



REPORT

2021 Annual CCR Groundwater Report

Nebraska Public Power District, Sheldon Station

Submitted to:

Nebraska Public Power District

Sheldon Station, 4500 West Pella Road
Hallam, Nebraska

Submitted by:

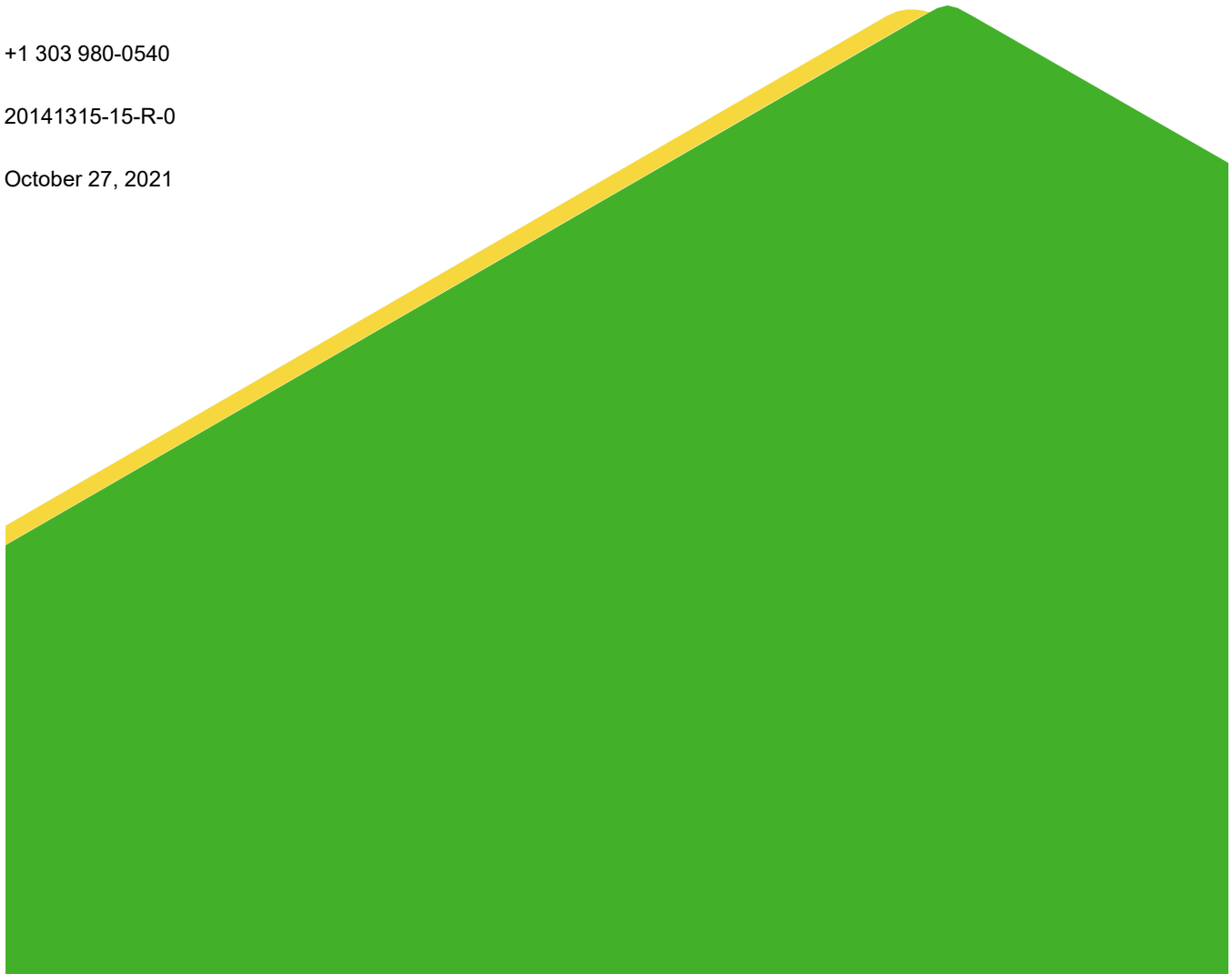
Golder Associates Inc.

7245 W Alaska Drive, Suite 200, Lakewood, Colorado, USA 80226

+1 303 980-0540

20141315-15-R-0

October 27, 2021



Executive Summary

This report presents the results from groundwater monitoring that occurred at Nebraska Public Power District's Sheldon Station in 2021. The facility entered 2021 under a detection monitoring program and remains in detection monitoring based on the results of the first (Q1) and third (Q3) quarter 2021 sampling and analysis events.

For the Q1 2021 sampling event, a potential exceedance was identified for chloride at upgradient well AP4-MW2. No false-positives were identified for the Q1 2021 sampling event. No verified SSIs were identified for samples collected during the Q1 2021 sampling event. The analytical result and calculated CUSUM values for field-measured pH at AP4-MW5, previously identified as a verified SSI in Q1 2020, were within statistical limits, but remain a verified SSI. A successful alternative source demonstration was previously completed showing that the verified SSI for field-measured pH at AP4-MW5 was not caused by the facility. The conclusions of the previously completed alternative source demonstration remain valid and the facility remained in detection monitoring entering the Q3 2021 sampling event.

During the Q3 2021 sampling event, a potential exceedance was identified for sulfate at upgradient well AP4-MW1. No false-positives were identified for the Q3 2021 sampling event. A verified SSI was identified for chloride at upgradient well AP4-MW2 following confirmatory re-sampling in Q3 2021. As an upgradient location, the verified SSI at AP4-MW2 was not caused by the facility, and an Alternative Source Demonstration supporting this has been completed. Field-measured pH at AP4-MW5 remains a verified SSI. A successful alternative source demonstration was previously completed showing that the verified SSI for field-measured pH at AP4-MW5 was not caused by the facility. Following review of the previously completed alternative source demonstration, the previously identified conclusions were determined to still be valid and the Sheldon Station monitoring program remains in detection monitoring entering 2022.

Table of Contents

- 1.0 INTRODUCTION 1**
 - 1.1 Facility Information 1
 - 1.2 Purpose 1
- 2.0 GROUNDWATER MONITORING NETWORK PROGRAM STATUS..... 1**
 - 2.1 Completed Key Actions in 2021 1
 - 2.2 Installation and Decommissioning of Monitoring Wells..... 1
 - 2.3 Problems and Resolutions 1
 - 2.4 Proposed Key Activities for 2022 2
- 3.0 GROUNDWATER MONITORING ANALYTICAL PROGRAM STATUS 2**
 - 3.1 Samples Collected 2
 - 3.1.1 Groundwater Elevation and Flow Rate 2
 - 3.2 Monitoring Data (Analytical Results)..... 2
 - 3.3 Comparative Statistical Analysis 3
 - 3.3.1 Definitions 3
 - 3.3.2 Potential Exceedances 3
 - 3.3.3 False-Positives..... 3
 - 3.3.4 Verified Statistically Significant Increases 3
 - 3.4 Program Transitions..... 4
 - 3.4.1 Detection Monitoring 4
 - 3.4.2 Alternative Source Demonstrations 4
 - 3.4.3 Assessment Monitoring..... 4
 - 3.4.4 Corrective Measures and Assessment 5
- 4.0 RECOMMENDATIONS AND CLOSING..... 5**
- 5.0 REFERENCES 7**

TABLES

- Table 1: Data Summary Table – AP4-MW1 (U)
- Table 2: Data Summary Table – AP4-MW2 (U)
- Table 3: Data Summary Table – AP4-MW3
- Table 4: Data Summary Table – AP4-MW4
- Table 5: Data Summary Table – AP4-MW5
- Table 6: Data Summary Table – AP4-MW6
- Table 7: Data Summary Table – AP4-MW7
- Table 8: Sheldon Station Ash Landfill No. 4 Groundwater Levels
- Table 9: Comparative Statistics – AP4-MW1 (U)
- Table 10: Comparative Statistics – AP4-MW2 (U)
- Table 11: Comparative Statistics – AP4-MW3
- Table 12: Comparative Statistics – AP4-MW4
- Table 13: Comparative Statistics – AP4-MW5
- Table 14: Comparative Statistics – AP4-MW6
- Table 15: Comparative Statistics – AP4-MW7

FIGURES

- Figure 1: Ash Landfill No. 4, Groundwater Contours, March 2021
- Figure 2: Ash Landfill No. 4, Groundwater Contours, August 2021
- Figure 3: Ash Landfill No. 4 Groundwater Elevations

APPENDICES**APPENDIX A**

Alternative Source Demonstration - Chloride, AP4-MW2, Q3 2021

1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this report describing the 2021 annual groundwater sampling events and comparative statistical analysis for Nebraska Public Power District's (NPPD) Sheldon Station Ash Landfill no. 4 (AP4) in Hallam, Nebraska. This report was written to meet the requirements of the site's permitted sampling and analysis plan (SAP) as approved by the Nebraska Department of Environment and Energy (NDEE) and the federal Coal Combustion Residuals (CCR) Rule's section on groundwater monitoring and corrective action, 40 CFR 257.90-98 and applicable revisions to the CFR.

1.1 Facility Information

Sheldon Station is owned and operated by NPPD and can generate 225 MW of power. The facility is located in southeastern Nebraska in Section 19, T7N, R6E, and is 19 miles south of Lincoln, in Lancaster County. The village of Hallam is the closest community to the site and is 1.5 miles south of the facility. NPPD constructed Sheldon Station in 1958, switching the facility entirely to low-sulfur coal from Wyoming's Powder River Basin in 1974. The active CCR landfill at the site (AP4) contains fly ash and bottom ash.

1.2 Purpose

The United States Environmental Protection Agency's (USEPA) CCR Rule established specific requirements for reporting of groundwater monitoring and corrective action at CCR facilities in 40 CFR 257.90 to 40 CFR 257.98. 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. The permitted SAP for AP4 was developed to comply with both the federal CCR regulations and NDEE requirements. In addition to the annual report for federal requirements, semi-annual reports are also prepared following each sampling event, at the request of the NDEE.

2.0 GROUNDWATER MONITORING NETWORK PROGRAM STATUS

The groundwater monitoring network for the active CCR landfill at Sheldon Station consists of seven monitoring wells, as shown in Figure 1 and Figure 2. The two upgradient wells are AP4-MW1 and AP4-MW2. The five downgradient monitoring wells are AP4-MW3, AP4-MW4, AP4-MW5, AP4-MW6, and AP4-MW7.

2.1 Completed Key Actions in 2021

A detection monitoring sampling event was completed during the first quarter of 2021, with an associated semi-annual report provided to the NDEE within 30 days of the end of the quarter.

A detection monitoring sampling event was also completed during the third quarter of 2021. Following the sampling event, the associated semi-annual report was provided to the NDEE within 30 days of the end of the quarter.

2.2 Installation and Decommissioning of Monitoring Wells

No monitoring wells were installed or decommissioned at Sheldon Station during 2021.

2.3 Problems and Resolutions

No problems were encountered in either the first or third quarter of 2021.

2.4 Proposed Key Activities for 2022

Detection monitoring sampling events are planned for the first and third quarters of 2022.

A baseline update is planned to occur prior to the first quarter 2022 detection monitoring event. Per the USEPA Unified Guidance (USEPA 2009), for monitoring programs where samples are collected on a semi-annual basis, statistical baselines should be reviewed for the potential to incorporate compliance data following collection of four to eight comparative samples, or every two to four years.

3.0 GROUNDWATER MONITORING ANALYTICAL PROGRAM STATUS

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

3.1 Samples Collected

Sheldon Station staff collected eight initial baseline samples on a quarterly basis between September 15, 2015 and May 16, 2017 at each of the two upgradient and five downgradient monitoring wells. Detection monitoring samples have been collected on a semi-annual basis beginning on September 19, 2017. This report outlines the results of the detection monitoring sampling events that occurred on March 8, 2021 and August 25, 2021. Specific dates for each sample collected as part of the program are provided in Table 1 through Table 7.

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 Table 8. Groundwater elevations and interpolated groundwater contours from the March 2021 (Q1 2020) detection monitoring sampling event and August 2021 (Q3 2021) detection monitoring sampling event are shown in Figure 1 and Figure 2, respectively. Figure 3 shows groundwater elevations over time at the site.

The groundwater flow rate across Ash Pond 4 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 in ft/day, estimated at 0.005 ft/day from slug testing results from system wells.
- i is the hydraulic gradient in feet per foot (ft/ft), calculated based on groundwater elevations during each monitoring event.
- n_e is the effective porosity, a unitless parameter, estimated to be 0.2 for site soils.

The average groundwater flow rate for March 2021 was estimated to be 8.5×10^{-4} ft/day, based on the calculated hydraulic gradient for March 2021 of 0.03 ft/ft.

The average groundwater flow rate for August 2021 was estimated to be 8.8×10^{-4} ft/day, based on the calculated hydraulic gradient for August 2021 of 0.04 ft/ft.

3.2 Monitoring Data (Analytical Results)

Analytical results for the CCR Rule Appendix III detection monitoring results for the March 2021 and August 2021 detection monitoring events are shown in Table 1 through Table 7.

3.3 Comparative Statistical Analysis

The comparative statistical analysis is summarized below with results presented in Table 9 through Table 15. A full description of the steps taken for the comparative statistical analysis can be found in the Groundwater Monitoring Statistical Methods Certification (Golder 2017a).

3.3.1 Definitions

The following definitions are used in discussion of the comparative statistical analysis.

- SSI – a statistically significant increase, defined as a result that exceeds the statistical limit established by the baseline statistical analysis, which has been verified by confirmatory re-sampling and analysis.
- Elevated CUSUM – occurs 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.
- Potential Exceedance – defined as an initial elevated CUSUM or an initial analytical result that exceeds the Shewhart-CUSUM limit or non-parametric prediction limit established by the baseline statistical analysis. Confirmatory re-sampling will determine if a potential exceedance is a false-positive or a verified SSI. Non-detect results that exceed either the Shewhart-CUSUM limit or the non-parametric prediction limit are not considered potential exceedances.
- False-positive – defined as an analytical result or elevated CUSUM that exceeded the associated statistical limit, but can be clearly attributed to laboratory error, changes in analytical precision, or is invalidated through confirmatory re-sampling. False-positive are not used in calculation of any subsequent CUSUM values.
- Confirmatory re-sampling – designated as the next sampling event.
- Verified exceedances (verified SSIs) – interpreted as two consecutive samples exceeding the statistical limit (the original sample and the confirmatory re-sample, or two consecutive elevated CUSUMs) for the same parameter at the same well.

3.3.2 Potential Exceedances

Chloride at AP4-MW2 (upgradient) was identified as a potential exceedance during the Q1 2021 comparative statistical analysis. Confirmatory re-sampling occurred during the Q3 2021 sampling event, with results discussed below.

Sulfate at AP4-MW1 (upgradient) was identified as a potential exceedance during the Q3 2021 comparative statistical analysis. Confirmatory re-sampling will occur during the Q1 2022 semi-annual sampling event.

3.3.3 False-Positives

No false-positives were identified for either the Q1 2021 or the Q3 2021 detection monitoring events.

3.3.4 Verified Statistically Significant Increases

Chloride at AP4-MW2 (upgradient) was identified as a verified SSI during the Q3 2021 detection monitoring event. A potential exceedance was identified during the Q1 2021 sampling event and verified through confirmatory re-sampling during the Q3 2021 sampling event.

Field pH was previously identified as a verified SSI for the sample collected from AP4-MW5 during the Q1 2020 monitoring event. An elevated CUSUM potential exceedance for field pH at AP4-MW5 was initially identified during the Q3 2019 monitoring event and was verified through confirmatory re-sampling during the Q1 2020 detection monitoring sampling event as a second elevated CUSUM. Elevated CUSUMs were also identified during the Q3 2020 and Q3 2021 monitoring events. The analytical results for field pH at AP4-MW5 during each monitoring event between Q3 2019 and Q3 2021 have remained within the statistical limits.

3.4 Program Transitions

Beginning in Q3 2017, the groundwater monitoring program at Sheldon Station transitioned from the initial baseline period to detection monitoring. During the initial 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).

3.4.1 Detection Monitoring

Samples for the detection monitoring program are collected on a semi-annual basis, beginning with the sample collected in September 2017. NPPD plans to continue to collect semi-annual samples under the detection monitoring program in 2022.

3.4.2 Alternative Source Demonstrations

Resulting from the verified SSI for the upper CUSUM limit for field-measured pH at AP4-MW5 verified during the Q1 2020 sampling event, NPPD and Golder pursued an alternative source demonstration (ASD). As specified in 40 CFR 257.94, the ASD was completed within 90 days of identification of the verified SSI (SSI identified April 24, 2020; ASD dated July 22, 2020). Following completion of the successful ASD (Golder 2020), Sheldon Station's AP4 remained in detection monitoring for the Q3 2020 sampling event. Based on the results of the Q3 2020 sampling event and the ongoing SSI for field-measured pH at AP4-MW5, the previously completed ASD was reviewed. As the associated conclusions from the previously completed ASD remained true, Sheldon Station remained in detection monitoring entering 2021. During Q1 2021, the analytical value and both the upper and lower calculated CUSUM values for field-measured pH at AP4-MW5 were within the upper and lower statistical limits. The Q3 2021 analytical value and lower calculated CUSUM value for field-measured pH at AP4-MW5 were within the upper and lower statistical limits, while the upper calculated CUSUM value exceeded the statistical limit. As the associated conclusions from the previously completed ASD remain true, Sheldon Station will remain in detection monitoring entering 2022.

Resulting from the verified SSI for the CUSUM limit for chloride at AP4-MW2 (upgradient), NPPD and Golder pursued an ASD (Appendix A). As an upgradient background location, groundwater from AP4-MW2 flows north towards the landfill, as shown in Figure 1 and Figure 2. As such, Ash Landfill No. 4 is not the source of the verified SSI at AP4-MW2. As specified in 40 CFR 257.94, the ASD was completed within 90 days of identification of the verified SSI. Following completion of the successful ASD (Appendix A), Sheldon Station's Ash Landfill No. 4 remains in detection monitoring.

3.4.3 Assessment Monitoring

The current groundwater monitoring program at Sheldon Station is not in assessment monitoring. Assessment monitoring has not been triggered as described in 40 CFR 257.95.

3.4.4 Corrective Measures and Assessment

The current groundwater monitoring program at Sheldon Station 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 alternative source demonstration stemming from statistically significant levels of Appendix IV parameters identified as part of an assessment monitoring program has been made. No actions are required at this time.

4.0 RECOMMENDATIONS AND CLOSING

This report presents the results from the CCR detection monitoring events that occurred on March 9 and August 25, 2021, along with the associated comparative statistical analysis.

As described in the Groundwater Monitoring System Certification (Golder 2017b) and the Groundwater Monitoring Statistical Methods Certification (Golder 2017a), 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.

Signature Page

Golder Associates Inc.



Erin L. Hunter, PhD, PE
Senior Project Engineer



Jacob J. Sauer, PE
Associate and Senior Engineer

ELH/JJS/rm

Golder and the G logo are trademarks of Golder Associates Corporation

[https://golderassociates.sharepoint.com/sites/124836/project files/6 deliverables/reports/15-r-nppd_annual_ccr_2021/15-r-0/20141315-15-r-0-sheldon_2021_annual_ccr_gw_report_27oct21.docx](https://golderassociates.sharepoint.com/sites/124836/project%20files/6%20deliverables/reports/15-r-nppd_annual_ccr_2021/15-r-0/20141315-15-r-0-sheldon_2021_annual_ccr_gw_report_27oct21.docx)

5.0 REFERENCES

Golder (Golder Associates, Inc.). 2017a. Groundwater Monitoring Statistical Methods Certification, Sheldon Station Ash Landfill No. 4. October 11, 2017.

Golder. 2017b. Coal Combustion Residuals Landfill Groundwater Monitoring System Certification. October 11, 2017.

Golder. 2020. 2020 Annual Groundwater Report, Nebraska Public Power District – Sheldon Station. October 30, 2020.

USEPA (United States Environmental Protection Agency). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. Office of Resource Conservation and Recovery. EPA-R-09-007. March 2009.

USEPA. 2015. Code of Federal Regulations Title 40 Part 257: Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities. April 17, 2015.

Tables

Table 1. Data Summary Table - AP4-MW1

Analyses		09/15/2015	11/23/2015	03/15/2016	05/18/2016	08/09/2016	11/09/2016	03/07/2017	05/16/2017	09/19/2017	03/21/2018	09/11/2018	03/20/2019	09/17/2019	03/08/2020	09/01/2020	03/09/2021	08/25/2021	
	Units	Background Collection									Detection Monitoring ¹								
Appendix III																			
Boron, Total	mg/L	0.0784	< 0.150	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	0.100	< 0.100	< 0.100	
Calcium, Total	mg/L	89.8	90.4	95.1	103	93.0	88.3	103	92.3	91.0	99.6	82.4	94.2	93.7	85.3	94.0	96.2	93.7	
Chloride	mg/L	22.5	7.05	5.57	6.43	6.24	11	5.37	7.48	7.47	6.52	5.61	6.15	1.18	6.74	7.27	7.13	7.17	
Fluoride	mg/L	< 0.500	0.598	0.923	0.796	0.604	< 0.500	0.656	1.22	1.2	0.846	0.723	1.07	0.194	0.552	0.816	0.856	0.615	
Field pH	pH units	6.95	6.94	7.46	7.26	7.19	7.19	7.32	7.19	7.17	7.36	7.23	7.59	7.60	7.37	7.16	6.8	7.14	
Sulfate	mg/L	22.8	23.7	22.2	22.2	22.8	24.5	20.6	21.7	24.4	23.4	19.6	23.2	4.79	25.7	25.3	25.2	27.2	
Total Dissolved Solids	mg/L	440	462	428	430	462	464	484	520	464	408	406	416	392	422	396	388	388	
Appendix IV																			
Antimony, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Arsenic, Total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---	---	---	---	---	---	---	---	
Barium, Total	mg/L	0.23	0.258	0.221	0.199	0.193	0.209	0.269	0.231	---	---	---	---	---	---	---	---	---	
Beryllium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Cadmium, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Chromium, Total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---	---	---	---	---	---	---	---	---	
Cobalt, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Fluoride	mg/L	< 0.500	0.598	0.923	0.796	0.604	< 0.500	0.656	1.22	---	---	---	---	---	---	---	---	---	
Lead, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Lithium, Total	mg/L	0.0508	0.0513	0.0504	0.0505	0.0506	0.0546	< 0.05	< 0.05	---	---	---	---	---	---	---	---	---	
Mercury, Total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---	---	---	---	---	---	
Molybdenum, Total	mg/L	0.00725	0.00823	0.00724	0.00647	0.00656	0.00655	0.00883	0.00739	---	---	---	---	---	---	---	---	---	
Radium-226	pCi/L	0.257 ± 0.0866	0.293 ± 0.104	0.35 ± 0.097	0.314 ± 0.0878	0.417 ± 0.111	0.527 ± 0.33	0.208 ± 0.0918	0.373 ± 0.125	---	---	---	---	---	---	---	---	---	
Radium-228	pCi/L	2.14 ± 0.411	2.68 ± 0.446	1.49 ± 0.319	1.19 ± 0.318	1.26 ± 0.383	2.09 ± 0.453	2.02 ± 0.392	1.88 ± 0.383	---	---	---	---	---	---	---	---	---	
Radium-226 + Radium-228	pCi/L	2.397 ± 0.42	2.973 ± 0.458	1.84 ± 0.333	1.51 ± 0.33	1.67 ± 0.399	2.62 ± 0.561	2.22 ± 0.403	2.25 ± 0.403	---	---	---	---	---	---	---	---	---	
Selenium, Total	mg/L	0.00901	0.0123	0.0101	0.00873	0.00826	0.00816	0.0114	0.00999	---	---	---	---	---	---	---	---	---	
Thallium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	

Legend:
 ---, Not analyzed
 mg/L, milligrams per liter
 pCi/L, picocuries per liter

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

Table 2. Data Summary Table - AP4-MW2

Analytes	Units	09/15/2015	11/23/2015	03/15/2016	05/18/2016	08/09/2016	11/09/2016	03/07/2017	05/16/2017	09/19/2017	03/21/2018	09/11/2018	03/20/2019	09/17/2019	03/08/2020	09/01/2020	03/09/2021	08/25/2021
		Background Collection									Detection Monitoring ¹							
Appendix III																		
Boron, Total	mg/L	0.0831	< 0.500	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.100	< 0.100	< 0.100
Calcium, Total	mg/L	335	321	294	320	289	286	342	278	293	331	263	297	291	239	292	296	288
Chloride	mg/L	89.9	93.3	83.6	94.2	92.7	92.5	87	88.6	88.6	94.3	92	87.6	88.8	93.9	106.0	113.0	111
Fluoride	mg/L	< 0.500	3.1	0.596	0.666	0.558	< 0.500	< 0.500	0.935	0.677	0.687	< 0.500	0.612	0.702	0.715	< 0.500	< 0.500	0.533
Field pH	pH units	6.98	6.99	7.37	7.2	7.16	7.13	7.25	7.18	7.16	7.26	7.19	7.44	7.60	7.33	7.09	7.05	7.08
Sulfate	mg/L	884	888	797	804	901	842	774	797	894	879 E	827	923	855	857	874	876	882
Total Dissolved Solids	mg/L	1720	1840	1700	1830	1900	1790	2360	1780	2210	1650	1680	1730	1570	1740	1620	1680	1620
Appendix IV																		
Antimony, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---
Arsenic, Total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---	---	---	---	---	---	---	---
Barium, Total	mg/L	0.0115	0.0117	0.0107	0.0102	0.00996	0.012	0.0138	0.0103	---	---	---	---	---	---	---	---	---
Beryllium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---
Cadmium, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---
Chromium, Total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---	---	---	---	---	---	---	---	---
Cobalt, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---
Fluoride	mg/L	< 0.500	3.1	0.596	0.666	0.558	< 0.500	< 0.500	0.935	---	---	---	---	---	---	---	---	---
Lead, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---
Lithium, Total	mg/L	0.0811	0.0754	0.0699	0.0681	0.0523	0.0705	0.0661	0.0694	---	---	---	---	---	---	---	---	---
Mercury, Total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---	---	---	---	---	---
Molybdenum, Total	mg/L	0.00543	0.00555	0.00526	0.00533	0.00519	0.00494	0.00627	0.00491	---	---	---	---	---	---	---	---	---
Radium-226	pCi/L	0.258 ± 0.0937	0.241 ± 0.0886	0.28 ± 0.0846	0.312 ± 0.0834	0.334 ± 0.097	0.778 ± 0.403	0.25 ± 0.103	0.188 ± 0.0925	---	---	---	---	---	---	---	---	---
Radium-228	pCi/L	2.02 ± 0.457	2.53 ± 0.497	2.07 ± 0.384	2.2 ± 0.449	2.41 ± 0.467	2.49 ± 0.485	2.01 ± 0.41	2.01 ± 0.405	---	---	---	---	---	---	---	---	---
Radium-226 + Radium-228	pCi/L	2.278 ± 0.467	2.771 ± 0.505	2.35 ± 0.394	2.51 ± 0.456	2.74 ± 0.477	3.27 ± 0.631	2.26 ± 0.423	2.2 ± 0.415	---	---	---	---	---	---	---	---	---
Selenium, Total	mg/L	0.714	0.697	0.634	0.706	0.628	0.628	0.779	0.657	---	---	---	---	---	---	---	---	---
Thallium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---

Legend:
 ---, Not analyzed
 mg/L, milligrams per liter
 pCi/L, picocuries per liter
 E, Result exceeded calibration range.

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

Table 3. Data Summary Table - AP4-MW3

Analytes		09/15/2015	11/23/2015	03/15/2016	05/18/2016	08/09/2016	11/09/2016	03/07/2017	05/16/2017	09/19/2017	03/21/2018	09/11/2018	03/20/2019	09/17/2019	03/08/2020	09/01/2020	03/09/2021	08/25/2021	
	Units	Background Collection									Detection Monitoring ¹								
Appendix III																			
Boron, Total	mg/L	0.0687	< 0.150	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.100	< 0.100	< 0.100	
Calcium, Total	mg/L	82.4	85.9	89.8	88.5	87.5	85	95.8	86.1	83.7	92.3	74.7	88.5	87.8	81.1	84.1	88.4	88.3	
Chloride	mg/L	12.4	< 5.00	< 5.00	< 5.00	6.94	5.4	< 5.00	5.18	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	
Fluoride	mg/L	< 0.500	0.975	1.08	1.1	0.513	0.884	1.04	1.82	1.2	1.29	1.05	1.29	1.24	1.24	1.34	1.33	0.914	
Field pH	pH units	7.15	7.21	7.60	7.38	7.30	7.34	7.39	7.40	7.28	7.48	7.43	7.69	7.60	7.56	7.3	6.55	7.36	
Sulfate	mg/L	33.2	24.4	25.2	34.6	31.2	29	20.6	21.7	33.2	30.7	20	35	32.3	30.3	26.7	22.9	29.2	
Total Dissolved Solids	mg/L	418	460	390	420	488	430	428	442	494	404	374	426	378	374	378	348	344	
Appendix IV																			
Antimony, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Arsenic, Total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---	---	---	---	---	---	---	---	
Barium, Total	mg/L	0.218	0.235	0.225	0.222	0.206	0.232	0.271	0.238	---	---	---	---	---	---	---	---	---	
Beryllium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Cadmium, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Chromium, Total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---	---	---	---	---	---	---	---	---	
Cobalt, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Fluoride	mg/L	< 0.500	0.975	1.08	1.1	0.513	0.884	1.04	1.82	---	---	---	---	---	---	---	---	---	
Lead, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Lithium, Total	mg/L	0.0502	< 0.0500	0.0519	< 0.05	< 0.05	0.0538	0.0520	0.0547	---	---	---	---	---	---	---	---	---	
Mercury, Total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---	---	---	---	---	---	
Molybdenum, Total	mg/L	0.00922	0.0101	0.00992	0.00873	0.00928	0.00978	0.0116	0.00983	---	---	---	---	---	---	---	---	---	
Radium-226	pCi/L	0.401 ± 0.101	0.389 ± 0.106	0.384 ± 0.103	0.501 ± 0.104	0.4 ± 0.102	0.426 ± 0.292	0.318 ± 0.108	0.188 ± 0.0889	---	---	---	---	---	---	---	---	---	
Radium-228	pCi/L	3.69 ± 0.576	2.87 ± 0.491	2.91 ± 0.463	3.42 ± 0.547	2.65 ± 0.477	3.19 ± 0.561	2.35 ± 0.432	2.26 ± 0.422	---	---	---	---	---	---	---	---	---	
Radium-226 + Radium-228	pCi/L	4.091 ± 0.474	3.259 ± 0.502	3.3 ± 0.474	3.92 ± 0.557	3.04 ± 0.487	3.62 ± 0.632	2.67 ± 0.445	2.45 ± 0.431	---	---	---	---	---	---	---	---	---	
Selenium, Total	mg/L	0.0138	0.0164	0.0165	0.0145	0.0152	0.0154	0.0201	0.0191	---	---	---	---	---	---	---	---	---	
Thallium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	

Legend:
 ---. Not analyzed
 mg/L, milligrams per liter
 pCi/L, picocuries per liter

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

Table 4. Data Summary Table - AP4-MW4

Analytes		09/15/2015	11/23/2015	03/15/2016	05/18/2016	08/09/2016	11/09/2016	03/07/2017	05/16/2017	09/19/2017	03/21/2018	09/11/2018	03/20/2019	09/17/2019	03/08/2020	09/01/2020	03/09/2021	08/25/2021	
	Units	Background Collection									Detection Monitoring ¹								
Appendix III																			
Boron, Total	mg/L	0.0674	< 0.150	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.100	< 0.100	< 0.100	
Calcium, Total	mg/L	128	123	103	115	111	105	132	95.4	108	109	97.1	100	112	91.9	104	112	109	
Chloride	mg/L	13	8.99	< 5.00	6.71	8.55	7.77	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	
Fluoride	mg/L	< 0.500	0.987	0.946	0.949	< 0.500	0.732	0.786	1.33	1.18	1.2	0.796	1.17	1.12	0.983	1.110	0.989	0.900	
Field pH	pH units	7.02	7.17	7.40	7.25	7.15	7.22	7.23	7.31	7.23	7.32	7.29	7.60	7.75	7.43	7.22	7.23	7.17	
Sulfate	mg/L	82.8	127	62.6	89.5	99.6	110	123	59.4	53.5	100	81.9	85.7	109	114	95.5	97.5	87.3	
Total Dissolved Solids	mg/L	506	590	476	518	582	556	576	666	498	530	466	486	490	516	510	466	452	
Appendix IV																			
Antimony, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Arsenic, Total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---	---	---	---	---	---	---	---	
Barium, Total	mg/L	0.151	0.14	0.168	0.128	0.131	0.177	0.123	0.158	---	---	---	---	---	---	---	---	---	
Beryllium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Cadmium, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Chromium, Total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---	---	---	---	---	---	---	---	---	
Cobalt, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Fluoride	mg/L	< 0.500	0.987	0.946	0.949	< 0.500	0.732	0.786	1.33	---	---	---	---	---	---	---	---	---	
Lead, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Lithium, Total	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	---	---	---	---	---	---	---	---	---	
Mercury, Total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---	---	---	---	---	---	
Molybdenum, Total	mg/L	0.00509	0.0054	0.00493	0.00443	0.00481	0.00466	0.00642	0.00483	---	---	---	---	---	---	---	---	---	
Radium-226	pCi/L	0.45 ± 0.107	0.451 ± 0.124	0.362 ± 0.104	0.471 ± 0.0996	0.36 ± 0.0976	< 0.481 U ± 0.277	0.327 ± 0.112	0.185 ± 0.0900	---	---	---	---	---	---	---	---	---	
Radium-228	pCi/L	2.78 ± 0.489	1.59 ± 0.370	1.86 ± 0.360	2.62 ± 0.468	2.05 ± 0.452	1.39 ± 0.384	1.93 ± 0.397	1.9 ± 0.388	---	---	---	---	---	---	---	---	---	
Radium-226 + Radium-228	pCi/L	3.23 ± 0.501	2.041 ± 0.390	2.23 ± 0.375	3.09 ± 0.478	2.41 ± 0.462	1.56 ± 0.474	2.25 ± 0.413	2.08 ± 0.399	---	---	---	---	---	---	---	---	---	
Selenium, Total	mg/L	0.0259	0.0137	0.0181	0.0132	0.0198	0.0119	0.0104	0.013	---	---	---	---	---	---	---	---	---	
Thallium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	

Legend:
 ---, Not analyzed
 mg/L, milligrams per liter
 pCi/L, picocuries per liter
 U, Result is less than the sample detection limit (varies by sample for radiological results).

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

Table 5. Data Summary Table - AP4-MW5

Analytes		09/15/2015	11/23/2015	03/15/2016	05/18/2016	08/09/2016	11/09/2016	03/07/2017	05/16/2017	09/19/2017	03/21/2018	09/11/2018	03/20/2019	09/17/2019	03/08/2020	09/01/2020	03/09/2021	08/25/2021	
	Units	Background Collection									Detection Monitoring ¹								
Appendix III																			
Boron, Total	mg/L	0.0934	< 0.150	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	0.133	< 0.100	< 0.100	
Calcium, Total	mg/L	358	520	439	460	523	517	608	310	488	537	146	541	504	363	579	210	177	
Chloride	mg/L	8.98	8.99	5.77	6.97	7.98	10	5.69	6.76	< 5.00	6.59	< 5.00	5.1	5.43	6.03	6.19	5.56	< 5.00	
Fluoride	mg/L	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	1.27	0.658	0.601	< 0.500	0.664	0.61	< 0.500	< 0.500	0.53	< 0.500	
Field pH	pH units	6.75	7.05	7.08	6.89	6.81	6.82	6.90	6.90	6.82	6.97	7.27	7.23	7.26	7.06	6.82	6.94	7.04	
Sulfate	mg/L	1420	1480	969	1410	1620	1570	1350	740	784	1630	468	1470	1370	1540	1580	678	592	
Total Dissolved Solids	mg/L	2540	2740	1950	2620	2860	2920	3010	1490	1710	2690	1020	2390	2210	2500	2740 H	1180	980	
Appendix IV																			
Antimony, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Arsenic, Total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---	---	---	---	---	---	---	---	
Barium, Total	mg/L	0.017	0.00903	0.0117	0.00926	0.00843	0.00795	0.00756	0.0124	---	---	---	---	---	---	---	---	---	
Beryllium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Cadmium, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Chromium, Total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---	---	---	---	---	---	---	---	---	
Cobalt, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Fluoride	mg/L	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	1.27	---	---	---	---	---	---	---	---	---	
Lead, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Lithium, Total	mg/L	0.0948	0.1330	0.1210	0.1280	0.1480	0.1680	0.1660	0.1080	---	---	---	---	---	---	---	---	---	
Mercury, Total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---	---	---	---	---	---	
Molybdenum, Total	mg/L	0.00444	0.00329	0.0035	0.00274	0.00263	0.00284	0.00373	0.00344	---	---	---	---	---	---	---	---	---	
Radium-226	pCi/L	0.167 ± 0.0816	0.156 ± 0.103	0.267 ± 0.084	0.176 ± 0.0734	0.217 ± 0.0891	< 0.397 U ± 0.253	0.105 ± 0.068	< 0.109 U ± 0.058	---	---	---	---	---	---	---	---	---	
Radium-228	pCi/L	2.08 ± 0.432	< 0.471 U ± 0.297	2 ± 0.392	1.02 ± 0.317	1.36 ± 0.373	0.972 ± 0.383	0.934 ± 0.294	< 0.361 U ± 0.234	---	---	---	---	---	---	---	---	---	
Radium-226 + Radium-228	pCi/L	2.247 ± 0.44	0.505 ± 0.314	2.27 ± 0.40	1.19 ± 0.325	1.57 ± 0.384	1.21 ± 0.459	1.04 ± 0.302	< 0.361 U ± 0.241	---	---	---	---	---	---	---	---	---	
Selenium, Total	mg/L	0.0563	< 0.00500	0.0286	0.0236	0.00561	< 0.00500	< 0.00500	0.0562	---	---	---	---	---	---	---	---	---	
Thallium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	

Legend:
 ---, Not analyzed
 mg/L, milligrams per liter
 pCi/L, picocuries per liter
 U, Result is less than the sample detection limit (varies by sample for radiological results).
 H, Sample was prepped or analyzed beyond the specified holding time.

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

Table 6. Data Summary Table - AP4-MW6

Analytes		09/15/2015	11/23/2015	03/15/2016	05/18/2016	08/09/2016	11/09/2016	03/07/2017	05/16/2017	09/19/2017	03/21/2018	09/11/2018	03/20/2019	09/17/2019	03/08/2020	09/01/2020	03/09/2021	08/25/2021	
	Units	Background Collection									Detection Monitoring ¹								
Appendix III																			
Boron, Total	mg/L	0.0862	< 0.150	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.100	< 0.100	< 0.100	
Calcium, Total	mg/L	103	105	101	104	106	101	118	94.1	106	106	92.7	90.6	101	99.2	99.5	105	99.9	
Chloride	mg/L	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	5.28	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	
Fluoride	mg/L	0.87	0.85	1.37	1.61	1.21	1.45	1.35	1.62	1.62	2.19	1.31	1.5	1.46	2.08	1.82	1.53	1.20	
Field pH	pH units	6.92	7.21	7.46	7.19	7.11	7.21	7.35	7.33	7.16	7.40	7.32	7.63	7.22	7.49	7.20	7.16	7.17	
Sulfate	mg/L	58.5	96.6	51.3	50.7	70.6	69.1	59.3	53.4	50	60.5	46.7	57.7	65.2	75.5	51.8	58.4	61.8	
Total Dissolved Solids	mg/L	468	506	506	436	514	530	584	550	498	432	396	440	458	422	454	414	414	
Appendix IV																			
Antimony, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Arsenic, Total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---	---	---	---	---	---	---	---	
Barium, Total	mg/L	0.0725	0.0611	0.0622	0.0589	0.0605	0.0629	0.0672	0.0568	---	---	---	---	---	---	---	---	---	
Beryllium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Cadmium, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Chromium, Total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---	---	---	---	---	---	---	---	---	
Cobalt, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Fluoride	mg/L	0.869	0.845	1.37	1.61	1.21	1.45	1.35	1.62	---	---	---	---	---	---	---	---	---	
Lead, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Lithium, Total	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	---	---	---	---	---	---	---	---	---	
Mercury, Total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---	---	---	---	---	---	
Molybdenum, Total	mg/L	0.00329	0.0039	0.00393	0.00344	0.00281	0.00397	0.00455	0.00411	---	---	---	---	---	---	---	---	---	
Radium-226	pCi/L	0.287 ± 0.0872	0.232 ± 0.0917	0.227 ± 0.0771	0.261 ± 0.073	0.361 ± 0.113	0.545 ± 0.358	0.163 ± 0.0907	0.17 ± 0.0861	---	---	---	---	---	---	---	---	---	
Radium-228	pCi/L	0.983 ± 0.307	0.766 ± 0.31	0.672 ± 0.243	0.699 ± 0.279	1.27 ± 0.439	0.735 ± 0.378	0.451 ± 0.245	0.752 ± 0.244	---	---	---	---	---	---	---	---	---	
Radium-226 + Radium-228	pCi/L	1.27 ± 0.319	0.998 ± 0.323	0.899 ± 0.254	0.961 ± 0.288	1.63 ± 0.454	1.28 ± 0.521	0.614 ± 0.261	0.921 ± 0.259	---	---	---	---	---	---	---	---	---	
Selenium, Total	mg/L	0.0103	0.00883	0.0109	0.00974	0.00984	0.0098	0.0112	0.0104	---	---	---	---	---	---	---	---	---	
Thallium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	

Legend:
 ---, Not analyzed
 mg/L, milligrams per liter
 pCi/L, picocuries per liter

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

Table 7. Data Summary Table - AP4-MW7

Analytes	Units	09/15/2015	11/23/2015	03/15/2016	05/18/2016	08/09/2016	11/09/2016	03/07/2017	05/16/2017	09/19/2017	03/21/2018	09/11/2018	03/20/2019	09/17/2019	03/08/2020	09/01/2020	03/09/2021	08/25/2021	
		Background Collection									Detection Monitoring ¹								
Appendix III																			
Boron, Total	mg/L	0.0758	< 0.150	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.100	< 0.100	< 0.100	
Calcium, Total	mg/L	67.7	68.7	72	66.2	69.4	66.9	79	67.6	67.5	64.3	65.5	66.4	69.4	66.6	66.3	71.7	70.5	
Chloride	mg/L	16.1	11.8	11.4	11.2	13	11.7	10.6	12.9	13.3	12.5	12.1	12.9	11.3	11.8	9.89	11.4	9.65	
Fluoride	mg/L	< 0.500	< 0.500	0.738	< 0.500	< 0.500	< 0.500	< 0.500	1.02	< 0.500	0.52	< 0.500	< 0.500	0.589	< 0.500	0.513	< 0.500	< 0.500	
Field pH	pH units	7.20	7.45	7.65	7.39	7.40	7.48	7.57	7.52	7.46	7.56	7.54	7.94	7.15	7.70	7.39	7.34	7.37	
Sulfate	mg/L	46	39.8	40.4	43.3	40.7	45.6	36.8	35.2	42.7	41.6	34.5	44.2	51.1	49.9	40.6	47.7	50.5	
Total Dissolved Solids	mg/L	546	548	516	558	588	616	534	538	598	476	480	536	504	510	404	488	488	
Appendix IV																			
Antimony, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Arsenic, Total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---	---	---	---	---	---	---	---	
Barium, Total	mg/L	0.165	0.161	0.154	0.137	0.146	0.159	0.177	0.159	---	---	---	---	---	---	---	---	---	
Beryllium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	
Cadmium, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Chromium, Total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	---	---	---	---	---	---	---	---	---	
Cobalt, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Fluoride	mg/L	< 0.500	< 0.500	0.738	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	---	---	---	---	---	---	---	---	---	
Lead, Total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	---	---	---	---	---	---	---	---	---	
Lithium, Total	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	---	---	---	---	---	---	---	---	---	
Mercury, Total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---	---	---	---	---	---	
Molybdenum, Total	mg/L	0.00841	0.00827	0.00823	0.0069	0.00785	0.00788	0.00955	0.00768	---	---	---	---	---	---	---	---	---	
Radium-226	pCi/L	0.189 ± 0.0807	0.206 ± 0.865	0.277 ± 0.0928	0.25 ± 0.0781	0.29 ± 0.0907	< 0.404 U ± 0.271	0.357 ± 0.112	0.227 ± 0.092	---	---	---	---	---	---	---	---	---	
Radium-228	pCi/L	1.2 ± 0.313	1.92 ± 0.396	1.58 ± 0.322	1.52 ± 0.342	1.60 ± 0.415	2.52 ± 0.481	1.91 ± 0.372	1.67 ± 0.358	---	---	---	---	---	---	---	---	---	
Radium-226 + Radium-228	pCi/L	1.389 ± 0.323	2.126 ± 0.405	1.86 ± 0.335	1.77 ± 0.350	1.89 ± 0.425	2.83 ± 0.552	2.27 ± 0.389	1.89 ± 0.369	---	---	---	---	---	---	---	---	---	
Selenium, Total	mg/L	0.00812	0.00846	0.00898	0.00834	0.00926	0.00764	0.00995	0.0103	---	---	---	---	---	---	---	---	---	
Thallium, Total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---	---	---	---	---	---	---	---	

Legend:
 ---, Not analyzed
 mg/L, milligrams per liter
 pCi/L, picocuries per liter
 U, Result is less than the sample detection limit (varies by sample for radiological results).

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

**Table 8 - Sheldon Station Ash Landfill No. 4
Groundwater Levels (ft amsl)**

Sample Period	Upgradient Wells			Downgradient Wells			
	AP4-MW1	AP4-MW2	AP4-MW3	AP4-MW4	AP4-MW5	AP4-MW6	AP4-MW7
MP Elev.	1425.95	1445.03	1411.72	1396.10	1403.10	1386.61	1424.29
QTR-2002-4	1410.90	1422.78	1392.14	1375.99	1385.78	1374.15	1401.53
QTR-2003-1	1409.36	1421.35	1390.20	1374.01	1383.07	1374.06	1399.28
QTR-2003-2	1412.99	1421.11	1396.11	1376.52	1387.68	1376.90	1398.78
QTR-2003-3	1411.22	1421.87	1390.91	1372.66	1382.35	1369.46	1401.34
QTR-2003-4	1410.02	1422.24	1390.31	1373.48	1382.30	1369.10	1401.38
QTR-2004-1	1411.81	1420.78	1393.01	1377.92	1384.12	1377.59	1398.98
QTR-2004-2	1412.04	1420.72	1394.77	1375.64	1383.75	1374.83	1400.70
QTR-2004-3	1411.24	1421.22	1393.89	1375.55	1384.18	1373.85	1408.14
QTR-2004-4	1409.40	1421.39	1391.65	1373.40	1381.88	1374.65	1407.23
QTR-2005-1	1409.32	1420.12	1390.66	1372.78	1381.29	1374.62	1401.20
QTR-2005-2	1410.36	1419.77	1388.86	1372.63	1381.27	1374.55	1399.82
QTR-2005-3	1425.95	1445.03	1411.72	1396.10	1403.10	1386.61	1424.29
QTR-2005-4	1407.83	1419.58	1387.67	1372.52	1380.80	1369.44	1399.32
QTR-2006-1	1406.35	1418.91	1387.02	1372.42	1380.15	1371.76	1397.99
QTR-2006-2	1408.37	1418.43	1387.52	1372.42	1383.05	1372.36	1397.48
QTR-2006-3	1403.26	1417.13	1386.38	1372.30	1379.83	1370.22	1399.99
QTR-2006-4	1404.91	1419.42	1386.32	1372.25	1380.51	1369.90	1399.89
QTR-2007-1	1407.21	1417.13	1390.63	1372.89	1382.85	1374.67	1397.74
QTR-2007-3	1409.61	1417.42	1391.60	1373.85	1382.19	1370.84	1409.74
QTR-2008-2	1415.33	1417.33	1406.98	1385.69	1395.04	1379.15	1414.16
QTR-2008-3	1412.64	1418.64	1393.61	1376.05	1385.14	1373.43	1413.10
QTR-2009-2	1409.86	1417.98	1390.72	1374.15	1381.58	1374.49	1403.78
QTR-2009-3	1408.87	1417.88	1389.01	1372.47	1380.60	1370.31	1407.03
QTR-2010-2	1413.98	1418.11	1405.12	1381.85	1390.80	1375.51	1414.59
QTR-2010-3	1411.22	1419.23	1392.72	1374.81	1383.50	1374.39	1413.39
QTR-2011-2	1409.32	1418.12	1389.92	1374.80	1382.48	1374.55	1403.83
QTR-2011-3	1411.24	1418.58	1391.87	1373.60	1382.88	1373.56	1411.18
QTR-2012-2	1412.85	1418.13	1399.77	1377.74	1388.74	1375.41	1413.29
QTR-2012-3	1408.70	1418.58	1390.03	1372.72	1381.35	1369.47	1410.77
QTR-2013-2	1411.47	1416.93	1391.01	1375.34	1388.23	1375.31	1402.57
QTR-2013-4	1410.46	1417.32	1391.21	1373.05	1382.79	1370.11	1407.27
QTR-2014-2	1407.80	1416.98	1387.42	1372.03	1383.19	1374.23	1400.05
QTR-2014-4	1407.74	1417.08	1387.30	1372.10	1381.27	1371.75	1404.99
QTR-2015-2	1412.00	1415.13	1405.17	1379.63	1394.50	1375.75	1409.78
QTR-2015-3	1412.05	1418.38	1393.87	1376.77	1386.49	1371.86	1412.67
QTR-2015-4	1410.50	1418.89	1391.46	1374.49	1383.76	1372.41	1408.79
QTR-2016-1	1412.60	1420.38	1394.97	1377.65	1387.59	1374.66	1405.38
QTR-2016-2	1414.94	1418.83	1406.92	1384.72	1395.85	1376.79	1410.62
QTR-2016-3	1412.06	1419.51	1393.22	1375.65	1386.20	1373.11	1414.29
QTR-2016-4	1410.10	1419.93	1390.81	1373.60	1382.98	1372.41	1408.39
QTR-2017-1	1408.24	1419.54	1389.29	1372.83	1381.40	1373.83	1403.49
QTR-2017-2	1410.15	1419.00	1389.52	1373.35	1386.96	1373.96	1402.41
QTR-2017-3	1410.40	1419.35	1392.04	1372.70	1383.00	1372.12	1409.31
QTR-2018-1	1408.01	1418.76	1389.65	1372.37	1381.38	1374.21	1402.92
QTR-2018-3	1410.46	1417.88	1397.84	1375.90	1389.87	1374.85	1410.27
QTR-2019-1	1413.80	1418.53	1400.72	1383.19	1391.10	1377.89	1411.27
QTR-2019-3	1412.07	1422.34	1399.14	1377.58	1390.40	1374.46	1415.12
QTR-2020-1	1414.38	1424.75	1399.62	1378.73	1390.27	1374.60	1411.49
QTR-2020-2	1414.67	1427.03	1403.73	1380.90	1394.55	1375.70	1415.83
QTR-2020-3	1411.10	1428.23	1394.10	1375.29	1387.19	1373.30	1414.78
QTR-2021-1	1410.62	1425.54	1390.69	1375.14	1386.42	1374.19	1405.72
QTR-2021-3	1410.46	1426.36	1392.03	1373.93	1384.00	1371.92	1412.38
Mean	1410.81	1420.30	1393.52	1375.70	1385.42	1373.83	1406.73
SD	3.23	4.42	5.88	4.37	4.86	2.91	6.16
Maximum	1415.33	1428.23	1406.98	1385.69	1395.85	1379.15	1415.83
Minimum	1403.26	1415.13	1386.32	1372.03	1379.83	1369.10	1397.48
Range	12.07	13.10	20.66	13.66	16.02	10.05	18.35
Hydraulic Gradient			0.04				

MP = Measuring Point

MSL = Mean Sea Level (measured to nearest 0.01')

Table 9: Comparative Statistics - AP4-MW1 (Upgradient)

		Statistical Method	Statistical Limit	Q1 2021 Detection Monitoring Result	Q1 2021 CUSUM Value	Q1 2021 - Within Limit?	Q3 2021 Detection Monitoring Result	Q3 2021 CUSUM Value	Q3 2021 - Within Limit?
Appendix III Analytes	Unit			03/09/2021					
Boron, Total	mg/L	NP-PL	0.200	< 0.100	--	Yes	< 0.100	--	Yes
Calcium, Total	mg/L	CUSUM	120.1	96.2	94.4	Yes	93.7	94.4	Yes
Chloride	mg/L	NP-PL	22.50	7.13	--	Yes	7.17	--	Yes
Fluoride	mg/L	CUSUM	1.835	0.856	0.725	Yes	0.615	0.725	Yes
pH, Field	pH units	CUSUM	6.40, 7.98	7.07	7.19, 7.19	Yes	7.14	7.19, 7.19	Yes
Sulfate	mg/L	CUSUM	28.0	25.2	27.5	Yes	27.2	30.9	No - Potential Exceedance
Total Dissolved Solids	mg/L	CUSUM	599	388	461	Yes	388	461	Yes

Notes:

NP-PL: Non-Parametric Prediction Limit

CUSUM: Parametric Shewhart-CUSUM Control Chart

Table 10: Comparative Statistics - AP4-MW2 (Upgradient)

		Statistical Method	Statistical Limit	Q1 2021 Detection Monitoring Result	Q1 2021 CUSUM Value	Q1 2021 - Within Limit?	Q3 2021 Detection Monitoring Result	Q3 2021 CUSUM Value	Q3 2021 - Within Limit?
Appendix III Analytes	Unit			03/09/2021					
Boron, Total	mg/L	NP-PL	0.500	< 0.100	--	Yes	< 0.100	--	Yes
Calcium, Total	mg/L	CUSUM	418	296	308	Yes	288	308	Yes
Chloride	mg/L	CUSUM	107	113	122	No - Potential Exceedance	111	139	No - Verified SSI
Fluoride	mg/L	NP-PL	3.100	< 0.500	--	Yes	0.533	--	Yes
pH, Field	pH units	CUSUM	6.57, 7.74	7.04	7.16, 7.23	Yes	7.08	7.16, 7.16	Yes
Sulfate	mg/L	CUSUM	1059	876	836	Yes	882	836	Yes
Total Dissolved Solids	mg/L	NP-PL	2360	1680	--	Yes	1620	--	Yes

Notes:

NP-PL: Non-Parametric Prediction Limit

CUSUM: Parametric Shewhart-CUSUM Control Chart

Table 11: Comparative Statistics - AP4-MW3

		Statistical Method	Statistical Limit	Q1 2021 Detection Monitoring Result	Q1 2021 CUSUM Value	Q1 2021 - Within Limit?	Q3 2021 Detection Monitoring Result	Q3 2021 CUSUM Value	Q3 2021 - Within Limit?
Appendix III Analytes	Unit			03/09/2021					
Boron, Total	mg/L	NP-PL	0.200	< 0.100	--	Yes	< 0.100	--	Yes
Calcium, Total	mg/L	CUSUM	105.6	88.4	87.6	Yes	88.3	87.6	Yes
Chloride	mg/L	NP-PL	12.40	< 5.00	--	Yes	< 5.00	--	Yes
Fluoride	mg/L	CUSUM	2.85	1.33	0.989	Yes	0.914	0.989	Yes
pH, Field	pH units	CUSUM	6.73, 7.96	7.31	7.35, 7.40	Yes	7.36	7.35, 7.35	Yes
Sulfate	mg/L	CUSUM	51.2	22.9	27.5	Yes	29.2	27.5	Yes
Total Dissolved Solids	mg/L	CUSUM	567	348	435	Yes	344	435	Yes

Notes:

NP-PL: Non-Parametric Prediction Limit

CUSUM: Parametric Shewhart-CUSUM Control Chart

Table 12: Comparative Statistics - AP4-MW4

		Statistical Method	Statistical Limit	Q1 2021 Detection Monitoring Result	Q1 2021 CUSUM Value	Q1 2021 - Within Limit?	Q3 2021 Detection Monitoring Result	Q3 2021 CUSUM Value	Q3 2021 - Within Limit?
Appendix III Analytes	Unit			03/09/2021					
Boron, Total	mg/L	NP-PL	0.200	< 0.100	--	Yes	< 0.100	--	Yes
Calcium, Total	mg/L	CUSUM	172	112	114	Yes	109	114	Yes
Chloride	mg/L	NP-PL	13.00	< 5.00	--	Yes	< 5.00	--	Yes
Fluoride	mg/L	CUSUM	2.08	0.989	0.841	Yes	0.900	0.841	Yes
pH, Field	pH units	CUSUM	6.71, 7.73	7.22	7.22, 7.36	Yes	7.17	7.22, 7.22	Yes
Sulfate	mg/L	CUSUM	208.9	97.5	94.2	Yes	87.3	94.2	Yes
Total Dissolved Solids	mg/L	CUSUM	826	466	559	Yes	452	559	Yes

Notes:

NP-PL: Non-Parametric Prediction Limit

CUSUM: Parametric Shewhart-CUSUM Control Chart

Table 13: Comparative Statistics - AP4-MW5

		Statistical Method	Statistical Limit	Q1 2021 Detection Monitoring Result	Q1 2021 CUSUM Value	Q1 2021 - Within Limit?	Q3 2021 Detection Monitoring Result	Q3 2021 CUSUM Value	Q3 2021 - Within Limit?
Appendix III Analytes	Unit			03/09/2021					
Boron, Total	mg/L	NP-PL	0.200	< 0.100	--	Yes	< 0.100	--	Yes
Calcium, Total	mg/L	CUSUM	903	210	467	Yes	177	467	Yes
Chloride	mg/L	CUSUM	14.82	5.56	7.64	Yes	< 5.00	7.64	Yes
Fluoride	mg/L	NP-PL	1.270	0.530	--	Yes	< 0.500	--	Yes
pH, Field	pH units	CUSUM	6.38, 7.42	6.96	6.90, 7.41	No - Previously Verified SSI	7.04	6.90, 7.44	No - Previously Verified SSI
Sulfate	mg/L	CUSUM	2698	678	1320	Yes	592	1320	Yes
Total Dissolved Solids	mg/L	CUSUM	4898	1180	2516	Yes	980	2516	Yes

Notes:

NP-PL: Non-Parametric Prediction Limit

CUSUM: Parametric Shewhart-CUSUM Control Chart

Field pH was previously identified as a verified SSI. An alternative source demonstration was prepared and accepted by the NDEE and included in the 2020 CCR Annual Groundwater Report.

Table 14: Comparative Statistics - AP4-MW6

		Statistical Method	Statistical Limit	Q1 2021 Detection Monitoring Result	Q1 2021 CUSUM Value	Q1 2021 - Within Limit?	Q3 2021 Detection Monitoring Result	Q3 2021 CUSUM Value	Q3 2021 - Within Limit?
Appendix III Analytes	Unit			03/09/2021					
Boron, Total	mg/L	NP-PL	0.200	< 0.100	--	Yes	< 0.100	--	Yes
Calcium, Total	mg/L	CUSUM	134.3	105	104	Yes	99.9	104.0	Yes
Chloride	mg/L	NP-PL	5.00	< 5.00	--	Yes	< 5.00	--	Yes
Fluoride	mg/L	CUSUM	2.64	1.53	2.08	Yes	1.20	1.69	Yes
pH, Field	pH units	CUSUM	6.48, 7.96	7.16	7.22, 7.22	Yes	7.17	7.22, 7.22	Yes
Sulfate	mg/L	CUSUM	132.4	58.4	63.7	Yes	61.8	63.7	Yes
Total Dissolved Solids	mg/L	CUSUM	718	414	512	Yes	414	512	Yes

Notes:

NP-PL: Non-Parametric Prediction Limit

CUSUM: Parametric Shewhart-CUSUM Control Chart

Table 15: Comparative Statistics - AP4-MW7

		Statistical Method	Statistical Limit	Q1 2021 Detection Monitoring Result	Q1 2021 CUSUM Value	Q1 2021 - Within Limit?	Q3 2021 Detection Monitoring Result	Q3 2021 CUSUM Value	Q3 2021 - Within Limit?
Appendix III Analytes	Unit			03/09/2021					
Boron, Total	mg/L	NP-PL	0.200	< 0.100	--	Yes	< 0.100	--	Yes
Calcium, Total	mg/L	NP-PL	79.0	71.7	--	Yes	70.5	--	Yes
Chloride	mg/L	CUSUM	20.09	11.4	12.34	Yes	9.65	12.34	Yes
Fluoride	mg/L	NP-PL	1.020	< 0.500	--	Yes	< 0.500	--	Yes
pH, Field	pH units	CUSUM	6.85, 8.07	7.34	7.46, 7.46	Yes	7.37	7.46, 7.46	Yes
Sulfate	mg/L	CUSUM	58.4	47.7	50.9	Yes	50.5	56.6	Yes
Total Dissolved Solids	mg/L	CUSUM	700	488	556	Yes	488	556	Yes

Notes:

NP-PL: Non-Parametric Prediction Limit

CUSUM: Parametric Shewhart-CUSUM Control Chart

Figures



Path: \\dunbar.golder.com\golder\pds\helen99_PROJECTS\2014\1316_MPPD\2020_GW_1_Files\Maps_SS_GW_Maps_2021_C1.dwg



FIGURE 1
ASH LANDFILL NO. 4
GROUNDWATER CONTOURS
MARCH 2021



Path: \\Denver\golder\golder\workspace\NP\GIS\head\99_PROJECT\20141316_NP\2020_GW_1_Files\Map_SG_GW_Map_2021_02.dwg

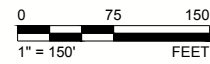
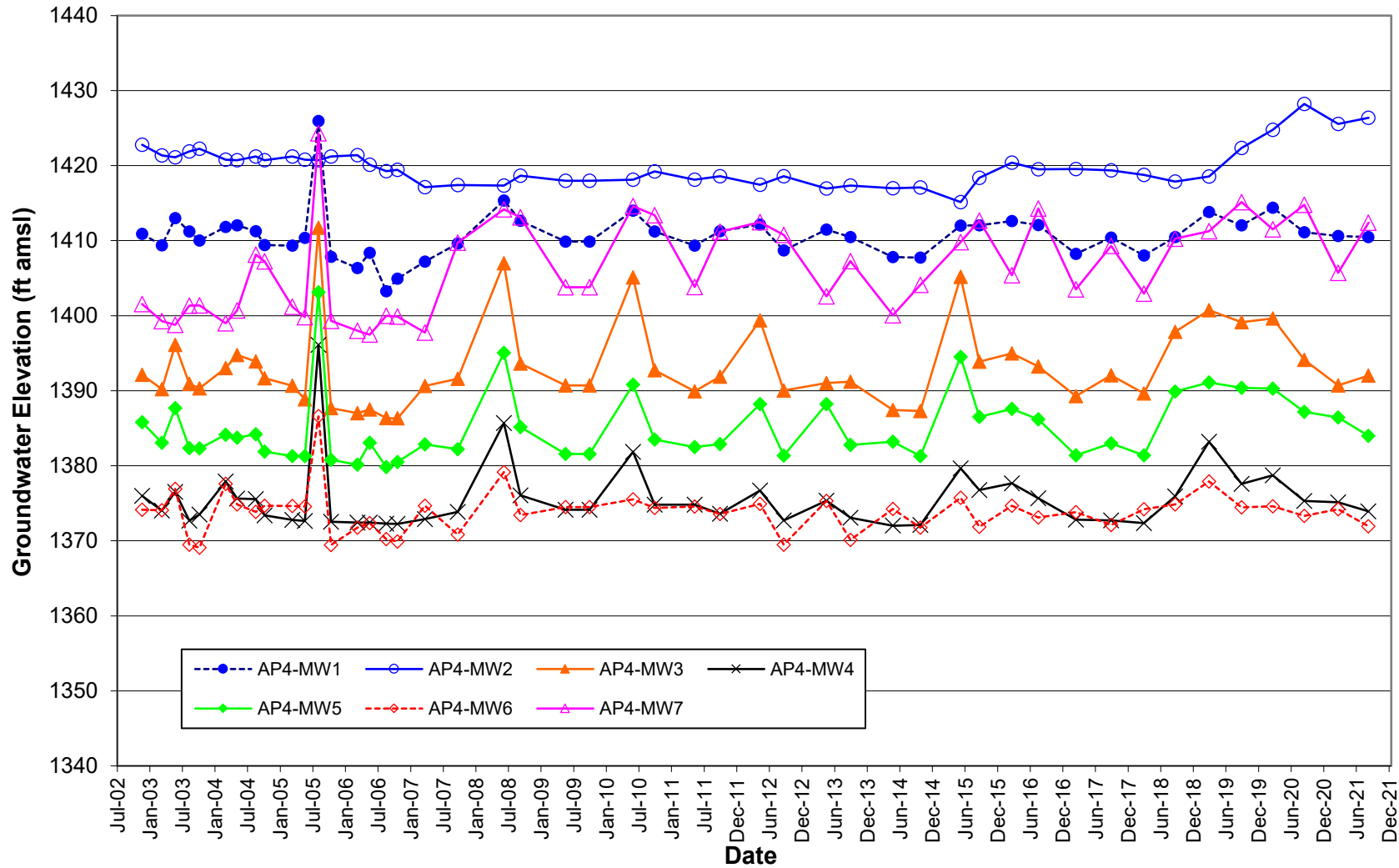


FIGURE 2
ASH LANDFILL NO. 4
GROUNDWATER CONTOURS
AUGUST 2021

FIGURE 3
Sheldon Station Ash Landfill No. 4
Groundwater Elevations



APPENDIX A

**Alternative Source Demonstration -
Chloride, AP4-MW2, Q3 2021**

TECHNICAL MEMORANDUM

DATE October 27, 2021

Project No. 20141315-14-TM-0

TO Nebraska Public Power District

CC Todd J. Stong, Erin L. Hunter

FROM Jacob J. Sauer

EMAIL jacob_sauer@golder.com

ALTERNATE SOURCE DEMONSTRATION FOR CHLORIDE AT UPGRADIENT LOCATION AP4-MW2

1.0 INTRODUCTION

On behalf of Nebraska Public Power District (NPPD), Golder Associates Inc. (Golder) a member of WSP performed a statistical evaluation of groundwater quality from the third quarter groundwater detection monitoring event of 2021 (Q3 2021) at Sheldon Station Ash Landfill No. 4 (the Site), located at 4500 W Pella Road, Hallam, Lancaster County, Nebraska (Figure 1). The statistical evaluation was performed in accordance with applicable provision of 40 Code of Federal Regulations (CFR) Part 257, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities" (CCR Rule), as amended, and corresponding regulations under Nebraska Administrative Code (NAC) Title 132, Chapter 7 (Integrated Solid Waste Management Regulations, Groundwater Monitoring and Remedial Action).

Statistical analysis of the Appendix III detection monitoring data for chloride in groundwater at upgradient monitoring well AP4-MW2 indicated a potential exceedance of the statistical limit based on the parametric Shewhart-CUSUM (cumulative summation) analysis in the Q1 2021 sampling result, which was subsequently verified as evidence of a statistically significant increase (SSI) in the Q3 2021 sampling event. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from detection monitoring to assessment monitoring, 40 CFR 257.94(e)(2) and NAC Title 132 Chapter 7 004.03C allows the owner or operator (i.e. NPPD) 90 days from the date of determination of an SSI (SSI verified October 22, 2021; 90 days from the date of determination: January 20, 2022), to demonstrate that a source other than the CCR unit, or another condition caused the SSI for chloride at AP4-MW2.

In accordance with provisions of the CCR Rule and NAC Title 132 Chapter 7, Golder prepared this Alternative Source Demonstration (ASD) for the Site. This ASD includes an evaluation of geological and hydrogeological information regarding groundwater obtained from monitoring wells installed adjacent to the Site. This ASD conforms to the requirements of 40 CFR 257.94(e)(2) and NAC Title 132 Chapter 7 004.03C and provides the basis for concluding the SSI for chloride in groundwater at AP4-MW2 is not a result of impacts from Ash Landfill No. 4.

2.0 BACKGROUND

2.1 Site Geology and Hydrology

A well drilling program was initiated at Sheldon Station between 1998 and 1999. The borings were used to characterize the nature of the Pleistocene Age sediments and glacial till present in the area. In the area of the CCR facility, the thickness of the till ranges from approximately 180 to 200 feet, thinning toward the north. The composition of the till varies throughout the formation, generally consisting of predominately clay to silty clay with sand lenses. The uppermost water-bearing zone is typically encountered between 15 and 25 feet below the ground surface in the area, well above the principal groundwater reservoir for the area (typically found approximately 300 feet below ground surface).

Regional groundwater in the upper water-bearing zone near Ash Landfill No. 4 flows from the southeast to the northwest. However, Sheldon Station is located in a geologic area dominated by glacial drift, and groundwater flow in the glacial deposits observed at Sheldon Station mimic local surface topography. The local groundwater flow system at Ash Landfill No. 4 varies from the regional groundwater flow pattern due to surface topography, which consists of a hill to the north and surface water drainages to the east and west of Ash Landfill No. 4. Thus, groundwater generally flows towards the landfill from the north and south, and away from the landfill to the east and west (see Figure 1).

2.2 Groundwater Monitoring Network

Design of the CCR Rule-compliant monitoring program considered the size, disposal and operational history, anticipated groundwater flow direction, and saturated thickness of the uppermost aquifer. Based on these factors, a monitoring well network that consists of two background monitoring wells and five downgradient monitoring wells was installed around the Site. The monitoring wells are listed in Table 1 and presented in Figure 1 and Figure 2.

Table 1: Monitoring Well Network

Location	Background Monitoring Wells	Downgradient Monitoring Wells
Ash Landfill #4	AP4-MW1, AP4-MW2	AP4-MW3, AP4-MW4, AP4-MW5, AP4-MW6, AP4-MW7

The two upgradient wells included in the groundwater monitoring program are used to represent the background groundwater quality, including its potential variability. The five downgradient wells were installed along the western, northern, and eastern boundaries of the active ash landfill. The depths of the monitoring wells were selected such that the monitoring wells are screened 10 to 37 feet below the ground surface to yield groundwater samples that are representative of water quality in the uppermost water-bearing zone. Figure 3 presents the groundwater levels in the monitoring wells between Q4 2002 and Q3 2021. Water levels in both the upgradient and downgradient monitoring wells have been generally stable over the last 19 years, with a slight recent increase at AP4-MW2.

2.3 Groundwater Conditions

Between September 2015 and May 2017, NPPD collected eight quarterly independent baseline groundwater samples from each of the background and downgradient monitoring wells listed in Table 1, as required by 40

CFR 257.94. The results of the baseline monitoring phase were used to develop appropriate and statistically valid baseline values for each constituent at each monitoring well (Golder 2017).

Following completion of the eight baseline monitoring events, NPPD started collecting groundwater samples on a semiannual basis in September 2017 to support the detection monitoring program. Groundwater samples for detection monitoring were collected at the two background and five downgradient monitoring wells and analyzed for 40 CFR 257 Appendix III constituents. During the detection monitoring program, the results of the groundwater analysis are compared to the calculated statistical limits to determine whether groundwater quality remains consistent, or if changes are considered an SSI.

During the baseline period, chloride values at upgradient location AP4-MW2 ranged from 83.6 to 94.2 mg/L (Figure 4). From the baseline period, a Shewhart-CUSUM parametric statistical limit of 107 mg/L was established for chloride at AP4-MW2.

The Q1 2021 detection monitoring event reported a chloride value of 113 mg/L, with a CUSUM value of 122 mg/L, both exceeding the calculated statistical limit of 107 mg/L. Verification sampling was completed in August 2021 (i.e. Q3 2021) with a result of 111 mg/L and a CUSUM value of 139 mg/L, confirming the SSI for chloride at AP4-MW2.

3.0 SOURCE EVALUATION

As an upgradient background location, groundwater from AP4-MW2 flows north towards the landfill, as shown in Figure 1 and Figure 2. Groundwater flow, direction, and elevations at the site have remained relatively consistent from the time of well installation, as shown in Figure 3. As such, Golder determined that Ash Landfill No. 4 is not the source of the verified SSI at AP4-MW2.

4.0 CONCLUSION

In accordance with 40 CFR 257.94(e)(2) and NAC Title 132 Chapter 7, this ASD has been prepared in response to the identification of an SSI for chloride at upgradient monitoring well AP4-MW2 following the Q3 2021 sampling event for Ash Landfill No. 4 at Sheldon Station.

A review of the groundwater flow, direction, and elevations indicates that the chloride in groundwater at AP4-MW2 was not the result of seepage from the site. Therefore, no further action (i.e., transition to Assessment Monitoring) is warranted, and Sheldon Station Ash Landfill No. 4 will remain in detection monitoring.

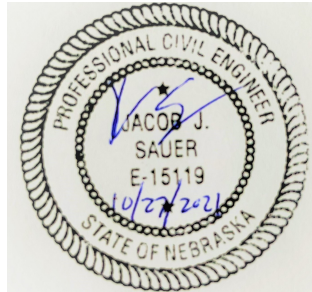
5.0 REFERENCES

Golder (Golder Associates Inc.). 2017. Coal Combustion Residuals Landfill Groundwater Monitoring System Certification, Nebraska Public Power District Sheldon Station, Hallam, Nebraska.

Golder Associates Inc.



Erin L. Hunter, PhD, PE
Senior Project Engineer



Jacob J. Sauer, PE
Associate and Senior Engineer

ELH/JJS/rm

Attachments: Figure 1 – Ash Landfill No. 4 Groundwater Contours March 2021

Figure 2 – Ash Landfill No. 4 Groundwater Contours August 2021

Figure 3 – Sheldon Station Ash Landfill No. 4 Groundwater Elevations

Figure 4 – Shewhart-CUSUM Control Chart for Chloride at AP4-MW2

[https://golderassociates.sharepoint.com/sites/124836/project files/6 deliverables/reports/15-r-nppd_annual_ccr_2021/15-r-0/attachment/20141315_014_tm_rev0_asd-ap4-mw2_27oct21.docx](https://golderassociates.sharepoint.com/sites/124836/project%20files/6%20deliverables/reports/15-r-nppd_annual_ccr_2021/15-r-0/attachment/20141315_014_tm_rev0_asd-ap4-mw2_27oct21.docx)

FIGURES



Path: \\Denver\golder\golder\workspace\PPDS\helen090_PROJECTS\20141316_MRPD\2020_GWA_T_Files\Name_S5_GWA_Maps\2021_G1.dwg



FIGURE 1
ASH LANDFILL NO. 4
GROUNDWATER CONTOURS
MARCH 2021

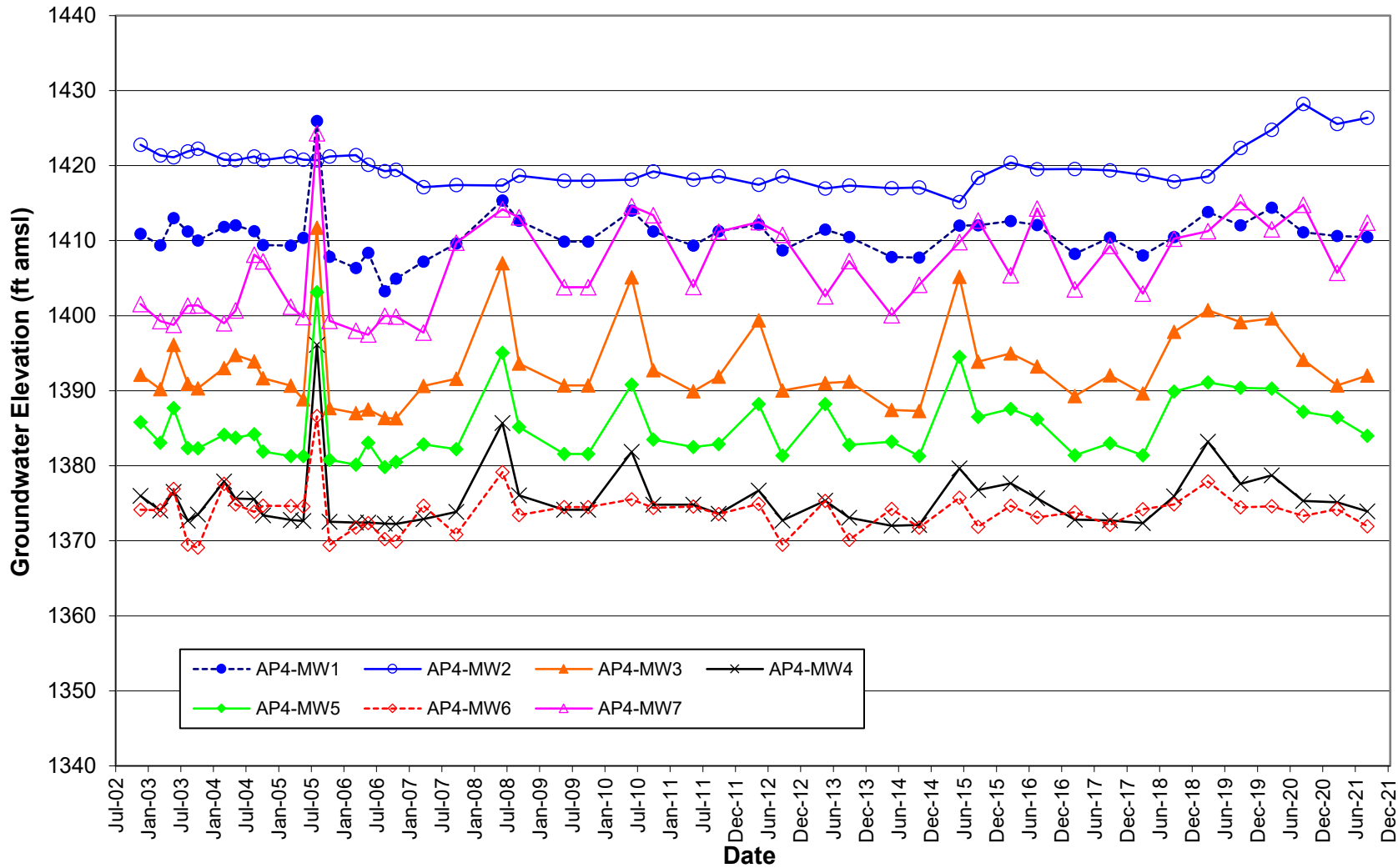


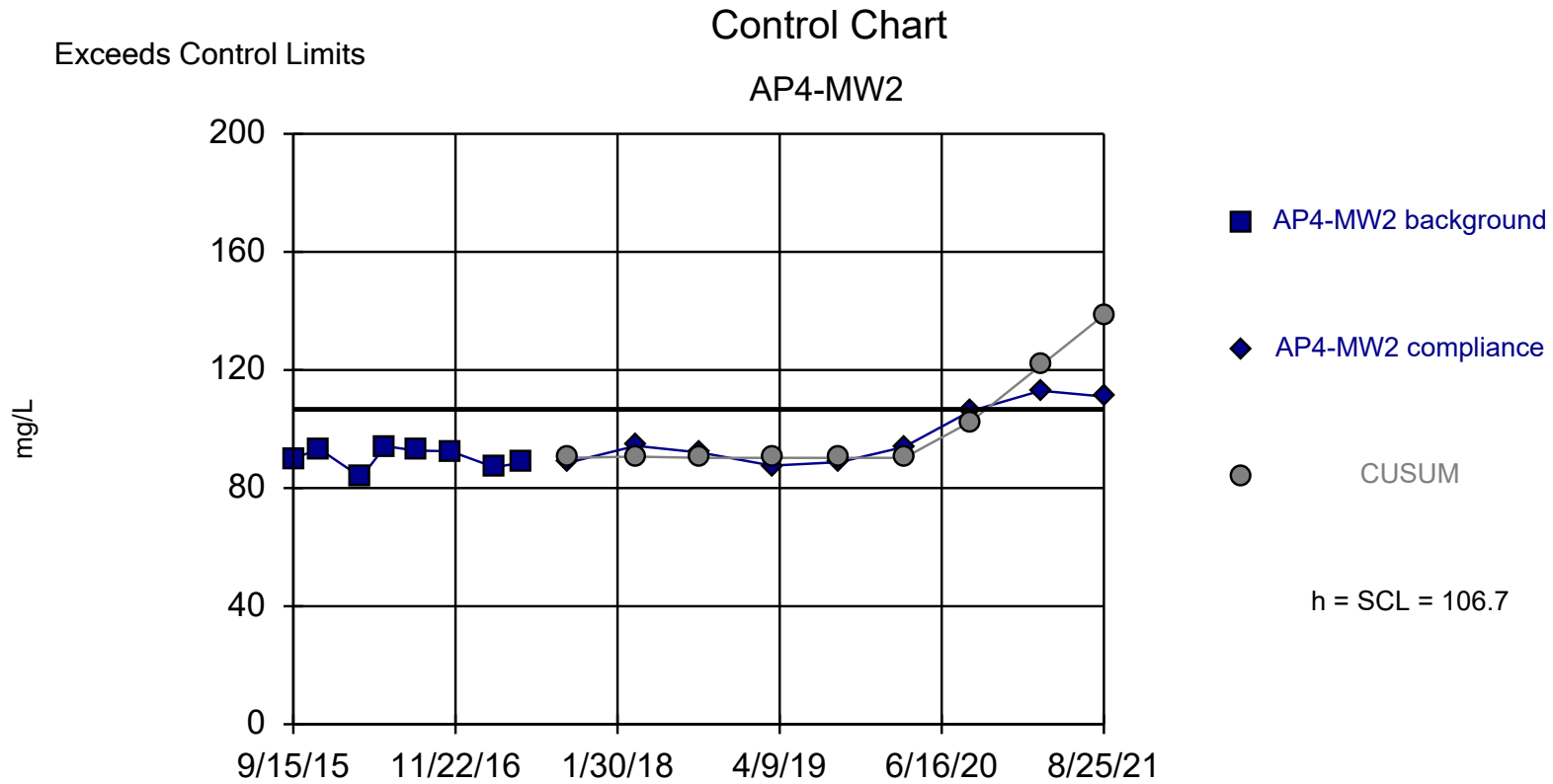
Path: \\Denver\golder\golder\pds\hudson99_PROJECT\30141316_MPD\2020_GW_1_Files\Map_08_GW_1.dwg



FIGURE 2
ASH LANDFILL NO. 4
GROUNDWATER CONTOURS
AUGUST 2021

FIGURE 3
Sheldon Station Ash Landfill No. 4
Groundwater Elevations





Background Data Summary: Mean=90.23, Std. Dev.=3.657, n=8. Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9179, critical = 0.818. Report alpha = 0.01052. Dates ending 5/16/2017 used for control stats. Standardized h=4.5, SCL=4.5.

Constituent: Chloride Analysis Run 10/7/2021 11:56 AM
Sheldon Station Client: NPPD Data: SheldonStation_CCR_Q3-2021.mdb



golder.com