

### REPORT

# Annual Coal Combustion Residuals Groundwater Monitoring and Corrective Action Report - 2021

Nebraska Public Power District, Gerald Gentleman Station

Submitted to:

### Nebraska Public Power District

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# **Executive Summary**

This report presents the results from groundwater monitoring that occurred at Nebraska Public Power District's (NPPD's) Gerald Gentleman Station in 2021 to meet the requirements of the United States Environmental Protection Agency's Coal Combustion Residuals (CCR) Rule (40 Code of Federal Regulations [CFR] 257.90 through 257.98). The facility entered 2021 under a detection monitoring program and remains in detection monitoring based on the results of sampling and analysis events conducted in the second quarter (Q2) and fourth quarter (Q4) of 2021.

For the Q2 2021 monitoring event, the following potential exceedances were identified:

- APMW-6, Chloride
- APMW-19, Sulfate Elevated Cumulative Sum (CUSUM)
- APMW-19, Total Dissolved Solids (TDS) Elevated CUSUM

Confirmatory re-sampling occurred during the Q2 2021 monitoring event. No other items of statistical significance were identified during the Q2 2021 monitoring event.

During the Q4 2021 monitoring event, the potential exceedances for chloride at APMW-6 and sulfate at APMW-19 identified during the Q2 2021 monitoring event were found to be verified exceedances based on confirmatory re-sampling. The potential exceedance for TDS at APMW-19 was found to be a false-positive. A potential exceedance was identified for chloride at APMW-8A during the Q4 2021 sampling event. Confirmatory re-sampling will occur during the next semi-annual sampling evening in Q2 2022. No other items of statistical significance were identified during the Q4 2021 sampling event.

Based on the results of the Q4 2021 sampling event, NPPD will pursue alternate source demonstrations for the verified statistically significant increases (SSIs). As specified in 40 CFR 257.94, NPPD has 90 days to complete the alternative source demonstration (ASD). Pending completion of the successful ASD, NPPD will remain in detection monitoring.

As described in the Groundwater Monitoring System Certification (Golder Associates USA Inc. [Golder] 2017a) and the Groundwater Monitoring Statistical Methods Certification (Golder 2017b), the groundwater monitoring and analytical procedures meet the general requirements of the CCR Rule, and modifications to the monitoring network and sampling program are not recommended at this time.



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# **1.0 INTRODUCTION**

Golder Associates USA Inc. (Golder), a Member of WSP, has prepared this report describing the 2021 groundwater sampling and comparative statistical analysis for Nebraska Public Power District's (NPPD's) Gerald Gentleman Station (GGS) in Sutherland, Nebraska. This report was written to meet the requirements of the federal Coal Combustion Residuals (CCR) Rule's sections on groundwater monitoring and corrective action, 40 Code of Federal Regulations (CFR) 257.90 to 257.98.

# **1.1 Facility Information**

GGS is located approximately 5 miles south of Sutherland, Nebraska, and 1.2 miles south of Sutherland Reservoir. The Ash Disposal Facility at GGS is situated in the NW 1/4, NE 1/2, Section 30 of Township 13 N, Range 33 W, in Lincoln County, Nebraska. NPPD began operating GGS in 1979 as a coal-fired electrical generation facility. GGS is both owned and operated by NPPD. The plant, with a generation capacity of 1,365 megawatts (MW) of power, uses a low-sulfur coal from Wyoming's Powder River Basin. The active CCR landfill at the site contains fly ash and bottom ash.

## 1.2 Purpose

The federal CCR Rule established specific requirements for reporting of groundwater monitoring and corrective actions in 40 CFR 257.90. Per part (e) of 40 CFR 257.90, no later than January 31, 2018, and annually thereafter, owners or operators of CCR units must prepare an annual groundwater monitoring and corrective action report.

# 2.0 GROUNDWATER MONITORING NETWORK PROGRAM STATUS

The groundwater monitoring network for the active CCR landfill at GGS consists of 14 monitoring wells, as shown in Figure 1 and Figure 2. The four upgradient wells are APMW-5, APMW-15, APMW-16A, and APMW-17 and are indicated by the inclusion of "(U)" throughout the text. The ten downgradient monitoring wells are APMW-4, APMW-6, APMW-8A, APMW-10, APMW-11, APMW-12, APMW-13, APMW-14, APMW-18, and APMW-19.

## 2.1 Completed Key Actions in 2021

The following key actions were completed in 2021:

- The 2020 annual CCR groundwater monitoring and corrective action report was completed and placed within the operating record and on NPPD's publicly accessible CCR website (Golder 2021).
- Detection monitoring samples were collected in May and November 2021 and analyzed for the Appendix III constituent list associated with the CCR Rule.
- Comparative statistical analysis was completed for the second quarter (Q2) 2021 and fourth quarter (Q4) 2021 detection monitoring events, collected in May and November 2021, respectively.

# 2.2 Installation and Decommissioning of Monitoring Wells

No monitoring wells associated with the Ash Disposal Facility groundwater quality monitoring network were installed or decommissioned at GGS in 2021.



# 2.3 **Problems and Resolutions**

A sample was unable to be collected at APMW-5 (U) on November 29, 2021 due to insufficient water in the well. The remaining wells within the monitoring network were able to be sampled during the monitoring event. NPPD will continue to monitor APMW-5 during future sampling events.

# 2.4 Proposed Key Activities for 2022

The following key activities are expected to be completed in 2022:

- The 2021 annual monitoring report will be placed on the publicly accessible CCR website.
- Detection monitoring sampling events and associated comparative statistical analysis are planned to occur in Q2 and Q4 2022.

# 3.0 GROUNDWATER MONITORING ANALYTICAL PROGRAM STATUS

Analytical activities associated with the groundwater monitoring program are described below.

## 3.1 Samples Collected

GGS staff collected monitoring samples from the program wells on May 24 and 25, 2021 and November 29 and 30, 2021. Specific dates for each sample are provided on Tables 1 through 14.

## 3.1.1 Groundwater Elevation and Flow Rate

Groundwater elevations were measured in each well during each sampling event prior to purging. Elevation measurements can be found in Tables 1 through 14 for each location. Groundwater elevations and interpolated groundwater contours are shown in Figure 1 for the May 2021 (Q2 2021) detection monitoring sampling event. Groundwater elevations and interpolated groundwater contours are shown on Figure 2 for the November 2021 (Q4 2021) detection monitoring sampling event.

The groundwater flow rate across the facility was estimated with the equation  $V_s = k \times i/n_e$ , where:

- $V_s$  is the groundwater flow rate, in feet per day (ft/day)
- *k* is the hydraulic conductivity, estimated from slug testing results from system wells, in ft/day
- *i* is the hydraulic gradient, calculated based on groundwater elevations for each monitoring event, in feet per feet (ft/ft)
- $\bullet$   $n_e$  is the effective porosity, estimated to be 0.25 for site soils

Hydraulic conductivity values at the site range from 0.14 to 19 ft/day, based on slug test data reported in Design and Construction of a Groundwater Monitoring Network, Final Report (Woodward-Clyde Consultants 1991). According to the 1991 report, a hydraulic conductivity value of 0.14 ft/day represents the Ogallala Formation silts. Values of 16 and 19 ft/day were reported for Ogallala Formation sands. Both 0.14 and 19 ft/day have been used to estimate a range of hydraulic conductivities. The effective porosity estimate above is based on typical values for sands and silts, as presented in Applied Hydrogeology (Fetter 1994).

Based on the range of site values for hydraulic conductivity, the estimated effective porosity and calculated hydraulic gradient based on water level readings, the average groundwater flow rate for June 2021 was estimated



between 3.4 x  $10^{-4}$  ft/day and 4.6 x  $10^{-2}$  ft/day. The average groundwater flow rate for November 2021 was estimated between 4.1 x  $10^{-4}$  ft/day and 5.5 x  $10^{-2}$  ft/day.

# 3.2 Monitoring Data (Analytical Results)

Analytical results for the CCR Rule Appendix III detection monitoring events in May 2021 and November 2021 are shown in Table 1 through Table 14.

## 3.3 Comparative Statistical Analysis

The comparative statistical analysis is summarized below with the results presented in Table 15 through Table 28. A description of the steps taken for the comparative statistical analysis is summarized below with the results presented in Table 15 through Table 28.

Comparative statistical analysis is conducted following each detection monitoring event, consisting of the Appendix III parameters (United States Environmental Protection Agency 2015). For both Shewhart-Cumulative Sum (CUSUM) limits and non-parametric prediction limits, the comparative statistical analysis consists of a comparison of detection monitoring results collected during the period of interest to the statistical limit calculated from the baseline data collection period. For well-constituent pairs with increasing trends identified during the baseline period, an alternative trend test, as described by the Electric Power Research Institute (EPRI 2015) has been used to determine compliance. For well-constituent pairs with decreasing trends identified for the baseline period, a Sen's Slope test was used to assess the compliance results. Additional information on the methods used for the comparative statistical analysis can be found in the Groundwater Monitoring Statistical Methods Certification (Golder 2017a).

The following definitions will be used in discussion of the comparative statistical analysis:

- Elevated CUSUM Defined as when the calculated CUSUM value is greater than the Shewhart-CUSUM limit established by the baseline statistical analysis, but the analytical result does not exceed the Shewhart-CUSUM limit. An elevated CUSUM is an indication that concentrations are gradually increasing and that analytical results may exceed the Shewhart-CUSUM limit in the future. For elevated CUSUMs in the case of two-tailed analysis for field-measured pH, the CUSUM value may also be below the lower Shewhart-CUSUM limit established by the baseline statistical analysis.
- Potential Exceedance Defined as an initial elevated CUSUM or an initial analytical result that exceeds the Shewhart-CUSUM limit or non-parametric statistical limit established by the baseline statistical analysis. Confirmatory re-sampling will determine if the potential exceedance is a false-positive or a verified statistically significant increase (SSI). Non-detect results that exceed either the Shewhart-CUSUM limit or the non-parametric statistical limit are not considered potential exceedances.
- False-positive Defined as an analytical result that exceeds the statistical limit that can clearly be attributed to laboratory error, changes in analytical precision, or is invalidated through confirmatory re-sampling. False positives are not used in calculation of any subsequent CUSUM values.
- Confirmatory Re-sampling Designated as the next scheduled sampling event.
- Verified SSI Interpreted as two consecutive exceedances (the original sample and the confirmatory re-sample for analytical results, or two consecutive elevated CUSUMs) for the same constituent at the same well.

Results of the statistical analysis for the Q2 2021 and Q4 2021 detection monitoring events are shown in Table 15 through Table 28. For reporting purposes, compliance samples with non-detect results are shown at the practical quantitation limit (PQL) in Table 15 through Table 28.

### 3.3.1 Potential Exceedances

The following potential exceedances were identified during the Q2 2021 monitoring event:

- APMW-6, Chloride
- APMW-19, Sulfate Elevated CUSUM
- APMW-19, Total Dissolved Solids (TDS) Elevated CUSUM

Confirmatory re-sampling occurred during the Q4 2021 monitoring event with results discussed below.

A potential exceedance was identified for chloride at APMW-8A during the Q4 2021 sampling event. Confirmatory re-sampling will occur during the next semi-annual sampling evening in Q2 2022.

### 3.3.2 False-Positives

No potential exceedances were identified during the Q4 2020 detection monitoring event. As such, no false-positives were identified during the Q2 2021 detection monitoring sampling event.

The potential exceedance identified for TDS at APMW-19 during the Q2 2021 sampling event was determined to be a false-positive through confirmatory re-sampling conducted during the Q4 2021 sampling event. No other false-positives were identified.

## 3.3.3 Verified SSIs

No potential exceedances were identified during the Q4 2020 detection monitoring event. As such, no verified SSIs were identified during the Q2 2021 detection monitoring sampling event.

The following verified SSIs were identified during the Q4 2021 detection monitoring sampling event:

- APMW-6, Chloride
- APMW-19, Sulfate

#### 3.3.4 Trending Data

Statistical limits were unable to be established for sulfate at APMW-15 due to a statistically significant trend identified through the proposed baseline period prior to the Q2 2021 monitoring event. As an upgradient location, the facility was determined not to be the source of the increasing sulfate trend at APMW-15. Upon review of the data set with inclusion of the Q2 2021 data, the data set no longer displays a statistically significant trend. A baseline period and CUSUM statistical limit were established with data through Q2 2021 prior to conducting comparative statistical analysis for the Q4 2021 event. No items of statistical significance were identified for sulfate at APMW-15 (U) during the Q4 2021 comparative statistical event.

# 3.4 **Program Transitions**

Beginning in Q4 2017, the groundwater monitoring program at GGS transitioned from the baseline period to detection monitoring. During the baseline period, eight independent samples from each well within the program were collected and analyzed for the constituents listed in Appendix III and Appendix IV of the rule prior to



October 17, 2017, as specified in 40 CFR 257.94(b), with the previously noted exceptions of APMW-4 and APMW-5 (U) due to lack of precipitation (Golder 2018).

## 3.4.1 Detection Monitoring

Samples for the detection monitoring program are collected on a semi-annual basis, beginning with the sample collected in November 2017. NPPD plans to collect semi-annual samples for the detection monitoring program in Q2 and Q4 2022.

## 3.4.2 Alternative Source Demonstrations

Resulting from the verified SSIs for chloride at APMW-6 and sulfate at APMW-19, NPPD will pursue an alternative source demonstration (ASD). As specified in 40 CFR 257.94, NPPD has 90 days to complete the ASD. Pending completion of the successful ASD, NPPD will remain in detection monitoring. An ASD has previously been prepared for sulfate at APMW-19, included in the 2020 Annual Report (Golder 2021). The validity of this ASD will be re-evaluated and updated as necessary.

## 3.4.3 Assessment Monitoring

The current groundwater monitoring program at GGS is not in assessment monitoring. Assessment monitoring has not been triggered as described in 40 CFR 257.95. If a successful ASD as described in Section 3.4.2 is not completed, GGS will enter assessment monitoring under the steps described in 40 CFR 257.95.

## 3.4.4 Corrective Measures and Assessment

The current groundwater monitoring program at GGS does not indicate the need for corrective measures. An assessment of corrective measures, as described in 40 CFR 257.96, has not been required. No ASDs for Appendix IV parameters have been made. No corrective actions are required at this time.

# 4.0 RECOMMENDATIONS AND CLOSING

This report presents the results from the Q2 2021 and Q4 2021 detection monitoring events of the CCR program and the associated comparative statistical analysis. The groundwater monitoring and analytical procedures implemented at GGS meet the requirements of the CCR Rule and are consistent with the approach described in the Groundwater Monitoring System Certification (Golder 2017b) and the Groundwater Monitoring Statistical Methods Certification (Golder 2017a). Modifications to the monitoring network and sampling program are not recommended at this time. Comparative statistics presented within this report support remaining in detection monitoring, pending results of the ASDs for chloride at APMW-6 and sulfate at APMW-19.

# Signature Page

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# TABLES



#### Table 1. Data Summary Table - APMW-5 (Upgradient)

A solution		5/24/2021	11/30/2021
Analytes	Units	Detection	Monitoring <sup>1</sup>
Water Elevation	ft amsl	3036.11	***
Appendix III			
Boron, Total	mg/L	< 0.100	***
Calcium, Total	mg/L	59.7	***
Chloride	mg/L	19.5	***
Fluoride	mg/L	0.598	***
pH, Field	pH units	7.65	***
рН	pH units	7.9	***
Sulfate	mg/L	35.4	***
Total Dissolved Solids	mg/L	292	***
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

#### Notes:

---: not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter

<sup>1</sup> As indicated by the CCR rule (40 CFR 257.94), the Detection Monitoring Program monitors all constituents found in Appendix III.

\*\*\* APMW-5 was dry during the Q4 2021 sampling event. See text for details.



#### Table 2. Data Summary Table - APMW-15 (Upgradient)

A we had a set		5/24/2021	11/29/2021
Analytes	Units	Detection I	Monitoring <sup>1</sup>
Water Elevation	ft amsl	3036.16	3034.03
Appendix III			
Boron, Total	mg/L	0.113	0.103
Calcium, Total	mg/L	95.3	89.8
Chloride	mg/L	25.4	29.5
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	7.29	7.21
рН	pH units	7.6	7.6
Sulfate	mg/L	129	118
Total Dissolved Solids	mg/L	512	416
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 3. Data Summary Table - APMW-16A (Upgradient)

Amelytee		5/24/2021	11/29/2021
Analytes	Units	Detection	Monitoring <sup>1</sup>
Water Elevation	ft amsl	3035.32	3035.46
Appendix III			
Boron, Total	mg/L	0.131	0.133
Calcium, Total	mg/L	99.8	130.0
Chloride	mg/L	25.4	72.7
Fluoride	mg/L	0.513	< 0.500
pH, Field	pH units	7.18	7.06
рН	pH units	7.5	7.5
Sulfate	mg/L	144	197
Total Dissolved Solids	mg/L	542	638
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 4. Data Summary Table - APMW-17 (Upgradient)

Analytae		5/24/2021	11/29/2021
Analytes	Units	Detection I	Monitoring <sup>1</sup>
Water Elevation	ft amsl	3037.28	3035.44
Appendix III			
Boron, Total	mg/L	< 0.100	< 0.100
Calcium, Total	mg/L	105	102
Chloride	mg/L	21.4	20.0
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	7.21	7.17
рН	pH units	7.5	7.6
Sulfate	mg/L	108	103
Total Dissolved Solids	mg/L	464	436
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 5. Data Summary Table - APMW-4

Analytas		5/24/2021	11/29/2021
Analytes	Units	Detection Monitoring <sup>1</sup>	
Water Elevation	ft amsl	3034.57	3031.64
Appendix III			
Boron, Total	mg/L	< 0.100	< 0.100
Calcium, Total	mg/L	53.0	52.0
Chloride	mg/L	37.7	43.6
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	7.63	7.71
рН	pH units	7.8	7.9
Sulfate	mg/L	25.1	27.6
Total Dissolved Solids	mg/L	262	224
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes: ---: Not analyzed ft amsl: feet above mean sea level

mg/L: milligrams per liter

pCi/L: picocuries per liter



#### Table 6. Data Summary Table - APMW-6

Analytaa		5/24/2021	11/29/2021
Analytes	Units	Detection	Monitoring <sup>1</sup>
Water Elevation	ft amsl	3034.65	3031.82
Appendix III			
Boron, Total	mg/L	< 0.100	< 0.100
Calcium, Total	mg/L	54.9	53.3
Chloride	mg/L	25.8	17.6
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	7.44	7.45
рН	pH units	7.7	7.8
Sulfate	mg/L	24.2	27.8
Total Dissolved Solids	mg/L	266	206
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 7. Data Summary Table - APMW-8A

Analidaa		5/24/2021	11/30/2021	
Analytes	Units	Detection Monitoring <sup>1</sup>		
Water Elevation	ft amsl	3034.51	3031.69	
Appendix III				
Boron, Total	mg/L	< 0.100	< 0.100	
Calcium, Total	mg/L	104.0	103.0	
Chloride	mg/L	90.7	104.0	
Fluoride	mg/L	< 0.500	< 0.500	
pH, Field	pH units	7.30	7.23	
рН	pH units	7.6	7.6	
Sulfate	mg/L	98.4	75.4	
Total Dissolved Solids	mg/L	498	468	
Appendix IV				
Antimony, Total	mg/L			
Arsenic, Total	mg/L			
Barium, Total	mg/L			
Beryllium, Total	mg/L			
Cadmium, Total	mg/L			
Chromium, Total	mg/L			
Cobalt, Total	mg/L			
Fluoride	mg/L			
Lead, Total	mg/L			
Lithium, Total	mg/L			
Mercury, Total	mg/L			
Molybdenum, Total	mg/L			
Radium-226	pCi/L			
Radium-228	pCi/L			
Radium-226 + Radium-228	pCi/L			
Selenium, Total	mg/L			
Thallium, Total	mg/L			

Notes:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 8. Data Summary Table - APMW-10

		5/24/2021	11/30/2021
Analytes	Units	Detection N	Ionitoring <sup>1</sup>
Water Elevation	ft amsl	3034.29	3031.92
Appendix III			
Boron, Total	mg/L	< 0.100	< 0.100
Calcium, Total	mg/L	61.7	58.5
Chloride	mg/L	23.8	18.3
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	7.52	7.49
рН	pH units	7.8	7.8
Sulfate	mg/L	51.6	48.5
Total Dissolved Solids	mg/L	318	240
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Legend:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter

#### NOTES:



#### Table 9. Data Summary Table - APMW-11

A stall start		5/24/2021	11/30/2021	
Analytes	Units	Detection Monitoring <sup>1</sup>		
Water Elevation	ft amsl	3034.83	3032.26	
Appendix III				
Boron, Total	mg/L	< 0.100	< 0.100	
Calcium, Total	mg/L	80.3	91.9	
Chloride	mg/L	54.4	93.5	
Fluoride	mg/L	< 0.500	< 0.500	
pH, Field	pH units	7.41	7.20	
рН	pH units	7.6	7.6	
Sulfate	mg/L	47.2	45.4	
Total Dissolved Solids	mg/L	364	342	
Appendix IV				
Antimony, Total	mg/L			
Arsenic, Total	mg/L			
Barium, Total	mg/L			
Beryllium, Total	mg/L			
Cadmium, Total	mg/L			
Chromium, Total	mg/L			
Cobalt, Total	mg/L			
Fluoride	mg/L			
Lead, Total	mg/L			
Lithium, Total	mg/L			
Mercury, Total	mg/L			
Molybdenum, Total	mg/L			
Radium-226	pCi/L			
Radium-228	pCi/L			
Radium-226 + Radium-228	pCi/L			
Selenium, Total	mg/L			
Thallium, Total	mg/L			

Notes:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 10. Data Summary Table - APMW-12

		5/25/2021	11/30/2021
Analytes	Units	Detection Monitoring <sup>1</sup>	
Water Elevation	ft amsl	3035.04	3032.74
Appendix III			
Boron, Total	mg/L	0.228	0.276
Calcium, Total	mg/L	146	154
Chloride	mg/L	153	177
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	6.91	6.93
рН	pH units	7.4	7.4
Sulfate	mg/L	290	299
Total Dissolved Solids	mg/L	1010	946
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes: ---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 11. Data Summary Table - APMW-13

Amelydee		5/25/2021	11/30/2021	
Analytes	Units	Detection Monitoring <sup>1</sup>		
Water Elevation	ft amsl	3035.11	3032.88	
Appendix III				
Boron, Total	mg/L	0.218	0.299	
Calcium, Total	mg/L	151	155	
Chloride	mg/L	115	148	
Fluoride	mg/L	< 0.500	< 0.500	
pH, Field	pH units	6.95	6.95	
рН	pH units	7.3	7.4	
Sulfate	mg/L	285	298	
Total Dissolved Solids	mg/L	956	934	
Appendix IV				
Antimony, Total	mg/L			
Arsenic, Total	mg/L			
Barium, Total	mg/L			
Beryllium, Total	mg/L			
Cadmium, Total	mg/L			
Chromium, Total	mg/L			
Cobalt, Total	mg/L			
Fluoride	mg/L			
Lead, Total	mg/L			
Lithium, Total	mg/L			
Mercury, Total	mg/L			
Molybdenum, Total	mg/L			
Radium-226	pCi/L			
Radium-228	pCi/L			
Radium-226 + Radium-228	pCi/L			
Selenium, Total	mg/L			
Thallium, Total	mg/L			

Notes: ---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 12. Data Summary Table - APMW-14

		5/25/2021	11/30/2021
Analytes	Units	Detection I	Monitoring <sup>1</sup>
Water Elevation	ft amsl	3035.26	3033.08
Appendix III			
Boron, Total	mg/L	0.204	0.212
Calcium, Total	mg/L	144	146
Chloride	mg/L	122	123
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	6.99	7.00
рН	pH units	7.4	7.5
Sulfate	mg/L	197	210
Total Dissolved Solids	mg/L	844	768
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes:

---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 13. Data Summary Table - APMW-18

		5/24/2021	11/29/2021
Analytes	Units	Detection M	Nonitoring <sup>1</sup>
Water Elevation	ft amsl	3033.74	3031.99
Appendix III			
Boron, Total	mg/L	< 0.100	< 0.100
Calcium, Total	mg/L	69.4	82.3
Chloride	mg/L	42.7	96.9
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	7.42	7.38
рН	pH units	7.7	7.7
Sulfate	mg/L	34.8	27.9
Total Dissolved Solids	mg/L	314	352
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes: ---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 14. Data Summary Table - APMW-19

		5/24/2021	11/29/2021
Analytes	Units	Detection N	Ionitoring <sup>1</sup>
Water Elevation	ft amsl	3034.37	3031.44
Appendix III			
Boron, Total	mg/L	< 0.100	< 0.100
Calcium, Total	mg/L	103	92.2
Chloride	mg/L	48.4	45.4
Fluoride	mg/L	< 0.500	< 0.500
pH, Field	pH units	7.31	7.27
рН	pH units	7.6	7.6
Sulfate	mg/L	161	122
Total Dissolved Solids	mg/L	552	402
Appendix IV			
Antimony, Total	mg/L		
Arsenic, Total	mg/L		
Barium, Total	mg/L		
Beryllium, Total	mg/L		
Cadmium, Total	mg/L		
Chromium, Total	mg/L		
Cobalt, Total	mg/L		
Fluoride	mg/L		
Lead, Total	mg/L		
Lithium, Total	mg/L		
Mercury, Total	mg/L		
Molybdenum, Total	mg/L		
Radium-226	pCi/L		
Radium-228	pCi/L		
Radium-226 + Radium-228	pCi/L		
Selenium, Total	mg/L		
Thallium, Total	mg/L		

Notes: ---: Not analyzed ft amsl: feet above mean sea level mg/L: milligrams per liter pCi/L: picocuries per liter



#### Table 15: Comparative Statistics - APMW-5 (Upgradient)

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
<b>Detection Monitoring Analytes</b>	Units			5	5/24/2021		1	1/30/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	***		
Calcium, Total	mg/L	CUSUM	120.2	59.7	71.5	Yes	***		
Chloride	mg/L	CUSUM	108.1	19.5	35.7	Yes	***		
Fluoride	mg/L	CUSUM	1.785	0.598	0.727	Yes	***		
pH, Field	pH units	NP-PL	7.23, 9.71	7.65		Yes	***		
Sulfate	mg/L	CUSUM	76.9	35.4	42.1	Yes	***		
Total Dissolved Solids	mg/L	CUSUM	653	292	386	Yes	***		

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter

NP-PL: Non-Parametric Prediction Limit

\*\*\*: APMW-5 was dry during the Q4 2021 sampling event. See text for details.



#### Table 16: Comparative Statistics - APMW-15 (Upgradient)

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/24/2021		1	1/29/2021	
Boron, Total	mg/L	NP-PL	0.200	0.113		Yes	0.103		Yes
Calcium, Total	mg/L	CUSUM	145.0	95.3	105.8	Yes	89.8	105.8	Yes
Chloride	mg/L	CUSUM	40.4	25.4	34.0	Yes	29.5	34.0	Yes
Fluoride	mg/L	NP-PL	0.716	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.24, 8.15	7.29	7.20, 7.21	Yes	7.21	7.20, 7.20	Yes
Sulfate <sup>1</sup>	mg/L	CUSUM	209	129			118	138	Yes
Total Dissolved Solids	mg/L	CUSUM	853	512	585	Yes	416	585	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter

NP-PL: Non-Parametric Prediction Limit

1: Statistical limit was established on data without a statistically significant trend collected through Q2 2021. Prior to Q2 2021, the data displayed a statistically significant increasing trend. See text for discussion of trend analysis prior to Q4 2021.



#### Table 17: Comparative Statistics - APMW-16A (Upgradient)

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/24/2021			11/29/2021	
Boron, Total	mg/L	NP-PL	0.200	0.131		Yes	0.133		Yes
Calcium, Total <sup>1</sup>	mg/L	CUSUM	199.3	99.8	134.0	Yes	130.0	133.5	Yes
Chloride <sup>1</sup>	mg/L	CUSUM	126.2	25.4	56.8	Yes	72.7	63.2	Yes
Fluoride	mg/L	NP-PL	1.490	0.513		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.08, 8.00	7.18	7.04, 7.11	Yes	7.06	7.04, 7.04	Yes
Sulfate <sup>1</sup>	mg/L	CUSUM	278	144	194	Yes	197	193	Yes
Total Dissolved Solids <sup>1</sup>	mg/L	CUSUM	1046	542	714	Yes	638	714	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter

NP-PL: Non-Parametric Prediction Limit

<sup>1</sup>: Seasonality was detected in the baseline period. Statistical limits may vary slightly between monitoring events due to deseasonalization of the data or if seasonality is not identified in the full data set (i.e. the baseline period and any comparative points).



#### Table 18: Comparative Statistics - APMW-17 (Upgradient)

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/24/2021			11/29/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100		Yes
Calcium, Total	mg/L	CUSUM	184	105	140	Yes	102	140	Yes
Chloride	mg/L	CUSUM	59.0	21.4	42.5	Yes	20.0	42.5	Yes
Fluoride	mg/L	NP-PL	1.070	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	5.99, 7.88	7.21	7.12, 7.17	Yes	7.17	7.12, 7.12	Yes
Sulfate	mg/L	CUSUM	225	108	142	Yes	103	142	Yes
Total Dissolved Solids	mg/L	CUSUM	927	464	589	Yes	436	589	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter



#### Table 19: Comparative Statistics - APMW-4

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/24/2021			11/29/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100		Yes
Calcium, Total	mg/L	CUSUM	64.3	53.0	55.1	Yes	52.0	55.1	Yes
Chloride	mg/L	CUSUM	51.4	37.7	38.5	Yes	43.6	40.7	Yes
Fluoride	mg/L	NP-PL	0.569	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.21, 9.02	7.63	7.61, 7.61	Yes	7.71	7.62, 7.62	Yes
Sulfate	mg/L	CUSUM	40.5	25.1	28.0	Yes	27.6	28.0	Yes
Total Dissolved Solids	mg/L	CUSUM	428	262	306	Yes	224	306	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart mg/L: milligrams per liter



#### Table 20: Comparative Statistics - APMW-6

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/24/2021			11/29/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100		Yes
Calcium, Total	mg/L	CUSUM	65.7	54.9	52.4	Yes	53.3	52.4	Yes
Chloride	mg/L	CUSUM	20.4	25.8	31.7	No - Potential Exceedance	17.6	36.6	No - Verified Exceedance
Fluoride	mg/L	NP-PL	0.713	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.24, 8.62	7.44	7.43, 7.43	Yes	7.45	7.43, 7.43	Yes
Sulfate	mg/L	CUSUM	38.4	24.2	28.1	Yes	27.8	28.1	Yes
Total Dissolved Solids	mg/L	CUSUM	414	266	291	Yes	206	291	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter



#### Table 21: Comparative Statistics - APMW-8A

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units			59	6/24/2021			11/30/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100		Yes
Calcium, Total	mg/L	CUSUM	176	104	106	Yes	103	106	Yes
Chloride	mg/L	CUSUM	104.9	90.7	100.7	Yes	104.0	113.2	No - Potential Exceedance
Fluoride	mg/L	NP-PL	13.700	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	5.86, 8.61	7.30	7.23, 7.23	Yes	7.23	7.23, 7.23	Yes
Sulfate	mg/L	CUSUM	244.9	98.4	90.5	Yes	75.4	90.5	Yes
Total Dissolved Solids	mg/L	CUSUM	850	498	536	Yes	468	536	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter



### Table 22: Comparative Statistics - APMW-10

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units			(	5/24/2021			11/30/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100		Yes
Calcium, Total	mg/L	CUSUM	78.3	61.7	62.5	Yes	58.5	62.5	Yes
Chloride	mg/L	CUSUM	63.8	23.8	38.1	Yes	18.3	38.1	Yes
Fluoride	mg/L	NP-PL	3.780	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	5.95, 8.89	7.52	7.42, 7.42	Yes	7.49	7.42, 7.42	Yes
Sulfate	mg/L	CUSUM	72.4	51.6	46.1	Yes	48.5	46.1	Yes
Total Dissolved Solids	mg/L	CUSUM	489	318	358	Yes	240	358	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter NP-PL: Non-Parametric Prediction Limit



## Table 23: Comparative Statistics - APMW-11

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units			5	5/24/2021			11/30/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100		Yes
Calcium, Total	mg/L	CUSUM	101.7	80.3	81.6	Yes	91.9	86.9	Yes
Chloride	mg/L	CUSUM	137.0	54.4	74.2	Yes	93.5	77.8	Yes
Fluoride	mg/L	NP-PL	6.960	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.89, 7.83	7.41	7.36, 7.37	Yes	7.20	7.32, 7.36	Yes
Sulfate	mg/L	CUSUM	75.0	47.2	37.0	Yes	45.4	37.9	Yes
Total Dissolved Solids	mg/L	CUSUM	622	364	438	Yes	342	438	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L milligrams per liter



#### Table 24: Comparative Statistics - APMW-12

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/25/2021			11/30/2021	
Boron, Total	mg/L	CUSUM	0.389	0.228	0.283	Yes	0.276	0.283	Yes
Calcium, Total	mg/L	CUSUM	203	146	166	Yes	154	166	Yes
Chloride	mg/L	CUSUM	272	153	163	Yes	177	163	Yes
Fluoride	mg/L	NP-PL	21.300	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.28, 7.66	6.91	6.97, 6.97	Yes	6.93	6.97, 6.97	Yes
Sulfate	mg/L	CUSUM	383	290	302	Yes	299	302	Yes
Total Dissolved Solids	mg/L	CUSUM	1602	1010	1108	Yes	946	1108	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter



### Table 25: Comparative Statistics - APMW-13

		Statistical Method	Statistical Limit	Detection Monitorin g Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/25/2021		,	11/30/2021	
Boron, Total	mg/L	CUSUM	0.449	0.218	0.314	Yes	0.299	0.314	Yes
Calcium, Total	mg/L	CUSUM	196	151	148	Yes	155	148	Yes
Chloride	mg/L	CUSUM	190	115	141	Yes	148	141	Yes
Fluoride	mg/L	NP-PL	8.250	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.05, 8.11	6.95	7.08, 7.08	Yes	6.95	7.08, 7.08	Yes
Sulfate	mg/L	CUSUM	362	285	264	Yes	298	273	Yes
Total Dissolved Solids	mg/L	CUSUM	1215	956	1026	Yes	934	1026	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter



#### Table 26: Comparative Statistics - APMW-14

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/25/2021			11/30/2021	
Boron, Total	mg/L	CUSUM	0.382	0.204	0.261	Yes	0.212	0.261	Yes
Calcium, Total	mg/L	CUSUM	195	144	158	Yes	146	158	Yes
Chloride	mg/L	CUSUM	207	122	135	Yes	123	135	Yes
Fluoride	mg/L	NP-PL	19.200	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	6.03, 8.44	6.99	7.17, 7.17	Yes	7.00	7.17, 7.17	Yes
Sulfate	mg/L	CUSUM	272	197	217	Yes	210	217	Yes
Total Dissolved Solids	mg/L	CUSUM	1240	844	949	Yes	768	949	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter NP-PL: Non-Parametric Prediction Limit



#### Table 27: Comparative Statistics - APMW-18

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
Detection Monitoring Analytes	Units				5/24/2021		1	1/29/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100		Yes
Calcium, Total	mg/L	CUSUM	103.7	69.4	81.7	Yes	82.3	81.7	Yes
Chloride	mg/L	CUSUM	160.4	42.7	55.8	Yes	96.9	70.8	Yes
Fluoride	mg/L	NP-PL	1.740	< 0.500		Yes	< 0.500		Yes
pH, Field	pH units	CUSUM	5.99, 8.01	7.42	7.33, 7.33	Yes	7.38	7.33, 7.33	Yes
Sulfate	mg/L	CUSUM	147.7	34.8	38.3	Yes	27.9	38.3	Yes
Total Dissolved Solids	mg/L	CUSUM	638	314	401	Yes	352	401	Yes

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart

mg/L: milligrams per liter NP-PL: Non-Parametric Prediction Limit



#### Table 28: Comparative Statistics - APMW-19

		Statistical Method	Statistical Limit	Detection Monitoring Result	CUSUM Value	Within Limit?	Detection Monitoring Result	CUSUM Value	Within Limit?
<b>Detection Monitoring Analytes</b>	Units				5/24/2021	1		11/29/2021	
Boron, Total	mg/L	NP-PL	0.200	< 0.100		Yes	< 0.100	-	Yes
Calcium, Total	mg/L	CUSUM	142.9	103.0	94.9	Yes	92.2	87.4	Yes
Chloride	mg/L	CUSUM	71.7	48.4	48.3	Yes	45.4	45.7	Yes
Fluoride	mg/L	NP-PL	0.665	< 0.500		Yes	< 0.500	-	Yes
pH, Field	pH units	CUSUM	6.25, 8.29	7.31	7.27, 7.27	Yes	7.27	7.27, 7.27	Yes
Sulfate	mg/L	CUSUM	191	161	212	No - Potential	122	223	No - Verified
				101		Exceedance			Exceedance
Total Dissolved Solids	mg/L	CUSUM	645		659	No Potential			Yes - Prior
				552		Exceedance	402	549	Result was a
						Exceedance			False-Positive

Notes:

CUSUM: Parametric Shewhart-CUSUM Control Chart mg/L: milligrams per liter NP-PL: Non-Parametric Prediction Limit



# FIGURES





MAY 2021 GROUNDWATER CONTOURS FIGURE 1



MEMBER OF WSP

GROUNDWATER CONTOURS DEVELOPED FROM LEVELS MEASURED IN ACTIVE MONITORING WELLS SHOWN.

**GROUNDWATER MONITORING WELL NETWORK** NOVEMBER 2021 GROUNDWATER CONTOURS FIGURE 2



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