2018 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

BOTTOM ASH IMPOUNDMENT
LA CYGNE GENERATING STATION
LA CYGNE, KANSAS

Presented To:
Kansas City Power & Light Company

SCS ENGINEERS

27217233.18 | January 2019

8575 W 110th Street, Suite 100
Overland Park, Kansas 66210
913-681-0030

CERTIFICATIONS

I, John R. Rockhold, being a qualified groundwater scientist and Professional Geologist in the State of Kansas, do hereby certify that the 2018 Annual Groundwater Monitoring and Corrective Action Report for the Bottom Ash Impoundment at the La Cygne Generating Station was prepared by me or under my direct supervision and fulfills the requirements of 40 CFR 257.90(e).

John R. Rockhold, P.G.

SCS Engineers

I, Douglas L. Doerr, being a qualified licensed Professional Engineer in the State of Kansas, do hereby certify that the 2018 Annual Groundwater Monitoring and Corrective Action Report for the Bottom Ash Impoundment at the La Cygne Generating Station was prepared by me or under my direct supervision and fulfills the requirements of 40 CFR 257.90(e).

Douglas L. Doerr

Digitally signed by Douglas L. Doerr
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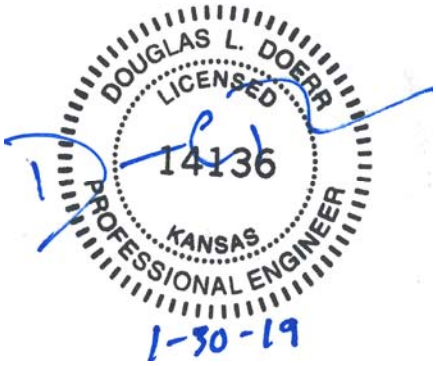

Douglas L. Doerr, P.E.

SCS Engineers

Revision Number	Revision Date	Revision Section	Summary of Revisions

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Appendices

1 INTRODUCTION

This 2018 Annual Groundwater Monitoring and Corrective Action Report was prepared to support compliance with the groundwater monitoring requirements of the "Coal Combustion Residuals (CCR) Final Rule" (Rule) published by the United States Environmental Protection Agency (USEPA) in the *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule*, dated April 17, 2015 (USEPA, 2015). Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.90 (e). The applicable sections of the Rule are provided below in *italics*, followed by applicable information relative to the 2018 Annual Groundwater Monitoring and Corrective Action Report for the Bottom Ash Impoundment at the La Cygne Generating Station.

2 § 257.90(E) ANNUAL REPORT REQUIREMENTS

Annual groundwater monitoring and corrective action report. *For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:*

2.1 § 257.90(E)(1) SITE MAP

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

A site map with an aerial image showing the Bottom Ash Impoundment and all background (or upgradient) and downgradient monitoring wells with identification numbers for the Bottom Ash Impoundment groundwater monitoring program is provided as **Figure 1** in **Appendix A**.

2.2 § 257.90(E)(2) MONITORING SYSTEM CHANGES

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

No new monitoring wells were installed and no wells were decommissioned as part of the CCR groundwater monitoring program for the Bottom Ash Impoundment in 2018.

2.3 § 257.90(E)(3) SUMMARY OF SAMPLING EVENTS

In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and

downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

Only detection monitoring was conducted during the reporting period (2018). Samples collected in 2018 were collected and analyzed for Appendix III detection monitoring constituents as indicated in **Appendix B**, **Table 1** (Appendix III Detection Monitoring Results, and **Table 2** (Detection Monitoring Field Measurements). The dates of sample collection, the monitoring program requiring the sample, and the results of the analyses are also provided in these tables. These tables include both the Spring 2018 semiannual detection monitoring data and the Fall 2018 semiannual detection monitoring data.

2.4 § 257.90(E)(4) MONITORING TRANSITION NARRATIVE

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

There was no transition between monitoring programs in 2018. Only detection monitoring was conducted in 2018.

2.5 § 257.90(e)(5) OTHER REQUIREMENTS

Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

A summary of potentially required information and the corresponding section of the Rule is provided in the following sections. In addition, the information, if applicable, is provided.

2.5.1 § 257.90(e) Program Status

Status of Groundwater Monitoring and Corrective Action Program.

The groundwater monitoring and corrective action program is in detection monitoring.

Summary of Key Actions Completed.

a. completion of the statistical evaluation of the initial Fall 2017 semiannual detection monitoring event per the certified statistical method,

b. completion of the 2017 Annual Groundwater Monitoring and Corrective Action Report,

c. completion of a successful alternative source demonstration for the Fall 2017 semiannual detection monitoring event,

d. completion of the Spring 2018 semiannual detection monitoring sampling and analysis event, and subsequent verification sampling per the certified statistical method,

e. completion of the statistical evaluation of the Spring 2018 semiannual detection monitoring event per the certified statistical method,

f. completion of a successful alternative source demonstration for the Spring 2018 semiannual

detection monitoring event, and

g. initiation of the Fall 2018 semiannual detection monitoring sampling and analysis event.

Description of Any Problems Encountered.

No noteworthy problems were encountered.

Discussion of Actions to Resolve the Problems.

Not applicable because no noteworthy problems were encountered.

Projection of Key Activities for the Upcoming Year (2019).

Semiannual Spring and Fall 2019 groundwater sampling and analysis. Completion of verification sampling and analyses and statistical evaluation of Fall 2018 and Spring 2019 detection monitoring data and, if required, alternative source demonstration(s).

2.5.2 § 257.94(d)(3) Demonstration for Alternative Detection Monitoring Frequency

The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable because no alternative monitoring frequency for detection monitoring and certification was pursued.

2.5.3 § 257.94(e)(2) Detection Monitoring Alternate Source Demonstration

Demonstration that a source other than the CCR unit caused the statistically significant increase (SSI) over background levels for a constituent or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. In addition, certification of the demonstration is to be included in the annual report.

The following reports are included as **Appendix C**.

C.1 CCR Groundwater Monitoring Alternative Source Demonstration Report October 2017 Groundwater Monitoring Event, Bottom Ash Impoundment, La Cygne Generating Station (April 2018)

C.2. CCR Groundwater Monitoring Alternative Source Demonstration Report May 2018 Groundwater Monitoring Event, La Cygne Generating Station (November 2018).

C.3 Supplemental Data for the Groundwater Monitoring Alternative Source Demonstration Report May 2018 Groundwater Monitoring Event, La Cygne Generating Station (November 2018).

2.5.4 § 257.95(c)(3) Demonstration for Alternative Assessment Monitoring Frequency

The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer or the approval from the Participating State Director or the approval from EPA where EPA is the permitting authority in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable because there was no assessment monitoring conducted.

2.5.5 § 257.95(d)(3) Assessment Monitoring Concentrations and Groundwater Protection Standards

Include the concentrations of Appendix III and detected Appendix IV constituents from the assessment monitoring, the established background concentrations, and the established groundwater protection standards.

Not applicable because there was no assessment monitoring conducted.

2.5.6 § 257.95(g)(3)(ii) Assessment Monitoring Alternate Source Demonstration

Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer. If a successful demonstration is made, the owner or operator must continue monitoring in accordance with the assessment monitoring program pursuant to this section, and may return to detection monitoring if the constituents in appendices III and IV to this part are at or below background as specified in paragraph (e) of this section. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

Not applicable because there was no assessment monitoring conducted.

2.5.7 § 257.96(a) Demonstration for Additional Time for Assessment of Corrective Measures

Within 90 days of finding that any constituent listed in appendix IV to this part has been detected at a statistically significant level exceeding the groundwater protection standard defined under § 257.95(h), or immediately upon detection of a release from a CCR unit, the owner or operator must initiate an assessment of corrective measures to prevent further releases, to remediate any releases

and to restore affected area to original conditions. The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measures due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for no longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

Not applicable because there was no assessment monitoring conducted.

3 GENERAL COMMENTS

This report has been prepared and reviewed under the direction of a qualified groundwater scientist and qualified professional engineer. The information contained in this report is a reflection of the conditions encountered at the La Cygne Generating Station at the time of fieldwork. This report includes a review and compilation of the required information and does not reflect any variations of the subsurface, which may occur between sampling locations. Actual subsurface conditions may vary and the extent of such variations may not become evident without further investigation.

Conclusions drawn by others from the result of this work should recognize the limitation of the methods used. Please note that SCS Engineers does not warrant the work of regulatory agencies or other third parties supplying information used in the assimilation of this report. This report is prepared in accordance with generally accepted environmental engineering and geological practices, within the constraints of the client's directives. It is intended for the exclusive use of Kansas City Power & Light Company for specific application to the La Cygne Generating Station Bottom Ash Impoundment. No warranties, express or implied, are intended or made.

APPENDIX A

FIGURES

Figure 1: Site Map

LEGEND

CCR UNIT BOUNDARY (APPROXIMATE LIMITS OF BOTTOM ASH IMPOUNDMENT)

MW–901 CCR GROUNDWATER MONITORING SYSTEM WELLS

NOTES:

1. KDHE FACILITY PERMIT AREA BOUNDARY NOT SHOWN.
2. GOOGLE EARTH IMAGE DATED OCTOBER 2014. BOUNDARY AND MONITOR WELL LOCATIONS ARE APPROXIMATE.
3. BOUNDARY AND MONITOR WELL LOCATIONS ARE PROVIDED BY AECOM.

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SCALE FEET

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SHEET TITLE
SITE MAP
BOTTOM ASH IMPOUNDMENT
CCR GROUNDWATER MONITORING SYSTEM

PROJECT TITLE
2018 CCR GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

CLIENT
KANSAS CITY POWER & LIGHT COMPANY
LA CYGNE GENERATING STATION
LA CYGNE, KANSAS

SCS ENGINEERS
8575 W. 110th St, Ste. 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX: (913) 681-0012

PROJ. NO.	DWN. BY:	TGW	Q/A RVW BY:	JRR
27217233.18	CHK. BY:	JRR	PROJ. MGR	JRR
DSN. BY:	TGW			

CADD FILE:
FIG 1 – LA CYGNE BA IMP.DWG

DATE:
1/21/19

FIGURE NO.
1

N:\KCPL\Projects\Groundwater\DWG\La Cygne\CCR Annual Report\2018\Fig 1 - La Cygne BA Imp.dwg Jan 21, 2019 - 1:28pm Layout Name: Fig 1 By: 4338t_w

APPENDIX B

TABLES

Table 1: Appendix III Detection Monitoring Results

Table 2: Detection Monitoring Field Measurements

Table 1
Bottom Ash Impoundment
Appendix III Detection Monitoring Results
KCP&L LaCygne Generating Station

Well Number	Sample Date	Appendix III Constituents						
		Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	pH (S.U.)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
MW-901	1/9/2018	---	---	---	---	*6.84	---	---
MW-901	5/23/2018	1.14	57.1	22.6	0.547	7.53	17.9	520
MW-901	11/29/2018	1.16	56.4	23.0	0.517	7.12	19.7	487
MW-902	1/9/2018	---	---	---	---	**6.99	*37.9	---
MW-902	5/23/2018	1.22	70.9	33.9	0.541	7.35	32.5	511
MW-902	7/11/2018	---	*69.1	---	---	**7.28	---	---
MW-902	11/29/2018	1.25	70.4	32.1	0.488	7.07	28.6	796
MW-903	1/9/2018	---	---	---	---	*6.87	---	---
MW-903	5/23/2018	0.428	368	25.6	<0.100	6.89	896	1920
MW-903	7/11/2018	---	*371	---	---	**6.84	---	---
MW-903	8/16/2018	---	*382	---	---	**6.65	---	---
MW-903	11/29/2018	0.493	375	24.7	0.104	6.58	1120	1230
MW-904	5/23/2018	1.10	72.2	33.8	0.444	7.38	80.7	677
MW-904	7/11/2018	---	---	---	---	*7.10	---	---
MW-904	11/29/2018	1.11	72.1	33.5	0.406	7.07	81.5	604
MW-905	5/23/2018	1.78	47.8	51.9	0.581	7.68	27.5	602
MW-905	11/29/2018	1.89	46.9	52.4	0.520	7.23	29.0	619

* Verification sample obtained per certified statistical method and Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009.

**Extra Sample for Quality Control Validation or per Standard Sampling Procedure

mg/L - miligrams per liter

S.U. - Standard Units

--- Not Sampled

Table 2
Bottom Ash Impoundment
Detection Monitoring Field Measurements
KCP&L LaCygne Generating Station

Well Number	Sample Date	pH (S.U.)	Specific Conductivity (µS)	Temperature (°C)	Turbidity (NTU)	ORP (mV)	DO (mg/L)	***Water Level (ft btoc)	Groundwater Elevation (ft NGVD)
MW-901	1/9/2018	*6.84	811	19.23	0.77	NA	NA	10.30	843.99
MW-901	5/23/2018	7.53	934	23.90	0.00	152	1.78	11.28	843.01
MW-901	11/29/2018	7.12	919	16.88	0.00	-4	0.00	11.28	843.01
MW-902	1/9/2018	**6.99	814	16.07	1.27	NA	NA	13.15	841.92
MW-902	5/23/2018	7.35	920	24.70	0.00	8	1.67	13.00	842.07
MW-902	7/11/2018	**7.28	908	28.94	0.00	-17	1.22	13.38	841.69
MW-902	11/29/2018	7.07	888	15.81	5.40	-32	0.00	13.60	841.47
MW-903	1/9/2018	*6.87	1889	16.21	1.07	NA	NA	12.32	842.08
MW-903	5/23/2018	6.89	2480	21.98	0.00	56	3.00	12.14	842.26
MW-903	7/11/2018	**6.84	2360	25.78	0.00	17	6.76	12.75	841.65
MW-903	8/16/2018	**6.65	2400	22.16	0.40	-5	7.15	14.80	839.60
MW-903	11/29/2018	6.58	2490	15.27	0.70	63	0.00	12.85	841.55
MW-904	5/23/2018	7.38	1200	20.78	66.10	-72	2.23	15.70	839.35
MW-904	7/11/2018	*7.10	1180	25.62	3.60	-68	2.33	17.33	837.72
MW-904	11/29/2018	7.07	1170	14.77	8.10	-38	0.00	15.14	839.91
MW-905	5/23/2018	7.68	1090	23.31	23.1	49	2.35	9.65	844.57
MW-905	11/29/2018	7.23	1080	16.01	19.9	-42	0.00	11.34	842.88

* Verification sample obtained per certified statistical method and Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009.

**Extra Sample for Quality Control Validation or per Standard Sampling Procedure

***Depth to water measured in all monitoring wells within 24 hour period prior to the sampling event

S.U. - Standard Units

µS - microsiemens

°C - Degrees Celsius

ft btoc - Feet Below Top of Casing

ft NGVD - National Geodetic Vertical Datum (NAVD 88)

NTU - Nephelometric Turbidity Unit

Appendix C

Alternative Source Demonstrations

C.1 Groundwater Monitoring Alternative Source Demonstration Report October 2017 Groundwater Monitoring Event

C.2 Groundwater Monitoring Alternative Source Demonstration Report May 2018 Groundwater Monitoring Event

C.3 Supplemental Data, Groundwater Monitoring Alternative Source Demonstration Report May 2018 Groundwater Monitoring Event

C.1 Groundwater Monitoring Alternative Source Demonstration Report October 2017 Groundwater Monitoring Event

CCR GROUNDWATER MONITORING
ALTERNATIVE SOURCE DEMONSTRATION REPORT
OCTOBER 2017 GROUNDWATER MONITORING EVENT

BOTTOM ASH IMPOUNDMENT
LA CYGNE GENERATING STATION
LA CYGNE, KANSAS

Presented To:

Kansas City Power & Light Company

Presented By:

SCS ENGINEERS
7311 West 130th Street, Suite 100
Overland Park, Kansas 66213
(913) 681-0030

April 2018
File No. 27217233.00

CERTIFICATIONS

I, John R. Rockhold, being a qualified groundwater scientist and licensed Professional Geologist in the State of Kansas, do hereby certify the accuracy of the information in the CCR Groundwater Monitoring Alternative Source Demonstration Report for the Bottom Ash Impoundment at the La Cygne Generating Station. The Alternative Source Demonstration was prepared by me or under my direct supervision in accordance with generally accepted hydrogeological practices and the local standard of care.

John R. Rockhold, P.G.
SCS Engineers

I, Douglas L. Doerr, being a qualified licensed Professional Engineer in the State of Kansas, do hereby certify the accuracy of the information in the CCR Groundwater Monitoring Alternative Source Demonstration Report for the Bottom Ash Impoundment at the La Cygne Generating Station. The Alternative Source Demonstration was prepared by me or under my direct supervision in accordance with generally accepted engineering practices and the local standard of care.

Douglas L. Doerr, P.E.
SCS Engineers

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Appendices

1 REGULATORY FRAMEWORK

In accordance with the Coal Combustion Residuals (CCR) Final Rule § 257.94(e)(2), the owner or operator of the CCR unit may demonstrate that a source other than the CCR unit caused the statistically significant increase (SSI) over background levels for a constituent, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a SSI over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under § 257.94. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

2 STATISTICAL RESULTS

Statistical analysis of monitoring data from the groundwater monitoring system for the Bottom Ash Impoundment at Kansas City Power & Light Company's (KCP&L) La Cygne Generating Station has been completed in substantial compliance with the "Statistical Method Certification by a Qualified Professional Engineer" document dated October 12, 2017. Groundwater samples were collected and analyzed by October 17, 2017. A statistical analysis was conducted to determine whether there is a SSI over background values for each constituent listed in Appendix III to Part 257-Constituents for Detection Monitoring.

If an SSI is preliminarily identified by the prediction limit analysis, verification retesting will be performed in accordance with the certified statistical method and the resampling plan to verify the result is not due to an error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Up to two rounds of verification sampling and retesting may be conducted. Verification retesting with a "1 of 2" or "1 of 3" resampling plan is performed by collecting a verification sample(s) and comparing it to the calculated prediction limit. If the resulting concentration of any verification sample is not an SSI, then an SSI has not occurred.

Determinations of SSIs for the Bottom Ash Impoundment at the La Cygne Generating Station were completed no later than January 15, 2018 and placed into the CCR Operating Record.

The completed statistical evaluation identified Appendix III constituent pH below its lower prediction limit in monitoring well MW-901. The lower prediction limit for pH in monitoring well MW-901 is 6.95 standard units (S.U.). The detection monitoring sample was reported at 6.77 S.U. The first verification sample was collected on January 9, 2018 with a result of 6.84 S.U., which is still below the lower prediction limit. Therefore, in accordance with the Statistical Method Certification, the detection monitoring sample for pH from monitoring well MW-901 exceeds its lower prediction limit and is a confirmed statistically significant decrease (SSD) below background. An SSD is similar to an SSI in that it indicates a statistically significant difference

from background (i.e., potential impact) when a bracketed (upper and lower) prediction limit is computed such as is done for pH.

Additionally, the completed statistical evaluation identified Appendix III constituent sulfate above its prediction limit in monitoring well MW-902. The prediction limit for sulfate in monitoring well MW-902 is 36 mg/L. The detection monitoring sample was reported at 36.5 mg/L. The first verification sample was collected on December 12, 2017 with a result of 36.1 mg/L. The second verification sample was collected on January 9, 2018 with a result of 37.9 mg/L. Therefore, in accordance with the Statistical Method Certification, the detection monitoring sample for sulfate from monitoring well MW-902 exceeds its prediction limit and is a confirmed SSI over background.

3 ALTERNATIVE SOURCE DEMONSTRATION

An Alternative Source Demonstration (ASD) is a means to provide supporting lines of evidence that something other than a release from a regulated CCR unit caused an SSI or an SSD. For the above identified SSD and SSI for the Bottom Ash Impoundment at the La Cygne Generating Station, there are multiple lines of supporting evidence to indicate the above SSI and SSD are not caused by a release from the Bottom Ash Impoundment. Select multiple lines of supporting evidence are described as follows.

3.1 UPGRADIENT WELL LOCATION

Figure 1 in **Appendix A** shows a potentiometric surface contour map indicating the direction of groundwater flow at the Bottom Ash Impoundment for the sampling event. Although the groundwater level in monitoring well MW-904 is lower than normal as compared to the other system wells, the flow directions indicated for the October 2017 groundwater monitoring event are typical. As seen in the map, monitoring well MW-901 is located upgradient from the Bottom Ash Impoundment indicating the SSD for pH is not caused by a release from the Bottom Ash Impoundment. This demonstrates that a source other than the Bottom Ash Impoundment caused the SSD below background levels for pH, or that the SSD resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

3.2 BOX AND WHISKERS PLOTS

A commonly accepted method to demonstrate and visualize the distribution of data in a given data set is to construct box and whiskers plots. The basic box plotted graphically locates the median, 25th and 75th percentiles of the data set; the "whiskers" extend to the minimum and maximum values of the data set. The range between the ends of a box plot represents the Interquartile Range, which can be used as an estimate of spread or variability. The mean is denoted by a "+".

When comparing multiple wells or well groups, box plots for each well can be lined up on the same axes to roughly compare the variability in each well. This may be used as an exploratory screening for the test of homogeneity of variance across multiple wells.

