GOLDER
MEMBER OF WSP

REPORT

Annual Groundwater Monitoring Report – 2021

Nucla Station Ash Disposal Facility
Nucla, Colorado

Submitted to:

Tri-State Generation and Transmission Association, Inc.

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Submitted by:

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Executive Summary

This report summarizes the groundwater monitoring activities and results for the 2021 detection monitoring program for the coal combustion residuals (CCR) landfill that served the former Nucla Station, along with the comparative statistical analysis. The CCR landfill, which is owned and operated by Tri-State Generation and Transmission Association, Inc., is currently in detection monitoring, and no program transitions occurred in 2021.

Verified statistically significant increases (SSIs) were identified in 2021 for total recoverable calcium and field-measured pH at MO-1 following both detection monitoring sampling events. Alternative source demonstrations (ASDs) previously conducted for field-measured pH and total recoverable calcium at MO-1 are applicable to the 2021 results, and it was recommended that the Facility remain in detection monitoring.

Field-measured pH at MO-5 was identified as a potential exceedance following the November 2020 detection monitoring sampling event. Confirmatory resampling conducted in March 2021 identified a field-measured pH above the non-parametric prediction limit, and the October 2020 result was identified as a verified SSI. Results from both detection monitoring sampling events in 2021 were also identified as verified SSIs. A demonstration of natural variability for field-measured pH at MO-5 was conducted in October 2021, and it was recommended that the Facility remain in detection monitoring.

Potential exceedances for total recoverable calcium and sulfate at MO-4 were identified following the April 2021 sampling event. Confirmatory resampling conducted in September 2021 indicated the April 2021 results were false-positive SSIs.

No other potential exceedances or false-positive SSIs were identified for the 2021 detection monitoring program.

As described in the Groundwater Monitoring System Certification (Golder 2019) and the Groundwater Statistical Method Certification (Golder 2020b), the groundwater monitoring and analytical procedures for the program meet the requirements of 40 CFR 257 Subpart D (the CCR Rule), and modifications to the monitoring network and sampling program are not recommended at this time.

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APPENDICES

1.0 INTRODUCTION

Golder Associates USA Inc. (Golder), a member of WSP, has prepared this report to describe the 2021 groundwater monitoring activities and comparative statistical analysis for the Nucla Station Ash Disposal Facility (the Facility), which is a coal combustion residuals (CCR) landfill owned and operated by Tri-State Generation and Transmission Association, Inc. (Tri-State) and subject to regulation under 40 CFR 257 Subpart D (the CCR Rule). This report was written to meet the requirements of 40 CFR 257.90(e).

1.1 Facility Information

The Facility serves as the location for containment of CCRs generated at Tri-State's Nucla Station, a retired 110-megawatt coal-fired electric generation plant located near Nucla, Colorado. Nucla Station was retired from service in September 2019. Within the 81.65-acre property of the Facility, the CCR disposal footprint comprises approximately 61 acres.

1.2 Purpose

The CCR Rule established specific requirements for reporting of groundwater monitoring activities and corrective action 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 PROGRAM STATUS

The groundwater monitoring system for the Nucla Station Ash Disposal Facility consists of five monitoring wells, as shown in Figure 1 and described in the Groundwater Monitoring System Certification (Golder 2019). The two upgradient monitoring wells are MO-1 and MO-2. The three downgradient monitoring wells are MO-3, MO-4, and MO-5.

2.1 Completed Key Actions in 2021

The following key actions were completed in 2021:

- The 2020 Annual Groundwater Monitoring Report was finalized and placed within the operating record and on Tri-State's publicly accessible CCR website.
- Confirmatory resampling was performed on March 3, 2021, for a potential exceedance identified during the October 2020 sampling event.
- An alternative source demonstration (ASD) was prepared in March 2021 to demonstrate that the verified SSI for total recoverable calcium at MO-1 identified following the October 2020 sampling event was not an indication of a release from the Facility (Appendix A), and it was recommended that the Facility remain in detection monitoring.
- Detection monitoring sampling events were performed in the second quarter, on April 7, 14, 20, and 21, and in the fourth quarter, on October 20, 25, and 27.
- Confirmatory resampling was performed on September 30, 2021, for potential exceedances identified following the April 2021 sampling event.
- A demonstration of natural variability was prepared in October 2021 to demonstrate that the verified SSI for field-measured pH at MO-5 identified following the March 2021 confirmatory resampling event was not an

indication of a release from the Facility (Appendix B), and it was recommended that the Facility remain in detection monitoring.

2.2 Installation and Decommissioning of Monitoring Wells

No monitoring wells were installed or decommissioned for the Nucla Station Ash Disposal Facility in 2021.

2.3 Problems and Resolutions

The following problems were identified in 2021:

- The groundwater level was not accurately measured at MO-1 during the April 2021 sampling event. Water levels were being measured using a transducer. The water level readings did not change following purging of the well, indicating that the transducer was not functioning properly. The transducer is being evaluated to determine the cause of the issue. For the October 2021 sampling event, the groundwater level was measured using a water level meter. This method will continue to be used if issues with the transducer persist.
- Inaccuracies were identified in the groundwater elevations at MO-3 and MO-4 reported in the 2017 to 2020 annual groundwater monitoring reports. Water elevations at MO-3 and MO-4 were reported 1.7 feet higher and 2.7 feet lower, respectively, than the actual groundwater elevations because of an incorrect understanding of the measuring point elevations. A summary of the revised historical groundwater elevations at these wells for the affected dates is provided in Appendix C. These revised groundwater levels do not change the understanding of groundwater flow direction at the Facility.

2.4 Proposed Key Activities for 2022

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

- Detection monitoring sampling events are planned to occur in the second and fourth quarters of 2022.

3.0 GROUNDWATER MONITORING RESULTS AND ANALYSIS

Results from the groundwater monitoring program in 2021 are described in this section.

3.1 Groundwater Flow

The groundwater elevation was measured in each well prior to purging during each sampling event, except in MO-1 during the April 2021 sampling event. Groundwater elevations are presented in Table 1 through Table 5. Groundwater elevations from the April 2021 and October 2021 sampling events are shown in Figure 1 and Figure 2, respectively.

The Morrison aquifer is characterized as highly heterogeneous with zones that are variably transmissive and/or subjected to variable amounts of confining pressure. This characterization is supported by the differences in groundwater levels, water column heights, and recovery times observed in the monitoring wells that have been installed to serve as the groundwater monitoring system for the Facility. Sandstone lenses in the Morrison aquifer vary considerably with respect to transmissivity (i.e., thickness and hydraulic conductivity) and horizontal extent due to the alluvial, shoreline, and lacustrine environments that deposited the Salt Wash and Brushy Basin Members of the Morrison Formation, resulting in interbedded siltstone, mudstone, claystone, and shale units. Groundwater elevation data suggest a general southerly groundwater flow direction in the Morrison aquifer near the Nucla Station Ash Disposal Facility. However, the heterogeneity and interbedded nature of the Morrison

Formation beneath the Facility, coupled with the significant differences in recharge characteristics between wells, suggest a lack of horizontal continuity and confound the ability to precisely discern groundwater flow direction and rate.

3.2 Monitoring Data (Analytical Results)

Analytical results from detection monitoring in 2021 are shown in Table 1 through Table 5.

3.3 Samples Collected

The detection monitoring sampling events were conducted in April and October 2021. Additionally, a sample was collected from MO-5 in March 2021 and a sample was collected from MO-4 in September 2021 for confirmatory resampling associated with the detection monitoring program.

3.4 Comparative Statistical Analysis

The comparative statistical analysis is summarized below, and the results are presented in Table 6 through Table 10. A full description of the steps taken for the comparative statistical analysis can be found in the Groundwater Statistical Method Certification (Golder 2020b).

