Prepared for
Illinois Power Generating Company

Date
January 31, 2022

Project No.
1940100711-012

2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

LANDFILL 2

NEWTON POWER PLANT

NEWTON, ILLINOIS

CCR UNIT 502

RAMBOLL Bright ideas. Sustainable change.

2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER PLANT LANDFILL 2

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Description	**Annual Report in Support of the CCR Rule Groundwater Monitoring Program**

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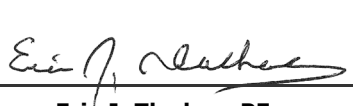

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ACRONYMS AND ABBREVIATIONS

§	Section
40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	coal combustion residuals
CMA	Corrective Measures Assessment
GWPS	groundwater protection standard
LF2	Landfill 2
NA	not applicable
NRT/OBG	Natural Resource Technology, an OBG Company
NPP	Newton Power Plant
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SAP	Sampling and Analysis Plan
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
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 Landfill 2 (LF2) located at Newton Power Plant (NPP) near Newton, Illinois.

Groundwater is being monitored at LF2 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 2021 (no wells were installed or decommissioned).

The following Statistically Significant Increases (SSIs) of 40 C.F.R. § 257 Appendix III parameter concentrations greater than background concentrations were determined:

- Boron at wells G06D, G208, G220, G222, and G223
- Calcium at wells G217D/R217D, G220, and G223
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at wells G208 and G220
- pH at well R217D
- Sulfate at well R217D
- Total Dissolved Solids (TDS) at wells G06D, G222, G223, and R217D

Alternate Source Demonstrations (ASDs) were completed for the SSIs referenced above and LF2 remains in the Detection Monitoring Program.

1. INTRODUCTION

This report has been prepared by Ramboll Americas Engineering Solutions, Inc. (Ramboll) on behalf of Illinois Power Generating Company, to provide the information required by 40 C.F.R. § 257.90(e) for LF2 located at the NPP near Newton, Illinois.

In accordance with 40 C.F.R. § 257.90(e), the owner or operator of a coal combustion residuals (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, summarizes key actions completed, describes any problems encountered, discusses actions to resolve the problems, and projects key activities for the upcoming year. 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.
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.
3. In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the Detection Monitoring or Assessment Monitoring Programs.
4. A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from Detection Monitoring to Assessment Monitoring in addition to identifying the constituent(s) detected at a Statistically Significant Increase [SSI] relative to background levels).
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. 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 SSI 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 the SSI(s).
        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] SSL 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 the SSL(s).

   B. Provide the date when the corrective measures assessment [CMA] was initiated for the CCR unit.

   C. Provide the date when the public meeting was held for CMA for the CCR unit.

   D. Provide the date when the CMA 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 LF2 for calendar year 2021.

2. MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

No changes have occurred to the monitoring program status in calendar year 2021 and LF2 remains in the Detection Monitoring Program in accordance with 40 C.F.R. § 257.94.

3. KEY ACTIONS COMPLETED IN 2021

The Detection Monitoring Program is summarized in **Table A** on the following page. The groundwater monitoring system, including the CCR unit and all background and compliance monitoring wells, is presented in **Figure 1**. No changes were made to the monitoring system in 2021. In general, one groundwater sample was collected from each background and compliance well during each monitoring event.[1] All samples were collected and analyzed in accordance with the Sampling and Analysis Plan (SAP; Natural Resource Technology, an OBG Company [NRT/OBG], 2017a). All monitoring data obtained under 40 C.F.R. § 257.90 through 257.98 (as applicable) in 2021, and analytical results for the July 2020 sampling event, are presented in **Tables 1** and **2**. Analytical data were evaluated in accordance with the Statistical Analysis Plan (NRT/OBG, 2017b) to determine any SSIs of Appendix III parameters relative to background concentrations.

Statistical background values are provided in **Table 3**. The background values reported in **Table 3** are slightly different from those reported previously because different software was utilized to calculate these values in 2021.

Potential alternate sources were evaluated as outlined in the 40 C.F.R. § 257.94(e)(2). ASDs were completed and certified by a qualified professional engineer. The dates the ASDs were completed are provided in **Table A**. The ASDs are included in **Appendix A**.

[1] Sampling was limited to G202, G208, G222, and G223 during the October 2020 sampling event, and G202 and G220 during the July 2021 sampling event, to confirm SSIs of select Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event, as allowed by the Statistical Analysis Plan.

Table A. 2020-2021 Detection Monitoring Program Summary

Sampling Date	Analytical Data Receipt Date	Parameters Collected	SSI(s)	SSI(s) Determination Date	ASD Completion Date
July 28 - 29, 2020	October 15, 2020	Appendix III	Boron (G208, G220, G222, G223) Calcium (G223, R217D) Chloride (G06D, G202, G203, G208, G220, G222, G223, G224, R217D) Fluoride (G220) Sulfate (R217D) TDS (G222, G223, R217D)	January 13, 2021	April 13, 2021
October 28, 2020 [1]	November 3, 2020	Boron at well G202 Calcium at well G202 Chloride at well G202 Fluoride at wells G202, G208, G222, and G223 pH at wells G202, G208, G222, and G223 Sulfate at well G202 Total Dissolved Solids at well G202 [2]	NA	NA	NA
February 8 - 10, 2021	April 14, 2021	Appendix III	Boron (G06D, G220, G222, G223) Calcium (G223, R217D) Chloride (G06D, G202, G203, G208, G220, G222, G223, G224, R217D) Fluoride (G208, G220) Sulfate (R217D) TDS (G222, G223, R217D)	July 13, 2021 rev. August 9, 2021	October 11, 2021
July 15, 2021 [3]	July 27, 2021	Calcium at well G220 pH at wells G202 and G220 [2]	NA	NA	NA
November 9 - 12, 2021	December 8, 2021	Appendix III	TBD	TBD	TBD

Notes:

NA: not applicable

TBD: to be determined

[1] Sampling was limited to G202, G208, G222, and G223 during the October 2020 sampling event to confirm SSIs of select Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event, as allowed by the Statistical Analysis Plan.

[2] Groundwater sample analysis was limited to select Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event to confirm SSIs, as allowed by the Statistical Analysis Plan.

[3] Sampling was limited to G202 and G220 during the July 2021 sampling event to confirm SSIs of select Appendix III parameters initially detected at concentrations greater than statistical background values in the preceding sampling event, as allowed by the Statistical Analysis Plan.

4. PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the Groundwater Monitoring Program during 2021. Groundwater samples were collected and analyzed in accordance with the SAP (NRT/OBG, 2017a), and all data were accepted.

5. KEY ACTIVITIES PLANNED FOR 2022

The following key activities are planned for 2022:

- Continuation of the Detection Monitoring Program with semi-annual sampling scheduled for the first and third quarters of 2022.
- Complete evaluation of analytical data from the compliance 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 demonstrated to be the cause of the SSI, a written demonstration will be completed within 90 days of SSI determination and included in the 2022 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 2022 (*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), 2017a. Sampling and Analysis Plan, Newton Landfill 2, Newton Power Station, Newton, Illinois, Project No. 2285, Revision 0, October 17, 2017.

Natural Resource Technology, an OBG Company (NRT/OBG), 2017b. Statistical Analysis Plan, Coffeen Power Station, Newton Power Station, Illinois Power Generating Company, October 17, 2017.

TABLES

TABLE 1
GROUNDWATER ELEVATIONS
2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER PLANT
502 - LANDFILL 2
NEWTON, IL

Well ID	Well Type	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft BMP)	Groundwater Elevation (ft NAVD88)
G48MG	Background	38.93925	-88.29601	07/27/2020	18.99	526.54
				10/22/2020	19.22	526.31
				02/04/2021	18.70	526.83
				02/15/2021	19.23	526.30
				03/09/2021	19.38	526.15
				03/29/2021	19.18	526.35
				04/27/2021	18.97	526.56
				05/24/2021	19.13	526.40
				06/15/2021	19.11	526.42
				06/24/2021	6.38	539.15
				07/14/2021	19.21	526.32
				08/02/2021	19.18	526.35
				11/18/2021	19.36	526.17
G06D	Compliance	38.92723	-88.29650	07/27/2020	28.75	502.94
				10/22/2020	28.80	502.89
				02/04/2021	28.12	503.54
				02/15/2021	32.76	498.90
				03/09/2021	39.40	492.26
				03/29/2021	29.89	501.77
				04/27/2021	28.96	502.70
				05/24/2021	28.64	503.02
				06/15/2021	28.44	503.22
				06/24/2021	28.40	503.26
				07/14/2021	28.32	503.34
				08/02/2021	28.29	503.37
				11/18/2021	28.11	503.55
G201	Background	38.93717	-88.29440	07/27/2020	18.51	526.34
				10/22/2020	18.65	526.20
				02/04/2021	17.99	526.88
				02/15/2021	Not Measured	
				03/09/2021	Not Measured	
				03/29/2021	Not Measured	
				05/24/2021	18.13	526.74
				08/02/2021	18.32	526.55
G202	Compliance	38.93088	-88.29056	07/28/2020	47.55	492.09
				10/22/2020	47.97	491.67
				02/04/2021	46.79	492.90
				02/15/2021	Dry	
				03/09/2021	47.61	492.08
				03/29/2021	47.22	492.47
				04/27/2021	47.39	492.30
				05/24/2021	37.21	502.48
				06/15/2021	47.68	492.01
				06/24/2021	47.70	491.99
				07/14/2021	47.64	492.05
				08/02/2021	Not Measured	

TABLE 1
GROUNDWATER ELEVATIONS
2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER PLANT
502 - LANDFILL 2
NEWTON, IL

Well ID	Well Type	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft BMP)	Groundwater Elevation (ft NAVD88)
G202	Compliance	38.93088	-88.29056	11/18/2021	47.86	491.83
G203	Compliance	38.92860	-88.29222	07/27/2020	41.03	491.99
				10/22/2020	41.39	491.63
				02/04/2021	40.29	492.84
				02/15/2021	Dry	
				03/09/2021	41.03	492.10
				03/29/2021	40.80	492.33
				04/27/2021	Not Measured	
				05/24/2021	31.95	501.18
				06/15/2021	41.14	491.99
				06/24/2021	41.20	491.93
				07/14/2021	41.21	491.92
				08/02/2021	41.18	491.95
				11/18/2021	41.43	491.70
G208	Compliance	38.92963	-88.29818	07/27/2020	26.25	508.69
				10/22/2020	24.98	509.96
				02/04/2021	25.12	509.91
				02/15/2021	30.15	504.88
				03/09/2021	6.46	528.57
				03/29/2021	25.50	509.53
				04/27/2021	24.78	510.25
				05/24/2021	24.59	510.44
				06/15/2021	28.84	506.19
				06/24/2021	27.59	507.44
				07/14/2021	26.19	508.84
				08/02/2021	25.35	509.68
				11/18/2021	25.10	509.93
G220	Compliance	38.92841	-88.29951	07/27/2020	18.75	515.78
				10/22/2020	18.30	516.23
				02/04/2021	17.82	516.81
				02/15/2021	Not Measured	
				03/09/2021	Not Measured	
				03/29/2021	Not Measured	
				05/24/2021	17.71	516.92
				08/02/2021	18.17	516.46
G222	Compliance	38.92719	-88.29967	07/27/2020	15.03	519.20
				10/22/2020	16.05	518.18
				02/04/2021	15.90	518.42
				02/15/2021	17.07	517.25
				03/09/2021	15.54	518.78
				03/29/2021	15.15	519.17
				04/27/2021	14.59	519.73
				05/24/2021	14.66	519.66
				06/15/2021	14.88	519.44
				06/24/2021	14.75	519.57
				07/14/2021	14.87	519.45

TABLE 1
GROUNDWATER ELEVATIONS
2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER PLANT
502 - LANDFILL 2
NEWTON, IL

Well ID	Well Type	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Depth to Groundwater (ft BMP)	Groundwater Elevation (ft NAVD88)
G222	Compliance	38.92719	-88.29967	08/02/2021	15.23	519.09
				11/18/2021	16.56	517.76
G223	Compliance	38.93016	-88.29345	07/27/2020	33.06	500.50
				10/22/2020	33.01	500.55
				02/04/2021	32.65	500.95
				02/15/2021	33.38	500.22
				03/09/2021	33.38	500.22
				03/29/2021	33.20	500.40
				04/27/2021	32.90	500.70
				05/24/2021	33.00	500.60
				06/15/2021	33.16	500.44
				06/24/2021	33.09	500.51
				07/14/2021	33.20	500.40
				08/02/2021	33.07	500.53
				11/18/2021	32.98	500.62
G224	Compliance	38.93177	-88.29240	07/27/2020	42.16	492.11
				10/22/2020	42.64	491.63
				02/04/2021	41.47	492.84
				02/15/2021	42.15	492.16
				03/09/2021	42.24	492.07
				03/29/2021	41.98	492.33
				04/27/2021	42.00	492.31
				05/24/2021	42.27	492.04
				06/15/2021	42.27	492.04
				06/24/2021	42.32	491.99
				07/14/2021	42.32	491.99
				08/02/2021	42.36	491.95
				11/18/2021	42.65	491.66
R217D	Compliance	38.93219	-88.29012	07/27/2020	19.36	518.82
				10/22/2020	19.65	518.53
				02/04/2021	19.39	518.79
				02/15/2021	19.48	518.70
				03/09/2021	19.55	518.63
				03/29/2021	19.36	518.82
				04/27/2021	19.36	518.82
				05/24/2021	19.50	518.68
				06/15/2021	19.55	518.63
				06/24/2021	19.57	518.61
				07/14/2021	19.57	518.61
				08/02/2021	19.62	518.56
				11/18/2021	19.90	518.28

Notes:
ATC = above top of casing (well under pressure)
BMP = below measuring point
ft = foot/feet
NAVD88 = North American Vertical Datum of 1988

TABLE 2
ANALYTICAL RESULTS - APPENDIX III PARAMETERS
2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER PLANT
502 - LANDFILL 2
NEWTON, IL

Well ID	Well Type	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (SU)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
G48MG	Background	38.93925	-88.29601	07/28/2020	0.077	57	23	0.426	7.4	27	480
				02/10/2021	0.11	49	26	0.434	7.2	13	390
				11/10/2021	0.097	64	27	0.584	7.5	15	470
G06D	Compliance	38.92723	-88.29650	07/28/2020	0.18	110	58	0.924	7.3	2	810
				02/09/2021	0.2	130	58	0.854	7.1	<1	760
				11/09/2021	0.19	120	51	1.01	7.0	<1	880
G201	Background	38.93717	-88.29440	10/28/2020	0.12	260	4.4	0.77	7.4	560	870
				02/09/2021	0.11	190	4.5	0.844	7.2	490	880
				11/09/2021	0.14	170	4.1	0.87	7.3	470	960
G202	Compliance	38.93088	-88.29056	10/28/2020	0.11	140	59	0.449	7.5	100	740
				02/08/2021	0.11	110	65	0.527	8.2	57	680
				07/15/2021	--	--	--	--	7.7	--	--
				11/10/2021	0.12	120	70	0.644	7.4	<1	800
G203	Compliance	38.92860	-88.29222	07/28/2020	0.083	140	57	0.33	7.5	160	820
				02/08/2021	0.086	160	53	0.442	7.5	170	730
				11/10/2021	0.086	130	55	0.51	7.5	150	800
G208	Compliance	38.92963	-88.29818	07/29/2020	0.2	100	52	1.14	7.2	<1	750
				10/28/2020	--	--	--	0.939	7.2	--	970
				02/09/2021	0.17	100	50	1.09	7.1	1.1	720
				11/12/2021	0.18	97	45	1.35	7.0	<1	700
G220	Compliance	38.92841	-88.29951	07/28/2020	0.26	120	42	1.43	7.1	13	770
				02/10/2021	0.31	170	37	1.24	7.2	9.6	--
				07/15/2021	--	110	--	--	7.4	--	--
				11/11/2021	0.27	170	39	1.33	7.0	7.8	790
G222	Compliance	38.92719	-88.29967	07/28/2020	0.22	140	74	1.1	7.1	130	1200

TABLE 2
ANALYTICAL RESULTS - APPENDIX III PARAMETERS
2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER PLANT
502 - LANDFILL 2
NEWTON, IL

Well ID	Well Type	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Date	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (field) (SU)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
				10/28/2020	--	--	--	0.742	7.4	--	1200
				02/09/2021	0.24	130	74	0.954	7.5	110	1100
				11/11/2021	0.23	120	68	0.966	7.2	110	1100
G223	Compliance	38.93016	-88.29345	07/28/2020	0.25	230	240	0.843	6.8	510	1900
				10/28/2020	--	--	--	0.838	6.9	--	2100
				02/08/2021	0.26	290	270	0.845	6.7	650	1900
				11/11/2021	0.23	290	310	0.863	6.8	760	2600
G224	Compliance	38.93177	-88.29240	07/28/2020	0.093	120	54	0.455	7.2	140	740
				02/09/2021	0.084	120	56	0.394	7.5	130	740
				11/11/2021	0.089	130	54	0.392	7.4	120	760
R217D	Compliance	38.93219	-88.29012	07/28/2020	0.17	620	110	0.263	6.7	2200	3800
				02/08/2021	0.19	560	110	0.268	6.6	2200	3700
				11/12/2021	0.18	640	99	0.296	6.5	2100	3500

Notes:
mg/L = milligrams per liter
SU = Standard Units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method; estimated concentrations below the reporting limit and associated qualifiers are not provided since they are not utilized in statistics to determine Statistically Significant Increases (SSIs) over background
-- = not analyzed

TABLE 3
STATISTICAL BACKGROUND VALUES
2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
NEWTON POWER PLANT
502 - LANDFILL 2
NEWTON, IL

Parameter	**Statistical Background Value (LPL/UPL)**
40 C.F.R. Part 257 Appendix III	
Boron (mg/L)	0.190
Calcium (mg/L)	160
Chloride (mg/L)	34.0
Fluoride (mg/L)	1.07
pH (field) (SU)	6.6/8.1
Sulfate (mg/L)	760
Total Dissolved Solids (mg/L)	860

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

BACKGROUND WELL
COMPLIANCE WELL
MONITORING WELL
PART 257 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE

0 250 500
Feet

MONITORING WELL LOCATION MAP

2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
LANDFILL PHASE 2
NEWTON POWER PLANT
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\2021_AnnualGWM_CAR\Newton\LF_502\Figure 1 NEW LF MW Location Map.mxd

PROJECT: 169000XXXX | DATED: 1/3/2022 | DESIGNER: galarmmc

APPENDICES

APPENDIX A
ALTERNATE SOURCE DEMONSTRATIONS

Intended for
Illinois Power Generating Company

Date
April 13, 2021

Project No.
1940100711-012

40 C.F.R. § 257.94(e)(2): ALTERNATE SOURCE DEMONSTRATION

NEWTON PHASE II LANDFILL (LF2)

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Nicole M. Pagano, a professional geologist in good standing in the State of Illinois, certify that the information in this report 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.

Nicole M. Pagano
Professional Geologist
196-000750
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: April 13, 2021

I, Anne Frances Ackerman, a qualified professional engineer in good standing in the State of Illinois, certify that the information in this report 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.

Anne Frances Ackerman
Qualified Professional Engineer
062-060586
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Ramboll Americas Engineering Solutions, Inc.
Date: April 13, 2021

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CONTENTS

FIGURES (IN TEXT)

FIGURES (ATTACHED)

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residuals
cm/s	centimeters per second
D7	Detection Monitoring Round 7
ft	foot/feet
IQR	interquartile range
LF2	Phase II Landfill
LOE	line of evidence
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
Site	Newton Power Station
SSI	Statistically Significant Increase
TDS	total dissolved solids

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.94(e)(2) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of a Statistically Significant Increase (SSI) over background for groundwater constituents listed in Appendix III of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSI(s), or that the SSI(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Illinois Power Generating Company, by Ramboll Americas Engineering Solutions, Inc., to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Newton Phase II Landfill (LF2), located near Newton, IL.

The most recent Detection Monitoring sampling event (Detection Monitoring Round 7 [D7]) was completed on July 28, 2020, and analytical data were received on October 15, 2020. Analytical data from D7 were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG] 2017a) to determine any SSIs of Appendix III parameters over background concentrations. That evaluation identified SSIs at downgradient monitoring wells as follows:

- Boron at wells G208, G220, G222, and G223
- Calcium at wells G223 and R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at well G208, G220, and G222
- Sulfate at R217D
- Total Dissolved Solids (TDS) at wells G222, G223, and R217D

In accordance with the Statistical Analysis Plan, wells G208 and G222 were resampled on October 28, 2021 and analyzed only for chloride and fluoride to confirm the SSIs. Following evaluation of analytical data from the resample event, the following SSIs remained:

- Boron at wells G208, G220, G222, and G223
- Calcium at well G223 and R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at well G220
- TDS at wells G222, G223, and R217D

Pursuant to 40 C.F.R. § 257.94(e)(2), the following lines of evidence (LOEs) demonstrate that sources other than LF2 were the cause of the boron, calcium, chloride, fluoride, and TDS SSIs listed above. This ASD was completed by April 13, 2021, within 90 days of determination of the SSIs (January 13, 2021), as required by 40 C.F.R. § 257.94(e)(2).

2. BACKGROUND

2.1 Site location and Description

The Newton Power Station (Site) is located in Jasper County in the southeastern part of central Illinois, approximately 7 miles southwest of the town of Newton. The plant is located on the north side of Newton Lake. The area is bounded by Newton Lake and agricultural land to the west, south, and east, and agricultural land to the north. Beyond the lake is additional agricultural land.

2.2 Description of Phase II Landfill CCR Unit

LF2 includes three lined disposal cells (Figure 1). LF2 Cells 1 and 2, encompassing approximately 12 acres, are adjacent to each other and located south and east of the Phase I Landfill (LF1). LF2 Cell 3 encompasses approximately 7 acres and is located approximately 1,100 feet (ft) west of Cells 1 and 2. All three cells of LF2 are constructed with composite liners and leachate collection systems that exceed the landfill liner performance standards of 40 CFR § 257.70. Cell 3 is inactive and has not received CCR since it was constructed in 2011.

2.3 Geology and Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected during monitoring well installation (NRT/OBG 2017b).

Quaternary deposits in the Newton area consist mainly of diamictons and outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations (Lineback 1979; Willman et al. 1975). The unconsolidated deposits occurring at Newton Power Station include the following units beginning at the ground surface:

- Upper Confining Unit – Low permeability clays and silts, including the Peoria Silt (Loess Unit) in upland areas and the Cahokia Formation in the flood plain and channel areas to the south and east, underlain by the Sangamon Soil, and the predominantly clay diamictons of the Hagarstown (Till) and Vandalia (Till) Members of the Glasford Formation.
- Uppermost Aquifer – Thin to moderately thick (3 to 17 ft), moderate to high permeability sand, silty sand, and sandy silt/clay units of the Mulberry Grove Member of the Glasford Formation.
- Lower Confining Unit – Thick, very low permeability silty clay diamictons of the Smithboro (Till) Member of the Glasford Formation and the silty clay diamictons of the Banner Formation.

The bedrock beneath the unconsolidated deposits consists of Pennsylvanian-age Mattoon Formation (Willman et al. 1967) that is mostly shale near the bedrock surface but is characterized at depth by a complex sequence of shales, thin limestones, coals, underclays, and several sandstones (Willman et al. 1975). The erosional surface of the Pennsylvanian-age Mattoon Formation bedrock ranges widely in depth in the vicinity of the Site but is typically encountered at 90 to 120 ft below ground surface (bgs).

Groundwater elevations (referenced to North American Vertical Datum of 1988 [NAVD88]) across LF2 ranged from approximately 492 to 519 ft during D7 (Figure 1). The groundwater elevation contours shown on Figure 1 were measured on July 27, 2020. Overall groundwater flow beneath LF2, within the Uppermost Aquifer, is southward toward Newton Lake, but with flow converging to the south-southeast along the major axis of LF2 Cells 1 and 2, and a predominantly eastward flow

near LF2 Cell 3. Based on groundwater flow directions near LF2, groundwater beneath LF2 Cells 1 and 2 does not influence groundwater beneath LF2 Cell 3.

2.4 Groundwater and Landfill Monitoring

The Uppermost Aquifer monitoring system for LF2 Cells 1, 2, and 3 is shown on Figure 1.

Monitoring wells G201 and G48MG are used to monitor background groundwater quality for LF2 (all cells). Groundwater quality at LF2 Cells 1 and 2 is monitored using wells G202, G203, G223, G224, and R217D (which replaced well G217D in October 2017). Groundwater quality at LF2 Cell 3 is monitored using wells G06D, G208, G220, and G222. Leachate from LF2 is monitored using leachate sample location L301 (Figure 1).

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

As allowed by 40 C.F.R. § 257.94(e)(2), this ASD demonstrates that sources other than LF2 caused the SSI(s), or that the SSI(s) was a result of natural variation in groundwater quality. This ASD is based on the following LOEs:

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. Boron concentrations in monitoring wells downgradient of LF2 Cells 1 and 2 are statistically similar to concentrations in monitoring wells downgradient of LF2 Cell 3 (where no CCR material has been placed).

These LOEs are described and supported in greater detail below.

3.1 LOE #1: LF2 Composite Liner Design

LF2 Cells 1 and 2 were constructed and began receiving CCR in 1997. Currently, a portion of LF2 Cell 2 is in operation. No CCR has been placed in LF2 Cell 3.

The constructed liner and leachate collection system for LF2 Cells 1, 2, and 3 include the following design components from top to bottom:

- Soil cover for liner frost protection
- 10-ounce per square yard geotextile separation layer between the leachate management system and the frost protection soil cover
- 1-ft thick sand drainage layer
- 60-millimeter high-density polyethylene geomembrane
- Three-ft thick compacted, low-permeability soil having a maximum hydraulic conductivity of 1.0×10^{-7} centimeters per second (cm/s)

These components exceed the landfill liner design criteria of 40 C.F.R. § 257. The landfill design criteria were intended to provide protection to the Uppermost Aquifer. Therefore, the presence of the composite liner suggests that LF2 is not contributing CCR constituents to the groundwater in the vicinity of LF2.

3.2 LOE #2: No CCR material has been placed in LF2 Cell 3

LF2 Cell 3 has never contained CCR; therefore, it cannot be the source of the CCR constituents boron, chloride, fluoride, or TDS detected in Cell 3 groundwater monitoring wells (G06D, G208, G220, and G222).

3.3 LOE #3: The ionic composition of groundwater is different than the ionic composition of leachate

Piper diagrams graphically represent ionic composition of aqueous solutions. A Piper diagram displays the position of water samples with respect to their major cation and anion content on the

two lower triangular portions of the diagram, providing the information which, when combined on the central, diamond-shaped portion of the diagram, identify composition categories or groupings (hydrochemical facies). Figure A, below, is a Piper diagram that displays the ionic composition of samples collected from the background and downgradient monitoring wells associated with LF2 (D7 sampling event), and leachate sampling location L301 associated with LF2 (measured during the D6 sampling event).

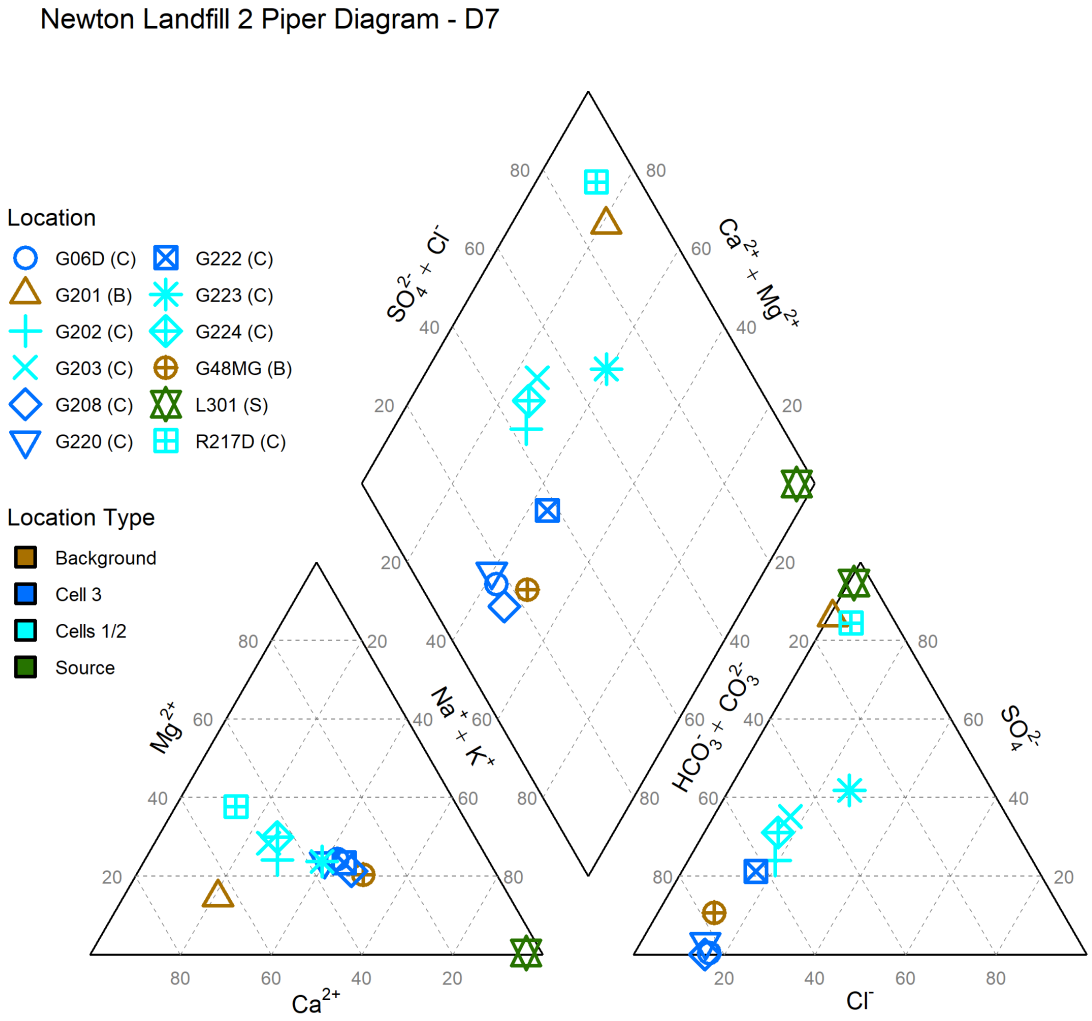

Figure A. Piper Diagram. Shows Ionic Composition of Samples of Groundwater During the D7 Sampling Event and Leachate Associated with LF2 (Collected During D6 Event).

It is evident from the Piper diagram (Figure A) that leachate from LF2 (L301; green symbol) is in the sodium-chloride hydrochemical facies, while the LF2 groundwater samples (blue and cyan symbols) are predominantly in the calcium-bicarbonate and calcium-sulfate hydrochemical facies. Therefore, downgradient groundwater samples associated with LF2 have a different ionic composition than leachate, indicating that leachate is not the source of CCR constituents detected in any LF2 groundwater monitoring wells.

3.4 LOE #4: Boron Concentrations in Monitoring Wells Downgradient of LF2 Cells 1 and 2 Are Statistically Similar to Concentrations in Monitoring Wells Downgradient of LF2 Cell 3 (Where No CCR Material Has Been Placed)

Box plots graphically represent the range of values of a given dataset using lines to construct a box where the lower line, midline, and upper line of the box represent the values of the first quartile, median, and third quartile values, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and third quartiles (*i.e.*, below and above) of the box. The interquartile range (IQR) is the distance between the first and third quartiles. Outliers (values that are at least 1.5 times the IQR away from the edges of the box) are represented by single points plotted outside of the range of the whiskers.

Boron SSIs were identified at all LF2 cells (LF2 Cells 1, 2, and 3) during the D7 sampling event. As noted above, groundwater flow direction indicates that Cell 3 wells are not influenced by Cells 1 and 2, and Cell 3 has never contained CCR. Box plots of the boron concentrations observed in LF2 Cells 1 and 2 downgradient monitoring wells (cyan), and LF2 Cell 3 downgradient monitoring wells (blue) are shown in Figure B.

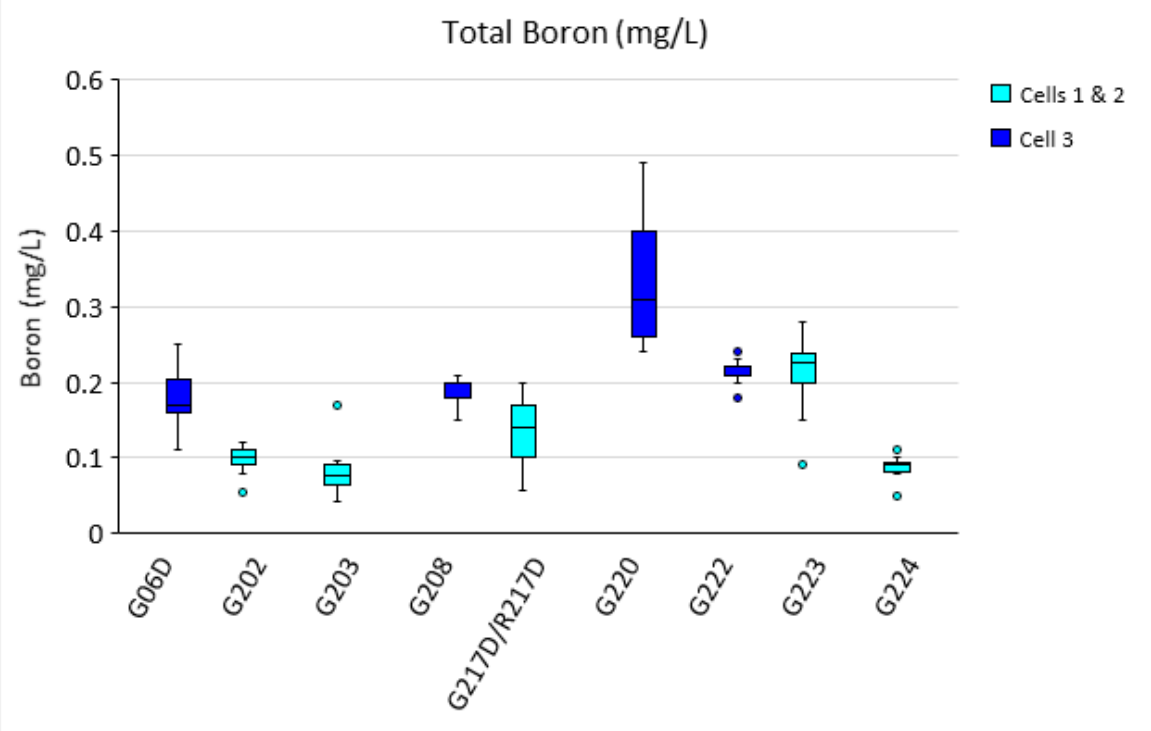

Figure B. Boron Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum boron concentrations in wells downgradient of LF2 Cell 3 ranged from 0.11 to 0.49 milligrams per liter (mg/L). The minimum and maximum boron concentrations in wells downgradient of LF2 Cells 1 and 2 ranged from 0.041 to 0.28 mg/L. Boron concentrations downgradient of LF2 Cells 1 and 2 were within or below the range of concentrations observed at wells downgradient of LF2 Cell 3.

The similarity of boron concentrations downgradient of LF2 Cell 3 (unaffected by leachate) and downgradient of LF2 Cells 1 and 2, coupled with the fact that no CCR material has been placed in LF2 Cell 3, suggests that LF2 Cells 1 and 2 are not the source of boron in the LF2 groundwater monitoring well G223.

4. CONCLUSIONS

Based on the four LOEs below, it has been demonstrated that the SSIs at G06D, G202, G203, G208, G220, G222, G223, G224, and R217D are not due to LF2 but are from a source other than the CCR unit being monitored:

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. Boron concentrations in monitoring wells downgradient of LF2 Cells 1 and 2 are statistically similar to concentrations in monitoring wells downgradient of LF2 Cell 3 (where no CCR material has been placed).

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.94(e)(2) that the SSIs observed during D7 were not due to LF2. Therefore, an assessment monitoring program is not required, and the Newton LF2 will remain in detection monitoring.

5. REFERENCES

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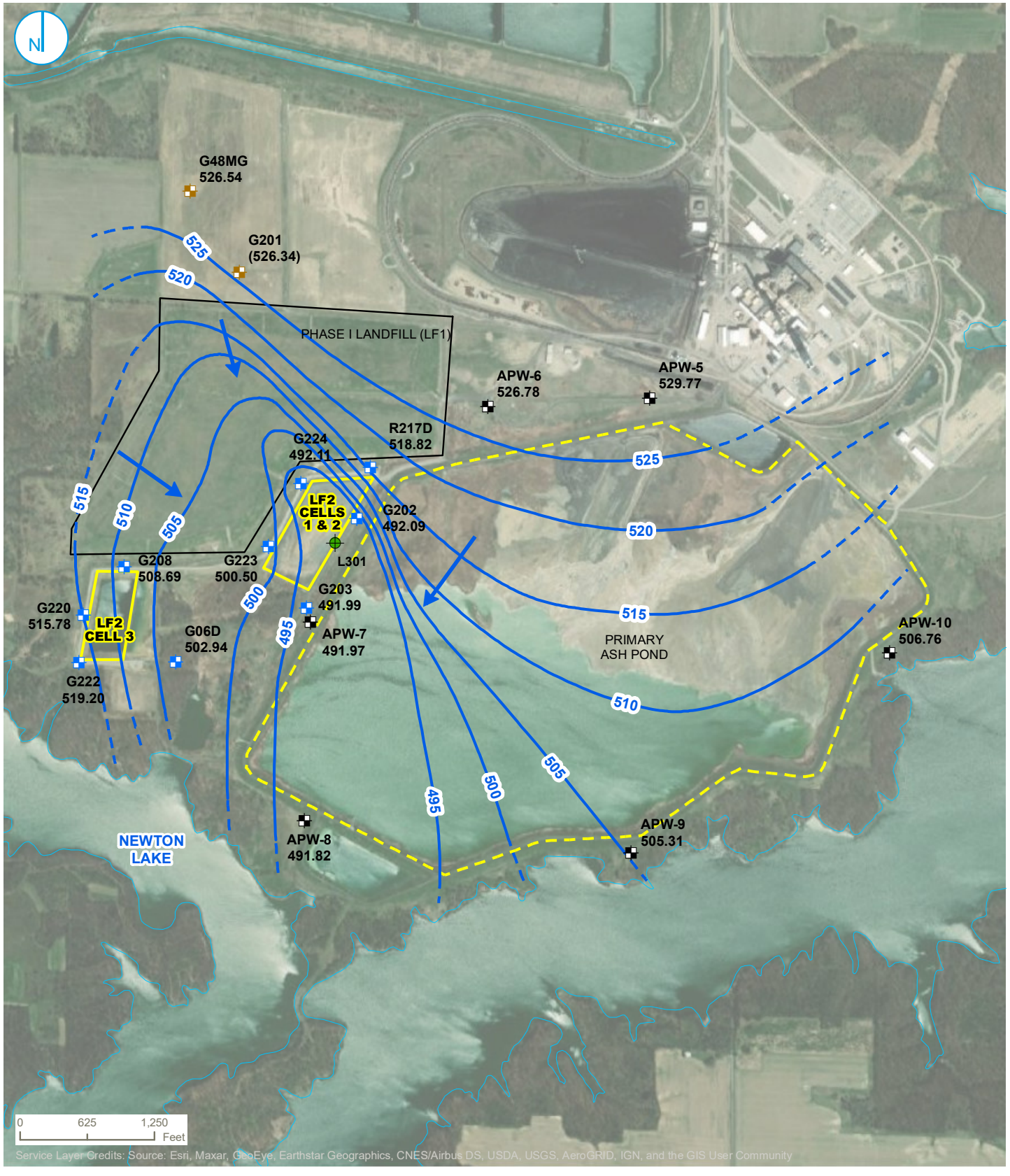
Willman, H.B., J.C. Frye, J.A. Simon, K.E. Clegg, D.H. Swann, E. Atherton, C. Collinson, J.A. Lineback, T.C. Buschbach, and H.B. Willman, 1967, Geologic Map of Illinois: Illinois State Geological Survey map, scale 1:500,000.

Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon, 1975, Handbook of Illinois Stratigraphy: Illinois State Geological Survey, Bulletin 95, 261 p.

FIGURES



Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Newton\Figure 1_SampLoc and GWC Map LF2_D7.mxd

PROJECT: 169000XXXX | DATED: 2/18/2021 | DESIGNER: STOLZSD

- LF2 DOWNGRADIENT MONITORING WELL
- LF2 UPGRADIENT MONITORING WELL
- PRIMARY ASH POND CCR RULE MONITORING WELL
- LF2 LEACHATE SAMPLE LOCATION
- GROUNDWATER ELEVATION CONTOUR (5-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- SURFACE WATER FEATURE
- LF2 CCR UNIT BOUNDARY
- PRIMARY ASH POND CCR UNIT BOUNDARY
- LF1 UNIT BOUNDARY

SAMPLING LOCATION AND GROUNDWATER ELEVATION CONTOUR MAP JULY 27, 2020

NEWTON PHASE II LANDFILL (LF2) (UNIT ID: 502)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
NEWTON POWER STATION
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Intended for
Illinois Power Generating Company

Date
October 11, 2021

Project No.
1940100711-012

40 C.F.R. § 257.94(e)(2): ALTERNATE SOURCE DEMONSTRATION

PHASE II LANDFILL (LF2)

NEWTON POWER PLANT

NEWTON, ILLINOIS

CCR UNIT 502

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Nicole M. Pagano, a professional geologist in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nicole M. Pagano
Professional Geologist
196-000750
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: October 11, 2021

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

Anne Frances Ackerman
Qualified Professional Engineer
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Date: October 11, 2021

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CONTENTS

FIGURES (IN TEXT)

FIGURES (ATTACHED)

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	Coal Combustion Residuals
CCR Rule	40 C.F.R. § 257 Subpart D
cm/s	centimeters per second
D8	Detection Monitoring Round 8
IQR	interquartile range
LCU	lower confining unit
LF1	Phase I Landfill
LF2	Phase II Landfill
LOE	line of evidence
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NPP	Newton Power Plant
NRT/OBG	Natural Resource Technology, an OBG Company
Rapps	Rapps Engineering and Applied Science
SSI	Statistically Significant Increase
TDS	total dissolved solids
UA	uppermost aquifer
UCU	upper confining unit

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.94(e)(2) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of a Statistically Significant Increase (SSI) over background for groundwater constituents listed in Appendix III of 40 C.F.R. § 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSI(s), or that the SSI(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Illinois Power Generating Company, by Ramboll Americas Engineering Solutions, Inc., to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Newton Power Plant (NPP) Phase II Landfill (LF2), located near Newton, Illinois.

The most recent Detection Monitoring sampling event (Detection Monitoring Round 8 [D8]) was completed on February 10, 2021, and analytical data were received on April 14, 2021. In accordance with 40 C.F.R. § 257.93(h)(2), statistical analysis of the data to identify SSIs of 40 C.F.R. § 257 Subpart D (CCR Rule) Appendix III parameters over background concentrations was completed by July 13, 2021, within 90 days of receipt of the analytical data. The statistical determination identified the following SSIs at compliance monitoring wells:

- Boron at wells G06D, G220, G222, and G223
- Calcium at wells G220, G223, and R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at well G208 and G220
- pH at well G202
- Sulfate at R217D
- Total Dissolved Solids (TDS) at wells G222, G223, and R217D

In accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG] 2017a), wells G202 and G220 were resampled on July 15, 2021 and analyzed only for pH (G202) and calcium (G220) to confirm the SSIs. Following evaluation of analytical data from the resample event, the following SSIs remained:

- Boron at wells G06D, G220, G222, and G223
- Calcium at wells G223 and R217D
- Chloride at wells G06D, G202, G203, G208, G220, G222, G223, G224, and R217D
- Fluoride at well G208 and G220
- Sulfate at R217D
- TDS at wells G222, G223, and R217D

Pursuant to 40 C.F.R. § 257.94(e)(2), the following lines of evidence (LOE) demonstrate that sources other than LF2 were the cause of the boron, calcium, chloride, fluoride, sulfate, and TDS SSIs listed above. This ASD was completed by October 11, 2021, within 90 days of determination of the SSIs (July 13, 2021), as required by 40 C.F.R. § 257.94(e)(2).

2. BACKGROUND

2.1 Site location and Description

The NPP is located in Jasper County in the southeastern part of central Illinois, approximately 7 miles southwest of the town of Newton. The plant is located on the north side of Newton Lake. The area is bounded by Newton Lake and agricultural land to the west, south, and east, and agricultural land to the north. Beyond the lake is additional agricultural land.

2.2 Description of Phase II Landfill CCR Unit

LF2 includes three lined disposal cells (Figure 1). LF2 Cells 1 and 2, encompassing approximately 12 acres, are adjacent to each other and located south and east of the Phase I Landfill (LF1). LF2 Cell 3 encompasses approximately 7 acres and is located approximately 1,100 feet west of Cells 1 and 2. All three cells of LF2 are constructed with composite liners and leachate collection systems that exceed the landfill liner performance standards of 40 CFR § 257.70. Cell 3 is inactive and has not received CCR since it was constructed in 2011.

2.3 Geology and Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected during site investigations conducted from 1997 to 2021.

Quaternary deposits in the Newton area consist mainly of diamictons and outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations (Lineback, 1979; Willman et al., 1975). The unconsolidated deposits include the following units (beginning at the ground surface):

- **Upper Drift:** The upper drift is composed of the low permeability silts and clays of the Peoria Silt and Sangamon Soil and the sandier soils of the Hagarstown Member. The hydraulic conductivity of this unit, calculated from field hydraulic test data from monitoring wells screened between 8 and 36 feet below ground surface (bgs), was observed to range from 2.4×10^{-6} to 6.1×10^{-5} centimeters per second (cm/s) with a geometric mean of 1.3×10^{-5} cm/s (Rapps Engineering and Applied Science [Rapps], 1997).
- **Upper Confining Unit (UCU):** The UCU consists of a thick package of the low permeability clay and silt of the Vandalia Till Member. This unit is a laterally continuous layer between the base of the upper drift and the top of the uppermost aquifer (UA). The hydraulic conductivity of this unit was observed to range from 6.3×10^{-9} to 2.1×10^{-8} cm/s with a geometric mean of 1.1×10^{-8} cm/s (Rapps, 1997).
- **Uppermost Aquifer (UA):** The UA is composed of the Mulberry Grove Member, which has been classified as poorly graded sand, silty sand, clayey sand, and gravel. Results of field hydraulic tests in monitoring wells screened in the UA ranged from 1.54×10^{-4} to 3.4×10^{-3} cm/s with a geometric mean hydraulic conductivity of 1.2×10^{-3} cm/s (NRT/OBG, 2017b).
- **Lower Confining Unit (LCU):** The LCU is comprised of low permeability silt and clay of the Smithboro Till Member and the Banner Formation. The hydraulic conductivity of this unit was observed to be 1.4×10^{-7} cm/s (Rapps, 1997).

The bedrock beneath the unconsolidated deposits consists of Pennsylvanian-age Mattoon Formation (Willman et al., 1967) that is mostly shale near the bedrock surface but is

characterized at depth by a complex sequence of shales, thin limestones, coals, underclays, and several sandstones (Willman et al., 1975). The erosional surface of the Pennsylvanian-age Mattoon Formation bedrock ranges widely in depth in the vicinity of the NPP, but is typically encountered at 90 to 120 feet bgs.

Groundwater elevations (referenced to North American Vertical Datum of 1988 [NAVD88]) across LF2 ranged from approximately 493 to 519 feet during D8 (Figure 1). Depth to groundwater measurements used to generate the groundwater elevation contours shown on Figure 1 were collected on February 4, 2021. Overall groundwater flow beneath LF2, within the UA, is southward toward Newton Lake, but with flow converging along the major axis of LF2 Cells 1 and 2, and a predominantly eastward flow near LF2 Cell 3. Based on groundwater flow directions near LF2, groundwater beneath LF2 Cells 1 and 2 does not influence groundwater beneath LF2 Cell 3.

2.4 Groundwater and Landfill Monitoring

The UA monitoring system for LF2 Cells 1, 2, and 3 is shown on Figure 1.

Monitoring wells G201 and G48MG are used to monitor background groundwater quality for LF2 (all cells). Groundwater quality at LF2 Cells 1 and 2 is monitored using wells G202, G203, G223, G224, and R217D (which replaced well G217D in October 2017). Groundwater quality at LF2 Cell 3 is monitored using wells G06D, G208, G220, and G222. Leachate from LF2 is monitored using leachate sample location L301 (Figure 1).

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

As allowed by 40 C.F.R. § 257.94(e)(2), this ASD demonstrates that sources other than LF2 caused the SSI(s), or that the SSI(s) was a result of natural variation in groundwater quality. This ASD is based on the following LOEs:

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. Boron concentrations in wells monitoring LF2 Cells 1 and 2 are statistically similar to concentrations in wells monitoring LF2 Cell 3 (where no CCR material has been placed)

These LOEs are described and supported in greater detail below.

3.1 LOE #1: LF2 Composite Liner Design

LF2 Cells 1 and 2 were constructed and began receiving CCR in 1997. Currently, a portion of LF2 Cell 2 is in operation. No CCR has been placed in LF2 Cell 3.

The constructed liner and leachate collection system for LF2 Cells 1, 2, and 3 include the following design components from top to bottom:

- Soil cover for liner frost protection
- 10-ounce per square yard geotextile separation layer between the leachate management system and the frost protection soil cover
- 1-foot-thick sand drainage layer
- 60-millimeter high-density polyethylene geomembrane
- Three-feet-thick compacted, low-permeability soil having a maximum hydraulic conductivity of 1.0×10^{-7} centimeters per second (cm/s)

These components exceed the landfill liner design criteria of 40 C.F.R. § 257. The landfill design criteria were intended to provide protection to the UA. Therefore, the presence of the composite liner suggests that LF2 is not contributing CCR constituents to the groundwater in the vicinity of LF2.

3.2 LOE #2: No CCR material has been placed in LF2 Cell 3

LF2 Cell 3 has never contained CCR; therefore, it cannot be the source of the CCR constituents boron, chloride, fluoride, or TDS detected in Cell 3 groundwater monitoring wells (G06D, G208, G220, and G222).

3.3 LOE #3: The ionic composition of groundwater is different than the ionic composition of leachate

Piper diagrams graphically represent ionic composition of aqueous solutions. A Piper diagram displays the position of water samples with respect to their major cation and anion content on the two lower triangular portions of the diagram, providing the information which, when combined on

the central, diamond-shaped portion of the diagram, identify composition categories or groupings (hydrochemical facies). Figure A, below, is a Piper diagram that displays the ionic composition of samples collected from the background and compliance monitoring wells associated with LF2 (D8 sampling event), and leachate sampling location L301 associated with LF2.

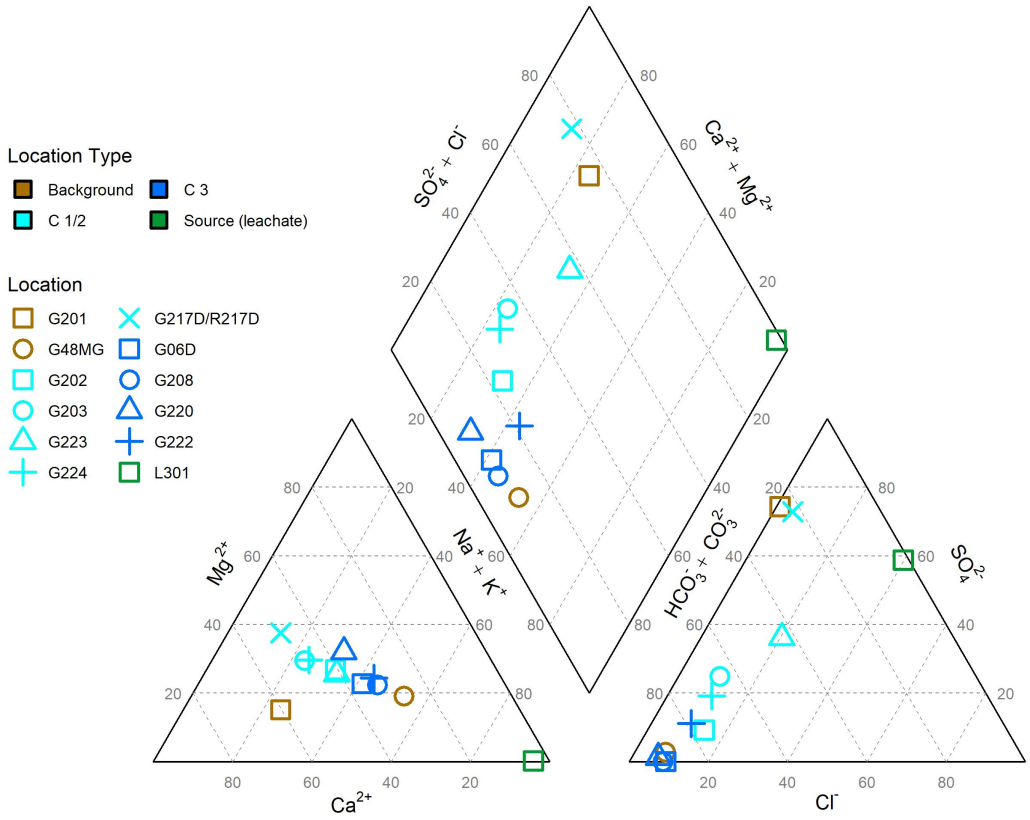

Figure A. Piper Diagram. Shows Ionic Composition of Samples of Groundwater During the D8 Sampling Event and Leachate Associated with LF2.

It is evident from the Piper diagram (Figure A) that leachate from LF2 (L301; green symbol) is in the sodium-chloride hydrochemical facies, while the LF2 groundwater samples (blue and cyan symbols) and background samples (brown symbols) are predominantly in the calcium-bicarbonate and calcium-sulfate hydrochemical facies. Therefore, groundwater samples from LF2 compliance wells have a different ionic composition than leachate, indicating that leachate is not the source of CCR constituents detected in any LF2 groundwater monitoring wells.

3.4 LOE #4: Boron Concentrations in Wells Monitoring LF2 Cells 1 and 2 Are Statistically Similar to Concentrations in Wells Monitoring LF2 Cell 3 (Where No CCR Material Has Been Placed)

Box plots graphically represent the range of values of a given dataset using lines to construct a box where the lower line, midline, and upper line of the box represent the values of the first quartile, median, and third quartile values, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and

third quartiles (*i.e.*, below and above) of the box. The interquartile range (IQR) is the distance between the first and third quartiles. Outliers (values that are at least 1.5 times the IQR away from the edges of the box) are represented by single points plotted outside of the range of the whiskers.

Boron SSIs were identified at LF2 Cells 1, 2, and 3 during the D8 sampling event. As noted above, groundwater flow direction indicates that groundwater beneath Cell 3 is not influenced by groundwater beneath Cells 1 and 2, and Cell 3 has never contained CCR. Box plots of the boron concentrations observed in LF2 Cells 1 and 2 compliance wells (cyan), and LF2 Cell 3 compliance wells (blue) are shown in Figure B.

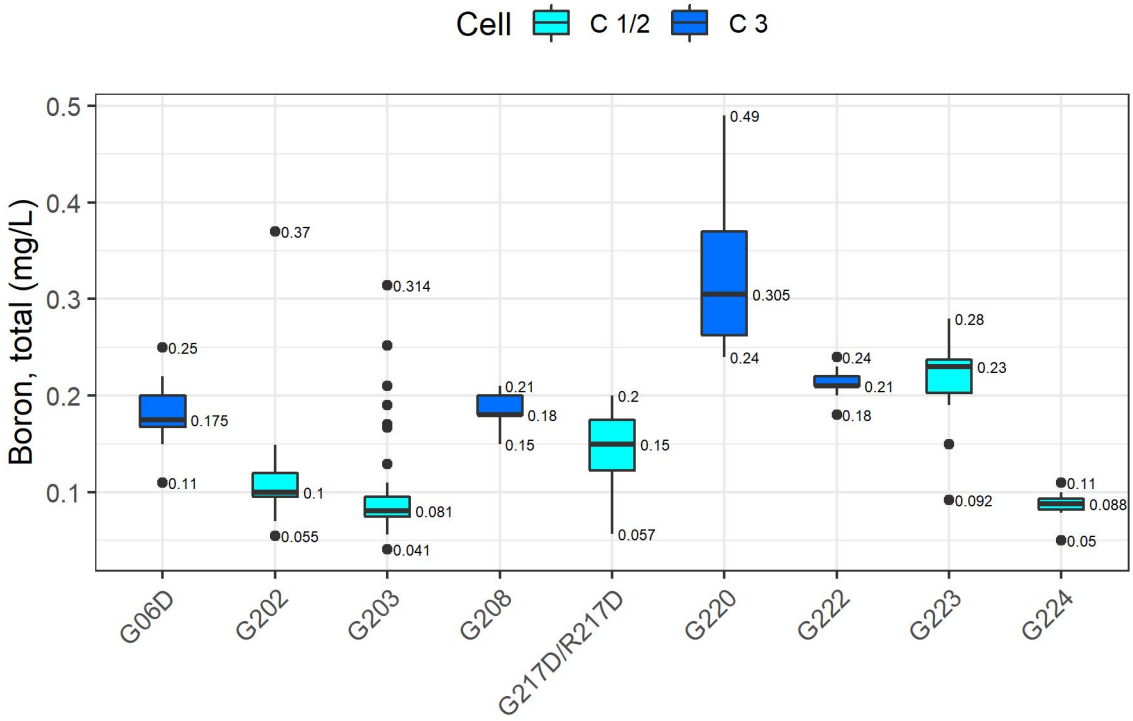

Figure B. Boron Box Plot. Includes LF2 Cells 1 and 2 Downgradient Monitoring Wells (cyan) and LF2 Cell 3 Downgradient Monitoring Wells (blue).

The minimum and maximum boron concentrations in compliance wells monitoring LF2 Cell 3 ranged from 0.11 to 0.49 milligrams per liter (mg/L). The minimum and maximum boron concentrations in compliance wells monitoring LF2 Cells 1 and 2 ranged from 0.041 to 0.28 mg/L. Boron concentrations in compliance wells monitoring LF2 Cells 1 and 2 were within or below the range of concentrations observed at compliance wells monitoring LF2 Cell 3.

The similarity of boron concentrations in wells monitoring LF2 Cell 3, which has never contained CCR, and in LF2 Cells 1 and 2 compliance wells, suggests that LF2 Cells 1 and 2 are not the source of boron in the LF2 groundwater monitoring well G223.

4. CONCLUSIONS

Based on the four LOEs below, it has been demonstrated that the SSIs at G06D, G202, G203, G208, G220, G222, G223, G224, and R217D are not due to LF2 but are from a source other than the CCR unit being monitored:

1. LF2 composite liner design.
2. No CCR material has been placed in LF2 Cell 3.
3. The ionic composition of groundwater is different than the ionic composition of leachate.
4. Boron concentrations in wells monitoring LF2 Cells 1 and 2 are statistically similar to concentrations in wells monitoring LF2 Cell 3 (where no CCR material has been placed).

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.94(e)(2) that the SSIs observed during D8 were not due to LF2. Therefore, an assessment monitoring program is not required, and the Newton LF2 will remain in detection monitoring.

5. REFERENCES

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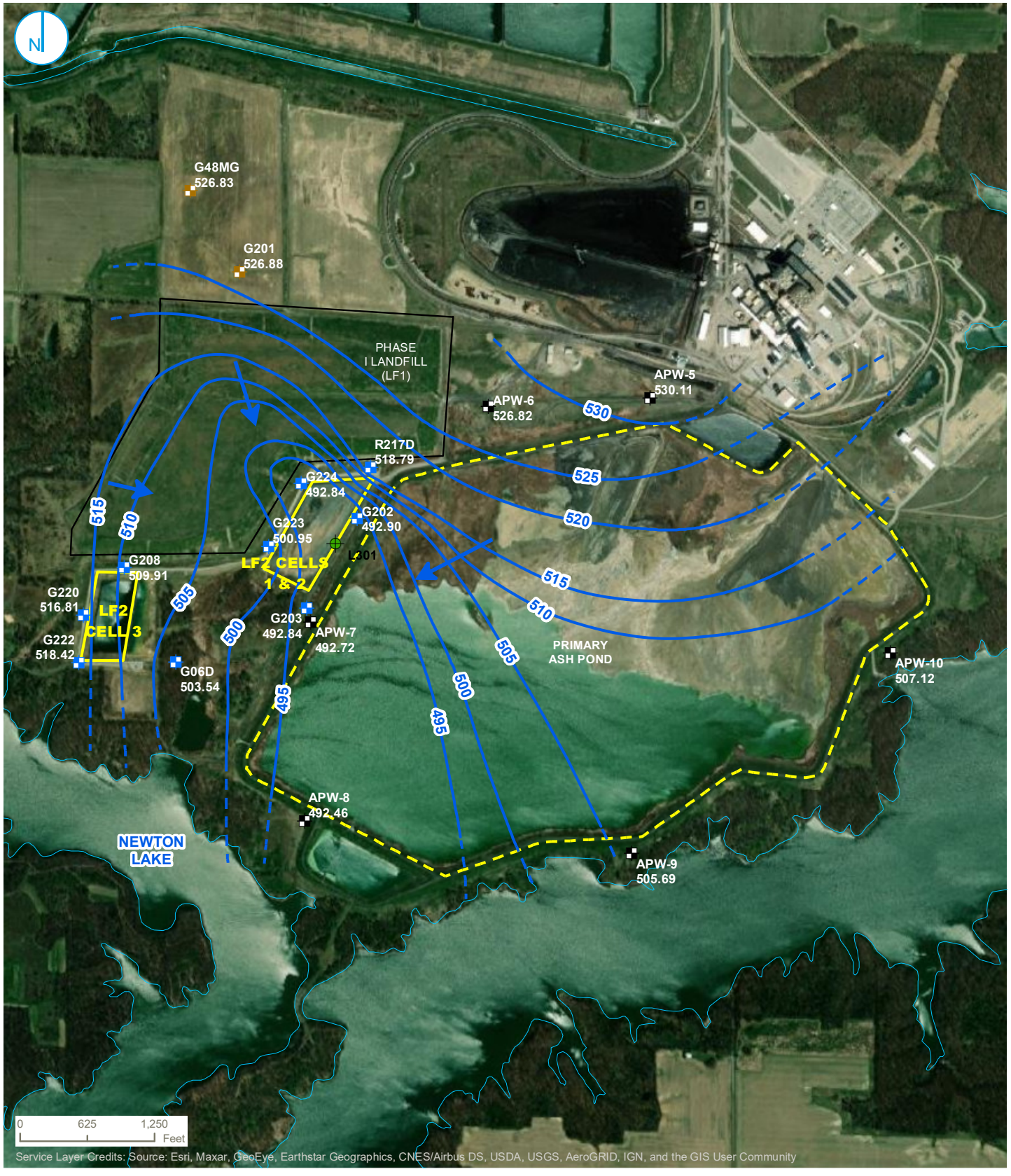
FIGURES



Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Newton\Figure 1_SampLoc and GWC Map LF2_D8.mxd

PROJECT: 169000XXXX | DATED: 9/9/2021 | DESIGNER: STOLZSD

- LF2 DOWNGRADIENT MONITORING WELL
- LF2 UPGRADIENT MONITORING WELL
- PRIMARY ASH POND CCR RULE MONITORING
- LF2 LEACHATE SAMPLE LOCATION
- GROUNDWATER ELEVATION CONTOUR (5-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- SURFACE WATER FEATURE
- LF2 CCR UNIT BOUNDARY
- PRIMARY ASH POND CCR UNIT BOUNDARY
- LF1 UNIT BOUNDARY

SAMPLING LOCATION AND GROUNDWATER ELEVATION CONTOUR MAP FEBRUARY 4, 2021

NEWTON PHASE II LANDFILL (LF2) (UNIT ID: 502)
ALTERNATE SOURCE DEMONSTRATION
NEWTON POWER PLANT
NEWTON, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL