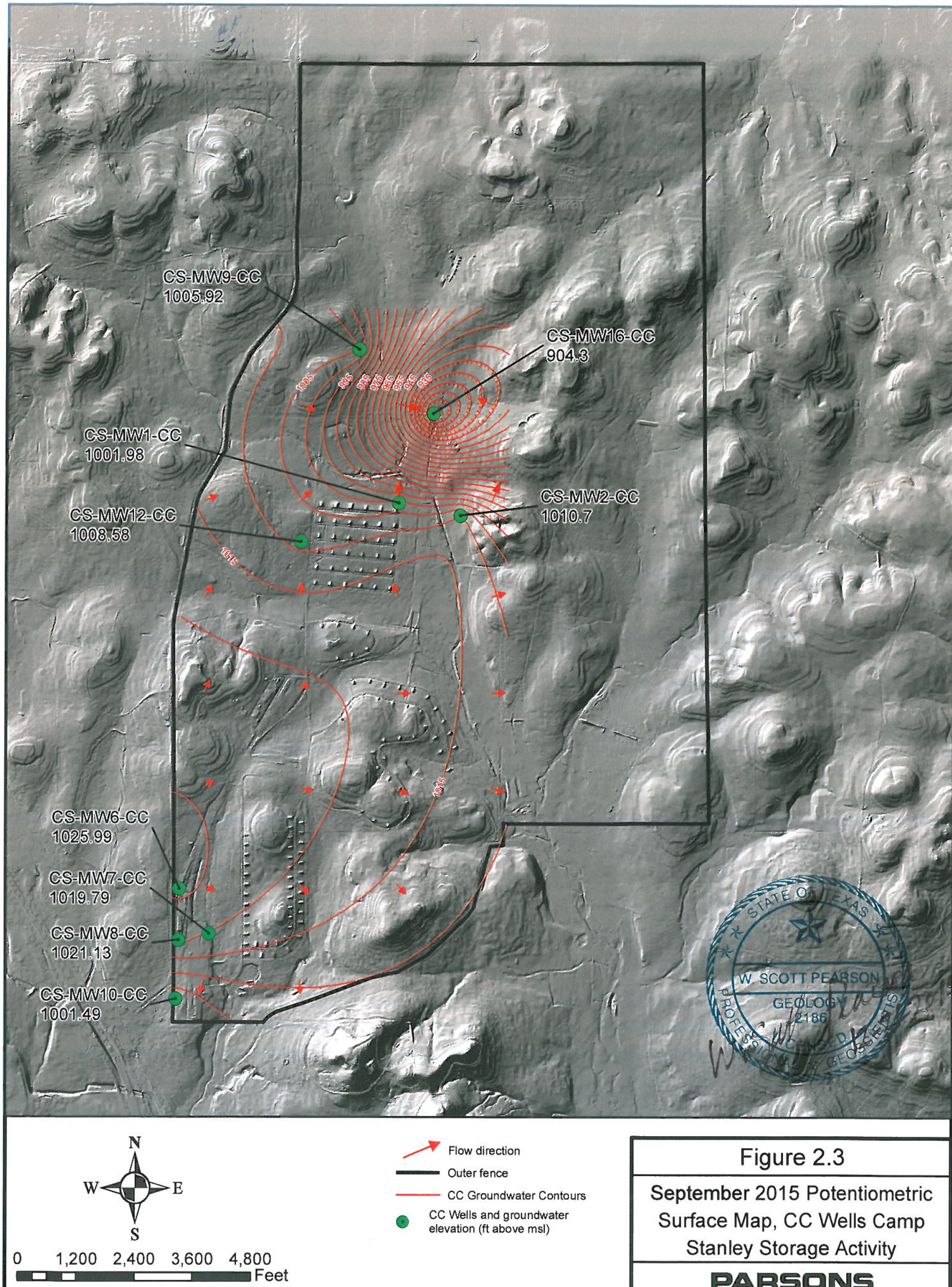
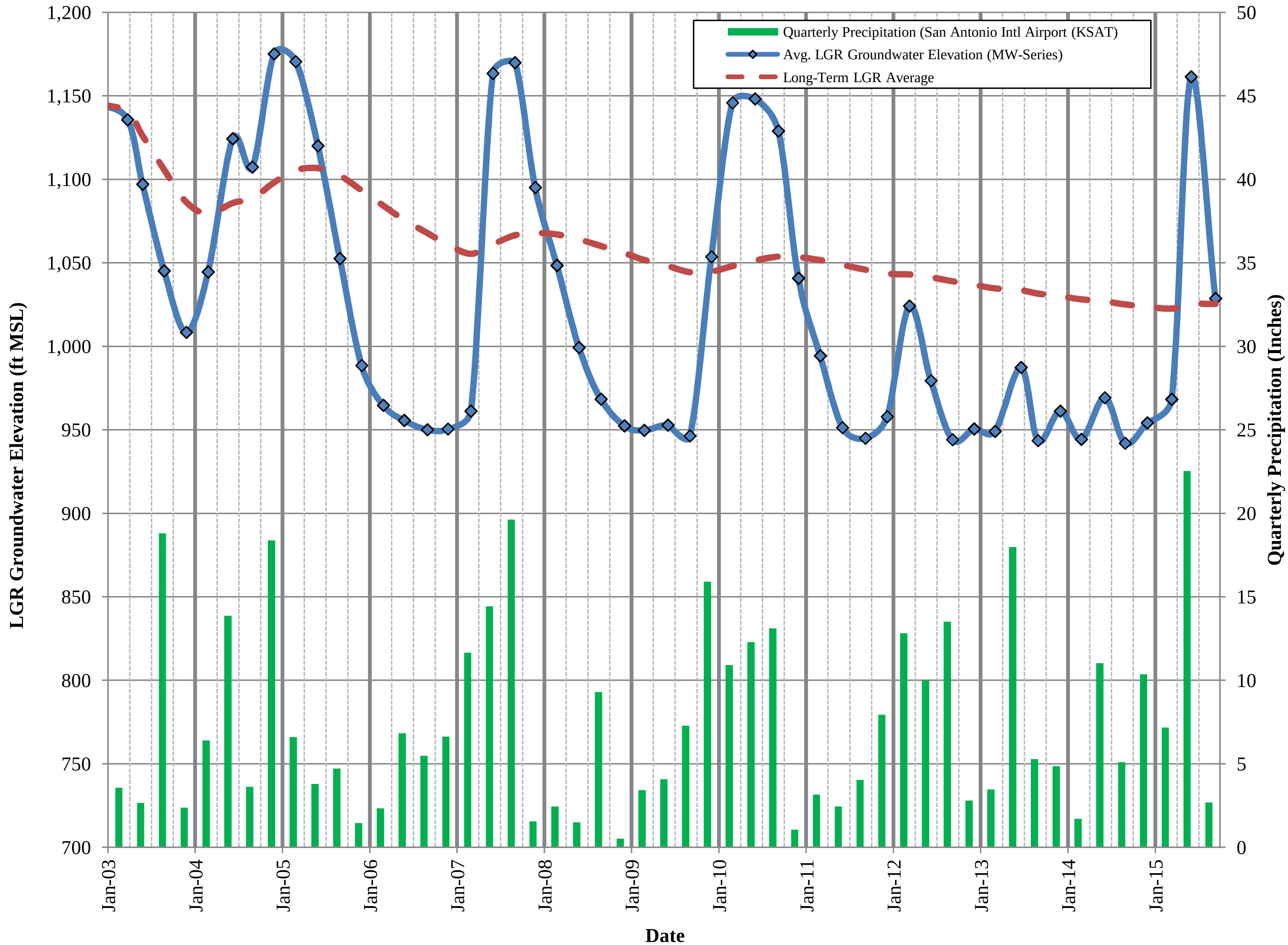


Figure 2.3

September 2015 Potentiometric Surface Map, CC Wells Camp Stanley Storage Activity

Figure 2.4 - Average LGR Groundwater Elevations and Quarterly Precipitation



CS-MW5-LGR, respectively. Long-term monitoring has ascertained that when groundwater in the vicinity of CS-MW4-LGR rises above about 970 feet MSL, the mounding effect is evident. As measured in September 2015, the water elevation at CS-MW4-LGR was 1101.78 feet MSL, and the typical mounding effect was discernible.