3.4.1 Definitions

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

- SSI – is a statistically significant increase and is defined as an analytical result that exceeds the parametric or non-parametric statistical limit established by the baseline statistical analysis.
- Potential Exceedance – is defined as an initial analytical result that exceeds the parametric or non-parametric statistical limit established by the baseline statistical analysis. Confirmatory resampling is used to determine whether the potential exceedance is a false-positive SSI or a verified SSI.
- False-positive SSI – is defined as an analytical result that exceeds the statistical limit but can clearly be attributed to laboratory error or changes in analytical precision or is invalidated through confirmatory resampling.
- Confirmatory resampling – is designated as the resampling event that occurs within 90 days of identifying an SSI over the statistical limit for determination of a verified SSI [1].
- Verified SSI – is interpreted as two consecutive SSIs (the original sample and the confirmatory resample for analytical results) for the same constituent at the same well.

If the data are assessed with a trend test, confirmatory resampling is generally not applicable, and a verified SSI is defined as a statistically significant increasing trend in the eight most recent results.

[1] Resampling might not occur within 90 days of the sampling event that resulted in the potential exceedance because of the additional time required for activities that must occur before a potential exceedance can be identified. These activities include sample delivery, analytical testing, review of results, and comparative statistical analysis.

3.4.2 Potential Exceedances

The total recoverable calcium and sulfate concentrations in the April 2021 sample collected from MO-4 were greater than the statistical limits and were therefore identified as potential exceedances. Results of the confirmatory resampling conducted in September 2021 is discussed in Section 3.4.3.

3.4.3 False-positive Statistically Significant Increases

Confirmatory resampling for potential exceedances associated with the April 2021 sampling event occurred in September 2021. The confirmatory resampling identified the April 2021 total recoverable calcium and sulfate results at MO-4 as false-positive SSIs. No further action is needed.

3.4.4 Verified Statistically Significant Increases

The total recoverable calcium concentrations in the samples collected from MO-1 during both 2021 detection monitoring events indicate verified SSIs. Due to a decreasing trend identified for the baseline data, the total recoverable calcium data are assessed with a trend test. Since the baseline period, the trend has reversed, and the trend test indicates a statistically significant increasing trend. In March 2021, an ASD was prepared for total recoverable calcium at MO-1, and it was recommended that the Facility remain in detection monitoring (Appendix A). The ASD is applicable to the SSIs identified from the 2021 sampling events.

The field-measured pH values for the samples collected from MO-1 during both 2021 detection monitoring events indicate verified SSIs[2]. The detrended pH values at MO-1 were less than the lower statistical limit during the semi-annual compliance events in April and October 2021. In December 2019, an ASD was prepared for field-measured pH at MO-1, and it was recommended that the Facility remain in detection monitoring (Golder 2020a). Field-measured pH values have been stable since October 2018, and the previous ASD is applicable to the SSIs identified from the 2021 sampling events.

A potential exceedance for field-measured pH at MO-5 was identified following the October 2020 sampling event. This potential exceedance was verified with confirmatory resampling conducted in March 2021. The field-measured pH values for the samples collected from MO-5 during both 2021 detection monitoring events indicate verified SSIs. In October 2021, a demonstration of natural variability was prepared for field-measured pH at MO-5, and it was recommended that the Facility remain in detection monitoring (Appendix B). The demonstration of natural variability is applicable to the SSIs identified from the 2021 sampling events.

4.0 PROGRAM TRANSITIONS

In the fourth quarter of 2017, the groundwater monitoring program for the Nucla Station Ash Disposal Facility transitioned from the baseline period to detection monitoring. The Facility remains in detection monitoring, and no program transitions occurred in 2021.

4.1.1 Detection Monitoring

Samples for the detection monitoring program are collected on a semi-annual basis, beginning with the sample collected in October 2017. Tri-State plans to collect semi-annual samples for the detection monitoring program in the second and fourth quarters of 2022.

[2] The term SSI is used to be consistent with generally accepted language. However, the SSI is for values less than the lower limit for field-measured pH (which has a two-tailed limit).

4.1.2 Assessment Monitoring

The groundwater monitoring program for the Facility is not in assessment monitoring. Assessment monitoring has not been triggered as described in 40 CFR 257.95. As such, no ASDs have been made under an assessment monitoring program, and no actions are required.

4.1.3 Corrective Measures and Assessment

The groundwater monitoring program for the Facility does not indicate the need for corrective measures. An assessment of corrective measures, as described in 40 CFR 257.96, is not required.

5.0 RECOMMENDATIONS AND CLOSING

This report presents the groundwater monitoring activities and results for the 2021 detection monitoring program for the Nucla Station Ash Disposal Facility, along with the comparative statistical analysis. The significant findings from the 2021 monitoring activities and comparative statistical analysis are as follows:

- Field-measured pH at MO-1 was identified as a verified SSI for both detection monitoring samples collected in 2021. An ASD conducted in December 2019 is applicable to the 2021 results, and it was recommended that the Facility remain in detection monitoring. No further actions are required.
- Total recoverable calcium at MO-1 was identified as a verified SSI for both detection monitoring samples collected in 2021. An ASD conducted in March 2021 is applicable to the 2021 results, and it was recommended that the Facility remain in detection monitoring. No further actions are required.
- A potential exceedance for field-measured pH at MO-5 was identified following the October 2020 sampling event and was verified as an SSI during confirmatory resampling in March 2021. Field-measured pH at MO-5 was identified as a verified SSI for both detection monitoring samples collected in 2021. A demonstration of natural variability conducted in October 2021 is applicable to the 2021 results, and it was recommended that the Facility remain in detection monitoring. No further actions are required.
- Potential exceedances for total recoverable calcium and sulfate at MO-4 were identified following the April 2021 sampling event. Confirmatory resampling conducted in September 2021 indicated the April 2021 results were false-positive SSIs. No other potential exceedances or false-positive SSIs were identified for the 2021 detection monitoring program.

As described in the Groundwater Monitoring System Certification (Golder 2019) and the Groundwater Statistical Method Certification (Golder 2020b), the groundwater monitoring and analytical procedures meet the requirements of the CCR Rule, and modifications to the monitoring network and sampling program are not recommended at this time.

Signature Page

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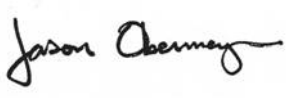

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6.0 REFERENCES

Golder (Golder Associates Inc.). 2019. Coal Combustion Residuals Landfill Groundwater Monitoring System Certification, Nucla Station Ash Disposal Facility. Report prepared for Tri-State Generation and Transmission Association, Inc. May 2.

Golder. 2020a. Annual Groundwater Monitoring Report – 2019, Coal Combustion Residuals Landfill, Nucla Station Ash Disposal Facility. Report prepared for Tri-State Generation and Transmission Association, Inc. January 29.

Golder. 2020b. Coal Combustion Residuals Landfill Groundwater Statistical Method Certification, Nucla Station Ash Disposal Facility. Report prepared for Tri-State Generation and Transmission Association, Inc. June 19.

Tables

Table 1: Sample Results Summary Table – MO-1

Analytes	Units	4/21/2021	10/27/2021
		Compliance Event	Compliance Event
Static Water Level Elevation	ft amsl	5765.2(1)	5715.2
Appendix III			
Boron, Total Recoverable	mg/L	0.387 B	0.423
Calcium, Total Recoverable	mg/L	15.0	16.2
Chloride	mg/L	267	259
Fluoride	mg/L	1.84 B	1.41 B
pH, Field-Measured	pH units	12.0	12.1
Sulfate	mg/L	544	501
Total Dissolved Solids	mg/L	1760	1760

Notes:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

B: Analyte was detected between the method detection limit and the practical quantitation limit

1) The water elevation measured at MO-1 during the sampling event is reported for completeness. However, an issue with the transducer that is used to measure the water level at MO-1 was identified following the sampling event, and the water elevation indicated is not considered to be accurate.

