2018 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

CCR LANDFILL
IATAN GENERATING STATION
IATAN, MISSOURI

Presented To:
Kansas City Power & Light Company

SCS ENGINEERS

27213167.18 | 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 Registered Geologist in the State of Missouri, do hereby certify that the 2018 Annual Groundwater Monitoring and Corrective Action Report for the CCR Landfill at the Iatan Generating Station was prepared by me or under my direct supervision and fulfills the requirements of 40 CFR 257.90(e).

John R. Rockhold, R.G.

SCS Engineers

I, Douglas L. Doerr, being a qualified licensed Professional Engineer in the State of Missouri, do hereby certify that the 2018 Annual Groundwater Monitoring and Corrective Action Report for the CCR Landfill at the Iatan 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
Date: 2019.01.30 15:34:25 -06'00'

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 CCR Landfill at the Iatan 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 CCR Landfill and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR Landfill 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 CCR Landfill 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, and

f. 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 report is included as **Appendix C**:

C.1 Groundwater Monitoring Alternative Source Demonstration Report October 2017 Groundwater Monitoring Event, CCR Landfill, Iatan Generating Station (April 2018).

C.2. Supplemental Data for Groundwater Monitoring Alternative Source Demonstration Report October 2017 Groundwater Monitoring Event, CCR Landfill, Iatan Generating Station (April 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

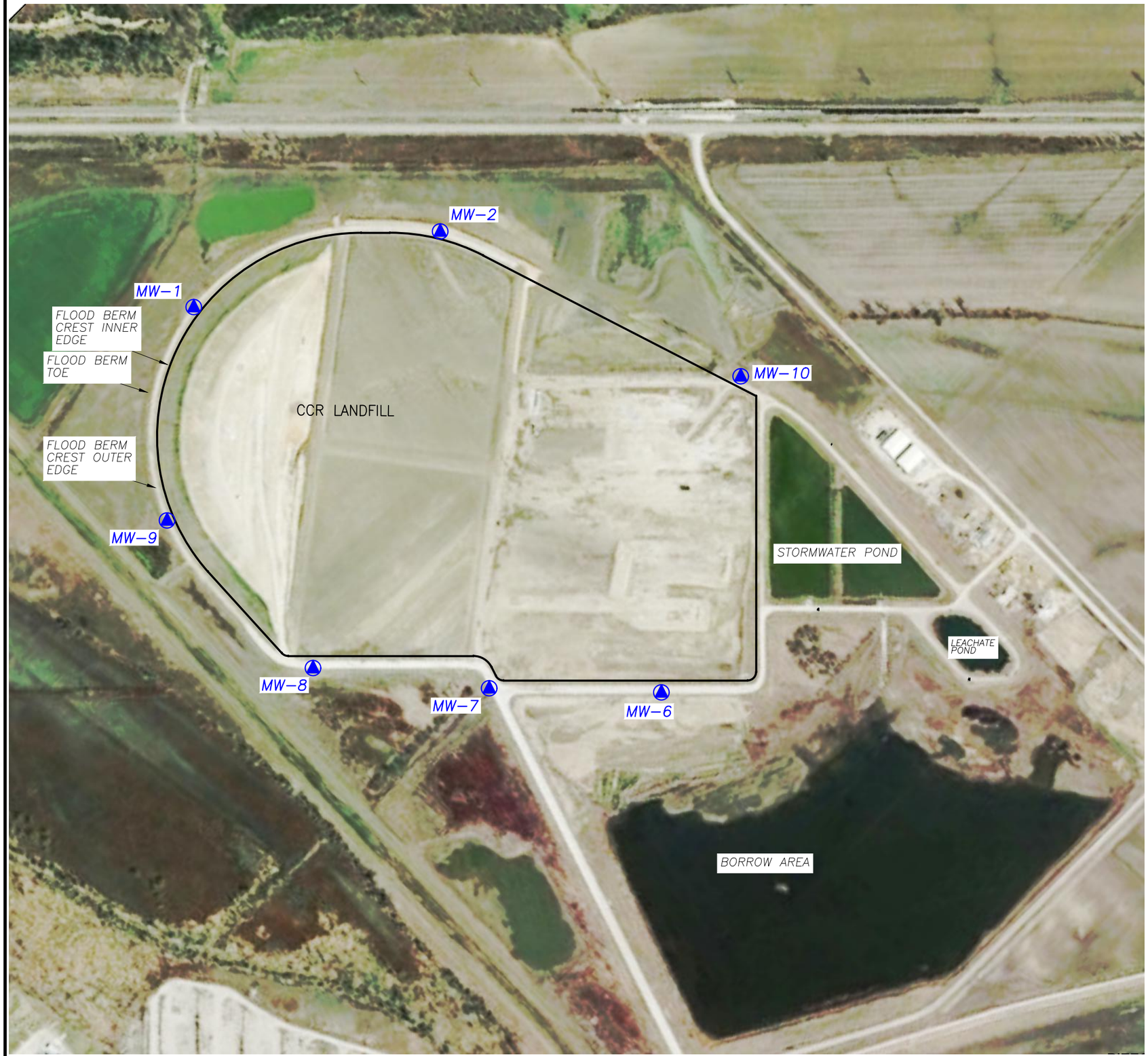
This report has been prepared and reviewed under the direction of a qualified groundwater scientist and qualified professional engineer. The information contained in this report is a reflection of the conditions encountered at the Iatan Generating Station at the time of fieldwork. This report includes 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 Iatan Generating Station CCR Landfill. No warranties, express or implied, are intended or made.

APPENDIX A

FIGURES

Figure 1: Site Map

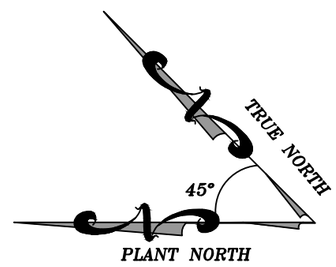


LEGEND:

- MW–1 — CCR GROUNDWATER MONITORING WELL SYSTEM
- ——— CCR LANDFILL UNIT BOUNDARY

NOTES:

1. HORIZONTAL DATUM: MISSOURI STATE PLANE COORDINATE SYSTEM, WEST ZONE (NAD 83)
2. VERTICAL DATUM: NAVD 88
3. GOOGLE EARTH IMAGE DATED MARCH 27, 2017. BOUNDARY AND MONITOR WELL LOCATIONS ARE APPROXIMATE
4. BOUNDARY AND MONITOR WELL LOCATIONS PROVIDED BY BURNS & MCDONNELL
5. CCR LANDFILL UNIT BOUNDARY SHOWN IS APPROXIMATE.



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SCALE FEET

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5	-	-

SHEET TITLE: SITE MAP
CCR LANDFILL
CCR GROUNDWATER MONITORING SYSTEM

PROJECT TITLE: 2018 GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

CLIENT: KANSAS CITY POWER & LIGHT COMPANY
IATAN GENERATING STATION
WESTON, MISSOURI

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

PROJ. NO. 27213167.18 | DSN. BY: TGW | DWN. BY: TGW | CHK. BY: JRR | Q/A RVW BY: JRR | PROJ. MGR: JRR

CADD FILE: FIG 1_IATAN SITE MAP_2018 CCR.DWG

DATE: 1/21/19

FIGURE NO. 1

N:\KCPL\Projects\Groundwater\DWG\Iatan\Annual CCR Reporting\2018\Fig 1_Iatan Site Map_2018 CCR.dwg Jan 21, 2019 - 1:05pm 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
CCR Landfill
Appendix III Detection Monitoring Results
KCP&L Iatan 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-1	05/21/18	<0.200	131	5.63	0.327	6.93	32.6	496
MW-1	06/26/18	---	---	---	*0.263	**6.99	---	---
MW-1	11/12/18	<0.200	137	5.04	0.288	6.99	24.6	485
MW-2	05/21/18	<0.200	164	8.14	0.383	6.90	137	648
MW-2	06/26/18	---	---	---	*0.320	**6.99	---	---
MW-2	11/12/18	<0.200	166	5.79	0.327	7.15	81.5	590
MW-6	05/21/18	<0.200	150	1.45	0.354	7.08	30.9	540
MW-6	11/12/18	<0.200	147	1.31	0.325	7.27	27.3	484
MW-7	05/21/18	<0.200	123	1.54	0.414	7.04	23.8	439
MW-7	11/12/18	<0.200	192	26.4	0.369	7.18	149	681
MW-8	05/21/18	<0.200	130	1.50	0.441	7.17	25.4	437
MW-8	11/12/18	<0.200	170	12.10	0.396	7.15	85.8	563
MW-9	05/21/18	<0.200	105	<1.00	0.426	7.05	18.3	412
MW-9	11/12/18	<0.200	122	1.1	0.390	7.21	25.8	435
MW-10	05/21/18	<0.200	115	14.1	0.654	7.04	23.6	509
MW-10	11/12/18	<0.200	138	15.1	0.680	7.19	32.9	554

* 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
CCR Landfill
Detection Monitoring Field Measurements
KCP&L Iatan 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-1	05/21/18	6.93	873	15.78	0.0	208	0.83	23.35	765.34
MW-1	06/26/18	**6.99	802	15.98	0.0	128	0.10	23.74	764.95
MW-1	11/12/18	6.99	875	8.84	2.2	-60	6.90	23.78	764.91
MW-2	05/21/18	6.90	995	15.96	0.0	-111	1.01	24.34	765.27
MW-2	06/26/18	**6.99	871	16.58	0.0	114	0.28	24.59	765.02
MW-2	11/12/18	7.15	876	6	4.2	-2	4.50	24.85	764.76
MW-6	05/21/18	7.08	951	16.18	0.0	211	0.58	25.15	764.50
MW-6	11/12/18	7.27	880	10.81	0.0	-84	3.25	20.28	769.37
MW-7	05/21/18	7.04	783	15.4	0.0	218	0.55	24.85	764.80
MW-7	11/12/18	7.18	1140	12.43	6.5	-84	0.00	19.46	770.19
MW-8	05/21/18	7.17	800	15.53	0.0	216	1.75	24.62	765.09
MW-8	11/12/18	7.15	799	6.92	5.4	-72	4.85	19.84	769.87
MW-9	05/21/18	7.05	710	15.78	0.0	-126	1.11	24.60	765.30
MW-9	11/12/18	7.21	808	9.77	0.0	-94	2.13	18.73	771.17
MW-10	05/21/18	7.04	917	14.83	1.2	236	0.00	24.48	764.98
MW-10	11/12/18	7.19	925	9.91	0.0	-50	0.00	19.67	769.79

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

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

C.2. Supplemental Data, Groundwater Monitoring Alternative Source Demonstration Report October 2017 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

CCR LANDFILL
IATAN GENERATING STATION
PLATTE COUNTY, MISSOURI

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. 27213167.17

CERTIFICATIONS

I, John R. Rockhold, being a qualified groundwater scientist and Registered Geologist in the State of Missouri, do hereby certify the accuracy of the information in the CCR Groundwater Monitoring Alternative Source Demonstration Report for the CCR Landfill at the Iatan 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, R.G.
SCS Engineers

I, Douglas L. Doerr, being a qualified licensed Professional Engineer in the State of Missouri, do hereby certify the accuracy of the information in the CCR Groundwater Monitoring Alternative Source Demonstration Report for the CCR Landfill at the Iatan 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 CCR Landfill at Kansas City Power & Light Company's (KCP&L) Iatan 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 above the prediction limit, then an SSI has not occurred.

Determinations of SSIs for the CCR Landfill at the Iatan Generating Station were completed no later than January 15, 2018 and placed into the CCR Operating Record.

The completed statistical evaluation identified one Appendix III constituent above its prediction limit. The prediction limit for chloride in monitoring well MW-1 is 6.27 mg/L. The detection monitoring sample was reported at 6.75 mg/L. The first verification sample was collected on November 14, 2017 with a result of 6.73 mg/L. The second verification sample was collected on December 29, 2017 with a result of 6.27 mg/L. However the, Sanitas™ Output identified the 6.27 mg/L chloride concentration in MW-1 as a confirmed SSI above background, due to numerical rounding. Therefore, in accordance with the Statistical Method Certification, the detection

monitoring sample for chloride from monitoring well MW-1 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. For the above identified SSI for the CCR Landfill at the Iatan Generating Station, there are multiple lines of supporting evidence to indicate the above SSI was not caused by a release from the CCR Landfill. 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 and near the CCR Landfill at the time of sampling. Monitoring well MW-1 is generally located upgradient from the CCR Landfill depending on river stage. During this detection monitoring sampling event, MW-1 was upgradient to crossgradient from the CCR Landfill indicating the SSI is not likely caused by a release from the CCR Landfill. This demonstrates that a source other than the CCR Landfill likely caused the SSI over background levels for chloride, or that the SSI 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 SSI was only identified in upgradient well MW-1, box and whiskers plots for chloride in the CCR groundwater monitoring system wells were prepared to allow comparison of chloride concentrations between wells. The comparison between wells indicates the chloride concentrations in upgradient well MW-1 are within the range of concentrations from the other wells. This demonstrates that a source other than the CCR Landfill caused the SSI over background levels for chloride, or that the 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 PIPER DIAGRAM 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 MW-1 and landfill leachate is provided in **Appendix C** and indicates the groundwater from this well does not exhibit the same geochemical characteristics as the leachate. The groundwater and the leachate plot in totally different hydrochemical facies indicating there is no mixing of the two types of water (groundwater and leachate). This demonstrates that a source other than the CCR Landfill caused the SSI over background levels for chloride or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

3.4 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 the CCR monitoring system wells indicate chloride concentrations in MW-1 are within the range of concentration of chloride from the other wells. This demonstrates that a source other than the CCR Landfill caused the SSI over background levels for chloride, 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 D**.

4 CONCLUSION

Our opinion is that a sufficient body of evidence is available and presented above to demonstrate that a source other than the CCR Landfill caused the SSI over background levels, 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 CCR Landfill may continue with the detection monitoring program under § 257.94.

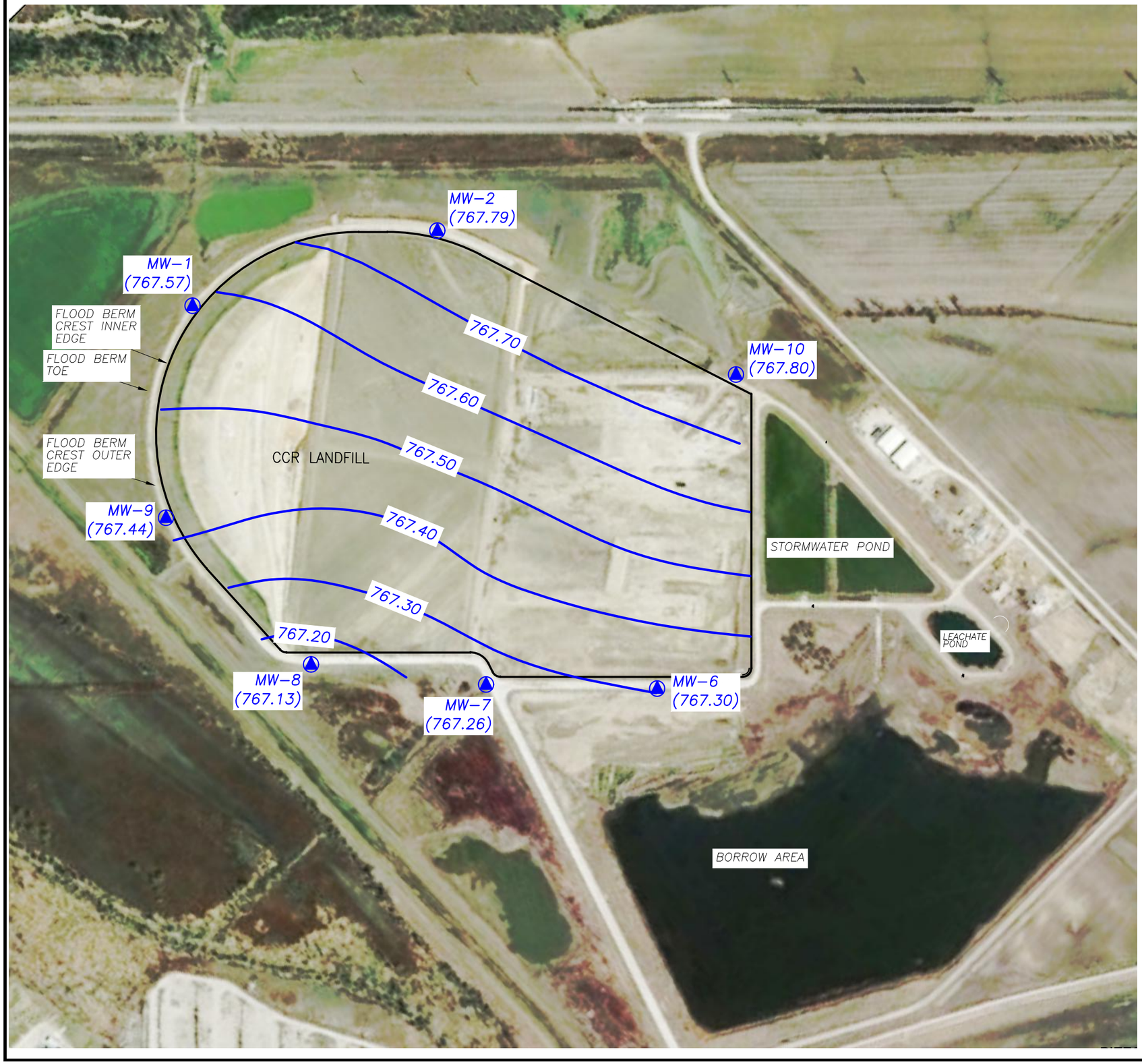
5 GENERAL COMMENTS

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 Iatan 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:

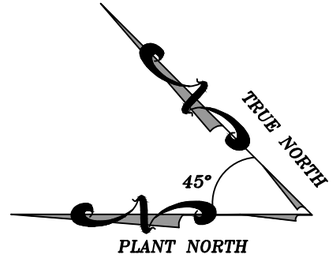
—769.00— GROUNDWATER SURFACE ELEVATIONS

MW-1 (767.57) CCR GROUNDWATER MONITORING WELL SYSTEM (GROUNDWATER ELEVATION)

CCR LANDFILL UNIT BOUNDARY

NOTES:

1. HORIZONTAL DATUM: MISSOURI STATE PLANE COORDINATE SYSTEM, WEST ZONE (NAD 83)
2. VERTICAL DATUM: NAVD 88
3. GOOGLE EARTH IMAGE DATED MARCH 27, 2017. BOUNDARY AND MONITOR WELL LOCATIONS ARE APPROXIMATE
4. BOUNDARY AND MONITOR WELL LOCATIONS PROVIDED BY BURNS & MCDONNELL



500 0 500 1000

SCALE FEET

REV.	DATE	CK. BY
0	-	-
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-

SHEET TITLE
POTENTIOMETRIC SURFACE MAP (OCT 2017)
CCR LANDFILL

PROJECT TITLE
CCR ALTERNATIVE SOURCE DEMONSTRATION

CLIENT
KANSAS CITY POWER & LIGHT COMPANY
IATAN GENERATING STATION
IATAN, MISSOURI

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

PROJ. NO. 27213167.17	DWN. BY: LAM	Q/A REVW BY: JRR	
DSN. BY: LAM	CHK. BY: JRR	PROJ. MGR: JRR	

CADD FILE:
IATAN LF CCR ASD FIG 1.DWG

DATE:
4/16/18

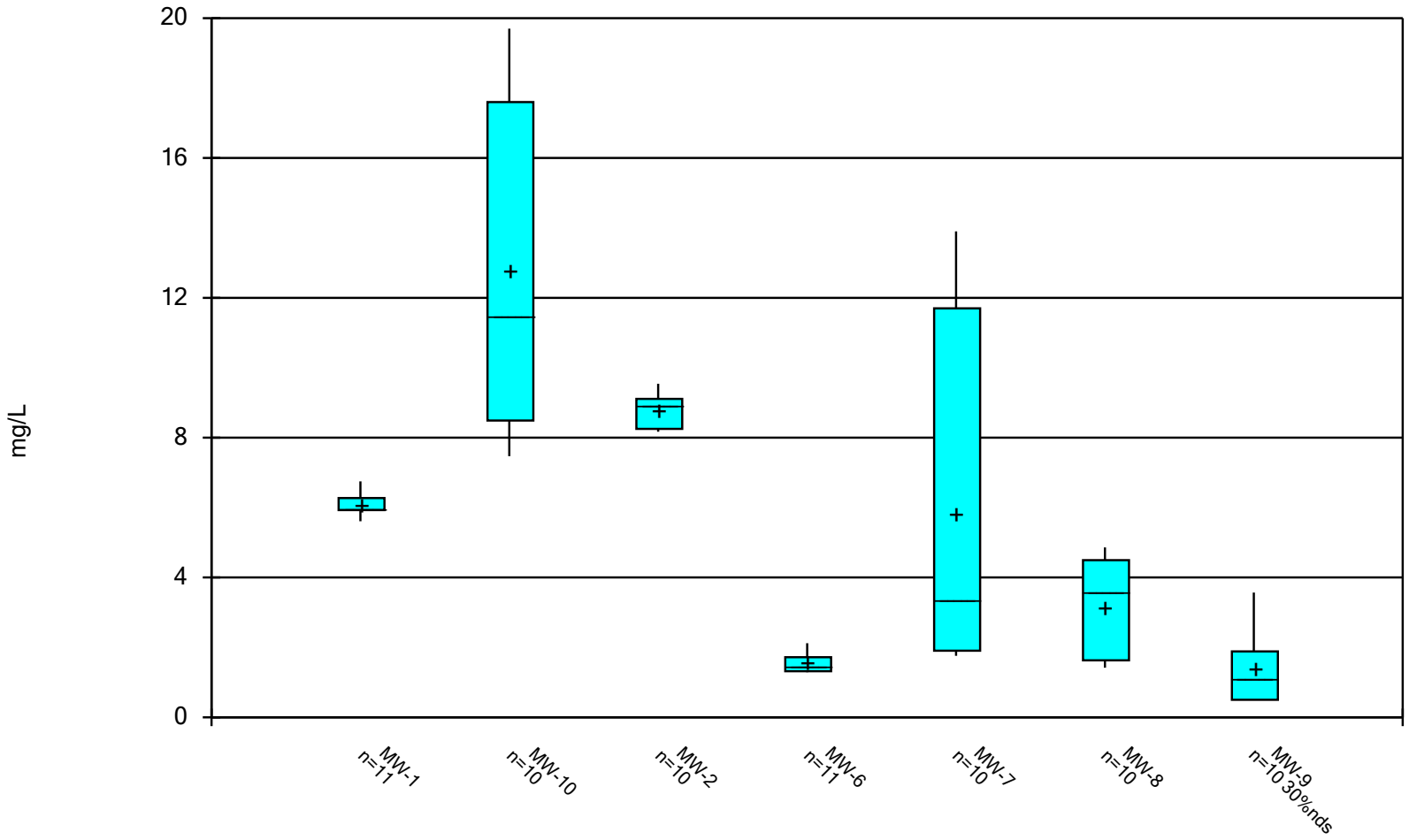
FIGURE NO.
1

N:\KCPL\Projects\Groundwater\DWG\Iatan\2018\CCR Alternative Source Demonstration\Iatan LF CCR ASD Fig 1.dwg Apr 16, 2018 - 10:27am Layout Name: Fig 1 By: 4121rcw

Appendix B

Box and Whiskers Plots

Box & Whiskers Plot



%nds = percent non-detects
n = number of samples

Constituent: Chloride Analysis Run 3/6/2018 2:24 PM View: CCR III

Iatan Utility Waste LF Client: SCS Engineers Data: Iatan

The basic box plot 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. The mean is denoted by a "+".

Box & Whiskers Plot

Constituent: Chloride (mg/L) Analysis Run 3/6/2018 2:25 PM View: CCR III

Iatan Utility Waste LF Client: SCS Engineers Data: Iatan

	MW-1	MW-10	MW-2	MW-6	MW-7	MW-8	MW-9
8/18/2016	5.93	7.47	8.26	1.31	12.3	1.5	1.95
9/29/2016	6.07	7.83	8.79	1.46	13.9	1.42	<1
11/9/2016	5.95	9.15	8.76	1.29	11.1	1.76	<1
12/21/2016	5.97	9.84	8.24	1.72	6.64	1.89	1.66
2/3/2017	6	10.3	8.17	1.4	3.32	4.02	1.16
5/24/2017	5.61	12.6	9.54	1.49	1.76	3.63	1.07
7/5/2017	5.78	15.9	8.99	1.54	1.81	4.44	1.06
8/17/2017	6.13	17.6	8.98	1.32	2	3.53	<1
10/5/2017	6.75	19.7	9.23	2.09	3.32	4.55	3.57
11/14/2017	6.73	17.6	8.97	2.12	2.58	4.86	1.82
12/29/2017	6.27			1.45			
Median	6	11.5	8.88	1.46	3.32	3.58	1.12
LowerQ.	5.93	8.49	8.25	1.32	1.91	1.63	0.5
UpperQ.	6.27	17.6	9.11	1.72	11.7	4.5	1.89
Min	5.61	7.47	8.17	1.29	1.76	1.42	0.5
Max	6.75	19.7	9.54	2.12	13.9	4.86	3.57
Mean	6.11	12.8	8.79	1.56	5.87	3.16	1.38

Box & Whiskers Plot

Iatan Utility Waste LF Client: SCS Engineers Data: Iatan Printed 3/6/2018, 2:25 PM

Constituent	Well	N	Mean	Std. Dev.	Std. Err.	Median	Min.	Max.	%NDs
Chloride (mg/L)	MW-1	11	6.11	0.356	0.107	6	5.61	6.75	0
Chloride (mg/L)	MW-10	10	12.8	4.53	1.43	11.5	7.47	19.7	0
Chloride (mg/L)	MW-2	10	8.79	0.451	0.143	8.88	8.17	9.54	0
Chloride (mg/L)	MW-6	11	1.56	0.294	0.0887	1.46	1.29	2.12	0
Chloride (mg/L)	MW-7	10	5.87	4.78	1.51	3.32	1.76	13.9	0
Chloride (mg/L)	MW-8	10	3.16	1.37	0.434	3.58	1.42	4.86	0
Chloride (mg/L)	MW-9	10	1.38	0.941	0.297	1.12	0.5	3.57	30

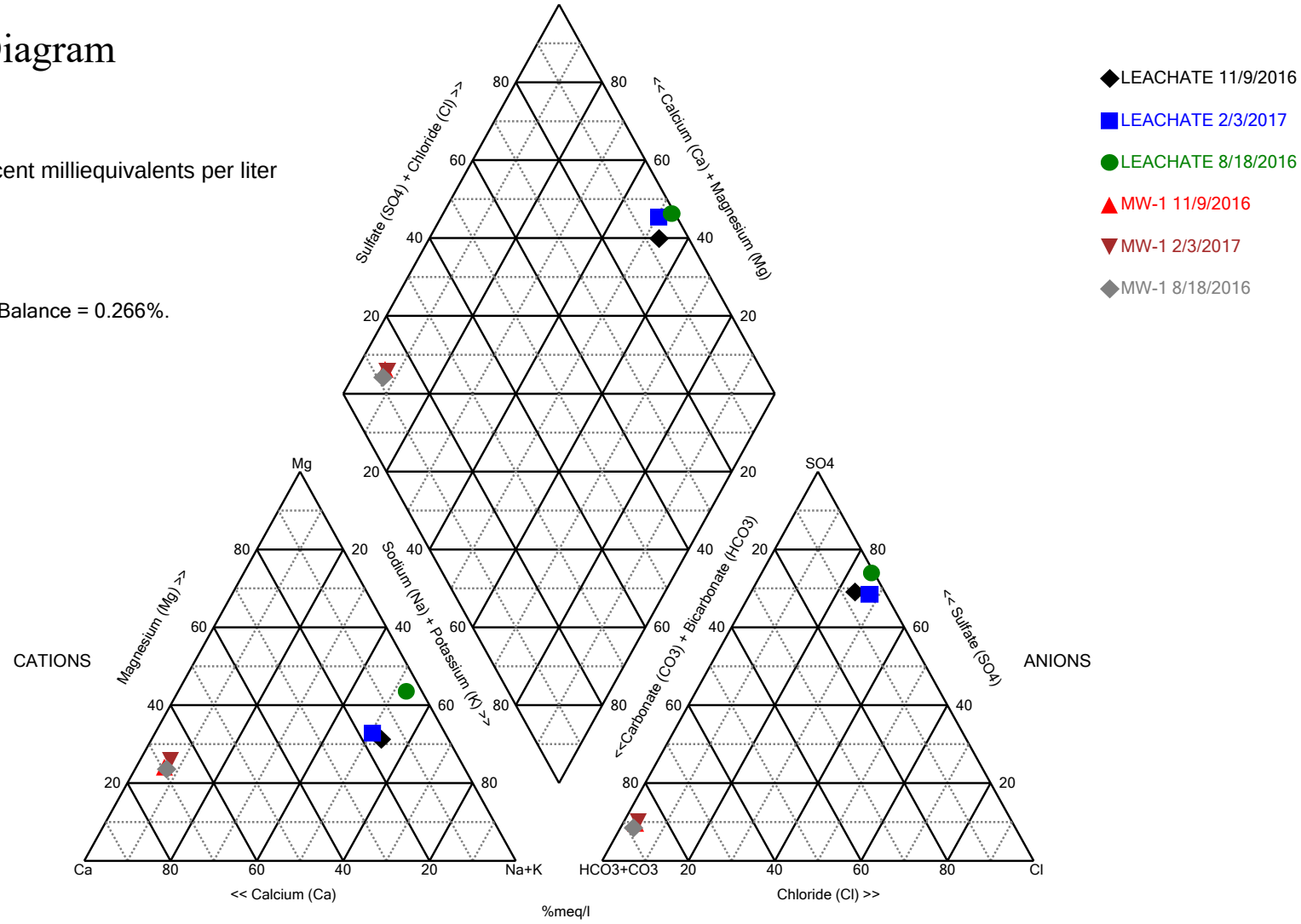
Appendix C

Piper Diagram

Piper Diagram

%meq/l = percent milliequivalents per liter

Cation-Anion Balance = 0.266%.



Analysis Run 4/10/2018 1:39 PM View: CCR III

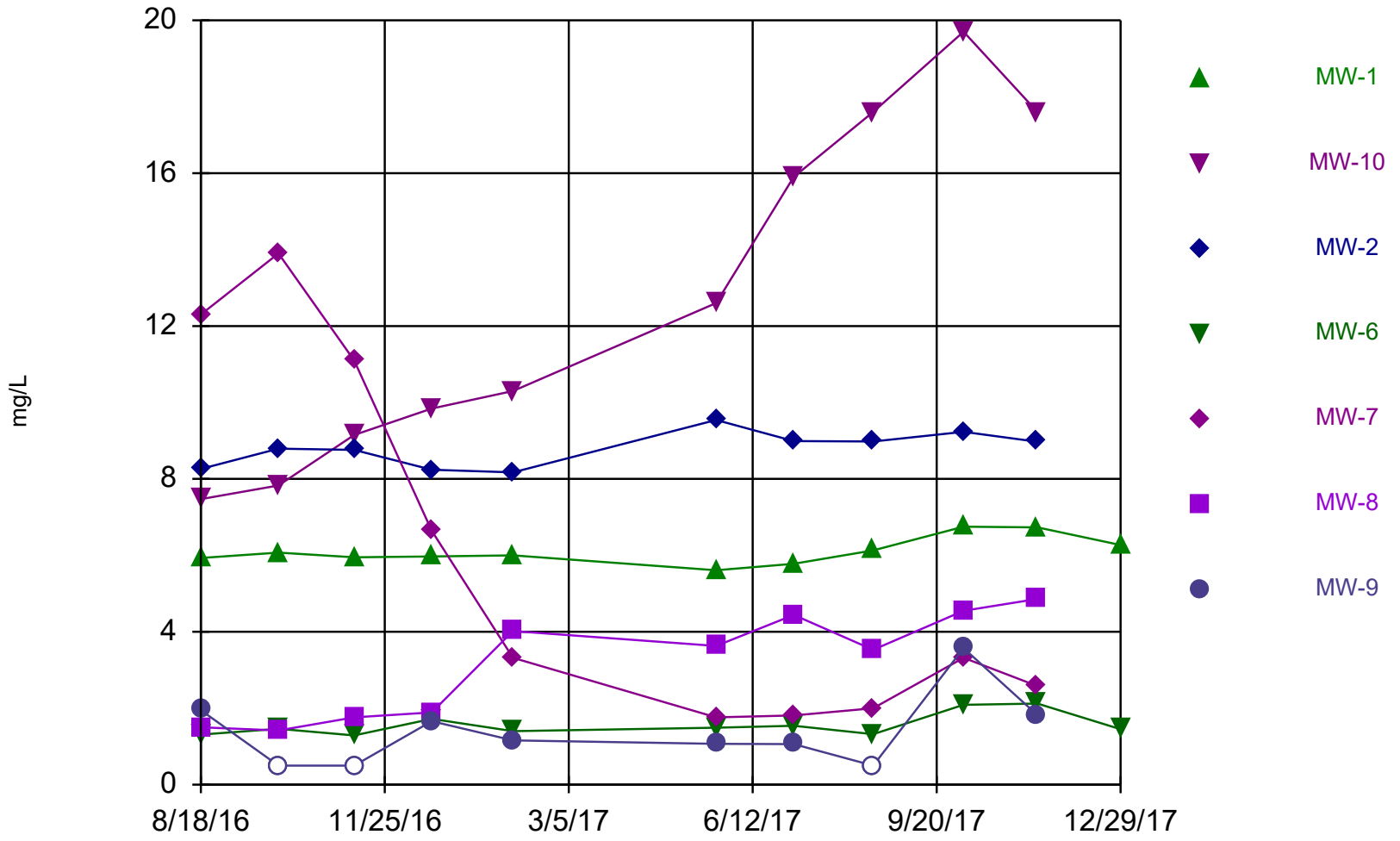
Iatan Utility Waste LF Client: SCS Engineers Data: Iatan

Appendix D

Time Series Plots

Hollow symbols indicate censored values.

Time Series



Constituent: Chloride Analysis Run 4/11/2018 2:48 PM View: CCR III

Iatan Utility Waste LF Client: SCS Engineers Data: Iatan

Time Series

Constituent: Chloride (mg/L) Analysis Run 4/11/2018 2:48 PM View: CCR III

Iatan Utility Waste LF Client: SCS Engineers Data: Iatan

	MW-1	MW-10	MW-2	MW-6	MW-7	MW-8	MW-9
8/18/2016	5.93	7.47	8.26	1.31	12.3	1.5	1.95
9/29/2016	6.07	7.83	8.79	1.46	13.9	1.42	<1
11/9/2016	5.95	9.15	8.76	1.29	11.1	1.76	<1
12/21/2016	5.97	9.84	8.24	1.72	6.64	1.89	1.66
2/3/2017	6	10.3	8.17	1.4	3.32	4.02	1.16
5/24/2017	5.61	12.6	9.54	1.49	1.76	3.63	1.07
7/5/2017	5.78	15.9	8.99	1.54	1.81	4.44	1.06
8/17/2017	6.13	17.6	8.98	1.32	2	3.53	<1
10/5/2017	6.75	19.7	9.23	2.09	3.32	4.55	3.57
11/14/2017	6.73	17.6	8.97	2.12	2.58	4.86	1.82
12/29/2017	6.27			1.45			

C.2. Supplemental Data, Groundwater Monitoring Alternative Source Demonstration Report October 2017 Groundwater Monitoring Event

Piper Diagram

Analysis Run 1/24/2019 1:58 PM View: CCR LF III

Iatan Utility Waste LF Client: SCS Engineers Data: Iatan jrr

Totals (ppm)	Na	K	Ca	Mg	Cl	SO4	HCO3	CO3
MW-1 8/18/2016	11.7	6.56	134	27.4	5.93	32.4	436	10
MW-1 11/9/2016	11.1	6	136	28.4	5.95	33.2	383	10
MW-1 2/3/2017	11	5.93	116	26.8	6	36.9	394	10
LEACHATE 8/18/2016	9250	689	573	4240	6990	28000	644	10
LEACHATE 11/9/2016	1230	90.7	334	398	876	3460	480	10
LEACHATE 2/3/2017	1880	121	560	671	1760	6070	505	10