2020 Annual Groundwater Monitoring and Corrective Action Report

Columbia Energy Center
Dry Ash Disposal Facility, Modules 1 through 3
Pardeeville, Wisconsin

Prepared for:

Alliant Energy

SCS ENGINEERS

25220067.00 | January 29, 2021

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Overview of Current Status
Columbia Energy Center, Dry Ash Disposal Facility, Modules 1 through 3
2020 Annual Report

In accordance with §257.90(e)(6), this section at the beginning of the annual report provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. The groundwater monitoring system for the Columbia Energy Center (COL) Dry Ash Disposal Facility Modules 1 through 3 monitors a single CCR unit. Supporting information is provided in the text of the annual report.

Category	Rule Requirement	Site Status
Monitoring Status – Start of Year	(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95;	Detection
Monitoring Status – End of Year	(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95;	Detection
Statistically Significant Increases (SSIs)	(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to §257.94(e):	
	(A) Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and	May 2020 Boron: MW-33AR, MW-34A, MW-302 Chloride: MW-33AR Sulfate: MW-33AR, MW-34A, MW-302 October 2020 Same as April plus Field pH: MW-34A
	(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.	Alternative Source Demonstrations prepared for October 2019 and May 2020 events during 2020. Assessment monitoring not required. Alternative source for October 2020 SSIs will be evaluated in 2021.

Category	Rule Requirement	Site Status
Statistically Significant Levels (SSL) Above Groundwater Protection Standard	(iv) If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to §257.95(g) include all of the following:	Not applicable – Appendix IV sampling not required
	(A) Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;	
	(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;	
	(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and	
	(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.	
Selection of Remedy	(v) Whether a remedy was selected pursuant to §257.97 during the current annual reporting period, and if so, the date of remedy selection; and	Not applicable – Site is in detection monitoring
Corrective Action	(vi) Whether remedial activities were initiated or are ongoing pursuant to §257.98 during the current annual reporting period.	Not applicable – Site is in detection monitoring

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1.0 INTRODUCTION

This 2020 Annual Groundwater Monitoring and Corrective Action Report was prepared to support compliance with the groundwater monitoring requirements of the Coal Combustion Residuals (CCR) Rule [40 CFR 257.50-107]. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.90(e). The applicable sections of the Rule are provided below in italics, followed by applicable information relative to the 2020 Annual Groundwater Monitoring and Corrective Action Report for the CCR Units. The site location is shown on **Figure 1**.

This report covers the period of groundwater monitoring from January 1, 2020, through December 31, 2020.

The groundwater monitoring system for the Columbia Energy Center (COL) Dry Ash Disposal Facility Modules 1 through 3 monitors a single CCR unit:

- COL Dry Ash Disposal Facility – Modules 1-3 (existing CCR Landfill)

The system is designed to detect monitored constituents at the waste boundary of Modules 1 through 3 of the COL Dry Ash Disposal Facility as required by 40 CFR 257.91(d). The groundwater monitoring system consists of two upgradient and three downgradient monitoring wells (**Table 1** and **Figure 2**). A separate groundwater monitoring system evaluates groundwater conditions for Module 4 of the COL Dry Ash Disposal Facility.

2.0 BACKGROUND

To provide context for the required annual report information, the following background information is provided in this section of the report, prior to the required information:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system

2.1 GEOLOGIC AND HYDROGEOLOGIC SETTING

2.1.1 Regional Information

For the purposes of groundwater monitoring, the surficial sand and gravel aquifer is considered to be the uppermost aquifer unit, as defined under 40 CFR 257.53, at the COL Ash Disposal Facility Modules 1 thought 3. Immediately underlying the surficial sand and gravel aquifer is the Cambrian-Ordovician sandstone aquifer. A summary of the regional hydrogeologic stratigraphy is presented in **Appendix A**.

The sand and gravel aquifer is capable of producing sufficient water for industrial or municipal use in some parts of Columbia County and is capable of producing sufficient water for domestic use in many areas, including along the Wisconsin River near the Columbia Energy Center (Harr et al., 1978). A map showing expected well yields within the sand and gravel aquifer in Columbia County is included in **Appendix A**.

Regional groundwater flow in the site vicinity is generally west toward the Wisconsin River. A map showing the regional water table elevations is included with the regional hydrogeologic information in **Appendix A**.

2.1.2 Site Information

Soils at the site are primarily sand to a depth of approximately 50 to 100 feet, and overlie sandstone bedrock. Soils encountered during the site feasibility study for the COL Ash Disposal Facility were described as generally sandy with interbedded silty clay lenses up to 20 feet thick (Warzyn, 1978). During drilling of CCR wells MW-301 and MW-302, the unconsolidated materials were identified as consisting primarily of silty sand and sand. Boring logs for previously installed monitoring wells MW-33AR, MW-34A, MW-84A, and M-4R show silty sand and sand as the primary unconsolidated materials at these locations. The boring logs for Ash Disposal Facility Modules 1 through 3 CCR monitoring wells are provided in **Appendix B**. All CCR monitoring wells are screened within the unconsolidated sand unit.

Shallow groundwater at the site generally flows to the north and west across the existing landfill area. The groundwater flow pattern on May 2020 is shown on **Figure 3**, and the groundwater flow pattern of the October 2020 sampling is shown on **Figure 4**. The groundwater elevation data for the CCR monitoring wells are provided in **Table 3.** Calculated horizontal gradients and flow velocities for each of the flow paths are provided in **Table 4.**

2.2 CCR RULE MONITORING SYSTEM

The groundwater monitoring system established in accordance with the CCR Rule consists of two upgradient (background) monitoring wells and three downgradient monitoring wells (**Table 1** and **Figure 2**). The background wells include MW-301 and MW-84A. The downgradient wells include MW-302, MW-33AR, and MW-34A. The CCR Rule wells are installed within the sand and gravel aquifer. Well depths range from approximately 29 to 40 feet, measured from the top of the well casing.

3.0 §257.90(e) ANNUAL REPORT REQUIREMENTS

Annual groundwater monitoring and corrective action report. *For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:*

3.1 §257.90(e)(1) SITE MAP

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

A map of the site location is provided on **Figure 1.** A map showing the Dry Ash Disposal Facility Modules 1 through 3 and all background (or upgradient) and downgradient monitoring wells with identification numbers for the groundwater monitoring program is provided as **Figure 2.** Other CCR units are also shown on **Figure 2.**

3.2 §257.90(e)(2) MONITORING SYSTEM CHANGES

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

No new monitoring wells were installed and no wells were decommissioned as part of the groundwater monitoring program for Modules 1 through 3 of the Dry Ash Disposal Facility in 2020.

3.3 §257.90(e)(3) SUMMARY OF SAMPLING EVENTS

In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

Two groundwater sampling events were completed in 2020 at the COL Dry Ash Disposal Modules 1 through 3 as part of ongoing detection monitoring.

Groundwater samples collected during the semiannual events, in May and October 2020, were analyzed for the Appendix III constituents. A summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection or assessment monitoring program is included in **Table 2.**

The sampling results for Appendix III parameters in 2020 are summarized in **Table 5.** Field parameter results for the 2020 sampling events are provided in **Table 6.** The analytical laboratory reports for 2020 are provided in **Appendix C.** Historical results for each monitoring well are summarized in **Appendix D.**

3.4 §257.90(e)(4) MONITORING TRANSITION NARRATIVE

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels);

There were no transitions between monitoring programs during 2020. The COL Dry Ash Disposal Facility, Modules 1 through 3, remained in the detection monitoring program.

In 2020, the monitoring results for the October 2019 and May 2020 monitoring events were evaluated for statistically significant increases (SSIs) in detection monitoring parameters relative to background. As part of the evaluation of the October 2019 monitoring results, the interwell UPLs were updated in January 2020 to be based on additional background monitoring results from the upgradient wells (MW-84A and MW-301). The Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (USEPA, 2009) recommends periodic updating of background; the UPL update calculations are included in **Appendix E.** The UPLs calculated in

January 2020 were applied to the evaluation of the October 2019, May 2020, and October 2020 monitoring results.

For the October 2019 and May 2020 events, SSIs for boron, chloride, and sulfate were identified, and an SSI for pH was identified for the May 2020 event. However, alternative source demonstrations (ASDs) were completed, demonstrating that sources other than the CCR units were the likely cause of the observed concentrations. The ASD reports are provided in **Appendix F.** A similar evaluation of alternative sources is anticipated to be performed in 2021 for SSIs identified in the October 2020 monitoring results.

3.5 §257.90(e)(5) OTHER REQUIREMENTS

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

Additional potentially applicable requirements for the annual report, and the location of the requirement within the Rule, are provided in the following sections. For each cited section of the Rule, the portion referencing the annual report requirement is provided below in italics, followed by applicable information relative to the 2020 Annual Groundwater Monitoring and Corrective Action Report for the CCR Units.

3.5.1 § 257.90(e) General Requirements

For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year.

Status of Groundwater Monitoring and Corrective Action Program: The groundwater monitoring and corrective action program was in detection monitoring throughout 2020.

Summary of Key Actions Completed:

- Statistical evaluation and determination of SSIs for the October 2019 and May 2020 monitoring events.
- ASD reports for the SSIs identified from the October 2019 and May 2020 monitoring events.
- Two semiannual groundwater sampling and analysis events (May and October 2020).

Description of Any Problems Encountered: No problems were encountered in 2020.

Discussion of Actions to Resolve the Problems: Not applicable.

Projection of Key Activities for the Upcoming Year (2021):

- Statistical evaluation and determination of any SSIs for the October 2020 and April 2021 monitoring events.
- If an SSI is determined, then within 90 days either:
  - Complete ASD (if applicable), or
  - Establish an assessment monitoring program.
- Two semiannual groundwater sampling and analysis events (April and October 2021).

3.5.2 §257.94(d) Alternative Detection Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. No alternative detection monitoring frequency has been proposed.

3.5.3 §257.94(e)(2) Alternative Source Demonstration for Detection Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

The ASD reports prepared to address the SSIs observed for the October 2019 and May 2020 sampling events are provided in **Appendix F.** The ASD reports are certified by a qualified professional engineer.

3.5.4 §257.95(c) Alternative Assessment Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. Assessment monitoring has not been initiated.

3.5.5 §257.95(d)(3) Assessment Monitoring Results and Standards

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

Not applicable. Assessment monitoring has not been initiated.

3.5.6 §257.95(g)(3)(ii) Alternative Source Demonstration for Assessment Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. Assessment monitoring has not been initiated.

3.5.7 §257.96(a) Extension of Time for Corrective Measures Assessment

The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measure due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. Corrective measures assessment has not been initiated.

3.6 §257.90(E)(6) OVERVIEW

A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit.

The specific requirements for the overview under §257.90(e)(6) are listed and the information is provided at the beginning of this report, before the Table of Contents.

4.0 REFERENCES

Harr, C.A., L.C. Trotta, and R.G. Borman, 1978, “Ground-Water Resources and Geology of Columbia County, Wisconsin,” University of Wisconsin-Extension Geological and Natural History Survey Information Circular Number 37, 1978.

U.S. Environmental Protection Agency (USEPA), 2009, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, EPA 530-R-09-007, March 2009.

Warzyn Engineering, Inc., 1978, Feasibility Study, Proposed Fly Ash and/or Scrubber Sludge Disposal Facility – Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

Tables

Table 1. Groundwater Monitoring Well Network
Columbia Energy Center Dry Ash Disposal Facility, Modules 1-3
SCS Engineers Project #25220067.00

Monitoring Well	Location in Monitoring Network	Role in Monitoring Network
MW-84A	Upgradient	Background
MW-301	Upgradient	Background
MW-302	Downgradient	Compliance
MW-34A	Downgradient	Compliance
MW-33AR	Downgradient	Compliance

Created by: RM Date: 12/14/2020
Last revision by: RM Date: 1/6/2021
Checked by: NDK Date: 1/7/2021

Table 2. CCR Rule Groundwater Samples Summary
Columbia Energy Center Dry Ash Disposal Facility, Modules 1-3
SCS Engineers Project #25220067.00

Sample Dates	Compliance Wells			Background Wells	
	MW-302	MW-34A	MW-33AR	MW-84A	MW-301
5/28-29/2020	D	D	D	D	D
10/8/2020	D	D	D	D	D
Total Samples	2	2	2	2	2

Abbreviations:
D = Required by Detection Monitoring Program
-- = Not sampled

Created by: ACW Date: 11/18/2019
Last revision by: RM Date: 1/7/2021
Checked by: NDK Date: 1/7/2021

Table 3. Groundwater Elevation

Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25220067.00

Dry Ash Facility (Facility ID #03025)	Well Number	MW-1AR	MW-4	MW-5R	MW-33AR	MW-33BR	MW-34A	MW-34B	MW-37A	MW-83	MW-84A	MW-84B	MW-86	MW-91AR	MW-91B	MW-92A	MW-92B
	Top of Casing Elevation (feet amsl)	822.55	819.74	805.44	808.29	808.39	805.95	806.05	813.04	807.96	814.28	814.26	824.79	809.03	808.45	808.47	808.41
	Screen Length (ft)																
	Total Depth (ft from top of casing)	44.40	39.58	25.97	31.08	57.50	35.43	56.95	31.80	25.42	40.21	52.02	45.43	32.90	52.38	28.94	51.75
	Top of Well Screen Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66
	Measurement Date																
	October 2, 2012	783.41	783.70	784.96	782.38	782.23	783.03	782.99	782.66	dry	783.84	783.94	783.81	784.09	783.90	784.49	784.06
	April 15, 2013	785.44	784.02	786.09	784.16	784.14	784.74	784.79	783.87	784.49	785.83	785.76	785.22	785.14	785.01	785.75	785.34
	October 8, 2013													785.66	785.42	785.97	785.52
	October 15, 2013	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.66	785.42	785.97	785.52
	April 14, 2014	784.95	784.09	785.63	783.74	783.91	784.63	784.70	783.45	783.73	785.58	785.52	784.96	785.04	784.96	785.99	785.54
	October 2-3, 2014	785.03	785.39	786.08	784.37	784.28	784.57	784.54	784.56	dry	785.24	785.18	785.19	785.47	785.28	785.75	785.33
	April 13-14, 2015	783.96	783.63	785.25	783.01	782.74	783.65	783.95	782.87	dry	784.43	784.51	784.17	784.48	784.37	785.07	784.66
	October 6-7, 2015	784.28	784.44	785.72	783.68	783.33	784.05	784.02	783.66	dry	784.80	784.76	784.66	784.89	784.70	785.20	784.76
	April 4-6, 2016	785.82	aband	787.02	785.29	785.07	785.63	785.67	784.76	785.43	786.37	786.26	785.89	786.05	785.95	786.61	786.21
	October 11-13, 2016	786.64	aband	788.00	787.36	786.46	786.45	786.32	786.40	786.81	787.22	787.11	786.96	787.17	786.81	787.68	787.25
	April 10-13, 2017	786.96	aband	788.13	786.39	785.99	786.30	786.28	786.34	786.23	787.16	787.06	786.96	787.24	787.03	787.90	787.60
	October 3-5, 2017	785.48	aband	786.66	784.51	784.22	784.67	784.63	784.86	784.29	NM	786.49	785.58	786.08	785.83	786.47	786.02
	October 9-10, 2017	NM	aband	NM	NM	NM	NM	NM	NM	NM	785.56 (6)	NM	NM	NM	NM	NM	NM
	February 21, 2018	783.97	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.68	784.46	NM	NM
	April 23-25, 2018	783.99	aband	785.36	783.09	786.36	781.77	780.79	783.28	783.32	785.88	784.91	782.54	784.71	784.53	785.23	784.81
	October 23-25, 2018	788.25	aband	789.71	788.77	787.96	787.88	787.73	787.62	788.26	788.32	788.19	788.21	788.59	788.31	789.32	788.87
	April 1-4, 2019	787.05	aband	788.64	786.63	786.54	786.82	786.92	786.47	786.78	787.35	787.34	787.16	787.45	787.18	788.04	787.63
	October 7-9, 2019	787.26	aband	789.23	788.26	787.64	787.92	787.74	786.77	788.90	787.79	787.73	787.44	787.78	787.62	788.63	788.17
	May 27-28, 2020	786.92	aband	788.34	786.01	785.75	785.98	785.99	786.22	786.03	787.02	786.99	786.94	787.26	787.05	787.86	787.47

Ash Pond Facility (Facility ID #02325)	Well Number	M-3	M-4R	MW-39A	MW-39B	MW-48A	MW-48B	MW-57	MW-59	MW-216R	MW-217	MW-220RR	SG-1	SG-2	SG-3	SG-4
	Top of Casing Elevation (feet amsl)	788.23	806.10	809.62	809.50	828.86	828.84	786.29	815.48	814.21	791.55	792.90	792.06	795.25	808.60	805.36
	Screen Length (ft)															
	Total Depth (ft from top of casing)	16.90	25.55	34.80	76.07	51.88	75.80	14.40	38.50	37.85	37.37	18.96	--	--	--	--
	Top of Well Screen Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94	--	--	--	--
	Measurement Date															
	October 2, 2012	780.13	786.76	781.49	781.34	782.03	781.93	780.58	779.88	781.91	780.95	780.55	789.14	793.85	dry	dry
	April 15, 2013	785.16	788.39	783.97	784.00	783.77	783.78	784.69	783.66	784.09	784.75	785.02	789.5(1)	NM	dry	dry
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36	789.5(1)	791.33	dry	dry
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM	NM	NM	NM	NM
	April 14, 2014	786.04	788.96	783.57	783.68	783.56	783.57	785.51	783.41	783.73	785.25	785.87	788.90	dry	dry	dry
	October 1-3, 2014	781.16	787.55	783.42	783.32	784.05	783.94	782.32	783.55	783.79	782.63	783.03	NM	dry	dry	dry
	April 13-14, 2015	783.08	786.83	782.77	782.68	782.80	782.82	782.81	782.83	782.93	783.34	783.42	789.3	791.70	dry	dry
	October 6-7, 2015	780.66	786.12	782.97	782.81	783.10	783.01	781.82	783.25	783.18	781.95	782.26	788.48	791.58	dry	dry
	April 4-6, 2016	784.21	789.09	785.27	785.27	784.79	784.76	783.21	784.97	785.68	785.02	784.36	NM	793.40	dry	dry
	October 11-13, 2016	781.88	787.88	785.75	785.52	785.73	785.61	783.12	786.51	786.16	783.75	784.09	788.32	792.52	dry	dry
	April 10-13, 2017	782.94	787.95	785.44	785.20	785.82	785.69	782.77	786.09	785.95	784.29	784.09	788.31	793.85	dry	dry
	October 3-5, 2017	780.93	787.04	783.35	783.18	784.30	784.19	782.37	784.23	783.89	782.48	782.61	788.3	793.45	dry	dry
	April 23-25, 2018	782.89	790.43	782.86	782.87	783.14	783.09	783.04	783.02	783.23	783.26	783.45	788.38	>795.25	dry	dry
	October 23-25, 2018	782.95	788.47	787.12	786.88	787.12	786.99	783.48	787.73	787.49	784.90	784.52	787.76	793.25	dry	dry
	April 1-4, 2019	785.68	789.44	786.28	786.31	786.56	786.45	785.27	787.39	786.53	786.33	785.46	--	794.60	dry	dry
	October 7-9, 2019	785.33	790.65	787.10	787.02	786.68	786.65	785.29	786.68	787.07	786.01	785.42	748.48	795.20	dry	dry
	May 27-29, 2020	781.80	787.73	785.12	784.92	785.74	785.59	783.11	785.89	785.60	783.41	783.89	748.48	>795.25	dry	dry
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94	--	--	--	--

Table 3. Groundwater Elevation
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25220067.00

CCR Rule Wells	Well Number	MW-301	MW-302	MW-303	MW-304	MW-305	M-4R	MW-33AR	MW-34A	MW-84A	MW-306	MW-307	MW-308	MW-309	MW-310	MW-311
	Top of Casing Elevation (feet amsl)	806.89	813.00	811.52	805.42	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74
	Screen Length (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Total Depth (ft from top of casing)	29.40	33.6	35.80	25.7	25.6	39.58	31.08	35.43	40.21	27	26.5	28	37.67	38.41	36.19
	Top of Well Screen Elevation (ft)	787.49	789.40	785.72	789.72	790.72	776.52	787.21	780.52	784.07	790.63	790.39	788.90	785.60	785.21	783.55
	Measurement Date													--	--	--
	December 21-22, 2015	NM	784.78	784.11	786.13	788.96	787.58	783.77	783.50	785.31	--	--	--	--	--	--
	April 4-5, 2016	786.78	785.81	785.48	788.08	789.61	789.09	785.29	785.63	786.37	--	--	--	--	--	--
	July 7-8, 2016	786.31	786.28	784.60	787.36	789.26	787.43	785.19	785.05	785.89	--	--	--	--	--	--
	July 28, 2016	NM	NM	784.35	NM	NM	NM	NM	784.86	785.61	--	--	--	--	--	--
	October 11-13, 2016	787.64	787.76	786.18	788.18	789.78	787.88	787.36	786.45	787.22	--	--	--	--	--	--
	December 29, 2016	787.37	787.05	NM	NM	NM	NM	785.66	785.72	786.63	--	--	--	--	--	--
	January 25-26, 2017	787.27	786.89	785.28	789.34	789.36	789.64	785.88	785.98	786.70	785.50	785.36	785.73	--	--	--
	April 10 & 11, 2017	787.89	787.55	786.00	788.22	789.57	787.95	786.39	786.30	787.16	786.22	785.64	786.51	--	--	--
	June 6, 2017	788.25	788.37	786.49	788.58	789.79	787.83	787.27	786.66	787.63	786.85	786.07	786.46	--	--	--
	August 7-9, 2017	787.34	787.55	785.42	789.52	789.30	788.54	786.11	785.81	786.68	785.69	785.19	785.37	--	--	--
	October 23-24, 2017	785.89	785.94	783.92	788.97	788.14	788.00	784.13	784.50	785.32	783.97	784.79	784.17	--	--	--
	February 21, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.19	783.05	783.02
	March 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.10	783.10	783.00
	April 23-25, 2018	785.29	784.37	783.27	789.69	787.67	790.43	783.09	781.77	785.88	783.24	783.65	782.65	783.07	782.97	781.83
	May 24, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.79	785.09	NM	785.45	785.97	786.11
	June 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.03	786.64	786.47
	July 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.27	786.35	786.55
	August 7, 2018	787.06	NM	785.20	788.25	788.56	787.63	NM	NM	786.55	NM	NM	NM	NM	NM	NM
	August 22, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.54	785.40	785.46
	September 21, 2018	NM	788.37	786.50	NM	NM	NM	787.90	787.01	NM	NM	NM	NM	787.08	787.24	787.66
	October 22-24, 2018	788.98	789.16	787.51	789.05	790.04	788.47	788.77	787.88	788.32	787.66	786.57	787.81	787.99	788.18	788.64
	April 1-4, 2019	787.04	787.56	786.52	789.72	790.07	789.44	786.63	786.82	787.35	786.72	786.71	787.53	786.30	786.38	786.38
	June 12, 2019	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	787.25	NM
	June 19, 2019	NM	NM	786.81	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	October 7-9,2019	788.47	788.31	787.02	790.41	790.36	790.65	NM	NM	NM	787.47	786.99	787.18	787.26	787.94	787.64
	December 13, 2019	--	--	--	--	--	--	--	--	--	787.03	785.68	786.43	--	--	--
	December 23, 2019	--	--	--	--	--	--	--	--	--	--	--	--	--	775.22	--
	January 17, 2020	--	--	785.58	--	--	--	--	--	--	--	--	--	--	--	--
	February 3, 2020	787.24	NM	NM	NM	NM	NM	NM	NM	786.50	785.77	785.57	786.48	NM	NM	NM
	May 27-29, 2020	787.77	787.29	785.56	789.30	787.78	787.73	786.01	785.98	787.02	785.77	785.35	786.28	785.98	785.81	785.85
	June 30, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM
	August 6, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM
	October 7-8, 2020	786.53	786.74	785.16	788.52	787.96	787.74	785.91	785.70	786.10	785.39	784.71	785.68	785.47	785.56	785.83
	December 11, 2020	--	--	--	--	788.19	--	--	--	--	--	--	--	785.26	785.26	--
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	780.63	780.39	778.90	775.60	775.21	773.55

Notes:
NM = not measured

Created by: MDB Date: 5/6/2013
Last revision by: NDK Date: 12/11/2020
Checked by: JSN Date: 12/17/2020
Proj Mgr QA/QC: TK Date: 1/6/2021

(1) The elevation for SG-1 is read off of the staff gauge (rather than measured from the top of the gauge).
(2) SG-2 could not be located during the April 2013 event.
(3) SG-3 could not be located during the October 2013 event. SG-1 could not be safely accessed during the October 2013 event.
(4) LH-2 measurements are given as leachate depth, measured by a transducer.
(5) LH-2 and LH-3 measurements were collected by WPL staff on October 9, 2017.
(6) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5 sampling event. The level was allowed to return to static and was measured on 10/10/2017.

Table 4. Horizontal Gradients and Flow Velocity
Columbia Energy Center - MOD 1-3 /
SCS Engineers Project #25220067.00
January - December 2020

	North				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
5/27-29/2020	787.00	785.98	305.25	0.0033	0.085
10/7-8/2020	786.00	785.47	848.55	0.0006	0.016

	Northwest				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
10/7-8/2020	786.00	785.91	379.40	0.0002	0.006

	West				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
5/27-29/2020	787.00	786.01	201.35	0.0049	0.125

Wells	**K Values (cm/sec)**	**K Values (ft/d)**
MW-34A	N/A	N/A
MW-302	3.22E-02	91.2
MW-33AR	4.01E-04	1.1
Geometric	3.59E-03	10.2

Assumed Porosity, n
0.40

Groundwater flow velocity equation: V = [K*(Δh/Δl)] / n

ft = feet
ft/d = feet per day
K = hydraulic conductivity
n = effective porosity
V = groundwater flow velocity

h1, h2 = point interpreted groundwater elevation at locations 1 and 2
Δl = distance between location 1 and 2
Δh/Δl = hydraulic gradient

Created by:	RM	Date: 12/29/2020
Last revision by:	RM	Date: 1/15/2021
Checked by:	NDK	Date: 1/15/2021

Table 5. 2020 Groundwater Analytical Results Summary
Columbia Secondary Pond / SCS Engineers Project #25220067.00

			Background Wells				Compliance Wells					
Parameter Name	UPL Method	UPL	MW-301		MW-84A		MW-33AR		MW-34A		MW-302	
			5/29/2020	10/8/2020	5/29/2020	10/8/2020	5/28/2020	10/8/2020	5/28/2020	10/8/2020	5/29/2020	10/8/2020
Appendix III												
Boron, µg/L	P	35	21.3	28.8	10.0	9.70 J	566	569	210	213	611	648
Calcium, µg/L	NP	129,000	112,000	93,000	77,600	69,200	58,400	57,100	58,700	61,300	90,500	80,600
Chloride, mg/L	P	6.02	2.00 J	3.40	3.70	4.30	15.9	27.3	3.90	2.10	1.20 J	1.10 J
Fluoride, mg/L	DQ	DQ	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095
Field pH, Std. Units	P	7.76	6.73	6.95	7.34	7.49	7.59	7.70	7.40	7.81	7.20	7.21
Sulfate, mg/L	P	30.8	11.5	25.1	1.50 J	1.30 J	104	97.4	44.4	58.7	34.6	36.5
Total Dissolved Solids, mg/L	NP	514	452	412	340	320	376	270	284	306	404	378

Abbreviations:

UPL = Upper Prediction Limit
mg/L = milligrams per liter
GPS = Groundwater Protection Standard
µg/L = micrograms per liter
LOD = Limit of Detection
LOQ = Limit of Quantitation

P = Parametric UPL with 1-of-2 retesting
NP = Nonparametric UPL (highest background value) with 1-of2- retesting

J = Estimated concentration at or above the LOD and below the LOQ.
* = UPL is below the LOQ for background sampling. For compliance wells, only results confirmed above the LOQ are evaluated as potential Statistically Significant Increases above background.
DQ = Double Quantification Rule (not detected in background)

Notes:

1. An individual result above the UPL or GPS does not constitute an SSI above background or statistically significant level above the GPS. See the accompanying letter text for identification of statistically significant results.
2. GPS is the United States Environmental Protection Agency (USEPA) Maximum Contamination Level (MCLs), if established; otherwise, the values from 40 CFR 257.95(h)(2).
3. Interwell UPLs calculated based on results from background wells MW-84 and MW-301.

Created by: NDK Date: 5/16/2019
Last revision by: JSN Date: 1/8/2021
Checked by: NDK Date: 1/8/2021
Proj Mgr QA/QC: TK Date: 1/15/2021

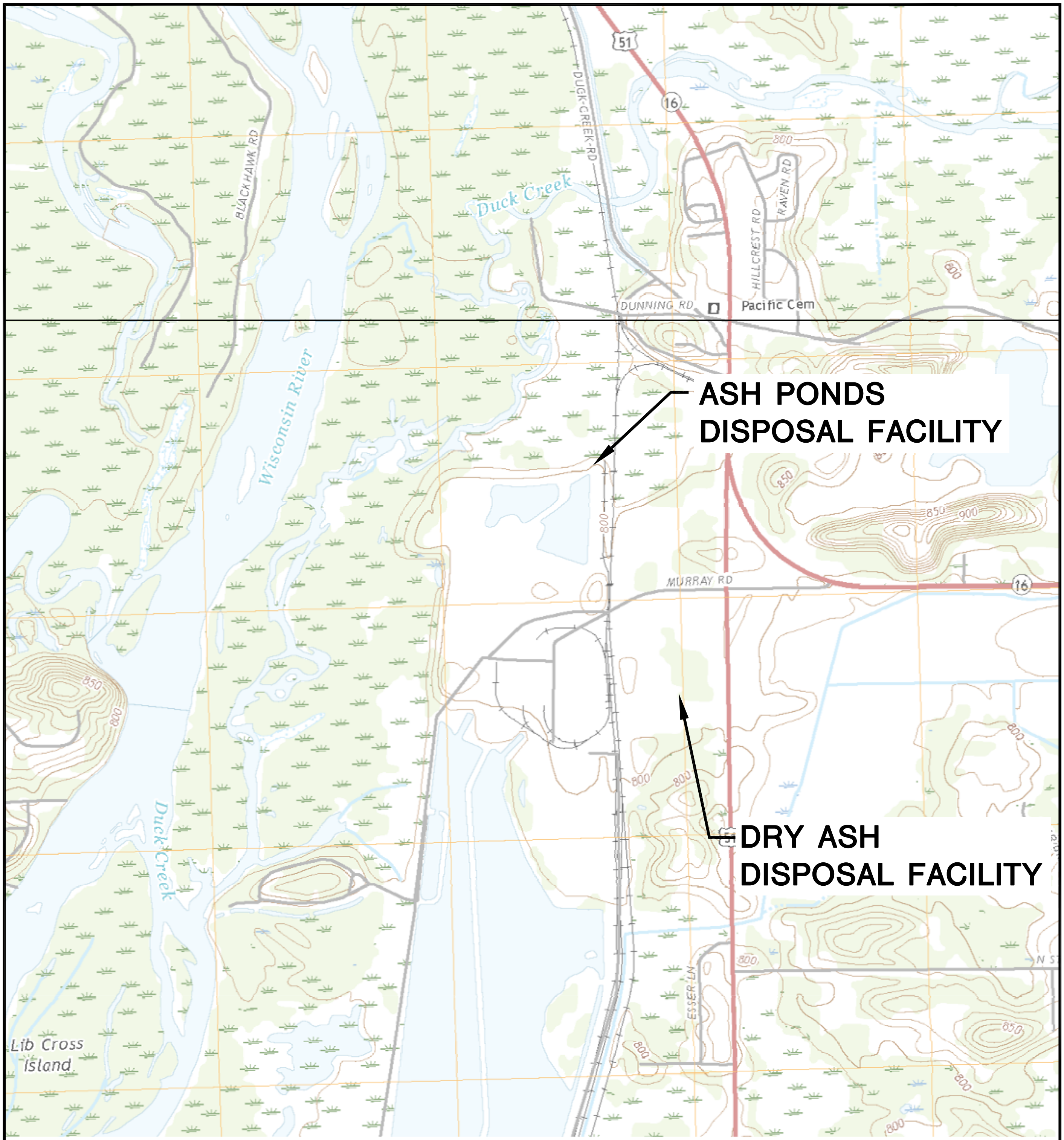
I:\25220067.00\Deliverables\2020 Fed Annual Report - COL MOD 1-3\Tables\[Table 5 - 2020 Groundwater Analytical Results Summary.xlsx]Table 5 - 2020 Analytical

Table 6. 2020 Groundwater Field Data Summary
Columbia Energy Center - Dry Ash Disposal Facility - MOD 1-3 / SCS Engineers Project #25220067.00
January - December 2020

Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-84A	5/29/2020	787.02	10.60	7.34	9.81	613.7	135.0	2.15
	10/8/2020	786.10	11.90	7.49	9.39	610.1	153.2	0.00
MW-301	5/29/2020	787.77	8.10	6.73	2.00	797	118.7	0.00
	10/8/2020	786.53	11.00	6.95	1.22	760	183.9	0.00
MW-302	5/29/2020	787.29	9.80	7.20	10.00	694.7	169.2	2.88
	10/8/2020	786.74	11.80	7.21	9.21	643.1	152.7	0.00
MW-33AR	5/28/2020	786.01	10.70	7.59	10.35	633.4	199.4	0.00
	10/8/2020	785.91	13.80	7.70	9.31	623.5	160.4	0.00
MW-34A	5/28/2020	785.98	11.10	7.40	10.12	459	198.5	84.51
	10/8/2020	785.70	12.90	7.81	9.88	464.2	143.2	55.00

Created by: RM Date: 12/22/2020
Last revision by: RM Date: 1/6/2021
Checked by: NDK Date: 1/8/2021

Figures



N

POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'

CLIENT
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SITE
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WI

SITE LOCATION MAP

PROJECT NO.	25220067.00	DRAWN BY:	BSS
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	01/10/2020	APPROVED BY:	TK 04/10/2020

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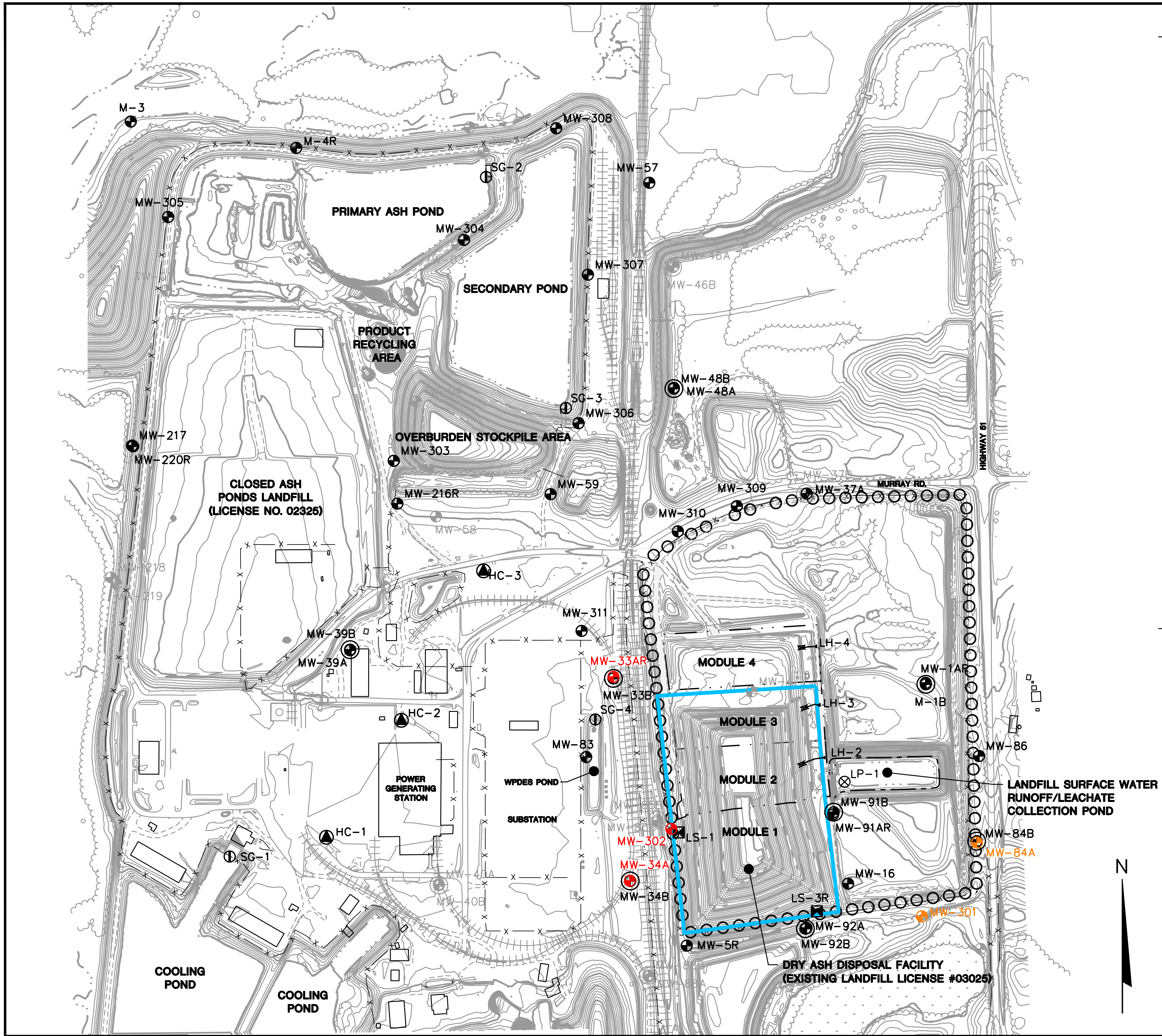
FIGURE
1

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Site Location Map.dwg, 4/12/2020 7:05:09 PM



LEGEND

—	EXISTING MAJOR CONTOUR (10' INTERVAL)
—	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—	EXISTING FENCELINE
┼┼┼┼┼┼┼┼	EXISTING TRACKS
═	EXISTING PAVED ROAD
========	EXISTING UNPAVED ROAD
— · · · —	EDGE OF WATER
○○○○○○	APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
— · · —	CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
▲	WATER SUPPLY WELL
◐	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
⇝	LEACHATE HEADWELL
—	CCR UNIT
🔴	CCR MONITORING WELL
🟠	CCR BACKGROUND MONITORING WELL

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, MAY 2019 AND SEPTEMBER 2020.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. BACKGROUND MONITORING WELLS FOR THE MODULE 1-3 DRY ASH DISPOSAL FACILITY ARE: MW-301 AND MW-84A.

500 0 500

SCALE: 1" = 500'

PROJECT NO.	25220067.00	DRAWN BY:	BSS/ZTW
DRAWN:	12/02/2019	CHECKED BY:	TK
REVISED:	01/05/2021	APPROVED BY:	TK 01/28/2021

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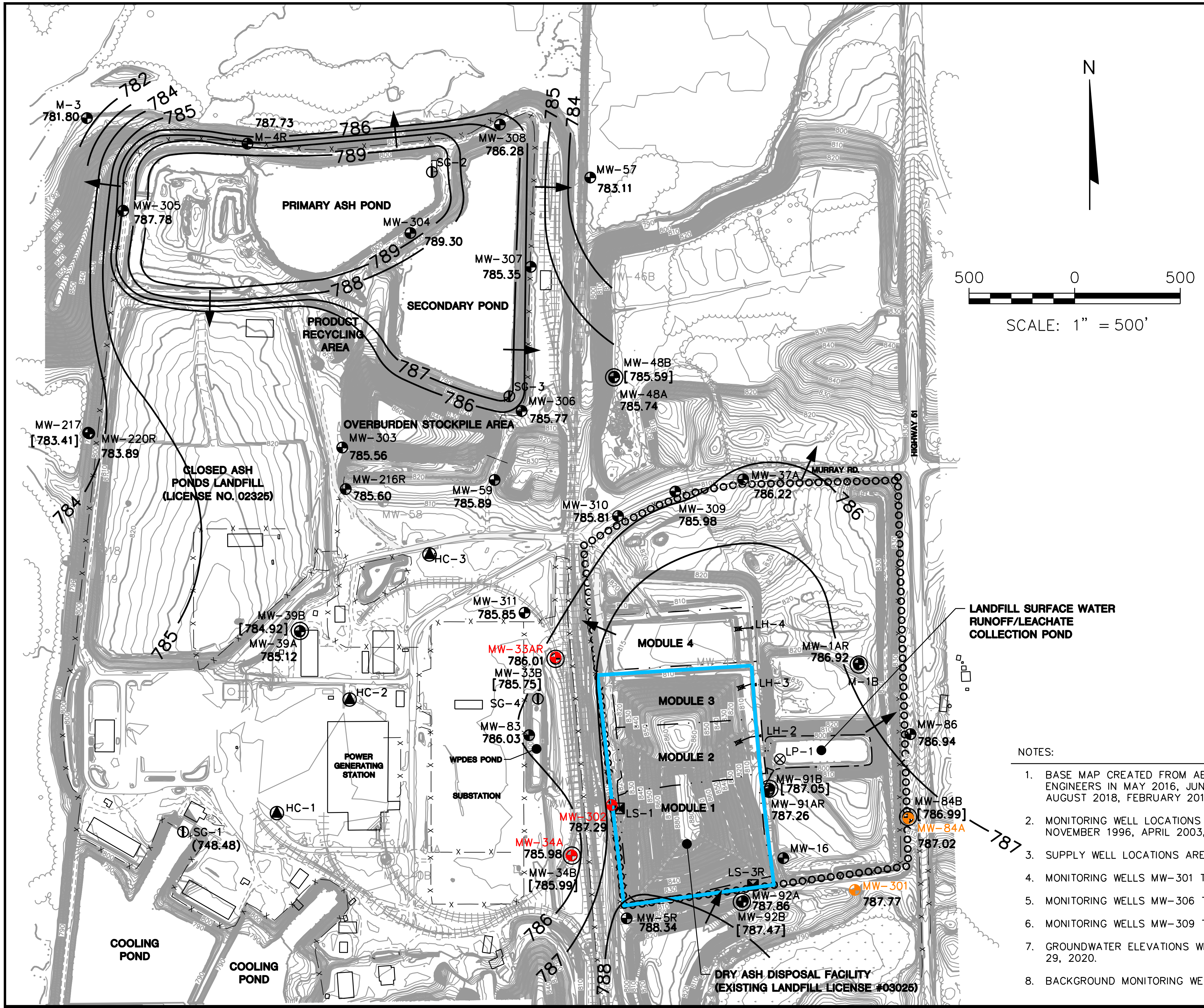
MODULE 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE
2

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Site Plan and Monitoring Well LocationsMOD1-3.dwg, 1/28/2021 11:32:08 AM



LEGEND

	EXISTING MAJOR CONTOUR (10' INTERVAL)
	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—	EXISTING FENCE LINE
	EXISTING TRACKS
	EXISTING PAVED ROAD
	EXISTING UNPAVED ROAD
	EDGE OF WATER
oooooooo	APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
	CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
	WATER SUPPLY WELL
	STAFF GAUGE
	WATER TABLE WELL
	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
	LYSIMETER
	ABANDONED WATER TABLE WELL
	ABANDONED PIEZOMETER
	LEACHATE HEADWELL
	CCR UNIT
	CCR MONITORING WELL
	CCR BACKGROUND MONITORING WELL
787.62	WATER TABLE ELEVATION MEASURED MAY 2020
[788.87]	POTENTIOMETRIC SURFACE ELEVATION MEASURED MAY 2020 (NOT CONTOURED)
(795.20)	SURFACE WATER ELEVATION MEASURED MAY 2020 (NOT CONTOURED)
	WATER TABLE CONTOUR
→	APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. GROUNDWATER ELEVATIONS WERE COLLECTED FROM MONITORING WELLS AND PIEZOMETERS ON MAY 27 THROUGH MAY 29, 2020.
8. BACKGROUND MONITORING WELLS FOR THE MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.

PROJECT NO.	25220067.00	DRAWN BY:	BSS
DRAWN:	08/26/2020	CHECKED BY:	NDK
REVISED:	08/26/2020	APPROVED BY:	SCC 09/25/2020

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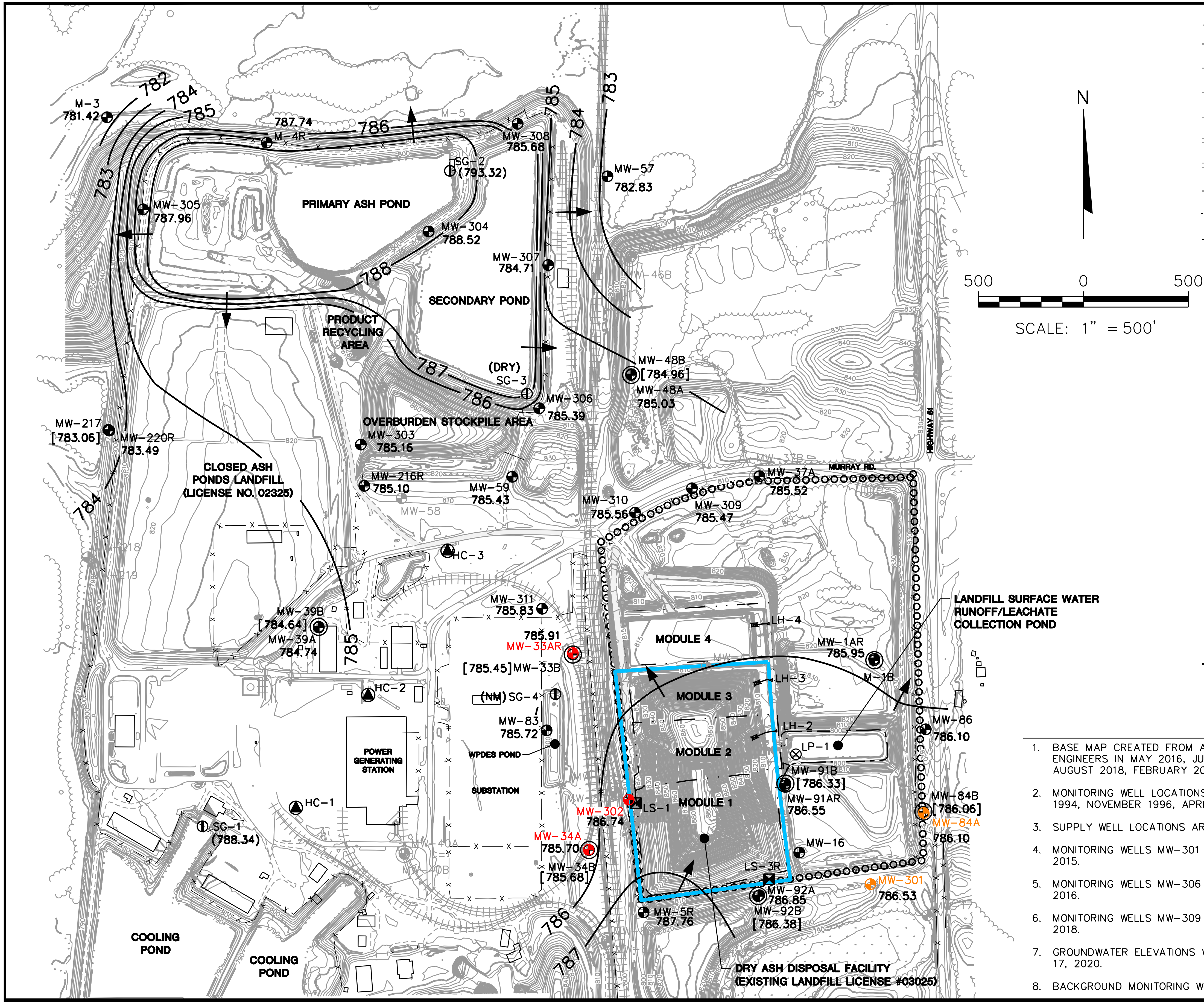
WATER TABLE MAP
MAY 2020

FIGURE
3

I:\25220067.00\Drawings\Water Table Map Ma□2020 MOD1-3.dwg, 1/20/2021 1:30:32 PM



LEGEND

——	EXISTING MAJOR CONTOUR (10' INTERVAL)
——	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—	EXISTING FENCE LINE
┼┼┼┼┼┼┼┼┼┼	EXISTING TRACKS
══	EXISTING PAVED ROAD
======	EXISTING UNPAVED ROAD
—··—	EDGE OF WATER
·oooooooo	APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
—·—·—	CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
◐	WATER TABLE WELL
◉	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
⧗	LYSIMETER
◐	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
↗	LEACHATE HEADWELL
🟦	CCR UNIT
🔴	CCR MONITORING WELL
🟠	CCR BACKGROUND MONITORING WELL
787.62	WATER TABLE ELEVATION MEASURED OCTOBER 2020
[788.87]	POTENTIOMETRIC SURFACE ELEVATION MEASURED OCTOBER 2020 (NOT CONTOURED)
(795.20)	SURFACE WATER ELEVATION MEASURED OCTOBER 2020 (NOT CONTOURED)
——	WATER TABLE CONTOUR
→	APPROXIMATE GROUNDWATER FLOW DIRECTION
(NM)	NOT MEASURED

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
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5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. GROUNDWATER ELEVATIONS WERE COLLECTED FROM MONITORING WELLS AND PIEZOMETERS ON OCTOBER 7, 8, and 17, 2020.
8. BACKGROUND MONITORING WELLS FOR THE MODULE 1-3 ASH DISPOSAL FACILITY ARE: MW-301 AND MW-84A

PROJECT NO.	25220067.00	DRAWN BY:	KP/ZTW
DRAWN:	08/07/2020	CHECKED BY:	TK
REVISED:	12/10/2020	APPROVED BY:	TK 01/28/2021

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WATER TABLE MAP
OCTOBER 2020

FIGURE
4

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Water Table Map Oct 2020 MOD1-3.dwg, 1/28/2021 11:36:38 AM

Appendix A

Regional Hydrogeologic Stratigraphy

Table COL-3. Regional Hydrogeologic Stratigraphy
Columbia Energy Center / SCS Engineers Project #25215053

Approximate Age	Hydrogeologic Unit	General Thickness (feet)	Name of Rock Unit*	Predominant Lithology
Quaternary (0-1 million years old)	Surficial Aquifer	0 to 300+	Holocene & Pleistocene Deposits	• Unconsolidated clay, silt, sand, gravel, cobbles, boulders, and organic matter
Ordovician (460 to 490 million years old)	Sandstone Aquifer	0 to 800+	Galena Decorah Platteville St. Peter Prairie du Chien	• Dolomite and shaley dolomite • Sandstone
Cambrian (490 to 500 million years old)			Trempeleau Franconia Galesville Eau Claire Mt. Simon	• Sandstone
Precambrian (more than 1 billion years old)	Used for domestic supply in some areas	--	Precambrian	• Igneous and metamorphic rocks

*This nomenclature and classification of rock units in this report are those of the Wisconsin Geological and Natural History Survey and do not necessarily coincide with those accepted by the U.S. Geological Survey.

Sources:
Harr, C.A., L.C. Trotta, and R.G. Borman, “Ground-Water Resources and Geology of Columbia County, Wisconsin,” University of Wisconsin-Extension Geological and Natural History Survey Information Circular Number 37, 1978.
Wisconsin Geological and Natural History Survey, Bedrock Stratigraphic Units in Wisconsin, UW Extension Educational Series 51, ISSN: 1052-2115, 2011.

I:\25215053\Reports\Report 3 - Columbia\Tables\Table_2_Regional_Hydrogeologic_Stratigraphy.doc

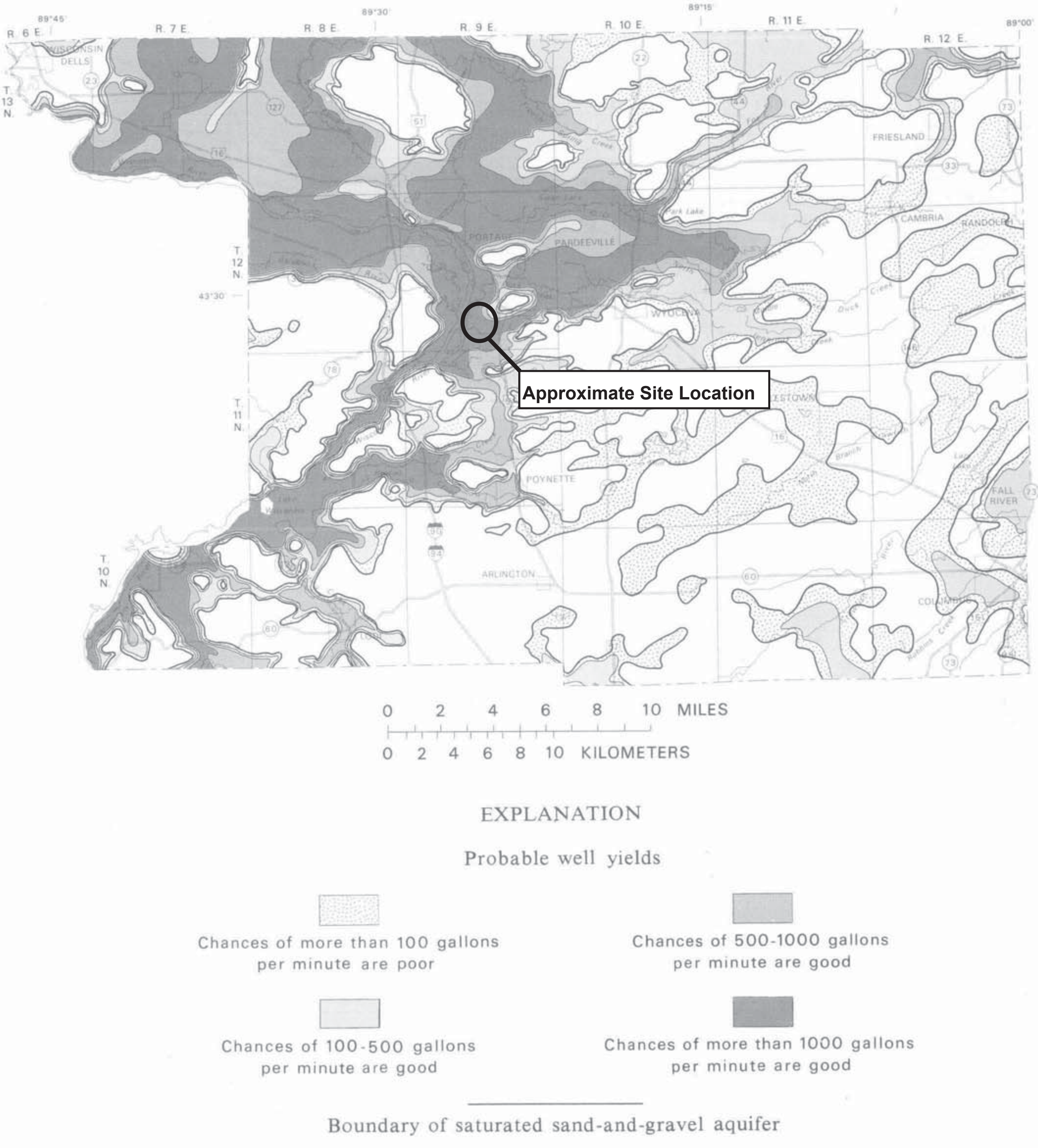
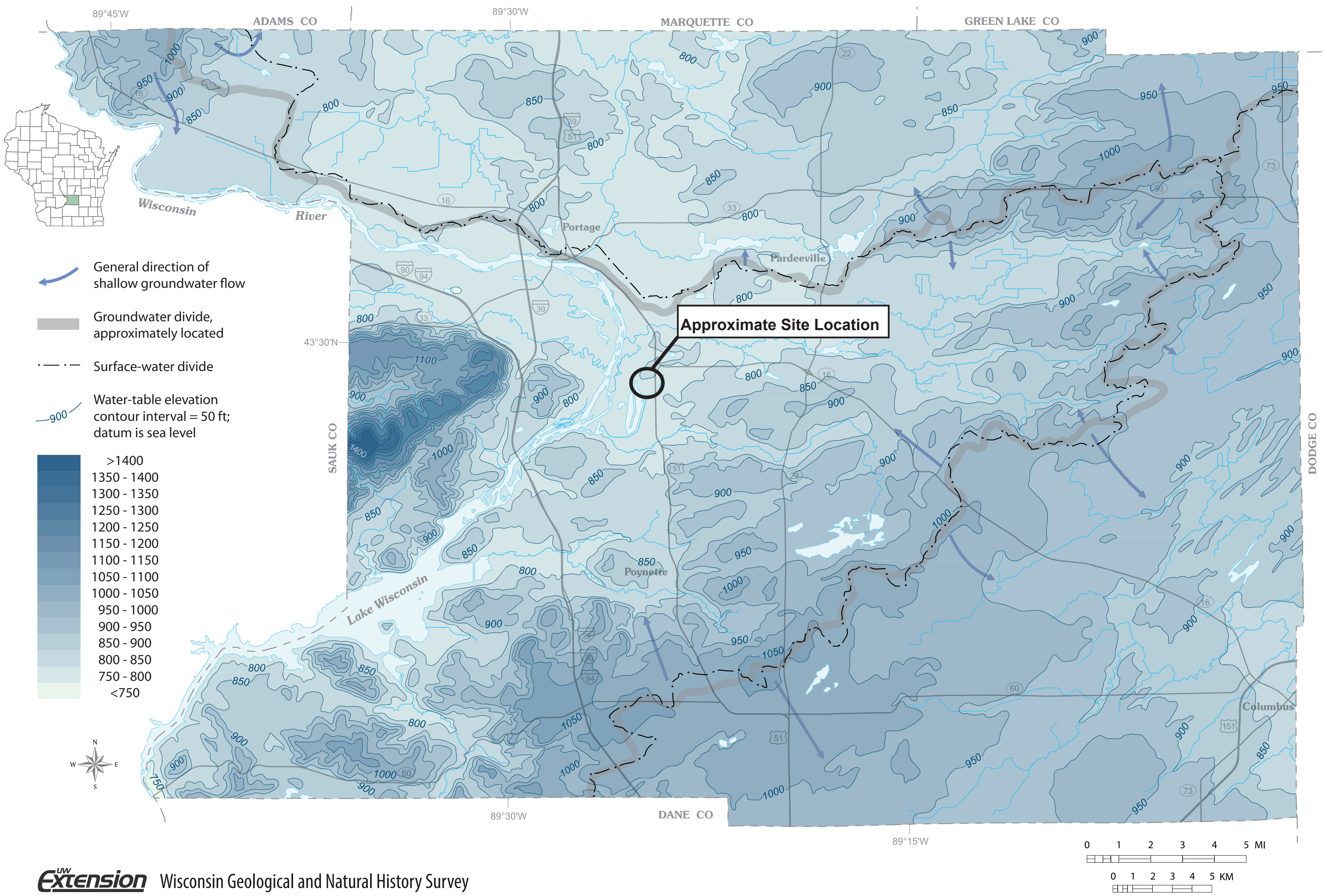


Figure 9. Probably well yields from the sand-and-gravel aquifer.

Source: Harr, C.A., L.C. Trotta, and R.G. Borman, "Ground-Water Resources and Geology of Columbia County, Wisconsin," University of Wisconisn-Extension Geological and Natural History Surevy Information Circular Number 37, 1978.

Generalized water-table elevation in Columbia County, Wisconsin



Extension Wisconsin Geological and Natural History Survey

Source: Sellwood, Stephen M., Wisconsin Geologic and Natural History Survey, Water Table Elevation, Groundwater Resources of Columbia County Wisconsin,

Appendix B

Boring Logs and Well Construction Documentation

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 2

Facility/Project Name WPL-Columbia SCS#: 25215135.00		License/Permit/Monitoring Number		Boring Number MW-301	
Boring Drilled By: Name of crew chief (first, last) and Firm Kevin Durst Badger State Drilling		Date Drilling Started 11/11/2015	Date Drilling Completed 11/11/2015		Drilling Method hollow stem auger
WI Unique Well No. VY701	DNR Well ID No.	Common Well Name	Final Static Water Level Feet	Surface Elevation 803.69 Feet	Borehole Diameter 8.5 in.

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 541562.2 N, 2025001.0 E S/C/N
1/4 of 1/4 of Section 27, T 12 N, R 9 E
Lat ° ' "
Long ° ' "
Local Grid Location
Feet ☐ N ☐ S
Feet ☐ E ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Columbia	11	Portage

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Pocket Penetration (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				SILTY SAND, yellowish brown (10YR 5/6), fine to medium grained.										
			1											
S1	21	7 6 9 10	2							M				
			3											
S2	20	6 7 9 10	4	Same as above except, 10YR 5/4 (top section), 10YR 3/6 (bottom section), trace gravel.						M				
			5											
			6	Same as above except, 10YR 3/4 (bottom), 10YR 5/4 (top), trace little roots and sticks, trace gravel.										
S3	22	7 6 9 6	7		SM					M				
			8											
			9	Same as above except, 10YR (top), 10YR 4/6 (bottom), trace clay at bottom.										
S4	21	4 5 6 5	10							M				
			11	Same as above except, fine to coarse grained sand, little gravel, trace clay in top half, 10YR 3/6.										
S5	18	2 2 4 5	12							M				
			13											
			14	Same as above except, 10YR 6/8.										
S6	20	2 3 3 3	15							M				

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm SCS Engineers 2830 Dairy Drive Madison, WI 53711	Tel: (608) 224-2830 Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-301   Use only as an attachment to Form 4400-122.   Page 2 of 2

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			16	SILTY SAND, yellowish brown (10YR 5/6), fine to medium grained.	SM									
S7	20	5 4 4 3	17							M				
			18											
			19											
S8	20	2 4 4 5	20							W				
			21											
S9	23	4 4 3 6	22							W				
			23											
			24	Same as above except, 10YR 6/4.										
S10	21	3 2 4 10	25							W				
			26											
			27											
			28	End of boring at 28 ft bgs.										

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 2

Facility/Project Name WPL-Columbia SCS#: 25215135.00			License/Permit/Monitoring Number		Boring Number MW-302
Boring Drilled By: Name of crew chief (first, last) and Firm Kevin Durst Badger State Drilling			Date Drilling Started 11/11/2015	Date Drilling Completed 11/12/2015	Drilling Method hollow stem auger
WI Unique Well No. VY702	DNR Well ID No.	Common Well Name	Final Static Water Level Feet	Surface Elevation 809.93 Feet	Borehole Diameter 8.5 in.

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Pla 541964.7 N, 2123849 E S/C/N
1/4 of 1/4 of Section 27, T 12 N, R 9 E

Lat ° ' "
Long ° ' "

Local Grid Location
Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Columbia	11	Portage

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				SILTY SAND, fine to medium grained, trace gravel, 10YR 5/6.										
			1											
S1	12	10 13 17 16	2							M				
			3											
			4	Same as above except, large gravel at bottom, trace to little gravel.										
S2	12	10 12 8 6	5							M				
			6	Same as above except, 10YR 4/6.										
S3	20	2 4 4 5	7		SM					M				
			8											
			9	Same as above except, 10YR 5/8.										
S4	23	3 3 4 5	10							M				
			11	Same as above except, 10YR 6/6.										
S5	20	3 3 3 4	12							M				
			13											
			14	POORLY GRADED SAND, 10YR 6/6.										
S6	20	3 4 4 7	15		SP					M				

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature for Zach Watson

Firm SCS Engineers
2830 Dairy Drive Madison, WI 53711
Tel: (608) 224-2830
Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-302 Use only as an attachment to Form 4400-122. Page 2 of 2

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			16	POORLY GRADED SAND, light tan 10YR 8/3.										
S7	20	6 8 10 12	17							M				
			18											
			19		SP									
S8	20	5 6 8 8	20							M				
			21											
S9	19	3 3 3 2	22							M				
			23											
			24	SILTY SAND, 10YR 5/6.	SM									
S10	20	3 3 8 8	25	POORLY GRADED SAND, 10YR 8/3.						W				
			26	Same as above except, light tan 10YR 6/6.										
S11	23	5 9 12 12	27							W				
			28											
			29											
			30		SP									
			31											
			32											
			33											
			34											
			35	End of boring at 35 ft bgs.										

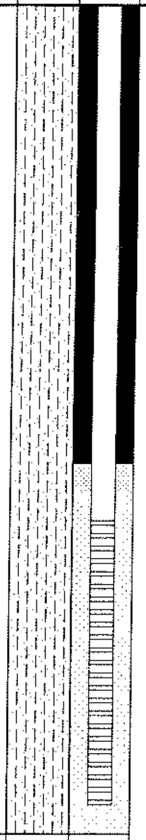
State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name: Alliant Energy - Columbia
License/Permit/Monitoring Number: 03025
Boring Number: MW-33AR
Boring Drilled By: Name of crew chief (first, last) and Firm: Ryan Fisher, Boart Longyear
Date Drilling Started: 4/9/2003
Date Drilling Completed: 4/9/2003
Drilling Method: 4 1/4" HSA
WI Unique Well No.: PE223
DNR Well ID No.: 138
Common Well Name: MW-33AR
Final Static Water Level: Feet MSL
Surface Elevation: 805.4 Feet MSL
Borehole Diameter: 8.0 inches
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 542,663 N, 2,123,584 E S/C/N
NE 1/4 of SW 1/4 of Section 27, T 12 N, R 9 E
Lat ° ' "
Long ° ' "
Local Grid Location: Feet ☐ N ☐ S; Feet ☐ E ☐ W
Facility ID: 111049180
County: Columbia
County Code: 11
Civil Town/City/ or Village: Pacific

Sample				Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet						Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5	**Blind drilled to 29 feet. See log of MW-33BR for lithology.**	SM									
				End of boring at 29 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature
Firm RMT, Inc. Tel: Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

WDNR_SBL_98 03024WDRY.GPJ WI_DNR98.GDT 7/18/03

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

Page 1 of 3

Facility/Project Name Alliant Energy - Columbia	License/Permit/Monitoring Number 03025	Boring Number MW-33BR

Boring Drilled By: Name of crew chief (first, last) and Firm Ryan Fisher Boart Longyear	Date Drilling Started 4/8/2003	Date Drilling Completed 4/9/2003	Drilling Method 4 1/4" HSA

WI Unique Well No. PE224	DNR Well ID No. 140	Common Well Name MW-33BR	Final Static Water Level 785.3 Feet MSL	Surface Elevation 805.3 Feet MSL	Borehole Diameter 8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 542,660 N, 2,123,585 E S/C/N
NE 1/4 of SW 1/4 of Section 27, T 12 N, R 9 E

Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "

Local Grid Location
Feet ☐ N ☐ S
Feet ☐ E ☐ W

Facility ID 111049180	County Columbia	County Code 11	Civil Town/City/ or Village Pacific

Sample									Soil Properties						
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
AUGE	60		1 2 3 4											
1 SS	24	4 4 4 4	5 6 7 8 9	**SILTY SAND (SM),** 85% fine to medium sand, 15% fines, nonplastic, 10YR 5/4 yellowish brown, no odor, moist.	SM									
2 SS	24	3 5 5 5	10 11 12 13 14 15											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm RMT, Inc.	Tel: Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

WDNR_SBL_98 03024WDRY.GPJ WI_DNR98.GDT 7/18/03

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-33BR Use only as an attachment to Form 4400-122. Page 2 of 3

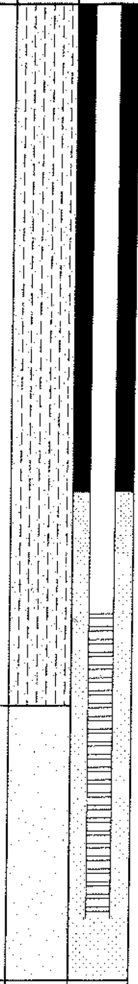
Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	
3 SS	24	4 5 4 5												
4 SS	24	4 3 4 4	20	Same as above, but wet.										
					SM									
5 SS	24	50/0	25	Hit a rock, auger through.										
6 SS	24	8 20 19 27	30	**SILTY SAND WITH GRAVEL (SM),** 70% fine to medium sand, 15% gravel, 15% fines, nonplastic, 10YR 4/3 brown, wet, dense.										
7 SS	24	10 17 19 24	35		SM									

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT

Form 4400-122A

Boring Number MW-33BR Use only as an attachment to Form 4400-122. Page 3 of 3



Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	
8 SS	24	18 20 28 39	41	Same as above.	SM									
9 SS	24	27 50/2	45											
			52	**WEATHERED SANDSTONE,** 95% poorly graded medium sand, 5% fines, white to brown, well sorted and rounded, poorly cemented.										
10 SS	24	7 50/1	53											
			56	**End of boring at 56 feet.**										

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Alliant Energy - Columbia
Local Grid Location of Well: ______ ft. ☐ N. ☐ S. ______ ft. ☐ E. ☐ W.
Well Name: MW-33AR

Facility License, Permit or Monitoring No.: 03025
Local Grid Origin ☐ (estimated: ☐) or Well Location ☒
Lat. ___ ° ___ ' ___ " Long. ___ ° ___ ' ___ " or
St. Plane 542,663 ft. N, 2,123,584 ft. E. S/C/N
Wis. Unique Well No.: PE223
DNR Well Number: 138

Facility ID: 111049180
Section Location of Waste/Source: NE 1/4 of SW 1/4 of Sec. 27, T. 12 N, R. 9 ☒ E ☐ W
Date Well Installed: 04/09/2003

Type of Well: Well Code 71/dw
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known
Gov. Lot Number: ______
Well Installed By: (Person's Name and Firm) R. Fischer
Boart Longyear

Distance from Waste/Source: 500 ft.
Enf. Stds. Apply ☐

A. Protective pipe, top elevation 808.09 ft. MSL
B. Well casing, top elevation 808.29 ft. MSL
C. Land surface elevation 805.4 ft. MSL
D. Surface seal, bottom 804.4 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
______ Other ☐

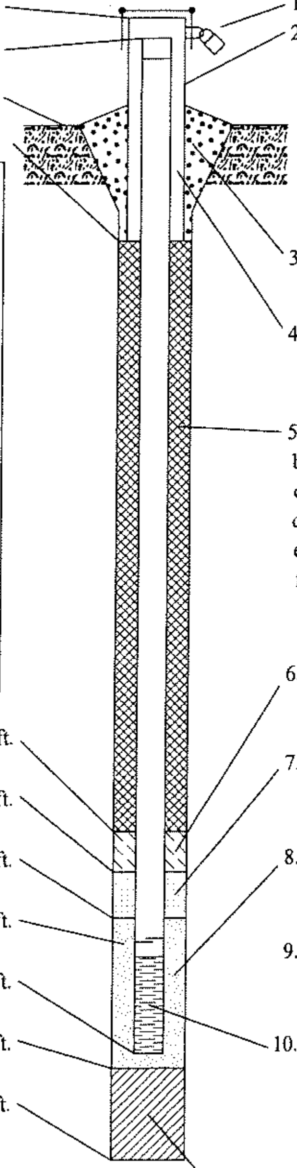
15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ______

17. Source of water (attach analysis, if required): ______

E. Bentonite seal, top 794.4 ft. MSL or 11.0 ft.
F. Fine sand, top 789.4 ft. MSL or 16.0 ft.
G. Filter pack, top 788.4 ft. MSL or 17.0 ft.
H. Screen joint, top 787.4 ft. MSL or 18.0 ft.
I. Well bottom 777.4 ft. MSL or 28.0 ft.
J. Filter pack, bottom 776.4 ft. MSL or 29.0 ft.
K. Borehole, bottom 776.4 ft. MSL or 29.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.37 in.
N. I.D. well casing 2.06 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 0 4
______ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ______
3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
______ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☒ 3 0
______ Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 3 3
b. ______ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. 10.5 Lbs/gal mud weight . . . Bentonite slurry ☒ 3 1
d. ______ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 3.5 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☒ 0 2
Gravity ☐ 0 8
6. Bentonite seal: a. Bentonite granules ☒ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2
c. ______ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added 4.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
______ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
______ Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ 1 4
______ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature
Firm RMT, Inc.
Tel:
Fax:

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

WARZYN
ENGINEERING INC
1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

LOG OF TEST BORING

Project Wisconsin Power & Light
Location Columbia Generating Station

Boring No. MW-84A
Surface Elevation 813.4
Job No. C 7134
Sheet 1 of 1

SAMPLE

No.	Type	Recovery ↓	Moisture ↓	N	Depth
					5
					10
					15
					20
					25
					30
					35
					40

VISUAL CLASSIFICATION and Remarks

Dark Brown Silty SAND (SM)

Brown Fine to Medium SAND, Little Silt, Trace to Little Gravel and Boulders (SM)

End Boring at 37'

Well Installed at 37'

SOIL PROPERTIES

Qu	W	LL	PL	D

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 10/5/83 Complete 10/5/83
Crew Chief JVS Rig B-40
Drilling Method ED 0-37'

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name Alliant Energy - Columbia	County Columbia		Well Name MW-33AR
Facility License, Permit or Monitoring Number 03025	County Code 11	Wis. Unique Well Number PE223	DNR Well Number 138

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	4 1
surged with bailer and pumped	☒	6 1
surged with block and bailed	☐	4 2
surged with block and pumped	☐	6 2
surged with block, bailed, and pumped	☐	7 0
compressed air	☐	2 0
bailed only	☐	1 0
pumped only	☐	5 1
pumped slowly	☐	5 0
other ______	☐	

3. Time spent developing well 60 min.

4. Depth of well (from top of well casing) 31.3 ft.

5. Inside diameter of well 2.06 in.

6. Volume of water in filter pack and well casing 6.0 gal.

7. Volume of water removed from well 35.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added ______

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	23.47 ft.	23.62 ft.
Date	b.	4/10/2003	4/10/2003
Time	c.	08:50 ☒ a.m. ☐ p.m.	11:50 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☐ 1 0 Turbid ☒ 1 5 (Describe) Opaque, brown	Clear ☐ 2 0 Turbid ☒ 2 5 (Describe) Slight, tan

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	72 mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm

Peter M. Chase
RMT, Inc.

17. Additional comments on development:

Pumped dry 3 times.

Facility Address or Owner/Responsible Party Address

Name: Peter M. Chase
Firm: RMT, Inc.
Street: 744 Heartland Tr.
City/State/Zip: Madison, WI 53717

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:
Print Name: Peter M. Chase
Firm: RMT, Inc.

NOTE: See instructions for more information including a list of county codes and well type codes.