Table 2: Sample Results Summary Table – MO-2

Analytes	Units	4/20/2021	10/27/2021
		Compliance Event	Compliance Event
Static Water Level Elevation	ft amsl	5733.9	5735.6
Appendix III			
Boron, Total Recoverable	mg/L	0.331 B	0.324
Calcium, Total Recoverable	mg/L	55.5	54.8
Chloride	mg/L	2050	1980
Fluoride	mg/L	< 12.5 U	< 12.5 U
pH, Field-Measured	pH units	8.1	8.1
Sulfate	mg/L	1950	1900
Total Dissolved Solids	mg/L	6300	6350

Notes:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Non-detects are reported as less than the practical quantitation limit

B: Analyte was detected between the method detection limit and the practical quantitation limit

U: Analyte was not detected above the method detection limit

Table 3: Sample Results Summary Table – MO-3

Analytes	Units	4/14/2021	10/25/2021
		Compliance Event	Compliance Event
Static Water Level Elevation	ft amsl	5636.0	5636.3
Appendix III			
Boron, Total Recoverable	mg/L	0.678	0.677
Calcium, Total Recoverable	mg/L	17.3	19.8
Chloride	mg/L	153	150
Fluoride	mg/L	2.30 B	2.59
pH, Field-Measured	pH units	7.9	8.0
Sulfate	mg/L	766	721
Total Dissolved Solids	mg/L	2400	2320

Notes:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

B: Analyte was detected between the method detection limit and the practical quantitation limit

Table 4: Sample Results Summary Table – MO-4

Analytes	Units	4/7/2021	9/29/2021	10/20/2021
		Compliance Event	Confirmatory Resample[(1)]	Compliance Event
Static Water Level Elevation	ft amsl	5632.3	5637.5	5637.5
Appendix III				
Boron, Total Recoverable	mg/L	0.362 B	--	0.447 B
Calcium, Total Recoverable	mg/L	50.7	48.1	48.4
Chloride	mg/L	986	984	898
Fluoride	mg/L	< 12.5 U	--	< 5 U
pH, Field-Measured	pH units	7.5	7.6	7.6
Sulfate	mg/L	2040	1930	1810
Total Dissolved Solids	mg/L	5000	--	5030

Notes:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Non-detects are reported as less than the practical quantitation limit

B: Analyte was detected between the method detection limit and the practical quantitation limit

U: Analyte was not detected above the method detection limit

1) Field-measured pH and chloride concentration are reported for informational purposes only. SSI determination for the confirmatory resample event (Table 9) only applies to parameters identified as potential exceedances for the preceding compliance event.

Table 5: Sample Results Summary Table – MO-5

Analytes	Units	3/3/2021	4/14/2021	10/25/2021
		Confirmatory Resample	Compliance Event	Compliance Event
Static Water Level Elevation	ft amsl	5656.5	5654.5	5664.2
Appendix III				
Boron, Total Recoverable	mg/L	--	0.364 B	0.383 B
Calcium, Total Recoverable	mg/L	--	10.8	11.0
Chloride	mg/L	--	956	894
Fluoride	mg/L	--	< 12.5 U	< 5 U
pH, Field-Measured	pH units	8.8	8.8	8.6
Sulfate	mg/L	--	1910	1680
Total Dissolved Solids	mg/L	--	5020	4920

Notes:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Non-detects are reported as less than the practical quantitation limit

B: Analyte was detected between the method detection limit and the practical quantitation limit

U: Analyte was not detected above the method detection limit

Table 6: Statistics Summary Table – MO-1

Analytes	Units	Selected Statistical Method	Statistical Limit	April 2021		October 2021	
				Compliance Event (4/21/2021)	SSI Determination	Compliance Event (10/27/2021)	SSI Determination
Appendix III							
Boron, Total Recoverable[1]	mg/L	P-PL	0.43	0.387 B	No	0.423	No
Calcium, Total Recoverable[1]	mg/L	Trend[2]	NL	15.0	Verified SSI[5]	16.2	Verified SSI[5]
Chloride	mg/L	P-PL	341	267	No	259	No
Fluoride	mg/L	P-PL	2.8	1.84 B	No	1.41 B	No
pH, Field-Measured[3]	pH units	P-PL	9.8, 10.0	12.0 (7.6)	Verified SSI[4]	12.1 (7.1)	Verified SSI[4]
Sulfate	mg/L	Trend[2]	NL	544	No	501	No
Total Dissolved Solids	mg/L	Trend[2]	NL	1760	No	1760	No

Notes:

NL: Statistical limit was not calculated for analytes for which the Sen's Slope methodology was selected

P-PL: Parametric Prediction Limit

mg/L: milligrams per liter

Once a verified SSI is identified, confirmatory resampling is not necessary for subsequent SSIs

B: Analyte was detected between the method detection limit and the practical quantitation limit

1) Statistical limits were based on total analyses. Only total recoverable analyses have been conducted for the compliance sampling events and used for comparisons.

2) Baseline data exhibited a statistically significant decreasing trend. Therefore, a trend analysis is used for the determination of SSIs.

3) Statistical limit (two-tailed) was established using detrended data. Compliance data are detrended for comparison to the statistical limit. Detrended value is shown in parentheses.

4) Successful alternative source demonstration prepared in December 2019 is applicable, and the Facility remains in detection monitoring.

5) Successful alternative source demonstration prepared in March 2021 is applicable, and the Facility remains in detection monitoring.

Table 7: Statistics Summary Table – MO-2

Analytes	Units	Selected Statistical Method	Statistical Limit	April 2021		October 2021	
				Compliance Event (4/20/2021)	SSI Determination	Compliance Event (10/27/2021)	SSI Determination
Appendix III							
Boron, Total Recoverable	mg/L	P-PL	0.44	0.331 B	No	0.324	No
Calcium, Total Recoverable	mg/L	P-PL	64.0	55.5	No	54.8	No
Chloride	mg/L	P-PL	2361	2050	No	1980	No
Fluoride	mg/L	NP-PL	12.5	< 12.5 U	No	< 12.5 U	No
pH, Field-Measured	pH units	P-PL	7.6, 8.7	8.1	No	8.1	No
Sulfate	mg/L	P-PL	2190	1950	No	1900	No
Total Dissolved Solids	mg/L	P-PL	6679	6300	No	6350	No

Notes:

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

Non-detects are reported as less than the practical quantitation limit

B: Analyte was detected between the method detection limit and the practical quantitation limit

U: Analyte was not detected above the practical quantitation limit

Table 8: Statistics Summary Table – MO-3

Analytes	Units	Selected Statistical Method	Statistical Limit	April 2021		October 2021	
				Compliance Event (4/14/2021)	SSI Determination	Compliance Event (10/25/2021)	SSI Determination
Appendix III							
Boron, Total Recoverable	mg/L	P-PL	0.73	0.678	No	0.677	No
Calcium, Total Recoverable	mg/L	P-PL	20.2	17.3	No	19.8	No
Chloride	mg/L	P-PL	179	153	No	150	No
Fluoride	mg/L	P-PL	3.25	2.30 B	No	2.59	No
pH, Field-Measured	pH units	P-PL	7.6, 8.2	7.9	No	8.0	No
Sulfate	mg/L	P-PL	875	766	No	721	No
Total Dissolved Solids	mg/L	P-PL	2640	2400	No	2320	No

Notes:

P-PL: Parametric Prediction Limit

mg/L: milligrams per liter

B: Analyte was detected between the method detection limit and the practical quantitation limit

Table 9: Statistics Summary Table – MO-4

Analytes	Units	Selected Statistical Method	Statistical Limit	April 2021		September 2021		October 2021	
				Compliance Event (4/7/2021)	SSI Determination	Confirmatory Resample (9/29/2021)	SSI Determination	Compliance Event (10/20/2021)	SSI Determination
Appendix III									
Boron, Total Recoverable	mg/L	P-PL	0.50	0.362 B	No	--	--	0.447 B	No
Calcium, Total Recoverable	mg/L	P-PL	49.2	50.7	False Positive	48.1	No	48.4	No
Chloride	mg/L	P-PL	1086	986	No	--	--	898	No
Fluoride	mg/L	NP-PL	12.5	< 12.5 U	No	--	--	< 5 U	No
pH, Field-Measured	pH units	NP-PL	7.4, 7.6	7.5	No	--	--	7.6	No
Sulfate	mg/L	P-PL	2012	2040	False Positive	1930	No	1810	No
Total Dissolved Solids	mg/L	P-PL	5373	5000	No	--	--	5030	No

Notes:

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

Non-detects are reported as less than the practical quantitation limit

B: Analyte was detected between the method detection limit and the practical quantitation limit

U: Analyte was not detected above the practical quantitation limit

Table 10: Statistics Summary Table – MO-5

Analytes	Units	Selected Statistical Method	Statistical Limit	March 2021		April 2021		October 2021	
				Confirmatory Resample (3/3/2021)	SSI Determination	Compliance Event (4/14/2021)	SSI Determination	Compliance Event (10/25/2021)	SSI Determination
Appendix III									
Boron, Total Recoverable	mg/L	P-PL	0.48	--	--	0.364 B	No	0.383 B	No
Calcium, Total Recoverable	mg/L	Trend(1)	NL	--	--	10.8	No	11.0	No
Chloride	mg/L	P-PL	1180	--	--	956	No	894	No
Fluoride	mg/L	NP-PL	12.5	--	--	< 12.5 U	No	< 5 U	No
pH, Field-Measured	pH units	NP-PL	7.6, 8.3	8.8	Verified SSI(2)	8.8	Verified SSI(2)	8.6	Verified SSI(2)
Sulfate	mg/L	P-PL	1990	--	--	1910	No	1680	No
Total Dissolved Solids	mg/L	P-PL	5495	--	--	5020	No	4920	No

Notes:

NL: statistical limit not calculated for analytes for which the Sen's Slope methodology was selected

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

Non-detects are reported as less than the practical quantitation limit

B: Analyte was detected between the method detection limit and the practical quantitation limit

U: Analyte was not detected above the practical quantitation limit

1) Baseline data exhibited a statistically significant decreasing trend. Therefore, a trend analysis is used for the determination of SSIs.

2) Successful demonstration of natural variability prepared in October 2021 is applicable, and the Facility remains in detection monitoring.

Figures

LEGEND

- PROPERTY BOUNDARY
- 5970 EXISTING GROUND TOPOGRAPHY
- MO-1 MONITORING WELL
- 5733.9 GROUNDWATER ELEVATION (APRIL 2021, NOTE 1)

NOTE(S)

1. GROUNDWATER ELEVATION AT MO-1 WAS MEASURED ON APRIL 21, 2021. GROUNDWATER ELEVATION AT MO-2 WAS MEASURED ON APRIL 20, 2021. GROUNDWATER ELEVATIONS AT MO-3 AND MO-5 WERE MEASURED ON APRIL 14, 2021. GROUNDWATER ELEVATION AT MO-4 WAS MEASURED ON APRIL 7, 2021.
2. THE WATER ELEVATION MEASURED AT MO-1 DURING THE SAMPLING EVENT IS REPORTED FOR COMPLETENESS. HOWEVER, AN ISSUE WITH THE TRANSDUCER THAT IS USED TO MEASURE THE WATER LEVEL AT MO-1 WAS IDENTIFIED FOLLOWING THE SAMPLING EVENT, AND THE WATER LEVEL INDICATED IS NOT CONSIDERED TO BE ACCURATE.

0 150 300
SCALE FEET

CLIENT
TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION
1100 WEST 116TH AVENUE
WESTMINSTER, COLORADO 80234

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-01-28
DESIGNED	BJP
PREPARED	BCB
REVIEWED	SAH
APPROVED	JEO

PROJECT
NUCLA STATION ASH DISPOSAL FACILITY
COAL COMBUSTION RESIDUALS LANDFILL
ANNUAL GROUNDWATER MONITORING REPORT

TITLE
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS (APRIL 2021)

PROJECT NO.	REV.	FIGURE
21453425	0	1

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LEGEND

- PROPERTY BOUNDARY
- 5970 EXISTING GROUND TOPOGRAPHY
- MO-1 MONITORING WELL
- 5715.2 GROUNDWATER ELEVATION (OCTOBER 2021, NOTE 1)

NOTE(S)

1. GROUNDWATER ELEVATIONS AT MO-1 AND MO-2 WERE MEASURED ON OCTOBER 27, 2021. GROUNDWATER ELEVATIONS AT MO-3 AND MO-5 WERE MEASURED ON OCTOBER 25, 2021. GROUNDWATER ELEVATION AT MO-4 WAS MEASURED ON OCTOBER 20, 2021.

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CLIENT
TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION
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WESTMINSTER, COLORADO 80234

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-01-21
DESIGNED	BJP
PREPARED	BCB
REVIEWED	SAH
APPROVED	JEO

PROJECT
NUCLA STATION ASH DISPOSAL FACILITY
COAL COMBUSTION RESIDUALS LANDFILL
ANNUAL GROUNDWATER MONITORING REPORT

TITLE
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS (OCTOBER 2021)

PROJECT NO.	REV.	FIGURE
21453425	0	2

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APPENDIX A

Alternative Source Demonstration for Total Recoverable Calcium at MO-1

CERTIFICATION

Professional Engineer Certification Statement [40 CFR 257.94(e)(2)]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.94 (40 CFR 257.94), this written demonstration is accurate to the best of my knowledge and has been prepared in accordance with recognized and generally accepted good engineering practices, including the consideration of applicable industry standards, and the requirements of 40 CFR 257.94(e)(2).

Golder Associates Inc.

Signature

March 31, 2021

Date of Certification

Jason Obermeyer, PE

Name

40294

Colorado Professional Engineer Number

TECHNICAL MEMORANDUM

DATE March 31, 2021 **Reference No.** 20138863-6-TM-0

TO Greg Wallingford
Tri-State Generation and Transmission Association, Inc.

CC Jason Obermeyer, Golder Associates Inc.

FROM Sara Harkins, Golder Associates Inc. **EMAIL SHarkins@Golder.com**

ALTERNATIVE SOURCE DEMONSTRATION FOR TOTAL RECOVERABLE CALCIUM AT MO-1, NUCLA STATION ASH DISPOSAL FACILITY

Golder Associates Inc. (Golder) is providing this technical memorandum to support an alternative source demonstration for a statistically significant increase (SSI) in total recoverable calcium concentrations at groundwater monitoring well MO-1, which is located at the coal combustion residuals (CCR) landfill that serves the Nucla Generating Station. The Nucla Generating Station is owned by Tri-State Generation and Transmission Association, Inc. (Tri-State). Tri-State disposes of CCRs from the Nucla Generating Station in an existing Tri-State-owned CCR landfill, the Nucla Station Ash Disposal Facility (the Facility), which is located approximately 2.5 miles southeast of the Nucla Generating Station. Groundwater is being monitored at the Facility to meet the requirements of the US Environmental Protection Agency's (USEPA) CCR Rule (40 CFR Part 257).

1.0 CCR GROUNDWATER MONITORING PROGRAM

The groundwater monitoring system for the Facility consists of five monitoring wells (MO-1, MO-2, MO-3, MO-4, and MO-5). Initially, baseline groundwater samples were collected on an approximately monthly basis between December 13, 2016 and August 8, 2017 at each of the monitoring wells (additional baseline samples were collected from MO-2 and MO-4 on October 3, 2017). In 2020, the baseline period for wells MO-2 through MO-5 was updated to include data collected through 2019. MO-1 was not included in the baseline update due to trending results (either increasing or decreasing) for most Appendix III constituents (Golder 2021).

The resulting baseline data were used to establish intrawell baseline statistical limits for each Appendix III constituent at each well. Intrawell baseline statistical limits represent groundwater conditions in each individual well (USEPA 2009). Samples collected after baseline statistical limits were established are part of the detection monitoring program. Data from detection monitoring are compared to the statistical limits to assess possible changes in groundwater chemistry at each well. When the concentration of a given constituent exceeds the statistical limit in two consecutive sampling events, it is considered a verified SSI over the baseline concentration.

The baseline data for calcium at MO-1 exhibit a statistically significant decreasing trend. Due to a decreasing trend identified for the baseline data, the calcium data for MO-1 are assessed with a trend test in accordance with the Statistical Method Certification for the Facility (Golder 2020). Since the baseline data period, the trend has reversed, and the trend test now indicates a statistically significant increasing trend.