Notable for September 2015 is a strong westward flow component in the northern half of the facility. Typically, the flow gradient in the North Pasture is strongly southward. However, during this monitoring event a surprisingly depressed water elevation (1,019.09 feet MSL) was measured in well CS-MWH-LGR, thereby creating a westward gradient towards Ralph Fair Road. Normally, the groundwater elevation is slightly higher than well CS-I, which had a recorded elevation of 1,042.55 ft MSL in September 2015. The source of the depressed water level measurement may range from a field collection error to direct response to a pumping influence from a nearby well, such as FO-21 located 1,000 feet northwest of CS-MWH-LGR at the Fair Oaks Elementary School.

It should be noted that well pumping on and around CSSA affects the potentiometric surface. On-post wells CS-MW16-LGR, CS-MW16-CC, B3-EXW01, B3-EXW02, B3-EXW03, B3-EXW04, and B3-EXW05 are cyclically pumped as part of the Bioreactor remediation system at Solid Waste Management Unit (SWMU) B-3. These remediation wells provide groundwater to the Bioreactor system, and are automatically operated based upon water level within each well.

CSSA drinking water wells CS-1, CS-10, and CS-12 are also cycled on and off to maintain the drinking water system currently in place at CSSA. Influence from the pumping of the Bioreactor wells B3-EXW01 through B3-EXW05 and CS-12 are manifested as "cones of depression" in **Figure 2.1**. The Bioreactor cone of depression is induced into the aquifer to extract contaminated water within its direct zone of influence, and otherwise retard the flow of the groundwater that cannot be directly captured by the extraction wells away from the site. Off-post water supply wells along Ralph Fair Road may also exert a subtle influence to gradients along the western and southern boundaries of the post.

It should be noted that well pumping on and around CSSA affects the potentiometric surface. On-post wells CS-MW16-LGR, CS-MW16-CC, B3-EXW01, B3-EXW02, B3-EXW03, B3-EXW04, and B3-EXW05 are cyclically pumped as part of the Bioreactor remediation system at Solid Waste Management Unit (SWMU) B-3. These remediation wells provide groundwater to the Bioreactor system, and are automatically operated based upon water level within each well. CSSA drinking water wells CS-1, CS-10, and CS-12 are also cycled on and off to maintain the drinking water system currently in place at CSSA. Influence from the pumping of the Bioreactor wells B3-EXW01 through B3-EXW05 are manifested as "cones of depression" in **Figure 2.1**. The Bioreactor cone of depression is induced into the aquifer to extract contaminated water within its direct zone of influence, and otherwise retard the flow of the groundwater that cannot be directly captured by the extraction wells away from the site. Off-post water supply wells along Ralph Fair Road may also exert a subtle influence to gradients along the western and southern boundaries of the post.

Historical groundwater monitoring at CSSA has demonstrated that the aquifer gradient typically slopes in a south-southeast direction (**Figure 2.1**); however, variable aquifer levels and well-pumping scenarios can affect the localized and regional gradients. In particular, pumping action at wells CS-1, CS-10, CS-MW16-LGR/CC, B3-EXW01 through B3-EXW05, CS-I, and even off-post wells (Fair Oaks Ranch) can significantly alter the LGR groundwater gradient. The regional gradient calculation, an overall groundwater gradient averaged across CSSA, is measured from CS-MWH-LGR to CS-MW21-LGR. However, this standard measurement is erroneous for September 2015, resulting in a countersloped northerly gradient of 0.00085 ft/ft. Localized gradients of 0.0034 ft/ft to west-southwest were measured between CS-1 and CS-MW9-LGR in the North Pasture and 0.0053 ft/ft to the south between CS-MW21-LGR and CS-1. The latter gradient of 0.0053 ft/ft is fairly typical of a regional groundwater gradient measured in prior events.

Under normal conditions, the potentiometric surface in both the BS and CC members of the aquifer generally trend in a southerly direction, like the LGR. However, the BS potentiometric surface has a distinctly northerly gradient towards CS-MW9-BS (**Figure 2.2**), with an average groundwater elevation of 1,055 feet MSL. The last time the BS had a northerly gradient was in December 2010 with an average groundwater elevation of 1,060.8 feet MSL. Not surprisingly, the December 2010 event also experienced a similar aquifer decline following a rapid recharge event. The hydrologic conditions in the BS are nearly identical to December 2010, with similar hydrologic results.

Likewise, the September 2015 CC potentiometric surface (**Figure 2.3**) remarkably mimics the same potentiometric map developed in December 2010, during the last period when average groundwater elevations were approximately 1,000 feet MSL. Like December 2010, the CC aquifer also shows a predominantly east-southeasterly flow gradient which is interrupted by a well-developed cone of depression around well CS-MW16-CC. That well is used for continuous groundwater extraction for the SWMU B-3 Bioreactor system.

Groundwater elevations have been measured and recorded since 1992. Previous droughts resulted in water levels decreasing substantially in 1996, 1999, 2000, 2006, 2008, 2009, 2011 through 2014. Above average rain (approximately 22 inches) fell in the second quarter of 2015,resulting in approximately 193 feet of aquifer level gain in the area. Most of that elevation gain was negated by a 133-foot aquifer loss during the dry spell between July and September 2015. In September 2015, the basewide average level in the LGR wells fell to 1,028.7 feet MSL. Incredibly, the September 2015 LGR groundwater average elevation (1,028.7 feet) is nearly equivalent (+3.4 feet) to the long-term (12.75 year) average groundwater elevation (1,025.3 feet MSL).

It is worth noting that, based on more than 12 years of program history, the basewide LGR groundwater level has declined by 120 feet (see **Figure 2.4**). As can be expected with sparse data sets, the largest rate of change/decline (90 feet) came during the initial 4 years of the groundwater monitoring program. Over the past 8 years, the average decline rate has subdued, losing an additional 30 feet of average groundwater elevation over 7 years of prolonged drought. Above average groundwater elevations have been recorded only six times in the past 24 monitoring events (6 years). Prior to June and September 2015, the LGR had not been above the long-term “average” water elevation since September 2010.

3.0 SEPTEMBER ANALYTICAL RESULTS

3.1 Monitoring Wells

Under the provisions of the groundwater monitoring DQOs and the 2010 LTMO evaluation, the schedule for sampling on-post in September 2015 included five wells. The samples included three production wells (CS-1, CS-10, and CS-12), one future production well (CS-13), and one on-post monitoring well (see **Table 3.1)**. In conjunction with the off-post monitoring initiative (under a separate report) the September 2015 groundwater sampling constituted a "quarterly" event in which selected wells are sampled every quarter.

All wells scheduled for analytical monitoring in September 2015 were sampled. Additional samples were collected as part of the AOC-65 in-situ chemical oxidation (ISCO) Treatability Study; these results will be reported in a separate treatability study report. **Tables 3.1** and **3.2** provide a sampling overview for September 2015 and the schedule under the LTMO recommendations. The above-listed monitoring well was sampled using a dedicated low-flow gas-operated bladder pump. Wells CS-1, CS-10, CS-12, and CS-13 were sampled using dedicated electric submersible pumps. **Figure 3.1** shows well sampling locations.

Wells sampled by low-flow pumps were purged until the field parameters of pH, temperature, and conductivity stabilized. The on-post monitoring wells were sampled in September 2015 for the short list of volatile organic compounds (VOC) and metals (chromium, cadmium, lead, and mercury). Active and future drinking water wells CS-1, CS-10, CS-12, and CS-13 were analyzed for the short list of VOCs and metals (arsenic, barium, chromium, copper, zinc, cadmium, mercury, and lead).

Samples were analyzed by Agriculture & Priority Pollutant Laboratories (APPL) in Clovis, California. All detected concentrations of VOCs and metals are presented in **Table 3.3**. Full analytical results are presented in **Appendix B**.

Tetrachloroethene (PCE) and Trichloroethene (TCE) were detected above the Maximum Contaminant Level (MCL) of 5 micrograms per liter (µg/L) in one on-post well sampled this quarter: CS-MW36-LGR. A comparison of VOC concentrations versus water level for select wells is presented in **Figure 3.2**. The overall trend for CS-MW36-LGR sampled in September 2015 was a slight increase in VOC concentrations coupled with a significant decrease in groundwater elevation. In September 2015, no metals were detected above the MCL/AL/SS for wells sampled.

Results from on-post monitoring wells are considered definitive data and are subject to data validation and verification under provisions of the CSSA Quality Assurance Project Plan (QAPP). Parsons data packages numbered 810000-#67, -#71 containing the analytical results from this sampling event, were received by Parsons October 8 through 13, 2015. Data validation was conducted and the data validation reports are presented in **Appendix C**.

Table 3.1
Overview of the On-Post Monitoring Program

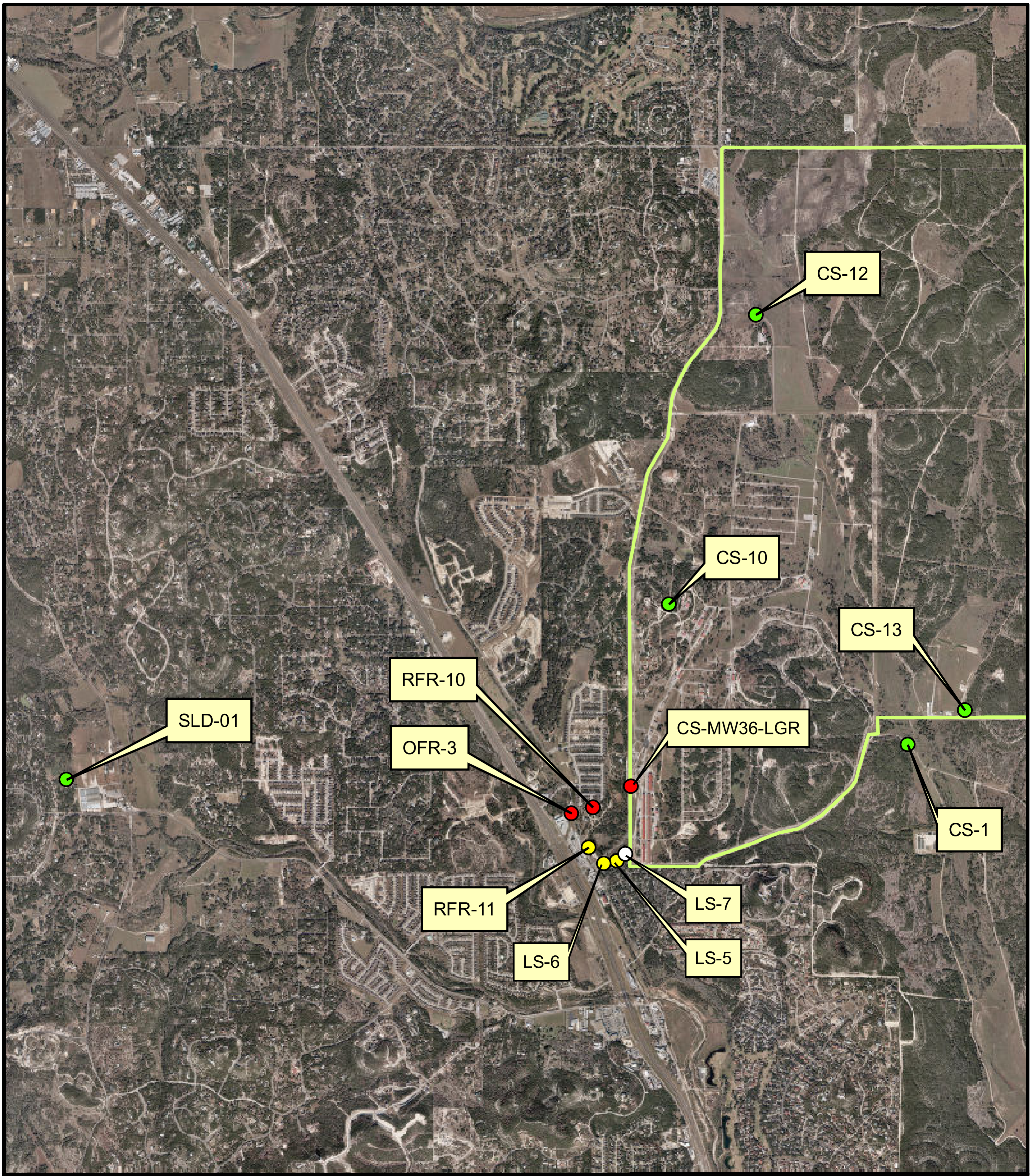
Count	Well ID	*Analytes*	*Last Sample Date*	*Dec-14*	*Mar-15 (9 mo. snapshot)*	*Jun-15*	*Sep-15*	*Sampling Frequency **
	CS-MW1-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	S	NS	Semi-annual + 9 month snapshot
	CS-MW1-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW1-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Sep-14	NS	NS	NS	NS	Every 18 months
	CS-MW2-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	S	NS	Semi-annual + 9 month snapshot
	CS-MW2-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
	CS-MW3-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW4-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW5-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
ISCO	CS-MW6-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	S	S	NS	NS	Every 9 months
	CS-MW6-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW6-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
ISCO	CS-MW7-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	S	S	NS	NS	Every 9 months
	CS-MW7-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
ISCO	CS-MW8-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	S	S	S	NS	Semi-annual + 9 month snapshot
	CS-MW8-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
	CS-MW9-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW9-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW9-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
	CS-MW10-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	S	NS	Semi-annual + 9 month snapshot
	CS-MW10-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	Every 18 months
	CS-MW11A-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	S	NS	Semi-annual + 9 month snapshot
	CS-MW11B-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-12	NS	NSWL	NS	NS	Every 9 months
	CS-MW12-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW12-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW12-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
	CS-MW16-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW16-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CW-MW17-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW18-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW19-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
1	CS-1	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-15	S	S	S	S	Quarterly
	CS-2	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-4	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-13	NS	NSWL	S	NS	Semi-annual + 9 month snapshot
	CS-9	VOCs & metals (Cr, Cd, Hg, Pb)	Sep-13	NS	NS	NS	NS	pump out
2	CS-10	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-15	S	S	S	S	Quarterly
3	CS-12	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-15	S	S	S	S	Quarterly
4	CS-13	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-15	S	S	S	S	Quarterly
	CS-D	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NSWL	S	NS	Semi-annual + 9 month snapshot
	CS-MWG-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
	CS-MWH-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
	CS-I	VOCs & metals (Cr, Cd, Hg, Pb)	Jun-14	NS	NS	NS	NS	Every 18 months
	CS-MW20-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW21-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW22-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW23-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW24-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	S	NS	Semi-annual + 9 month snapshot
	CS-MW25-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	NS	NS	Every 9 months
	CS-MW35-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	NS	S	S	NS	Semi-annual + 9 month snapshot
5/ISCO	CS-MW36-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-15	S	S	S	S	Quarterly

* New LTMO sampling frequency implemented June 2011
S = Sample
NS = No Sample
NSWL = No Sample due to low water level
ISCO = well sampled as part of treatability study

Table 3.2 Westbay Sampling Frequency

Westbay Interval	Last Sample Date	Dec-14 (9 month)	Mar-15 (snapshot)	Jun-15	Sep-15 (18 month)	LTMO Sampling Frequency (as of June '11)
CS-WB01-UGR-01	Dec-04	NSWL	NS	NS	S	Every 9 months
CS-WB01-LGR-01	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-02	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-03	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-04	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-05	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-06	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-07	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-08	Dec-14	S	NS	NS	S	Every 9 months
CS-WB01-LGR-09	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB02-UGR-01	Dec-04	NSWL	NS	NS	S	Every 9 months
CS-WB02-LGR-01	Dec-14	S	NS	NS	S	Every 9 months
CS-WB02-LGR-02	Mar-10	NSWL	NS	NS	S	Every 9 months
CS-WB02-LGR-03	Dec-14	S	NS	NS	S	Every 9 months
CS-WB02-LGR-04	Dec-14	S	NS	NS	S	Every 9 months
CS-WB02-LGR-05	Dec-14	S	NS	NS	S	Every 9 months
CS-WB02-LGR-06	Dec-14	S	NS	NS	S	Every 9 months
CS-WB02-LGR-07	Dec-14	S	NS	NS	S	Every 9 months
CS-WB02-LGR-08	Dec-14	S	NS	NS	S	Every 9 months
CS-WB02-LGR-09	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB03-UGR-01	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-01	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-02	Oct-07	NSWL	NS	NS	S	Every 9 months
CS-WB03-LGR-03	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-04	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-05	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-06	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-07	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-08	Dec-14	S	NS	NS	S	Every 9 months
CS-WB03-LGR-09	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB04-UGR-01	Mar-04	NSWL	NS	NS	S	Every 9 months
CS-WB04-LGR-01	Sep-14	NS	NS	NS	S	Every 18 months
CS-WB04-LGR-02	Mar-14	NS	NS	NS	S	Every 18 months
CS-WB04-LGR-03	Mar-14	NS	NS	NS	S	Every 18 months
CS-WB04-LGR-04	Mar-14	NS	NS	NS	S	Every 18 months
CS-WB04-LGR-06	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB04-LGR-07	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB04-LGR-08	Dec-14	S	NS	NS	S	Every 9 months
CS-WB04-LGR-09	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB04-LGR-10	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB04-LGR-11	Mar-15	S	S	NS	S	Every 9 months + snapshot
CS-WB04-BS-01	Mar-14	NS	NS	NS	S	Every 18 months
CS-WB04-BS-02	Mar-14	NS	NS	NS	S	Every 18 months
CS-WB04-CC-01	Mar-14	NS	NS	NS	S	Every 18 months
CS-WB04-CC-02	Mar-14	NS	NS	NS	S	Every 18 months
CS-WB04-CC-03	Mar-14	NS	NS	NS	S	Every 18 months

Profiling performed quarterly, in conjunction with post wide water levels.