DEPARTMENT OF NATURAL RESOURCES

SAMPLING POINT ID FORM
FORM 4400-40 REV. 6-79

FACILITY NAME: Wisconsin Power and Light Co. / Dry Ash

SAMPLING REQUIRED (✓ ONE)
☐ YES
☐ NO

POINT (✓ ONE)
☐ CAN BE SAMPLED
☐ CANNOT BE SAMPLED

COMMON NAME OF SAMPLING POINT: mw 34A

PREVIOUS COMMON NAME OF SAMPLING POINT:

FACILITY ID NO.:

POINT ID NO.:

TYPE OF POINT (✓ ONE)

1 (G) GROUND WATER
11 ☒ MONITOR WELL
12 ☐ PIEZOMETER
13 ☐ PRIVATE WELL
14 ☐ LYSIMETER
15 ☐ SPRING
16 ☐ RESISTIVITY PROBE

2 (L) LEACHATE
21 ☐ FLOW OR SEEP
22 ☐ POND
23 ☐ COLLECTION SYSTEM

3 (S) SURFACE WATER
31 ☐ UPSTREAM
32 ☐ MID-SITE
33 ☐ DOWNSTREAM
34 ☐ RUN-OFF
35 ☐ IMPOUNDED

POINT LOCATION
2,155 . 200 FT. (+) ☒ E. (-) ☐ W.
541 . 740 FT. (+) ☒ N. (-) ☐ S.
FROM ☒ GRID ORIGIN ☐ BENCHMARK

DATE POINT ESTABLISHED: 09/28/77
MON DAY YEAR

6 COMMENTS ABOUT SAMPLING POINT:
Well depth - 30.6' Gradient from landfill - downgradient
Geologic formation of well screen - sand
Location of well seals/materials used - bentonite seal above well screen

WELL DESCRIPTION

PIPE DIAMETER 2 . 0 0 INCHES

PIPE TOP ELEVATION 806 . 0 0 FEET ☒ MSL ☐ SITE

GROUND SURFACE ELEVATION 802 . 7 0 FEET ☒ MSL ☐ SITE

TYPE OF CASING (✓ ONE)
☒ 1 PLASTIC ☐ 2 STEEL

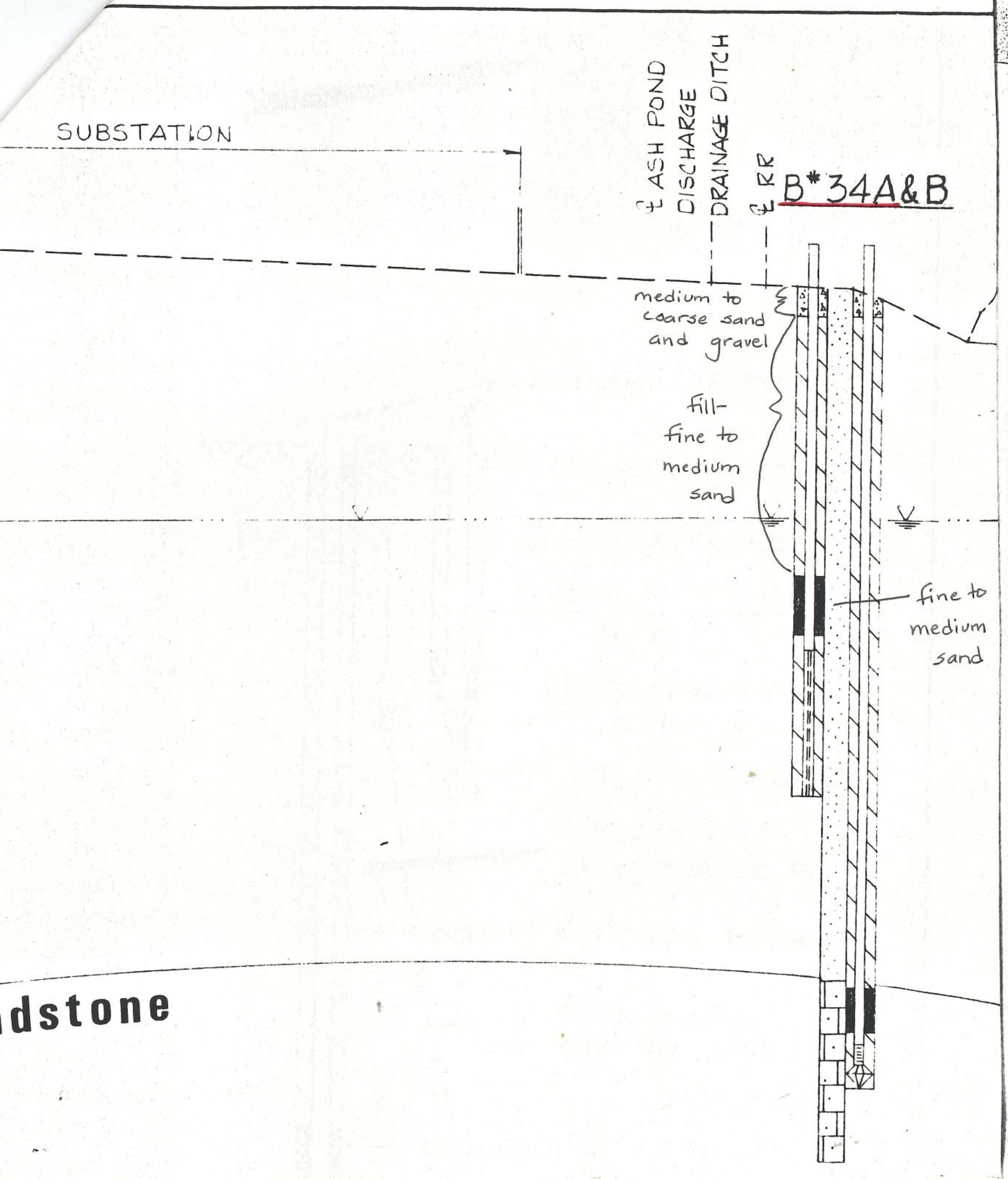
7 COMMENTS ABOUT REQUIRED SAMPLING:
Avg. vol. of water to be bailed:

Groundwater Flow - westerly

REQUIRED SAMPLING (MG/l except as noted)

	NO.	PARAMETERS	MONTHS OF REQUIRED SAMPLING
🟥	00410	ALKALINITY (AS CA CO_3)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00310	BOD (5 DAY)	1-2-3-4-5-6-7-8-9-10-11-12
☐	00916	CALCIUM	1-2-3-4-5-6-7-8-9-10-11-12
☐	00307	CHLORIDES	1-2-3-4-5-6-7-8-9-10-11-12
☐	00340	COD	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00872	CONDUCTIVITY (SU)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00277	COPPER (DISSOLVED)	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00900	HARDNESS (AS CA CO_3)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥	01046	IRON (DISSOLVED)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00348	MAGNESIUM	1-2-3-4-5-6-7-8-9-10-11-12
☐	00620	NITRATES (AS NO_3)	1-2-3-4-5-6-7-8-9-10-11-12
☐	00640	NITROGEN (TOTAL INOGRANIC N)	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00400	pH (SU)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00129	PHENOLS	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00929	SODIUM	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥	00945	SULFATES	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00360	TOTAL DIS. SOLIDS	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00842	WATER ELEVATION (FT. MSL)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00275	ZINC (DISSOLVED)	1-2-3-4-5-6-7-8-9-10-11-12

	NO.	PARAMETERS (OTHERS)	MONTHS
🟥	01022	Boron	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥		Color	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥		Odor	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥		Turbidity	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥	01002	Arsenic	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	01007	Barium	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00312	Cadmium	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00273	Chromium	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00240	Lead	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00126	Mercury	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00270	Selenium	1-2-3-4-5-[✓ 6]-7-8-9-1-11-12
🟥	[illegible]	Silver	[✓ -6-]



Scale:

Horizontal 1"=100'

Vertical 1"=10'

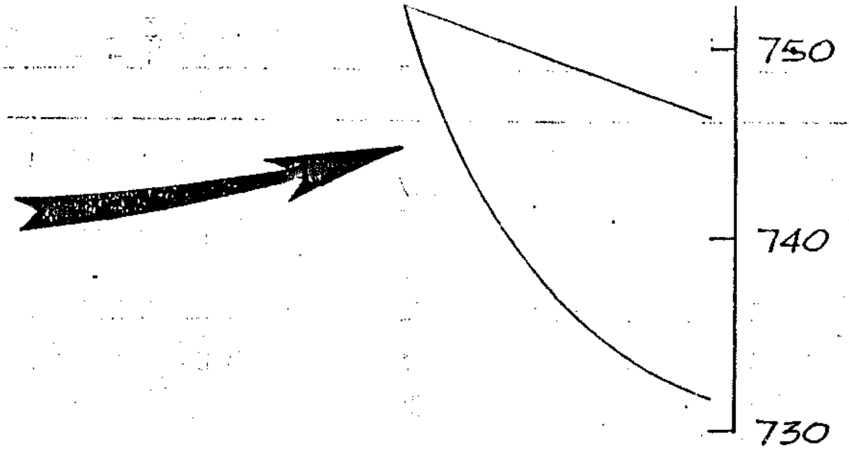
No legend available

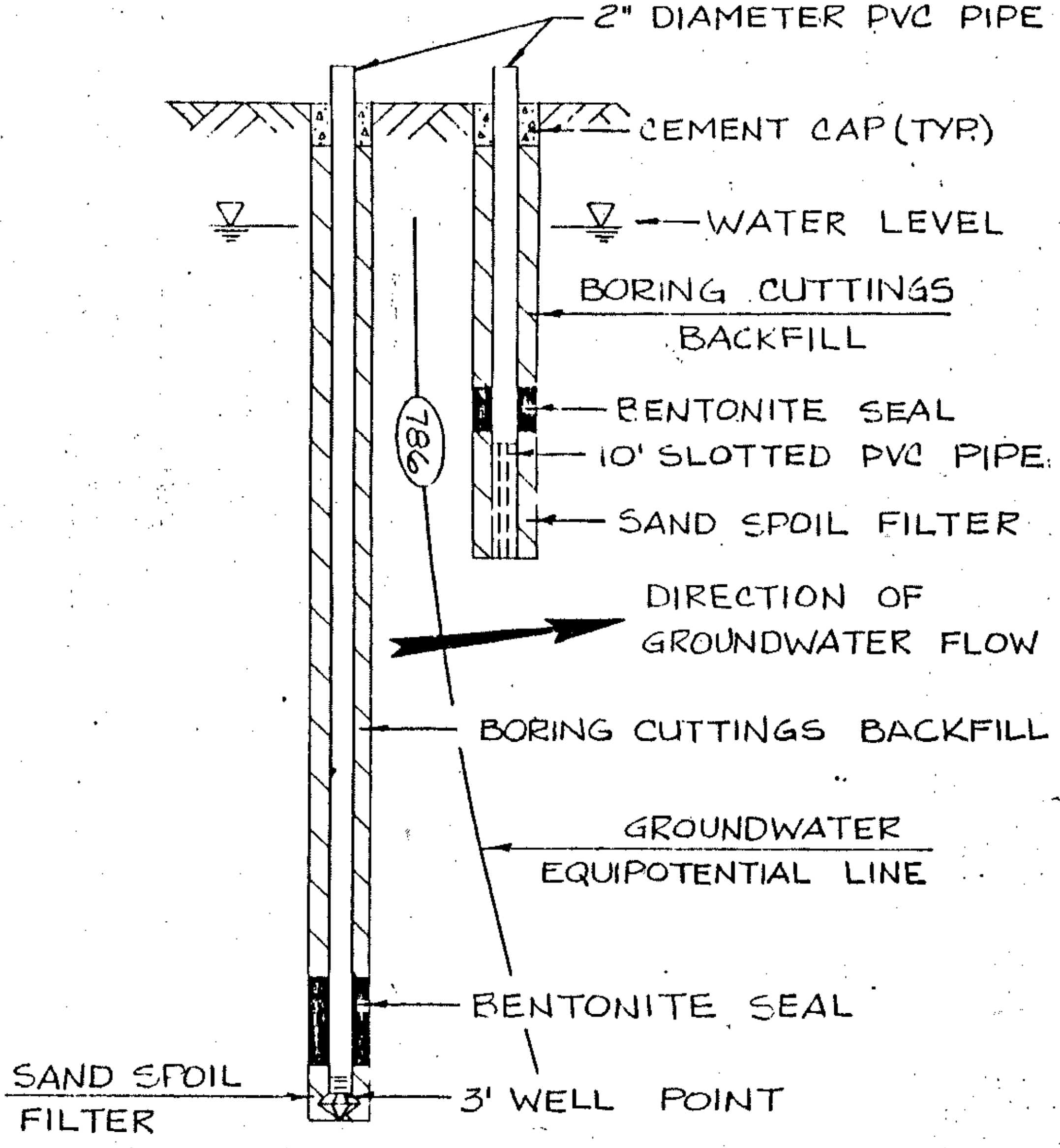
Warzyn Engineering Inc.

Geologic Cross Sections

Drawing No.C7134-11

Date 1-20-78





TYPICAL MONITORING WELL DETAIL

NOT TO SCALE

Date- 1-20-78 Drawing No. 7134-9

Warzyn Engineering Inc.

WELL DETAIL INFORMATION SHEET

JOB NO. C 7134

BORING NO. MW-84A

DATE 10/5/83

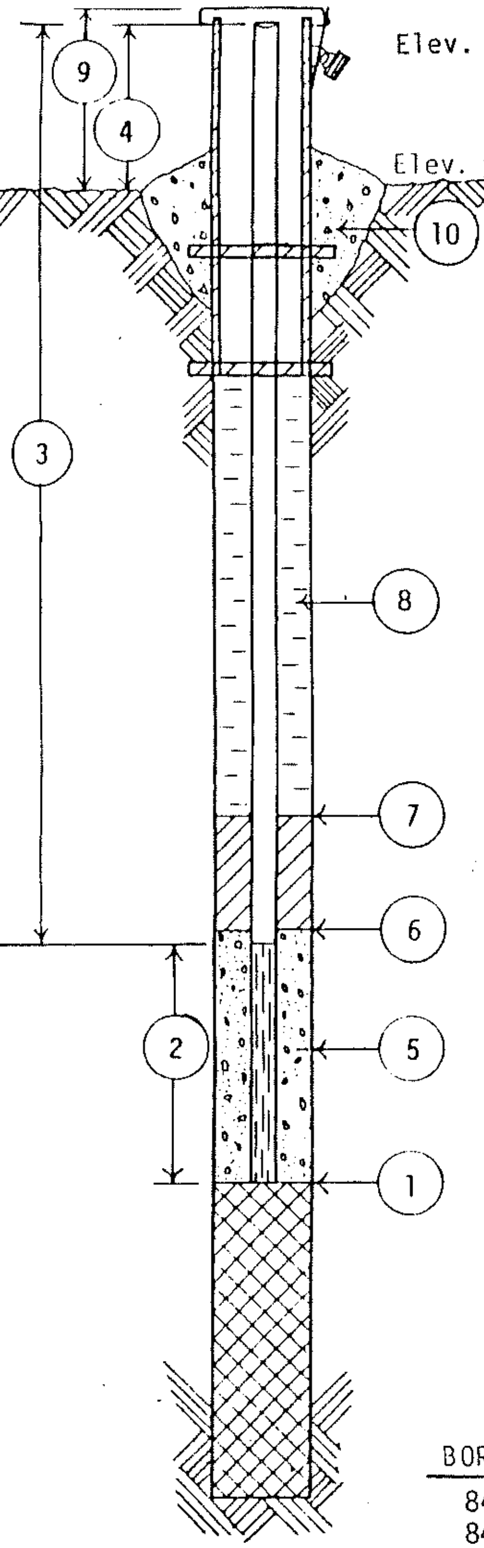
Elev. 814.57 Steel
814.32 PVC

CHIEF JS

LOCATION WP&L-Columbia Generating Station

All depth measurements of well detail assumed to be from ground surface unless otherwise indicated.

Elev. 813.4



① DEPTH TO BOTTOM OF BOREHOLE 37 FEET

② LENGTH OF WELL POINT, [✓ WELL SCREEN], OR SLOTTED PIPE 10 FEET

③ TOTAL LENGTH OF SOLID PIPE 29 FEET @ 2 IN. DIAMETER

④ HEIGHT OF WELL CASING ABOVE GROUND 2 FEET

⑤ TYPE OF FILTER MATERIAL AROUND WELL POINT OR SLOTTED PIPE Flint Sand

⑥ DEPTH OF LOWER OR BOTTOM SEAL 3 FEET

⑦ DEPTH OF UPPER OR TOP SEAL 0 FEET

⑧ TYPE OF BACKFILL Spoils (Sand)

⑨ PROTECTIVE CASING [✓ YES] NO

HEIGHT ABOVE GROUND 2'

LOCKING CAP [✓ YES] NO

⑩ CONCRETE CAP [✓ YES] NO

WATER LEVEL CHECKS

* From top of casing, if protective casing higher take measurement from top of protective casing.

BORING #	DATE	TIME	DEPTH TO WATER	REMARKS
84A	10/7/83	3 days	21'	
84B	10/7/83	3 days	19'6"	

WARZY
ENGINEERING IN

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ ____________

Facility/Project Name: Alliant-Columbia
County Name: Columbia
Well Name: MW-301
Facility License, Permit or Monitoring Number:
County Code: 11
Wis. Unique Well Number: VY701
DNR Well ID Number:

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method
- surged with bailer and bailed ☐ 41
- surged with bailer and pumped ☒ 61
- surged with block and bailed ☐ 42
- surged with block and pumped ☐ 62
- surged with block, bailed and pumped ☐ 70
- compressed air ☐ 20
- bailed only ☐ 10
- pumped only ☐ 51
- pumped slowly ☐ 50
- Other ____________ ☐

3. Time spent developing well 120 min.

4. Depth of well (from top of well casisng) 29.4 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 7.6 gal.

7. Volume of water removed from well 84.0 gal.

8. Volume of water added (if any) ___.__ gal.

9. Source of water added ____________

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 21.72 ft.	21.77 ft.
Date	b. 12/02/2015 (mm/dd/yyyy)	12/02/2015 (mm/dd/yyyy)
Time	c. 08:30 ☒ a.m. ☐ p.m.	10:30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	0. inches	0. inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Well developed by: Name (first, last) and Firm
First Name: Gary Last Name: Sterkel
Firm: SCS ENGINEERS

17. Additional comments on development:

Name and Address of Facility Contact /Owner/Responsible Party
First Name: Nate Last Name: Sievers
Facility/Firm: Wisconsin Power and Light
Street: W8375 Murray Rd.
City/State/Zip: Pardeville, WI 53954

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: for Gary Sterkel
Print Name: Gary Sterkel
Firm: SCS ENGINEERS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ ____________

Facility/Project Name Alliant - Columbia	**County Name** Columbia		**Well Name** MW-302
Facility License, Permit or Monitoring Number	**County Code** 11	**Wis. Unique Well Number** VY702	**DNR Well ID Number**

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☐	4 1
surged with bailer and pumped	☒	6 1
surged with block and bailed	☐	4 2
surged with block and pumped	☐	6 2
surged with block, bailed and pumped	☐	7 0
compressed air	☐	2 0
bailed only	☐	1 0
pumped only	☐	5 1
pumped slowly	☐	5 0
Other ____________	☐	

3. Time spent developing well 120 min.

4. Depth of well (from top of well casisng) 33 . 6 ft.

5. Inside diameter of well 2 . 00 in.

6. Volume of water in filter pack and well casing 5 . 4 gal.

7. Volume of water removed from well 60 . 0 gal.

8. Volume of water added (if any) ___ . ___ gal.

9. Source of water added ____________

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	28 . 37 ft.	28 . 41 ft.
Date	b.	12 / 02 / 2015 (mm dd yyyy)	12 / 02 / 2015 (mm dd yyyy)
Time	c.	02 : 00 ☐ a.m. ☒ p.m.	04 : 00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		0 . ___ inches	0 . ___ inches
13. Water clarity		Clear ☐ 1 0 Turbid ☒ 1 5 (Describe)	Clear ☒ 2 0 Turbid ☐ 2 5 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	___ . ___ mg/l	___ . ___ mg/l
15. COD	___ . ___ mg/l	___ . ___ mg/l

16. Well developed by: Name (first, last) and Firm
First Name: Gary Last Name: Sterkel
Firm: SCS ENGINEERS

17. Additional comments on development:

Name and Address of Facility Contact /Owner/Responsible Party
First Name: Nate Last Name: Sievers
Facility/Firm: Wisconsin Power and Light
Street: W8375 Murray Rd.
City/State/Zip: Pardeeville, WI 53954

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: for G.S.
Print Name: Gary Sterkel
Firm: SCS ENGINEERS

NOTE: See instructions for more information including a list of county codes and well type codes.

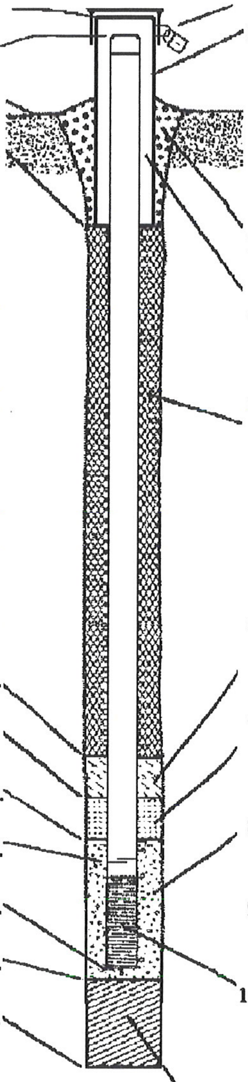
SCS # 25215135

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Remediation/Redevelopment ☐ Waste Managemen ☐ Other ☐ ______

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: WPL-Columbia
Local Grid Location of Well: ______ ft. ☐ N. ☐ S. ______ ft. ☐ E. ☐ W.
Well Name: MW-301
Facility License, Permit or Monitoring No.:
Local Grid Origin ☐ (estimated: ☐) or Well Location ☐
Lat. ___° ___' ___" Long. ___° ___' ___" or
Wis. Unique Well No.: VY701
DNR Well ID No.:
Facility ID:
St. Plane 541562.2 ft. N, 2125001 ft. E. S/C/N
Date Well Installed: 11 / 11 / 2015 (m m d d y y y y)
Type of Well: Well Code 11 / MW
Section Location of Waste/Source: SW 1/4 of SE 1/4 of Sec. 27, T. 12 N, R. 9 ☒ E ☐ W
Well Installed By: Name (first, last) and Firm: Kevin Duerst, Badger State Drilling
Distance from Waste/ Source ______ ft.
Enf. Stds. Apply ☐
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known
Gov. Lot Number:



A. Protective pipe, top elevation 807 . 16 ft. MSL
B. Well casing, top elevation 806 89 ft. MSL
C. Land surface elevation 803 69 ft. MSL
D. Surface seal, bottom 791 . 69 ft. MSL or 12 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
Other ☐ ______

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ______

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 803.69 ft. MSL or 0 ft.
F. Fine sand, top 791.69 ft. MSL or 12 ft.
G. Filter pack, top 789.69 ft. MSL or 14 ft.
H. Screen joint, top 787.69 ft. MSL or 16 ft.
I. Well bottom 777.69 ft. MSL or 26 ft.
J. Filter pack, bottom 776.69 ft. MSL or 27 ft.
K. Borehole, bottom 775.69 ft. MSL or 28 ft.
L. Borehole, diameter 8.5 in.
M. O.D. well casing 2.4 in.
N. I.D. well casing 2.0 in.

1. Cap and lock? ☐ Yes ☒ No
2. Protective cover pipe:
a. Inside diameter: 6 in.
b. Length: 5 ft.
c. Material: Steel ☒ 0 4; Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: bumper posts
3. Surface seal: Bentonite ☒ 3 0; Concrete ☐ 0 1; Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ 3 0
Bentonite to grade, sand above Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . . . . Bentonite-cement grout ☐ 5 0
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1; Tremie pumped ☐ 0 2; Gravity ☐ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☑ 3 2
c. 4 ft3 Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. RW Sidley Inc. #7 ☐
b. Volume added 0.5 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. RW Sidley #5 ☐
b. Volume added 2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 1 1; Continuous slot ☐ 0 1; Other ☐
b. Manufacturer Johnson
c. Slot size: 0. 01 in.
d. Slotted length: 10 ft.
11. Backfill material (below filter pack): None ☐ 1 4
Native Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm: SCS ENGINEERS, 2830 Dairy Drive, Madison, WI 53718-6751

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

SCS #25215135

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: WPL-Columbia

Local Grid Location of Well: ______ ft. ☐ N. ☐ S. ______ ft. ☐ E. ☐ W.

Well Name: MW-302

Facility License, Permit or Monitoring No.:

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐
Lat. ____ ° ____ ' ____ " Long. ____ ° ____ ' ____ " or

Wis. Unique Well No.: VY702

DNR Well ID No.:

Facility ID:

St. Plane 541964.7 ft. N, 2123849 ft. E. S/C/N

Date Installed: 11 / 12 / 2015 (m m / d d / y y y y)

Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 27, T. 12 N, R. 9 ☒ E ☐ W

Type of Well: Well Code 11 / MW

Well Installed By: Name (first, last) and Firm
Kevin Duerst
Badger State Drilling

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number:

Distance from Waste/Source ______ ft.

Enf. Stds. Apply ☐

A. Protective pipe, top elevation 813.19 ft. MSL

B. Well casing, top elevation 813.00 ft. MSL

C. Land surface elevation 809.93 ft. MSL

D. Surface seal, bottom 793.53 ft. MSL or 16.4 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ______

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 809.93 ft. MSL or 0 ft.

F. Fine sand, top 793.53 ft. MSL or 16.4 ft.

G. Filter pack, top 791.53 ft. MSL or 18.4 ft.

H. Screen joint, top 789.53 ft. MSL or 20.4 ft.

I. Well bottom 779.53 ft. MSL or 30.4 ft.

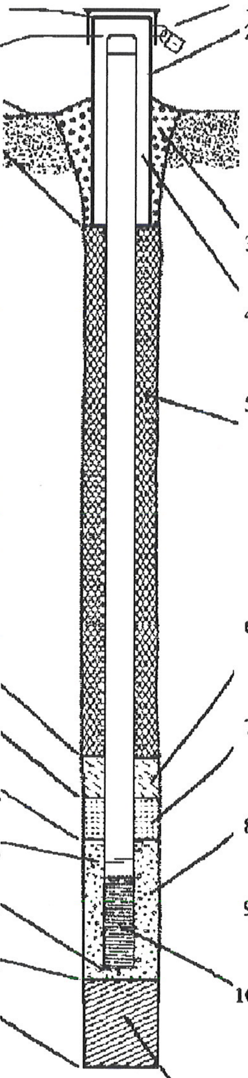
J. Filter pack, bottom 776.93 ft. MSL or 33 ft.

K. Borehole, bottom 776.93 ft. MSL or 33 ft.

L. Borehole, diameter 8.5 in.

M. O.D. well casing 2 3/8 in.

N. I.D. well casing 2 in.



1. Cap and lock? ☐ Yes ☒ No

2. Protective cover pipe:
a. Inside diameter: 6 in.
b. Length: 5 ft.
c. Material: Steel ☐ 0 4
steel Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe: yes, bumper posts

3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
Other ☐

4. Material between well casing and protective pipe: Bentonite ☒ 3 0
Bentonite to grade, sand above Other ☐

5. Annular space seal: a. Granular/Chipped Bentonite ☐ 3 3
b. ______ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ______ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 3 1
d. ______ % Bentonite . . . . . . Bentonite-cement grout ☐ 5 0
e. ______ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☐ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2
c. 4.7 ft3 Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. RW Sidley Inc. #7 ☐
b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. RW Sidley #5 ☐
b. Volume added 2.5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
Other ☐

10. Screen material: PVC
a. Screen type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
Other ☐
b. Manufacturer Johnson
c. Slot size: 0.01 in.
d. Slotted length: 10 ft.

11. Backfill material (below filter pack): None ☐ 1 4
Native Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: for Zach Watson

Firm: SCS ENGINEERS, 2830 Dairy Drive, Madison, WI 53718-6751

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

Appendix C

Laboratory Reports

C1 May 2020 Detection Monitoring

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

August 07, 2020

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on May 30, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay

Revised Report: The field pH has been updated for MW-302

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Tom Karwoski, SCS ENGINEERS
Nicole Kron, SCS ENGINEERS
Jeff Maxted, ALLIANT ENERGY
Marc Morandi, ALLIANT ENERGY

CERTIFICATIONS

Project:	25219067 COLUMBIA CCR MOD 1-3
Pace Project No.:	40208541

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

SAMPLE SUMMARY

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40208541001	**MW-302**	Water	05/29/20 11:45	05/30/20 08:00
40208541002	**MW-33AR**	Water	05/28/20 14:00	05/30/20 08:00
40208541003	**MW-34A**	Water	05/28/20 11:30	05/30/20 08:00
40208541004	**FIELD BLANK-MOD1-3LF**	Water	05/28/20 11:30	05/30/20 08:00

SAMPLE ANALYTE COUNT

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Lab ID	Sample ID	Method	Analysts	Analytes Reported
40208541001	**MW-302**	EPA 6020	KXS	2
			HMG	7
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3
40208541002	**MW-33AR**	EPA 6020	KXS	2
			HMG	7
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3
40208541003	**MW-34A**	EPA 6020	KXS	2
			HMG	7
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3
40208541004	**FIELD BLANK-MOD1-3LF**	EPA 6020	KXS	2
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3

PASI-G = Pace Analytical Services - Green Bay

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Sample: MW-302 **Lab ID: 40208541001** Collected: 05/29/20 11:45 Received: 05/30/20 08:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**611**	ug/L	100	30.3	10	06/01/20 17:36	06/05/20 18:28	7440-42-8	
Calcium	**90500**	ug/L	254	76.2	1	06/01/20 17:36	06/04/20 20:29	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.2**	Std. Units			1		05/29/20 11:45		
Field Specific Conductance	**694.7**	umhos/cm			1		05/29/20 11:45		
Oxygen, Dissolved	**10.00**	mg/L			1		05/29/20 11:45	7782-44-7	
REDOX	**169.2**	mV			1		05/29/20 11:45		
Turbidity	**2.88**	NTU			1		05/29/20 11:45		
Static Water Level	**787.29**	feet			1		05/29/20 11:45		
Temperature, Water (C)	**9.8**	deg C			1		05/29/20 11:45		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**404**	mg/L	20.0	8.7	1		06/02/20 14:51		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.4**	Std. Units	0.10	0.010	1		06/01/20 09:35		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**1.2J**	mg/L	2.0	0.43	1		06/15/20 23:33	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		06/15/20 23:33	16984-48-8	
Sulfate	**34.6**	mg/L	2.0	0.44	1		06/15/20 23:33	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Sample: MW-33AR **Lab ID: 40208541002** Collected: 05/28/20 14:00 Received: 05/30/20 08:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**566**	ug/L	100	30.3	10	06/01/20 17:36	06/05/20 18:35	7440-42-8	
Calcium	**58400**	ug/L	254	76.2	1	06/01/20 17:36	06/04/20 20:36	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.59**	Std. Units			1		05/28/20 14:00		
Field Specific Conductance	**633.4**	umhos/cm			1		05/28/20 14:00		
Oxygen, Dissolved	**10.35**	mg/L			1		05/28/20 14:00	7782-44-7	
REDOX	**199.4**	mV			1		05/28/20 14:00		
Turbidity	**0.0**	NTU			1		05/28/20 14:00		
Static Water Level	**786.01**	feet			1		05/28/20 14:00		
Temperature, Water (C)	**10.7**	deg C			1		05/28/20 14:00		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**376**	mg/L	20.0	8.7	1		06/02/20 14:51		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.6**	Std. Units	0.10	0.010	1		06/01/20 09:40		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**15.9**	mg/L	2.0	0.43	1		06/15/20 23:46	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		06/15/20 23:46	16984-48-8	
Sulfate	**104**	mg/L	10.0	2.2	5		06/16/20 09:38	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Sample: MW-34A **Lab ID: 40208541003** Collected: 05/28/20 11:30 Received: 05/30/20 08:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**210**	ug/L	20.0	6.1	2	06/01/20 17:36	06/05/20 18:56	7440-42-8	
Calcium	**58700**	ug/L	254	76.2	1	06/01/20 17:36	06/04/20 20:43	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.40**	Std. Units			1		05/28/20 11:30		
Field Specific Conductance	**459**	umhos/cm			1		05/28/20 11:30		
Oxygen, Dissolved	**10.12**	mg/L			1		05/28/20 11:30	7782-44-7	
REDOX	**198.5**	mV			1		05/28/20 11:30		
Turbidity	**84.51**	NTU			1		05/28/20 11:30		
Static Water Level	**785.98**	feet			1		05/28/20 11:30		
Temperature, Water (C)	**11.1**	deg C			1		05/28/20 11:30		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**284**	mg/L	20.0	8.7	1		06/02/20 14:51		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.6**	Std. Units	0.10	0.010	1		06/03/20 09:35		H6,PI
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**3.9**	mg/L	2.0	0.43	1		06/15/20 23:59	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		06/15/20 23:59	16984-48-8	
Sulfate	**44.4**	mg/L	2.0	0.44	1		06/15/20 23:59	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Sample: FIELD BLANK-MOD1-3LF **Lab ID: 40208541004** Collected: 05/28/20 11:30 Received: 05/30/20 08:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**<3.0**	ug/L	10.0	3.0	1	06/01/20 17:36	06/05/20 17:47	7440-42-8	
Calcium	**<76.2**	ug/L	254	76.2	1	06/01/20 17:36	06/04/20 20:50	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**<8.7**	mg/L	20.0	8.7	1		06/02/20 14:51		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**6.4**	Std. Units	0.10	0.010	1		06/03/20 09:38		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**<0.43**	mg/L	2.0	0.43	1		06/16/20 00:12	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		06/16/20 00:12	16984-48-8	
Sulfate	**<0.44**	mg/L	2.0	0.44	1		06/16/20 00:12	14808-79-8	

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

QC Batch: 356328
QC Batch Method: EPA 3010
Analysis Method: EPA 6020
Analysis Description: 6020 MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208541001, 40208541002, 40208541003, 40208541004

METHOD BLANK: 2060969 Matrix: Water
Associated Lab Samples: 40208541001, 40208541002, 40208541003, 40208541004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	<3.0	10.0	06/04/20 17:39	
Calcium	ug/L	<76.2	254	06/04/20 17:39	

LABORATORY CONTROL SAMPLE: 2060970

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	500	492	98	80-120	
Calcium	ug/L	5000	4940	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2060971 2060972

Parameter	Units	40208448001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	16.2	500	500	516	512	100	99	75-125	1	20	
Calcium	ug/L	48200	5000	5000	51200	50900	59	54	75-125	1	20	P6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

QC Batch: 356448
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208541001, 40208541002, 40208541003, 40208541004

METHOD BLANK: 2061521
Matrix: Water
Associated Lab Samples: 40208541001, 40208541002, 40208541003, 40208541004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	06/02/20 14:49	

LABORATORY CONTROL SAMPLE: 2061522

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	559	540	97	80-120	

SAMPLE DUPLICATE: 2061523

Parameter	Units	40208499001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	306	304	1	10	

SAMPLE DUPLICATE: 2061524

Parameter	Units	40208542001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	960	988	3	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

QC Batch: 356227
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208541001, 40208541002

SAMPLE DUPLICATE: 2060671

Parameter	Units	40208420014 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.2	7.3	1	20	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

QC Batch: 356504
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208541003, 40208541004

SAMPLE DUPLICATE: 2061791

Parameter	Units	40208541003 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.6	7.8	3	20	H6,PI

SAMPLE DUPLICATE: 2061792

Parameter	Units	40208560016 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.5	7.6	1	20	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

QC Batch: 356987
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208541001, 40208541002, 40208541003, 40208541004

METHOD BLANK: 2064877
Matrix: Water
Associated Lab Samples: 40208541001, 40208541002, 40208541003, 40208541004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.43	2.0	06/15/20 20:54	
Fluoride	mg/L	<0.095	0.32	06/15/20 20:54	
Sulfate	mg/L	<0.44	2.0	06/15/20 20:54	

LABORATORY CONTROL SAMPLE: 2064878

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	19.5	98	90-110	
Fluoride	mg/L	2	2.0	99	90-110	
Sulfate	mg/L	20	19.4	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2064879 2064880

Parameter	Units	40208499001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	0.76J	20	20	21.1	20.4	102	98	90-110	3	15	
Fluoride	mg/L	<0.095	2	2	2.1	2.0	106	102	90-110	4	15	
Sulfate	mg/L	6.9	20	20	27.6	26.7	103	99	90-110	3	15	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2064881 2064882

Parameter	Units	40208801002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	65.2	100	100	166	164	101	99	90-110	2	15	
Fluoride	mg/L	<0.48	10	10	10.2	10.1	102	101	90-110	1	15	
Sulfate	mg/L	23.1	100	100	122	121	99	98	90-110	1	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25219067 COLUMBIA CCR MOD 1-3
Pace Project No.:	40208541

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.
PI	The precision between the sample and the duplicate sample exceeded laboratory control limits.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40208541

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40208541001	**MW-302**	EPA 3010	356328	EPA 6020	356381
40208541002	**MW-33AR**	EPA 3010	356328	EPA 6020	356381
40208541003	**MW-34A**	EPA 3010	356328	EPA 6020	356381
40208541004	**FIELD BLANK-MOD1-3LF**	EPA 3010	356328	EPA 6020	356381
40208541001	**MW-302**				
40208541002	**MW-33AR**				
40208541003	**MW-34A**				
40208541001	**MW-302**	SM 2540C	356448		
40208541002	**MW-33AR**	SM 2540C	356448		
40208541003	**MW-34A**	SM 2540C	356448		
40208541004	**FIELD BLANK-MOD1-3LF**	SM 2540C	356448		
40208541001	**MW-302**	EPA 9040	356227		
40208541002	**MW-33AR**	EPA 9040	356227		
40208541003	**MW-34A**	EPA 9040	356504		
40208541004	**FIELD BLANK-MOD1-3LF**	EPA 9040	356504		
40208541001	**MW-302**	EPA 300.0	356987		
40208541002	**MW-33AR**	EPA 300.0	356987		
40208541003	**MW-34A**	EPA 300.0	356987		
40208541004	**FIELD BLANK-MOD1-3LF**	EPA 300.0	356987		

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

40208541

Page : 1 **Of** 1

Section A
Required Client Information:

Company: SCS ENGINEERS
Address: 2830 Dairy Drive
Madison, WI 53718
Email: mblodgett@scsengineers.com
Phone: 608-216-7362 Fax
Requested Due Date:

Section B
Required Project Information:

Report To: Meghan Blodgett
Copy To:
Purchase Order #:
Project Name: 25219067 Columbia CCR Mod 1-3
Project #:

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote:
Pace Project Manager: dan.milewsky@pacelabs.com,
Pace Profile #: x

Regulatory Agency
State / Location

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

SAMPLE ID
One Character per box.
(A-Z, 0-9 / , -)
Sample Ids must be unique

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Boron/Calcium	pH	TDS, Cl, F, SO4	Residual Chlorine (Y/N)	
1																							
2	MW-302	WT				5/29	1145		3	2		1							x	x	x		001
3	MW-33AR	WT				5/28	1400		3	2		1							x	x	x		002
4	MW-34A	WT				5/28	1130		3	2		1							x	x	x		003
5	FIELD BLANK-MOD1-3LF	WT				5/28	1130		3	2		1							x	x	x		004
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Requested Analysis Filtered (Y/N)

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
ALL SAMPLES UNFILTERED	Adam Watson / SCS Eng.	5/29/20	1615							
	C.S logistics	5/30/20	0800	Pace	5/30/20	0800	RoI	Y	N	Y.

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:
SIGNATURE of SAMPLER:
DATE Signed:

Pace Container Order #648415

40208541

Addresses

Order By :
Company SCS ENGINEERS
Contact Blodgett, Meghan
Email mblodgett@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Ship To :
Company SCS ENGINEERS (Pace Analytical Green
Contact Paul Grover
Email pgrover@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Return To:
Company Pace Analytical Green Bay
Contact Milewsky, Dan
Email dan.milewsky@pacelabs.com
Address 1241 Bellevue Street
Address 2 Suite 9
City Green Bay
State WI Zip 54302
Phone (920)469-2436

Info

Project Name 25219067 Columbia CCR Mod 1-3
Due Date 05/19/2020
Profile x
Quote
Project Manager Milewsky, Dan
Return Date
Carrier Most Economical
Location

Trip Blanks

☐ Include Trip Blanks

Bottle Labels

☐ Blank
☐ Pre-Printed No Sample IDs
☒ Pre-Printed With Sample IDs

Bottles

☐ Boxed Cases
☐ Individually Wrapped
☒ Grouped By Sample ID/Matrix

Return Shipping Labels

☐ No Shipper
☐ With Shipper

COC Options

☐ Number of Blanks
☒ Pre-Printed

Misc

☐ Sampling Instructions
☐ Custody Seal
☐ Temp. Blanks
☒ Coolers
☐ Syringes
☐ Extra Bubble Wrap
☐ Short Hold/Rush Stickers
☒ DI Water 1 Liter(s)
☐ USDA Regulated Soils

# of Samples	Matrix	Test	Container	Total	# of	Lot #	Notes
5	WT	Boron/Calcium	250mL plastic w/HNO3	5	0	M-9-354-03BB	
5	WT	pH	250mL plastic unpres	5	0	M-9-311-06BB	
5	WT	TDS, Cl, F, SO4	250mL plastic unpres	5	0	M-9-311-06BB	

Hazard Shipping Placard In Place : NA

*Sample receiving hours are typically 8am-5pm, but may differ by location. Please check with your Pace Project Manager.
*Pace Analytical reserves the right to return hazardous, toxic, or radioactive samples to you.
*Pace Analytical reserves the right to charge for unused bottles, as well as cost associated with sample storage/disposal.
*Payment term are net 30 days.
*Please include the proposal number on the chain of custody to insure proper billing.

LAB USE:
Ship Date : 05/14/2020
Prepared By: Mai Yer Her
Verified By:

Sample

ALL SAMPLES UNFILTERED

CLIENT USE (Optional):
Date Rec'd:
Received By:
Verified By:

F-ALL-C-009-rev.00, 19Dec2016

Sample Preservation Receipt Form

Pace Analytical Services, LLC
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Client Name: SCS

Project # 40208541

All containers needing preservation have been checked and noted below: ☒Yes ☐No ☐N/A

Lab Lot# of pH paper: 10US279 Lab Std #ID of preservation (if pH adjusted):

Initial when completed: NP

Date/ Time:

	Glass								Plastic					Vials						Jars				General			VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
Pace Lab #	AG1U	BG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	VG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN							
001										2		1																			X		2.5 / 5 / 10
002										2		1																			X		2.5 / 5 / 10
003										2		1																			X		2.5 / 5 / 10
004										2		1																			X		2.5 / 5 / 10
005																																	2.5 / 5 / 10
006																																	2.5 / 5 / 10
007																																	2.5 / 5 / 10
008																																	2.5 / 5 / 10
009																																	2.5 / 5 / 10
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012																																	2.5 / 5 / 10
013																																	2.5 / 5 / 10
014																																	2.5 / 5 / 10
015																																	2.5 / 5 / 10
016																																	2.5 / 5 / 10
017																																	2.5 / 5 / 10
018																																	2.5 / 5 / 10
019																																	2.5 / 5 / 10
020																																	2.5 / 5 / 10

5/20/20 NP

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:________ Headspace in VOA Vials (>6mm) : ☐Yes ☐No ☒N/A ***If yes look in headspace column**

AG1U	1 liter amber glass
BG1U	1 liter clear glass
AG1H	1 liter amber glass HCL
AG4S	125 mL amber glass H2SO4
AG4U	120 mL amber glass unpres
AG5U	100 mL amber glass unpres
AG2S	500 mL amber glass H2SO4
BG3U	250 mL clear glass unpres

BP1U	1 liter plastic unpres
BP3U	250 mL plastic unpres
BP3B	250 mL plastic NaOH
BP3N	250 mL plastic HNO3
BP3S	250 mL plastic H2SO4

VG9A	40 mL clear ascorbic
DG9T	40 mL amber Na Thio
VG9U	40 mL clear vial unpres
VG9H	40 mL clear vial HCL
VG9M	40 mL clear vial MeOH
VG9D	40 mL clear vial DI

JGFU	4 oz amber jar unpres
JG9U	9 oz amber jar unpres
WGFU	4 oz clear jar unpres
WPFU	4 oz plastic jar unpres
SP5T	120 mL plastic Na Thiosulfate
ZPLC	ziploc bag
GN	

F-GB-C-046-Rev.03 (11Feb2020) Sample Preservation Receipt Form

Page 1 of 2

Pace Analytical® 1241 Bellevue Street, Green Bay, WI 54302	Document Name: **Sample Condition Upon Receipt (SCUR)**	Document Revised: 26Mar2020
	Document No.: **ENV-FRM-GBAY-0014-Rev.00**	Author: Pace Green Bay Quality Office

Sample Condition Upon Receipt Form (SCUR)

Project #:

WO# : 40208541

40208541

Client Name: SCS

Courier: ☒ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco ☐ Client ☐ Pace Other:

Tracking #: 1578 052820

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other

Thermometer Used SR - ~~NA~~ 24 **Type of Ice:** [✓ Wet] Blue Dry None ☒ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: ~~LOF~~ 6° Corr: 6°C

Temp Blank Present: ☐ yes ☒ no ~~MLR 5-2~~ 5-30-20 MLR 5-30-20 **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Person examining contents:
Date: 5/30/20 /Initials: Mo
Labeled By Initials: MLR

Chain of Custody Present: ☒ Yes ☐ No ☐ N/A	1. copy to info, PO#, invoice info, proj. state ①
Chain of Custody Filled Out: ☐ Yes ☒ No ☐ N/A	2. No pr # 5/30/20 Mo MLR 5-30-20
Chain of Custody Relinquished: ☒ Yes ☐ No ☐ N/A	3.
Sampler Name & Signature on COC: ☐ Yes ☒ No ☐ N/A	4.
Samples Arrived within Hold Time: ☒ Yes ☐ No - VOA Samples frozen upon receipt ☐ Yes ☐ No	5. Date/Time:
Short Hold Time Analysis (<72hr): ☐ Yes ☒ No	6.
Rush Turn Around Time Requested: ☐ Yes ☒ No	7.
Sufficient Volume: For Analysis: ☒ Yes ☐ No MS/MSD: ☐ Yes ☒ No ☐ N/A	8.
Correct Containers Used: ☒ Yes ☐ No -Pace Containers Used: ☒ Yes ☐ No ☐ N/A -Pace IR Containers Used: ☐ Yes ☐ No ☒ N/A	9.
Containers Intact: ☒ Yes ☐ No	10.
Filtered volume received for Dissolved tests ☐ Yes ☐ No ☒ N/A	11.
Sample Labels match COC: ☒ Yes ☐ No ☐ N/A -Includes date/time/ID/Analysis Matrix: W	12.
Trip Blank Present: ☐ Yes ☐ No ☒ N/A Trip Blank Custody Seals Present ☐ Yes ☐ No ☒ N/A Pace Trip Blank Lot # (if purchased):	13.

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: Date/Time:

Comments/ Resolution: ① sample type, collection year MLR 5-30-20

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logir

Page 2 of 2

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

June 23, 2020

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on May 30, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay
- Pace Analytical Services - Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Tom Karwoski, SCS ENGINEERS
Nicole Kron, SCS ENGINEERS
Jeff Maxted, ALLIANT ENERGY
Marc Morandi, ALLIANT ENERGY

CERTIFICATIONS

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Florida: Cert E871149 SEKS WET
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

SAMPLE SUMMARY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40208571001	**MW-301**	Water	05/29/20 13:30	05/30/20 08:00
40208571002	**MW-84A**	Water	05/29/20 12:40	05/30/20 08:00

SAMPLE ANALYTE COUNT

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40208571001	**MW-301**	EPA 6020	DS1	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			HMG	7	PASI-G
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C	HNT	1	PASI-G
		EPA 9040	ALY	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40208571002	**MW-84A**	EPA 6020	DS1	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			HMG	7	PASI-G
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C	HNT	1	PASI-G
		EPA 9040	ALY	1	PASI-G
		EPA 300.0	HMB	3	PASI-G

PASI-G = Pace Analytical Services - Green Bay
PASI-PA = Pace Analytical Services - Greensburg

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Sample: MW-301 **Lab ID: 40208571001** Collected: 05/29/20 13:30 Received: 05/30/20 08:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Antimony	**<0.15**	ug/L	1.0	0.15	1	06/01/20 18:15	06/11/20 08:30	7440-36-0	
Arsenic	**0.33J**	ug/L	1.0	0.28	1	06/01/20 18:15	06/11/20 08:30	7440-38-2	
Barium	**9.8**	ug/L	2.3	0.70	1	06/01/20 18:15	06/11/20 08:30	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	06/01/20 18:15	06/11/20 08:30	7440-41-7	
Boron	**21.3**	ug/L	10.0	3.0	1	06/01/20 18:15	06/11/20 17:29	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	06/01/20 18:15	06/11/20 08:30	7440-43-9	
Calcium	**112000**	ug/L	254	76.2	1	06/01/20 18:15	06/11/20 08:30	7440-70-2	
Chromium	**<1.0**	ug/L	3.4	1.0	1	06/01/20 18:15	06/11/20 08:30	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	06/01/20 18:15	06/11/20 08:30	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	06/01/20 18:15	06/11/20 08:30	7439-92-1	
Lithium	**0.47J**	ug/L	1.0	0.22	1	06/01/20 18:15	06/11/20 08:30	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	06/01/20 18:15	06/11/20 08:30	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	06/01/20 18:15	06/11/20 08:30	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	06/01/20 18:15	06/11/20 08:30	7440-28-0	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.084**	ug/L	0.28	0.084	1	06/10/20 10:40	06/11/20 09:21	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**6.73**	Std. Units			1		05/29/20 13:30		
Field Specific Conductance	**797**	umhos/cm			1		05/29/20 13:30		
Oxygen, Dissolved	**2.00**	mg/L			1		05/29/20 13:30	7782-44-7	
REDOX	**118.7**	mV			1		05/29/20 13:30		
Turbidity	**0.0**	NTU			1		05/29/20 13:30		
Static Water Level	**787.77**	feet			1		05/29/20 13:30		
Temperature, Water (C)	**8.1**	deg C			1		05/29/20 13:30		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**452**	mg/L	20.0	8.7	1		06/02/20 14:53		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.0**	Std. Units	0.10	0.010	1		06/03/20 09:50		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**2.0J**	mg/L	2.0	0.43	1		06/16/20 01:58	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		06/16/20 01:58	16984-48-8	
Sulfate	**11.5**	mg/L	2.0	0.44	1		06/16/20 01:58	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Sample: MW-84A **Lab ID: 40208571002** Collected: 05/29/20 12:40 Received: 05/30/20 08:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Antimony	**<0.15**	ug/L	1.0	0.15	1	06/01/20 18:15	06/11/20 08:37	7440-36-0	
Arsenic	**0.34J**	ug/L	1.0	0.28	1	06/01/20 18:15	06/11/20 08:37	7440-38-2	
Barium	**13.9**	ug/L	2.3	0.70	1	06/01/20 18:15	06/11/20 08:37	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	06/01/20 18:15	06/11/20 08:37	7440-41-7	
Boron	**10.0**	ug/L	10.0	3.0	1	06/01/20 18:15	06/11/20 17:36	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	06/01/20 18:15	06/11/20 08:37	7440-43-9	
Calcium	**77600**	ug/L	254	76.2	1	06/01/20 18:15	06/11/20 08:37	7440-70-2	
Chromium	**1.7J**	ug/L	3.4	1.0	1	06/01/20 18:15	06/11/20 08:37	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	06/01/20 18:15	06/11/20 08:37	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	06/01/20 18:15	06/11/20 08:37	7439-92-1	
Lithium	**0.40J**	ug/L	1.0	0.22	1	06/01/20 18:15	06/11/20 08:37	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	06/01/20 18:15	06/11/20 08:37	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	06/01/20 18:15	06/11/20 08:37	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	06/01/20 18:15	06/11/20 08:37	7440-28-0	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.084**	ug/L	0.28	0.084	1	06/10/20 10:40	06/11/20 09:23	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.34**	Std. Units			1		05/29/20 12:40		
Field Specific Conductance	**613.7**	umhos/cm			1		05/29/20 12:40		
Oxygen, Dissolved	**9.81**	mg/L			1		05/29/20 12:40	7782-44-7	
REDOX	**135.0**	mV			1		05/29/20 12:40		
Turbidity	**2.15**	NTU			1		05/29/20 12:40		
Static Water Level	**787.02**	feet			1		05/29/20 12:40		
Temperature, Water (C)	**10.6**	deg C			1		05/29/20 12:40		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**340**	mg/L	20.0	8.7	1		06/02/20 14:53		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.6**	Std. Units	0.10	0.010	1		06/03/20 09:51		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**3.7**	mg/L	2.0	0.43	1		06/16/20 02:11	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		06/16/20 02:11	16984-48-8	
Sulfate	**1.5J**	mg/L	2.0	0.44	1		06/16/20 02:11	14808-79-8	

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

QC Batch: 357238
QC Batch Method: EPA 7470
Analysis Method: EPA 7470
Analysis Description: 7470 Mercury
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208571001, 40208571002

METHOD BLANK: 2066129 Matrix: Water
Associated Lab Samples: 40208571001, 40208571002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	<0.084	0.28	06/11/20 08:58	

LABORATORY CONTROL SAMPLE: 2066130

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	5.1	101	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2066131 2066132

Parameter	Units	40208929001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	<0.084	5	5	5.3	4.9	105	98	85-115	7	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

QC Batch: 356333
QC Batch Method: EPA 3010
Analysis Method: EPA 6020
Analysis Description: 6020 MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208571001, 40208571002

METHOD BLANK: 2060982
Matrix: Water
Associated Lab Samples: 40208571001, 40208571002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	<0.15	1.0	06/11/20 05:17	
Arsenic	ug/L	<0.28	1.0	06/11/20 05:17	
Barium	ug/L	<0.70	2.3	06/11/20 05:17	
Beryllium	ug/L	<0.25	1.0	06/11/20 05:17	
Boron	ug/L	<3.0	10.0	06/11/20 15:11	
Cadmium	ug/L	<0.15	1.0	06/11/20 05:17	
Calcium	ug/L	<76.2	254	06/11/20 05:17	
Chromium	ug/L	<1.0	3.4	06/11/20 05:17	
Cobalt	ug/L	<0.12	1.0	06/11/20 05:17	
Lead	ug/L	<0.24	1.0	06/11/20 05:17	
Lithium	ug/L	<0.22	1.0	06/11/20 05:17	
Molybdenum	ug/L	<0.44	1.5	06/11/20 05:17	
Selenium	ug/L	<0.32	1.1	06/11/20 05:17	
Thallium	ug/L	<0.14	1.0	06/11/20 05:17	

LABORATORY CONTROL SAMPLE: 2060983

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	500	528	106	80-120	
Arsenic	ug/L	500	494	99	80-120	
Barium	ug/L	500	488	98	80-120	
Beryllium	ug/L	500	448	90	80-120	
Boron	ug/L	500	461	92	80-120	
Cadmium	ug/L	500	513	103	80-120	
Calcium	ug/L	5000	5060	101	80-120	
Chromium	ug/L	500	476	95	80-120	
Cobalt	ug/L	500	471	94	80-120	
Lead	ug/L	500	493	99	80-120	
Lithium	ug/L	500	425	85	80-120	
Molybdenum	ug/L	500	508	102	80-120	
Selenium	ug/L	500	471	94	80-120	
Thallium	ug/L	500	486	97	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2060984 2060985

Parameter	Units	40208496001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Antimony	ug/L	0.22J	500	500	552	539	110	108	75-125	2	20	
Arsenic	ug/L	5.9	500	500	521	508	103	100	75-125	3	20	
Barium	ug/L	13.8	500	500	524	514	102	100	75-125	2	20	
Beryllium	ug/L	0.36J	500	500	446	438	89	87	75-125	2	20	
Boron	ug/L	2700	500	500	3180	3090	94	78	75-125	3	20	
Cadmium	ug/L	0.30J	500	500	521	510	104	102	75-125	2	20	
Calcium	ug/L	27400	5000	5000	32700	30400	107	61	75-125	7	20	P6
Chromium	ug/L	42.8	500	500	530	525	98	96	75-125	1	20	
Cobalt	ug/L	0.49J	500	500	484	474	97	95	75-125	2	20	
Lead	ug/L	0.32J	500	500	514	516	103	103	75-125	0	20	
Lithium	ug/L	1.2	500	500	438	432	87	86	75-125	1	20	
Molybdenum	ug/L	67.1	500	500	604	587	107	104	75-125	3	20	
Selenium	ug/L	18.7	500	500	500	495	96	95	75-125	1	20	
Thallium	ug/L	0.28J	500	500	509	513	102	102	75-125	1	20	

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

QC Batch: 356448
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208571001, 40208571002

METHOD BLANK: 2061521 Matrix: Water
Associated Lab Samples: 40208571001, 40208571002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	06/02/20 14:49	

LABORATORY CONTROL SAMPLE: 2061522

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	559	540	97	80-120	

SAMPLE DUPLICATE: 2061523

Parameter	Units	40208499001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	306	304	1	10	

SAMPLE DUPLICATE: 2061524

Parameter	Units	40208542001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	960	988	3	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

QC Batch: 356504
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208571001, 40208571002

SAMPLE DUPLICATE: 2061791

Parameter	Units	40208541003 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.6	7.8	3	20	H6,PI

SAMPLE DUPLICATE: 2061792

Parameter	Units	40208560016 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.5	7.6	1	20	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

QC Batch: 356987
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40208571001, 40208571002

METHOD BLANK: 2064877
Matrix: Water
Associated Lab Samples: 40208571001, 40208571002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.43	2.0	06/15/20 20:54	
Fluoride	mg/L	<0.095	0.32	06/15/20 20:54	
Sulfate	mg/L	<0.44	2.0	06/15/20 20:54	

LABORATORY CONTROL SAMPLE: 2064878

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	19.5	98	90-110	
Fluoride	mg/L	2	2.0	99	90-110	
Sulfate	mg/L	20	19.4	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2064879 2064880

Parameter	Units	40208499001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	0.76J	20	20	21.1	20.4	102	98	90-110	3	15	
Fluoride	mg/L	<0.095	2	2	2.1	2.0	106	102	90-110	4	15	
Sulfate	mg/L	6.9	20	20	27.6	26.7	103	99	90-110	3	15	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2064881 2064882

Parameter	Units	40208801002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	65.2	100	100	166	164	101	99	90-110	2	15	
Fluoride	mg/L	<0.48	10	10	10.2	10.1	102	101	90-110	1	15	
Sulfate	mg/L	23.1	100	100	122	121	99	98	90-110	1	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Sample: MW-301 **Lab ID: 40208571001** Collected: 05/29/20 13:30 Received: 05/30/20 08:00 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**0.000 ± 0.307 (0.495)** **C:NA T:82%**	pCi/L	06/22/20 15:54	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.193 ± 0.370 (0.813)** **C:71% T:90%**	pCi/L	06/18/20 10:59	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.193 ± 0.677 (1.31)**	pCi/L	06/23/20 09:27	7440-14-4	

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Sample: MW-84A **Lab ID: 40208571002** Collected: 05/29/20 12:40 Received: 05/30/20 08:00 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**0.368 ± 0.419 (0.661)** **C:NA T:97%**	pCi/L	06/22/20 15:54	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.0273 ± 0.391 (0.895)** **C:71% T:86%**	pCi/L	06/18/20 10:59	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.395 ± 0.810 (1.56)**	pCi/L	06/23/20 09:27	7440-14-4	

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

QC Batch: 399236
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40208571001, 40208571002

METHOD BLANK: 1933438
Matrix: Water
Associated Lab Samples: 40208571001, 40208571002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	-0.176 ± 0.245 (0.622) C:NA T:95%	pCi/L	06/22/20 15:33	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

QC Batch: 399239
QC Batch Method: EPA 904.0
Analysis Method: EPA 904.0
Analysis Description: 904.0 Radium 228
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40208571001, 40208571002

METHOD BLANK: 1933446
Matrix: Water
Associated Lab Samples: 40208571001, 40208571002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.173 ± 0.299 (0.652) C:77% T:94%	pCi/L	06/18/20 10:58	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25219067 COLUMBIA CCR BACKGRND
Pace Project No.:	40208571

DEFINITIONS

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.
PI	The precision between the sample and the duplicate sample exceeded laboratory control limits.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40208571

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40208571001	**MW-301**	EPA 3010	356333	EPA 6020	356385
40208571002	**MW-84A**	EPA 3010	356333	EPA 6020	356385
40208571001	**MW-301**	EPA 7470	357238	EPA 7470	357374
40208571002	**MW-84A**	EPA 7470	357238	EPA 7470	357374
40208571001	**MW-301**				
40208571002	**MW-84A**				
40208571001	**MW-301**	EPA 903.1	399236		
40208571002	**MW-84A**	EPA 903.1	399236		
40208571001	**MW-301**	EPA 904.0	399239		
40208571002	**MW-84A**	EPA 904.0	399239		
40208571001	**MW-301**	Total Radium Calculation	402044		
40208571002	**MW-84A**	Total Radium Calculation	402044		
40208571001	**MW-301**	SM 2540C	356448		
40208571002	**MW-84A**	SM 2540C	356448		
40208571001	**MW-301**	EPA 9040	356504		
40208571002	**MW-84A**	EPA 9040	356504		
40208571001	**MW-301**	EPA 300.0	356987		
40208571002	**MW-84A**	EPA 300.0	356987		

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

40208571

Page : 1 **Of** 1

Section A
Required Client Information:

Company: SCS ENGINEERS
Address: 2830 Dairy Drive
Madison, WI 53718
Email: mblodgett@scsengineers.com
Phone: 608-216-7362 Fax:
Requested Due Date:

Section B
Required Project Information:

Report To: Meghan Blodgett
Copy To:
Purchase Order #:
Project Name: 25219067 Columbia CCR Background
Project #:

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote:
Pace Project Manager: dan.milewsky@pacelabs.com,
Pace Profile #: x

Regulatory Agency

State / Location

MATRIX / CODE
Drinking Water DW
Water WT
Waste Water WW
Product P
Soil/Solid SL
Oil OL
Wipe WP
Air AR
Other OT
Tissue TS

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Radium 226	Radium 228	Metals	pH	TDS, Cl, F, SO4	Residual Chlorine (Y/N)	
1	MW-301	WT				5/29	1330		5	2		3							x	x	x	x	x		001
2	MW-84A	WT				5/29	1240		5	2		3							x	x	x	x	x		002
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Requested Analysis Filtered (Y/N)

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
Full List Metals = B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li Hg, Mo, Se, Tl ALL SAMPLES UNFILTERED	Adam Watson / SCS Eng	5/29/20	1615							
	CS Logistics	5/30/20	0800	Erik Weir / Pace	5/30/20	0800	1.0	Y	N	Y
							TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER:

DATE Signed:

Pace Container Order #648412

40208571

Addresses

Order By :
Company SCS ENGINEERS
Contact Blodgett, Meghan
Email mblodgett@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Ship To :
Company SCS ENGINEERS (Pace Analytical Green
Contact Paul Grover
Email pgrover@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Return To:
Company Pace Analytical Green Bay
Contact Milewsky, Dan
Email dan.milewsky@pacelabs.com
Address 1241 Bellevue Street
Address 2 Suite 9
City Green Bay
State WI Zip 54302
Phone (920)469-2436

Info

Project Name 25219067 Columbia CCR Background
Due Date 05/19/2020
Profile x
Quote
Project Manager Milewsky, Dan
Return Date
Carrier Most Economical
Location

Trip Blanks

☐ Include Trip Blanks

Bottle Labels

☐ Blank
☐ Pre-Printed No Sample IDs
☒ Pre-Printed With Sample IDs

Bottles

☐ Boxed Cases
☐ Individually Wrapped
☒ Grouped By Sample ID/Matrix

Return Shipping Labels

☐ No Shipper
☐ With Shipper

COC Options

☐ Number of Blanks
☒ Pre-Printed

Misc

☐ Sampling Instructions
☐ Custody Seal
☐ Temp. Blanks
☒ Coolers
☐ Syringes
☐ Extra Bubble Wrap
☐ Short Hold/Rush Stickers
☐ DI Water Liter(s)
☐ USDA Regulated Soils

# of Samples	Matrix	Test	Container	Total	# of	Lot #	Notes
2	WT	Radium 226	1L Plastic HNO3 pres	2	0		
2	WT	Radium 228	1L Plastic HNO3 pres	2	0		
2	WT	Metals	250mL plastic w/HNO3	2	0	M-9-354-03BB	
2	WT	pH	250mL plastic unpres	2	0	M-9-311-06BB	
2	WT	TDS, Cl, F, SO4	250mL plastic unpres	2	0	M-9-311-06BB	

Hazard Shipping Placard In Place : NA

*Sample receiving hours are typically 8am-5pm, but may differ by location. Please check with your Pace Project Manager.
*Pace Analytical reserves the right to return hazardous, toxic, or radioactive samples to you.
*Pace Analytical reserves the right to charge for unused bottles, as well as cost associated with sample storage/disposal.
*Payment term are net 30 days.
*Please include the proposal number on the chain of custody to insure proper billing.

LAB USE:
Ship Date : 05/14/2020
Prepared By: Mai Yer Her
Verified By:

Sample

Full List Metals = B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li Hg, Mo, Se, Tl
ALL SAMPLES UNFILTERED

CLIENT USE (Optional):
Date Rec'd:
Received By:
Verified By:

Sample Preservation Receipt Form

Pace Analytical Services, LLC
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Client Name: SCS

Project # 40208571

All containers needing preservation have been checked and noted below: ☑Yes ☐No ☐N/A

Lab Lot# of pH paper: 10052741 Lab Std #ID of preservation (if pH adjusted):

Initial when completed: EMW Date/ Time:

	Glass								Plastic					Vials						Jars				General									
Pace Lab #	AG1U	BG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	VG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN	VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
001										2		1														2							2.5 / 5 / 10
002										2		1														2							2.5 / 5 / 10
003																																	2.5 / 5 / 10
004																																	2.5 / 5 / 10
005																																	2.5 / 5 / 10
006																																	2.5 / 5 / 10
007																																	2.5 / 5 / 10
008																																	2.5 / 5 / 10
009																																	2.5 / 5 / 10
010																																	2.5 / 5 / 10
011																																	2.5 / 5 / 10
012																																	2.5 / 5 / 10
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014																																	2.5 / 5 / 10
015																																	2.5 / 5 / 10
016																																	2.5 / 5 / 10
017																																	2.5 / 5 / 10
018																																	2.5 / 5 / 10
019																																	2.5 / 5 / 10
020																																	2.5 / 5 / 10

EMW 5/30/20

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other: Red Chem Headspace in VOA Vials (>6mm) : ☐Yes ☐No ☑N/A ***If yes look in headspace column**

AG1U	1 liter amber glass
BG1U	1 liter clear glass
AG1H	1 liter amber glass HCL
AG4S	125 mL amber glass H2SO4
AG4U	120 mL amber glass unpres
AG5U	100 mL amber glass unpres
AG2S	500 mL amber glass H2SO4
BG3U	250 mL clear glass unpres

BP1U	1 liter plastic unpres
BP3U	250 mL plastic unpres
BP3B	250 mL plastic NaOH
BP3N	250 mL plastic HNO3
BP3S	250 mL plastic H2SO4

VG9A	40 mL clear ascorbic
DG9T	40 mL amber Na Thio
VG9U	40 mL clear vial unpres
VG9H	40 mL clear vial HCL
VG9M	40 mL clear vial MeOH
VG9D	40 mL clear vial DI

JGFU	4 oz amber jar unpres
JG9U	9 oz amber jar unpres
WGFU	4 oz clear jar unpres
WPFU	4 oz plastic jar unpres
SP5T	120 mL plastic Na Thiosulfate
ZPLC	ziploc bag
GN	1L poly Nitric Acid

EMW 5/30/20

Pace Analytical® 1241 Bellevue Street, Green Bay, WI 54302	Document Name: **Sample Condition Upon Receipt (SCUR)**	Document Revised: 26Mar2020
	Document No.: **ENV-FRM-GBAY-0014-Rev.00**	Author: Pace Green Bay Quality Office

Sample Condition Upon Receipt Form (SCUR)

Project #: **WO# : 40208571**

40208571

Client Name: SCS

Courier: ☑ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco ☐ Client ☐ Pace Other:

Tracking #: 1578 052820

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ Other

Thermometer Used SR - 97 **Type of Ice:** [✓ Wet] Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 1.0 /Corr: 1.0

Temp Blank Present: ☐ yes ☑ no **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Person examining contents:
Date 5/30/20 **/Initials:** SMW
Labeled By Initials: NP

Chain of Custody Present: ☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out: ☐Yes ☑No ☐N/A	2. No pr State, pr#, Invoice, SMW 5/30/20
Chain of Custody Relinquished: ☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC: ☐Yes ☑No ☐N/A	4.
Samples Arrived within Hold Time: ☑Yes ☐No - VOA Samples frozen upon receipt ☐Yes ☐No	5. Date/Time:
Short Hold Time Analysis (<72hr): ☐Yes ☑No	6.
Rush Turn Around Time Requested: ☐Yes ☑No	7.
Sufficient Volume: For Analysis: ☑Yes ☐No MS/MSD: ☐Yes ☑No ☐N/A	8.
Correct Containers Used: ☑Yes ☐No -Pace Containers Used: ☑Yes ☐No ☐N/A -Pace IR Containers Used: ☐Yes ☐No ☑N/A	9.
Containers Intact: ☑Yes ☐No	10.
Filtered volume received for Dissolved tests ☐Yes ☐No ☑N/A	11.
Sample Labels match COC: ☑Yes ☐No ☐N/A -Includes date/time/ID/Analysis Matrix: W	12.
Trip Blank Present: ☐Yes ☐No ☑N/A Trip Blank Custody Seals Present ☐Yes ☐No ☑N/A Pace Trip Blank Lot # (if purchased):	13.

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: Date/Time:

Comments/ Resolution:

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logir

C2 October 2020 Detection Monitoring

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

November 06, 2020

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on October 10, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay
- Pace Analytical Services - Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Tom Karwoski, SCS ENGINEERS
Nicole Kron, SCS ENGINEERS
Jeff Maxted, ALLIANT ENERGY
Marc Morandi, ALLIANT ENERGY

CERTIFICATIONS

Project:	25219067 COLUMBIA CCR BACKGRND
Pace Project No.:	40216311

Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Florida: Cert E871149 SEKS WET
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

SAMPLE SUMMARY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40216311001	**MW-301**	Water	10/08/20 14:45	10/10/20 08:15
40216311002	**MW-84A**	Water	10/08/20 14:35	10/10/20 08:15

SAMPLE ANALYTE COUNT

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40216311001	**MW-301**	EPA 6020	DS1	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			VGC	7	PASI-G
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C	HNT	1	PASI-G
		EPA 9040	ALY	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40216311002	**MW-84A**	EPA 6020	DS1	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			VGC	7	PASI-G
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C	HNT	1	PASI-G
		EPA 9040	ALY	1	PASI-G
		EPA 300.0	HMB	3	PASI-G

PASI-G = Pace Analytical Services - Green Bay
PASI-PA = Pace Analytical Services - Greensburg

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Sample: MW-301 **Lab ID: 40216311001** Collected: 10/08/20 14:45 Received: 10/10/20 08:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Antimony	**0.33J**	ug/L	1.0	0.15	1	10/13/20 07:04	10/15/20 22:04	7440-36-0	
Arsenic	**0.62J**	ug/L	1.0	0.28	1	10/13/20 07:04	10/15/20 22:04	7440-38-2	
Barium	**9.4**	ug/L	2.3	0.70	1	10/13/20 07:04	10/15/20 22:04	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	10/13/20 07:04	10/15/20 22:04	7440-41-7	
Boron	**28.8**	ug/L	10.0	3.0	1	10/13/20 07:04	10/15/20 22:04	7440-42-8	
Cadmium	**0.19J**	ug/L	1.0	0.15	1	10/13/20 07:04	10/15/20 22:04	7440-43-9	
Calcium	**93000**	ug/L	2540	762	10	10/13/20 07:04	10/15/20 21:36	7440-70-2	P6
Chromium	**<1.0**	ug/L	3.4	1.0	1	10/13/20 07:04	10/15/20 22:04	7440-47-3	
Cobalt	**0.29J**	ug/L	1.0	0.12	1	10/13/20 07:04	10/15/20 22:04	7440-48-4	
Lead	**0.25J**	ug/L	1.0	0.24	1	10/13/20 07:04	10/15/20 22:04	7439-92-1	
Lithium	**0.46J**	ug/L	1.0	0.22	1	10/13/20 07:04	10/15/20 22:04	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	10/13/20 07:04	10/15/20 22:04	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	10/13/20 07:04	10/15/20 22:04	7782-49-2	
Thallium	**0.30J**	ug/L	1.0	0.14	1	10/13/20 07:04	10/15/20 22:04	7440-28-0	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.066**	ug/L	0.20	0.066	1	10/14/20 10:10	10/15/20 10:45	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**6.95**	Std. Units			1		10/08/20 14:45		
Field Specific Conductance	**760.0**	umhos/cm			1		10/08/20 14:45		
Oxygen, Dissolved	**1.22**	mg/L			1		10/08/20 14:45	7782-44-7	
REDOX	**183.9**	mV			1		10/08/20 14:45		
Turbidity	**0.00**	NTU			1		10/08/20 14:45		
Static Water Level	**786.53**	feet			1		10/08/20 14:45		
Temperature, Water (C)	**11.0**	deg C			1		10/08/20 14:45		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**412**	mg/L	20.0	8.7	1		10/12/20 14:17		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.2**	Std. Units	0.10	0.010	1		10/13/20 10:30		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**3.4**	mg/L	2.0	0.43	1		10/20/20 13:09	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/20/20 13:09	16984-48-8	
Sulfate	**25.1**	mg/L	2.0	0.44	1		10/20/20 13:09	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Sample: MW-84A **Lab ID: 40216311002** Collected: 10/08/20 14:35 Received: 10/10/20 08:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Antimony	**<0.15**	ug/L	1.0	0.15	1	10/13/20 07:04	10/15/20 22:45	7440-36-0	
Arsenic	**0.49J**	ug/L	1.0	0.28	1	10/13/20 07:04	10/15/20 22:45	7440-38-2	
Barium	**12.6**	ug/L	2.3	0.70	1	10/13/20 07:04	10/15/20 22:45	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	10/13/20 07:04	10/15/20 22:45	7440-41-7	
Boron	**9.7J**	ug/L	10.0	3.0	1	10/13/20 07:04	10/15/20 22:45	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	10/13/20 07:04	10/15/20 22:45	7440-43-9	
Calcium	**69200**	ug/L	254	76.2	1	10/13/20 07:04	10/15/20 22:45	7440-70-2	
Chromium	**1.6J**	ug/L	3.4	1.0	1	10/13/20 07:04	10/15/20 22:45	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	10/13/20 07:04	10/15/20 22:45	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	10/13/20 07:04	10/15/20 22:45	7439-92-1	
Lithium	**0.39J**	ug/L	1.0	0.22	1	10/13/20 07:04	10/15/20 22:45	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	10/13/20 07:04	10/15/20 22:45	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	10/13/20 07:04	10/15/20 22:45	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	10/13/20 07:04	10/15/20 22:45	7440-28-0	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.066**	ug/L	0.20	0.066	1	10/14/20 10:10	10/15/20 10:47	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.49**	Std. Units			1		10/08/20 14:35		
Field Specific Conductance	**610.1**	umhos/cm			1		10/08/20 14:35		
Oxygen, Dissolved	**9.39**	mg/L			1		10/08/20 14:35	7782-44-7	
REDOX	**153.2**	mV			1		10/08/20 14:35		
Turbidity	**0.00**	NTU			1		10/08/20 14:35		
Static Water Level	**786.10**	feet			1		10/08/20 14:35		
Temperature, Water (C)	**11.9**	deg C			1		10/08/20 14:35		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**320**	mg/L	20.0	8.7	1		10/12/20 14:17		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.6**	Std. Units	0.10	0.010	1		10/13/20 10:33		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**4.3**	mg/L	2.0	0.43	1		10/20/20 13:24	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/20/20 13:24	16984-48-8	
Sulfate	**1.3J**	mg/L	2.0	0.44	1		10/20/20 13:24	14808-79-8	

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

QC Batch: 368204
QC Batch Method: EPA 7470
Analysis Method: EPA 7470
Analysis Description: 7470 Mercury
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216311001, 40216311002

METHOD BLANK: 2128432 Matrix: Water
Associated Lab Samples: 40216311001, 40216311002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	<0.066	0.20	10/15/20 10:08	

LABORATORY CONTROL SAMPLE: 2128433

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	5.0	100	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2128434 2128435

Parameter	Units	40216436001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	<0.066	5	5	5.1	5.0	101	101	85-115	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

QC Batch: 368047
Analysis Method: EPA 6020
QC Batch Method: EPA 3010
Analysis Description: 6020 MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216311001, 40216311002

METHOD BLANK: 2127636
Matrix: Water
Associated Lab Samples: 40216311001, 40216311002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	<0.15	1.0	10/15/20 21:23	
Arsenic	ug/L	<0.28	1.0	10/15/20 21:23	
Barium	ug/L	<0.70	2.3	10/15/20 21:23	
Beryllium	ug/L	<0.25	1.0	10/15/20 21:23	
Boron	ug/L	<3.0	10.0	10/15/20 21:23	
Cadmium	ug/L	<0.15	1.0	10/15/20 21:23	
Calcium	ug/L	<76.2	254	10/15/20 21:23	
Chromium	ug/L	<1.0	3.4	10/15/20 21:23	
Cobalt	ug/L	<0.12	1.0	10/15/20 21:23	
Lead	ug/L	<0.24	1.0	10/15/20 21:23	
Lithium	ug/L	<0.22	1.0	10/15/20 21:23	
Molybdenum	ug/L	<0.44	1.5	10/15/20 21:23	
Selenium	ug/L	<0.32	1.1	10/15/20 21:23	
Thallium	ug/L	<0.14	1.0	10/15/20 21:23	

LABORATORY CONTROL SAMPLE: 2127637

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	500	516	103	80-120	
Arsenic	ug/L	500	498	100	80-120	
Barium	ug/L	500	476	95	80-120	
Beryllium	ug/L	500	446	89	80-120	
Boron	ug/L	500	433	87	80-120	
Cadmium	ug/L	500	511	102	80-120	
Calcium	ug/L	5000	4980	100	80-120	
Chromium	ug/L	500	462	92	80-120	
Cobalt	ug/L	500	463	93	80-120	
Lead	ug/L	500	442	88	80-120	
Lithium	ug/L	500	426	85	80-120	
Molybdenum	ug/L	500	500	100	80-120	
Selenium	ug/L	500	511	102	80-120	
Thallium	ug/L	500	450	90	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2127638 2127639

Parameter	Units	40216311001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Antimony	ug/L	0.33J	500	500	513	524	102	105	75-125	2	20	
Arsenic	ug/L	0.62J	500	500	503	512	100	102	75-125	2	20	
Barium	ug/L	9.4	500	500	486	501	95	98	75-125	3	20	
Beryllium	ug/L	<0.25	500	500	470	479	94	96	75-125	2	20	
Boron	ug/L	28.8	500	500	494	508	93	96	75-125	3	20	
Cadmium	ug/L	0.19J	500	500	506	515	101	103	75-125	2	20	
Calcium	ug/L	93000	5000	5000	98400	103000	107	194	75-125	4	20	P6
Chromium	ug/L	<1.0	500	500	465	478	93	95	75-125	3	20	
Cobalt	ug/L	0.29J	500	500	464	477	93	95	75-125	3	20	
Lead	ug/L	0.25J	500	500	442	458	88	92	75-125	4	20	
Lithium	ug/L	0.46J	500	500	459	473	92	95	75-125	3	20	
Molybdenum	ug/L	<0.44	500	500	509	522	102	104	75-125	2	20	
Selenium	ug/L	<0.32	500	500	509	513	102	102	75-125	1	20	
Thallium	ug/L	0.30J	500	500	459	474	92	95	75-125	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

QC Batch: 367994
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216311001, 40216311002

METHOD BLANK: 2127414 Matrix: Water
Associated Lab Samples: 40216311001, 40216311002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	10/12/20 14:13	

LABORATORY CONTROL SAMPLE: 2127415

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	584	552	95	80-120	

SAMPLE DUPLICATE: 2127416

Parameter	Units	40216194004 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	508	500	2	10	

SAMPLE DUPLICATE: 2127417

Parameter	Units	40216312001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	532	524	2	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

QC Batch: 368069
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216311001, 40216311002

SAMPLE DUPLICATE: 2127694

Parameter	Units	40216239003 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.5	7.5	1	20	H6

SAMPLE DUPLICATE: 2127695

Parameter	Units	40216282001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.6	7.6	0	20	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

QC Batch: 368419
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216311001, 40216311002

METHOD BLANK: 2129786 Matrix: Water
Associated Lab Samples: 40216311001, 40216311002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.43	2.0	10/20/20 09:28	
Fluoride	mg/L	<0.095	0.32	10/20/20 09:28	
Sulfate	mg/L	<0.44	2.0	10/20/20 09:28	

LABORATORY CONTROL SAMPLE: 2129787

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	19.2	96	90-110	
Fluoride	mg/L	2	1.8	91	90-110	
Sulfate	mg/L	20	19.2	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2129788 2129789

Parameter	Units	40216308001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	0.63J	20	20	21.8	21.8	106	106	90-110	0	15	
Fluoride	mg/L	<0.095	2	2	2.2	2.2	109	109	90-110	0	15	
Sulfate	mg/L	8.4	20	20	30.2	30.3	109	109	90-110	0	15	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2129790 2129791

Parameter	Units	40216573006 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	35.3	20	20	54.3	54.3	95	95	90-110	0	15	
Fluoride	mg/L	<0.095	2	2	2.3	2.3	113	114	90-110	0	15	M0
Sulfate	mg/L	37.0	20	20	56.6	56.6	98	98	90-110	0	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Sample: MW-301 **Lab ID: 40216311001** Collected: 10/08/20 14:45 Received: 10/10/20 08:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**0.0511 ± 0.361 (0.720)** **C:NA T:88%**	pCi/L	10/29/20 15:16	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.329 ± 0.354 (0.740)** **C:83% T:87%**	pCi/L	10/28/20 10:59	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.380 ± 0.715 (1.46)**	pCi/L	11/02/20 13:23	7440-14-4	

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Sample: MW-84A **Lab ID: 40216311002** Collected: 10/08/20 14:35 Received: 10/10/20 08:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
		Pace Analytical Services - Greensburg				
Radium-226	EPA 903.1	**0.000 ± 0.374 (0.810)** **C:NA T:85%**	pCi/L	10/29/20 15:16	13982-63-3	
		Pace Analytical Services - Greensburg				
Radium-228	EPA 904.0	**0.390 ± 0.280 (0.537)** **C:82% T:92%**	pCi/L	10/28/20 10:58	15262-20-1	
		Pace Analytical Services - Greensburg				
Total Radium	Total Radium Calculation	**0.390 ± 0.654 (1.35)**	pCi/L	11/02/20 13:23	7440-14-4	

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

QC Batch: 418548
QC Batch Method: EPA 904.0
Analysis Method: EPA 904.0
Analysis Description: 904.0 Radium 228
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40216311001, 40216311002

METHOD BLANK: 2023103
Matrix: Water
Associated Lab Samples: 40216311001, 40216311002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.545 ± 0.288 (0.495) C:81% T:94%	pCi/L	10/28/20 10:57	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

QC Batch: 418546
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40216311001, 40216311002

METHOD BLANK: 2023102
Matrix: Water
Associated Lab Samples: 40216311001, 40216311002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.0400 ± 0.260 (0.524) C:NA T:93%	pCi/L	10/29/20 14:53	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25219067 COLUMBIA CCR BACKGRND
Pace Project No.:	40216311

DEFINITIONS

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval).
Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25219067 COLUMBIA CCR BACKGRND
Pace Project No.: 40216311

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40216311001	**MW-301**	EPA 3010	368047	EPA 6020	368141
40216311002	**MW-84A**	EPA 3010	368047	EPA 6020	368141
40216311001	**MW-301**	EPA 7470	368204	EPA 7470	368253
40216311002	**MW-84A**	EPA 7470	368204	EPA 7470	368253
40216311001	**MW-301**				
40216311002	**MW-84A**				
40216311001	**MW-301**	EPA 903.1	418546		
40216311002	**MW-84A**	EPA 903.1	418546		
40216311001	**MW-301**	EPA 904.0	418548		
40216311002	**MW-84A**	EPA 904.0	418548		
40216311001	**MW-301**	Total Radium Calculation	421177		
40216311002	**MW-84A**	Total Radium Calculation	421177		
40216311001	**MW-301**	SM 2540C	367994		
40216311002	**MW-84A**	SM 2540C	367994		
40216311001	**MW-301**	EPA 9040	368069		
40216311002	**MW-84A**	EPA 9040	368069		
40216311001	**MW-301**	EPA 300.0	368419		
40216311002	**MW-84A**	EPA 300.0	368419		

Pace Analytical
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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

4026311

Page : 1 Of 1

Section A
Required Client Information:

Company: SCS ENGINEERS
Address: 2830 Dairy Drive
Madison, WI 53718
Email: mblodgett@scsengineers.com
Phone: 608-216-7362 Fax:
Requested Due Date:

Section B
Required Project Information:

Report To: Meghan Blodgett
Copy To:
Purchase Order #:
Project Name: 25219067 Columbia CCR Background
Project #:

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote:
Pace Project Manager: dan.milewsky@pacelabs.com,
Pace Profile #: 3946-12

Regulatory Agency:
State / Location:

SAMPLE ID
One Character per box.
(A-Z, 0-9 / , -)
Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Radium 226	Radium 228	Metals	pH	TDS, Cl, F, SO4								Residual Chlorine (Y/N)	
1	MW-301	WT				10/8	1445		5	2		3							X	X	X	X	X									001
2	MW-84A	WT				10/8	1435		5	2		3							X	X	X	X	X									002
3																																
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
Full List Metals = B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li Hg, Mo, Se, Tl ALL SAMPLES UNFILTERED	C.S logistics	10/10/20	0815	Pace	10/10/20	0815	1.0 ~~ROI~~ 10/10/20 SRK	Y	N	Y
							TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Adam Watson
SIGNATURE of SAMPLER:
DATE Signed: 10/8/2020

Pace Container Order #703790

40216311

Addresses

Order By :

Company SCS ENGINEERS
Contact Blodgett, Meghan
Email mblodgett@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Ship To :

Company SCS ENGINEERS (Pace Analytical Green
Contact Paul Grover
Email pgrover@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Return To:

Company Pace Analytical Green Bay
Contact Milewsky, Dan
Email dan.milewsky@pacelabs.com
Address 1241 Bellevue Street
Address 2 Suite 9
City Green Bay
State WI Zip 54302
Phone (920)469-2436

Info

Project Name 25219067 Columbia CCR Background
Due Date 10/06/2020
Profile 3946-12
Quote
Project Manager Milewsky, Dan
Return Date
Carrier Most Economical
Location

Trip Blanks

☐ Include Trip Blanks

Bottle Labels

☐ Blank
☐ Pre-Printed No Sample IDs
☒ Pre-Printed With Sample IDs

Bottles

☐ Boxed Cases
☐ Individually Wrapped
☒ Grouped By Sample ID/Matrix

Return Shipping Labels

☐ No Shipper
☐ With Shipper

COC Options

☐ Number of Blanks
☒ Pre-Printed

Misc

☐ Sampling Instructions
☐ Custody Seal
☐ Temp. Blanks
☒ Coolers
☐ Syringes
☐ Extra Bubble Wrap
☐ Short Hold/Rush Stickers
☐ DI Water Liter(s)
☐ USDA Regulated Soils

# of Samples	Matrix	Test	Container	Total	# of	Lot #	Notes
2	WT	Radium 226	1L Plastic HNO3 pres	2	0		
2	WT	Radium 228	1L Plastic HNO3 pres	2	0		
2	WT	Metals	250mL plastic w/HNO3	2	0	M-0-156-04BB	
2	WT	pH	250mL plastic unpres	2	0	M-0-156-05BB	
2	WT	TDS, Cl, F, SO4	250mL plastic unpres	2	0	M-0-156-05BB	

Hazard Shipping Placard In Place : NA

Sample receiving hours are typically 8am-5pm, but may differ by location. Please check with your Pace Project Manager.
Pace Analytical reserves the right to return hazardous, toxic, or radioactive samples to you.
Pace Analytical reserves the right to charge for unused bottles, as well as cost associated with sample storage/disposal.
Payment term are net 30 days.
Please include the proposal number on the chain of custody to insure proper billing.

LAB USE:

Ship Date : 10/05/2020
Prepared By: Mai Yer Her
Verified By:

Sample

Full List Metals = B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li Hg, Mo, Se, Tl
ALL SAMPLES UNFILTERED

CLIENT USE (Optional):

Date Rec'd:
Received By:
Verified By:

1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Sample Preservation Receipt Form

Client Name: SCS Engineers
Project # 4021631

Initial when completed: MP
Date/Time:

All containers needing preservation have been checked and noted below: ☒Yes ☐No ☐N/A

Lab Lot# of pH paper: 10D4194

Lab Std #ID of preservation (if pH adjusted):

	Glass								Plastic					Vials						Jars				General									
Pace Lab #	AG1U	BG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	VG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN	VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
001										2		1														2					✓		2.5 / 5 / 10
002										2		1														2					X		2.5 / 5 / 10
003																																	2.5 / 5 / 10
004																																	2.5 / 5 / 10
005																																	2.5 / 5 / 10
006																																	2.5 / 5 / 10
007																																	2.5 / 5 / 10
008																																	2.5 / 5 / 10
009																																	2.5 / 5 / 10
010																																	2.5 / 5 / 10
011																																	2.5 / 5 / 10
012																																	2.5 / 5 / 10
013																													1/11/20 MP				2.5 / 5 / 10
014																																	2.5 / 5 / 10
015																																	2.5 / 5 / 10
016																																	2.5 / 5 / 10
017																																	2.5 / 5 / 10
018																																	2.5 / 5 / 10
019																																	2.5 / 5 / 10
020																																	2.5 / 5 / 10

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:

Headspace in VOA Vials (>6mm) : ☐Yes ☐No ☒N/A *If yes look in headspace column

AG1U	1 liter amber glass
BG1U	1 liter clear glass
AG1H	1 liter amber glass HCL
AG4S	125 mL amber glass H2SO4
AG4U	120 mL amber glass unpres
AG5U	100 mL amber glass unpres
AG2S	500 mL amber glass H2SO4
BG3U	250 mL clear glass unpres

BP1U	1 liter plastic unpres
BP3U	250 mL plastic unpres
BP3B	250 mL plastic NaOH
BP3N	250 mL plastic HNO3
BP3S	250 mL plastic H2SO4

VG9A	40 mL clear ascorbic
DG9T	40 mL amber Na Thio
VG9U	40 mL clear vial unpres
VG9H	40 mL clear vial HCL
VG9M	40 mL clear vial MeOH
VG9D	40 mL clear vial DI

JGFU	4 oz amber jar unpres
JG9U	9 oz amber jar unpres
WGFU	4 oz clear jar unpres
WPFU	4 oz plastic jar unpres
SP5T	120 mL plastic Na Thiosulfate
ZPLC	ziploc bag
GN	1L poly HNO3

Page 1 of 2

Pace Analytical® 1241 Bellevue Street, Green Bay, WI 54302	Document Name: **Sample Condition Upon Receipt (SCUR)**	Document Revised: 26Mar2020
	Document No.: **ENV-FRM-GBAY-0014-Rev.00**	Author: Pace Green Bay Quality Office

Sample Condition Upon Receipt Form (SCUR)

Project #:

WO#: 40216311

40216311

Client Name: SCS Engineers

Courier: ☒ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco
☐ Client ☐ Pace Other: ____

Tracking #: ____

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other ____

Thermometer Used SR - ~~NA~~ 99 **Type of Ice:** [✓ Wet] Blue Dry None 10/10/20 SRK ☒ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 1-0 ~~ROI~~ /Corr: 1-0

Temp Blank Present: ☐ yes ☒ no **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Person examining contents:
Date: 10/10/20 /Initials:
Labeled By Initials: SRK

Chain of Custody Present:	☒ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out:	☐ Yes	☒ No	☐ N/A	2. PV #, invoice info., proj. state 10/10/20 SRK 10/10/20
Chain of Custody Relinquished:	☐ Yes	☒ No	☐ N/A	3.
Sampler Name & Signature on COC:	☒ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time:	☒ Yes	☐ No		5.
- VOA Samples frozen upon receipt	☐ Yes	☐ No		Date/Time:
Short Hold Time Analysis (<72hr):	☐ Yes	☒ No		6.
Rush Turn Around Time Requested:	☐ Yes	☒ No		7.
Sufficient Volume:				8.
For Analysis: ☒ Yes ☐ No MS/MSD:	☐ Yes	☒ No	☐ N/A	
Correct Containers Used:	☒ Yes	☐ No		9.
-Pace Containers Used:	☒ Yes	☒ No	☐ N/A	
-Pace IR Containers Used:	☐ Yes	☐ No	☒ N/A	
Containers Intact:	☒ Yes	☐ No		10.
Filtered volume received for Dissolved tests	☐ Yes	☐ No	☒ N/A	11.
Sample Labels match COC:	☒ Yes	☐ No	☐ N/A	12.
-Includes date/time/ID/Analysis Matrix: W				
Trip Blank Present:	☐ Yes	☐ No	☒ N/A	13.
Trip Blank Custody Seals Present	☐ Yes	☐ No	☒ N/A	
Pace Trip Blank Lot # (if purchased): ____				

If checked, see attached form for additional comments ☐

Client Notification/ Resolution:

Person Contacted: ____ Date/Time: ____

Comments/ Resolution: ____

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logi

www.pacelabs.com

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

October 29, 2020

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on October 10, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Tom Karwoski, SCS ENGINEERS
Nicole Kron, SCS ENGINEERS
Jeff Maxted, ALLIANT ENERGY
Marc Morandi, ALLIANT ENERGY

CERTIFICATIONS

Project:	25219067 COLUMBIA CCR MOD 1-3
Pace Project No.:	40216310

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

SAMPLE SUMMARY

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40216310001	**MW-302**	Water	10/08/20 11:45	10/10/20 08:15
40216310002	**MW-33AR**	Water	10/08/20 13:10	10/10/20 08:15
40216310003	**MW-34A**	Water	10/08/20 12:55	10/10/20 08:15
40216310004	**FIELD BLANK-MOD1-3LF**	Water	10/08/20 11:45	10/10/20 08:15

SAMPLE ANALYTE COUNT

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Lab ID	Sample ID	Method	Analysts	Analytes Reported
40216310001	**MW-302**	EPA 6020	KXS	2
			VGC	7
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3
40216310002	**MW-33AR**	EPA 6020	KXS	2
			VGC	7
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3
40216310003	**MW-34A**	EPA 6020	KXS	2
			VGC	7
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3
40216310004	**FIELD BLANK-MOD1-3LF**	EPA 6020	KXS	2
		SM 2540C	HNT	1
		EPA 9040	ALY	1
		EPA 300.0	HMB	3

PASI-G = Pace Analytical Services - Green Bay

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Sample: MW-302 **Lab ID: 40216310001** Collected: 10/08/20 11:45 Received: 10/10/20 08:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**648**	ug/L	10.0	3.0	1	10/13/20 05:31	10/15/20 14:52	7440-42-8	
Calcium	**80600**	ug/L	254	76.2	1	10/13/20 05:31	10/15/20 14:52	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.21**	Std. Units			1		10/08/20 11:45		
Field Specific Conductance	**643.1**	umhos/cm			1		10/08/20 11:45		
Oxygen, Dissolved	**9.21**	mg/L			1		10/08/20 11:45	7782-44-7	
REDOX	**152.7**	mV			1		10/08/20 11:45		
Turbidity	**0.00**	NTU			1		10/08/20 11:45		
Static Water Level	**786.74**	feet			1		10/08/20 11:45		
Temperature, Water (C)	**11.8**	deg C			1		10/08/20 11:45		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**378**	mg/L	20.0	8.7	1		10/13/20 17:27		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.6**	Std. Units	0.10	0.010	1		10/13/20 10:19		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**1.1J**	mg/L	2.0	0.43	1		10/20/20 11:29	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/20/20 11:29	16984-48-8	
Sulfate	**36.5**	mg/L	2.0	0.44	1		10/20/20 11:29	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Sample: MW-33AR **Lab ID: 40216310002** Collected: 10/08/20 13:10 Received: 10/10/20 08:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**569**	ug/L	10.0	3.0	1	10/13/20 05:31	10/15/20 14:59	7440-42-8	
Calcium	**57100**	ug/L	254	76.2	1	10/13/20 05:31	10/15/20 14:59	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.70**	Std. Units			1		10/08/20 13:10		
Field Specific Conductance	**623.5**	umhos/cm			1		10/08/20 13:10		
Oxygen, Dissolved	**9.31**	mg/L			1		10/08/20 13:10	7782-44-7	
REDOX	**160.4**	mV			1		10/08/20 13:10		
Turbidity	**0.00**	NTU			1		10/08/20 13:10		
Static Water Level	**785.91**	feet			1		10/08/20 13:10		
Temperature, Water (C)	**13.8**	deg C			1		10/08/20 13:10		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**270**	mg/L	20.0	8.7	1		10/13/20 17:28		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.8**	Std. Units	0.10	0.010	1		10/13/20 10:20		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**27.3**	mg/L	2.0	0.43	1		10/20/20 11:43	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/20/20 11:43	16984-48-8	
Sulfate	**97.4**	mg/L	10.0	2.2	5		10/20/20 16:59	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Sample: MW-34A **Lab ID: 40216310003** Collected: 10/08/20 12:55 Received: 10/10/20 08:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**213**	ug/L	10.0	3.0	1	10/13/20 05:31	10/15/20 15:06	7440-42-8	
Calcium	**61300**	ug/L	254	76.2	1	10/13/20 05:31	10/15/20 15:06	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.81**	Std. Units			1		10/08/20 12:55		
Field Specific Conductance	**464.2**	umhos/cm			1		10/08/20 12:55		
Oxygen, Dissolved	**9.88**	mg/L			1		10/08/20 12:55	7782-44-7	
REDOX	**143.2**	mV			1		10/08/20 12:55		
Turbidity	**55.00**	NTU			1		10/08/20 12:55		
Static Water Level	**785.70**	feet			1		10/08/20 12:55		
Temperature, Water (C)	**12.9**	deg C			1		10/08/20 12:55		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**306**	mg/L	20.0	8.7	1		10/13/20 17:28		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.7**	Std. Units	0.10	0.010	1		10/13/20 10:25		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**2.1**	mg/L	2.0	0.43	1		10/20/20 12:40	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/20/20 12:40	16984-48-8	
Sulfate	**58.7**	mg/L	2.0	0.44	1		10/20/20 12:40	14808-79-8	

ANALYTICAL RESULTS

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Sample: FIELD BLANK-MOD1-3LF **Lab ID: 40216310004** Collected: 10/08/20 11:45 Received: 10/10/20 08:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010 Pace Analytical Services - Green Bay								
Boron	**<3.0**	ug/L	10.0	3.0	1	10/13/20 05:31	10/15/20 12:20	7440-42-8	
Calcium	**<76.2**	ug/L	254	76.2	1	10/13/20 05:31	10/15/20 12:20	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**18.0J**	mg/L	20.0	8.7	1		10/13/20 17:28		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.5**	Std. Units	0.10	0.010	1		10/13/20 10:28		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**<0.43**	mg/L	2.0	0.43	1		10/20/20 12:55	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/20/20 12:55	16984-48-8	
Sulfate	**<0.44**	mg/L	2.0	0.44	1		10/20/20 12:55	14808-79-8	

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

QC Batch: 368040
QC Batch Method: EPA 3010
Analysis Method: EPA 6020
Analysis Description: 6020 MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216310001, 40216310002, 40216310003, 40216310004

METHOD BLANK: 2127606
Matrix: Water
Associated Lab Samples: 40216310001, 40216310002, 40216310003, 40216310004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	<3.0	10.0	10/15/20 12:07	
Calcium	ug/L	<76.2	254	10/15/20 12:07	

LABORATORY CONTROL SAMPLE: 2127607

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	500	455	91	80-120	
Calcium	ug/L	5000	4740	95	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2127608 2127609

Parameter	Units	40216309001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	226	500	500	690	704	93	96	75-125	2	20	
Calcium	ug/L	83700	5000	5000	91400	92200	154	171	75-125	1	20	P6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

QC Batch: 368159
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216310001, 40216310002, 40216310003, 40216310004

METHOD BLANK: 2128288
Matrix: Water
Associated Lab Samples: 40216310001, 40216310002, 40216310003, 40216310004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	10/13/20 17:25	

LABORATORY CONTROL SAMPLE: 2128289

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	584	592	101	80-120	

SAMPLE DUPLICATE: 2128290

Parameter	Units	40216285001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	1160	1190	2	10	

SAMPLE DUPLICATE: 2128291

Parameter	Units	40216349001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	930	980	5	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

QC Batch: 368069
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216310001, 40216310002, 40216310003, 40216310004

SAMPLE DUPLICATE: 2127694

Parameter	Units	40216239003 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.5	7.5	1	20	H6

SAMPLE DUPLICATE: 2127695

Parameter	Units	40216282001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.6	7.6	0	20	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

QC Batch: 368419
Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40216310001, 40216310002, 40216310003, 40216310004

METHOD BLANK: 2129786
Matrix: Water
Associated Lab Samples: 40216310001, 40216310002, 40216310003, 40216310004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.43	2.0	10/20/20 09:28	
Fluoride	mg/L	<0.095	0.32	10/20/20 09:28	
Sulfate	mg/L	<0.44	2.0	10/20/20 09:28	

LABORATORY CONTROL SAMPLE: 2129787

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	19.2	96	90-110	
Fluoride	mg/L	2	1.8	91	90-110	
Sulfate	mg/L	20	19.2	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2129788 2129789

Parameter	Units	40216308001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	0.63J	20	20	21.8	21.8	106	106	90-110	0	15	
Fluoride	mg/L	<0.095	2	2	2.2	2.2	109	109	90-110	0	15	
Sulfate	mg/L	8.4	20	20	30.2	30.3	109	109	90-110	0	15	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2129790 2129791

Parameter	Units	40216573006 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	35.3	20	20	54.3	54.3	95	95	90-110	0	15	
Fluoride	mg/L	<0.095	2	2	2.3	2.3	113	114	90-110	0	15	M0
Sulfate	mg/L	37.0	20	20	56.6	56.6	98	98	90-110	0	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25219067 COLUMBIA CCR MOD 1-3
Pace Project No.:	40216310

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25219067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40216310

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40216310001	**MW-302**	EPA 3010	368040	EPA 6020	368132
40216310002	**MW-33AR**	EPA 3010	368040	EPA 6020	368132
40216310003	**MW-34A**	EPA 3010	368040	EPA 6020	368132
40216310004	**FIELD BLANK-MOD1-3LF**	EPA 3010	368040	EPA 6020	368132
40216310001	**MW-302**				
40216310002	**MW-33AR**				
40216310003	**MW-34A**				
40216310001	**MW-302**	SM 2540C	368159		
40216310002	**MW-33AR**	SM 2540C	368159		
40216310003	**MW-34A**	SM 2540C	368159		
40216310004	**FIELD BLANK-MOD1-3LF**	SM 2540C	368159		
40216310001	**MW-302**	EPA 9040	368069		
40216310002	**MW-33AR**	EPA 9040	368069		
40216310003	**MW-34A**	EPA 9040	368069		
40216310004	**FIELD BLANK-MOD1-3LF**	EPA 9040	368069		
40216310001	**MW-302**	EPA 300.0	368419		
40216310002	**MW-33AR**	EPA 300.0	368419		
40216310003	**MW-34A**	EPA 300.0	368419		
40216310004	**FIELD BLANK-MOD1-3LF**	EPA 300.0	368419		

Pace Analytical
WWW.PACELABS.COM

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

40216310

Page : 1 Of 1

Section A
Required Client Information:

Company: SCS ENGINEERS
Address: 2830 Dairy Drive
Madison, WI 53718
Email: mblodgett@scsengineers.com
Phone: 608-216-7362 Fax:
Requested Due Date:

Section B
Required Project Information:

Report To: Meghan Blodgett
Copy To:
Purchase Order #:
Project Name: 25219067 Columbia CCR Mod 1-3
Project #:

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote:
Pace Project Manager: dan.milewsky@pacelabs.com,
Pace Profile #: 3946-13

Regulatory Agency
State / Location

SAMPLE ID
One Character per box.
(A-Z, 0-9 / , -)
Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Boron/Calcium	pH	TDS, Cl, F, SO4	Residual Chlorine (Y/N)	
1		WT																	X	X	X		
2	MW-302	WT				10/8	1145		3	2		1							X	X	X		001
3	MW-33AR	WT				10/8	1310		3	2		1							X	X	X		002
4	MW-34A	WT				10/8	1255		3	2		1							X	X	X		003
5	FIELD BLANK-MOD1-3LF	WT				10/8	1145		3	2		1							X	X	X		004
6																							
7																							
8																							
9																							
10																							
11																							
12																							

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
ALL SAMPLES UNFILTERED										
	C.S logistics	10/10/20	0815		10/10/20	0815	1.0 ~~[illegible]~~ 10/10/20 SRK	Y	N	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Adam Watson
SIGNATURE of SAMPLER: A Wat
DATE Signed: 10/8/2020

Pace Container Order #703791

40216310

Addresses

Order By :

Company SCS ENGINEERS
Contact Blodgett, Meghan
Email mblodgett@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Ship To :

Company SCS ENGINEERS (Pace Analytical Green
Contact Paul Grover
Email pgrover@scsengineers.com
Address 2830 Dairy Drive
Address 2
City Madison
State WI Zip 53718
Phone 608-216-7362

Return To:

Company Pace Analytical Green Bay
Contact Milewsky, Dan
Email dan.milewsky@pacelabs.com
Address 1241 Bellevue Street
Address 2 Suite 9
City Green Bay
State WI Zip 54302
Phone (920)469-2436

Info

Project Name 25219067 Columbia CCR Mod 1-3
Due Date 10/06/2020
Profile 3946-13
Quote
Project Manager Milewsky, Dan
Return Date
Carrier Most Economical
Location

Trip Blanks

☐ Include Trip Blanks

Bottle Labels

☐ Blank
☐ Pre-Printed No Sample IDs
☒ Pre-Printed With Sample IDs

Bottles

☐ Boxed Cases
☐ Individually Wrapped
☒ Grouped By Sample ID/Matrix

Return Shipping Labels

☐ No Shipper
☐ With Shipper

COC Options

☐ Number of Blanks
☒ Pre-Printed

Misc

☐ Sampling Instructions
☐ Custody Seal
☐ Temp. Blanks
☒ Coolers
☐ Syringes
☐ Extra Bubble Wrap
☐ Short Hold/Rush Stickers
☒ DI Water 1 Liter(s)
☐ USDA Regulated Soils

# of Samples	Matrix	Test	Container	Total	# of	Lot #	Notes
5	WT	Boron/Calcium	250mL plastic w/HNO3	5	0	M-0-156-04BB	
5	WT	pH	250mL plastic unpres	5	0	M-0-156-05BB	
5	WT	TDS, Cl, F, SO4	250mL plastic unpres	5	0	M-0-156-05BB	

Hazard Shipping Placard In Place : NA

- Sample receiving hours are typically 8am-5pm, but may differ by location. Please check with your Pace Project Manager.
- Pace Analytical reserves the right to return hazardous, toxic, or radioactive samples to you.
- Pace Analytical reserves the right to charge for unused bottles, as well as cost associated with sample storage/disposal.
- Payment term are net 30 days.
- Please include the proposal number on the chain of custody to insure proper billing.

LAB USE:

Ship Date : 10/05/2020
Prepared By: Mai Yer Her
Verified By:

Sample

ALL SAMPLES UNFILTERED

CLIENT USE (Optional):

Date Rec'd:
Received By:
Verified By:

1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Sample Preservation Receipt Form

Client Name: SCS Engineers

Project # 40216310

All containers needing preservation have been checked and noted below: ☒Yes ☐No ☐N/A

Lab Lot# of pH paper: 10D4194

Lab Std #ID of preservation (if pH adjusted):

Initial when completed:

Date/ Time:

	Glass								Plastic					Vials						Jars				General									
Pace Lab #	AG1U	BG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	VG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN	VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
001										2		1																			/		2.5 / 5 / 10
002										2		1																			/		2.5 / 5 / 10
003										2		1																			/		2.5 / 5 / 10
004										2		1																			/		2.5 / 5 / 10
005																																	2.5 / 5 / 10
006																																	2.5 / 5 / 10
007																																	2.5 / 5 / 10
008																																	2.5 / 5 / 10
009																																	2.5 / 5 / 10
010																																	2.5 / 5 / 10
011																																	2.5 / 5 / 10
012																																	2.5 / 5 / 10
013																																	2.5 / 5 / 10
014																																	2.5 / 5 / 10
015																																	2.5 / 5 / 10
016																																	2.5 / 5 / 10
017																																	2.5 / 5 / 10
018																																	2.5 / 5 / 10
019																																	2.5 / 5 / 10
020																																	2.5 / 5 / 10

10/10/20

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:________ Headspace in VOA Vials (>6mm) : ☐Yes ☐No ☒N/A *If yes look in headspace column

AG1U	1 liter amber glass
BG1U	1 liter clear glass
AG1H	1 liter amber glass HCL
AG4S	125 mL amber glass H2SO4
AG4U	120 mL amber glass unpres
AG5U	100 mL amber glass unpres
AG2S	500 mL amber glass H2SO4
BG3U	250 mL clear glass unpres

BP1U	1 liter plastic unpres
BP3U	250 mL plastic unpres
BP3B	250 mL plastic NaOH
BP3N	250 mL plastic HNO3
BP3S	250 mL plastic H2SO4

VG9A	40 mL clear ascorbic
DG9T	40 mL amber Na Thio
VG9U	40 mL clear vial unpres
VG9H	40 mL clear vial HCL
VG9M	40 mL clear vial MeOH
VG9D	40 mL clear vial DI

JGFU	4 oz amber jar unpres
JG9U	9 oz amber jar unpres
WGFU	4 oz clear jar unpres
WPFU	4 oz plastic jar unpres
SP5T	120 mL plastic Na Thiosulfate
ZPLC	ziploc bag
GN	

Page 1 of 2

F-GB-C-046-Rev.03 (11Feb2020) Sample Preservation Receipt Form

Pace Analytical® 1241 Bellevue Street, Green Bay, WI 54302	Document Name: **Sample Condition Upon Receipt (SCUR)** Document No.: **ENV-FRM-GBAY-0014-Rev.00**	Document Revised: 26Mar2020 Author: Pace Green Bay Quality Office

Sample Condition Upon Receipt Form (SCUR)

Project #:

WO# : 40216310

40216310

Client Name: SCS Engineers

Courier: ☒ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco
☐ Client ☐ Pace Other:

Tracking #:

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other

Thermometer Used SR - ~~AA~~ 99 **Type of Ice:** [✓ Wet] Blue Dry None ☒ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 1.0 /Corr: 1.0 10/10/20 SRK

Temp Blank Present: ☐ yes ☒ no **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Person examining contents:
Date: 10/10/20 /Initials:
Labeled By Initials: SRK

Chain of Custody Present:	☒ Yes ☐ No ☐ N/A	1.
Chain of Custody Filled Out:	☐ Yes ☒ No ☐ N/A	2. pr #, invoice info., 10/10/20 SRK 10/10/20
Chain of Custody Relinquished:	☐ Yes ☒ No ☐ N/A	3. proj. state
Sampler Name & Signature on COC:	☒ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time: - VOA Samples frozen upon receipt	☒ Yes ☐ No ☐ Yes ☐ No	5. Date/Time:
Short Hold Time Analysis (<72hr):	☐ Yes ☒ No	6.
Rush Turn Around Time Requested:	☐ Yes ☒ No	7.
Sufficient Volume: For Analysis: ☒ Yes ☐ No MS/MSD:	☐ Yes ☒ No ☐ N/A	8.
Correct Containers Used: -Pace Containers Used: -Pace IR Containers Used:	☒ Yes ☐ No ☒ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☒ N/A	9.
Containers Intact:	☒ Yes ☐ No	10.
Filtered volume received for Dissolved tests	☐ Yes ☐ No ☒ N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: W	☒ Yes ☐ No ☐ N/A	12.
Trip Blank Present: Trip Blank Custody Seals Present Pace Trip Blank Lot # (if purchased):	☐ Yes ☐ No ☒ N/A ☐ Yes ☐ No ☒ N/A	13.

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: Date/Time:

Comments/ Resolution:

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logi

Appendix D

Historical Monitoring Results

Single Location

Name: WPL - Columbia

Location ID: MW-33AR
Number of Sampling Dates: 17

Parameter Name	Units	GPS	12/21/2015	4/5/2016	7/7/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/7/2017	10/24/2017	4/24/2018	9/21/2018	10/22/2018	4/2/2019	10/8/2019	5/28/2020	10/8/2020
Boron	ug/L	--	954	813	794	827	812	763	760	692	697	678	601	683	682	568	548	566	569
Calcium	ug/L	--	50000	48900	50500	79000	63100	57500	66800	80700	84800	98200	99800	--	66900	131000	121000	58400	57100
Chloride	mg/L	--	10.6	12.5	12.5	52.5	39.6	41.4	47.1	68.1	105	119	188	32.6	14.4	229	153	15.9	27.3
Fluoride	mg/L	4	<0.2 U	<0.2 U	<0.2 U	<0.5 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	--	<0.1 U	<0.1 U	<0.1 U	<0.095 U	<0.095 U
Field pH	Std. Units	--	7.87	8.08	7.68	8.23	7.63	8.62	8.19	7.78	7.47	7.81	7.74	8.16	7.69	7.72	7.74	7.59	7.7
Sulfate	mg/L	--	96.2	91.5	99.2	124	132	133	139	151	164	175	163	124	112	201	182	104	97.4
Total Dissolved Solids	mg/L	--	356	354	364	456	440	426	446	492	598	606	692	466	388	784	634	376	270
Antimony	ug/L	6	0.14 J	0.11 J	0.18 J	0.79 J	0.11 J	0.12 J	<0.073 U	<0.15 U	0.35 J	--	--	--	--	--	--	--	--
Arsenic	ug/L	10	0.46 J	0.38 J	0.52 J	1.2	0.32 J	0.45 J	0.31 J	0.36 J	0.59 J	--	--	--	--	--	--	--	--
Barium	ug/L	2000	25.8	24.8	26.8	47.7	37.8	33.8	35.1	37.7	42.4	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	<0.13 U	<0.13 U	<0.13 U	0.28 J	<0.13 U	<0.13 U	<0.13 U	<0.18 U	0.19 J	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	<0.089 U	<0.089 U	0.11 J	0.66 J	<0.089 U	<0.089 U	<0.089 U	<0.081 U	0.22 J	--	--	--	--	--	--	--	--
Chromium	ug/L	100	2.3	2.1	1.9	2.2	1.9	2	2.4	1.5 J	1.7 J	--	--	--	--	--	--	--	--
Cobalt	ug/L	6	<0.036 U	<0.036 U	0.13 J	0.68 J	0.039 J	0.065 J	<0.036 U	<0.085 U	0.23 J	--	--	--	--	--	--	--	--
Lead	ug/L	15	<0.04 U	<0.04 U	0.14 J	0.73 J	<0.04 U	0.046 J	<0.04 U	<0.2 U	0.35 J	--	--	--	--	--	--	--	--
Lithium	ug/L	40	1.3	1.3	1.1	2.8	1.4	1.3	1.2	1.4	1.4	--	--	--	--	--	--	--	--
Mercury	ug/L	2	<0.1 U	<0.1 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	4.7	4.1	4.4	2.4	3.8	3.6	3	1.3 J	2.1	--	--	--	--	--	--	--	--
Selenium	ug/L	50	2.2	2	2.1	2.9	2	2.3	2.3	1.9	2.4	--	--	--	--	--	--	--	--
Thallium	ug/L	2	<0.14 U	<0.14 U	0.17 J	0.76 J	<0.14 U	<0.14 U	<0.14 U	<0.14 U	0.31 J	--	--	--	--	--	--	--	--
Total Radium	pCi/L	5	0.76	0.852	1.79	1.01	1.53	0.556	0.313	0.829	1.12	--	--	--	--	--	--	--	--
Radium-226	pCi/L	--	0.202	0.709	0.835	-0.209	0.834	0.314	0.166	0.3	0.426	--	--	--	--	--	--	--	--
Radium-228	pCi/L	--	0.558	0.143	0.951	1.01	0.698	0.242	0.147	0.529	0.698	--	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	--	607	417.6	583.4	1255	702	797	1165	689	823	804	1079	632	618.4	1312	1102	633.4	623.5
Oxygen, Dissolved	mg/L	--	10.6	9.67	3.82	9.98	9.41	6.46	9.98	10.7	8.1	9.5	3	10.33	9.88	10.22	12.19	10.35	9.31
Field Oxidation Potential	mV	--	269	176	39.9	67.7	73.5	193.9	833	101.5	152.1	191	33.8	2.9	136.9	129	165.1	199.4	160.4
Groundwater Elevation	feet	--	783.77	763.29	785.19	787.36	785.66	785.88	786.39	787.27	786.11	784.13	783.09	787.9	788.77	786.63	788.26	786.01	785.91
Temperature	deg C	--	11.6	10.1	11.9	13.2	12.2	11.3	10.3	10.9	12.3	12.5	10.9	13.8	13.6	10.3	12.8	10.7	13.8
Turbidity	NTU	--	--	1.37	0.57	0.45	0.44	0.23	0.45	0.68	0.32	3.24	0.61	3.79	4.69	2.71	2.13	0	0
pH at 25 Degrees C	Std. Units	--	7.8	7.8	7.7	7.6	7.6	7.6	8	7.8	7.4	7.7	7.7	7.8	7.8	7.6	7.6	7.6	7.8

Single Location

Name: WPL - Columbia

Location ID: MW-34A
Number of Sampling Dates: 18

Parameter Name	Units	GPS	12/21/2015	4/5/2016	7/7/2016	7/28/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/7/2017	10/24/2017	4/24/2018	9/21/2018	10/22/2018	4/2/2019	10/8/2019	5/28/2020	10/8/2020
Boron	ug/L	--	230/205	220	216	--	212	224	214	214	201	205	208	209	241	233	204	207	210	213
Calcium	ug/L	--	65300/65200	63500	60000	--	55600	62800	58900	66300	66900	67300	69600	69600	--	70100	67500	78800	58700	61300
Chloride	mg/L	--	4.9/4.8	5.1	5.6	--	6.8	7.1	7.2	6.2	7.8	7.4	7.6	8.2	17.1	19.9	18.7	57.9	3.9	2.1
Fluoride	mg/L	4	<0.2 U/<0.2 U	<0.2 U	<0.2 U	--	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	--	<0.1 U	<0.1 U	<0.1 U	<0.095 U	<0.095 U
Field pH	Std. Units	--	7.91	7.92	7.52	7.4	8.19	7.43	7.71	8.03	7.57	7.39	7.67	7.8	8.12	7.64	7.73	7.79	7.4	7.81
Sulfate	mg/L	--	69.9/71.3	71.6	63.4	--	54.8	63.9	71.2	87.6	106	105	98	144	141	123	70.4	39.8	44.4	58.7
Total Dissolved Solids	mg/L	--	300/324	298	304	--	288	242	310	330	366	358	340	412	460	392	310	314	284	306
Antimony	ug/L	6	<0.073 U/<0.073 U	<0.073 U	<0.073 U	--	0.59 J	<0.073 U	<0.073 U	<0.073 U	<0.15 U	<0.15 U	--	--	--	--	--	--	--	--
Arsenic	ug/L	10	0.2 J/0.2 J	0.35 J	0.26 J	--	0.87 J	0.23 J	0.36 J	0.29 J	<0.28 U	0.36 J	--	--	--	--	--	--	--	--
Barium	ug/L	2000	15.8/11.1	9.1	9.4	--	9.9	9.5	8.9	11.6	9.9	10.2	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	<0.13 U/<0.13 U	<0.13 U	<0.13 U	--	0.28 J	<0.13 U	<0.13 U	<0.13 U	<0.18 U	<0.18 U	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	<0.089 U/<0.089 U	<0.089 U	<0.089 U	--	0.51 J	<0.089 U	<0.089 U	<0.089 U	<0.081 U	0.089 J	--	--	--	--	--	--	--	--
Chromium	ug/L	100	2.5/2.2	2	2.2	--	2.2	1.8	1.8	2.4	1.7 J	1.5 J	--	--	--	--	--	--	--	--
Cobalt	ug/L	6	0.29 J/0.13 J	0.048 J	0.16 J	--	0.53 J	<0.036 U	<0.036 U	0.18 J	<0.085 U	0.13 J	--	--	--	--	--	--	--	--
Lead	ug/L	15	0.38 J/0.18 J	0.046 J	0.18 J	--	0.61 J	0.049 J	<0.04 U	0.18 J	<0.2 U	<0.2 U	--	--	--	--	--	--	--	--
Lithium	ug/L	40	0.7 J/0.64 J	0.4 J	0.56 J	--	0.8 J	0.51 J	0.46 J	0.57 J	0.45 J	0.62 J	--	--	--	--	--	--	--	--
Mercury	ug/L	2	<0.1 U/<0.1 U	<0.1 U	<0.13 U	--	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	1.1/1.1	1.1	1.1	--	1.7	1.1	1	1.1	0.93 J	1.1 J	--	--	--	--	--	--	--	--
Selenium	ug/L	50	0.77 J/1	0.78 J	0.71 J	--	1.2	0.45 J	0.82 J	1.2	0.77 J	1.2	--	--	--	--	--	--	--	--
Thallium	ug/L	2	<0.14 U/<0.14 U	<0.14 U	<0.14 U	--	0.68 J	<0.14 U	<0.14 U	<0.14 U	<0.14 U	0.24 J	--	--	--	--	--	--	--	--
Total Radium	pCi/L	5	0.689 /0.696	0.869	--	0.788	0.602	0.509	0.477	0.215	0.373	0.348	--	--	--	--	--	--	--	--
Radium-226	pCi/L	--	0.585 /0.198	0.869	--	-0.132	0.256	-0.235	0.477	0	-0.29	0.0539	--	--	--	--	--	--	--	--
Radium-228	pCi/L	--	0.104 /0.498	-0.021	--	0.788	0.346	0.509	-0.459	0.215	0.373	0.294	--	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	--	517	386.9	494.3	503.6	819	490	470.9	843	499.1	510.6	454	581.4	578	607.7	531.7	572.9	459	464.2
Oxygen, Dissolved	mg/L	--	10	9.38	3.96	5.11	10.33	9.9	9.83	9.96	10.27	8.02	9.9	2.45	10.54	10.62	10.22	11.71	10.12	9.88
Field Oxidation Potential	mV	--	255	163.5	28.8	130.8	77.5	72.9	17.9	82.5	109.3	144.8	207	38.3	-2.6	118.8	104.4	150.9	198.5	143.2
Groundwater Elevation	feet	--	783.5	795.16	785.05	784.86	786.45	785.72	785.98	786.3	786.66	785.81	784.5	781.77	787.01	787.88	786.82	787.92	785.98	785.7
Temperature	deg C	--	11.7	10.9	10.8	10.9	12.2	12.3	12.3	11	11	11.5	11.7	11	12.45	12.7	10.6	13.4	11.1	12.9
Turbidity	NTU	--	--	4.08	6.3	4.96	2.27	0.95	2.09	15.96	3.7	2.68	14.34	2.72	24.9	9.32	64.77	52.88	84.51	55
pH at 25 Degrees C	Std. Units	--	7.7/7.7	7.7	7.4	--	7.6	7.4	7.3	7.9	7.7	7.8	7.7	7.7	7.7	7.8	7.7	7.7	7.6	7.7

Single Location

Name: WPL - Columbia

Location ID: MW-84A
Number of Sampling Dates: 19

Parameter Name	Units	GPS	12/22/2015	4/5/2016	7/8/2016	7/28/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/8/2017	10/24/2017	4/25/2018	8/8/2018	10/24/2018	4/3/2019	10/9/2019	2/3/2020
Boron	ug/L	--	11.9	14	14.7	--	11.1	14.7	16.1	12.9	14.8	22.9	13.8	25	12.8	10.1 J	13.6	12	15.7
Calcium	ug/L	--	74000	72200	67600	--	74000	76000	70800	73200	76100	74900	77500	76600	76000	74000	80100	73500	72700
Chloride	mg/L	--	4.9	4.7	5.1	--	4.3	4.7	4.6	4.9	5.5	5.5	5.1	4.8	4.9	4.2	3.6	3.9	3.7
Fluoride	mg/L	4	<0.2 U	<0.2 U	<0.2 U	--	<0.1 U	<0.1 U	0.12 J	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	--
Field pH	Std. Units	--	7.6	7.61	7.45	7.34	7.91	7.25	6.99	7.8	7.28	7.23	7.68	7.45	7.38	7.24	7.03	7.23	7.51
Sulfate	mg/L	--	4.9	4.3	3.7 J	--	2.6 J	2.7 J	3	2.8 J	2.7 J	2 J	2.2 J	2.8 J	1.9 J	1.6 J	1.4 J	1.3 J	<2.2 U
Total Dissolved Solids	mg/L	--	316	322	316	--	324	316	328	342	344	342	314	328	372	330	318	310	316
Antimony	ug/L	6	<0.073 U	0.084 J	0.1 J	--	<0.073 U	<0.073 U	<0.073 U	<0.073 U	<0.15 U	<0.15 U	--	<0.15 U	<0.15 U	<0.15 U	<0.15 U	<0.15 U	--
Arsenic	ug/L	10	0.15 J	0.29 J	0.14 J	--	0.35 J	0.19 J	0.35 J	<0.099 U	<0.28 U	0.28 J	--	<0.28 U	<0.28 U	0.33 J	<0.28 U	0.46 J	0.38 J
Barium	ug/L	2000	15.3	12.7	12.2	--	14.2	18.4	13.8	14.1	13.4	14	--	14.6	13.7	14.5	14.7	13.2	14
Beryllium	ug/L	4	<0.13 U	<0.13 U	<0.13 U	--	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.18 U	<0.18 U	--	<0.18 U	<0.18 U	<0.18 U	<0.18 U	<0.25 U	--
Cadmium	ug/L	5	<0.089 U	<0.089 U	<0.089 U	--	<0.089 U	<0.089 U	<0.089 U	<0.089 U	<0.081 U	<0.081 U	--	<0.081 U	--	<0.15 U	<0.15 U	<0.15 U	--
Chromium	ug/L	100	2.5	1.9	1.8	--	2	2	1.9	2.4	2 J	1.6 J	--	2.4 J	1.5 J	1.6 J	1.8 J	1.6 J	1.6 J
Cobalt	ug/L	6	0.095 J	<0.036 U	0.053 J	--	<0.036 U	<0.036 U	<0.036 U	<0.036 U	<0.085 U	<0.085 U	--	<0.085 U	<0.085 U	<0.12 U	<0.12 U	<0.12 U	<0.12 U
Lead	ug/L	15	0.16 J	<0.04 U	0.39 J	--	0.049 J	0.11 J	<0.04 U	0.041 J	<0.2 U	<0.2 U	--	<0.2 U	--	<0.24 U	<0.24 U	<0.24 U	--
Lithium	ug/L	40	0.72 J	0.44 J	0.5 J	--	0.56 J	0.56 J	0.56 J	0.55 J	0.46 J	0.58 J	--	0.5 J	0.4 J	0.49 J	0.56 J	0.52 J	0.58 J
Mercury	ug/L	2	<0.1 U	<0.1 U	<0.13 U	--	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	--	<0.13 U	--	<0.084 U	<0.084 U	<0.084 U	--
Molybdenum	ug/L	100	<0.07 U	<0.07 U	0.073 J	--	0.12 J	<0.07 U	<0.07 U	<0.07 U	<0.44 U	<0.44 U	--	<0.44 U	<0.44 U	<0.44 U	<0.44 U	<0.44 U	<0.44 U
Selenium	ug/L	50	<0.21 U	<0.21 U	<0.21 U	--	<0.21 U	<0.21 U	<0.21 U	<0.21 U	<0.32 U	<0.32 U	--	<0.32 U	<0.32 U	<0.32 U	<0.32 U	<0.32 U	<0.32 U
Thallium	ug/L	2	<0.14 U	<0.14 U	<0.14 U	--	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	--	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U
Total Radium	pCi/L	5	0.593	0.0809	--	1.37	0.825	0.404	1.39	0.0929	0.676	0.509	--	0.526	0.529	0.62	0.681	0.247	0.1
Radium-226	pCi/L	--	0.156	-0.088	--	-0.058	0.132	0.168	0.624	0.0768	0.27	0.242	--	0.155	-0.203	0.313	0.199	0.247	0.1
Radium-228	pCi/L	--	0.437	0.0809	--	1.37	0.693	0.236	0.766	0.0161	0.406	0.267	--	0.371	0.529	0.307	0.482	-0.024	-0.153
Field Specific Conductance	umhos/cm	--	599	427	574.8	579.3	1002	578.2	489	948	535.3	557.2	491	581.7	617.1	609	637.2	614.1	618.4
Oxygen, Dissolved	mg/L	--	9.7	9.37	3.78	5.11	9.61	8.94	6.48	9.28	9.46	7.5	9.3	3.94	8.84	10.01	9.49	11.36	8.43
Field Oxidation Potential	mV	--	154	165.1	139.9	138.3	82.7	87	192.9	102	123.6	204.7	210	53.3	142.7	71.5	103.4	181.7	121.5
Groundwater Elevation	feet	--	785.31	786.3	785.89	785.61	787.22	786.63	786.7	787.16	787.63	786.68	785.32	785.88	786.55	788.32	787.35	787.79	786.5
Temperature	deg C	--	10.4	10.2	11.3	11	11.5	10.8	10.9	10.6	11.3	11.2	11.1	10.2	12	11.6	10.2	11.8	10.3
Turbidity	NTU	--	--	0.86	2.75	0.17	0.3	0.25	0.33	0.04	0.56	0.08	2.93	0.81	0.71	3.79	1.9	2.41	1.23
pH at 25 Degrees C	Std. Units	--	7.5	7.4	7.4	--	7.3	7.4	7.3	7.7	7.6	7.4	7.6	7.6	7.4	7.5	7.4	7.5	7.4

Location ID: MW-84A
Number of Sampling Dates: 19

Parameter Name	Units	GPS	5/29/2020	10/8/2020
Boron	ug/L	--	10	9.7 J
Calcium	ug/L	--	77600	69200
Chloride	mg/L	--	3.7	4.3
Fluoride	mg/L	4	<0.095 U	<0.095 U
Field pH	Std. Units	--	7.34	7.49
Sulfate	mg/L	--	1.5 J	1.3 J
Total Dissolved Solids	mg/L	--	340	320
Antimony	ug/L	6	<0.15 U	<0.15 U
Arsenic	ug/L	10	0.34 J	0.49 J
Barium	ug/L	2000	13.9	12.6
Beryllium	ug/L	4	<0.25 U	<0.25 U
Cadmium	ug/L	5	<0.15 U	<0.15 U
Chromium	ug/L	100	1.7 J	1.6 J
Cobalt	ug/L	6	<0.12 U	<0.12 U
Lead	ug/L	15	<0.24 U	<0.24 U
Lithium	ug/L	40	0.4 J	0.39 J
Mercury	ug/L	2	<0.084 U	<0.066 U
Molybdenum	ug/L	100	<0.44 U	<0.44 U
Selenium	ug/L	50	<0.32 U	<0.32 U
Thallium	ug/L	2	<0.14 U	<0.14 U
Total Radium	pCi/L	5	0.395	0.39
Radium-226	pCi/L	--	0.368	0
Radium-228	pCi/L	--	0.0273	0.39
Field Specific Conductance	umhos/cm	--	613.7	610.1
Oxygen, Dissolved	mg/L	--	9.81	9.39
Field Oxidation Potential	mV	--	135	153.2
Groundwater Elevation	feet	--	787.02	786.1
Temperature	deg C	--	10.6	11.9
Turbidity	NTU	--	2.15	0
pH at 25 Degrees C	Std. Units	--	7.6	7.6

Single Location

Name: WPL - Columbia

Location ID: MW-301

Number of Sampling Dates: 18

Parameter Name	Units	GPS	12/22/2015	4/5/2016	7/8/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/8/2017	10/23/2017	4/25/2018	8/8/2018	10/24/2018	4/2/2019	10/9/2019	2/3/2020	5/29/2020
Boron	ug/L	--	26.5	25.2	23.6	30.6	32.8	32.6	28.8	21.3	30.6	34.3	24.3	22.8	27.8	26.9	35.9	27.9	21.3
Calcium	ug/L	--	126000	115000	108000	118000	129000	124000	120000	111000	108000	87200	112000	105000	101000	126000	114000	113000	112000
Chloride	mg/L	--	3.7 J	4	3.5 J	2.2	2 J	1.5 J	2	3.5	5.5	4	2.3	5.2	3.2	0.79 J	1.7 J	1.3 J	2 J
Fluoride	mg/L	4	<0.2 U	<0.2 U	<0.2 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	--	<0.095 U
Field pH	Std. Units	--	6.85	7.01	6.87	7.28	6.63	7.1	7.11	6.7	6.75	7.37	6.76	6.91	6.79	6.62	6.67	6.89	6.73
Sulfate	mg/L	--	9.3	15.3	15	13.9	12.3 J	6.5	10.3	17.1	31.6	27.5	8.6	21.6	19.2	4.4	8.4	7.2	11.5
Total Dissolved Solids	mg/L	--	478	486	464	490	444	514	502	458	462	362	464	502	424	462	418	462	452
Antimony	ug/L	6	0.15 J	0.094 J	0.13 J	<0.073 U	0.4 J	<0.073 U	<0.073 U	<0.15 U	<0.15 U	--	<0.15 U	0.36 J	<0.15 U	0.32 J	<0.15 U	--	<0.15 U
Arsenic	ug/L	10	0.26 J	0.26 J	0.19 J	0.24 J	0.4 J	0.13 J	0.18 J	<0.28 U	<0.28 U	--	<0.28 U	0.45 J	<0.28 U	0.4 J	0.42 J	<0.28 U	0.33 J
Barium	ug/L	2000	20.2	11.1	11.6	15.6	15	13.5	13.2	11.3	11.8	--	9.3	10.2	11.5	11.8	10	10.9	9.8
Beryllium	ug/L	4	<0.13 U	<0.13 U	<0.13 U	<0.13 U	0.19 J	<0.13 U	<0.13 U	<0.18 U	<0.18 U	--	<0.18 U	0.37 J	<0.18 U	0.28 J	<0.25 U	--	<0.25 U
Cadmium	ug/L	5	<0.089 U	<0.089 U	<0.089 U	<0.089 U	0.32 J	<0.089 U	<0.089 U	<0.081 U	<0.081 U	--	<0.081 U	--	<0.15 U	0.21 J	<0.15 U	--	<0.15 U
Chromium	ug/L	100	2.1	0.58 J	0.59 J	<0.39 U	0.7 J	0.53 J	0.7 J	2.3 J	<1 U	--	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Cobalt	ug/L	6	1.4	0.25 J	0.22 J	0.041 J	0.38 J	0.071 J	0.064 J	0.13 J	0.12 J	--	<0.085 U	0.28 J	<0.12 U	0.35 J	<0.12 U	0.17 J	<0.12 U
Lead	ug/L	15	0.9 J	0.077 J	0.48 J	<0.04 U	0.34 J	<0.04 U	<0.04 U	<0.2 U	<0.2 U	--	<0.2 U	--	<0.24 U	0.3 J	<0.24 U	--	<0.24 U
Lithium	ug/L	40	1.3	0.58 J	0.69 J	0.6 J	0.87 J	0.67 J	0.68 J	0.62 J	0.6 J	--	0.55 J	0.85 J	0.52 J	0.9 J	0.61 J	0.67 J	0.47 J
Mercury	ug/L	2	<0.1 U	<0.1 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	--	<0.13 U	--	<0.084 U	<0.084 U	<0.084 U	--	<0.084 U
Molybdenum	ug/L	100	0.35 J	0.15 J	0.14 J	0.12 J	0.38 J	<0.07 U	<0.07 U	<0.44 U	<0.44 U	--	<0.44 U	<0.44 U	<0.44 U	<0.44 U	<0.44 U	<0.44 U	<0.44 U
Selenium	ug/L	50	0.3 J	0.21 J	0.39 J	<0.21 U	0.26 J	<0.21 U	<0.21 U	<0.32 U	<0.32 U	--	<0.32 U	0.71 J	<0.32 U	0.49 J	<0.32 U	<0.32 U	<0.32 U
Thallium	ug/L	2	<0.14 U	<0.14 U	<0.14 U	<0.14 U	0.48 J	<0.14 U	<0.14 U	<0.14 U	<0.14 U	--	<0.14 U	0.3 J	<0.14 U	0.48 J	<0.14 U	<0.14 U	<0.14 U
Total Radium	pCi/L	5	1.31	1.11	0.89	0.631	1.01	2.42	1.35	1.3	1.74	--	0.882	0.0351	0.652	0.552	0.701	0.502	0.193
Radium-226	pCi/L	--	0.655	0.294	0.404	-0.067	0.108	1.46	0.513	0.287	1.09	--	0.122	-0.06	0.247	0	0.252	0.136	0
Radium-228	pCi/L	--	0.651	0.82	0.486	0.631	0.905	0.964	0.833	1.01	0.647	--	0.76	0.0351	0.405	0.552	0.449	0.366	0.193
Field Specific Conductance	umhos/cm	--	897	573	796	1464	859	1018	1354	698.4	691.7	561	774	799	767	883	801	868	797
Oxygen, Dissolved	mg/L	--	1.7	2.71	1.47	1.99	1.34	1.24	1.44	1.81	1.43	1.1	2.35	2.14	2.49	2.2	1.67	1.07	2
Field Oxidation Potential	mV	--	135	123.7	133.9	100.8	95.8	226.1	100.9	115.1	187.4	204	74.3	126.5	77.9	152.1	173	132.3	118.7
Groundwater Elevation	feet	--	785.56	768.12	786.31	787.64	787.37	787.27	787.89	788.25	787.34	785.89	785.29	787.06	788.98	787.04	788.47	787.24	787.77
Temperature	deg C	--	9.7	7.7	10	11.2	10.1	8.8	7.7	8.9	10.2	11.1	7.4	10.6	11.1	7.5	11.3	8.5	8.1
Turbidity	NTU	--	--	1.52	3.89	0.59	0.74	0.42	0.1	0.22	0.18	1.52	1.12	0.46	3.3	2.02	2.12	1.41	0
pH at 25 Degrees C	Std. Units	--	7	7	6.8	6.8	6.9	6.9	7.1	7	7	7.3	7	7	7.1	6.8	7	6.8	7

Location ID: MW-301
Number of Sampling Dates: 18

Parameter Name	Units	GPS	10/8/2020
Boron	ug/L	--	28.8
Calcium	ug/L	--	93000
Chloride	mg/L	--	3.4
Fluoride	mg/L	4	<0.095 U
Field pH	Std. Units	--	6.95
Sulfate	mg/L	--	25.1
Total Dissolved Solids	mg/L	--	412
Antimony	ug/L	6	0.33 J
Arsenic	ug/L	10	0.62 J
Barium	ug/L	2000	9.4
Beryllium	ug/L	4	<0.25 U
Cadmium	ug/L	5	0.19 J
Chromium	ug/L	100	<1 U
Cobalt	ug/L	6	0.29 J
Lead	ug/L	15	0.25 J
Lithium	ug/L	40	0.46 J
Mercury	ug/L	2	<0.066 U
Molybdenum	ug/L	100	<0.44 U
Selenium	ug/L	50	<0.32 U
Thallium	ug/L	2	0.3 J
Total Radium	pCi/L	5	0.38
Radium-226	pCi/L	--	0.0511
Radium-228	pCi/L	--	0.329
Field Specific Conductance	umhos/cm	--	760
Oxygen, Dissolved	mg/L	--	1.22
Field Oxidation Potential	mV	--	183.9
Groundwater Elevation	feet	--	786.53
Temperature	deg C	--	11
Turbidity	NTU	--	0
pH at 25 Degrees C	Std. Units	--	7.2

Single Location

Name: WPL - Columbia

Location ID: MW-302
Number of Sampling Dates: 17

Parameter Name	Units	GPS	12/22/2015	4/5/2016	7/7/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/8/2017	10/24/2017	4/24/2018	9/21/2018	10/22/2018	4/2/2019	10/9/2019	5/29/2020	10/8/2020
Boron	ug/L	--	80	78.8	134	132	106	149	322	671	833	691	1950	203	296	254	246	611	648
Calcium	ug/L	--	68800	65900	66900	71700	76100	75400	79600	88900	87100	94400	110000	--	56900	62400	61400	90500	80600
Chloride	mg/L	--	4.2	4.1	3.1 J	1.1 J	1.2 J	1.6 J	1.6 J	3.5	4.5	6.9	15	1.7 J	1.8 J	1.5 J	1.1 J	1.2 J	1.1 J
Fluoride	mg/L	4	<0.2 U	<0.2 U	<0.2 U	<0.1 U	<0.1 U	0.13 J	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U	--	<0.1 U	<0.1 U	<0.1 U	<0.095 U	<0.095 U
Field pH	Std. Units	--	7.63	7.7	7.29	7.72	7.12	8.21	7.63	7.16	7.04	8.23	7.21	7.74	7.22	7.32	7.08	7.2	7.21
Sulfate	mg/L	--	37.4	55.6	35.4	64.7	56.4	61.6	81.3	84.6	79	78.4	109	30	26.9	25.2	16.7	34.6	36.5
Total Dissolved Solids	mg/L	--	312	312	344	360	330	384	436	466	470	446	598	280	288	290	274	404	378
Antimony	ug/L	6	0.17 J	0.092 J	0.2 J	0.14 J	0.14 J	0.17 J	<0.073 U	<0.15 U	<0.15 U	--	--	--	--	--	--	--	--
Arsenic	ug/L	10	<0.099 U	0.17 J	0.23 J	0.2 J	<0.099 U	0.24 J	<0.099 U	<0.28 U	<0.28 U	--	--	--	--	--	--	--	--
Barium	ug/L	2000	14.3	9.7	14.6	16.4	16.9	17.8	20.3	22	22.2	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.18 U	<0.18 U	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	<0.089 U	<0.089 U	0.14 J	<0.089 U	<0.089 U	<0.089 U	<0.089 U	<0.081 U	<0.081 U	--	--	--	--	--	--	--	--
Chromium	ug/L	100	2.3	3.3	2.7	1.7	2.4	2.6	2.7	2.3 J	2 J	--	--	--	--	--	--	--	--
Cobalt	ug/L	6	0.11 J	0.11 J	0.2 J	<0.036 U	0.079 J	0.083 J	0.08 J	<0.085 U	<0.085 U	--	--	--	--	--	--	--	--
Lead	ug/L	15	0.1 J	0.084 J	0.24 J	<0.04 U	0.073 J	0.075 J	0.047 J	<0.2 U	<0.2 U	--	--	--	--	--	--	--	--
Lithium	ug/L	40	17.1	13.7	4.5	3	3.3	3.2	2.7	2.2	2.4	--	--	--	--	--	--	--	--
Mercury	ug/L	2	<0.1 U	<0.1 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	8.9	8	2.4	1.6	1.6	1.6	1.5	1.3 J	1.6	--	--	--	--	--	--	--	--
Selenium	ug/L	50	2.8	2.7	1.8	1.2	2	1.6	2.5	2	2.4	--	--	--	--	--	--	--	--
Thallium	ug/L	2	<0.14 U	<0.14 U	0.24 J	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	--	--	--	--	--	--	--	--
Total Radium	pCi/L	5	0.184	0.505	1.21	0.4	0.252	2.6	0.555	1.45	0.731	--	--	--	--	--	--	--	--
Radium-226	pCi/L	--	0.184	0.1	-0.358	0.208	-0.103	1.37	0.077	0.649	0.193	--	--	--	--	--	--	--	--
Radium-228	pCi/L	--	-0.028	0.405	1.21	0.192	0.252	1.23	0.478	0.802	0.538	--	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	--	566	383.6	578	1006	588.9	726	1114	641.8	679	596	894	461	507.6	538.6	515.4	694.7	643.1
Oxygen, Dissolved	mg/L	--	6.8	9.7	3.7	9.37	8.5	6.22	9.53	9.91	7.4	8.7	2.8	9.82	9.34	9.65	11.38	10	9.21
Field Oxidation Potential	mV	--	132	198.6	80	96.3	88.9	223.4	107.4	130.4	191.1	220	49.1	56	135.1	126.7	134.5	169.2	152.7
Groundwater Elevation	feet	--	784.78	778.91	786.28	787.76	787.05	786.89	787.55	788.37	787.55	785.94	784.37	788.37	789.16	787.56	788.31	787.29	786.74
Temperature	deg C	--	10.6	9.8	11.2	12.2	11.1	10.4	9.5	10.1	11.4	11.4	10.7	12.45	13.1	9.8	12.6	9.8	11.8
Turbidity	NTU	--	--	9.69	2.08	0.81	1.78	1.26	1.68	1.9	0.83	2.61	3.42	5.26	5.23	9.72	2.01	2.88	0
pH at 25 Degrees C	Std. Units	--	7.5	7.6	7.3	7.2	7.1	7.8	7.6	7.5	7.4	7.2	7.4	7.4	7.3	7.4	7.4	7.4	7.6

Appendix E

Statistical Evaluation

SCS ENGINEERS
Environmental Consultants & Contractors

January 10, 2020 (Revised January 14, 2021)
File No. 25219067.00

TECHNICAL MEMORANDUM

SUBJECT: Statistical Evaluation of Groundwater Monitoring Results
COL Mod 1-3 Landfill, October 2019 Sampling Event

PREPARED BY: Sherren Clark

CHECKED BY: Nicole Kron

Note: Revisions on January 14, 2021, were limited to the text of the memorandum describing the process. The statistical analysis and attached Sanitas output were not changed.

STATISTICAL METHOD

The statistical analysis uses a prediction interval approach as recommended for detection monitoring in the March 2009 United States Environmental Protection Agency (USEPA) Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act (RCRA) Facilities. For the prediction interval evaluation, interwell testing was selected based on the considerations outlined in Chapter 6 of the Unified Guidance. The statistical program used to calculate the interwell prediction interval is Sanitas™.

Under the interwell approach, detection monitoring results are compared to upper prediction limits (UPLs) calculated based on background monitoring results from the two background wells: MW-84A and MW-301. Compliance wells for Mod 1-3 include MW-33AR, MW-34A, and MW-302.

Nine rounds of background monitoring were performed prior to the initiation of compliance monitoring, from December 2015 through August 2017. Since then, 6 additional rounds of monitoring for Appendix III parameters have been performed at the background wells. As part of the evaluation of the October 2019 detection monitoring results, the background data set for the UPL calculations is being updated to include data from the background wells collected through October 2019.

The statistical approach uses an interwell UPL with 1-of-2 retesting, calculated using Sanitas software. For a UPL calculated with 1-of-2 retesting, only 1 of 2 samples collected for the event (original and retest) must meet the UPL to demonstrate compliance.

The October 2019 monitoring event includes the following sample dates:

- October 8-9, 2019: All wells, all detection monitoring parameters

TIME SERIES PLOTS

Time series plots were prepared for the required detection monitoring parameters to show the concentration variations over time, and are included in **Attachment A**. The time series plots include the three compliance wells and two background wells for Mod 1-3.

BACKGROUND UPDATE

The background data pool was updated in accordance with the Unified Guidance, which recommends updating background every 2 to 3 years for semiannual sampling. Prior to expanding the data pool, the original background data set (12/15 through 8/17) and the data to be added (10/17 through 10/19) were compared. The Unified Guidance states that recently collected measurements from the background wells can be added to the existing pool if a Student's t-test or Wilcoxon rank-sum test (finds no significant difference between the two groups at the 1% level of significance. The Wilcoxon rank-sum analysis for the COL background data sets, included in **Attachment B**, indicated no signficant difference at the 1% level; therefore, the more recent data can be added to the background pool.

OUTLIER ANALYSIS

For the interwell evaluation, an outlier analysis was performed for the background monitoring results at each of the two background wells. A statistical outlier is a value that is extremely different from the other values in the data set. The Sanitas outlier tests identify data points that do not appear to fit the distribution of the rest of the data set and determine if they differ significantly from the rest of the data. The outlier analysis performed in Sanitas includes the following steps:

1) Run normality test (Shapiro Wilk)
    a) If not normal, transform to natural log and test for lognormal distribution

2) If normally or lognormally distributed, run USEPA's 1989 Outlier Test to identify suspected outliers:
    a) If number of background samples is less than or equal to 25, run Dixon's test for suspected outliers.
    b) If number of background samples is more than 25, run Rosner's test for suspected outliers.

3) If not normally distributed, run Tukey's test for outliers.

4) Review data flagged as possible outliers to evaluate whether they should be removed from the background data set. Also review time series plots for possible outliers that were not picked up in the statistical evaluation (e.g., outlier test may not identify outliers when two values are similar to each other, but very different from all other data).

The Sanitas output for the outlier analysis is provided in **Attachment C**.

Results identified as statistical outliers are checked for possible lab instrument failure, field collection problems, or data entry errors. However, outliers may exist naturally in the data if there is an extremely wide inherent or temporal variability in the data. The Unified Guidance states that unless a likely error can be identified, the outlier should not be removed.

For the October 2019 data evaluation, the following background values were identified as potential outliers and handled as described:

- **Boron (MW-84A):** One high result from the April 2018 sampling were flagged by Sanitas as a statistical outlier. This result was kept in the dataset because there was no known explanation for the varying results, and the result (25 ug/l) falls within a reasonable range for this parameter. A similar but slightly lower result (22.9 ug/l) was reported for the August 2017 sampling event.

- **Fluoride (MW-84A):** Three high results from the first three rounds of background sampling were flagged by Sanitas as a statistical outliers. These three results were all non-detect results, as were all but one of the fluoride results to date from both background wells. The detection limit for fluoride was higher in the first three rounds than in subsequent rounds. Due to the high proportion of non-detect results, with no results above the limit of quantification, a UPL will not be calculated for fluoride, and the Double Quantification rule will apply. Therefore, the identification of these outliers for fluoride based on detection limits is not meaningful, and these results will not affect the prediction limit evaluation.

- **Total Dissolved Solids (MW-84A):** One high result from the August 2018 sampling was flagged by Sanitas as a statistical outlier. This result was kept in the dataset because there was no known explanation for the varying results, and the result (372 mg/l) falls within a reasonable range for this parameter.

INTERWELL PREDICTION LIMITS

Interwell upper prediction limits (UPLs) were calculated using data from the background wells for each monitored constituent, with outliers handled as noted above. The prediction limit analysis performed in Sanitas includes the following steps:

1) If more than 50 percent of results are non-detect, apply a non-parametric UPL. For small background sample sizes, the non-parametric UPL is the highest background value.

2) If 50 percent or fewer of the results are non-detect, run normality test (Shapiro Wilk/Francia) to assess whether the data fit a normal distribution or can be transformed to fit a normal distribution (e.g., lognormal).

3) If normal or transformed normal, calculate parametric UPL.

4) If not normal or transformed normal, calculate non-parametric UPL.

Consistent with the Unified Guidance, parametric prediction limits were calculated based on a 1-of-2 retesting protocol and a target 10 percent annual site-wide false positive rate. Sanitas establishes the per-test significance level based on user inputs of the number of events per year, number of constituents being evaluated, and number of compliance wells. For the October 2019 event, the following values were used:

Parameter	Value	Comments
Evaluations per year	2	April and October events
Constituents analyzed	6	Total of 7 constituents analyzed for detection monitoring. Fluoride not counted because all but one of the 30 background results were non-detect and all were well below the limit of quantification. Double Quantification rule will apply.
Compliance wells	3	MW-33AR, MW-34A, MW-302

Non-parametric prediction limits are also based on a 1-of-2 retesting protocol. The non-parametric limit is the highest value in the background dataset. Due to the small sample size, the false positive rate for the non-parametric tests is higher than for the parametric tests, but will go down as more background data are obtained.

Under the Double Quantification Rule, an SSI has not occurred for a compliance well unless two sample results from the well exceed the laboratory's reporting limit or quanitification limit. The Double Quantification rule is typically applied for background datasets with 100% non-detects, but was applied for fluoride because only 1 of 30 background samples had a detection, and the result was only slightly above the method detection limit and well bolow the limit of quantification (LOQ). If a UPL were calculated for this parameter, it would be below the LOQ, and under the 1-of-2 retesting plan an SSI would occur only if a sample and retest both exceeded the UPL and the LOQ. Excluding fluoride from the UPL calculations increases the power of the test for the other Appendix III parameters while maintaining the same site-wide false positive rate (10% annual).

For evaluation of parameters with less than 100 percent non-detects in the background sampling, the non-detects were replaced with a value of one-half the detection limit. For all parameters, only results at or above the laboratory's reporting limit or quanitification limit are compared to the UPL for SSI determination.

Interwell prediction limit analysis results for 2019 are included in Attachment D

Sanitas settings are provided in Attachment E.

RESULTS

SSIs were identified for the following parameters and wells:

- Boron: MW-33AR, MW-34A, MW-302
- Chloride: MW-33AR, MW-34A
- Field pH: MW-34A
- Sulfate: MW-33AR, MW-34A
- Total Dissolved Solids: MW-33AR

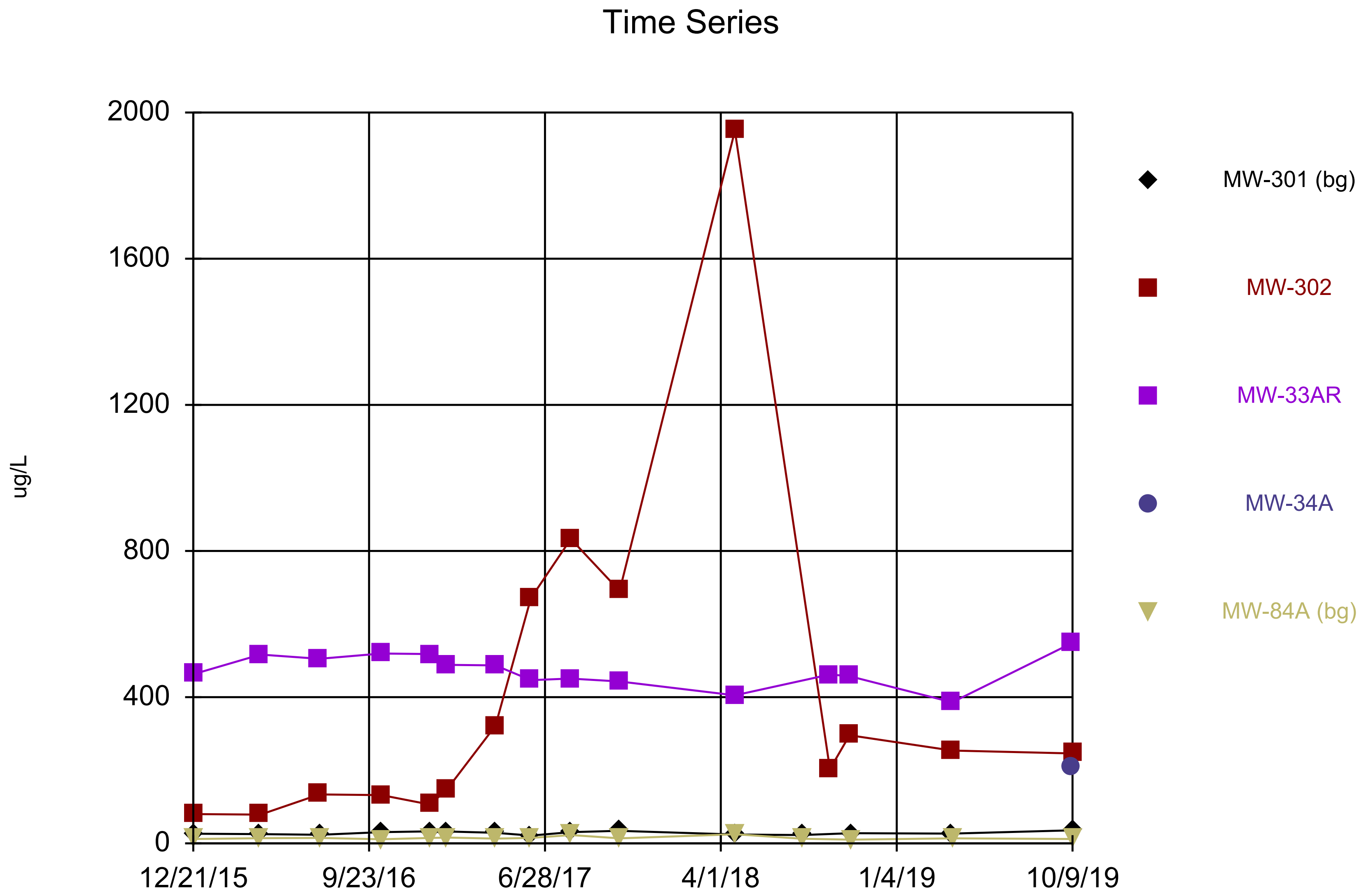
SCC/NDK

\\Mad-fs01\data\Projects\25220067.00\Deliverables\2020 Fed Annual Report - COL MOD 1-3\Appendix E - Statistics\COL Interwell_2019 Oct_UPL Update_R210114.docx

Attachment A

Times Series Plots

Sanitas™ v.9.6.24 Software licensed to SCS Engineers. UG



Constituent: Boron Analysis Run 1/8/2020 5:22 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

02/04/2021 - Classification: Internal - ECRM7850515

Time Series

Constituent: Boron (ug/L)   Analysis Run 1/8/2020 5:23 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			463 (D)		
12/22/2015	26.5	80			11.9
4/5/2016	25.2	78.8	516.5 (D)		14
7/7/2016		134	505 (D)		
7/8/2016	23.6				14.7
10/13/2016	30.6	132	519.5 (D)		11.1
12/29/2016	32.8	106	518 (D)		14.7
1/25/2017	32.6	149	488.5 (D)		16.1
4/11/2017	28.8	322	487 (D)		12.9
6/6/2017	21.3	671	446.5 (D)		14.8
8/7/2017			451 (D)		
8/8/2017	30.6	833			22.9
10/23/2017	34.3				
10/24/2017		691	443 (D)		13.8
4/24/2018		1950	405 (D)		
4/25/2018	24.3				25
8/8/2018	22.8				12.8
9/21/2018		203	462 (D)		
10/22/2018		296	457.5 (D)		
10/24/2018	27.8				10.1 (J)
4/2/2019	26.9	254	386 (D)		
4/3/2019					13.6
10/8/2019			548	207	
10/9/2019	35.9	246			12

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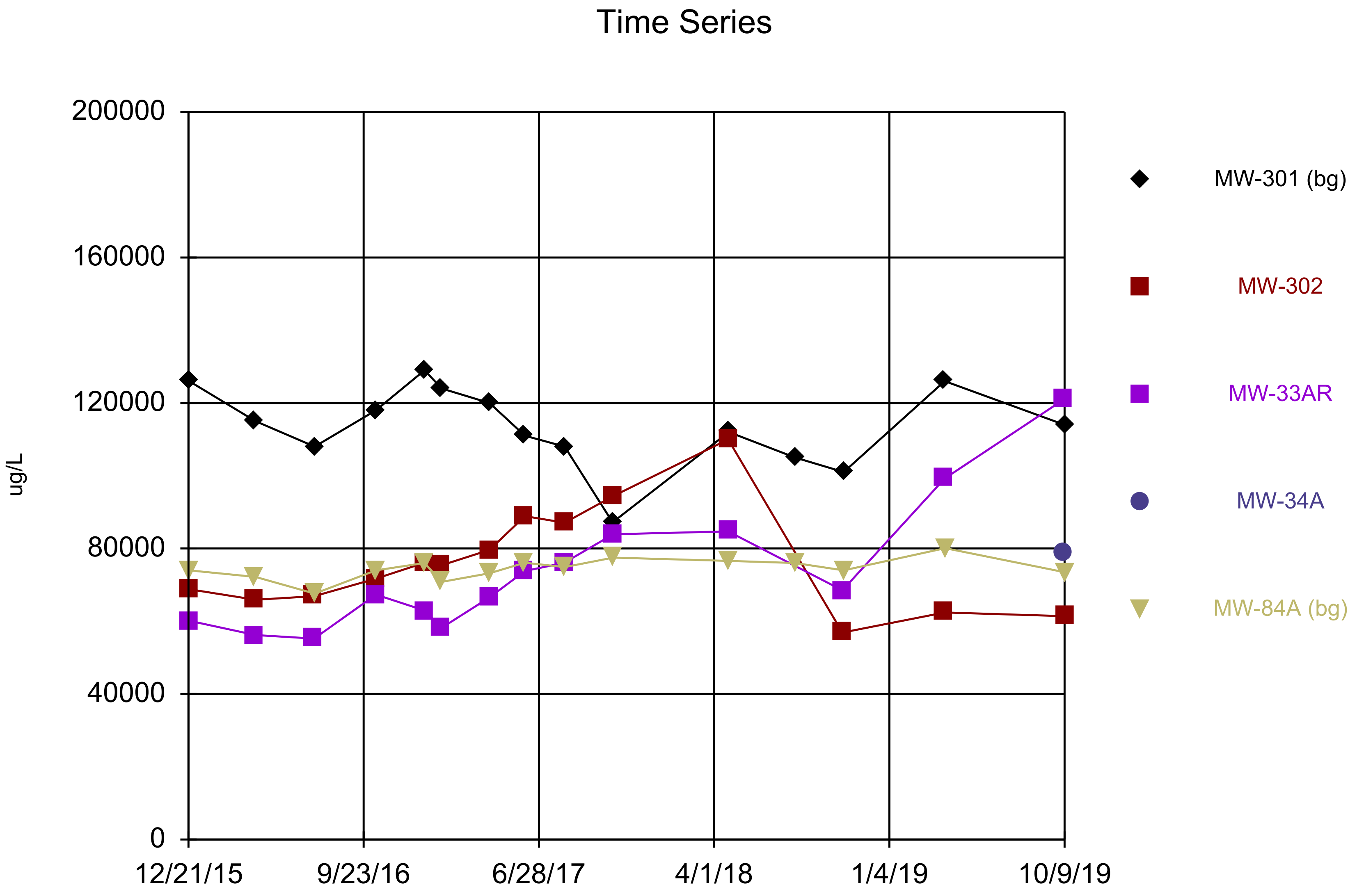


Constituent: Calcium Analysis Run 1/8/2020 5:22 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

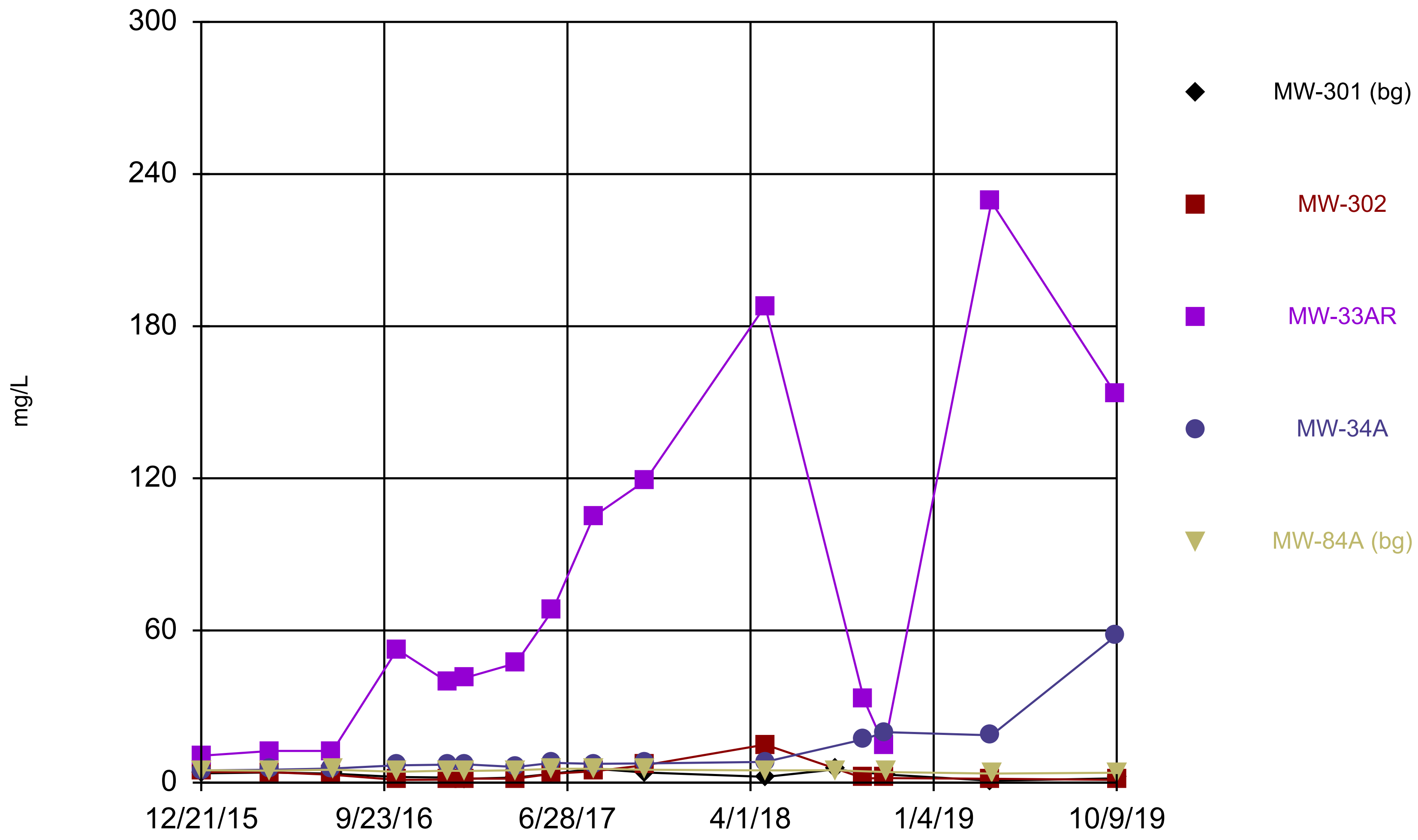
Time Series

Constituent: Calcium (ug/L)   Analysis Run 1/8/2020 5:23 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			60167 (D)		
12/22/2015	126000	68800			74000
4/5/2016	115000	65900	56200 (D)		72200
7/7/2016		66900	55250 (D)		
7/8/2016	108000				67600
10/13/2016	118000	71700	67300 (D)		74000
12/29/2016	129000	76100	62950 (D)		76000
1/25/2017	124000	75400	58200 (D)		70800
4/11/2017	120000	79600	66550 (D)		73200
6/6/2017	111000	88900	73800 (D)		76100
8/7/2017			76050 (D)		
8/8/2017	108000	87100			74900
10/23/2017	87200				
10/24/2017		94400	83900 (D)		77500
4/24/2018		110000	84700 (D)		
4/25/2018	112000				76600
8/8/2018	105000				76000
10/22/2018		56900	68500 (D)		
10/24/2018	101000				74000
4/2/2019	126000	62400	99250 (D)		
4/3/2019					80100
10/8/2019			121000	78800	
10/9/2019	114000	61400			73500

Time Series



Constituent: Chloride Analysis Run 1/8/2020 5:22 PM

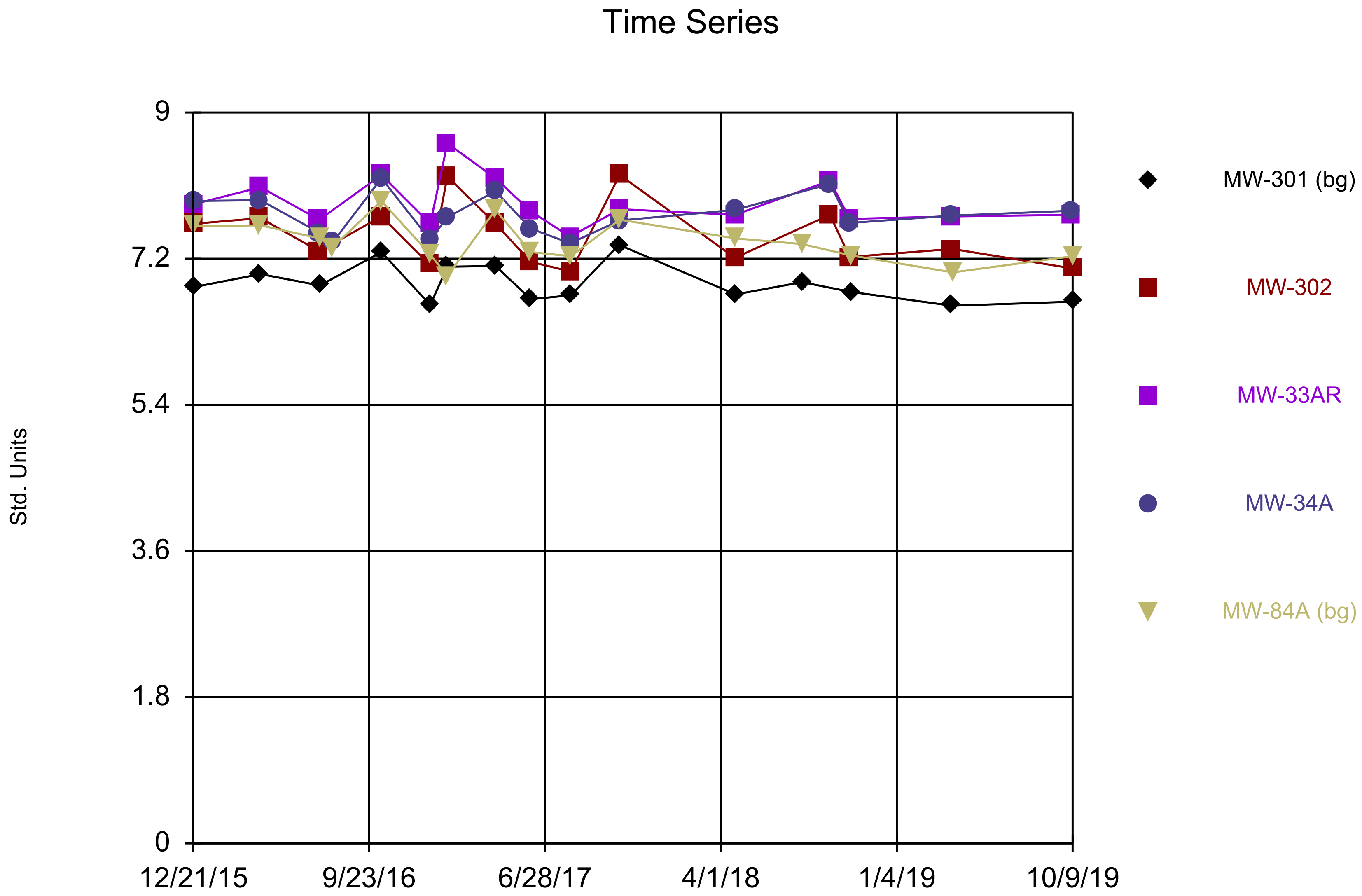
Columbia Energy Center Client: SCS Engineers Data: Input -191203

Time Series

Constituent: Chloride (mg/L)   Analysis Run 1/8/2020 5:23 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			10.6	4.85 (D)	
12/22/2015	3.7 (J)	4.2			4.9
4/5/2016	4	4.1	12.5	5.1	4.7
7/7/2016		3.1 (J)	12.5	5.6	
7/8/2016	3.5 (J)				5.1
10/13/2016	2.2	1.1 (J)	52.5	6.8	4.3
12/29/2016	2 (J)	1.2 (J)	39.6	7.1	4.7
1/25/2017	1.5 (J)	1.6 (J)	41.4	7.2	4.6
4/11/2017	2	1.6 (J)	47.1	6.2	4.9
6/6/2017	3.5	3.5	68.1	7.8	5.5
8/7/2017			105	7.4	
8/8/2017	5.5	4.5			5.5
10/23/2017	4				
10/24/2017		6.9	119	7.6	5.1
4/24/2018		15	188	8.2	
4/25/2018	2.3				4.8
8/8/2018	5.2				4.9
9/21/2018		1.7 (J)	32.6	17.1	
10/22/2018		1.8 (J)	14.4	19.9	
10/24/2018	3.2				4.2
4/2/2019	0.79 (J)	1.5 (J)	229	18.7	
4/3/2019					3.6
10/8/2019			153	57.9	
10/9/2019	1.7 (J)	1.1 (J)			3.9



Constituent: Field pH   Analysis Run 1/8/2020 5:22 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Time Series

Constituent: Field pH (Std. Units)   Analysis Run 1/8/2020 5:23 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			7.87	7.91	
12/22/2015	6.85	7.63			7.6
4/5/2016	7.01	7.7	8.08	7.92	7.61
7/7/2016		7.29	7.68	7.52	
7/8/2016	6.87				7.45
7/28/2016				7.4	7.34
10/13/2016	7.28	7.72	8.23	8.19	7.91
12/29/2016	6.63	7.12	7.63	7.43	7.25
1/25/2017	7.1	8.21	8.62	7.71	6.99
4/11/2017	7.11	7.63	8.19	8.03	7.8
6/6/2017	6.7	7.16	7.78	7.57	7.28
8/7/2017			7.47	7.39	
8/8/2017	6.75	7.04			7.23
10/23/2017	7.37				
10/24/2017		8.23	7.81	7.67	7.68
4/24/2018		7.21	7.74	7.8	
4/25/2018	6.76				7.45
8/8/2018	6.91				7.38
9/21/2018		7.74	8.16	8.12	
10/22/2018		7.22	7.69	7.64	
10/24/2018	6.79				7.24
4/2/2019	6.62	7.32	7.72	7.73	
4/3/2019					7.03
10/8/2019			7.74	7.79	
10/9/2019	6.67	7.08			7.23

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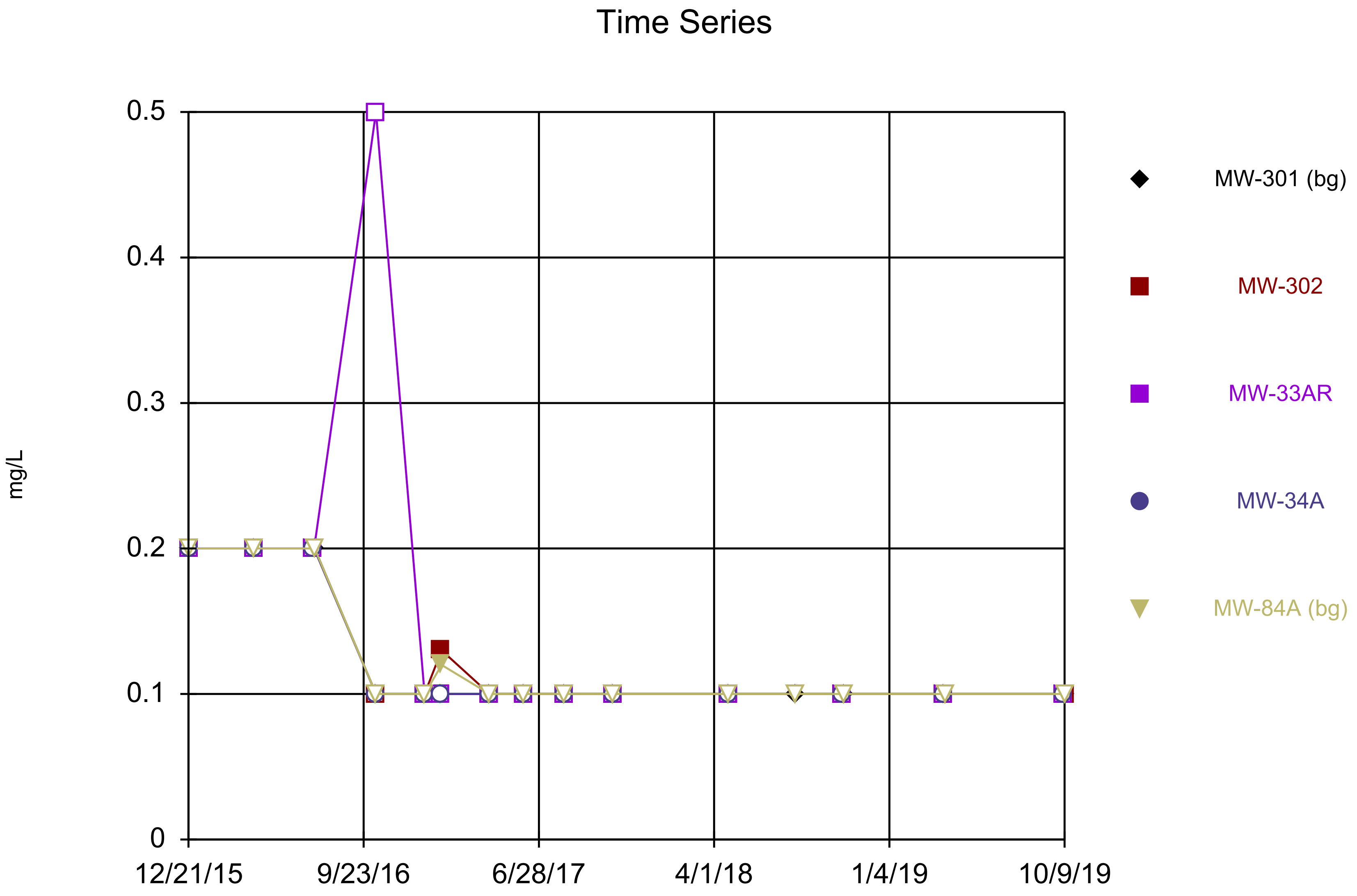
Hollow symbols indicate censored values.



Constituent: Fluoride Analysis Run 1/8/2020 5:22 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

02/04/2021 - Classification: Internal - ECRM7850515

Time Series

Constituent: Fluoride (mg/L)   Analysis Run 1/8/2020 5:23 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			<0.2	<0.2 (D)	
12/22/2015	<0.2	<0.2			<0.2
4/5/2016	<0.2	<0.2	<0.2	<0.2	<0.2
7/7/2016		<0.2	<0.2	<0.2	
7/8/2016	<0.2				<0.2
10/13/2016	<0.1	<0.1	<0.5	<0.1	<0.1
12/29/2016	<0.1	<0.1	<0.1	<0.1	<0.1
1/25/2017	<0.1	0.13 (J)	<0.1	<0.1	0.12 (J)
4/11/2017	<0.1	<0.1	<0.1	<0.1	<0.1
6/6/2017	<0.1	<0.1	<0.1	<0.1	<0.1
8/7/2017			<0.1	<0.1	
8/8/2017	<0.1	<0.1			<0.1
10/23/2017	<0.1				
10/24/2017		<0.1	<0.1	<0.1	<0.1
4/24/2018		<0.1	<0.1	<0.1	
4/25/2018	<0.1				<0.1
8/8/2018	<0.1				<0.1
10/22/2018		<0.1	<0.1	<0.1	
10/24/2018	<0.1				<0.1
4/2/2019	<0.1	<0.1	<0.1	<0.1	
4/3/2019					<0.1
10/8/2019			<0.1	<0.1	
10/9/2019	<0.1	<0.1			<0.1

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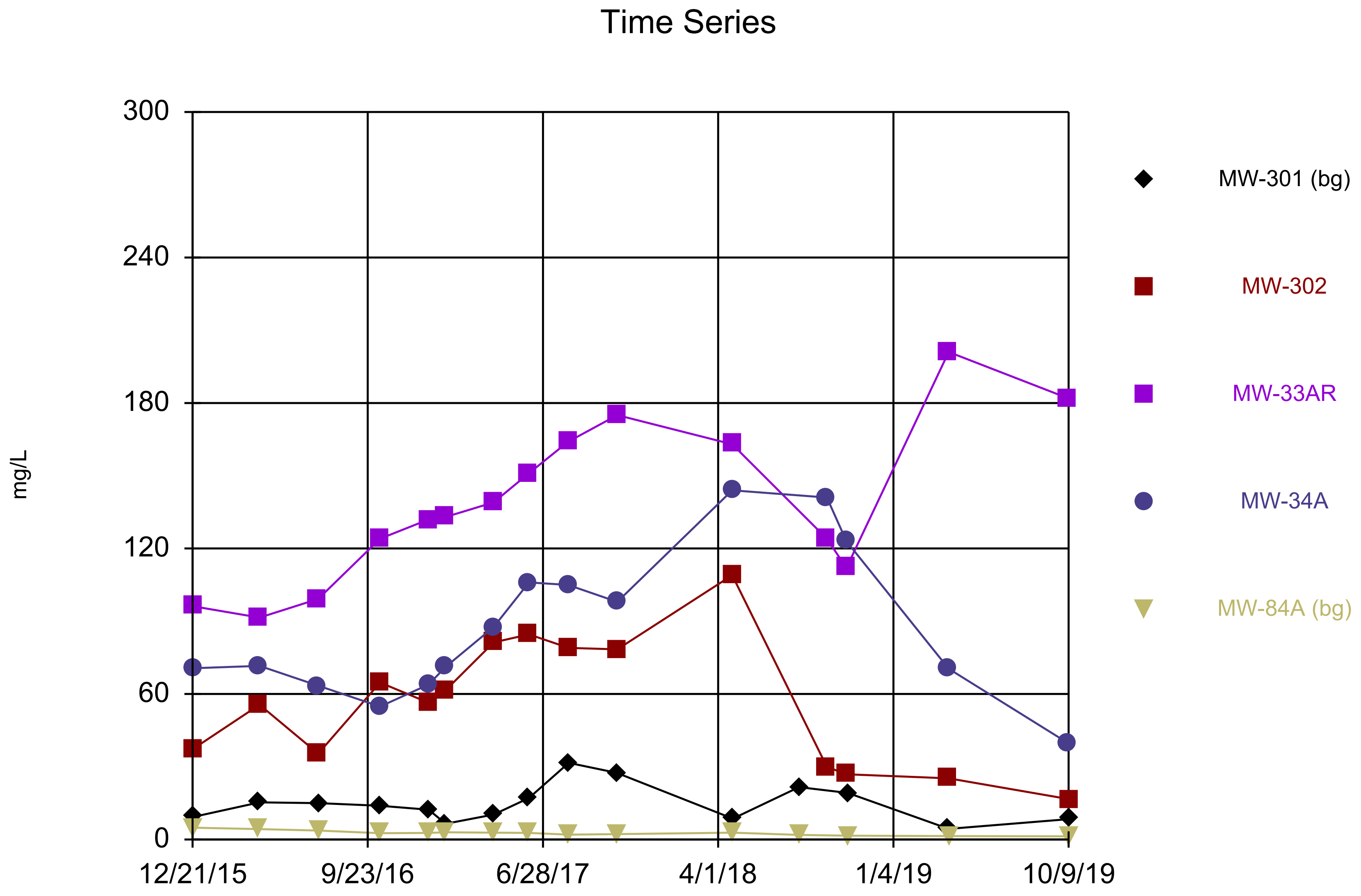


Constituent: Sulfate Analysis Run 1/8/2020 5:22 PM

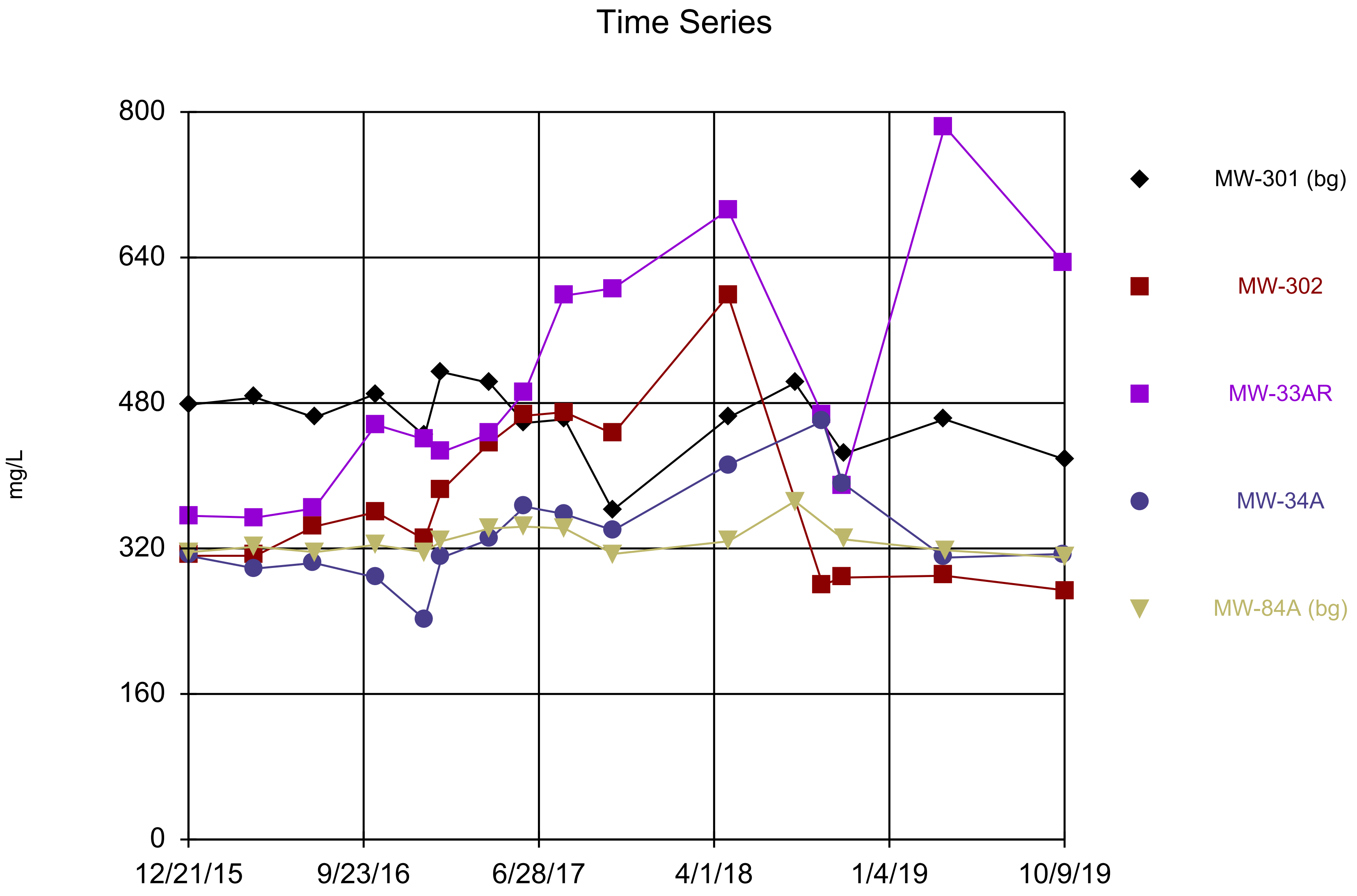
Columbia Energy Center Client: SCS Engineers Data: Input -191203

Time Series

Constituent: Sulfate (mg/L)   Analysis Run 1/8/2020 5:23 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			96.2	70.6 (D)	
12/22/2015	9.3	37.4			4.9
4/5/2016	15.3	55.6	91.5	71.6	4.3
7/7/2016		35.4	99.2	63.4	
7/8/2016	15				3.7 (J)
10/13/2016	13.9	64.7	124	54.8	2.6 (J)
12/29/2016	12.3 (J)	56.4	132	63.9	2.7 (J)
1/25/2017	6.5	61.6	133	71.2	3
4/11/2017	10.3	81.3	139	87.6	2.8 (J)
6/6/2017	17.1	84.6	151	106	2.7 (J)
8/7/2017			164	105	
8/8/2017	31.6	79			2 (J)
10/23/2017	27.5				
10/24/2017		78.4	175	98	2.2 (J)
4/24/2018		109	163	144	
4/25/2018	8.6				2.8 (J)
8/8/2018	21.6				1.9 (J)
9/21/2018		30	124	141	
10/22/2018		26.9	112	123	
10/24/2018	19.2				1.6 (J)
4/2/2019	4.4	25.2	201	70.4	
4/3/2019					1.4 (J)
10/8/2019			182	39.8	
10/9/2019	8.4	16.7			1.3 (J)



Constituent: Total Dissolved Solids Analysis Run 1/8/2020 5:22 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

Time Series

Constituent: Total Dissolved Solids (mg/L) Analysis Run 1/8/2020 5:23 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			356	312 (D)	
12/22/2015	478	312			316
4/5/2016	486	312	354	298	322
7/7/2016		344	364	304	
7/8/2016	464				316
10/13/2016	490	360	456	288	324
12/29/2016	444	330	440	242	316
1/25/2017	514	384	426	310	328
4/11/2017	502	436	446	330	342
6/6/2017	458	466	492	366	344
8/7/2017			598	358	
8/8/2017	462	470			342
10/23/2017	362				
10/24/2017		446	606	340	314
4/24/2018		598	692	412	
4/25/2018	464				328
8/8/2018	502				372
9/21/2018		280	466	460	
10/22/2018		288	388	392	
10/24/2018	424				330
4/2/2019	462	290	784	310	
4/3/2019					318
10/8/2019			634	314	
10/9/2019	418	274			310

Attachment B

Wilcoxon rank-sum analysis

Welch's t-test/Mann-Whitney

Columbia Energy Center Client: SCS Engineers Data: Input -191203 Printed 12/30/2019, 4:28 PM

Constituent	Well	Calc.	0.1	0.05	0.025	0.01	Alpha	Sig.	Bg. Wells	Method
Boron (ug/L)	Combined	-0....	No	No	No	No	0.05	No	MW-301,MW...	Mann-W
Calcium (ug/L)	Combined	0.1059	No	No	No	No	0.05	No	MW-301,MW...	Mann-W
Chloride (mg/L)	Combined	-0....	No	No	No	No	0.05	No	MW-301,MW...	Mann-W
Field pH (Std. Units)	Combined	-0....	No	No	No	No	0.1	No	MW-301,MW...	Mann-W
Fluoride (mg/L)	Combined	-2.444	No	No	No	No	0.05	No	MW-301,MW...	Mann-W
Sulfate (mg/L)	Combined	-1.016	No	No	No	No	0.05	No	MW-301,MW...	Mann-W
Total Dissolved Solids (mg/L)	Combined	-0....	No	No	No	No	0.05	No	MW-301,MW...	Mann-W

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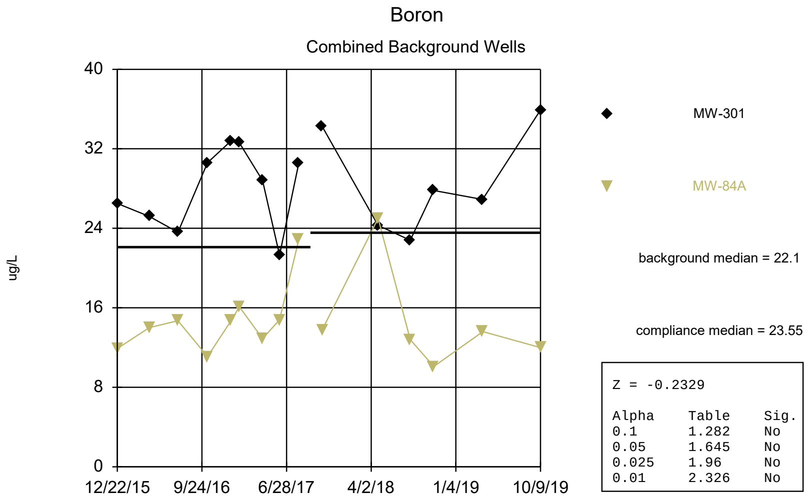


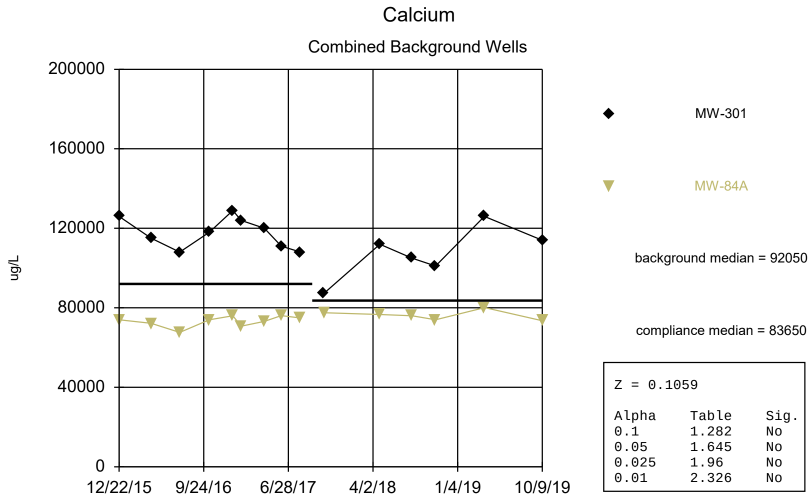
```
Z = -0.2329

Alpha     Table     Sig.
0.1       1.282     No
0.05      1.645     No
0.025     1.96      No
0.01      2.326     No
```

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 12/30/2019 4:26 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Sanitas™ v.9.6.24 Software licensed to SCS Engineers. UG



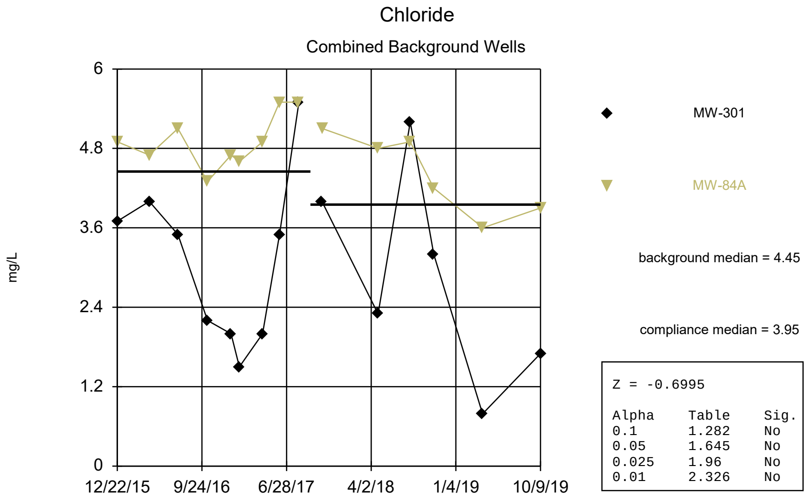
```
Z = 0.1059

Alpha     Table     Sig.
0.1       1.282     No
0.05      1.645     No
0.025     1.96      No
0.01      2.326     No
```

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 12/30/2019 4:26 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Sanitas™ v.9.6.24 Software licensed to SCS Engineers. UG



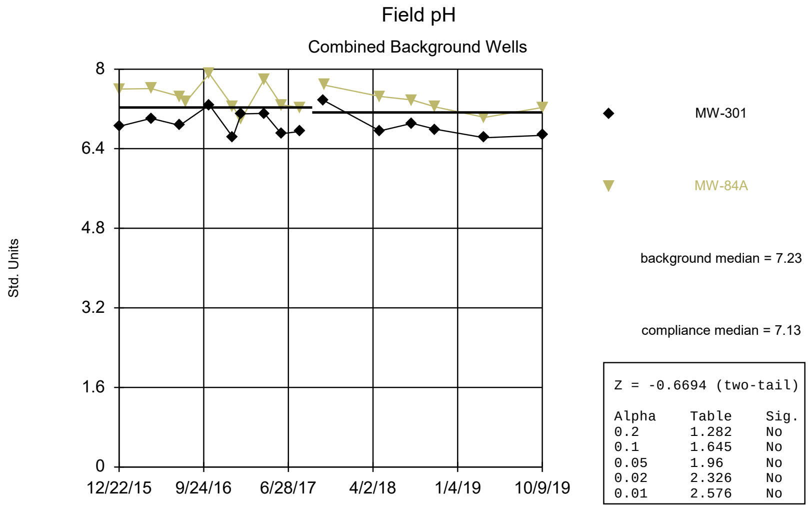
```
Z = -0.6995

Alpha     Table     Sig.
0.1       1.282     No
0.05      1.645     No
0.025     1.96      No
0.01      2.326     No
```

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 12/30/2019 4:26 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Sanitas™ v.9.6.24 Software licensed to SCS Engineers. UG



```
Z = -0.6694 (two-tail)

Alpha     Table     Sig.
0.2       1.282     No
0.1       1.645     No
0.05      1.96      No
0.02      2.326     No
0.01      2.576     No
```

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 12/30/2019 4:26 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Boron (ug/L)   Analysis Run 12/30/2019 4:28 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-84A (bg)	MW-301 (bg)	MW-301	MW-84A
12/22/2015	11.9	26.5		
4/5/2016	14	25.2		
7/8/2016	14.7	23.6		
10/13/2016	11.1	30.6		
12/29/2016	14.7	32.8		
1/25/2017	16.1	32.6		
4/11/2017	12.9	28.8		
6/6/2017	14.8	21.3		
8/8/2017	22.9	30.6		
10/23/2017			34.3	
10/24/2017				13.8
4/25/2018			24.3	25
8/8/2018			22.8	12.8
10/24/2018			27.8	10.1 (J)
4/2/2019			26.9	
4/3/2019				13.6
10/9/2019			35.9	12

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Calcium (ug/L) Analysis Run 12/30/2019 4:28 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-301 (bg)	MW-84A (bg)	MW-301	MW-84A
12/22/2015	126000	74000		
4/5/2016	115000	72200		
7/8/2016	108000	67600		
10/13/2016	118000	74000		
12/29/2016	129000	76000		
1/25/2017	124000	70800		
4/11/2017	120000	73200		
6/6/2017	111000	76100		
8/8/2017	108000	74900		
10/23/2017			87200	
10/24/2017				77500
4/25/2018			112000	76600
8/8/2018			105000	76000
10/24/2018			101000	74000
4/2/2019			126000	
4/3/2019				80100
10/9/2019			114000	73500

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Chloride (mg/L)   Analysis Run 12/30/2019 4:28 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-84A (bg)	MW-301	MW-84A
12/22/2015	3.7 (J)	4.9		
4/5/2016	4	4.7		
7/8/2016	3.5 (J)	5.1		
10/13/2016	2.2	4.3		
12/29/2016	2 (J)	4.7		
1/25/2017	1.5 (J)	4.6		
4/11/2017	2	4.9		
6/6/2017	3.5	5.5		
8/8/2017	5.5	5.5		
10/23/2017			4	
10/24/2017				5.1
4/25/2018			2.3	4.8
8/8/2018			5.2	4.9
10/24/2018			3.2	4.2
4/2/2019			0.79 (J)	
4/3/2019				3.6
10/9/2019			1.7 (J)	3.9

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Field pH (Std. Units)   Analysis Run 12/30/2019 4:28 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-84A (bg)	MW-301 (bg)	MW-301	MW-84A
12/22/2015	7.6	6.85		
4/5/2016	7.61	7.01		
7/8/2016	7.45	6.87		
7/28/2016	7.34			
10/13/2016	7.91	7.28		
12/29/2016	7.25	6.63		
1/25/2017	6.99	7.1		
4/11/2017	7.8	7.11		
6/6/2017	7.28	6.7		
8/8/2017	7.23	6.75		
10/23/2017			7.37	
10/24/2017				7.68
4/25/2018			6.76	7.45
8/8/2018			6.91	7.38
10/24/2018			6.79	7.24
4/2/2019			6.62	
4/3/2019				7.03
10/9/2019			6.67	7.23

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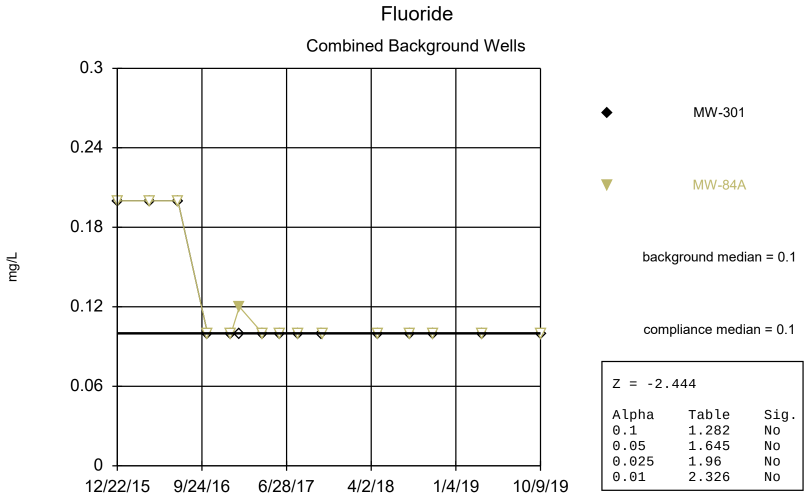
Hollow symbols indicate censored values.

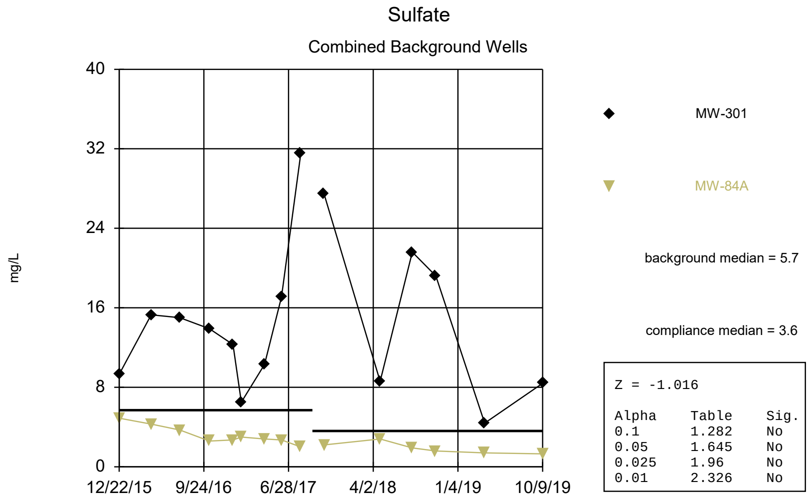


Z = -2.444

Alpha	Table	Sig.
0.1	1.282	No
0.05	1.645	No
0.025	1.96	No
0.01	2.326	No

Mann-Whitney (Wilcoxon Rank Sum) Analysis Run 12/30/2019 4:26 PM
Columbia Energy Center Client: SCS Engineers Data: Input -191203

Sanitas™ v.9.6.24 Software licensed to SCS Engineers. UG

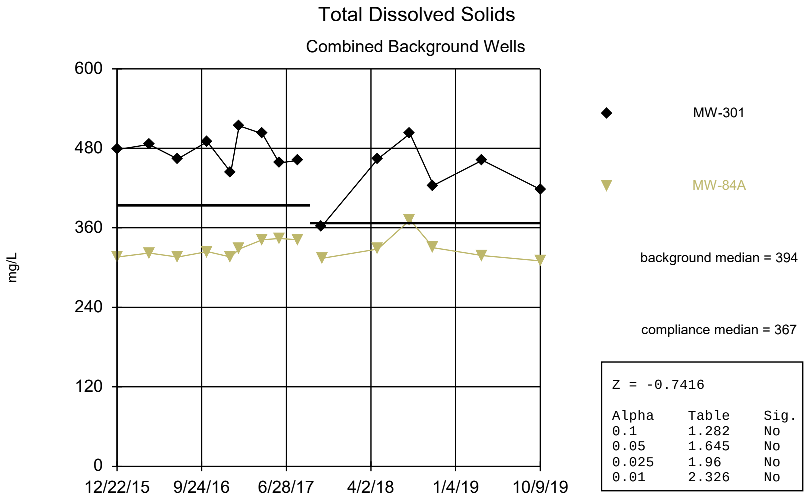


Z = -1.016

Alpha	Table	Sig.
0.1	1.282	No
0.05	1.645	No
0.025	1.96	No
0.01	2.326	No

Mann-Whitney (Wilcoxon Rank Sum) Analysis Run 12/30/2019 4:26 PM
Columbia Energy Center Client: SCS Engineers Data: Input -191203

Sanitas™ v.9.6.24 Software licensed to SCS Engineers. UG



Z = -0.7416

Alpha	Table	Sig.
0.1	1.282	No
0.05	1.645	No
0.025	1.96	No
0.01	2.326	No

Mann-Whitney (Wilcoxon Rank Sum) Analysis Run 12/30/2019 4:26 PM
Columbia Energy Center Client: SCS Engineers Data: Input -191203

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Fluoride (mg/L)   Analysis Run 12/30/2019 4:28 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-84A (bg)	MW-301	MW-84A
12/22/2015	<0.2	<0.2		
4/5/2016	<0.2	<0.2		
7/8/2016	<0.2	<0.2		
10/13/2016	<0.1	<0.1		
12/29/2016	<0.1	<0.1		
1/25/2017	<0.1	0.12 (J)		
4/11/2017	<0.1	<0.1		
6/6/2017	<0.1	<0.1		
8/8/2017	<0.1	<0.1		
10/23/2017			<0.1	
10/24/2017				<0.1
4/25/2018			<0.1	<0.1
8/8/2018			<0.1	<0.1
10/24/2018			<0.1	<0.1
4/2/2019			<0.1	
4/3/2019				<0.1
10/9/2019			<0.1	<0.1

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Sulfate (mg/L)   Analysis Run 12/30/2019 4:28 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-84A (bg)	MW-301	MW-84A
12/22/2015	9.3	4.9		
4/5/2016	15.3	4.3		
7/8/2016	15	3.7 (J)		
10/13/2016	13.9	2.6 (J)		
12/29/2016	12.3 (J)	2.7 (J)		
1/25/2017	6.5	3		
4/11/2017	10.3	2.8 (J)		
6/6/2017	17.1	2.7 (J)		
8/8/2017	31.6	2 (J)		
10/23/2017			27.5	
10/24/2017				2.2 (J)
4/25/2018			8.6	2.8 (J)
8/8/2018			21.6	1.9 (J)
10/24/2018			19.2	1.6 (J)
4/2/2019			4.4	
4/3/2019				1.4 (J)
10/9/2019			8.4	1.3 (J)

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Total Dissolved Solids (mg/L)   Analysis Run 12/30/2019 4:28 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-84A (bg)	MW-301	MW-84A
12/22/2015	478	316		
4/5/2016	486	322		
7/8/2016	464	316		
10/13/2016	490	324		
12/29/2016	444	316		
1/25/2017	514	328		
4/11/2017	502	342		
6/6/2017	458	344		
8/8/2017	462	342		
10/23/2017			362	
10/24/2017				314
4/25/2018			464	328
8/8/2018			502	372
10/24/2018			424	330
4/2/2019			462	
4/3/2019				318
10/9/2019			418	310

Attachment C

Outliers Analysis

Outlier Analysis

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203   Printed 12/29/2019, 12:18 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (ug/L)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	15	28.27	4.438	normal	ShapiroWilk
Boron (ug/L)	**MW-84A (bg)**	**Yes**	**25**	**4/25/2018**	**NP (nrm)**	**NaN**	**15**	**14.69**	**4.088**	**unknown**	**ShapiroWilk**
Calcium (ug/L)	MW-301 (bg)	No	n/a	n/a	Dixon`s	0.05	15	113613	11074	normal	ShapiroWilk
Calcium (ug/L)	MW-84A (bg)	No	n/a	n/a	EPA 1989	0.05	15	74433	2951	normal	ShapiroWilk
Chloride (mg/L)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	15	3.006	1.365	normal	ShapiroWilk
Chloride (mg/L)	MW-84A (bg)	No	n/a	n/a	EPA 1989	0.05	15	4.713	0.5343	normal	ShapiroWilk
Field pH (Std. Units)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	15	6.895	0.2334	normal	ShapiroWilk
Field pH (Std. Units)	MW-84A (bg)	No	n/a	n/a	EPA 1989	0.05	16	7.404	0.2603	normal	ShapiroWilk
Fluoride (mg/L)	MW-301 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	15	0.12	0.0414	unknown	ShapiroWilk
Fluoride (mg/L)	**MW-84A (bg)**	**Yes**	**0.2,0.2,0.2**	**12/22/201...**	**NP (nrm)**	**NaN**	**15**	**0.1213**	**0.04103**	**unknown**	**ShapiroWilk**
Sulfate (mg/L)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	15	14.73	7.693	normal	ShapiroWilk
Sulfate (mg/L)	MW-84A (bg)	No	n/a	n/a	EPA 1989	0.05	15	2.66	1.026	normal	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-301 (bg)	No	n/a	n/a	Dixon`s	0.05	15	462	38.96	normal	ShapiroWilk
Total Dissolved Solids (mg/L)	**MW-84A (bg)**	**Yes**	**372**	**8/8/2018**	**Dixon`s**	**0.05**	**15**	**328.1**	**16.24**	**normal**	**ShapiroWilk**

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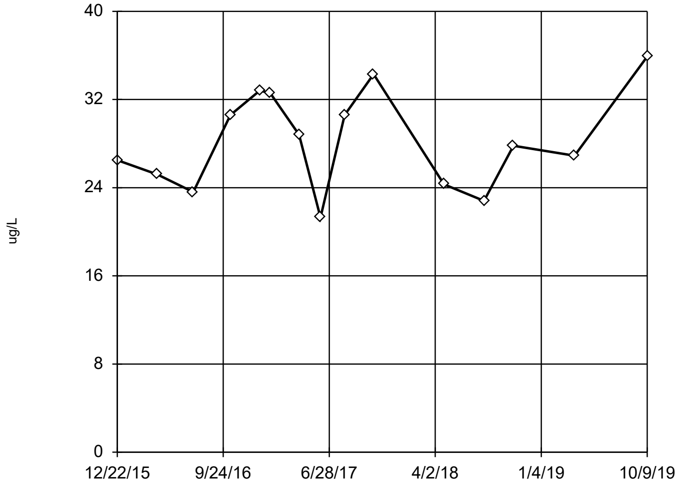
Boron

MW-301 (bg)



n = 15

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 28.27, std. dev.
4.438, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9694
Critical = 0.881
The distribution was found
to be normally distrib-
uted.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM
Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

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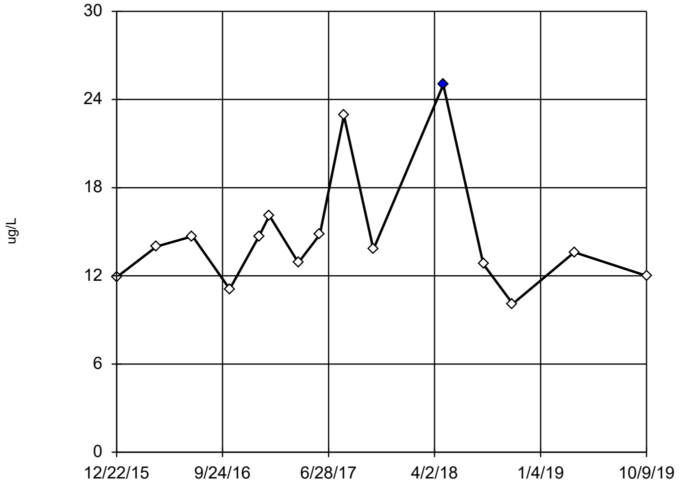
Boron

MW-84A (bg)



n = 15

Outlier is drawn as solid.
Tukey's method used in
lieu of parametric test
because the Shapiro Wilk
normality test failed
at the 0.05 alpha level.

High cutoff = 23.2, low
cutoff = 3.6, based on
IQR multiplier of 3.

Tukey's Outlier Screening   Analysis Run 12/29/2019 12:10 PM
Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

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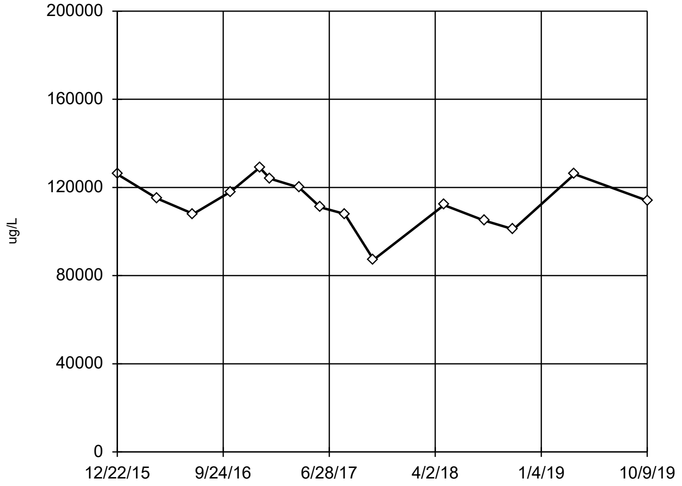
Calcium

MW-301 (bg)



n = 15

No statistical outliers.
Testing for 1 low outlier.
Mean = 113613.
Std. Dev. = 11074.
87200: c = 0.4588
tabl = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9632
Critical = 0.874
The distribution was found
to be normally distrib-
uted.

Dixon's Outlier Test   Analysis Run 12/29/2019 12:10 PM
Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

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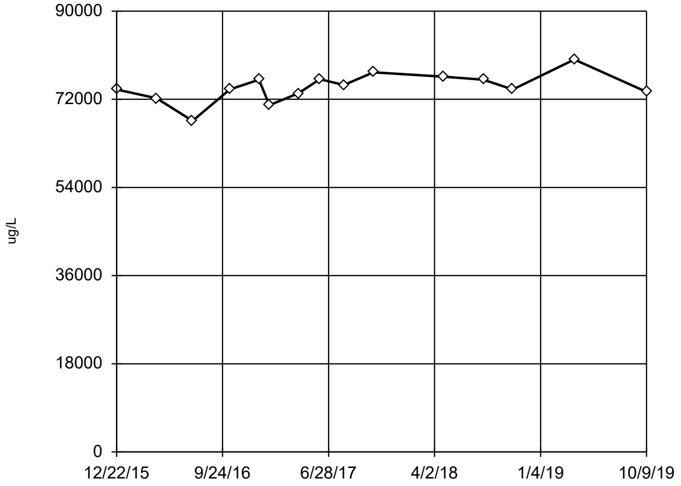
Calcium

MW-84A (bg)



n = 15

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 74433, std. dev.
2951, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.965
Critical = 0.881
The distribution was found
to be normally distrib-
uted.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM
Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

EPA 1989 Outlier Screening

Constituent: Boron (ug/L)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)
12/22/2015	26.5
4/5/2016	25.2
7/8/2016	23.6
10/13/2016	30.6
12/29/2016	32.8
1/25/2017	32.6
4/11/2017	28.8
6/6/2017	21.3
8/8/2017	30.6
10/23/2017	34.3
4/25/2018	24.3
8/8/2018	22.8
10/24/2018	27.8
4/2/2019	26.9
10/9/2019	35.9

Tukey's Outlier Screening

Constituent: Boron (ug/L) Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-84A (bg)
12/22/2015	11.9
4/5/2016	14
7/8/2016	14.7
10/13/2016	11.1
12/29/2016	14.7
1/25/2017	16.1
4/11/2017	12.9
6/6/2017	14.8
8/8/2017	22.9
10/24/2017	13.8
4/25/2018	25 (O)
8/8/2018	12.8
10/24/2018	10.1 (J)
4/3/2019	13.6
10/9/2019	12

Dixon's Outlier Test

Constituent: Calcium (ug/L)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)
12/22/2015	126000
4/5/2016	115000
7/8/2016	108000
10/13/2016	118000
12/29/2016	129000
1/25/2017	124000
4/11/2017	120000
6/6/2017	111000
8/8/2017	108000
10/23/2017	87200
4/25/2018	112000
8/8/2018	105000
10/24/2018	101000
4/2/2019	126000
10/9/2019	114000

EPA 1989 Outlier Screening

Constituent: Calcium (ug/L)   Analysis Run 12/29/2019 12:18 PM
Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-84A (bg)
12/22/2015	74000
4/5/2016	72200
7/8/2016	67600
10/13/2016	74000
12/29/2016	76000
1/25/2017	70800
4/11/2017	73200
6/6/2017	76100
8/8/2017	74900
10/24/2017	77500
4/25/2018	76600
8/8/2018	76000
10/24/2018	74000
4/3/2019	80100
10/9/2019	73500

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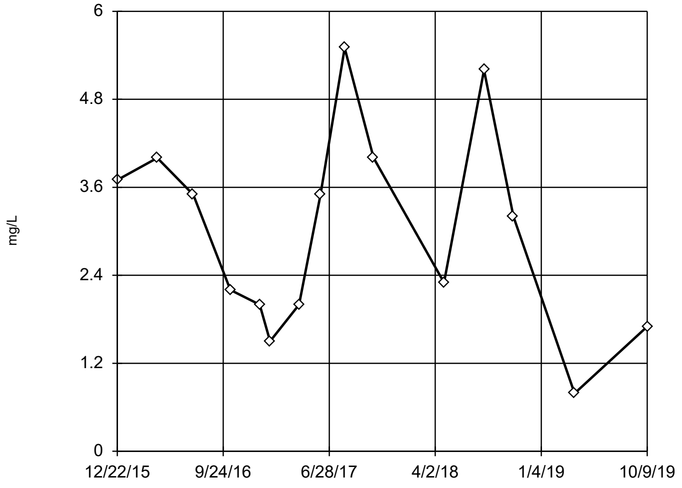
Chloride

MW-301 (bg)



n = 15

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 3.006, std. dev.
1.365, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9568
Critical = 0.881
The distribution was found
to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

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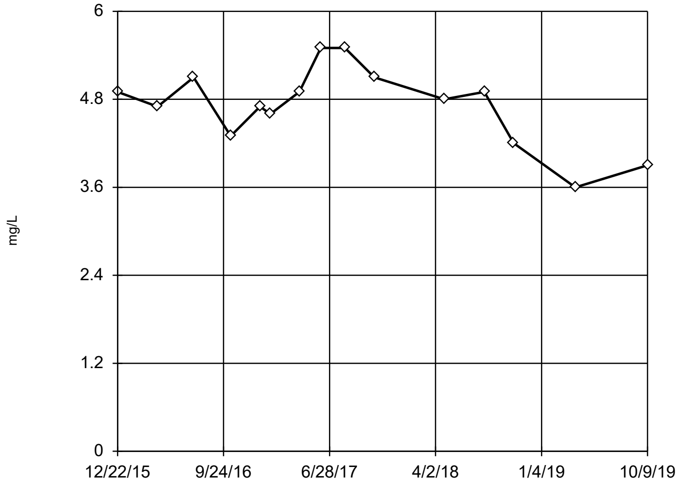
Chloride

MW-84A (bg)



n = 15

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 4.713, std. dev.
0.5343, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9504
Critical = 0.881
The distribution was found
to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

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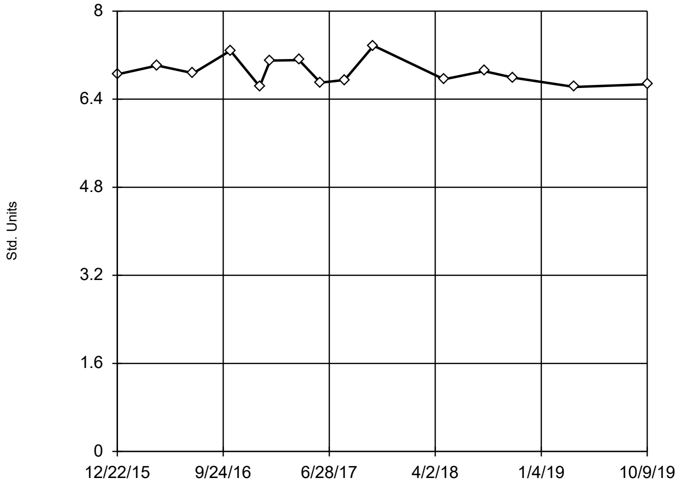
Field pH

MW-301 (bg)



n = 15

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 6.895, std. dev.
0.2334, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9201
Critical = 0.881
The distribution was found
to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

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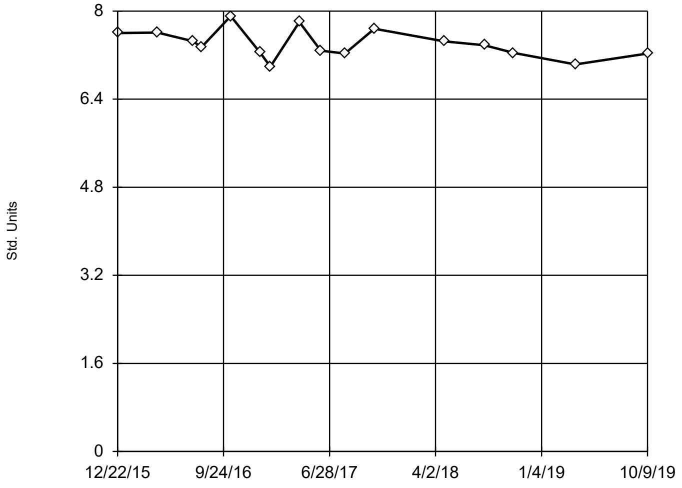
Field pH

MW-84A (bg)



n = 16

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 7.404, std. dev.
0.2603, critical Tn 2.443

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9615
Critical = 0.887
The distribution was found
to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

EPA 1989 Outlier Screening

Constituent: Chloride (mg/L)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)
12/22/2015	3.7 (J)
4/5/2016	4
7/8/2016	3.5 (J)
10/13/2016	2.2
12/29/2016	2 (J)
1/25/2017	1.5 (J)
4/11/2017	2
6/6/2017	3.5
8/8/2017	5.5
10/23/2017	4
4/25/2018	2.3
8/8/2018	5.2
10/24/2018	3.2
4/2/2019	0.79 (J)
10/9/2019	1.7 (J)

EPA 1989 Outlier Screening

Constituent: Chloride (mg/L) Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-84A (bg)
12/22/2015	4.9
4/5/2016	4.7
7/8/2016	5.1
10/13/2016	4.3
12/29/2016	4.7
1/25/2017	4.6
4/11/2017	4.9
6/6/2017	5.5
8/8/2017	5.5
10/24/2017	5.1
4/25/2018	4.8
8/8/2018	4.9
10/24/2018	4.2
4/3/2019	3.6
10/9/2019	3.9

EPA 1989 Outlier Screening

Constituent: Field pH (Std. Units)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

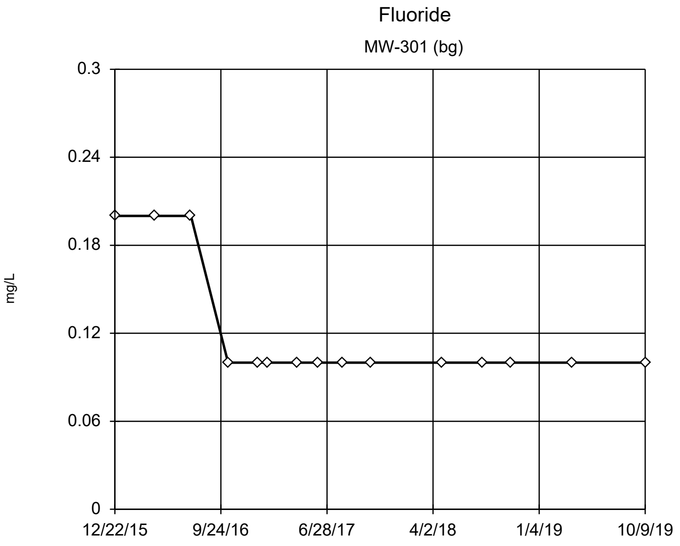
	MW-301 (bg)
12/22/2015	6.85
4/5/2016	7.01
7/8/2016	6.87
10/13/2016	7.28
12/29/2016	6.63
1/25/2017	7.1
4/11/2017	7.11
6/6/2017	6.7
8/8/2017	6.75
10/23/2017	7.37
4/25/2018	6.76
8/8/2018	6.91
10/24/2018	6.79
4/2/2019	6.62
10/9/2019	6.67

EPA 1989 Outlier Screening

Constituent: Field pH (Std. Units)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-84A (bg)
12/22/2015	7.6
4/5/2016	7.61
7/8/2016	7.45
7/28/2016	7.34
10/13/2016	7.91
12/29/2016	7.25
1/25/2017	6.99
4/11/2017	7.8
6/6/2017	7.28
8/8/2017	7.23
10/24/2017	7.68
4/25/2018	7.45
8/8/2018	7.38
10/24/2018	7.24
4/3/2019	7.03
10/9/2019	7.23



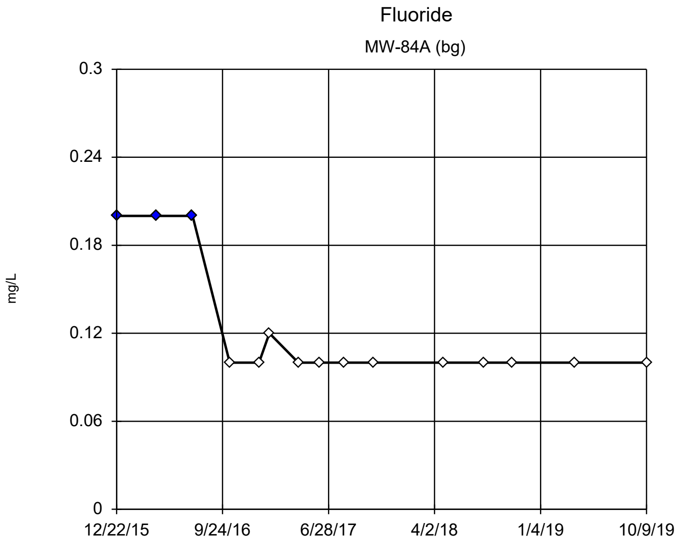
n = 15

No outliers found.
Tukey's method used in
lieu of parametric test
because the Shapiro Wilk
normality test failed
at the 0.05 alpha level.

The results were invalid-
ated, because the lower
and upper quartiles are
equal.

Tukey's Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203



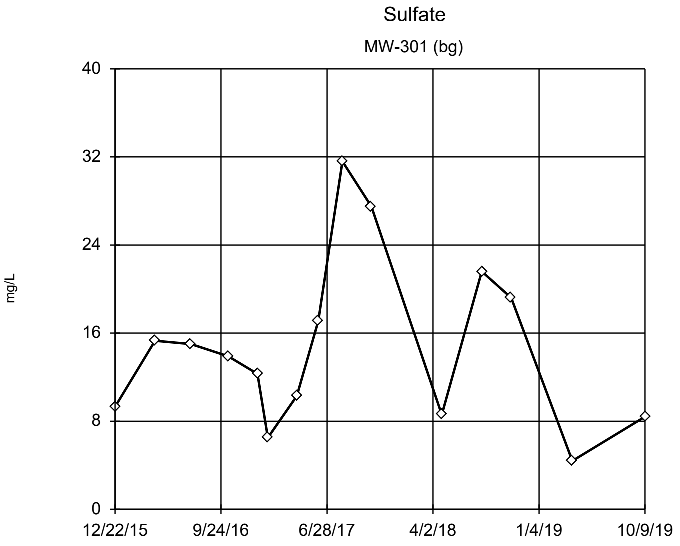
n = 15

Outliers are drawn as
solid.
Tukey's method used in
lieu of parametric test
because the Shapiro Wilk
normality test failed
at the 0.05 alpha level.

High cutoff = 0.18, low
cutoff = 0.04, based on
IQR multiplier of 3.

Tukey's Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203



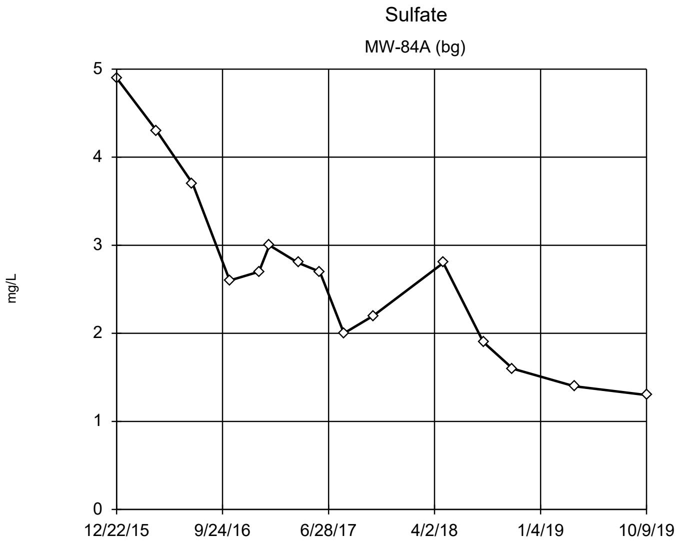
n = 15

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 14.73, std. dev.
7.693, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9358
Critical = 0.881
The distribution was found
to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203



n = 15

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 2.66, std. dev. 1.026,
critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9334
Critical = 0.881
The distribution was found
to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Tukey's Outlier Screening

Constituent: Fluoride (mg/L) Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-301 (bg)
12/22/2015	<0.2
4/5/2016	<0.2
7/8/2016	<0.2
10/13/2016	<0.1
12/29/2016	<0.1
1/25/2017	<0.1
4/11/2017	<0.1
6/6/2017	<0.1
8/8/2017	<0.1
10/23/2017	<0.1
4/25/2018	<0.1
8/8/2018	<0.1
10/24/2018	<0.1
4/2/2019	<0.1
10/9/2019	<0.1

Tukey's Outlier Screening

Constituent: Fluoride (mg/L)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-84A (bg)
12/22/2015	<0.2 (O)
4/5/2016	<0.2 (O)
7/8/2016	<0.2 (O)
10/13/2016	<0.1
12/29/2016	<0.1
1/25/2017	0.12 (J)
4/11/2017	<0.1
6/6/2017	<0.1
8/8/2017	<0.1
10/24/2017	<0.1
4/25/2018	<0.1
8/8/2018	<0.1
10/24/2018	<0.1
4/3/2019	<0.1
10/9/2019	<0.1

EPA 1989 Outlier Screening

Constituent: Sulfate (mg/L) Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-301 (bg)
12/22/2015	9.3
4/5/2016	15.3
7/8/2016	15
10/13/2016	13.9
12/29/2016	12.3 (J)
1/25/2017	6.5
4/11/2017	10.3
6/6/2017	17.1
8/8/2017	31.6
10/23/2017	27.5
4/25/2018	8.6
8/8/2018	21.6
10/24/2018	19.2
4/2/2019	4.4
10/9/2019	8.4

EPA 1989 Outlier Screening

Constituent: Sulfate (mg/L) Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-84A (bg)
12/22/2015	4.9
4/5/2016	4.3
7/8/2016	3.7 (J)
10/13/2016	2.6 (J)
12/29/2016	2.7 (J)
1/25/2017	3
4/11/2017	2.8 (J)
6/6/2017	2.7 (J)
8/8/2017	2 (J)
10/24/2017	2.2 (J)
4/25/2018	2.8 (J)
8/8/2018	1.9 (J)
10/24/2018	1.6 (J)
4/3/2019	1.4 (J)
10/9/2019	1.3 (J)

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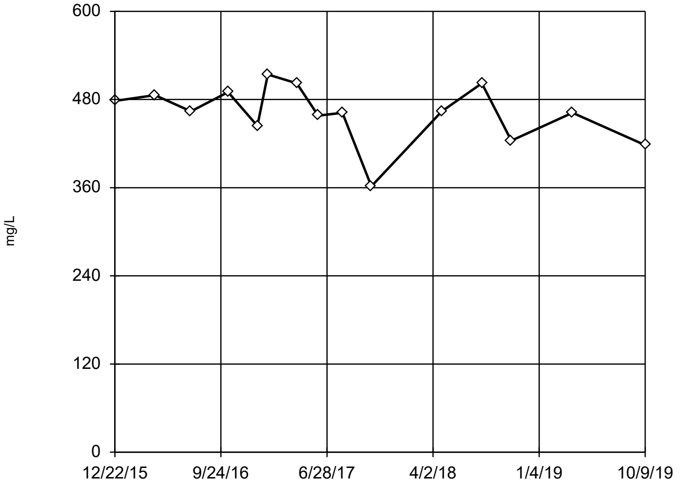
Total Dissolved Solids

MW-301 (bg)



n = 15

No statistical outliers.
Testing for 1 low outlier.
Mean = 462.
Std. Dev. = 38.96.
362: c = 0.4429
tabl = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9582
Critical = 0.874
The distribution was found to be normally distributed.

Dixon's Outlier Test   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

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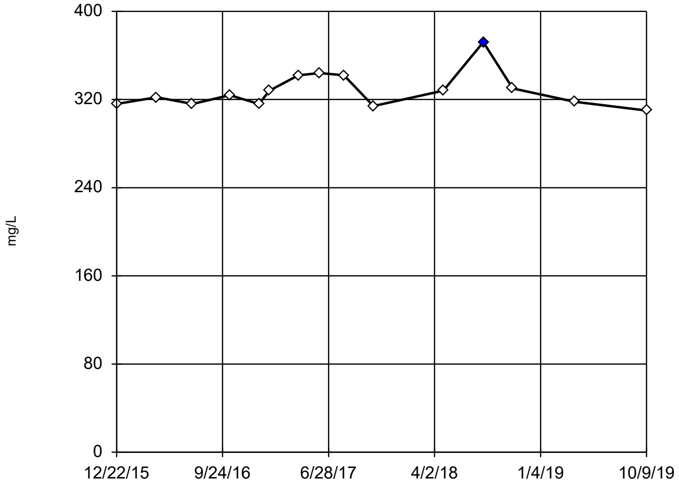
Total Dissolved Solids

MW-84A (bg)



n = 15

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 328.1.
Std. Dev. = 16.24.
372: c = 0.5357
tabl = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9011
Critical = 0.874
The distribution, after removal of suspect value, was found to be normally distributed.

Dixon's Outlier Test   Analysis Run 12/29/2019 12:10 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Dixon's Outlier Test

Constituent: Total Dissolved Solids (mg/L)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)
12/22/2015	478
4/5/2016	486
7/8/2016	464
10/13/2016	490
12/29/2016	444
1/25/2017	514
4/11/2017	502
6/6/2017	458
8/8/2017	462
10/23/2017	362
4/25/2018	464
8/8/2018	502
10/24/2018	424
4/2/2019	462
10/9/2019	418

Dixon's Outlier Test

Constituent: Total Dissolved Solids (mg/L)   Analysis Run 12/29/2019 12:18 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-84A (bg)
12/22/2015	316
4/5/2016	322
7/8/2016	316
10/13/2016	324
12/29/2016	316
1/25/2017	328
4/11/2017	342
6/6/2017	344
8/8/2017	342
10/24/2017	314
4/25/2018	328
8/8/2018	372 (O)
10/24/2018	330
4/3/2019	318
10/9/2019	310

Attachment D

Interwell Prediction Limit Analysis

Prediction Limit

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203   Printed 1/8/2020, 6:56 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Wells	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (ug/L)	**MW-302**	**35.6**	**n/a**	**10/9/2019**	**246**	**Yes**	**30**	**MW-301,MW-84A**	**21.48**	**8.076**	**0**	**None**	**No**	**0.002922**	**Param Inter 1 of 2**
Boron (ug/L)	**MW-33AR**	**35.6**	**n/a**	**10/8/2019**	**548**	**Yes**	**30**	**MW-301,MW-84A**	**21.48**	**8.076**	**0**	**None**	**No**	**0.002922**	**Param Inter 1 of 2**
Boron (ug/L)	**MW-34A**	**35.6**	**n/a**	**10/8/2019**	**207**	**Yes**	**30**	**MW-301,MW-84A**	**21.48**	**8.076**	**0**	**None**	**No**	**0.002922**	**Param Inter 1 of 2**
Calcium (ug/L)	MW-302	129000	n/a	10/9/2019	61400	No	30	MW-84A,MW-301	n/a	n/a	0	n/a	n/a	0.00197	NP Inter (normality) ...
Calcium (ug/L)	MW-33AR	129000	n/a	10/8/2019	121000	No	30	MW-84A,MW-301	n/a	n/a	0	n/a	n/a	0.00197	NP Inter (normality) ...
Calcium (ug/L)	MW-34A	129000	n/a	10/8/2019	78800	No	30	MW-84A,MW-301	n/a	n/a	0	n/a	n/a	0.00197	NP Inter (normality) ...
Chloride (mg/L)	MW-302	6.2	n/a	10/9/2019	1.1	No	30	MW-301,MW-84A	3.86	1.338	0	None	No	0.002922	Param Inter 1 of 2
Chloride (mg/L)	**MW-33AR**	**6.2**	**n/a**	**10/8/2019**	**153**	**Yes**	**30**	**MW-301,MW-84A**	**3.86**	**1.338**	**0**	**None**	**No**	**0.002922**	**Param Inter 1 of 2**
Chloride (mg/L)	**MW-34A**	**6.2**	**n/a**	**10/8/2019**	**57.9**	**Yes**	**30**	**MW-301,MW-84A**	**3.86**	**1.338**	**0**	**None**	**No**	**0.002922**	**Param Inter 1 of 2**
Field pH (Std. Units)	MW-302	7.78	n/a	10/9/2019	7.08	No	31	MW-301,MW-84A	7.158	0.3555	0	None	No	0.002922	Param Inter 1 of 2
Field pH (Std. Units)	MW-33AR	7.78	n/a	10/8/2019	7.74	No	31	MW-301,MW-84A	7.158	0.3555	0	None	No	0.002922	Param Inter 1 of 2
Field pH (Std. Units)	**MW-34A**	**7.78**	**n/a**	**10/8/2019**	**7.79**	**Yes**	**31**	**MW-301,MW-84A**	**7.158**	**0.3555**	**0**	**None**	**No**	**0.002922**	**Param Inter 1 of 2**
Fluoride (mg/L)	MW-302	0.200	n/a	10/9/2019	0.1ND	No	30	MW-301,MW-84A	n/a	n/a	96.67	n/a	n/a	0.00197	NP Inter (NDs) 1 of 2
Fluoride (mg/L)	MW-33AR	0.200	n/a	10/8/2019	0.1ND	No	30	MW-301,MW-84A	n/a	n/a	96.67	n/a	n/a	0.00197	NP Inter (NDs) 1 of 2
Fluoride (mg/L)	MW-34A	0.200	n/a	10/8/2019	0.1ND	No	30	MW-301,MW-84A	n/a	n/a	96.67	n/a	n/a	0.00197	NP Inter (NDs) 1 of 2
Sulfate (mg/L)	MW-302	30.3	n/a	10/9/2019	16.7	No	30	MW-301,MW-84A	1.735	0.9574	0	None	ln(x)	0.002922	Param Inter 1 of 2
Sulfate (mg/L)	**MW-33AR**	**30.3**	**n/a**	**10/8/2019**	**182**	**Yes**	**30**	**MW-301,MW-84A**	**1.735**	**0.9574**	**0**	**None**	**ln(x)**	**0.002922**	**Param Inter 1 of 2**
Sulfate (mg/L)	**MW-34A**	**30.3**	**n/a**	**10/8/2019**	**39.8**	**Yes**	**30**	**MW-301,MW-84A**	**1.735**	**0.9574**	**0**	**None**	**ln(x)**	**0.002922**	**Param Inter 1 of 2**
Total Dissolved Solids (mg/L)	MW-302	514	n/a	10/9/2019	274	No	30	MW-84A,MW-301	n/a	n/a	0	n/a	n/a	0.00197	NP Inter (normality) ...
Total Dissolved Solids (mg/L)	**MW-33AR**	**514**	**n/a**	**10/8/2019**	**634**	**Yes**	**30**	**MW-84A,MW-301**	**n/a**	**n/a**	**0**	**n/a**	**n/a**	**0.00197**	**NP Inter (normality) ...**
Total Dissolved Solids (mg/L)	MW-34A	514	n/a	10/8/2019	314	No	30	MW-84A,MW-301	n/a	n/a	0	n/a	n/a	0.00197	NP Inter (normality) ...

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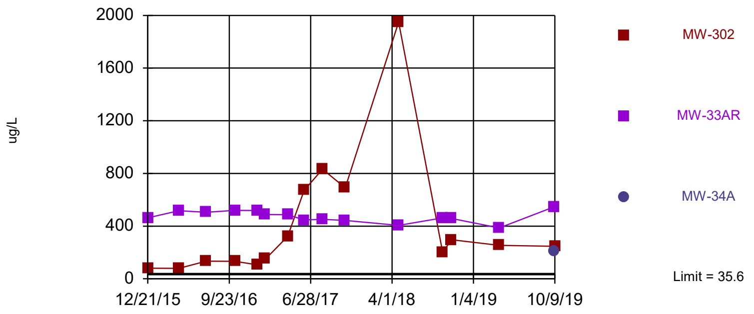
Exceeds Limit: MW-302, MW-33AR, MW-34A

Boron

Interwell Parametric



Background Data Summary: Mean=21.48, Std. Dev.=8.076, n=30. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9105, critical = 0.9. Kappa = 1.752 (c=6, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.008742. Individual comparison alpha = 0.002922. Comparing 3 points to limit.

Prediction Limit Analysis Run 1/8/2020 6:54 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

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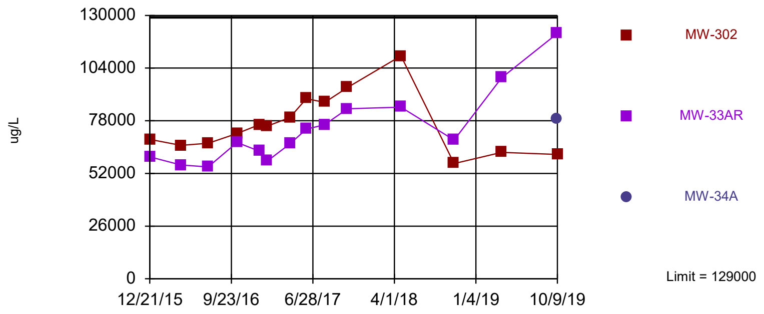
Within Limit

Calcium

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 30 background values. Annual per-constituent alpha = 0.01176. Individual comparison alpha = 0.00197 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 1/8/2020 6:54 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

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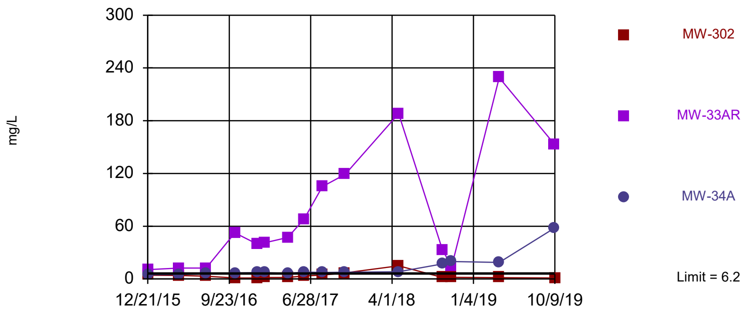
Exceeds Limit: MW-33AR, MW-34A

Chloride

Interwell Parametric



Background Data Summary: Mean=3.86, Std. Dev.=1.338, n=30. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9071, critical = 0.9. Kappa = 1.752 (c=6, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.008742. Individual comparison alpha = 0.002922. Comparing 3 points to limit.

Prediction Limit Analysis Run 1/8/2020 6:54 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

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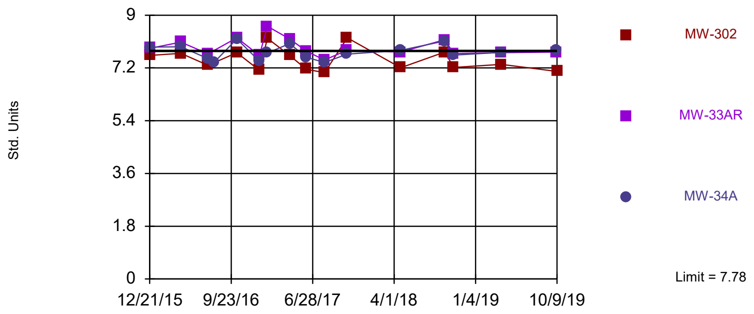
Exceeds Limit: MW-34A

Field pH

Interwell Parametric



Background Data Summary: Mean=7.158, Std. Dev.=0.3555, n=31. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9611, critical = 0.902. Kappa = 1.748 (c=6, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.008742. Individual comparison alpha = 0.002922. Comparing 3 points to limit.

Prediction Limit Analysis Run 1/8/2020 6:54 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

Prediction Limit

Constituent: Boron (ug/L) Analysis Run 1/8/2020 6:56 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			463 (D)		
12/22/2015	26.5	80			11.9
4/5/2016	25.2	78.8	516.5 (D)		14
7/7/2016		134	505 (D)		
7/8/2016	23.6				14.7
10/13/2016	30.6	132	519.5 (D)		11.1
12/29/2016	32.8	106	518 (D)		14.7
1/25/2017	32.6	149	488.5 (D)		16.1
4/11/2017	28.8	322	487 (D)		12.9
6/6/2017	21.3	671	446.5 (D)		14.8
8/7/2017			451 (D)		
8/8/2017	30.6	833			22.9
10/23/2017	34.3				
10/24/2017		691	443 (D)		13.8
4/24/2018		1950	405 (D)		
4/25/2018	24.3				25
8/8/2018	22.8				12.8
9/21/2018		203	462 (D)		
10/22/2018		296	457.5 (D)		
10/24/2018	27.8				10.1 (J)
4/2/2019	26.9	254	386 (D)		
4/3/2019					13.6
10/8/2019			548	207	
10/9/2019	35.9	246			12

Prediction Limit

Constituent: Calcium (ug/L)   Analysis Run 1/8/2020 6:56 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-33AR	MW-84A (bg)	MW-302	MW-301 (bg)	MW-34A
12/21/2015	60167 (D)				
12/22/2015		74000	68800	126000	
4/5/2016	56200 (D)	72200	65900	115000	
7/7/2016	55250 (D)		66900		
7/8/2016		67600		108000	
10/13/2016	67300 (D)	74000	71700	118000	
12/29/2016	62950 (D)	76000	76100	129000	
1/25/2017	58200 (D)	70800	75400	124000	
4/11/2017	66550 (D)	73200	79600	120000	
6/6/2017	73800 (D)	76100	88900	111000	
8/7/2017	76050 (D)				
8/8/2017		74900	87100	108000	
10/23/2017				87200	
10/24/2017	83900 (D)	77500	94400		
4/24/2018	84700 (D)		110000		
4/25/2018		76600		112000	
8/8/2018		76000		105000	
10/22/2018	68500 (D)		56900		
10/24/2018		74000		101000	
4/2/2019	99250 (D)		62400	126000	
4/3/2019		80100			
10/8/2019	121000				78800
10/9/2019		73500	61400	114000	

Prediction Limit

Constituent: Chloride (mg/L)   Analysis Run 1/8/2020 6:56 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			10.6	4.85 (D)	
12/22/2015	3.7 (J)	4.2			4.9
4/5/2016	4	4.1	12.5	5.1	4.7
7/7/2016		3.1 (J)	12.5	5.6	
7/8/2016	3.5 (J)				5.1
10/13/2016	2.2	1.1 (J)	52.5	6.8	4.3
12/29/2016	2 (J)	1.2 (J)	39.6	7.1	4.7
1/25/2017	1.5 (J)	1.6 (J)	41.4	7.2	4.6
4/11/2017	2	1.6 (J)	47.1	6.2	4.9
6/6/2017	3.5	3.5	68.1	7.8	5.5
8/7/2017			105	7.4	
8/8/2017	5.5	4.5			5.5
10/23/2017	4				
10/24/2017		6.9	119	7.6	5.1
4/24/2018		15	188	8.2	
4/25/2018	2.3				4.8
8/8/2018	5.2				4.9
9/21/2018		1.7 (J)	32.6	17.1	
10/22/2018		1.8 (J)	14.4	19.9	
10/24/2018	3.2				4.2
4/2/2019	0.79 (J)	1.5 (J)	229	18.7	
4/3/2019					3.6
10/8/2019			153	57.9	
10/9/2019	1.7 (J)	1.1 (J)			3.9

Prediction Limit

Constituent: Field pH (Std. Units) Analysis Run 1/8/2020 6:56 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			7.87	7.91	
12/22/2015	6.85	7.63			7.6
4/5/2016	7.01	7.7	8.08	7.92	7.61
7/7/2016		7.29	7.68	7.52	
7/8/2016	6.87				7.45
7/28/2016				7.4	7.34
10/13/2016	7.28	7.72	8.23	8.19	7.91
12/29/2016	6.63	7.12	7.63	7.43	7.25
1/25/2017	7.1	8.21	8.62	7.71	6.99
4/11/2017	7.11	7.63	8.19	8.03	7.8
6/6/2017	6.7	7.16	7.78	7.57	7.28
8/7/2017			7.47	7.39	
8/8/2017	6.75	7.04			7.23
10/23/2017	7.37				
10/24/2017		8.23	7.81	7.67	7.68
4/24/2018		7.21	7.74	7.8	
4/25/2018	6.76				7.45
8/8/2018	6.91				7.38
9/21/2018		7.74	8.16	8.12	
10/22/2018		7.22	7.69	7.64	
10/24/2018	6.79				7.24
4/2/2019	6.62	7.32	7.72	7.73	
4/3/2019					7.03
10/8/2019			7.74	7.79	
10/9/2019	6.67	7.08			7.23

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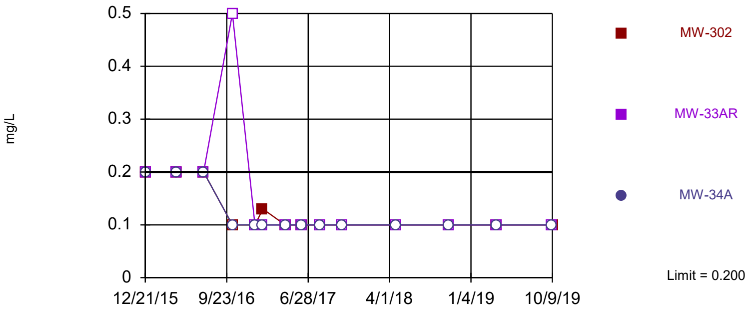
Hollow symbols indicate censored values.

Within Limit

Fluoride

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 30 background values. 96.67% NDs. Annual per-constituent alpha = 0.01176. Individual comparison alpha = 0.00197 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 1/8/2020 6:54 PM
Columbia Energy Center Client: SCS Engineers Data: Input -191203

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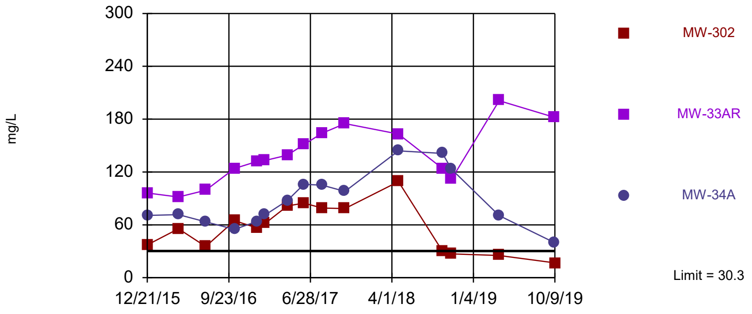
Exceeds Limit: MW-33AR, MW-34A

Sulfate

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=1.735, Std. Dev.=0.9574, n=30. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9384, critical = 0.9. Kappa = 1.752 (c=6, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.008742. Individual comparison alpha = 0.002922. Comparing 3 points to limit.

Prediction Limit Analysis Run 1/8/2020 6:54 PM
Columbia Energy Center Client: SCS Engineers Data: Input -191203

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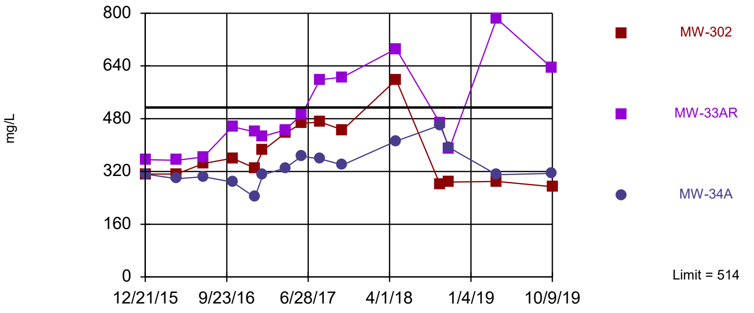
Exceeds Limit: MW-33AR

Total Dissolved Solids

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 30 background values. Annual per-constituent alpha = 0.01176. Individual comparison alpha = 0.00197 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 1/8/2020 6:54 PM
Columbia Energy Center Client: SCS Engineers Data: Input -191203

Prediction Limit

Constituent: Fluoride (mg/L)   Analysis Run 1/8/2020 6:56 PM

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

	MW-33AR	MW-34A	MW-301 (bg)	MW-84A (bg)	MW-302
12/21/2015	<0.2	<0.2 (D)			
12/22/2015			<0.2	<0.2	<0.2
4/5/2016	<0.2	<0.2	<0.2	<0.2	<0.2
7/7/2016	<0.2	<0.2			<0.2
7/8/2016			<0.2	<0.2	
10/13/2016	<0.5	<0.1	<0.1	<0.1	<0.1
12/29/2016	<0.1	<0.1	<0.1	<0.1	<0.1
1/25/2017	<0.1	<0.1	<0.1	0.12 (J)	0.13 (J)
4/11/2017	<0.1	<0.1	<0.1	<0.1	<0.1
6/6/2017	<0.1	<0.1	<0.1	<0.1	<0.1
8/7/2017	<0.1	<0.1			
8/8/2017			<0.1	<0.1	<0.1
10/23/2017			<0.1		
10/24/2017	<0.1	<0.1		<0.1	<0.1
4/24/2018	<0.1	<0.1			<0.1
4/25/2018			<0.1	<0.1	
8/8/2018			<0.1	<0.1	
10/22/2018	<0.1	<0.1			<0.1
10/24/2018			<0.1	<0.1	
4/2/2019	<0.1	<0.1	<0.1		<0.1
4/3/2019				<0.1	
10/8/2019	<0.1	<0.1			
10/9/2019			<0.1	<0.1	<0.1

Prediction Limit

Constituent: Sulfate (mg/L) Analysis Run 1/8/2020 6:56 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			96.2	70.6 (D)	
12/22/2015	9.3	37.4			4.9
4/5/2016	15.3	55.6	91.5	71.6	4.3
7/7/2016		35.4	99.2	63.4	
7/8/2016	15				3.7 (J)
10/13/2016	13.9	64.7	124	54.8	2.6 (J)
12/29/2016	12.3 (J)	56.4	132	63.9	2.7 (J)
1/25/2017	6.5	61.6	133	71.2	3
4/11/2017	10.3	81.3	139	87.6	2.8 (J)
6/6/2017	17.1	84.6	151	106	2.7 (J)
8/7/2017			164	105	
8/8/2017	31.6	79			2 (J)
10/23/2017	27.5				
10/24/2017		78.4	175	98	2.2 (J)
4/24/2018		109	163	144	
4/25/2018	8.6				2.8 (J)
8/8/2018	21.6				1.9 (J)
9/21/2018		30	124	141	
10/22/2018		26.9	112	123	
10/24/2018	19.2				1.6 (J)
4/2/2019	4.4	25.2	201	70.4	
4/3/2019					1.4 (J)
10/8/2019			182	39.8	
10/9/2019	8.4	16.7			1.3 (J)

Prediction Limit

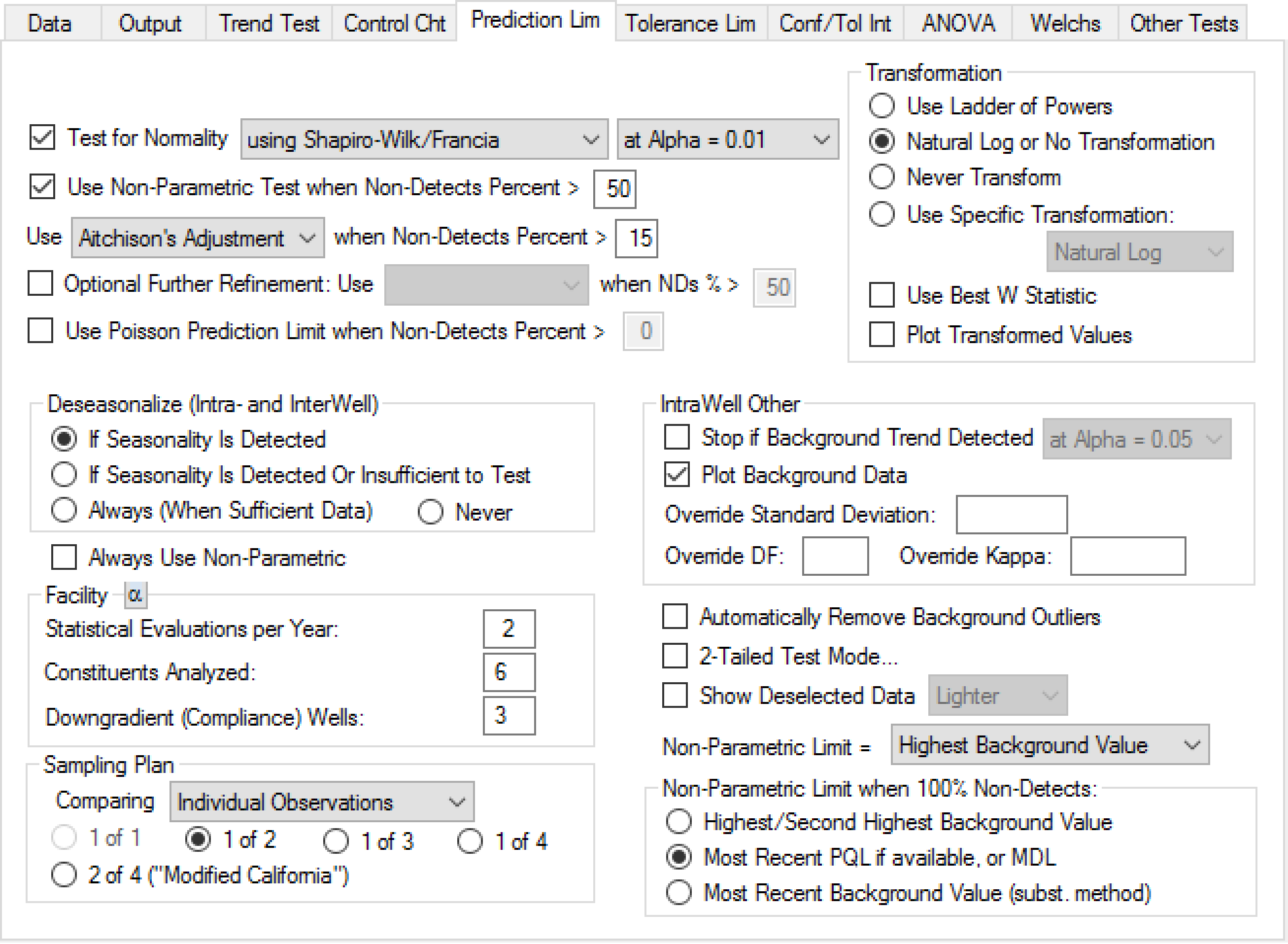
Constituent: Total Dissolved Solids (mg/L) Analysis Run 1/8/2020 6:56 PM

Columbia Energy Center Client: SCS Engineers Data: Input -191203

	MW-34A	MW-33AR	MW-301 (bg)	MW-84A (bg)	MW-302
12/21/2015	312 (D)	356			
12/22/2015			478	316	312
4/5/2016	298	354	486	322	312
7/7/2016	304	364			344
7/8/2016			464	316	
10/13/2016	288	456	490	324	360
12/29/2016	242	440	444	316	330
1/25/2017	310	426	514	328	384
4/11/2017	330	446	502	342	436
6/6/2017	366	492	458	344	466
8/7/2017	358	598			
8/8/2017			462	342	470
10/23/2017			362		
10/24/2017	340	606		314	446
4/24/2018	412	692			598
4/25/2018			464	328	
8/8/2018			502	372	
9/21/2018	460	466			280
10/22/2018	392	388			288
10/24/2018			424	330	
4/2/2019	310	784	462		290
4/3/2019				318	
10/8/2019	314	634			
10/9/2019			418	310	274

Attachment E

Sanitas Settings



☑ Test for Normality using Shapiro-Wilk/Francia at Alpha = 0.01

☑ Use Non-Parametric Test when Non-Detects Percent > 50

Use Aitchison's Adjustment when Non-Detects Percent > 15

☐ Optional Further Refinement: Use when NDs % > 50

☐ Use Poisson Prediction Limit when Non-Detects Percent > 0

Transformation

○ Use Ladder of Powers
● Natural Log or No Transformation
○ Never Transform
○ Use Specific Transformation: Natural Log

☐ Use Best W Statistic

☐ Plot Transformed Values

Deseasonalize (Intra- and InterWell)

● If Seasonality Is Detected
○ If Seasonality Is Detected Or Insufficient to Test
○ Always (When Sufficient Data) ○ Never

☐ Always Use Non-Parametric

Facility α

Statistical Evaluations per Year: 2
Constituents Analyzed: 6
Downgradient (Compliance) Wells: 3

Sampling Plan

Comparing Individual Observations

○ 1 of 1 ● 1 of 2 ○ 1 of 3 ○ 1 of 4
○ 2 of 4 ("Modified California")

IntraWell Other

☐ Stop if Background Trend Detected at Alpha = 0.05

☑ Plot Background Data

Override Standard Deviation:

Override DF: Override Kappa:

☐ Automatically Remove Background Outliers

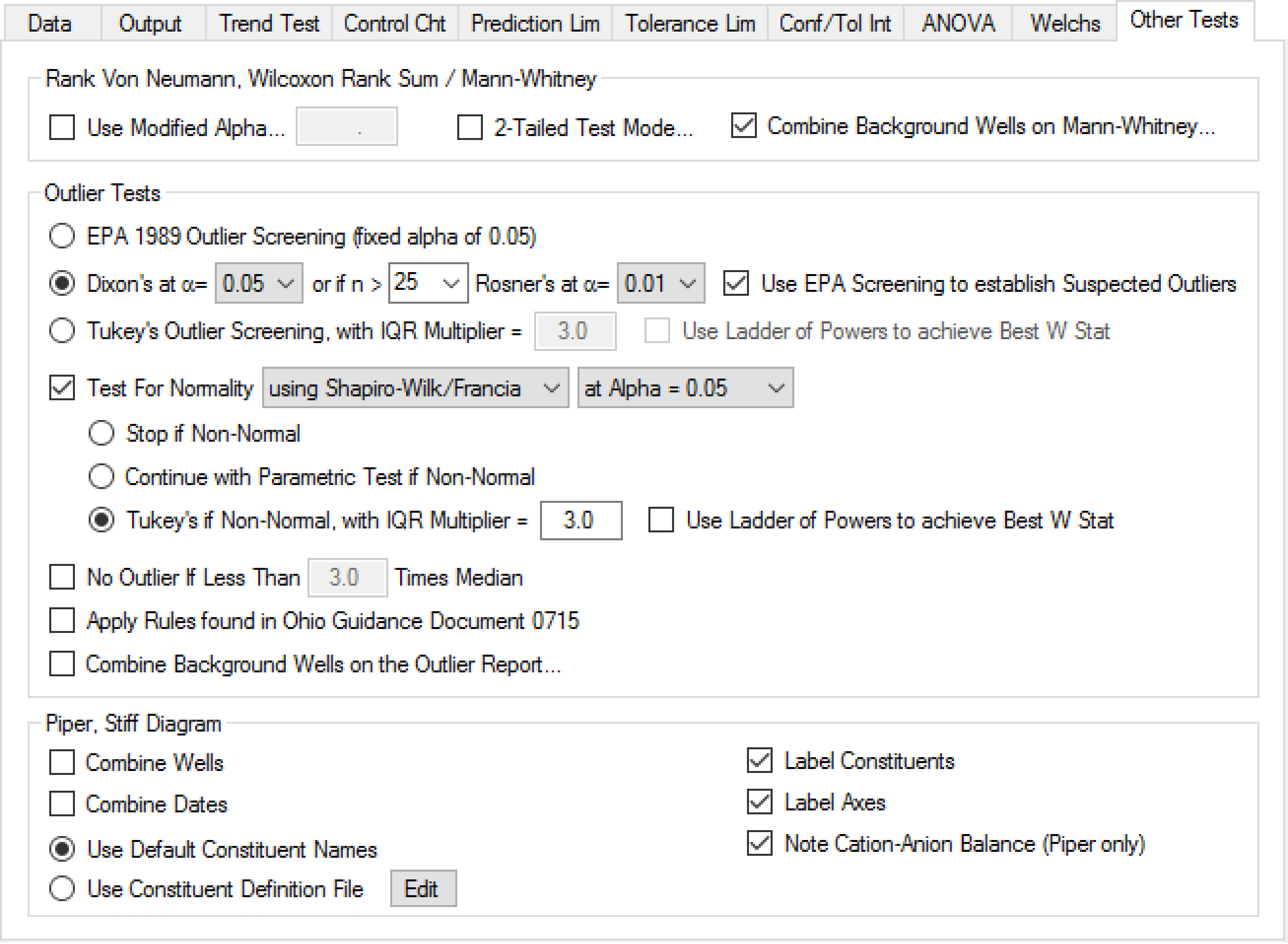
☐ 2-Tailed Test Mode...

☐ Show Deselected Data Lighter

Non-Parametric Limit = Highest Background Value

Non-Parametric Limit when 100% Non-Detects:

○ Highest/Second Highest Background Value
● Most Recent PQL if available, or MDL
○ Most Recent Background Value (subst. method)



Rank Von Neumann, Wilcoxon Rank Sum / Mann-Whitney

☐ Use Modified Alpha... .   ☐ 2-Tailed Test Mode...   ☑ Combine Background Wells on Mann-Whitney...

Outlier Tests

○ EPA 1989 Outlier Screening (fixed alpha of 0.05)

● Dixon's at α= 0.05 or if n > 25 Rosner's at α= 0.01   ☑ Use EPA Screening to establish Suspected Outliers

○ Tukey's Outlier Screening, with IQR Multiplier = 3.0   ☐ Use Ladder of Powers to achieve Best W Stat

☑ Test For Normality using Shapiro-Wilk/Francia at Alpha = 0.05

- ○ Stop if Non-Normal
- ○ Continue with Parametric Test if Non-Normal
- ● Tukey's if Non-Normal, with IQR Multiplier = 3.0   ☐ Use Ladder of Powers to achieve Best W Stat

☐ No Outlier If Less Than 3.0 Times Median

☐ Apply Rules found in Ohio Guidance Document 0715

☐ Combine Background Wells on the Outlier Report...

Piper, Stiff Diagram

☐ Combine Wells   ☑ Label Constituents

☐ Combine Dates   ☑ Label Axes

● Use Default Constituent Names   ☑ Note Cation-Anion Balance (Piper only)

○ Use Constituent Definition File

Appendix F

Alternative Source Demonstrations

F1 Alternative Source Demonstration, October 2019 Detection Monitoring

Alternative Source Demonstration October 2019 Detection Monitoring

Dry Ash Disposal Facility, Modules 1-3
Columbia Energy Center
Pardeeville, Wisconsin

Prepared for:

Alliant Energy

SCS ENGINEERS

25220067.00 | April 14, 2020

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

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Figures

Appendices

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PE CERTIFICATION

Sherren C.
Clark
E-29863
Madison,
Wis.

4-11-2020

I, Sherren Clark, hereby certify that that the information in this alternate source demonstration is accurate and meets the requirements of 40 CFR 257.94(e)(2). This certification is based on my review of the groundwater data and related site information available for the Columbia Energy Center Dry Ash Disposal Facility. I am a duly licensed Professional Engineer under the laws of the State of Wisconsin.

4-11-2020

(signature) (date)

Sherren Clark

(printed or typed name)

License number E-29863

My license renewal date is July 31, 2020.

Pages or sheets covered by this seal:
Alternative Source Demonstration, October 2020 Detection Monitoring, Dry Ash Disposal Facility, Modules 1-3, Columbia Energy Center, Pardeeville, Wisconsin

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1.0 INTRODUCTION

This Alternative Source Demonstration (ASD) was prepared to support compliance with the groundwater monitoring requirements of the "Coal Combustion Residuals (CCR) Final Rule" published by the U.S. Environmental Protection Agency (USEPA) in the *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule*, dated April 17, 2015 (USEPA, 2015), and subsequent amendments. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.94(e)(2). The applicable sections of the Rule are provided below in *italics*.

1.1 §257.94(E)(2) ALTERNATIVE SOURCE DEMONSTRATION REQUIREMENTS

The owner and operator may demonstrate that a source other than the CCR Unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels.

An ASD is completed when there are exceedances of one or more benchmarks established within the groundwater monitoring program. The ASD is completed to determine if any other sources are likely causes of the identified exceedance(s) of established benchmark(s) at the site. This ASD was performed in response to results indicating a statistically significant increase (SSI) over background levels during detection monitoring under the CCR Rule.

This ASD report is evaluating the SSIs observed in the statistical evaluation of the October 2019 detection monitoring event at the Columbia Energy Center (COL) Dry Ash Disposal Facility, Modules 1-3 CCR Units. The first ASD was prepared for this facility evaluating the SSIs observed in the statistical evaluation of the October 2017 detection monitoring event (SCS Engineers [SCS], 2018). The October 2017 ASD and subsequent semiannual updates have concluded that several lines of evidence demonstrated that SSIs reported for boron, chloride, field pH, sulfate, and total dissolved solids (TDS) concentrations in the downgradient monitoring wells were likely due to man-made sources other than the CCR Units and/or naturally occurring constituents in the alluvial aquifer.

As discussed in more detail in **Section 4.2** of this ASD, the findings for the October 2019 monitoring event were consistent with those for the previous events.

1.2 SITE INFORMATION AND MAP

The COL site is located at W8375 Murray Road, Pardeeville, Columbia County, Wisconsin (**Figure 1**). The COL site is an active coal-burning generating station which has been burning coal and disposing of CCR on site since the mid-1970s. The layout of the site is shown on **Figure 2**. The COL property includes two areas of CCR storage and disposal. These are the Dry Ash Disposal Facility (ADF) and the Ash Ponds Facility. This ASD will evaluate the conditions at the site for Modules 1-3 of the ADF only. The ADF is operated under the Wisconsin Department of Natural Resources (WDNR) License No. 3025.

The groundwater monitoring system for the COL ADF Modules 1-3 (MOD 1-3) is a multi-unit system, monitoring three existing CCR Units:

- COL Dry ADF – Module 1 (existing CCR Landfill)
- COL Dry ADF – Module 2 (existing CCR Landfill)
- COL Dry ADF – Module 3 (existing CCR Landfill)

A map showing the CCR Units and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR groundwater monitoring program and the state monitoring program is provided as **Figure 2.** Separate monitoring systems have been established for Module 4 of the COL ADF, for the primary ash pond and for the secondary ash pond.

1.3 STATISTICALLY SIGNIFICANT INCREASES IDENTIFIED

SSIs were identified for boron, chloride, sulfate, field pH, and TDS at one or more wells based on the October 2019 detection monitoring event. SSIs were identified by comparing the monitoring results to Upper Prediction Limits (UPLs) established in accordance with 40 CFR 257.93(f)(3) and the statistical method previously selected for the CCR Unit. The UPLs are based on an interwell approach using two background monitoring wells: MW-84A and MW-301.

A summary of the October 2019 constituent concentrations and the UPLs is provided in **Table 1.** The constituent results with SSIs above background are highlighted in the table. Concentration trends for the parameters with SSIs are shown in **Appendix A.**

1.4 OVERVIEW OF ALTERNATIVE SOURCE DEMONSTRATION

This ASD report includes:

- Background information (**Section 2.0**)
- Evaluation of potential that SSIs are due to methodology or analysis (**Section 3.0**)
- Evaluation of potential that SSIs are due to natural sources or man-made sources other than the CCR Units (**Section 4.0**)
- ASD conclusions (**Section 5.0**)
- Monitoring recommendations (**Section 6.0**)

The CCR Rule constituent results from background and compliance sampling for parameters with SSIs are provided in **Table 2.** The laboratory report for the October 2019 detection monitoring event was included in the 2019 Annual Groundwater Monitoring and Corrective Action Report submitted in January 2020. Complete laboratory reports for the background monitoring events and the previous detection monitoring events were included in previous annual groundwater monitoring and corrective action reports.

2.0 BACKGROUND

To provide context for the ASD evaluation, the following background information is provided in this section of the report, prior to the ASD evaluation sections:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system
- Other monitoring wells

A more detailed discussion of the background information for the site is provided in the ASD for the October 2017 event (SCS, 2018).

2.1 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.1.1 Regional Information

For the purposes of groundwater monitoring, the surficial sand and gravel aquifer is considered the uppermost aquifer, as defined under 40 CFR 257.53. Immediately underlying the surficial sand and gravel aquifer is the Cambrian-Ordovician sandstone aquifer.

Additional details on the regional geology and hydrogeology were provided in the October 2017 ASD (SCS, 2018).

2.1.2 Site Information

Soils at the site are primarily sand to a depth of approximately 50 to 100 feet, and overlie sandstone bedrock. Soils encountered during the site feasibility study for the COL ADF were described as generally sandy with interbedded silty clay lenses up to 20 feet thick (Warzyn, 1978). During drilling of CCR wells MW-301 and MW-302, the unconsolidated materials were identified as consisting primarily of silty sand. Boring logs for previously installed monitoring wells MW-33AR, MW-34A, MW-84A, and M-4R show silty sand and sand as the primary unconsolidated materials at these locations. All CCR monitoring wells are screened within the unconsolidated sand unit.

Shallow groundwater at the site generally flows to the north and west across the existing landfill area, then generally flows west toward the Wisconsin River. A groundwater flow map for October 2019 is shown on **Figure 3**. The groundwater elevation data for the CCR monitoring wells are provided in **Table 3**.

2.2 CCR RULE MONITORING SYSTEM

The groundwater monitoring system established in accordance with the CCR Rule consists of two upgradient (background) monitoring wells and three downgradient monitoring wells. The background wells include MW-301 and MW-84A. The downgradient wells include MW-302, MW-33AR, and MW-34A. The CCR Rule wells are installed within the sand and gravel aquifer. Well depths range from approximately 29 to 40 feet, measured from the top of the well casing.

2.3 OTHER MONITORING WELLS

Additional groundwater monitoring wells currently exist at COL as part of the monitoring systems developed for the state monitoring program and for the other CCR Units.

Monitoring wells for the state monitoring program are installed in the unconsolidated sand and gravel unit, which is the uppermost aquifer as defined under 40 CFR 257.53. This shallow monitoring system includes water table wells and mid-depth piezometers. Well depths range from approximately 14 to 76 feet, measured from the top of the well casing.

3.0 METHODOLOGY AND ANALYSIS REVIEW

To evaluate the potential that an SSI is due to a source other than the regulated CCR Unit, SCS used a two-step evaluation process. First, the sample collection, field and laboratory analysis, and statistical evaluation were reviewed to identify any potential error or analysis that led to exceedance of the benchmark. Second, potential alternative sources, including natural variation and man-made sources other than the CCR Unit, were evaluated. This section of the report provides the findings of the methodology and analysis review. **Section 4.0** of the report addresses the potential alternative sources.

3.1 SAMPLING AND FIELD ANALYSIS

Field notes and sampling results were reviewed to determine if any sampling error may have caused or contributed to the observed SSIs. Potential field sampling errors or issues could include mislabeling of samples, improper sample handling, missed holding times, cross contamination during sampling, or other field error. Field blank sample results were also reviewed for any indication of potential contamination from sampling equipment or containers. Based on the review of the field notes and results, SCS did not identify any indication that the SSI concentrations were due to a sampling error.

For field pH, the reading for which an SSI was indicated (MW-34 sample) exceeded the UPL by only 0.01 pH units. This is within the accuracy range for the YSI pH meter, which is +/- 0.2 pH units. Therefore, the true field pH may or may not have exceeded the UPL and normal instrument error may have contributed to the reported SSI. Because the field pH exceedance of the UPL was well within the range of the instrument accuracy, it cannot be concluded that the true field pH exceeds the UPL. This approach is equivalent to the exclusion of “J” flagged estimated laboratory results from the determination of SSIs.

SCS did not identify any other issues with the field analysis based on review of the data and field notes. Because boron, chloride, sulfate, and TDS are laboratory parameters, there is little potential for a field analysis error to contribute to an SSI.

3.2 LABORATORY ANALYSIS REVIEW

The laboratory reports for the October 2019 detection monitoring event were reviewed to determine if any laboratory analysis error or issue may have caused or contributed to an observed SSI for boron, chloride, sulfate, or TDS. The laboratory report review included reviewing the laboratory quality control flags and narrative, verifying that correct methods were used and desired detection limits were achieved, and checking the field and laboratory blank sample results.

Based on the review of the laboratory reports, SCS did not identify any indication that the SSIs were due to a laboratory analysis error. There were no laboratory quality control flags or issues identified in the laboratory report that affect the usability of the data for detection monitoring.

Time series plots of the SSI constituent analytical data were also reviewed for any anomalous results that might indicate a possible sampling or laboratory error (e.g., dilution error or incorrect sample labeling). The time series plots are provided in **Appendix A**. The concentrations observed are similar to historical concentrations.

3.3 STATISTICAL EVALUATION REVIEW

The review of the statistical results and methods included a quality control check of the following:

- Input analytical data vs. laboratory analytical reports
- Statistical method and process for each SSI

Based on the review of the statistical evaluation, SCS did not identify any errors or issues in the statistical evaluation that caused or contributed to the determination of interwell SSIs for the October 2019 detection monitoring event.

For the October 2019 event, SCS recalculated the Appendix III parameter UPLs using additional rounds of groundwater data collected since the first calculations of the Appendix III parameter UPLs in early 2018. The updated UPLs are shown in **Table 1**. The October 2019 pH measurement at MW-34A (7.79 standard units) slightly exceeded the updated UPL of 7.78, but was below the previous field pH UPL of 7.93.

3.4 SUMMARY OF METHODOLOGY AND ANALYSIS REVIEW FINDINGS

In summary, there were no changes to the SSI determinations for the October 2019 monitoring event based on the methodology and analysis review, and no errors or issues causing or contributing to the reported SSIs were identified.

4.0 ALTERNATIVE SOURCES

This section of the report discusses the potential alternative sources for the boron, chloride, sulfate, field pH, and TDS SSIs at the downgradient monitoring wells; identifies the most likely alternative source(s); and presents the lines of evidence indicating that an alternative source is the most likely cause of the observed SSIs.

4.1 POTENTIAL CAUSES OF SSI

4.1.1 Natural Variation

The statistical analysis was completed using an interwell approach, comparing the October 2019 detection monitoring results to the UPLs calculated based on sampling of the background wells (MW-84A and MW-301). If concentrations of a constituent that is naturally present in the aquifer vary spatially, then the potential exists that the downgradient concentrations may be higher than upgradient concentrations due to natural variation.

Natural variation may be present in the shallow aquifer for any of the parameters, and may have contributed to the SSI for field pH at MW-34. Previous field pH measurements in the background wells (MW-84A and MW-301) include pH values similar to or higher than the field pH in compliance well MW-34A from the October 2019 sampling event (**Table 2**).

Although natural variation is present in the shallow aquifer, it does not appear likely that natural variation is the primary source causing the boron, chloride, sulfate, and TDS SSIs.

4.1.2 Man-Made Alternative Sources

Man-made alternative sources that could potentially contribute to the boron, chloride, pH, sulfate, and TDS SSIs could include the closed ash pond landfill, the active ash ponds, the former ash pond effluent ditch, the coal storage area, road salt use, railroad operations, or other plant operations.

Based on the groundwater flow directions and on previous investigations at the site, the former ash pond effluent ditch appears to be the most likely cause of the boron and/or sulfate SSIs for wells MW-33AR, MW-34A, and MW-302. The ash pond effluent ditch also likely contributed to the chloride SSIs at MW-33AR and MW34A.

The higher chloride and TDS concentrations at MW-33AR are likely related to a non-CCR alternative source.

4.2 LINES OF EVIDENCE

The lines of evidence indicating that the SSIs for boron, chloride, sulfate, and TDS in compliance wells MW-33AR, MW-34A, and MW-302, relative to the background wells, are due to an alternative source include:

1. Elevated concentrations of boron, chloride, sulfate, and TDS were present in the area west of the landfill, where the three compliance wells are located, before the landfill was constructed.
2. Monitoring performed under the state program documents that the concentrations of boron, chloride, and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation.
3. Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing west and/or north.
4. The increase in chloride and TDS results for well B-33AR in the last 2 years has not correlated with an increase in boron, as would be expected for a CCR leachate source; therefore, an alternative source is more likely.

4.2.1 Pre-Landfill Water Quality

Elevated concentrations of boron, chloride, sulfate, and TDS were present in the area west of the landfill, where the three compliance wells are located, before the landfill was constructed. Groundwater monitoring performed in 1977 and 1978 as part of the feasibility study for the landfill permitting showed that wells located along the west side of the future landfill footprint, where the current compliance wells are located, had elevated results for sulfate, chloride, and specific conductance. TDS was not monitored, but is generally correlated with specific conductance.

The 1978 Feasibility Study (Warzyn, 1978) for the dry ADF discusses the influence of the ash pond effluent ditch on groundwater west of the proposed site. The former ash pond effluent ditch, shown on **Figure 2**, carried effluent from the ash ponds located north of the plant, and flowed south between the west side of the current landfill and the substation. Groundwater monitoring in December 1977 indicated that sulfate was present at 1,200 milligrams per liter (mg/L) in MW-33A, which was located near the point where the ash pond effluent discharged from a culvert into the effluent ditch. The sulfate concentration at this well decreased to 830 mg/L in the December 1978 sampling (Warzyn, 1979). Current concentrations of sulfate in this area are much lower, but remain above background. The October 2019 sulfate result for MW-33AR (installed to replace MW-33A) was 182 mg/L and at MW-34A were 39.8 mg/L.

Selected text and tables from the 1978 Feasibility Study and the 1979 Supplementary Feasibility Study Report are included in **Appendix B**.

4.2.2 Long-Term Concentration Trends

Monitoring performed under the state program documents that the concentrations of boron and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation. Routine groundwater monitoring for the COL ADF began after the Plan of Operation was approved and prior to initial CCR disposal. The earliest data available from the WDNR Groundwater Environmental Monitoring System (GEMS) database is from September 1984. Initial placement of CCR in test plots in Module 1 of the ADF was approved in October 1984 and CCR disposal began sometime after that. Therefore, the initial groundwater monitoring results in the GEMS database represent pre-disposal conditions for the landfill.

The historic monitoring data show that concentrations of boron and sulfate were significantly higher in the area west of the landfill where the compliance wells are located. Graphs of historical concentrations are provided in **Appendix C**. Results for compliance well MW-33AR are plotted with results from well MW-33A. MW-33AR was a replacement well for MW-33A at a slightly different location and depth. The well screen was installed approximately 10 feet higher in MW-33AR than in MW-33A, intersecting the water table, which may explain the increase in concentration that occurred with the well replacement. Results for compliance well MW-302 are plotted with results from monitoring well MW-85, which was located near the current MW-302 location (see **Figure 2**) and was monitored from September 1984 through September 1995.

The recent boron concentrations are consistent with generally decreasing or stable historical concentrations at MW-33AR and MW-34A (**Appendix A** and **Appendix C**).

4.2.3 Groundwater Flow Direction Changes

Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing west. The 1978 Feasibility Study report states that the southern 2/3 of the proposed fill area (including the area of the active CCR landfill phases) exhibits a southeast and southerly groundwater flow direction, toward an agricultural drainage ditch southeast and south of the landfill area. The 1981 Plan of Operation indicates that flow in the landfill area is to the east-southeast. A water table map prepared by RMT, based on October 2002 water level measurements, shows flow under the landfill generally to the east and northeast from a groundwater high near the effluent ditch and Wisconsin Pollutant Discharge Elimination System (WPDES) pond between the landfill and the substation. The 1981 and 2002 water table maps are provided in **Appendix D**.

Under current conditions, groundwater flow below the active landfill area is generally to the west and northwest. The flow changes with time reflect the termination of discharge to the ash pond effluent ditch in the mid-2000s. When discharge via this ditch was active, the ditch was a source of recharge to the groundwater and created a high groundwater area with flow moving away from the ditch to the east. After discharge to the ditch was terminated, water levels in this area decreased significantly and the groundwater flow direction changed.

With the changes in groundwater flow, historically impacted groundwater moved in alternating directions. While the effluent ditch was active, impacted groundwater likely moved eastward past the current compliance wells, as indicated by the long-term concentration data. Although the compliance wells are downgradient from the landfill under current flow conditions, the observed groundwater impacts may be residual from the past when the wells were downgradient from the effluent ditch.

4.2.4 Chloride and Boron Leachate Concentrations

The chloride and TDS results for well MW-33AR increased significantly without a corresponding increase in boron, indicating the source of the increasing chloride and TDS is not likely the CCR landfill. Sampling of the landfill leachate pond and the lysimeters indicates that boron and chloride concentrations are generally both elevated in leachate (**Table 4**). Furthermore, the chloride concentration in the October 2019 sample from MW-33AR was significantly higher than the chloride concentrations measured in the leachate, indicating the leachate is not the source (**Tables 2** and **4**). An alternative man-made source, such as road salt, is a more likely source of chloride than the CCR Units. The TDS increase correlated closely with the chloride increase and likely has the same alternative source.

5.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSIONS

The lines of evidence discussed above regarding the SSIs reported for boron, chloride, sulfate, field pH, and TDS concentrations in downgradient monitoring wells MW-33AR, MW-34A, and/or MW-302 demonstrate that the SSIs are likely primarily due to sources other than the CCR Units. Boron, sulfate, and chloride concentrations were elevated prior to disposal of CCR in the landfill and are associated with historical discharges from the ash ponds via the effluent ditch located west of the landfill. Elevated chloride and TDS concentrations detected at well MW-33AR appear likely to be related to an alternative non-CCR source, such as salt. The field pH exceedance of the UPL at well MW-34A was well within the range of the instrument accuracy and therefore it cannot be concluded that the result exceeds the UPL. Furthermore, pH measurements at similar or higher levels have been observed in samples from background well MW-84A, indicating that the result is within the range of natural variation.

6.0 SITE GROUNDWATER MONITORING RECOMMENDATIONS

In accordance with section 257.94(e)(2) of the CCR Rule, the COL MOD 1-3 CCR Units may continue with detection monitoring based on this ASD. The ASD report will be included in the 2020 Annual Report due January 31, 2021.

7.0 REFERENCES

SCS, 2018, Alternative Source Demonstration, October 2017 Detection Monitoring, Columbia Energy Center Dry Ash Disposal Facility, April 2018.

USEPA, 2015, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. April 2015.

Warzyn Engineering, Inc., 1978, Feasibility Study, Proposed Fly Ash and/or Scrubber Sludge Disposal Facility – Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

Warzyn Engineering, Inc., 1979, and Preliminary Engineering Concepts, Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

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Tables

Table 1. Groundwater Analytical Results Summary - CCR Program - Detection Monitoring
Columbia Landfill MOD 1-3 / SCS Engineers Project #25220067.00
October 2019

		Background Wells		Compliance Wells		
Parameter Name	Interwell Upper Prediction Limit (UPL)	MW-84A Oct-19 10/9/2019	MW-301 Oct-19 10/9/2019	MW-33AR Oct-19 10/8/2019	MW-34A Oct-19 10/8/2019	MW-302 Oct-19 10/9/2019
Boron, ug/L	35.6	12.0	35.9	548	207	246
Calcium, ug/L	129,000	73,500	114,000	121,000	78,800	61,400
Chloride, mg/L	6.2	3.9	1.7 J	153	57.9	1.1 J
Fluoride, mg/L	DQ	<0.10	<0.10	<0.10	<0.10	<0.10
Field pH, Std. Units	7.78	7.23	6.67	7.74	7.79	7.08
Sulfate, mg/L	30.3	1.3 J	8.4	182	39.8	16.7
Total Dissolved Solids, mg/L	514	310	418	634	314	274

4.4 Blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

Abbreviations:
UPL = Upper Prediction Limit
SSI = Statistically Significant Increase
LOQ = Limit of Quantification
LOD = Limit of Detection
μg/L = micrograms per liter
mg/L = milligrams per liter

DQ = Double Quantification rule applies (not detected in background samples)
J = Estimated concentration at or above the LOD and below the LOQ.

Notes:
1. Interwell UPLs based on 1-of-2 retesting approach; therefore, if restesting is performed, there is no SSI unless the original sample result and a retest result are above the UPL.
2. Interwell UPL for fluoride is based on the double quantification rule, because fluoride was not detected above the LOQ in the background samples.
3. Interwell UPLs calculated from background well results for December 2015 through October 2019.

Created by: AJR Date: 1/21/2020
Last revision by: NDK Date: 1/22/2020
Checked by: MDB Date: 1/22/2020
Proj Mgr QA/QC: SCC Date: 1/22/2020

Table 2. Analytical Results - Appendix III Constituents with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Field pH (Std. Units)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
Background	MW-301	12/22/2015	26.5	3.7 J	6.85	9.3	478
		4/5/2016	25.2	4	7.01	15.3	486
		7/8/2016	23.6	3.5 J	6.87	15	464
		10/13/2016	30.6	2.2	7.28	13.9	490
		12/29/2016	32.8	2 J	6.63	12.3 J	444
		1/25/2017	32.6	1.5 J	7.1	6.5	514
		4/11/2017	28.8	2	7.11	10.3	502
		6/6/2017	21.3	3.5	6.7	17.1	458
		8/8/2017	30.6	5.5	6.75	31.6	462
		10/23/2017	34.3	4	7.37	27.5	362
		4/25/2018	24.3	2.3	6.76	8.6	464
		8/8/2018	-	-	6.91	-	-
		10/22/2018	27.8	3.2	6.79	19.2	424
		4/3/2019	26.9	2.9 J, B	6.62	5.3 J	462
		10/9/2019	35.9	1.7	6.67	8.4	418
	MW-84A	12/22/2015	11.9	4.9	7.6	4.9	316
		4/5/2016	14	4.7	7.61	4.3	322
		7/8/2016	14.7	5.1	7.45	3.7 J	316
		7/28/2016	-	-	7.34	-	-
		10/13/2016	11.1	4.3	7.91	2.6 J	324
		12/29/2016	14.7	4.7	7.25	2.7 J	316
		1/25/2017	16.1	4.6	6.99	3	328
		4/11/2017	12.9	4.9	7.8	2.8 J	342
		6/6/2017	14.8	5.5	7.28	2.7 J	344
		8/8/2017	22.9	5.5	7.23	2 J	342
		10/24/2017	13.8	5.1	7.68	2.2 J	314
		4/25/2018	25	4.8	7.45	2.8 J	328
		8/8/2018	--	--	7.38	--	--
		10/22/2018	10.1 J	4.2	7.24	1.6 J	330
		4/3/2019	13.6	3.6 B	7.03	1.4 J	318
		10/9/2019	12.0	3.9	7.23	1.3 J	310
Compliance	MW-302	12/22/2015	80	4.2	7.63	37.4	312
		4/5/2016	78.8	4.1	7.7	55.6	312
		7/7/2016	134	3.1 J	7.29	35.4	344
		10/13/2016	132	1.1 J	7.72	64.7	360
		12/29/2016	106	1.2 J	7.12	56.4	330
		1/25/2017	149	1.6 J	8.21	61.6	384
		4/11/2017	322	1.6 J	7.63	81.3	436
		6/6/2017	671	3.5	7.16	84.6	466
		8/8/2017	833	4.5	7.04	79	470
		10/24/2017	691	6.9	8.23	78.4	446
		4/24/2018	1,950	15	7.21	109	598
		9/21/2018	203	1.7 J	7.74	30	280
		10/22/2018	296	1.8 J	7.22	26.9	288
		4/2/2019	254	1.5 J	7.32	25.2	290
		10/9/2019	246	1.1 J	7.08	16.7	274

Table 2. Analytical Results - Appendix III Constituents with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Field pH (Std. Units)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
Compliance	MW-33AR	12/21/2015	954	10.6	7.87	96.2	356
		4/5/2016	813	12.5	8.08	91.5	354
		7/7/2016	794	12.5	7.68	99.2	364
		10/13/2016	827	52.5	8.23	124	456
		12/29/2016	812	39.6	7.63	132	440
		1/25/2017	763	41.4	8.62	133	426
		4/11/2017	760	47.1	8.19	139	446
		6/6/2017	692	68.1	7.78	151	492
		8/7/2017	697	105	7.47	164	598
		10/24/2017	678	119	7.81	175	606
		4/24/2018	601	188	7.74	163	692
		9/21/2018	683	32.6	8.16	124	466
		10/22/2018	682	14.4	7.69	112	388
		4/2/2019	568	229	7.72	201	784
		10/8/2019	548	153	7.74	182	634
	MW-34A	12/21/2015	230	4.9	7.91	69.9	324
		4/5/2016	220	5.1	7.92	71.6	298
		7/7/2016	216	5.6	7.52	63.4	304
		7/28/2016	-	-	7.4	-	-
		10/13/2016	212	6.8	8.19	54.8	288
		12/29/2016	224	7.1	7.43	63.9	242
		1/25/2017	214	7.2	7.71	71.2	310
		4/11/2017	214	6.2	8.03	87.6	330
		6/6/2017	201	7.8	7.57	106	366
		8/7/2017	205	7.4	7.39	105	358
		10/24/2017	208	7.6	7.67	98	340
		4/24/2018	209	8.2	7.8	144	412
		9/21/2018	241	17.1	8.12	141	460
		10/22/2018	233	19.9	7.64	123	392
		4/4/2019	204	18.7	7.73	70.4	310
		10/8/2019	207	57.9	7.79	39.8	314

Abbreviations:
µg/L = micrograms per liter or parts per billion (ppb)
mg/l = milligrams per liter or parts per million (ppm)
J = Estimated value below the laboratory's limit of quantitation
B = Analyte was detected in the associated Method Blank.

Notes:
(1) Analytical laboratory reports provided in the 2017 Annual Groundwater Monitoring and Corrective Action Report.

Created by:	NDK	Date:	3/19/2020
Last revision by:	NDK	Date:	3/19/2020
Checked by:	AJR	Date:	3/20/2020

I:\25220067.00\Data and Calculations\Tables\CCR ASD COL MOD 1-3 LF Tables\[2 and 3_COL LF ASD.xlsx]Table 2. Analy. Rslts- CCR

Table 3. Groundwater Elevations - State Monitoring Program and CCR Well Network
Columbia Generating Station

Dry Ash Facility	**Well Number**	**MW-1AR**	**MW-5R**	**MW-33AR**	**MW-33BR**	**MW-34A**	**MW-34B**	**MW-37A**	**MW-83**	**MW-84A**	**MW-84B**	**MW-86**	**MW-91AR**	**MW-91B**	**MW-92A**	**MW-92B**
	Top of Casing Elevation (feet amsl)	822.55	805.44	808.29	808.39	805.95	806.05	813.04	807.96	814.28	814.26	824.79	809.03	808.45	808.47	808.41
	Screen Length (ft)															
	Total Depth (ft from top of casing)	44.40	25.97	31.08	57.50	35.43	56.95	31.80	25.42	40.21	52.02	45.43	32.90	52.38	28.94	51.75
	Top of Well Screen Elevation (ft)	778.15	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66
	Measurement Date															
	April 4-6, 2016	785.82	787.02	785.29	785.07	785.63	785.67	784.76	785.43	786.37	786.26	785.89	786.05	785.95	786.61	786.21
	October 3-5, 2017	785.48	786.66	784.51	784.22	784.67	784.63	784.86	784.29	--	786.49	785.58	786.08	785.83	786.47	786.02
	October 9-10, 2017	--	--	--	--	--	--	--	--	785.56 (2)	--	--	--	--	--	--
	April 23-25, 2018	783.99	785.36	783.09	786.36	781.77	780.79	783.28	783.32	785.88	784.91	782.54	784.71	784.53	785.23	784.81
	October 23-25, 2018	788.25	789.71	788.77	787.96	787.88	787.73	787.62	788.26	788.32	788.19	788.21	788.59	788.31	789.32	788.87
	April 1-4, 2019	787.05	788.64	786.63	786.54	786.82	786.92	786.47	786.78	787.35	787.34	787.16	787.45	787.18	788.04	787.63
	October 7-9, 2019	787.26	789.23	788.26	787.64	787.92	787.74	786.77	788.90	787.79	787.73	787.44	787.78	787.62	788.63	788.17
	Bottom of Well Elevation (ft)	778.15	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66

Ash Pond Facility	**Well Number**	**M-3**	**M-4R**	**MW-39A**	**MW-39B**	**MW-48A**	**MW-48B**	**MW-57**	**MW-59**	**MW-216R**	**MW-217**	**MW-220RR**
	Top of Casing Elevation (feet amsl)	788.23	806.10	809.62	809.50	828.86	828.84	786.29	815.48	814.21	791.55	792.90
	Screen Length (ft)											
	Total Depth (ft from top of casing)	16.90	25.55	34.80	76.07	51.88	75.80	14.40	38.50	37.85	37.37	18.96
	Top of Well Screen Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94
	Measurement Date											
	April 4-6, 2016	784.21	789.09	785.27	785.27	784.79	784.76	783.21	784.97	785.68	785.02	784.36
	October 3-5, 2017	780.93	787.04	783.35	783.18	784.30	784.19	782.37	784.23	783.89	782.48	782.61
	April 23-25, 2018	782.89	790.43	782.86	782.87	783.14	783.09	783.04	783.02	783.23	783.26	783.45
	October 22-24, 2018	782.95	788.47	787.12	786.88	787.12	786.99	783.48	787.73	787.49	784.90	784.52
	April 1-4, 2019	785.68	789.44	786.28	786.31	786.56	786.45	785.27	787.39	786.53	786.33	785.46
	October 7-9, 2019	785.33	790.65	787.10	787.02	786.68	786.65	785.29	786.68	787.07	786.01	785.42
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94

		Background Wells		Mod 1- 3 LF			Primary Pond				Secondary Pond			Mod 4 Landfill		
CCR Rule Wells	**Well Number**	**MW-301**	**MW-84A**	**MW-302**	**MW-33AR**	**MW-34A**	**MW-303**	**MW-304**	**MW-305**	**M-4R**	**MW-306**	**MW-307**	**MW-308**	**MW-309**	**MW-310**	**MW-311**
	Top of Casing Elevation (feet amsl)	806.89	814.28	813.00	808.29	805.95	811.52	805.42	806.32	806.1	807.63	806.89	806.9	813.27	813.62	809.74
	Screen Length (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Total Depth (ft from top of casing)	29.40	40.21	33.6	31.08	35.43	35.8	25.7	25.6	39.58	27	26.5	28	37.67	38.41	36.19
	Top of Well Screen Elevation (ft)	787.49	784.07	789.40	787.21	780.52	785.72	789.72	790.72	776.52	790.63	790.39	788.90	785.60	785.21	783.55
	Measurement Date															
	April 4-5, 2016	786.78	786.37	785.81	785.29	785.63	785.48	788.08	789.61	789.09	--	--	--	--	--	--
	July 7-8, 2016	786.31	785.89	786.28	785.19	785.05	784.60	787.36	789.26	787.43	--	--	--	--	--	--
	July 28, 2016	NM	785.61	NM	NM	784.86	784.35	NM	NM	NM	--	--	--	--	--	--
	October 11-13, 2016	787.64	787.22	787.76	787.36	786.45	786.18	788.18	789.78	787.88	--	--	--	--	--	--
	December 29, 2016	787.37	786.63	787.05	785.66	785.72	NM	NM	NM	NM	--	--	--	--	--	--
	January 25-26, 2017	787.27	786.70	786.89	785.88	785.98	785.28	789.34	789.36	789.64	785.50	785.36	785.73	--	--	--
	April 10 & 11, 2017	787.89	787.16	787.55	786.39	786.30	786.00	788.22	789.57	787.95	786.22	785.64	786.51	--	--	--
	June 6, 2017	788.25	787.63	788.37	787.27	786.66	786.49	788.58	789.79	787.83	786.85	786.07	786.46	--	--	--
	August 7-9, 2017	787.34	786.68	787.55	786.11	785.81	785.42	789.52	789.30	788.54	785.69	785.19	785.37	--	--	--
	October 23-24, 2017	785.89	785.32	785.94	784.13	784.50	783.92	788.97	788.14	788.00	783.97	784.79	784.17	--	--	--
	February 21, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.19	783.05	783.02
	March 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.10	783.10	783.00
	April 23-25, 2018	785.29	785.88	784.37	783.09	781.77	783.27	789.69	787.67	790.43	783.24	783.65	782.65	783.07	782.97	781.83
	May 24, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.79	785.09	NM	785.45	785.97	786.11
	June 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.03	786.64	786.47
	July 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.27	786.35	786.55
	August 7, 2018	787.06	786.55	NM	NM	NM	785.20	788.25	788.56	787.63	NM	NM	NM	NM	NM	NM
	August 22, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.54	785.40	785.46
	September 21, 2018	NM	NM	788.37	787.90	787.01	786.50	NM	NM	NM	NM	NM	NM	787.08	787.24	787.66
	October 22-24, 2018	788.98	788.32	789.16	788.77	787.88	787.51	789.05	790.04	788.47	787.66	786.57	787.81	787.99	788.18	788.64
	April 1-4, 2019	787.04	787.35	787.56	786.63	786.82	786.52	789.72	790.07	789.44	786.72	786.71	787.53	786.30	786.38	786.38
	October 7-9, 2019	788.47	NM	788.31	NM	NM	787.02	790.41	790.36	790.65	787.47	786.99	787.18	787.26	787.94	787.64
	Bottom of Well Elevation (ft)	771.33	776.36	780.55	771.89	776.98	774.82	733.43	776.98	753.04	780.63	780.39	778.90	775.60	775.21	773.55

Notes:
NM = not measured

Created by: MDB Date: 5/6/2013
Last revision by: NDK Date: 3/19/2020
Checked by: AJR Date: 3/20/2020

(1) Water Levels collected during sample collection.
(2) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5, 2017 sampling event. The level was allowed to return to static and was measured on 10/10/2017.

I:\25220067.00\Data and Calculations\Tables\CCR ASD COL MOD 1-3 LF Tables\[2 and 3_COL LF ASD.xlsx]Table 3. GW Elevations

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25220067.00

Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LS-1	2015-Apr	DRY	--	--	--
	2015-Oct	BROKEN	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	--	6530	12.3	789
	2017-Apr	--	6510	20.7 J	814
	2017-Oct	--	6200	14.2 J	764
	2018-Apr	--	5920	16 J	856
	2018-Oct	DRY	--	--	
	2019-Apr	--	5,640	22 J	911
	2019-Oct	--	6,180	19.2 J	861
LS-3R	2015-Apr	--	6480	20.6 B	807
	2015-Oct	DRY	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	DRY	--	--	--
	2017-Apr	DRY	--	--	--
	2017-Oct	DRY	--	--	--
	2018-Apr	DRY	--	--	--
	2018-Oct	--	6180	26.2 J	841
	2019-Apr	DRY	--	--	--
	2019-Oct	DRY	--	--	--
LP-1	2015-Apr	--	4060	27.8	734
	2015-Oct	--	4300	37.1	820
	2016-Apr	--	1830	26.8	416
	2016-Oct	--	4610	71.5	835
	2017-Apr	--	2690	66.3	587
	2017-Oct	--	4970	91.7	739
	2018-Apr	--	2060	63.2	634
	2018-Oct	--	2630	151	907
	2019-Apr	--	570	35.1	249
	2019-Oct	--	1,270	63.9	602

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25220067.00

Abbreviations:

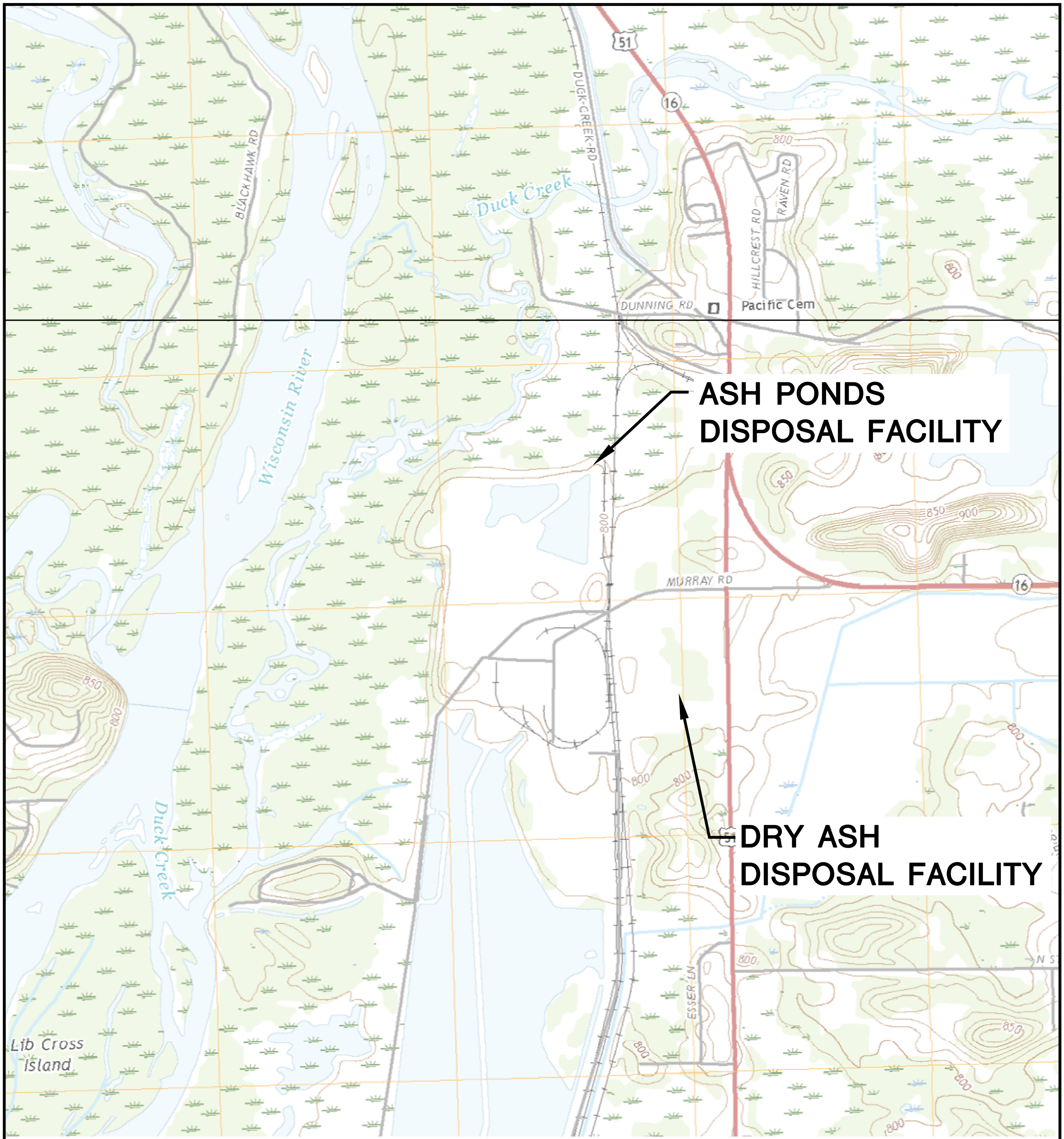
µg/L = micrograms per liter	-- = not analyzed
mg/L = milligrams per liter	µmhos/cm = micromhos/centimeter

Notes:
J = Estimated concentration at or above the LOD and below the LOQ.

Created by:	TLC	Date:	12/1/2014
Last revision by:	NDK	Date:	3/19/2020
Checked by:	AJR	Date:	3/20/2020

I:\25220067.00\Data and Calculations\Tables\CCR ASD COL MOD 1-3 LF Tables\[4_Leachate_2015-2019.xlsx]Lys LP1

Figures



N

POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'

CLIENT
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WI

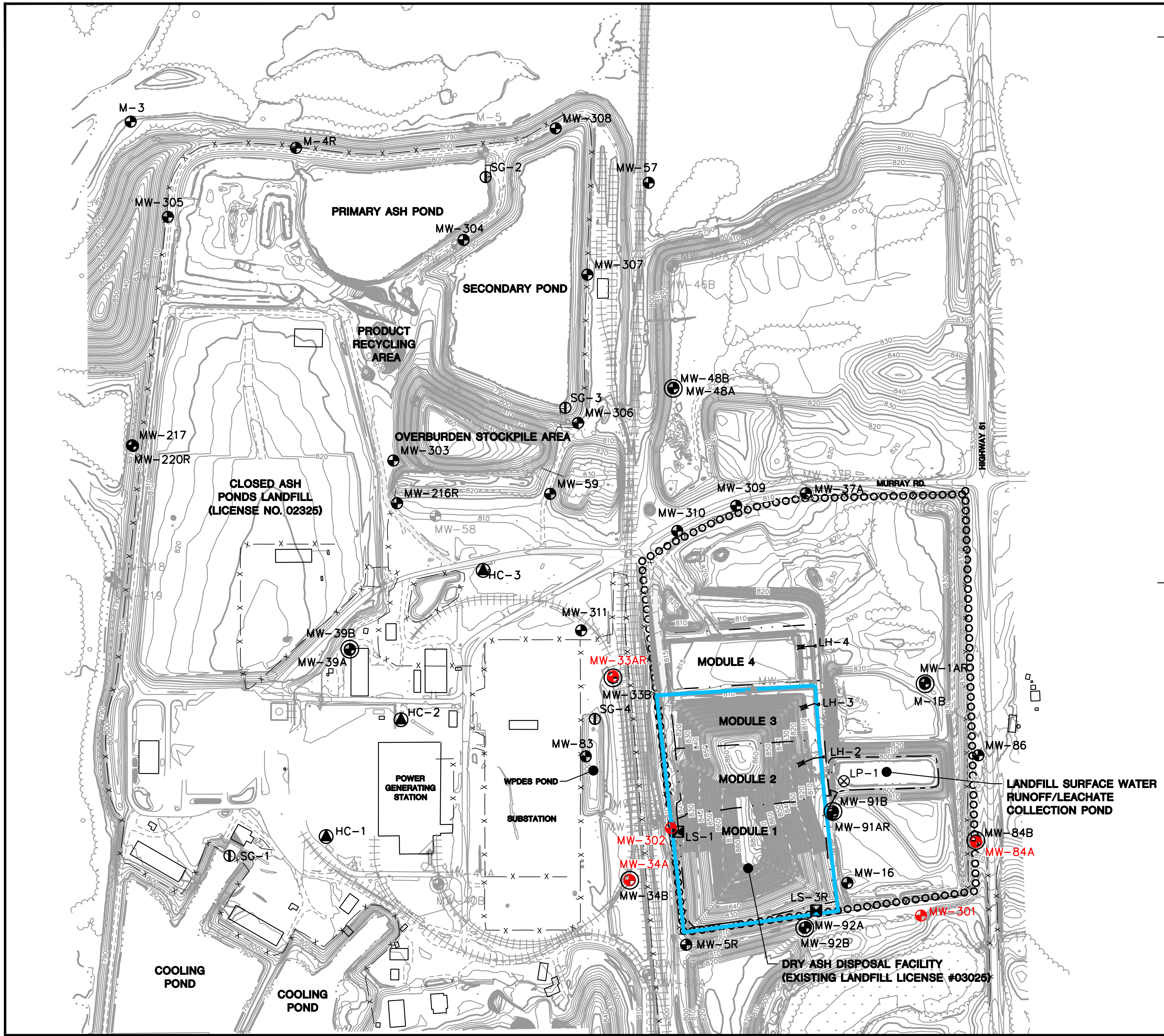
SITE LOCATION MAP

PROJECT NO.	25220067.00	DRAWN BY:	BSS
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	01/10/2020	APPROVED BY:	TK 04/10/2020

ENGINEER
SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

FIGURE
1

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Site Location Map.dwg, 4/12/2020 7:05:09 PM



LEGEND

EXISTING MAJOR CONTOUR (10' INTERVAL)
EXISTING MINOR CONTOUR (2' CONTOUR)
EXISTING FENCELINE
EXISTING TRACKS
EXISTING PAVED ROAD
EXISTING UNPAVED ROAD
EDGE OF WATER
APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
WATER SUPPLY WELL
STAFF GAUGE
WATER TABLE WELL
PIEZOMETER
SURFACE WATER SAMPLE LOCATION
LYSIMETER
ABANDONED WATER TABLE WELL
ABANDONED PIEZOMETER
LEACHATE HEADWELL
CCR UNIT
CCR MONITORING WELL

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.

N

500 0 500

SCALE: 1" = 500'

PROJECT NO.	25220067.00	DRAWN BY:	BSS
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	01/13/2020	APPROVED BY:	TK 04/10/2020

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SCS ENGINEERS
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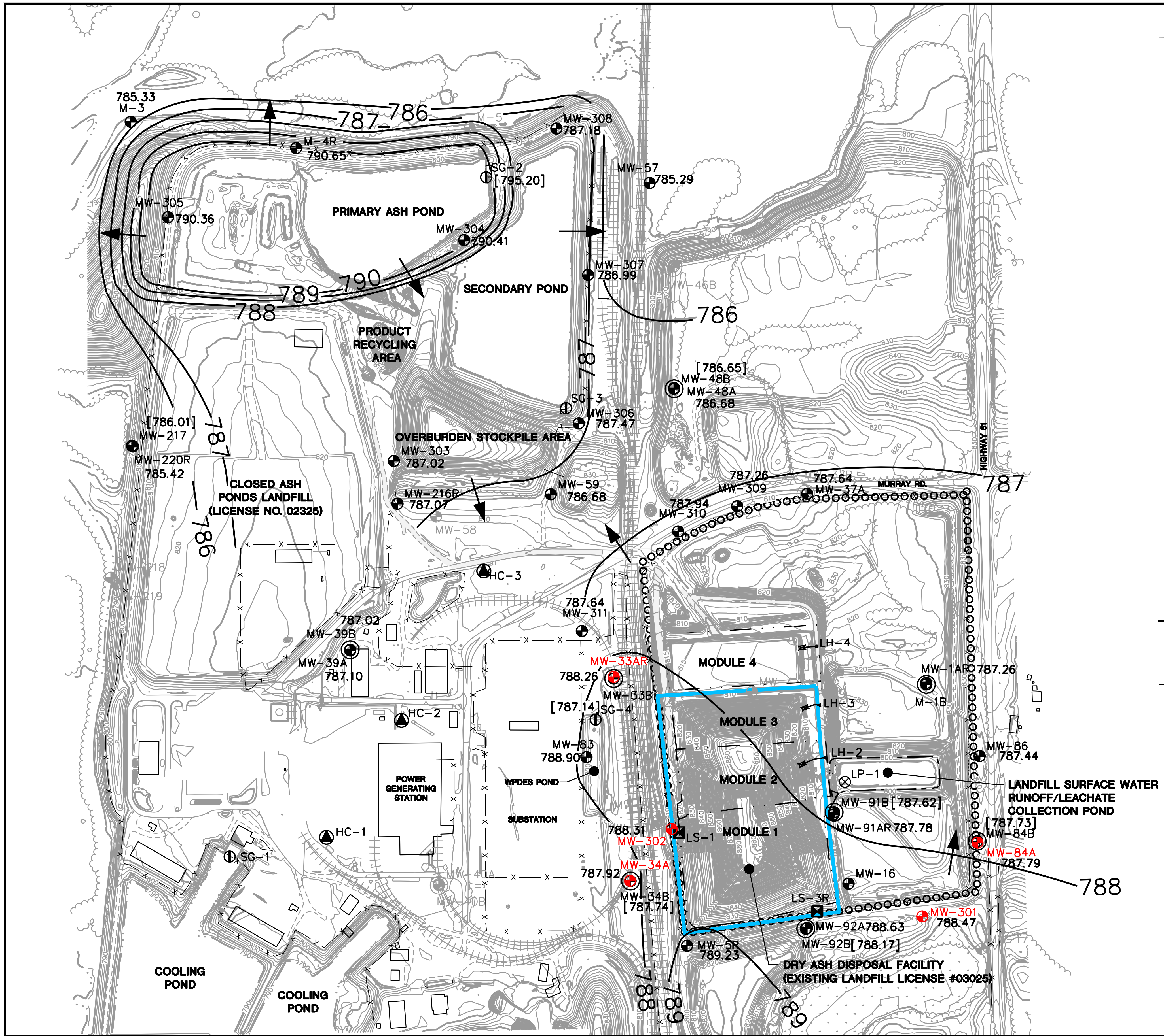
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULE 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE
2

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Site Plan and Monitoring Well Locations.dwg, □/12/2020 6:51:29 PM



LEGEND

———	EXISTING MAJOR CONTOUR (10' INTERVAL)
———	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—	EXISTING FENCELINE
┼┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
- - - -	EXISTING UNPAVED ROAD
— · · · —	EDGE OF WATER
·oooooo	APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
— · —	CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
▲	WATER SUPPLY WELL
◐	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
➝	LEACHATE HEADWELL
787.62	WATER TABLE ELEVATION MEASURED OCTOBER 2019
[788.87]	POTENTIOMETRIC SURFACE ELEVATION MEASURED OCTOBER 2019 (NOT CONTOURED)
(795.20)	SURFACE WATER ELEVATION MEASURED OCTOBER 2019 (NOT CONTOURED
———	WATER TABLE CONTOUR
	APPROXIMATE GROUND WATER FLOW DIRECTION

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.

N

500 0 500

SCALE: 1" = 500'

PROJECT NO.	25220067.00	DRAWN BY:	BSS/LEC
DRAWN:	12/02/2019	CHECKED BY:	NDK
REVISED:	03/30/2020	APPROVED BY:	TK 04/10/2020

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SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULE 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

WATER TABLE MAP
OCTOBER 2019

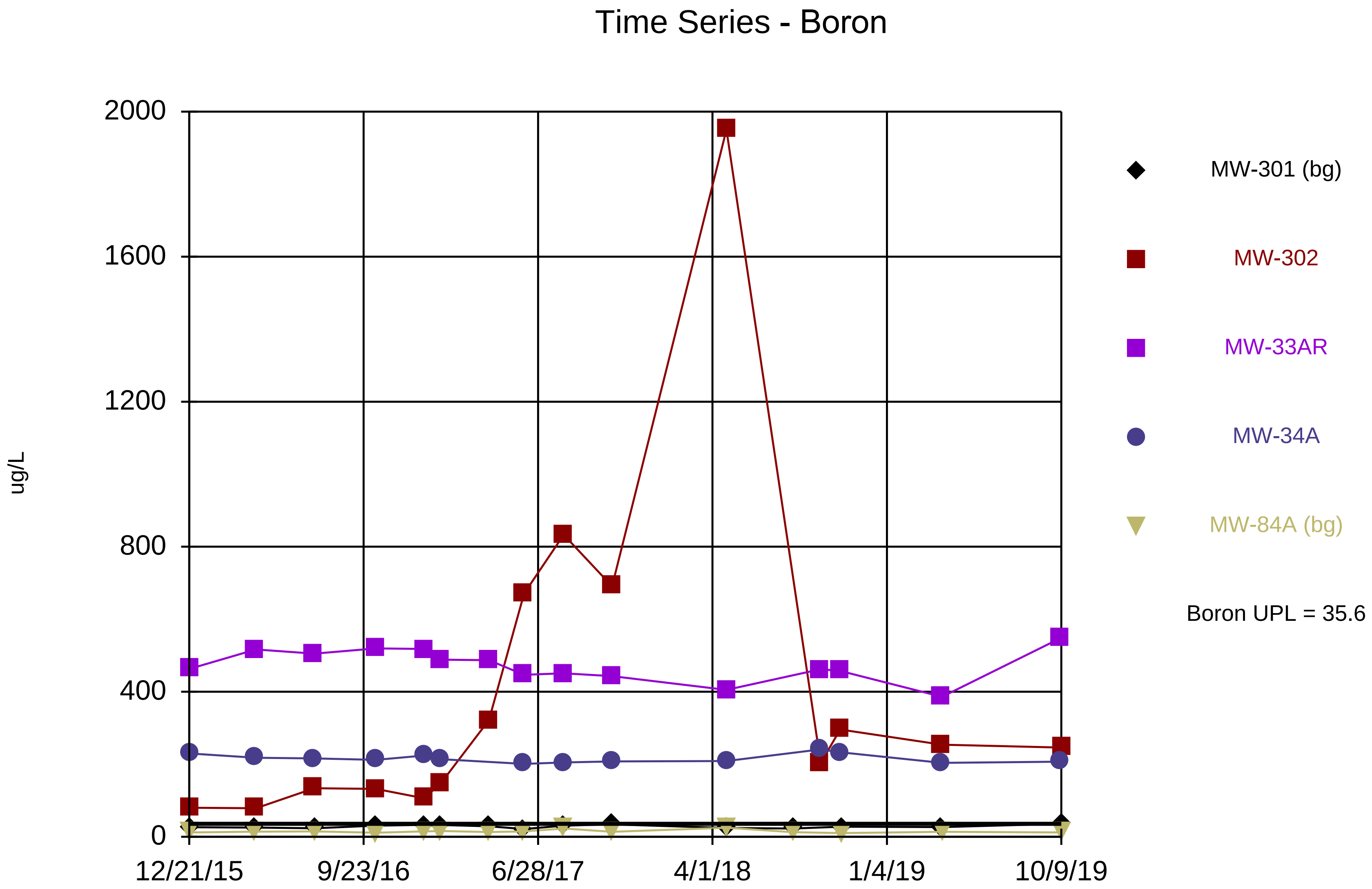
FIGURE
3

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Water Table Map 2019.dwg. □/12/2020 6:5□:30 PM

Appendix A

Trend Plots for CCR Wells

Sanitas™ v.9.6.25 Software licensed to SCS Engineers. UG

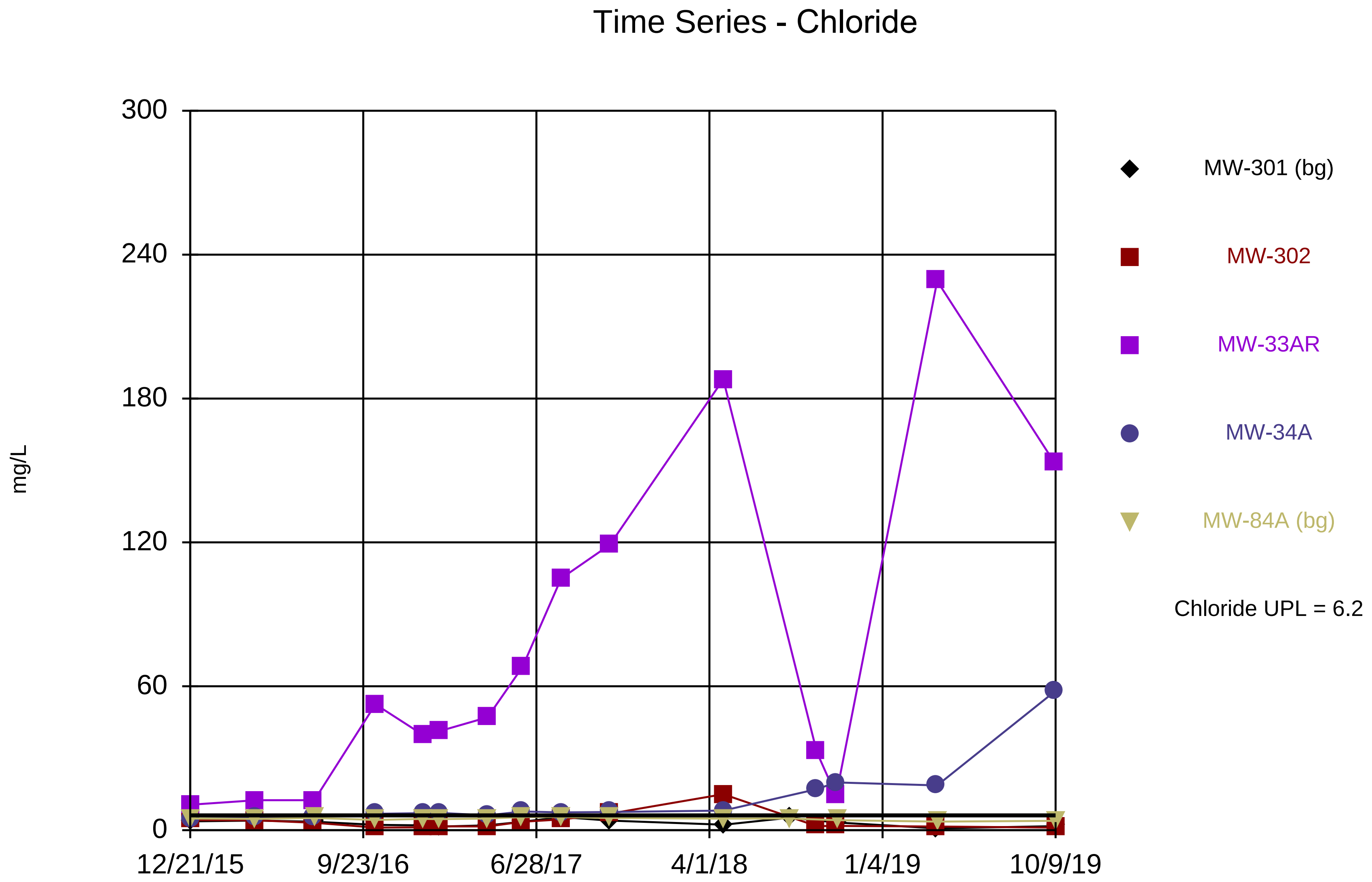


Constituent: Boron   Analysis Run 3/30/2020 12:12 PM   View: COL MOD 1-3

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

02/04/2021 - Classification: Internal - ECRM7850515

Sanitas™ v.9.6.25 Software licensed to SCS Engineers. UG

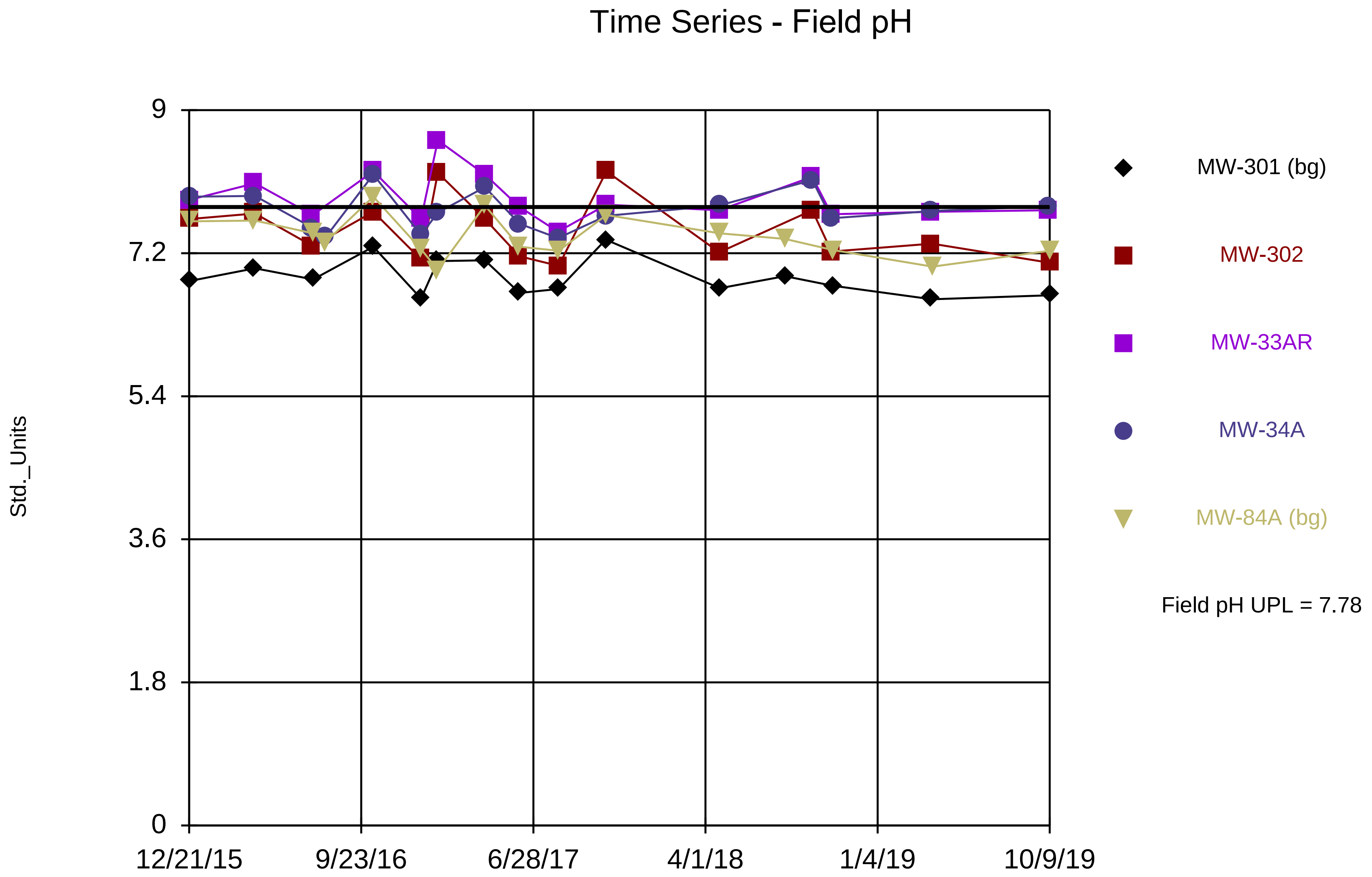


Constituent: Chloride Analysis Run 3/30/2020 12:12 PM View: COL MOD 1-3

Columbia Energy Center Client: SCS Engineers Data: Input -191203

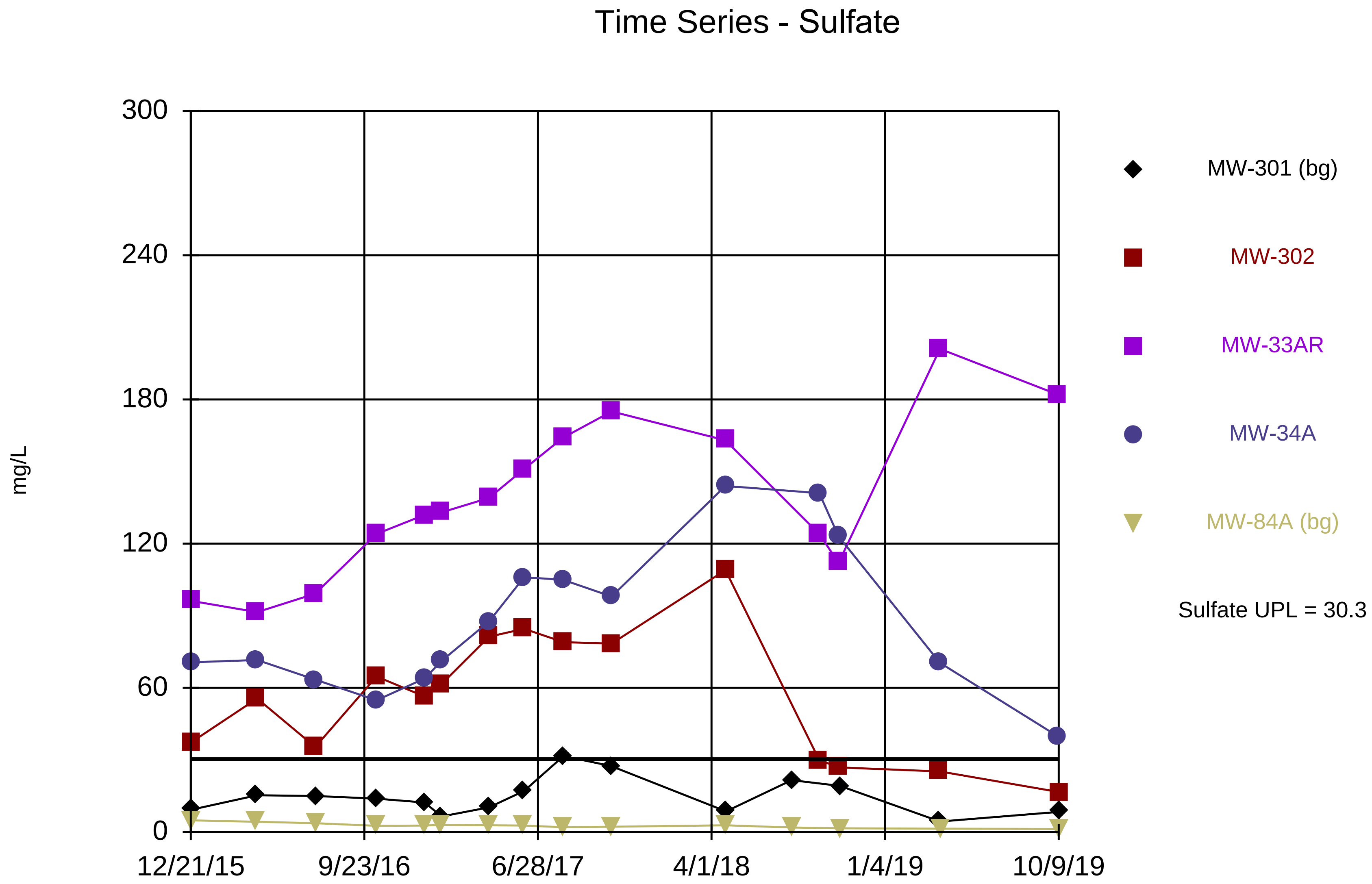
02/04/2021 - Classification: Internal - ECRM7850515

Sanitas™ v.9.6.25 Software licensed to SCS Engineers. UG



Constituent: Field pH Analysis Run 3/30/2020 12:12 PM View: COL MOD 1-3

Columbia Energy Center Client: SCS Engineers Data: Input -191203

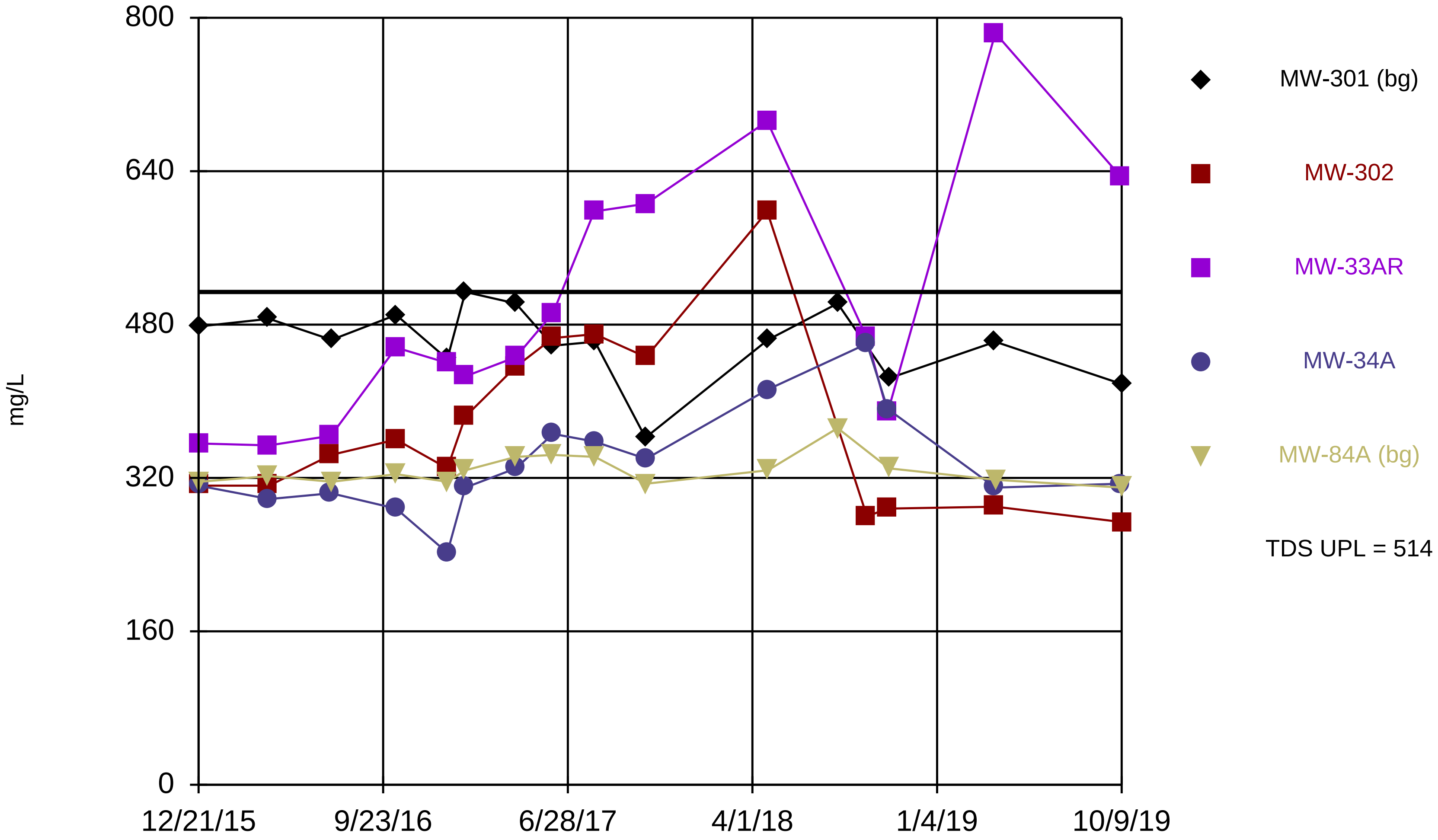


Constituent: Sulfate   Analysis Run 3/30/2020 12:12 PM   View: COL MOD 1-3

Columbia Energy Center   Client: SCS Engineers   Data: Input -191203

Sanitas™ v.9.6.25 Software licensed to SCS Engineers. UG

Time Series - Total Dissolved Solids



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Columbia Energy Center Client: SCS Engineers Data: Input -191203

02/04/2021 - Classification: Internal - ECRM7850515

Appendix B

Feasibility Study Water Quality Information

1370

FEASIBILITY STUDY
PROPOSED FLY ASH AND/OR SCRUBBER SLUDGE DISPOSAL FACILITY-COLUMBIA SITE

WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

Jan 78 C 7134

conceivable that groundwater flow in the area north of Murray Road may be altered such that contaminants derived from the present ash settling basin might be diverted southerly towards the homes along Murray Road. These questions would have to be addressed in greater detail, consistent with the goals of Wisconsin Power and Light Company.

WATER QUALITY

During the first two weeks of December, 1977, 64 water samples were obtained from surface waters and groundwater monitoring wells at the Columbia Energy Center. The purpose of the sampling was to assess background water quality in the vicinity of the proposed disposal site. The sampling stations included 59 monitoring wells, the cooling lake, ash settling pond, the drainage ditch carrying the ash pond discharge waters and the agricultural drainage ditch along the southern boundary of the site. Due to the large number of sampling stations, the analyses were limited to pH, specific conductance, iron, calcium, magnesium, sulfate and chloride. The analytical data is contained in Appendix F and is discussed below.

pH

Most groundwaters found in the United States have pH values ranging from around 6.0 to 8.5. The pH of a water represents the result of a number of interrelated chemical equilibria. This equilibria can be altered shortly after sampling by gains or losses of carbon dioxide, the oxidation of ferrous iron and numerous other chemical reactions. Thus, pH measurements must be taken shortly after obtaining the sample. For this study, the pH of samples was determined immediately upon return to the laboratory.

Within the proposed site boundaries at the Columbia Energy Center, pH values ranged between 6.3 and 8.1 and averaged 7.5. Typically, the lower pH values were observed in the lowland areas and wetlands, probably as a result of acidic organic soils. The pH of water in the ash disposal settling pond and the cooling lake was 11.4 and 8.3, respectively.

SPECIFIC CONDUCTANCE

Specific conductance, or conductivity, is the ability of a substance to conduct an electric current. The conductance determination is correlative with the dissolved-solids concentration. Conductivity, however, is temperature dependent and thus requires the reference of specific conductance measurements to a standard temperature. The values discussed here are referred to 25°C.

The specific conductance of groundwater in the study area ranged from 220 umhos/cm to a maximum of 2600 umhos/cm. The highest conductivity readings were observed in monitoring wells located along the coal storage area and the drainage ditch carrying the ash pond discharge where values up to 2600 umhos/cm were measured. The conductivity of the ash pond effluent was 1380 umhos/cm. This data appears to confirm earlier speculation of infiltration of effluent from the ash pond discharge channel and from the coal storage area into the groundwater. Conductance within the proposed site boundaries averaged approximately 465 umhos/cm.

Conductivity in the ash disposal settling pond was measured at 1510 umhos/cm. Shallow monitoring wells M-6 and 39A, located adjacent to the pond also exhibited elevated values of 1160 umhos/cm and 1800 umhos/cm, respectively.

High conductivities were also observed along U. S. Highway 51 at monitoring wells 51A and 51B. The chloride data, discussed below, indicates infiltration of road salt has probably occurred at this location.

Specific conductance measurements obtained in the vicinity of the proposed disposal site are shown on Drawing C 7134-15.

IRON

The element iron is an abundant element found in most rocks and soil. It generally occurs as sulfides and oxides in igneous and metamorphic rocks and as iron oxide and hydroxide cementing materials in coarse-grained sedimentary rocks.

Ferrous iron is unstable in the presence of oxygen where it is bound to hydroxide anions as $2Fe(OH)_3$.

$$2Fe^{++} + 4HCO_3^- + H_2O \rightleftharpoons 2Fe(OH)_3 + 4CO_2$$

If subjected to a strong reducing environment, such as a marsh, the reaction is reversed and iron goes back into solution. The amount which dissolves is related to a number of variables including the velocity with which water moves through this environment.

The U. S. Public Health Service recommends an iron concentration of less than 0.3 mg/l in water used for drinking and culinary purposes. Laundry and porcelain tend to be stained when concentrations reach 0.5 to 1.0 mg/l. At this level it can also be tasted.

The presence of iron under the proposed disposal area in the majority of cases was below the detection limit of 0.1 mg/l. In monitoring wells 5 and 18, located in or near the central marsh area, iron increased to 10 mg/l and 5.7 mg/l, respectively. In the southern marsh, monitoring wells exhibited concentrations between 0.5 mg/l and 6.1 mg/l. Although the iron concentration in the cooling lake was below the detection limit, downgradient wells 44 and 30A located on the cooling lake dike yielded values of 11 mg/l and 26 mg/l iron respectively. Boring logs indicated trace amounts of organic material at the base of the dike which is probably the reason for the high concentrations observed. At the same location, iron in well 30B installed to a depth of 100 feet below the surface was below 0.1 mg/l. Thus, the occurrence of high iron concentrations in this area appears restricted to groundwater in the upper portion of the aquifer where organic material is present and conditions are favorable for the dissolution of iron.

The ash pond discharge in the drainage ditch paralleling the west site boundary showed an iron concentration of 3.7 mg/l. Shallow monitoring wells 33A and 34A adjacent to the ditch indicated less than 0.1 mg/l iron.

North of Murray Road the iron concentration in monitoring wells in the marsh and uplands were typically less than 0.1 mg/l. Although the ash basin had less than 0.1 mg/l iron, several wells along cross-section F-F' showed anomalously high values (#M6-2.3 mg/l; #47-16 mg/l; #51B-21 mg/l).

CALCIUM

Calcium, because of its relative abundance and mobility, is the principle cation in most natural fresh water. Calcium is a constituent of many rock types but is found in greatest quantities in waters leaching deposits of limestone and dolomite. In sandstone and other detrital rock, calcium carbonate is a common cement between grains.

Monitoring wells located within the site boundaries exhibited calcium concentrations between 30 mg/l and 66 mg/l and averaged about 42 mg/l. Similar to iron, the concentrations of calcium in monitoring wells along cross-section F-F' were anomalously high, up to 150 mg/l calcium. Water table wells along the drainage ditch carrying the ash pond discharge averaged 83 mg/l while the ash pond effluent contained 28 mg/l. Generally the amount of calcium in groundwater decreased with depth. Nested monitoring wells typically showed somewhat lower concentrations of calcium in the deeper wells.

MAGNESIUM

As a relatively abundant element on the earth's crust, the principle sources of magnesium in natural waters are considered to be ferromagnesian minerals in igneous rocks and magnesium carbonate in carbonate rocks (limestone and dolomite). Waters in which magnesium is the predominant cation are somewhat unusual. Like calcium, magnesium imparts the property of hardness to water and is, therefore, of concern to industrial users.

Generally, concentrations of magnesium were 1/3 to 1/2 of the calcium levels. Magnesium concentrations within the site boundaries ranged between 10 mg/l and 36 mg/l and averaged 27 mg/l. Similar to calcium and iron, higher magnesium values were observed, in general, north of Murray Road and especially in monitoring wells along cross-section F-F'.

SULFATE

Sulphur is widely distributed in reduced form in both igneous and sedimentary rocks as metallic sulfides and when present in sufficient concentrations, constitutes ore of economic importance. During weathering processes with aerated water, the sulfides are oxidized to sulfate ions and are dissolved into water. Pyrite (FeS_2) crystals often occur in sedimentary rocks and are particularly associated with biogenic deposits such as coal which were deposited under strongly reducing conditions.

The concentrations of sulfate in groundwater in the vicinity of the proposed disposal site ranged from less than 1 mg./l to 1,200 mg./l of sulfate. (Refer to Drawing C 7134-15.) Typically, within the site boundaries concentrations averaged approximately 12 mg./l. Near the coal storage area, however, significant increases were observed. Observation wells 26A, 26B, and 42 exhibited concentrations between 900 and 1100 mg./l. The depth of sulfate enrichment in groundwater, near the coal pile, appears to extend to considerable depths, indicated by relatively high sulfate concentrations in Well 26B sealed 100 feet below ground surface. The oxidation of pyrite minerals in the coal leaching into the groundwater is probably the major source of the high concentrations observed.

Sulfate concentrations in the ash disposal settling pond were 520 mg./l. In the ditch carrying the ash pond discharge, the effluent is treated with sulfuric acid which results in precipitation of barium sulfate and aluminum hydroxide (personal communication, Merlin Horn, 1978). Consequently, the sulfate concentration of the effluent waters is lowered considerably to 13 mg./l. Well 33A, however, located near the point of effluent discharge, exhibited 1200 mg./l sulfates.

CHLORIDE

Chloride is generally present in much lower concentrations in rocks than many of the other major constituents of natural water. Important sources, however, are associated with sedimentary rocks, particularly the evaporites. The chemical behavior of chloride in natural water is relatively inert compared to the other major ions. There are few oxidation-reduction reactions and no significant chemical complexing reactions which chloride enters into. In addition, chloride ions are not significantly adsorbed on mineral surfaces. For these reasons, chloride is commonly used as a tracer in groundwater.

Chloride concentrations in groundwater in the vicinity of the Columbia Energy Center typically range between 0.5 mg./l and 30 mg./l. The highest concentrations in monitoring wells tended to be located adjacent to U. S. Highway 51 where the use of road salt has resulted in the percolation of chloride into the groundwater. Monitoring Wells 51A and 51B located in a low area north of Murray Road along U. S. Highway 51, yielded chloride concentrations in excess of 200 mg./l. Two other wells, 52A and 19, also located along U. S. Highway 51, yielded values of 30 mg./l and 42.5 mg./l chloride, respectively.

Within the proposed site boundaries, the chloride concentration averaged 7.1 mg./l. Excluding the few wells adjacent to U. S. Highway 51 exhibiting elevated concentrations, no other significant trends in the occurrence of chloride were observed.

SUMMARY

In summary, the groundwater in the vicinity of the proposed disposal site exhibited a somewhat alkaline pH. In lowland areas, the pH was typically below 7.0, probably a result of the presence of acidic organic soils.

Specific conductance within the proposed site averaged 465 umhos/cm. Conductivities up to 2600 umhos/cm were observed, however, in the vicinity of the coal storage area, the present ash disposal pond and ash pond effluent channel where infilatration of water from these sources is occurring into the groundwater system.

The groundwater typically exhibted relatively low iron concentrations although, locally, concentrations in excess of drinking water standards were observed in about 20% of the wells. The occurrence of the higher iron concentrations appears to be related to the presence of organic soils.

Groundwater at the proposed site also tended to exhibit high calculated hardness (216 mg./l) based on average observed values for calcium (42 mg./l) and magnesium (27 mg./l). Dissolution of limestone and dolomite rocks in the glacial drift are the probable sources of these elements in the groundwater.

Enrichment of sulfate in groundwater has occurred as a result of leaching of pyrite (FeS_2) minerals from the coal storage area where concentrations up to 1200 mg./l were observed. The depth of this enrichment appears to extend beyond the maximum depth into the aquifer investigated. Sulfate concentrations decreased rapidly away from the coal storage area to an average of 12 mg./l within the proposed site boundaries. Other local sources of sulfate in groundwater appear to be related to the present ash settling pond.

The concentration of chloride within the proposed site averaged 7.1 mg./l. Higher levels were generally observed in wells adjacent to U. S. Highway 51 where the infiltration of road salt has locally raised chloride concentrations.

The above interpretations are based on one round of water quality sampling only and should be considered as preliminary in nature. High sulfate and chloride concentrations observed at greater depths may be a temporary condition resulting from contamination of spoil backfill materials with coal dust or salt, respectively, during installation of the monitoring well. Future sampling of these monitoring wells will help to distinguish short term contamination from actual conditions existing in the aquifer.

APPENDIX F
WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
1A	7.6	550	17.	6.5	52	37	<0.1
1B	8.05	460	16.	10.5	39	31	<0.1
2	7.8	527	14.	2.5	45	32	<0.1
3A	7.5	548	13.	2.5	58	36	<0.1
3B	8.1	506	14.	7.0	50	34	<0.1
4	7.8	580	10.	4.0	59	34	<0.1
5	6.3	560	210.	12.5	13	29	10
16	7.6	408	12.	1.5	42	28	<0.1
17	6.45	350	30.	16.5	16	13	0.6
18	6.45	380	4.	4.5	33	22	5.7
19	7.9	570	10.	42.5	44	24	<0.1
20	8.0	340	10.	5.0	36	24	<0.1
21	6.9	220	20.	4.5	23	10	0.1
24A	7.45	775	18.	6.0	76	52	0.1
24B	7.85	440	15.	6.0	43	31	0.1
25	8.1	300	10.	2.5	29	20	<0.1
26A	7.2	2100	900	17.0	140	48	1.5
26B	7.5	2600	1100	16.5	43	7.0	0.2
27	7.15	400	6.	8.0	23	18	<0.1
28A	7.75	500	3.	0.5	48	31	<0.1
28B	7.6	480	4.	3.5	39	28	<0.1
29A	7.8	330	16.	1.5	33	21	0.5
30A	6.75	920	64.	11.0	38	30	26
30B	7.6	770	210	21.0	37	19	<0.1
33A	8.2	2500	1200	24.0	83	50	<0.1
33B	7.9	390	22.	6.5	31	27	0.2
34A	7.7	680	140.	10.0	58	45	0.1
34B	7.7	1700	660	15.0	48	22	<0.1
35	6.8	740	<1.0	4.0	66	33	2.9
36	6.8	740	<1.0	3.5	53	35	6.1
37A	7.7	460	9.	4.0	48	31	0.8
37B	7.5	630	73.	7.5	71	35	<0.1
39A	7.5	1800	350	22.0	180	100	0.1
39B	7.9	330	560	20.5	31	22	0.1
40A	8.0	630	140	8.5	43	29	<0.1
40B	8.1	330	17.	3.0	31	22	<0.1
41	6.8	590	16.	11.0	58	27	9.3

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
42	7.4	2400	900	17.5	50	12	0.5
44	6.9	490	<1.	16.5	39	23	11
45	7.6	390	14.	3.0	40	25	<0.1
46A	7.3	1100	21.	15.5	140	82	<0.1
46B	7.8	470	25.	17.5	40	26	<0.1
47	6.6	1200	3.	8.0	140	40	16
48A	7.3	620	15.	8.0	62	37	<0.1
48B	7.1	520	22.	20.0	43	29	0.2
49	7.15	730	6.	3.5	75	41	<0.1
50A	7.6	520	28.	15.5	51	34	<0.1
50B	7.5	410	21.	18.0	31	21	<0.1
51A	6.1	1850	8.	205.	65	40	<0.1
51B	7.2	1250	23.	275.	57	36	21
52A	7.7	450	16.	30.5	36	17	<0.1
52B	7.4	430	40.	17.5	32	20	<0.1
53	7.75	450	27.	10.5	39	28	<0.1
54A	7.8	350	12.	4.0	34	21	0.1
54B	7.55	390	15.	5.5	40	24	0.1
55B	7.9	340	23.	17.5	32	22	0.1
56	7.8	450	22.	9.5	43	28	0.1
57	7.85	380	17.	7.0	38	24	0.1
M-6	7.0	1160	5.	7.0	150	91	2.3
Cooling Lake	8.3	370	31.	18.0	34	21	<0.1
Ash Pond Effluent	7.45	1380	13.	4.0	28	1.2	3.7
Ash Pond	11.4	1510	520.	23.5	29	0.2	<0.1
Drainage Ditch (A)	7.8	500	21.	7.0	43	29	<0.1
Drainage Ditch (B)	9.05	1780	750	14.0	42	5.4	<0.1

DEC 19 1979

APPENDICES TO

SUPPLEMENTARY FEASIBILITY STUDY REPORT
AND PRELIMINARY ENGINEERING CONCEPTS
COLUMBIA SITE
WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

D. N. R. APPROVED
DATE 9/3/80
Nile Ostenso, Hydro

WARZYN
ENGINEERING INC

APPENDIX I

WATER QUALITY DATA - DECEMBER 1978

WARZYN
ENGINEERING INC

12/76

C 7134

WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
1A	7.3	530	30	3.1	54	35	<0.1	-
1B	7.0	470	67	6.1	49	30	<0.1	-
2	7.25	458	91	<.5	48	24	<0.1	-
3A	7.0	560	36	<.5	61	31	<0.1	-
3B	7.15	530	52	35.7	37	33	<0.1	-
4	7.2	750	69	5.8	49	30	<0.1	-
5	6.35	1,650	670	14.1	14	13	1.7	-
16	6.9	390	69	1.0	49	23	<0.1	-
17	5.55	295	57	16.3	14	8.6	0.2	-
18	5.9	430	10	4.2	47	21	1.1	-
19	7.4	765	75	4.2	51	28	<0.1	-
20	7.4	380	26	1.6	39	26	<0.1	-
21	5.7	250	54	10.4	15	8.3	0.2	-
24A	7.2	730	36	1.6	65	42	<0.1	-
24B	7.2	470	10	7.3	42	28	<0.1	-
25	7.0	335	29	7.8	39	21	0.2	-
26A	7.4	2,250	650	12.6	32	8.6	<0.1	-
26B	6.8	2,530	840	20.8	49	18	<0.1	-
27	6.9	410	24	4.2	40	24	0.4	-
28A	7.2	500	61	0.5	45	28	<0.1	-
28B	7.0	465	6	2.1	39	26	0.1	-
29A	7.1	410	24	3.6	31	22	0.1	-
30A near ditch	5.8	1,140	15	<0.5	97	56	38	-
30B	6.65	835	160	14.6	37	20	<0.1	-
33A near ditch	7.8	1,970	830	16.7	21	8.9	<0.1	-
33B	7.5	380	31	7.3	24	27	<0.1	-
34A	7.25	560	46	4.2	53	33	<0.1	-
34B	8.5	1,575	730	21.9	28	29	<0.1	-
35	6.7	545	61	3.6	60	26	0.1	-
36	6.4	515	5.0	2.6	43	24	1.0	-
37A	7.05	438	30	3.7	50	28	4.8	-
37B	6.7	325	18	7.3	1.0	0.5	<0.1	-
39A	6.35	1,260	33	13.6	70	7.6	<0.1	-
39B	6.7	385	25	4.2	30	21	0.1	-
40A	7.35	483	40	<0.5	48	24	<0.1	<.05
40B	7.25	343	4	4.2	21	14	<0.1	-
41	6.1	640	54	19.8	43	32	<0.1	-

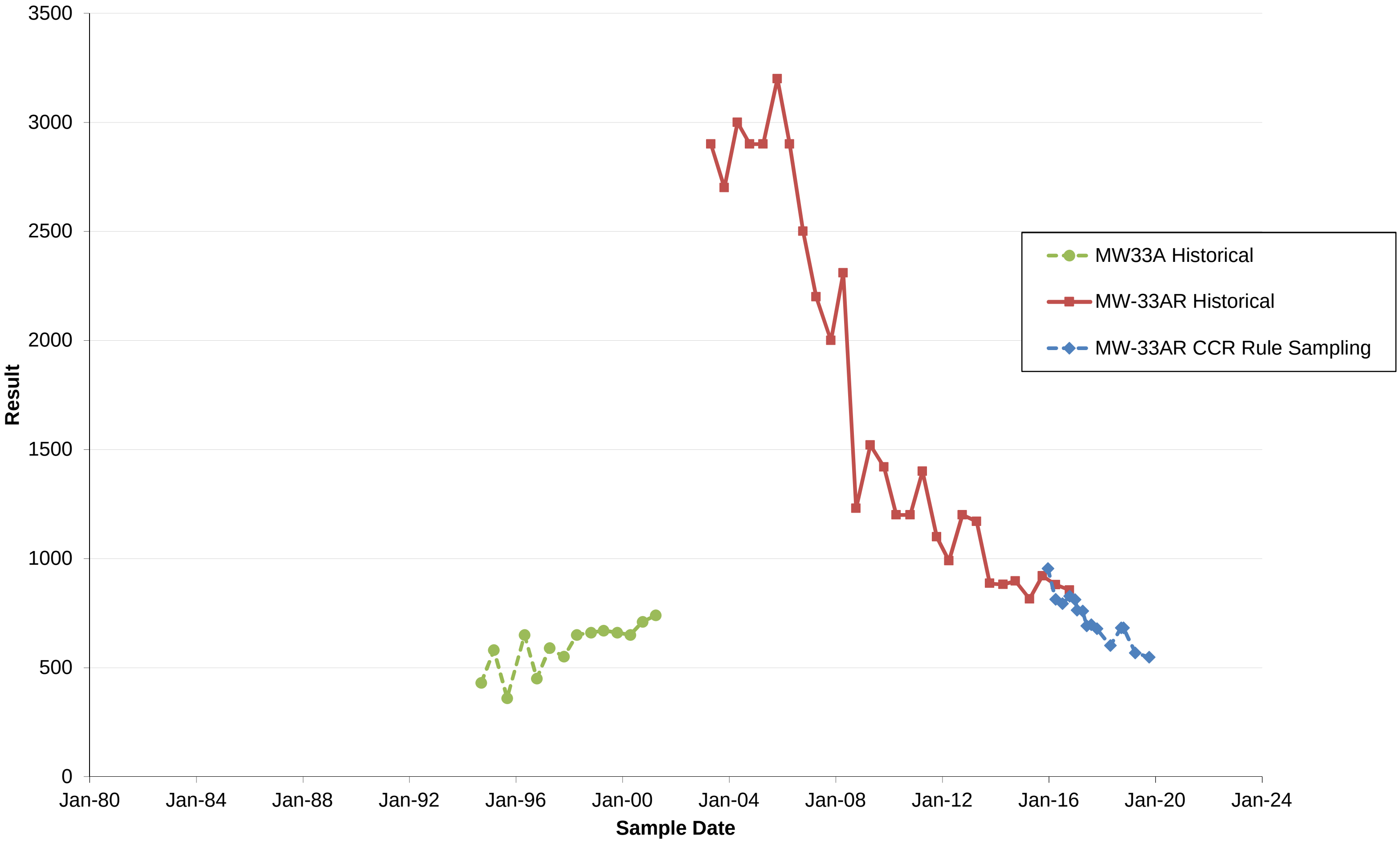
WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
42 near ditch on west	7.15	2,050	910	15.6	23	7.5	0.1	-
44 near cooling lake	6.15	710	6	0.5	56	27	3.5	-
45	7.2	420	32	1.0	44	26	<0.1	-
46A [illegible]	7.0	560	93	<0.5	130	75	<0.1	<0.05
46B [illegible]	6.5	1,290	170	20.8	46	30	<0.1	<0.05
47 [illegible] ?	7.3	958	120	<0.5	110	48	<0.1	-
48A [illegible]	6.15	640	59	<0.5	42	51	<0.1	<0.05
48B [illegible]	6.8	450	23	5.2	40	27	<0.1	<0.05
49	7.0	880	26	2.1	93	58	0.1	-
50A	7.4	660	25	17.7	60	36	<0.1	-
50B	7.1	405	16	17.7	38	23	<0.1	-
51A [illegible]	7.0	1,170	57	135	66	31	<0.1	-
51B [illegible]	7.3	1,410	22	330	46	39	<0.1	-
52A	7.0	370	110	18.5	35	10	<0.1	-
52B	7.0	595	43	52.5			0.1	-
53	Frozen							
54A	7.5	345	10	1.0	36	22	<0.1	<0.05
54B	Frozen							
55B	7.3	505	26	15.6	52	29	<0.1	<0.05
56	Frozen							
57	Frozen							
M-6								
58 [illegible] old	6.55	1,265	140	<0.5	110	65	0.1	-
59 [illegible]	6.8	925	40	<0.5	86	60	<0.1	-
60 Hwy [illegible]	7.2	1,510	54	4.7	130	85	<0.1	-
61A [illegible]	6.85	590	39	30.2	58	31	<0.1	-
61B	7.2	505	6	13.5	48	29	<0.1	-
62 [illegible] Hwy/[illegible]	6.7	1,517	72	178	120	53	<0.1	-
64	6.9	670	100	26.8	63	36	0.8	-
65 Hwy?	7.2	830	57	17.8	78	50	<0.1	-
66	6.5	680	55	40	66	24	3.6	-

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
67	7.0	560	100	1.0	57	32	1.0	-
68A	7.6	440	32	2.1	40	27	<0.1	-
68B	7.2	400	36	1.0	42	25	<0.1	-
70A	7.5	440	20	<0.5	27	37	<0.1	-
70B	7.3	520	25	5.2	51	34	<0.1	-
72A Martin Marietta	6.45	860	11	<0.5	100	41	1.8	-
72B	8.4	230	45	<0.5	17	19	<0.1	-
M-4	7.6	864	180	26.1	20	11	<0.1	0.39
MM-4			2	2.6	14	21	0.9	-
Cooling Lake at 1	7.7	355	36	13.6	31	21.2	<0.1	-
Ash Pond at 2	11.4	3,210	1,100	22.9	34	<0.1	<0.1	-
Ash Pond at 3	8.7	725	34	21.9	48	16	<0.1	-
Ash Pond Effluent at 4	6.7	3,090	1,400	25.0	39	0.4	<0.1	-
Drainage Ditch at 5	7.2	730	74	33.9	56	38	<0.1	-
Drainage Ditch at 6	7.35	2,750	640	18.8	34	7.5	<0.1	-
Drainage Ditch at 7	8.05	1,780	740	27.1	31	0.2	<0.1	-

Appendix C

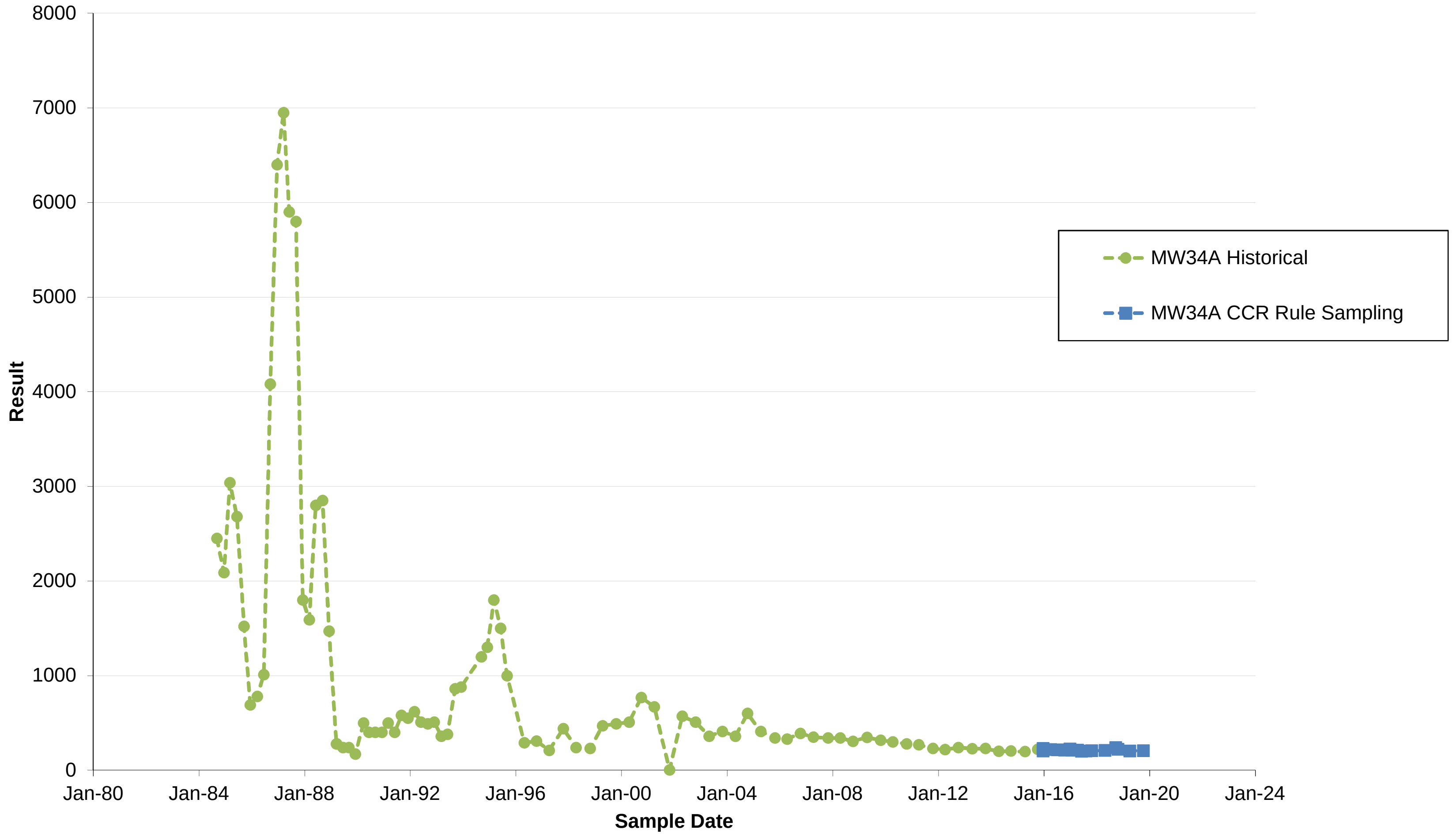
Long-Term Concentration Trend Plots

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33A and MW-33AR - Boron (µg/l as B)



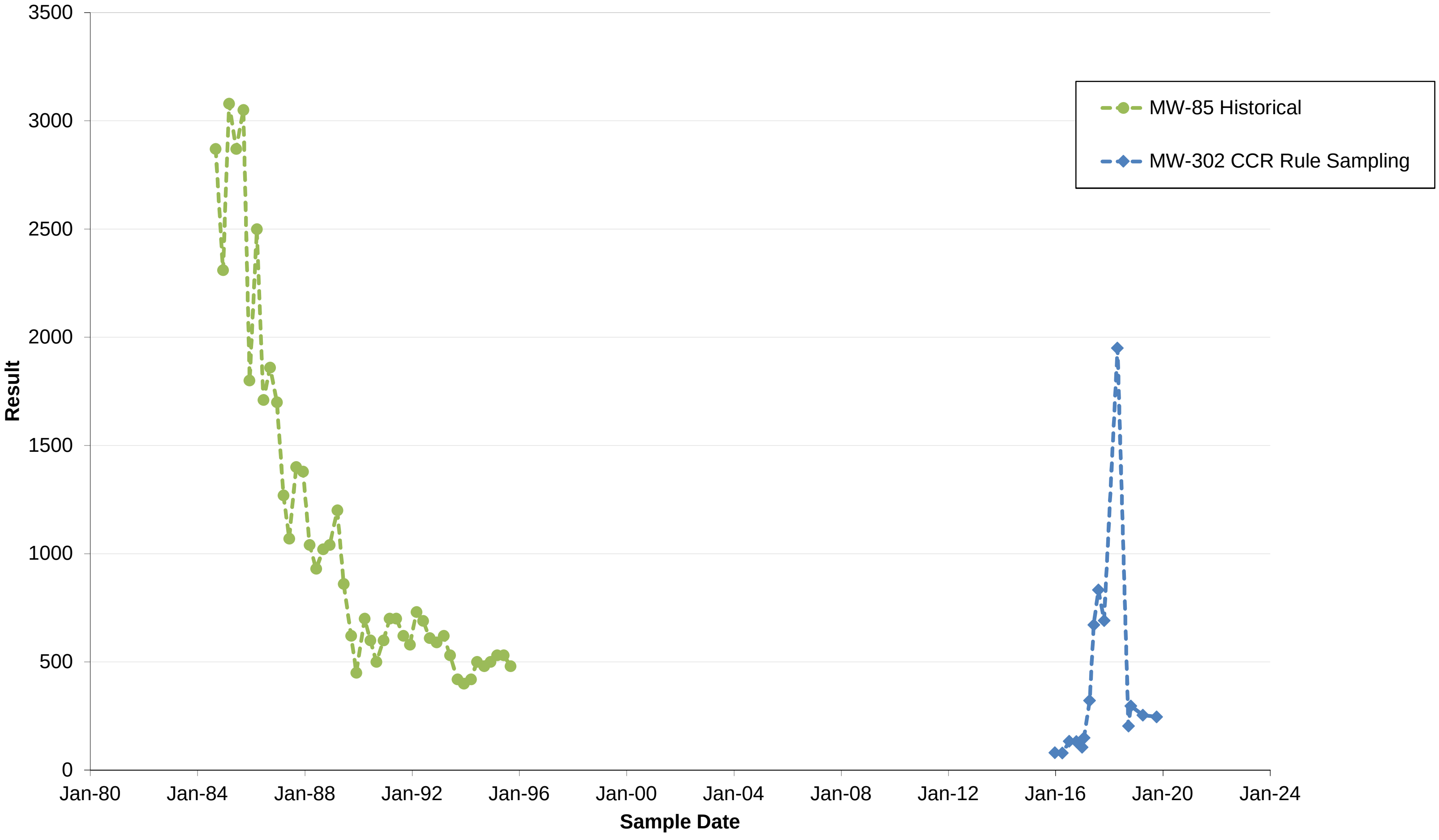
I:\25220067.00\Deliverables\2019 October ASD\Graphs\[Bo_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Boron (µg/l as B)



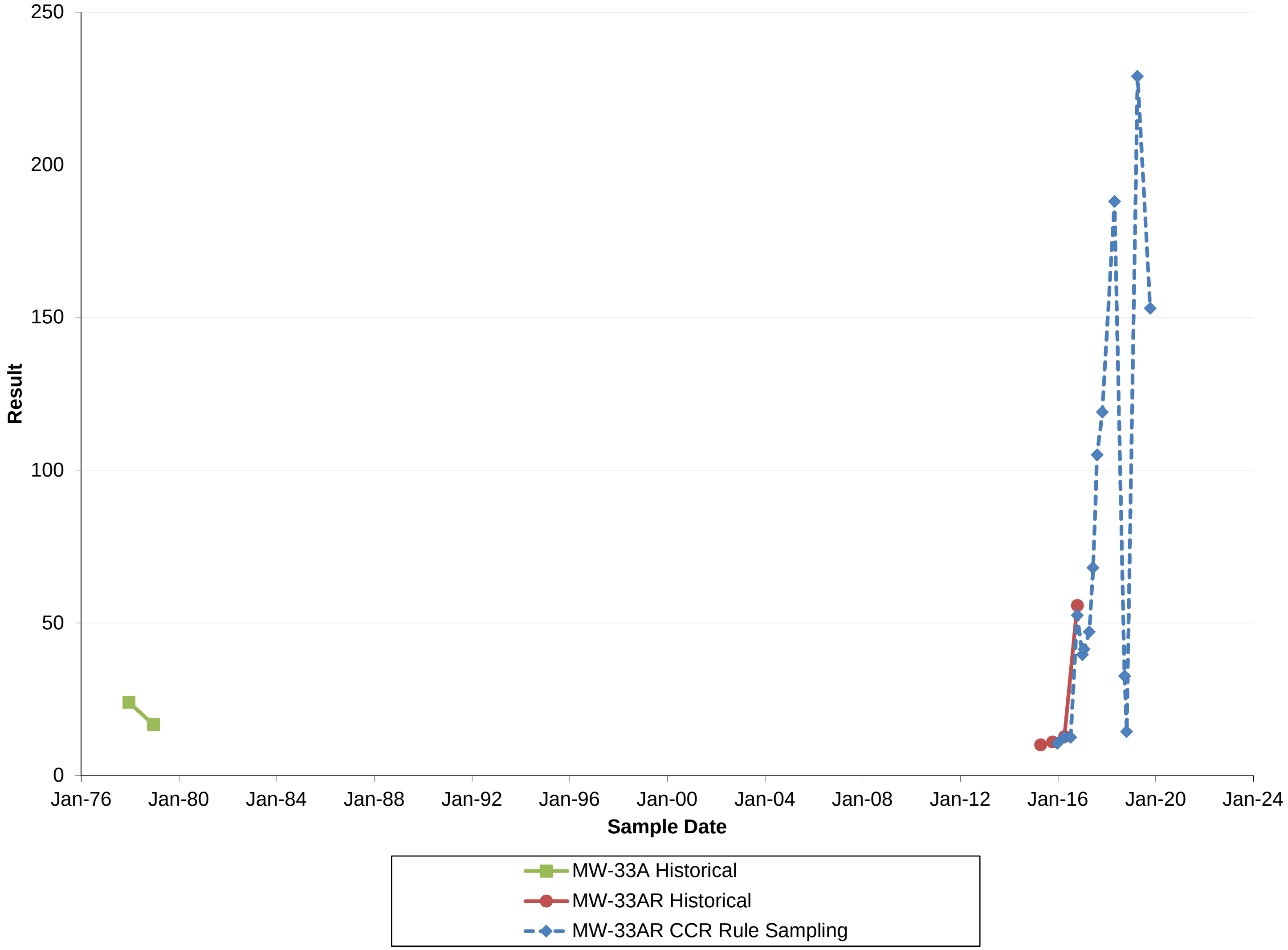
I:\25220067.00\Deliverables\2019 October ASD\Graphs\[Bo_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-302 and MW-85 - Boron (µg/l as B)



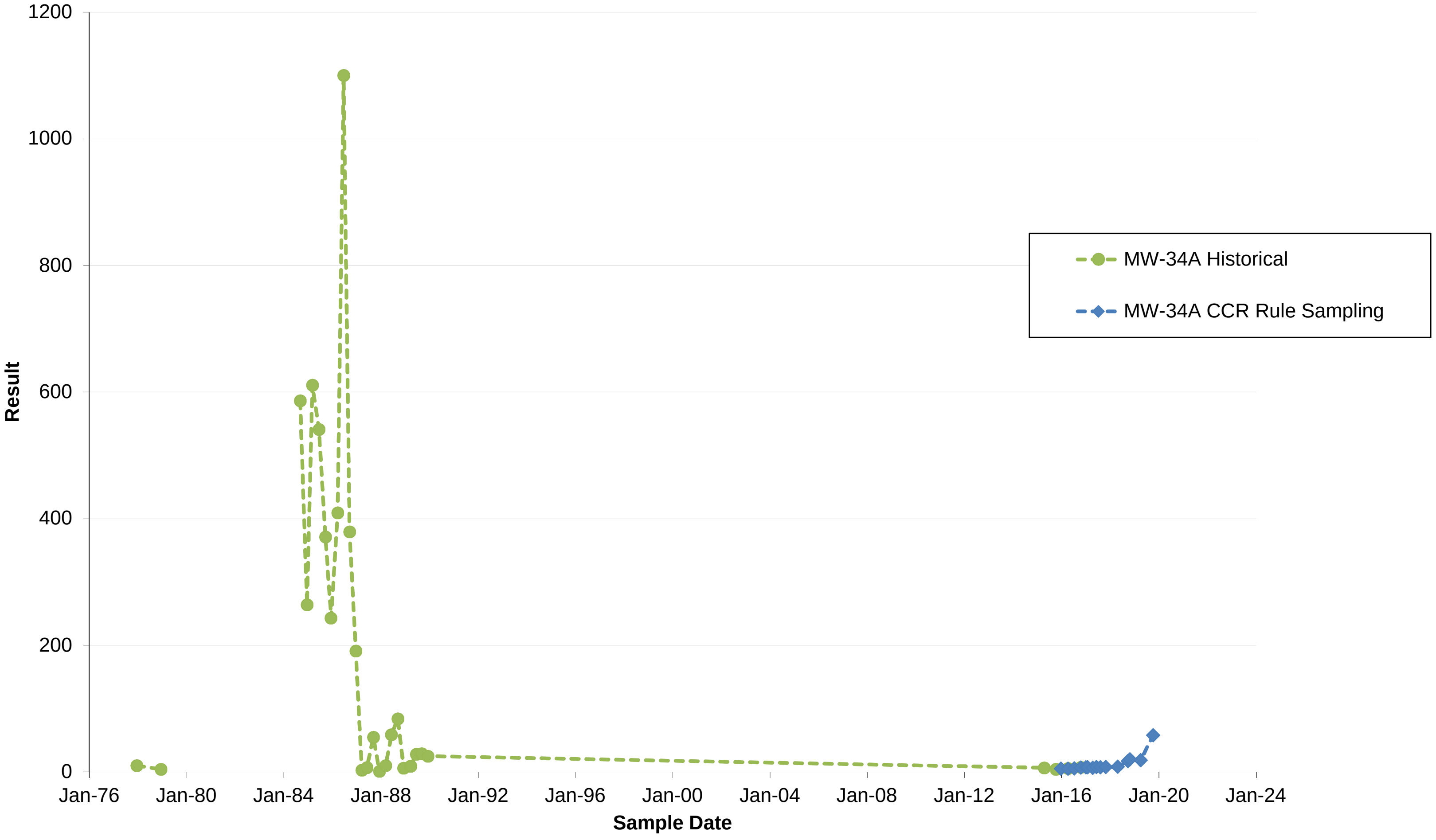
I:\25220067.00\Deliverables\2019 October ASD\Graphs\[Bo_COL Dry.xlsx]MW-85

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Chloride (mg/l as Cl)



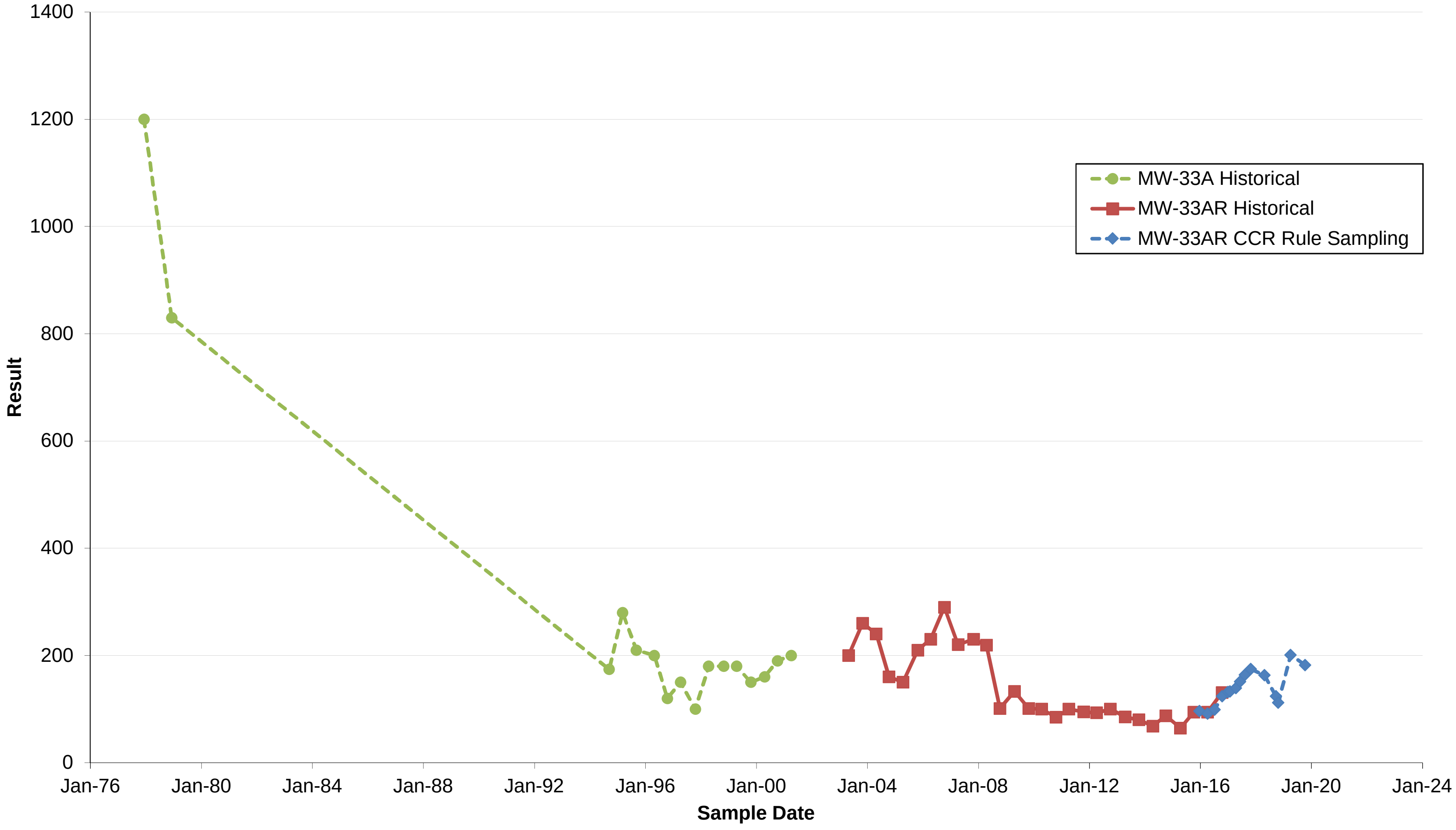
I:\25220067.00\Deliverables\2019 October ASD\Graphs\[Cl_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Chloride (mg/l as Cl)



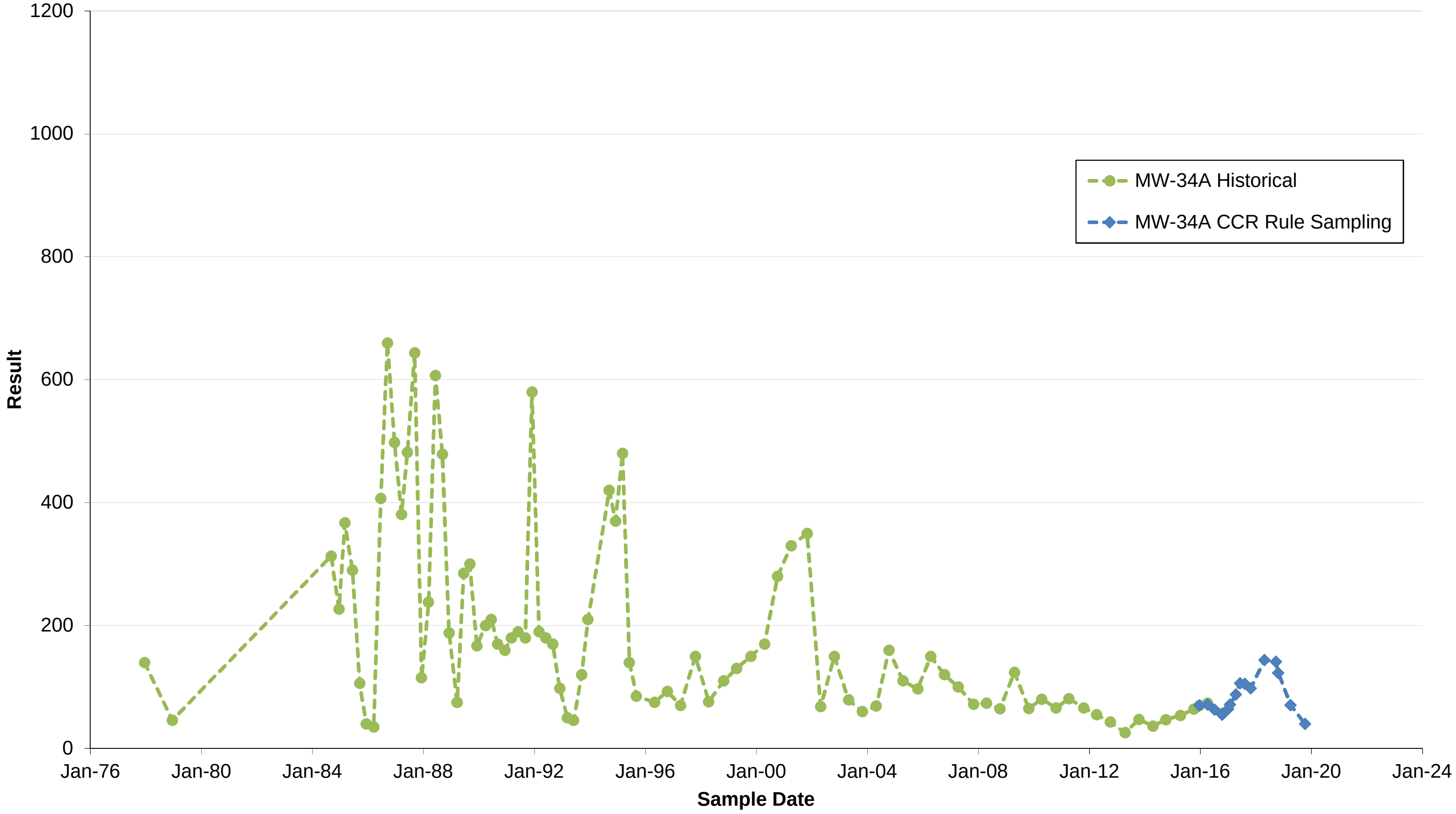
I:\25220067.00\Deliverables\2019 October ASD\Graphs\[Cl_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Sulfate (mg/l as SO4)



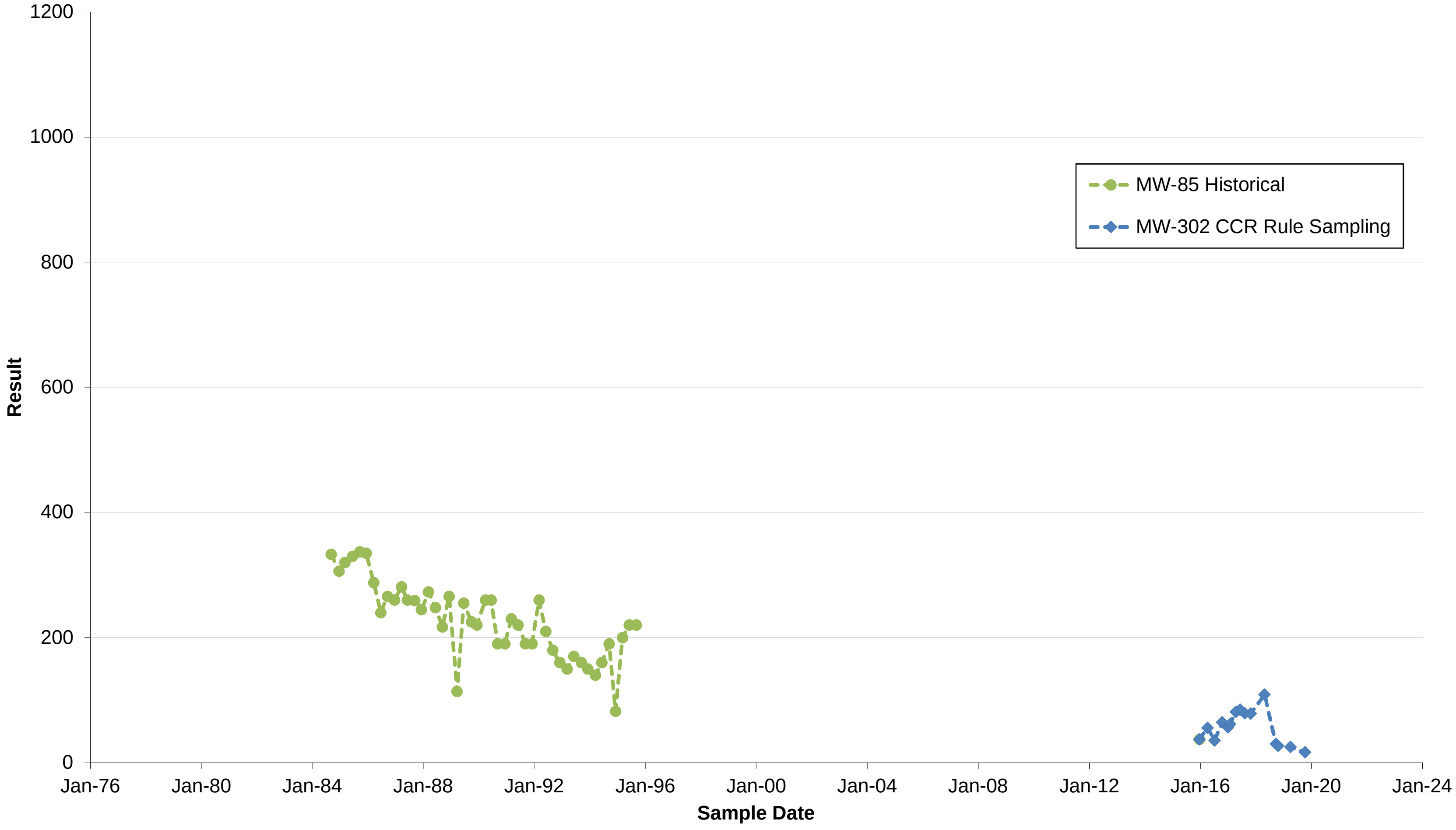
I:\25220067.00\Deliverables\2019 October ASD\Graphs\[SO4_COL Dry.xlsx]MW-33AR CCR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-34A - Sulfate (mg/l as SO4)



I:\25220067.00\Deliverables\2019 October ASD\Graphs\[SO4_COL Dry.xlsx]MW-34A CCR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-85 and MW-302 - Sulfate (mg/l as SO4)



Appendix D

Historical Groundwater Flow Maps

LEGEND

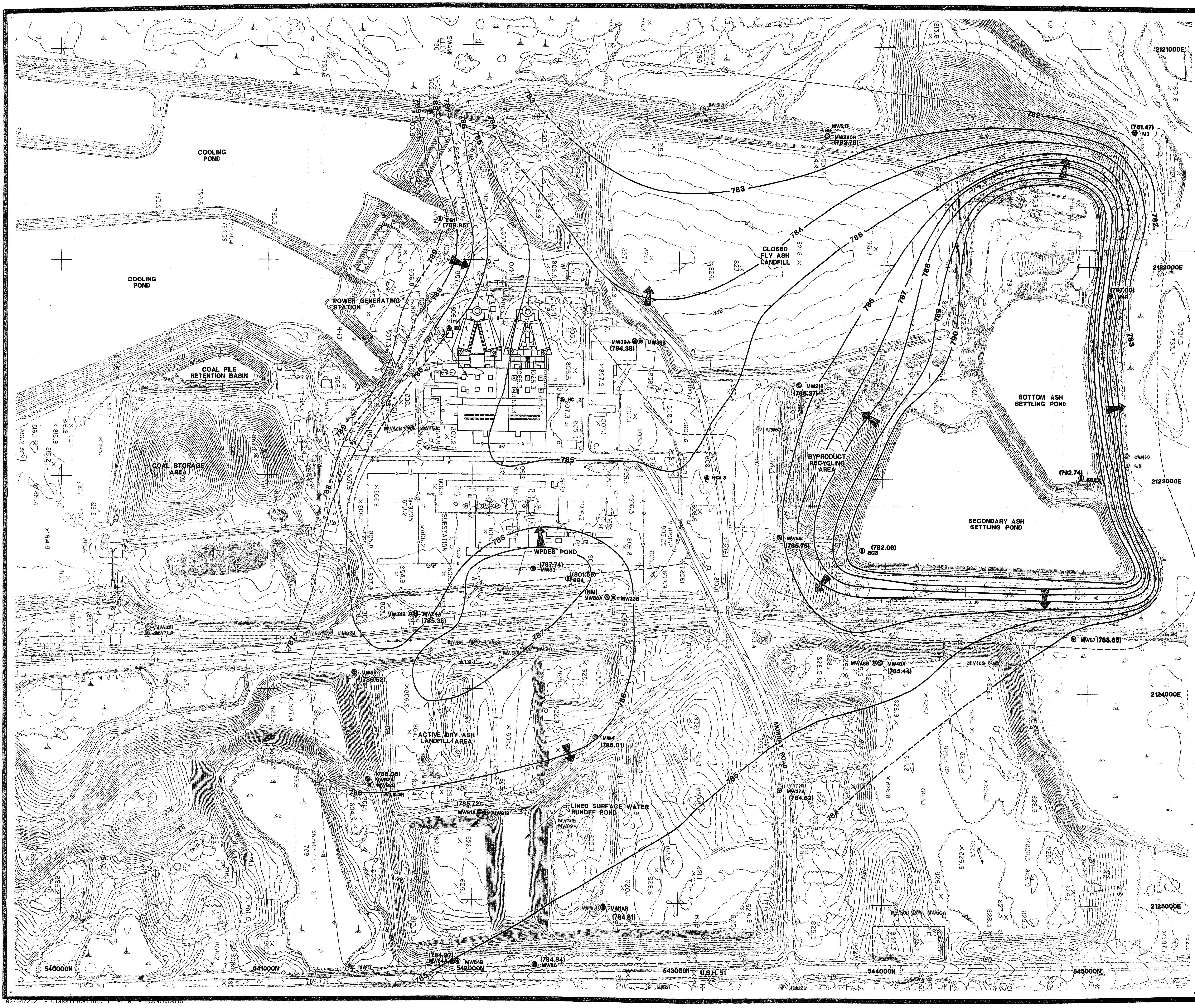
…………	PROPOSED PROJECT AREA
✚ 63 720.29	OBSERVATION WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION
◆	BORING LOCATION AND NUMBER
⩛	WETLANDS
780	TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL: 20 FT.)
■	PRIVATE RESIDENCES (ASSUMED LOCATIONS OF PRIVATE WATER SUPPLY WELLS)
▨	COMMERCIAL BUILDINGS (ASSUMED LOCATIONS OF POSSIBLE PUBLIC WATER SUPPLY WELLS)
—·—→—	SURFACE WATERS (STREAMS OR DRAINAGE DITCHES) ARROWS INDICATE DIRECTION OF FLOW
□	OTHER BUILDINGS (GARAGES, BARNS, ETC.)
◆	HIGH CAPACITY WELLS
—790—	WATER TABLE CONTOURS (CONTOUR INTERVAL: 1 FT.)
➡	DIRECTION OF GROUNDWATER FLOW

NO	BY	DATE	REVISION	APP'D

WATER TABLE CONTOUR MAP 2/4/81

PLAN OF OPERATION – ASH DISPOSAL FACILITY
COLUMBIA SITE
WISCONSIN POWER & LIGHT COMPANY
PART OF SECTIONS 27 & 34, T12N, R9E
TOWN OF PACIFIC COLUMBIA CO. WISCONSIN

WARZYN ENGINEERING INC	DRAWN TDH	SCALE 1"=300'	SHEET 39 OF 39
	CHECKED RJK	DATE 2/10/81	DRAWING NO. C7134-94
	APPROVED		
	REFERENCE		PRINTED 8/3/88



LEGEND

- - - - - -	PROPERTY LINE
	EXISTING RAILROAD TRACKS
30	EXISTING GROUND CONTOUR
	CONTOUR DEPRESSION
	EXISTING PAVED ROAD
	EXISTING UNPAVED ROAD
	EXISTING FENCE
○ □ □	EXISTING BUILDING
	EXISTING SPOT ELEVATION
	TREES AND/OR BRUSH
	WETLAND AREA
	EDGE OF WATER
HC 1	WATER SUPPLY WELL
MW91A	WATER TABLE WELL
MW91B	PIEZOMETER
	ABANDONED WATER TABLE WELL
	ABANDONED PIEZOMETER
SG1	STAFF GAUGE
▲ LS-1	LYSIMETER
- - - - - -	DESIGN MANAGEMENT ZONE
— — — —	PROPERTY LINE
O.S.	OPEN STORAGE
O.H.	OVERHEAD STRUCTURE
E.P.S.	ELECTRICAL POWER STATION
T	TANK
W	WALL
(785.31)	WATER TABLE ELEVATION (FT-MSL) (N.M. = NOT MEASURED)
—— 786 ——	GROUNDWATER CONTOUR LINE (1FT INTERVAL- FT. M.S.L.) (DASHED WHERE INFERRED)
➡	GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IS PROVIDED BY WISCONSIN POWER & LIGHT CO. AND IS BASED ON PHOTOS TAKEN ON APRIL 6, 1995 BY AERO-METRIC ENGINEERING, SHEBOYGAN, WI.
2. HORIZONTAL DATUM IS BASED ON THE WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE - DATUM: NAD 83(91).
3. VERTICAL DATUM IS REFERENCED TO U.S.G.S. MEAN SEA LEVEL (MSL). TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
4. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER & LIGHT CO. IN DECEMBER 1994 & NOVEMBER 1996.
5. THE LOCATION OF THE DESIGN MANAGEMENT ZONE DEMARCATION LINE IS APPROXIMATE.
6. WATER ELEVATION USED TO PREPARE THIS MAP WERE MEASURED ON OCTOBER 24, 2002.
7. THE WATER LEVEL AT MW 33A AND MW 33B COULD NOT BE MEASURED DURING OCTOBER 2002 DUE TO AN OBSTRUCTION IN THE WELL CASING.

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT:
ALLIANT ENERGY - WP&L
COLUMBIA ASH PONDS & DRY ASH
DISPOSAL FACILITY

SHEET TITLE:
WATER TABLE MAP
(OCTOBER 2002)

DRAWN BY: defoej	SCALE: 1"=200'	PROJ. NO. 3024.28
CHECKED BY: JMR		FILE NO. WATERTBL.PLT
APPROVED BY: JCO	DATE PRINTED:	**FIGURE 3**
DATE: JANUARY 2003		

RMT®

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Madison, WI 53708-8923
Phone: 608-831-4444

F2 Alternative Source Demonstration, May 2020 Detection Monitoring

Alternative Source Demonstration May 2020 Detection Monitoring

Dry Ash Disposal Facility, Modules 1-3
Columbia Energy Center
Pardeeville, Wisconsin

Prepared for:

Alliant Energy

SCS ENGINEERS

25220067.00 | November 12, 2020

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

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Tables

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Appendices

I:\25220067.00\Deliverables\2020 May ASD COL MOD 1-3\201027_COL_1-3 LF_May20 ASD- rev 2.docx

PE CERTIFICATION

Sherren O.
Clark
E-29863
Madison,
Wis.

11-12-2020

I, Sherren Clark, hereby certify that that the information in this alternative source demonstration is accurate and meets the requirements of 40 CFR 257.94(e)(2). This certification is based on my review of the groundwater data and related site information available for the Columbia Energy Center Dry Ash Disposal Facility. I am a duly licensed Professional Engineer under the laws of the State of Wisconsin.

11-12-2020
(signature) (date)

Sherren Clark
(printed or typed name)

License number E-29863

My license renewal date is January 31, 2021.

Pages or sheets covered by this seal:
Alternative Source Demonstration, May 2020 Detection Monitoring, Dry Ash Disposal Facility, Modules 1-3, Columbia Energy Center, Pardeeville, Wisconsin

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1.0 INTRODUCTION

This Alternative Source Demonstration (ASD) was prepared to support compliance with the groundwater monitoring requirements of the "Coal Combustion Residuals (CCR) Final Rule" published by the U.S. Environmental Protection Agency (USEPA) in the *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule*, dated April 17, 2015 (USEPA, 2015), and subsequent amendments. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.94(e)(2). The applicable sections of the Rule are provided below in *italics*.

1.1 §257.94(E)(2) ALTERNATIVE SOURCE DEMONSTRATION REQUIREMENTS

The owner and operator may demonstrate that a source other than the CCR Unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels.

An ASD is completed when there are exceedances of one or more benchmarks established within the groundwater monitoring program. The ASD is completed to determine if any other sources are likely causes of the identified exceedance(s) of established benchmark(s) at the site. This ASD was performed in response to results indicating a statistically significant increase (SSI) over background levels during detection monitoring under the CCR Rule.

This ASD report is evaluating the SSIs observed in the statistical evaluation of the May 2020 detection monitoring event at the Columbia Energy Center (COL) Dry Ash Disposal Facility, Modules 1-3 CCR Units. The first ASD was prepared for this facility evaluating the SSIs observed in the statistical evaluation of the October 2017 detection monitoring event (SCS Engineers [SCS], 2018). The October 2017 ASD and subsequent semiannual updates have concluded that several lines of evidence demonstrated that SSIs reported for boron, chloride, and sulfate concentrations in the downgradient monitoring wells were likely due to man-made sources other than the CCR Units and/or naturally occurring constituents in the alluvial aquifer.

As discussed in more detail in **Section 4.2** of this ASD, the findings for the May 2020 monitoring event were consistent with those for the previous events.

1.2 SITE INFORMATION AND MAP

The COL site is located at W8375 Murray Road, Pardeeville, Columbia County, Wisconsin (**Figure 1**). The COL site is an active coal-burning generating station, which has been burning coal and disposing of CCR on site since the mid-1970s. The layout of the site is shown on **Figure 2**. The COL property includes two areas of CCR storage and disposal. These are the Dry Ash Disposal Facility (ADF) and the Ash Ponds Facility. This ASD will evaluate the conditions at the site for Modules 1-3 of the ADF only. The ADF is operated under the Wisconsin Department of Natural Resources (WDNR) License No. 3025.

The groundwater monitoring system for the COL ADF Modules 1-3 (MOD 1-3) is a multi-unit system, monitoring three existing CCR Units:

- COL Dry ADF – Module 1 (existing CCR Landfill)
- COL Dry ADF – Module 2 (existing CCR Landfill)
- COL Dry ADF – Module 3 (existing CCR Landfill)

A map showing the CCR Units and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR groundwater monitoring program and the state monitoring program is provided as **Figure 2.** Separate monitoring systems have been established for Module 4 of the COL ADF, for the primary ash pond and for the secondary ash pond.

1.3 STATISTICALLY SIGNIFICANT INCREASES IDENTIFIED

SSIs were identified by comparing the monitoring results to Upper Prediction Limits (UPLs) established in accordance with 40 CFR 257.93(f)(3) and the statistical method previously selected for the CCR Unit. The UPLs are based on an interwell approach using two background monitoring wells: MW-84A and MW-301. The interwell UPLs were calculated based on a 1-of-2 resampling approach. The UPLs and results for the May 2020 monitoring event are summarized in the attached **Table 1.**

The May 2020 SSIs include the following parameters and wells:

- Boron: MW-33AR, MW-34A, MW-302
- Chloride: MW-33AR
- Sulfate: MW-33AR, MW-34A, MW-302

Concentration trends for the parameters with SSIs are shown in **Appendix A.**

1.4 OVERVIEW OF ALTERNATIVE SOURCE DEMONSTRATION

This ASD report includes:

- Background information (**Section 2.0**)
- Evaluation of potential that SSIs are due to methodology or analysis (**Section 3.0**)
- Evaluation of potential that SSIs are due to natural sources or man-made sources other than the CCR Units (**Section 4.0**)
- ASD conclusions (**Section 5.0**)
- Monitoring recommendations (**Section 6.0**)

The CCR Rule constituent results from background and compliance sampling for parameters with SSIs are provided in **Table 2.** The laboratory reports for the May 2020 detection monitoring event will be included in the 2020 Annual Groundwater Monitoring and Corrective Action Report submitted in January 2021. Complete laboratory reports for the background monitoring events and the previous detection monitoring events were included in previous annual groundwater monitoring and corrective action reports.

2.0 BACKGROUND

To provide context for the ASD evaluation, the following background information is provided in this section of the report, prior to the ASD evaluation sections:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system
- Other monitoring wells

A more detailed discussion of the background information for the site is provided in the ASD for the October 2017 event (SCS, 2018).

2.1 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.1.1 Regional Information

For the purposes of groundwater monitoring, the surficial sand and gravel aquifer is considered the uppermost aquifer, as defined under 40 CFR 257.53. Immediately underlying the surficial sand and gravel aquifer is the Cambrian-Ordovician sandstone aquifer.

Additional details on the regional geology and hydrogeology were provided in the October 2017 ASD (SCS, 2018).

2.1.2 Site Information

Soils at the site are primarily sand to a depth of approximately 50 to 100 feet, and overlie sandstone bedrock. Soils encountered during the site feasibility study for the COL ADF were described as generally sandy with interbedded silty clay lenses up to 20 feet thick (Warzyn, 1978). During drilling of CCR wells MW-301 and MW-302, the unconsolidated materials were identified as consisting primarily of silty sand. Boring logs for previously installed monitoring wells MW-33AR, MW-34A, MW-84A, and M-4R show silty sand and sand as the primary unconsolidated materials at these locations. All CCR monitoring wells are screened within the unconsolidated sand unit.

Shallow groundwater at the site generally flows to the north and west across the existing landfill area, then generally flows west toward the Wisconsin River. A groundwater flow map for May 2020 is shown on **Figure 3**. The groundwater elevation data for the CCR monitoring wells and state monitoring program wells are provided in **Table 3**.

2.2 CCR RULE MONITORING SYSTEM

The groundwater monitoring system established in accordance with the CCR Rule consists of two upgradient (background) monitoring wells and three downgradient monitoring wells. The background wells include MW-301 and MW-84A. The downgradient wells include MW-302, MW-33AR, and MW-34A. The CCR Rule wells are installed within the sand and gravel aquifer. Well depths range from approximately 29 to 40 feet, measured from the top of the well casing.

2.3 OTHER MONITORING WELLS

Additional groundwater monitoring wells currently exist at COL as part of the monitoring systems developed for the state monitoring program and for the other CCR Units.

Monitoring wells for the state monitoring program are installed in the unconsolidated sand and gravel unit, which is the uppermost aquifer as defined under 40 CFR 257.53. This shallow monitoring system includes water table wells and mid-depth piezometers. Well depths range from approximately 14 to 76 feet, measured from the top of the well casing.

3.0 METHODOLOGY AND ANALYSIS REVIEW

To evaluate the potential that an SSI is due to a source other than the regulated CCR Unit, SCS used a two-step evaluation process. First, the sample collection, field and laboratory analysis, and statistical evaluation were reviewed to identify any potential error or analysis that led to exceedance of the benchmark. Second, potential alternative sources, including natural variation and man-made sources other than the CCR Unit, were evaluated. This section of the report provides the findings of the methodology and analysis review. **Section 4.0** of the report addresses the potential alternative sources.

3.1 SAMPLING AND FIELD ANALYSIS

Field notes and sampling results were reviewed to determine if any sampling error may have caused or contributed to the observed SSIs. Potential field sampling errors or issues could include mislabeling of samples, improper sample handling, missed holding times, cross contamination during sampling, or other field error. Field blank sample results were also reviewed for any indication of potential contamination from sampling equipment or containers. Based on the review of the field notes and results, SCS did not identify any indication that the SSI concentrations were due to a sampling error.

SCS did not identify any other issues with the field analysis based on review of the data and field notes. Because boron, chloride, and sulfate are laboratory parameters, there is little potential for a field analysis error to contribute to an SSI.

3.2 LABORATORY ANALYSIS REVIEW

The laboratory reports for the May 2020 detection monitoring event were reviewed to determine if any laboratory analysis error or issue may have caused or contributed to an observed SSI for boron, chloride, or sulfate. The laboratory report review included reviewing the laboratory quality control flags and narrative, verifying that correct methods were used and desired detection limits were achieved, and checking the field and laboratory blank sample results.

Based on the review of the laboratory reports, SCS did not identify any indication that the SSIs were due to a laboratory analysis error. There were no laboratory quality control flags or issues identified in the laboratory report that affect the usability of the data for detection monitoring.

Time series plots of the SSI constituent analytical data were also reviewed for any anomalous results that might indicate a possible sampling or laboratory error (e.g., dilution error or incorrect sample labeling). The time series plots are provided in **Appendix A**. The concentrations observed are similar to historical concentrations.

3.3 STATISTICAL EVALUATION REVIEW

The review of the statistical results and methods included a quality control check of the following:

- Input analytical data vs. laboratory analytical reports
- Statistical method and process for each SSI

Based on the review of the statistical evaluation, SCS did not identify any errors or issues in the statistical evaluation that caused or contributed to the determination of interwell SSIs for the May 2020 detection monitoring event. The interwell SSIs and UPLs are shown in **Table 1**.

3.4 SUMMARY OF METHODOLOGY AND ANALYSIS REVIEW FINDINGS

In summary, there were no changes to the SSI determinations for the May 2020 monitoring event based on the methodology and analysis review, and no errors or issues causing or contributing to the reported SSIs were identified.

4.0 ALTERNATIVE SOURCES

This section of the report discusses the potential alternative sources for the boron, chloride, and sulfate SSIs at the downgradient monitoring wells; identifies the most likely alternative source(s); and presents the lines of evidence indicating that an alternative source is the most likely cause of the observed SSIs.

4.1 POTENTIAL CAUSES OF SSI

4.1.1 Natural Variation

The statistical analysis was completed using an interwell approach, comparing the May 2020 detection monitoring results to the UPLs calculated based on sampling of the background wells (MW-84A and MW-301). If concentrations of a constituent that is naturally present in the aquifer vary spatially, then the potential exists that the downgradient concentrations may be higher than upgradient concentrations due to natural variation. Previous compliance results for boron, chloride, and sulfate at COL MOD 1-3 LF are shown in **Table 2**.

Although natural variation is present in the shallow aquifer, it does not appear likely that natural variation is the primary source causing the boron, chloride, and sulfate SSIs.

4.1.2 Man-Made Alternative Sources

Man-made alternative sources that could potentially contribute to the boron, chloride, and sulfate SSIs could include the closed ash pond landfill, the active ash ponds, the former ash pond effluent ditch, the coal storage area, road salt use, railroad operations, or other plant operations.

Based on the groundwater flow directions and on previous investigations at the site, the former ash pond effluent ditch appears to be the most likely cause of the boron and/or sulfate SSIs for wells MW-33AR, MW-34A, and MW-302. The ash pond effluent ditch also likely contributed to the chloride SSIs at MW-33AR.

4.2 LINES OF EVIDENCE

The lines of evidence indicating that the SSIs for boron, chloride, and sulfate in compliance wells MW-33AR, MW-34A, and MW-302, relative to the background wells, are due to an alternative source include:

1. Elevated concentrations of boron, chloride, and sulfate were present in the area west of the landfill, where the three compliance wells are located, before the landfill was constructed.

2. Monitoring performed under the state program documents that the concentrations of boron, chloride, and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation.

3. Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing west and/or north.

4. The increased and variable chloride results for well B-33AR in the last 2 years have not correlated with an increase in boron, as would be expected for a CCR leachate source; therefore, an alternative source is more likely.

4.2.1 Pre-Landfill Water Quality

Elevated concentrations of boron, chloride, and sulfate were present in the area west of the landfill, where the three compliance wells are located, before the landfill was constructed. Groundwater monitoring performed in 1977 and 1978 as part of the feasibility study for the landfill permitting showed that wells located along the west side of the future landfill footprint, where the current compliance wells are located, had elevated results for sulfate, chloride, and specific conductance.

The 1978 Feasibility Study (Warzyn, 1978) for the dry ADF discusses the influence of the ash pond effluent ditch on groundwater west of the proposed site. The former ash pond effluent ditch, shown on **Figure 2**, carried effluent from the ash ponds located north of the plant, and flowed south between the west side of the current landfill and the substation. Groundwater monitoring in December 1977 indicated that sulfate was present at 1,200 milligrams per liter (mg/L) in MW-33A, which was located near the point where the ash pond effluent discharged from a culvert into the effluent ditch. The sulfate concentration at this well decreased to 830 mg/L in the December 1978 sampling (Warzyn, 1979). Current concentrations of sulfate in this area, while above background, are much lower. The May 2020 sulfate result for MW-33AR (installed to replace MW-33A) was 104 mg/L, at MW-34A was 44.4 mg/L, and at MW-302 was 34.6 mg/L.

Selected text and tables from the 1978 Feasibility Study and the 1979 Supplementary Feasibility Study Report are included in **Appendix B.**

4.2.2 Long-Term Concentration Trends

Monitoring performed under the state program documents that the concentrations of boron and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation. Routine groundwater monitoring for the COL ADF began after the Plan of Operation was approved and prior to initial CCR disposal. The earliest data available from the WDNR Groundwater Environmental Monitoring System (GEMS) database is from September 1984. Initial placement of CCR in test plots in Module 1 of the ADF was approved in October 1984 and CCR disposal began sometime after that. Therefore, the initial groundwater monitoring results in the GEMS database represent pre-disposal conditions for the landfill.

The historic monitoring data show that concentrations of boron and sulfate were significantly higher in the area west of the landfill where the compliance wells are located. Graphs of historical concentrations are provided in **Appendix C**. Results for compliance well MW-33AR are plotted with results from well MW-33A. MW-33AR was a replacement well for MW-33A at a slightly different location and depth. The well screen was installed approximately 10 feet higher in MW-33AR than in MW-33A, intersecting the water table, which may explain the increase in concentration that occurred with the well replacement. Results for compliance well MW-302 are plotted with results from monitoring well MW-85, which was located near the current MW-302 location (see **Figure 2**) and was monitored from September 1984 through September 1995.

The recent boron concentrations are consistent with generally decreasing or stable historical concentrations at MW-33AR and MW-34A (**Appendix A** and **Appendix C**).

4.2.3 Groundwater Flow Direction Changes

Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing west. The 1978 Feasibility Study report states that the southern 2/3 of the proposed fill area (including the area of the active CCR landfill phases) exhibits a southeast and southerly groundwater flow direction, toward an agricultural drainage ditch southeast and south of the landfill area. The 1981 Plan of Operation indicates that flow in the landfill area is to the east-southeast. A water table map prepared by RMT, based on October 2002 water level measurements, shows flow under the landfill generally to the east and northeast from a groundwater high near the effluent ditch and Wisconsin Pollutant Discharge Elimination System (WPDES) pond between the landfill and the substation. The 1981 and 2002 water table maps are provided in **Appendix D**.

Under current conditions, groundwater flow below the active landfill area is generally to the west and northwest. The flow changes with time reflect the termination of discharge to the ash pond effluent ditch in the mid-2000s. When discharge via this ditch was active, the ditch was a source of recharge to the groundwater and created a high groundwater area with flow moving away from the ditch to the east. After discharge to the ditch was terminated, water levels in this area decreased significantly and the groundwater flow direction changed.

With the changes in groundwater flow, historically impacted groundwater moved in alternating directions. While the effluent ditch was active, impacted groundwater likely moved eastward past the current compliance wells, as indicated by the long-term concentration data. Although the compliance wells are downgradient from the landfill under current flow conditions, the observed groundwater impacts may be residual from the past when the wells were downgradient from the effluent ditch.

4.2.4 Chloride and Boron Leachate Concentrations

The chloride results for well MW-33AR increased beginning in 2016 and have been variable since 2018, without a corresponding increase or variability in boron (**Table 2** and **Appendix A**), indicating the source of the increasing chloride is not likely the CCR landfill. Sampling of the landfill leachate pond and the lysimeters indicates that boron and chloride concentrations are generally both elevated in leachate (**Table 4**). Furthermore, the peak chloride concentrations in the groundwater samples from MW-33AR during 2018 and 2019 exceeded the chloride concentrations measured in the leachate, indicating the leachate is not the source of chloride at this location (**Tables 2** and **4**). An alternative man-made source, such as road salt, is a more likely source of chloride than the CCR Units.

5.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSIONS

The lines of evidence discussed above regarding the SSIs reported for boron, chloride, and sulfate concentrations in downgradient monitoring wells MW-33AR, MW-34A, and/or MW-302 demonstrate that the SSIs are likely primarily due to sources other than the CCR Units. Boron, sulfate, and chloride concentrations were elevated prior to disposal of CCR in the landfill and are associated with historical discharges from the ash ponds via the effluent ditch located west of the landfill. Elevated chloride concentrations detected at well MW-33AR appear likely to be related to an alternative non-CCR source, such as salt.

6.0 SITE GROUNDWATER MONITORING RECOMMENDATIONS

In accordance with section 257.94(e)(2) of the CCR Rule, the COL MOD 1-3 CCR Units may continue with detection monitoring based on this ASD. The ASD report will be included in the 2020 Annual Report due January 31, 2021.

7.0 REFERENCES

SCS Engineers, 2018, Alternative Source Demonstration, October 2017 Detection Monitoring, Columbia Energy Center Dry Ash Disposal Facility, April 2018.

USEPA, 2015, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, April 2015.

Warzyn Engineering, Inc., 1978, Feasibility Study, Proposed Fly Ash and/or Scrubber Sludge Disposal Facility – Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

Warzyn Engineering, Inc., 1979, and Preliminary Engineering Concepts, Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

Tables

Table 1. Groundwater Analytical Results Summary - May 2020 Event
Columbia Landfill MOD 1-3 / SCS Engineers Project #25220067.00

		Background Wells		Compliance Wells		
Parameter Name	**UPL**	**MW-84A**	**MW-301**	**MW-33AR**	**MW-34A**	**MW-302**
		5/29/2020	5/29/2020	5/28/2020	5/28/2020	5/29/2020
Appendix III						
Boron, ug/L	35.6	10	21.3	566	210	611
Calcium, ug/L	129,000	77,600	112,000	58,400	58,700	90,500
Chloride, mg/L	6.2	3.7	2 J	15.9	3.9	1.2 J
Fluoride, mg/L	DQ	<0.095	<0.095	<0.095	<0.095	<0.095
Field pH, Std. Units	7.78	7.34	6.73	7.59	7.40	7.20
Sulfate, mg/L	30.3	1.5 J	11.5 J	104	44.4	34.6
Total Dissolved Solids, mg/L	514	340	452	376	284	404

4.4 Blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

Abbreviations:
UPL = Upper Prediction Limit
DQ = Double Qualification
SSI = Statistically Significant Increase
LOQ = Limit of Quantitation
LOD = Limit of Detection
μg/L = micrograms per liter
mg/L = milligrams per liter

Lab Notes:
J = Estimated concentration at or above the LOD and below the LOQ.

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-84A and MW-301. Interwell UPLs based on 1-of-2 retesting approach.

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Scientist/Proj Mgr QA/QC: TK Date: 8/7/2020

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Field pH (Std. Units)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
Background	MW-301	12/22/2015	26.5	3.70 J	6.85	9.30	478
		4/5/2016	25.2	4.00	7.01	15.3	486
		7/8/2016	23.6	3.50 J	6.87	15.0	464
		10/13/2016	30.6	2.20	7.28	13.9	490
		12/29/2016	32.8	2.00 J	6.63	12.3 J	444
		1/25/2017	32.6	1.50 J	7.10	6.50	514
		4/11/2017	28.8	2.00	7.11	10.3	502
		6/6/2017	21.3	3.50	6.70	17.1	458
		8/8/2017	30.6	5.50	6.75	31.6	462
		10/23/2017	34.3	4.00	7.37	27.5	362
		4/25/2018	24.3	2.30	6.76	8.60	464
		8/8/2018	22.8	-	6.91	-	-
		10/22/2018	27.8	3.20	6.79	19.2	424
		4/3/2019	26.9	2.90 J, B	6.62	5.30 J	462
		10/9/2019	35.9	1.70	6.67	8.40	418
		5/29/2020	21.3	2.00 J	6.73	11.5 J	452
	MW-84A	12/22/2015	11.9	4.90	7.60	4.90	316
		4/5/2016	14.0	4.70	7.61	4.30	322
		7/8/2016	14.7	5.10	7.45	3.70 J	316
		7/28/2016	-	-	7.34	-	-
		10/13/2016	11.1	4.30	7.91	2.60 J	324
		12/29/2016	14.7	4.70	7.25	2.70 J	316
		1/25/2017	16.1	4.60	6.99	3.00	328
		4/11/2017	12.9	4.90	7.80	2.80 J	342
		6/6/2017	14.8	5.50	7.28	2.70 J	344
		8/8/2017	22.9	5.50	7.23	2.00 J	342
		10/24/2017	13.8	5.10	7.68	2.20 J	314
		4/25/2018	25.0	4.80	7.45	2.80 J	328
		8/8/2018	12.8	--	7.38	--	--
		10/22/2018	10.1 J	4.20	7.24	1.60 J	330
		4/3/2019	13.6	3.60 B	7.03	1.40 J	318
		10/9/2019	12.0	3.90	7.23	1.30 J	310
		5/29/2020	10.0	3.70	7.34	1.50 J	340
Compliance	MW-302	12/22/2015	80.0	4.20	7.63	37.4	312
		4/5/2016	78.8	4.10	7.70	55.6	312
		7/7/2016	134	3.10 J	7.29	35.4	344
		10/13/2016	132	1.10 J	7.72	64.7	360
		12/29/2016	106	1.20 J	7.12	56.4	330
		1/25/2017	149	1.60 J	8.21	61.6	384
		4/11/2017	322	1.60 J	7.63	81.3	436
		6/6/2017	671	3.50	7.16	84.6	466
		8/8/2017	833	4.50	7.04	79.0	470
		10/24/2017	691	6.90	8.23	78.4	446
		4/24/2018	1,950	15.0	7.21	109	598
		9/21/2018	203	1.70 J	7.74	30.0	280
		10/22/2018	296	1.80 J	7.22	26.9	288
		4/2/2019	254	1.50 J	7.32	25.2	290
		10/9/2019	246	1.10 J	7.08	16.7	274
		5/29/2020	611	1.20 J	7.20	34.6	404

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Field pH (Std. Units)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
Compliance	MW-33AR	12/21/2015	954	10.6	7.87	96.2	356
		4/5/2016	813	12.5	8.08	91.5	354
		7/7/2016	794	12.5	7.68	99.2	364
		10/13/2016	827	52.5	8.23	124	456
		12/29/2016	812	39.6	7.63	132	440
		1/25/2017	763	41.4	8.62	133	426
		4/11/2017	760	47.1	8.19	139	446
		6/6/2017	692	68.1	7.78	151	492
		8/7/2017	697	105	7.47	164	598
		10/24/2017	678	119	7.81	175	606
		4/24/2018	601	188	7.74	163	692
		9/21/2018	683	32.6	8.16	124	466
		10/22/2018	682	14.4	7.69	112	388
		4/2/2019	568	229	7.72	201	784
		10/8/2019	548	153	7.74	182	634
		5/28/2020	566	15.9	7.59	104	376
	MW-34A	12/21/2015	230	4.90	7.91	69.9	324
		4/5/2016	220	5.10	7.92	71.6	298
		7/7/2016	216	5.60	7.52	63.4	304
		7/28/2016	-	-	7.40	-	-
		10/13/2016	212	6.80	8.19	54.8	288
		12/29/2016	224	7.10	7.43	63.9	242
		1/25/2017	214	7.20	7.71	71.2	310
		4/11/2017	214	6.20	8.03	87.6	330
		6/6/2017	201	7.80	7.57	106	366
		8/7/2017	205	7.40	7.39	105	358
		10/24/2017	208	7.60	7.67	98.0	340
		4/24/2018	209	8.20	7.80	144	412
		9/21/2018	241	17.1	8.12	141	460
		10/22/2018	233	19.9	7.64	123	392
		4/4/2019	204	18.7	7.73	70.4	310
		10/8/2019	207	57.9	7.79	39.8	314
		5/28/2020	210	3.90	7.40	44.4	284

Abbreviations:
µg/L = micrograms per liter or parts per billion (ppb)
mg/l = milligrams per liter or parts per million (ppm)
J = Estimated value below the laboratory's limit of quantitation
B = Analyte was detected in the associated Method Blank.

Notes:
(1) Analytical laboratory reports provided in the Annual Groundwater Monitoring and Corrective Action Reports.

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Scientist Check: MDB Date: 9/28/2020

I:\25220067.00\Data and Calculations\Tables\CCR ASD COL MOD 1-3 LF Tables\May 2020 ASD\[2 and _COL LF ASD- May 2020 ASD.xlsx]Table 2. Analy. Rslts- CCR

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25220067.00

Dry Ash Facility (Facility ID #03025)	**Well Number**	**MW-1AR**	**MW-4**	**MW-5R**	**MW-33AR**	**MW-33BR**	**MW-34A**	**MW-34B**	**MW-37A**	**MW-83**	**MW-84A**	**MW-84B**	**MW-86**	**MW-91AR**	**MW-91B**	**MW-92A**	**MW-92B**
	Top of Casing Elevation (feet amsl)	822.55	819.74	805.44	808.29	808.39	805.95	806.05	813.04	807.96	814.28	814.26	824.79	809.03	808.45	808.47	808.41
	Screen Length (ft)																
	Total Depth (ft from top of casing)	44.40	39.58	25.97	31.08	57.50	35.43	56.95	31.80	25.42	40.21	52.02	45.43	32.90	52.38	28.94	51.75
	Top of Well Screen Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66
	Measurement Date																
	October 2, 2012	783.41	783.70	784.96	782.38	782.23	783.03	782.99	782.66	dry	783.84	783.94	783.81	784.09	783.90	784.49	784.06
	April 15, 2013	785.44	784.02	786.09	784.16	784.14	784.74	784.79	783.87	784.49	785.83	785.76	785.22	785.14	785.01	785.75	785.34
	October 8, 2013													785.66	785.42	785.97	785.52
	October 15, 2013	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.66	785.42	785.97	785.52
	April 14, 2014	784.95	784.09	785.63	783.74	783.91	784.63	784.70	783.45	783.73	785.58	785.52	784.96	785.04	784.96	785.99	785.54
	October 2-3, 2014	785.03	785.39	786.08	784.37	784.28	784.57	784.54	784.56	dry	785.24	785.18	785.19	785.47	785.28	785.75	785.33
	April 13-14, 2015	783.96	783.63	785.25	783.01	782.74	783.65	783.95	782.87	dry	784.43	784.51	784.17	784.48	784.37	785.07	784.66
	October 6-7, 2015	784.28	784.44	785.72	783.68	783.33	784.05	784.02	783.66	dry	784.80	784.76	784.66	784.89	784.70	785.20	784.76
	April 4-6, 2016	785.82	aband	787.02	785.29	785.07	785.63	785.67	784.76	785.43	786.37	786.26	785.89	786.05	785.95	786.61	786.21
	October 11-13, 2016	786.64	aband	788.00	787.36	786.46	786.45	786.32	786.40	786.81	787.22	787.11	786.96	787.17	786.81	787.68	787.25
	April 10-13, 2017	786.96	aband	788.13	786.39	785.99	786.30	786.28	786.34	786.23	787.16	787.06	786.96	787.24	787.03	787.90	787.60
	October 3-5, 2017	785.48	aband	786.66	784.51	784.22	784.67	784.63	784.86	784.29	NM	786.49	785.58	786.08	785.83	786.47	786.02
	October 9-10, 2017	NM	aband	NM	NM	NM	NM	NM	NM	NM	785.56 (6)	NM	NM	NM	NM	NM	NM
	February 21, 2018	783.97	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.68	784.46	NM	NM
	April 23-25, 2018	783.99	aband	785.36	783.09	786.36	781.77	780.79	783.28	783.32	785.88	784.91	782.54	784.71	784.53	785.23	784.81
	October 23-25, 2018	788.25	aband	789.71	788.77	787.96	787.88	787.73	787.62	788.26	788.32	788.19	788.21	788.59	788.31	789.32	788.87
	April 1-4, 2019	787.05	aband	788.64	786.63	786.54	786.82	786.92	786.47	786.78	787.35	787.34	787.16	787.45	787.18	788.04	787.63
	October 7-9, 2019	787.26	aband	789.23	788.26	787.64	787.92	787.74	786.77	788.90	787.79	787.73	787.44	787.78	787.62	788.63	788.17
	May 27-28, 2020	786.92	aband	788.34	786.01	785.75	785.98	785.99	786.22	786.03	787.02	786.99	786.94	787.26	787.05	787.86	787.47

Ash Pond Facility (Facility ID #02325)	**Well Number**	**M-3**	**M-4R**	**MW-39A**	**MW-39B**	**MW-48A**	**MW-48B**	**MW-57**	**MW-59**	**MW-216R**	**MW-217**	**MW-220RR**	**SG-1**	**SG-2**	**SG-3**	**SG-4**
	Top of Casing Elevation (feet amsl)	788.23	806.10	809.62	809.50	828.86	828.84	786.29	815.48	814.21	791.55	792.90	792.06	795.25	808.60	805.36
	Screen Length (ft)															
	Total Depth (ft from top of casing)	16.90	25.55	34.80	76.07	51.88	75.80	14.40	38.50	37.85	37.37	18.96	--	--	--	--
	Top of Well Screen Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94	--	--	--	--
	Measurement Date															
	October 2, 2012	780.13	786.76	781.49	781.34	782.03	781.93	780.58	779.88	781.91	780.95	780.55	789.14	793.85	dry	dry
	April 15, 2013	785.16	788.39	783.97	784.00	783.77	783.78	784.69	783.66	784.09	784.75	785.02	789.5(1)	NM	dry	dry
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36	789.5(1)	791.33	dry	dry
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM	NM	NM	NM	NM
	April 14, 2014	786.04	788.96	783.57	783.68	783.56	783.57	785.51	783.41	783.73	785.25	785.87	788.90	dry	dry	dry
	October 1-3, 2014	781.16	787.55	783.42	783.32	784.05	783.94	782.32	783.55	783.79	782.63	783.03	NM	dry	dry	dry
	April 13-14, 2015	783.08	786.83	782.77	782.68	782.80	782.82	782.81	782.83	782.93	783.34	783.42	789.3	791.70	dry	dry
	October 6-7, 2015	780.66	786.12	782.97	782.81	783.10	783.01	781.82	783.25	783.18	781.95	782.26	788.48	791.58	dry	dry
	April 4-6, 2016	784.21	789.09	785.27	785.27	784.79	784.76	783.21	784.97	785.68	785.02	784.36	NM	793.40	dry	dry
	October 11-13, 2016	781.88	787.88	785.75	785.52	785.73	785.61	783.12	786.51	786.16	783.75	784.09	788.32	792.52	dry	dry
	April 10-13, 2017	782.94	787.95	785.44	785.20	785.82	785.69	782.77	786.09	785.95	784.29	784.09	788.31	793.85	dry	dry
	October 3-5, 2017	780.93	787.04	783.35	783.18	784.30	784.19	782.37	784.23	783.89	782.48	782.61	788.3	793.45	dry	dry
	April 23-25, 2018	782.89	790.43	782.86	782.87	783.14	783.09	783.04	783.02	783.23	783.26	783.45	788.38	>795.25	dry	dry
	October 23-25, 2018	782.95	788.47	787.12	786.88	787.12	786.99	783.48	787.73	787.49	784.90	784.52	787.76	793.25	dry	dry
	April 1-4, 2019	785.68	789.44	786.28	786.31	786.56	786.45	785.27	787.39	786.53	786.33	785.46	--	794.60	dry	dry
	October 7-9, 2019	785.33	790.65	787.10	787.02	786.68	786.65	785.29	786.68	787.07	786.01	785.42	748.48	795.20	dry	dry
	May 27-29, 2020	781.80	787.73	785.12	784.92	785.74	785.59	783.11	785.89	785.60	783.41	783.89	748.48	>795.25	dry	dry
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94	--	--	--	--

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network

Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25220067.00

CCR Rule Wells	**Well Number**	**MW-301**	**MW-302**	**MW-303**	**MW-304**	**MW-305**	**M-4R**	**MW-33AR**	**MW-34A**	**MW-84A**	**MW-306**	**MW-307**	**MW-308**	**MW-309**	**MW-310**	**MW-311**
	Top of Casing Elevation (feet amsl)	806.89	813.00	811.52	805.42	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74
	Screen Length (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Total Depth (ft from top of casing)	29.40	33.6	35.80	25.7	25.6	39.58	31.08	35.43	40.21	27	26.5	28	37.67	38.41	36.19
	Top of Well Screen Elevation (ft)	787.49	789.40	785.72	789.72	790.72	776.52	787.21	780.52	784.07	790.63	790.39	788.90	785.60	785.21	783.55
	Measurement Date													--	--	--
	December 21-22, 2015	NM	784.78	784.11	786.13	788.96	787.58	783.77	783.50	785.31	--	--	--	--	--	--
	May 27-29, 2020	787.77	787.29	785.56	789.30	787.78	787.73	786.01	785.98	787.02	785.77	785.35	786.28	785.98	785.81	785.85
	June 30, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM
	August 6, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM
	January 0, 1900															
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	780.63	780.39	778.90	775.60	775.21	773.55

Notes:
NM = not measured

Created by: MDB Date: 5/6/2013
Last revision by: RM Date: 8/7/2020
Checked by: JSN Date: 8/7/2020
Proj Mgr QA/QC: ______ Date: ______

(1) The elevation for SG-1 is read off of the staff gauge (rather than measured from the top of the gauge).
(2) SG-2 could not be located during the April 2013 event.
(3) SG-3 could not be located during the October 2013 event. SG-1 could not be safely accessed during the October 2013 event.
(4) LH-2 measurements are given as leachate depth, measured by a transducer.
(5) LH-2 and LH-3 measurements were collected by WPL staff on October 9, 2017.
(6) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5 sampling event. The level was allowed to return to static and was measured on 10/10/2017.

I:\25220067.00\Data and Calculations\Tables\[wlstat_Columbia.xls]levels

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25220067.00

Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LS-1	2015-Apr	DRY	--	--	--
	2015-Oct	BROKEN	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	--	6530	12.3	789
	2017-Apr	--	6510	20.7 J	814
	2017-Oct	--	6200	14.2 J	764
	2018-Apr	--	5920	16 J	856
	2018-Oct	DRY	--	--	
	2019-Apr	--	5,640	22 J	911
	2019-Oct	--	6,180	19.2 J	861
	2020-May	--	6,180	25.4 J	1,040
LS-3R	2015-Apr	--	6480	20.6 B	807
	2015-Oct	DRY	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	DRY	--	--	--
	2017-Apr	DRY	--	--	--
	2017-Oct	DRY	--	--	--
	2018-Apr	DRY	--	--	--
	2018-Oct	--	6180	26.2 J	841
	2019-Apr	DRY	--	--	--
	2019-Oct	DRY	--	--	--
	2020-May	DRY	--	--	--

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25220067.00

Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LP-1	2015-Apr	--	4060	27.8	734
	2015-Oct	--	4300	37.1	820
	2016-Apr	--	1830	26.8	416
	2016-Oct	--	4610	71.5	835
	2017-Apr	--	2690	66.3	587
	2017-Oct	--	4970	91.7	739
	2018-Apr	--	2060	63.2	634
	2018-Oct	--	2630	151	907
	2019-Apr	--	570	35.1	249
	2019-Oct	--	1,270	63.9	602
	2020-May	--	2,460	179	952

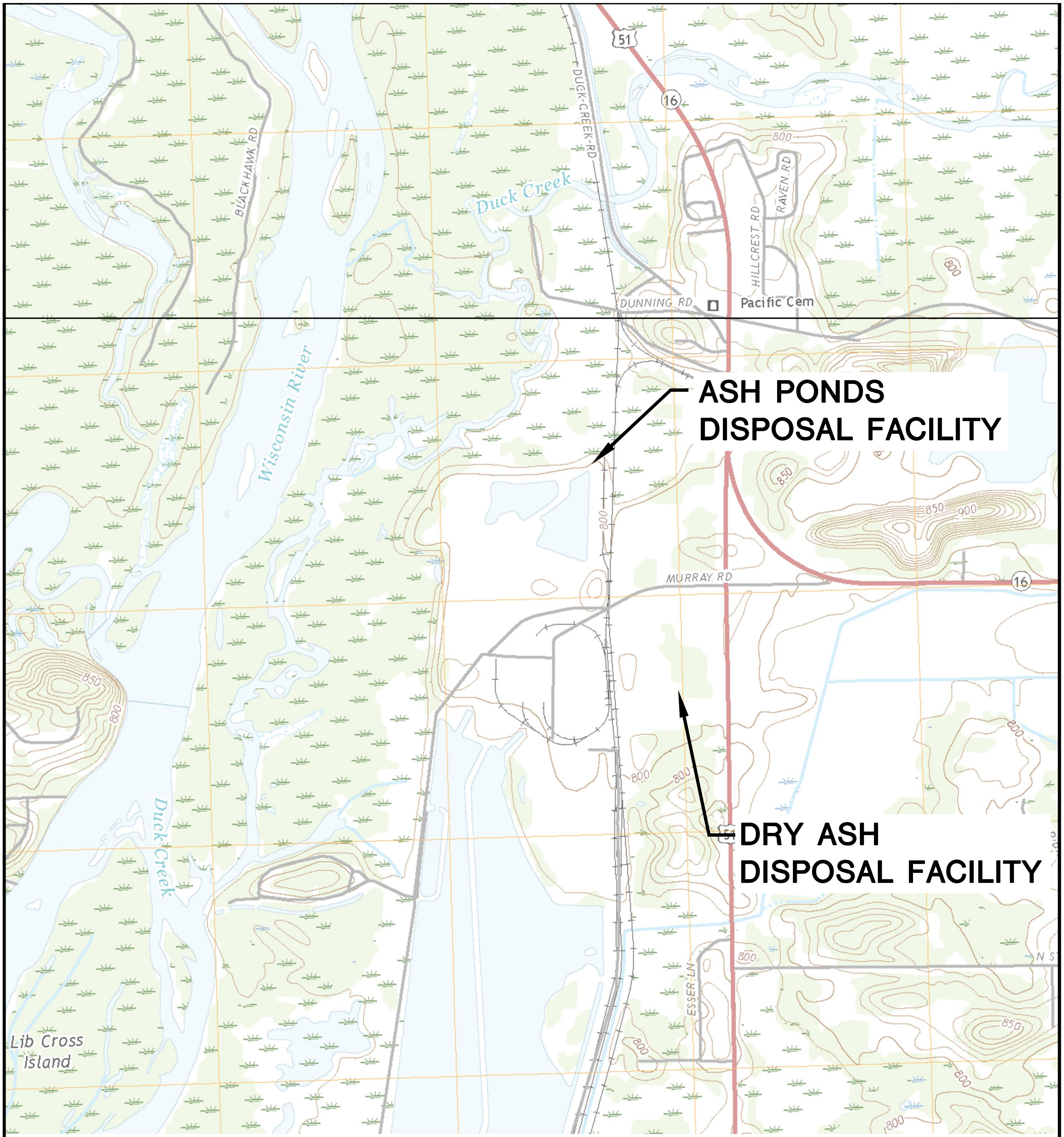
Abbreviations:
µg/L = micrograms per liter
mg/L = milligrams per liter
-- = not analyzed
µmhos/cm = micromhos/centimeter

Notes:
B = Analyte was detected in the associated method blank.
J = Estimated concentration at or above the LOD and below the LOQ.

Created by: TLC Date: 12/1/2014
Last revision by: NDK Date: 9/2/2020
Checked by: AJR Date: 9/2/2020

I:\25220067.00\Data and Calculations\Tables\CCR ASD COL MOD 1-3 LF Tables\May 2020 ASD\[4_Leachate_2015-Apr2020 - May 2020 ASD.xlsx]Lys LP1 App III

Figures



ASH PONDS DISPOSAL FACILITY

DRY ASH DISPOSAL FACILITY

POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'

CLIENT
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WI

SITE LOCATION MAP

PROJECT NO.	25219067.00	DRAWN BY:	BSS
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	01/10/2020	APPROVED BY:	TK 01/30/2020

ENGINEER
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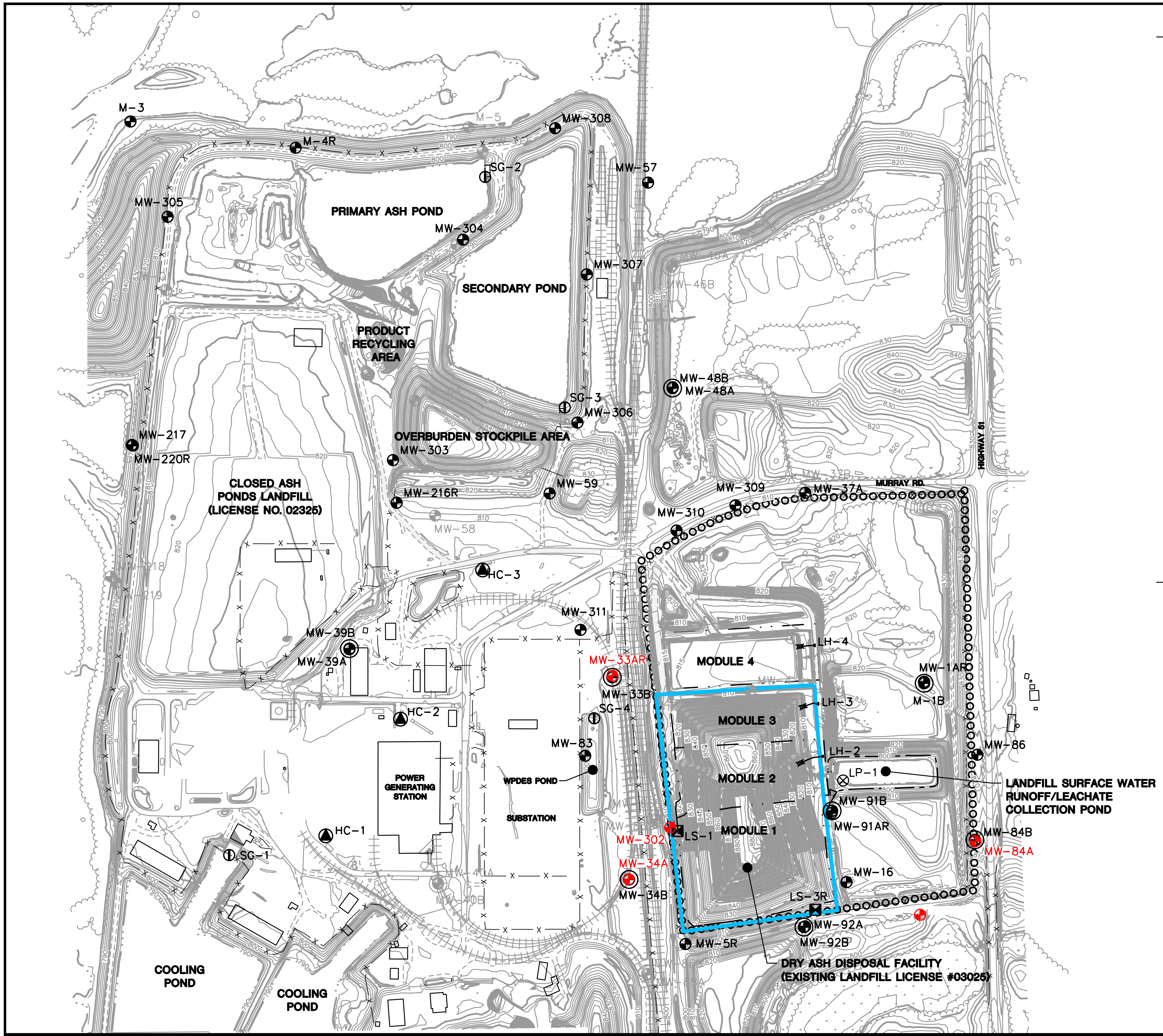
FIGURE
1

I:\25219067.00\Drawings\CCR 2019 Ann□al Report\Site Location Map.dwg, 1/30/2020 3:38:21 PM

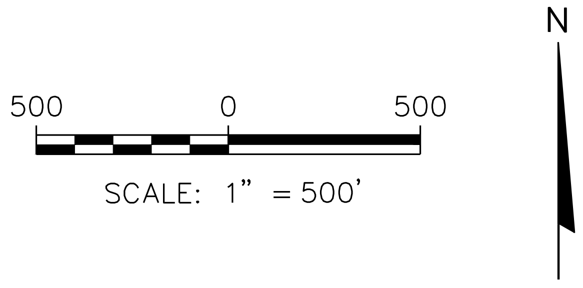


LEGEND

———	EXISTING MAJOR CONTOUR (10' INTERVAL)
———	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—	EXISTING FENCELINE
┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
======	EXISTING UNPAVED ROAD
— · · —	EDGE OF WATER
·oooooo	APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
— · · —	CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
▲	WATER SUPPLY WELL
◐	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
↗	LEACHATE HEADWELL
━━━	CCR UNIT
●	CCR MONITORING WELL

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.



PROJECT NO.	25219067.00	DRAWN BY:	BSS
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	01/13/2020	APPROVED BY:	TK 01/30/2020

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PARDEEVILLE, WI 53954

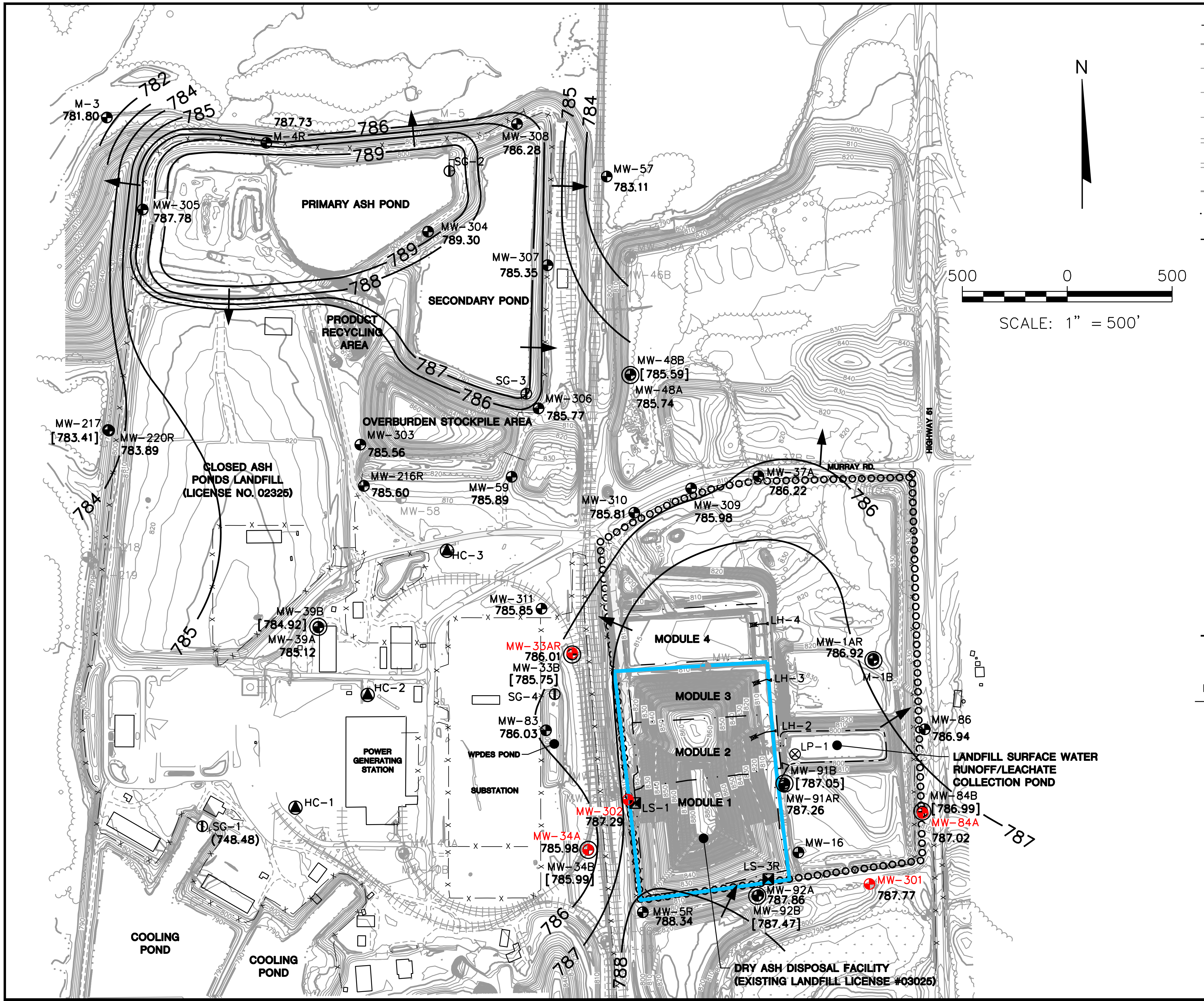
SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULE 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE
2

I:\25219067.00\Drawings\CCR 2019 Ann□al Report\Mod 1-3 LF\Site Plan and Monitoring Well Locations.dwg, 1/30/2020 3:39:□3 PM



LEGEND

───	EXISTING MAJOR CONTOUR (10' INTERVAL)
───	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—	EXISTING FENCE LINE
┼┼┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
-------	EXISTING UNPAVED ROAD
— · · —	EDGE OF WATER
·oooooooo	APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
— · · —	CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
▲	WATER SUPPLY WELL
◐	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
⇝	LEACHATE HEADWELL
───	CCR UNIT
🔴	CCR MONITORING WELL
787.62	WATER TABLE ELEVATION MEASURED MAY 2020
[788.87]	POTENTIOMETRIC SURFACE ELEVATION MEASURED MAY 2020 (NOT CONTOURED)
(795.20)	SURFACE WATER ELEVATION MEASURED MAY 2020 (NOT CONTOURED)
───	WATER TABLE CONTOUR
→	APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. GROUNDWATER ELEVATIONS WERE COLLECTED FROM MONITORING WELLS AND PIEZOMETERS ON MAY 27 THROUGH MAY 29, 2020.