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This demonstration is performed in accordance with the Statistical Method Certification for the Facility (Golder 2020) to meet the requirements of 40 CFR 257.94(e)(2), which states that the regulated CCR unit may remain in detection monitoring if a demonstration can be made that a source other than the regulated CCR unit caused the SSI or that the SSI was a result of an error in sampling, analysis, or statistical evaluation or natural variability in groundwater quality that was not fully captured during baseline data collection. More specifically, this technical memorandum supports the demonstration that the SSI for total recoverable calcium at MO-1 (October 2020 sample) was a result of well stabilization and that the Facility is not the source of the changing values because the well is located upgradient of the Facility.

2.0 GEOLOGY AND HYDROGEOLOGY

Near-surface geology at the Nucla Station Ash Disposal Facility is generally characterized by a thin layer (0 to 15 feet thick) of unconsolidated regolith underlain by 0 to approximately 110 feet of the Dakota Sandstone, approximately 90 to 210 feet of the Burro Canyon Formation, and the Morrison Formation, which is approximately 700 to 800 feet thick regionally. The uppermost aquifer at the Facility is within the Morrison Formation, with the depths to groundwater in the monitoring wells ranging from approximately 220 to 305 feet below ground surface in October 2020.

The Morrison aquifer is characterized as highly heterogeneous with zones that are variably transmissive and/or subjected to variable amounts of confining pressure. This characterization is supported by the differences in groundwater levels, water column heights, and recovery times observed in the monitoring wells that have been installed to serve as the groundwater monitoring system for the Facility. Sandstone lenses in the Morrison aquifer vary considerably with respect to transmissivity (i.e., thickness and hydraulic conductivity) and horizontal extent due to the alluvial, shoreline, and lacustrine environments that deposited the Salt Wash and Brushy Basin Members of the Morrison Formation, resulting in interbedded siltstone, mudstone, claystone, and shale units. Groundwater elevation data suggest a general southerly and westerly groundwater flow direction in the Morrison aquifer near the Nucla Station Ash Disposal Facility.

3.0 GROUNDWATER MONITORING SYSTEM

The Groundwater Monitoring System Certification for the Facility (Golder 2019) indicates that the groundwater monitoring system that has been designed and constructed for the Nucla Station Ash Disposal Facility meets the requirements of 40 CFR 257.91. The site layout and monitoring well network are presented in Figure 1. MO-1 and MO-2 are the Facility upgradient wells and MO-3, MO-4, and MO-5 are the Facility downgradient wells. Since MO-1 is designated as an upgradient well, and in the absence of evidence of mounding under the Facility, it is very unlikely that the SSI for total recoverable calcium at MO-1 is an indication of a release from the Facility.

4.0 SUMMARY OF MO-1 CALCIUM CONCENTRATIONS

Time series graphs of the available calcium concentrations for MO-1 are presented in Figure 2. Due to the time constraints associated with the implementation of the CCR Rule, the baseline data for MO-1 were collected on a compressed schedule, which consisted of approximately monthly sampling between December 2016 and August 2017. As mentioned in Section 1.0, the calcium compliance data at MO-1 are evaluated for statistical significance with a trend test because the baseline data exhibit a statistically significant decreasing trend. Figure 2 demonstrates that between December 2016 and July 2017 calcium concentrations decreased before a brief stable period between July 2017 and April 2018. Since April 2018, calcium concentrations have gradually increased, with the most recent values similar to those observed in downgradient wells MO-3 and MO-5 and three times lower than those observed in the other upgradient well, MO-2.

5.0 SUMMARY AND CONCLUSIONS

This demonstration describes the rationale behind Golder's conclusion that the SSI for total recoverable calcium at MO-1 is not an indication of groundwater impacts from the Nucla Station Ash Disposal Facility because MO-1 is located upgradient of the Facility. Therefore, in the absence of evidence of mounding under the Facility, it is very unlikely that the SSI for calcium at MO-1 is an indication of a release from the Facility. Although recent calcium concentrations at MO-1 have increased, the recent concentrations are in the range of concentrations observed in samples collected from other network wells and lower than those in the other upgradient well. Additionally, as mentioned in Section 1.0, most other Appendix III constituents also exhibit temporal trends (increasing or decreasing) at MO-1, indicating ongoing well stabilization.

Based on the findings of this demonstration, Golder recommends that Tri-State continue with the detection monitoring program for the Nucla Station Ash Disposal Facility.

6.0 REFERENCES

Golder (Golder Associates Inc.). 2019. Coal Combustion Residuals Landfill Groundwater Monitoring System Certification, Nucla Station Ash Disposal Facility, Nucla, Colorado. Golder Project Number 19118707. May 2.

Golder. 2020. Coal Combustion Residuals Landfill Groundwater Statistical Method Certification, Nucla Station Ash Disposal Facility, Nucla, Colorado. Golder Project Number 20138863. June 29.

Golder. 2021. Annual Groundwater Monitoring Report – 2020, Coal Combustion Residuals Landfill, Nucla Station Ash Disposal Facility, Nucla, Colorado. Golder Project Number 20138863. January 29.

USEPA (United States Environmental Protection Agency). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance. Office of Resource Conservation and Energy. EPA 530/R-09-007. March.

ATTACHMENTS

Figure 1 – Monitoring Well Locations and Groundwater Elevations (October 2020)
Figure 2 – Time Series of Calcium Concentrations

SH/JO/mp

20138863-6-TM-0-ASD_Ca_MO-1_31MAR21

Figures

LEGEND

- PROPERTY BOUNDARY
- 5870 — EXISTING GROUND TOPOGRAPHY
- MO-1 — MONITORING WELL
- 5715.4 — GROUNDWATER ELEVATION (OCTOBER 2020, NOTE 1)

NOTE(S)

1. GROUNDWATER ELEVATIONS AT MO-4 AND MO-5 WERE MEASURED ON OCTOBER 21, 2020. GROUNDWATER ELEVATIONS AT MO-2 AND MO-3 WERE MEASURED ON OCTOBER 28, 2020. GROUNDWATER ELEVATION AT MO-1 WAS MEASURED ON OCTOBER 29, 2020.

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CONSULTANT
GOLDER

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PREPARED	BJP
REVIEWED	SAH
APPROVED	JEO

PROJECT
NUCLA STATION ASH DISPOSAL FACILITY
COAL COMBUSTION RESIDUALS LANDFILL
ASD: TOTAL RECOVERABLE CALCIUM AT MO-1

TITLE
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS (OCTOBER 2020)

PROJECT NO.	REV.	FIGURE
20138863	0	1

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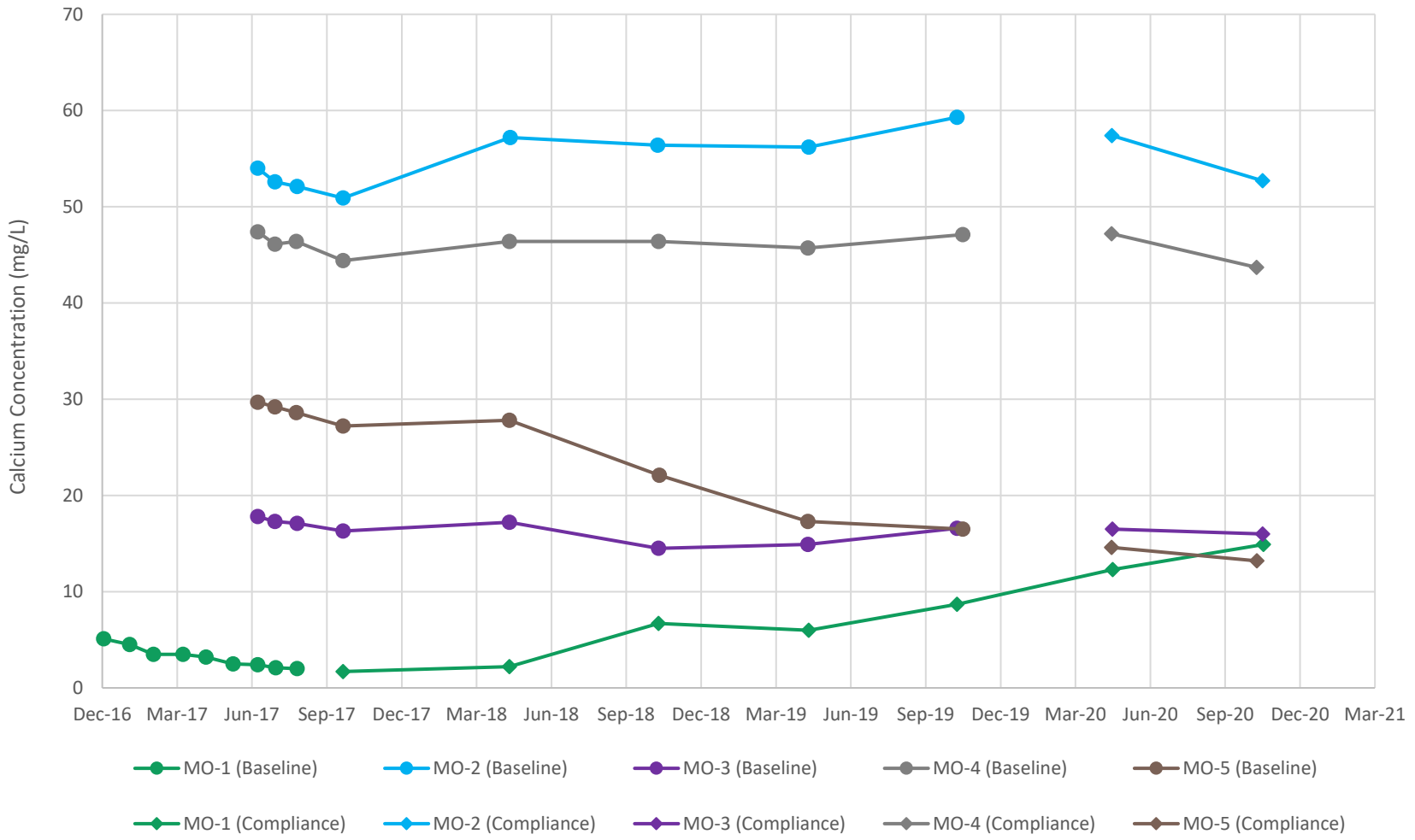

Notes:
MO-1 baseline data are total concentrations, while compliance data are total recoverable concentrations.
MO-2 through MO-5 baseline and compliance data are total recoverable concentrations.

Figure 2
Time Series of Calcium Concentrations
Alternative Source Demonstration for Total Recoverable Calcium at MO-1
Tri-State Generation and Transmission Association, Inc.

https://golderassociates.sharepoint.com/sites/122669/Project Files/6 Deliverables/TechMemos/6-TM-ASD_Recoverable_Calcium_MO-1/6-TM-A/Figures/[Fig 2.xlsx]2

APPENDIX B

Demonstration of Natural Variability for Field-measured pH at MO-5

CERTIFICATION

Professional Engineer Certification Statement [40 CFR 257.94(e)(2)]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.94 (40 CFR 257.94), this written demonstration is accurate to the best of my knowledge and has been prepared in accordance with recognized and generally accepted good engineering practices, including the consideration of applicable industry standards, and the requirements of 40 CFR 257.94(e)(2).

Golder Associates Inc.

Signature

October 21, 2021

Date of Certification

Jason Obermeyer, PE

Name

40294

Colorado Professional Engineer Number

GOLDER
MEMBER OF WSP

TECHNICAL MEMORANDUM

DATE October 21, 2021 **Reference No.** 21453425-1-TM-0

TO Chantell Johnson and Darlene Crosby
Tri-State Generation and Transmission Association, Inc.

FROM Sara Harkins and Jason Obermeyer **EMAIL sharkins@golder.com**
jobermeyer@golder.com

DEMONSTRATION OF NATURAL VARIABILITY FOR FIELD pH AT MO-5, NUCLA STATION ASH DISPOSAL FACILITY

Golder Associates Inc. (Golder), a member of WSP, is providing this technical memorandum to support a demonstration of natural variability resulting in a statistically significant increase (SSI) for field pH at groundwater monitoring well MO-5 located at the Nucla Station Ash Disposal Facility (the Facility), which is owned and operated by Tri-State Generation and Transmission Association, Inc. (Tri-State). Since 1987, the Facility has served as the location for final deposition of coal combustion residuals (CCR) generated at the Nucla Generating Station, a retired coal-fired electric generation plant that was located near Nucla, Colorado, approximately 2.5 miles northwest of the Facility. Groundwater is being monitored at the Facility to meet the requirements of the United States Environmental Protection Agency's (USEPA's) CCR Rule (40 CFR Part 257, Subpart D) (USEPA 2015).

1.0 GROUNDWATER MONITORING PROGRAM

The groundwater monitoring system for the Facility consists of five monitoring wells (MO-1, MO-2, MO-3, MO-4, and MO-5). Initially, baseline groundwater samples were collected on an approximately monthly basis between December 13, 2016, and August 8, 2017, at each of the monitoring wells (additional baseline samples were collected from MO-2 and MO-4 on October 3, 2017). In 2020, the baseline periods for MO-2 through MO-5 were updated to include data collected through 2019. MO-1 was not included in the baseline update due to trending results (either increasing or decreasing) for most Appendix III constituents (Golder 2021).

The baseline data were used to establish intrawell baseline statistical limits for each Appendix III constituent at each well. Intrawell baseline statistical limits represent groundwater conditions in each individual well (USEPA 2009). Samples collected after the initial baseline statistical limits were established are part of the detection monitoring program. Data from detection monitoring are compared to the statistical limits to assess possible changes in groundwater chemistry at each well. When the concentration of a given constituent exceeds the statistical limit in two consecutive sampling events, it is considered a verified SSI over the baseline concentration. In the case of field pH, which is a two-tailed limit, values below the lower statistical limit also indicate an SSI.

At MO-5, field pH exceeded the upper non-parametric statistical limit of 8.3 during the semi-annual sampling event in October 2020 (field pH measured as 8.4) and during the confirmatory sampling event in March 2021 (field pH measured as 8.8), indicating an SSI over baseline. The upper non-parametric limit is the highest

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concentration observed during the baseline period for the well. A non-parametric methodology was selected for field pH at MO-5 because the baseline data were not normally or lognormally distributed, which is a requirement to implement a parametric methodology.

This demonstration is performed in accordance with the Coal Combustion Residuals Landfill Groundwater Statistical Method Certification, Nucla Station Ash Disposal Facility, Nucla, Colorado (Golder 2020) to meet the requirements of 40 CFR 257.94(e)(2), which states that the site may remain in detection monitoring if a demonstration can be made that a source other than the regulated CCR unit caused the SSI or that the SSI was a result of an error in sampling, analysis, or statistical evaluation or natural variability in groundwater quality that was not fully captured during baseline data collection (USEPA 2015). More specifically, this technical memorandum supports the demonstration that the SSI for field pH at MO-5 (October 2020 and March 2021 samples) was a result of natural variability in groundwater quality that was not fully captured during baseline data collection.

2.0 GEOLOGY AND HYDROGEOLOGY

Near-surface geology at the Facility is generally characterized by a thin layer (0 to 15 feet thick) of unconsolidated regolith underlain by 0 to approximately 110 feet of the Dakota sandstone; approximately 90 to 210 feet of the Burro Canyon Formation; and the Morrison Formation, which is approximately 700 to 800 feet thick regionally. The uppermost aquifer at the Facility is within the Morrison Formation, with the depths to groundwater in the monitoring wells ranging from approximately 220 to 305 feet below the ground surface in October 2020.

The Morrison aquifer is characterized as highly heterogeneous with zones that are variably transmissive and/or subjected to variable amounts of confining pressure. This characterization is supported by the differences in groundwater levels, water column heights, and recovery times observed in the monitoring wells that have been installed to serve as the groundwater monitoring system for the Facility. Sandstone lenses in the Morrison aquifer vary considerably with respect to transmissivity (i.e., thickness and hydraulic conductivity) and horizontal extent due to the alluvial, shoreline, and lacustrine environments that deposited the Salt Wash and Brushy Basin Members of the Morrison Formation, resulting in interbedded siltstone, mudstone, claystone, and shale units. Groundwater elevation data suggest a general southerly and westerly groundwater flow direction in the Morrison aquifer near the Facility.

3.0 GROUNDWATER MONITORING SYSTEM AND NATURAL VARIABILITY

The groundwater monitoring system certification for the Facility (Golder 2019) indicates that the groundwater monitoring system that has been designed and constructed for the Facility meets the requirements of 40 CFR 257.91 (USEPA 2015). The site layout and monitoring well network are presented in Figure 1. MO-1 and MO-2 are the Facility upgradient wells and MO-3, MO-4, and MO-5 are the Facility downgradient wells. Figure 2 shows groundwater elevations for the monitoring wells spanning the duration of the monitoring program. While groundwater levels have slowly risen in MO-5 since well installation, the groundwater level increase (which is similar to the one observed in upgradient well MO-2) is indicative of stabilization of a deep, low-yield well and does not represent a rise in groundwater level due to a release from the Facility.

The groundwater monitoring wells are installed in the Morrison aquifer, and it was noted as early as the 2017 groundwater monitoring system certification (Golder 2017) that the Morrison aquifer contains heterogeneous zones with variable transmissivity and/or confining pressure. This is consistent with the observation that well stabilization has taken an extended period of time in some wells and not in others (see Figure 2). During the

baseline period (roughly three years), the groundwater level in MO-5 did not stabilize. Instead, because of low yield, the groundwater level gradually and slowly increased, ultimately by more than 200 feet, which unavoidably corresponded to continually changing well recharge conditions. Thus, the conditions monitored by the well during the baseline period were not fully indictive of formation conditions, as the ongoing stabilization would have influenced groundwater quality monitored by the well.

Despite a gap in groundwater level data in 2019 and 2020 due to a malfunctioning transducer, there are indications that groundwater levels in MO-5 may have finally stabilized recently. If that is confirmed to be the case, recent measurements of field pH are likely more indicative of formation conditions than field pH measurements obtained during the baseline period (i.e., those on which the statistical limits are based). A time series graph of field pH values at MO-5 is presented in Figure 3.

4.0 SAMPLING PROTOCOL MODIFICATIONS

Beginning in April 2020, the primary sampling personnel for the groundwater monitoring program at the Facility changed. The new personnel continued using low-flow pumps and sampling methods to collect groundwater samples, as had been done throughout the duration of the monitoring program, following manufacturer recommendations and USEPA guidance (USEPA Region I 2017).

Although the same sampling methods were used, there is a potential for minor differences in sampling technique between sampling personnel. Thus, a detailed review of the sampling notes was performed, with a focus on field pH measurement and the following modifications to sampling protocols were identified starting in October 2020 (the sampling event during which the first exceedance of the statistical limit for field pH was detected at MO-5):

- The brand of the field meter calibration solution changed from VWR Chemicals BDH to Hach.
- The field meter calibration procedure was improved to conduct a three-point calibration for field pH rather than a two-point calibration.
- A different field meter was used for data collection.
- The pump rate during purging increased to 200 milliliters per cycle. For comparison, a pump rate between 130 and 165 milliliters per cycle was used between April 2018 and April 2020.

The potential influence of these changes would likely have been subtle but may have played a secondary role in the increase in field pH measurements. The purge rate will be adjusted during future sampling events to more closely replicate those that characterized the baseline period.

5.0 SUMMARY AND CONCLUSIONS

This demonstration details the rationale supporting Golder's conclusion that the SSI in field pH at MO-5 is not an indication of groundwater impacts from the Facility, but rather a reflection of natural variability related to well stabilization during the baseline period, and may also have been related to sampling protocol modifications. Based on the findings of this demonstration, Golder recommends that Tri-State continue with the detection monitoring program for the Facility.

SH/JO/mb

Attachments: Figure 1: Monitoring Well Locations and Groundwater Elevations (October 2020)
Figure 2: Time Series of Water Level Elevations
Figure 3: Time Series of MO-5 Field pH Measurements

https://golderassociates.sharepoint.com/sites/141312/project files/6 deliverables/techmemos/1-tm-demo_of_nv_ph_mo-5/1-tm-0/21453425-1-tm-0-demo_of_natural_variability-field_ph_at_mo-5_21oct21.docx

REFERENCES

Golder (Golder Associates Inc.). 2017. Coal Combustion Residuals Landfill Groundwater Monitoring System Certification, Nucla Station Ash Disposal Facility, Nucla, Colorado. Golder Project Number 1779126B. October 16.

Golder. 2019. Coal Combustion Residuals Landfill Groundwater Monitoring System Certification, Nucla Station Ash Disposal Facility, Nucla, Colorado. Golder Project Number 19118707. May 2.

Golder. 2020. Coal Combustion Residuals Landfill Groundwater Statistical Method Certification, Nucla Station Ash Disposal Facility, Nucla, Colorado. Golder Project Number 20138863. June 29.

Golder. 2021. Annual Groundwater Monitoring Report – 2020, Coal Combustion Residuals Landfill, Nucla Station Ash Disposal Facility, Nucla, Colorado. Golder Project Number 20138863. January 29.

USEPA (United States Environmental Protection Agency). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance. Office of Resource Conservation and Energy. EPA 530/R-09-007. March.

USEPA. 2015. Code of Federal Regulations: Title 40 – Protection of Environment; Part 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices. Available online: https://www.govinfo.gov/content/pkg/CFR-2017-title40-vol27/xml/CFR-2017-title40-vol27-part257.xml (accessed September 14, 2021).

USEPA Region I. 2017. Region I Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. EQASOP-GW4. Revision 4. September 19.

Figures

LEGEND

- PROPERTY BOUNDARY
- 5870 — EXISTING GROUND TOPOGRAPHY
- MO-1 — MONITORING WELL
- 5715.4 — GROUNDWATER ELEVATION (OCTOBER 2020, NOTE 1)

NOTE(S)

1. GROUNDWATER ELEVATION AT MO-1 WAS MEASURED ON OCTOBER 29, 2020. GROUNDWATER ELEVATIONS AT MO-2 AND MO-3 WERE MEASURED ON OCTOBER 28, 2020. GROUNDWATER ELEVATIONS AT MO-4 AND MO-5 WERE MEASURED ON OCTOBER 21, 2020.

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GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-09-13
DESIGNED	BJP
PREPARED	AGD
REVIEWED	SAH
APPROVED	JEO

PROJECT
DEMONSTRATION OF NATURAL VARIABILITY FOR FIELD pH AT MO-5, NUCLA STATION ASH DISPOSAL FACILITY

TITLE
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS (OCTOBER 2020)

PROJECT NO.	REV.	FIGURE
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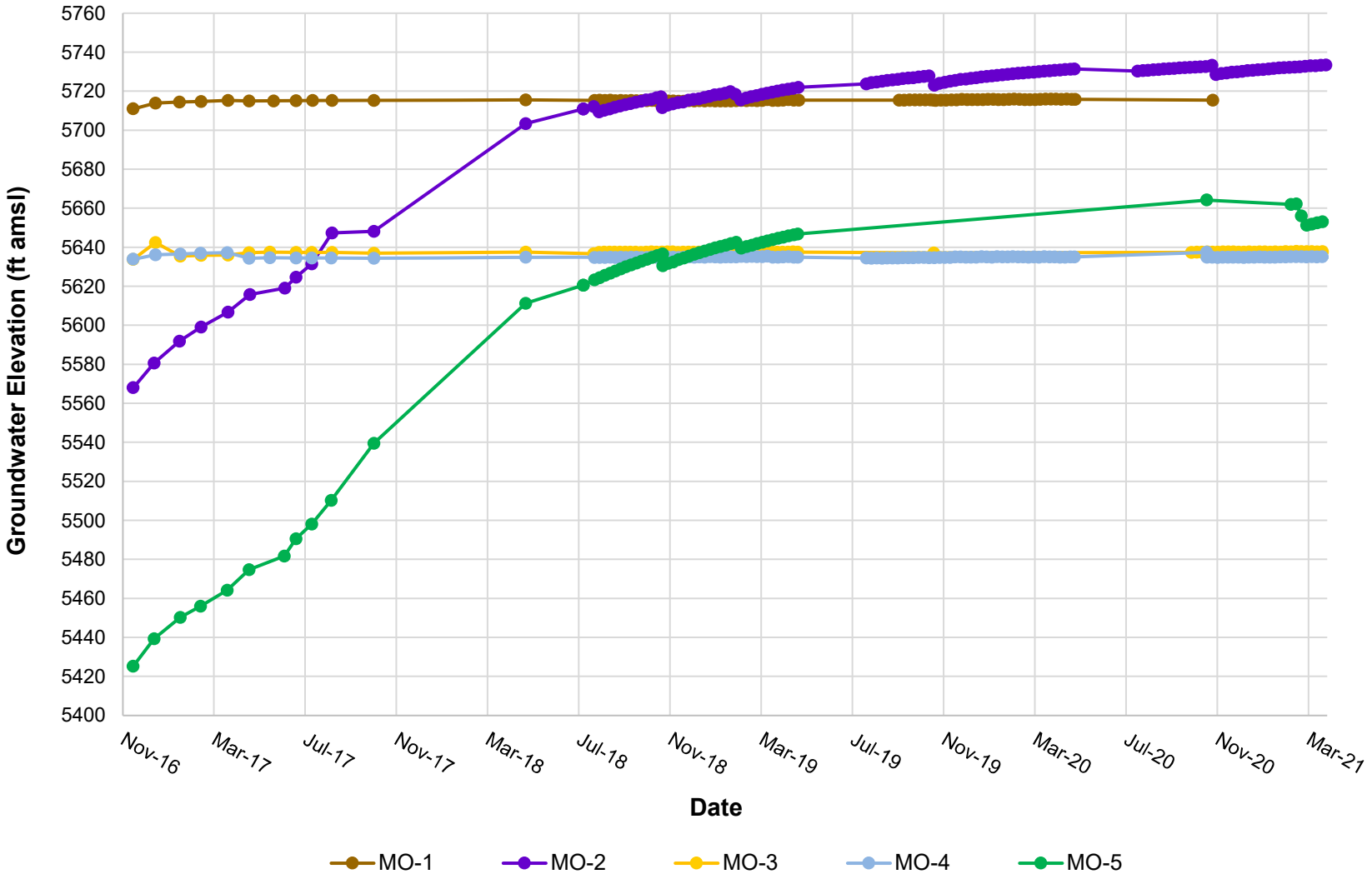

Figure 2

Time Series of Water Level Elevations

Demonstration of Natural Variability for Field pH at MO-5, Nucla Station Ash Disposal Facility

Tri-State Generation and Transmission Association, Inc.

https://golderassociates.sharepoint.com/sites/141312/Project Files/5 Technical Work/CCR Program/MO-5 pH ASD/final/[Fig2&3.xlsx]2

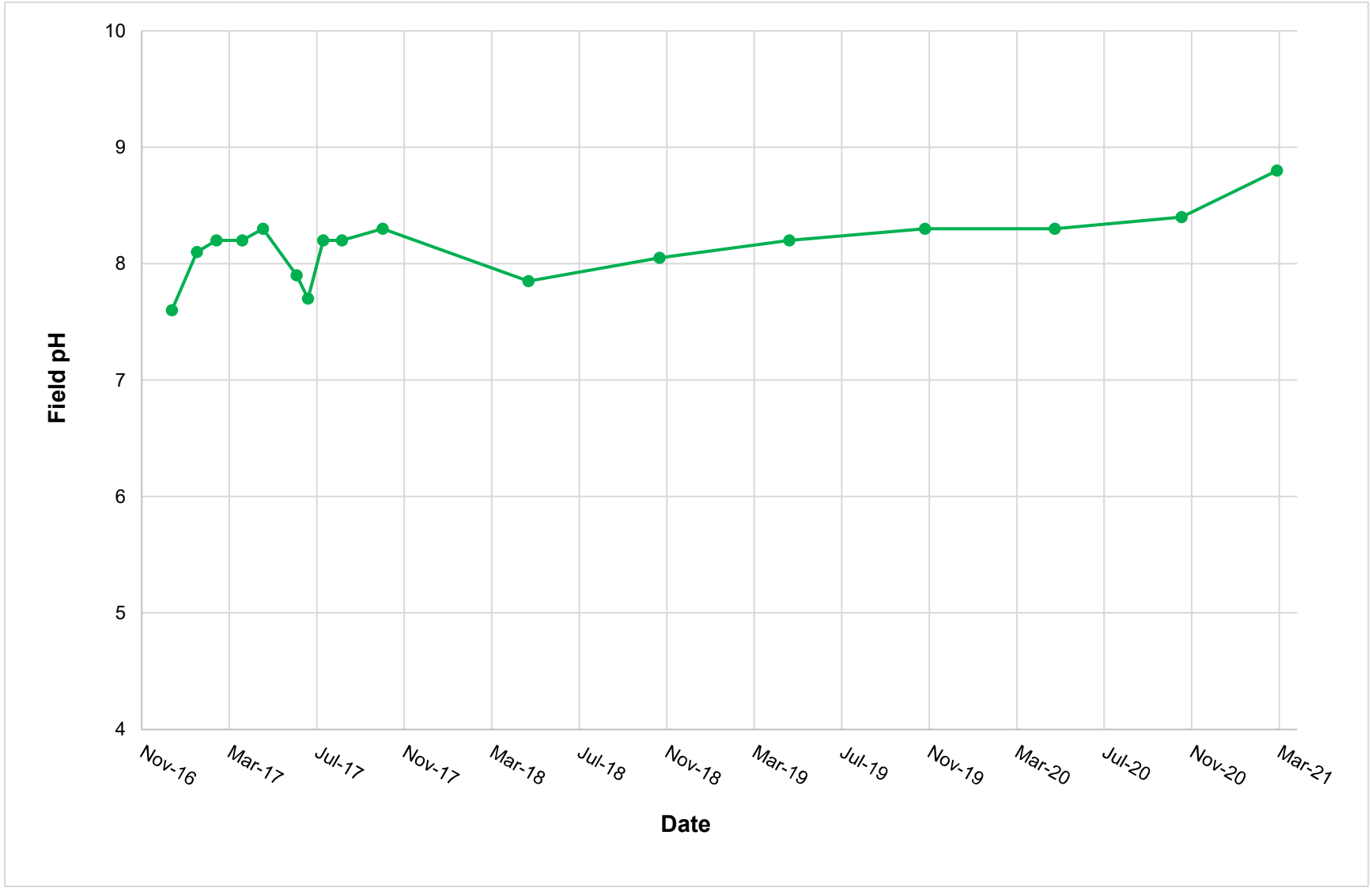

Figure 3

Time Series of MO-5 Field pH Measurements

Demonstration of Natural Variability for Field pH at MO-5, Nucla Station Ash Disposal Facility

Tri-State Generation and Transmission Association, Inc.

https://golderassociates.sharepoint.com/sites/141312/Project Files/5 Technical Work/CCR Program/MO-5 pH ASD/final/[Fig2&3.xlsx]3

APPENDIX C

Revised Historical Groundwater Elevations at MO-3 and MO-4

Appendix C: Revised Historical Groundwater Elevations at MO-3 and MO-4

Annual Groundwater Monitoring Report	Water Level Measurement Date	Revised MO-3 Water Elevation[(1)] (ft amsl)	Revised MO-4 Water Elevation[(1)] (ft amsl)
2017 Annual Report	4/19/2017	5635.6	5637.0
	5/17/2017	5635.8	5637.3
	6/21/2017	5635.6	5637.1
	7/12/2017	5635.6	5637.2
	8/7/2017	--	5637.2
	8/8/2017	5635.6	--
	10/3/2017	5635.3	5637.0
2018 Annual Report	4/24/2018	5635.8	5637.6
	7/24/2018	5635.0	--
	10/23/2018	5635.8	5637.6
2019 Annual Report	4/23/2019	5635.8	5637.7
	10/22/2019	5635.4	--
	10/29/2019	--	5637.7
2020 Annual Report	4/27/2020	--	5637.7

Notes:

ft amsl: feet above mean sea level

1) Groundwater elevations were revised based on corrections to the measuring point elevations.

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