Although an SSD for pH was only identified in upgradient well MW-901 and the SSI for sulfate was only identified in well MW-902, the box and whiskers plot for pH and sulfate in MW-901 and MW-902 were compared to each other. Parts of Lake La Cygne surround the Bottom Ash Impoundment on three sides, including upgradient. The background sulfate concentration for Lake La Cygne as identified in an application for an NPDES permit modification dated September 16, 2016 was plotted alongside the sulfate data for comparison. The comparison indicates the pH levels in upgradient wells MW-901 and MW-902 are similar and sulfate concentrations in both MW-901 and MW-902 are below the background concentration for Lake La Cygne. This demonstrates that a source other than the Bottom Ash Impoundment caused the observed pH SSD below background and the observed sulfate SSI above background, or that the SSD and SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Box and whisker plots are provided in **Appendix B**.

3.3 TIME SERIES PLOTS

Time series plots provide a graphical method to view changes in data at a particular well (monitoring point) or wells over time. Time series plots display the variability in concentration levels over time and can be used to indicate possible outliers or data errors. More than one well can be compared on the same plot to look for differences between wells. Non-detect data is plotted as censored data at one-half of the laboratory reporting limit. Time series plots can also be used to examine the data for trends.

Time series plots for monitoring wells MW-901 and MW-902 indicate pH levels for both wells are similar. Additionally, time series plots for sulfate concentrations for both wells when plotted along with the background sulfate concentration for Lake La Cygne indicate the well concentrations are less than the lake concentration. This demonstrates that a source other than the Bottom Ash Impoundment caused the observed pH SSD below background and the observed sulfate SSI above background, or that the SSD and SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Time series plots are provided in **Appendix C**.

4 CONCLUSION

Our opinion is that a sufficient body of evidence is available and presented above to demonstrate that a source other than the Bottom Ash Impoundment caused the SSD below background levels for pH, and SSI above background levels for sulfate, or that the SSD and SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Based on the successful ASD, the owner or operator of the Bottom Ash Impoundment may continue with the detection monitoring program under § 257.94.

5 GENERAL COMMENTS

This report has been prepared and reviewed under the direction of a qualified groundwater scientist and qualified professional engineer. Please note that SCS Engineers does not warrant the work of regulatory agencies or other third parties supplying information used in the assimilation of this report. This report is prepared in accordance with generally accepted environmental engineering

and geological practices, within the constraints of the client's directives. It is intended for the exclusive use of KCP&L for specific application to the La Cygne Generating Station. No warranties, express or implied, are intended or made.

The signature of the certifying registered geologist and professional engineer on this document represents that to the best of his knowledge, information, and belief in the exercise of his professional judgement in accordance with the standard of practice, it is his professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by him are made on the basis of his experience, qualifications, and professional judgement and are not to be construed as warranties or guaranties. In addition, opinions relating to regulatory, environmental, geologic, geochemical and geotechnical conditions interpretations or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

Appendix A

Figure 1

LEGEND

- CCR UNIT BOUNDARY (APPROXIMATE LIMITS OF BOTTOM ASH IMPOUNDMENT)
- MW–901 (843.84) CCR GROUNDWATER MONITORING SYSTEM WELLS (GROUNDWATER ELEVATION)
- 823 GROUNDWATER SURFACE ELEVATIONS
- MW–904* INDICATES WELL NOT USED IN POTENTIOMETRIC SURFACE MAP CREATION

NOTES:

1. KDHE FACILITY PERMIT AREA BOUNDARY NOT SHOWN.
2. GOOGLE EARTH IMAGE DATED OCTOBER 2014. BOUNDARY AND MONITOR WELL LOCATIONS ARE APPROXIMATE.
3. BOUNDARY AND MONITOR WELL LOCATIONS ARE PROVIDED BY AECOM.
4. GROUNDWATER ELEVATIONS PROVIDED BY AECOM□201□.

□. WATER LEVELS MEASURED OCTOBER 201□.

100 0 100 200

SCALE FEET

REV.	DATE	CK. BY
1	–	–
2	–	–
3	–	–
4	–	–
5	–	–
6	–	–

SHEET TITLE
POTENTIOMETRIC SURFACE MAP (OCT 2017)
BOTTOM ASH IMPOUNDMENT

PROJECT TITLE
CCR ALTERNATIVE SOURCE DEMONSTRATION

CLIENT
KANSAS CITY POWER & LIGHT COMPANY
LA CYGNE GENERATING STATION
LA CYGNE, KANSAS

SCS ENGINEERS
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO.	DSN. BY:	DWN. BY:	CHK. BY:	Q/A REVW BY:	PROJ. MGR
27217233.00	RCW	RCW	JRR	JRR	JRR

CADD FILE:
LA CYGNE BA IMP_CCR ASD_FIG 1.DWG

DATE:
4/16/18

FIGURE NO.
1

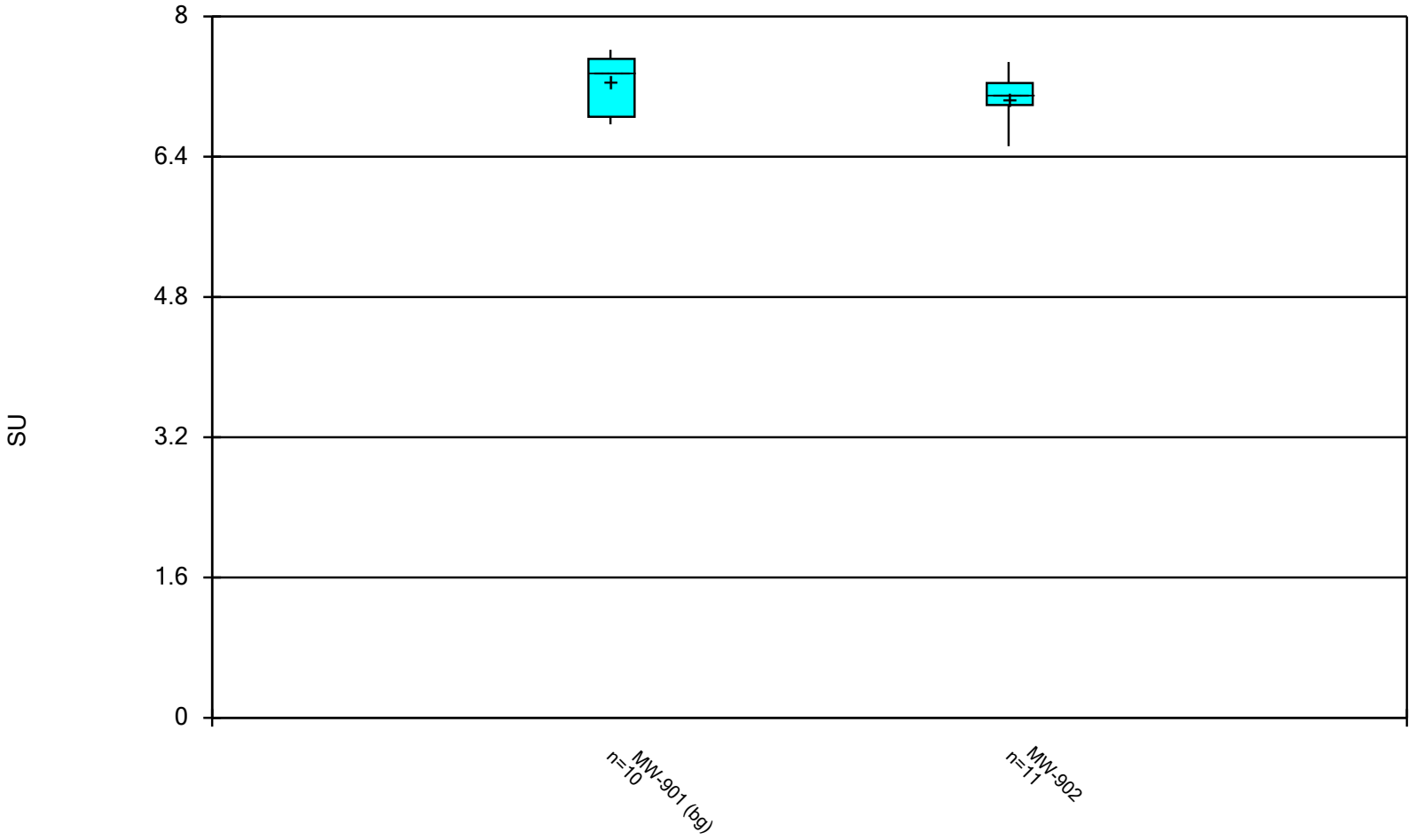
N:\KCPL\Projects\Groundwater\DWG\La Cygne\2018\CCR ASD\La Cygne BA Imp_CCR ASD_Fig 1.dwg Apr 16, 2018 - 11:37am Layout Name: Fig 1 By: 4121rcw

Appendix B

Box and Whiskers Plots

Sanitas™ v.9.5.32 Sanitas software licensed to SCS Engineers. UG

Box & Whiskers Plot

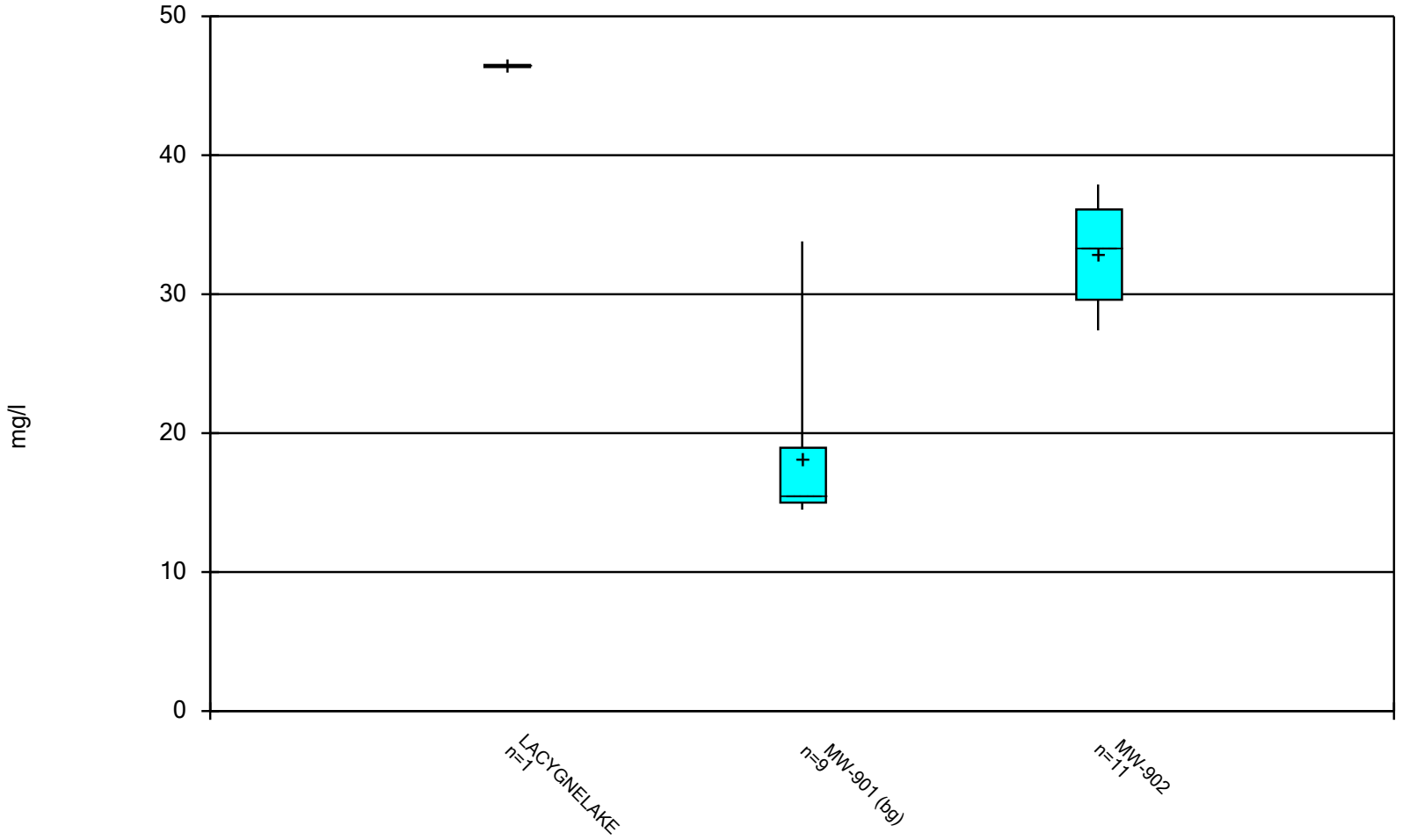


Constituent: pH Analysis Run 4/10/2018 4:38 PM View: CCR III

LaCygne Client: SCS Engineers Data: LaC GW Data

Sanitas™ v.9.5.32 Sanitas software licensed to SCS Engineers. UG

Box & Whiskers Plot



Constituent: SULFATE Analysis Run 4/10/2018 4:38 PM View: CCR III

LaCygne Client: SCS Engineers Data: LaC GW Data

Box & Whiskers Plot

LaCygne Client: SCS Engineers Data: LaC GW Data Printed 4/10/2018, 4:40 PM

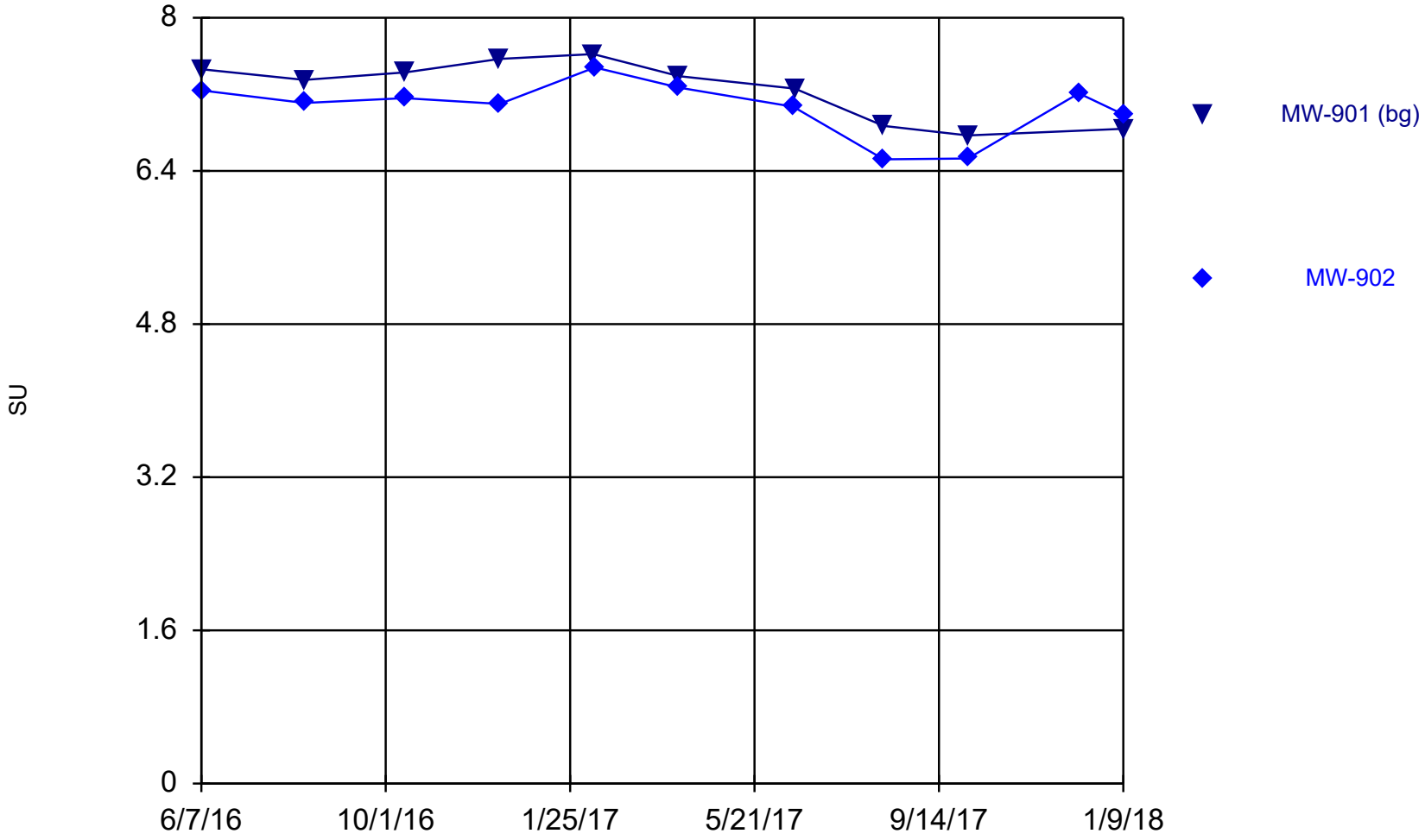
Constituent	Well	N	Mean	Std. Dev.	Std. Err.	Median	Min.	Max.	%NDs
pH (SU)	MW-901 (bg)	10	7.26	0.314	0.0993	7.37	6.77	7.62	0
pH (SU)	MW-902	11	7.06	0.294	0.0888	7.11	6.52	7.48	0
SULFATE (mg/l)	LACYGNELAKE	1	46.5	0	0	46.5	46.5	46.5	0
SULFATE (mg/l)	MW-901 (bg)	9	18.3	6.06	2.02	15.6	14.5	33.8	0
SULFATE (mg/l)	MW-902	11	32.9	3.35	1.01	33.3	27.4	37.9	0

Appendix C

Time Series Plots

Sanitas™ v.9.5.32 Sanitas software licensed to SCS Engineers. UG

Time Series



Constituent: pH Analysis Run 4/11/2018 3:17 PM View: Bottom Ash III

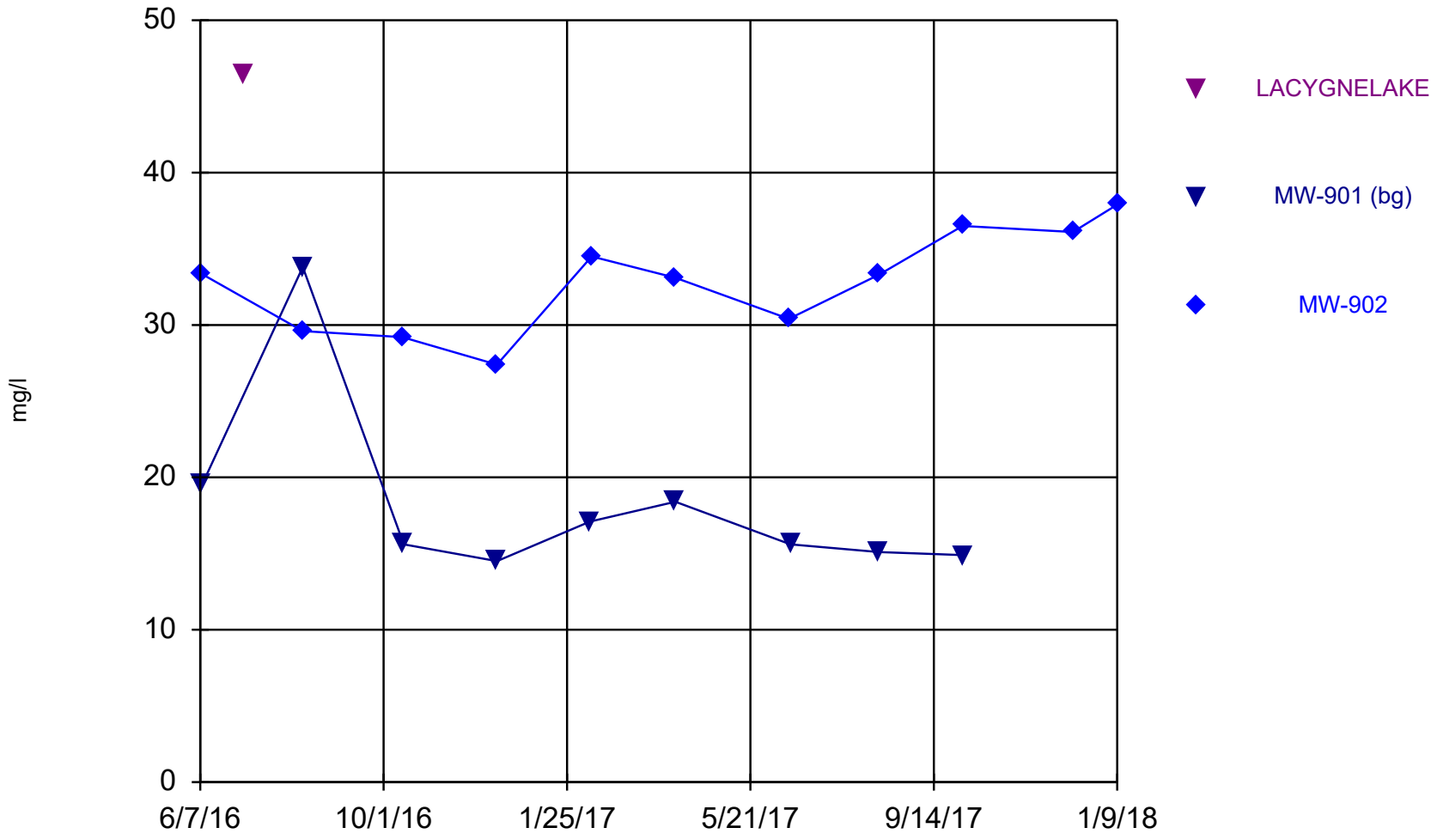
LaCygne Client: SCS Engineers Data: LaC GW Data

Time Series

Constituent: pH (SU) Analysis Run 4/11/2018 3:17 PM View: Bottom Ash III
LaCygne Client: SCS Engineers Data: LaC GW Data

