Prepared for
We Energies

Date
January 31, 2024

Project No.
1940102327

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

CALEDONIA ASH LANDFILL

RAMBOLL Bright ideas. Sustainable change.

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CALEDONIA ASH LANDFILL

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Recipient	**We Energies**
Document type	**Annual Groundwater Monitoring and Corrective Action Report**
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APPENDICES

ACRONYMS AND ABBREVIATIONS

§	Section
40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
B	boron
Ca	calcium
CCR	coal combustion residuals
GWPS	groundwater protection standard
mg/L	milligrams per liter
NA	not applicable
NRT/OBG	Natural Resource Technology, Inc., an OBG Company
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SAP	Sampling and Analysis Plan
SO_4	sulfate
SSI	statistically significant increase
TBD	to be determined
TDS	total dissolved solids

EXECUTIVE SUMMARY

This report has been prepared to provide the information required by Title 40 of the Code of Federal Regulations (40 C.F.R.) Section (§) 257.90(e) for the Caledonia Ash Landfill (CAL) located in Caledonia, Wisconsin.

Groundwater is being monitored at CAL in accordance with the Detection Monitoring Program requirements specified in 40 C.F.R. § 257.94.

No changes were made to the monitoring system in 2023 (no wells were installed or decommissioned).

In 2023, groundwater analytical data was evaluated for statistically significant increases (SSIs) over background concentrations for 40 C.F.R. § 257.94 Appendix III constituents in groundwater monitoring wells at the CAL. The following constituents and wells had SSIs reported in 2023:

- Boron (B) – W08D, W09D, W10D, W49 and W50
- Calcium (Ca) – W08D
- Sulfate (SO_4) – W08D, W09D, W10D, W49 and W50
- Total Dissolved Solids (TDS) – W08D and W50

Alternate Source Demonstrations (ASDs) completed in prior years for these parameters and monitoring locations, with exception of TDS at W50, provide lines of evidence that the SSIs observed during the Detection Monitoring Program were not due to a release from CAL but were either from an error in sampling or analysis or from naturally occurring conditions (*e.g.,* natural variation in groundwater quality). TDS at W50 was addressed in an ASD dated July 5, 2023.

CAL remains in the Detection Monitoring Program in accordance with 40 C.F.R. § 257.94.

1. INTRODUCTION

This report has been prepared by Ramboll Americas Engineering Solutions, Inc. (Ramboll) on behalf of We Energies to provide the information required by 40 C.F.R. § 257.90(e) for CAL located in Caledonia, WI.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a CCR unit must prepare an Annual Groundwater Monitoring and Corrective Action Report for the preceding calendar year that documents the status of the Groundwater Monitoring and Corrective Action Program for the CCR unit (**Section 2**), summarizes key actions completed (**Section 3**), describes any problems encountered, discusses actions to resolve the problems (**Section 4**), and projects key activities for the upcoming year (**Section 5**). At a minimum, the annual report must contain the following information, to the extent available:

1. A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit (**Figure 1**).
2. 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 (**Section 3**).
3. In addition to all the monitoring data obtained under §§ 257.90 through 257.98 (**Tables 1 and 2**), 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 (**Section 3 and Table A**).
4. A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from Detection Monitoring to Assessment Monitoring (**Section 2**) in addition to identifying the constituent(s) detected at a statistically significant increase relative to background levels) (**Table A**).
5. Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.
6. 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 (**Executive Summary**). At a minimum, the summary must specify all of the following:
    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.
    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.
    iii. If it was determined that there was a statistically significant increase over background for one or more constituents listed in Appendix III of § 257 pursuant to § 257.94(e):
        A. Identify those constituents listed in Appendix III of § 257 and the names of the monitoring wells associated with such an increase.

B. Provide the date when the Assessment Monitoring Program was initiated for the CCR unit.

iv. If it was determined that there was a statistically significant level above the groundwater protection standard [GWPS] for one or more constituents listed in Appendix IV of § 257 pursuant to § 257.95(g) include all of the following:

A. Identify those constituents listed in Appendix IV of § 257 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.

D. Provide the date when the assessment of corrective measures was completed for the CCR unit.

v. Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection.

vi. Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

This report provides the required information for CAL for calendar year 2023.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the monitoring program status in calendar year 2023 and the CAL remains in the Detection Monitoring Program in accordance with 40 C.F.R. § 257.94.

3. KEY ACTIONS COMPLETED IN 2023

The Detection Monitoring Program is summarized in **Table A** on the following page. The groundwater monitoring system, including the CCR unit and all background (upgradient) and downgradient monitoring wells, is presented in **Figure 1**. No changes were made to the monitoring system in 2023. In general, one groundwater sample was collected from each background and downgradient well during each monitoring event. All samples were collected and analyzed in accordance with the *Sampling and Analysis Plan* (SAP; Natural Resource Technology, an OBG Company [NRT/OBG], 2017). Potentiometric surface maps for the fourth quarter of 2022 and both monitoring events in 2023 are included in **Figures 2 through 4**. Water level data, collected from background and downgradient monitoring wells, are included in **Table 1**. All monitoring data and analytical results obtained under 40 C.F.R. §§ 257.90 through 257.98 (as applicable) in the fourth quarter of 2022 and both monitoring events in 2023 are presented in **Tables 2**. Laboratory reports for both 2023 monitoring events are included in **Appendix A**[1].

Analytical data were evaluated in accordance with the *Statistical Analysis Plan, Caledonia Ash Landfill* (NRT/OBG, 2017) to determine any SSIs for Appendix III parameters relative to background concentrations. Statistical background values are provided in **Table 3**. A flow chart showing the statistical methodology for determining background values is included as **Appendix B**.

Statistical evaluation, including SSI determinations, of analytical data from the Detection Monitoring Program for the November 7, 2022 (Detection Monitoring Round 11) and May 9-10, 2023 (Detection Monitoring Round 12) sampling events were completed in 2023 and within 90 days of receipt of the analytical data. SSIs over background concentrations for Appendix III constituents were identified; SSI parameters and well locations are provided in **Table A**.

An ASD for the SSIs determined during Detection Monitoring Round 11 was prepared within 90 days of the SSI determination and is included in **Appendix C**. The ASD was prepared in accordance with 40 CFR 257.94(e)(2) and provides a description, data, and pertinent information to support that the SSIs observed during Detection Monitoring Round 11 were not due to a release from the CAL but were either errors in sampling, analysis, statistical evaluation, or from naturally occurring conditions (e.g. natural variation in groundwater quality). The ASDs dated April 15, 2018 and November 23, 2020 for CAL provided a description, data, and pertinent information supporting an alternate source for the remaining wells and parameters with SSIs in Detection Monitoring Rounds 11-12.

[1] Laboratory reports for the fourth quarter of 2022 monitoring event were provided in the 2022 annual report.

Table A. 2022-2023 Detection Monitoring Program Summary

Detection Round	Sampling Date	Analytical Data Receipt Date	Parameters Collected	SSI Wells (Parameters)	SSI(s) Determination Date	ASD Completion Date[1]
11	November 7, 2022	January 6, 2023	Appendix III	W08D (B, Ca, SO_4, TDS) W09D (B, SO_4) W10D (B, SO_4) W49 (B, SO_4) W50 (B, SO_4, TDS)	April 6, 2023	July 5, 2023
12	May 9-10, 2023	June 2, 2023	Appendix III	W08D (B, Ca, SO_4, TDS) W09D (B, SO_4) W10D (B, SO_4) W49 (B, SO_4) W50 (B, SO_4, TDS)	August 31, 2023	NA
13	November 6-7, 2023	December 1, 2023	Appendix III	TBD	TBD Before February 29, 2024	TBD

Notes:

NA: not applicable

TBD: to be determined

[1]ASDs previously completed on April 15, 2018, November 23, 2020, and July 5, 2023 for the CAL provided a description, data, and pertinent information supporting an alternate source for the wells and parameters with SSIs identified during the November 7, 2021 and May 9-10, 2023 sampling events.

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the Groundwater Monitoring Program during 2023. Groundwater samples were collected and analyzed in accordance with the SAP and all data were accepted.

5. KEY ACTIVITIES PLANNED FOR 2024

The following key activities are planned for 2024:

- Continuation of the Detection Monitoring Program with semi-annual sampling scheduled for the second and fourth quarters of 2024.
- Complete evaluation of analytical data from the downgradient wells using background data to determine whether an SSI of Appendix III parameters detected at concentrations greater than background concentrations has occurred.
- If an SSI is identified, potential alternate sources (*i.e.,* a source other than the CCR unit caused the SSI or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated.
  - If an alternate source is identified to be the cause of the SSI, a written demonstration will be completed within 90 days of SSI determination and included in the 2024 Annual Groundwater Monitoring and Corrective Action Report.
  - If an alternate source(s) is not identified to be the cause of the SSI, the applicable requirements of 40 C.F.R. §§ 257.94 through 257.98 as may apply in 2024 (*e.g.,* Assessment Monitoring) will be met, including associated recordkeeping/notifications required by 40 C.F.R. §§ 257.105 through 257.108.

6. REFERENCES

Natural Resource Technology, an OBG Company (NRT/OBG), 2017, *Sampling and Analysis Plan Revision 2, Caledonia Ash Landfill, Caledonia, Wisconsin, September 29, 2017.*

Natural Resource Technology, an OBG Company (NRT/OBG), 2017, *Statistical Analysis Plan, Caledonia Ash Landfill, Caledonia, Wisconsin, October 17, 2017.*

TABLES

TABLE 1
GROUNDWATER ELEVATIONS
2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CALEDONIA ASH LANDFILL
CALEDONIA, WI

Well ID	Well Type	Latitude (Decimal degrees)	Longitude (Decimal degrees)	Date	Groundwater Elevation (ft NAVD88)
W46D	Background (Upgradient/Side-gradient)	42.83840	-87.84685	11/07/2022	651.73
				5/9/2023	655.55
				11/6/2023	654.97
W48	Background (Upgradient)	42.83564	-87.84441	11/07/2022	655.11
				5/10/2023	657.49
				11/7/2023	656.85
W08D	Compliance (Downgradient)	42.83621	-87.83965	11/07/2022	650.23
				5/9/2023	655.07
				11/6/2023	654.48
W09D	Compliance (Downgradient)	42.83892	-87.83924	11/07/2022	652.92
				5/9/2023	656.14
				11/6/2023	653.23
W10D	Compliance (Downgradient)	42.83985	-87.84015	11/07/2022	651.57
				5/9/2023	654.19
				11/6/2023	652.44
W49	Compliance (Downgradient)	42.83987	-87.84187	11/07/2022	652.68
				5/10/2023	655.08
				11/7/2023	653.31
W50	Compliance (Downgradient)	42.83751	-87.83865	11/07/2022	653.06
				5/9/2023	655.54
				11/7/2023	653.70

Notes:
ft = foot/feet
NAVD88 = North American Vertical Datum of 1988

Caledonia
Table 2. Analytical Results - Appendix III Parameters

Date Range: 11/01/2022 to 11/10/2022

Lab Methods:

Well Id	Date Sampled	Lab Id	Boron, total, mg/L	Calcium, total, mg/L	Chloride, total, mg/L	Fluoride, total, mg/L	pH (Field), SU	Sulfate, total, mg/L
W08D	11/7/2022	AE63530	0.460	48.6	9.5	1.20	7.7	210.0
W09D	11/7/2022	AE63529	0.422	17.9	3.6	1.30	7.9	32.9
W10D	11/7/2022	AE63528	0.443	20.2	3.9	1.30	7.7	42.2
W46D	11/7/2022	AE63526	0.368	24.6	6.8	1.10	7.1	34.4
W48	11/7/2022	AE63525	0.386	26.0	3.8	0.96	7.7	0.5
W49	11/7/2022	AE63532	0.458	15.6	4.3	1.50	8.1	50.0
W50	11/7/2022	AE63531	0.541	28.9	5.8	1.20	7.6	67.0

Caledonia
Table 2. Analytical Results - Appendix III Parameters

Date Range: 11/01/2022 to 11/10/2022
Lab Methods:

Well Id	Date Sampled	Lab Id	TDS, mg/L
W08D	11/7/2022	AE63530	482
W09D	11/7/2022	AE63529	212
W10D	11/7/2022	AE63528	218
W46D	11/7/2022	AE63526	216
W48	11/7/2022	AE63525	280
W49	11/7/2022	AE63532	220
W50	11/7/2022	AE63531	292

Caledonia
Table 2. Analytical Results - Appendix III Parameters

Date Range: 05/01/2023 to 05/11/2023

Lab Methods:

Well Id	Date Sampled	Lab Id	Boron, total, mg/L	Calcium, total, mg/L	Chloride, total, mg/L	Fluoride, total, mg/L	pH (Field), SU	Sulfate, total, mg/L
W08D	5/9/2023	AE66425	0.500	46.5	9.6	2.10	7.9	196.0
W09D	5/9/2023	AE66427	0.420	17.4	3.8	1.90	8.5	30.9
W10D	5/9/2023	AE66428	0.430	20.4	4.1	2.10	8.2	39.8
W46D	5/9/2023	AE66430	0.380	24.5	5.9	1.70	7.8	32.0
W48	5/10/2023	AE66463	0.380	25.7	<10.0	1.10	8.3	<20.0
W49	5/10/2023	AE66464	0.450	15.3	10.2	1.60	8.4	58.5
W50	5/9/2023	AE66426	0.550	26.9	5.6	1.70	7.9	75.4

Caledonia
Table 2. Analytical Results - Appendix III Parameters

Date Range: 05/01/2023 to 05/11/2023
Lab Methods:

Well Id	Date Sampled	Lab Id	TDS, mg/L
W08D	5/9/2023	AE66425	458
W09D	5/9/2023	AE66427	206
W10D	5/9/2023	AE66428	202
W46D	5/9/2023	AE66430	214
W48	5/10/2023	AE66463	226
W49	5/10/2023	AE66464	206
W50	5/9/2023	AE66426	276

Caledonia
Table 2. Analytical Results - Appendix III Parameters

Date Range: 11/01/2023 to 11/10/2023

Lab Methods:

Well Id	Date Sampled	Lab Id	Boron, total, mg/L	Calcium, total, mg/L	Chloride, total, mg/L	Fluoride, total, mg/L	pH (Field), SU	Sulfate, total, mg/L
W08D	11/6/2023	AE69873	0.436	45.8	11.4	1.40	7.5	214.0
W09D	11/6/2023	AE69874	0.394	17.1	3.6	1.30	8.0	34.6
W10D	11/6/2023	AE69875	0.411	19.2	3.7	1.30	7.6	42.8
W46D	11/6/2023	AE69876	0.344	23.4	5.2	1.20	7.6	37.7
W48	11/7/2023	AE69877	0.375	25.3	3.7	0.95	7.8	<0.4
W49	11/7/2023	AE69878	0.429	16.3	5.6	1.60	7.4	48.2
W50	11/7/2023	AE69879	0.479	26.5	13.1	2.20	7.4	86.1

Caledonia
Table 2. Analytical Results - Appendix III Parameters

Date Range: 11/01/2023 to 11/10/2023
Lab Methods:

Well Id	Date Sampled	Lab Id	TDS, mg/L
W08D	11/6/2023	AE69873	456
W09D	11/6/2023	AE69874	206
W10D	11/6/2023	AE69875	194
W46D	11/6/2023	AE69876	202
W48	11/7/2023	AE69877	234
W49	11/7/2023	AE69878	200
W50	11/7/2023	AE69879	266

Notes:
Exceedance of Background

TABLE 3

STATISTICAL BACKGROUND VALUES

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

CALEDONIA ASH LANDFILL

CALEDONIA, WI

Parameter	Statistical Background Value (LPL / UPL)
40 C.F.R. Part 257 Appendix III	
Boron (mg/L)	0.401
Calcium (mg/L)	34.4
Chloride (mg/L)	13.8
Fluoride (mg/L)	4.00
pH (field) (SU)	7.0/8.5
Sulfate (mg/L)	30.2
Total Dissolved Solids (mg/L)	260

Notes:

40 C.F.R. = Title 40 of the Code of Federal Regulations

LPL = Lower Prediction Limit (applicable for pH only)

mg/L = milligrams per liter

SU = Standard Units

UPL = Upper Prediction Limit

FIGURES

Y:\GIS\Projects\161\660\CALEDONIA\MXD\GM_CAR_2023\Figure 1_GW Samp Well Loc_Caledonia.mxd

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CCR RULE BACKGROUND MONITORING WELL LOCATION

CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

CCR RULE UPGRADIENT MONITORING WELL LOCATION

UNIT BOUNDARY

NOTES

IMAGERY DATE = 5/1/2022

0 200 400 Feet

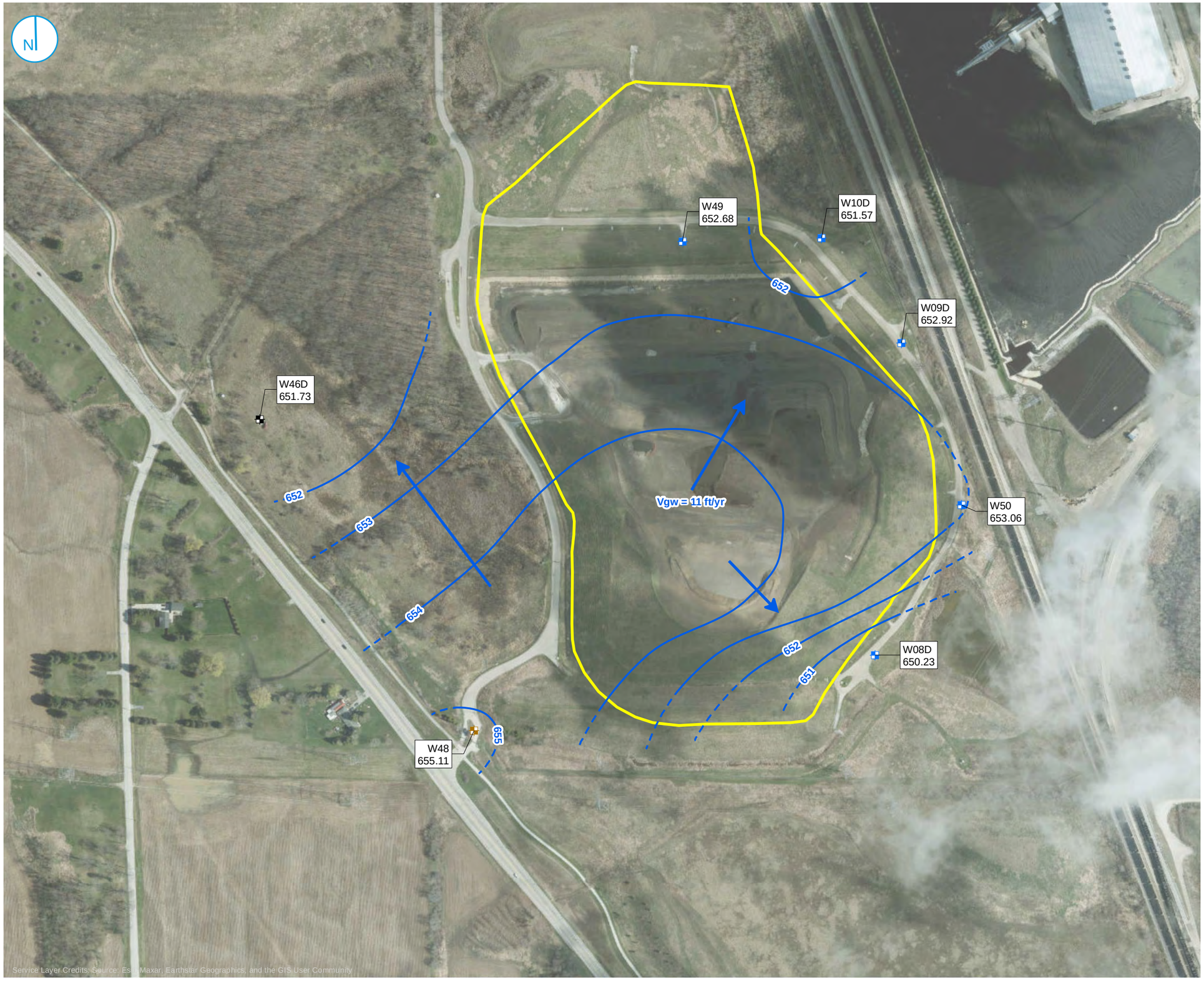
MONITORING WELL LOCATION MAP

FIGURE 1

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CALEDONIA ASH LANDFILL
CALEDONIA POWER PLANT
CALEDONIA, WISCONSIN

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL



CCR RULE BACKGROUND MONITORING WELL LOCATION

CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

CCR RULE UPGRADIENT MONITORING WELL LOCATION

UNIT BOUNDARY

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

NOTES

Vgw = ESTIMATED FT/YR GROUNDWATER FLOW VELOCITY

IMAGERY DATE = 5/1/2022

0 150 300

Feet

POTENTIOMETRIC SURFACE MAP NOVEMBER 7, 2022

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CALEDONIA ASH LANDFILL
CALEDONIA POWER PLANT
CALEDONIA, WISCONSIN

FIGURE 2

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Y:\GIS\Projects\1161660\CALEDONIA\MXD\GM_CAR_2023\Figure 2_GW Contour Map Nov 2022.mxd

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GROUNDWATER AVERAGE LINEAR VELOCITY CALCULATIONS
CALEDONIA ASH LANDFILL
CALEDONIA, WISCONSIN

NOVEMBER 2022 $V = K i / n_e$

V = Groundwater Velocity
K = Hydraulic Conductivity
i = Hydraulic Gradient (unitless value)
n_e = Effective Porosity

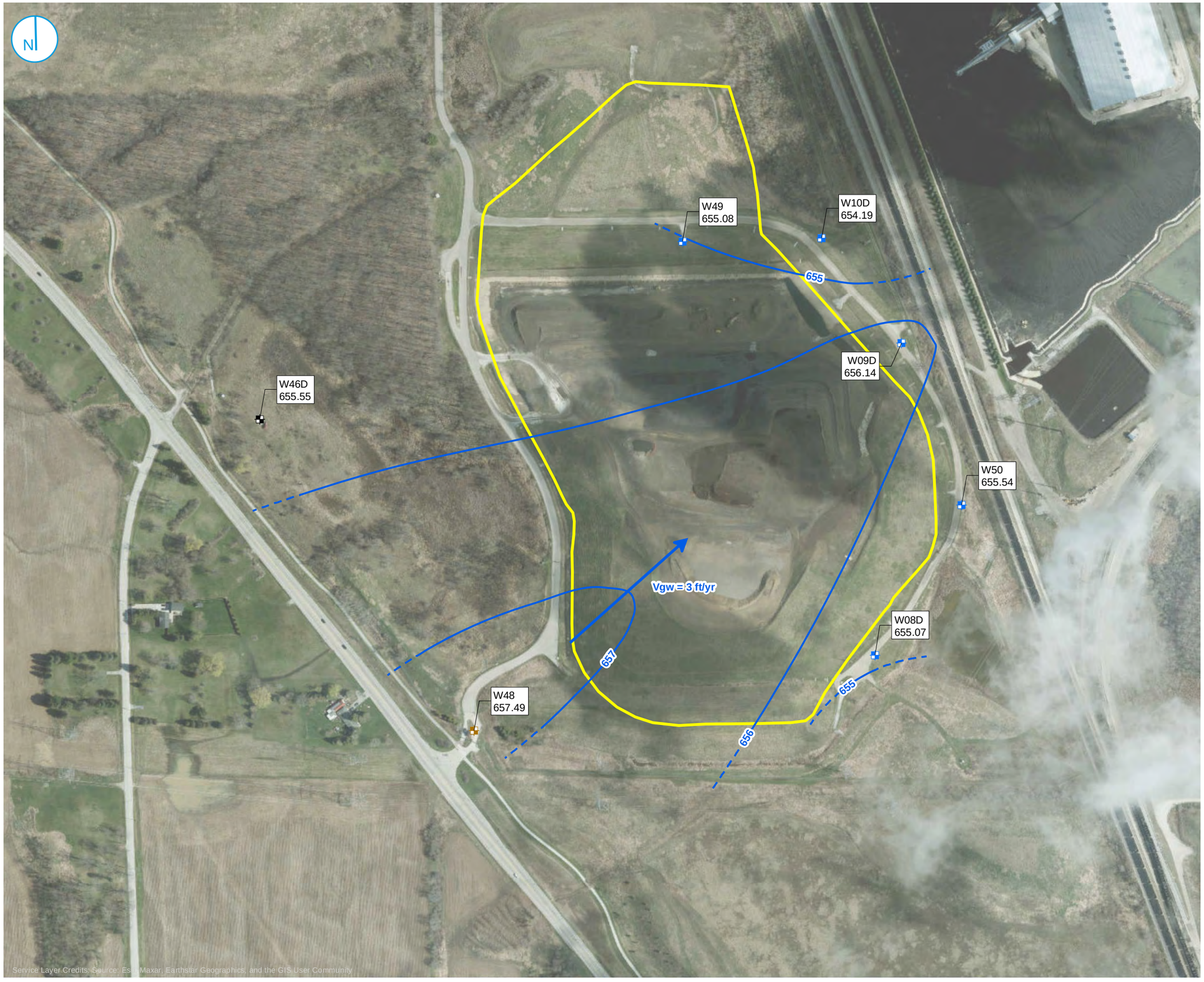
UPPERMOST AQUIFER

Contours	**654**	**to**	**653**	**North to Northeast Across the Landfill**	Elevation Change (ft)		Distance Change (ft)
K =	1.04E+03	ft/yr	Geometric mean for Landfill 3 (all)				
i =	0.003		between contours identified above				
n_e =	25	%			1	/	370 = 0.003

$$V = \frac{1.04E+03 * 2.70E-03}{0.25}$$

V = 11 feet/year

[O: KLT 1/31/2023, C:NMD 1/31/2023]



CCR RULE BACKGROUND MONITORING WELL LOCATION

CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

CCR RULE UPGRADIENT MONITORING WELL LOCATION

UNIT BOUNDARY

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

NOTES

Vgw = ESTIMATED FT/YR GROUNDWATER FLOW VELOCITY

IMAGERY DATE = 5/1/2022

0 150 300

Feet

POTENTIOMETRIC SURFACE MAP MAY 9-10, 2023

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CALEDONIA ASH LANDFILL
CALEDONIA POWER PLANT
CALEDONIA, WISCONSIN

FIGURE 3

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Y:\GIS\Projects\1161660\CALEDONIA\MXD\GM_CAR_2023\Figure 3_GW Contour Map May 2023.mxd

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GROUNDWATER AVERAGE LINEAR VELOCITY CALCULATIONS
CALEDONIA ASH LANDFILL
CALEDONIA, WISCONSIN

May 2023 **$V = K i / n_e$**

V = Groundwater Velocity
K = Hydraulic Conductivity
i = Hydraulic Gradient (unitless value)
n_e = Effective Porosity

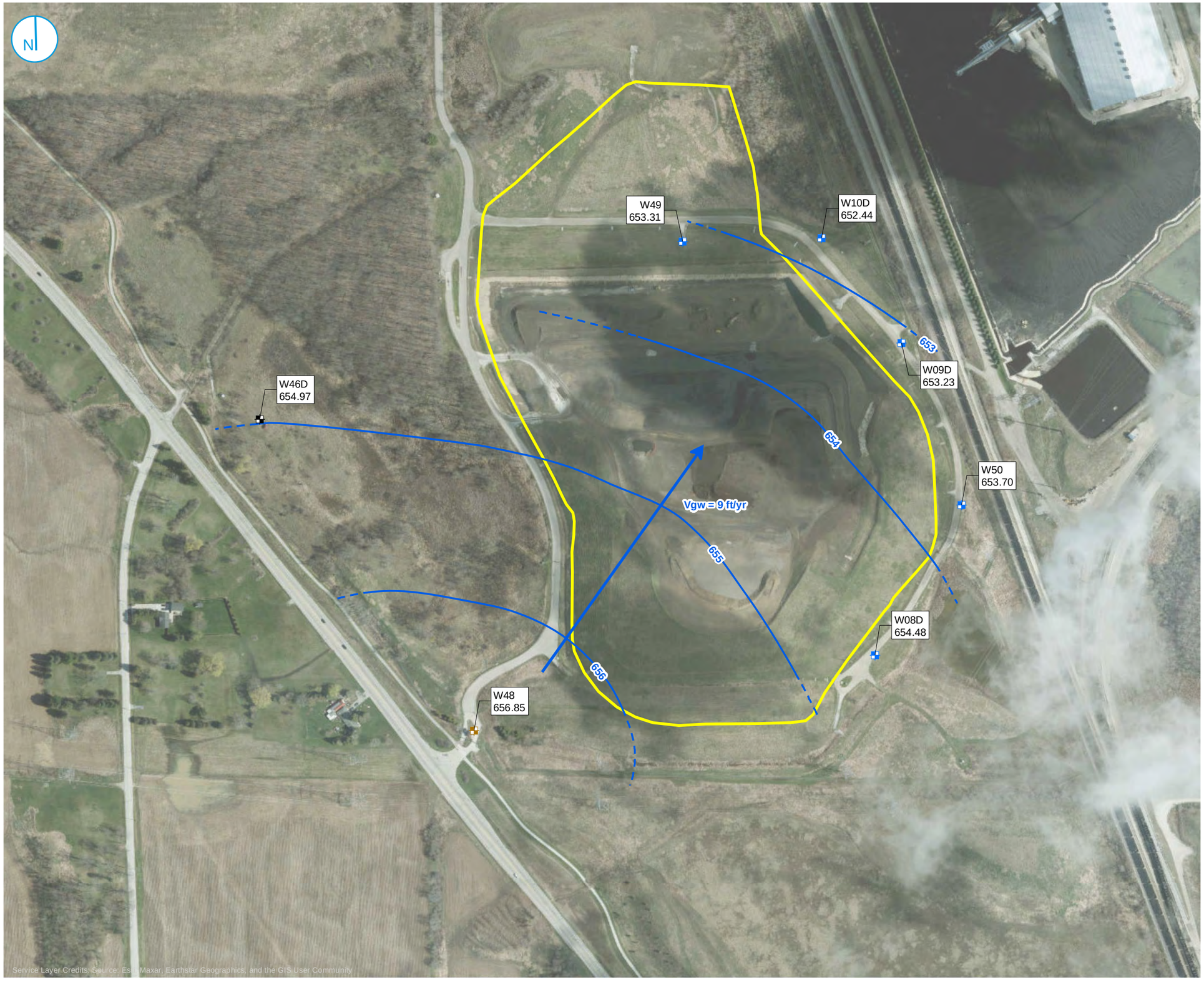
UPPERMOST AQUIFER

Contours	**657**	**to**	**656**	**North to Northeast Across the Landfill**	Elevation Change (ft)	Distance Change (ft)
K =	1.04E+03	ft/yr	Geometric mean for Landfill 3 (all)			
i =	0.001		between contours identified above		1 /	1398 = 0.001
n_e =	25	%				

$$V = \frac{1.04E+03 * 7.15E-04}{0.25}$$

V = 3 feet/year

[O: KJS 1/29/2024, C:EJT 1/29/2024]



CCR RULE BACKGROUND MONITORING WELL LOCATION

CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

CCR RULE UPGRADIENT MONITORING WELL LOCATION

UNIT BOUNDARY

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

NOTES

Vgw = ESTIMATED FT/YR GROUNDWATER FLOW VELOCITY

IMAGERY DATE = 5/1/2022

0 150 300

Feet

POTENTIOMETRIC SURFACE MAP NOVEMBER 6-7, 2023

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
CALEDONIA ASH LANDFILL
CALEDONIA POWER PLANT
CALEDONIA, WISCONSIN

FIGURE 4

RAMBOLL AMERICAS
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Y:\GIS\Projects\1161660\CALEDONIA\MXD\GM_CAR_2023\Figure 4_GW Contour Map Nov 2023.mxd

GROUNDWATER AVERAGE LINEAR VELOCITY CALCULATIONS
CALEDONIA ASH LANDFILL
CALEDONIA, WISCONSIN

November 2023

UPPERMOST AQUIFER

$V = K i / n_e$

V = Groundwater Velocity
K = Hydraulic Conductivity
i = Hydraulic Gradient (unitless value)
n_e = Effective Porosity

Contours	**656**	**to**	**653**	**North to Northeast Across the Landfill**	Elevation Change (ft)		Distance Change (ft)
K =	1.04E+03	ft/yr	Geometric mean for Landfill 3 (all)				
i =	0.002		between contours identified above				
n_e =	25	%			3	/	1358 = 0.002

$$V = \frac{1.04E+03 * 2.21E-03}{0.25}$$

V = 9 feet/year

[O: KJS 1/19/2024, C:EJT 1/29/2024]

APPENDICES

APPENDIX A
LABORATORY REPORTS

To: Eric Kovatch
PSB Annex A231

From: WEC Business Services
Laboratory Services PSBA-A070
WDNR Cert # 241329000

Report Date: Wednesday, January 24, 2024

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W08D Caledonia CCR Well Sample**
Sample ID: AE66425 Sample Collection Date/Time: 05/09/2023 09:52
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	43.21	0.05	feet		1		H2OD	5/9/23	RAMBOLL
Field Temperature	12	0.1	Degrees C		1		TEMP	5/9/23	RAMBOLL
Field Conductivity	740	0	umhos		1		FCOND25	5/9/23	RAMBOLL
Field pH	7.9	0.1	Units	0.1	1		FIELDPH	5/9/23	RAMBOLL
Total Dissolved Solids	458	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	9.6	1.0	mg/L	3.4	20		EPA 300.0	5/11/23	057
Total Sulfate	196	2.0	mg/L	6.8	20		EPA 300.0	5/11/23	057
Total Calcium	46500	2800	ug/L	9100	5		EPA 200.7	5/16/23	057
Total Boron	500	10	ug/L	50	1		EPA 200.7	5/16/23	057
Total Copper	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Magnesium	21400	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Manganese	130	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Total Fluoride	2.1	1.5	mg/L	5.0	50	J	EPA 300.0	5/16/23	057
Total Filtered Alkalinity as CaCO3	142	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Hardness as CaCO3	210	1	mg/L		1		Std Mtd 2340B	5/30/23	JLM
Dissolved Calcium	47200	1600	ug/L	5100	5		EPA 200.7	5/18/23	057
Dissolved Magnesium	22300	200	ug/L	400	5		EPA 200.7	5/18/23	057
Nitrate	Less Than	0.2	mg/L	0.68	1	H1	EPA 300.0	5/11/23	057
Nitrite	Less Than	0.2	mg/L	0.8	1	H1	EPA 300.0	5/11/23	057

Sample Comments:

Sample Description: **W50 Caledonia CCR Well Sample**
Sample ID: AE66426 Sample Collection Date/Time: 05/09/2023 10:49
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	39.14	0.05	feet		1		H2OD	5/9/23	RAMBOLL
Field Temperature	11	0.1	Degrees C		1		TEMP	5/9/23	RAMBOLL
Field Conductivity	470	0	umhos		1		FCOND25	5/9/23	RAMBOLL
Field pH	7.9	0.1	Units	0.1	1		FIELDPH	5/9/23	RAMBOLL
Total Dissolved Solids	276	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	5.6	1.0	mg/L	3.4	20		EPA 300.0	5/11/23	057
Total Sulfate	75.4	2.0	mg/L	6.8	20		EPA 300.0	5/11/23	057

Report Date: Wednesday, January 24, 2024

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W50 Caledonia CCR Well Sample**
Sample ID: AE66426 Sample Collection Date/Time: 05/09/2023 10:49
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Calcium	26900	600	ug/L	1800	1		EPA 200.7	5/16/23	057
Total Boron	550	10	ug/L	50	1		EPA 200.7	5/18/23	057
Total Copper	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Magnesium	10300	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Manganese	30	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Total Fluoride	1.7	1.5	mg/L	5.0	50	J	EPA 300.0	5/16/23	057
Total Filtered Alkalinity as CaCO3	144	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Hardness as CaCO3	110	1	mg/L		1		Std Mtd 2340B	5/30/23	JLM
Dissolved Calcium	27200	1600	ug/L	5100	5		EPA 200.7	5/16/23	057
Dissolved Magnesium	10200	30	ug/L	80	1		EPA 200.7	5/16/23	057
Total Mercury	Less Than	0.76	ng/L	2.5	1		EPA 245.7	5/16/23	JLM
Nitrate	1.51	0.20	mg/L	0.68	20		EPA 300.0	5/11/23	057
Nitrite	Less Than	0.2	mg/L	0.8	1		EPA 300.0	5/11/23	057
Mercury	Less Than	1.2	ng/L		1		EPA 245.7	5/16/23	JLM

Sample Comments:

Sample Description: **W09D Caledonia CCR Well Sample**
Sample ID: AE66427 Sample Collection Date/Time: 05/09/2023 11:31
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	57.21	0.05	feet		1		H2OD	5/9/23	RAMBOLL
Field Temperature	11	0.1	Degrees (		1		TEMP	5/9/23	RAMBOLL
Field Conductivity	343	0	umhos		1		FCOND25	5/9/23	RAMBOLL
Field pH	8.5	0.1	Units	0.1	1		FIELDPH	5/9/23	RAMBOLL
Total Dissolved Solids	206	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	3.8	1.0	mg/L	3.4	20		EPA 300.0	5/11/23	057
Total Sulfate	30.9	2.0	mg/L	6.8	20		EPA 300.0	5/11/23	057
Total Calcium	17400	600	ug/L	1800	1		EPA 200.7	5/16/23	057
Total Boron	420	10	ug/L	50	1		EPA 200.7	5/16/23	057
Total Copper	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Magnesium	10100	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Manganese	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	1.2	ug/L	4.0	1		EPA 200.7	5/22/23	057
Total Zinc	Less Than	1.8	ug/L	6.0	1		EPA 200.7	5/16/23	057
Total Fluoride	1.9	1.5	mg/L	5.0	50	J	EPA 300.0	5/16/23	057
Total Filtered Alkalinity as CaCO3	132	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Hardness as CaCO3	88	1	mg/L		1		Std Mtd 2340B	5/30/23	JLM
Dissolved Calcium	18200	300	ug/L	1000	1		EPA 200.7	5/18/23	057
Dissolved Magnesium	10400	30	ug/L	80	1		EPA 200.7	5/18/23	057
Nitrate	0.24	0.20	mg/L	0.68	20	JB	EPA 300.0	5/11/23	057

Report Date: Wednesday, January 24, 2024

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W09D Caledonia CCR Well Sample**
Sample ID: AE66427 Sample Collection Date/Time: 05/09/2023 11:31
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Nitrite	Less Than	0.2	mg/L	0.8	1		EPA 300.0	5/11/23	057

Sample Comments:

Sample Description: **W10D Caledonia CCR Well Sample**
Sample ID: AE66428 Sample Collection Date/Time: 05/09/2023 11:53
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	48.91	0.05	feet		1		H2OD	5/9/23	RAMBOLL
Field Temperature	14	0.1	Degrees (		1		TEMP	5/9/23	RAMBOLL
Field Conductivity	341	0	umhos		1		FCOND25	5/9/23	RAMBOLL
Field pH	8.2	0.1	Units	0.1	1		FIELDPH	5/9/23	RAMBOLL
Total Dissolved Solids	202	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	4.1	1.0	mg/L	3.4	20		EPA 300.0	5/11/23	057
Total Sulfate	39.8	2.0	mg/L	6.8	20		EPA 300.0	5/11/23	057
Total Calcium	20400	600	ug/L	1800	1		EPA 200.7	5/16/23	057
Total Boron	430	10	ug/L	50	1		EPA 200.7	5/16/23	057
Total Copper	5	4	ug/L	10	1	J	EPA 200.7	5/16/23	057
Total Magnesium	8200	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Manganese	10	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Total Fluoride	2.1	1.5	mg/L	5.0	50	J	EPA 300.0	5/16/23	057
Total Filtered Alkalinity as CaCO3	126	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Hardness as CaCO3	84	1	mg/L		1		Std Mtd 2340B	5/31/23	JLM
Dissolved Calcium	20300	300	ug/L	1000	1		EPA 200.7	5/16/23	057
Dissolved Magnesium	8200	30	ug/L	80	1		EPA 200.7	5/16/23	057
Nitrate	0.27	0.20	mg/L	0.68	20	JB	EPA 300.0	5/11/23	057
Nitrite	Less Than	0.2	mg/L	0.8	20		EPA 300.0	5/11/23	057

Sample Comments:

Sample Description: **QA/QC1 Caledonia CCR Well Sample**
Sample ID: AE66429 Sample Collection Date/Time: 05/09/2023 11:58
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Dissolved Solids	200	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	4.2	1.0	mg/L	3.4	20		EPA 300.0	5/11/23	057
Total Sulfate	39.4	2.0	mg/L	6.8	20		EPA 300.0	5/11/23	057
Total Calcium	19600	600	ug/L	1800	1		EPA 200.7	5/16/23	057

Report Date: Wednesday, January 24, 2024

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **QA/QC1 Caledonia CCR Well Sample**
Sample ID: AE66429 Sample Collection Date/Time: 05/09/2023 11:58
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Boron	430	10	ug/L	50	1		EPA 200.7	5/16/23	057
Total Copper	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Magnesium	8000	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Manganese	20	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Total Fluoride	1.9	1.5	mg/L	5.0	50	J	EPA 300.0	5/16/23	057
Total Filtered Alkalinity as CaCO3	128	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Hardness as CaCO3	85	1	mg/L		1		Std Mtd 2340B	5/31/23	JLM
Dissolved Calcium	20500	300	ug/L	1000	1		EPA 200.7	5/16/23	057
Dissolved Magnesium	8200	30	ug/L	80	1		EPA 200.7	5/16/23	057
Nitrate	Less Than	0.20	mg/L	0.68	20	H1	EPA 300.0	5/11/23	057
Nitrite	Less Than	0.2	mg/L	0.8	20	H1	EPA 300.0	5/11/23	057

Sample Comments:

Sample Description: **W46D Caledonia CCR Well Sample**
Sample ID: AE66430 Sample Collection Date/Time: 05/09/2023 12:26
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	45.71	0.05	feet		1		H2OD	5/9/23	RAMBOLL
Field Temperature	11	0.1	Degrees (		1		TEMP	5/9/23	RAMBOLL
Field Conductivity	373	0	umhos		1		FCOND25	5/9/23	RAMBOLL
Field pH	7.8	0.1	Units	0.1	1		FIELDPH	5/9/23	RAMBOLL
Total Dissolved Solids	214	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	5.9	1.0	mg/L	3.4	20		EPA 300.0	5/11/23	057
Total Sulfate	32.0	2.0	mg/L	6.8	20		EPA 300.0	5/11/23	057
Total Calcium	24500	600	ug/L	1800	1		EPA 200.7	5/16/23	057
Total Boron	380	10	ug/L	50	1		EPA 200.7	5/18/23	057
Total Copper	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Magnesium	14700	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Manganese	40	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Total Fluoride	1.7	1.5	mg/L	5.0	50	J	EPA 300.0	5/16/23	057
Total Filtered Alkalinity as CaCO3	154	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Hardness as CaCO3	130	1	mg/L		1		Std Mtd 2340B	5/31/23	JLM
Dissolved Calcium	25300	1600	ug/L	5100	5		EPA 200.7	5/16/23	057
Dissolved Magnesium	15200	30	ug/L	80	1		EPA 200.7	5/16/23	057
Nitrate	Less Than	0.20	mg/L	0.68	20		EPA 300.0	5/11/23	057
Nitrite	Less Than	0.20	mg/L	0.8	20		EPA 300.0	5/11/23	057

Report Date: Wednesday, January 24, 2024

The following are the analytical results for samples received by Laboratory Services:

Sample Comments:

Sample Description: **EB1 Caledonia CCR Well Sample**
Sample ID: AE66431 Sample Collection Date/Time: 05/09/2023 14:00
Sample Received: 05/09/2023 Sample Collector: NATE DUDA

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Temperature	18	0.1	Degrees C		1		TEMP	5/9/23	RAMBOLL
Field Conductivity	21	0	umhos		1		FCOND25	5/9/23	RAMBOLL
Field pH	8.2	0.1	Units	0.1	1		FIELDPH	5/9/23	RAMBOLL
Total Dissolved Solids	Less Than	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	Less Than	1.0	mg/L	3.4	20		EPA 300.0	5/11/23	057
Total Sulfate	Less Than	2.0	mg/L	6.8	20		EPA 300.0	5/11/23	057
Total Calcium	1900	600	ug/L	1800	1		EPA 200.7	5/16/23	057
Total Boron	Less Than	10	ug/L	50	1		EPA 200.7	5/16/23	057
Total Copper	10	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Magnesium	1000	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Manganese	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Total Fluoride	Less Than	1.5	mg/L	5.0	50		EPA 300.0	5/16/23	057
Total Filtered Alkalinity as CaCO3	10	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Hardness as CaCO3	9.1	1	mg/L		1		Std Mtd 2340B	5/31/23	JLM
Dissolved Calcium	2000	300	ug/L	1000	1		EPA 200.7	5/16/23	057
Dissolved Magnesium	1000	30	ug/L	80	1		EPA 200.7	5/16/23	057
Nitrate	1.19	0.20	mg/L	0.68	20		EPA 300.0	5/11/23	057
Nitrite	Less Than	0.2	mg/L	0.8	20		EPA 300.0	5/11/23	057

Sample Comments:

Sample Description: **Caledonia CCR Well Sample W48**
Sample ID: AE66463 Sample Collection Date/Time: 05/10/2023 13:05
Sample Received: 05/10/2023 Sample Collector: ND

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	58.39	0.05	feet		1		H2OD	5/10/23	RAMBOLL
Field Temperature	11	0.1	Degrees C		1		TEMP	5/10/23	RAMBOLL
Field Conductivity	372	0	umhos		1		FCOND25	5/10/23	RAMBOLL
Field pH	8.3	0.1	Units	0.1	1		FIELDPH	5/10/23	RAMBOLL
Total Dissolved Solids	226	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	Less Than	10	mg/L	34	200		EPA 300.0	5/13/23	057
Total Sulfate	Less Than	20	mg/L	68	200		EPA 300.0	5/13/23	057
Total Calcium	25700	600	ug/L	1800	1		EPA 200.7	5/16/23	057
Total Boron	380	10	ug/L	50	1		EPA 200.7	5/16/23	057
Total Hardness as CaCO3	140	1	mg/L		1		Std Mtd 2340B	5/31/23	JLM
Total Magnesium	17300	60	ug/L	100	1		EPA 200.7	5/16/23	057

Report Date: Wednesday, January 24, 2024

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **Caledonia CCR Well Sample W48**
Sample ID: AE66463 Sample Collection Date/Time: 05/10/2023 13:05
Sample Received: 05/10/2023 Sample Collector: ND

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Copper	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Manganese	9	4	ug/L	10	1	J	EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Fluoride	1.1	0.6	mg/L	2.0	20	J	EPA 300.0	5/17/23	057
Nitrite as N	Less Than	2.0	mg/L	8.0	200		EPA 300.0	5/13/23	057
Nitrate-Nitrite as N	Less Than	2.20	mg/L	7.20	200		EPA 300.0	5/17/23	057
Nitrate as N	0.52	0.20	mg/L	0.68	20	H1	EPA 300.0	5/17/23	057
Total Filtered Alkalinity as CaCO3	222	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Dissolved Calcium	26100	1600	ug/L	5100	5		EPA 200.7	5/16/23	057
Dissolved Magnesium	17400	30	ug/L	80	1		EPA 200.7	5/16/23	057

Sample Comments:
Boron - An ICS associated with this sample suggests interelemental interferences

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Sample Description: **Caledonia CCR Well Sample W49**
Sample ID: AE66464 Sample Collection Date/Time: 05/10/2023 13:52
Sample Received: 05/10/2023 Sample Collector: ND

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	62.41	0.05	feet		1		H2OD	5/10/23	RAMBOLL
Field Temperature	12	0.1	Degrees C		1		TEMP	5/10/23	RAMBOLL
Field Conductivity	350	0	umhos		1		FCOND25	5/10/23	RAMBOLL
Field pH	8.4	0.1	Units	0.1	1		FIELDPH	5/10/23	RAMBOLL
Total Dissolved Solids	206	10	mg/L	10	1		Std Mtd 2540 C	5/16/23	057
Total Chloride	10.2	10	mg/L	34	200	J	EPA 300.0	5/13/23	057
Total Sulfate	58.5	20	mg/L	68	200	J	EPA 300.0	5/13/23	057
Total Calcium	15300	600	ug/L	1800	1		EPA 200.7	5/16/23	057
Total Boron	450	10	ug/L	50	1		EPA 200.7	5/16/23	057
Total Hardness as CaCO3	65	1	mg/L		1		Std Mtd 2340B	5/31/23	JLM
Total Magnesium	6.8	60	ug/L	100	1		EPA 200.7	5/16/23	057
Total Copper	Less Than	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Manganese	10	4	ug/L	10	1		EPA 200.7	5/16/23	057
Total Silver	Less Than	20	ug/L	70	1		EPA 200.7	5/22/23	057
Total Fluoride	1.6	0.6	mg/L	2.0	20	J	EPA 300.0	5/17/23	057
Nitrite as N	Less Than	2.0	mg/L	8.0	200	H1	EPA 300.0	5/13/23	057
Nitrate-Nitrite as N	Less Than	2.20	mg/L	7.20	200		EPA 300.0	5/17/23	057
Nitrate as N	Less Than	0.2	mg/L	0.68	20	H1	EPA 300.0	5/17/23	057
Total Filtered Alkalinity as CaCO3	112	2	mg/l	6	1		Std Mtd 2320 B	5/18/23	057
Mercury	Less Than	1.2	ng/L		1		EPA 245.7	5/16/23	JLM
Total Zinc	Less Than	60	ug/L	160	1		EPA 200.7	5/16/23	057
Dissolved Calcium	14800	600	ug/L	1800	1		EPA 200.7	5/19/23	057
Dissolved Magnesium	6700	30	ug/L	80	1		EPA 200.7	5/16/23	057
Total Antimony	Less Than	0.04	mg/L	0.11	1		EPA 200.7	5/16/23	057
Total Arsenic	Less Than	0.04	mg/L	0.13	1		EPA 200.7	5/16/23	057

Report Date: Wednesday, January 24, 2024

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **Caledonia CCR Well Sample W49**

Sample ID: AE66464 Sample Collection Date/Time: 05/10/2023 13:52

Sample Received: 05/10/2023 Sample Collector: ND

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Barium	0.014	0.012	mg/L	0.040	1		EPA 200.7	5/16/23	057
Total Beryllium	Less Than	0.006	mg/L	0.02	1		EPA 6010C	5/16/23	057
Total Chromium	Less Than	0.006	mg/L	0.02	1		EPA 200.7	5/16/23	057
Total Cobalt	Less Than	0.006	mg/L	0.02	1		EPA 200.7	5/16/23	057
Total Lead	Less Than	0.04	mg/L	0.13	1		EPA 200.7	5/16/23	057
Total Lithium	Less Than	0.04	mg/L	0.13	1		EPA 200.7	5/16/23	057
Total Molybdenum	0.04	0.01	mg/L	0.03	1		EPA 200.7	5/16/23	057
Total Selenium	Less Than	0.08	mg/L	0.27	1		EPA 200.7	5/16/23	057
Total Thallium	Less Than	0.08	ug/L	0.27	1		EPA 200.7	5/16/23	057

Sample Comments:

LOD and LOQ are adjusted for dilution factor.

'J' Flag, if present indicates an estimated concentration at or above the LOD and below the LOQ.

If there are any questions concerning this report, please contact: Laboratory Services at (414) 221-4595.

To: Eric Kovatch
PSB Annex A231

From: WEC Business Services
Laboratory Services PSBA-A070
WDNR Cert # 241329000

Report Date: Tuesday, December 26, 2023

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W08D** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69873 Sample Collection Date/Time: 11/06/2023 12:01
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	43.80	0.05	feet		1		H2OD	11/6/23	RAMBOLL
Field Temperature	15	0.1	Degrees C		1		TEMP	11/6/23	RAMBOLL
Field Conductivity	780	0	umhos		1		FCOND25	11/6/23	RAMBOLL
Field pH	7.5	0.1	Units	0.1	1		FIELDPH	11/6/23	RAMBOLL
Total Alkalinity as CaCO3	155	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	202	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	456	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	1.4	0.48	mg/L	1.6	5	J	EPA 300.0	11/27/23	020
Total Chloride	11.4	3.0	mg/L	10.0	5		EPA 300.0	11/27/23	020
Total Sulfate	214	2.2	mg/L	10.0	5		EPA 300.0	11/30/23	020
Carbonate Ion	Less than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	155	5.0	mg/L		1		HCO3	11/15/23	020
Dissolved Chloride	10.3	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Dissolved Sulfate	200	4.4	mg/L	20.0	10		EPA 300.0	11/27/23	020
Total Boron	436	30.3	ug/L	100	10		EPA 200.8	11/15/23	020
Total Sodium	72900	420	ug/L	2500	10	M0	EPA 200.8	11/15/23	020
Total Potassium	2790	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	21400	31.2	ug/L	250	1		EPA 200.8	11/15/23	020
Total Calcium	45800	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	51000	762	ug/L	2540	10	M0	EPA 200.8	11/16/23	020
Dissolved Magnesium	20900	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	2900	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	69900	420	ug/L	2500	10		EPA 200.8	11/16/23	020

Sample Comments:

Sample Description: **W09D** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69874 Sample Collection Date/Time: 11/06/2023 10:31
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	54.12	0.05	feet		1		H2OD	11/6/23	RAMBOLL
Field Temperature	12	0.1	Degrees C		1		TEMP	11/6/23	RAMBOLL
Field Conductivity	300	0	umhos		1		FCOND25	11/6/23	RAMBOLL
Field pH	8.0	0.1	Units	0.1	1		FIELDPH	11/6/23	RAMBOLL
Total Alkalinity as CaCO3	145	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020

Report Date: Tuesday, December 26, 2023

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W09D Caledonia Landfill Semi Annual Sample**
Sample ID: AE69874 Sample Collection Date/Time: 11/06/2023 10:31
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Hardness as CaCO3	87.3	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	206	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	1.3	0.095	mg/L	0.32	1		EPA 300.0	11/27/23	020
Total Chloride	3.6	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Sulfate	34.6	0.44	mg/L	2.0	1		EPA 300.0	11/30/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	145	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	3.9	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Dissolved Sulfate	34.3	0.44	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Boron	394	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	42400	42.0	ug/L	250	1		EPA 200.8	11/15/23	020
Total Potassium	920	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	10800	31.2	ug/L	250	1		EPA 200.8	11/15/23	020
Total Calcium	17100	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	16800	76.2	ug/L	254	1		EPA 200.8	11/21/23	020
Dissolved Magnesium	9840	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	1000	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	41900	42.0	ug/L	250	1		EPA 200.8	11/16/23	020

Sample Comments:

Sample Description: **W10D Caledonia Landfill Semi Annual Sample**
Sample ID: AE69875 Sample Collection Date/Time: 11/06/2023 09:02
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	50.66	0.05	feet		1		H2OD	11/6/23	RAMBOLL
Field Temperature	11	0.1	Degrees (		1		TEMP	11/6/23	RAMBOLL
Field Conductivity	380	0	umhos		1		FCOND25	11/6/23	RAMBOLL
Field pH	7.6	0.1	Units	0.1	1		FIELDPH	11/6/23	RAMBOLL
Total Alkalinity as CaCO3	143	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	82.0	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	194	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	1.3	0.095	mg/L	0.32	1		EPA 300.0	11/27/23	020
Total Chloride	3.7	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Sulfate	42.8	2.2	mg/L	10.0	5		EPA 300.0	11/30/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	143	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	4.1	0.59	mg/L	2.0	1	B	EPA 300.0	11/27/23	020
Dissolved Sulfate	42.5	0.44	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Boron	411	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	44900	42.0	ug/L	250	1		EPA 200.8	11/15/23	020
Total Potassium	1320	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	8290	31.2	ug/L	250	1		EPA 200.8	11/15/23	020

Report Date: Tuesday, December 26, 2023

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W10D Caledonia Landfill Semi Annual Sample**
Sample ID: AE69875 Sample Collection Date/Time: 11/06/2023 09:02
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Calcium	19200	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	23400	76.2	ug/L	254	1		EPA 200.8	11/16/23	020
Dissolved Magnesium	8020	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	1380	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	43100	42.0	ug/L	250	1		EPA 200.8	11/16/23	020

Sample Comments:

Sample Description: **W46D Caledonia Landfill Semi Annual Sample**
Sample ID: AE69876 Sample Collection Date/Time: 11/06/2023 14:55
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	46.29	0.05	feet		1		H2OD	11/6/23	RAMBOLL
Field Temperature	12	0.1	Degrees C		1		TEMP	11/6/23	RAMBOLL
Field Conductivity	410	0	umhos		1		FCOND25	11/6/23	RAMBOLL
Field pH	7.6	0.1	Units	0.1	1		FIELDPH	11/6/23	RAMBOLL
Total Alkalinity as CaCO3	161	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	119	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	202	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	1.2	0.095	mg/L	0.32	1		EPA 300.0	11/27/23	020
Total Chloride	5.2	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Sulfate	37.7	2.2	mg/L	10.0	5		EPA 300.0	11/30/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	161	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	5.7	0.59	mg/L	2.0	1	B	EPA 300.0	11/27/23	020
Dissolved Sulfate	37.6	0.44	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Boron	344	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	34900	42.0	ug/L	250	1		EPA 200.8	11/15/23	020
Total Potassium	1580	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	14700	31.2	ug/L	250	1		EPA 200.8	11/15/23	020
Total Calcium	23400	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	26200	76.2	ug/L	254	1		EPA 200.8	11/16/23	020
Dissolved Magnesium	13900	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	1710	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	33200	42.0	ug/L	250	1		EPA 200.8	11/16/23	020

Sample Comments:

Report Date: Tuesday, December 26, 2023

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W48** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69877 Sample Collection Date/Time: 11/07/2023 12:13
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	59.03	0.05	feet		1		H2OD	11/7/23	RAMBOLL
Field Temperature	11	50	Degrees C		460		TEMP	11/7/23	RAMBOLL
Field Conductivity	460	0	umhos		1		FCOND25	11/7/23	RAMBOLL
Field pH	7.8	0.1	Units	0.1	1		FIELDPH	11/7/23	RAMBOLL
Total Alkalinity as CaCO3	233	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	138	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	234	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	0.95	0.095	mg/L	0.32	1		EPA 300.0	11/27/23	020
Total Chloride	3.7	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Sulfate	Less Than	0.44	mg/L	2.0	1		EPA 300.0	11/30/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	233	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	4.5	0.59	mg/L	2.0	1	B	EPA 300.0	11/27/23	020
Dissolved Sulfate	0.69	0.44	mg/L	2.0	1	J	EPA 300.0	11/27/23	020
Total Boron	375	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	48400	42.0	ug/L	250	1		EPA 200.8	11/15/23	020
Total Potassium	1490	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	18100	31.2	ug/L	250	1		EPA 200.8	11/15/23	020
Total Calcium	25300	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	29100	76.2	ug/L	254	1		EPA 200.8	11/16/23	020
Dissolved Magnesium	16000	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	1990	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	43100	42.0	ug/L	250	1		EPA 200.8	11/16/23	020

Sample Comments:

Sample Description: **W49** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69878 Sample Collection Date/Time: 11/07/2023 13:40
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	64.18	0.05	feet		1		H2OD	11/7/23	RAMBOLL
Field Temperature	11	0.1	Degrees C		1		TEMP	11/7/23	RAMBOLL
Field Conductivity	380	0	umhos		1		FCOND25	11/7/23	RAMBOLL
Field pH	7.4	0.1	Units	0.1	1		FIELDPH	11/7/23	RAMBOLL
Total Alkalinity as CaCO3	132	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	72.5	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	200	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	1.6	0.48	mg/L	1.6	5	J	EPA 300.0	11/29/23	020
Total Chloride	5.6	3.0	mg/L	10.0	5	J	EPA 300.0	11/29/23	020
Total Sulfate	48.2	2.2	mg/L	10.0	5		EPA 300.0	11/29/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	132	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	4.6	0.59	mg/L	2.0	1	B	EPA 300.0	11/27/23	020

Report Date: Tuesday, December 26, 2023

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W49** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69878 Sample Collection Date/Time: 11/07/2023 13:40
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Dissolved Sulfate	50.9	0.44	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Boron	429	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	53500	42.0	ug/L	250	1		EPA 200.8	11/15/23	020
Total Potassium	849	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	7730	31.2	ug/L	250	1		EPA 200.8	11/15/23	020
Total Calcium	16300	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	19500	76.2	ug/L	254	1		EPA 200.8	11/16/23	020
Dissolved Magnesium	7880	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	838	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	45900	42.0	ug/L	250	1		EPA 200.8	11/16/23	020
Total Lithium	2.6	0.22	ug/L	1.0	1		EPA 200.8	11/15/23	020
Dissolved Lithium	2.7	0.22	ug/L	1.0	1		EPA 200.8	11/16/23	020

Sample Comments:

Sample Description: **W50** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69879 Sample Collection Date/Time: 11/07/2023 14:36
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Water Level	40.98	0.05	feet		1		H2OD	11/7/23	RAMBOLL
Field Temperature	11	0.1	Degrees C		1		TEMP	11/7/23	RAMBOLL
Field Conductivity	500	0	umhos		1		FCOND25	11/7/23	RAMBOLL
Field pH	7.4	0.1	Units	0.1	1		FIELDPH	11/7/23	RAMBOLL
Total Alkalinity as CaCO3	154	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	110	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	266	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	2.2	1.9	mg/L	6.3	20	J	EPA 300.0	11/29/23	020
Total Chloride	13.1	11.8	mg/L	40.0	20	J	EPA 300.0	11/29/23	020
Total Sulfate	86.1	8.9	mg/L	40.0	20		EPA 300.0	11/29/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	154	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	5.6	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Dissolved Sulfate	79.1	8.9	mg/L	40.0	20		EPA 300.0	11/29/23	020
Total Boron	479	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	59300	42.0	ug/L	250	1		EPA 200.8	11/15/23	020
Total Potassium	1480	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	10600	31.2	ug/L	250	1		EPA 200.8	11/15/23	020
Total Calcium	26500	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	27500	76.2	ug/L	254	1		EPA 200.8	11/16/23	020
Dissolved Magnesium	9320	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	1470	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	52800	42.0	ug/L	250	1		EPA 200.8	11/16/23	020
Total Lithium	4.4	0.22	ug/L	1.0	1		EPA 200.8	11/15/23	020

Report Date: Tuesday, December 26, 2023

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **W50** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69879 Sample Collection Date/Time: 11/07/2023 14:36
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Dissolved Lithium	3.9	0.22	ug/L	1.0	1		EPA 200.8	11/16/23	020

Sample Comments:

Sample Description: **QAQC** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69880 Sample Collection Date/Time: 11/07/2023 14:41
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Total Alkalinity as CaCO3	156	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	112	0.32	mg/L	1.7	1		StdMtd 2340B	11/15/23	020
Total Dissolved Solids	258	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	2.0	1.9	mg/L	6.3	20	J	EPA 300.0	11/29/23	020
Total Chloride	12.8	11.8	mg/L	40.0	20	J	EPA 300.0	11/29/23	020
Total Sulfate	85.3	8.9	mg/L	40.0	20		EPA 300.0	11/29/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	156	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	5.5	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Dissolved Sulfate	75.9	8.9	mg/L	40.0	20		EPA 300.0	11/29/23	020
Field pH	7.4	0.1	Units	0.1	1		FIELDPH	11/7/23	RAMBOLL
Field Temperature	11	0.1	Degrees (		1		TEMP	11/7/23	RAMBOLL
Field Water Level	40.98	0.05	feet		1		H2OD	11/7/23	RAMBOLL
Field Conductivity	500	0	umhos		1		FCOND25	11/7/23	RAMBOLL
Total Boron	495	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	61500	42.0	ug/L	250	1		EPA 200.8	11/15/23	020
Total Potassium	1560	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	10900	31.2	ug/L	250	1		EPA 200.8	11/15/23	020
Total Calcium	27100	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	28900	76.2	ug/L	254	1		EPA 200.8	11/16/23	020
Dissolved Magnesium	10200	31.2	ug/L	250	1		EPA 200.8	11/16/23	020
Dissolved Potassium	1590	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	57700	42.0	ug/L	250	1		EPA 200.8	11/16/23	020

Sample Comments:

Sample Description: **EB3** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69881 Sample Collection Date/Time: 11/07/2023 15:10
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field Temperature	12	0.1	Degrees (		1		TEMP	11/7/23	RAMBOLL
Field Conductivity	14	0	umhos		1		FCOND25	11/7/23	RAMBOLL

Report Date: Tuesday, December 26, 2023

The following are the analytical results for samples received by Laboratory Services:

Sample Description: **EB3** **Caledonia Landfill Semi Annual Sample**
Sample ID: AE69881 Sample Collection Date/Time: 11/07/2023 15:10
Sample Received: 11/08/2023 Sample Collector: RAMBOLL

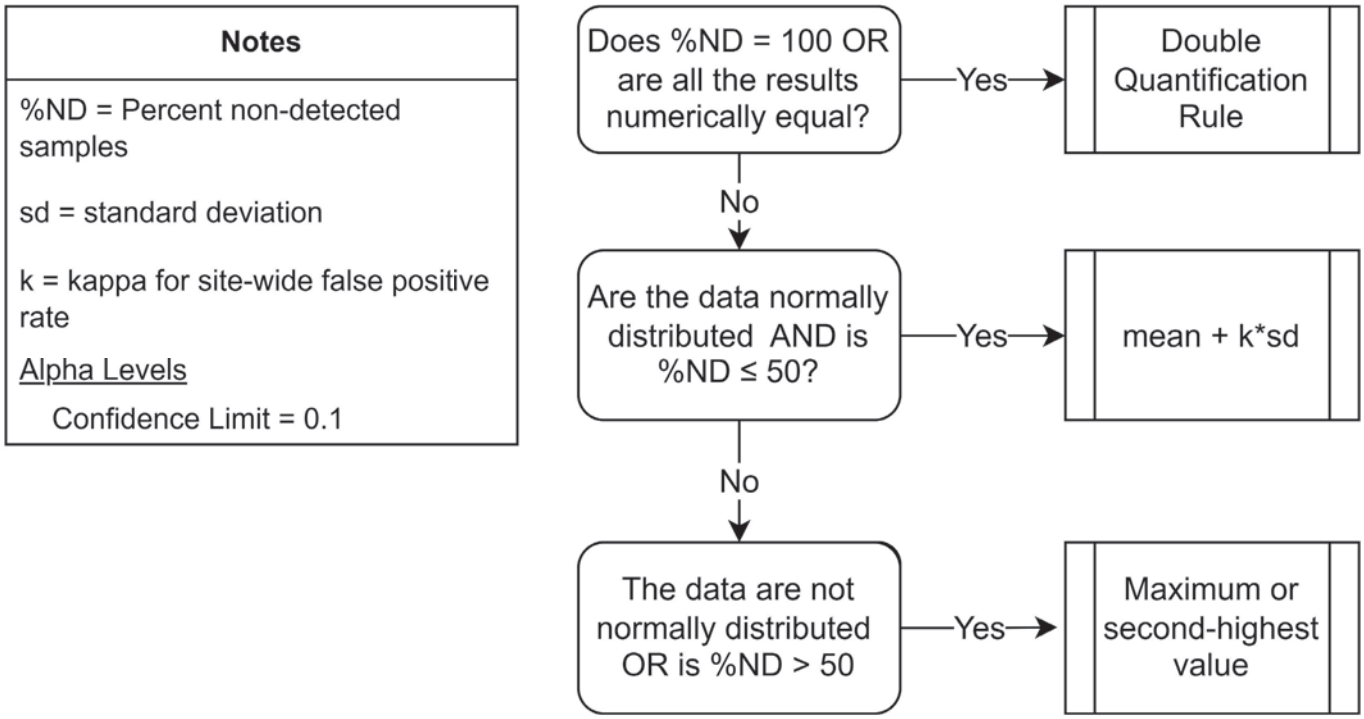
Parameter	Result	LOD	Units	LOQ	DIL	Result Flag	Analysis Method	Analysis Date	Analyst
Field pH	8.0	0.1	Units	0.1	1		FIELDPH	11/7/23	RAMBOLL
Total Alkalinity as CaCO3	Less Than	5.0	mg/L	10.0	1		SM 2320 B-1997	11/15/23	020
Total Hardness as CaCO3	1.6	0.32	mg/L	1.7	1	J	StdMtd 2340B	11/15/23	020
Total Dissolved Solids	Less Than	8.7	mg/L	20.0	1		Std Mtd 2540 C	11/13/23	020
Total Fluoride	Less Than	0.095	mg/L	0.32	1		EPA 300.0	11/29/23	020
Total Chloride	Less Than	0.59	mg/L	2.0	1		EPA 300.0	11/29/23	020
Total Sulfate	Less Than	0.44	mg/L	2.0	1		EPA 300.0	11/29/23	020
Carbonate Ion	Less Than	5.0	mg/L	10.0	1		CO3	11/15/23	020
Bicarbonate Ion	Less Than	5.0	mg/L	10.0	1		HCO3	11/15/23	020
Dissolved Chloride	Less Than	0.59	mg/L	2.0	1		EPA 300.0	11/27/23	020
Dissolved Sulfate	Less Than	0.44	mg/L	2.0	1		EPA 300.0	11/27/23	020
Total Boron	Less Than	3.0	ug/L	10.0	1		EPA 200.8	11/15/23	020
Total Sodium	42.7	42.0	ug/L	250	1	J	EPA 200.8	11/15/23	020
Total Potassium	Less Than	237	ug/L	789	1		EPA 200.8	11/15/23	020
Total Magnesium	183	31.2	ug/L	250	1	J	EPA 200.8	11/15/23	020
Total Calcium	327	76.2	ug/L	254	1		EPA 200.8	11/15/23	020
Dissolved Calcium	358	76.2	ug/L	254	1		EPA 200.8	11/16/23	020
Dissolved Magnesium	190	31.2	ug/L	250	1	J	EPA 200.8	11/16/23	020
Dissolved Potassium	Less Than	237	ug/L	789	1		EPA 200.8	11/16/23	020
Dissolved Sodium	Less Than	42.0	ug/L	250	1		EPA 200.8	11/16/23	020

Sample Comments:

LOD and LOQ are adjusted for dilution factor.
'J' Flag, if present indicates an estimated concentration at or above the LOD and below the LOQ.

If there are any questions concerning this report, please contact: Laboratory Services at (414) 221-4595.

APPENDIX B
STATISTICAL METHODOLOGY FOR DETERMINATION OF BACKGROUND VALUES



When data are not normally distributed or %ND > 50, the maximum value is used if the background sample size is < 60. Where the background sample size is ≥ 60, the achievable per-constituent false positive rates for the maximum and second-highest background values will be compared, and the background value with the achievable per-constituent false positive rate that is closest to, but does not exceed, the target per-constituent false positive rate of 0.015% is used.

APPENDIX C
ALTERNATE SOURCE DEMONSTRATION

Prepared for
We Energies

Date
July 5, 2023

Project No.
1940102327

40 C.F.R. § 257.94(E)(2) ALTERNATE SOURCE DEMONSTRATION DETECTION MONITORING ROUND 11

CALEDONIA ASH LANDFILL

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Wisconsin, certify that enclosed information is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Eric J. Tlachac, PE
Senior Managing Engineer
Professional Engineer No. 36088-6
State of Wisconsin
Ramboll Americas Engineering Solutions, Inc.
Date: July 5, 2023

I, Nathaniel R. Keller, a qualified professional geologist, certify that the enclosed information is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nathaniel R. Keller, PG
Senior Hydrogeologist
Professional Geologist No. 1283-013
State of Wisconsin
Ramboll Americas Engineering Solutions, Inc.
Date: July 5, 2023

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CONTENTS

FIGURES (IN TEXT)

FIGURES (ATTACHED)

ACRONYMS AND ABBREVIATIONS

§	Section
40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	coal combustion residuals
CCR Rule	40 C.F.R. Part 257 Subpart D
D11	eleventh semi-annual Detection Monitoring event
ERGS	Elm Road Generating Station
HDPE	high density polyethylene
mg/L	milligrams per liter
NRT/OBG	Natural Resource Technology, an OBG Company
OCPP	Oak Creek Power Plant
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SSI	statistically significant increase
STD	standard units
TDS	total dissolved solids
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources

1. INTRODUCTION

This document has been prepared on behalf of We Energies by Ramboll Americas Engineering Solutions, Inc. (Ramboll) to provide pertinent information for an alternate source demonstration (ASD) as allowed by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.94(e)(2) for the Caledonia Ash Landfill (CAL) located in Caledonia, Wisconsin.

The eleventh semi-annual detection monitoring event (D11) samples were collected on November 7, 2022 and analytical data were received on January 6, 2023. Analysis of the data for statistically significant increases (SSIs) of 40 C.F.R. Part 257 Appendix III parameters over background concentrations was completed within 90 days of receipt of sample results (April 6, 2023) in accordance with the *Statistical Analysis Plan* (Natural Resource Technology, an OBG Company, 2017a). That statistical determination identified the following SSIs at uppermost aquifer downgradient monitoring wells:

- Boron at W08D, W09D, W10D, W49, and W50
- Calcium at W08D
- Sulfate at W08D, W09D, W10D, W49, and W50
- TDS at W08D and W50

These listed SSIs are consistent with those detected in previous Detection Monitoring Rounds for which ASDs were prepared, with the exception of TDS at W50. 40 C.F.R. § 257.94(e)(2) allows the owner or operator 90 days from the date of determination to demonstrate that a source other than the coal combustion residuals (CCR) unit caused the SSI, or that the SSI resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Pursuant to 40 C.F.R. § 257.94(e)(2), the following demonstrates that sources other than the CAL were the cause of the SSIs listed above. This ASD was completed within 90 days of determination of the SSIs (July 5, 2023) as required by 40 C.F.R. § 257.94(e)(2).

2. BACKGROUND

2.1 Site Location and Description

CAL is located at the Oak Creek (electrical power) Generating Site located next to Lake Michigan in Oak Creek, Wisconsin. The Site occupies about 1,000 acres of land in portions of Section 31, T5N, R23E, Section 6, T4N, R23E, Section 1, T4N, R22E and Section 36, T5N, R22E, straddling Milwaukee and Racine counties. CAL is located approximately 3,800 feet west of Lake Michigan.

The Site began commercial operation in 1953 with the completion of the first units of the Oak Creek Power Plant (OCPP). Electrical generation facilities and associated supporting infrastructure have expanded since that time, including additional units at the OCPP and construction of the Elm Road Generating Station (ERGS), in response to increasing demand. The Site is bordered on the east by Lake Michigan and on the north, west, and south by residential, recreational, commercial, and undeveloped lands. **Figure 1** shows the CAL and adjacent properties. The eastern portion of the property is occupied by the power plants and structures related to the generation of electric power. Land use immediately surrounding the power plant is also related to power generation and CCR management. Prior to acquisition by We Energies, the property was undeveloped and/or residential, and primarily used for agricultural purposes. The Site also includes coal storage areas, electrical transmission facilities, wastewater treatment facilities, and water intake and discharge structures.

CAL was originally permitted in 1987. Construction of the first phase of landfill development was completed in 1990 and a license to operate the site was issued the same year. The permitted area of the landfill covers approximately 45 acres and provides for a disposal capacity of 4,050,000 cubic yards of fly ash and other CCRs. The first six base cells were constructed with a 5-foot thick compacted clay liner and leachate collection system. A Plan of Operation Modification was approved on May 19, 2010, which changed the liner design for future cells to a composite liner consisting of a 4-foot thick compacted clay liner with a 60-mil HDPE geomembrane. Cell 10 was constructed in 2010 and was approved for operation on March 10, 2011. There are three additional cells included with the permit that will be constructed in the future as additional space is needed.

2.2 Geology and Hydrogeology

A detailed hydrogeological assessment of the Oak Creek Site was completed and submitted to the WDNR in 2013 (NRT 2013). Oak Creek Site hydrogeologic information pertinent to this ASD is included in this report, however, more complete information on site hydrogeology and stratigraphy is available in the 2013 hydrogeologic assessment.

The site geology is heterogeneous, consisting of the Oak Creek Formation (clay till) with intermittent sand lenses of variable thicknesses occurring at several depths. Geologic investigations have indicated that sand units are not continuous across the site. The unlithified materials overlie the Silurian Dolomite bedrock, which is also the uppermost aquifer in this area. Most potable water wells in the vicinity of the site are screened in the upper portions of this aquifer.

The bedrock surface elevation is contoured on **Figure 2**. The site overlies a bedrock valley which trends northwest to southeast. Background well W46D is located near the base of the valley and W48 is located on the southern upper slope of the valley. Downgradient wells (W09D, W10D,

W49 and W50) are located on the northern slope of the valley, W08D is located near the apex of the valley. The bedrock valley separates the upgradient and downgradient monitoring wells, and potentially influences the groundwater chemistry at the downgradient locations.

Geologic cross-sections across the site are shown on **Figures 3, 4, 5 ,6, and 7**. Cross Section B-B' (**Figure 4**) and C-C' (**Figure 5**) run west to east and illustrate the background wells and downgradient monitoring wells with respect to the bedrock valley. Cross-section D-D' (**Figure 6**) and E-E' (**Figure 7**) run north to south and show the extent of the intermediate sand to the south.

Vertical groundwater movement is limited within the clay till and as a result, significant downward gradients are present at the site. Regional groundwater flows eastward in the dolomite bedrock, likely discharging into Lake Michigan.

2.3 Groundwater Monitoring

The CAL uppermost aquifer groundwater monitoring system established to comply with the CCR Rule consists of two background monitoring wells (W46D, and W48) and five downgradient monitoring wells (W08D, W09D, W10D, W49 and W50). A map showing the groundwater monitoring system, including the CCR unit and all background and downgradient monitoring wells, is presented in **Figure 1**. Groundwater generally flows to the northeast in the uppermost aquifer, representative groundwater contours are shown on **Figure 1**.

Samples are collected and analyzed in accordance with the Sampling and Analysis Plan (Natural Resource Technology, an OBG Company, 2017b) prepared for CAL.

3. ALTERNATE SOURCE DEMONSTRATION

As allowed by 40 C.F.R. § 257.94(e)(2), this ASD demonstrates that sources other than CAL resulted in the SSIs or that the SSIs were a result of natural variation in groundwater quality. Lines of Evidence (LOEs) supporting this ASD include the following:

1. Composite Liner Design and Construction
2. Geologic and Hydrogeologic Conditions
3. Ionic composition of background and downgradient groundwater are similar and distinct from CAL Leachate
4. Natural variability and evidence for a geogenic (or natural) source

These LOEs were developed and described in detail following Detection Monitoring Round 1 in an ASD prepared for a set of similar parameters and locations (OBG, 2018). This ASD includes portions of that analysis with updated groundwater results to support the LOEs listed above.

3.1 LOE #1: Composite Liner Design and Construction

CAL was constructed with either a five-foot thick compacted clay liner or a 60-mil high density polyethylene (HDPE) liner overlying four feet of compacted clay. Precipitation and/or leachate that collects on top of the liner is removed by a leachate collection system and managed in accordance with the landfill's operating permit. Leachate levels are monitored within the landfill and the system includes high level alarms to notify the landfill operators if leachate levels exceed predetermined levels. The system is jetted and flushed annually as part of regular operation and maintenance. System monitoring and reporting indicate that the leachate collection system is functioning as designed and indicate there is not significant leachate migration into underlying materials. The liner creates a barrier to groundwater, and collection of leachate eliminates potential migration of impacted water, indicating that CAL is not the source of the SSIs.

3.2 LOE #2: Geologic and Hydrogeologic Conditions

The landfill and liner system overlie approximately 100 feet of silty clay and the potential for downward migration of leachate into the bedrock is limited by the low hydraulic conductivity of the Oak Creek Formation. Simpkins and Bradbury (1992) calculated downward velocities of 0.3 to 0.5 cm/yr in the Oak Creek Formation. At the highest velocities, it would require over 3,000 years for leachate to migrate through 50 feet of the Oak Creek Formation (a conservative thickness after removing potential sand lenses and fractured clay near the surface), but CAL has only been active for about 30 years, indicating the SSIs are attributable to another source.

Concentrations of sulfate and TDS are highest in W08D relative to the other wells in the monitoring system, while boron is second highest, only lower than W50. Evaluating boron and sulfate concentrations (TDS is not sampled in shallow wells) versus screened elevation provides evidence that there is no vertical migration near the W08 well nest because there are no elevated boron or sulfate concentrations in the shallow wells indicating the source of the elevated concentrations in the deep, uppermost aquifer wells is unrelated to the CCR landfill (**Figure A and B**).

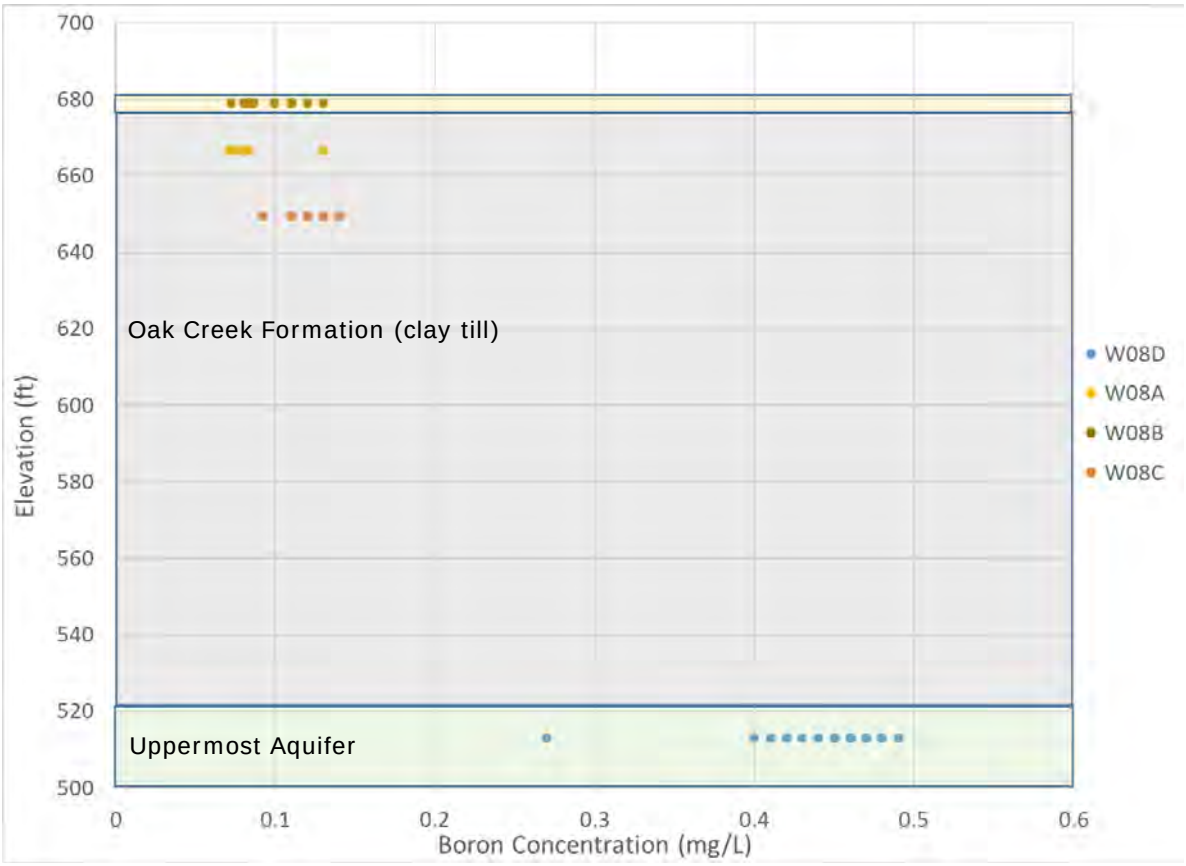


Figure A. Concentrations of Boron with Depth, Monitoring Well Nest W08A, B, C, D

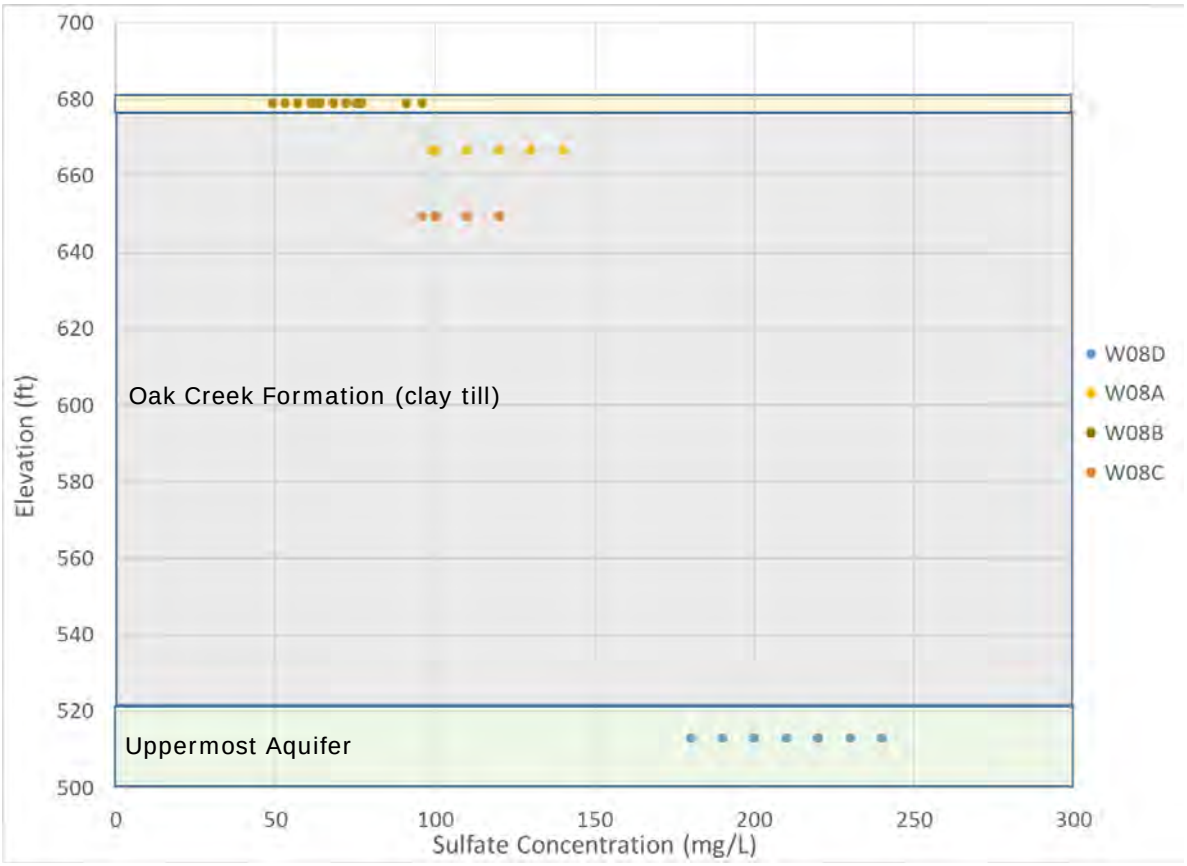


Figure B. Concentrations of Sulfate with Depth, Monitoring Well Nest W08A, B, C, D

Similar concentration distributions are also observed at the W09 well nest (**Figure C**), except for concentrations of boron in W09C are higher than W09D. However, similar concentrations have been measured historically since the well was installed in 1985 (**Figure D**), which is prior to CAL being constructed and put into service in 1990, indicating the landfill is not a source of boron to W09C or W09D.

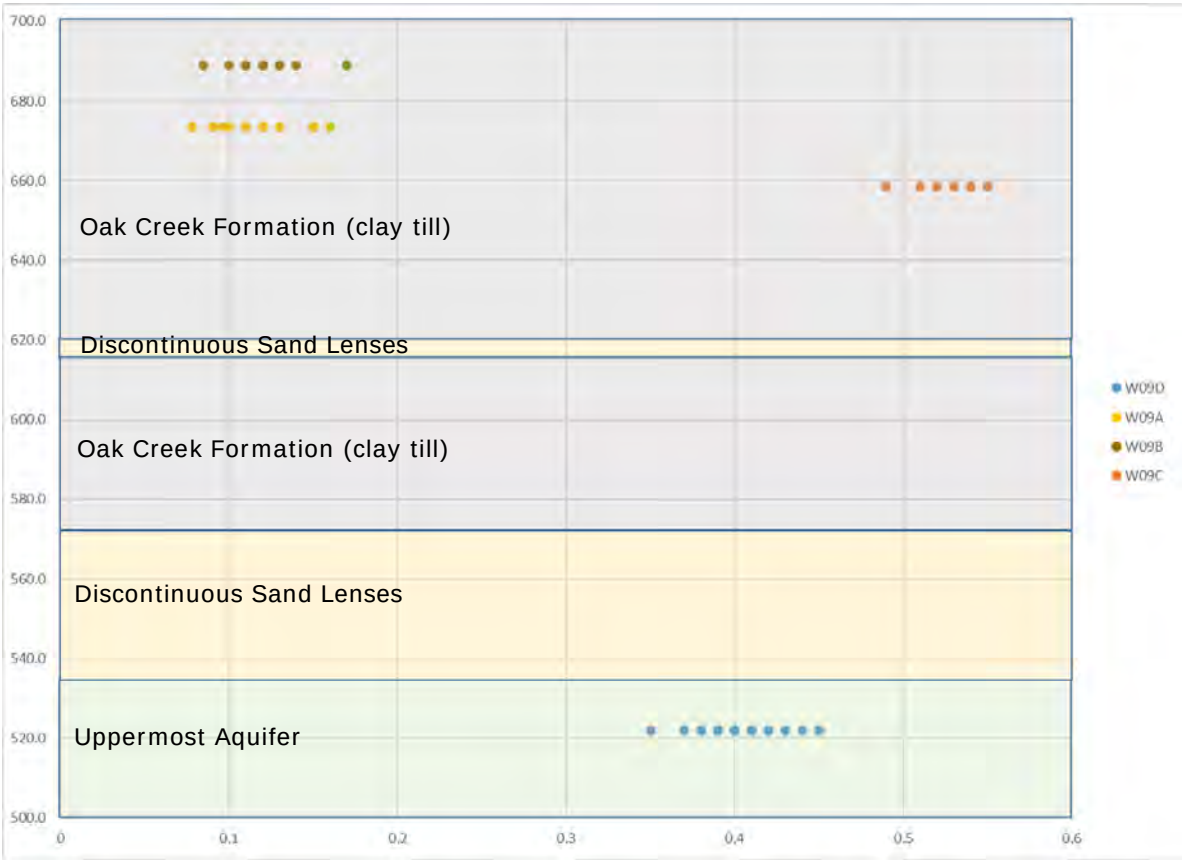


Figure C. Concentrations of Boron with Depth, Monitoring Well Nest W09A, B, C, D

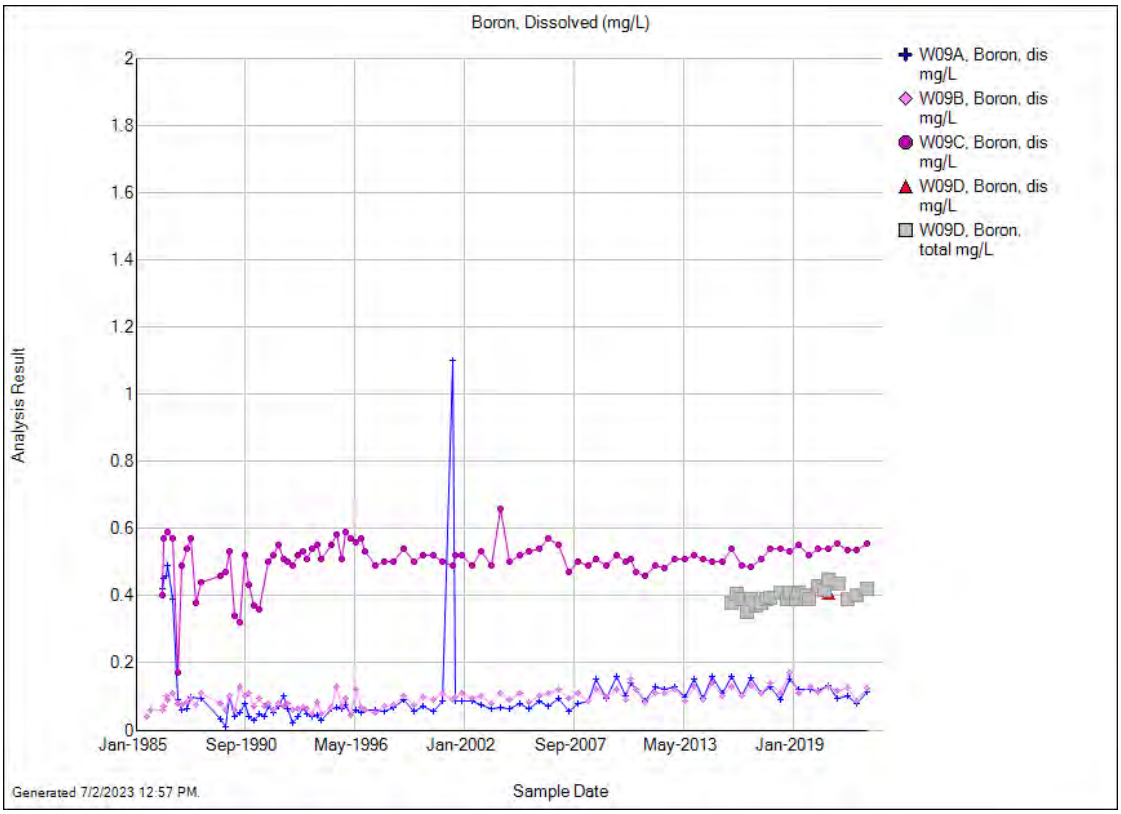


Figure D. Concentrations of Boron, Monitoring Well Nest W09A, B, C, D

3.3 LOE #3: Ionic Composition of Background and Downgradient Groundwater are Similar and Distinct from CAL Leachate

Groundwater samples collected from landfill monitoring wells from November 2021 (concentrations of SSI parameters are similar to those in D11), and a landfill leachate sample collected from the leachate tank in October 2017, were analyzed for ionic composition (major ions). **Figure E** is a Stiff diagram that displays the ionic composition of groundwater and landfill leachate. Polygons with similar shapes on Stiff diagrams indicate solutions with similar ionic compositions, whereas polygons with different shapes indicate solutions with dissimilar ionic compositions. The larger the area of the polygon, the greater the concentration of the various ions.

The Stiff diagram indicates that the background and downgradient groundwater are more similar in ionic composition and distinct from the ionic composition of the CAL leachate. The similarity in ionic composition between the background and downgradient wells demonstrates that downgradient wells are not impacted by CCR from CAL.

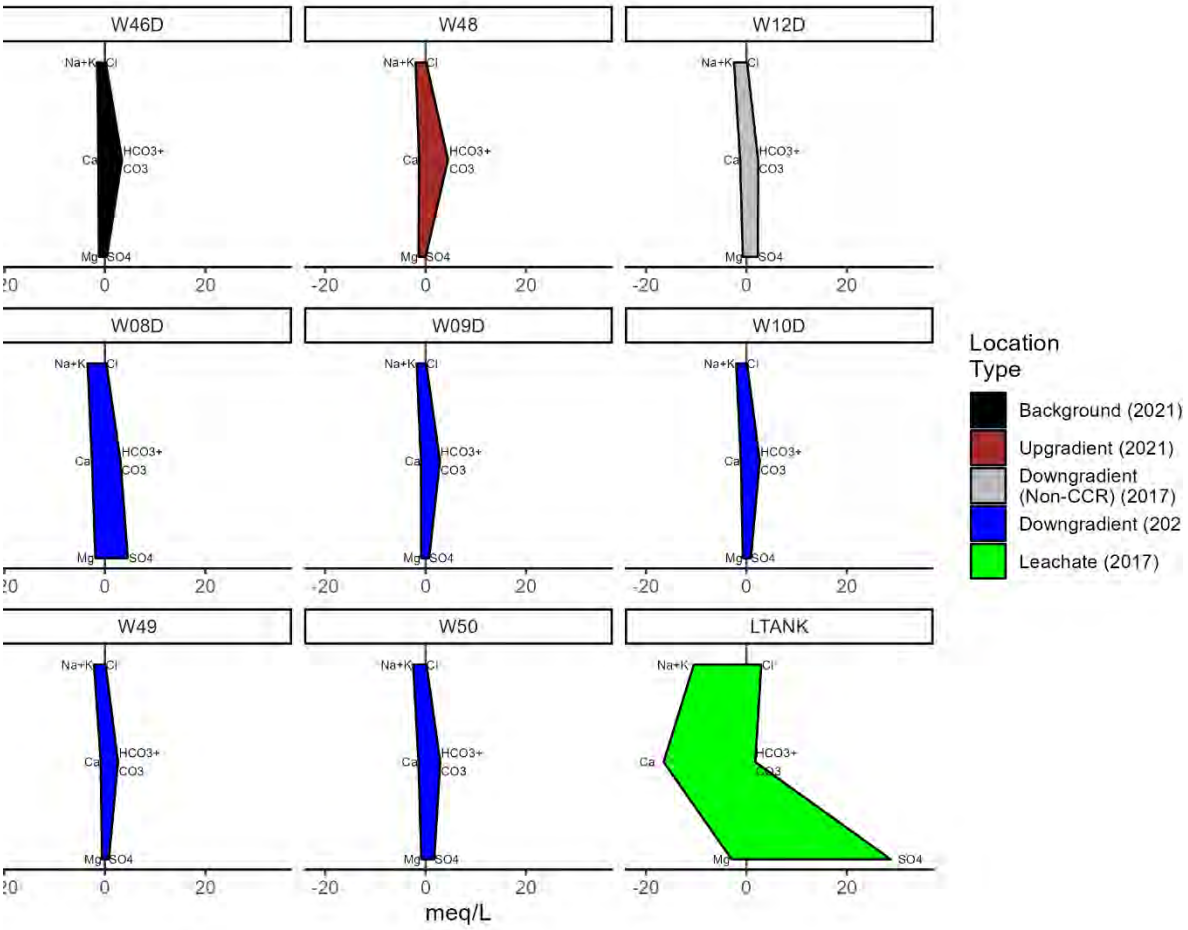


Figure E. Stiff Diagrams illustrating ionic composition of groundwater and CAL leachate

3.4 LOE #4: Natural Variability and Evidence for a Geogenic (or Natural) Source

Boron and sulfate are naturally occurring and present at variable concentrations within the uppermost aquifer. Regional studies that were completed to identify and determine sources of molybdenum in private wells located near CAL (WDNR, 2013, and Harkness et al, 2017) also have investigated the occurrence of boron, sulfate, and tritium to evaluate the elevated concentrations of molybdenum.

Important conclusions from these studies are as follows:

- **WDNR, 2013 -** *"Both MW-06(W12B) and MW-07 (W12C) are nested monitoring wells screened at different depths, along with MW-08 (W12D). MW-07 is the shallowest well, followed by MW-06 which is deeper and MW-08 is the deepest, screened at the top of the dolomite. This monitoring well nest does not show significant vertical migration of the boron to the dolomite. In addition, the δ11B[1] value for MW-08 (W12D) is outside of the "mixing zone," suggesting it is naturally*

[1] Stable boron isotopes have been used in other studies as an indicator of the boron source found in the environment around CCR disposal sites. These studies have found δ11B values between -40 ‰ and +6.6 ‰ in coal ash samples. Most natural waters have a δ11B value between+10 and +30 ‰. (Buska et al, 2007, Ruhl et al, 2011, and Ruhl, 2012)

occurring, and tritium was not detected in MW-08 (W12D) but was detected in both MW-06 (W12B) and MW-07(W12C), suggesting that the water in the deepest well is more reflective of preash- disposal conditions."

"The data appear to be more conclusive regarding boron. While the [shallow] monitoring wells may have been affected, the boron isotope data and other evidence appear to show that the boron in most of the [bedrock aquifer] private wells is naturally occurring. Boron may also be coming from other man-made sources. There is more available boron data for the area's groundwater resources than molybdenum data. Boron is known to occur naturally in area groundwater."

- **HARKNESS ET AL, 2017** – *"the Silurian dolomite has dual permeability with the majority of flow dominated by fractures in the extensive, lower-conductivity mudstone units, and interspersed, coarse-grained lenses that allow for faster groundwater flow."*

  "Exchange between the Maquoketa Shale and the Silurian Dolomite have been reported in geophysical studies of the area, and both aquifers are known to host pyrite and other sulfide minerals."

  "We hypothesize that a groundwater flowpath through clay-rich unconsolidated materials would induce cation exchange. Na and B bound to clay particles would be preferentially exchanged for Ca and Mg, resulting in the evolution from Ca–Mg dominated shallow groundwater to Na- (and B-rich) dominated deep groundwater with increasing groundwater residence time."

  "While B and Na could be sourced from local water–rock interactions, they are commonly enriched and highly leachable from shales, and thus the strong correlation between B and Na, along with correlations between B and SO4 ($r = 0.66$, $p < 0.05$), and Na and SO4 ($r = 0.75$, $p < 0.05$) suggest that the sulfide oxidation may occur within shale; this would release Mo and allow it to subsequently mix into the shallow aquifer along with Na and B. The δ11B values >20‰ found in the groundwater are higher than the ~15% expected from exchange of B on marine clays, and yet are consistent with the values found in formation waters from shales."

  "In the case study of southeastern Wisconsin, the groundwater residence times indicate a premodern age for waters (recharged before 1950) in deep, Mo-rich groundwater from the eastern area of the study region. These groundwater wells all yielded apparent ages of >300 years."

The results of both investigations support a geogenic source of boron either in the dolomite aquifer itself, or from interactions of groundwater with the underlying Maquoketa Shale. These reports infer that elevated sulfate and sodium concentrations occur with boron because of the groundwater residence time and interactions with the host rock. In summary, the study data indicates naturally occurring groundwater, unimpacted by CCRs, may exhibit higher concentrations of boron, sodium, and sulfate, as a result of chemical interactions of groundwater with sulfide minerals as a result of long residence times within the Silurian Dolomite (i.e., uppermost aquifer).

Concentrations of SSI parameters are generally highest at W08D, except for boron, which is highest at W50, and similar to concentrations observed at W12D that were determined in the studies referenced above to be naturally occurring. Trend plots for SSI parameters are included below **(Figure F through Figure I).** At W08D, concentrations of boron, calcium, sulfate, and TDS in groundwater exceed background. Elevated concentrations in this well are attributed to several factors, including the geology and hydrogeologic position of this well in the aquifer (OBG, 2018).

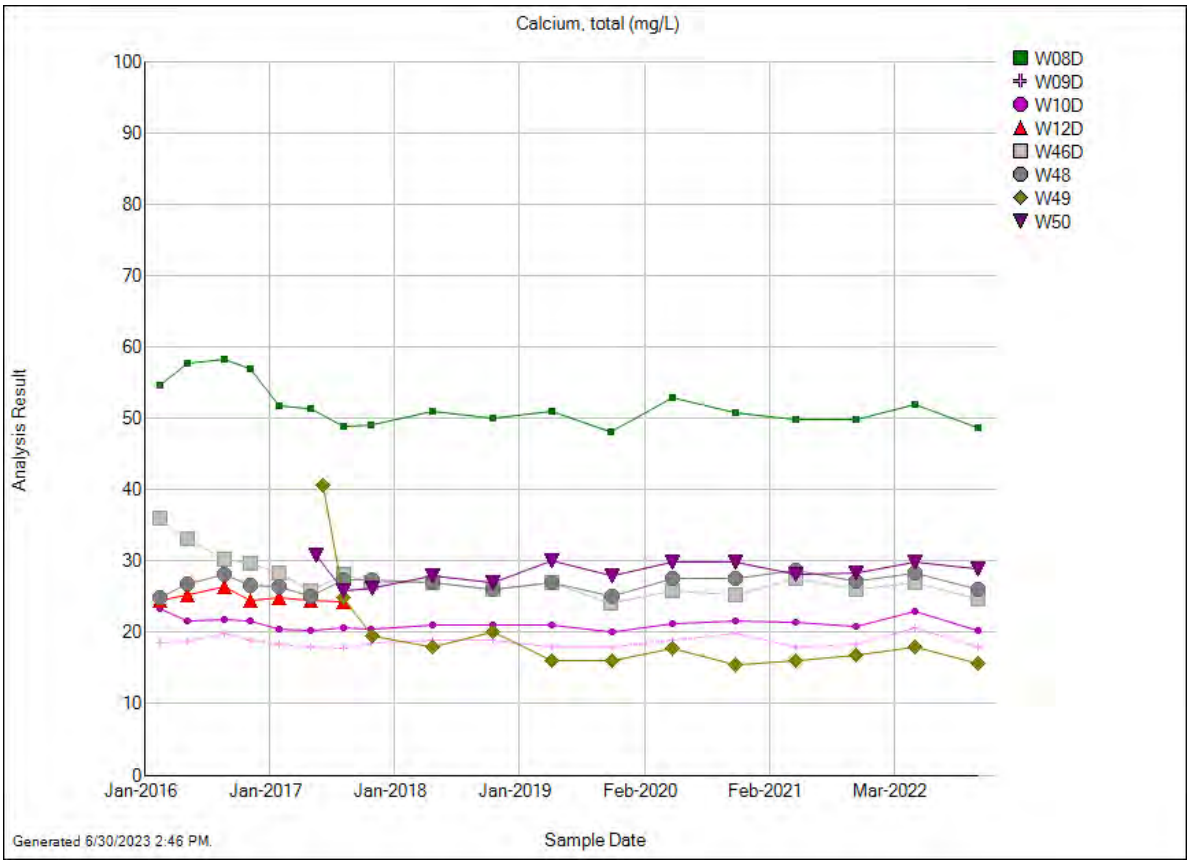


Figure F. Concentrations of calcium at select monitoring wells.

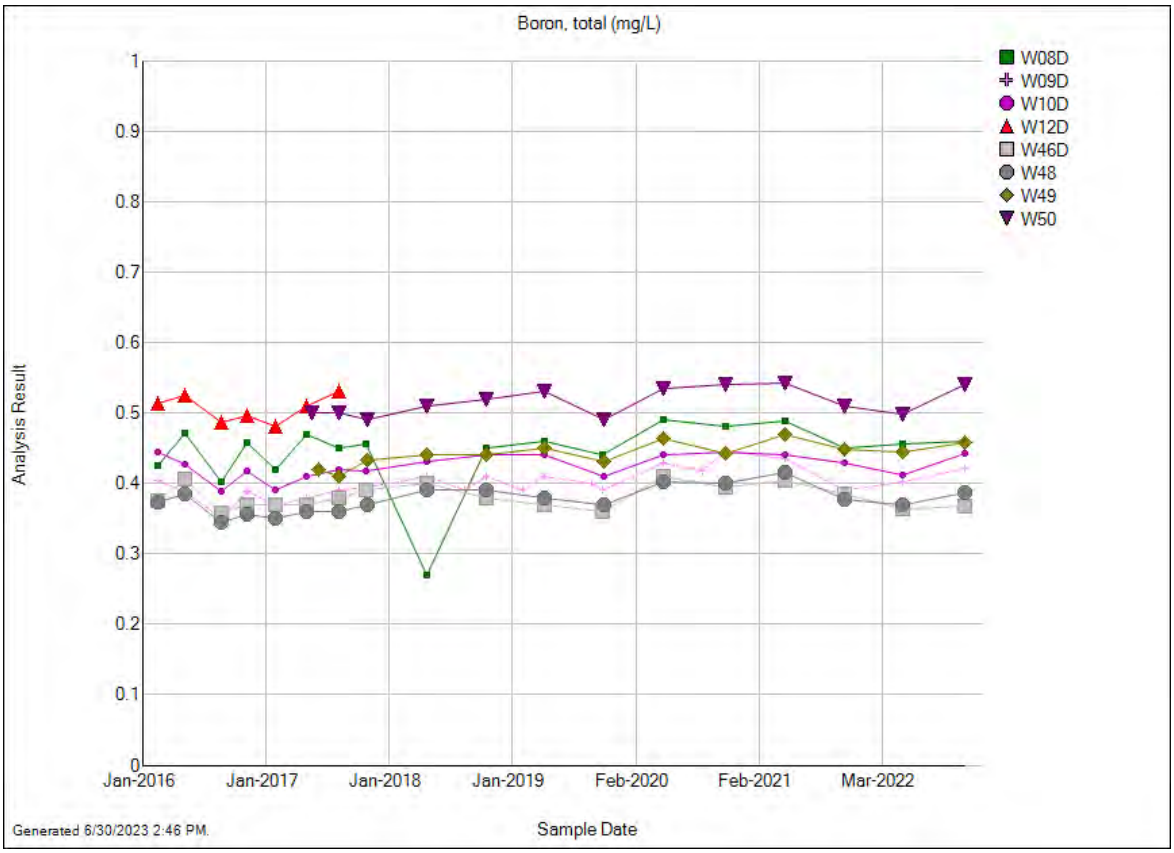


Figure G. Concentrations of boron at select monitoring wells.

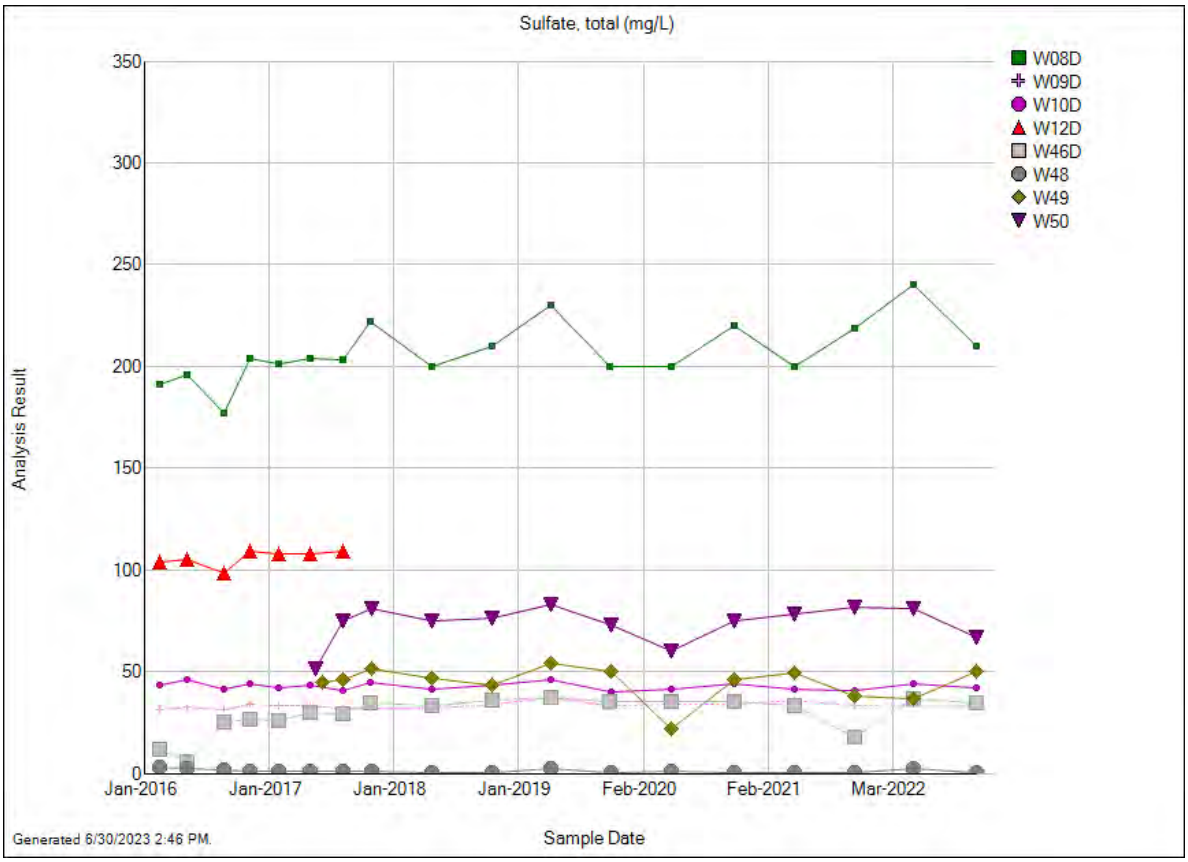


Figure H. Concentrations of sulfate at select monitoring wells.

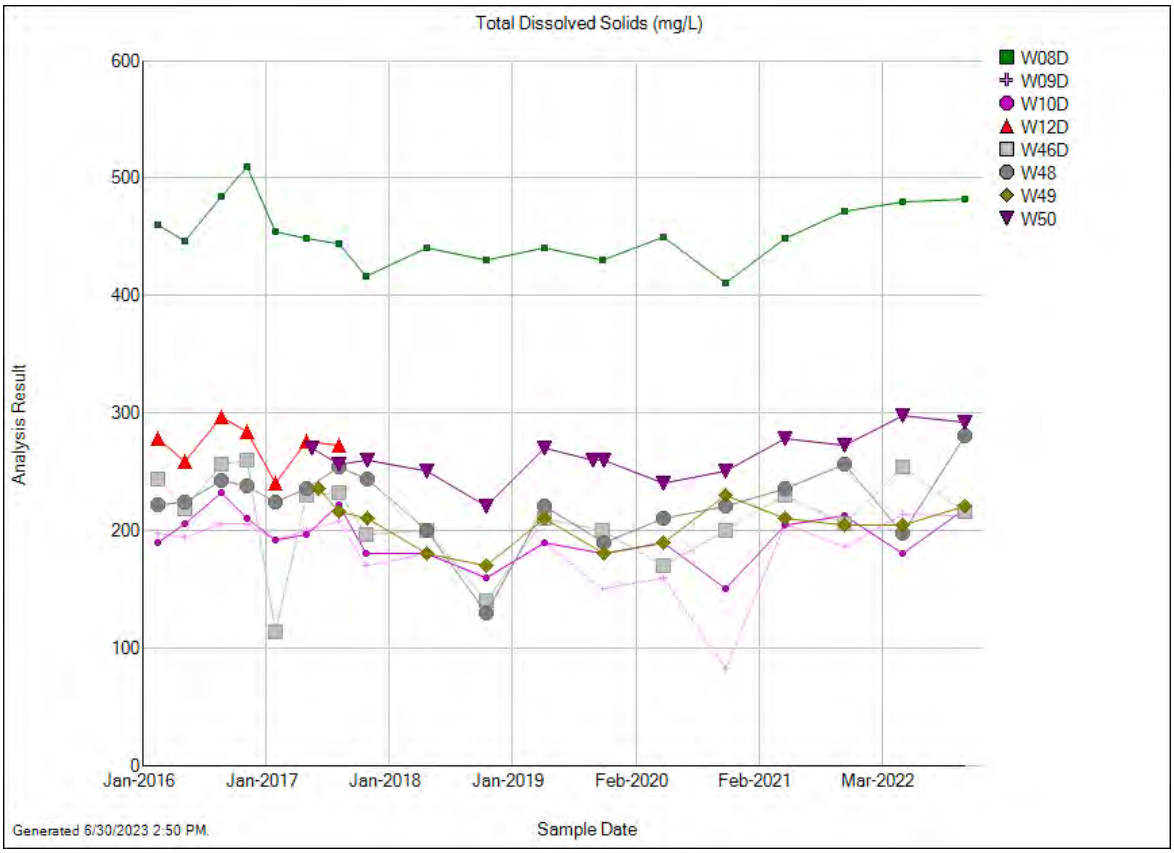


Figure I. Concentrations of TDS at select monitoring wells.

The bedrock surface elevation is contoured on **Figure 2** and geologic cross-sections across the site are shown on **Figures 3 through 7**. **Figure 2** illustrates the bedrock valley which trends northwest to southeast, and cross-sections B-B' and C-C' run west to east and illustrate the positions of the background wells and downgradient monitoring wells with respect to the bedrock valley. The site overlies the bedrock valley, where background well W46D is located near the base of the valley and background well W48 is located on the southern upper slope of the valley. Downgradient wells W09D, W10D, W49, and W50 are located on the northern slope of the valley, W08D is located near the apex of the valley. The bedrock valley separates the upgradient and downgradient monitoring wells and influences the groundwater chemistry at the downgradient locations.

The bedrock surface was eroded to the southwest of W10D and W49, and west of W50. The lower bedrock surface within the valley located to the southwest and west of these wells also corresponds to the upgradient groundwater flow direction. The higher bedrock elevations within which downgradient wells W09D, W10D, W49, and W50 are screened (midpoint screen elevations of 520 to 522.5 ft) are over 20 feet higher in elevation than the midpoint screen elevation of background well W46D, which is located near the base of the bedrock erosional valley. The slightly elevated concentrations of boron and sulfate in the higher elevation downgradient wells relative to the lower elevation upgradient well may be due to varying geologic and geochemical conditions within these different bedrock horizons.

In addition to the observations discussed above, oxidation-reduction potential (ORP) and pH measured in the field during groundwater sampling at downgradient wells W10D and W49 indicate slightly less reducing conditions and more acidic groundwater. These conditions can elevate boron concentrations with respect to background by increasing the solubility of iron and manganese hydroxides onto which boron and sulfate may be adsorbed.

Boron and sodium are commonly enriched and highly leachable from shales. A strong correlation between boron and sodium in groundwater contained in shales would support this hypothesis. Figure J contains a scatter plot of sodium and boron concentrations from both the site wells and additional sampling locations in the uppermost aquifer. The strong correlation coefficient of 0.96 indicates that there is a high correlation between boron and sodium indicating they are likely from the same source. Previous investigations indicate the strong correlation between these two parameters is evidence to support that the groundwater in the Silurian Dolomite is interacting with the underlying Maquoketa Shale, this results in progressively elevated concentrations of sodium and boron as the distance from recharge areas increases, as observed in CCR Rule monitoring wells on-site. The underlying shale as a potential source of boron in groundwater is consistent with the observation that higher boron concentrations occur at depth in the dolomite (because they are screened deeper and closer to the Maquoketa Shale).

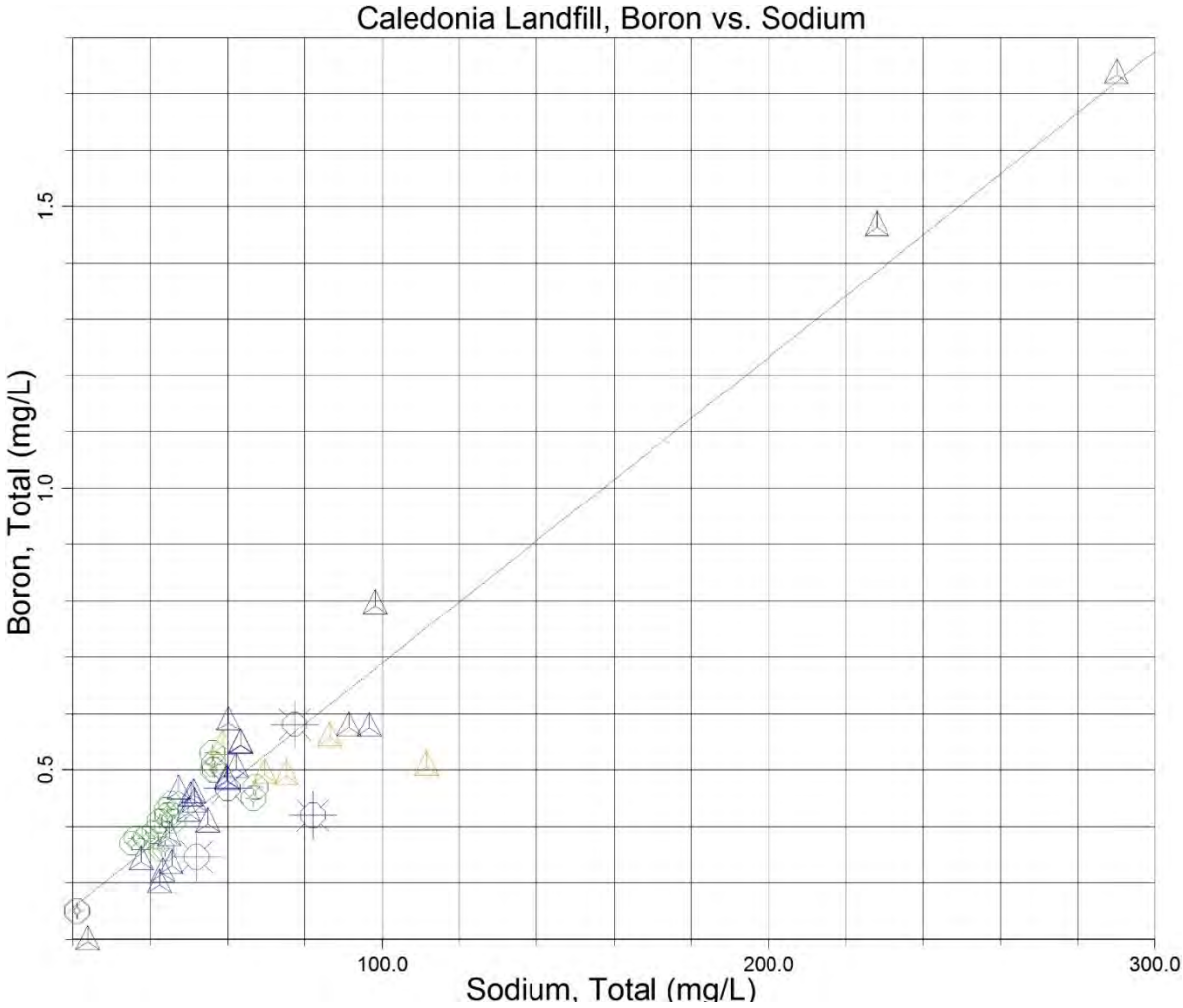


Figure J. Scatter plot of boron and sodium concentrations observed in groundwater samples collected from the uppermost aquifer.

4. CONCLUSIONS

The following LOEs demonstrate that the SSIs observed during D11 are due to alternate sources as follows:

1. Composite Liner Design and Construction
2. Geologic and Hydrogeologic Conditions
3. Ionic composition of background and downgradient groundwater are similar and distinct from CAL Leachate
4. Natural variability and evidence for a geogenic (or natural) source

The preceding information serves as the ASD prepared in accordance with 40 C.F.R. §257.94(e)(2) and supports the position that the SSIs observed during the D11 Detection Monitoring event are not due to a release from the CCR unit but were from naturally occurring conditions in the area of CAL. Therefore, no further action (i.e., Assessment Monitoring) is warranted and the CAL will remain in Detection Monitoring.

5. REFERENCES

Buska, Paul M., Fitzpatrick, John and Watson, Lee R. and Kay, Robert T. *Evaluation of Ground-Water and Boron Sources by Use of Boron Stable-Isotope Ratios, Tritium, and Selected Water Chemistry Constituents near Beverly Shores, Northwestern Indiana, 2004.* U.S. Geological Survey Scientific Investigations Report 2007-5166. 2007.

Harkness, Jennifer S., Thomas H. Darrah, Myles T. Moore, Colin J. Whyte, Paul D. Mathewson, Tyson Cook, and Avner Vengosh, 2017. Naturally Occurring versus Anthropogenic Sources of Elevated Molybdenum in Groundwater: Evidence for Geogenic Contamination from Southeast Wisconsin, United States. *Environmental Science & Technology* 2017 *51* (21), 12190-12199.

Natural Resource Technology, 2013. Hydrogeology, Groundwater Quality, and Environmental Monitoring, Oak Creek Site, Oak Creek and Caledonia, Wisconsin, January 21, 2013.

Natural Resource Technology, an OBG Company, 2017a, Statistical Analysis Plan, Caledonia Ash Landfill, Caledonia, WI, October 17, 2017.

Natural Resource Technology, an OBG Company, 2017b, Sampling and Analysis Plan – Revision 2, Caledonia Ash Landfill, Caledonia, WI, September 29, 2017.

OBG, 2018. Caledonia Ash Landfill. 40 CFR Section 257.94 (E)(2) Alternate Source Demonstration. Caledonia, WI, April 15, 2018.

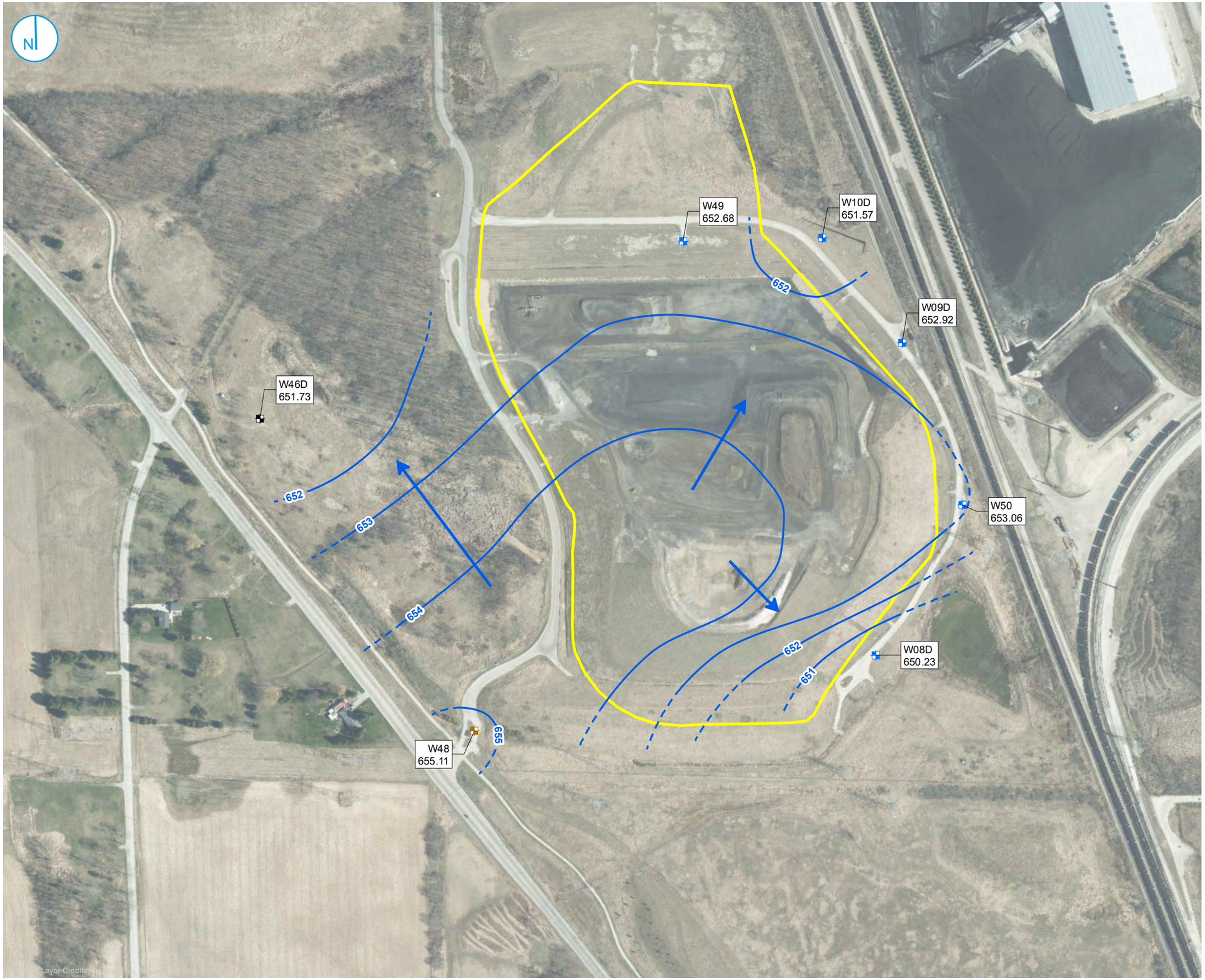
Ruhl, Laura S., Vengosh, Avner, Dwyer, Gary S., Hsu-Kim, Heileen and Deonarine, Amrika. A Twenty-Month Geochemical and Isotopic Investigation into Environmental Impacts of the 2008 TVA Coal Ash Spill, – May Denver, CO, USA : s.n., 2011. 2011 World of Coal Ash (WOCA) Conference - May 9-12, 2011.

Ruhl, Laura. Boron and Strontium Isotopic Characterization of Coal Combustion Residuals: Validation of Novel Environmental Tracers, Paper No. 30616-208920. Charlotte, NC: s.n., 2012. 2012 Geological Society of America Annual Meeting and Exposition, 4-7 November.

WDNR, 2013. Caledonia Groundwater Molybdenum Investigation, Southeast Wisconsin. January 2013.

FIGURES

Y:\GIS\Projects\16\1660\CALEDONIA\MXD\GM_CAR_2022\Figure 4_GW Contour Map Nov 2022.mxd



- CCR RULE BACKGROUND MONITORING WELL LOCATION
- CCR RULE DOWNGRADIENT MONITORING WELL LOCATION
- CCR RULE UPGRADIENT MONITORING WELL LOCATION
- UNIT BOUNDARY
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

0 150 300
Feet

POTENTIOMETRIC SURFACE MAP
NOVEMBER 7, 2022

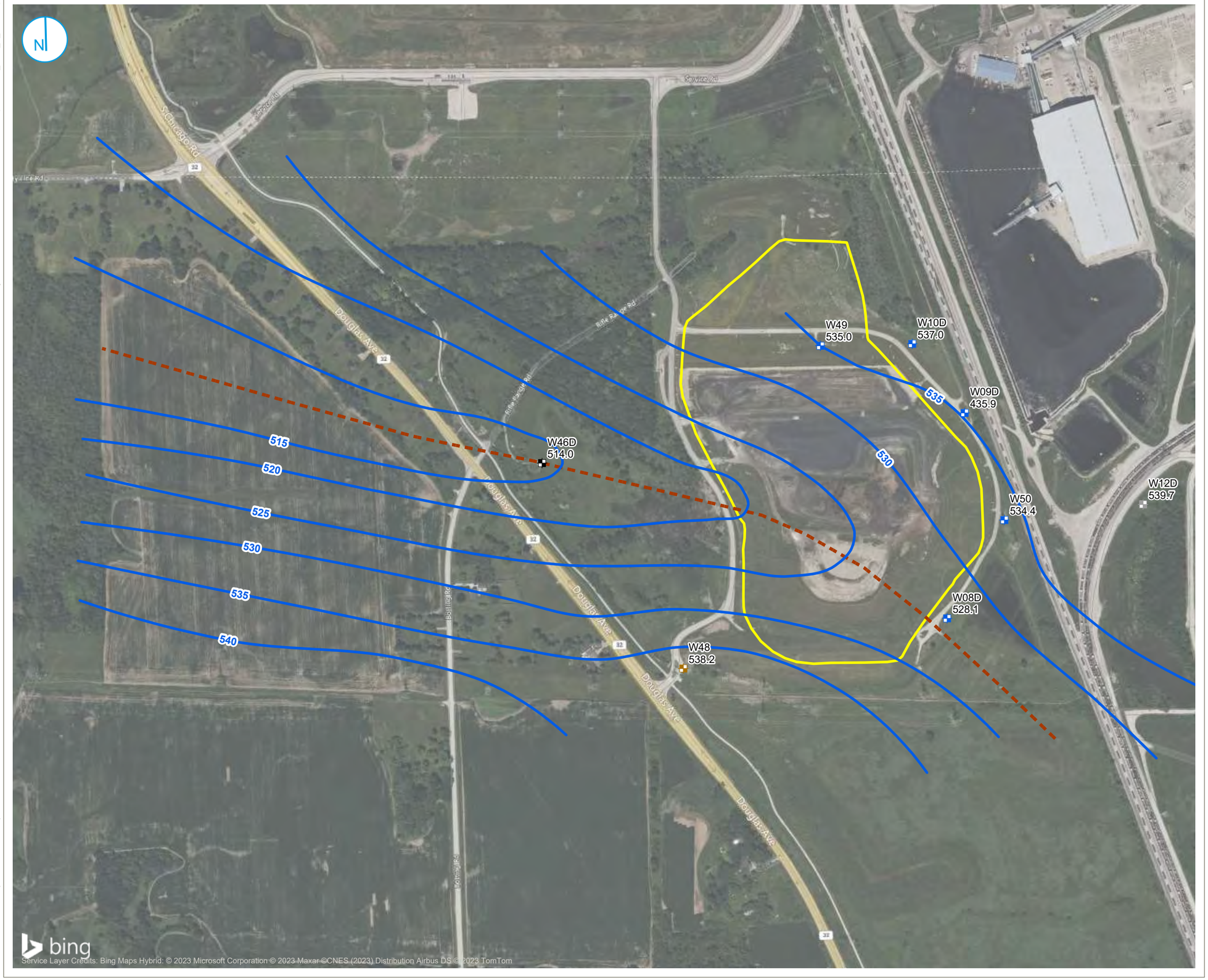
Alternate Source Demonstration
Caledonia Ash Landfill
Caledonia, WI

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC

RAMBOLL

PROJECT: 169000XXXX | DATED: 1/27/2023 | DESIGNER: galarnmc



CCR RULE BACKGROUND MONITORING WELL LOCATION

CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

NON-CCR RULE DOWNGRADIENT MONITORING WELL LOCATION

CCR RULE UPGRADIENT MONITORING WELL LOCATION

TOP OF AQUIFER ELEVATION CONTOUR (5-FT CONTOUR INTERVAL, NAVD88)

APPROXIMATE CENTERLINE OF BEDROCK VALLEY

Unit Boundary

0 225 450 Feet

TOP OF UPPERMOST AQUIFER-SILURIAN DOLOMITE

Alternate Source Demonstration
Caledonia Ash Landfill
Caledonia, WI

FIGURE 2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC

RAMBOLL

C:\Users\ChurchKE\OneDrive - Ramboll\Documents\ArcGIS\Projects\CaledoniaAshLandfill\CaledoniaAshLandfill.aprx\Ramboll_ANSI_B_Landscape

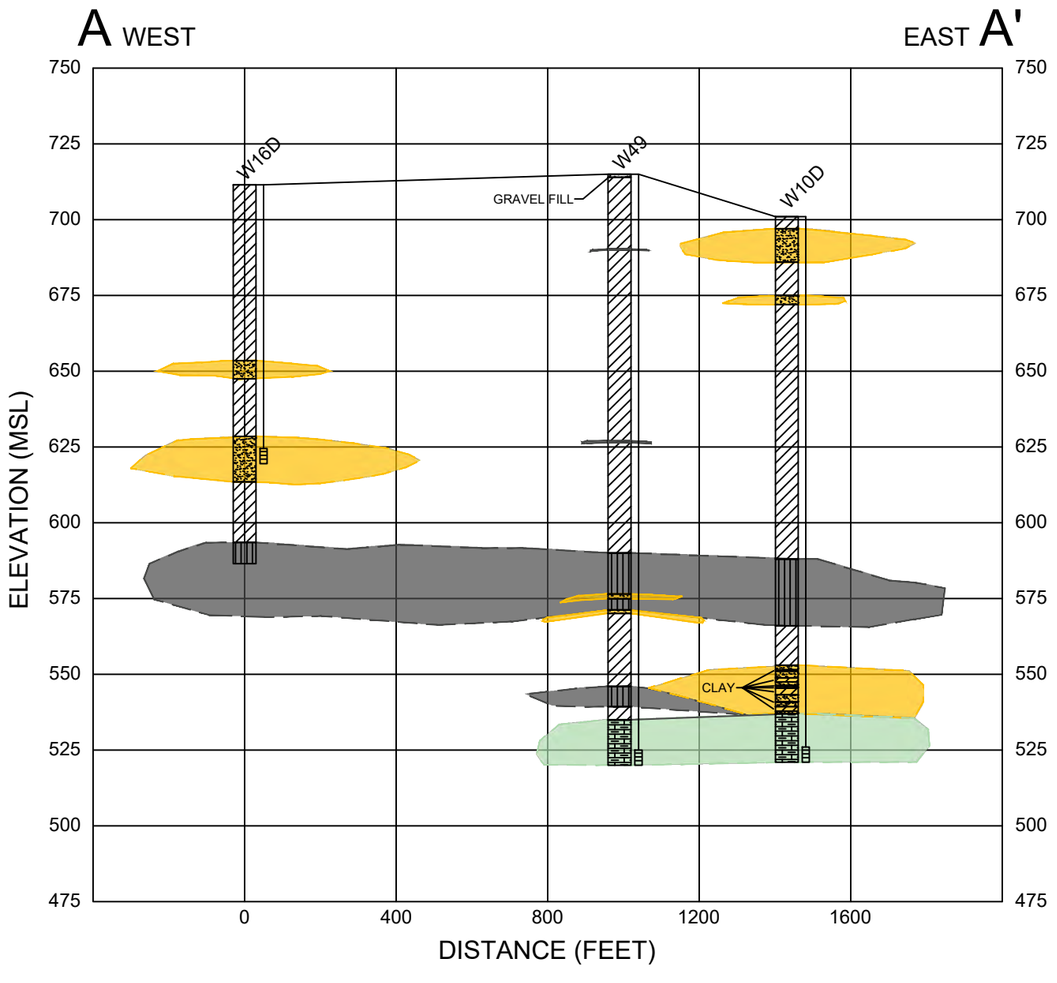
PROJECT: 169000XXXX | DATED: 9/8/2023 | DESIGNER: CHURCHKE

N

0 350 700

SCALE IN FEET

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



W16D — MONITORING WELL LOCATION

A — A' — CROSS-SECTION TRANSECT

- SAND
- SILT
- CLAY
- DOLOMITE (BEDROCK)
- LOW/ NO RECOVERY
- WELL SCREEN
- SAND
- SILT
- DOLOMITE (BEDROCK)

NOTES:
1. DASHED LINE INDICATES INFERRED CONTACT

VERTICAL SCALE IN FEET: 50

HORIZONTAL SCALE IN FEET: 400

VERTICAL EXAGGERATION = 8

GEOLOGIC CROSS-SECTION A-A'

Alternate Source Demonstration
Caledonia Ash Landfill
Caledonia, WI

FIGURE 3

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

W16D MONITORING WELL LOCATION

B — B' CROSS-SECTION TRANSECT

ASH
SAND
SILT
CLAY
DOLOMITE (BEDROCK)
LOW/ NO RECOVERY
WELL SCREEN
ASH
SAND
SILT
SANDY CLAY/ SANDY SILT
DOLOMITE (BEDROCK)

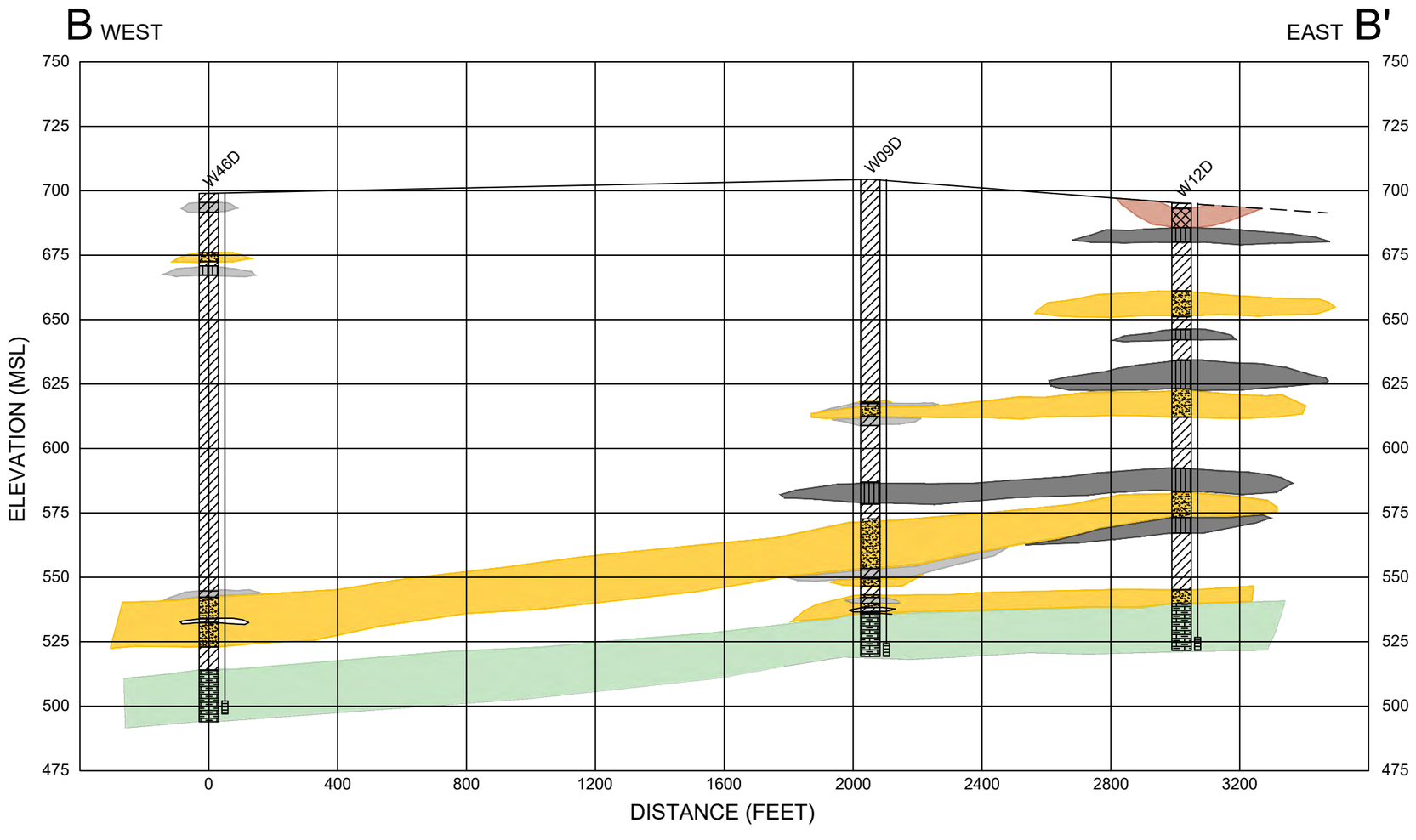
VERTICAL SCALE IN FEET: 50
HORIZONTAL SCALE IN FEET: 400

VERTICAL EXAGGERATION = 8

N

0 350 700
SCALE IN FEET

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



GEOLOGIC CROSS-SECTION B-B'

Alternate Source Demonstration
Caledonia Ash Landfill
Caledonia, WI

FIGURE 4

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

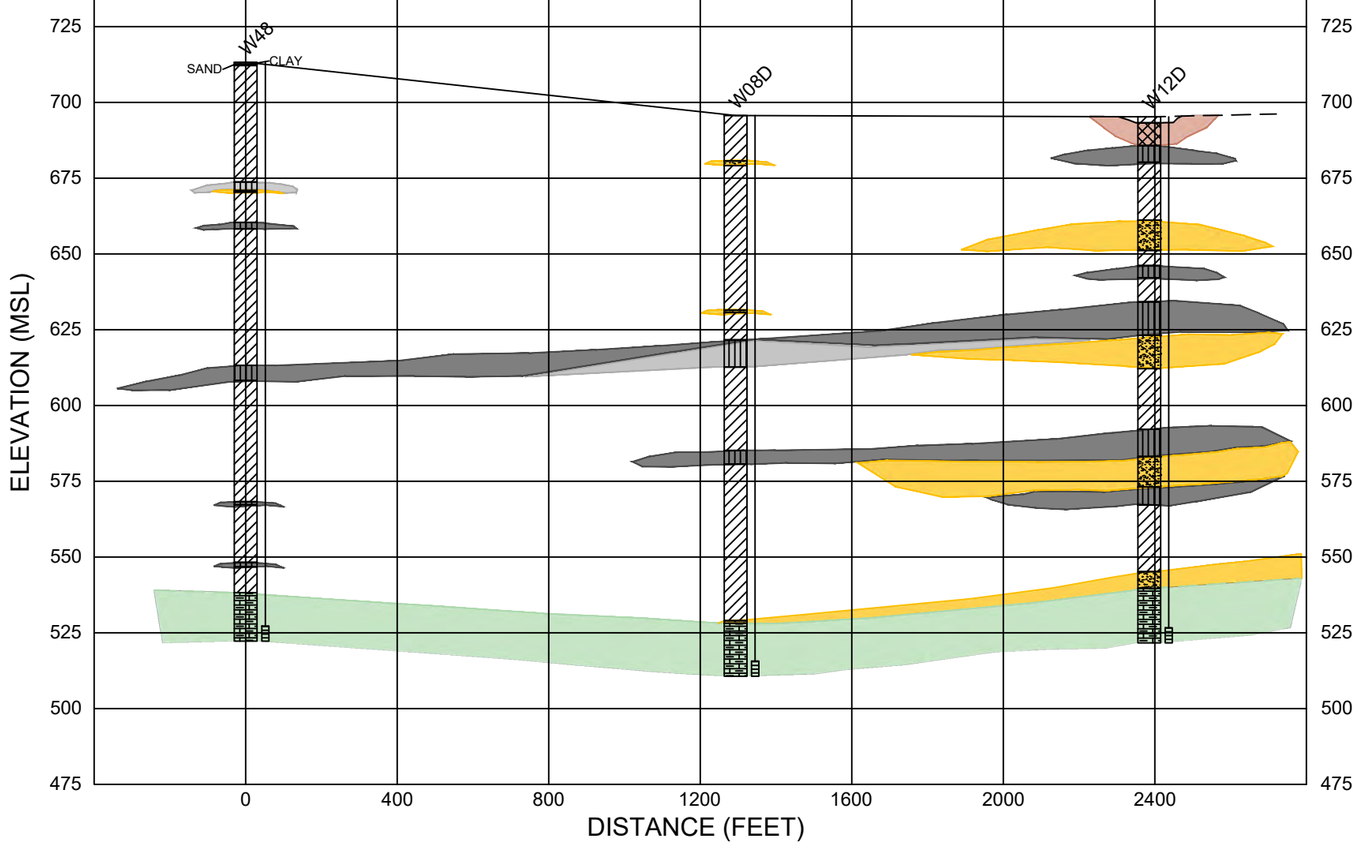
RAMBOLL

N

0 350 700

SCALE IN FEET

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



W16D MONITORING WELL LOCATION

C — C' CROSS-SECTION TRANSECT

ASH
SAND
SILT
CLAY
DOLOMITE (BEDROCK)
LOW/ NO RECOVERY
WELL SCREEN
ASH
SAND
SILT
SANDY CLAY/ SANDY SILT
DOLOMITE (BEDROCK)

VERTICAL SCALE IN FEET 50

HORIZONTAL SCALE IN FEET 400

VERTICAL EXAGGERATION = 8

GEOLOGIC CROSS-SECTION C-C'

Alternate Source Demonstration
Caledonia Ash Landfill
Caledonia, WI

FIGURE 5

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

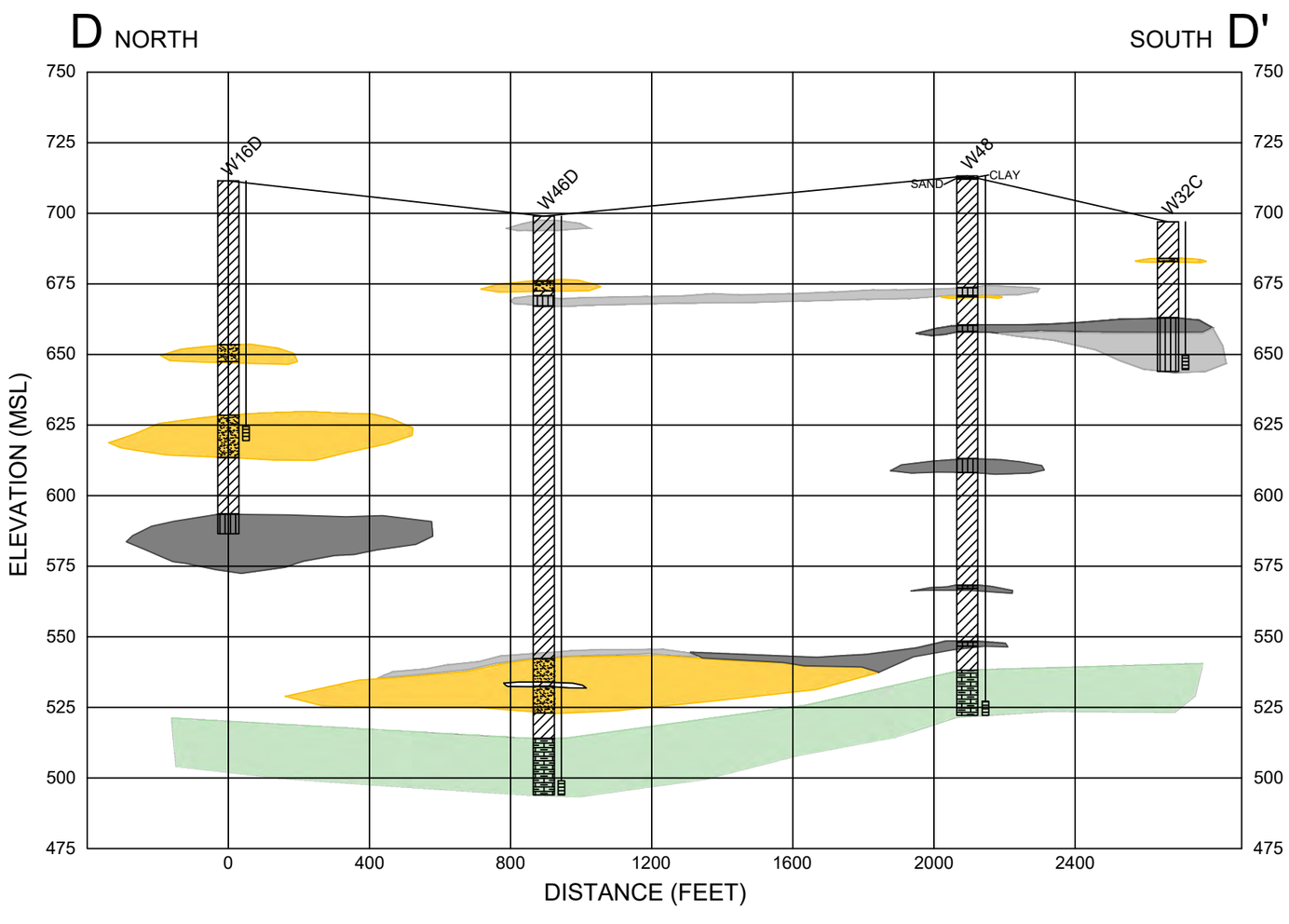
RAMBOLL

N

0 350 700

SCALE IN FEET

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



W16D MONITORING WELL LOCATION

D — D' CROSS-SECTION TRANSECT

SAND

SILT

CLAY

DOLOMITE (BEDROCK)

LOW/ NO RECOVERY

WELL SCREEN

SAND

SILT

SANDY CLAY/ SANDY SILT

DOLOMITE (BEDROCK)

VERTICAL SCALE IN FEET: 50

HORIZONTAL SCALE IN FEET: 400

VERTICAL EXAGGERATION = 8

GEOLOGIC CROSS-SECTION D-D'

Alternate Source Demonstration
Caledonia Ash Landfill
Caledonia, WI

FIGURE 6

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

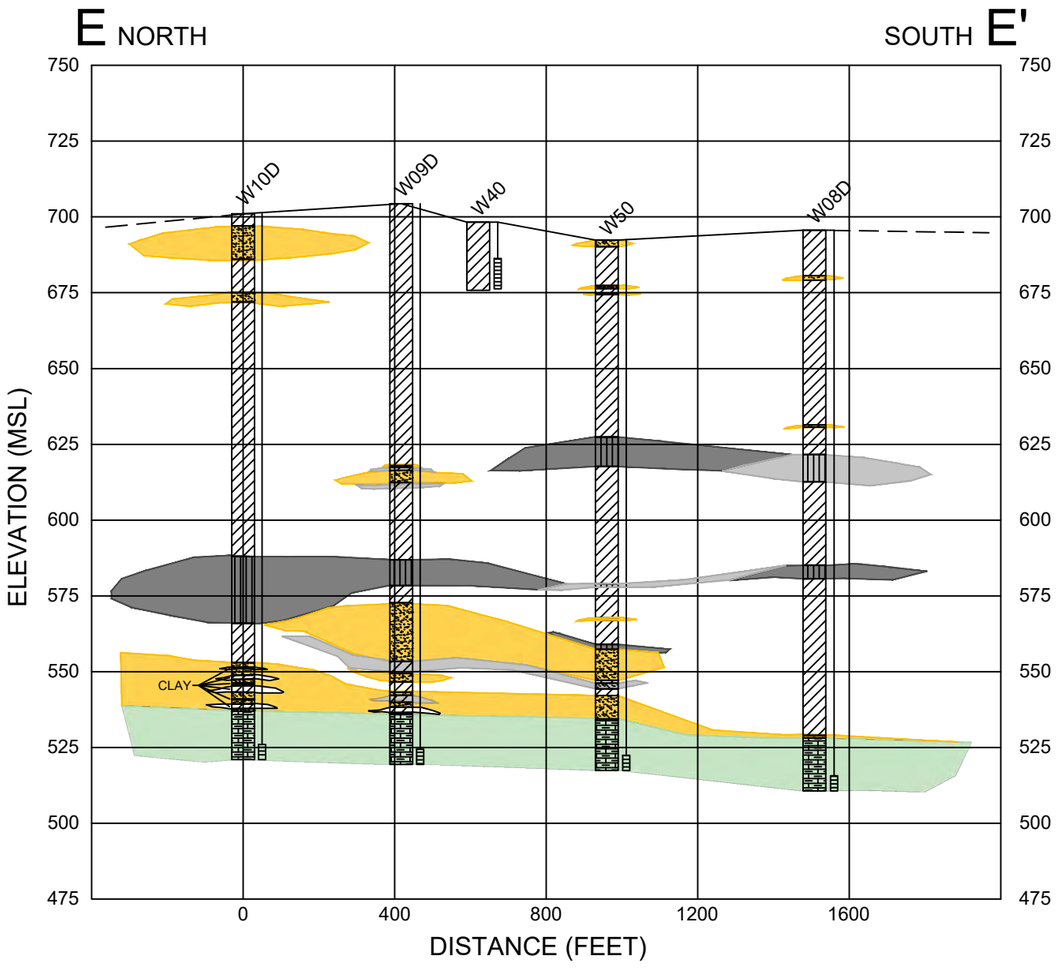
PROJECT: 1940102327 DATED: 1/25/2023 DESIGNER: CAWRSEAG

N

0 350 700

SCALE IN FEET

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



W16D MONITORING WELL LOCATION

E — E' CROSS-SECTION TRANSECT

SAND

SILT

CLAY

DOLOMITE (BEDROCK)

LOW/ NO RECOVERY

WELL SCREEN

SAND

SILT

SANDY CLAY/ SANDY SILT

DOLOMITE (BEDROCK)

VERTICAL SCALE IN FEET: 50

HORIZONTAL SCALE IN FEET: 400

VERTICAL EXAGGERATION = 8

GEOLOGIC CROSS-SECTION E-E'

Alternate Source Demonstration
Caledonia Ash Landfill
Caledonia, WI

FIGURE 7

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL