

2020 ANNUAL GROUNDWATER MONITORING  
AND CORRECTIVE ACTION REPORT  
BOTTOM ASH SETTLING AREA  
TECUMSEH ENERGY CENTER  
TECUMSEH, KANSAS

by Haley & Aldrich, Inc.  
Cleveland, Ohio

for Evergy Kansas Central, Inc.  
Topeka, Kansas

File No. 129778-029  
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Revision No.	Date	Notes
0	2/1/2021	Original
1	3/5/2021	Revised to include groundwater flow direction to Figure 1

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**2020 Annual Groundwater Monitoring  
and Corrective Action Report**

This Annual Groundwater Monitoring and Corrective Action Report documents the groundwater monitoring program for the Tecumseh Energy Center (TEC) Bottom Ash Settling Area (BASA) consistent with applicable sections of 257.90 through 257.98, and describes activities conducted in the prior calendar year (2020) and documents compliance with the U.S. Environmental Protection Agency Coal Combustion Residual Rule. I certify that the 2020 Annual Groundwater Monitoring and Corrective Action Report for the TEC BASA is, to the best of my knowledge, accurate and complete.

Signed:   
Professional Geologist

Print Name: Mark Nicholls  
Kansas License No.: Professional Geologist No. 881  
Title: Technical Expert 2  
Company: Haley & Aldrich, Inc.



## 1. Introduction

This 2020 Annual Groundwater Monitoring and Corrective Action Report (Annual Report) addresses the Bottom Ash Settling Area (BASA; also known as the Bottom Ash Settling Pond) at the Tecumseh Energy Center (TEC), operated by Evergy Kansas Central, Inc. (Evergy). This Annual Report was developed in accordance with the U.S. Environmental Protection Agency Coal Combustion Residual (CCR) Rule (Rule) effective October 19, 2015, including subsequent revisions, specifically Code of Federal Regulations Title 40 (40 CFR), subsection 257.90(e). The Annual Report documents the groundwater monitoring system for the BASA consistent with applicable sections of 257.90 through 257.98, and describes activities conducted in the prior calendar year (2020) and documents compliance with the Rule. The specific requirements for the Annual Report listed in § 257.90(e) of the Rule are provided in Sections 1 and 2 of this Annual Report and are in bold italic font, followed by a short narrative describing how each Rule requirement has been met.

### 1.1 40 CFR § 257.90(E)(6) SUMMARY

*A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:*

#### 1.1.1 40 CFR § 257.90(e)(6)(i) – Initial Monitoring Program

*At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;*

At the start of the current annual reporting period (January 1, 2020), the BASA was operating under an assessment monitoring program in compliance with 40 CFR § 257.95.

#### 1.1.2 40 CFR § 257.90(e)(6)(ii) – Final Monitoring Program

*At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;*

At the end of the current annual reporting period (December 31, 2020), the BASA was closed in accordance with the requirements of 40 CFR § 257.102(c). Upon documentation of CCR waste material removal from the unit on September 5, 2019, two consecutive sampling events, October 2019 and December 2019, were used to document that detected appendix IV constituents did not exceed the groundwater protection standards for the BASA pursuant to § 257.95(h). The TEC BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c).

#### 1.1.3 40 CFR § 257.90(e)(6)(iii) – Statistically Significant Increases

*If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to § 257.94(e):*

2020 Annual Groundwater Monitoring  
and Corrective Action Report

1.1.3.1 40 CFR § 257.90(e)(6)(iii)(a)

**Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and**

The BASA was operating under an assessment monitoring program until August 2020 prior to closure; therefore, no statistical evaluations were completed on appendix III constituents in 2020.

1.1.3.2 40 CFR § 257.90(e)(6)(iii)(b)

**Provide the date when the assessment monitoring program was initiated for the CCR unit.**

An assessment monitoring program was initiated on July 17, 2018 for the BASA with a notification establishing assessment monitoring provided on August 15, 2018 to meet the requirements of 40 CFR § 257.95. The TEC BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c).

1.1.4 40 CFR § 257.90(e)(6)(iv) – Statistically Significant Levels

**If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to § 257.95(g) include all of the following:**

1.1.4.1 40 CFR § 257.90(e)(6)(iv)(A) – Statistically Significant Level Constituents

**Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;**

No statistically significant levels were identified above the groundwater protection standard for those constituents listed in appendix IV to this part in 2020 for the BASA.

1.1.4.2 40 CFR § 257.90(e)(6)(iv)(B) – Initiation of the Assessment of Corrective Measures

**Provide the date when the assessment of corrective measures was initiated for the CCR unit;**

No assessment of corrective measures was required to be initiated in 2020 for this unit. The BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c).

1.1.4.3 40 CFR § 257.90(e)(6)(iv)(C) – Assessment of Corrective Measures Public Meeting

**Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and**

An assessment of corrective measures was not required for the BASA in 2020; therefore, a public meeting was not held.

**2020 Annual Groundwater Monitoring  
and Corrective Action Report**

**1.1.4.4 40 CFR § 257.90(e)(6)(iv)(D) – Completion of the Assessment of Corrective Measures**  
***Provide the date when the assessment of corrective measures was completed for the CCR unit.***

No assessment of corrective measures was required to be initiated in 2020 for this unit. The BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c).

**1.1.5 40 CFR § 257.90(e)(6)(v) – Selection of Remedy**  
***Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and***

The BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c), and no remedy was required to be selected.

**1.1.6 40 CFR § 257.90(e)(6)(vi) – Remedial Activities**  
***Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.***

No remedial activities were required in 2020.

## 2. 40 CFR § 257.90 Applicability

### 2.1 40 CFR § 257.90(a)

***All CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under §§ 257.90 through 257.99, except as provided in paragraph (g) [Suspension of groundwater monitoring requirements] of this section.***

Energy has installed and certified a groundwater monitoring system at the TEC BASA. The BASA is subject to the groundwater monitoring and corrective action requirements described under 40 CFR §§ 257.90 through 257.98. This document addresses the requirement for the Owner/Operator to prepare an Annual Report per § 257.90(e).

### 2.2 40 CFR § 257.90(e) – SUMMARY

***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).***

This Annual Report describes monitoring completed and actions taken for the groundwater monitoring system at the TEC BASA as required by the Rule. Groundwater sampling and analysis was conducted per the requirements described in § 257.93, and the status of the groundwater monitoring program described in § 257.94 and § 257.95 is also provided in this report. This Annual Report documents the applicable groundwater-related activities completed in the calendar year 2020.

#### 2.2.1 Status of the Groundwater Monitoring Program

The BASA unit was closed on August 11, 2020 in accordance with the requirements of § 257.102(c).

#### 2.2.2 Key Actions Completed

The 2019 Annual Groundwater Monitoring and Corrective Action Report was completed in January 2020. Statistical evaluations, in support of § 257.95(e), were completed in January and April 2020 on analytical data from the October and December 2019 semi-annual assessment monitoring sampling events, respectively.



## 2020 Annual Groundwater Monitoring and Corrective Action Report

During the December 2019 semi-annual assessment monitoring sampling event, downgradient monitoring well MW-9 was identified as being dry. The monitoring well was unable to be sampled; therefore, statistical evaluation was not completed for MW-9 for the December 2019 sampling event. Monitoring well MW-9 was re-confirmed to be dry in March 2020.

The TEC BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c). No sampling events were completed at the TEC BASA in 2020.

### 2.2.3 Problems Encountered

No noteworthy problems (i.e., problems could include damaged wells, issues with sample collection or lack of sampling, and problems with analytical analysis) were encountered at the BASA in 2020.

### 2.2.4 Actions to Resolve Problems

No problems were encountered at the BASA in 2020, therefore, no actions to resolve problems were required.

### 2.2.5 Project Key Activities for Upcoming Year

The TEC BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c). No key activities are planned to be completed in 2021 at the unit under the CCR Rule.

## 2.3 40 CFR § 257.90(e) – INFORMATION

***At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:***

### 2.3.1 40 CFR § 257.90(e)(1)

***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;***

As required by § 257.90(e)(1), a map showing the locations of the CCR unit and associated upgradient and downgradient monitoring wells for the TEC BASA is included in this report as Figure 1.

### 2.3.2 40 CFR § 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 monitoring wells were installed or decommissioned during 2020.

**2.3.3 40 CFR § 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;*

Upon completion of the statistical evaluation of the December 2019 semi-annual assessment monitoring sampling event, the TEC BASA was closed in accordance with the requirements of § 257.102(c). No sampling events were completed at the TEC BASA in 2020.

**2.3.4 40 CFR § 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*

The assessment monitoring program was initiated on July 17, 2018 with a notification establishing assessment monitoring provided on August 15, 2018 to meet the requirements of 40 CFR § 257.95. Upon documentation of CCR waste material removal from the unit on September 5, 2019, two consecutive sampling events, October 2019 and December 2019, were used to document that detected appendix IV constituents did not exceed the groundwater protection standards for the BASA pursuant to § 257.95(h). The TEC BASA surface impoundment was closed on August 11, 2020 in accordance with the requirements of § 257.102(c).

**2.3.5 40 CFR § 257.90(e)(5) – Other Requirements**

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

This Annual Report documents activities conducted to comply with §§ 257.90 through 257.95 of the Rule. It is understood that there are supplemental references in §§ 257.90 through 257.98 that must be placed in the Annual Report. The following requirements include relevant and required information in the Annual Report for activities completed in calendar year 2020.

**2.3.5.1 40 CFR § 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).*

**2020 Annual Groundwater Monitoring  
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This unit was closed on August 11, 2020 in accordance with § 257.102(c). Prior to that date, the unit was operating under an assessment monitoring program; therefore, no demonstration or certification is applicable.

**2.3.5.2 40 CFR § 257.94(e)(2) – Detection Monitoring Alternate Source Demonstration**

***The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase 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 statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority 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 this section. 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 or approval from the Participating State Director or approval from EPA where EPA is the permitting authority.***

The TEC BASA was closed on August 11, 2020 in accordance with § 257.102(c). Prior to that date, the unit was operating under an assessment monitoring program; therefore, no detection monitoring alternate source demonstration or certification is applicable.

**2.3.5.3 40 CFR § 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 approval from EPA where EPA is the permitting authority in the annual groundwater monitoring and corrective action report required by § 257.90(e).***

An alternative assessment monitoring sampling and analysis frequency was not established for this unit; therefore, no demonstration or certification is applicable. This unit was closed on August 11, 2020 in accordance with § 257.102(c).

2.3.5.4 *40 CFR § 257.95(d)(3) – Assessment Monitoring Concentrations and Groundwater Protection Standards*

***Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).***

An assessment monitoring program was implemented at the CCR unit until closure on August 11, 2020. The background concentrations (upper tolerance limits) and groundwater protection standards established for detected appendix IV constituents for the TEC BASA are included in Table I. The background concentrations and groundwater protection standards provided in Table I were utilized for the statistical evaluations completed in 2020 for the October 2019 and December 2019 semi-annual assessment monitoring sampling events.

2.3.5.5 *40 CFR § 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 or approval from the Participating State Director or approval from EPA where EPA is the permitting authority. 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.***

No assessment monitoring alternative source demonstration or certification was required in 2020.

2.3.5.6 *40 CFR § 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 or approval from the Participating State Director or approval from EPA where EPA is the permitting authority 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***

**2020 Annual Groundwater Monitoring  
and Corrective Action Report**

***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.***

No assessment of corrective measures was required to be initiated in 2020; therefore, no demonstration or certification is applicable for this unit.

## TABLE

**TABLE I**  
**ASSESSMENT GROUNDWATER MONITORING - DETECTED APPENDIX IV GWPS**  
 SEPTEMBER AND DECEMBER 2019 SAMPLING EVENT  
 TECUMSEH ENERGY CENTER  
 BOTTOM ASH SETTLING AREA

Well Number	Background Value <sup>1</sup>	GWPS
<b>CCR Appendix-IV Arsenic, Total (mg/L)</b>		
MW-7 (upgradient)	0.0021	NA
MW-10 <sup>2,3</sup>	0.118	0.118
MW-8		0.010
MW-9 <sup>2,3</sup>	0.198	0.198
<b>CCR Appendix-IV Barium, Total (mg/L)</b>		
MW-7 (upgradient)	0.0953	NA
MW-10		2
MW-8		2
MW-9		2
<b>CCR Appendix-IV Cadmium, Total (mg/L)</b>		
MW-7 (upgradient)	0.0005	NA
MW-10		0.005
MW-8		0.005
MW-9		0.005
<b>CCR Appendix-IV Cobalt, Total (mg/L)</b>		
MW-7 (upgradient)	0.00217	NA
MW-10		0.006
MW-8		0.006
MW-9 <sup>2,3</sup>	0.0641	0.064
<b>CCR Appendix-IV Fluoride, Total (mg/L)</b>		
MW-7 (upgradient)	0.371	NA
MW-10		4.0
MW-8		4.0
MW-9		4.0
<b>CCR Appendix-IV Lithium, Total (mg/L)</b>		
MW-7 (upgradient)	0.0295	NA
MW-10		0.040
MW-8		0.040
MW-9		0.040
<b>CCR Appendix-IV Molybdenum, Total (mg/L)</b>		
MW-7 (upgradient)	0.0138	NA
MW-10		0.100
MW-8		0.100
MW-9		0.100
<b>CCR Appendix-IV Radium-226 &amp; 228 Combined (pCi/L)</b>		
MW-7 (upgradient)	5.88	NA
MW-10		5.88
MW-8		5.88
MW-9		5.88

**Notes and Abbreviations:**

<sup>1</sup> Interwell background value based on background data collected through September 2018.

<sup>2</sup> Denotes intrawell evaluation for the listed constituent. All other constituents are interwell evaluation.

<sup>3</sup> Intrawell background value based on background data collected through June 2019.

CCR = Coal Combustion Residuals

GWPS = Groundwater Protection Standard

mg/L = milligrams per Liter

NA = Not Applicable





pCi/L = picoCuries per Liter

**FIGURE**



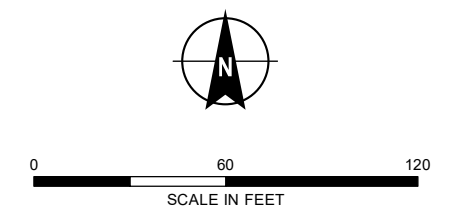


**LEGEND**

-  MONITORING WELL
-  PIEZOMETER OBSERVATION ONLY
-  TYPICAL GROUNDWATER FLOW DIRECTION
-  BOTTOM ASH SETTLING AREA

**NOTES**

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
4. AERIAL IMAGERY SOURCE: ESRI, NOVEMBER 7, 2019



**HALEY ALDRICH** EVERGY KANSAS CENTRAL, INC.  
 TECUMSEH ENERGY CENTER  
 TECUMSEH, KANSAS

**BOTTOM ASH SETTLING AREA  
 MONITORING WELL LOCATION MAP**

**evergy** MARCH 2021 FIGURE 1



March 18, 2022  
Project No. 0204993-000

TO: Evergy Kansas Central, Inc.  
Jared Morrison – Director, Water and Waste Programs

FROM: Haley & Aldrich, Inc.  
Steven F. Putrich, P.E., Principal Consultant – Engineering Principal  
Mark Nicholls, P.G., Senior Associate – Senior Hydrogeologist

SUBJECT: 2020 Annual Groundwater Monitoring and Corrective Action Report Addendum  
Evergy Kansas Central, Inc. (Evergy)  
Bottom Ash Settling Area  
Tecumseh Energy Center – Tecumseh, Kansas

The Bottom Ash Settling Area (BASA) at the Evergy Tecumseh Energy Center (TEC) is subject to the groundwater monitoring and corrective action requirements described under Code of Federal Regulations Title 40 (40 CFR) §257.90 through §257.98 (Rule). An Annual Groundwater Monitoring and Corrective Action (GWMCA) Report documenting the activities completed in 2020 for the BASA was completed and placed in the facility's operating record on January 31, 2021, as required by the Rule. The Annual GWMCA Report contained the specific information listed in 40 CFR §257.90(e).

This report addendum has been prepared to supplement the operating record in recognition of comments received by Evergy from the U.S. Environmental Protection Agency (USEPA) on January 11, 2022. In addition to the information listed in 40 CFR §257.90(e), the USEPA indicated in their comments that the GWMCA Report should contain:

- Results of laboratory analysis of groundwater or other environmental media samples for the presence of constituents of Appendices III and IV to 40 CFR part 257 (or of other constituents, such as those supporting characterization of site conditions that may ultimately affect a remedy);
- Required statistical analyses performed on those [laboratory analysis] results;
- Measured groundwater elevations; and
- Calculated groundwater flow rate and direction.

While this information is not specifically referred to in 40 CFR §257.90(e) for inclusion in the GWMCA Reports, it has been routinely collected and maintained in Evergy's files and is being provided in the attachments to this addendum. In the calendar year 2020, no sampling events were completed under the CCR Rule as closure sampling events were completed in December of 2019. Therefore, there are no laboratory analyses to report in the 2020 GWMCA and likewise there were no measured groundwater elevations or calculated groundwater flow rates or directions to report. Statistical analysis of sampling events in October 2019 and December 2019 were completed in 2020 and a discussion of those results are included as Attachment 1.

The attachments to this addendum are as follows providing the additional information:

- Attachment 1 – Statistical Analyses: Includes a discussion of the statistical analyses utilized along with a table summarizing the statistical outputs (e.g., frequency of detection, maximum detection, variance, standard deviation, coefficient of variance, outlier tests, trends, upper and lower confidence limits, and comparison against Groundwater Protection Standards), and supporting backup for statistical analyses completed in 2020. Statistical analyses completed in 2020 included:
  - January 2020 statistical analyses for data obtained in the October 2019 sampling event; and
  - April 2020 statistical analyses for data obtained in the December 2019 sampling event.

**ATTACHMENT 1**

**Statistical Analyses**

**ATTACHMENT 1-1**

**October 2019 Semi-Annual Sampling Event Statistical Analyses**



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## TECHNICAL MEMORANDUM

March 18, 2022  
File No. 0204993-000

TO: Eversource Energy Kansas Central, Inc. (f/k/a Westar Energy, Inc.)  
Jared Morrison – Senior Manager, Water and Waste Programs

FROM: Haley & Aldrich, Inc.  
Steven F. Putrich, P.E., Senior Associate — Engineering Principal  
Mark Nicholls, P.G., Senior Associate — Senior Hydrogeologist

SUBJECT: October 2019 Semi-annual Groundwater Assessment Monitoring  
Data Statistical Evaluation  
**Completed January 20, 2020**  
Tecumseh Energy Center  
Bottom Ash Settling Area

Pursuant to Code of Federal Regulations Title 40 (40 CFR) §257.93 and §257.95 (Rule), this memorandum summarizes the statistical evaluation of the analytical results for the October 2019 semi-annual assessment monitoring groundwater sampling event for the Tecumseh Energy Center (TEC) Bottom Ash Settling Area (BASA). This semi-annual assessment monitoring groundwater sampling event was completed October 9 and 10, 2019, with laboratory results received and accepted on December 6, 2019.

The statistical evaluation discussed in this memorandum was conducted to determine if Appendix IV groundwater monitoring constituents have been detected in downgradient wells at concentrations that represent a statistically significant increase (SSI) above background values and if one or more of the constituents have been detected at statistically significant levels (SSLs) above the Groundwater Protection Standard (GWPS) consistent with the requirements of the Rule. GWPSs for each of the Appendix IV constituents have been set equal to the highest value of the maximum contaminant level, regional screening level, or background concentration.

### Statistical Evaluation of Appendix IV Constituents

The Rule provides four specific options for statistical evaluation of groundwater quality data collected at a coal combustion residuals (CCR) unit (40 CFR §257.93(f)(1-4)). The statistical method used for these evaluations (tolerance limit [TL]), was certified by Haley & Aldrich, Inc. on January 14, 2019. The TL method, as determined applicable for this sampling event, was used to evaluate potential SSLs above background. Background levels for each constituent listed in Appendix IV were computed as upper

tolerance limits (UTL), and a minimum 95 percent confidence coefficient and 95 percent coverage. The most recent groundwater sampling event from each compliance well was compared to the corresponding background UTL to determine if an SSL existed.

## STATISTICAL EVALUATION

Either an interwell or intrawell evaluation was used to determine SSIs. Interwell evaluation compares the most recent values from downgradient compliance wells against a background dataset composed of upgradient well data, and the intrawell evaluation compares the most recent values from each compliance well against a background dataset composed of its own historical data. Because the CCR unit has transitioned into assessment monitoring, no statistical evaluations were conducted on Appendix III (detection monitoring) semi-annual assessment monitoring data.

The parametric TL methods were used to complete statistical evaluations of the referenced dataset. The TL procedure is one in which a concentration limit for each constituent is established from the distribution of the background data, with a minimum 95 percent confidence level. The upper endpoint of a TL is called the UTL. Depending on the data distribution, parametric or non-parametric TL procedures are used to evaluate groundwater monitoring data using this method. Parametric TLs utilize normally distributed data or normalized data via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the TL. If all the background data are non-detect, a maximum reporting limit may serve as an appropriate UTL.

These statistical evaluations were conducted using a background dataset for all Appendix IV constituents that were detected in the annual assessment monitoring sample event in June 2019 using parametric TLs. If an Appendix IV constituent concentration from the October 2019 sampling event was above the GWPS, the lower confidence limit (LCL) for the downgradient well constituent will be used to evaluate if an SSI is present. The LCL is the lower end of the confidence interval range, which is an estimated concentration range intended to contain the true mean or median of the population from which the sample is drawn. The confidence interval range is designed to locate the true population mean or median with a high degree of statistical confidence, or conversely, with a low probability of error.

The UTLs were calculated from the background well dataset using Chemstat software after testing for outlier sample results that would warrant removal from the dataset based on likely error in sampling or measurement. Both visual and statistical outlier tests for the background data were performed using Chemstat and U.S. Environmental Protection Agency's ProUCL 5.1 software, and a visual inspection of the data was performed using box plots and distribution plots for the downgradient sample data. No sample data were identified as outliers that warranted removal from the dataset.

## BACKGROUND DISTRIBUTIONS

The groundwater analytical results for each sampling event from the background sample location (MW-7 for interwell evaluation) were combined to calculate the UTL for each detected Appendix IV

constituent. The variability and distribution of the pooled dataset was evaluated to determine the method for UTL calculation. Per the document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009*, background concentrations were updated based on statistical evaluation of analytical results collected through September 2018 (interwell evaluation) or through June 2019 (intra-well evaluation).

#### RESULTS OF APPENDIX IV DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the October 2019 semi-annual assessment monitoring event were compared to their respective background UTLs and GWPSs (Table I). A sample concentration greater than the background UTL is considered to represent an SSI. A sample concentration greater than the GWPS is considered to represent an SSL. Based on previous compliance sampling event statistical evaluations and associated alternative source demonstrations, an intra-well comparison is utilized for MW-9 and MW-10 for arsenic statistical evaluations, and for MW-9 for cobalt statistical evaluations. Interwell comparisons are being utilized for all other well and constituent evaluations. The results of the groundwater assessment monitoring statistical evaluation are discussed below and provided in Table I. **Based on this statistical evaluation on groundwater sampling data collected in October 2019, no SSLs above GWPS occurred at the TEC BASA.**

Tables:

Table I – Summary of Semi-annual Assessment Groundwater Monitoring Statistical Evaluation



## TABLE

TABLE I  
SUMMARY OF SEMI-ANNUAL ASSESSMENT GROUNDWATER MONITORING STATISTICAL EVALUATION  
OCTOBER 2019 SAMPLING EVENT  
TECUMSEH ENERGY CENTER  
BOTTOM ASH SETTLING AREA (BASA)

Location Id	Frequency of Detection	Percent Non-Detects	Maximum Detect	Variance	Standard Deviation	Coefficient of Variance	CCR MCL/RSL § 257.95(h)(2)*	Report Result Unit	Detection Exceedances (Y/N)	MCL Comparison		Outlier Presence	Outlier Removed	Trend	Distribution Well*	October 2019 Concentration (mg/L)	Detect?	Inter-well Analysis		Intra-well Analysis		Groundwater Protection Standard		
										Number of Detection Exceedances	Number of Non-Detection Exceedances							Upper Tolerance Limit (mg/L) <sup>1</sup>	SSI (exceedance above Background at Individual Well)	Upper Tolerance Limit (mg/L) <sup>2</sup>	SSI (exceedance above Background at Individual Well)	GWPS (Higher of MCL/RSL or Upper Tolerance Limit) mg/L	Exceedance above GWPS at Individual Well	SSL
<b>CCR Appendix-IV: Arsenic, Total (mg/L)</b>																								
MW-7 (upgradient)	13/13	0%	0.0021	3.397E-08	0.0001843	0.1175	0.010	mg/L	N	0	0	Yes	No	Stable	Non-parametric	0.0160	Y	0.0021						
MW-10	13/13	0%	0.077	0.0003392	0.01842	0.3537	0.010	mg/L	Y	13	0	No	No	Decreasing	Normal	0.021	Y		0.118	N	0.118	N	No	
MW-8	13/13	0%	0.0041	0.00000471	0.0006863	0.2916	0.010	mg/L	N	0	0	No	No	Stable	Normal	0.0024	Y		Y		0.010	N	No	
MW-9	13/13	0%	0.14	0.0007757	0.02785	0.284	0.010	mg/L	Y	13	0	No	No	Decreasing	Normal	0.051	Y		0.198	N	0.198	N	No	
<b>CCR Appendix-IV: Barium, Total (mg/L)</b>																								
MW-7 (upgradient)	13/13	0%	0.1	0.0001235	0.01111	0.1497	2	mg/L	N	0	0	Yes	No	Stable	Normal	0.053	Y	0.0953				2		
MW-10	13/13	0%	0.36	0.00116	0.03406	0.1115	2	mg/L	N	0	0	No	No	Stable	Normal	0.36	Y		Y				N	No
MW-8	13/13	0%	0.064	0.0001047	0.003236	0.05565	2	mg/L	N	0	0	No	No	Stable	Normal	0.064	Y		N				N	No
MW-9	13/13	0%	0.91	0.002334	0.1528	0.2052	2	mg/L	N	0	0	No	No	Stable	Normal	0.85	Y		Y				N	No
<b>CCR Appendix-IV: Cadmium, Total (mg/L)</b>																								
MW-7 (upgradient)	0/12	100%	-	0	0	0	0.005	mg/L	N	0	0	NA	NA	NA	NA	0.00050	N	0.0005				0.005		
MW-10	0/12	100%	-	0	0	0	0.005	mg/L	N	0	0	NA	NA	NA	NA	0.00050	N		N				N	No
MW-8	0/12	100%	-	0	0	0	0.005	mg/L	N	0	0	NA	NA	NA	NA	0.00050	N		N				N	No
MW-9	4/12	67%	0.0013	5.347E-08	0.0002312	0.393	0.005	mg/L	N	0	0	Yes	No	NA	Non-parametric	0.00050	N						N	No
<b>CCR Appendix-IV: Cobalt, Total (mg/L)</b>																								
MW-7 (upgradient)	10/13	23%	0.0022	0.00000154	0.0003924	0.2866	0.006	mg/L	N	0	0	No	No	Decreasing	Normal	0.0010	N	0.00217				0.006		
MW-10	11/13	15%	0.0091	0.00005668	0.002381	0.6105	0.006	mg/L	Y	3	0	No	No	Stable	Normal	0.0020	Y		N				N	No
MW-8	10/13	23%	0.0018	7.526E-08	0.0002743	0.2073	0.006	mg/L	N	0	0	No	No	Decreasing	Normal	0.0014	Y		N				N	No
MW-9	13/13	0%	0.048	0.0001151	0.01073	0.5073	0.006	mg/L	Y	13	0	No	No	Stable	Normal	0.016	Y		0.064	N	0.064	N	No	
<b>CCR Appendix-IV: Fluoride (mg/L)</b>																								
MW-7 (upgradient)	14/14	0%	0.37	0.0008681	0.02946	0.0929	4.0	mg/L	N	0	0	Yes	No	Stable	Normal	0.34	Y	0.371				4.0		
MW-10	13/14	7%	0.55	0.006579	0.08111	0.1829	4.0	mg/L	N	0	0	No	No	Stable	Normal	0.41	Y		Y				N	No
MW-8	13/14	7%	0.33	0.001134	0.03368	0.1274	4.0	mg/L	N	0	0	No	No	Stable	Normal	0.25	Y		N				N	No
MW-9	13/14	7%	0.56	0.008003	0.08946	0.2248	4.0	mg/L	N	0	0	No	No	Stable	Normal	0.32	Y		N				N	No
<b>CCR Appendix-IV: Lithium, Total (mg/L)</b>																								
MW-7 (upgradient)	13/13	0%	0.029	0.00001258	0.003546	0.1482	0.040	mg/L	N	0	0	Yes	No	Stable	Normal	0.017	Y	0.0295				0.040		
MW-10	3/13	77%	0.011	7.692E-08	0.0002774	0.02752	0.040	mg/L	N	0	0	No	No	NA	Non-parametric	0.010	N		N				N	No
MW-8	13/13	0%	0.024	0.00001153	0.003395	0.1809	0.040	mg/L	N	0	0	No	No	Stable	Normal	0.017	Y		N				N	No
MW-9	10/13	23%	0.021	0.00001431	0.003783	0.2732	0.040	mg/L	N	0	0	No	No	Stable	Normal	0.010	N		N				N	No
<b>CCR Appendix-IV: Molybdenum, Total (mg/L)</b>																								
MW-7 (upgradient)	13/13	0%	0.013	0.00005279	0.002298	0.2326	0.100	mg/L	N	0	0	No	No	Decreasing	Normal	0.011	Y	0.0138				0.100		
MW-10	13/13	0%	0.0053	0.000000879	0.0009375	0.2582	0.100	mg/L	N	0	0	No	No	Stable	Normal	0.0041	Y		N				N	No
MW-8	13/13	0%	0.044	0.00002827	0.005317	0.1419	0.100	mg/L	N	0	0	No	No	Stable	Normal	0.039	Y		Y				N	No
MW-9	12/13	8%	0.0085	0.00005898	0.002429	0.5719	0.100	mg/L	N	0	0	No	No	Stable	Normal	0.0085	Y		N				N	No
<b>CCR Appendix-IV: Radium-226 &amp; 228 (pCi/L)</b>																								
MW-7 (upgradient)	11/11	0%	5.88	2.57	1.603	1.398	5	pCi/L	Y	1	0	Yes	No	Stable	Non-parametric	0.403	N	5.88				5.88		
MW-10	11/11	0%	3.58	0.4693	0.685	0.3253	5	pCi/L	N	0	0	No	No	Stable	Normal	2.64	Y		N				N	No
MW-8	11/11	0%	1.308	0.142	0.3768	0.4327	5	pCi/L	N	0	0	No	No	Stable	Normal	0.721	N		N				N	No
MW-9	11/11	0%	3.249	0.5045	0.7103	0.4051	5	pCi/L	N	0	0	No	No	Stable	Normal	1.67	Y		N				N	No

**Notes and Abbreviations:**

<sup>1</sup> Based on background data collected from 08/30/2016 through 09/6/2018

<sup>2</sup> Based on background data collected from 08/30/2016 through 06/25/2019

\* Values obtained from U.S. Environmental Protection Agency Federal CCR Rule Title 40 Code of Federal Regulations (CFR) § 257.95(h)(2) on December 23, 2020.

CCR = coal combustion residuals

GWPS = Groundwater Protection Standard

MCL = maximum contaminant level

mg/L = milligrams per liter

NA = not analyzed

pCi/L = picoCuries per liter

SSI = statistically significant increase

SSL = statistically significant level

UTL = upper tolerance limits

**ATTACHMENT 1-2**

**December 2019 Semi-Annual Sampling Event Statistical Analyses**



HALEY & ALDRICH, INC.  
6500 Rockside Road  
Suite 200  
Cleveland, OH 44131  
216.739.0555

## TECHNICAL MEMORANDUM

March 18, 2022  
File No. 0204993-000

TO: Evergy Kansas Central, Inc. (f/k/a Westar Energy, Inc.)  
Jared Morrison – Director, Water and Waste Programs

FROM: Haley & Aldrich, Inc.  
Steven F. Putrich, P.E., Senior Associate — Engineering Principal  
Mark Nicholls, P.G., Senior Associate — Senior Hydrogeologist

SUBJECT: December 2019 Semi-annual Groundwater Assessment Monitoring  
Data Statistical Evaluation  
**Completed April 8, 2020**  
Tecumseh Energy Center  
Bottom Ash Settling Area

Pursuant to Code of Federal Regulations Title 40 (40 CFR) §257.93 and §257.95 (Rule), this memorandum summarizes the statistical evaluation of the analytical results for the October 2019 semi-annual assessment monitoring groundwater sampling event for the Tecumseh Energy Center (TEC) Bottom Ash Settling Area (BASA). This semi-annual assessment monitoring groundwater sampling event was completed on December 5, 2019, with laboratory results received and validated on January 9, 2020.

The statistical evaluation discussed in this memorandum was conducted to determine if Appendix IV groundwater monitoring constituents have been detected in downgradient wells at concentrations that represent a statistically significant increase (SSI) above background values and if one or more of the constituents have been detected at statistically significant levels (SSL) above the Groundwater Protection Standard (GWPS) consistent with the requirements of the Rule. GWPSs for each of the Appendix IV constituents have been set equal to the highest value of the maximum contaminant level, regional screening level, or background concentration.

### Statistical Evaluation of Appendix IV Constituents

The Rule provides four specific options for statistical evaluation of groundwater quality data collected at a coal combustion residuals (CCR) unit (40 CFR §257.93(f) (1-4)). The statistical method used for these evaluations, tolerance limit (TL), was certified by Haley & Aldrich, Inc. on January 14, 2019. The TL method, as determined applicable for this sampling event, was used to evaluate potential SSLs above background. Background levels for each constituent listed in Appendix IV were computed as upper tolerance limits (UTL), and a minimum 95 percent confidence coefficient and 95 percent coverage. The most recent groundwater sampling event from each compliance well was compared to the corresponding background UTL to determine if an SSL existed.

## STATISTICAL EVALUATION

Either an interwell or intrawell evaluation was used to determine SSIs. Interwell evaluation compares the most recent values from downgradient compliance wells against a background dataset composed of upgradient well data, and the intrawell evaluation compares the most recent values from each compliance well against a background dataset composed of its own historical data. Because the CCR unit has transitioned into assessment monitoring, no statistical evaluations were conducted on Appendix III (detection monitoring) semi-annual assessment monitoring data.

The parametric TL methods were used to complete statistical evaluations of the referenced dataset. The TL procedure is one in which a concentration limit for each constituent is established from the distribution of the background data, with a minimum 95 percent confidence level. The upper endpoint of a TL is called the UTL. Depending on the data distribution, parametric or non-parametric TL procedures are used to evaluate groundwater monitoring data using this method. Parametric TLs utilize normally distributed data or normalized data via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the TL. If all the background data are non-detect, a maximum reporting limit may serve as an appropriate UTL.

These statistical evaluations were conducted using a background dataset for all Appendix IV constituents that were detected in the annual assessment monitoring sample event in June 2019 using parametric TLs. If an Appendix IV constituent concentration from the December 2019 sampling event was above the GWPS, the lower confidence limit (LCL) for the downgradient well constituent will be used to evaluate if an SSI is present. The LCL is the lower end of the confidence interval range, which is an estimated concentration range intended to contain the true mean or median of the population from which the sample is drawn. The confidence interval range is designed to locate the true population mean or median with a high degree of statistical confidence, or conversely, with a low probability of error.

The UTLs were calculated from the background well dataset using Chemstat software after testing for outlier sample results that would warrant removal from the dataset based on likely error in sampling or measurement. Both visual and statistical outlier tests for the background data were performed using Chemstat and U.S. Environmental Protection Agency's ProUCL 5.1 software, and a visual inspection of the data was performed using box plots and distribution plots for the downgradient sample data. No sample data were identified as outliers that warranted removal from the dataset.

## BACKGROUND DISTRIBUTIONS

The groundwater analytical results for each sampling event from the background sample location (MW-7 for interwell evaluation) were combined to calculate the UTL for each detected Appendix IV constituent. The variability and distribution of the pooled dataset was evaluated to determine the method for UTL calculation. Per the document *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009*, background concentrations were updated based on statistical evaluation of analytical results collected through September 2018 (interwell evaluation) or through June 2019 (intrawell evaluation).

## RESULTS OF APPENDIX IV DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the December 2019 semi-annual assessment monitoring event were compared to their respective background UTLs and GWPSs (Table I). A sample concentration greater than the background UTL is considered to represent an SSI. A sample concentration greater than the GWPS is considered to represent an SSL. During the December 2019 sampling event, downgradient monitoring well MW-9 was identified as being dry. The monitoring well was unable to be sampled; therefore, statistical evaluation was not completed for MW-9.

Based on previous compliance sampling event statistical evaluations and associated alternative source demonstrations, an intrawell comparison is utilized for MW-9 and MW-10 for arsenic statistical evaluations, and for MW-9 for cobalt statistical evaluations. Interwell comparisons are being utilized for all other well and constituent evaluations. The results of the groundwater assessment monitoring statistical evaluation are discussed below and provided in Table I. **Based on this statistical evaluation on groundwater sampling data collected in December 2019, no SSLs above GWPS occurred at the TEC BASA.**

Tables:

Table I – Summary of Semi-annual Assessment Groundwater Monitoring Statistical Evaluation

## TABLE

TABLE I  
SUMMARY OF SEMI-ANNUAL ASSESSMENT GROUNDWATER MONITORING STATISTICAL EVALUATION  
DECEMBER 2019 SAMPLING EVENT  
TECUMSEH ENERGY CENTER  
BOTTOM ASH SETTLING AREA (BASA)

Location Id	Frequency of Detection	Percent Non-Detects	Maximum Detect	Variance	Standard Deviation	Coefficient of Variance	CCR MCL/RSL § 257.95(h)(2)*	Report Result Unit	Detection Exceedances (Y/N)	MCL Comparison		Outlier Presence	Outlier Removed	Trend	Distribution Well*	December 2019 Concentration (mg/L)	Detect?	Inter-well Analysis		Intra-well Analysis		Groundwater Protection Standard		
										Number of Detection Exceedances	Number of Non-Detection Exceedances							Upper Tolerance Limit (mg/L) <sup>1</sup>	SSI (exceedance above Background at Individual Well)	Upper Tolerance Limit (mg/L) <sup>2</sup>	SSI (exceedance above Background at Individual Well)	GWPS (Higher of MCL/RSL or Upper Tolerance Limit) mg/L	Exceedance above GWPS at Individual Well	SSL
<b>CCR Appendix-IV: Arsenic, Total (mg/L)</b>																								
MW-7 (upgradient)	14/14	0%	0.0021	3.143E-08	0.0001773	0.1128	0.010	mg/L	N	0	0	Yes	No	Stable	Non-parametric	0.0016	Y	0.0021						
MW-10	14/14	0%	0.077	0.0003617	0.01902	0.3788	0.010	mg/L	Y	14	0	No	No	Decreasing	Normal	0.026	Y		0.118	N	0.118	N	No	
MW-8	14/14	0%	0.0041	6.055E-07	0.0007782	0.3158	0.010	mg/L	N	0	0	No	No	Stable	Normal	0.0039	Y		Y		0.010	N	No	
MW-9	13/13	0%	0.14	0.0007757	0.02785	0.284	0.010	mg/L	Y	13	0	No	No	Decreasing	Normal	NS	NS		0.198	NA	0.198	NA	NA	
<b>CCR Appendix-IV: Barium, Total (mg/L)</b>																								
MW-7 (upgradient)	14/14	0%	0.1	0.0001462	0.01209	0.1663	2	mg/L	N	0	0	Yes	No	Decreasing	Normal	0.053	Y	0.0953			2			
MW-10	14/14	0%	0.36	0.001073	0.03276	0.1074	2	mg/L	N	0	0	No	No	Stable	Normal	0.30	Y		Y			N	No	
MW-8	14/14	0%	0.077	0.00003504	0.005919	0.09948	2	mg/L	N	0	0	Yes	No	Stable	Non-parametric	0.077	Y		N			N	No	
MW-9	13/13	0%	0.91	0.02334	0.1528	0.2052	2	mg/L	N	0	0	Yes	No	Stable	Normal	NS	NS		NA			NA	NA	
<b>CCR Appendix-IV: Cadmium, Total (mg/L)</b>																								
MW-7 (upgradient)	0/13	100%	-	0	0	0	0.005	mg/L	N	0	0	NA	NA	NA	NA	0.00050	N	0.0005				0.005		
MW-10	0/13	100%	-	0	0	0	0.005	mg/L	N	0	0	NA	NA	NA	NA	0.00050	N		N			N	No	
MW-8	0/13	100%	-	0	0	0	0.005	mg/L	N	0	0	NA	NA	NA	NA	0.00050	N		N			N	No	
MW-9	4/12	67%	0.0013	5.347E-08	0.002312	0.393	0.005	mg/L	N	0	0	Yes	No	Stable	Non-parametric	NS	NS		NA			NA	NA	
<b>CCR Appendix-IV: Cobalt, Total (mg/L)</b>																								
MW-7 (upgradient)	11/14	21%	0.0022	1.554E-07	0.0003942	0.2816	0.006	mg/L	N	0	0	No	No	Decreasing	Normal	0.0018	Y	0.00217				0.006		
MW-10	12/14	14%	0.0091	0.00005319	0.002306	0.6035	0.006	mg/L	Y	3	0	No	No	Stable	Normal	0.0028	Y		Y			N	No	
MW-8	11/14	21%	0.0025	1.684E-07	0.0004104	0.2916	0.006	mg/L	N	0	0	No	No	Decreasing	Normal	0.0025	Y		Y			N	No	
MW-9	13/13	0%	0.048	0.0001151	0.01073	0.5073	0.006	mg/L	Y	13	0	No	No	Stable	Normal	NS	NS			0.0641	NA	0.064	NA	NA
<b>CCR Appendix-IV: Fluoride (mg/L)</b>																								
MW-7 (upgradient)	15/15	0%	0.37	0.001435	0.03788	0.1219	4.0	mg/L	N	0	0	Yes	No	Stable	Normal	0.22	Y	0.371				4.0		
MW-10	14/15	7%	0.55	0.006692	0.08181	0.1871	4.0	mg/L	N	0	0	Yes	No	Stable	Normal	0.35	Y		N			N	No	
MW-8	13/15	13%	0.33	0.001329	0.03645	0.1402	4.0	mg/L	N	0	0	No	No	Stable	Normal	0.20	N		N			N	No	
MW-9	13/14	7%	0.56	0.008003	0.08946	0.2248	4.0	mg/L	N	0	0	No	No	Stable	Normal	NS	NS		NA			NA	NA	
<b>CCR Appendix-IV: Lithium, Total (mg/L)</b>																								
MW-7 (upgradient)	14/14	0%	0.029	0.00001161	0.003407	0.1424	0.040	mg/L	N	0	0	Yes	No	Stable	Normal	0.024	Y	0.0295				0.040		
MW-10	3/14	79%	0.011	7.143E-08	0.0002673	0.02654	0.040	mg/L	N	0	0	No	No	Stable	Normal	0.010	N		N			N	No	
MW-8	14/14	0%	0.024	0.00001259	0.003549	0.1854	0.040	mg/L	N	0	0	No	No	Stable	Normal	0.024	Y		N			N	No	
MW-9	10/13	23%	0.021	0.00001431	0.003783	0.2732	0.040	mg/L	N	0	0	No	No	Stable	Normal	NS	NS		NA			NA	NA	
<b>CCR Appendix-IV: Molybdenum, Total (mg/L)</b>																								
MW-7 (upgradient)	14/14	0%	0.013	0.000004874	0.002208	0.2233	0.100	mg/L	N	0	0	No	No	Decreasing	Normal	0.010	Y	0.0138				0.100		
MW-10	14/14	0%	0.0053	8.434E-07	0.0009183	0.2496	0.100	mg/L	N	0	0	No	No	Stable	Normal	0.0043	Y		N			N	No	
MW-8	14/14	0%	0.046	0.0000313	0.005595	0.147	0.100	mg/L	N	0	0	No	No	Stable	Normal	0.046	Y		Y			N	No	
MW-9	12/13	8%	0.0085	0.000005898	0.002429	0.5719	0.100	mg/L	N	0	0	No	No	Stable	Normal	NS	NS		NA			NA	NA	
<b>CCR Appendix-IV: Radium-226 &amp; 228 (pCi/L)</b>																								
MW-7 (upgradient)	13/14	7%	5.88	2.029	1.424	1.365	5	pCi/L	Y	1	0	Yes	No	Stable	Non-parametric	0.666	N	5.88				5.88		
MW-10	14/14	0%	3.58	0.4067	0.6377	0.3049	5	pCi/L	N	0	0	No	No	Stable	Normal	1.60	Y		N			N	No	
MW-8	13/14	7%	1.46	0.1445	0.3802	0.4317	5	pCi/L	N	0	0	No	No	Stable	Normal	0.569	N		N			N	No	
MW-9	13/13	0%	3.249	0.4626	0.6802	0.4025	5	pCi/L	N	0	0	No	No	Stable	Normal	NS	NS		NA			NA	NA	

**Notes and Abbreviations:**

<sup>1</sup> Based on background data collected from 08/30/2016 through 09/6/2018

<sup>2</sup> Based on background data collected from 08/30/2016 through 06/25/2019

\* Values obtained from U.S. Environmental Protection Agency Federal CCR Rule Title 40 Code of Federal Regulations (CFR) § 257.95(h)(2) on December 23, 2020.

CCR = coal combustion residuals

GWPS = Groundwater Protection Standard

MCL = maximum contaminant level

mg/L = milligrams per Liter

NA = not analyzed

NS = sample not collected; no sample

pCi/L = picoCuries per Liter

SSI = statistically significant increase

SSL = statistically significant level

UTL = upper tolerance limits