N
W E
S

0 0.5 1 Miles

Sep2015_Sampled_Wells

- > MCL (VOC's) only
- > RL (VOC's) only
- > MDL (VOC's) only
- ND

Figure 3.1

On-Post and Off-Post Well Sampling Locations for September 2015

Camp Stanley Storage Activity

PARSONS

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Table 3.3
September 2015 On-Post Quarterly Groundwater Results, Detected Analytes

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CS-MW36-LGR	9/11/2015	NA	NA	--	**0.0126**	NA	--	NA	--
CSSA Drinking Water Well System									
CS-1	9/15/2015	**0.0008F**	**0.0324**	--	--	--	--	**0.148**	--
CS-10	9/15/2015	**0.0008F**	**0.037**	--	--	**0.005F**	--	**0.062**	--
CS-12	9/15/2015	--	**0.0282**	--	--	**0.096**	--	**0.126**	--
CS-13	9/14/2015	**0.0058F**	**0.0272**	--	**0.0011F**	**0.013**	--	**0.232**	--
CS-13 FD	9/14/2015	**0.0044F**	**0.0274**	--	**0.0011F**	**0.009F**	--	**0.242**	--
Comparison Criteria									
Method Detection Limit (MDL)		**0.00022**	**0.0003**	**0.0005**	**0.001**	**0.003**	**0.0019**	**0.008**	**0.0001**
Reporting Limit (RL)		**0.03**	**0.005**	**0.007**	**0.01**	**0.01**	**0.025**	**0.05**	**0.001**
Max. Contaminant Level (MCL)		**0.01**	**2**	**0.005**	**0.1**	**AL=1.3**	**AL=0.015**	**SS=5.0**	**0.002**

Well ID	Sample Date	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	Vinyl Chloride
CS-MW36-LGR	9/11/2015	--	**0.36F**	--	**13.21**	**12.01**	--
CSSA Drinking Water Well System							
CS-1	9/15/2015	--	--	--	--	--	--
CS-10	9/15/2015	--	--	--	--	--	--
CS-12	9/15/2015	--	--	--	--	--	--
CS-13	9/14/2015	--	--	--	--	--	--
CS-13 FD	9/14/2015	--	--	--	--	--	--
Comparison Criteria							
Method Detection Limit (MDL)		**0.12**	**0.07**	**0.08**	**0.06**	**0.05**	**0.08**
Reporting Limit (RL)		**1.2**	**1.2**	**0.6**	**1.4**	**1**	**1.1**
Max. Contaminant Level (MCL)		**7**	**70**	**100**	**5**	**5**	**2**

BOLD	≥ MDL
BOLD (blue)	≥ RL
BOLD (red)	≥ MCL

Precipitation per Quarter:	Mar-15	Jun-15	Sep-15
Weather Station South (WS-S):	5.52	15.44	3.66
Weather Station North (WS-N):	7.95	18.62	6.76

All samples were analyzed by APPL, Inc.
VOC data reported in ug/L & metals data reported in mg/L.

Abbreviations/Notes:

FD	Field Duplicate
TCE	Trichloroethene
PCE	Tetrachloroethene
DCE	Dichloroethene
AL	Action Level
SS	Secondary Standard
NA	Not Analyzed for this parameter

Data Qualifiers:
--The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.
F-The analyte was positively identified but the associated numerical value is below the RL.

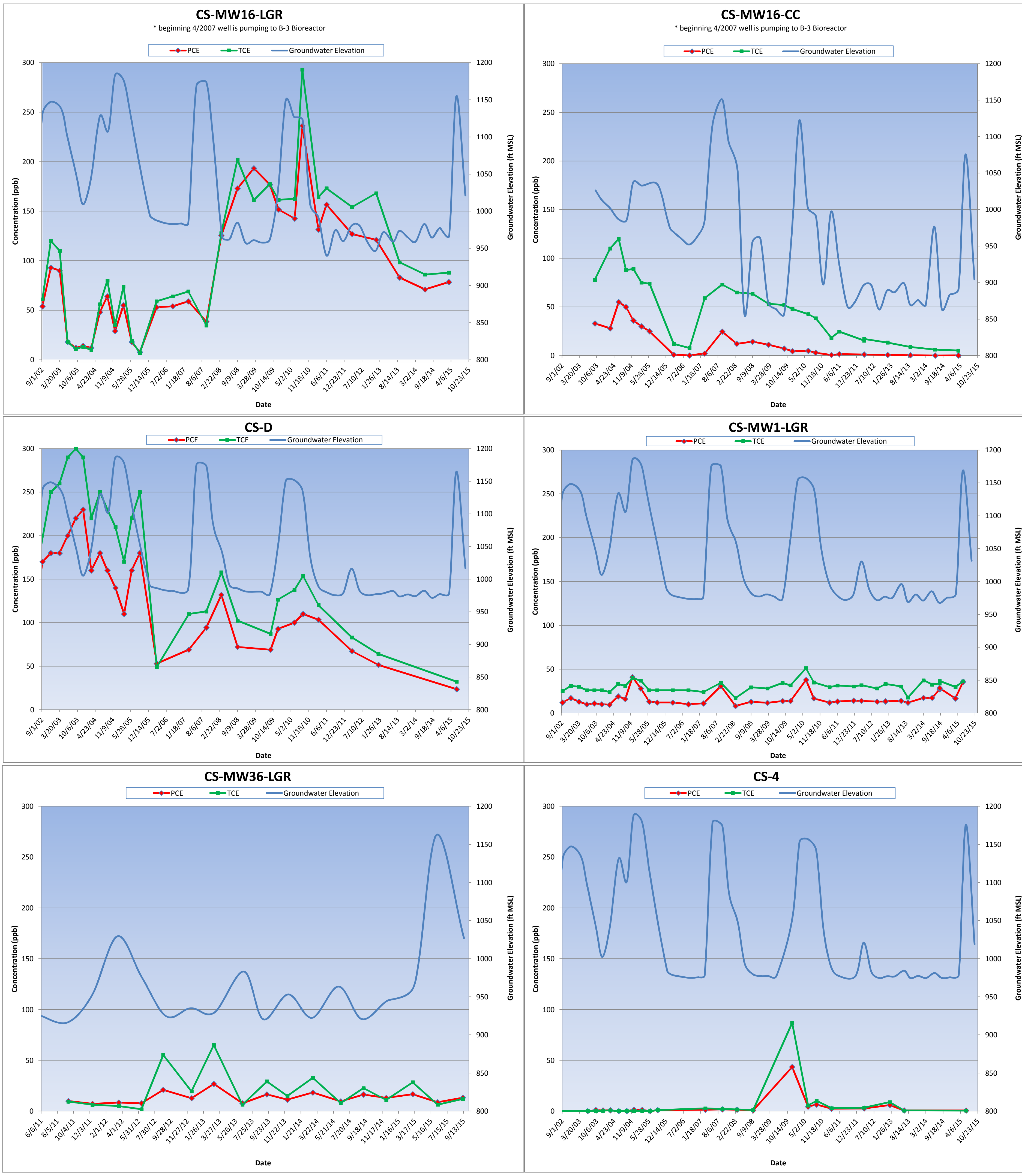
Table 3.4
September 2015 Westbay Analytical Results, Detected Analytes

Well ID	Date Sampled	1,1-DCE (1,1-dichloroethene)	cis-1,2-DCE (cis-1,2-dichloroethene)	TCE (trichloroethene)	PCE (tetrachloroethene)	trans-1,2-DCE (trans-1,2-dichloroethene)	Vinyl Chloride
CS-WB01-LGR-01	9/16/2015	--	--	**0.26F**	**1.30F**	--	--
CS-WB01-LGR-02	9/16/2015	--	--	**2.26**	**11.09**	--	--
CS-WB01-LGR-03	9/16/2015	--	--	**8.37**	**2.87**	--	--
CS-WB01-LGR-04	9/16/2015	--	**0.61F**	--	--	--	--
CS-WB01-LGR-05	9/16/2015	--	**0.24F**	**0.88F**	--	--	--
CS-WB01-LGR-06	9/16/2015	--	**0.92F**	**1.58**	--	--	--
CS-WB01-LGR-07	9/16/2015	--	**5.23**	**13.68**	**14.83**	--	--
CS-WB01-LGR-08	9/16/2015	--	**8.57**	**7.86**	**0.68F**	**0.31F**	--
CS-WB01-LGR-09	9/16/2015	--	**0.60F**	**14.37**	**12.41**	--	--
CS-WB02-LGR-03	9/23/2015	--	--	**0.26F**	**2.47**	--	--
CS-WB02-LGR-04	9/23/2015	--	--	**5.74**	**3.38**	--	--
CS-WB02-LGR-05	9/23/2015	--	**0.17F**	**1.84**	**0.79F**	--	--
CS-WB02-LGR-06	9/23/2015	--	**0.43F**	**2.39**	**4.61**	**0.23F**	--
CS-WB02-LGR-07	9/23/2015	--	**0.29F**	**1.22**	**0.34F**	--	--
CS-WB02-LGR-08	9/23/2015	--	**2.45**	**0.54F**	--	**0.39F**	--
CS-WB02-LGR-09	9/23/2015	--	**0.20F**	**7.31**	**9.43**	--	--
CS-WB03-UGR-01	9/21/2015	--	**21.70F****	**216.25****	**23737.01*****	--	--
CS-WB03-LGR-01	9/21/2015	--	**0.85F**	**26.33**	**621.09***	--	--
CS-WB03-LGR-03	9/21/2015	--	--	**1.96**	**7.28**	--	--
CS-WB03-LGR-04	9/21/2015	--	--	**5.67**	**18.61**	--	--
CS-WB03-LGR-05	9/21/2015	--	--	**2.44**	**16.74**	--	--
CS-WB03-LGR-06	9/21/2015	--	**5.53**	--	--	--	--
CS-WB03-LGR-07	9/21/2015	--	**2.6**	**5.43**	**1.71**	--	--
CS-WB03-LGR-08	9/21/2015	--	**2.4**	**0.39F**	--	--	--
CS-WB03-LGR-09	9/17/2015	--	**0.49F**	**4.39**	**4.61**	--	--
CS-WB04-LGR-01	9/22/2015	--	--	--	**1.67**	--	--
CS-WB04-LGR-03	9/22/2015	--	--	--	**0.34F**	--	--
CS-WB04-LGR-04	9/22/2015	--	**0.27F**	**0.16F**	**0.40F**	--	--
CS-WB04-LGR-06	9/22/2015	--	**5.1**	**12.09**	**16.68**	**0.25F**	--
CS-WB04-LGR-07	9/22/2015	--	**35.47**	**13.03**	**2.01**	**0.25F**	--
CS-WB04-LGR-08	9/22/2015	--	**0.47F**	**0.75F**	**0.82F**	--	--
CS-WB04-LGR-09	9/22/2015	--	--	**6.33**	**10.03**	--	--
CS-WB04-LGR-10	9/22/2015	--	--	**0.59F**	**2.2**	--	--
CS-WB04-LGR-11	9/22/2015	--	--	--	**1.5**	--	--
CS-WB04-BS-01	9/22/2015	--	--	--	**0.46F**	--	--
CS-WB04-BS-02	9/22/2015	--	--	--	**0.94F**	--	--
CS-WB04-CC-01	9/22/2015	--	**1.02F**	--	**0.84F**	--	--
CS-WB04-CC-02	9/22/2015	--	**0.21F**	--	**1.29F**	--	--
CS-WB04-CC-03	9/22/2015	--	**0.17F**	--	**6.66**	--	--
Comparison Criteria							
Method Detection Limit	**MDL**	**0.12**	**0.07**	**0.05**	**0.06**	**0.08**	**0.08**
Reporting Limit	**RL**	**1.2**	**1.2**	**1**	**1.4**	**0.6**	**1.1**
Max. Contaminant Level	**MCL**	**7**	**70**	**5**	**5**	**100**	**2**

Data Qualifiers
'--' indicates the result was non-detect.
F-The analyte was positively identified but the associated numerical value is below the RL.
* dilution of 10 run for this sample.
** dilution of 100 run for this sample.
*** dilution of 500 run for this sample.
All values are reported in µg/L.

BOLD	≥ MDL
BOLD (blue)	≥ RL
BOLD (red)	≥ MCL

Figure 3.2
On-Post Cumulative Analytical vs. Groundwater Elevation



NOTE: Sampling dates are indicated by the squares on the trend line.

3.2 Westbay-equipped Wells

Under the provisions of the groundwater monitoring LTMO recommendations, all 46 zones in the AOC-65 Westbay wells (CS-WB01, CS-WB02, CS-WB03, and CS-WB04) were scheduled for sampling in September 2015. These wells were also profiled to capture water level readings. These Westbay wells are located in the vicinity of AOC-65, and are part of the basewide quarterly groundwater monitoring program. The Upper Glen Rose (UGR)/LGR zones are sampled on a 9-month schedule, and the BS/CC zones are sampled on an 18-month schedule, as recommended in the LTMO. The sampling of these wells began in September 2003.

Of the 46 zones scheduled for sampling in September 2015, 39 samples were collected and the other 7 zones were dry (**Table 3.4**). A total of 29 zones had detections of either *cis*-1,2-DCE, PCE, or TCE above their respective reporting limits (RL). Of which, 17 of those zones were also in excess of the MCLS for either PCE and/or TCE. Five of these zones also had trace detections of *trans*-1,2-DCE reported at concentrations less than the RL (F- Flagged).

In WB01 several zones reported historic highs as well as first time detections for *cis*-1,2-DCE and *trans*-1,2-DCE. Zones WB01-LGR-04, -LGR06, -LGR-07, and -LGR-08 has historic high concentrations of *cis*-1,2-DCE. Zone -LGR-05 had its first detection of *cis*-1,2-DCE and zone -LGR-08 had its first detection of *trans*-1,2-DCE.

WB02 did not have as many fluctuations in contamination as the other 3 Westbays but zone -LGR-05 did have its first detection of *cis*-1,2-DCE.

The PCE and TCE concentrations in WB03 tripled since last quarter in zone -UGR-01. Zones -LGR-07 and -LGR-09 also showed significant increases in PCE and TCE concentrations. Zone -LGR-06 also reported its highest *cis*-1,2-DCE concentration to date.

WB04 has 6 zones with historic high PCE concentrations: -LGR-01, -LGR-03, -BS-01, -BS-02, -CC-01, -CC-03. Also in WB04 historic high concentrations of *cis*-1,2-DCE were detected in zones -LGR-04, -LGR-06, -LGR-07, and -CC-01. On the other hand the PCE concentration in WB04-LGR-11 decreased significantly from 444 µg/L in March 2015 to 1.5 µg/L in September 2015.

It should be noted that ISCO injections were performed at AOC-65 August 24 through 27, 2015 and included the application of approximately 3,500 gallons of chemical oxidants (permanganate solution) within the AOC-65 north, middle and southern infiltration cells to destroy contaminants. Once applied, the oxidant solution follows similar subsurface flow paths as contaminants and precipitation, destroying and releasing contaminants encountered (including PCE) from the host rock until the solution reactivity has been consumed. Contaminants mobilized from the host rock during this process are more readily transported downgradient following significant rain events when the flow paths are saturated. The significant concentrations changes noted above in the Westbay zones are a direct response to the ISCO injection conducted in August 2015.

There are four other Westbay wells (CS-WB05, CS-WB06, CS-WB07, and CS-WB08) that are located at the SWMU B-3 remediation site. Those wells are sampled on a separate schedule in association with the SWMU B-3 bioreactor monitoring. Results for those wells are presented in the SWMU B-3 Performance Status Reports.

4.0 SEPTEMBER 2015 SUMMARY

- Groundwater samples were collected from all 5 of the on-post wells scheduled for monitoring September 2015.
- From June 16 to September 24, 2015, CSSA's AOC-65 weather station recorded 3.66 inches of rain. The rainfall was sporadic, with a majority of the rain falling in the last few weeks of June, 2.41 inches. No events had greater than one inch of rain. The SWMU B-3 weather station measured 6.76 inches of precipitation for the same time period. This is a significant decrease in quarterly rainfall from last quarter which measured 15.44 inches at AOC-65 and 18.62 inches at B-3.
- The Middle Trinity aquifer levels (LGR, BS, and CC) decreased an average of 119.17 feet per non-pumping wells since last quarter. The average water level in September 2015 (excluding pumping wells) was 214.31 feet BTOC (1027.23 feet MSL).
- VOCs were detected above the MCL in well CS-MW36-LGR. The VOC levels in CS-MW36-LGR showed a moderate increase from the previous sampling event. **(see Figure 3.2)**.
- There were no metals detected above the MCL/AL/SS in wells sampled in September 2015.
- Thirty-nine of 46 Westbay Well zones (WB01-WB04), in the vicinity of AOC-65, were sampled in September 2015. Seven zones were not sampled because they were dry. These wells were also profiled to collect water level data in the area.
- At AOC-65, 3,500 gallons of permanganate solution was injected into the AOC-65 subsurface in August 2015. Once applied, the oxidant solution follows similar subsurface flow paths as contaminants and precipitation, destroying and releasing contaminants encountered (including PCE) from the host rock until the solution reactivity has been consumed. Direct responses to this injection event were measured in most of the Westbay multi-port zones as noted by significant increases in mobilized PCE, TCE, or DCE isomers. Concentrations are expected to decrease rapidly as the VOCs are destroyed by the oxidant material.
- In WB01 several zones reported historic highs as well as first time detections for *cis*-1,2-DCE and *trans*-1,2-DCE. WB02 did not have as many fluctuations in contamination as the other 3 Westbays, but zone -LGR-05 did have its first detection of *cis*-1,2-DCE. The PCE and TCE concentrations in WB03 tripled since last quarter in zone -UGR-01. WB04 has 6 zones with historic high PCE concentrations: -LGR-01, -LGR-03, -BS-01, -BS-02, -CC-01, -CC-03. Also in WB04 historic high concentrations of *cis*-1,2-DCE were detected in zones -LGR-04, -LGR-06, -LGR-07, and -CC-01.
- The groundwater project DQOs and LTMO, last revised in 2010, have been updated and will be submitted to the TCEQ and EPA for approval in January 2016.

APPENDIX A

EVALUATION OF DATA QUALITY OBJECTIVES ATTAINMENT

Appendix A 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, HSP, and LTMO recommendations.	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 on September 15, 2015.	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 September 15, 2015 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 every 9 or 18 months and 8 selected zones are sampled during the 'snapshot' event.	Yes.	Continue sampling.

Activity	Objectives	Action	Objective Attained?	Recommendations
Characterization of Environmental Setting (Hydrogeology) (Continued)	Identify any temporal changes in hydraulic gradients due to seasonal influences (2.1.5).	Downloaded data from continuous-reading transducers in wells: CS-MW4-LGR, CS-MW24-LGR. Additional continuous reading transducers were added to the program through the SCADA project. The following wells can be uploaded to see real time water level data: CS-MW16-LGR, CS-MW16-CC, CS-1, CS-12, and CS-10. Data was also downloaded from the AOC-65, B-3, and MW18 weather stations. Water levels will be graphed at these wells against precipitation data through December 2015 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 5 of 49 CSSA wells. The 4 BS wells are no longer sampled as part of the groundwater program.	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 (COC) 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 well: CS-MW36-LGR. Samples were analyzed for the short list of VOCs using USEPA method SW8260B, and metals (cadmium, lead, mercury, and chromium). The drinking water wells (CS-1, CS-10, CS-12 and CS-13) were sampled for the short list of VOCs and additional metals (arsenic, barium, copper, and zinc). Analyses were conducted in accordance with the CSSA QAPP and approved variances. All reporting limits (RL) were below MCLs, as listed below:	Yes.	Continue sampling.

Activity	Objectives	Action	Objective Attained?	Recommendations
Contamination Characterization (Ground Water Contamination) (Continued)	Determine the horizontal and vertical concentration profiles of all constituents of concern (COC) 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.	**ANALYTE** / **RL (µg /L)** / **MCL(µg/L)** 1,1-DCE / 1.2 / 7 *cis*-1,2-DCE / 1.2 / 70 *trans*-1,2-DCE / 0.6 / 100 PCE / 1.4 / 5 TCE / 1.0 / 5 Vinyl chloride / 1.1 / 2	Yes.	Continue sampling.
		ANALYTE / **RL (µg/L)** / **MCL/AL (µg /L)** Barium / 5 / 2,000 Chromium / 10 / 100 Copper / 10 / 1,300 Zinc / 50 / 5,000 Arsenic / 30 / 10 Cadmium / 7 / 5 Lead / 25 / 15 Mercury / 1 / 2	Yes.	Continue sampling.
	Meet CSSA QAPP quality assurance requirements.	Samples were analyzed in accordance with the CSSA QAPP and approved variances. Parsons chemists verified all data.	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
Contamination Characterization (Ground Water Contamination) (Continued)	Meet CSSA QAPP quality assurance requirements. (Continued)	Previously, a method detection limit (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 B

QUARTERLY ON-POST GROUNDWATER MONITORING ANALYTICAL RESULTS SEPTEMBER 2015

Appendix B
Quarterly On-Post Groundwater Monitoring Analytical Results, September 2015

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CS-MW36-LGR	9/11/2015	NA	NA	0.0005U	**0.0126**	NA	0.0019U	NA	0.0001U
CSSA Drinking Water Well System									
CS-1	9/15/2015	**0.0008F**	**0.0324**	0.0005U	0.0010U	0.003U	0.0019U	**0.148**	0.0001U
CS-10	9/15/2015	**0.0008F**	**0.037**	0.0005U	0.0010U	**0.005F**	0.0019U	**0.062**	0.0001U
CS-12	9/15/2015	0.0002U	**0.0282**	0.0005U	0.0010U	**0.096**	0.0019U	**0.126**	0.0001U
CS-13	9/14/2015	**0.0058F**	**0.0272**	0.0005U	**0.0011F**	**0.013**	0.0019U	**0.232**	0.0001U
CS-13 FD	9/14/2015	**0.0044F**	**0.0274**	0.0005U	**0.0011F**	**0.009F**	0.0019U	**0.242**	0.0001U

Well ID	Sample Date	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	Vinyl Chloride
CS-MW36-LGR	9/11/2015	0.12U	**0.36F**	0.08U	**13.21**	**12.01**	0.08U
CSSA Drinking Water Well System							
CS-1	9/15/2015	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-10	9/15/2015	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-12	9/15/2015	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-13	9/14/2015	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-13 FD	9/14/2015	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U

BOLD	≥ MDL
BOLD (blue)	≥ RL
BOLD (red)	≥ MCL

All samples were analyzed by APPL, Inc.
VOC data reported in ug/L & metals data reported in mg/L.

Abbreviations/Notes:

FD	Field Duplicate
TCE	Trichloroethene
PCE	Tetrachloroethene
DCE	Dichloroethene
AL	Action Level
SS	Secondary Standard
NA	Not Analyzed for this parameter

Data Qualifiers:
U-The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.
F-The analyte was positively identified but the associated numerical value is below the RL.

APPENDIX C

QUARTERLY WESTBAY ANALYTICAL RESULTS
SEPTEMBER 2015

Appendix C
Quarterly Westbay Analytical Results, September 2015

Well ID	Date Sampled	1,1-DCE (1,1-dichloroethene)	cis-1,2-DCE (cis-1,2-dichloroethene)	TCE (trichloroethene)	PCE (tetrachloroethene)	trans-1,2-DCE (trans-1,2-dichloroethene)	Vinyl Chloride
CS-WB01-LGR-01	9/16/2015	<0.12	<0.07	**0.26F**	**1.30F**	<0.08	<0.08
CS-WB01-LGR-02	9/16/2015	<0.12	<0.07	**2.26**	**11.09**	<0.08	<0.08
CS-WB01-LGR-03	9/16/2015	<0.12	<0.07	**8.37**	**2.87**	<0.08	<0.08
CS-WB01-LGR-04	9/16/2015	<0.12	**0.61F**	<0.05	<0.06	<0.08	<0.08
CS-WB01-LGR-05	9/16/2015	<0.12	**0.24F**	**0.88F**	<0.06	<0.08	<0.08
CS-WB01-LGR-06	9/16/2015	<0.12	**0.92F**	**1.58**	<0.06	<0.08	<0.08
CS-WB01-LGR-07	9/16/2015	<0.12	**5.23**	**13.68**	**14.83**	<0.08	<0.08
CS-WB01-LGR-08	9/16/2015	<0.12	**8.57**	**7.86**	**0.68F**	**0.31F**	<0.08
CS-WB01-LGR-09	9/16/2015	<0.12	**0.60F**	**14.37**	**12.41**	<0.08	<0.08
CS-WB02-LGR-03	9/23/2015	<0.12	<0.07	**0.26F**	**2.47**	<0.08	<0.08
CS-WB02-LGR-04	9/23/2015	<0.12	<0.07	**5.74**	**3.38**	<0.08	<0.08
CS-WB02-LGR-05	9/23/2015	<0.12	**0.17F**	**1.84**	**0.79F**	<0.08	<0.08
CS-WB02-LGR-06	9/23/2015	<0.12	**0.43F**	**2.39**	**4.61**	**0.23F**	<0.08
CS-WB02-LGR-07	9/23/2015	<0.12	**0.29F**	**1.22**	**0.34F**	<0.08	<0.08
CS-WB02-LGR-08	9/23/2015	<0.12	**2.45**	**0.54F**	<0.06	**0.39F**	<0.08
CS-WB02-LGR-09	9/23/2015	<0.12	**0.20F**	**7.31**	**9.43**	<0.08	<0.08
CS-WB03-UGR-01	9/21/2015	<12.0**	**21.70F****	**216.25****	**23737.01*****	<8.0**	<8.0**
CS-WB03-LGR-01	9/21/2015	<0.12	**0.85F**	**26.33**	**621.09***	<0.08	<0.08
CS-WB03-LGR-03	9/21/2015	<0.12	<0.07	**1.96**	**7.28**	<0.08	<0.08
CS-WB03-LGR-04	9/21/2015	<0.12	<0.07	**5.67**	**18.61**	<0.08	<0.08
CS-WB03-LGR-05	9/21/2015	<0.12	<0.07	**2.44**	**16.74**	<0.08	<0.08
CS-WB03-LGR-06	9/21/2015	<0.12	**5.53**	<0.05	<0.06	<0.08	<0.08
CS-WB03-LGR-07	9/21/2015	<0.12	**2.6**	**5.43**	**1.71**	<0.08	<0.08
CS-WB03-LGR-08	9/21/2015	<0.12	**2.4**	**0.39F**	<0.06	<0.08	<0.08
CS-WB03-LGR-09	9/17/2015	<0.12	**0.49F**	**4.39**	**4.61**	<0.08	<0.08
CS-WB04-LGR-01	9/22/2015	<0.12	<0.07	<0.05	**1.67**	<0.08	<0.08
CS-WB04-LGR-03	9/22/2015	<0.12	<0.07	<0.05	**0.34F**	<0.08	<0.08
CS-WB04-LGR-04	9/22/2015	<0.12	**0.27F**	**0.16F**	**0.40F**	<0.08	<0.08
CS-WB04-LGR-06	9/22/2015	<0.12	**5.1**	**12.09**	**16.68**	**0.25F**	<0.08
CS-WB04-LGR-07	9/22/2015	<0.12	**35.47**	**13.03**	**2.01**	**0.25F**	<0.08
CS-WB04-LGR-08	9/22/2015	<0.12	**0.47F**	**0.75F**	**0.82F**	<0.08	<0.08
CS-WB04-LGR-09	9/22/2015	<0.12	<0.07	**6.33**	**10.03**	<0.08	<0.08
CS-WB04-LGR-10	9/22/2015	<0.12	<0.07	**0.59F**	**2.2**	<0.08	<0.08
CS-WB04-LGR-11	9/22/2015	<0.12	<0.07	<0.05	**1.5**	<0.08	<0.08
CS-WB04-BS-01	9/22/2015	<0.12	<0.07	<0.05	**0.46F**	<0.08	<0.08
CS-WB04-BS-02	9/22/2015	<0.12	<0.07	<0.05	**0.94F**	<0.08	<0.08
CS-WB04-CC-01	9/22/2015	<0.12	**1.02F**	<0.05	**0.84F**	<0.08	<0.08
CS-WB04-CC-02	9/22/2015	<0.12	**0.21F**	<0.05	**1.29F**	<0.08	<0.08
CS-WB04-CC-03	9/22/2015	<0.12	**0.17F**	<0.05	**6.66**	<0.08	<0.08

Data Qualifiers
F-The analyte was positively identified but the associated numerical value is below the RL.
* The analyte was run at a dilution of 10.
** The analyte was run at a dilution of 100.
*** The analyte was run at a dilution of 500.
All values are reported in µg/L.

BOLD	≥ MDL
BOLD (blue)	≥ RL
BOLD (red)	≥ MCL

APPENDIX D

DATA VALIDATION REPORT

SDG 77325
SDG 77371

DATA VERIFICATION SUMMARY REPORT

for on- and off-post samples collected from

CAMP STANLEY STORAGE ACTIVITY

BOERNE, TEXAS

Data Verification by: Tammy Chang
Parsons - Austin

INTRODUCTION

The following data verification summary report covers groundwater samples and the associated field quality control (QC) sample collected from on-post and off-post Camp Stanley Storage Activity (CSSA) from September 11 to 14, 2015. The samples were assigned to the following Sample Delivery Group (SDG). All samples were analyzed for volatile organic compounds (VOCs) and all on-post drinking water samples were also analyzed for metals including arsenic, barium, cadmium, chromium, copper, lead, zinc, and mercury. The one monitoring well sample was analyzed for cadmium, chromium, and lead only.

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The field QC samples associated with this SDG were one set of parent/field duplicate (FD) and one trip blank (TB). TB was analyzed for VOC only. No ambient blanks were collected. During the initiation of this project, it was determined that ambient blanks were not necessary due to the absence of a source at these sites.

All samples were collected by Parsons and analyzed by APPL, Inc. following the procedures outlined in the Statement of Work and CSSA QAPP, Version 1.0. The samples in this SDG were shipped to the laboratory in one cooler. The cooler was received by the laboratory at a temperature of 3.0 ºC, which was within the 2-6ºC range recommended by the CSSA QAPP.

EVALUATION CRITERIA

The data submitted by the laboratory has been reviewed and verified following the guidelines outlined in the CSSA QAPP, Version 1.0. Information reviewed in the data package included sample results; field and laboratory quality control samples; calibrations; case narratives; raw data; chain-of-custody (COC) forms and the sample receipt checklist. The findings presented in this report are based on the reviewed information, and whether the guidelines in the CSSA QAPP, Version 1.0, were met.

VOLATILES

General

The volatiles portion of this data package consisted of five (5) samples, including two (2) on-post groundwater samples, one (1) off-post groundwater samples, one (1) FD, and one (1) TB. All samples were collected from September 11 to 14, 2015 and analyzed for a reduced list of VOCs which included: 1,1-dichloroethene, *cis*-1,2-dichloroethene, tetrachloroethene, *trans*-1,2-dichloroethene, trichloroethene, and vinyl chloride.

The VOC analyses were performed using United States Environmental Protection Agency (USEPA) SW846 Method 8260B. The samples were analyzed in analytical batch #200498 under one set of initial calibration (ICAL). All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery (%R) obtained from the laboratory control spike (LCS) sample and the surrogate spikes.

All LCS and surrogate spike recoveries were within acceptance criteria.

Precision

Precision was evaluated based on the relative percent difference (%RPD) of parent/FD results. Sample CS-13 was collected in duplicate.

None of the target compounds were detected at or above the reporting limit in the parent/FD samples.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining trip and laboratory blanks for cross contamination of samples during transit or analysis.

All samples in this data package were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0. All samples were prepared and analyzed within the holding time required by the method.

- All instrument performance check criteria were met.
- All initial calibration criteria were met for both sets of curves.

- The LCS was prepared using a secondary source standard. All second source verification criteria were met.
- All initial calibration verification (ICV) criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- All internal standard criteria were met.

There were one method blank and one TB associated with the VOC analyses in this SDG. Both blanks were non-detect for all target VOCs.

Completeness

Completeness has been evaluated in accordance with the CSSA QAPP. The number of usable results has been divided by the number of possible individual analyte results and expressed as a percentage to determine the completeness of the data set.

All VOC results for the samples in this SDG were considered usable. The completeness for this SDG is 100%, which meets the minimum acceptance criteria of 95%.

ICP-AES METALS

General

The ICP-AES portion of this SDG consisted of three (3) groundwater samples including one (1) on-post drinking water well sample, one FD, and one monitor well sample. All samples were collected from September 11 to 14, 2015 and analyzed for cadmium, chromium, and lead. The two drinking water samples were also analyzed for arsenic, barium, copper, and zinc.

The ICP-AES metals analyses were performed using USEPA SW846 Method 6010B. These on-post well samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method.

The samples for ICP-AES metals were digested in batch #200731. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS.

All LCS recoveries were within acceptance criteria.

Precision

Precision was measured based on the %RPD of parent/FD sample results. Sample CS-13 was collected in duplicate.

Only barium and zinc were detected above the reporting limits in both parent and FD samples. The %RPD was 0.7% for barium and 4.2% which met the 20%RPD requirement. No flags were applied.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating preservation and holding times; and
- Examining laboratory blank for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0, prepared and analyzed within the holding time required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All CCV criteria were met.
- All interference check (ICSA/ICSAB) criteria were met.
- No dilution test was required, as per the CSSA QAPP.

One method blank and several calibration blanks were analyzed in association with the ICP-AES analyses in this SDG. All blanks were free of target metals at or above the RL.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All ICP-AES metals results for the samples in this SDG were considered usable. The completeness for the ICP metals portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

MERCURY

General

The mercury portion of this SDG consisted of three (3) groundwater samples including one (1) on-post drinking water well sample, one FD, and one monitor well sample. All samples were collected from September 11 to 14, 2015 and analyzed for mercury.

The mercury analyses were performed using USEPA SW846 Method 7470A. These on-post well samples were analyzed following the procedures outlined in the CSSA QAPP, prepared and analyzed within the holding time required by the method.

The mercury samples were prepared in batch #200907. The analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS.

The LCS recovery was within acceptance criteria.

Precision

Precision was measured based on the %RPD of parent/FD sample results. Sample CS-13 was collected in duplicate.

Mercury was not detected in the parent and FD samples.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, prepared and analyzed within the holding times required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All calibration verification criteria were met.

There was one method blank and several calibration blanks associated with the mercury analyses in this SDG. All blanks were free of mercury at or above the RL.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All mercury result for the samples in this SDG was considered usable. The completeness for the mercury portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.

DATA VERIFICATION SUMMARY REPORT

for off-post samples collected from

CAMP STANLEY STORAGE ACTIVITY

BOERNE, TEXAS

Data Verification by: Tammy Chang
Parsons - Austin

INTRODUCTION

The following data verification summary report covers groundwater samples and the associated field quality control (QC) samples collected from on-post Camp Stanley Storage Activity (CSSA) on 15 of September 2015. The samples were assigned to the following Sample Delivery Group (SDG). All on-post groundwater samples were analyzed for VOCs and metals including arsenic, barium, cadmium, chromium, copper, lead and zinc.

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The field QC samples associated with this SDG was a trip blank (TB), and one set of matrix spike/matrix spike duplicate (MS/MSD) samples. TB was analyzed for VOC only. No ambient blanks were collected. During the initiation of this project, it was determined that ambient blanks were not necessary due to the absence of a source at these sites.

All samples were collected by Parsons and analyzed by APPL, Inc. following the procedures outlined in the Statement of Work and CSSA QAPP, Version 1.0. The samples in this SDG were shipped to the laboratory in one cooler. The cooler was received by the laboratory at a temperature of 3.0ºC, which was within the 2-6ºC range recommended by the CSSA QAPP.

EVALUATION CRITERIA

The data submitted by the laboratory has been reviewed and verified following the guidelines outlined in the CSSA QAPP, Version 1.0. Information reviewed in the data package included sample results; field and laboratory quality control samples; calibrations; case narratives; raw data; chain-of-custody (COC) forms and the sample receipt checklist. The findings presented in this report are based on the reviewed information, and whether the guidelines in the CSSA QAPP, Version 1.0, were met.

VOLATILES

General

The volatiles portion of this data package consisted of six (6) water samples, including three (3) on-post groundwater samples, one set of MS/MSD, and one (1) TB. All samples were collected on 15 of September 2015 and analyzed for a reduced list of

VOCs which included: 1,1-dichloroethene, *cis*-1,2-dichloroethene, tetrachloroethene, *trans*-1,2-dichloroethene, trichloroethene, and vinyl chloride.

The VOC analyses were performed using United States Environmental Protection Agency (USEPA) SW846 Method 8260B. The samples were analyzed in the analytical batch #200686 under one set of initial calibration (ICAL). All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery (%R) obtained from the laboratory control spike (LCS) sample, MS/MSD, and the surrogate spikes. Sample CS-1 was designated as the parent sample for the MS/MSD analyses.

All LCS, MS, MSD, and surrogate spike recoveries were within acceptance criteria.

Precision

Precision was evaluated based on the relative percent difference (%RPD) of the MS and MSD results.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining trip and laboratory blank for cross contamination of samples during transit or analysis.

All samples in this data package were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0. All samples were prepared and analyzed within the holding time required by the method.

- All instrument performance check criteria were met.
- All initial calibration criteria were met.
- The LCS was prepared using a secondary source. All second source verification criteria were met.
- All initial calibration verification (ICV) criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- All internal standard criteria were met.

There were one method blank and one TB associated with the VOC analyses in this SDG. All blanks were non-detect for all target VOCs at method detection limits.

Completeness

Completeness has been evaluated in accordance with the CSSA QAPP. The number of usable results has been divided by the number of possible individual analyte results and expressed as a percentage to determine the completeness of the data set.

All VOC results for the samples in this SDG were considered usable. The completeness for this SDG is 100%, which meets the minimum acceptance criteria of 95%.

ICP-AES METALS

General

The ICP-AES portion of this SDG consisted of five (5) groundwater samples including three (3) on-post water well samples and a set of MS/MSD samples. All samples were collected on 15 September, 2015 and analyzed for arsenic, barium, cadmium, chromium, copper, lead, and zinc.

The ICP-AES metals analyses were performed using USEPA SW846 Method 6010B. These on-post well samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method.

The samples for ICP-AES metals were digested in batch #201107. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS, MS, and MSD. Sample CS-1 was designated as the parent sample for MS/MSD analyses.

All LCS, MS, and MSD recoveries were within acceptance criteria.

Precision

Precision was measured based on the %RPD of MS/MSD results.

All RPDs were compliant.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating preservation and holding times; and
- Examining laboratory blank for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0, prepared and analyzed within the holding time required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All CCV criteria were met.
- All interference check (ICSA/ICSAB) criteria were met.
- No dilution test was required, as per the CSSA QAPP.

One method blank and several calibration blanks were analyzed in association with the ICP-AES analyses in this SDG. All blanks were free of target metals at or above the RL.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All ICP-AES metals results for the samples in this SDG were considered usable. The completeness for the ICP metals portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

MERCURY

General

The mercury portion of this SDG consisted of five (5) groundwater samples including three (3) on-post drinking water well samples and one set of MS/MSD. All samples were collected on 15 September, 2015 and analyzed for mercury.

The mercury analyses were performed using USEPA SW846 Method 7470A. These on-post well samples were analyzed following the procedures outlined in the CSSA QAPP, prepared and analyzed within the holding time required by the method.

The mercury samples were prepared in batch #200907. The analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS, MS, and MSD. CS-1 was designated as the parent sample for the MS/MSD analyses.

The LCS, MS, and MSD recoveries were within acceptance criteria.

Precision

Precision was measured based on the %RPD of MS and MSD results.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining laboratory blank for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, prepared and analyzed within the holding times required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All calibration verification criteria were met.

There was one method blank and several calibration blanks associated with the mercury analyses in this SDG. All blanks were free of mercury at or above the RL.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All mercury result for the samples in this SDG was considered usable. The completeness for the mercury portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.