	MW-901 (bg)	MW-902
6/7/2016		7.24
6/8/2016	7.46	
8/11/2016	7.35	7.11
10/13/2016		7.16
10/14/2016	7.43	
12/12/2016	7.57	7.1
2/9/2017	7.62	
2/10/2017		7.48
4/4/2017	7.39	7.27
6/15/2017		7.07
6/16/2017	7.26	
8/11/2017	6.87	6.52
10/3/2017	6.77	6.53
12/12/2017		7.21
1/9/2018	6.84	6.99

Time Series



Constituent: SULFATE Analysis Run 4/11/2018 3:17 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

Time Series

Constituent: SULFATE (mg/l) Analysis Run 4/11/2018 3:17 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

	LACYGNELAKE	MW-901 (bg)	MW-902
6/7/2016			33.4
6/8/2016		19.5	
7/5/2016	46.5		
8/11/2016		33.8	29.6
10/13/2016			29.2
10/14/2016		15.6	
12/12/2016		14.5	27.4
2/9/2017		17.1	
2/10/2017			34.5
4/4/2017		18.4	33.1
6/15/2017			30.4
6/16/2017		15.6	
8/11/2017		15.1	33.3
10/3/2017		14.9	36.5
12/12/2017			36.1
1/9/2018			37.9

C.2. Groundwater Monitoring Alternative Source Demonstration Report May 2018 Groundwater Monitoring Event

CCR GROUNDWATER MONITORING

ALTERNATIVE SOURCE DEMONSTRATION REPORT

May 2018 GROUNDWATER MONITORING EVENT

BOTTOM ASH IMPOUNDMENT

LA CYGNE GENERATING STATION

LA CYGNE, KANSAS

Presented To:

Kansas City Power & Light Company

Presented By:

SCS ENGINEERS

8575 West 110th Street, Suite 100

Overland Park, Kansas 66210

(913) 681-0030

November 2018

File No. 27217233.18

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CERTIFICATIONS

I, John R. Rockhold, being a qualified groundwater scientist and licensed Professional Geologist in the State of Kansas, do hereby certify the accuracy of the information in the CCR Groundwater Monitoring Alternative Source Demonstration Report for the Bottom Ash Impoundment at the La Cygne Generating Station. The Alternative Source Demonstration was prepared by me or under my direct supervision in accordance with generally accepted hydrogeological practices and the local standard of care.

John R. Rockhold, P.G.

SCS Engineers

I, Douglas L. Doerr, being a qualified licensed Professional Engineer in the State of Kansas, do hereby certify the accuracy of the information in the CCR Groundwater Monitoring Alternative Source Demonstration Report for the Bottom Ash Impoundment at the La Cygne Generating Station. The Alternative Source Demonstration was prepared by me or under my direct supervision in accordance with generally accepted engineering practices and the local standard of care.

Douglas L. Doerr, P.E.

SCS Engineers

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Section **Page**

Appendices

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1 REGULATORY FRAMEWORK

Certain owners or operators of Coal Combustion Residuals (CCR) units are required to complete groundwater monitoring activities to evaluate whether a release from the unit has occurred. Included in the activities is the completion of a statistical analysis of the groundwater quality data as prescribed in § 257.93(h) of the CCR Final Rule. If the initial analysis indicates a statistically significant increase (SSI) over background levels, the owner or operator may perform an alternate source demonstration (ASD). In accordance with § 257.94(e)(2), the owner or operator of the CCR unit may demonstrate that a source other than the CCR unit caused the SSI over background levels for a constituent, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a SSI over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under § 257.94. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

2 STATISTICAL RESULTS

Statistical analysis of monitoring data from the groundwater monitoring system for the Bottom Ash Impoundment at Kansas City Power & Light Company's (KCP&L) La Cygne Generating Station has been completed in substantial compliance with the "Statistical Method Certification by a Qualified Professional Engineer" document dated October 12, 2017. Detection monitoring groundwater samples were collected on May 23, 2018. Review and validation of the results from the May 2018 Detection Monitoring Event was completed on June 15, 2018, which constitutes completion and finalization of detection monitoring laboratory analyses. A statistical analysis was then conducted to determine whether there was a statistically significant increase (SSI) over background values for each constituent listed in Appendix III to Part 257-Constituents for Detection Monitoring. Two rounds of verification sampling were conducted for certain constituents on July 11, 2018 and August 16, 2018.

If an SSI is preliminarily identified by the prediction limit analysis, verification retesting is performed in accordance with the certified statistical method and the resampling plan to verify the result is not due to an error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Up to two rounds of verification sampling and retesting may be conducted. Verification retesting with a "1 of 2" or "1 of 3" resampling plan is performed by collecting a verification sample(s) and comparing it to the calculated prediction limit. If the resulting concentration of any verification sample is not above the prediction limit, then an SSI is not confirmed.

Determinations of SSIs for the Bottom Ash Impoundment at the La Cygne Generating Station were completed September 12, 2018 and placed into the CCR Operating Record.

The completed statistical evaluation identified Appendix III constituent, calcium, above its prediction limit in monitoring well MW-903. The prediction limit for calcium in monitoring well MW-903 is 358 milligrams per liter (mg/L). The detection monitoring sample was reported at 368 mg/L. The first verification re-sample was collected on July 11, 2018 with a result of 371 mg/L. The second verification re-sample was collected on August 16, 2018 with a result of 382 mg/L.

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Therefore, in accordance with the Statistical Method Certification, the detection monitoring sample for calcium from monitoring wells MW-903 exceeds its prediction limit and is a confirmed SSI over background.

Determination: A statistical evaluation was completed for all Appendix III detection monitoring constituents in accordance with the certified statistical method. The statistical evaluation identified one SSI above the background prediction limit for calcium in monitoring well MW-903.

3 ALTERNATIVE SOURCE DEMONSTRATION

An Alternative Source Demonstration (ASD) is a means to provide supporting lines of evidence that something other than a release from a regulated CCR unit caused an SSI or an SSD. For the above identified SSI for the Bottom Ash Impoundment at the La Cygne Generating Station, there are multiple lines of supporting evidence to indicate the SSI was not caused by a release from the Bottom Ash Impoundment. Select multiple lines of supporting evidence are described as follows.

3.1 BOTTOM ASH SPLP ANALYSIS

The Synthetic Precipitation Leaching Procedure (SPLP) is an Environmental Protection Agency (EPA) approved extraction procedure designed to simulate and then analyze leachate, which would be produced from rainfall passing through a contaminated material (assuming the rainfall is slightly acidic). The SPLP is used to assess the potential of a contaminated material (in or on top of the ground) to impact groundwater (or surface water), when exposed to normal weathering. A bottom ash sample was collected on September 17, 2018 and submitted to the laboratory for SPLP analysis for calcium. The calcium result for the SPLP extract (simulated leachate) was 73.7 mg/L. The prediction limit for calcium in monitoring well MW-903 is 358 mg/L and the detection monitoring sample was reported at 368 mg/L. The calcium concentration in the groundwater from MW-903 is significantly greater than what would be expected from bottom ash leachate. The comparison indicates the elevated calcium concentrations in monitoring well MW-903 are not from bottom ash leachate but from a source other than bottom ash, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The laboratory report is provided in **Appendix A.**

3.2 BOX AND WHISKERS PLOTS

A commonly accepted method to demonstrate and visualize the distribution of data in a given data set is to construct box and whiskers plots. The basic box plotted graphically locates the median, 25th and 75th percentiles of the data set; the "whiskers" extend to the minimum and maximum values of the data set. The range between the ends of a box plot represents the Interquartile Range, which can be used as an estimate of spread or variability. The mean is denoted by a "+".

When comparing multiple wells or well groups, box plots for each well can be lined up on the same axes to roughly compare the variability in each well. This may be used as an exploratory screening for the test of homogeneity of variance across multiple wells.

Based on the bottom ash SPLP calcium analysis compared to the calcium results for MW-903, the calcium levels for additional wells at the LaCygne Generating Station (not part of the CCR Bottom Ash groundwater monitoring system) were reviewed for elevated calcium levels to determine if elevated calcium concentrations could occur naturally in the vicinity of the facility and if natural variability

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between wells occurred in the vicinity of the facility. Four wells were identified as exhibiting elevated calcium and one of them was an upgradient well. Box and whiskers plots for calcium for upgradient monitoring wells MW-13 and MW-602 and downgradient wells MW-707B, MW-805, and MW-903 were prepared for comparison. Upgradient monitoring well MW-602 does not have elevated calcium but is located close to MW-13 indicating natural variability of calcium over short distances occurs at the site. The comparison indicates the calcium levels in monitoring well MW-903 are within the range of calcium concentrations in upgradient wells at the facility site and that significant natural variability occurs between wells and across the site. This demonstrates that a source other than the bottom ash caused the SSI above background levels for calcium, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Box and whiskers plots are provided in **Appendix B**.

3.3 TIME SERIES PLOTS

Time series plots provide a graphical method to view changes in data at a particular well (monitoring point) or wells over time. Time series plots display the variability in concentration levels over time and can be used to indicate possible outliers or data errors. More than one well can be compared on the same plot to look for differences between wells. Non-detect data is plotted as censored data at one-half of the laboratory reporting limit. Time series plots can also be used to examine the data for trends.

Four wells were identified as exhibiting elevated calcium and one of them was an upgradient well. Of the four wells exhibiting elevated calcium, one well, MW-903 also exhibited an SSI. Time series plots for calcium for upgradient monitoring wells MW-13 and MW-602 and downgradient wells MW-707B, MW-805, and MW-903 were prepared for comparison. Upgradient monitoring well MW-602 does not have elevated calcium but is located close to MW-13 indicating natural variability of calcium over short distances occurs at the site. The comparison indicates the calcium levels in monitoring well MW-903 are within the range of calcium concentrations in upgradient wells at the site and that significant natural variability occurs between wells and across the site. This demonstrates that a source other than the bottom ash caused the SSI above background levels for calcium, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Time series plots are provided in **Appendix C**.

3.4 PIPER PLOTS

Piper diagrams are a form of tri-linear diagram, and a widely accepted method to provide a visual representation of the ion concentration of groundwater. Piper diagrams portray water compositions and facilitate the interpretation and presentation of chemical analysis. They may be used to visually compare the chemical composition of water quality across wells, and aid in determining whether the waters are similar or dis-similar, and can over time indicate whether the waters are mixing.

A piper diagram has two triangular plots on the right and left side of a 4-sided center field. The three major cations are plotted in the left triangle and anions in the right. Each of the three cation/anion variables, in milliequivalents, is divided by the sum of the three values, to produce a percent of total cation/anions. These percentages determine the location of the associated symbol. The data points in the center field are located by extending the points in the lower triangles to the point of intersection. In order for a piper diagram to be produced, the selected data file must contain the following constituents: Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sulfate (SO4), Carbonate (CO3), and Bicarbonate (HCO3).

A piper diagram generated for a sample from MW-903 and a sample from MW-13 (upgradient well for the CCR Landfill and Lower AQC) are provided in **Appendix D.** The samples plot near one another in

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the same hydrochemical facies indicating similar geochemical characteristics between an upgradient well in the vicinity of the facility and a downgradient well for the Bottom Ash Impoundment. The comparison indicates the hydrochemical characteristics (particularly calcium) of groundwater from monitoring well MW-903 are similar to the hydrochemical characteristics (particularly calcium) of background groundwater and are in the range as that of an upgradient well at the facility and that significant natural variability occurs between wells and across the site. This demonstrates that a source other than the bottom ash caused the SSI above background levels for calcium, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The piper diagram plots are provided in **Appendix D**.

3.5 FACILITY WIDE INTERWELL PREDICTION LIMIT

Because of known complexities and heterogeneities of the water bearing zone at the facility, an intrawell prediction limit analysis with retesting was the selected statistical method for the Bottom Ash Impoundment. However, false positives (SSIs) may occur due to a limited background data set that may not truly represent the background population for that particular well until the number of background observations are increased to better represent the entire population. The CCR Rule preamble recommends a minimum of eight to ten independent background observations be collected before performing the first statistical test; but also states that background sample sets of at least 20 are considered optimal. To further demonstrate that an interwell prediction limit exceedance (SSI) could be naturally occurring and likely the result of a limited background data set for a particular well, an interwell prediction limit analysis on a facility wide basis can be useful to further demonstrate natural variability across a site or in the vicinity of the site and that the potential true background population may not be represented.

An interwell prediction limit analysis on a facility wide basis was performed comparing the calcium concentration in MW-903 to the prediction limit calculated from the combined background calcium data from all of the background monitoring wells across the facility. The facility wide interwell prediction limit for calcium is 395 mg/L. The highest calcium concentration from MW-903 is 384 mg/L, which is below the facility wide interwell prediction limit for calcium. The interwell prediction limit analysis further indicates the calcium levels in monitoring well MW-903 are within the range of calcium concentrations in upgradient wells at the facility site. This demonstrates that a source other than the bottom ash could cause the SSI above background levels for calcium, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Facility wide interwell prediction limit outputs are provided in **Appendix E**.

4 CONCLUSION

Our opinion is that a sufficient body of evidence is available and presented above to demonstrate that a source other than the Bottom Ash Impoundment caused the SSI above background levels for calcium, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Based on the successful ASD, the owner or operator of the Bottom Ash Impoundment may continue with the detection monitoring program under § 257.94.

5 GENERAL COMMENTS

This report has been prepared and reviewed under the direction of a qualified groundwater scientist and qualified professional engineer. Please note that SCS Engineers does not warrant the work of regulatory agencies or other third parties supplying information used in the assimilation of this report.

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This report is prepared in accordance with generally accepted environmental engineering and geological practices, within the constraints of the client's directives. It is intended for the exclusive use of KCP&L for specific application to the La Cygne Generating Station. No warranties, express or implied, are intended or made.

The signature of the certifying registered geologist and professional engineer on this document represents that to the best of their knowledge, information, and belief in the exercise of his professional judgement in accordance with the standard of practice, it is his professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by them are made on the basis of his experience, qualifications, and professional judgement and are not to be construed as warranties or guaranties. In addition, opinions relating to regulatory, environmental, geologic, geochemical and geotechnical conditions interpretations or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

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Appendix A

Bottom Ash SPLP Laboratory Report

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Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

October 01, 2018

SCS Engineers - KS

Sample Delivery Group:	L1027123
Samples Received:	09/19/2018
Project Number:	27217233.18
Description:	KCPL - LaCygne Generating Station

Report To: Jason Franks
8575 West 110th Street
Suite 100
Overland Park, KS 66210

Entire Report Reviewed By:

Jeff Carr
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

TABLE OF CONTENTS

BOTTOM ASH L1027123-01 GW

Collected by	Collected date/time	Received date/time
Jason R Franks	09/17/18 12:00	09/19/18 11:50

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Preparation by Method 1312	WG1169395	1	09/21/18 11:47	09/21/18 11:47	TM
Wet Chemistry by Method 9056A	WG1169693	1	09/24/18 20:14	09/24/18 20:14	NJM
Metals (ICP) by Method 6010B	WG1170271	1	09/23/18 09:55	09/23/18 22:31	CCE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jeff Carr
Project Manager

Preparation by Method 1312

Analyte	Result	Qualifier	Prep date / time	Batch
SPLP Extraction	-		9/21/2018 11:47:27 AM	WG1169395

Wet Chemistry by Method 9056A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Chloride	ND		1000	1	09/24/2018 20:14	WG1169693
Fluoride	118		100	1	09/24/2018 20:14	WG1169693
Sulfate	51100		5000	1	09/24/2018 20:14	WG1169693

Metals (ICP) by Method 6010B

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Boron	959		200	1	09/23/2018 22:31	WG1170271
Calcium	73700		1000	1	09/23/2018 22:31	WG1170271

Method Blank (MB)

(MB) R3344732-1 09/24/18 17:59

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Chloride	U		51.9	1000
Fluoride	U		9.90	100
Sulfate	U		77.4	5000

L1027594-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1027594-11 09/24/18 22:52 • (DUP) R3344732-4 09/24/18 23:07

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	244	184	1	27.8	J P1	15
Sulfate	U	0.000	1	0.000		15

L1027715-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1027715-01 09/25/18 01:45 • (DUP) R3344732-7 09/25/18 02:00

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	8430	8420	1	0.118		15
Sulfate	8690	8710	1	0.147		15

L1027594-11 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1027594-11 09/24/18 22:52 • (MS) R3344732-5 09/24/18 23:21 • (MSD) R3344732-6 09/24/18 23:36

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Chloride	50000	244	50900	51100	101	102	1	80.0-120			0.435	15
Sulfate	50000	U	51800	51400	104	103	1	80.0-120			0.729	15

L1027715-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1027715-01 09/25/18 01:45 • (MS) R3344732-8 09/25/18 02:14

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Chloride	50000	8430	59200	102	1	80.0-120	
Sulfate	50000	8690	59100	101	1	80.0-120	

Method Blank (MB)

(MB) R3344358-1 09/23/18 21:58

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ug/l		ug/l	ug/l
Boron	U		12.6	200
Calcium	U		46.3	1000

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3344358-2 09/23/18 22:01 • (LCSD) R3344358-3 09/23/18 22:03

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	%	%	%			%	%
Boron	1000	992	995	99.2	99.5	80.0-120			0.340	20
Calcium	10000	10000	9930	100	99.3	80.0-120			0.917	20

L1026826-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1026826-01 09/23/18 22:06 • (MS) R3344358-5 09/23/18 22:12 • (MSD) R3344358-6 09/23/18 22:14

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	ug/l	%	%		%			%	%
Boron	1000	155	1170	1170	101	102	1	75.0-125			0.133	20
Calcium	10000	43500	53700	53700	102	102	1	75.0-125			0.0395	20

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

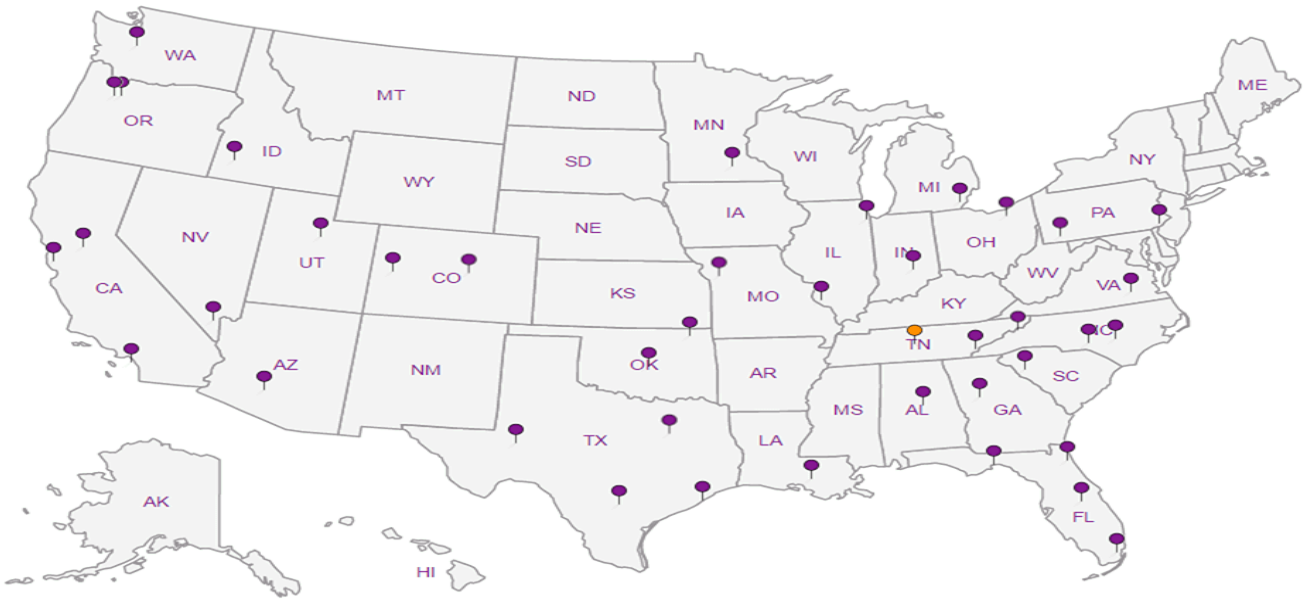
Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



SCS Engineers - KS

8575 West 110th Street
Suite 100
Overland Park, KS 66210

Billing Information:
Accounts Payable
8575 West 110th Street
Suite 100
Overland Park, KS 66210

Pres Chk

Report to: **Jason Franks**

Email To: **jfranks@scsengineers.com; jay.martin@kcpl.com;**

Project Description: **KCPL - LaCygne Generating Station**

City/State Collected: **LaCygne, KS**

Phone: **913-681-0030**
Fax: **913-681-0012**

Client Project # **27217233.18**

Lab Project # **AQUAOPKS-LACYGNE**

Collected by (print): **JASON R. FRANKS**

Site/Facility ID #

P.O. #

Collected by (signature): **Jason R. Franks**

Immediately Packed on Ice N ___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Date Results Needed

Quote #

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	SPLP metals / anions 16oz Clr-NoPres										Remarks	Sample # (lab only)
BOTTOM ASH	GRAB	SS	—	9/17/18	1200	1	X											-01

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L1027123
E242

Acctnum: **AQUAOPKS**
Template: **T140691**
Prelogin: **P672563**
TSR: **206 - Jeff Carr**
PB:
Shipped Via:

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks: SPLP - Extract for B, Ca, Cl, Fl, and SO4

pH _____ Temp _____
Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier __ _____

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Jason R. Franks	9/18/18	1500	9-18-18 1505
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)
			801

Trip Blank Received: Yes (No) HCL / MeoH TBR

Temp: 1.6 °C Bottles Received: 1

Date: 9/19/18 Time: 1150

If preservation required by Login: Date/Time

Hold:

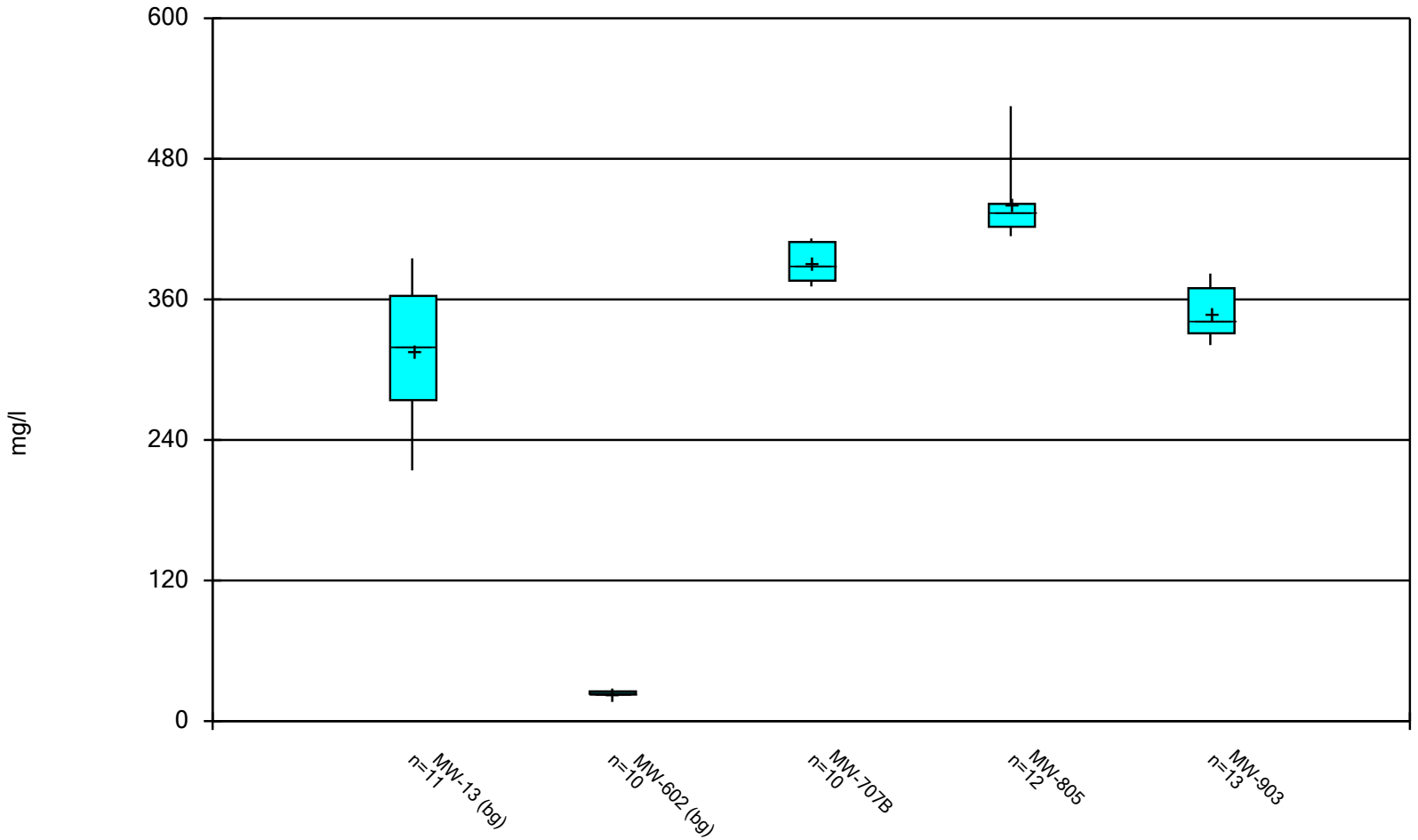
Condition: NCF / (OK)

Appendix B

Box and Whiskers Plots

Internal Use Only

Box & Whiskers Plot



Constituent: CALCIUM Analysis Run 11/14/2018 5:04 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

Box & Whiskers Plot

Constituent: CALCIUM (mg/l) Analysis Run 11/14/2018 5:05 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

	MW-13 (bg)	MW-602 (bg)	MW-707B	MW-805	MW-903
6/7/2016				422	
6/8/2016					362
6/9/2016	363				
6/10/2016		24.7			
6/23/2016			371		
8/9/2016		23.3	412		
8/10/2016				437	
8/11/2016	371				342
10/11/2016			408	422	
10/13/2016	395	25.7			333
12/6/2016			410	422	
12/9/2016		25.3			331
12/13/2016	336				
2/6/2017				435	
2/7/2017			398		
2/8/2017		24			
2/10/2017	297				321
4/4/2017			382	444	339
4/6/2017	320				
4/7/2017		24.9			
6/13/2017			374	430	
6/15/2017	339	23.2			
6/16/2017					331
8/8/2017	319		378	414	
8/10/2017		23.3			330
10/3/2017			382		344
10/5/2017	274	25.3		467	
12/12/2017				525	
1/9/2018				439	
5/23/2018	248	22.9		434	368
5/24/2018			396		
7/11/2018					371
8/16/2018					382
9/17/2018	214				376
Median	320	24.4	389	435	342
LowerQ.	274	23.3	376	422	331
UpperQ.	363	25.3	409	442	370
Min	214	22.9	371	414	321
Max	395	25.7	412	525	382
Mean	316	24.3	391	441	348

Box & Whiskers Plot

LaCygne Client: SCS Engineers Data: LaC GW Data Printed 11/14/2018, 5:05 PM

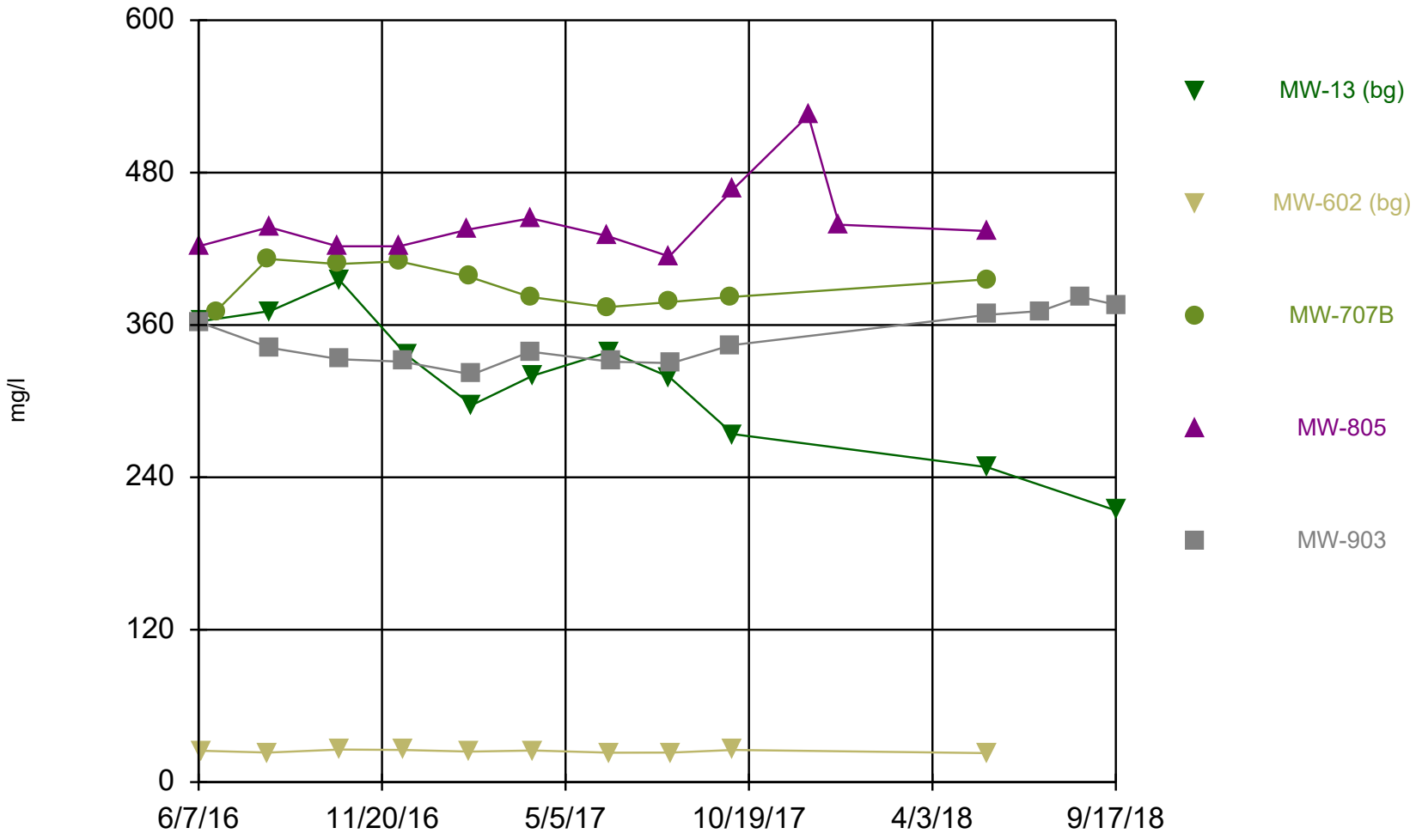
Constituent	Well	N	Mean	Std. Dev.	Std. Err.	Median	Min.	Max.	%NDs
CALCIUM (mg/l)	MW-13 (bg)	11	316	54.4	16.4	320	214	395	0
CALCIUM (mg/l)	MW-602 (bg)	10	24.3	1.04	0.329	24.4	22.9	25.7	0
CALCIUM (mg/l)	MW-707B	10	391	15.6	4.93	389	371	412	0
CALCIUM (mg/l)	MW-805	12	441	29.8	8.61	435	414	525	0
CALCIUM (mg/l)	MW-903	13	348	20.5	5.69	342	321	382	0

Appendix C

Time Series Plots

Internal Use Only

Time Series



Constituent: CALCIUM Analysis Run 11/14/2018 5:05 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

Time Series

Constituent: CALCIUM (mg/l) Analysis Run 11/14/2018 5:06 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

	MW-13 (bg)	MW-602 (bg)	MW-707B	MW-805	MW-903
6/7/2016				422	
6/8/2016					362
6/9/2016	363				
6/10/2016		24.7			
6/23/2016			371		
8/9/2016		23.3	412		
8/10/2016				437	
8/11/2016	371				342
10/11/2016			408	422	
10/13/2016	395	25.7			333
12/6/2016			410	422	
12/9/2016		25.3			331
12/13/2016	336				
2/6/2017				435	
2/7/2017			398		
2/8/2017		24			
2/10/2017	297				321
4/4/2017			382	444	339
4/6/2017	320				
4/7/2017		24.9			
6/13/2017			374	430	
6/15/2017	339	23.2			
6/16/2017					331
8/8/2017	319		378	414	
8/10/2017		23.3			330
10/3/2017			382		344
10/5/2017	274	25.3		467	
12/12/2017				525	
1/9/2018				439	
5/23/2018	248	22.9		434	368
5/24/2018			396		
7/11/2018					371
8/16/2018					382
9/17/2018	214				376

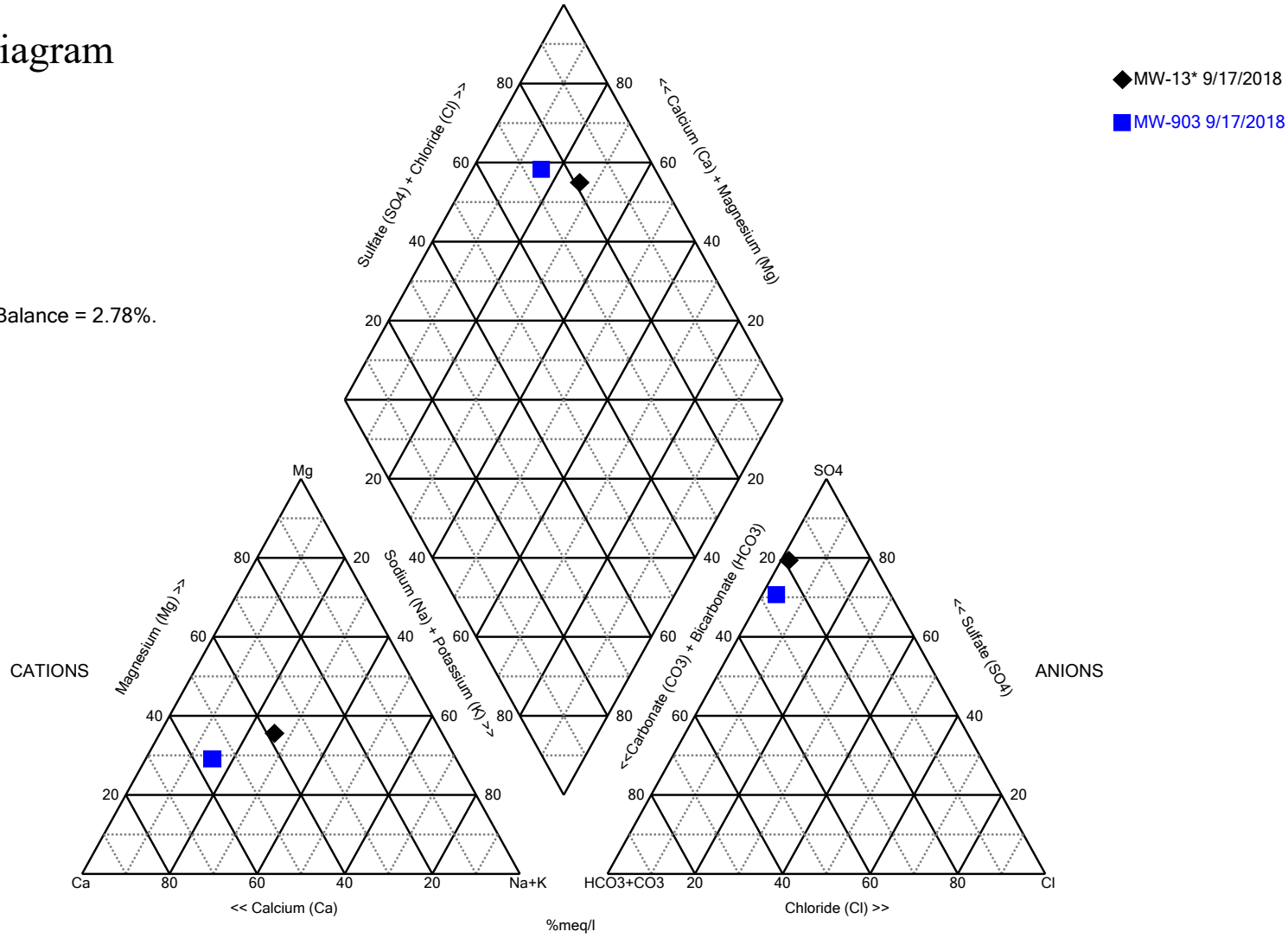
Appendix D

Piper Diagrams

Internal Use Only

Piper Diagram

Cation-Anion Balance = 2.78%.



Analysis Run 11/15/2018 5:20 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

Appendix E

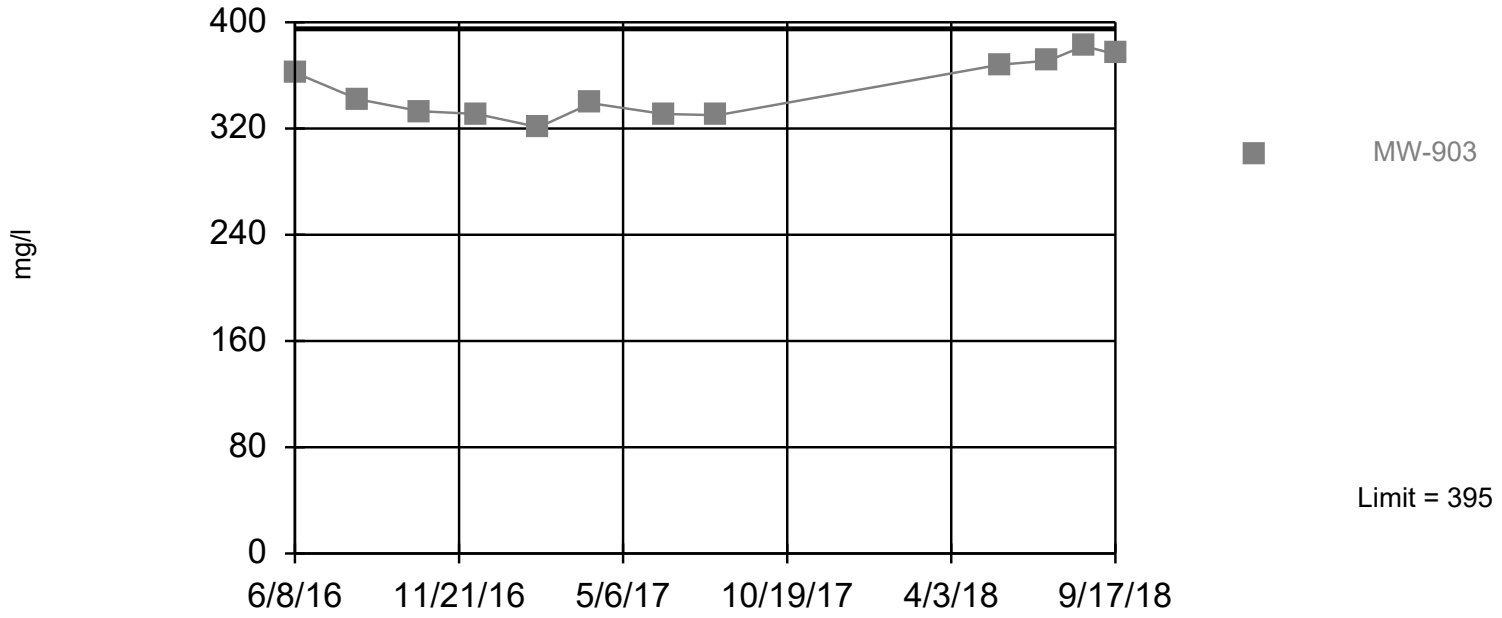
Facility Wide Interwell Prediction Limits

Internal Use Only

Within Limit

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 73 background values. Annual per-constituent alpha = 0.000029. Individual comparison alpha = 0.0000145 (1 of 3). Seasonality was not detected with 95% confidence.

Constituent: CALCIUM Analysis Run 11/16/2018 11:48 AM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

Prediction Limit

Constituent: CALCIUM (mg/l) Analysis Run 11/16/2018 11:51 AM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

	MW-10 (bg)	MW-703 (bg)	MW-701 (bg)	MW-901 (bg)	MW-702 (bg)	MW-903	MW-13 (bg)	MW-601 (bg)	MW-602 (bg)
6/6/2016	60.1								
6/7/2016		22	39.6						
6/8/2016				57.2	17.3	362			
6/9/2016							363	21.7	
6/10/2016									24.7
8/9/2016		17.9	35.3		11.2			20.3	23.3
8/11/2016	58.7			53.9		342	371		
10/11/2016		20.5	37.2		14.9				
10/12/2016	60.7								
10/13/2016						333	395	23.9	25.7
10/14/2016				52.1					
12/6/2016		19.8	37.2						
12/7/2016								22.5	
12/8/2016					19.4				
12/9/2016	59					331			25.3
12/12/2016				56.9					
12/13/2016							336		
2/7/2017		17.7	37.4						
2/8/2017	58.8				18.1			20.1	24
2/9/2017				55.7					
2/10/2017						321	297		
4/4/2017		22.4	36.3	57.6		339			
4/5/2017					18.5				
4/6/2017	57.4						320	21.3	
4/7/2017									24.9
6/13/2017			36.1						
6/14/2017		17.4							
6/15/2017	55.5				15.1		339	22	23.2
6/16/2017				56.7		331			
8/8/2017			36.3				319		
8/9/2017					20.3			20.9	
8/10/2017	56.1	17.5				330			23.3
8/11/2017				56					
5/23/2018	54.1			57.1		368	248	17.6	22.9
5/24/2018		21.8	39.5		7.13				
7/11/2018						371			
8/16/2018						382			
9/17/2018						376	214		

Prediction Limit

LaCygne Client: SCS Engineers Data: LaC GW Data Printed 11/16/2018, 11:51 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	%NDs	Transform	Alpha	Method
CALCIUM (mg/l)	MW-903	395	n/a	9/17/2018	376	No	73	0	n/a	0.000...	NP Inter (normality) ...

C.3 Supplemental Data, Groundwater Monitoring Alternative Source Demonstration Report May 2018 Groundwater Monitoring Event

Piper Diagram

Analysis Run 1/24/2019 6:36 PM View: Bottom Ash III

LaCygne Client: SCS Engineers Data: LaC GW Data

Totals (ppm)	Na	K	Ca	Mg	Cl	SO4	HCO3	CO3
MW-13* 9/17/2018	165	3.55	214	120	13.1	1010	295	10
MW-903 9/17/2018	116	6.47	376	117	26.1	1070	497	10