PROJECT NO.	25220067.00	DRAWN BY:	KP
DRAWN:	08/07/2020	CHECKED BY:	NDK
REVISED:	08/26/2020	APPROVED BY:	SCC 09/25/2020

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PARDEEVILLE, WI 53954

SITE
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULE 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

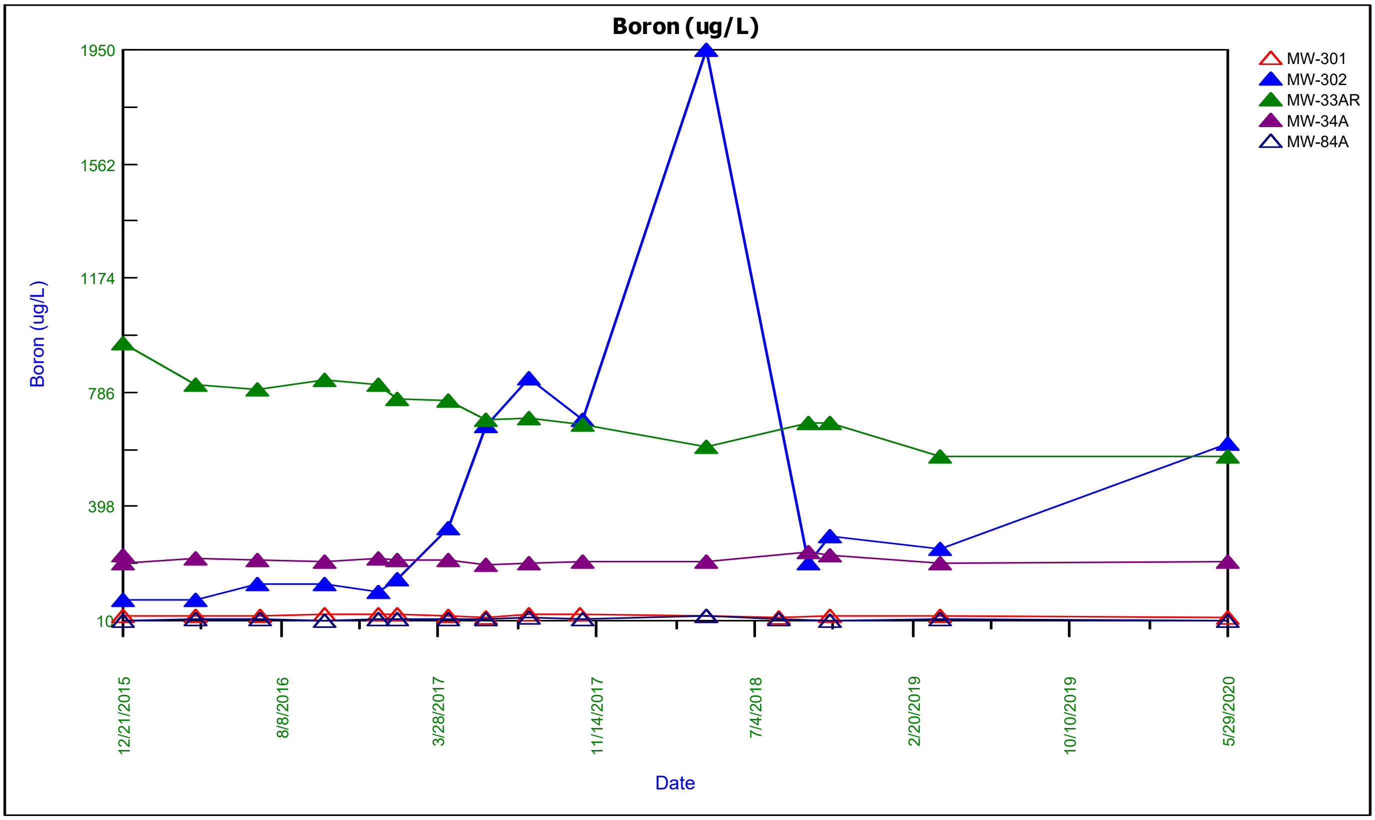
WATER TABLE MAP
MAY 2020

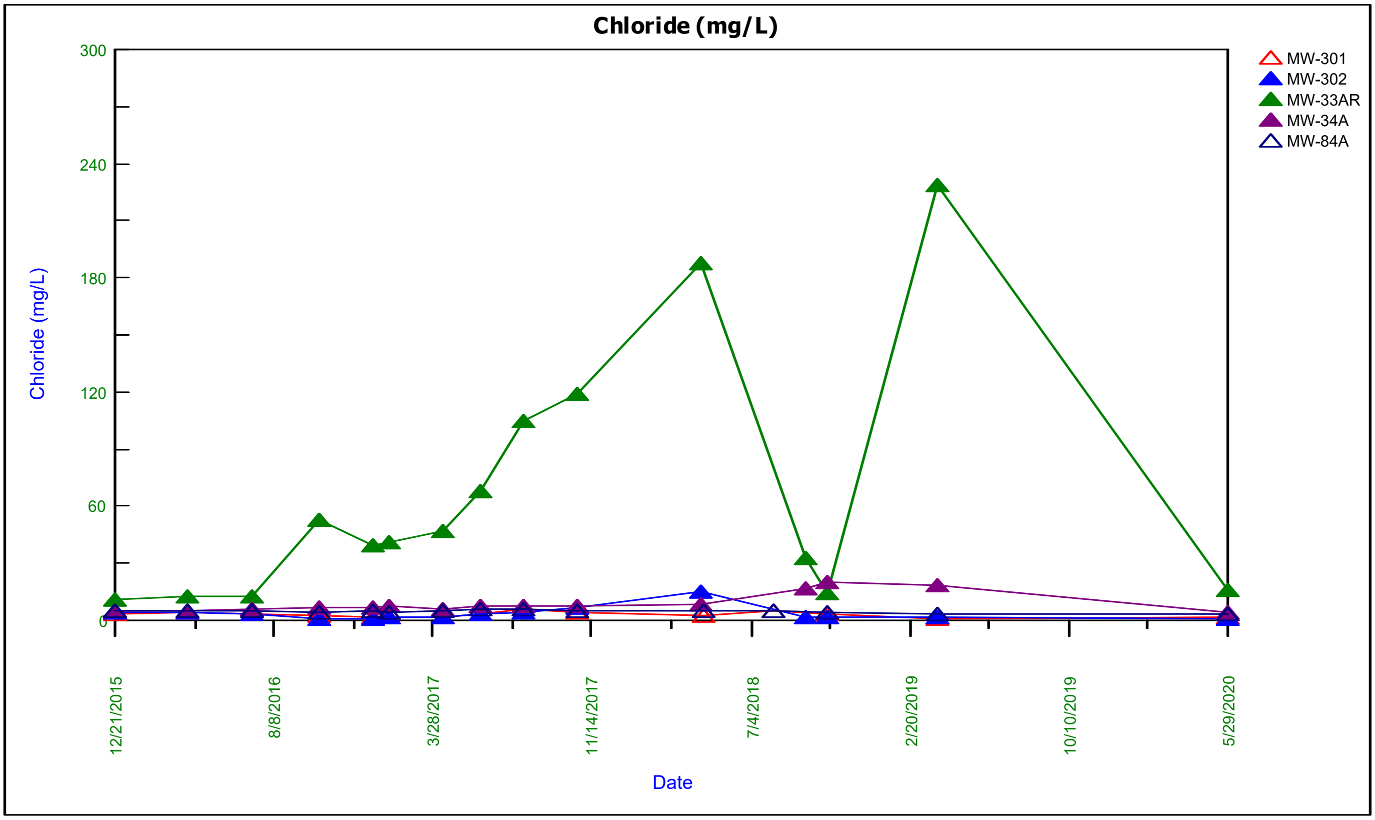
FIGURE
3

\\10.2.18.8\data\Projects\25220067.00\Drawings\ASD Mod 1-3 LF\Water Table Map 2020.dwg, 9/25/2020 10:02:26 AM

Appendix A

Trend Plots for CCR Wells


Boron (ug/L)
Boron (ug/L)
1950
1562
1174
786
398
10
12/21/2015
8/8/2016
3/28/2017
11/14/2017
7/4/2018
2/20/2019
10/10/2019
5/29/2020
Date
MW-301
MW-302
MW-33AR
MW-34A
MW-84A


Chloride (mg/L)
Chloride (mg/L)
300
240
180
120
60
0
12/21/2015
8/8/2016
3/28/2017
11/14/2017
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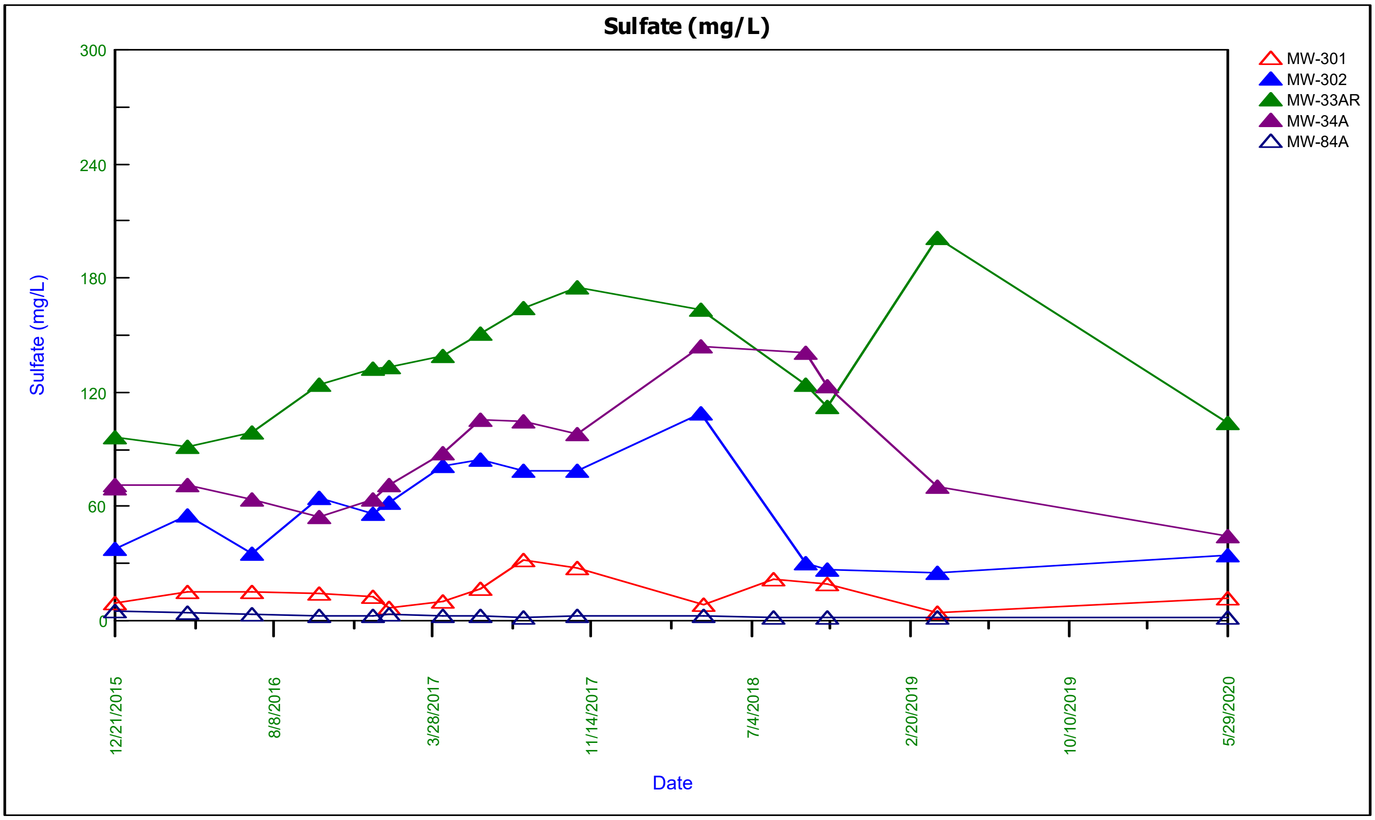
MW-302
MW-33AR
MW-34A
MW-84A


Sulfate (mg/L)
Sulfate (mg/L)
300
240
180
120
60
0
12/21/2015
8/8/2016
3/28/2017
11/14/2017
7/4/2018
2/20/2019
10/10/2019
5/29/2020
Date
MW-301
MW-302
MW-33AR
MW-34A
MW-84A

Appendix B

Feasibility Study Water Quality Information

1370

FEASIBILITY STUDY
PROPOSED FLY ASH AND/OR SCRUBBER SLUDGE
DISPOSAL FACILITY-COLUMBIA SITE
WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

Jan 78 C 7134

conceivable that groundwater flow in the area north of Murray Road may be altered such that contaminants derived from the present ash settling basin might be diverted southerly towards the homes along Murray Road. These questions would have to be addressed in greater detail, consistent with the goals of Wisconsin Power and Light Company.

WATER QUALITY

During the first two weeks of December, 1977, 64 water samples were obtained from surface waters and groundwater monitoring wells at the Columbia Energy Center. The purpose of the sampling was to assess background water quality in the vicinity of the proposed disposal site. The sampling stations included 59 monitoring wells, the cooling lake, ash settling pond, the drainage ditch carrying the ash pond discharge waters and the agricultural drainage ditch along the southern boundary of the site. Due to the large number of sampling stations, the analyses were limited to pH, specific conductance, iron, calcium, magnesium, sulfate and chloride. The analytical data is contained in Appendix F and is discussed below.

pH

Most groundwaters found in the United States have pH values ranging from around 6.0 to 8.5. The pH of a water represents the result of a number of interrelated chemical equilibria. This equilibria can be altered shortly after sampling by gains or losses of carbon dioxide, the oxidation of ferrous iron and numerous other chemical reactions. Thus, pH measurements must be taken shortly after obtaining the sample. For this study, the pH of samples was determined immediately upon return to the laboratory.

Within the proposed site boundaries at the Columbia Energy Center, pH values ranged between 6.3 and 8.1 and averaged 7.5. Typically, the lower pH values were observed in the lowland areas and wetlands, probably as a result of acidic organic soils. The pH of water in the ash disposal settling pond and the cooling lake was 11.4 and 8.3, respectively.

SPECIFIC CONDUCTANCE

Specific conductance, or conductivity, is the ability of a substance to conduct an electric current. The conductance determination is correlative with the dissolved-solids concentration. Conductivity, however, is temperature dependent and thus requires the reference of specific conductance measurements to a standard temperature. The values discussed here are referred to 25°C.

The specific conductance of groundwater in the study area ranged from 220 umhos/cm to a maximum of 2600 umhos/cm. The highest conductivity readings were observed in monitoring wells located along the coal storage area and the drainage ditch carrying the ash pond discharge where values up to 2600 umhos/cm were measured. The conductivity of the ash pond effluent was 1380 umhos/cm. This data appears to confirm earlier speculation of infiltration of effluent from the ash pond discharge channel and from the coal storage area into the groundwater. Conductance within the proposed site boundaries averaged approximately 465 umhos/cm.

Conductivity in the ash disposal settling pond was measured at 1510 umhos/cm. Shallow monitoring wells M-6 and 39A, located adjacent to the pond also exhibited elevated values of 1160 umhos/cm and 1800 umhos/cm, respectively.

High conductivities were also observed along U. S. Highway 51 at monitoring wells 51A and 51B. The chloride data, discussed below, indicates infiltration of road salt has probably occurred at this location.

Specific conductance measurements obtained in the vicinity of the proposed disposal site are shown on Drawing C 7134-15.

IRON

The element iron is an abundant element found in most rocks and soil. It generally occurs as sulfides and oxides in igneous and metamorphic rocks and as iron oxide and hydroxide cementing materials in coarse-grained sedimentary rocks.

Ferrous iron is unstable in the presence of oxygen where it is bound to hydroxide anions as $2Fe(OH)_3$.

$$2Fe^{++} + 4HCO_3^- + H_2O \rightleftharpoons 2Fe(OH)_3 + 4CO_2$$

If subjected to a strong reducing environment, such as a marsh, the reaction is reversed and iron goes back into solution. The amount which dissolves is related to a number of variables including the velocity with which water moves through this environment.

The U. S. Public Health Service recommends an iron concentration of less than 0.3 mg/l in water used for drinking and culinary purposes. Laundry and porcelain tend to be stained when concentrations reach 0.5 to 1.0 mg/l. At this level it can also be tasted.

The presence of iron under the proposed disposal area in the majority of cases was below the detection limit of 0.1 mg/l. In monitoring wells 5 and 18, located in or near the central marsh area, iron increased to 10 mg/l and 5.7 mg/l, respectively. In the southern marsh, monitoring wells exhibited concentrations between 0.5 mg/l and 6.1 mg/l. Although the iron concentration in the cooling lake was below the detection limit, downgradient wells 44 and 30A located on the cooling lake dike yielded values of 11 mg/l and 26 mg/l iron respectively. Boring logs indicated trace amounts of organic material at the base of the dike which is probably the reason for the high concentrations observed. At the same location, iron in well 30B installed to a depth of 100 feet below the surface was below 0.1 mg/l. Thus, the occurrence of high iron concentrations in this area appears restricted to groundwater in the upper portion of the aquifer where organic material is present and conditions are favorable for the dissolution of iron.

The ash pond discharge in the drainage ditch paralleling the west site boundary showed an iron concentration of 3.7 mg/l. Shallow monitoring wells 33A and 34A adjacent to the ditch indicated less than 0.1 mg/l iron.

North of Murray Road the iron concentration in monitoring wells in the marsh and uplands were typically less than 0.1 mg/l. Although the ash basin had less than 0.1 mg/l iron, several wells along cross-section F-F' showed anomalously high values (#M6-2.3 mg/l; #47-16 mg/l; #51B-21 mg/l).

CALCIUM

Calcium, because of its relative abundance and mobility, is the principle cation in most natural fresh water. Calcium is a constituent of many rock types but is found in greatest quantities in waters leaching deposits of limestone and dolomite. In sandstone and other detrital rock, calcium carbonate is a common cement between grains.

Monitoring wells located within the site boundaries exhibited calcium concentrations between 30 mg/l and 66 mg/l and averaged about 42 mg/l. Similar to iron, the concentrations of calcium in monitoring wells along cross-section F-F' were anomalously high, up to 150 mg/l calcium. Water table wells along the drainage ditch carrying the ash pond discharge averaged 83 mg/l while the ash pond effluent contained 28 mg/l. Generally the amount of calcium in groundwater decreased with depth. Nested monitoring wells typically showed somewhat lower concentrations of calcium in the deeper wells.

MAGNESIUM

As a relatively abundant element on the earth's crust, the principle sources of magnesium in natural waters are considered to be ferromagnesian minerals in igneous rocks and magnesium carbonate in carbonate rocks (limestone and dolomite). Waters in which magnesium is the predominant cation are somewhat unusual. Like calcium, magnesium imparts the property of hardness to water and is, therefore, of concern to industrial users.

Generally, concentrations of magnesium were 1/3 to 1/2 of the calcium levels. Magnesium concentrations within the site boundaries ranged between 10 mg/l and 36 mg/l and averaged 27 mg/l. Similar to calcium and iron, higher magnesium values were observed, in general, north of Murray Road and especially in monitoring wells along cross-section F-F'.

SULFATE

Sulphur is widely distributed in reduced form in both igneous and sedimentary rocks as metallic sulfides and when present in sufficient concentrations, constitutes ore of economic importance. During weathering processes with aerated water, the sulfides are oxidized to sulfate ions and are dissolved into water. Pyrite (FeS_2) crystals often occur in sedimentary rocks and are particularly associated with biogenic deposits such as coal which were deposited under strongly reducing conditions.

The concentrations of sulfate in groundwater in the vicinity of the proposed disposal site ranged from less than 1 mg./l to 1,200 mg./l of sulfate. (Refer to Drawing C 7134-15.) Typically, within the site boundaries concentrations averaged approximately 12 mg./l. Near the coal storage area, however, significant increases were observed. Observation wells 26A, 26B, and 42 exhibited concentrations between 900 and 1100 mg./l. The depth of sulfate enrichment in groundwater, near the coal pile, appears to extend to considerable depths, indicated by relatively high sulfate concentrations in Well 26B sealed 100 feet below ground surface. The oxidation of pyrite minerals in the coal leaching into the groundwater is probably the major source of the high concentrations observed.

Sulfate concentrations in the ash disposal settling pond were 520 mg./l. In the ditch carrying the ash pond discharge, the effluent is treated with sulfuric acid which results in precipitation of barium sulfate and aluminum hydroxide (personal communication, Merlin Horn, 1978). Consequently, the sulfate concentration of the effluent waters is lowered considerably to 13 mg./l. Well 33A, however, located near the point of effluent discharge, exhibited 1200 mg./l sulfates.

CHLORIDE

Chloride is generally present in much lower concentrations in rocks than many of the other major constituents of natural water. Important sources, however, are associated with sedimentary rocks, particularly the evaporites. The chemical behavior of chloride in natural water is relatively inert compared to the other major ions. There are few oxidation-reduction reactions and no significant chemical complexing reactions which chloride enters into. In addition, chloride ions are not significantly adsorbed on mineral surfaces. For these reasons, chloride is commonly used as a tracer in groundwater.

Chloride concentrations in groundwater in the vicinity of the Columbia Energy Center typically range between 0.5 mg./l and 30 mg./l. The highest concentrations in monitoring wells tended to be located adjacent to U. S. Highway 51 where the use of road salt has resulted in the percolation of chloride into the groundwater. Monitoring Wells 51A and 51B located in a low area north of Murray Road along U. S. Highway 51, yielded chloride concentrations in excess of 200 mg./l. Two other wells, 52A and 19, also located along U. S. Highway 51, yielded values of 30 mg./l and 42.5 mg./l chloride, respectively.

Within the proposed site boundaries, the chloride concentration averaged 7.1 mg./l. Excluding the few wells adjacent to U. S. Highway 51 exhibiting elevated concentrations, no other significant trends in the occurrence of chloride were observed.

SUMMARY

In summary, the groundwater in the vicinity of the proposed disposal site exhibited a somewhat alkaline pH. In lowland areas, the pH was typically below 7.0, probably a result of the presence of acidic organic soils.

Specific conductance within the proposed site averaged 465 umhos/cm. Conductivities up to 2600 umhos/cm were observed, however, in the vicinity of the coal storage area, the present ash disposal pond and ash pond effluent channel where infilatration of water from these sources is occurring into the groundwater system.

The groundwater typically exhibted relatively low iron concentrations although, locally, concentrations in excess of drinking water standards were observed in about 20% of the wells. The occurrence of the higher iron concentrations appears to be related to the presence of organic soils.

Groundwater at the proposed site also tended to exhibit high calculated hardness (216 mg./l) based on average observed values for calcium (42 mg./l) and magnesium (27 mg./l). Dissolution of limestone and dolomite rocks in the glacial drift are the probable sources of these elements in the groundwater.

Enrichment of sulfate in groundwater has occurred as a result of leaching of pyrite (FeS_2) minerals from the coal storage area where concentrations up to 1200 mg./l were observed. The depth of this enrichment appears to extend beyond the maximum depth into the aquifer investigated. Sulfate concentrations decreased rapidly away from the coal storage area to an average of 12 mg./l within the proposed site boundaries. Other local sources of sulfate in groundwater appear to be related to the present ash settling pond.

The concentration of chloride within the proposed site averaged 7.1 mg./l. Higher levels were generally observed in wells adjacent to U. S. Highway 51 where the infiltration of road salt has locally raised chloride concentrations.

The above interpretations are based on one round of water quality sampling only and should be considered as preliminary in nature. High sulfate and chloride concentrations observed at greater depths may be a temporary condition resulting from contamination of spoil backfill materials with coal dust or salt, respectively, during installation of the monitoring well. Future sampling of these monitoring wells will help to distinguish short term contamination from actual conditions existing in the aquifer.

APPENDIX F
WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
1A	7.6	550	17.	6.5	52	37	<0.1
1B	8.05	460	16.	10.5	39	31	<0.1
2	7.8	527	14.	2.5	45	32	<0.1
3A	7.5	548	13.	2.5	58	36	<0.1
3B	8.1	506	14.	7.0	50	34	<0.1
4	7.8	580	10.	4.0	59	34	<0.1
5	6.3	560	210.	12.5	13	29	10
16	7.6	408	12.	1.5	42	28	<0.1
17	6.45	350	30.	16.5	16	13	0.6
18	6.45	380	4.	4.5	33	22	5.7
19	7.9	570	10.	42.5	44	24	<0.1
20	8.0	340	10.	5.0	36	24	<0.1
21	6.9	220	20.	4.5	23	10	0.1
24A	7.45	775	18.	6.0	76	52	0.1
24B	7.85	440	15.	6.0	43	31	0.1
25	8.1	300	10.	2.5	29	20	<0.1
26A	7.2	2100	900	17.0	140	48	1.5
26B	7.5	2600	1100	16.5	43	7.0	0.2
27	7.15	400	6.	8.0	23	18	<0.1
28A	7.75	500	3.	0.5	48	31	<0.1
28B	7.6	480	4.	3.5	39	28	<0.1
29A	7.8	330	16.	1.5	33	21	0.5
30A	6.75	920	64.	11.0	38	30	26
30B	7.6	770	210	21.0	37	19	<0.1
33A	8.2	2500	1200	24.0	83	50	<0.1
33B	7.9	390	22.	6.5	31	27	0.2
34A	7.7	680	140.	10.0	58	45	0.1
34B	7.7	1700	660	15.0	48	22	<0.1
35	6.8	740	<1.0	4.0	66	33	2.9
36	6.8	740	<1.0	3.5	53	35	6.1
37A	7.7	460	9.	4.0	48	31	0.8
37B	7.5	630	73.	7.5	71	35	<0.1
39A	7.5	1800	350	22.0	180	100	0.1
39B	7.9	330	560	20.5	31	22	0.1
40A	8.0	630	140	8.5	43	29	<0.1
40B	8.1	330	17.	3.0	31	22	<0.1
41	6.8	590	16.	11.0	58	27	9.3

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
42	7.4	2400	900	17.5	50	12	0.5
44	6.9	490	<1.	16.5	39	23	11
45	7.6	390	14.	3.0	40	25	<0.1
46A	7.3	1100	21.	15.5	140	82	<0.1
46B	7.8	470	25.	17.5	40	26	<0.1
47	6.6	1200	3.	8.0	140	40	16
48A	7.3	620	15.	8.0	62	37	<0.1
48B	7.1	520	22.	20.0	43	29	0.2
49	7.15	730	6.	3.5	75	41	<0.1
50A	7.6	520	28.	15.5	51	34	<0.1
50B	7.5	410	21.	18.0	31	21	<0.1
51A	6.1	1850	8.	205.	65	40	<0.1
51B	7.2	1250	23.	275.	57	36	21
52A	7.7	450	16.	30.5	36	17	<0.1
52B	7.4	430	40.	17.5	32	20	<0.1
53	7.75	450	27.	10.5	39	28	<0.1
54A	7.8	350	12.	4.0	34	21	0.1
54B	7.55	390	15.	5.5	40	24	0.1
55B	7.9	340	23.	17.5	32	22	0.1
56	7.8	450	22.	9.5	43	28	0.1
57	7.85	380	17.	7.0	38	24	0.1
M-6	7.0	1160	5.	7.0	150	91	2.3
Cooling Lake	8.3	370	31.	18.0	34	21	<0.1
Ash Pond Effluent	7.45	1380	13.	4.0	28	1.2	3.7
Ash Pond	11.4	1510	520.	23.5	29	0.2	<0.1
Drainage Ditch (A)	7.8	500	21.	7.0	43	29	<0.1
Drainage Ditch (B)	9.05	1780	750	14.0	42	5.4	<0.1

DEC 19 1979

APPENDICES TO

SUPPLEMENTARY FEASIBILITY STUDY REPORT AND PRELIMINARY ENGINEERING CONCEPTS
COLUMBIA SITE
WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

D. N. R. APPROVED
DATE 9/3/80
Nile Ostenso, Hydro

WARZYN
ENGINEERING INC

APPENDIX I

WATER QUALITY DATA - DECEMBER 1978

WARZYN
ENGINEERING INC

12/78

C 7134

WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
1A	7.3	530	30	3.1	54	35	<0.1	-
1B	7.0	470	67	6.1	49	30	<0.1	-
2	7.25	458	91	<.5	48	24	<0.1	-
3A	7.0	560	36	<.5	61	31	<0.1	-
3B	7.15	530	52	35.7	37	33	<0.1	-
4	7.2	750	69	5.8	49	30	<0.1	-
5 [illegible]	6.35	1,650	670	14.1	14	13	<0.1	-
16	6.9	390	69	1.0	49	23	1.7	-
17	5.55	295	57	16.3	14	8.6	<0.1	-
18	5.9	430	10	4.2	47	21	0.2	-
19	7.4	765	75	4.2	51	28	1.1	-
20	7.4	380	26	1.6	39	26	<0.1	-
21	5.7	250	54	10.4	15	8.3	<0.1	-
24A	7.2	730	36	1.6	65	42	0.2	-
24B	7.2	470	10	7.3	42	28	<0.1	-
25	7.0	335	29	7.8	39	21	<0.1	-
26A [illegible]	7.4	2,250	650	12.6	32	8.6	0.2	-
26B	6.8	2,530	840	20.8	49	18	<0.1	-
27	6.9	410	24	4.2	40	24	<0.1	-
28A	7.2	500	61	0.5	45	28	0.4	-
28B	7.0	465	6	2.1	39	26	<0.1	-
29A	7.1	410	24	3.6	31	22	0.1	-
30A near ditch	5.8	1,140	15	<0.5	97	56	0.1	-
30B in wash	6.65	835	160	14.6	37	20	38	-
33A near ditch	7.8	1,970	830	16.7	21	8.9	<0.1	-
33B [illegible]	7.5	380	31	7.3	24	27	<0.1	-
34A [illegible]	7.25	560	46	4.2	53	33	<0.1	-
34B [illegible]	8.5	1,575	730	21.9	28	29	<0.1	-
35	6.7	545	61	3.6	60	26	0.1	-
36	6.4	515	5.0	2.6	43	24	1.0	-
37A	7.05	438	30	3.7	50	28	4.8	-
37B	6.7	325	18	7.3	1.0	0.5	<0.1	-
39A	6.35	1,260	33	13.6	70	7.6	<0.1	-
39B	6.7	385	25	4.2	30	21	0.1	-
40A [illegible]	7.35	483	40	<0.5	48	24	<0.1	<.05
40B	7.25	343	4	4.2	21	14	<0.1	-
41	6.1	640	54	19.8	43	32	<0.1	-

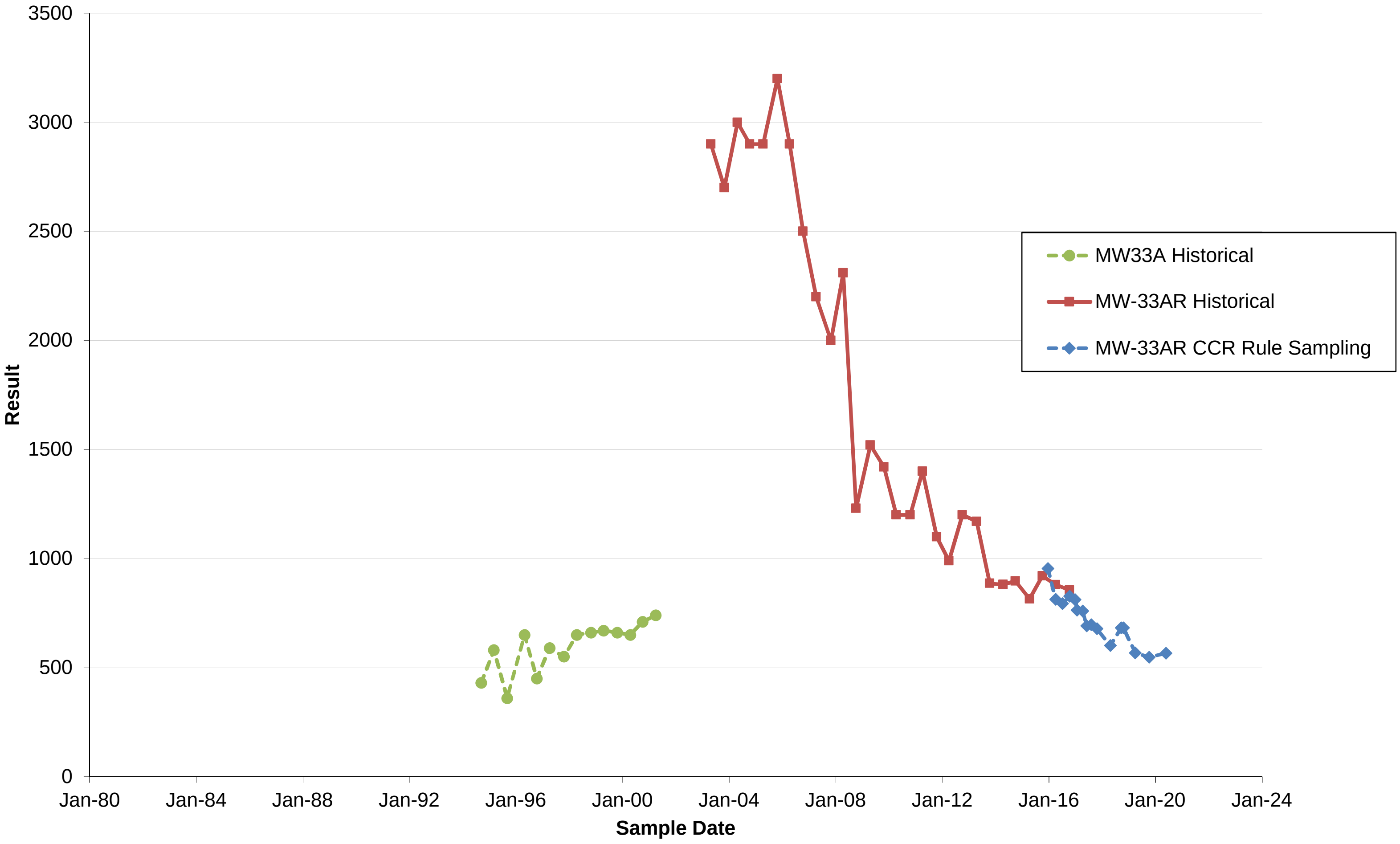
WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
42 near ditch on west	7.15	2,050	910	15.6	23	7.5	0.1	-
44 [illegible]	6.15	710	6	0.5	56	27	3.5	-
45	7.2	420	32	1.0	44	26	<0.1	-
46A [illegible]	7.0	560	93	<0.5	130	75	<0.1	<0.05
46B [illegible]	6.5	1,290	170	20.8	46	30	<0.1	<0.05
47 [illegible]	7.3	958	120	<0.5	110	48	<0.1	-
48A [illegible]	6.15	640	59	<0.5	42	51	<0.1	<0.05
48B [illegible]	6.8	450	23	5.2	40	27	<0.1	<0.05
49	7.0	880	26	2.1	93	58	0.1	-
50A	7.4	660	25	17.7	60	36	<0.1	-
50B	7.1	405	16	17.7	38	23	<0.1	-
51A [illegible]	7.0	1,170	57	135	66	31	<0.1	-
51B [illegible]	7.3	1,410	22	330	46	39	<0.1	-
52A	7.0	370	110	18.5	35	10	<0.1	-
52B	7.0	595	43	52.5			0.1	-
53	Frozen							
54A	7.5	345	10	1.0	36	22	<0.1	<0.05
54B	Frozen							
55B	7.3	505	26	15.6	52	29	<0.1	<0.05
56	Frozen							
57	Frozen							
M-6								
58 [illegible] old	6.55	1,265	140	<0.5	110	65	0.1	-
59 [illegible]	6.8	925	40	<0.5	86	60	<0.1	-
60 Hwy [illegible]	7.2	1,510	54	4.7	130	85	<0.1	-
61A [illegible]	6.85	590	39	30.2	58	31	<0.1	-
61B	7.2	505	6	13.5	48	29	<0.1	-
62 [illegible] Hwy [illegible]	6.7	1,517	72	178	120	53	<0.1	-
64	6.9	670	100	26.8	63	36	0.8	-
65 ← Hwy?	7.2	830	57	17.8	78	50	<0.1	-
66	6.5	680	55	40	66	24	3.6	-

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
67	7.0	560	100	1.0	57	32	1.0	-
68A	7.6	440	32	2.1	40	27	<0.1	-
68B	7.2	400	36	1.0	42	25	<0.1	-
70A Martin Marietta	7.5	440	20	<0.5	27	37	<0.1	-
70B	7.3	520	25	5.2	51	34	<0.1	-
72A Martin Marietta	6.45	860	11	<0.5	100	41	1.8	-
72B	8.4	230	45	<0.5	17	19	<0.1	-
M-4	7.6	864	180	26.1	20	11	<0.1	0.39
MM-4			2	2.6	14	21	0.9	-
Cooling Lake at 1	7.7	355	36	13.6	31	21.2	<0.1	-
Ash Pond at 2	11.4	3,210	1,100	22.9	34	<0.1	<0.1	-
Ash Pond at 3	8.7	725	34	21.9	48	16	<0.1	-
Ash Pond Effluent at 4	6.7	3,090	1,400	25.0	39	0.4	<0.1	-
Drainage Ditch at 5	7.2	730	74	33.9	56	38	<0.1	-
Drainage Ditch at 6	7.35	2,750	640	18.8	34	7.5	<0.1	-
Drainage Ditch at 7	8.05	1,780	740	27.1	31	0.2	<0.1	-

Appendix C

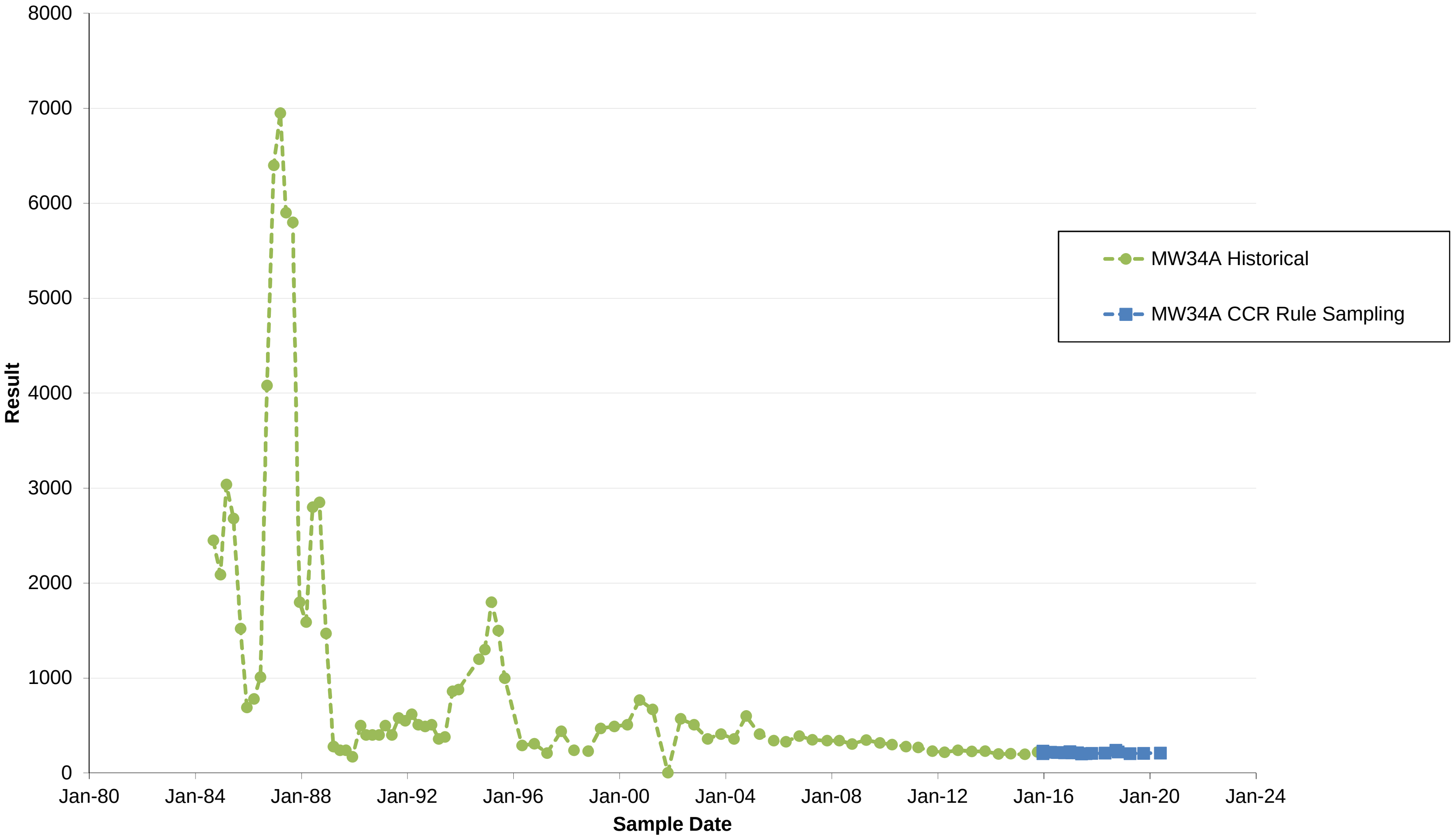
Long-Term Concentration Trend Plots

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33A and MW-33AR - Boron (µg/l as B)



I:\25220067.00\Deliverables\2020 May ASD COL MOD 1-3\Graphs\[Bo_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Boron (µg/l as B)



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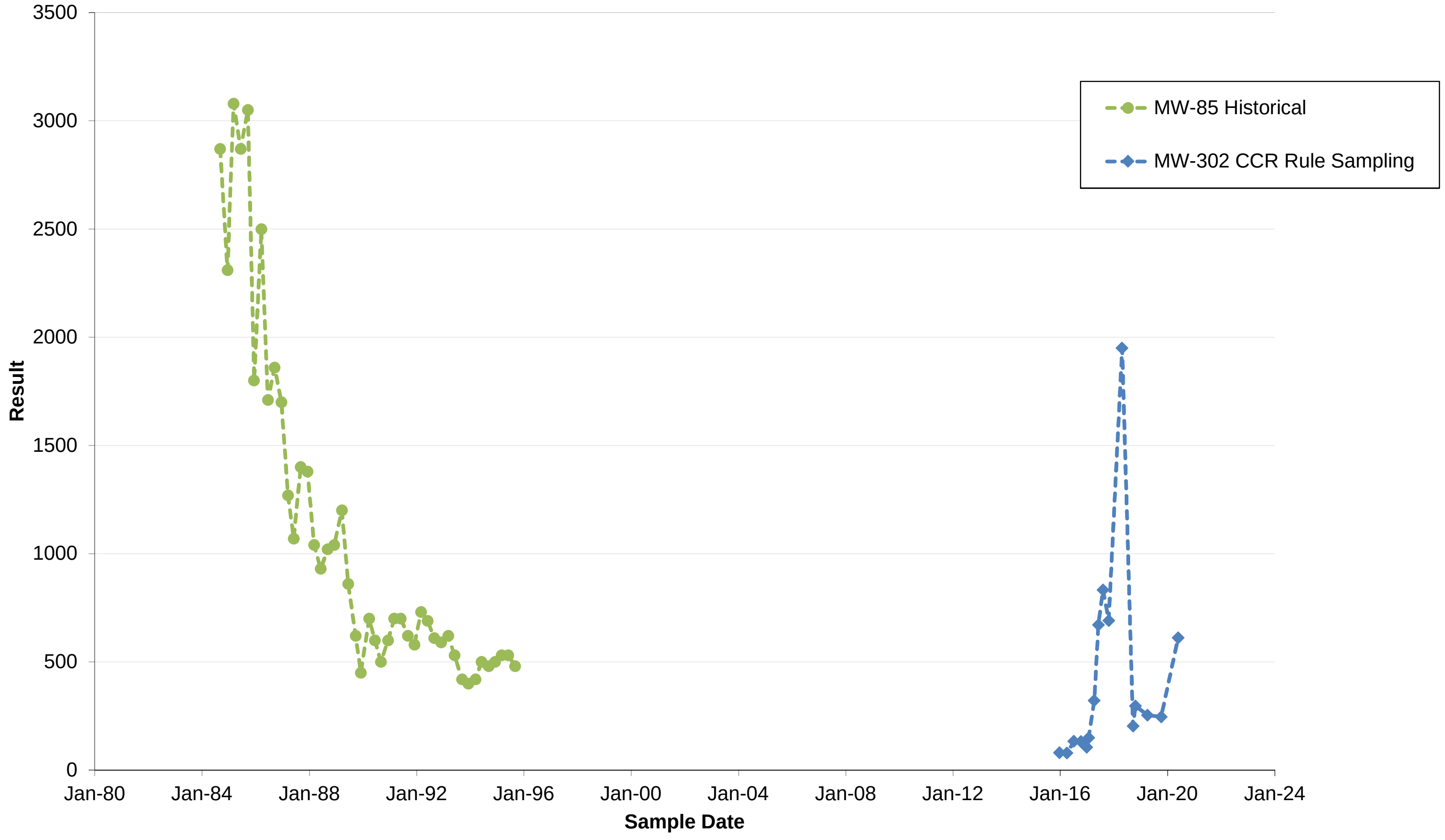
Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-302 and MW-85 - Boron (µg/l as B)



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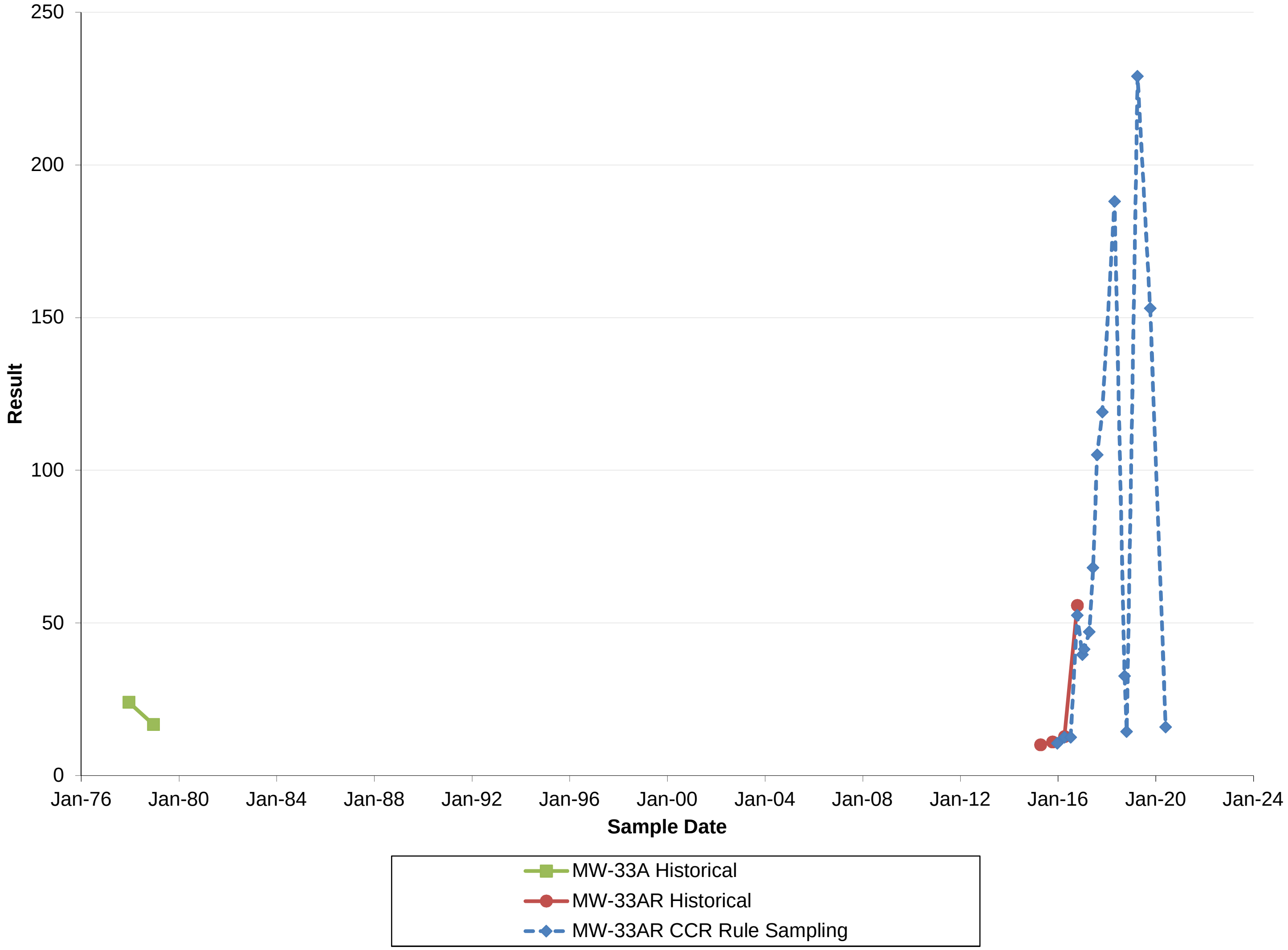

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Chloride (mg/l as Cl)

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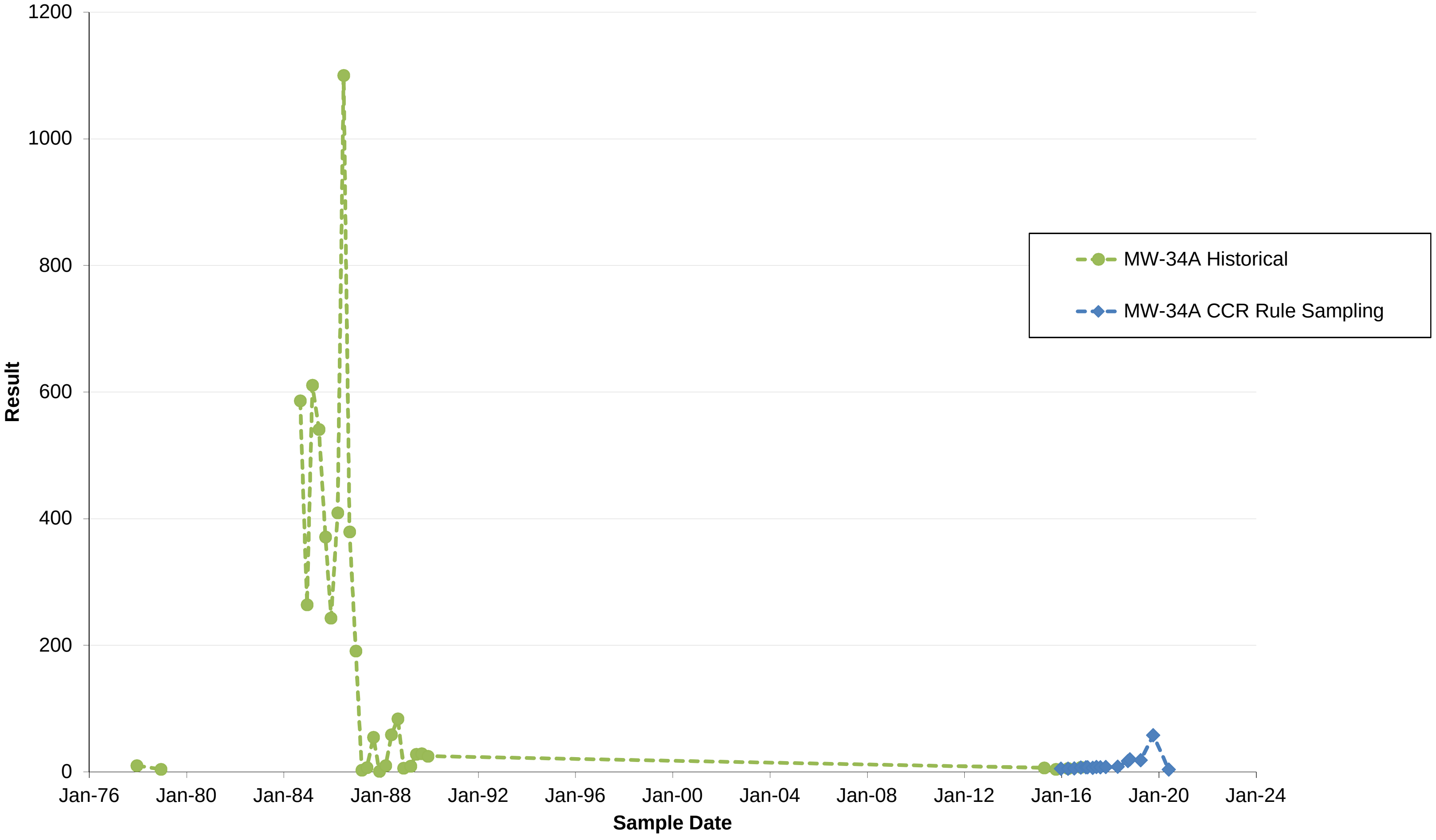
Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Chloride (mg/l as Cl)



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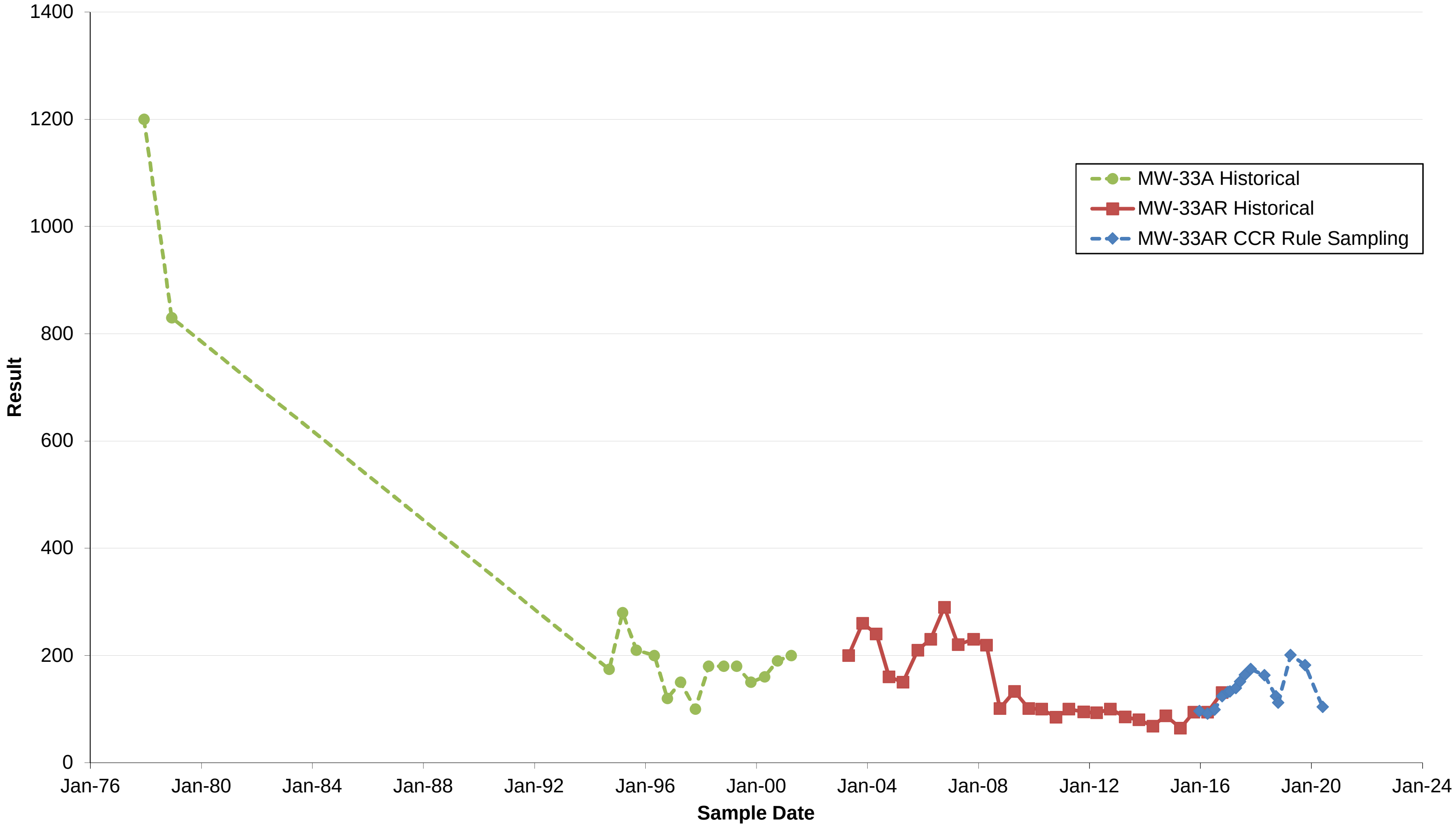
Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Sulfate (mg/l as SO4)



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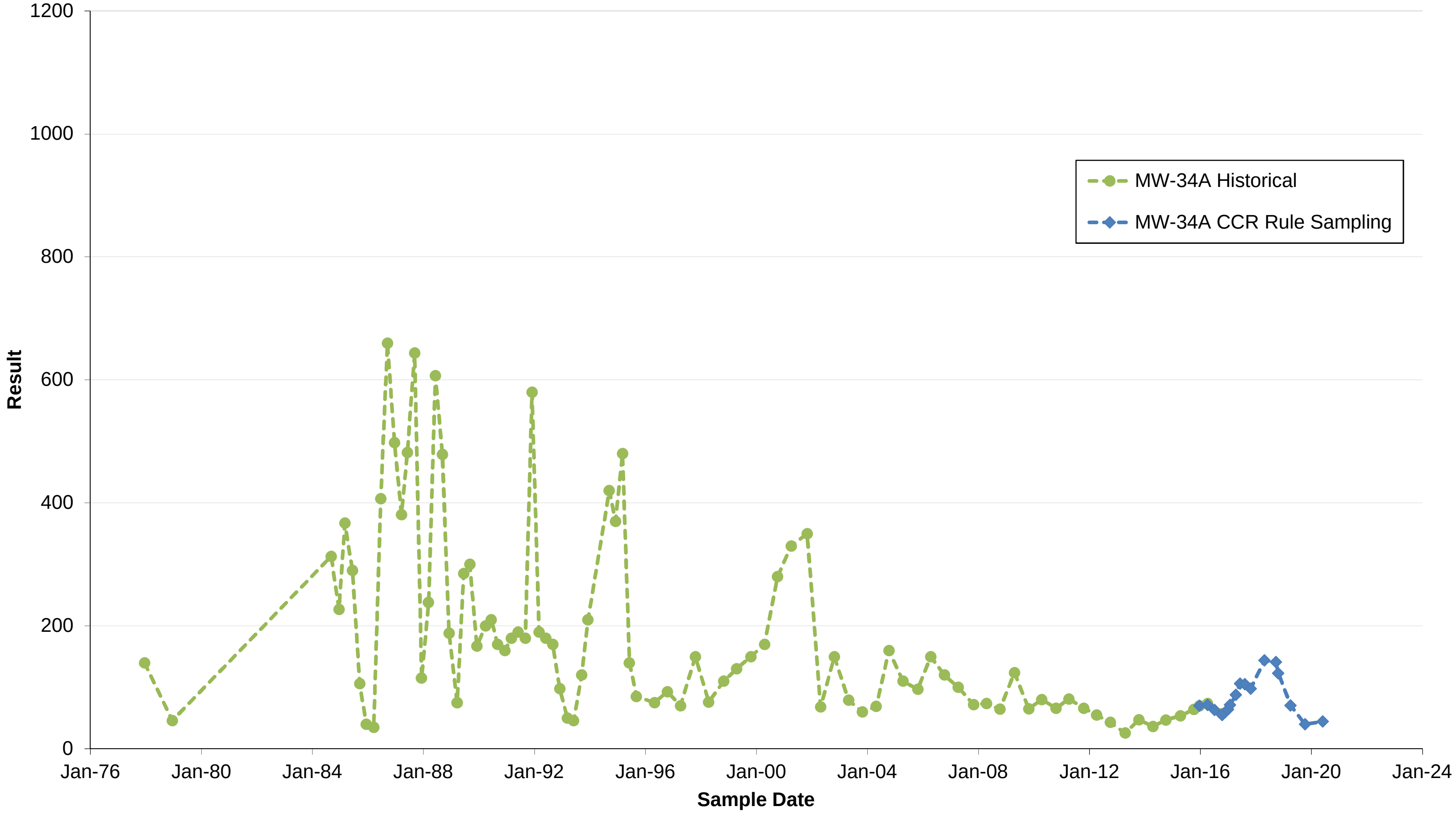
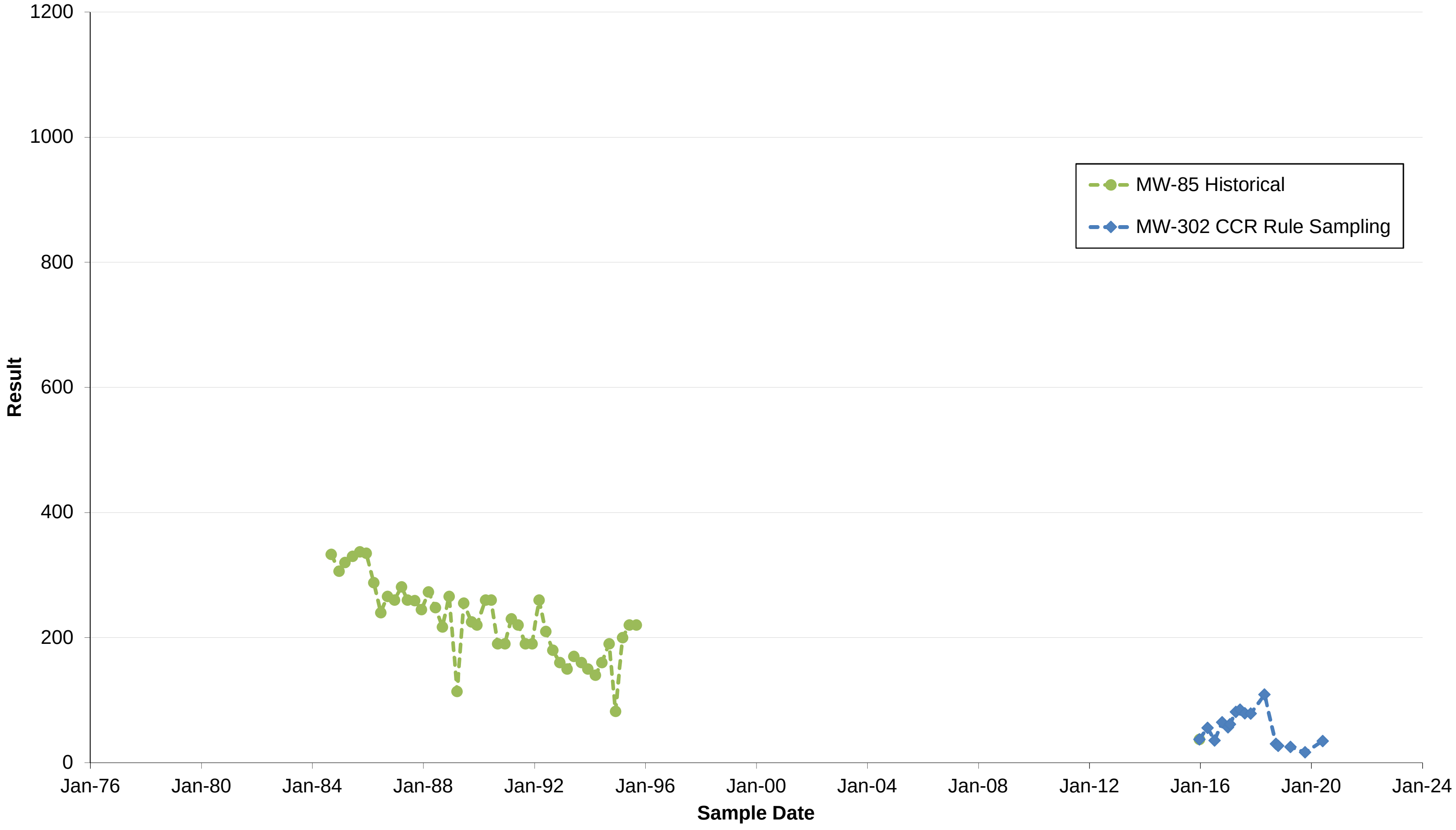
Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-34A - Sulfate (mg/l as SO4)



I:\25220067.00\Deliverables\2020 May ASD COL MOD 1-3\Graphs\[SO4_COL Dry.xlsx]MW-34A CCR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-85 and MW-302 - Sulfate (mg/l as SO4)



Appendix D

Historical Groundwater Flow Maps

LEGEND

·········	PROPOSED PROJECT AREA
63 720.29	OBSERVATION WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION
	BORING LOCATION AND NUMBER
	WETLANDS
	TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL: 20 FT.)
■	PRIVATE RESIDENCES (ASSUMED LOCATIONS OF PRIVATE WATER SUPPLY WELLS)
▨	COMMERCIAL BUILDINGS (ASSUMED LOCATIONS OF POSSIBLE PUBLIC WATER SUPPLY WELLS)
→	SURFACE WATERS (STREAMS OR DRAINAGE DITCHES) ARROWS INDICATE DIRECTION OF FLOW
□	OTHER BUILDINGS (GARAGES, BARNS, ETC.)
	HIGH CAPACITY WELLS
—790—	WATER TABLE CONTOURS (CONTOUR INTERVAL: 1 FT.)
➡	DIRECTION OF GROUNDWATER FLOW

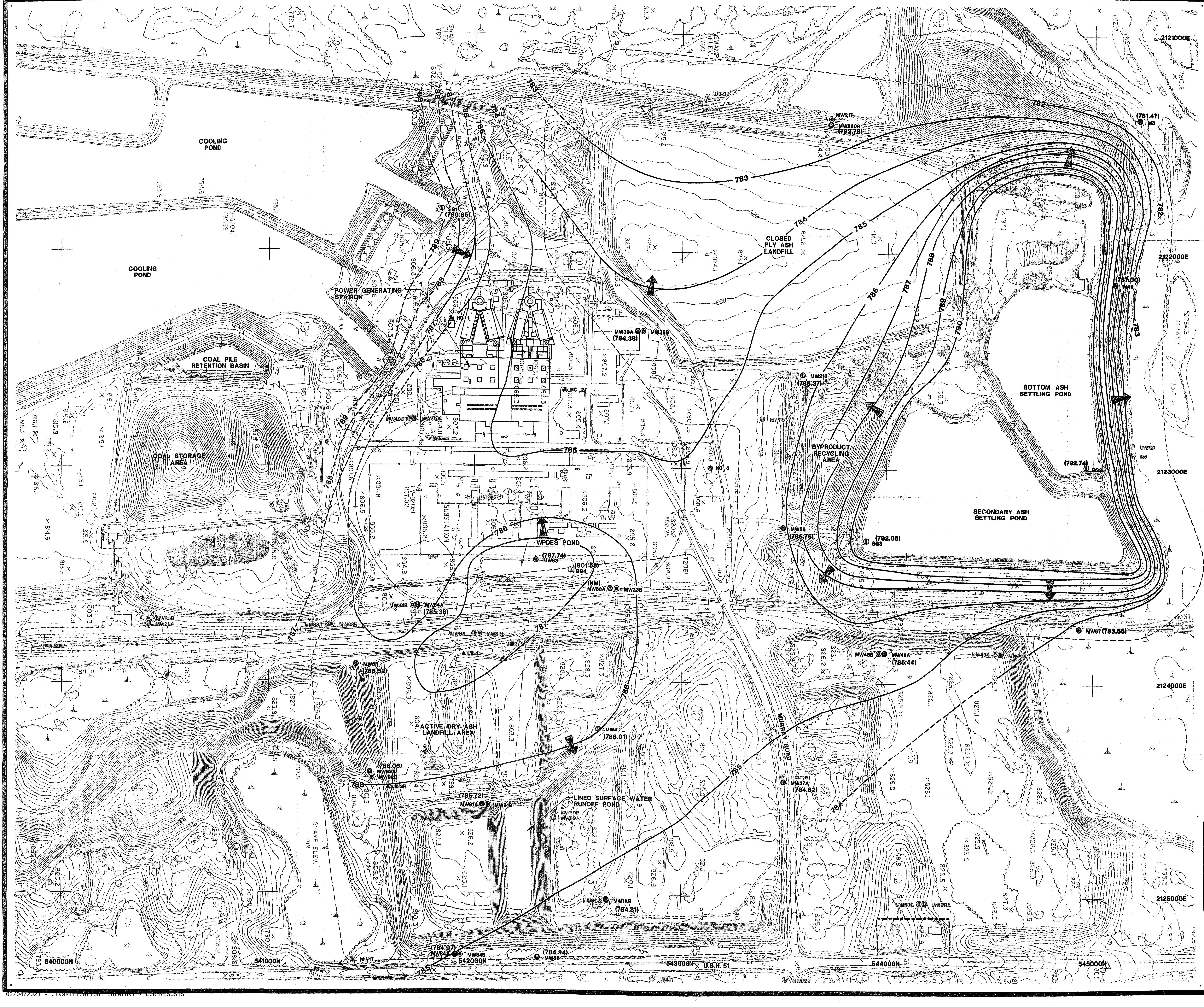
NO	BY	DATE	REVISION	APP'D

WATER TABLE CONTOUR MAP 2/4/81

PLAN OF OPERATION – ASH DISPOSAL FACILITY
COLUMBIA SITE
WISCONSIN POWER & LIGHT COMPANY
PART OF SECTIONS 27 & 34, T12N, R9E
TOWN OF PACIFIC COLUMBIA CO. WISCONSIN

WARZYN ENGINEERING INC

DRAWN TDH	SCALE 1"=300'	SHEET 39 OF 39
CHECKED RJK	DATE 2/10/81	DRAWING NO. C7134-94
APPROVED		
REFERENCE		PRINTED 8/3/88



LEGEND

	PROPERTY LINE
	EXISTING RAILROAD TRACKS
	EXISTING GROUND CONTOUR
	CONTOUR DEPRESSION
	EXISTING PAVED ROAD
	EXISTING UNPAVED ROAD
	EXISTING FENCE
○ ☐ □	EXISTING BUILDING
	EXISTING SPOT ELEVATION
	TREES AND/OR BRUSH
	WETLAND AREA
	EDGE OF WATER
HC 1	WATER SUPPLY WELL
MW91A	WATER TABLE WELL
MW91B	PIEZOMETER
	ABANDONED WATER TABLE WELL
	ABANDONED PIEZOMETER
SG1	STAFF GAUGE
▲LS-1	LYSIMETER
	DESIGN MANAGEMENT ZONE
	PROPERTY LINE
O.S.	OPEN STORAGE
O.H.	OVERHEAD STRUCTURE
E.P.S.	ELECTRICAL POWER STATION
T	TANK
W	WALL
(785.31)	WATER TABLE ELEVATION (FT-MSL) (N.M. = NOT MEASURED)
786	GROUNDWATER CONTOUR LINE (1FT INTERVAL- FT. M.S.L.) (DASHED WHERE INFERRED)
➡	GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IS PROVIDED BY WISCONSIN POWER & LIGHT CO. AND IS BASED ON PHOTOS TAKEN ON APRIL 6, 1995 BY AERO-METRIC ENGINEERING, SHEBOYGAN, WI.
2. HORIZONTAL DATUM IS BASED ON THE WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE - DATUM: NAD 83(91).
3. VERTICAL DATUM IS REFERENCED TO U.S.G.S. MEAN SEA LEVEL (MSL). TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
4. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER & LIGHT CO. IN DECEMBER 1994 & NOVEMBER 1996.
5. THE LOCATION OF THE DESIGN MANAGEMENT ZONE DEMARCATION LINE IS APPROXIMATE.
6. WATER ELEVATION USED TO PREPARE THIS MAP WERE MEASURED ON OCTOBER 24, 2002.
7. THE WATER LEVEL AT MW 33A AND MW 33B COULD NOT BE MEASURED DURING OCTOBER 2002 DUE TO AN OBSTRUCTION IN THE WELL CASING.

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT:
ALLIANT ENERGY - WP&L
COLUMBIA ASH PONDS & DRY ASH
DISPOSAL FACILITY

SHEET TITLE:
WATER TABLE MAP
(OCTOBER 2002)

DRAWN BY: defoej	SCALE: 1"=200'	PROJ. NO. 3024.28
CHECKED BY: JMR		FILE NO. WATERTBL.PLT
APPROVED BY: JCO	DATE PRINTED:	FIGURE 3
DATE: JANUARY 2003		

RMT®

744 Heartland Trail
Madison, WI 53717-1934

P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

Plot Data
Design File = j:\03024\28\WATERTBL.plt
User ID = defoej
Plot File = j:\03024\28\WATERTBL.prf
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Rotation = 90.000000
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Levels On = 1,3,5-8,10,11,34,44-47,51,63

Referenced Files
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Ref. File 3 = J:\03024\14\bmrmt.dgn
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Ref. File 5 = •no ref name•
Ref. File 6 = •no ref name•
Ref. File 7 = •no ref name•
Ref. File 8 = •no ref name•
Ref. File 9 = •no ref name•
Ref. File 10 = •no ref name•

Logical Names
(1) bdr
(2) bmc
(3) bmr
(4) •no ref logical•
(5) •no ref logical•
(6) •no ref logical•
(7) •no ref logical•
(8) •no ref logical•
(9) •no ref logical•
(10) •no ref logical•

Levels
(1) 1-5,9,11,63
(2) 1-6,9-27,29-34,36-63
(3) 7,45-47,50,51
(4) •no ref levels•
(5) •no ref levels•
(6) •no ref levels•
(7) •no ref levels•
(8) •no ref levels•
(9) •no ref levels•
(10) •no ref levels•