Annual Groundwater Monitoring Report

Public Service Company of Oklahoma

Northeastern Power Station

Bottom Ash Pond CCR Management Unit

Permit No. Pending

7300 E HWY 88

Oologah, Oklahoma

January 31, 2023

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PUBLIC SERVICE COMPANY OF OKLAHOMA℠

An AEP Company

BOUNDLESS ENERGY℠

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Abbreviations:
ASD - Alternate Source Demonstration
BAP – Bottom Ash Pond
CCR – Coal Combustion Residual
GWPS - Groundwater protection standards
NPS – Northeastern Power Station
SSI - Statistically Significant Increase
SSL - Statistically Significant Level

I. Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year for an existing Coal Combustion Residual (CCR) unit at Public Service Company of Oklahoma's (PSO's), a wholly owned subsidiary of American Electric Power Company (AEP), Northeastern Power Station (NPS). The Oklahoma Department of Environmental Quality (ODEQ) CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31, 2023.
In general, the following activities were completed:

- At the start of the current annual reporting period, the BAP was operating under the Assessment monitoring program.
- At the end of the current annual reporting period, the BAP was operating under the Assessment monitoring program.
- The BAP initiated an assessment monitoring program on April 13, 2018.
- A statistical process in accordance with OAC 252:517 to evaluate groundwater data was updated, certified, and posted to AEP's CCR website in 2022 titled: *Statistical Analysis Plan (*Geosyntec Nov 2021). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009). This report was approved by ODEQ January 20, 2022.
- Annual and Semi-Annual groundwater samples were collected from SP-1, SP-2, SP-4, SP-5R, SP-10 and SP-11 and analyzed for Appendix A and Appendix B constituents, as specified in OAC 255:517-9-6 Assessment Monitoring program and AEP's *Groundwater Sampling and Analysis Plan* (2021).
- Data and statistical analysis not available for the previous reporting period indicated that during the 2nd semi-annual 2021 sampling event (December 2021):
    - Potential SSIs were identified for:
        - Boron at SP-10
        - Chloride at SP-10
        - Fluoride at SP-10
        - Sulfate SP-11
        - TDS at SP-10
    - Potential SSLs were identified for:
        - Lithium, Barium, and Fluoride in SP-10

- During the 1st semi-annual 2022 sampling event (June 2022):
    - Potential SSIs were identified for:
        - Boron at SP-10 and SP-11
        - Chloride at SP-2 and SP-10
        - Fluoride at SP-10
        - Sulfate at SP-11
        - TDS at SP-2 and SP-10
    - Potential SSLs were identified for:
        - Lithium, Barium, and Fluoride in SP-10
- Statistical evaluation of the 2nd semi-annual 2022 groundwater sampling event in November 2022 is underway.
- ASDs for the 2nd semi-annual 2021 potential Lithium, Barium, and Fluoride SSLs were certified July 15, 2022, and approved by ODEQ September 20, 2022.
- ASDs for the 1st semi-annual 2022 potential Lithium, Barium, and Fluoride SSLs is underway.

The major components of this annual report, to the extent applicable at this time, are presented in sections that follow:

- A map, aerial photograph or a drawing showing the BAP CCR management unit, all groundwater monitoring wells and monitoring well identification numbers;
- All of the monitoring data collected, including the rate and direction of groundwater flow, plus a summary showing the number of samples collected per monitoring well, the dates the samples were collected and whether the sample was collected as part of detection monitoring or assessment monitoring programs is included in Appendix 1;
- Statistical comparison of monitoring data to determine if there have been SSI(s) or SSL(s) (Attached as Appendix 2, where applicable);
- A discussion of whether any alternate source demonstrations (ASDs) were performed, and the conclusions (Attached as Appendix 3, where applicable);
- A summary of any transition between monitoring programs or an alternate monitoring frequency, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring, in addition to identifying the constituents detected at a statistically significant increase over background concentrations (Appendix 4).

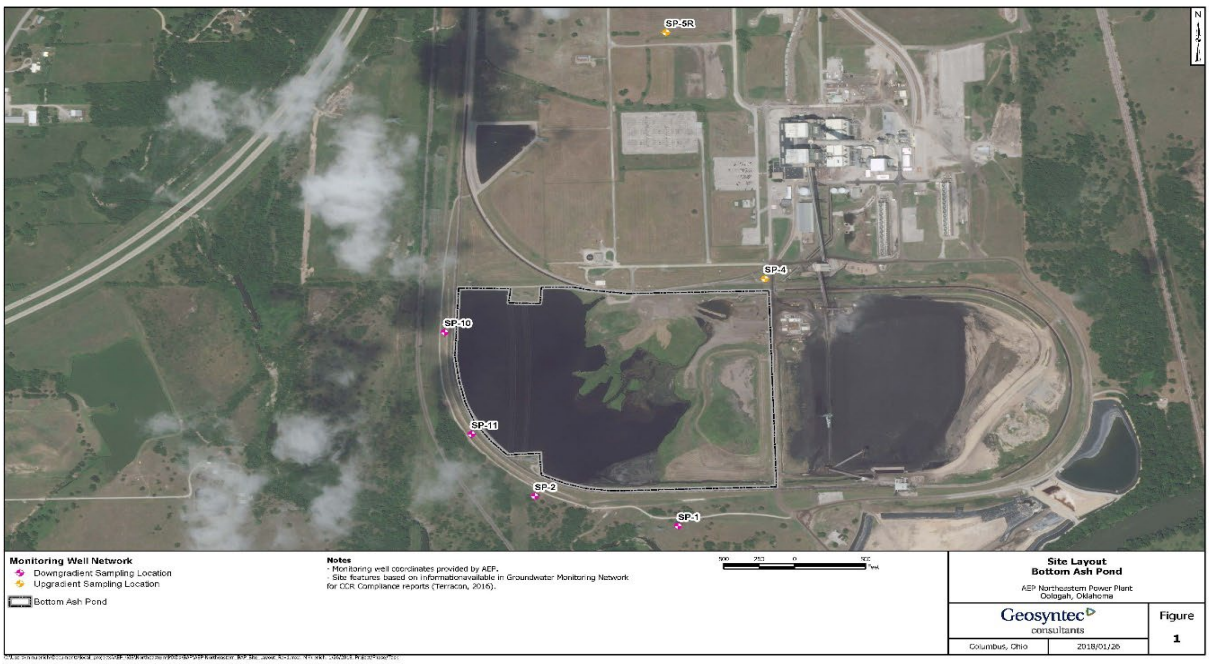
- Identification of any monitoring wells that were installed, or decommissioned during the preceding year, along with a statement as to why that happened (Attached as Appendix 5, where applicable); and
- Other information required to be included in the annual report such as field sheets and analytical reports, if applicable.

In addition, this report summarizes key actions completed, and where applicable, describes any problems encountered and actions taken to resolve those problems. The report includes a projection of key activities for the upcoming year.

II. Groundwater Monitoring Well Locations and Identification Numbers

The figure that follows depicts the PE-certified groundwater monitoring network, the monitoring well locations and their corresponding identification numbers.

Bottom Ash Pond Monitoring Wells	
Background	Down Gradient
SP-4	SP-1
SP-5R	SP-2
	SP-10
	SP-11



III. Monitoring Wells Installed or Decommissioned

There were no groundwater monitoring wells installed or decommissioned during this reporting period. The network design, as summarized in the *Groundwater Monitoring Network Design Report* (September 2017) and as posted at the CCR website for NPS's Bottom Ash Pond (BAP), did not change. That network design report, viewable on the AEP CCR web site, discusses the facility location, the hydrogeological setting, the hydrostratigraphic units, the uppermost aquifer, downgradient monitoring well locations and the upgradient monitoring well locations.

IV. Groundwater Quality Data and Static Water Elevation Data, With Flow Rate and Direction and Discussion

Appendix 1 contains tables showing the applicable groundwater quality data obtained under OAC 252:517-9-4 through 252:517-9-6 relevant to this reporting period. Static water elevation data from each monitoring event also are shown in Appendix 1, along with the groundwater velocity calculations groundwater flow directions and potentiometric maps developed after each sampling event.

The site-wide groundwater flow velocity varies from the velocity computed in residence time calculations because assumptions used in these calculations vary based on the scale of the application of groundwater flow. The site-wide groundwater flow velocity is determined as a representative average over the entire CCR unit, which is a large area (multiple acres) consisting of different rock formations. The residence time calculation is a localized estimate use to establish the residence time of groundwater within a single well (<100 sq ft). The site-wide groundwater flow velocity utilizes the maximum and minimum hydraulic gradient based on groundwater elevation differences between two widely spaced site monitoring wells. For a localized hydraulic gradient, the residence time calculations use the elevation difference between the target monitoring well and the nearest groundwater elevation contour line. Additionally, the hydraulic conductivity and effective porosity used in the site-wide groundwater flow velocity are represented by average parameters based on field tests conducted at the Unit. The residence time calculation uses an estimated hydraulic conductivity and effective porosity from a reference work representative of the formation in contact with the well.

A summary of the varying methods is shown below

	Site-Wide Flow Calculation	Residence Time Calculation
Purpose	Determine representative average groundwater flow velocity across the entire Unit (multiple acres)	Determine residence time of groundwater within a 2-inch diameter groundwater monitoring well (<100 square feet)
Hydraulic Gradient	Greatest groundwater elevation difference between two wells monitoring the Unit, and smallest groundwater elevation difference between two wells monitoring the Unit	Elevation difference between target groundwater monitoring well, and nearest groundwater elevation contour line
Hydraulic Conductivity	Average hydraulic conductivity determined from slug tests conducted at the Unit	Estimated hydraulic conductivity from referenced work representative of the formation in contact with the individual well
Effective Porosity	Average effective porosity determined from field tests	Estimated effective porosity from referenced work representative of the formation in contact with the well

The annual screening event for Appendix B constituents conducted in March 2022 satisfies the requirement of 252:517-9-6(b). ODEQ agreed via email dated August 22, 2022, that the 252:517-9-6(b) sampling event is not needed if all Appendix A and B parameters are collected during each semi-annual sampling event (email attached in Appendix 6). Therefore, PSO will no longer conduct the 252:517-9-6(b) sampling event and will collect all Appendix A and B parameters at each monitoring well for this CCR Unit during each semi-annual sampling event.

The semi-annual groundwater sampling events for Appendix A and Appendix B constituents were conducted June 14, 2022, and November 7-8, 2022. When the data becomes available, it is placed into NPS's Operating Record, satisfying the requirement of 252:517-9-6(d).

Appendix 6 contains the available Field sheets and laboratory reports for this reporting period.

V. Groundwater Quality Data Statistical Analysis

Annual and Semi-Annual groundwater samples were collected SP-1, SP-2, SP-4, SP-5R, SP-10 and SP-11 and analyzed for Appendix A and Appendix B constituents, as specified in OAC 255:517-9-6 Assessment Monitoring program and AEP's *Groundwater Sampling and Analysis Plan* (2021) and approved by ODEQ January 20, 2022.

Appendix 2 contains the available statistical analysis reports for this reporting period.

Data and statistical analysis not available for the previous reporting period was certified April 18, 2022 and indicated that during the 2nd semi-annual 2021 sampling event (December 27-28, 2021):

- Potential SSIs were identified for:
  - Boron at SP-10
  - Chloride at SP-10
  - Fluoride at SP-10
  - Sulfate SP-11
  - TDS at SP-10
- Potential SSLs were identified for:
  - Lithium, Barium, and Fluoride in SP-10

During the 1st semi-annual 2022 sampling event (June 14, 2022) and certified October 7, 2022 indicated:

- Potential SSIs were identified for:
  - Boron at SP-10 and SP-11
  - Chloride at SP-2 and SP-10
  - Fluoride at SP-10
  - Sulfate at SP-11
  - TDS at SP-2 and SP-10
- Potential SSLs were identified for:
  - Lithium, Barium, and Fluoride in SP-10

Statistical evaluation of the 2nd semi-annual 2022 groundwater sampling event in November 2022 is underway.

VI. Alternate Source Demonstrations Completed

An alternate source demonstration (ASD) investigation relative to past SSIs was completed in April 2018. That demonstration concluded that alternate sources could not be identified. Additionally, an ASD investigation was not undertaken for the current SSI(s).

ASDs for the 2nd semi-annual 2021 potential Lithium, Barium, and Fluoride SSLs was certified July 15, 2022, and approved by ODEQ September 20, 2022.

ASDs for the 1st semi-annual 2022 potential Lithium, Barium, and Fluoride SSLs is underway.

Because successful ASDs for the potential SSL(s) were identified, but no alternate sources for the SSI(s) were identified, the BAP remained in Assessment Monitoring.

VII. Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency

Because an ASD for the SSIs could not be identified, an assessment monitoring program was established at NE's BAP in April 2018. Assessment monitoring continued throughout the 2022 calendar year.

VIII. Other Information Required

A statistical process in accordance with OAC 252:517 to evaluate groundwater data was updated, certified, and posted to AEP's CCR website in 2022 titled: *Statistical Analysis Plan (*Geosyntec Nov 2021). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009). This report was approved by ODEQ January 20, 2022.

NPS continues to work with ODEQ towards completing the permit for this CCR Unit.

IX. Description of Any Problems Encountered and Actions Taken

No significant problems were encountered. The low flow sampling effort continued, and the schedule was met to support the annual groundwater report preparation covering this reporting period's groundwater monitoring activities.

X. A Projection of Key Activities for the Upcoming Year

Key activities for the next reporting period include:

- As required by OAC 252:517-9-6, conduct assessment monitoring of the groundwater for the BAP CCR unit on a semi-annual basis;
- Evaluation of the assessment monitoring results from a statistical analysis viewpoint, looking for SSLs above GWPS;
- Complete ASDs for potential SSLs and submit to ODEQ for approval;
- Continue to work towards obtaining a permit;
- Preparation of the next annual groundwater report.

APPENDIX 1

Potentiometric Maps and Tables follow, showing the groundwater monitoring data collected, the rate and direction of groundwater flow, and a summary showing the number of samples collected per monitoring well. The dates that the samples were collected also is shown.

Legend

- Groundwater Monitoring Well
- Groundwater Elevation Contour
- Approximate Groundwater Flow Direction
- Bottom Ash Pond
- Impoundment
- Landfill
- Slurry Wall

Notes

- Monitoring well coordinates and water level data (collected on 3/16/2022) provided by AEP.
- Groundwater elevation units are feet above mean sea level (ft. msl).
- Only wells screened in the upper portion of the Oolagah Limestone were used for contouring.

600 300 0 600 Feet

Potentiometric Contours - Uppermost Aquifer
March 2022

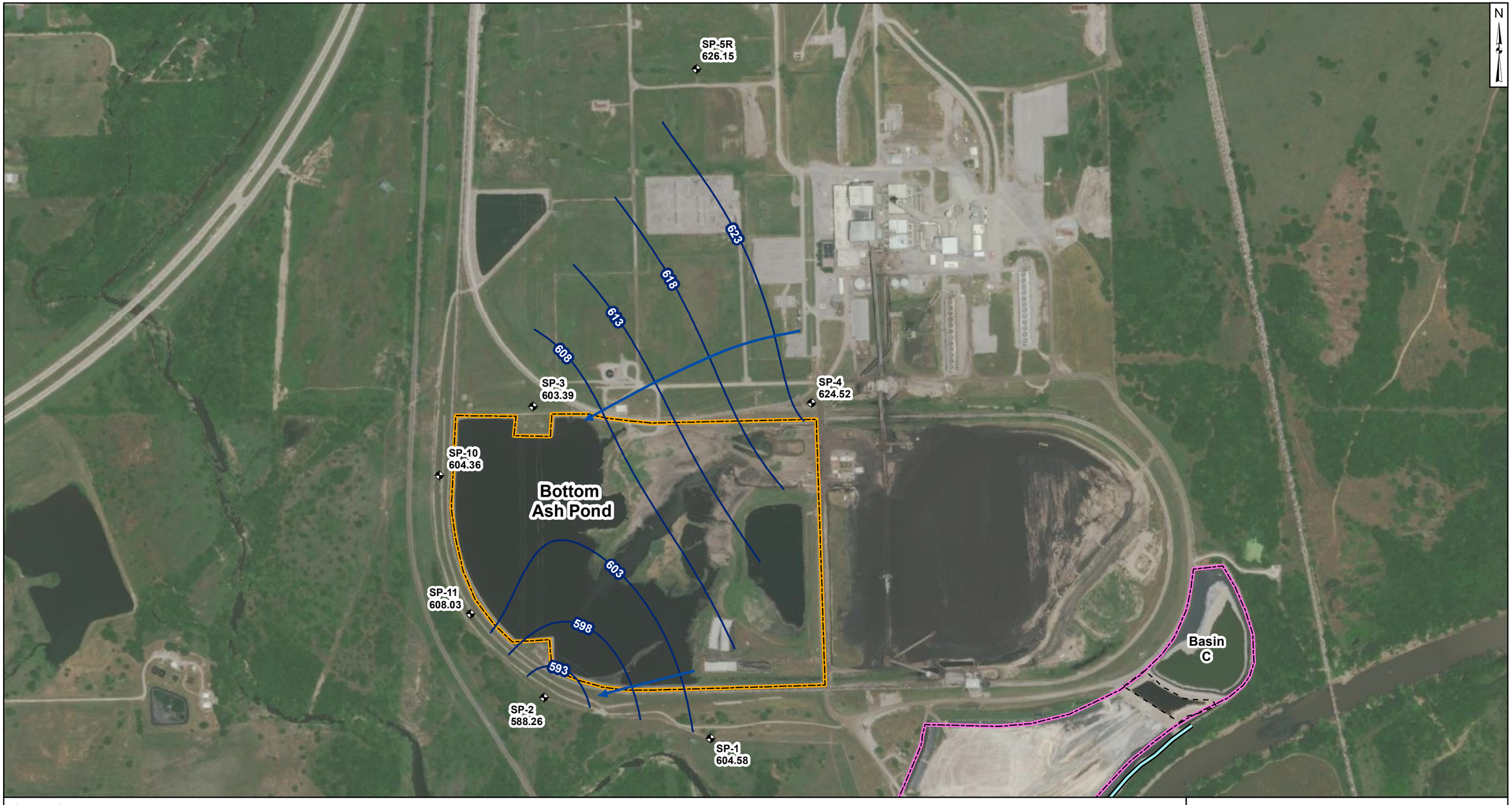
AEP Northeastern Power Plant - Bottom Ash Pond
Oologah, Oklahoma

Geosyntec consultants

Columbus, Ohio | 2022/06/17

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Northeastern\2022\AEP-Northeastern_BAP_2022-03Mar.mxd. ASoltero. 6/17/2022. Project/Phase/Task.



Legend

- Groundwater Monitoring Well
- Groundwater Elevation Contour
- Approximate Groundwater Flow Direction
- Bottom Ash Pond
- Impoundment
- Landfill
- Slurry Wall

Notes

- Monitoring well coordinates and water level data (collected on 6/14/2022) provided by AEP.
- Groundwater elevation units are feet above mean sea level (ft. msl).
- Only wells screened in the upper portion of the Oolagah Limestone were used for contouring.

600 300 0 600 Feet

Potentiometric Contours - Uppermost Aquifer
June 2022

AEP Northeastern Power Plant - Bottom Ash Pond
Oologah, Oklahoma

Geosyntec consultants

Columbus, Ohio | 2022/08/01

Figure **3**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Northeastern\2022\AEP-Northeastern_BAP_2022-06June.mxd. ASoltero. 8/1/2022. Project/Phase/Task.

Legend

- Groundwater Monitoring Well
- Groundwater Elevation Contour
- Approximate Groundwater Flow Direction
- Bottom Ash Pond
- Impoundment
- Landfill
- Slurry Wall

Notes

- Monitoring well coordinates and water level data (collected on November 7 and 8, 2022) provided by AEP.
- Groundwater elevation units are feet above mean sea level (ft. msl).
- Only wells screened in the upper portion of the Oolagah Limestone were used for contouring.
- Satellite imagery provided by ESRI.

600 300 0 600 Feet

Potentiometric Contours - Uppermost Aquifer
November 2022

AEP Northeastern Power Plant - Bottom Ash Pond
Oologah, Oklahoma

Geosyntec consultants

Columbus, Ohio | 2022/11/16

Figure **4**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Northeastern\2022\AEP-Northeastern_BAP_2022-11_Nov.mxd. ASoltero. 11/16/2022. Project/Phase/Task.

Table 1: Residence Time Calculation Summary
Northeastern Bottom Ash Pond

Geosyntec Consultants, Inc.

			2022-03		2022-06		2022-11	
CCR Management Unit	Monitoring Well	Well Diameter (inches)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Bottom Ash Pond	SP-1 [2]	2.0	5.6	10.9	5.7	10.7	3.7	16.3
	SP-2 [2]	2.0	9.6	6.4	9.7	6.3	6.1	9.9
	SP-4 [2]	2.0	2.7	22.5	5.0	12.2	3.4	17.7
	SP-5R [1]	2.0	2.0	29.9	3.2	18.9	0.8	76.8
	SP-10 [1]	2.0	2.1	29.2	1.2	51.1	5.3	11.4
	SP-11 [1]	2.0	9.8	6.2	10.5	5.8	5.7	10.6

Notes:
[1] - Background Well
[2] - Downgradient Well

NE CCR Units
NE BAP

$$v = 0.00463 \frac{cm}{sec} * \frac{head(ft)}{dist(ft)} * \frac{1}{0.045} * \frac{ft}{30.48cm} * \frac{31536000\ sec}{yr}$$

Distance between wells.

	SP1	SP2	SP3	SP4	SP5R	SP10	SP11
SP1	-	1000.0		2250.0	3750.0	2333.0	1677.0
SP2		-		2444.0	3972	1500.0	666.7
SP3							
SP4				-	2167.0	2333.0	2444.0
SP5R					-	2944.0	3611.0
SP10						-	861.1
SP11							-

NE BAP

Hydraulic gradient. Use row **83** 11/7/2022

	SP1	SP2	SP3	SP4	SP5R	SP10	SP11
SP1	-	0.010		0.0096	0.005	0.00611	0.000
SP2		-		0.013	0.007	0.016	0.014
SP3			-				
SP4				-	0.001	0.00315	0.009
SP5R					-	0.001	0.005
SP10						-	0.0165
SP11							-

effective porosity(n) = 0.045
Hydraulic conductivity of aquifer (k) = 4759 ft/yr
Max gradient (dh/dl)
0.017
min gradient
0.00003

$$v = k \frac{(dh / dl)}{n}$$

Groundwater elevations, sea level

Well	SP-1	SP-2	SP-3	SP-4	SP-5R	SP-10	SP-11
total depth*	37.99	38.19	37.90	38.30	78.00	54.10	34.51
TOC	621.26	617.49	621.02	639.16	631.17	617.52	615.17

* includes riser

	-----Depth to water-----						
date							
10/4/2017	17.57	36.46	11.60	35.84	7.09	34.79	31.97
10/11/2017	16.53	35.79	9.28	35.04	5.76	34.66	32.21
5/1/2018	16.69	22.15	18.38	15.29	5.8	15.13	12.64
5/29/2018	17.43	21.71	19.12	14.45	6.99	14.89	14.31
7/30/2018	18.04	27.02		20.41	8.53	8.13	16.41
2/27/2019	16.58	20.86		13.09	4.81	20.12	11.15
6/20/2019	16.88	23.31		22.53	4.82	12.32	4.72
8/26/2019	17.51	28.43	16.28	25	6.39	3.85	14.6
3/25/2020	15.34	19.07	14.88	13.28	3.43	13.13	7.16
6/29/2020	17.87	26.71	17.14	24.83	7.41	12.06	11.52
7/28/2020	17.36	32.6	14.29	30.78	7.25	11.76	18.16
10/20/2020	17.68	28.9	1.55	19.29	8.55	0	14.19
3/3/2021	16.18	22.95	11.63	17.19	4.43	11.31	7.26
4/12/2021	16.87	29.25	16.93	29.73	5.55	18.14	7.84
12/27/2021	16.94	21.43	0.79	12.36	6.93	0.42	11.96
3/16/2022	16.37	29.29	11.03	21.09	5.86	11.38	7.88
6/14/2022	16.68	29.23	17.63	14.64	5.02	13.16	7.14
11/7/2022	18	23.84	0	14.3	9.39	0	11.86

-----Calculated groundwater elevation-----

Well	SP-1	SP-2	SP-3	SP-4	SP-5R	SP-10	SP-11 Max	MIN			
TOC	621.26	617.49	621.02	639.16	631.17	617.52	615.17			**(dh/dl)**	
Date	**SP-1**	**SP-2**	**SP-3**	**SP-4**	**SP-5R**	**SP-10**	**SP-11**			**gradient**	**max v(ft/yr)**	**min v(ft/yr)**
10/4/17	603.69	581.03	609.42	603.32	624.08	582.73	583.20	624.08	581.03	0.037	**3912.96**	
10/11/17	604.73	581.7	611.74	604.12	625.41	582.86	582.96	625.41	581.70	0.023	**2432.38**	**12.27**
5/1/18	604.57	595.34	602.64	623.87	625.37	602.39	602.53	625.37	595.34	0.012	**1269.07**	**17.24**
5/29/18	603.83	595.78	601.90	624.71	624.18	602.63	600.86	624.71	595.78	0.012	**1269.07**	**25.91**
7/30/18	603.22	590.47		618.75	622.64	609.39	598.76	622.64	590.47	0.013	**1374.82**	**18.93**
2/27/19	604.68	596.63		626.07	626.36	597.4	604.02	626.36	596.63	0.012	**1269.07**	**12.69** 1H2019
6/20/19	604.38	594.18		616.63	626.35	605.2	610.45	626.35	594.18	0.024	**2538.13**	**37.12** annual screening
8/26/19	603.75	589.06	604.74	614.16	624.78	613.67	600.57	624.78	589.06	0.017	**1797.84**	**22.21** 2H2019
3/25/20	605.92	598.42	606.14	625.88	627.74	604.39	608.01	627.74	598.42	0.014	**1480.58**	**69.38** annual screening
6/29/20	603.39	590.78	603.88	614.33	623.76	605.46	603.65	623.76	590.78	0.019	**2009.36**	**16.39** 1H2020
7/28/20	603.90	584.89	606.73	608.38	623.92	605.76	597.01	623.92	584.89	0.019	**2009.36**	**16.39** 1H2020 SSI confirmatory
10/20/20	603.58	588.59	619.47	619.87	622.62	617.52	600.98	622.62	588.6	0.019	**2009.36**	**10.65** 2H2020
3/3/21	605.08	594.54	609.39	621.97	626.74	606.21	607.91	626.74	594.54	0.02	**2115.11**	**51.19** annual screening
4/12/21	604.39	588.24	604.09	609.43	625.62	599.38	607.33	625.62	588.24	0.029	**3066.91**	**90.95** 1H2021
12/27/21	604.32	596.06	620.23	626.8	624.24	617.1	603.21	626.8	596.06	0.016	**1692.09**	**69.80** 2H2021
3/16/22	604.89	588.2	609.99	618.07	625.31	606.14	607.29	625.31	588.2	0.029	**3066.91**	**57.11** annual screening
6/14/22	604.58	588.26	603.39	624.52	626.15	604.36	608.03	626.15	588.26	0.03	**3172.67**	**9.62** 1H2022
11/7/22	603.26	593.65	621.02	624.86	621.78	617.52	603.31	624.86	593.65	0.017	**1797.84**	**3.28** 2H2022

Table 1 - Groundwater Data Summary: SP-1
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.298	111	60	< 1 U1	7.5	66	514
3/13/2017	Background	0.186	117	548	4	--	30	480
4/24/2017	Background	0.202	108	83	1.02	7.6	60	496
5/18/2017	Background	0.284	131	104	1.3	--	60	574
6/15/2017	Background	0.242	115	50	0.6437 J1	9.3	48	478
6/27/2017	Background	0.232	113	19	0.582 J1	11.1	48	424
7/12/2017	Background	0.287	122	70	0.6283 J1	9.8	56	504
8/4/2017	Background	0.299	125	20	0.542 J1	8.7	52	394
8/17/2017	Background	--	--	--	--	7.9	--	--
8/30/2017	Background	0.25	120	34	0.581 J1	7.7	59	456
9/13/2017	Background	0.369	119	62	0.4042 J1	8.2	54	536
9/20/2017	Background	0.331	129	22	< 0.083 U1	7.3	62	440
10/11/2017	Detection	0.35	152	136	1.4051	7.4	58	676
1/22/2018	Detection	--	119	--	--	6.9	--	--
5/30/2018	Assessment	--	--	--	1.2525	7.3	--	--
7/30/2018	Assessment	0.397	130	46	0.9863 J1	7.0	63	1,060
2/4/2019	Assessment	0.354	150	--	--	--	--	--
2/27/2019	Assessment	0.200	122	42.7	0.80	7.3	87.1	532
6/20/2019	Assessment	0.198	126	25.2	0.77	7.1	61.4	452
8/26/2019	Assessment	0.124	120	9	0.525 J1	9.0	48	438
3/25/2020	Assessment	0.184	96.7	40.8	0.96	8.5	62.9	500
6/30/2020	Assessment	0.180	99.4	29.6	0.81	9.0	49.3	435
7/28/2020	Assessment	--	--	--	--	8.4	--	--
10/20/2020	Assessment	0.146	103	12.9	0.81	8.5	51.1	427
3/3/2021	Assessment	0.169	105	--	0.85	7.4	--	--
4/12/2021	Assessment	0.186	104	37.2	0.88	7.6	50.0	438
12/28/2021	Assessment	0.127	91.2	34.2	0.93	7.1	40.0	410
6/14/2022	Assessment	0.176	102	21.2	0.78	7.3	65.2	430 L1
11/8/2022	Assessment	0.147	102 M1	16.3	0.85	7.3	54.1	400

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: SP-1
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	< 5 U1	211	< 1 U1	< 1 U1	< 1 U1	< 5 U1	3.48	< 1 U1	< 5 U1	0.006	< 0.025 U1	11	< 5 U1	< 2 U1
3/13/2017	Background	< 5 U1	< 5 U1	146	< 1 U1	< 1 U1	< 1 U1	< 5 U1	3.014	4	< 5 U1	0.007	< 0.025 U1	16	< 5 U1	< 2 U1
4/24/2017	Background	2.75 J1	1.91 J1	195	0.1 J1	< 0.07 U1	0.84 J1	2.42 J1	4.71	1.02	0.94 J1	0.00789	< 0.005 U1	19.92	4.85 J1	< 0.86 U1
5/18/2017	Background	6.85	5.48	243	0.26 J1	0.22 J1	2.55	2.55 J1	4.12	1.3	1.63 J1	0.00853	0.023 J1	16.77	6.51	< 0.86 U1
6/15/2017	Background	1.14 J1	< 1.05 U1	183	0.04 J1	< 0.07 U1	< 0.23 U1	0.77 J1	2.096	0.6437 J1	< 0.68 U1	0.00407	0.009 J1	7.02	2.54 J1	< 0.86 U1
6/27/2017	Background	< 0.93 U1	< 1.05 U1	187	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.77 J1	14.29	0.582 J1	< 0.68 U1	0.00334	< 0.005 U1	6.42	2.77 J1	< 0.86 U1
7/12/2017	Background	1.25 J1	< 1.05 U1	217	0.09 J1	< 0.07 U1	0.62 J1	1.34 J1	4.01	0.6283 J1	1.24 J1	0.00395	< 0.005 U1	8.14	5.21	0.89 J1
8/4/2017	Background	< 0.93 U1	2.11 J1	298	0.1 J1	< 0.07 U1	0.78 J1	1.33 J1	3.41	0.542 J1	0.94 J1	0.00577	0.009 J1	19.96	11.96	< 0.86 U1
8/30/2017	Background	2.09 J1	1.34 J1	218	0.14 J1	< 0.07 U1	0.55 J1	1.75 J1	4.15	0.581 J1	< 0.68 U1	0.00468	< 0.005 U1	12.08	3.51 J1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	< 1.05 U1	210	0.09 J1	0.08 J1	0.31 J1	1.07 J1	2.584	0.4042 J1	< 0.68 U1	0.00548	< 0.005 U1	14.65	4.13 J1	< 0.86 U1
9/20/2017	Background	< 0.93 U1	< 1.05 U1	168	0.05 J1	0.11 J1	< 0.23 U1	1.15 J1	4.53	< 0.083 U1	< 0.68 U1	0.00318	< 0.005 U1	5.32	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	< 0.93 U1	< 1.05 U1	190	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.53 J1	3.64	1.2525	< 0.68 U1	0.00785	< 0.005 U1	16.39	4.23 J1	2
7/30/2018	Assessment	0.69	0.93	174	0.06 J1	0.08 J1	1.83	0.676	3.056	0.9863 J1	0.354	0.00615	< 0.005 U1	17.1	5.8	0.09 J1
2/27/2019	Assessment	0.6 J1	0.7 J1	168	< 0.2 U1	< 0.1 U1	2.72	< 0.2 U1	3.056	0.80	0.2 J1	0.00641	< 0.005 U1	10 J1	2.8	< 1 U1
6/20/2019	Assessment	0.93	1.44	242	0.2 J1	0.1 J1	0.7 J1	5.54	2.745	0.77	0.650	0.03 J1	0.01 J1	12.1	9.9	< 0.5 U1
8/26/2019	Assessment	0.43	0.73	160	0.08 J1	0.09	1.49	0.481	2.75	0.525 J1	0.835	0.00285	< 0.005 U1	5.86	3.4	0.1 J1
3/25/2020	Assessment	0.62	0.72	158	0.07 J1	0.08	0.499	0.362	6.67	0.96	0.351	0.00600	< 0.002 U1	15.8	6.6	< 0.1 U1
6/30/2020	Assessment	0.58	0.69	159	0.07 J1	0.07	0.969	0.431	2.531	0.81	0.886	0.00534	< 0.002 U1	13.6	8.3	< 0.1 U1
10/20/2020	Assessment	0.46	0.57	143	0.05 J1	0.08	0.215	0.727	2.82	0.81	0.254	0.00336	< 0.002 U1	11.5	3.8	< 0.1 U1
3/3/2021	Assessment	0.51	0.53	144	0.05 J1	0.08	0.426	0.307	4.27	0.85	0.259	0.00443	< 0.002 U1	14.3	4.5	< 0.1 U1
4/12/2021	Assessment	0.46	0.54	158	0.04 J1	0.05	0.359	0.202	3.47	0.88	0.2 J1	0.00549	< 0.002 U1	13.7	3.9	0.05 J1
12/28/2021	Assessment	0.51	0.51	155	0.040 J1	0.051	0.70	0.246	4.12	0.93	0.24	0.00474	< 0.002 U1	15.2	6.45	0.05 J1
6/14/2022	Assessment	0.72	0.84	161	0.061	0.066	0.60	1.14	3.98	0.78	0.22	0.00473	< 0.002 U1	21.2	9.63	0.07 J1
11/8/2022	Assessment	0.80	0.69	157	0.054	0.055	1.30	0.684	5.68	0.85	0.15 J1	0.00558	< 0.002 U1	28.8	15.4	0.07 J1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: SP-2
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.274	108	607	3	6.4	21	1,786
3/13/2017	Background	0.251	82.6	37	1	--	70	1,340
4/24/2017	Background	0.152	62	527	2.82	6.5	27	1,242
5/18/2017	Background	0.336	117	1,240	3.1	--	15	2,214
6/15/2017	Background	0.303	108	888	2.96	8.3	61	1,912
6/27/2017	Background	0.292	98.5	883	2.8408	7.4	58	1,872
7/12/2017	Background	0.339	111	863	3.581	7.9	58	1,846
8/4/2017	Background	0.28	147	1,064	2.788	7.2	57	2,132
8/17/2017	Background	--	--	--	--	7.6	--	--
8/30/2017	Background	0.275	86.8	1,001	4.0998	7.5	47	2,192
9/13/2017	Background	0.311	91.8	930	3.196	7.0	43	1,956
9/20/2017	Background	0.3	129	856	1.726	6.9	37	1,778
10/11/2017	Detection	0.307	91.9	970	3.5881	7.3	41	2,076
1/22/2018	Detection	--	--	975	--	7.0	--	1,910
5/30/2018	Assessment	--	--	--	3.4972	7.5	--	--
7/30/2018	Assessment	0.276	117	268	2.6556	7.5	30	1,006
2/27/2019	Assessment	0.116	94.0	351	2.68	7.6	26.1	932
6/20/2019	Assessment	0.109	58.2	357	2.69	6.8	28.5	1,044
8/26/2019	Assessment	0.173	211	1,072	2.685	8.5	14	2,246
3/25/2020	Assessment	0.114	60.4	418	2.73	8.8	22.0	1,120
6/30/2020	Assessment	0.163	83.9	420	2.64	8.8	26.3	977
7/28/2020	Assessment	--	--	--	--	8.4	--	--
10/20/2020	Assessment	0.151	75.3	850	2.98	8.7	19.1	1,790
3/3/2021	Assessment	0.140	72.0	--	3.00	7.5	--	--
4/12/2021	Assessment	0.255	91.5	1,130	3.19	7.6	12.4	2,000
12/28/2021	Assessment	0.111	104	341	2.73	7.3	20.8	920
6/14/2022	Assessment	0.228	115	844	3.08	7.4	22.3	1,720 L1
11/8/2022	Assessment	0.108	103	695	2.7	7.3	18.1	1,480

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits

Table 1 - Groundwater Data Summary: SP-2
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	11	1,460	< 1 U1	< 1 U1	3	< 5 U1	6.89	3	< 5 U1	0.098	< 0.025 U1	19	< 5 U1	< 2 U1
3/13/2017	Background	< 5 U1	5	1,130	< 1 U1	< 1 U1	1	< 5 U1	9.96	1	< 5 U1	0.073	< 0.025 U1	23	< 5 U1	< 2 U1
4/24/2017	Background	--	--	--	--	--	--	--	8.98	--	--	--	--	--	--	--
4/27/2017	Background	2.09 J1	2.08 J1	760	0.04 J1	< 0.07 U1	0.24 J1	0.87 J1	--	2.82	< 0.68 U1	0.05305	< 0.005 U1	24.67	2.04 J1	< 0.86 U1
5/18/2017	Background	8.71	9.02	3,130	0.26 J1	0.18 J1	2.87	2.77 J1	26.48	3	2.02 J1	0.111	0.006 J1	11.63	6.16	< 0.86 U1
6/15/2017	Background	11.34	5.5	1,710	0.18 J1	< 0.07 U1	2.04	2.51 J1	22.16	2.96	< 0.68 U1	0.103	0.005 J1	29.57	37.83	< 0.86 U1
6/27/2017	Background	5.15	1.4 J1	1,560	0.06 J1	< 0.07 U1	1.29	1.82 J1	--	2.8408	< 0.68 U1	0.09272	< 0.005 U1	29.62	22.41	< 0.86 U1
7/12/2017	Background	4.74 J1	2.51 J1	1,540	0.07 J1	< 0.07 U1	0.59 J1	1.23 J1	--	3.581	1.41 J1	0.0961	< 0.005 U1	33.32	23.23	< 0.86 U1
8/4/2017	Background	3.51 J1	2.54 J1	1,010	0.09 J1	0.07 J1	1.07	1.08 J1	16.34	2.788	< 0.68 U1	0.09164	0.014 J1	39.4	23.36	< 0.86 U1
8/30/2017	Background	2.95 J1	1.25 J1	1,120	0.12 J1	< 0.07 U1	< 0.23 U1	0.8 J1	14.48	4.0998	< 0.68 U1	0.0931	< 0.005 U1	33.86	11.86	< 0.86 U1
9/13/2017	Background	2.67 J1	1.83 J1	992	0.11 J1	< 0.07 U1	< 0.23 U1	0.87 J1	14.89	3.196	< 0.68 U1	0.09207	0.006 J1	37.61	9.87	< 0.86 U1
9/20/2017	Background	2.64 J1	3.05 J1	1,150	0.2 J1	0.09 J1	3.46	2.55 J1	--	1.726	0.91 J1	0.09111	< 0.005 U1	39.39	9.87	< 0.86 U1
5/30/2018	Assessment	1.3 J1	< 1.05 U1	869	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.55 J1	7.85	3.4972	< 0.68 U1	0.04039	< 0.005 U1	26.46	2.16 J1	< 0.86 U1
7/30/2018	Assessment	1.21	1.42	656	0.05 J1	0.08 J1	< 40 U1	0.400	9.61	2.6556	0.245	0.0346	< 0.005 U1	26.1	2.9	0.06 J1
2/27/2019	Assessment	1.39	1.29	841	< 0.2 U1	< 0.1 U1	4.30	< 0.2 U1	5.76	2.68	0.3 J1	0.0329	< 0.005 U1	25.8	3.7	< 1 U1
6/20/2019	Assessment	1.34	1.43	868	0.1 J1	0.09 J1	0.9 J1	0.434	7.94	2.69	0.4 J1	0.062	< 0.005 U1	25.0	2.9	< 0.5 U1
8/26/2019	Assessment	1.22	1.53	1,220	0.07 J1	0.05	0.701	0.568	8.72	2.685	0.334	0.0582	< 0.005 U1	22.3	3.7	0.1 J1
3/25/2020	Assessment	1.14	1.68	1,060	0.07 J1	0.13	0.806	0.361	9.73	2.73	0.694	0.0352	< 0.002 U1	20.3	2.4	< 0.1 U1
6/30/2020	Assessment	1.26	1.28	1,140	0.109	0.05	0.573	0.733	7.84	2.64	0.263	0.0585	< 0.002 U1	19.7	6.2	< 0.1 U1
10/20/2020	Assessment	1.22	1.08	1,110	0.07 J1	0.04 J1	0.398	0.433	12.96	2.98	0.1 J1	0.0517	< 0.002 U1	20.1	4.4	< 0.1 U1
3/3/2021	Assessment	1.09	1.07	1,050	0.09 J1	0.06	0.700	0.323	11.81	3.00	0.253	0.0523	< 0.002 U1	17.1	3.5	< 0.1 U1
4/12/2021	Assessment	0.84	1.53	1,790	0.112	0.04 J1	0.559	1.10	7.87	3.19	0.211	0.0862	< 0.002 U1	14.6	1.1	0.05 J1
12/28/2021	Assessment	0.97	1.08	1,210	0.055	0.044	0.52	0.312	12.05	2.73	0.16 J1	0.0327	< 0.002 U1	13.8	2.08	< 0.04 U1
6/14/2022	Assessment	1.51	1.11	1,070	0.1 J1	0.063	1.05	0.791	10.83	3.08	0.17 J1	0.084	< 0.002 U1	26.5	9.56	0.07 J1
11/8/2022	Assessment	1.17	1.21	872	0.048 J1	0.328	2.12	0.186	6.75	2.7	0.33	0.0308	< 0.002 U1	22.1	2.36	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: SP-4
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.406	57.7	401	3	7.7	37	1,122
3/15/2017	Background	0.399	67	52	4	--	38	1,128
4/25/2017	Background	0.442	58.8	459	3.2	7.0	41	1,128
5/18/2017	Background	0.411	296	232	2.1	--	50	846
6/15/2017	Background	0.395	118	475	3.34	8.3	36	1,164
6/27/2017	Background	0.388	110	471	3.2489	8.1	37	1,388
7/12/2017	Background	0.42	648	489	3.863	8.1	36	1,128
8/4/2017	Background	0.412	1,920	469	3.078	7.7	50	1,150
8/17/2017	Background	0.493	793	460	3.049	7.8	75	1,132
8/30/2017	Background	0.392	612	576	4.086	7.6	74	1,400
9/13/2017	Background	0.387	810	450	3.199	7.7	88	1,236
9/20/2017	Background	0.477	630	440	1.747	7.2	90	1,208
10/11/2017	Detection	0.425	206	431	3.7702	7.4	78	1,200
5/30/2018	Assessment	--	--	--	4.169	7.4	--	--
7/30/2018	Assessment	0.399	164	521	< 0.083 U1	7.6	70	1,180
2/27/2019	Assessment	0.370	85.6	470	3.26	7.4	61.5	1,122
6/20/2019	Assessment	0.325	56.4	450	3.24	7.1	58.0	1,128
8/26/2019	Assessment	0.365	182	458	2.99	8.8	61	1,170
3/25/2020	Assessment	0.340	59.6	476	3.29	9.1	68.6	1,130
6/30/2020	Assessment	0.338	80.5	531	3.16	9.0	70.2	1,160
10/21/2020	Assessment	0.333	63.9	441	3.24	8.9	70.4	1,150
3/3/2021	Assessment	0.347	58.7	--	3.50	7.8	--	--
4/12/2021	Assessment	0.393	70.8	495	3.49	7.7	68.1	1,160
12/28/2021	Assessment	0.342	88.7	458	3.24	7.4	79.6	1,100
6/14/2022	Assessment	0.367	70.2	452	3.25	7.8	80.4	1,160 L1
11/8/2022	Assessment	0.354	97.6	447	3.23	7.4	81.9	1,150

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: SP-4
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	< 5 U1	398	< 1 U1	< 1 U1	< 1 U1	< 5 U1	4.00	3	< 5 U1	0.072	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
3/15/2017	Background	< 5 U1	< 5 U1	477	< 1 U1	< 1 U1	< 1 U1	< 5 U1	3.57	4	< 5 U1	0.073	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
4/25/2017	Background	1.36 J1	1.72 J1	578	0.03 J1	0.1 J1	0.64 J1	1.01 J1	2.566	3.2	< 0.68 U1	0.06973	< 0.005 U1	1.5 J1	< 0.99 U1	1.21 J1
5/18/2017	Background	2.04 J1	5.5	762	0.56 J1	0.57 J1	10.73	5.49	6.37	2.1	3.65 J1	0.07998	0.015 J1	1.02 J1	< 0.99 U1	< 0.86 U1
6/15/2017	Background	1.74 J1	4.59 J1	633	0.34 J1	< 0.07 U1	4.04	4.63 J1	4.18	3.34	1.39 J1	0.07422	< 0.005 U1	0.65 J1	1.67 J1	< 0.86 U1
6/27/2017	Background	< 0.93 U1	2.01 J1	576	0.24 J1	< 0.07 U1	2.98	5.29	9.64	3.2489	0.96 J1	0.07041	< 0.005 U1	0.46 J1	< 0.99 U1	< 0.86 U1
7/12/2017	Background	2.66 J1	10.65	1,340	1.28	1.37	22.48	10.64	5.79	3.863	8.47	0.09243	0.01 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
8/4/2017	Background	3.87 J1	44.98	4,590	4.97	6.55	84.15	40.69	4.04	3.078	36.63	0.136	0.058	5.03	4.99 J1	< 0.86 U1
8/17/2017	Background	< 0.93 U1	19.31	2,310	2.12	2.05	41.82	17.86	6.71	3.049	10.7	0.111	0.03	4.23 J1	1.04 J1	< 0.86 U1
8/30/2017	Background	2.45 J1	9.13	1,490	1.26	1.66	25.81	12.06	8.09	4.086	7.11	0.0962	0.021 J1	4.61 J1	1.86 J1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	16.34	1,910	1.71	2.47	30.83	17.71	5.92	3.199	8.92	0.104	0.029	6.21	1.65 J1	< 0.86 U1
9/20/2017	Background	2.3 J1	13.95	1,930	1.77	1.9	34.55	16.32	--	1.747	9.6	0.101	0.014 J1	7.02	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	5.14	< 1.05 U1	268	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.49 J1	3.186	4.169	< 0.68 U1	0.06851	< 0.005 U1	3.7 J1	< 0.99 U1	1.62 J1
7/30/2018	Assessment	0.37	1.14	303	0.078	0.07	0.562	0.497	4.85	< 0.083 U1	0.356	0.0627	0.006 J1	3.63	0.7	0.05 J1
2/27/2019	Assessment	0.3 J1	1 J1	276	< 0.2 U1	< 0.1 U1	5.71	< 0.2 U1	3.144	3.26	< 0.2 U1	0.0602	< 0.005 U1	< 4 U1	0.6 J1	< 1 U1
6/20/2019	Assessment	0.3 J1	0.83	337	< 0.1 U1	0.07 J1	1.06	0.388	3.751	3.24	1.07	0.068	0.007 J1	2 J1	0.4 J1	< 0.5 U1
8/26/2019	Assessment	0.25	1.64	359	0.101	0.05	1.01	1.07	3.24	2.99	0.596	0.0554	< 0.005 U1	2 J1	0.6	< 0.1 U1
3/25/2020	Assessment	0.28	0.83	327	0.04 J1	0.04 J1	0.332	0.166	4.28	3.29	0.2 J1	0.0535	< 0.002 U1	4.07	0.7	< 0.1 U1
6/30/2020	Assessment	0.32	1.52	334	0.118	0.04 J1	1.09	1.28	4.16	3.16	0.527	0.0564	< 0.002 U1	3.57	0.7	< 0.1 U1
10/21/2020	Assessment	0.29	1.03	322	0.06 J1	0.07	0.523	0.508	3.42	3.24	0.359	0.0559	< 0.002 U1	3.24	0.7	< 0.1 U1
3/3/2021	Assessment	0.27	0.99	367	0.04 J1	0.06	0.449	0.207	5.49	3.50	1.17	0.0594	< 0.002 U1	3.60	0.6	< 0.1 U1
4/12/2021	Assessment	0.22	1.41	435	0.09 J1	0.04 J1	1.03	0.921	4.09	3.49	0.392	0.0613	< 0.002 U1	2.94	0.4 J1	< 0.04 U1
12/28/2021	Assessment	0.26	0.76	304	0.033 J1	0.035	0.47	0.240	4.48	3.24	0.14 J1	0.0529	< 0.002 U1	3.0	0.48 J1	< 0.04 U1
6/14/2022	Assessment	0.21	0.80	246	0.04 J1	0.024	0.56	0.159	3.56	3.25	0.10 J1	0.0571	< 0.002 U1	3.7	0.38 J1	< 0.04 U1
11/8/2022	Assessment	0.23	0.92	214	0.053	0.059	1.19	0.345	6.29	3.23	0.38	0.0579	< 0.002 U1	3.5	0.39 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: SP-5R
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.233	52.4	500	3	8.0	10	1,354
3/15/2017	Background	0.236	61.7	62	4	--	10	1,420
4/25/2017	Background	0.245	53.8	674	3.06	7.5	9	1,436
5/18/2017	Background	0.319	79.1	1,834	4	--	8	3,008
6/15/2017	Background	0.231	57.1	607	3	8.3	7	1,368
6/27/2017	Background	0.224	53	636	2.835	8.2	8	1,156
7/12/2017	Background	0.261	53.8	640	3.156	8.2	7	1,388
8/4/2017	Background	0.256	61.3	638	2.889	7.9	8	1,372
8/17/2017	Background	0.293	52	661	3.258	8.2	6	1,378
8/30/2017	Background	0.252	57.3	652	3.5698	7.7	7	1,424
9/13/2017	Background	0.232	55.6	644	2.797	8.4	6	1,452
9/20/2017	Background	0.257	53.7	729	1.535	7.4	6	1,312
10/11/2017	Detection	0.61	71	630	3.7844	7.5	5	1,368
5/30/2018	Assessment	--	--	--	4.1115	7.6	--	--
7/30/2018	Assessment	0.246	131	793	4.3905	8.0	4	1,480
2/27/2019	Assessment	0.233	72.8	739	3.08	7.7	1.6	1,530
6/20/2019	Assessment	0.202	48.5	675	3.06	7.3	0.9 J1	1,428
8/26/2019	Assessment	0.220	128	697	2.789	8.8	3	1,450
3/25/2020	Assessment	0.214	49.2	790	3.13	8.8	0.8 J1	1,580
6/30/2020	Assessment	0.211	64.9	840	2.99	9.0	5.1	1,560
10/21/2020	Assessment	0.188	50.4	584	3.03	8.8	5.0	1,320
3/3/2021	Assessment	0.188	52.4	--	3.18	7.6	--	--
4/12/2021	Assessment	0.215	54.6	725	3.20	7.9	7.0	1,420
12/27/2021	Assessment	0.190	71.7	660	3.09	7.4	6.1	1,370
6/14/2022	Assessment	0.209	52.5	675	3.09	7.7	4.7	1,410 L1
11/7/2022	Assessment	0.256	90.2	1,010	3.28	7.4	2.8	1,940

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.

In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: SP-5R
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	12	1,650	< 1 U1	< 1 U1	< 1 U1	< 5 U1	10.09	3	< 5 U1	0.114	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
3/15/2017	Background	< 5 U1	13	1,590	< 1 U1	< 1 U1	1	< 5 U1	9.65	4	< 5 U1	0.112	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
4/25/2017	Background	< 0.93 U1	17.03	1,610	0.03 J1	< 0.07 U1	0.33 J1	0.88 J1	10.27	3.06	< 0.68 U1	0.112	0.016 J1	1.16 J1	< 0.99 U1	< 0.86 U1
5/18/2017	Background	< 0.93 U1	29.42	2,270	0.23 J1	< 0.07 U1	3.41	2.32 J1	15.3	4	2.36 J1	0.163	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
6/15/2017	Background	2.02 J1	13.7	2,050	0.11 J1	< 0.07 U1	1.42	1.44 J1	10.27	3	< 0.68 U1	0.109	0.016 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
6/27/2017	Background	< 0.93 U1	12.65	1,790	0.02 J1	< 0.07 U1	0.3 J1	1.01 J1	15.84	2.835	0.76 J1	0.1	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
7/12/2017	Background	< 0.93 U1	17.24	1,880	0.06 J1	< 0.07 U1	0.5 J1	1.1 J1	12.21	3.156	0.9 J1	0.111	< 0.005 U1	< 0.29 U1	1.14 J1	< 0.86 U1
8/4/2017	Background	< 0.93 U1	21.6	1,800	0.09 J1	< 0.07 U1	1.69	1.32 J1	11.6	2.889	1.44 J1	0.119	0.015 J1	1.27 J1	< 0.99 U1	< 0.86 U1
8/17/2017	Background	1.63 J1	19.11	1,890	0.04 J1	< 0.07 U1	< 0.23 U1	1 J1	10.95	3.258	< 0.68 U1	0.106	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
8/30/2017	Background	< 0.93 U1	19.47	1,930	0.11 J1	< 0.07 U1	1.16	1.2 J1	12.47	3.5698	< 0.68 U1	0.112	0.009 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	20.36	1,930	0.1 J1	0.16 J1	0.62 J1	1 J1	10.62	2.797	< 0.68 U1	0.11	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
9/20/2017	Background	< 0.93 U1	20.77	1,880	0.05 J1	< 0.07 U1	< 0.23 U1	0.97 J1	10.5	1.535	1.06 J1	0.111	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	1.21 J1	28.86	1,760	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.88 J1	9.15	4.1115	< 0.68 U1	0.102	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
7/30/2018	Assessment	0.05 J1	47.3	2,140	0.052	0.02 J1	0.082	0.482	11.28	4.3905	0.415	0.0946	< 0.005 U1	1.17	0.1	0.02 J1
2/27/2019	Assessment	< 0.2 U1	25.7	2,130	< 0.2 U1	< 0.1 U1	2 J1	0.3 J1	6.702	3.08	0.7 J1	0.102	< 0.005 U1	< 4 U1	< 0.3 U1	< 1 U1
6/20/2019	Assessment	< 0.1 U1	59.9	2,410	< 0.1 U1	< 0.05 U1	0.8 J1	0.598	12.977	3.06	0.701	0.111	0.008 J1	< 2 U1	< 0.2 U1	< 0.5 U1
8/26/2019	Assessment	0.06 J1	49.3	2,340	0.06 J1	0.02 J1	0.335	0.485	11.56	2.789	0.545	0.0928	< 0.005 U1	1 J1	0.1 J1	< 0.1 U1
3/25/2020	Assessment	0.05 J1	26.2	2,600	0.04 J1	0.02 J1	0.346	0.296	12.09	3.13	0.371	0.0911	< 0.002 U1	1 J1	0.1 J1	< 0.1 U1
6/30/2020	Assessment	0.13	27.0	2,520	0.151	0.04 J1	1.51	0.774	14.34	2.99	1.65	0.0913	< 0.002 U1	1 J1	0.5	< 0.1 U1
10/21/2020	Assessment	0.10	10.9	2,070	0.05 J1	< 0.01 U1	0.320	0.378	6.502	3.03	0.373	0.0792	< 0.002 U1	0.8 J1	0.2 J1	< 0.1 U1
3/3/2021	Assessment	0.16	6.56	1,840	0.05 J1	0.27	0.496	0.391	13.31	3.18	0.793	0.0856	< 0.002 U1	0.7 J1	0.1 J1	< 0.1 U1
4/12/2021	Assessment	0.09 J1	7.12	2,180	0.05 J1	0.01 J1	0.415	0.378	14.10	3.20	0.325	0.0894	< 0.002 U1	1 J1	0.1 J1	< 0.04 U1
12/27/2021	Assessment	0.09 J1	10.0	1,840	0.031 J1	0.029	0.26	0.257	13.16	3.09	0.18 J1	0.0766	< 0.002 U1	0.9	< 0.09 U1	< 0.04 U1
6/14/2022	Assessment	0.19	20.3	2,010	0.07 J1	0.200	0.47	0.699	11.26	3.09	0.66	0.0896	< 0.002 U1	0.9	0.1 J1	< 0.04 U1
11/7/2022	Assessment	0.16	14.2	2,070	0.066	0.108	0.75	0.511	9.37	3.28	4.34	0.120	< 0.002 U1	0.8	0.11 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: SP-10
Northeastern - BAP
Appendix A Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
7/12/2017	Background	0.965	53	1,844	6.502	6.7	294	3,416
8/4/2017	Background	1.08	83.1	1,616	< 0.083 U1	7.6	761	5,142
8/17/2017	Background	1.09	91.4	1,700	< 0.083 U1	7.8	915	5,678
8/30/2017	Background	1.09	81.8	1,932	10.2663	7.6	834	5,264
9/13/2017	Background	1.1	76.9	1,592	7.028	8.3	738	5,168
9/20/2017	Background	1.08	64.6	1,946	< 0.083 U1	7.1	544	4,424
9/27/2017	Background	1.07	65.7	1,784	5	7.8	419	4,516
10/4/2017	Background	1.1	52.3	1,553	5.11	7.4	286	3,660
10/11/2017	Detection	1.03	58.4	1,934	7.3938	7.0	188	4,060
1/22/2018	Detection	1.08	--	1,630	5.71	7.0	63.1	3,236
5/30/2018	Assessment	--	--	--	7.333	7.8	--	--
7/30/2018	Assessment	1.17	227	2,283	8.9991	7.6	75	3,632
2/4/2019	Assessment	1.17	144	--	--	--	--	--
2/27/2019	Assessment	1.16	92.6	1,740	5.59	7.8	6.9	3,504
6/20/2019	Assessment	0.916	50.3	1,780	6.40	7.8	30.3	3,512
8/26/2019	Assessment	1.03	216	1,939	4.874	8.9	29	3,446
3/25/2020	Assessment	1.04	44.2	2,000	6.45	8.2	12.6	3,560
6/30/2020	Assessment	0.944	52.1	2,010	6.29	8.9	25.5	3,550
7/28/2020	Assessment	0.914	--	1,960	6.63	8.3	--	3,440
10/20/2020	Assessment	0.955	39.9	1,830	6.55	9.1	9.6	3,540
3/3/2021	Assessment	0.853	40.4	--	7.12	7.7	--	--
4/12/2021	Assessment	1.03	43.8	2,000	6.84	8.1	15.4	3,540
12/27/2021	Assessment	0.868	76.6	1,890	6.7	7.6	10.4	3,440
6/14/2022	Assessment	1.04	56.1	1,810	6.3	7.7	16.3	3,600 L1
11/8/2022	Assessment	0.967	109	1,820	6.8	7.4	16.7	3,330

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: SP-10
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
7/12/2017	Background	4.62 J1	< 1.05 U1	1,900	< 0.02 U1	< 0.07 U1	110	5.96	17.23	6.502	< 0.68 U1	0.278	0.006 J1	934	5.67	< 0.86 U1
8/4/2017	Background	2.51 J1	2.43 J1	330	0.03 J1	< 0.07 U1	2.44	4.74 J1	1.153	< 0.083 U1	< 0.68 U1	0.284	0.029	129	8.82	< 0.86 U1
8/17/2017	Background	< 0.93 U1	< 1.05 U1	282	< 0.02 U1	< 0.07 U1	< 0.23 U1	< 0.14 U1	0.995	< 0.083 U1	< 0.68 U1	0.317	0.027	45.43	< 0.99 U1	< 0.86 U1
8/30/2017	Background	< 0.93 U1	5.66	279	0.06 J1	< 0.07 U1	1.09	4.27 J1	0.763	10.2663	< 0.68 U1	0.306	0.019 J1	30.35	2.56 J1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	9.42	266	0.07 J1	< 0.07 U1	0.46 J1	2.41 J1	0.774	7.028	< 0.68 U1	0.315	0.013 J1	16.28	3.11 J1	< 0.86 U1
9/20/2017	Background	1.16 J1	13.92	399	0.03 J1	< 0.07 U1	0.72 J1	2.19 J1	1.062	< 0.083 U1	< 0.68 U1	0.292	0.016 J1	13.58	2.38 J1	< 0.86 U1
9/27/2017	Background	1.57 J1	15.31	928	0.04 J1	< 0.07 U1	2.07	3.71 J1	1.723	5	< 0.68 U1	0.329	0.013 J1	35.93	3.84 J1	< 0.86 U1
10/4/2017	Background	1.27 J1	4.3 J1	664	0.03 J1	< 0.07 U1	0.36 J1	4.02 J1	3.226	5.11	0.87 J1	0.279	0.015 J1	29.19	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	< 0.93 U1	8.9	2,550	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.83 J1	6.06	7.333	< 0.68 U1	0.245	< 0.005 U1	2.94 J1	2.26 J1	< 0.86 U1
7/30/2018	Assessment	0.34	7.61	2,330	0.043	0.02 J1	0.06 J1	2.16	7.89	8.9991	0.102	0.242	0.006 J1	18.5	0.09 J1	0.04 J1
2/27/2019	Assessment	2 J1	3.48	5,810	< 0.4 U1	< 0.2 U1	1 J1	< 0.4 U1	15.35	5.59	< 0.4 U1	0.275	< 0.005 U1	< 8 U1	< 0.6 U1	< 2 U1
6/20/2019	Assessment	0.65	3.66	3,880	< 0.1 U1	< 0.05 U1	8.76	0.743	26.4	6.40	0.3 J1	0.290	0.01 J1	9 J1	< 0.2 U1	< 0.5 U1
8/26/2019	Assessment	0.61	3.00	3,060	0.08 J1	0.03 J1	1.61	1.06	8.11	4.874	0.449	0.241	< 0.005 U1	8.22	0.4	< 0.1 U1
3/25/2020	Assessment	0.17	0.61	6,670	< 0.02 U1	0.03 J1	0.383	0.522	26.79	6.45	0.08 J1	0.214	< 0.002 U1	7.39	0.1 J1	< 0.1 U1
6/30/2020	Assessment	0.21	1.40	3,960	0.03 J1	0.01 J1	0.204	0.724	8.33	6.29	0.07 J1	0.226	< 0.002 U1	4.81	0.08 J1	< 0.1 U1
10/20/2020	Assessment	0.08 J1	0.42	6,800	0.03 J1	0.01 J1	0.2 J1	0.103	13.9507	6.55	0.1 J1	0.209	< 0.002 U1	0.6 J1	0.09 J1	< 0.1 U1
3/3/2021	Assessment	0.08 J1	0.36	5,530	0.02 J1	0.03 J1	0.409	0.199	18.84	7.12	0.230	0.218	< 0.002 U1	1 J1	0.08 J1	< 0.1 U1
4/12/2021	Assessment	0.12	1.14	6,360	0.03 J1	0.01 J1	0.277	0.218	20.36	6.84	0.1 J1	0.221	< 0.002 U1	5.01	< 0.09 U1	< 0.04 U1
12/27/2021	Assessment	0.08 J1	0.34	6,980	0.019 J1	0.021	0.19 J1	0.044	17.31	6.7	0.05 J1	0.198	< 0.002 U1	0.4 J1	< 0.09 U1	< 0.04 U1
6/14/2022	Assessment	0.03 J1	0.19	7,590	< 0.4 U1	0.033	0.57	0.216	1.31	6.3	0.19 J1	0.289	< 0.002 U1	0.5	< 0.09 U1	< 0.04 U1
11/8/2022	Assessment	0.05 J1	0.61	5,050	0.036 J1	0.017 J1	0.47	0.061	19.09	6.8	0.06 J1	0.242	< 0.002 U1	0.3 J1	< 0.09 U1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: SP-11
Northeastern - BAP
Appendix A Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
7/12/2017	Background	0.839	742	568	2.386	7.4	798	2,880
8/4/2017	Background	0.543	272	567	3.355	7.9	870	3,076
8/17/2017	Background	0.453	171	789	4.52	6.9	741	3,308
8/30/2017	Background	0.428	161	683	4.1325	7.6	541	2,732
9/13/2017	Background	0.447	190	628	3.359	7.2	515	2,420
9/20/2017	Background	0.469	1,220	690	2.016	7.2	329	2,336
9/27/2017	Background	0.447	1,170	759	3	7.2	332	2,428
10/4/2017	Background	0.531	1,110	744	2.9	7.5	305	2,288
10/11/2017	Detection	0.446	479	824	4.4661	7.0	223	2,322
1/22/2018	Detection	--	--	470	2.96	6.9	222	1,544
5/30/2018	Assessment	--	--	--	3.574	7.5	--	--
7/30/2018	Assessment	0.280	124	234	3.7832	7.7	79	996
2/27/2019	Assessment	0.375	49.6	241	3.44	7.7	95.1	1,168
6/20/2019	Assessment	0.550	65.6	137	1.67	6.8	203	1,000
8/26/2019	Assessment	0.304	139	129	2.225	8.9	122	970
3/25/2020	Assessment	0.428	40.5	187	2.66	9.0	108	1,060
6/30/2020	Assessment	0.545	57.3	140	1.77	8.9	188	927
7/28/2020	Assessment	0.301	--	--	--	8.6	158	--
10/20/2020	Assessment	0.220	43.8	98.1	3.05	9.2	35.6	764
3/3/2021	Assessment	0.371	39.0	--	2.88	7.7	--	--
4/12/2021	Assessment	0.562	79.6	130	1.66	7.8	232	918
12/27/2021	Assessment	0.459	77.6	78.9	1.76	7.5	193	840
6/14/2022	Assessment	0.627	113	60.0	1.10	7.3	402	1,020 L1
11/8/2022	Assessment	0.510	113	97.3	1.3	7.2	356	1,060

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: SP-11
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
7/13/2017	Background	9.43	3.99 J1	194	0.22 J1	1.4	18.52	9.76	--	2.386	5.16	0.04698	0.009 J1	61.27	5.95	< 0.86 U1
8/4/2017	Background	4.7 J1	1.82 J1	98.74	0.07 J1	0.44 J1	5.25	6.52	25.367	3.355	2.01 J1	0.0877	0.023 J1	66.41	6.26	< 0.86 U1
8/17/2017	Background	< 0.93 U1	< 1.05 U1	83.42	< 0.02 U1	< 0.07 U1	< 0.23 U1	< 0.14 U1	0.947	4.52	< 0.68 U1	0.08931	0.007 J1	51.5	< 0.99 U1	< 0.86 U1
8/30/2017	Background	4.29 J1	1.2 J1	93.07	0.07 J1	0.34 J1	2.76	3.85 J1	0.438	4.1325	1.23 J1	0.08933	0.008 J1	44.33	2.49 J1	< 0.86 U1
9/13/2017	Background	2.4 J1	3.66 J1	108	0.08 J1	0.09 J1	2.57	3.21 J1	2.685	3.359	< 0.68 U1	0.105	0.009 J1	36.16	1.55 J1	< 0.86 U1
9/20/2017	Background	7.73	12.14	240	0.39 J1	2.7	31.3	14.62	4.2	2.016	8.16	0.13	0.027	46.9	5.46	< 0.86 U1
9/27/2017	Background	6.89	7.5	269	0.39 J1	3.01	32.71	14.37	--	3	8.58	0.129	0.048	48.61	7.47	< 0.86 U1
10/4/2017	Background	4.44 J1	8.47	347	0.35 J1	2.49	29.49	11.99	2.817	2.9	7.05	0.146	0.047	42.14	3.27 J1	< 0.86 U1
5/30/2018	Assessment	< 0.93 U1	5.3	160	< 0.02 U1	< 0.07 U1	0.34 J1	1.61 J1	1.334	3.574	< 0.68 U1	0.04956	< 0.005 U1	3.27 J1	1.43 J1	< 0.86 U1
7/30/2018	Assessment	0.35	4.22	539	0.029	0.04	0.379	5.12	0.95	3.7832	0.404	0.0370	0.005 J1	8.85	0.7	0.03 J1
2/27/2019	Assessment	< 0.2 U1	8.83	529	< 0.2 U1	< 0.1 U1	0.7 J1	0.720	1.81	3.44	0.2 J1	0.0580	< 0.005 U1	6 J1	< 0.3 U1	< 1 U1
6/20/2019	Assessment	0.3 J1	4.18	169	< 0.1 U1	0.06 J1	6.71	0.948	0.81	1.67	0.719	0.047	0.01 J1	< 2 U1	0.3 J1	< 0.5 U1
8/26/2019	Assessment	0.37	6.30	492	0.04 J1	0.13	1.47	2.73	1.623	2.225	0.764	0.0337	< 0.005 U1	5.70	0.8	< 0.1 U1
3/25/2020	Assessment	0.15	2.88	415	0.02 J1	0.05 J1	0.705	0.702	1.73	2.66	0.409	0.0402	0.003 J1	3.01	0.3	< 0.1 U1
6/30/2020	Assessment	0.14	2.79	187	< 0.02 U1	0.01 J1	0.201	0.620	3.845	1.77	0.1 J1	0.0278	0.008	2.15	0.2 J1	< 0.1 U1
10/20/2020	Assessment	0.48	1.49	630	0.03 J1	0.15	2.20	1.16	0.661	3.05	0.719	0.0298	0.004 J1	2 J1	0.5	< 0.1 U1
3/3/2021	Assessment	0.06 J1	1.33	330	< 0.02 U1	0.01 J1	0.243	0.939	0.901	2.88	0.1 J1	0.0396	< 0.002 U1	2 J1	0.2 J1	< 0.1 U1
4/12/2021	Assessment	0.19	2.14	212	0.02 J1	0.02 J1	0.944	1.52	1.354	1.66	0.224	0.0248	< 0.002 U1	2 J1	0.2 J1	< 0.04 U1
12/27/2021	Assessment	0.28	1.11	270	0.013 J1	0.021	0.28	0.259	2.06	1.76	0.14 J1	0.0187	< 0.002 U1	1.8	0.20 J1	< 0.04 U1
6/14/2022	Assessment	0.43	2.73	139	< 0.04 U1	0.027	0.59	2.36	1.17	1.10	0.23	0.0140	< 0.002 U1	2.9	0.19 J1	< 0.04 U1
11/8/2022	Assessment	0.12	2.29	146	0.027 J1	0.009 J1	0.46	1.76	3.32	1.3	0.11 J1	0.0157	< 0.002 U1	1.7	0.15 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

APPENDIX 2

Where applicable, shown in this appendix are the results from statistical analyses, and a description of the statistical analysis method chosen.

STATISTICAL ANALYSIS SUMMARY
BOTTOM ASH POND
Northeastern Power Station
Oologah, Oklahoma

Submitted to

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane
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April 15, 2022
CHA8500

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
BAP	Bottom Ash Pond
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
ODEQ	Oklahoma Department of Environmental Quality
OAC	Oklahoma Administrative Code
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the Oklahoma Department of Environmental Quality (ODEQ) and Oklahoma administrative code (OAC) regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (OAC 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power Station located in Oologah, Oklahoma. Recent groundwater monitoring results were compared to site-specific groundwater protection standards (GWPSs) to identify potential exceedances.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, chloride, fluoride, total dissolved solids (TDS), and sulfate at the BAP. Also, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. GWPS were set in accordance with OAC 252:517-9-6(h) and a statistical evaluation of the assessment monitoring data was conducted. During 2021, two assessment monitoring events were conducted at the BAP in March and April 2021, in accordance with OAC 252:517-9-6(b) and OAC 252:517-9-6(d), respectively. During the March and April 2021 assessment monitoring events, statistically significant levels (SSLs) were observed for fluoride and lithium (Geosyntec, 2021a). An alternative source demonstration (ASD) was successfully completed (Geosyntec, 2021b); thus, the unit remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in December 2021 in accordance with OAC 252:517-9-6(d). Results of the December 2021 event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. GWPSs were established for the Appendix B parameters. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs of Appendix B parameters were present above the GWPS. SSLs were identified for barium, fluoride, and lithium. Thus, either the unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A. The statistical analysis and certification of the selected methods were completed within 90 days of obtaining the data.

SECTION 2

BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, one set of samples was collected for analysis from each upgradient and downgradient well to meet the requirements of OAC 252:517-9-6(d)(1) in December 2021. Samples from the sampling event were analyzed for the Appendix A and Appendix B parameters. A summary of data collected during this assessment monitoring event may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.32 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec, 2021c). Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained in December 2021 were screened for potential outliers. No outliers were identified for these events.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix B parameter in accordance with OAC 252:517-9-6(h) and the *Statistical Analysis Plan* (Geosyntec, 2021c). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in OAC 252:517-9-6(h) for each Appendix B parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Parametric tolerance limits were calculated parametrically with 95% coverage and 95% confidence for antimony, arsenic, and lithium. Non-parametric tolerance limits were

calculated for barium, beryllium, cadmium, chromium, cobalt, combined radium, fluoride, lead, molybdenum, and selenium due to apparent non-normal distributions and for mercury and thallium due to a high non-detect frequency. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix B SSLs

A confidence interval was constructed for each Appendix B parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium exceeded the GWPS of 2.60 mg/L at SP-10 (3.42 mg/L).
- The LCL for fluoride exceeded the GWPS of 4.39 mg/L at SP-10 (5.11 mg/L).
- The LCL for lithium exceeded the GWPS of 0.140 mg/L at SP-10 (0.238 mg/L).

As a result, the Northeastern BAP will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

2.2.3 Establishment of Appendix A Prediction Limits

Upper prediction limits (UPL) were previously established for all Appendix A parameters following the background monitoring period (Geosyntec, 2018). Intrawell tests were used to evaluate potential SSIs for calcium, whereas interwell tests were used to evaluate potential SSIs for boron, chloride, fluoride, pH, sulfate, and TDS. Interwell and intrawell prediction limits are updated periodically during the assessment monitoring period as sufficient data became available.

For the intrawell tests, insufficient data was available to compare against the existing background dataset, the prediction limits were not updated for the intrawell tests at this time. The intrawell prediction limits were previously calculated using historical data through June 2020 (Geosyntec, 2020). The existing intrawell prediction limits were used to evaluate potential SSIs for calcium.

Prediction limits for the interwell tests were calculated using data collected during the 2021 assessment monitoring events. New upgradient well data were tested for outliers prior to being added to the background dataset. Upgradient well data were also evaluated for statistically significant trends using the Sen's Slope/Mann-Kendall trend test, and the results are included in Attachment B. The interwell prediction limits were used to evaluate potential SSIs for boron, chloride, fluoride, pH, sulfate, and TDS.

After the revised background set was established, a parametric or non-parametric analysis was selected based on the distribution of the data and the frequency of non-detect data. Estimated results less than the practical quantitation limit (PQL) – i.e., "J-flagged" data – were considered detections and the estimated results were used in the statistical analyses. Non-parametric analyses were selected for datasets with at least 50% non-detect data or datasets that could not be normalized. Parametric analyses were selected for datasets (either transformed or untransformed) that passed the Shapiro-Wilk / Shapiro-Francía test for normality. The Kaplan-Meier non-detect adjustment was applied to datasets with between 15% and 50% non-detect data. For datasets with fewer than 15% non-detect data, non-detect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or non-parametric) and transformation (where applicable) for each background dataset are shown in Attachment B.

Interwell UPLs were updated for boron, chloride, fluoride, pH, sulfate, and TDS and interwell LPLs were updated for pH using all the historical data through December 2021 to represent background values. The intrawell UPL was previously calculated for calcium using all the historical data through June 2020 to represent background values. The updated prediction limits are summarized in Table 3. The prediction limits were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, or in the case of pH, is neither less than the LPL nor greater than the UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL, or in the case of pH, is neither less than the LPL nor greater than the UPL, a second sample will not be collected. The retesting procedures allowed achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.2.4 Evaluation of Potential Appendix A SSIs

While SSLs were identified for the Appendix B parameters, a review of the Appendix A results was completed to assess whether concentrations of Appendix A parameters at the compliance wells exceeded background concentrations.

Data collected during the December 2021 assessment monitoring event from each compliance well were compared to the prediction limits to evaluate results above background values. The results from the December 2021 event and the prediction limits are summarized in Table 3. The following exceedances of the UPLs were noted:

- Boron concentrations exceeded the interwell UPL of 0.510 mg/L at SP-10 (0.868 mg/L).
- Chloride concentrations exceeded the interwell UPL of 802 mg/L at SP-10 (1,890 mg/L).
- Fluoride concentrations exceeded the interwell UPL of 4.39 mg/L at SP-10 (6.7 mg/L).
- Sulfate concentrations exceeded the interwell UPL of 90.0 mg/L at SP-11 (193 mg/L).
- TDS concentrations exceeded the interwell UPL of 1,570 mg/L at SP-10 (3,440 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the December 2021 sample was above the UPL or below the LPL. Based on these results, boron, chloride, fluoride, sulfate, and TDS concentrations appear to be above background concentrations.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the December 2021 data. GWPSs were re-established for the Appendix B parameters. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. SSLs were identified for barium, fluoride, and lithium at compliance well SP-10. Appendix A parameters were compared to recalculated prediction limits, with exceedances identified for boron, chloride, fluoride, sulfate, and TDS.

Based on this evaluation, the Northeastern BAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

SECTION 3

REFERENCES

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Bottom Ash Pond, Northeastern Plant, Oologah, Oklahoma. January.

Geosyntec. 2020. Statistical Analysis Summary – Bottom Ash Pond, Northeastern Plant, Oologah, Oklahoma. October.

Geosyntec. 2021a. Statistical Analysis Summary – Bottom Ash Pond, Northeastern Plant, Oologah, Oklahoma. August.

Geosyntec. 2021b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. October.

Geosyntec. 2021c. Statistical Analysis Plan – Northeastern Power Station, Oologah, Oklahoma. November.

TABLES

Table 1 - Groundwater Data Summary
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

Well ID		SP-1	SP-10	SP-11	SP-2	SP-4	SP-5R
Well Classification		Compliance	Compliance	Compliance	Compliance	Background	Background
Parameter	Unit	12/28/2021	12/27/2021	12/27/2021	12/28/2021	12/28/2021	12/27/2021
Antimony	µg/L	0.51	0.08 J	0.28	0.97	0.26	0.09 J
Arsenic	µg/L	0.51	0.34	1.11	1.08	0.76	10.0
Barium	µg/L	155	6,980	270	1,210	304	1,840
Beryllium	µg/L	0.040 J	0.019 J	0.013 J	0.055	0.033 J	0.031 J
Boron	mg/L	0.127	0.868	0.459	0.111	0.342	0.190
Cadmium	µg/L	0.051	0.021	0.021	0.044	0.035	0.029
Calcium	mg/L	91.2	76.6	77.6	104	88.7	71.7
Chloride	mg/L	34.2	1,890	78.9	341	458	660
Chromium	µg/L	0.70	0.19 J	0.28	0.52	0.47	0.26
Cobalt	µg/L	0.246	0.044	0.259	0.312	0.240	0.257
Combined Radium	pCi/L	4.12	17.31	2.06	12.05	4.48	13.16
Fluoride	mg/L	0.93	6.7	1.76	2.73	3.24	3.09
Lead	µg/L	0.24	0.05 J	0.14 J	0.16 J	0.14 J	0.18 J
Lithium	mg/L	0.00474	0.198	0.0187	0.0327	0.0529	0.0766
Mercury	µg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Molybdenum	µg/L	15.2	0.4 J	1.8	13.8	3.0	0.9
Selenium	µg/L	6.45	0.5 U	0.20 J	2.08	0.48 J	0.5 U
Sulfate	mg/L	40.0	10.4	193	20.8	79.6	6.1
Thallium	µg/L	0.05 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Total Dissolved Solids	mg/L	410	3,440	840	920	1,100	1,370
pH	SU	7.1	7.6	7.5	7.3	7.4	7.4

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
J: Estimated value. Parameter was detected in concentrations below the reporting limit.
-: Not analyzed

Table 2 - Appendix B Groundwater Protection Standards
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600		0.00708	0.00708
Arsenic, Total (mg/L)	0.0100		0.0572	0.0572
Barium, Total (mg/L)	2.00		2.60	2.60
Beryllium, Total (mg/L)	0.00400		0.00212	0.00400
Cadmium, Total (mg/L)	0.00500		0.00247	0.00500
Chromium, Total (mg/L)	0.100		0.0418	0.100
Cobalt, Total (mg/L)	n/a	0.00600	0.0179	0.0179
Combined Radium, Total (pCi/L)	5.00		15.8	15.8
Fluoride, Total (mg/L)	4.00		4.39	4.39
Lead, Total (mg/L)	n/a	0.0150	0.0107	0.0150
Lithium, Total (mg/L)	n/a	0.0400	0.140	0.140
Mercury, Total (mg/L)	0.00200		0.0000300	0.00200
Molybdenum, Total (mg/L)	n/a	0.100	0.0100	0.100
Selenium, Total (mg/L)	0.0500		0.00499	0.0500
Thallium, Total (mg/L)	0.00200		0.00162	0.00200

Notes:
MCL = Maximum Contaminant Level
CCR = Coal Combustion Residual
GWPS = Groundwater Protection Standard
Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.

Table 3 - Appendix A Data Summary
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

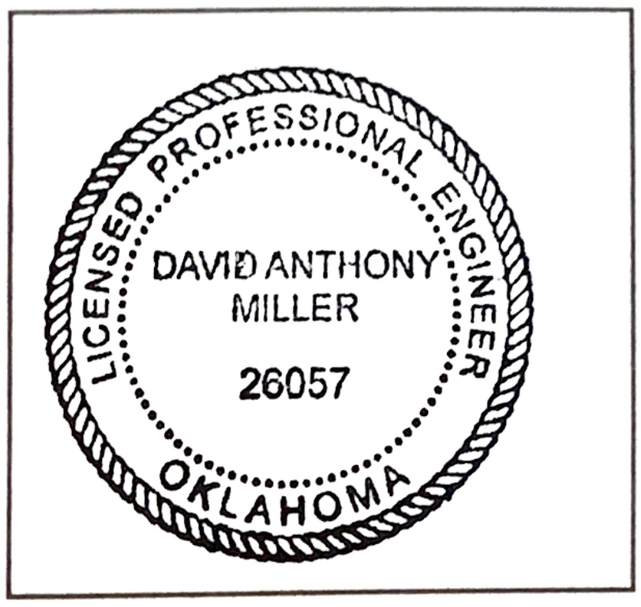
Analyte	Unit	Description	SP-1	SP-2	SP-10	SP-11
			12/28/2021	12/28/2021	12/27/2021	12/27/2021
Boron	mg/L	Interwell Background Value (UPL)	0.510			
		Analytical Result	0.127	0.111	**0.868**	0.459
Calcium	mg/L	Intrawell Background Value (UPL)	144	176	227	1,460
		Analytical Result	91.2	104	76.6	77.6
Chloride	mg/L	Interwell Background Value (UPL)	802			
		Analytical Result	34.2	341	**1,890**	78.9
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.93	2.73	**6.7**	1.76
pH	SU	Interwell Background Value (UPL)	9.0			
		Interwell Background Value (LPL)	6.9			
		Analytical Result	7.1	7.3	7.6	7.5
Sulfate	mg/L	Interwell Background Value (UPL)	90.0			
		Analytical Result	40.0	20.8	10.4	**193**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,570			
		Analytical Result	410	920	**3,440**	840

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.
- : Not Sampled

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern Bottom Ash Pond CCR management area and that the requirements of OAC 252:517-9-4(g) have been met.



DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

26057	OKLAHOMA	04.18.22
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

April 6, 2022

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

Re: Northeastern BAP (Bottom Ash Pond)
Background Update & Assessment Monitoring Statistics – December 2021

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis and background update of 2021 groundwater data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the Oklahoma Administrative Code (OAC) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the OAC program in 2017. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5R
- **Downgradient wells:** SP-1, SP2, SP-10, and SP-11

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was reviewed by Kristina Rayner, Groundwater Statistician and Founder of Groundwater Stats Consulting.

The OAC program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix A** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS
- **Appendix B** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. In the time series plots, a single reporting limit substitution is used across all wells for a given parameter since the wells are plotted as a group. For calculating intrawell prediction limits, the substitution is performed for individual wells and may differ across wells. This generally gives the most conservative limit in each case.

Time series plots for Appendix A and B parameters are provided for all wells and are used to evaluate concentrations over time as well as for the purpose of updating statistical limits (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). Values in background which have been flagged as outliers may be seen in a lighter font and as a disconnected symbol on the graph. A summary of these values follows this letter (Figure C). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells.

For regulatory comparison of current observations against statistical limits for Appendix A constituents, the annual site-wide false positive rate is based on the USEPA Unified Guidance (2009) recommendation of 10% (5% for each semi-annual sample event). Power curves were provided with the previous screening and demonstrated that the selected statistical method provides sufficient power to detect a change at any of the downgradient wells which complies with the USEPA Unified Guidance recommendation. The EPA suggests the selected statistical method should provide at least 55% power at 3 standard deviations or at least 80% power at 4 standard deviations. Power curves were based on the following:

Semi-Annual Sampling
1-of-2 resample plan
Constituents, c=7
Downgradient wells, w=4

Summary of Statistical Method – Appendix A Parameters

Based on the original background screening described in the 2017 screening report, the following statistical methods were selected for Appendix A parameters:

1) Intrawell prediction limits, combined with a 1-of-2 resample plan for calcium
2) Interwell prediction limits, combined with a 1-of-2 resample plan for boron, chloride, fluoride, pH, sulfate, and TDS

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are non-detects, a nonparametric test is utilized. While the annual false positive rate associated with parametric limits is fixed at 10% as recommended by the EPA Unified Guidance (2009), the false positive rate associated with nonparametric limits is not fixed and depends upon the available background sample size, number of future comparisons, and verification resample plan. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits as appropriate. Non-detects are handled as follows:

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% non-detects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the most recent practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% non-detects, the Kaplan-Meier non-detect adjustment is applied to the background data. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric prediction limits are used on data containing greater than 50% non-detects.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits is necessary to accommodate these types of changes. In the intrawell case, data for all wells and constituents may be re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater

quality. In the interwell case, prediction limits are updated with upgradient well data following each sampling event after careful screening for any new outliers. In some cases, deselecting the earlier portion of data may be necessary prior to construction of limits so that resulting statistical limits are conservative (lower) from a regulatory perspective and capable of rapidly detecting changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Summary of Appendix A Background Screening and Updates

December 2017 – Initial Background Screening

Interwell prediction limits combined with a 1-of-2 verification strategy were recommended for boron, chloride, fluoride, pH, sulfate and TDS; and intrawell prediction limits combined with a 1-of-2 verification strategy were recommended for calcium. All proposed background data were screened for outliers and trends during the background screening. The findings of those reports were submitted with that analysis. Interwell prediction limits utilize all upgradient well data for construction of statistical limits. During each sample event, upgradient well data are screened for any newly suspected outliers or obvious trending patterns using time series plots. Intrawell prediction limits utilized the background data set that was originally screened in 2017. As recommended in the EPA Unified Guidance (2009), the background data sets are evaluated for the purpose of updating statistical limits, as described below, using the Mann-Whitney two-sample test when at least four additional measurements are available.

December 2020 – Background Update

<u>Outlier Analysis</u>

Prior to updating background data sets for the Fall 2020 analysis, Tukey's outlier test and visual screening were used to re-evaluate data for outliers at all wells for calcium and at all upgradient wells for boron, chloride, fluoride, pH, sulfate, and TDS. No outliers were noted by Tukey's test at any of the wells for calcium. Values were flagged as outliers as a result of not accurately representing the populations for the following constituents in downgradient well SP-1: chloride, fluoride, and TDS. These constituents are evaluated using interwell methods; therefore, the values have no effect on the calculation of the prediction limits. Tukey's outlier test on pooled upgradient well data identified a few outliers for Appendix A parameters, which included chloride and TDS. These values were flagged accordingly in the database.

Mann-Whitney Test

For calcium, which requires intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through October 2017 to the new compliance samples at each well through June 2020. A statistically significant difference was found between the two groups for calcium in well SP-11. The background for calcium in well SP-11 was truncated to consist of the 8 most recent samples, which represents more recent current groundwater quality while providing statistical limits that are conservative from a regulatory perspective. Intrawell prediction limits, combined with a 1-of-2 resample plan, were constructed using all historical data through June 2020 for the remaining well/constituent pairs for calcium.

Trend Test

For parameters tested using interwell analyses (boron, chloride, fluoride, pH, sulfate, and TDS), the Sen's Slope/Mann-Kendall trend test was used on upgradient wells to determine whether concentrations are statistically increasing, decreasing or stable. Although statistically significant trends were identified, the magnitudes of the trends were either fairly small relative to average concentrations within each well or would not greatly affect the interwell prediction limits. Therefore, all well/constituent pairs using interwell prediction limits were updated using data through October 2020.

Background Update – March 2022

During this analysis, upgradient well data through December 2021 were screened for the purpose of updating the interwell prediction limits for boron, chloride, fluoride, pH, sulfate, and TDS. Intrawell prediction limits for calcium will be updated after the Fall 2022 sample event when sufficient compliance samples are available.

Outlier Analysis

Prior to updating interwell prediction limits, Tukey's outlier test and visual screening were used to re-evaluate data through December 2021 at all upgradient wells for boron, chloride, fluoride, pH, sulfate, and TDS (Figure C). Tukey's outlier test on pooled upgradient well data confirmed previously identified values for chloride and TDS, and no new values were flagged. No changes to values flagged in previous background updates occurred. As mentioned above, any flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. A summary table of all flagged outliers follows this report (Figure C).

Intrawell - Prediction Limits

Intrawell prediction limits, combined with a 1-of-2 resample plan, are constructed using historical data through June 2020 for calcium at all wells. As discussed earlier, background data sets for calcium will be updated after the Fall 2022 sample event when a minimum of 4 new compliance samples are available. A summary table of the limits follows this report (Figure D). A list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

Interwell – Trend Test Evaluation

For parameters tested using interwell analyses (boron, chloride, fluoride, pH, sulfate, and TDS) the Sen's Slope/Mann-Kendall trend test was used on upgradient wells to determine whether concentrations are statistically increasing, decreasing or stable (Figure E). Statistically significant trends were identified for the following upgradient well/constituent pairs:

Increasing:

- Sulfate: SP-4

Decreasing:

- Boron: SP-4 and SP-5R
- Sulfate: SP-5R

The magnitudes of the trends above are either fairly small relative to average concentrations within each well or would not greatly affect the interwell prediction limits. With limited background samples collected to date, all data from upgradient wells were used to construct interwell prediction limits for all Appendix A parameters except calcium, which is tested using intrawell prediction limits. As more data are collected, all upgradient well data will be re-evaluated for possible deselection of earlier measurements if they no longer represent present-day groundwater quality conditions.

Interwell – Prediction Limits

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells through October 2021 for boron, chloride, fluoride, pH, sulfate, and TDS (Figure F). Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent. A summary table of the updated limits may be found following this letter in the Prediction Limit Summary Tables.

Evaluation of Appendix B Parameters – December 2021

Prior to evaluating Appendix B parameters, background data are screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

For the current analysis, Tukey's outlier test on pooled upgradient well data identified outliers for cadmium, lead, mercury, and selenium, which confirmed previously flagged values. Several of the values identified by Tukey's test were either similar to concentrations upgradient of the facility or were lower than the respective Maximum Contaminant Level (MCL); therefore, the values were not flagged as outliers. A summary of previously flagged outliers follows this report (Figure C). Although no new outliers were flagged during this analysis, more recent concentrations for barium in downgradient well SP-10 were noted to be significantly higher than historical concentrations. Therefore, earlier concentrations were deselected prior to constructing confidence intervals in order to evaluate present-day groundwater concentrations of barium at this well. As mentioned above, list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

During previous screenings, due to no variation in the data, Tukey's outlier test was not performed for cadmium in well SP-5R, mercury in all wells, selenium in well SP-5R, and thallium in all wells. Among upgradient wells, high values for cadmium, lead, and selenium were identified by Tukey's outlier test. Substantially high values were identified for upgradient well SP-4 on 8/4/17 through visual screening. Only the highest values for cadmium and lead were flagged as outliers to maintain statistical limits that are conservative from a regulatory perspective. This step will result in upper tolerance limits that are conservative (lower) from a regulatory perspective

Tukey's outlier test for Appendix B parameters in downgradient wells only identified a high value for combined radium 226 + 228 in well SP-1, which was flagged as an outlier. The following additional values were flagged as outliers as they did not adequately represent the populations at their respective wells: chromium in well SP-10; combined radium 226 + 228 in well SP-11; lithium in well SP-1; and molybdenum in well SP-10.

<u>Tolerance Limits</u>

Parametric tolerance limits were used to calculate background limits from pooled upgradient well data through December 2021 for Appendix B parameters with a target of 95% confidence and 95% coverage to determine background limits. These limits will be updated on an annual basis at the end of each year. The confidence and coverage levels

for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the MCLs and background limits in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure G).

Groundwater Protection Standards

These background limits were compared to the Maximum Contaminant Levels (MCLs) and CCR Rule-Specified levels as shown in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure H).

Confidence Intervals

Confidence intervals were then constructed on downgradient wells with data through December 2021 for each of the Appendix B parameters and then compared to the GWPS, i.e., the highest limit of the MCL, CCR Rule-Specified level, or background limit as discussed above (Figure I). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. Complete graphical results of the confidence intervals follow this letter. Exceedances were identified for the following well/constituent pairs:

- Barium: SP-10
- Fluoride: SP-10
- Lithium: SP-10

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Andrew T. Collins
Project Manager

Kristina L. Rayner
Groundwater Statistician

Date Ranges

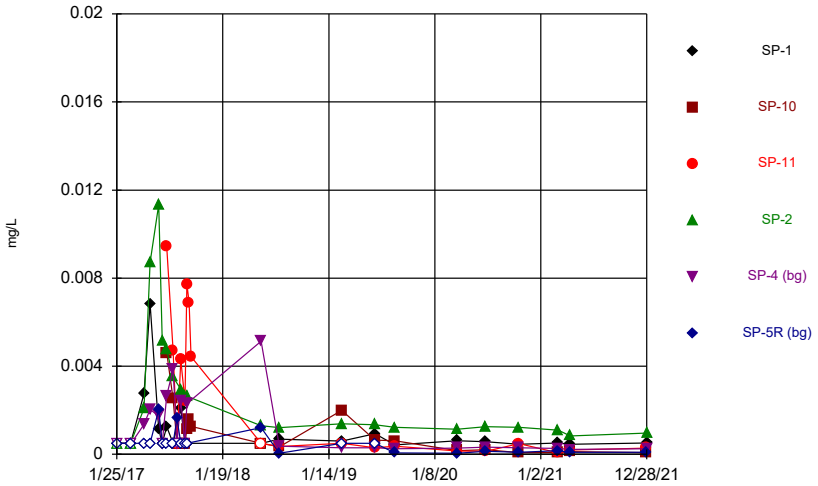
Date: 4/6/2022 2:50 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Barium (mg/L)
    SP-10 overall:5/30/2018-12/27/2021
Calcium (mg/L)
    SP-11 background:10/4/2017-6/30/2020

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

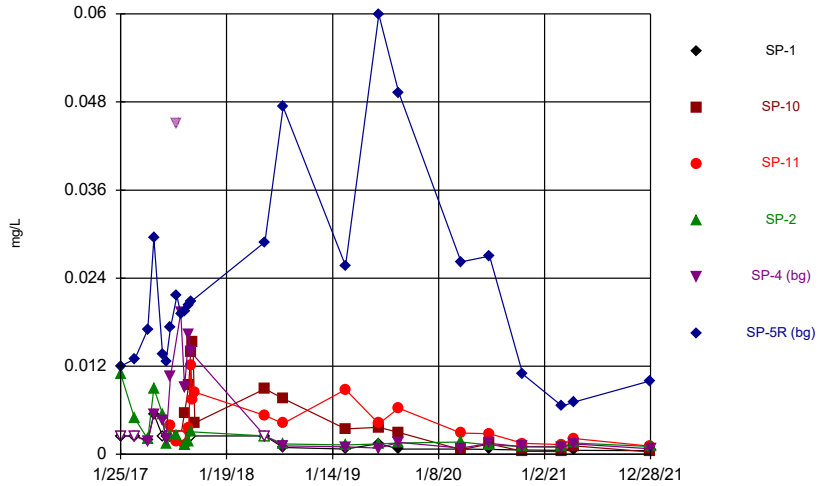
Time Series



Constituent: Antimony Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

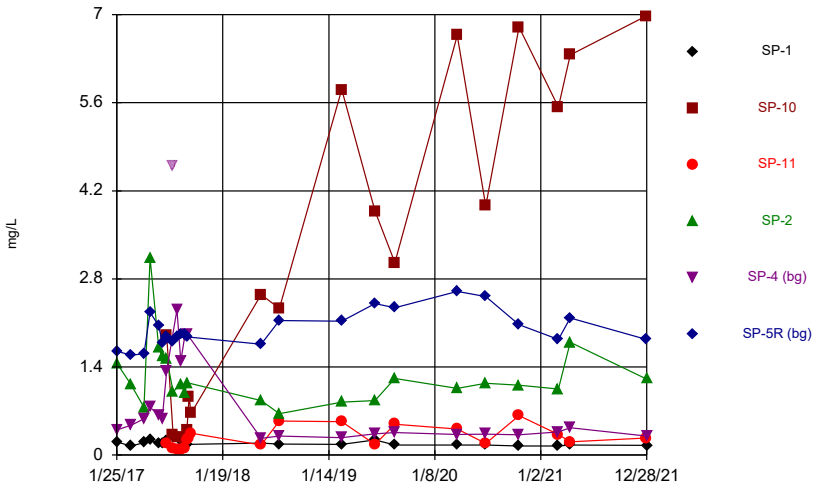
Time Series



Constituent: Arsenic Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

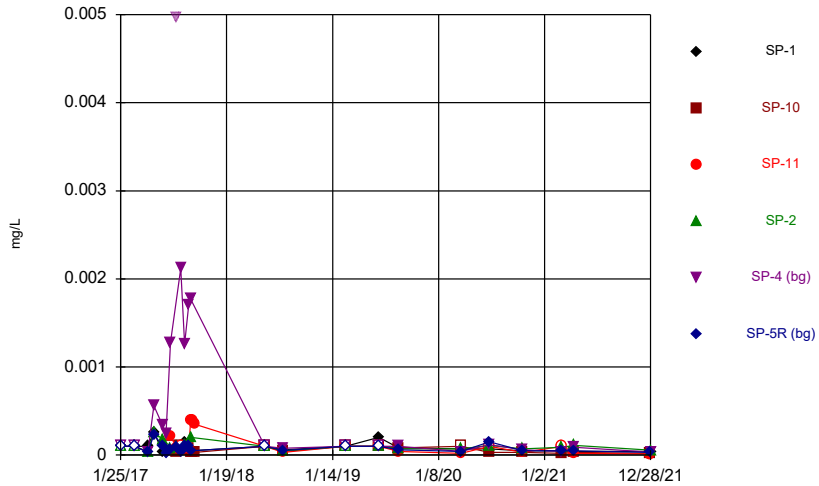
Time Series



Constituent: Barium Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

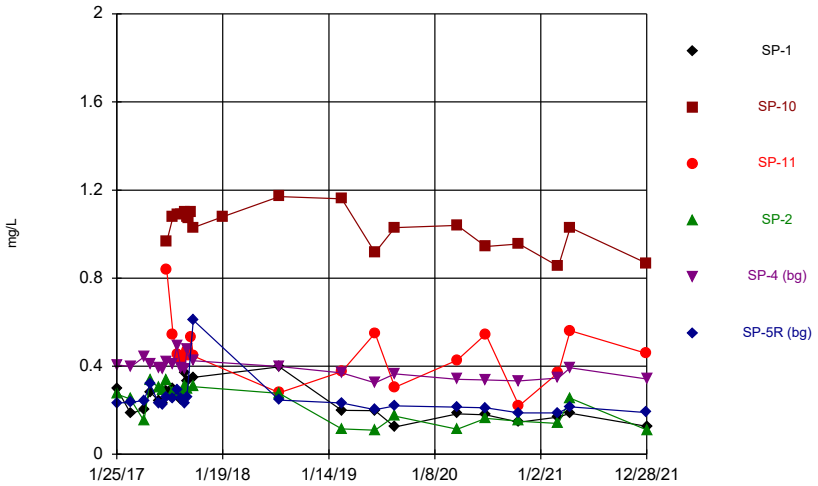
Time Series



Constituent: Beryllium Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Time Series



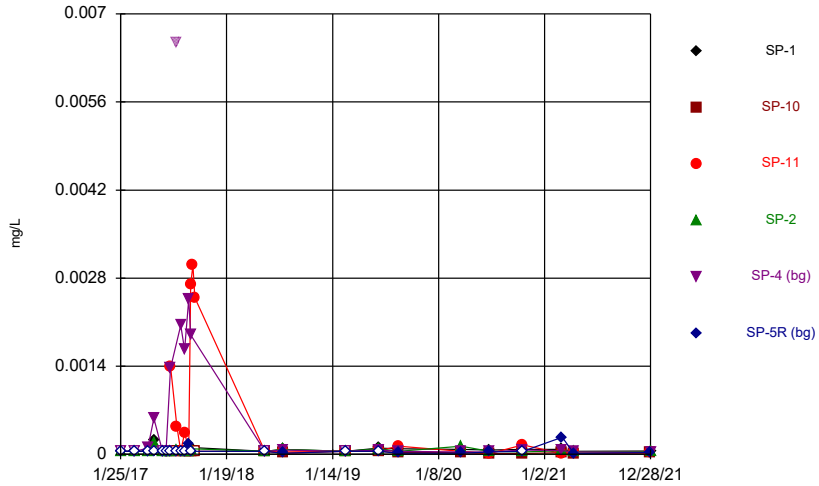
Constituent: Boron Analysis Run 3/22/2022 9:14 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Time Series

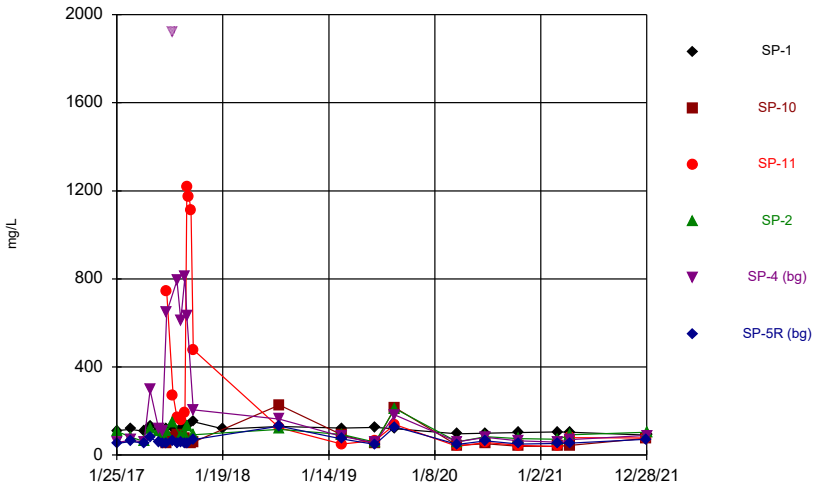


Constituent: Cadmium Analysis Run 3/22/2022 9:14 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Time Series

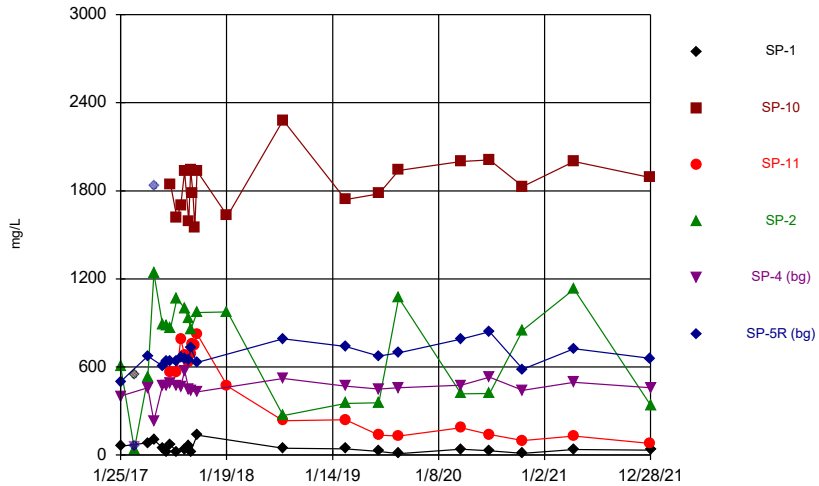


Constituent: Calcium Analysis Run 3/22/2022 9:14 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Time Series

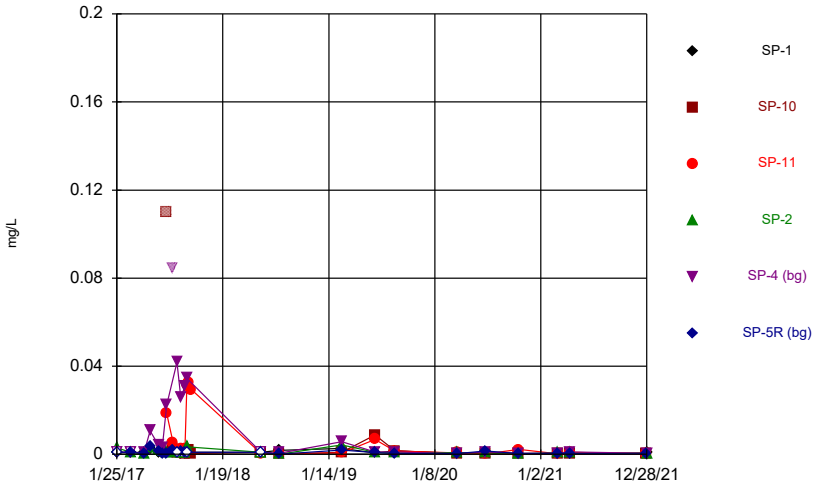


Constituent: Chloride Analysis Run 3/22/2022 9:14 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

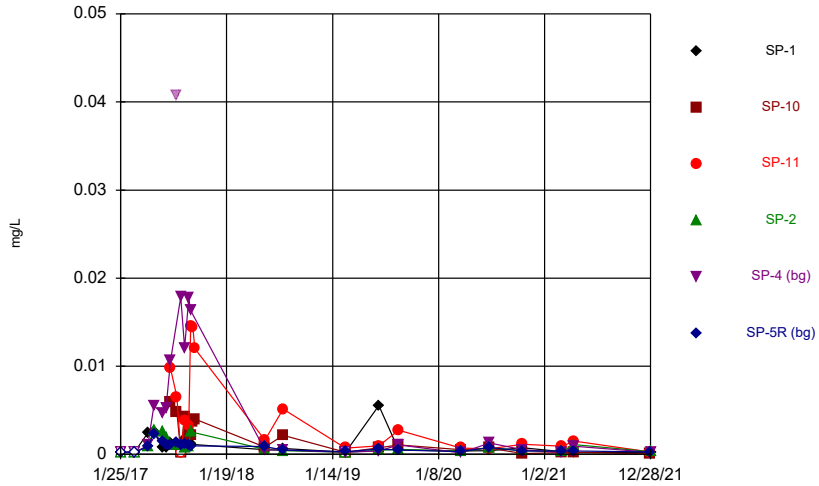
Time Series



Constituent: Chromium Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

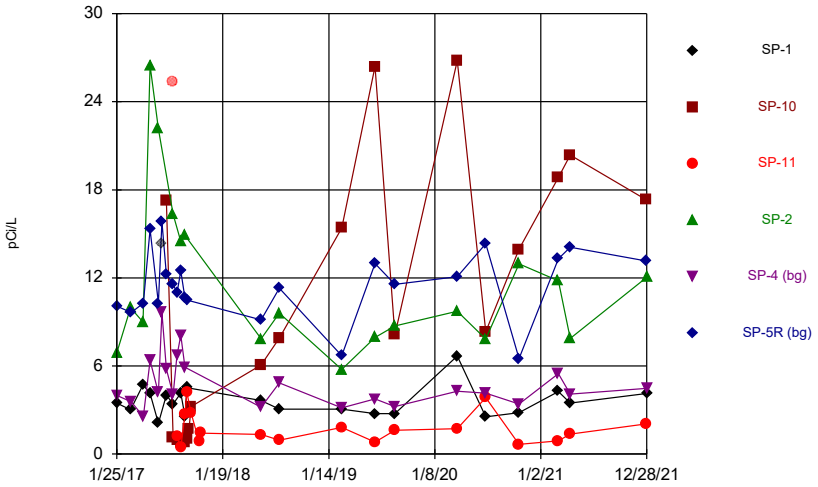
Time Series



Constituent: Cobalt Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

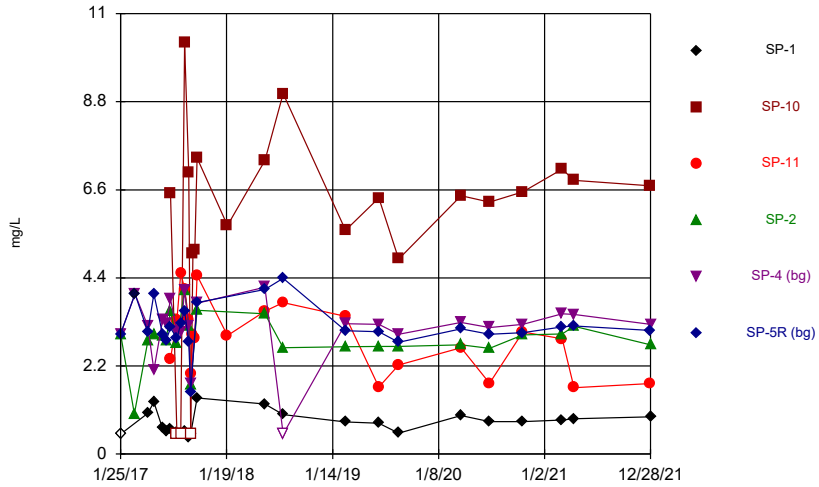
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

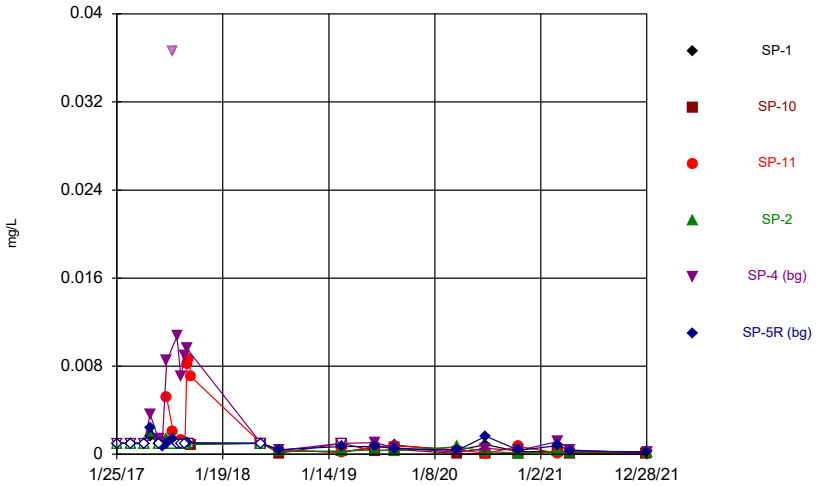
Time Series



Constituent: Fluoride Analysis Run 3/22/2022 9:14 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

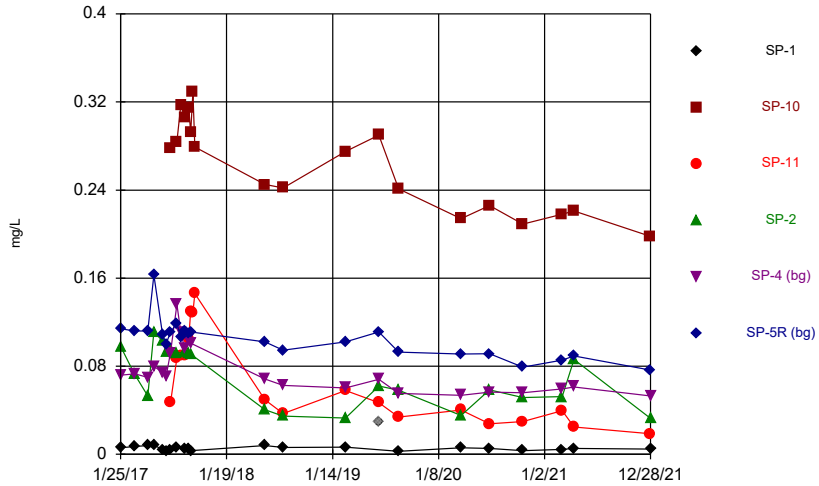
Time Series



Constituent: Lead Analysis Run 3/22/2022 9:15 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

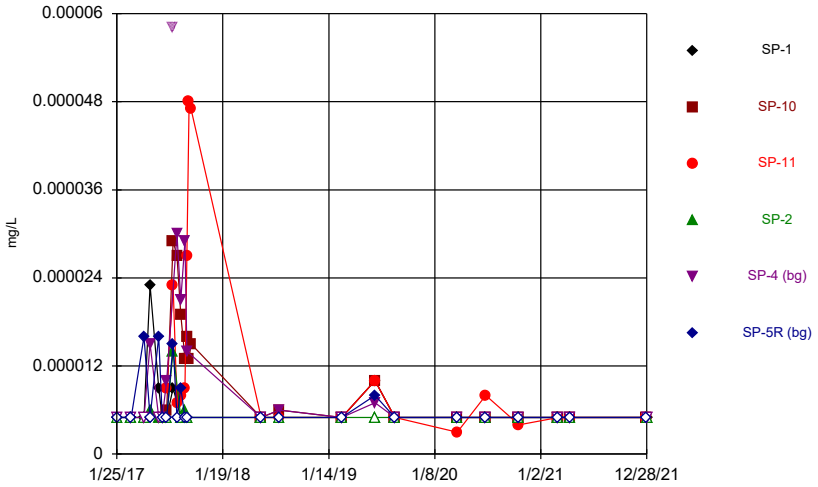
Time Series



Constituent: Lithium Analysis Run 3/22/2022 9:15 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

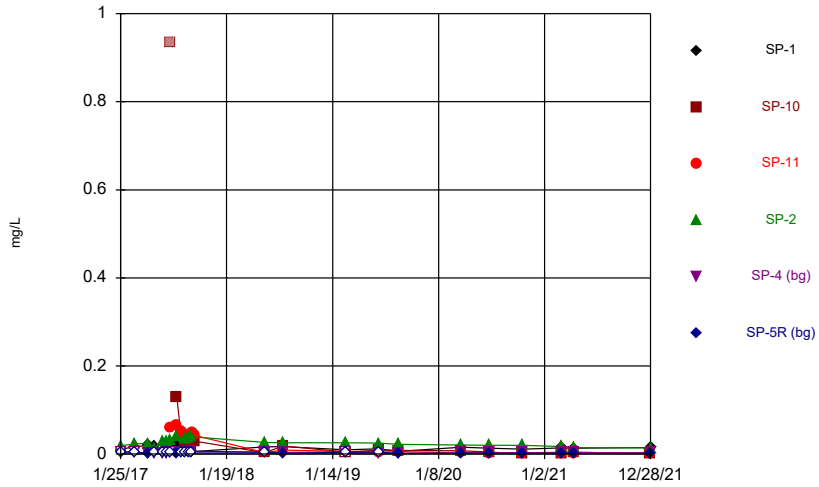
Time Series



Constituent: Mercury Analysis Run 3/22/2022 9:15 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

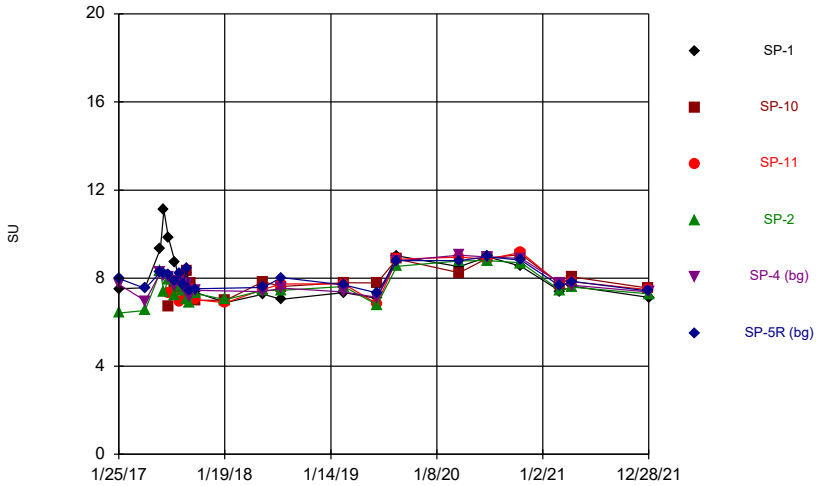
Time Series



Constituent: Molybdenum Analysis Run 3/22/2022 9:15 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Time Series

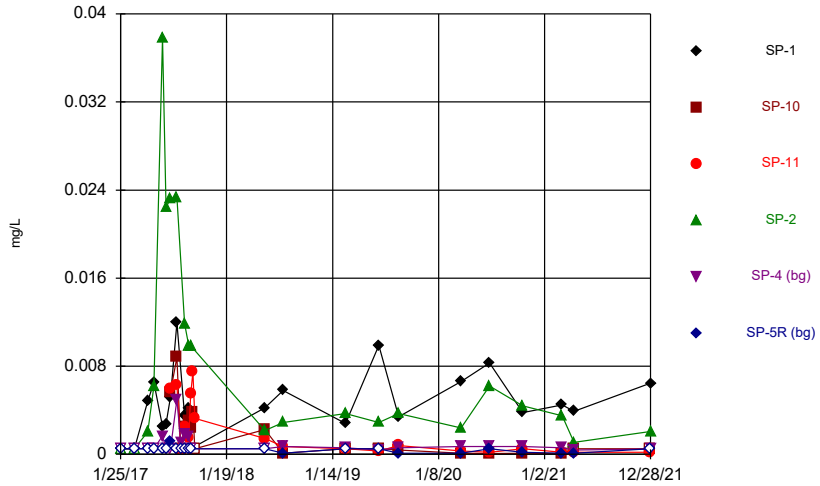


Constituent: pH, field Analysis Run 3/22/2022 9:15 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series

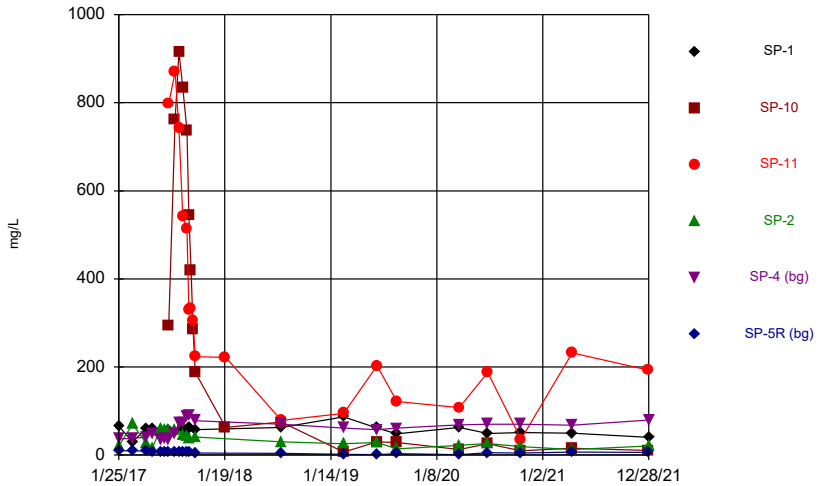


Constituent: Selenium Analysis Run 3/22/2022 9:15 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Time Series

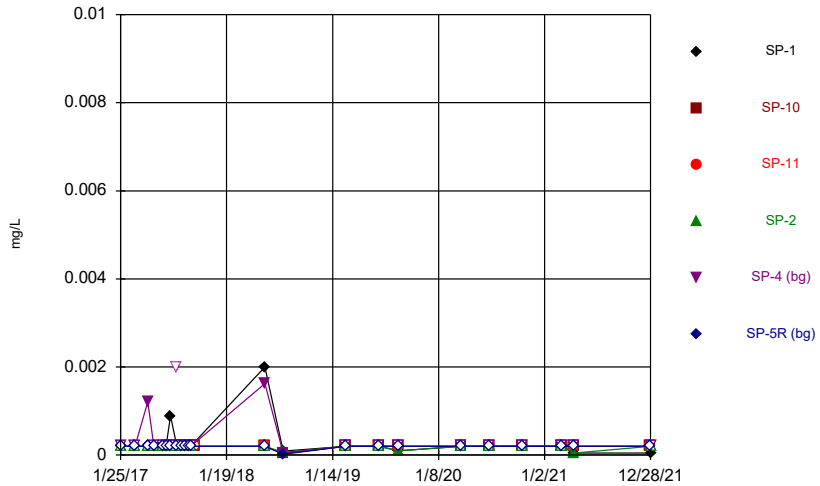


Constituent: Sulfate Analysis Run 3/22/2022 9:15 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

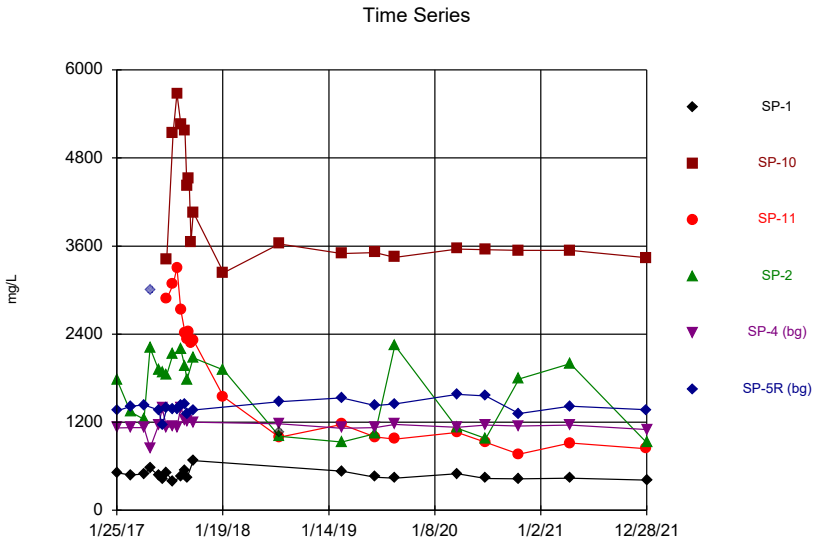
Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Thallium Analysis Run 3/22/2022 9:15 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

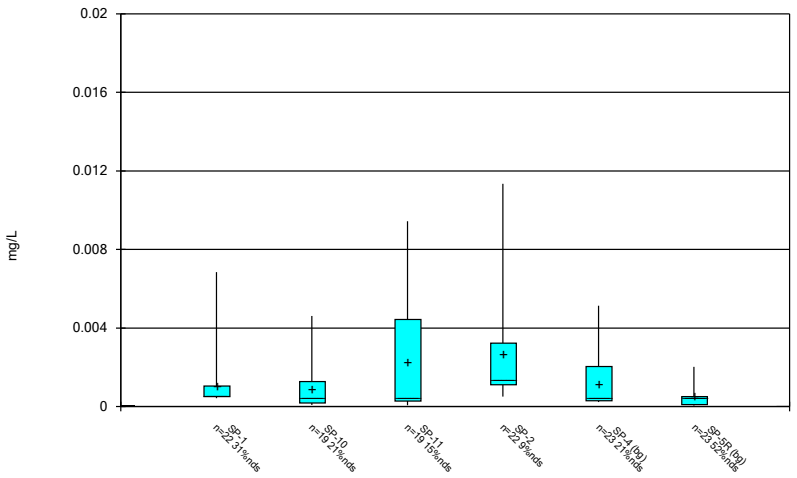


Constituent: Total Dissolved Solids [TDS] Analysis Run 3/22/2022 9:15 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

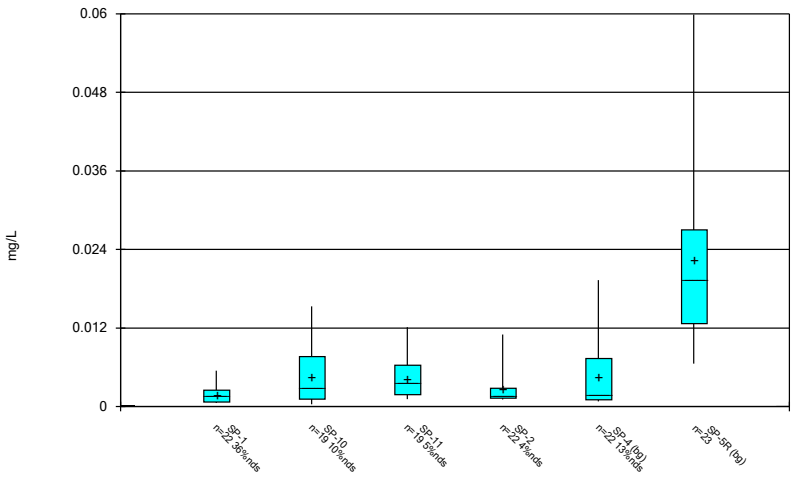
Box & Whiskers Plot



Constituent: Antimony Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

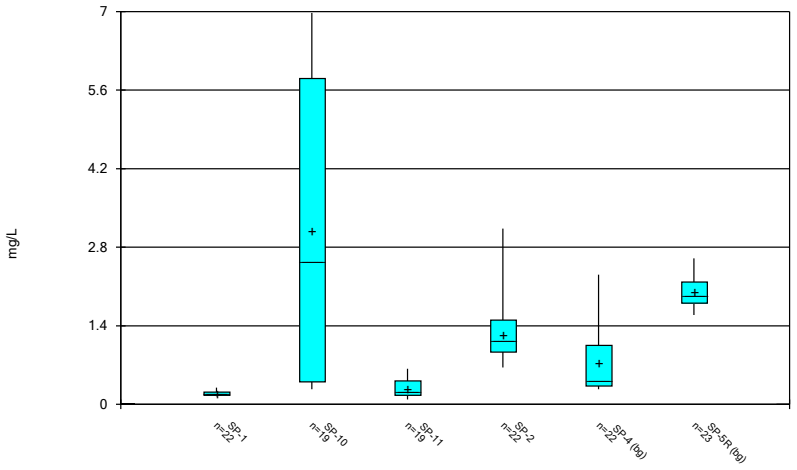
Box & Whiskers Plot



Constituent: Arsenic Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

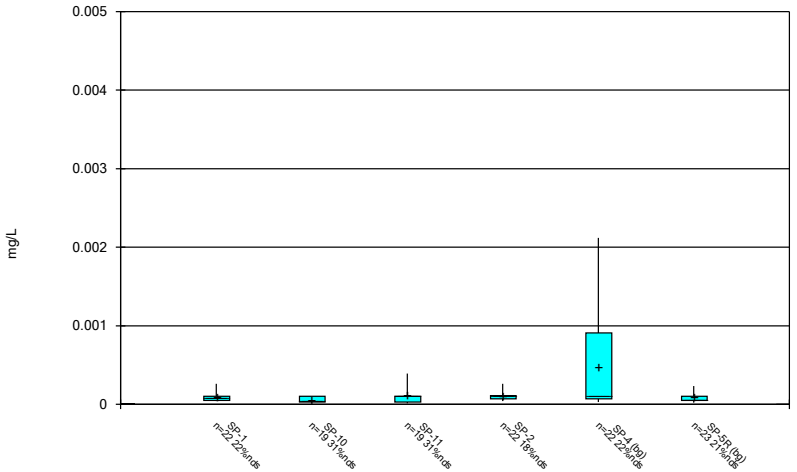
Box & Whiskers Plot



Constituent: Barium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

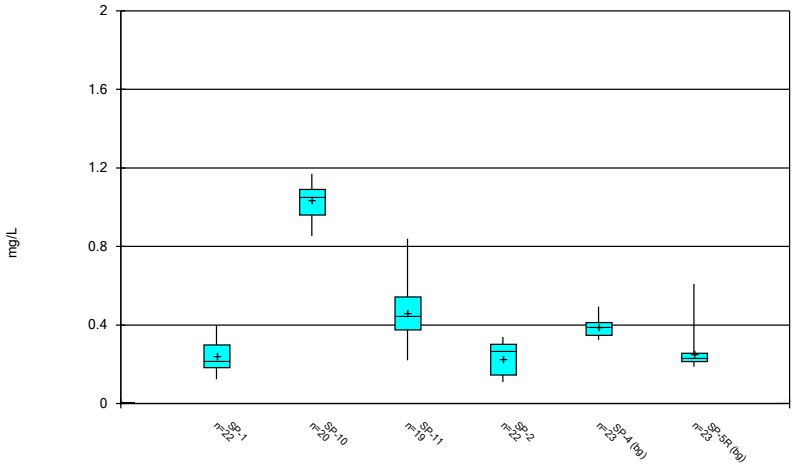
Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Beryllium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

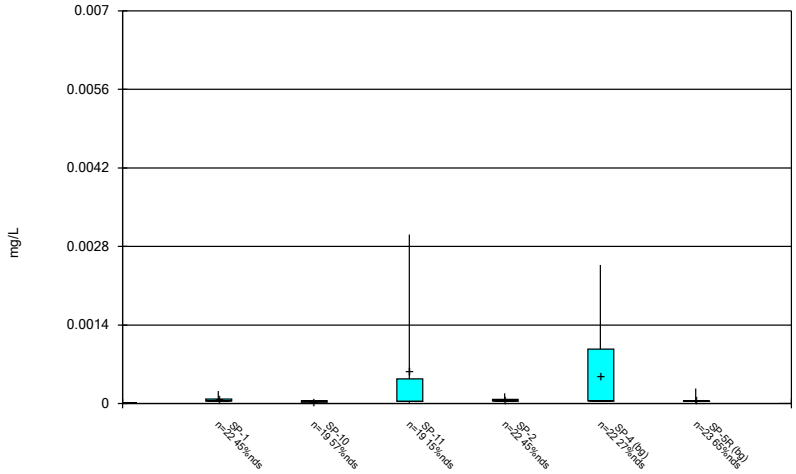
Box & Whiskers Plot



Constituent: Boron Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

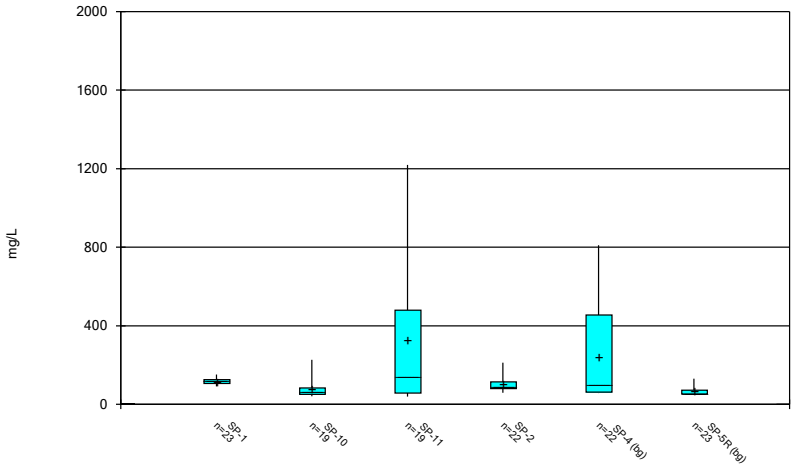
Box & Whiskers Plot



Constituent: Cadmium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

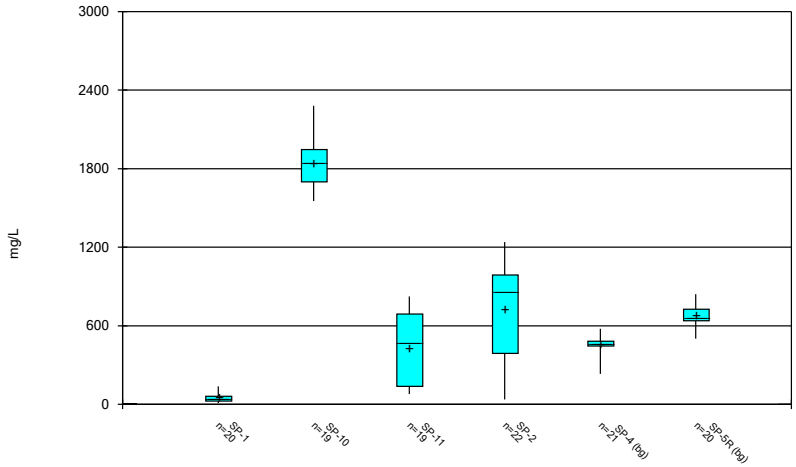
Box & Whiskers Plot



Constituent: Calcium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

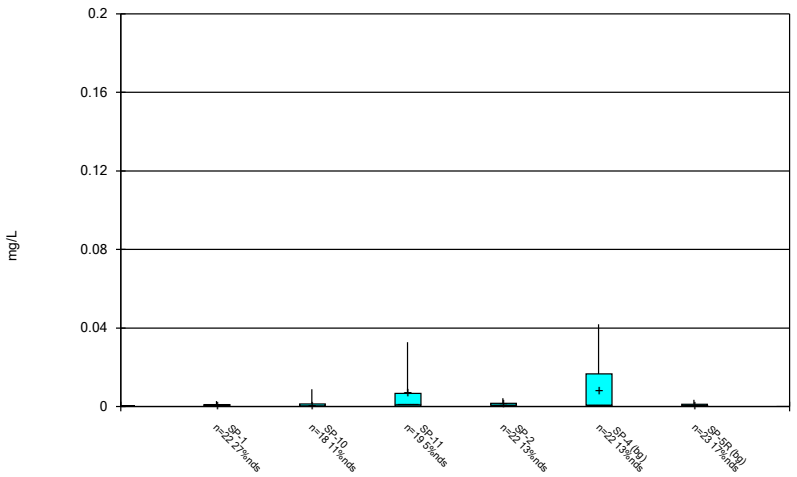
Box & Whiskers Plot



Constituent: Chloride Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

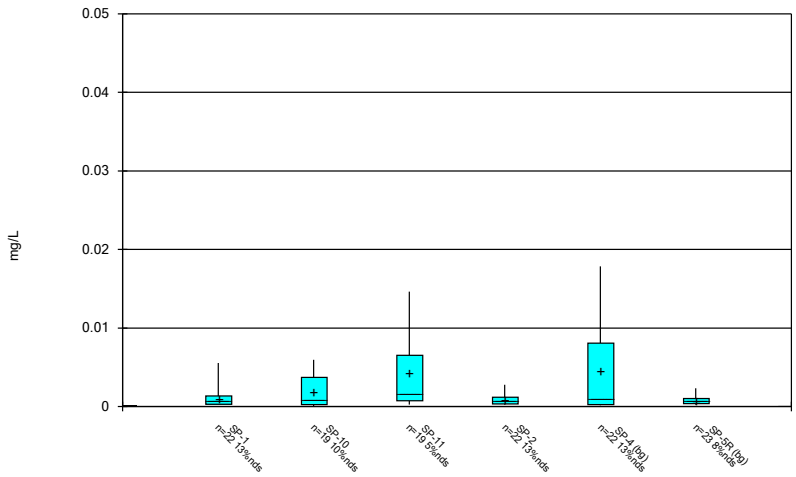
Box & Whiskers Plot



Constituent: Chromium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

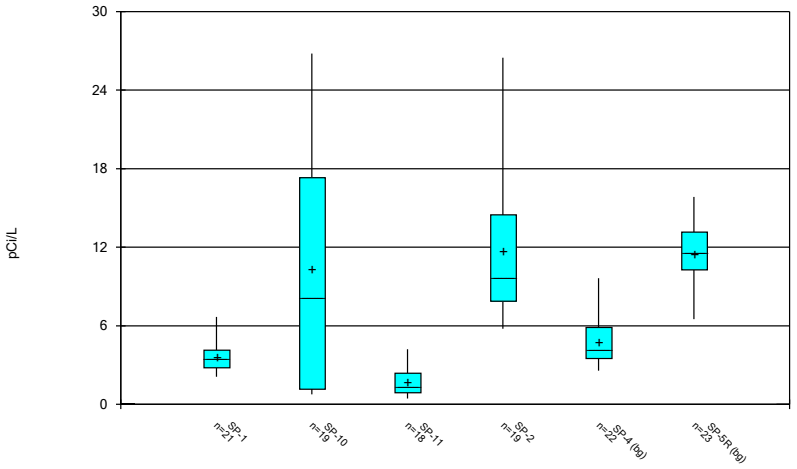
Box & Whiskers Plot



Constituent: Cobalt Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

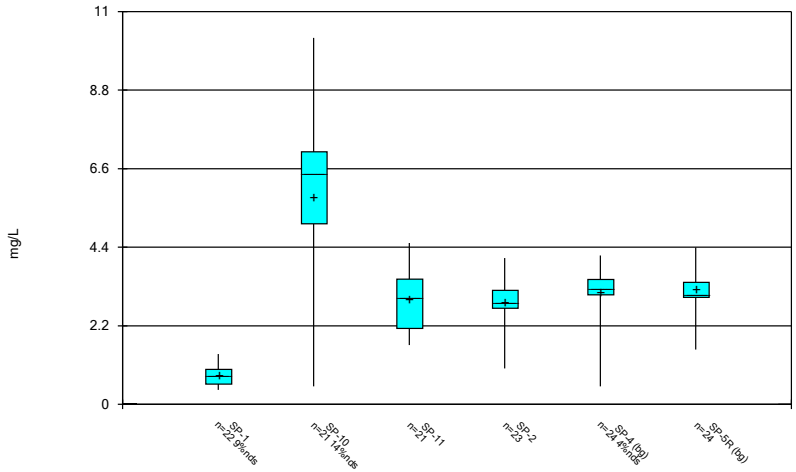
Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

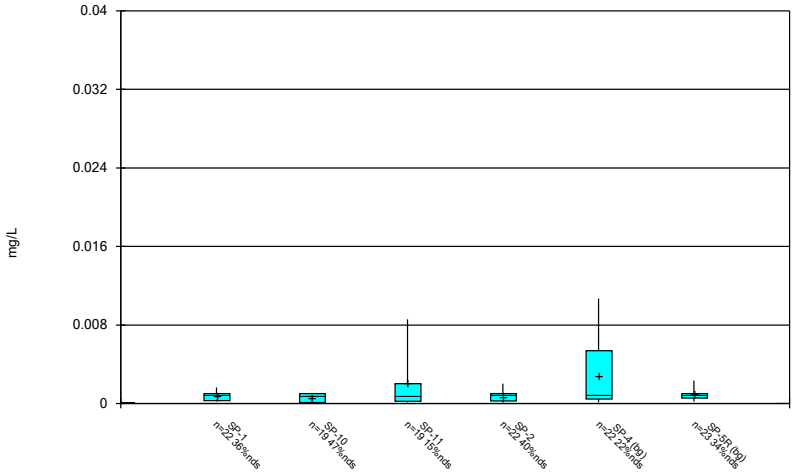
Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Box & Whiskers Plot



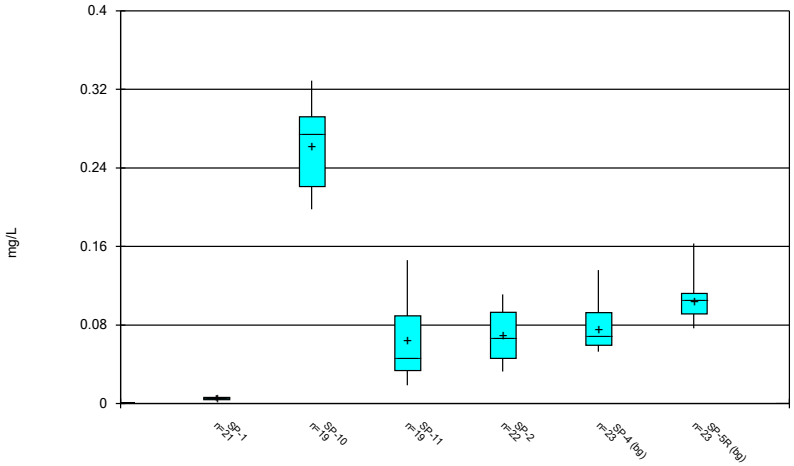
Constituent: Fluoride Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



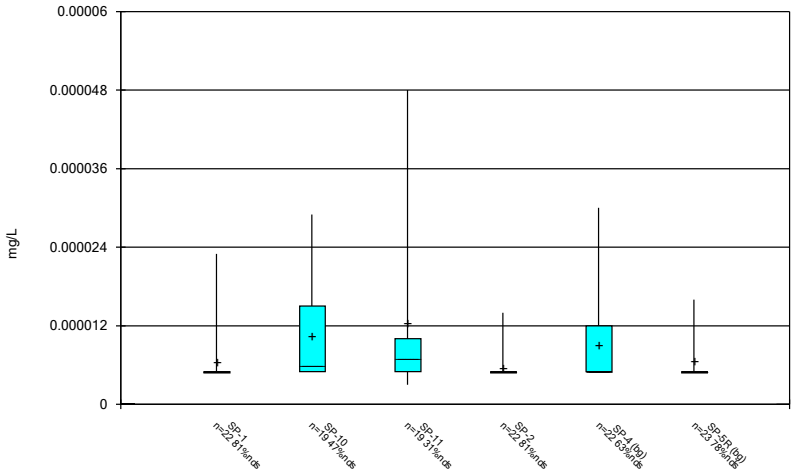
Constituent: Lead Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



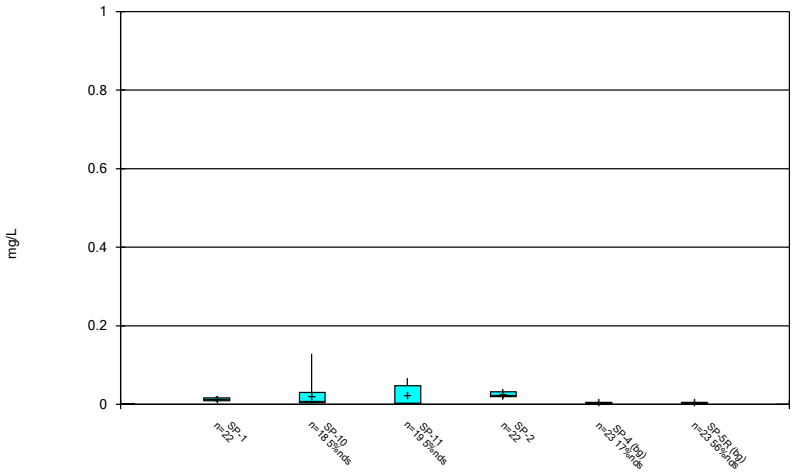
Constituent: Lithium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



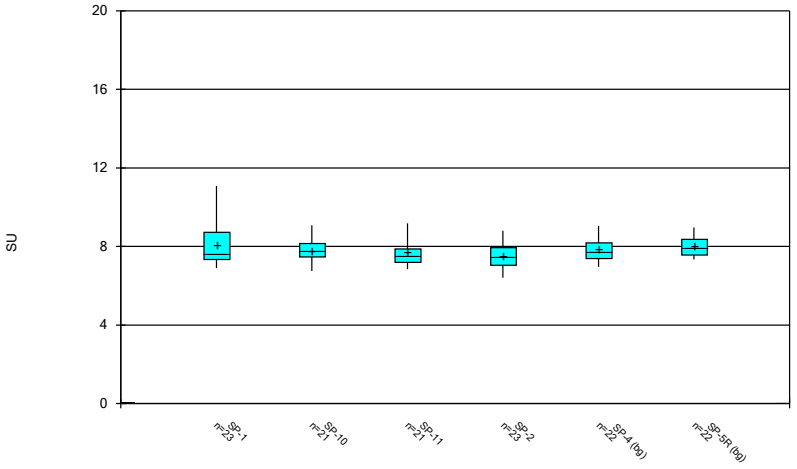
Constituent: Mercury Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Molybdenum Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

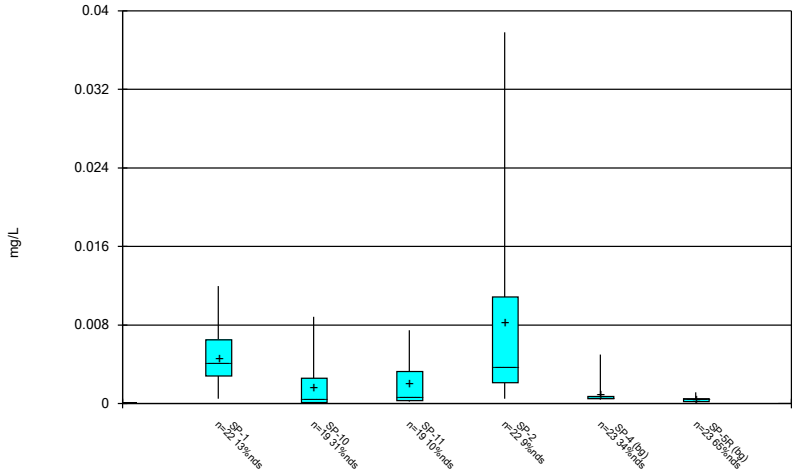
Box & Whiskers Plot



Constituent: pH, field Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

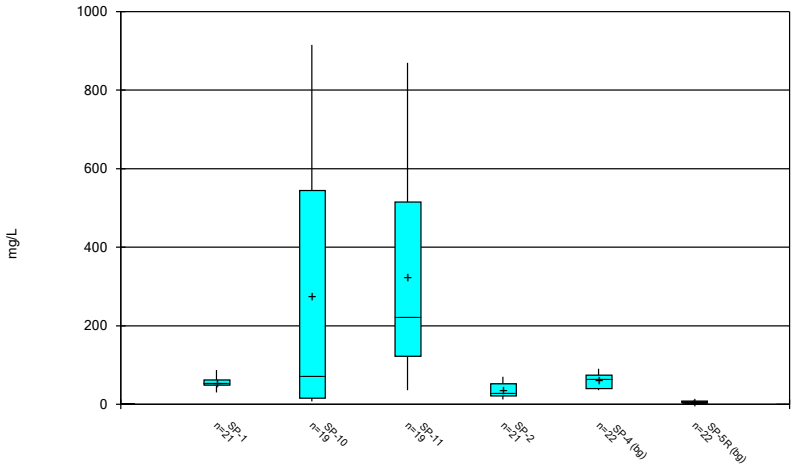
Box & Whiskers Plot



Constituent: Selenium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

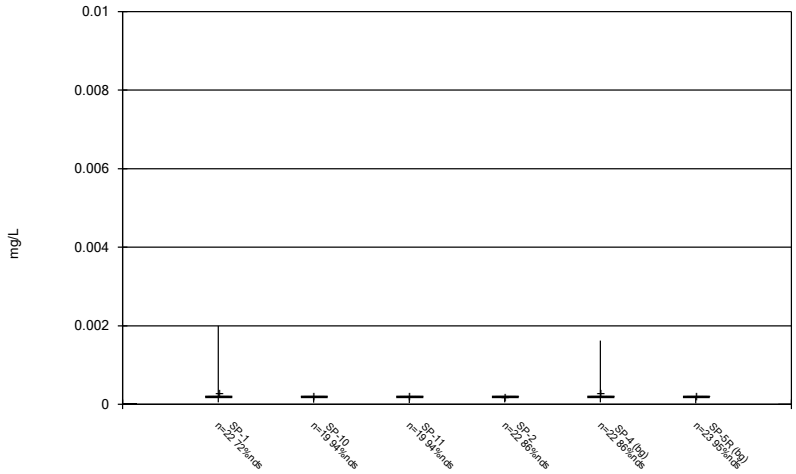
Box & Whiskers Plot



Constituent: Sulfate Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

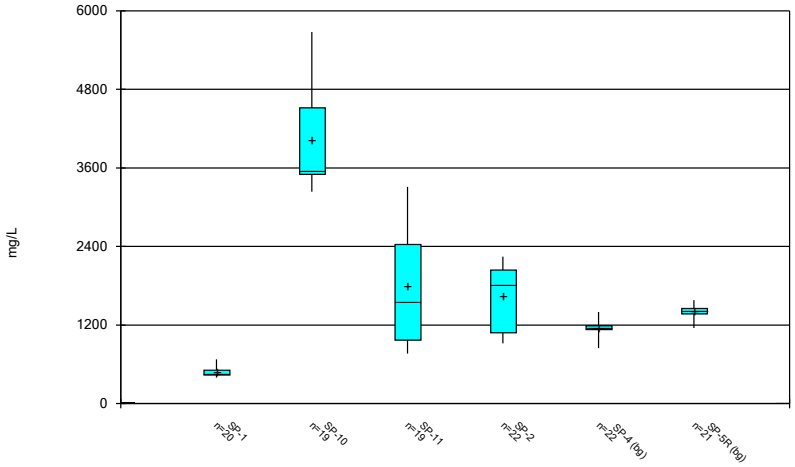
Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium Analysis Run 3/22/2022 10:21 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 3/22/2022 10:21 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 10:17 AM

	SP-4 Arsenic (mg/L)	SP-4 Barium (mg/L)	SP-4 Beryllium (mg/L)	SP-4 Cadmium (mg/L)	SP-4 Calcium (mg/L)	SP-1 Chloride (mg/L)	SP-4 Chloride (mg/L)	SP-5R Chloride (mg/L)	SP-10 Chromium (mg/L)	SP-4 Chromium (mg/L)
3/13/2017						548 (o)				
3/15/2017							52 (o)	62 (o)		
5/18/2017								1834 (o)		
6/27/2017										
7/13/2017									0.11 (o)	
8/4/2017	0.04498 (o)	4.59 (o)	0.00497 (o)	0.00655 (o)	1920 (o)					0.08415 (o)
7/30/2018										
6/20/2019										

	SP-4 Cobalt (mg/L)	SP-1 Combined Radium 226 + 228 (pCi/L)	SP-11 Combined Radium 226 + 228 (pCi/L)	SP-1 Fluoride (mg/L)	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)	SP-10 Molybdenum (mg/L)	SP-4 Thallium (mg/L)	SP-1 Total Dissolved Solids [TDS] (mg/L)
3/13/2017				4 (o)						
3/15/2017										
5/18/2017										
6/27/2017		14.29 (o)								
7/13/2017								0.934 (o)		
8/4/2017	0.04069 (o)		25.367 (o)		0.03663 (o)		5.8E-05 (o)		<0.002 (o)	
7/30/2018										1060 (o)
6/20/2019						0.03 (J,o)				

	SP-5R Total Dissolved Solids [TDS] (mg/L)
3/13/2017	
3/15/2017	
5/18/2017	3008 (o)
6/27/2017	
7/13/2017	
8/4/2017	
7/30/2018	
6/20/2019	

Tukey's Outlier Test - Upgradient Wells - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 9:28 AM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Cadmium (mg/L)	**SP-4,SP-5R**	**Yes**	**0.00057,0.00137,0.00655,0.00205,0.00166,0.00247,0**	**NP**	**NaN**	**46**	**0.0004079**	**0.001099**	**ln(x)**	**ShapiroWilk**
Chloride (mg/L)	**SP-4,SP-5R**	**Yes**	**52,62,1834**	**NP**	**NaN**	**44**	**570.8**	**255.2**	**sqrt(x)**	**ShapiroWilk**
Lead (mg/L)	**SP-4,SP-5R**	**Yes**	**0.03663**	**NP**	**NaN**	**46**	**0.002561**	**0.005767**	**ln(x)**	**ShapiroWilk**
Mercury (mg/L)	**SP-4,SP-5R**	**Yes**	**0.000058**	**NP**	**NaN**	**46**	**0.000009**	**0.000009555**	**ln(x)**	**ShapiroWilk**
Selenium (mg/L)	**SP-4,SP-5R**	**Yes**	**0.00167,0.00499,0.00104,0.00186,0.00165,0.00114,0**	**NP**	**NaN**	**46**	**0.0006724**	**0.0007474**	**ln(x)**	**ShapiroWilk**
Total Dissolved Solids [TDS] (mg/L)	**SP-4,SP-5R**	**Yes**	**3008**	**NP**	**NaN**	**44**	**1321**	**303.9**	**ln(x)**	**ShapiroWilk**

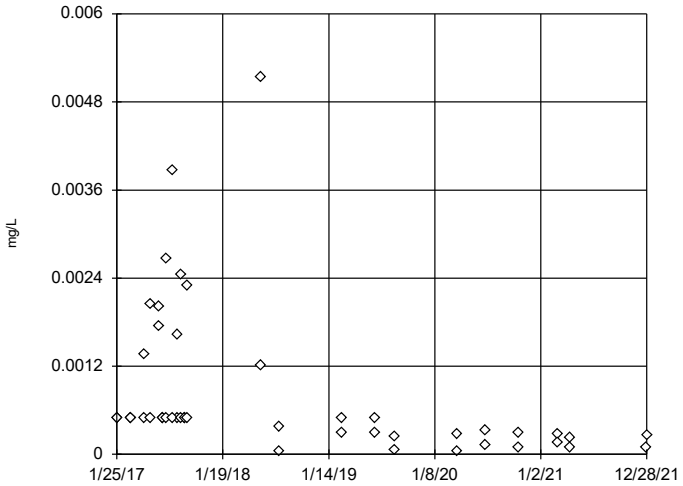
Tukey's Outlier Test - Upgradient Wells - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 9:28 AM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.0008372	0.001053	ln(x)	ShapiroWilk
Arsenic (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.01439	0.01435	x^(1/3)	ShapiroWilk
Barium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	1.451	0.9238	normal	ShapiroWilk
Beryllium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.0004601	0.0008422	ln(x)	ShapiroWilk
Boron (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.3208	0.09752	x^(1/3)	ShapiroWilk
Cadmium (mg/L)	**SP-4,SP-5R**	**Yes**	**0.00057,0.00137,0.00655,0.00205,0.00166,0.00247,0**	**NP**	**NaN**	**46**	**0.0004079**	**0.001099**	**ln(x)**	**ShapiroWilk**
Chloride (mg/L)	**SP-4,SP-5R**	**Yes**	**52,62,1834**	**NP**	**NaN**	**44**	**570.8**	**255.2**	**sqrt(x)**	**ShapiroWilk**
Chromium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.006397	0.01526	ln(x)	ShapiroWilk
Cobalt (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.003395	0.007285	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	SP-4,SP-5R	No	n/a	NP	NaN	45	8.221	3.982	sqrt(x)	ShapiroWilk
Fluoride (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	48	3.181	0.6783	x^2	ShapiroWilk
Lead (mg/L)	**SP-4,SP-5R**	**Yes**	**0.03663**	**NP**	**NaN**	**46**	**0.002561**	**0.005767**	**ln(x)**	**ShapiroWilk**
Lithium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.08976	0.02426	sqrt(x)	ShapiroWilk
Mercury (mg/L)	**SP-4,SP-5R**	**Yes**	**0.000058**	**NP**	**NaN**	**46**	**0.000009**	**0.000009555**	**ln(x)**	**ShapiroWilk**
Molybdenum (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	46	0.005271	0.003926	ln(x)	ShapiroWilk
pH, field (SU)	SP-4,SP-5R	No	n/a	NP	NaN	44	7.925	0.5593	ln(x)	ShapiroWilk
Selenium (mg/L)	**SP-4,SP-5R**	**Yes**	**0.00167,0.00499,0.00104,0.00186,0.00165,0.00114,0**	**NP**	**NaN**	**46**	**0.0006724**	**0.0007474**	**ln(x)**	**ShapiroWilk**
Sulfate (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	44	33.36	30.41	ln(x)	ShapiroWilk
Thallium (mg/L)	SP-4,SP-5R	n/a	n/a	NP	NaN	46	0.0002457	0.000258	unknown	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	**SP-4,SP-5R**	**Yes**	**3008**	**NP**	**NaN**	**44**	**1321**	**303.9**	**ln(x)**	**ShapiroWilk**

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

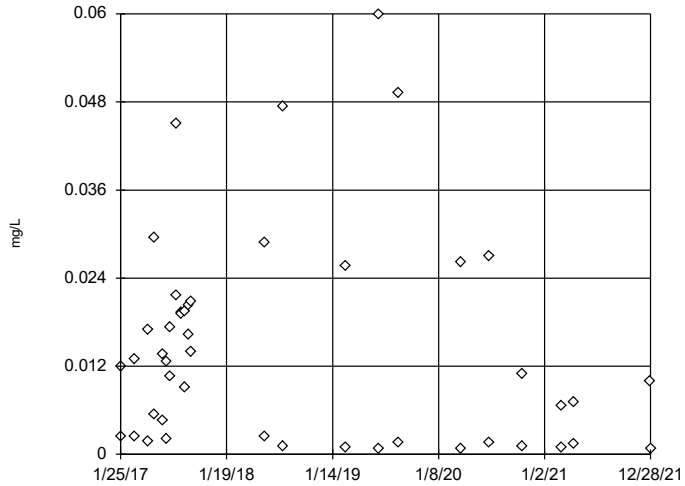
High cutoff = 0.01968, low cutoff = 0.00001047, based on IQR multiplier of 3.

Constituent: Antimony Analysis Run 3/22/2022 9:27 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

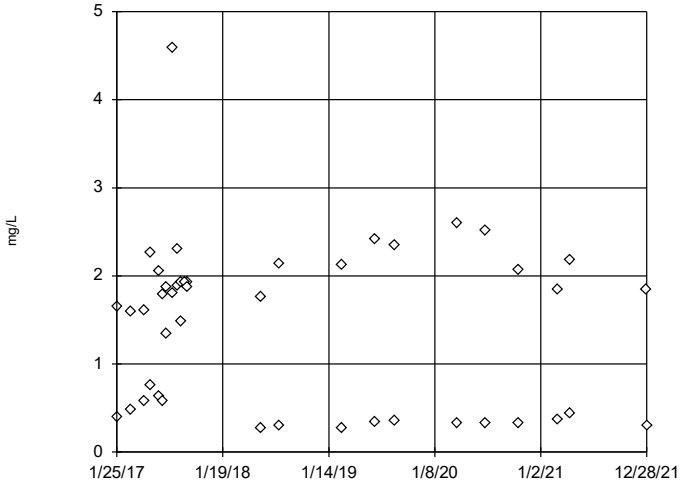
High cutoff = 0.384, low cutoff = -0.0359, based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 3/22/2022 9:27 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

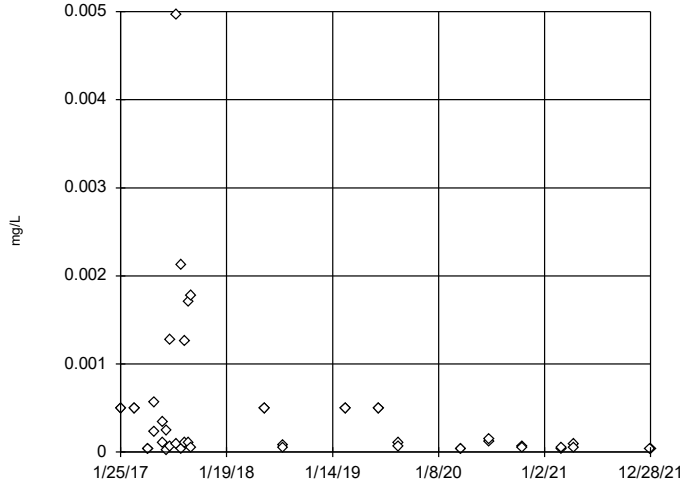
High cutoff = 6.991, low cutoff = -4.514, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 3/22/2022 9:27 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found. Tukey's method selected by user.

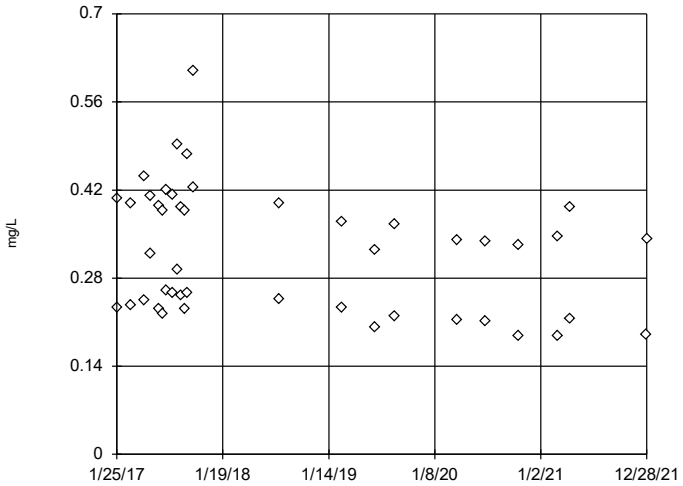
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.5, low cutoff = 5.0e-8, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 3/22/2022 9:27 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found.
Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

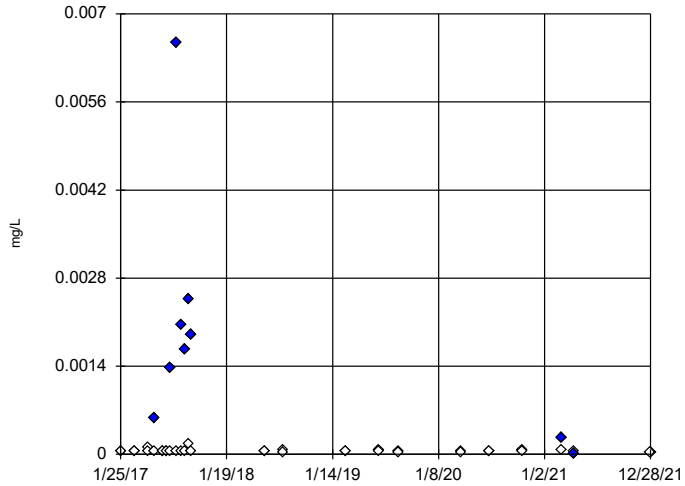
High cutoff = 1.313, low cutoff = 0.01653, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

Outliers are drawn as solid.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

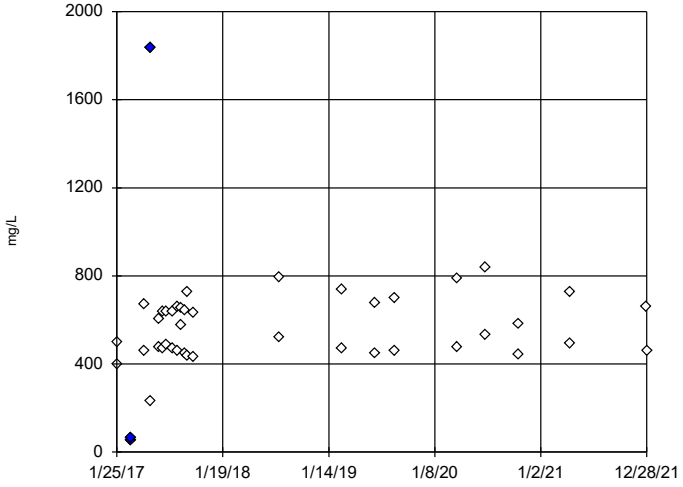
High cutoff = 0.0001921, low cutoff = 0.00001822, based on IQR multiplier of 3.

Constituent: Cadmium Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 44

Outliers are drawn as solid.
Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

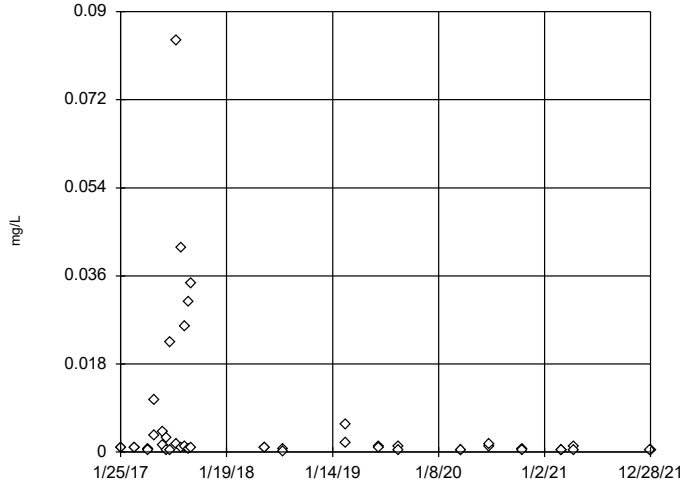
High cutoff = 1487, low cutoff = 73.1, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found.
Tukey's method selected by user.

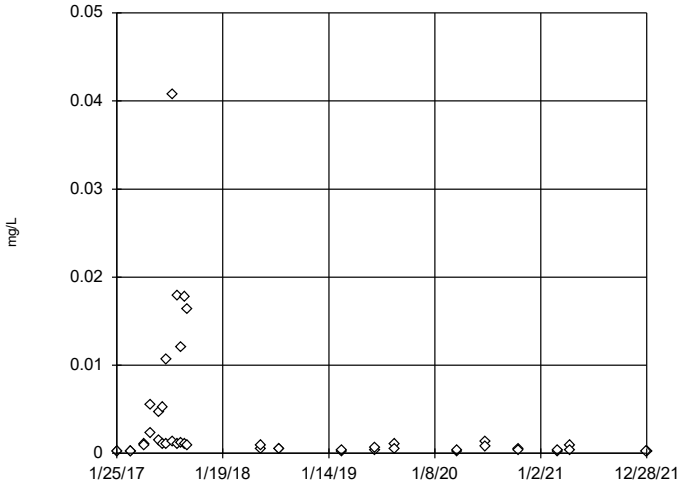
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3156, low cutoff = 0.000003735, based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found. Tukey's method selected by user.

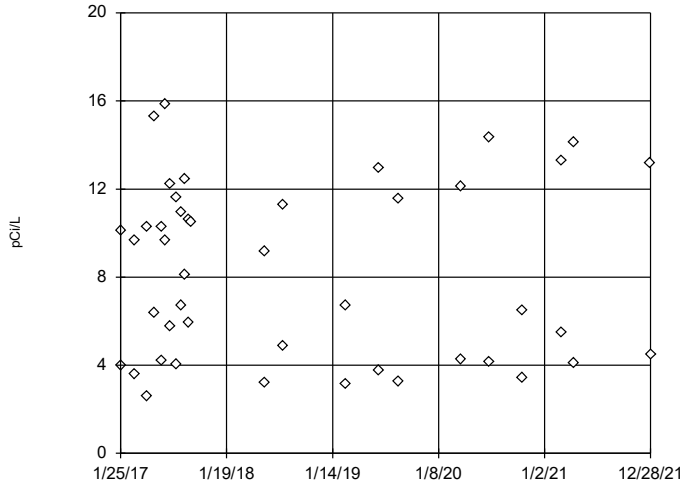
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.09461, low cutoff = 0.000004907, based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 45

No outliers found. Tukey's method selected by user.

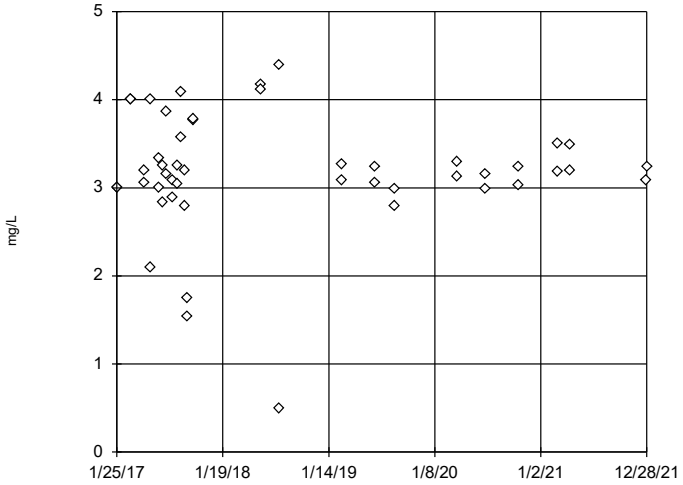
Data were square root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 56.03, low cutoff = -4.164, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 48

No outliers found. Tukey's method selected by user.

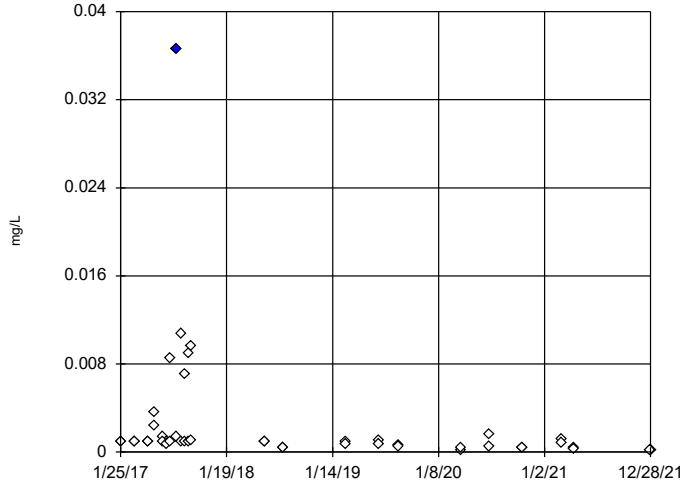
Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 4.675, low cutoff = -0.8032, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

Outlier is drawn as solid. Tukey's method selected by user.

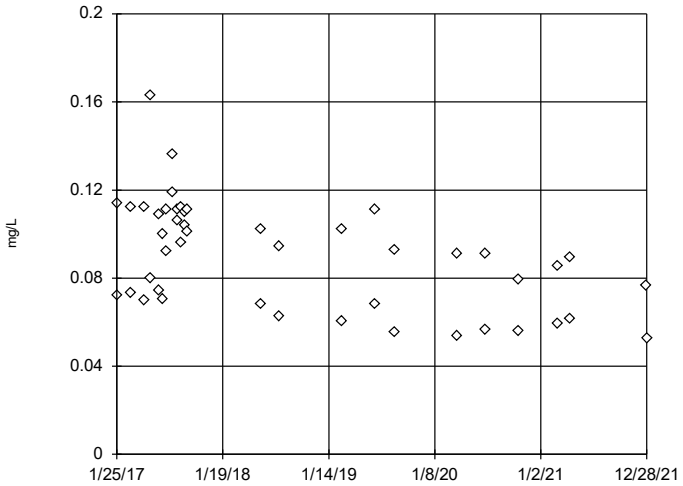
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.01718, low cutoff = 0.00003978, based on IQR multiplier of 3.

Constituent: Lead Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found. Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

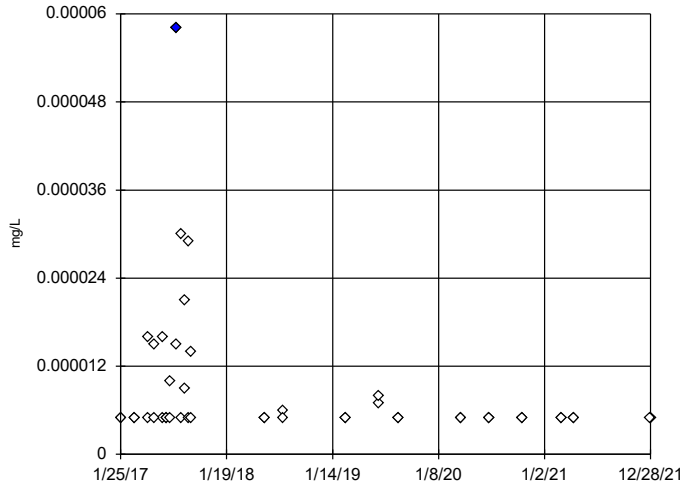
High cutoff = 0.2927, low cutoff = 0.002952, based on IQR multiplier of 3.

Constituent: Lithium Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

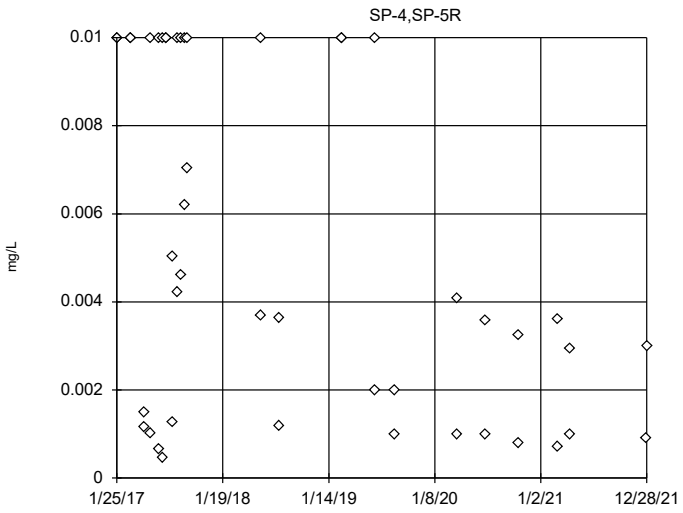
High cutoff = 0.00004147, low cutoff = 0.000001023, based on IQR multiplier of 3.

Constituent: Mercury Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

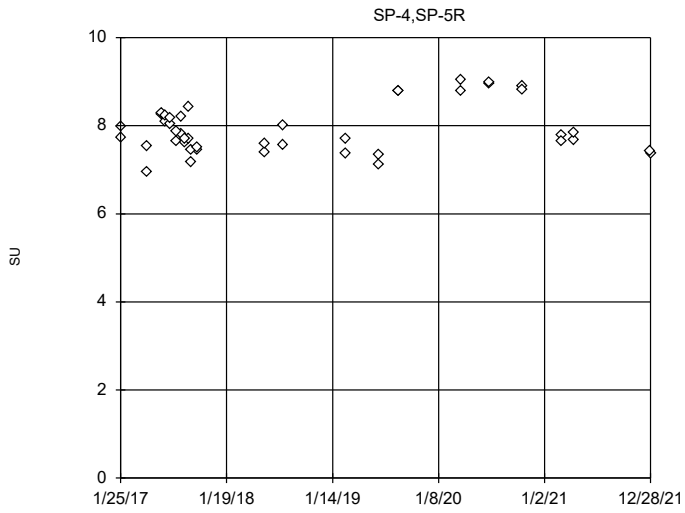
High cutoff = 6.325, low cutoff = 0.000001842, based on IQR multiplier of 3.

Constituent: Molybdenum Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 44

No outliers found. Tukey's method selected by user.

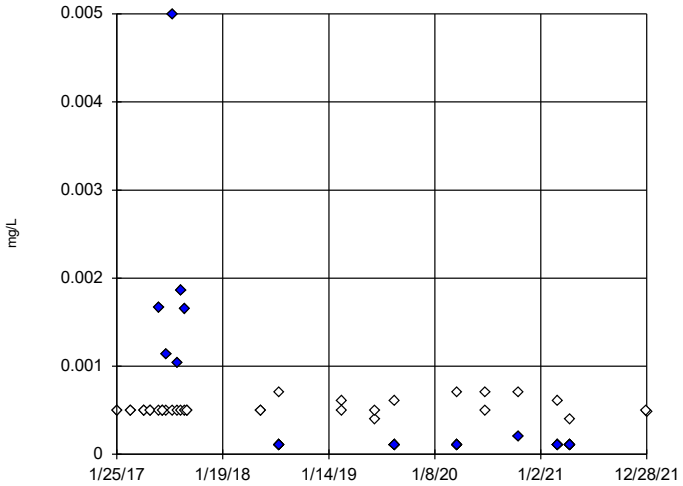
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 10.77, low cutoff = 5.757, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

Outliers are drawn as solid.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

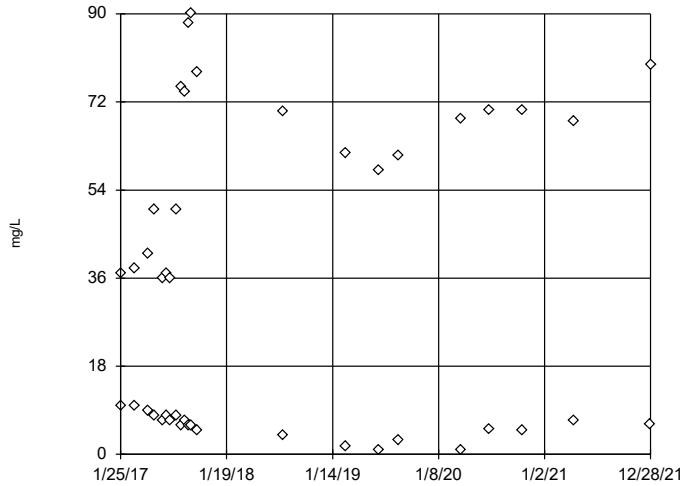
High cutoff = 0.001037, low cutoff = 0.0002894, based on IQR multiplier of 3.

Constituent: Selenium Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 44

No outliers found.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

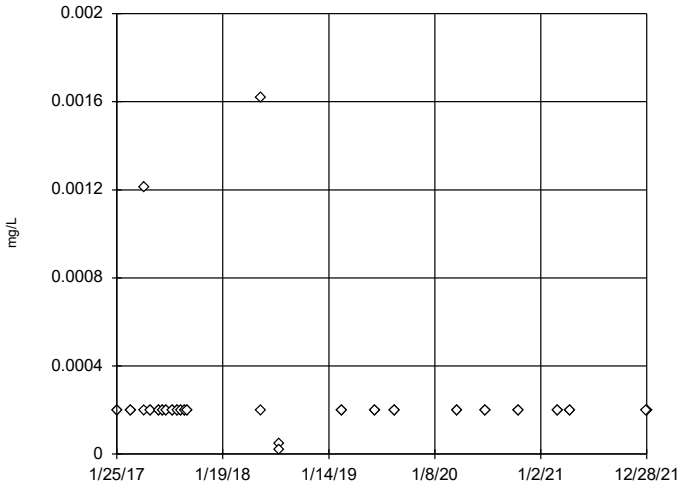
High cutoff = 79218, low cutoff = 0.004942, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 46

No outliers found.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

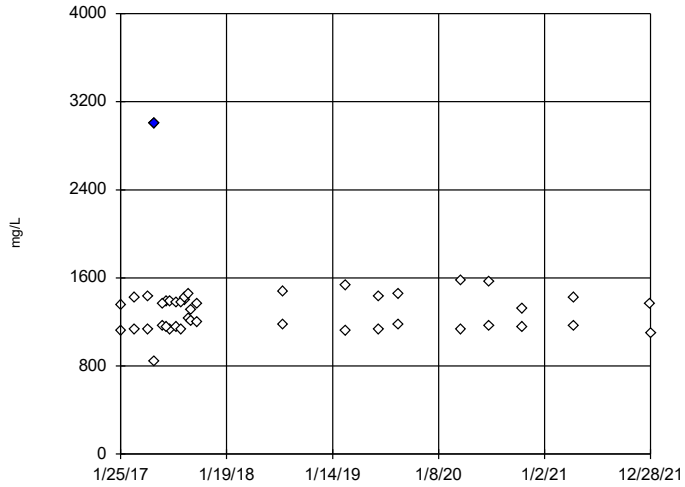
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Thallium Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 44

Outlier is drawn as solid.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2673, low cutoff = 610.8, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 3/22/2022 9:28 AM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

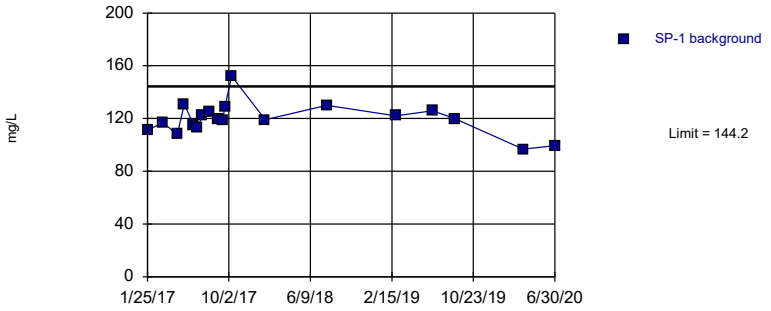
Intrawell Prediction Limits - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 10:28 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium (mg/L)	SP-1	144.2	n/a	n/a	1 future	n/a	19	119.7	12.18	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-10	227	n/a	n/a	1 future	n/a	15	n/a	n/a	0	n/a	n/a	0.007533	NP Intra (normality) 1 of 2
Calcium (mg/L)	SP-11	1458	n/a	n/a	1 future	n/a	8	13.4	9.475	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-2	175.8	n/a	n/a	1 future	n/a	18	103.2	35.71	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-4	1333	n/a	n/a	1 future	n/a	18	5.155	1.004	0	None	ln(x)	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-5R	131	n/a	n/a	1 future	n/a	19	n/a	n/a	0	n/a	n/a	0.004832	NP Intra (normality) 1 of 2

Prediction Limit

Intrawell Parametric, SP-1



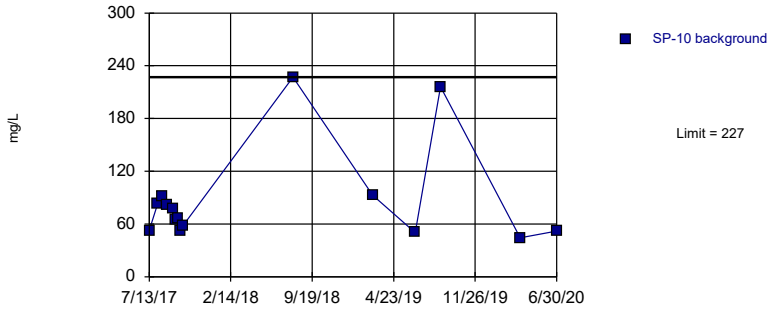
Background Data Summary: Mean=119.7, Std. Dev.=12.18, n=19. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9445, critical = 0.863. Kappa = 2.01 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/22/2022 10:23 AM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, SP-10



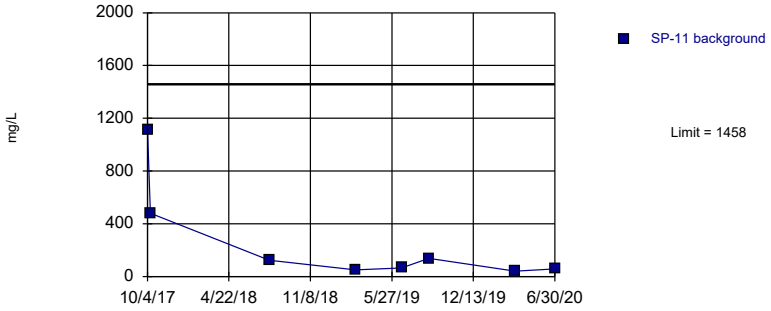
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 15 background values. Well-constituent pair annual alpha = 0.01501. Individual comparison alpha = 0.007533 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 3/22/2022 10:23 AM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, SP-11



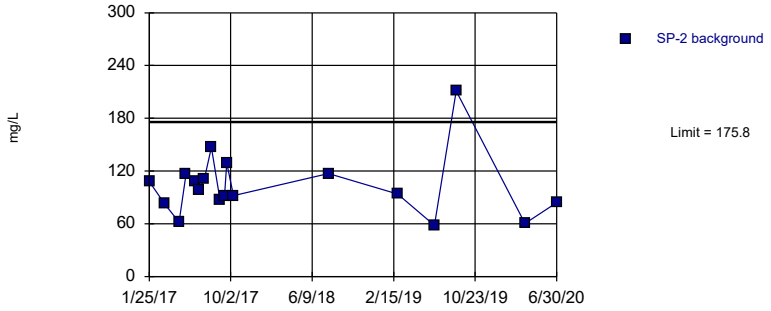
Background Data Summary (based on square root transformation): Mean=13.4, Std. Dev.=9.475, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7642, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/22/2022 10:23 AM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, SP-2

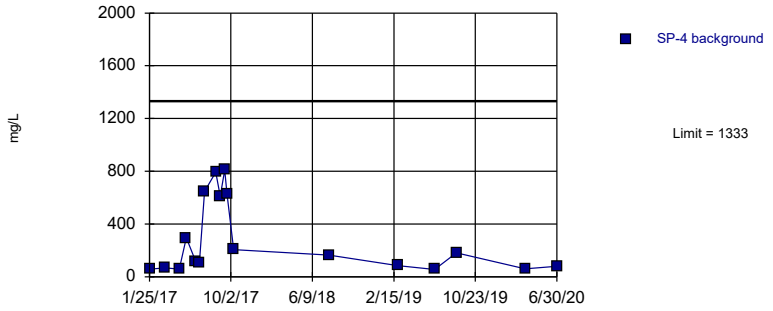


Background Data Summary: Mean=103.2, Std. Dev.=35.71, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8694, critical = 0.858. Kappa = 2.032 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/22/2022 10:23 AM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Intrawell Parametric, SP-4 (bg)



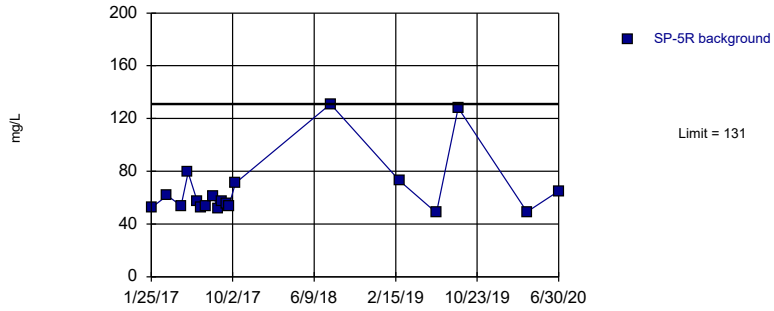
Background Data Summary (based on natural log transformation): Mean=5.155, Std. Dev.=1.004, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8679, critical = 0.858. Kappa = 2.032 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/22/2022 10:23 AM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, SP-5R (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 19 background values. Well-constituent pair annual alpha = 0.009641. Individual comparison alpha = 0.004832 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 3/22/2022 10:23 AM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Trend Tests - Upgradient Wells - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 10:32 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.0175**	**-116**	**-98**	**Yes**	**23**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.01209**	**-113**	**-98**	**Yes**	**23**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	**SP-4 (bg)**	**8.43**	**94**	**92**	**Yes**	**22**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	**SP-5R (bg)**	**-2.295**	**-139**	**-92**	**Yes**	**22**	**0**	**n/a**	**n/a**	**0.01**	**NP**

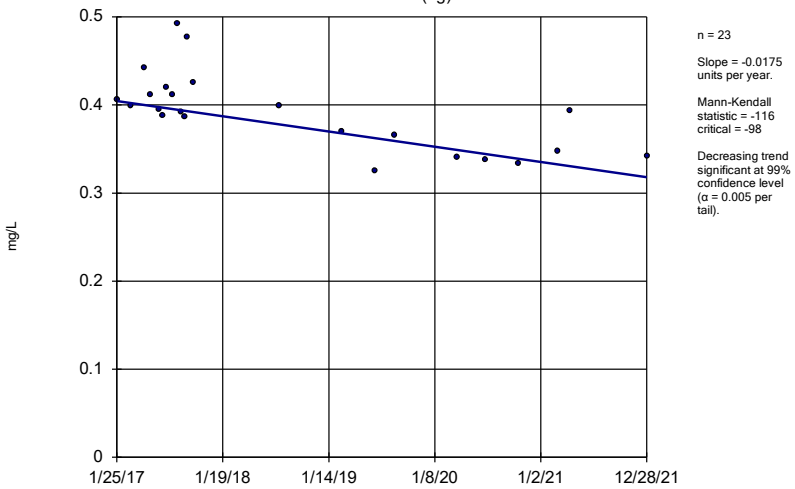
Trend Tests - Upgradient Wells - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 10:32 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.0175**	**-116**	**-98**	**Yes**	**23**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.01209**	**-113**	**-98**	**Yes**	**23**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride (mg/L)	SP-4 (bg)	4.709	26	87	No	21	0	n/a	n/a	0.01	NP
Chloride (mg/L)	SP-5R (bg)	28.43	74	81	No	20	0	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-4 (bg)	0.01409	13	105	No	24	4.167	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-5R (bg)	0	1	105	No	24	0	n/a	n/a	0.01	NP
pH, field (SU)	SP-4 (bg)	-0.009493	-6	-92	No	22	0	n/a	n/a	0.01	NP
pH, field (SU)	SP-5R (bg)	-0.00271	-2	-92	No	22	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	**SP-4 (bg)**	**8.43**	**94**	**92**	**Yes**	**22**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	**SP-5R (bg)**	**-2.295**	**-139**	**-92**	**Yes**	**22**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Total Dissolved Solids [TDS] (mg/L)	SP-4 (bg)	0.66	9	92	No	22	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-5R (bg)	30.08	52	87	No	21	0	n/a	n/a	0.01	NP

Sen's Slope Estimator

SP-4 (bg)



n = 23

Slope = -0.0175 units per year.

Mann-Kendall statistic = -116 critical = -98

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

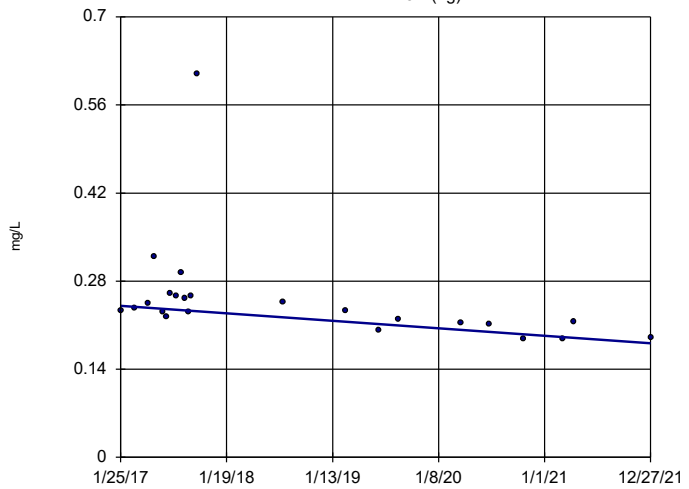
Constituent: Boron Analysis Run 3/22/2022 10:29 AM View: Interwell

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 23

Slope = -0.01209 units per year.

Mann-Kendall statistic = -113 critical = -98

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

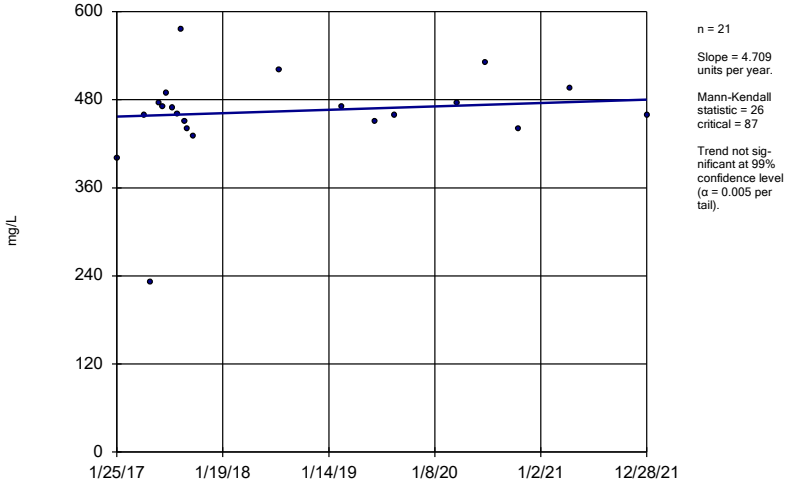
Constituent: Boron Analysis Run 3/22/2022 10:29 AM View: Interwell

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-4 (bg)



n = 21

Slope = 4.709 units per year.

Mann-Kendall statistic = 26 critical = 87

Trend not significant at 99% confidence level (α = 0.005 per tail).

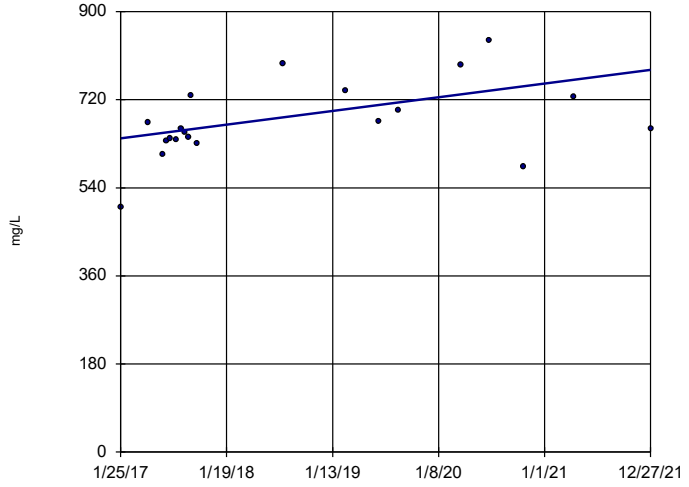
Constituent: Chloride Analysis Run 3/22/2022 10:29 AM View: Interwell

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 20

Slope = 28.43 units per year.

Mann-Kendall statistic = 74 critical = 81

Trend not significant at 99% confidence level (α = 0.005 per tail).

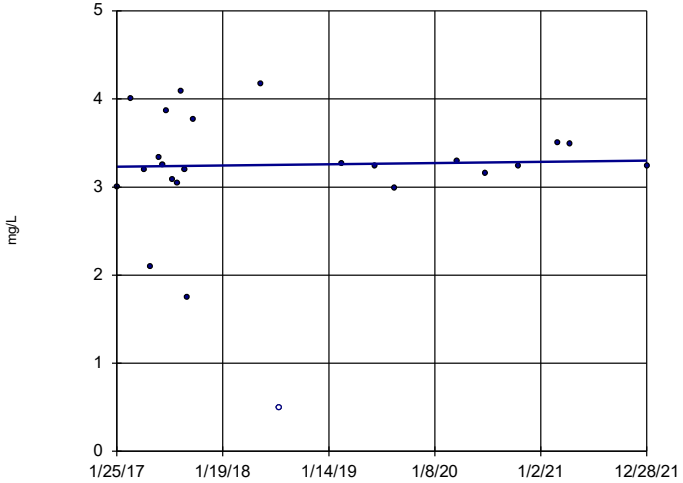
Constituent: Chloride Analysis Run 3/22/2022 10:29 AM View: Interwell

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 24

Slope = 0.01409 units per year.

Mann-Kendall statistic = 13
critical = 105

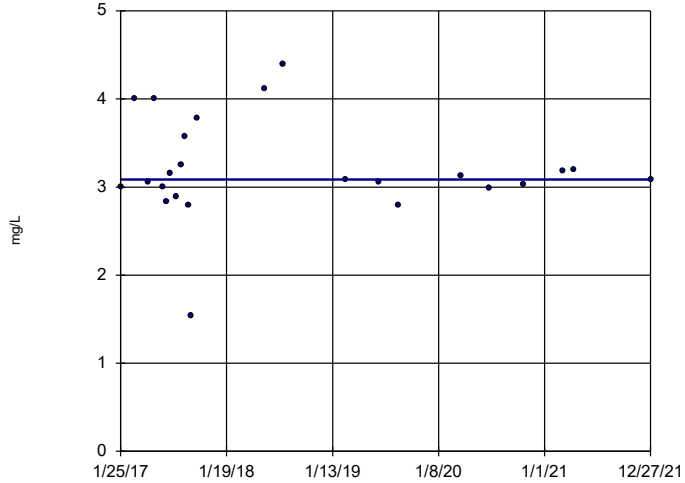
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 3/22/2022 10:29 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 24

Slope = 0 units per year.

Mann-Kendall statistic = 1
critical = 105

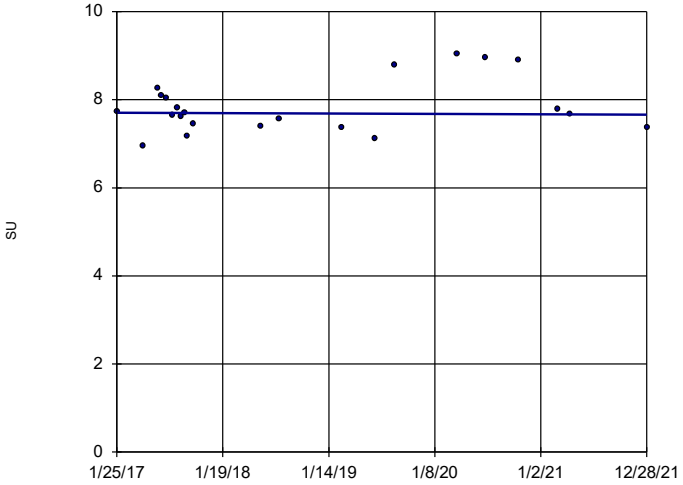
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 3/22/2022 10:29 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-4 (bg)



n = 22

Slope = -0.009493 units per year.

Mann-Kendall statistic = -6
critical = -92

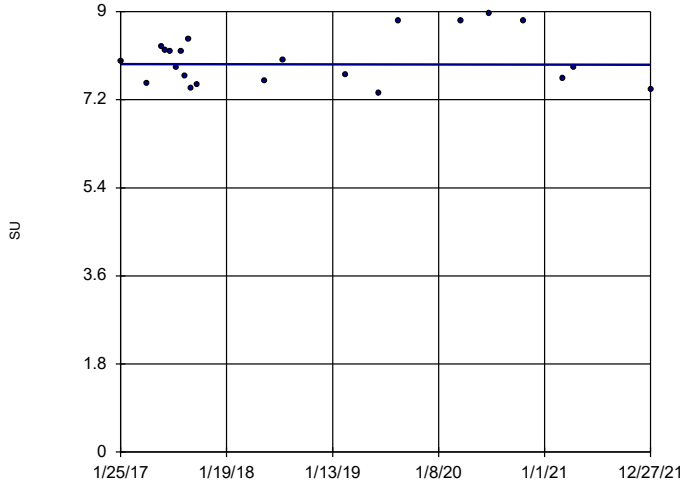
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH, field Analysis Run 3/22/2022 10:29 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 22

Slope = -0.00271 units per year.

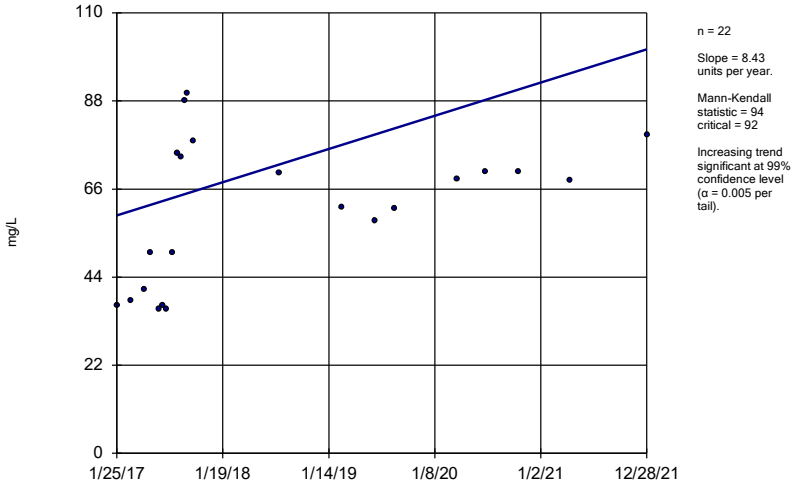
Mann-Kendall statistic = -2
critical = -92

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH, field Analysis Run 3/22/2022 10:29 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 22

Slope = 8.43 units per year.

Mann-Kendall statistic = 94 critical = 92

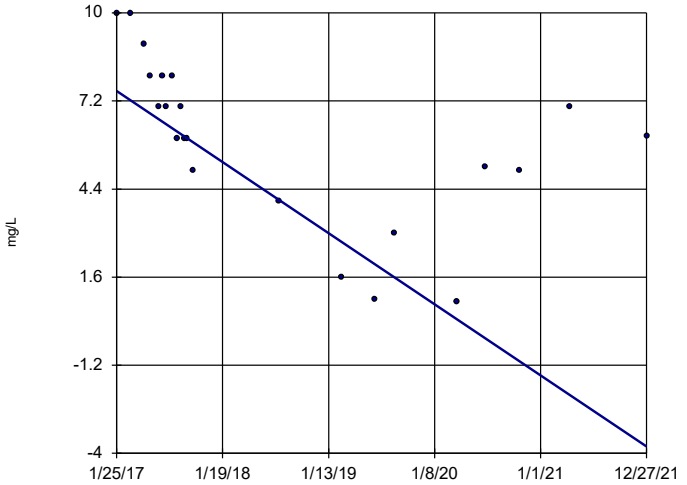
Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate Analysis Run 3/22/2022 10:30 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 22

Slope = -2.295 units per year.

Mann-Kendall statistic = -139 critical = -92

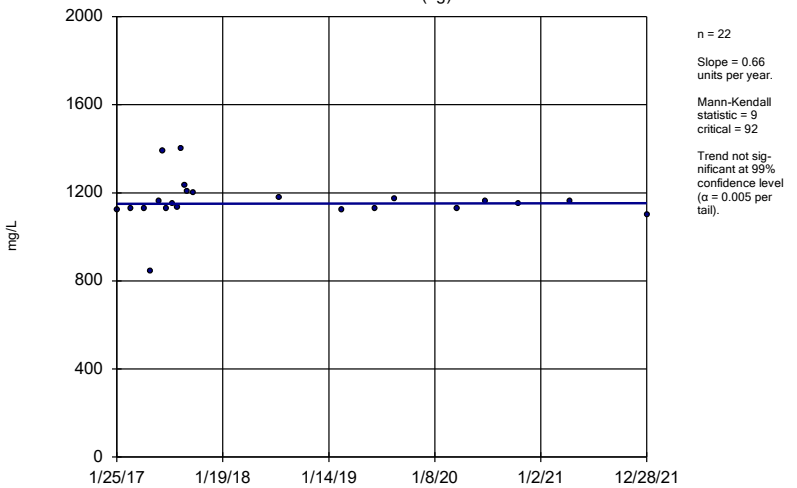
Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate Analysis Run 3/22/2022 10:30 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-4 (bg)



n = 22

Slope = 0.66 units per year.

Mann-Kendall statistic = 9 critical = 92

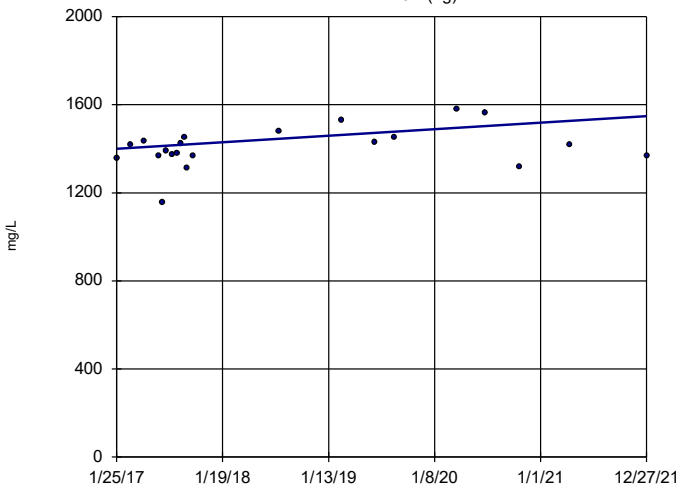
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 3/22/2022 10:30 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 21

Slope = 30.08 units per year.

Mann-Kendall statistic = 52 critical = 87

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 3/22/2022 10:30 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

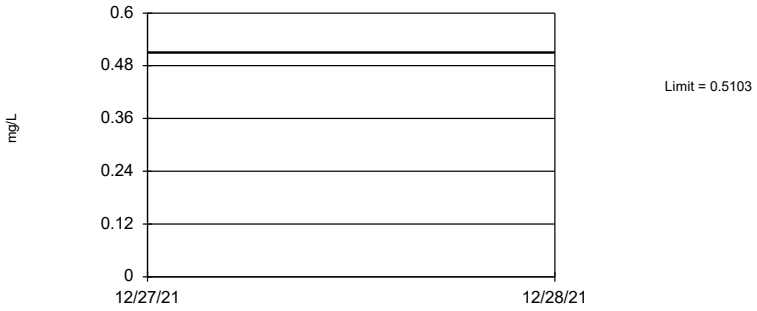
Interwell Prediction Limits - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 10:33 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	n/a	0.5103	n/a	n/a	4 future	n/a	46	0.5601	0.08507	0	None	sqrt(x)	0.00188	Param Inter 1 of 2
Chloride (mg/L)	n/a	802.2	n/a	n/a	4 future	n/a	41	565	130	0	None	No	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	n/a	4.39	n/a	n/a	4 future	n/a	48	n/a	n/a	2.083	n/a	n/a	0.0008242	NP Inter (normality) 1 of 2
pH, field (SU)	n/a	8.955	6.94	n/a	4 future	n/a	44	2.813	0.0985	0	None	sqrt(x)	0.0009398	Param Inter 1 of 2
Sulfate (mg/L)	n/a	90	n/a	n/a	4 future	n/a	44	n/a	n/a	0	n/a	n/a	0.0009825	NP Inter (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	n/a	1570	n/a	n/a	4 future	n/a	43	1281	158.7	0	None	No	0.00188	Param Inter 1 of 2

Prediction Limit

Interwell Parametric

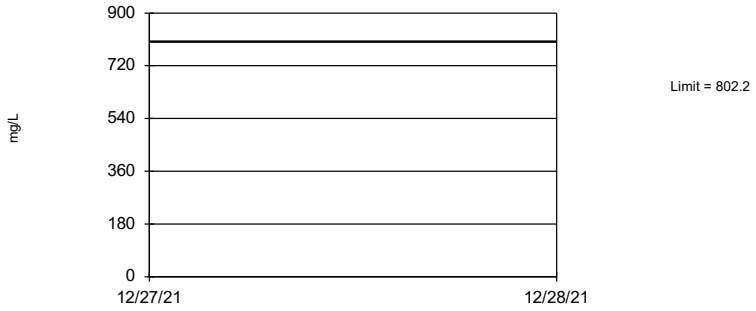


Background Data Summary (based on square root transformation): Mean=0.5601, Std. Dev.=0.08507, n=46. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9334, critical = 0.927. Kappa = 1.813 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Boron Analysis Run 3/22/2022 10:33 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Interwell Parametric

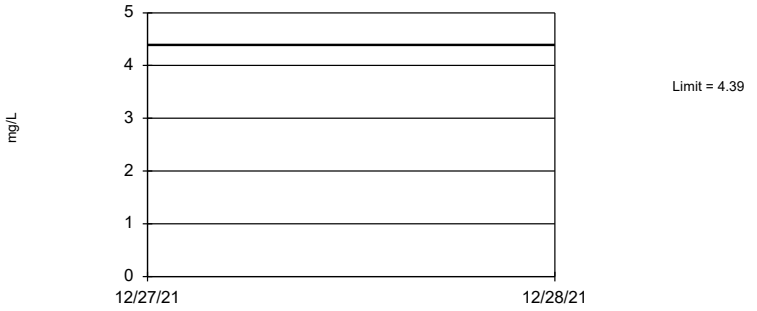


Background Data Summary: Mean=565, Std. Dev.=130, n=41. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9472, critical = 0.92. Kappa = 1.824 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Chloride Analysis Run 3/22/2022 10:33 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Interwell Non-parametric

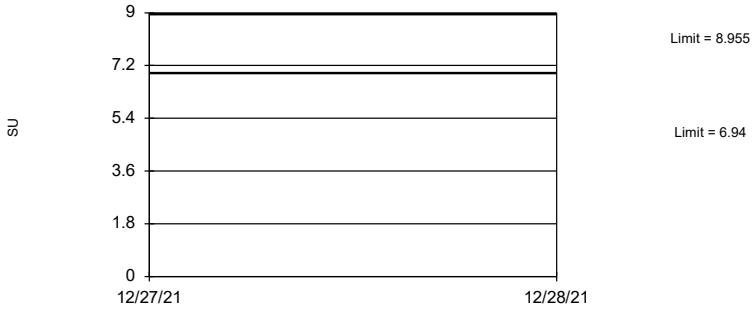


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 48 background values. 2.083% NDs. Annual per-constituent alpha = 0.006575. Individual comparison alpha = 0.0008242 (1 of 2). Assumes 4 future values.

Constituent: Fluoride Analysis Run 3/22/2022 10:33 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Interwell Parametric

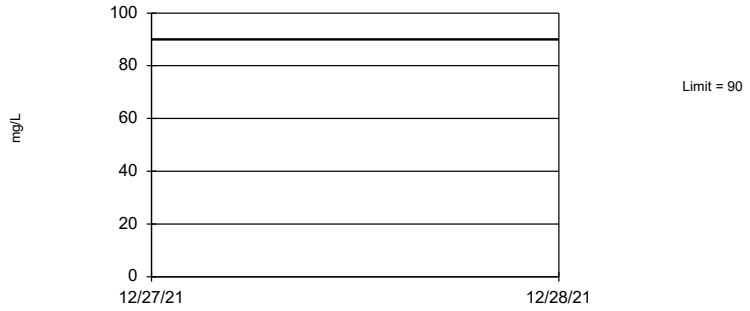


Background Data Summary (based on square root transformation): Mean=2.813, Std. Dev.=0.0985, n=44. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9279, critical = 0.924. Kappa = 1.818 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.0009398. Assumes 4 future values.

Constituent: pH, field Analysis Run 3/22/2022 10:33 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 44 background values. Annual per-constituent alpha = 0.007833. Individual comparison alpha = 0.0009825 (1 of 2). Assumes 4 future values.

Constituent: Sulfate Analysis Run 3/22/2022 10:33 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Prediction Limit

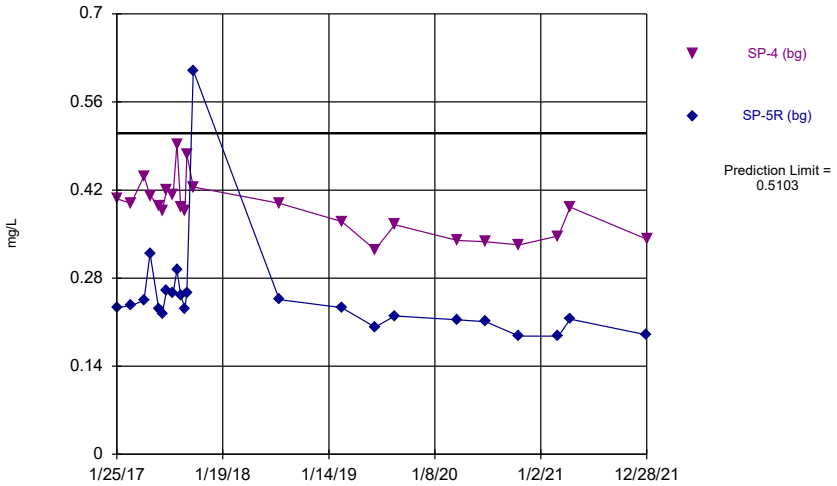
Interwell Parametric

Background Data Summary: Mean=1281, Std. Dev.=158.7, n=43. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9244, critical = 0.923. Kappa = 1.82 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Total Dissolved Solids [TDS] Analysis Run 3/22/2022 10:33 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

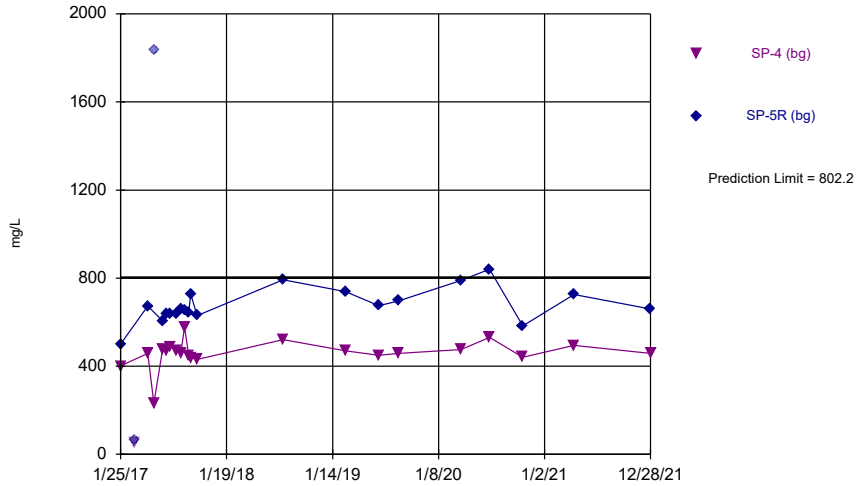
Time Series



Constituent: Boron Analysis Run 3/22/2022 10:35 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

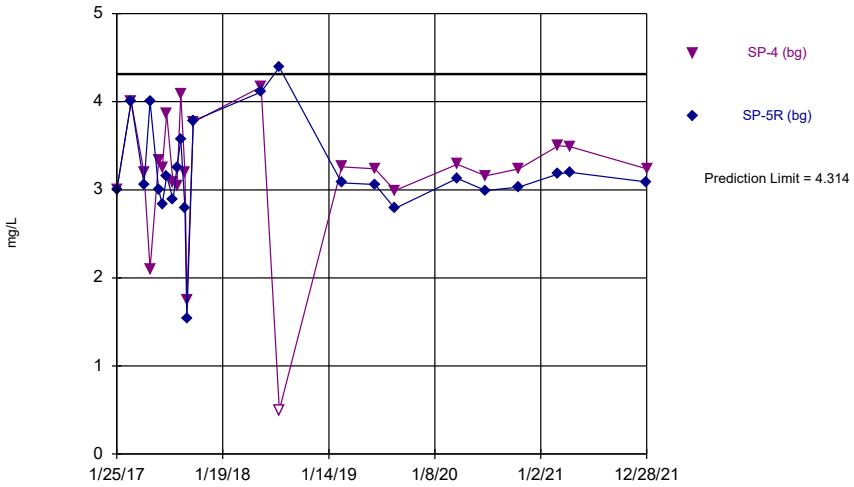
Time Series



Constituent: Chloride Analysis Run 3/22/2022 10:35 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

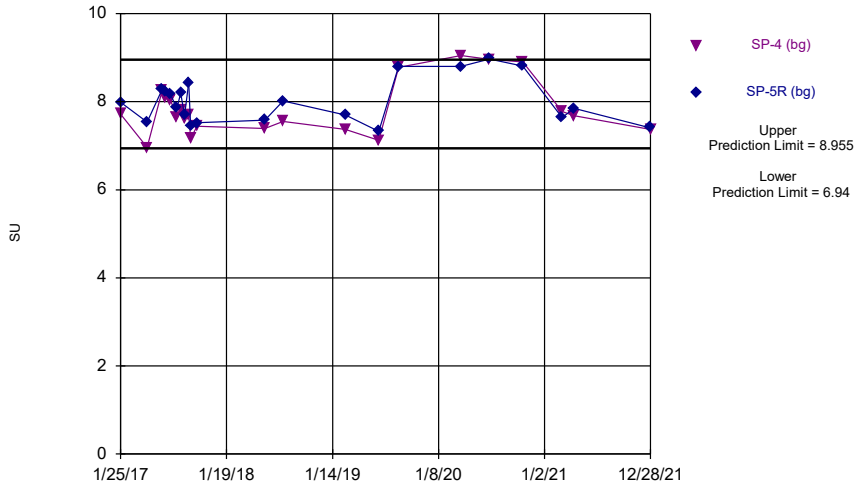
Time Series



Constituent: Fluoride Analysis Run 3/22/2022 10:36 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

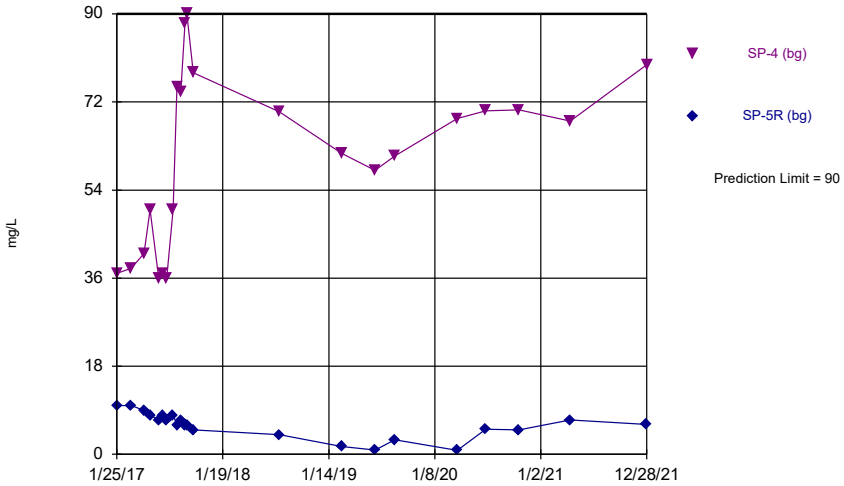
Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Time Series



Constituent: pH, field Analysis Run 3/22/2022 10:36 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

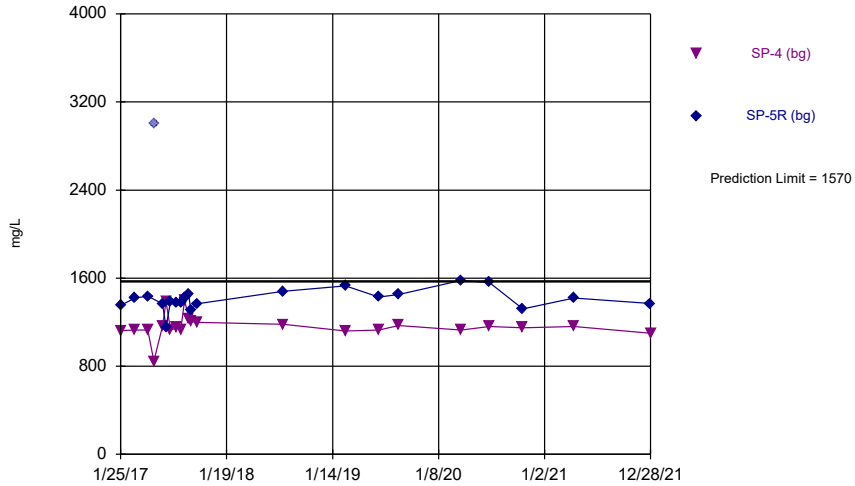
Time Series



Constituent: Sulfate Analysis Run 3/22/2022 10:37 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 3/22/2022 10:37 AM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Upper Tolerance Limits Summary Table

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 10:42 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	n/a	0.007084	n/a	n/a	n/a	n/a	46	-7.866	1.398	36.96	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	n/a	0.05715	n/a	n/a	n/a	n/a	45	0.2106	0.08347	6.667	None	x^(1/3)	0.05	Inter
Barium (mg/L)	n/a	2.6	n/a	n/a	n/a	n/a	45	n/a	n/a	0	n/a	n/a	0.09944	NP Inter(normality)
Beryllium (mg/L)	n/a	0.00212	n/a	n/a	n/a	n/a	45	n/a	n/a	22.22	n/a	n/a	0.09944	NP Inter(normality)
Cadmium (mg/L)	n/a	0.00247	n/a	n/a	n/a	n/a	45	n/a	n/a	46.67	n/a	n/a	0.09944	NP Inter(normality)
Chromium (mg/L)	n/a	0.04182	n/a	n/a	n/a	n/a	45	n/a	n/a	15.56	n/a	n/a	0.09944	NP Inter(normality)
Cobalt (mg/L)	n/a	0.01786	n/a	n/a	n/a	n/a	45	n/a	n/a	11.11	n/a	n/a	0.09944	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	n/a	15.84	n/a	n/a	n/a	n/a	45	n/a	n/a	0	n/a	n/a	0.09944	NP Inter(normality)
Fluoride (mg/L)	n/a	4.39	n/a	n/a	n/a	n/a	48	n/a	n/a	2.083	n/a	n/a	0.08526	NP Inter(normality)
Lead (mg/L)	n/a	0.0107	n/a	n/a	n/a	n/a	45	n/a	n/a	28.89	n/a	n/a	0.09944	NP Inter(normality)
Lithium (mg/L)	n/a	0.1404	n/a	n/a	n/a	n/a	46	0.08976	0.02426	0	None	No	0.05	Inter
Mercury (mg/L)	n/a	0.00003	n/a	n/a	n/a	n/a	45	n/a	n/a	71.11	n/a	n/a	0.09944	NP Inter(NDs)
Molybdenum (mg/L)	n/a	0.01	n/a	n/a	n/a	n/a	46	n/a	n/a	36.96	n/a	n/a	0.09447	NP Inter(normality)
Selenium (mg/L)	n/a	0.00499	n/a	n/a	n/a	n/a	46	n/a	n/a	50	n/a	n/a	0.09447	NP Inter(normality)
Thallium (mg/L)	n/a	0.00162	n/a	n/a	n/a	n/a	45	n/a	n/a	91.11	n/a	n/a	0.09944	NP Inter(NDs)

Confidence Intervals - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 4/6/2022, 2:52 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.39**	**3.415**	**2.6**	**Yes**	**11**	**4.903**	**1.785**	**0**	**None**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**7.301**	**5.105**	**4.39**	**Yes**	**21**	**5.793**	**2.536**	**14.29**	**None**	**x^2**	**0.01**	**Param.**
Lithium (mg/L)	**SP-10**	**0.2861**	**0.238**	**0.14**	**Yes**	**19**	**0.2621**	**0.04109**	**0**	**None**	**No**	**0.01**	**Param.**

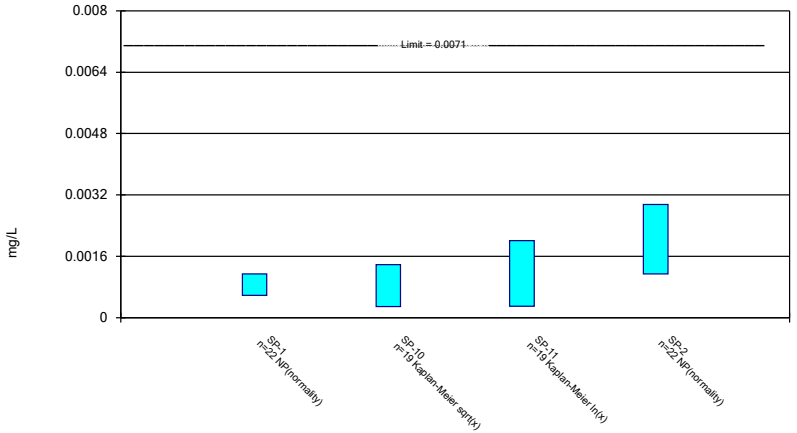
Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 4/6/2022, 2:52 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00114	0.00058	0.0071	No	22	0.001221	0.001371	31.82	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.001383	0.0002874	0.0071	No	19	0.001025	0.001109	21.05	Kaplan-Meier	sqrt(x)	0.01	Param.
Antimony (mg/L)	SP-11	0.002007	0.0002973	0.0071	No	19	0.002379	0.002966	15.79	Kaplan-Meier	ln(x)	0.01	Param.
Antimony (mg/L)	SP-2	0.00295	0.00114	0.0071	No	22	0.002672	0.002703	9.091	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-1	0.0025	0.0007	0.057	No	22	0.001736	0.001189	36.36	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.006212	0.001683	0.057	No	19	0.004577	0.004494	10.53	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.005626	0.002387	0.057	No	19	0.004308	0.003073	5.263	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-2	0.00254	0.00129	0.057	No	22	0.002776	0.002636	4.545	None	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.2086	0.1666	2.6	No	22	0.1876	0.0391	0	None	No	0.01	Param.
Barium (mg/L)	**SP-10**	**6.39**	**3.415**	**2.6**	**Yes**	**11**	**4.903**	**1.785**	**0**	**None**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.3807	0.1842	2.6	No	19	0.2824	0.1678	0	None	No	0.01	Param.
Barium (mg/L)	SP-2	1.437	0.9785	2.6	No	22	1.244	0.5159	0	None	x^(1/3)	0.01	Param.
Beryllium (mg/L)	SP-1	0.00009917	0.00004973	0.004	No	22	0.00009227	0.00005264	22.73	Kaplan-Meier	x^(1/3)	0.01	Param.
Beryllium (mg/L)	SP-10	0.0001	0.00003	0.004	No	19	0.00005853	0.00003285	31.58	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.00009201	0.00002475	0.004	No	19	0.0001222	0.0001229	31.58	Kaplan-Meier	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-2	0.0001205	0.00006484	0.004	No	22	0.0001025	0.00005169	18.18	Kaplan-Meier	sqrt(x)	0.01	Param.
Cadmium (mg/L)	SP-1	0.0002	0.00008	0.005	No	22	0.0001405	0.00006411	45.45	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.0002	0.00002	0.005	No	19	0.0001243	0.00009143	57.89	None	No	0.01	NP (NDs)
Cadmium (mg/L)	SP-11	0.0003705	0.00004231	0.005	No	19	0.0006085	0.0009989	15.79	Kaplan-Meier	ln(x)	0.01	Param.
Cadmium (mg/L)	SP-2	0.0002	0.00006	0.005	No	22	0.0001329	0.00006966	45.45	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.0009496	0.0004574	0.1	No	22	0.0008435	0.0006879	27.27	Kaplan-Meier	ln(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.001155	0.000286	0.1	No	18	0.00118	0.002009	11.11	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.005238	0.0006845	0.1	No	19	0.007225	0.01147	5.263	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-2	0.001564	0.0005498	0.1	No	22	0.001207	0.00116	13.64	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-1	0.001289	0.0004507	0.018	No	22	0.001064	0.001208	13.64	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.002466	0.0005459	0.018	No	19	0.001811	0.001864	10.53	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-11	0.005345	0.001154	0.018	No	19	0.004258	0.004863	5.263	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-2	0.001142	0.0004753	0.018	No	22	0.0009302	0.0007872	13.64	None	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.141	3.025	15.84	No	21	3.583	1.012	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	18.84	1.062	15.84	No	19	10.34	8.929	0	None	No	0.01	NP (normality)
Combined Radium 226 + 228 (pCi/L)	SP-11	2.202	1.04	15.84	No	18	1.706	1.062	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	13.99	8.588	15.84	No	19	11.7	5.341	0	None	x^(1/3)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9508	0.6562	4.39	No	22	0.8035	0.2745	9.091	None	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**7.301**	**5.105**	**4.39**	**Yes**	**21**	**5.793**	**2.536**	**14.29**	**None**	**x^2**	**0.01**	**Param.**
Fluoride (mg/L)	SP-11	3.421	2.442	4.39	No	21	2.931	0.8869	0	None	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.208	2.634	4.39	No	23	2.873	0.6129	0	None	x^2	0.01	Param.
Lead (mg/L)	SP-1	0.002	0.000351	0.015	No	22	0.001135	0.0007566	36.36	None	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.002	0.0001	0.015	No	19	0.001071	0.0009234	47.37	None	No	0.01	NP (normality)
Lead (mg/L)	SP-11	0.001566	0.0002701	0.015	No	19	0.002209	0.002823	15.79	Kaplan-Meier	ln(x)	0.01	Param.
Lead (mg/L)	SP-2	0.002	0.000263	0.015	No	22	0.00115	0.0008428	40.91	None	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006252	0.004463	0.14	No	21	0.005358	0.001621	0	None	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2861**	**0.238**	**0.14**	**Yes**	**19**	**0.2621**	**0.04109**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.08284	0.03964	0.14	No	19	0.06471	0.03981	0	None	sqrt(x)	0.01	Param.
Lithium (mg/L)	SP-2	0.084	0.05595	0.14	No	22	0.06998	0.02613	0	None	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	No	22	0.000006409	0.000004008	81.82	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000016	0.000005	0.002	No	19	0.00001047	0.000007684	47.37	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-11	0.000023	0.000005	0.002	No	19	0.00001253	0.0000138	31.58	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	No	22	0.0000055	0.000001921	81.82	None	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01518	0.01053	0.1	No	22	0.01286	0.004337	0	None	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.02503	0.004205	0.1	No	18	0.02015	0.03024	5.556	None	x^(1/3)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.04861	0.00215	0.1	No	19	0.02311	0.02414	5.263	None	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02943	0.02078	0.1	No	22	0.02511	0.008058	0	None	No	0.01	Param.
Selenium (mg/L)	SP-1	0.006212	0.00312	0.05	No	22	0.004666	0.00288	13.64	None	No	0.01	Param.
Selenium (mg/L)	SP-10	0.001367	0.0001686	0.05	No	19	0.001709	0.002332	31.58	Kaplan-Meier	ln(x)	0.01	Param.
Selenium (mg/L)	SP-11	0.00546	0.0003	0.05	No	19	0.002015	0.002434	10.53	None	No	0.01	NP (normality)
Selenium (mg/L)	SP-2	0.0108	0.002876	0.05	No	22	0.008303	0.009784	9.091	None	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.00089	0.0001	0.002	No	22	0.00029	0.0004143	72.73	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	No	19	0.0001916	0.00003671	94.74	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	No	19	0.0001911	0.000039	94.74	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.0001	0.002	No	22	0.0001823	0.00004639	86.36	None	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

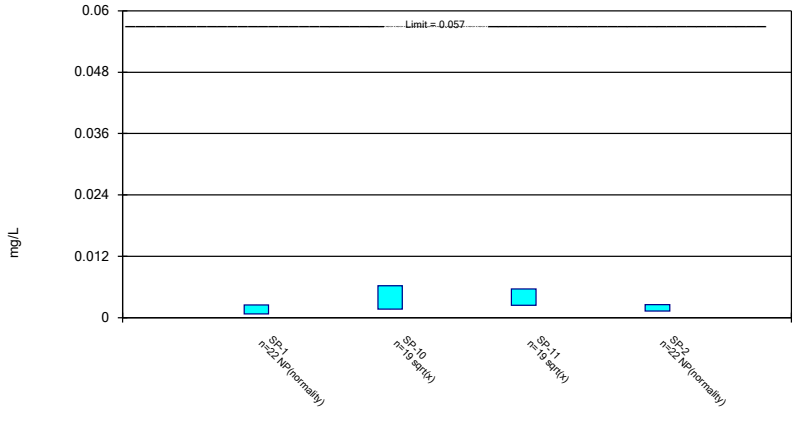
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

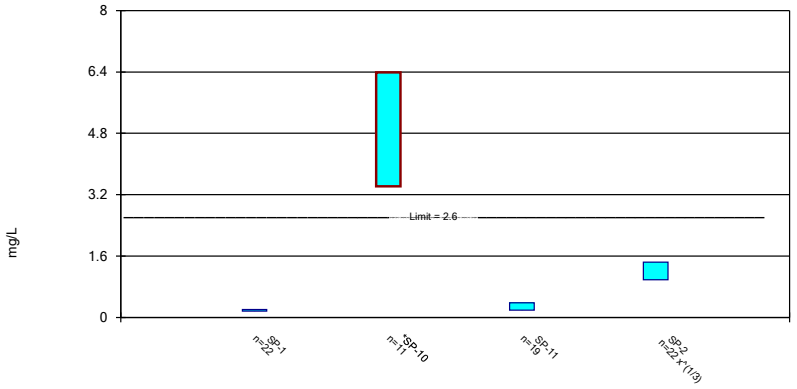
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

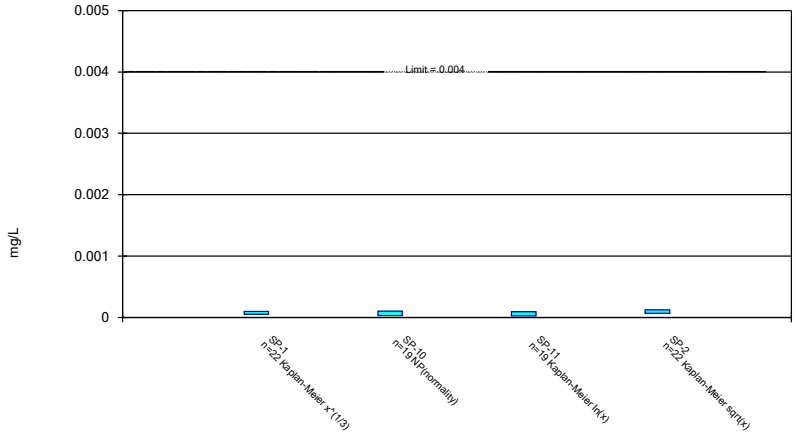
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

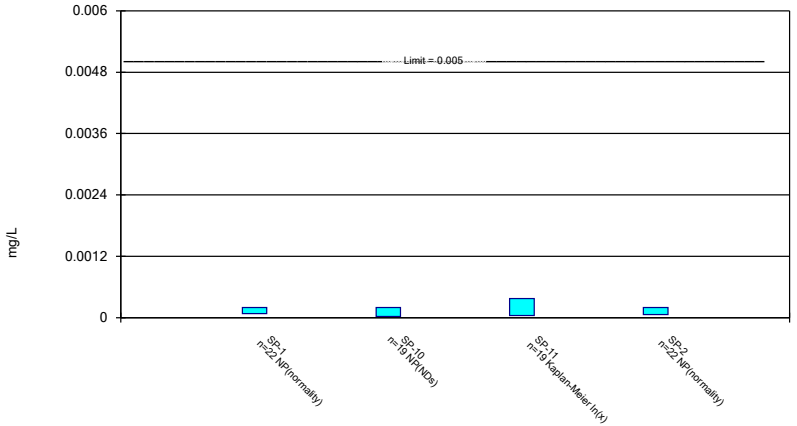
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Beryllium Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

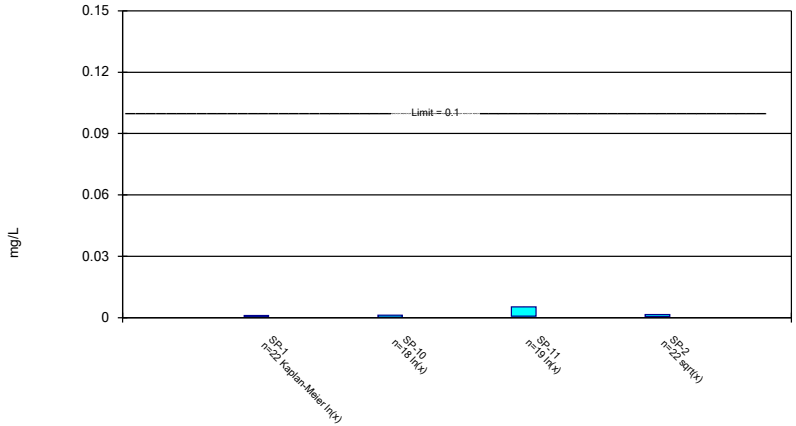
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

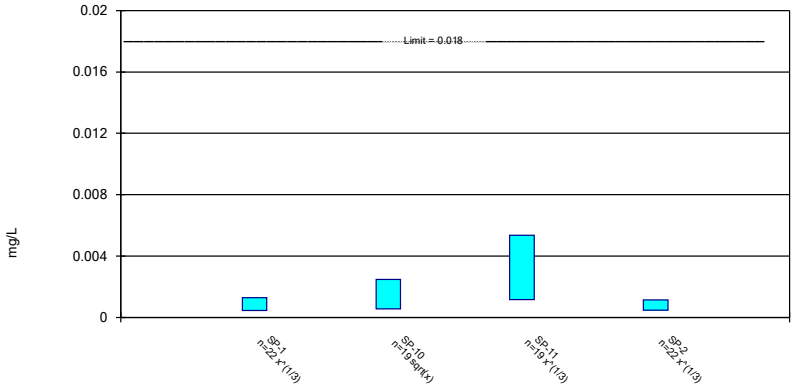
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

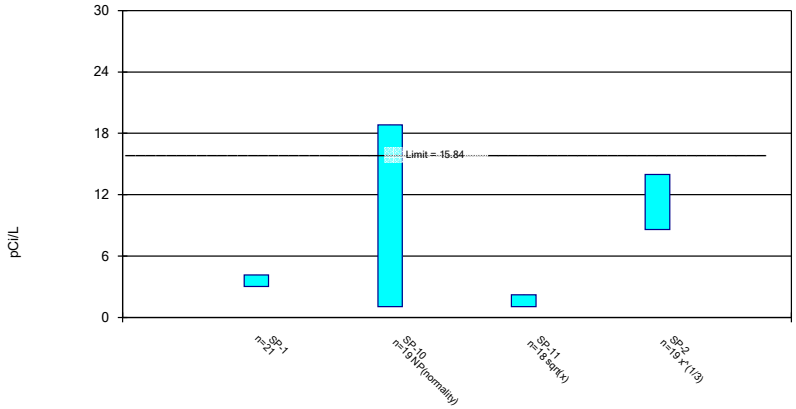
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

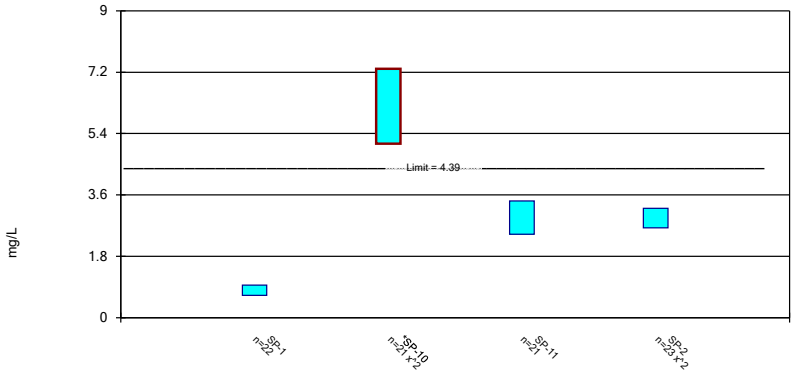


Constituent: Combined Radium 226 + 228 Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32j Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

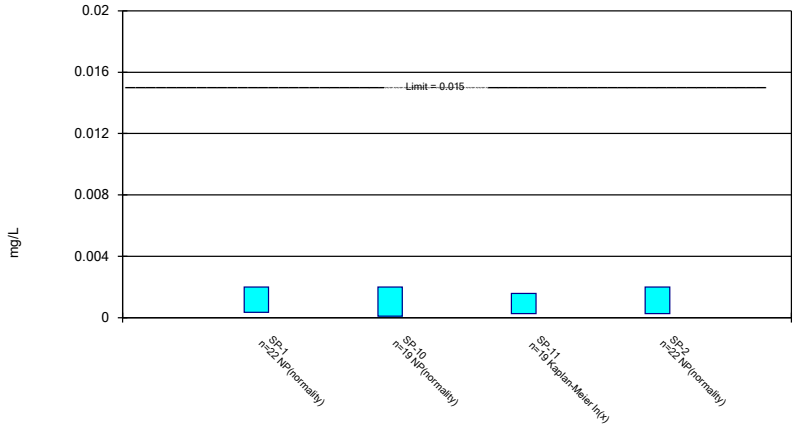


Constituent: Fluoride Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32j Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

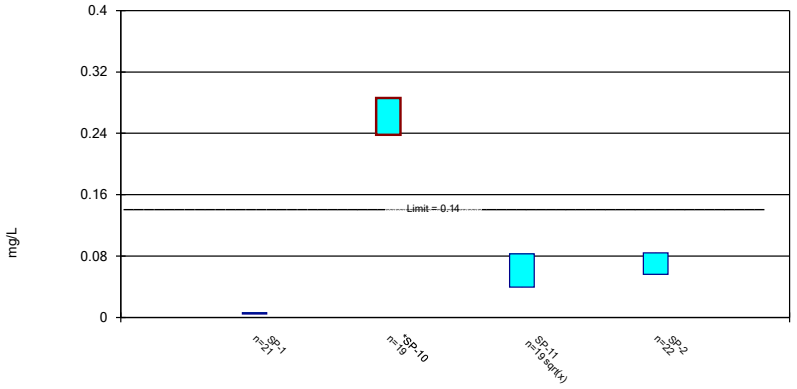


Constituent: Lead Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32j Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

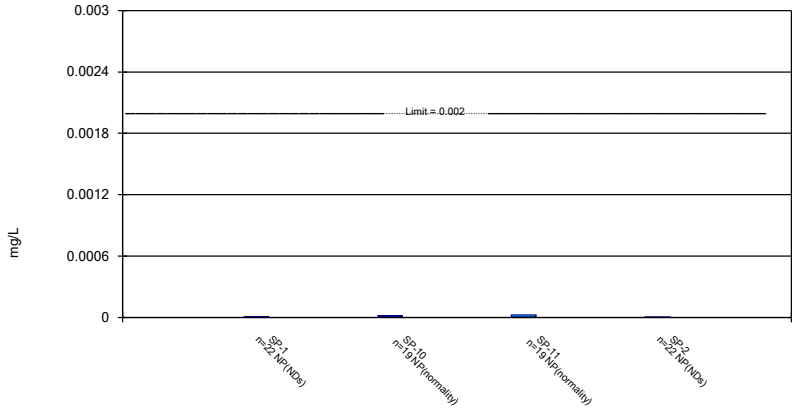


Constituent: Lithium Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32j Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

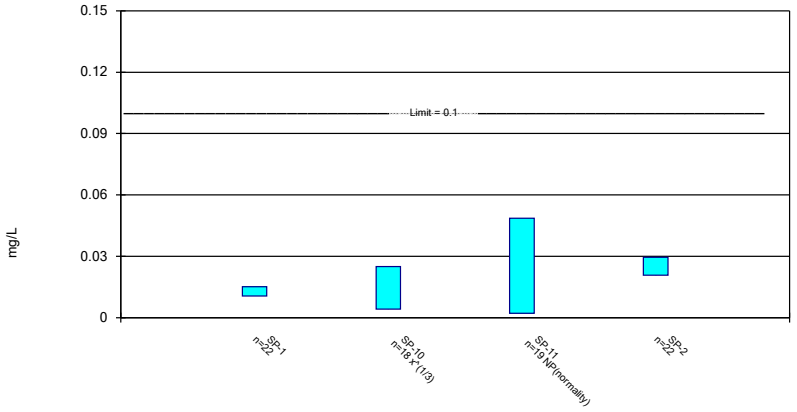
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

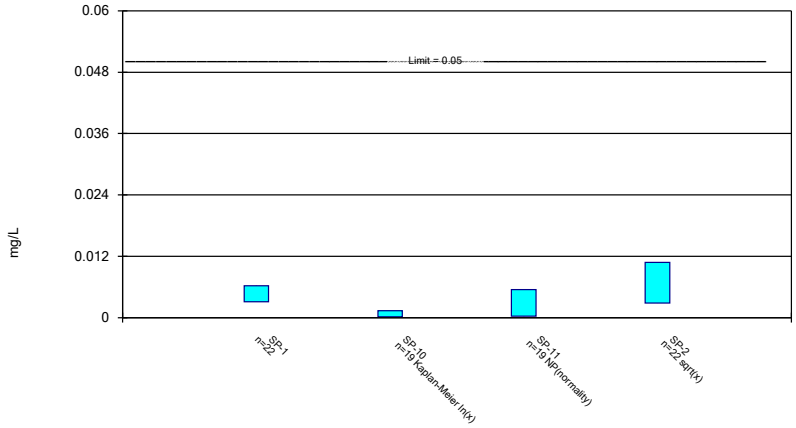


Constituent: Molybdenum Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32j Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

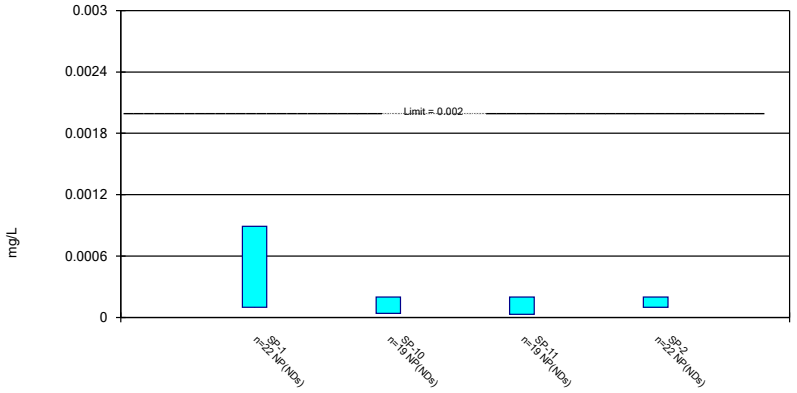


Constituent: Selenium Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32j Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium Analysis Run 4/6/2022 2:51 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

STATISTICAL ANALYSIS SUMMARY
BOTTOM ASH POND
Northeastern Power Station
Oologah, Oklahoma

Submitted to

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

500 West Wilson Bridge Road
Suite 250
Worthington, Ohio 43085

October 7, 2022

CHA8500B

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
BAP	Bottom Ash Pond
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
NPS	Northeastern Power Station
ODEQ	Oklahoma Department of Environmental Quality
OAC	Oklahoma Administrative Code
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
SU	Standard Units
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the Oklahoma Department of Environmental Quality (ODEQ) and Oklahoma administrative code (OAC) regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (OAC 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power Station (NPS) located in Oologah, Oklahoma. Recent groundwater monitoring results were compared to site-specific groundwater protection standards (GWPSs) to identify potential exceedances.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, chloride, fluoride, total dissolved solids (TDS), and sulfate at the BAP. Also, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. GWPSs were set in accordance with OAC 252:517-9-6(h) and a statistical evaluation of the assessment monitoring data was conducted. An assessment monitoring event was conducted at the BAP in December 2021, in accordance with OAC 252:517-9-6(d). During the December 2021 assessment monitoring event, statistically significant levels (SSLs) were observed for barium, fluoride, and lithium (Geosyntec, 2022a). An alternative source demonstration (ASD) was successfully completed (Geosyntec, 2022b); thus the unit remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in June 2022, in accordance with OAC 252:517-9-6(d). Results of this event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs for Appendix B parameters were present above previously calculated GWPSs. SSLs were identified for barium, fluoride, and lithium. Thus, either the unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A. The statistical analysis and certification of the selected methods were completed within 90 days of obtaining the data.

SECTION 2

BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, one set of samples was collected in June 2022 for analysis from each upgradient and downgradient well to meet the requirements of OAC 252:517-9-6(d)(1). Samples from this sampling event were analyzed for both the Appendix A and Appendix B parameters. A summary of data collected during this assessment monitoring event may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.33 statistics software. The export file was checked against the analytical data for transcription errors and completeness. While the TDS results were flagged for laboratory control sample results outside of the acceptance limits (Table 1), the results were similar to previous results and were retained in the dataset for statistical evaluation. Thus, no QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec, 2021) for the samples collected in June 2022. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained in June 2022 were screened for potential outliers. No outliers were identified for this event.

2.2.1 Evaluation of Potential Appendix B SSLs

A confidence interval was constructed for each Appendix B parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B. The calculated confidence

limits were compared to the GWPSs provided in Table 2. The GWPSs were established during a previous statistical analysis as either the greater value of the background concentration or the maximum contaminant level (MCL) and risk-based level specified in OAC 252:517-9-6(h) (Geosyntec, 2022).

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium exceeded the GWPS of 2.60 mg/L at SP-10 (3.66 mg/L).
- The LCL for fluoride exceeded the GWPS of 4.39 mg/L at SP-10 (5.17 mg/L).
- The LCL for lithium exceeded the GWPS of 0.140 mg/L at SP-10 (0.240 mg/L).

ODEQ previously noted in a letter provided to the NPS that "If lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and June 4, 2021 approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (ODEQ, 2021). ODEQ provided a similar letter dated September 20, 2022 documenting ASD approval for a barium SSL at SP-10 which is applicable in the future if conditions do not change (ODEQ, 2022). Thus, an ASD will be submitted to ODEQ demonstrating that conditions at the BAP remain unchanged so that the unit will continue assessment monitoring.

2.2.2 Evaluation of Potential Appendix A SSIs

While SSLs were identified, a review of the Appendix A results was also completed to assess whether concentrations of Appendix A parameters at the compliance wells exceeded background concentrations.

Data collected during the June 2022 assessment monitoring event from each compliance well were compared to previously calculated prediction limits to evaluate results above background values. The results from this event and the prediction limits are summarized in Table 3. The following exceedances of the UPLs were noted:

- Boron concentrations exceeded the interwell UPL of 0.510 mg/L at SP-10 (1.04 mg/L) and SP-11 (0.627 mg/L).
- Chloride concentrations exceeded the interwell UPL of 802 mg/L at SP-2 (844 mg/L) and SP-10 (1,810 mg/L).
- Fluoride concentrations exceeded the interwell UPL of 4.39 mg/L at SP-10 (6.3 mg/L).
- Sulfate concentrations exceeded the interwell UPL of 90.0 mg/L at SP-11 (402 mg/L).
- TDS concentrations exceeded the interwell UPL of 1,570 mg/L at SP-2 (1,720 mg/L) and SP-10 (3,600 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the June 2022 sample was above the UPL or below the LPL. Based on these results, boron, chloride, fluoride, sulfate, and TDS concentrations exceeded background levels at compliance wells at the Northeastern BAP during assessment monitoring.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in June 2022 in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the June 2022 data. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval exceeded the GWPSs. SSLs were identified for barium, fluoride, and lithium. Appendix A parameters were compared to prediction limits, with exceedances identified for boron, chloride, fluoride, sulfate, and TDS.

Based on this evaluation, the Northeastern BAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

SECTION 3

REFERENCES

Geosyntec. 2021. Statistical Analysis Plan – Northeastern Power Station. Oologah, Oklahoma. November.

Geosyntec. 2022a. Statistical Analysis Summary – Bottom Ash Pond. Northeastern Power Station. Oologah, Oklahoma. April.

Geosyntec. 2022b. Alternative Source Demonstration Report – State CCR Rule. Northeastern Power Station – Bottom Ash Pond. Oologah, Oklahoma. July.

Oklahoma Department of Environmental Quality (ODEQ). 2021. Letter Transmittal – Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. June.

ODEQ. 2022. Letter Transmittal – Alternate Source Demonstration for Barium, Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. September.

TABLES

Table 1 - Groundwater Data Summary
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

Well ID		SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
Well Classification		Compliance	Compliance	Background	Background	Compliance	Compliance
Parameter	Unit	6/14/2022	6/14/2022	6/14/2022	6/14/2022	6/14/2022	6/14/2022
Antimony	µg/L	0.72	1.51	0.21	0.19	0.03 J1	0.43
Arsenic	µg/L	0.84	1.11	0.80	20.3	0.19	2.73
Barium	µg/L	161	1,070	246	2,010	7,590	139
Beryllium	µg/L	0.061	0.1 J1	0.04 J1	0.07 J1	2.5 U1	0.25 U1
Boron	mg/L	0.176	0.228	0.367	0.209	1.04	0.627
Cadmium	µg/L	0.066	0.063	0.024	0.200	0.033	0.027
Calcium	mg/L	102	115	70.2	52.5	56.1	113
Chloride	mg/L	21.2	844	452	675	1,810	60.0
Chromium	µg/L	0.60	1.05	0.56	0.47	0.57	0.59
Cobalt	µg/L	1.14	0.791	0.159	0.699	0.216	2.36
Combined Radium	pCi/L	3.98	10.83	3.56	11.26	1.31	1.17
Fluoride	mg/L	0.78	3.08	3.25	3.09	6.3	1.10
Lead	µg/L	0.22	0.17 J1	0.10 J1	0.66	0.19 J1	0.23
Lithium	mg/L	0.00473	0.084	0.0571	0.0896	0.289	0.0140
Mercury	µg/L	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1
Molybdenum	µg/L	21.2	26.5	3.7	0.9	0.5	2.9
Selenium	µg/L	9.63	9.56	0.38 J1	0.1 J1	0.5 U1	0.19 J1
Sulfate	mg/L	65.2	22.3	80.4	4.7	16.3	402
Thallium	µg/L	0.07 J1	0.07 J1	0.2 U1	0.2 U1	0.2 U1	0.2 U1
Total Dissolved Solids	mg/L	430 L1	1,720 L1	1,160 L1	1,410 L1	3,600 L1	1,020 L1
pH	SU	7.27	7.35	7.83	7.72	7.74	7.34

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U1: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
J1: Estimated value. Parameter was detected in concentrations below the reporting limit.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.
-: Not analyzed

Table 2 - Appendix B Groundwater Protection Standards
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600		0.00708	0.00708
Arsenic, Total (mg/L)	0.0100		0.0572	0.0572
Barium, Total (mg/L)	2.00		2.60	2.60
Beryllium, Total (mg/L)	0.00400		0.00212	0.00400
Cadmium, Total (mg/L)	0.00500		0.00247	0.00500
Chromium, Total (mg/L)	0.100		0.0418	0.100
Cobalt, Total (mg/L)	n/a	0.00600	0.0179	0.0179
Combined Radium, Total (pCi/L)	5.00		15.8	15.8
Fluoride, Total (mg/L)	4.00		4.39	4.39
Lead, Total (mg/L)	n/a	0.0150	0.0107	0.0150
Lithium, Total (mg/L)	n/a	0.0400	0.140	0.140
Mercury, Total (mg/L)	0.00200		0.0000300	0.00200
Molybdenum, Total (mg/L)	n/a	0.100	0.0100	0.100
Selenium, Total (mg/L)	0.0500		0.00499	0.0500
Thallium, Total (mg/L)	0.00200		0.00162	0.00200

Notes:
MCL = Maximum Contaminant Level
CCR = Coal Combustion Residual
GWPS = Groundwater Protection Standard
Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.

Table 3 - Appendix A Data Summary
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

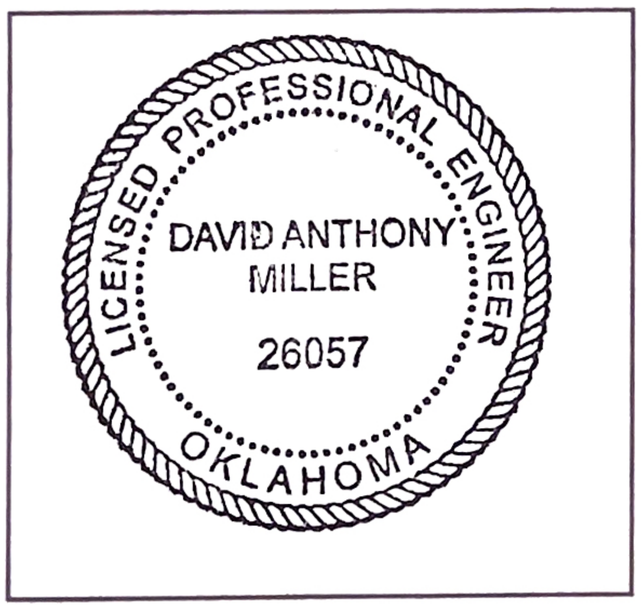
Analyte	Unit	Description	SP-1	SP-2	SP-10	SP-11
			6/14/2022	6/14/2022	6/14/2022	6/14/2022
Boron	mg/L	Interwell Background Value (UPL)	0.510			
		Analytical Result	0.176	0.228	**1.04**	**0.627**
Calcium	mg/L	Intrawell Background Value (UPL)	144	176	227	1,460
		Analytical Result	102	115	56.1	113
Chloride	mg/L	Interwell Background Value (UPL)	802			
		Analytical Result	21.2	**844**	**1,810**	60.0
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.78	3.08	**6.3**	1.10
pH	SU	Interwell Background Value (UPL)	9.0			
		Interwell Background Value (LPL)	6.9			
		Analytical Result	7.3	7.4	7.7	7.3
Sulfate	mg/L	Interwell Background Value (UPL)	90.0			
		Analytical Result	65.2	22.3	16.3	**402**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,570			
		Analytical Result	430	**1,720**	**3,600**	1,020

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern Bottom Ash Pond CCR management area and that the requirements of OAC 252:517-9-4(g) have been met.



DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

26057	OKLAHOMA	10.07.22
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

August 31, 2022

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

Re: Northeastern BAP (Bottom Ash Pond)
Assessment Monitoring Statistics –June 2022

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the June 2022 assessment monitoring analysis of groundwater data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the Oklahoma Administrative Code (OAC) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the OAC program in 2017. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5R
- **Downgradient wells:** SP-1, SP2, SP-10, and SP-11

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was reviewed by Andrew Collins, Project Manager of GSC.

The OAC program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix B** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. Time series and box plots are provided for all wells for the parameters listed above (Figures A & B). The time series plots display concentrations over time for each well while the box plots provide visual representation of variation within a given well and across all wells.

Summary of Background Screening

Outlier Screening

Data were re-evaluated for outliers using Tukey's outlier test during the background update performed in April 2022, and a summary of those findings was submitted with that report. No additional values were flagged during that screening; however, elevated concentrations earlier in the record for barium at well SP-10 were deselected to construct confidence intervals that are representative of present-day groundwater quality conditions for barium at this well. Values identified as outliers are flagged in the database with "o" and are deselected prior to construction of statistical limits. A list of all previously flagged outliers follows this letter (Figure C). Additionally, flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. A list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table)

Evaluation of Appendix B Parameters – June 2022

For Appendix B parameters, confidence intervals for each downgradient well/constituent were compared against corresponding Groundwater Protection Standards (GWPS). GWPS were developed as described below. Downgradient well/constituent pairs that have 100% non-detects do not require analysis; however, no downgradient wells had 100% non-detects, and all well/constituent pairs were eligible for confidence intervals.

Interwell Upper Tolerance Limits

Interwell upper tolerance limits were used to calculate the site-specific background limits from pooled upgradient well data during the Fall 2021 analysis using data through December 2021 for Appendix B parameters (Figure D). These limits are updated on an annual basis and will be updated again during the Fall 2022 sample event. Parametric tolerance limits are calculated, with a target of 95% confidence and 95% coverage, when data follow a normal or transformed-normal distribution. When data contained greater than 50% non-detects or did not follow a normal or transformed-normal distribution, non-parametric tolerance limits were constructed using the highest background measurement. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

The upper tolerance limits were compared to the Maximum Contaminant Levels (MCLs) and background limits in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure E).

Confidence Intervals

Confidence intervals were then constructed on downgradient wells with data through June 2022 for each of the Appendix B parameters using the highest limit of the MCL or background limit as discussed above for the GWPS (Figure F). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. A summary of the confidence interval results follows this letter. Exceedances were found for the following well/constituent pairs:

- Barium: SP-10
- Fluoride: SP-10
- Lithium: SP-10

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Tristan Clark
Groundwater Analyst

Andrew Collins
Project Manager

Date Ranges

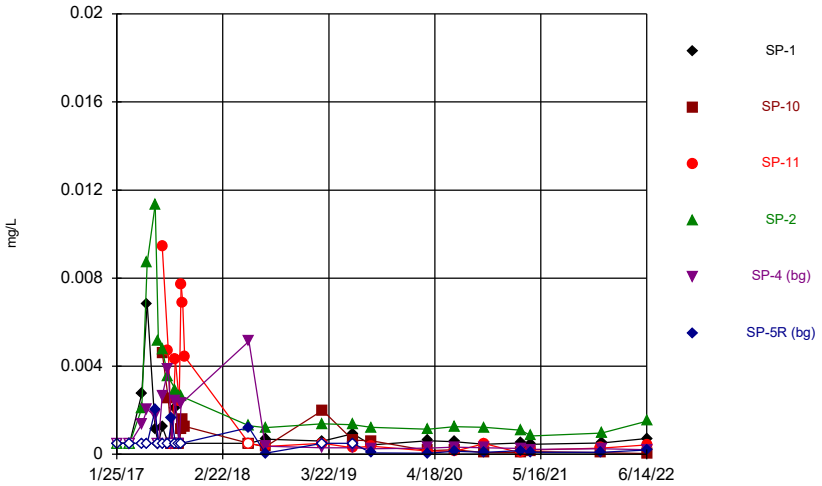
Date: 8/8/2022 3:09 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Barium (mg/L)
SP-10 overall:5/30/2018-6/14/2022
Calcium (mg/L)
SP-11 background:10/4/2017-6/30/2020

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

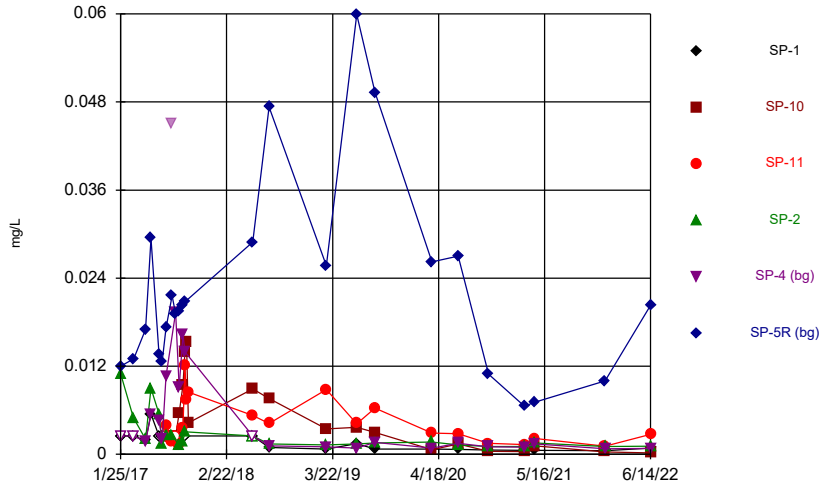
Time Series



Constituent: Antimony Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Arsenic Analysis Run 8/30/2022 2:18 PM View: Appendix IV
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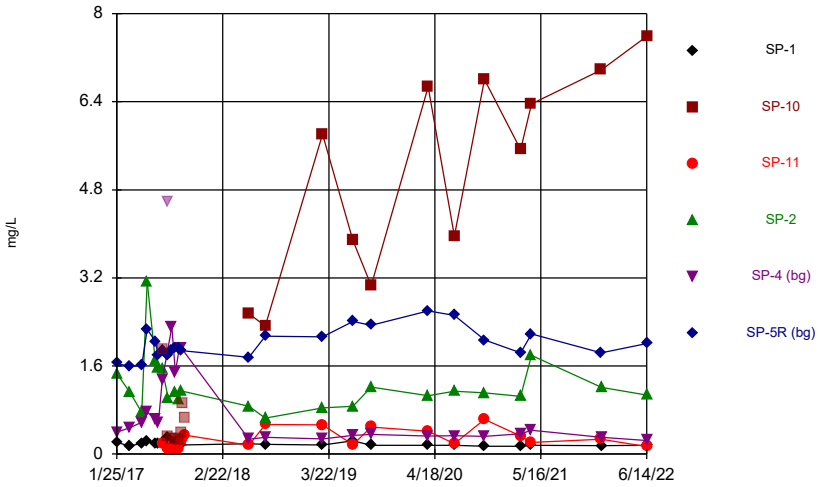
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Barium Analysis Run 8/30/2022 2:18 PM View: Appendix IV
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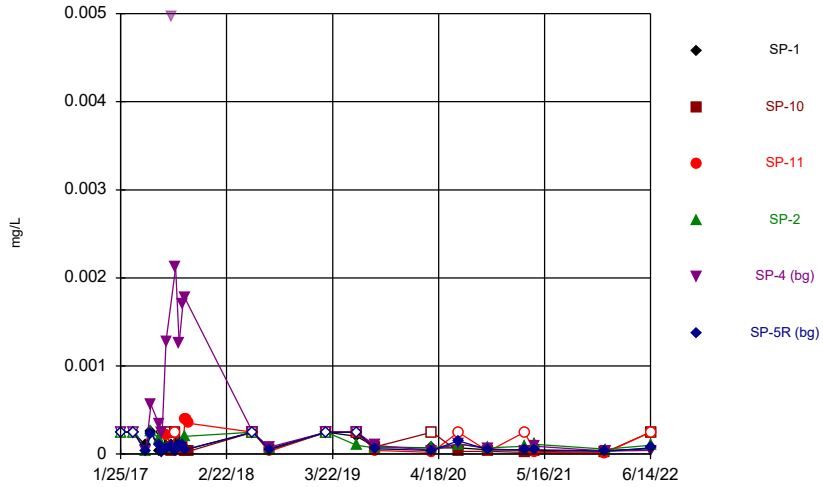
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Beryllium Analysis Run 8/30/2022 2:18 PM View: Appendix IV
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Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

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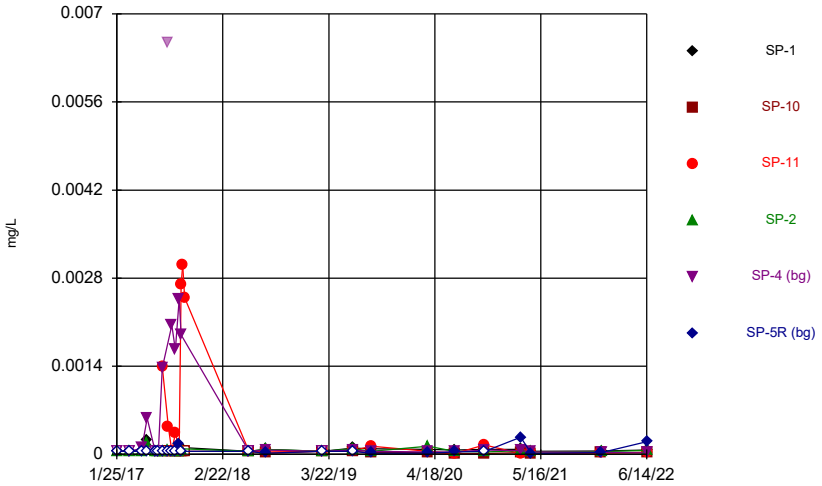
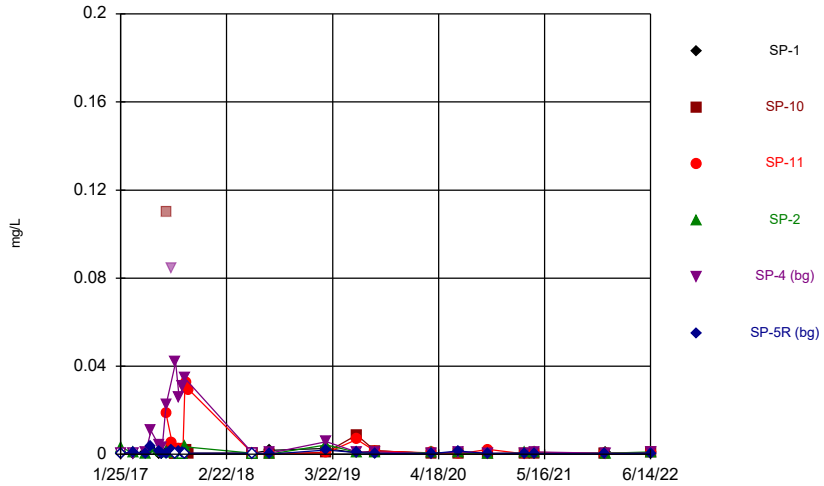


Constituent: Cadmium Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Chromium Analysis Run 8/30/2022 2:18 PM View: Appendix IV
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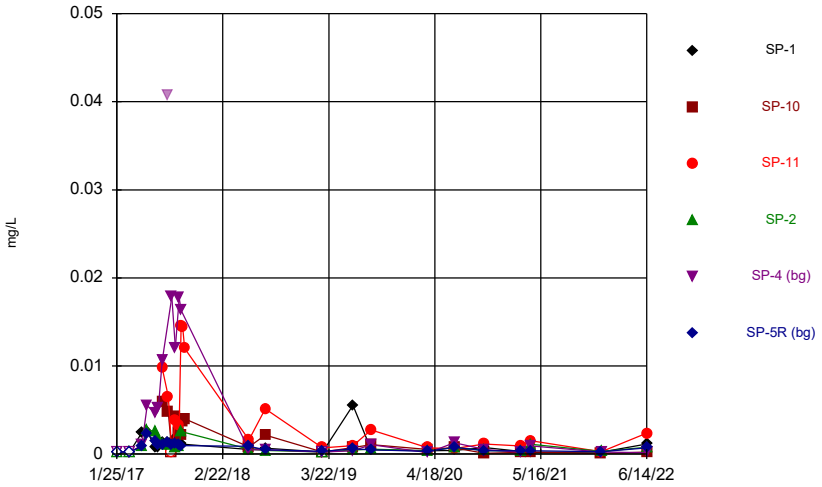
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

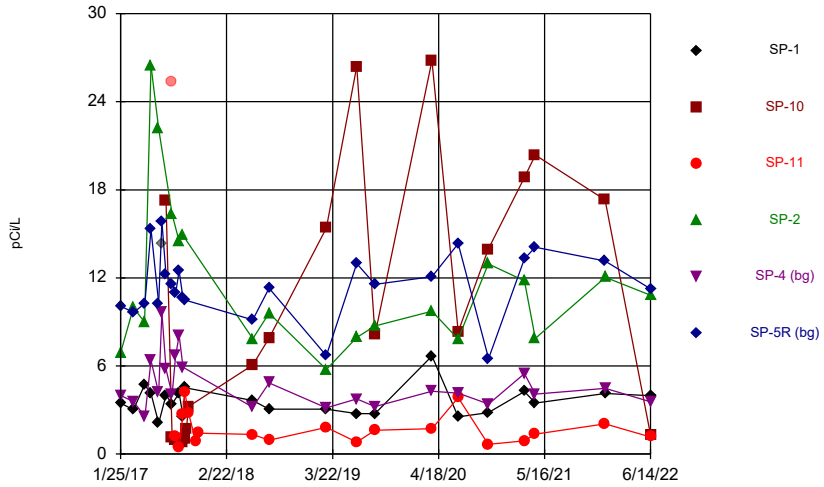
Time Series



Constituent: Cobalt Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

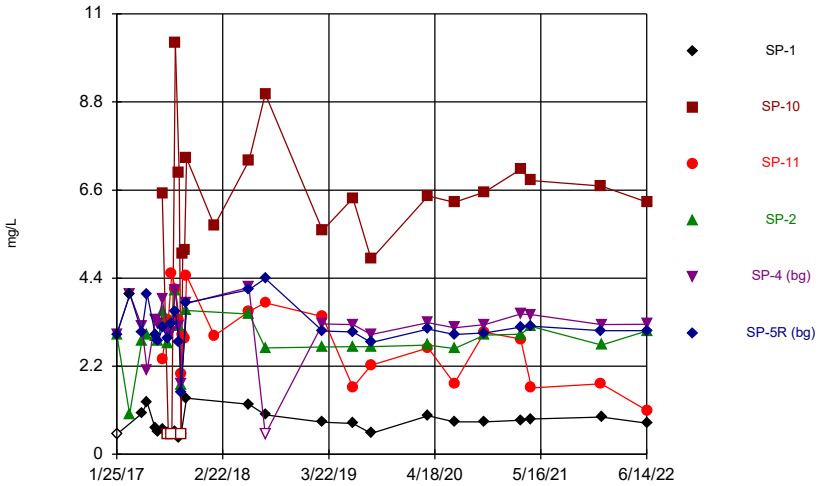
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Fluoride Analysis Run 8/30/2022 2:18 PM View: Appendix IV
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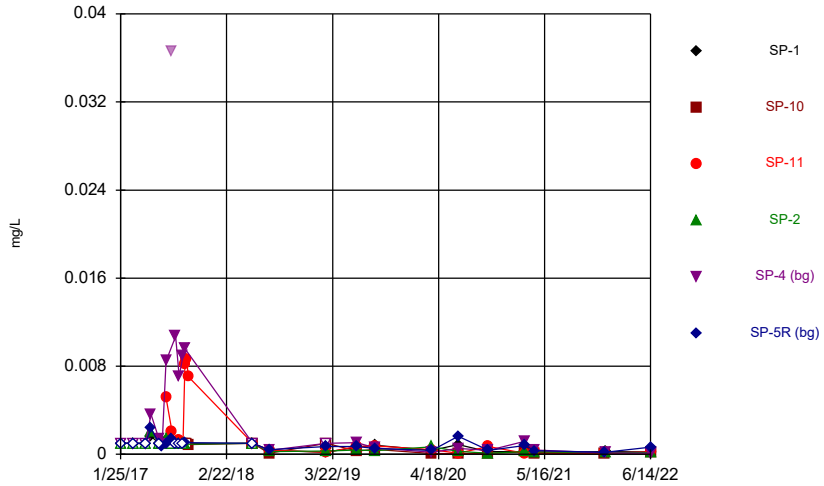
Hollow symbols indicate censored values.

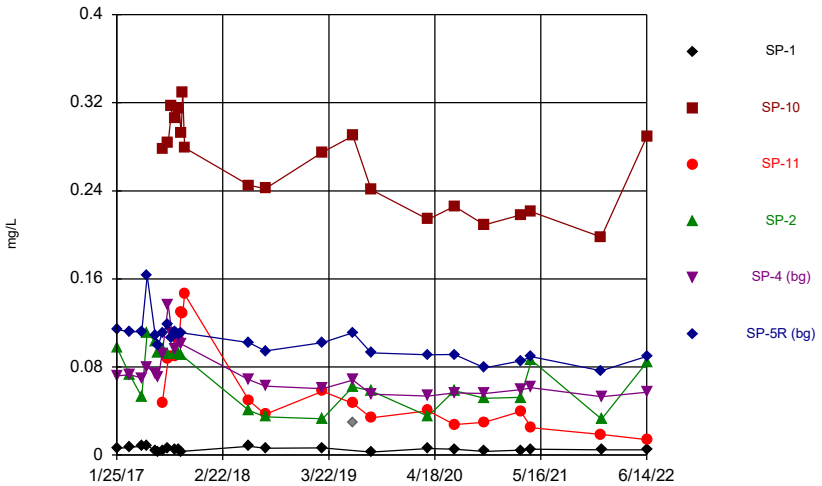
Time Series



Constituent: Lead Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Lithium Analysis Run 8/30/2022 2:18 PM View: Appendix IV
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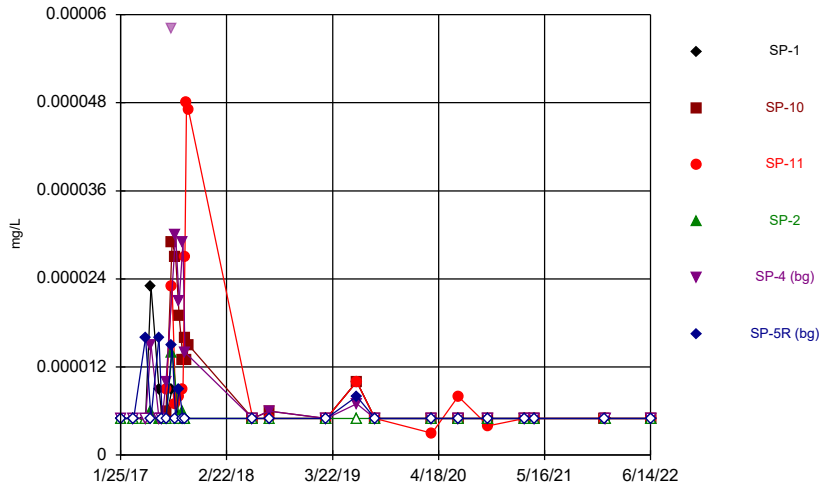
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Mercury Analysis Run 8/30/2022 2:18 PM View: Appendix IV
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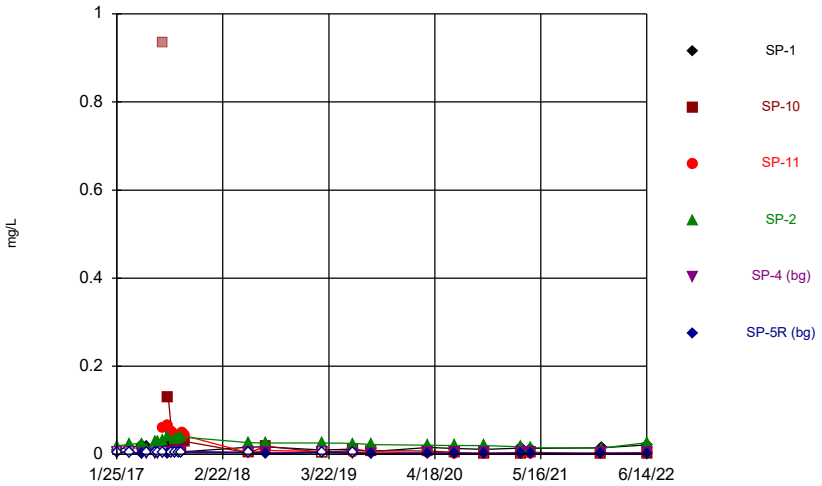
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

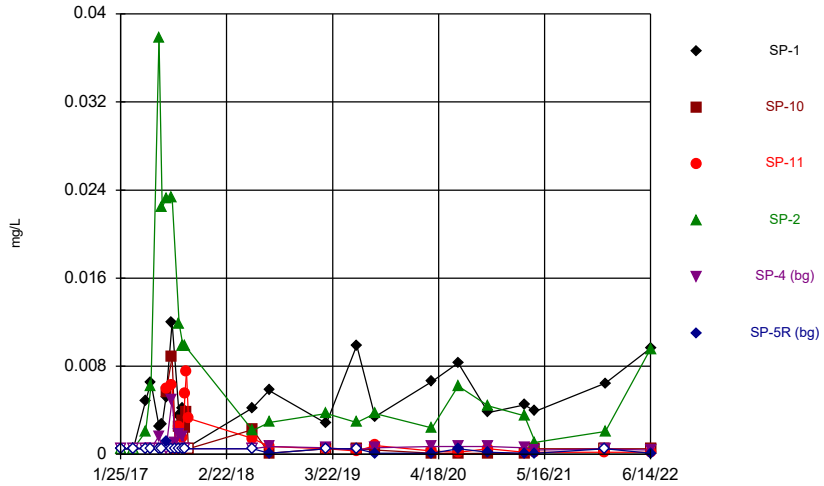
Time Series



Constituent: Molybdenum Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

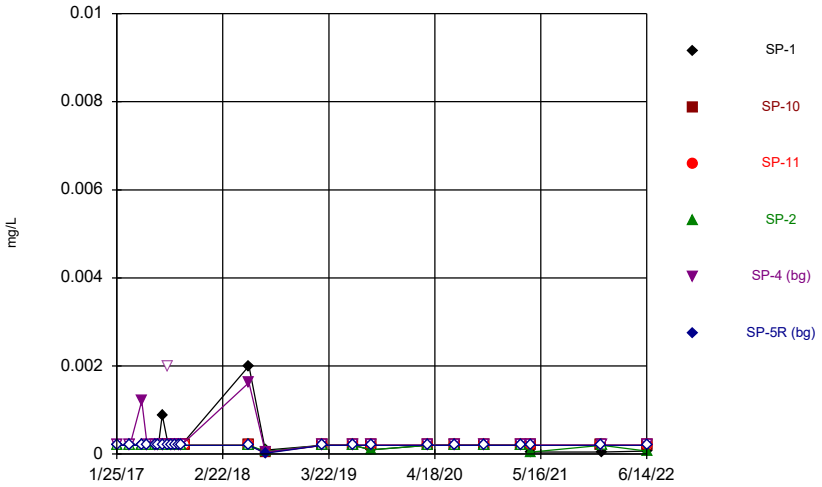
Time Series



Constituent: Selenium Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

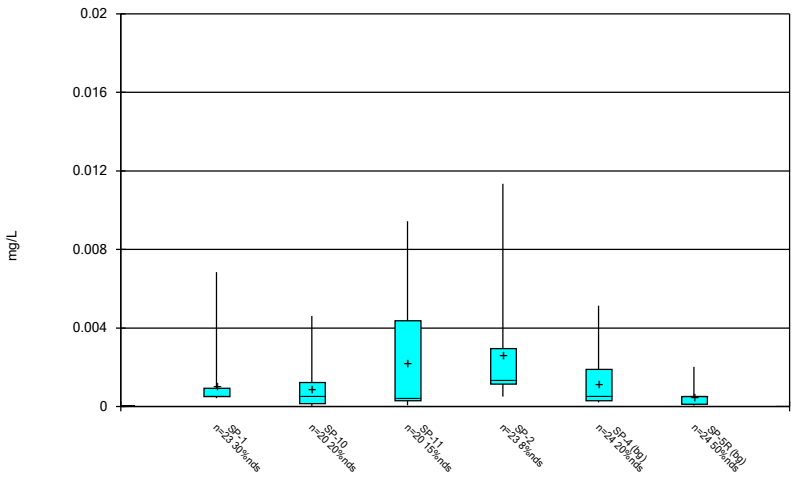
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Thallium Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

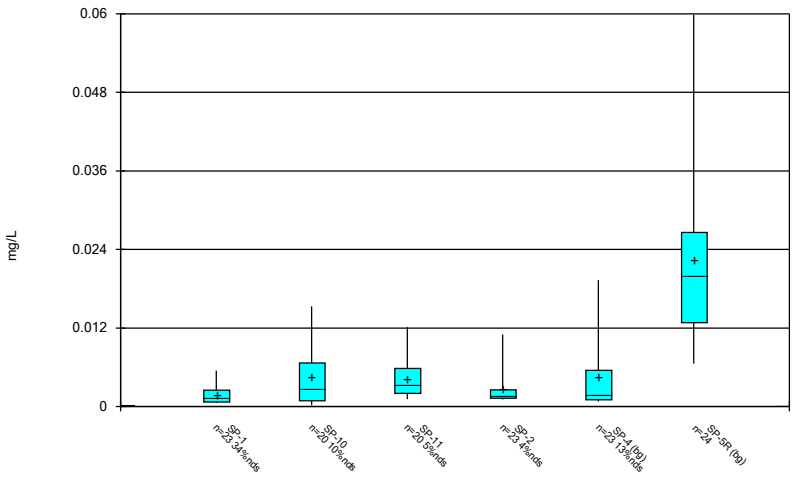
Box & Whiskers Plot



Constituent: Antimony Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

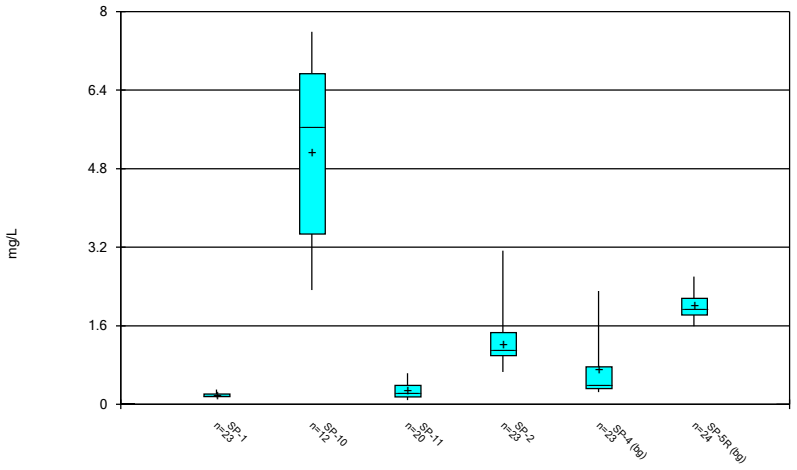
Box & Whiskers Plot



Constituent: Arsenic Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

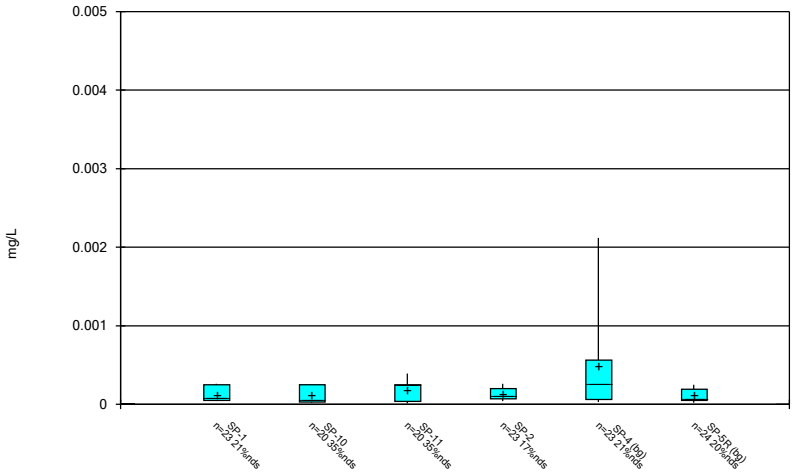
Box & Whiskers Plot



Constituent: Barium Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

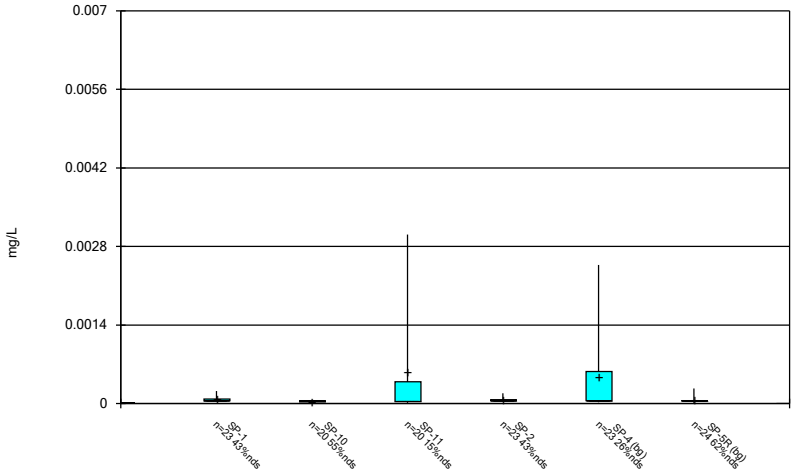
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Beryllium Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

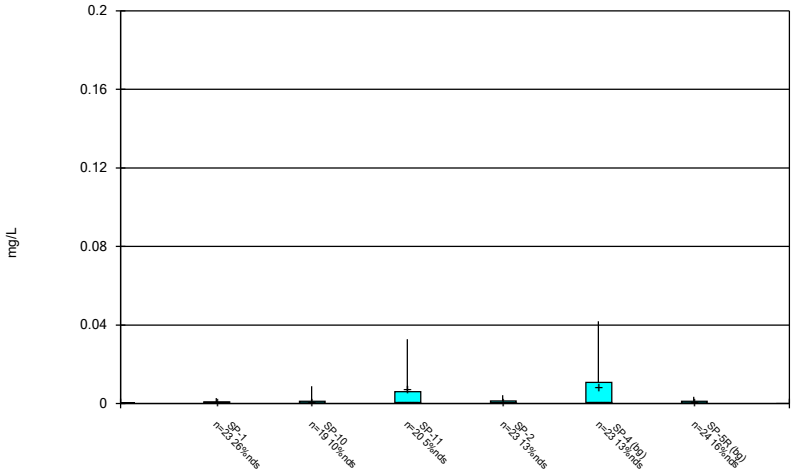
Box & Whiskers Plot



Constituent: Cadmium Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

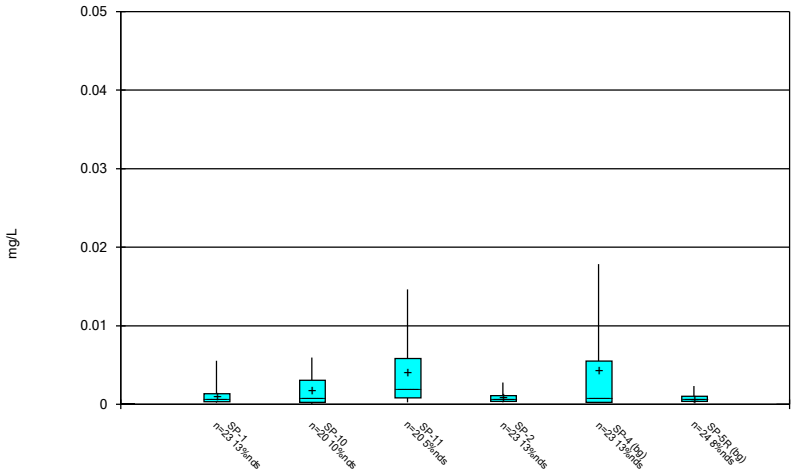
Box & Whiskers Plot



Constituent: Chromium Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

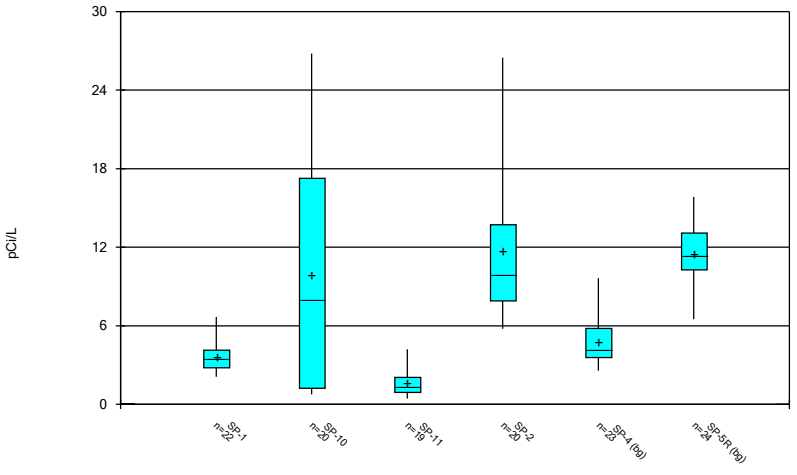
Box & Whiskers Plot



Constituent: Cobalt Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

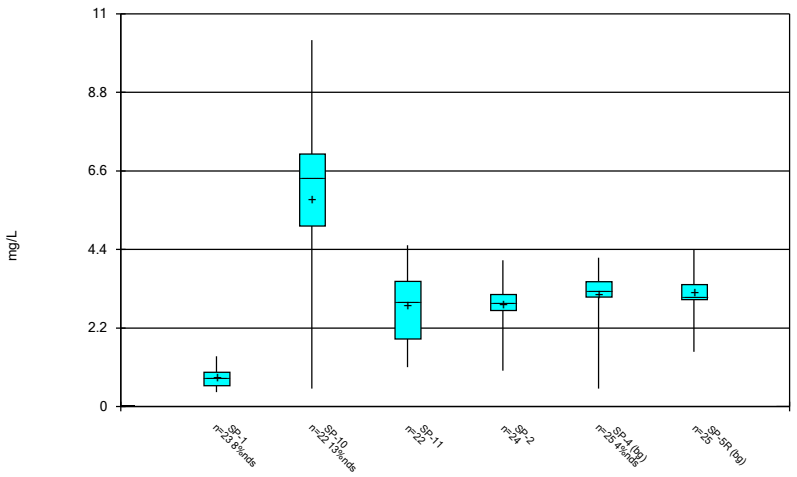
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

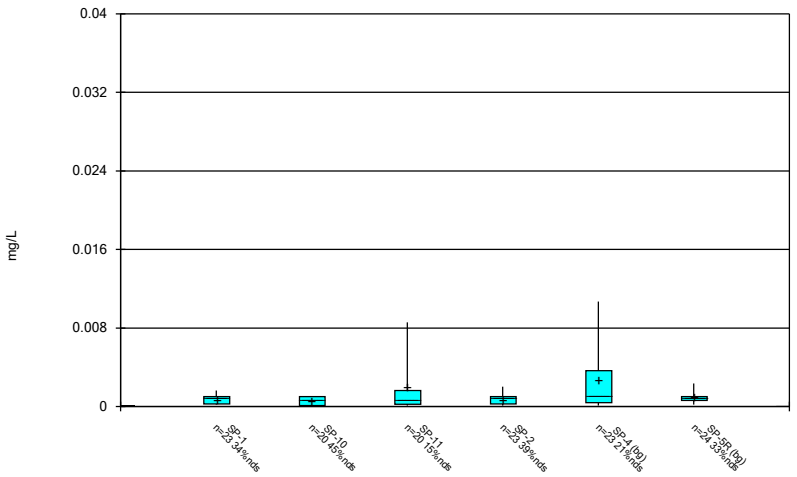
Box & Whiskers Plot



Constituent: Fluoride Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

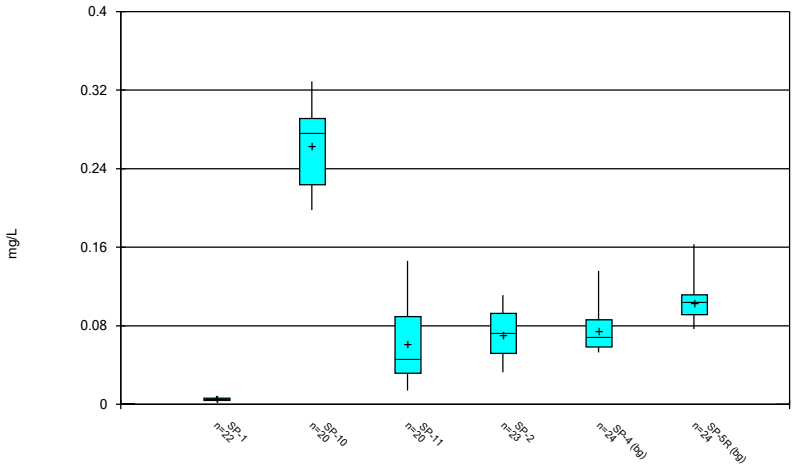
Box & Whiskers Plot



Constituent: Lead Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

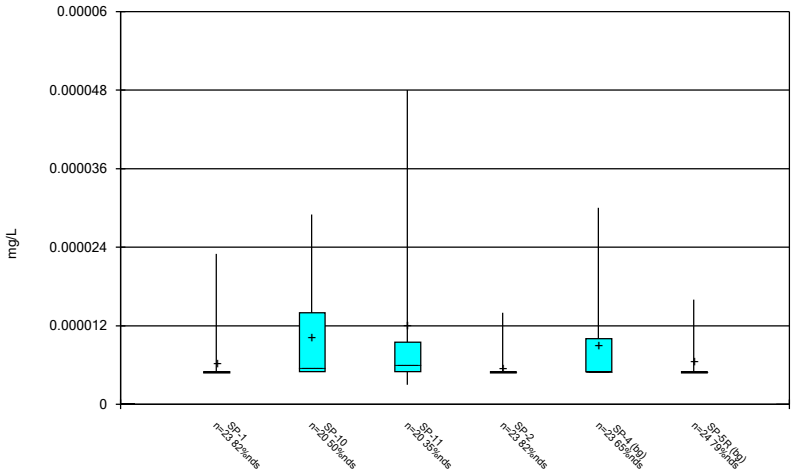
Box & Whiskers Plot



Constituent: Lithium Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

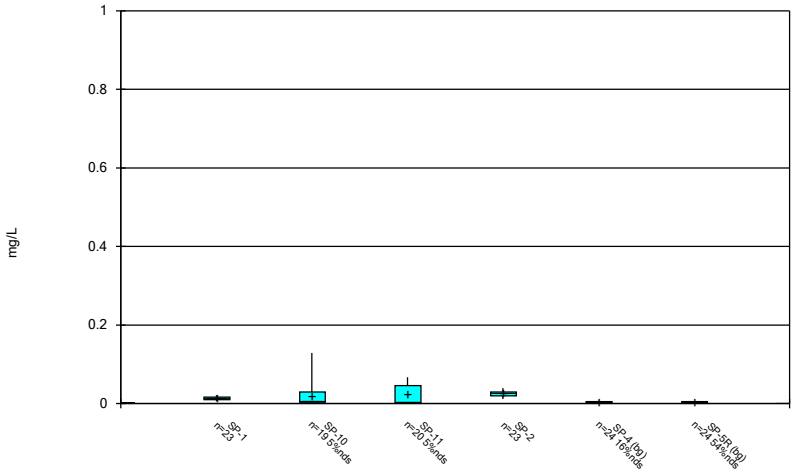
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Mercury Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

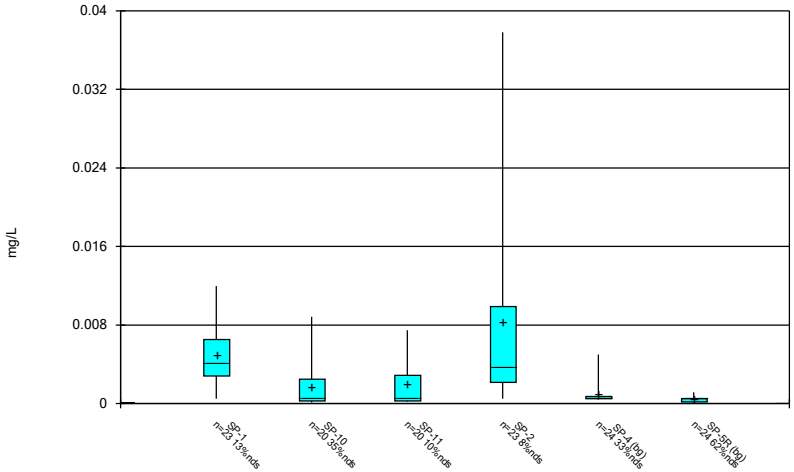
Box & Whiskers Plot



Constituent: Molybdenum Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

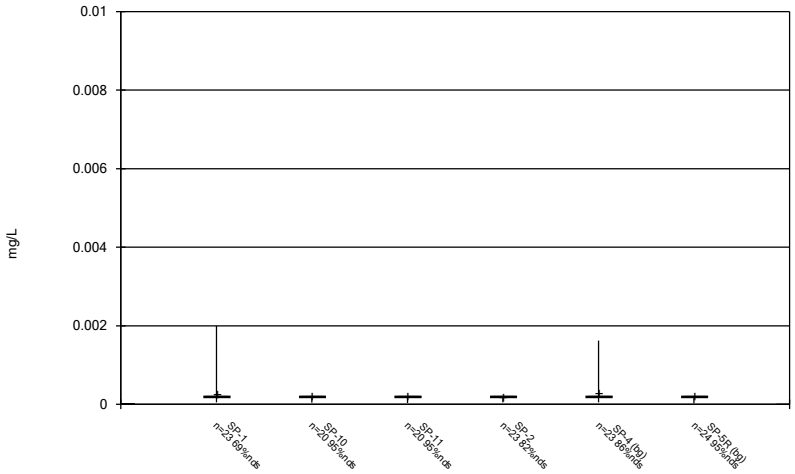
Box & Whiskers Plot



Constituent: Selenium Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium Analysis Run 8/30/2022 2:20 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 8/8/2022, 3:12 PM

	SP-4 Arsenic (mg/L)	SP-4 Barium (mg/L)	SP-4 Beryllium (mg/L)	SP-4 Cadmium (mg/L)	SP-10 Chromium (mg/L)	SP-4 Chromium (mg/L)	SP-4 Cobalt (mg/L)	SP-1 Combined Radium 226 + 228 (pCi/L)	SP-11 Combined Radium 226 + 228 (pCi/L)	SP-1 Fluoride (mg/L)
3/13/2017										4 (o)
6/27/2017								14.29 (o)		
7/13/2017					0.11 (o)					
8/4/2017	0.04498 (o)	4.59 (o)	0.00497 (o)	0.00655 (o)		0.08415 (o)	0.04069 (o)		25.367 (o)	
6/20/2019										

	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)	SP-10 Molybdenum (mg/L)	SP-4 Thallium (mg/L)
3/13/2017					
6/27/2017					
7/13/2017				0.934 (o)	
8/4/2017	0.03663 (o)		5.8E-05 (o)		<0.0002 (o)
6/20/2019		0.03 (Jo)			

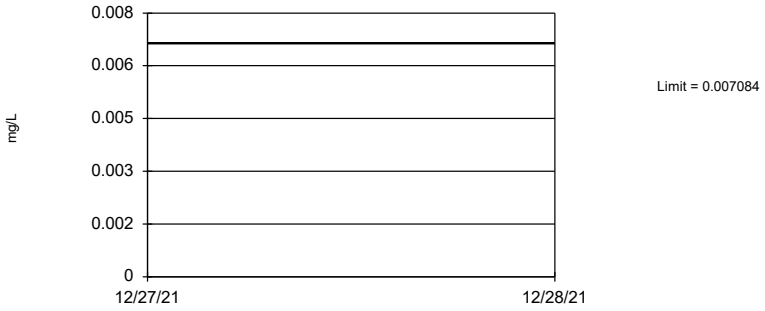
Upper Tolerance Limits Summary Table

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 3/22/2022, 10:42 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	n/a	0.007084	n/a	n/a	n/a	n/a	46	-7.866	1.398	36.96	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	n/a	0.05715	n/a	n/a	n/a	n/a	45	0.2106	0.08347	6.667	None	x^(1/3)	0.05	Inter
Barium (mg/L)	n/a	2.6	n/a	n/a	n/a	n/a	45	n/a	n/a	0	n/a	n/a	0.09944	NP Inter(normality)
Beryllium (mg/L)	n/a	0.00212	n/a	n/a	n/a	n/a	45	n/a	n/a	22.22	n/a	n/a	0.09944	NP Inter(normality)
Cadmium (mg/L)	n/a	0.00247	n/a	n/a	n/a	n/a	45	n/a	n/a	46.67	n/a	n/a	0.09944	NP Inter(normality)
Chromium (mg/L)	n/a	0.04182	n/a	n/a	n/a	n/a	45	n/a	n/a	15.56	n/a	n/a	0.09944	NP Inter(normality)
Cobalt (mg/L)	n/a	0.01786	n/a	n/a	n/a	n/a	45	n/a	n/a	11.11	n/a	n/a	0.09944	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	n/a	15.84	n/a	n/a	n/a	n/a	45	n/a	n/a	0	n/a	n/a	0.09944	NP Inter(normality)
Fluoride (mg/L)	n/a	4.39	n/a	n/a	n/a	n/a	48	n/a	n/a	2.083	n/a	n/a	0.08526	NP Inter(normality)
Lead (mg/L)	n/a	0.0107	n/a	n/a	n/a	n/a	45	n/a	n/a	28.89	n/a	n/a	0.09944	NP Inter(normality)
Lithium (mg/L)	n/a	0.1404	n/a	n/a	n/a	n/a	46	0.08976	0.02426	0	None	No	0.05	Inter
Mercury (mg/L)	n/a	0.00003	n/a	n/a	n/a	n/a	45	n/a	n/a	71.11	n/a	n/a	0.09944	NP Inter(NDs)
Molybdenum (mg/L)	n/a	0.01	n/a	n/a	n/a	n/a	46	n/a	n/a	36.96	n/a	n/a	0.09447	NP Inter(normality)
Selenium (mg/L)	n/a	0.00499	n/a	n/a	n/a	n/a	46	n/a	n/a	50	n/a	n/a	0.09447	NP Inter(normality)
Thallium (mg/L)	n/a	0.00162	n/a	n/a	n/a	n/a	45	n/a	n/a	91.11	n/a	n/a	0.09944	NP Inter(NDs)

Tolerance Limit

Interwell Parametric



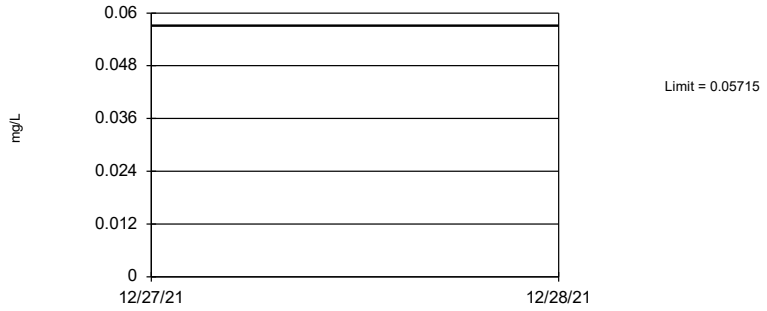
95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.866, Std. Dev.=1.398, n=46, 36.96% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9381, critical = 0.927. Report alpha = 0.05.

Constituent: Antimony Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Parametric



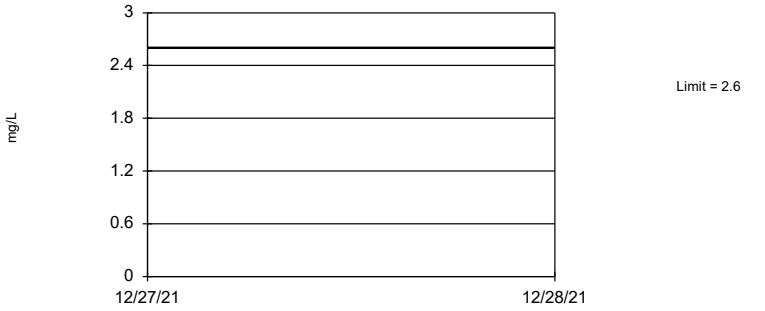
95% coverage. Background Data Summary (based on cube root transformation): Mean=0.2106, Std. Dev.=0.08347, n=45, 6.667% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9293, critical = 0.926. Report alpha = 0.05.

Constituent: Arsenic Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



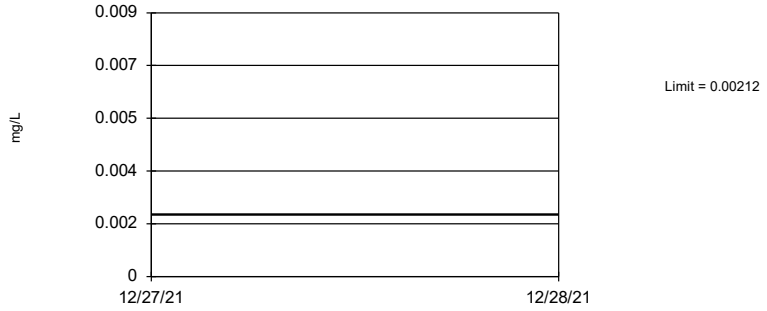
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Barium Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric

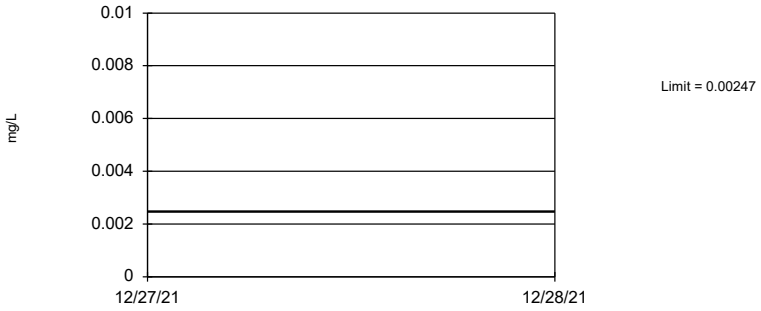


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 22.22% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Beryllium Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



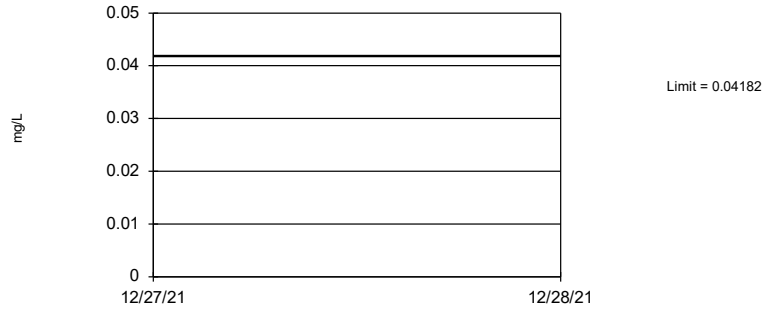
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 46.67% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Cadmium Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



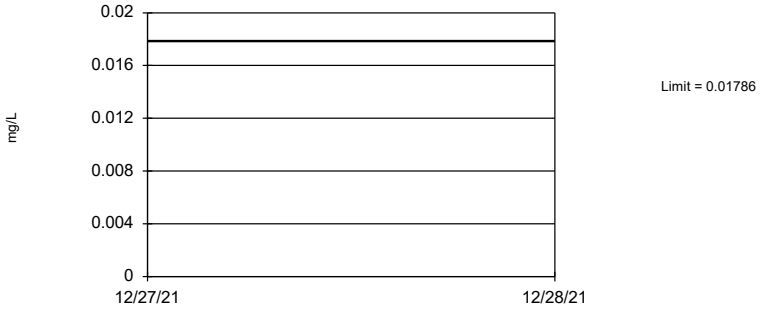
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 15.56% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Chromium Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



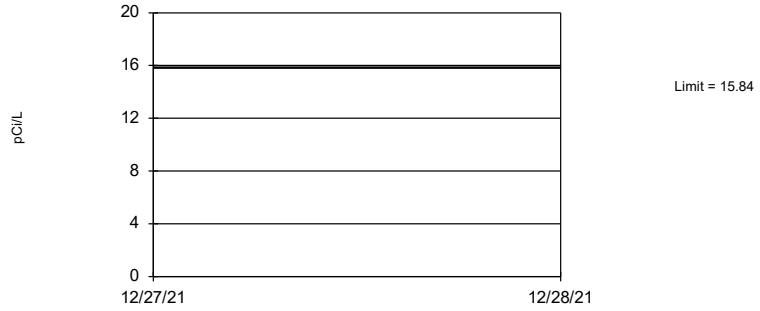
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 11.11% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Cobalt Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric

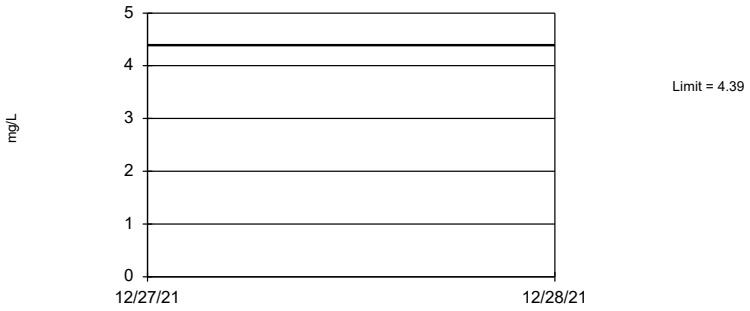


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Combined Radium 226 + 228 Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



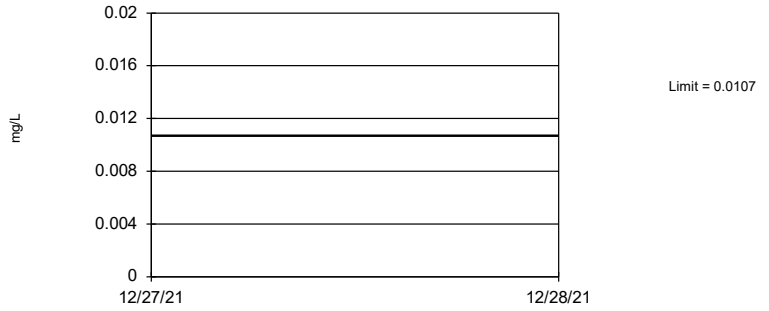
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 48 background values. 2.083% NDs. 90.82% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08526.

Constituent: Fluoride Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



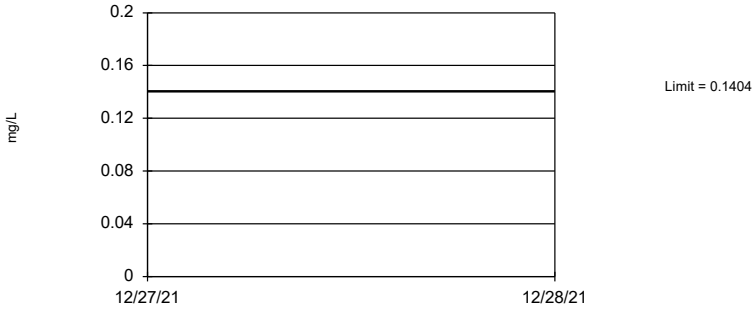
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 28.89% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Lead Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Parametric



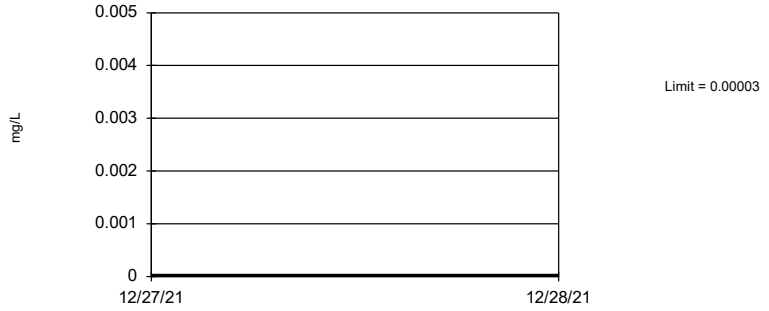
95% coverage. Background Data Summary: Mean=0.08976, Std. Dev.=0.02426, n=46. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9416, critical = 0.927. Report alpha = 0.05.

Constituent: Lithium Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric

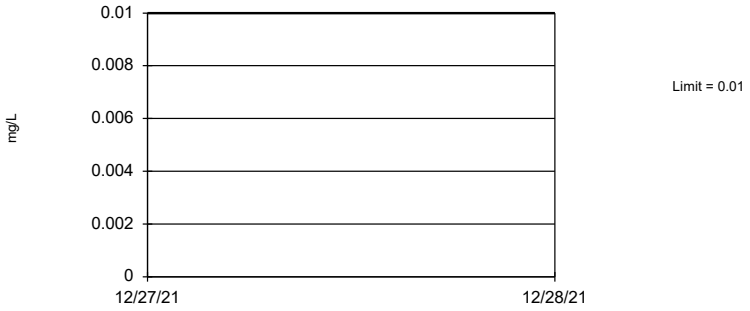


Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 45 background values. 71.11% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Mercury Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 46 background values. 36.96% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09447.

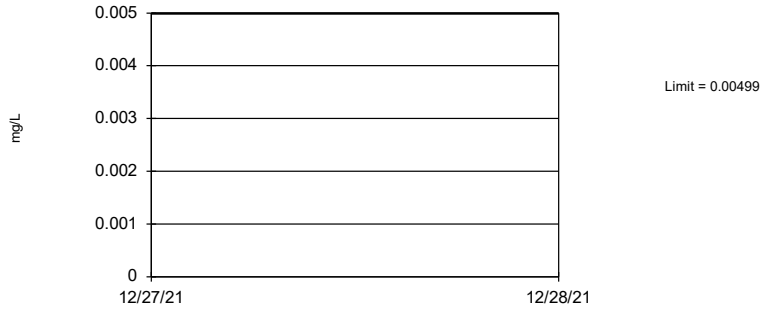
Constituent: Molybdenum Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 46 background values. 50% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09447.

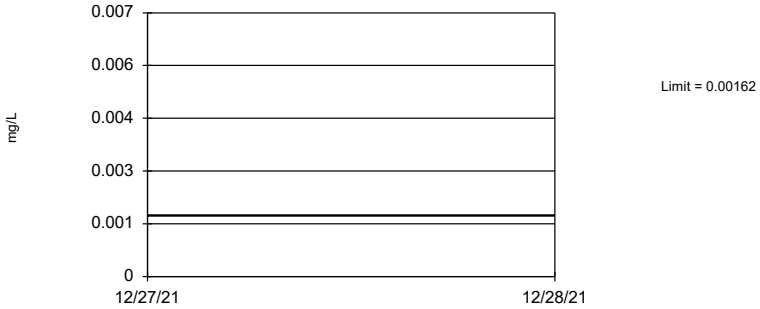
Constituent: Selenium Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 45 background values. 91.11% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

Constituent: Thallium Analysis Run 3/22/2022 10:40 AM View: Appendix IV - UTLs

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

NORTHEASTERN BAP GWPS				
Constituent Name	**MCL**	**CCR-Rule Specified Level**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006		0.0071	0.0071
Arsenic, Total (mg/L)	0.01		0.057	0.057
Barium, Total (mg/L)	2		2.6	2.6
Beryllium, Total (mg/L)	0.004		0.0021	0.004
Cadmium, Total (mg/L)	0.005		0.0025	0.005
Chromium, Total (mg/L)	0.1		0.042	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.018	0.018
Combined Radium, Total (pCi/L)	5		15.84	15.84
Fluoride, Total (mg/L)	4		4.39	4.39
Lead, Total (mg/L)	n/a	0.015	0.011	0.015
Lithium, Total (mg/L)	n/a	0.04	0.14	0.14
Mercury, Total (mg/L)	0.002		0.00003	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.01	0.1
Selenium, Total (mg/L)	0.05		0.005	0.05
Thallium, Total (mg/L)	0.002		0.0016	0.002

**Grey cell indicates Background Limit is higher than MCL*

**GWPS = Groundwater Protection Standard*

**MCL = Maximum Contaminant Level*

**CCR = Coal Combustion Residuals*

Confidence Interval - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 8/30/2022, 2:23 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.594**	**3.659**	**2.6**	**Yes**	**12**	**0**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**7.254**	**5.171**	**4.39**	**Yes**	**22**	**13.64**	**x^2**	**0.01**	**Param.**
Lithium (mg/L)	**SP-10**	**0.2864**	**0.2404**	**0.14**	**Yes**	**20**	**0**	**No**	**0.01**	**Param.**

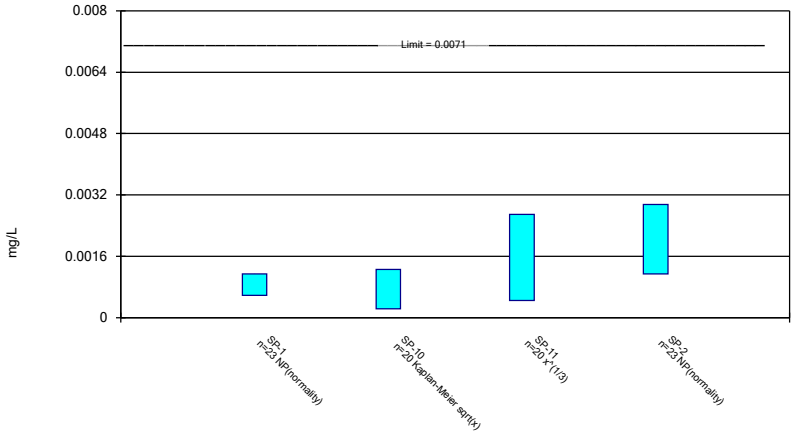
Confidence Interval - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 8/30/2022, 2:23 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00114	0.00058	0.0071	No	23	30.43	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.00126	0.0002275	0.0071	No	20	20	sqrt(x)	0.01	Param.
Antimony (mg/L)	SP-11	0.002695	0.0004495	0.0071	No	20	15	x^(1/3)	0.01	Param.
Antimony (mg/L)	SP-2	0.00295	0.00114	0.0071	No	23	8.696	No	0.01	NP (normality)
Arsenic (mg/L)	SP-1	0.001272	0.0006887	0.057	No	23	34.78	ln(x)	0.01	Param.
Arsenic (mg/L)	SP-10	0.005835	0.001509	0.057	No	20	10	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.005939	0.002519	0.057	No	20	5	No	0.01	Param.
Arsenic (mg/L)	SP-2	0.00254	0.00128	0.057	No	23	4.348	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.2066	0.1662	2.6	No	23	0	No	0.01	Param.
Barium (mg/L)	**SP-10**	**6.594**	**3.659**	**2.6**	**Yes**	**12**	**0**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.3698	0.1807	2.6	No	20	0	No	0.01	Param.
Barium (mg/L)	SP-2	1.386	0.9815	2.6	No	23	0	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.00026	0.00005	0.004	No	23	21.74	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.0025	0.00003	0.004	No	20	35	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.0025	0.00003	0.004	No	20	35	No	0.01	NP (normality)
Beryllium (mg/L)	SP-2	0.0002	0.00007	0.004	No	23	17.39	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.0002	0.00008	0.005	No	23	43.48	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.0002	0.000021	0.005	No	20	55	No	0.01	NP (NDs)
Cadmium (mg/L)	SP-11	0.0003893	0.00005019	0.005	No	20	15	ln(x)	0.01	Param.
Cadmium (mg/L)	SP-2	0.0002	0.00006	0.005	No	23	43.48	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.0009329	0.0004677	0.1	No	23	26.09	ln(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.001107	0.000298	0.1	No	19	10.53	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.00472	0.000676	0.1	No	20	5	ln(x)	0.01	Param.
Chromium (mg/L)	SP-2	0.001537	0.0005699	0.1	No	23	13.04	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-1	0.001281	0.0004727	0.018	No	23	13.04	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.002317	0.0005156	0.018	No	20	10	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-11	0.005575	0.001289	0.018	No	20	5	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-2	0.001123	0.0004879	0.018	No	23	13.04	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.133	3.069	15.84	No	22	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	14.95	4.817	15.84	No	20	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.138	1.047	15.84	No	19	0	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	13.99	8.718	15.84	No	20	0	sqrt(x)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9428	0.6622	4.39	No	23	8.696	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**7.254**	**5.171**	**4.39**	**Yes**	**22**	**13.64**	**x^2**	**0.01**	**Param.**
Fluoride (mg/L)	SP-11	3.358	2.339	4.39	No	22	0	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.202	2.655	4.39	No	24	0	x^2	0.01	Param.
Lead (mg/L)	SP-1	0.002	0.000259	0.015	No	23	34.78	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.002	0.0001	0.015	No	20	45	No	0.01	NP (normality)
Lead (mg/L)	SP-11	0.002506	0.0004524	0.015	No	20	15	x^(1/3)	0.01	Param.
Lead (mg/L)	SP-2	0.002	0.000253	0.015	No	23	39.13	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006181	0.004477	0.14	No	22	0	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2864**	**0.2404**	**0.14**	**Yes**	**20**	**0**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.0851	0.03925	0.14	No	20	0	No	0.01	Param.
Lithium (mg/L)	SP-2	0.08403	0.05715	0.14	No	23	0	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	No	23	82.61	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000015	0.000005	0.002	No	20	50	No	0.01	NP (normality)
Mercury (mg/L)	SP-11	0.00001	0.000005	0.002	No	20	35	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	No	23	82.61	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01561	0.01082	0.1	No	23	0	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.0229	0.003682	0.1	No	19	5.263	x^(1/3)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.0469	0.00215	0.1	No	20	5	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02929	0.02105	0.1	No	23	0	No	0.01	Param.
Selenium (mg/L)	SP-1	0.00645	0.003314	0.05	No	23	13.04	No	0.01	Param.
Selenium (mg/L)	SP-10	0.001805	0.0002167	0.05	No	20	35	x^(1/3)	0.01	Param.
Selenium (mg/L)	SP-11	0.001829	0.0004073	0.05	No	20	10	ln(x)	0.01	Param.
Selenium (mg/L)	SP-2	0.01074	0.003089	0.05	No	23	8.696	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.00089	0.0001	0.002	No	23	69.57	No	0.01	NP (NDs)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	No	20	95	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	No	20	95	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.0001	0.002	No	23	82.61	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

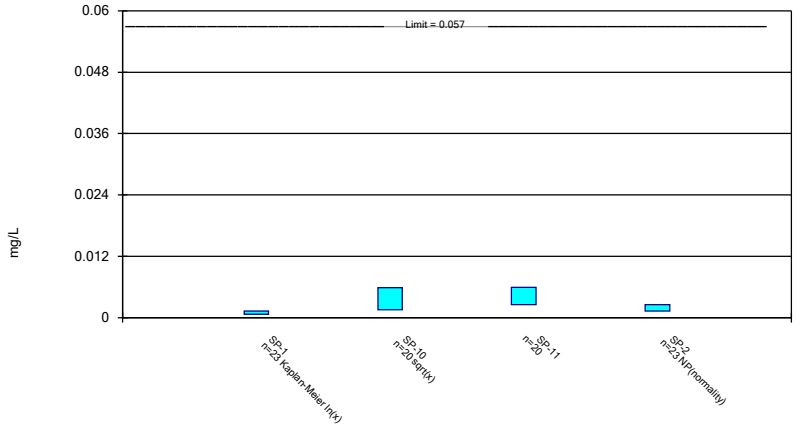
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

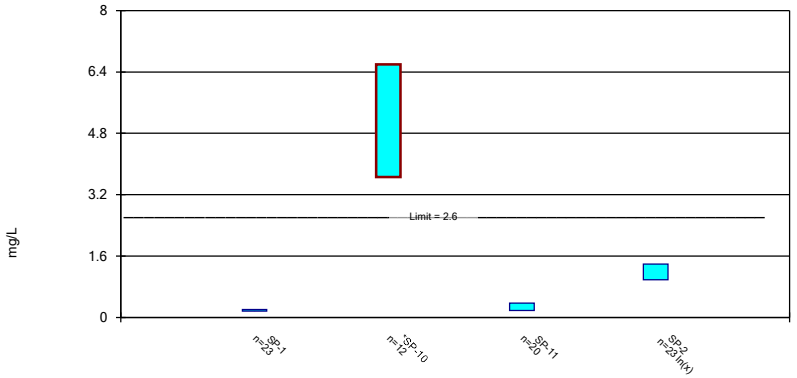
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

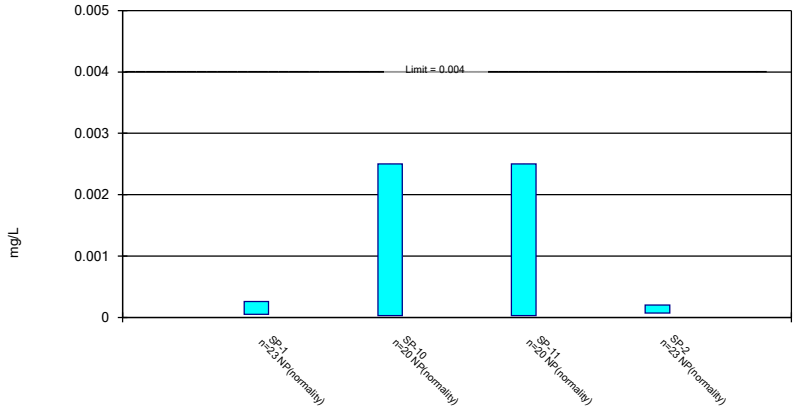
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

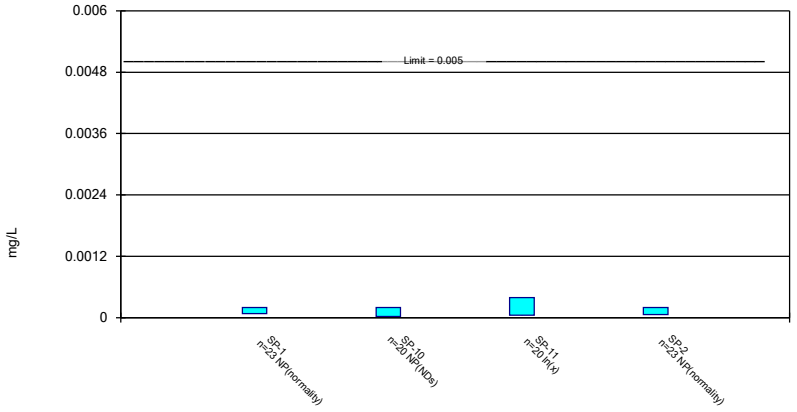
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Beryllium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

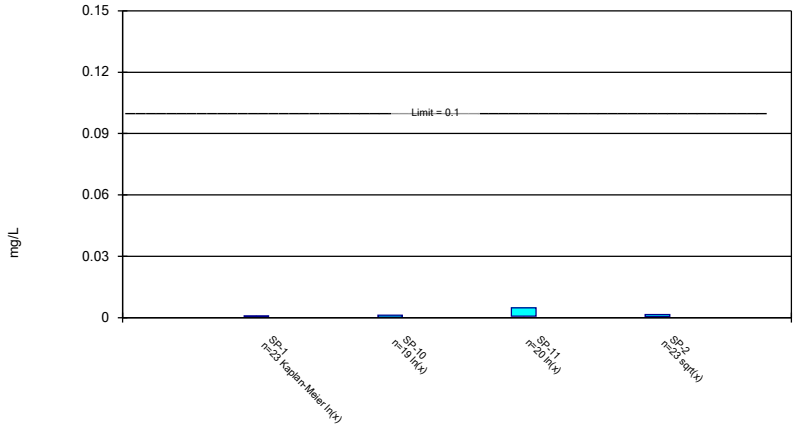
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

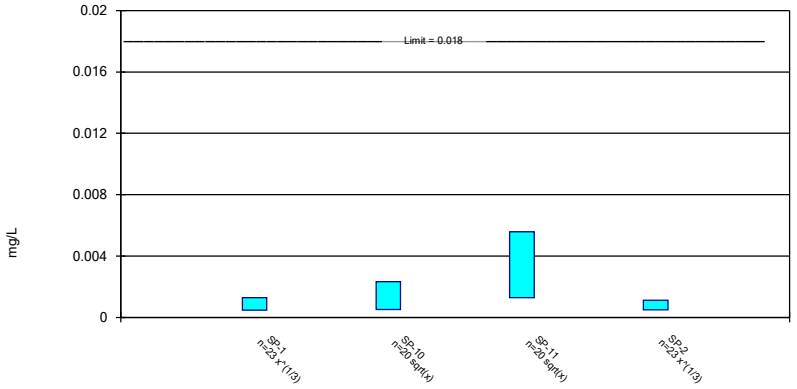
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

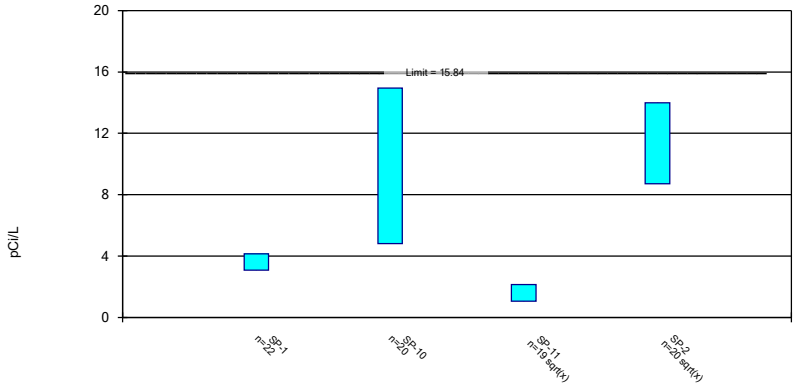
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

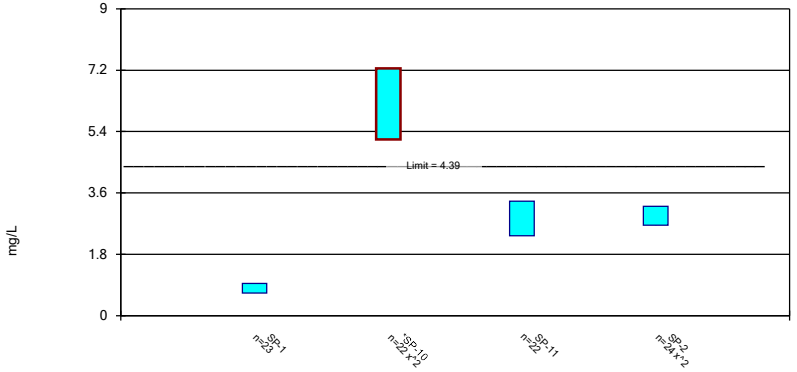
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

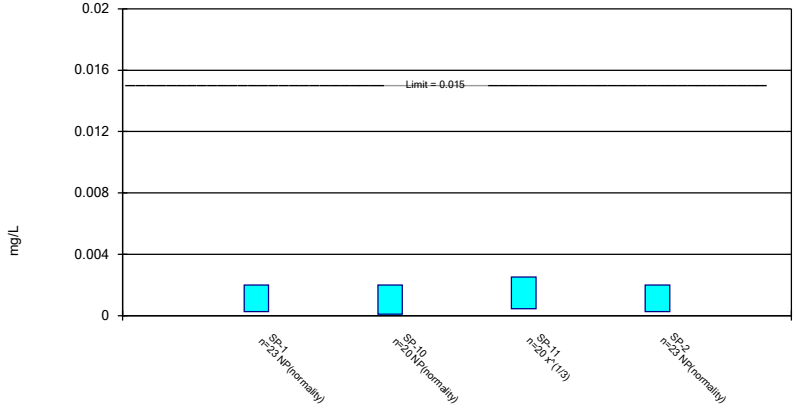
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

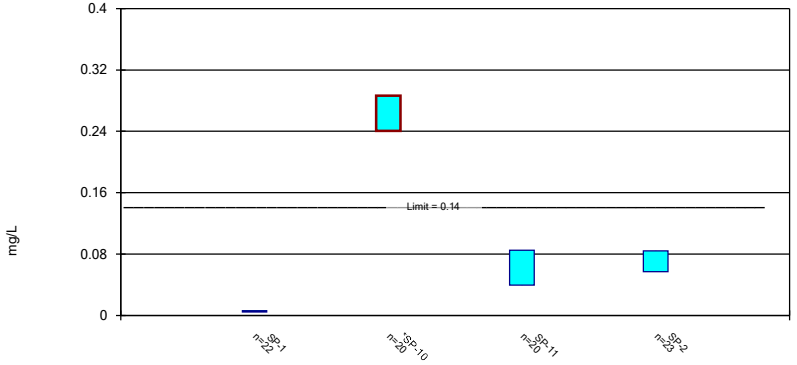
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lead Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

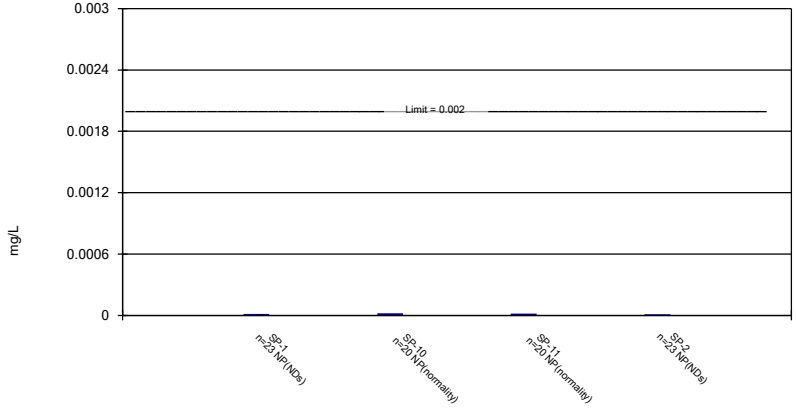
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

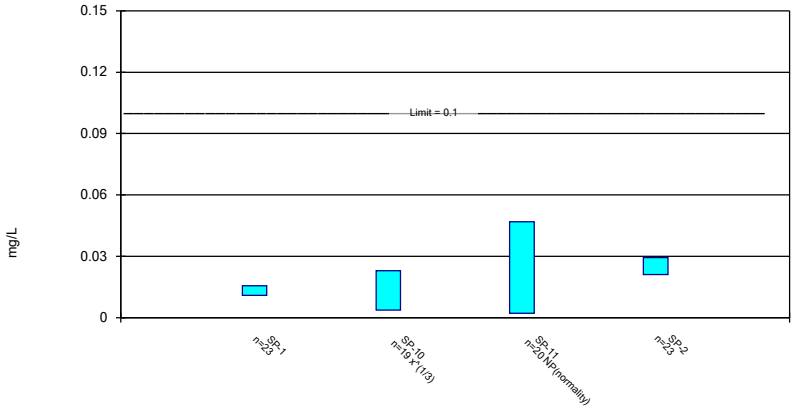
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 8/30/2022 2:22 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

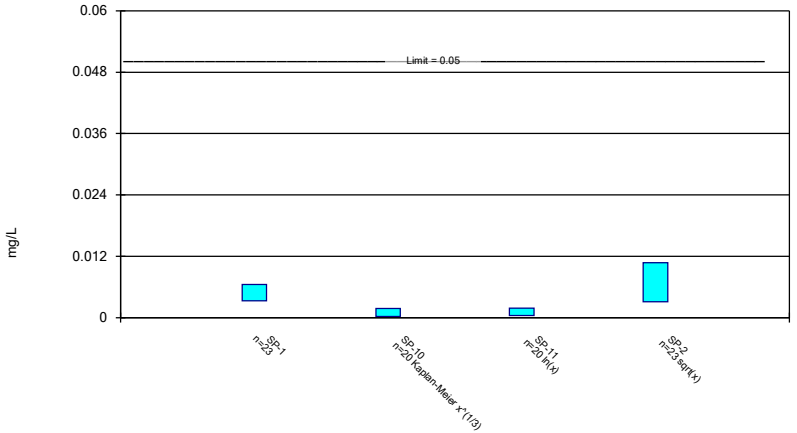
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 8/30/2022 2:22 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

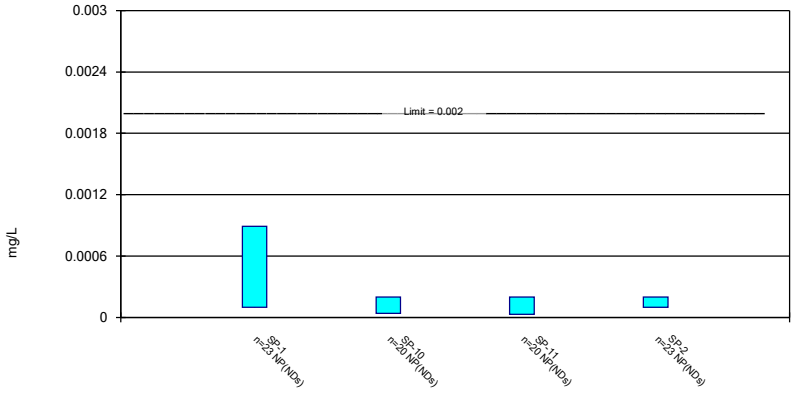
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 8/30/2022 2:22 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium Analysis Run 8/30/2022 2:22 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

APPENDIX 3

Alternative Source Demonstrations

Scott A. Thompson
Executive Director

OKLAHOMA Environmental Quality

Kevin Stitt
Governor

September 20, 2022

Ms. Jill Parker-Witt, P.E.
American Electric Power
502 North Allen Avenue
Shreveport, LA 71101

Re: Alternate Source Demonstration for Barium, Fluoride and Lithium Exceedance – Bottom Ash Pond
Public Service Company of Oklahoma - Northeastern Power Station
Rogers County
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

On October 29, 2019, the Oklahoma Department of Environmental Quality (DEQ) approved the revised alternate source demonstration (ASD) for lithium detected in monitoring well SP-10 for the Bottom Ash Pond (BAP). The ASD proposed that naturally occurring lithium was the source of the statistically significant level (SSL) above the groundwater protection standard (GWPS) in SP-10 during the 2018 sampling events. On June 3, 2021, DEQ approved an ASD for fluoride exceedances detected in SP-10 for the BAP.

In a July 15, 2022 email, American Electric Power Public Service Company of Oklahoma – Northeastern Power Station (AEP) submitted a notification of barium, lithium and fluoride exceedances in SP-10 during the second 2021 semi-annual sampling event conducted on December 27, 2021. Additionally, an ASD for barium in SP-10 for the BAP was submitted.

In an email to AEP dated November 9, 2021, DEQ addressed the ASDs for lithium and fluoride in SP-10 with respect to all sampling events performed by AEP. The ASDs are applicable for lithium and fluoride exceedances of their relative GWPS in SP-10 if conditions have not changed. AEP provided sampling evidence that conditions in the BAP have not changed.

DEQ reviewed the ASD for barium. Sediment was collected from the BAP on July 10, 2019. Barium in pore water was measured at 0.083 mg/L, and extractable barium from the BAP solids was measured at 0.352 mg/L. A surface water sample collected from the BAP on February 5, 2019 had a reported barium concentration of 0.315 mg/L. These barium concentrations are roughly an order of magnitude below the barium concentration collected on April 12, 2021 from SP-10 (6.36 mg/L) and the GWPS (2.60 mg/L). A comparison of the BAP pore water and extractable barium samples with SP-10 groundwater samples using Piper diagrams also showed dissimilar fingerprinting signatures.

The shale lenses observed within the screened interval of SP-10 are predominantly composed of clay minerals such as kaolinite (2 wt.%), chlorite (3 wt. %), illite (38 wt.%), and mixed layer illite-smectite (24 wt.%). Laboratory studies indicate that elevated barium concentrations may be associated with

these clay minerals due to their cation exchange capacity. AEP proposes that the clay minerals are the source of the barium exceedances and not the BAP. DEQ concurs with AEP's demonstration and accepts the ASD for barium in SP-10.

The ASD is applicable for Ba exceedances in SP-10 of the GWPS if conditions do not change. AEP may refer to the ASD approval for Ba and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B). If exceedances of GWPSs are determined in other monitoring wells, AEP is required to submit a separate ASD for constituents in those monitoring wells if applicable.

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114 or at cindy.hailes@deq.ok.gov.

Sincerely,

Hillary Young, P.E.
Chief Engineer
Land Protection Division

HY/ckh

ALTERNATIVE SOURCE DEMONSTRATION REPORT STATE CCR RULE

Northeastern Power Station
Bottom Ash Pond
Oologah, Oklahoma

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, OH 43221

July 2022

CHA8495

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ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
BAP	Bottom Ash Pond
CCR	Coal Combustion Residuals
EPRI	Electric Power Research Institute
ft bgs	Feet Below Ground Surface
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
OGS	Oklahoma Geological Survey
SPLP	Synthetic Precipitation Leaching Procedure
SSL	Statistically Significant Level
SU	Standard Units
USEPA	United States Environmental Protection Agency
XRD	X-Ray Diffraction

SECTION 1

INTRODUCTION AND SUMMARY

This Alternative Source Demonstration (ASD) report has been prepared to address statistically significant levels (SSLs) above the site-specific groundwater protection standard (GWPS) of barium, fluoride, and lithium in groundwater from a compliance monitoring well at the Northeastern Power Station Bottom Ash Pond (BAP; the Site), in Oologah, Oklahoma. The BAP is a regulated coal combustion residuals (CCR) management unit at the Northeastern Power Station. A semi-annual assessment monitoring event was conducted at the BAP in December 2021 in accordance with Oklahoma Administrative Code (OAC) 252:517-9-6(d)(1).

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. GWPSs were re-established for each Appendix B parameter in accordance with United States Environmental Protection Agency's (USEPA's) *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* (Unified Guidance; USEPA, 2009). Confidence intervals were calculated for Appendix B parameters at the BAP compliance wells to assess whether Appendix B parameters were present at an SSL above the GWPS. An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS).

The following SSLs were identified at the Northeastern BAP for the second semi-annual assessment monitoring event of 2021 (Geosyntec, 2022):

- The LCL for barium exceeded the GWPS of 2.60 mg/L at SP-10 (3.42 mg/L).
- The LCL for fluoride exceeded the GWPS of 4.39 mg/L at SP-10 (5.11 mg/L).
- The LCL for lithium exceeded the GWPS of 0.140 mg/L at SP-10 (0.238 mg/L).

1.1 CCR Rule Requirements

Oklahoma Department of Environmental Quality (ODEQ) regulations regarding assessment monitoring of CCR landfills and surface impoundments provide owners and operators with the option to make an ASD when an SSL is identified (OAC 252:517-9-6(g)(3)(B)). An owner or operator may:

> *Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer and submitted to DEQ for approval. If a successful demonstration is made, the owner or operator must continue*

> *monitoring in accordance with the assessment monitoring program pursuant to this Section…*

Pursuant to OAC 252:517-9-6(g)(3)(B), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report to document that the SSLs identified for barium, fluoride, and lithium should not be attributed to the BAP.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which the identified SSL could be attributed. Alternative sources were identified amongst five types, based on methodology provided by the Electric Power Research Institute (EPRI; 2017):

- ASD Type I: Sampling Causes;
- ASD Type II: Laboratory Causes;
- ASD Type III: Statistical Evaluation Causes;
- ASD Type IV: Natural Variation; and
- ASD Type V: Alternative Sources.

A demonstration was conducted to show that the SSLs identified for barium, fluoride, and lithium at SP-10 were based on Type IV causes and not by a release from the BAP.

SECTION 2

SITE SETTING

A description of the regional and Site geology is provided below. Field efforts to characterize the Site geology are also described below.

2.1 Regional Geology

The generalized stratigraphic column of the regional geology in the Site vicinity is summarized below:

Series	Group	Formation
Desmoinesian	Marmaton	Oologah
		Labette
		Fort Scott Limestone
	Cherokee	Senora
		Boggy
		Savanna

The Site is underlain by the Oologah Formation. The Oologah Formation is characterized as a dark gray argillaceous limestone with a small amount of fissile shale (Oakes et al., 1952). The limestone is typically dense to moderately crystalline, unjointed, and thinly to massively bedded. The Oologah Formation is approximately 80 to 100 feet thick and is subdivided into three members, the Altamont Limestone, the Bandera Shale, and the Pawnee Limestone (in descending order) as described below:

- *Altamont Limestone*. Grayish orange pink to medium gray limestone, mudstone, wackestones and locally packstones. The texture varies from thin and somewhat wavy to medium planar and is influenced by the presence of fossil algal material. The bedding of the upper portion of the member is typically thinner than the lower portion (Oklahoma Geological Survey [OGS], 2005). The thickness of the Altamont Limestone typically ranges from approximately 65 to 100 feet.
- *Bandera Shale*. Medium dark gray to dark gray, well-laminated to fissile shale. The nearest published thickness of this member is approximately 2 feet about 13 miles south of the Site (OGS, 2005; Woodruff and Cooper, 1928).
- *Pawnee Limestone*. Medium gray, slightly wavy, thin to medium bedded limestone. The bedding is typically 2 to 4-inches thick but can reach 12 inches in thickness. The Pawnee Limestone contains abundant fossil debris and varies in thickness from approximately 19 to 22 feet (OGS, 2005).

The Oologah Formation is underlain by the Labette Formation, a grayish-brown to dark gray, laminated clayshale. The clayshale contains some zones of weakly calcareous shale, and multiple

horizons of sandy shale to sandstone. The thickness of the Labette Formation typically ranges from approximately 120 to 180 feet. A zone of alternating shale and sandstone (Peru Sandstone) or shale and limestone (Sageeyah Limestone) may be present near the top of the Labette Formation. This member (if present) does not typically contain fossils and varies in thickness up to 20 feet south of the Site (OGS, 2005).

The Labette Formation is underlain by the Fort Scott Formation which consists of three members, in descending order: the Higginsville Limestone; the Little Osage Shale; and the Blackjack Creek Limestone. The Fort Scott Formation limestone consists primarily of a light gray, thin to medium, wavy-bedded fossiliferous wackestone and mudstone (OGS, 2004).

2.2 Site Geology

Two soil borings (BAP-B1 and BAP-B2) were advanced in the vicinity of the BAP by Geosyntec staff in early 2019 to clarify the Site geology. The locations of these borings are shown on **Figure 1**. The deeper of those boring (BAP-B1) was advanced to 186 feet below ground surface (ft bgs). Detailed discussion of these borings, supplemented by boring logs and photologs, was provided in the 2019 ASD completed for lithium at SP-10 (Geosyntec, 2019). The borings and associated mineralogical analyses of rock samples indicated that limestone is present at depths to at least 72 ft bgs. This limestone unit is underlain by a shale unit. The following is a general summary of the geologic units encountered at BAP-B1:

Geologic Unit	Depth (ft bgs)	Elevation (ft amsl)[1]
Unconsolidated Soil	0 to 3	625.8 to 622.8
Limestone (Oologah Formation)	3 to 100	622.8 to 525.8
Shale (Labette Formation)	100 to 181	525.8 to 444.8
Limestone (Fort Scott Formation)	181 to 186	444.8 to 439.8

Note: 1. ft amsl = feet above mean sea level

The wells within the CCR compliance network (SP-1, SP-2, SP-4, SP-5R, SP-10, and SP-11) monitor the upper limestone unit (Oologah Limestone), which was determined to contain the shallow aquifer at the site. Monitoring well SP-10 is screened from 40.25-50.75 ft bgs. Based on the BAP-B1 boring log and logs for other borings near the BAP, the screened interval may be inclusive of the Altamont limestone member (upper portion of the Oologah Formation) and the Pawnee member (lower portion of the Oologah Formation). At several boring locations, thin horizons of shale (1-2 inches thick) were identified from elevations of approximately 25 to 75 ft bgs. A 2-inch thick shale horizon was found to occur around 46 ft bgs in multiple boring logs. This shale horizon may be the Bandera Shale.

Boring BAP-B2 was advanced in the vicinity of SP-10, the monitoring well containing SSLs for lithium, fluoride, and barium, and SP-9, its paired deeper well. A thin (approximately 2-inch thick) shale horizon was observed at 46 ft bgs, which is within the screened interval of SP-10. This horizon is underlain by interbedded shale and limestone. As described in the 2019 ASD (Geosyntec, 2019), samples were collected from four intervals at boring BAP-B2 for laboratory analysis, as summarized below:

Sample Depth (ft bgs)	Sample ID	Description
32.0-32.4	SP-10-LOG-1	Upper limestone
46.0-47.0	SP-10-LOG-2	Shale lens within the screened interval of SP-10
46.0-47.0	SP-10-LOG-3	Limestone within screened interval of SP-10
72.0-72.4	SP-10-LOG-4	Limestone within the screened interval of SP-9

X-ray diffraction (XRD) analysis of samples confirmed that limestone is present at depths to at least 72 ft bgs. The analyses also confirmed the horizon observed at 46 ft bgs is a shale lens comprised of primarily 2:1 high activity clay minerals illite and smectite. The mineralogy results of these samples are provided in **Table 1**.

SECTION 3

ALTERNATIVE SOURCE DEMONSTRATION

In accordance with OAC 252:517-9-6(g)(3)(B), the owner of operator of a CCR unit has 90 days from finding that any of the constituents listed in Appendix B have been detected at an SSL exceeding the GWPS to demonstrate that a source other than the CCR unit caused the SSL. The methodology used to evaluate the SSLs identified for barium, lithium, and fluoride at the BAP and the proposed alternative sources are described below.

3.1 Lithium

As described in previous ASDs (Geosyntec, 2019; Geosyntec, 2021a, Geosyntec, 2021b; Geosyntec, 2021c), lower concentrations of lithium in the BAP solid and liquid phases, including pore water, than those observed at SP-10 suggest that the BAP is not the source of this exceedance. Instead, the release of lithium from the clay minerals in the shale lens located at 46 ft bgs in the screened interval of SP-10 is the likely source of lithium in groundwater at that location.

Data from the December 2021 monitoring event indicate a lithium concentration of 0.198 mg/L at SP-10. This lithium concentration is consistent with previous results collected during the assessment monitoring period and continues to show no statistically significant positive trends (**Figure 2**). This is an indication that conditions have not changed substantially since the previous ASD was submitted (Geosyntec, 2021c).

3.2 Fluoride

As described in previous ASDs (Geosyntec, 2021a, Geosyntec, 2021b; Geosyntec, 2021c), lower concentrations of fluoride in the BAP solid and liquid phases, including pore water, than those observed at SP-10 suggest that the BAP is not the source of this exceedance. Instead, the release of fluoride from the clay minerals in the shale lens located at 46 ft below ground surface in the screened interval of SP-10 is the likely source of fluoride in groundwater at that location.

Data from the December 2021 monitoring event indicate a fluoride concentration of 6.7 mg/L at SP-10. This fluoride concentration is consistent with previous results collected during the assessment monitoring period and continues to show no statistically significant positive trends (**Figure 3**). This is an indication that conditions have not changed substantially since the previous ASD was submitted (Geosyntec, 2021c).

3.3 Barium

Solid and liquid phase samples collected from the BAP in July 2019 (AEP, 2019) indicate that barium concentrations within the BAP are less than groundwater concentration at SP-10 as well as below the barium GWPS. Barium in pore water was measured at 0.083 mg/L, and extractable barium from the BAP solids was measured at 0.352 mg/L via synthetic precipitation leaching

procedure (SPLP extraction). A surface water sample collected from the BAP in February 2019 had a reported barium concentration of 0.315 mg/L. These concentrations of barium are roughly an order of magnitude below the barium LCL at SP-10 (3.42 mg/L) and the GWPS (2.60 mg/L). The analytical laboratory reports for the BAP samples are provided in **Attachment A**. Since February 2019 (the date of the BAP liquid and solid phase sampling) there have been no notable changes in coal handling or sourcing at the plant that would have affected the composition of the ash or pond water in the BAP. Therefore, the BAP is not the source of barium at SP-10.

Furthermore, a review of the major ion chemistry of the BAP in contrast to SP-10 groundwater chemistry illustrates very different chemical compositions for these two sample types (**Figure 4**). SP-10 groundwater samples plot in a tight cluster on a Piper diagram, displaying a predominantly sodium/potassium-chloride composition which is clearly distinct from the BAP samples. The BAP samples have a greater contribution of calcium and very little chloride compared to the SP-10 samples. If a release from the BAP had occurred, the major ion chemistry of SP-10 groundwater would be expected to deviate from a sodium/potassium-chloride type and approach the more calcium-bicarbonate/sulfate dominant BAP samples on the Piper diagram. As recent SP-10 groundwater results have not shown a change in geochemical composition, these results do not support a mixing scenario between the BAP and SP-10 to account for changes in SP-10 groundwater composition.

As discussed in Section 2.2, shale lenses were identified within the screened interval of SP-10. These shale lenses are predominantly composed of clay minerals such as kaolinite (2 wt.%), chlorite (3 wt. %), illite (38 wt.%), and mixed layer illite-smectite (24 wt.%) (**Table 1**). Laboratory studies have confirmed that elevated barium concentrations may be associated with these clay minerals due to their cation exchange capacity (Eylem et. al, 1990; Atun and Bascetin, 2003). The presence of these minerals within the screened interval of SP-10 suggests a potential geogenic source of barium instead of the BAP.

3.4 Proposed Alternative Sources

Low concentrations of lithium, fluoride, and barium in the BAP liquid and solid phases, including pore water, suggest that the BAP is not the source of these exceedances. As described in previous ASDs (Geosyntec, 2019; Geosyntec, 2021a), the release of lithium and fluoride from the clay minerals in the shale lens located at 46 ft bgs within the screened interval of SP-10 is the likely source of lithium and fluoride in groundwater at that location. Similarly, the observed barium concentrations in the groundwater at SP-10 are likely associated with the clay minerals in the shale lenses.

3.5 Sampling Requirements

As the ASD described above supports the position that the identified SSLs are not due to a release from the BAP, the unit will remain in the assessment monitoring program. Groundwater sampling at the unit will continue in accordance with OAC 252:517-9-6 on a semi-annual basis.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

The preceding information serves as the ASD prepared in accordance with OAC 252:517-9-6(g)(3)(B) and supports the position that the SSLs of lithium, fluoride, and barium at SP-10 identified during the second semi-annual assessment monitoring event of 2021 were not due to a release from the BAP. The identified SSLs were, instead, attributed to natural variation in the underlying lithology, including the presence of shale lenses within the screened interval at SP-10. Therefore, no further action is warranted, and the BAP will remain in the assessment monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment B**.

SECTION 5

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TABLES

Table 1: X-Ray Diffraction Laboratory Analysis Results
Northeastern Plant Bottom Ash Pond

Geosyntec Consultants

Sample ID	SP-10-LOG 1	SP-10-LOG 2	SP-10-LOG 4	SP-10-LOG 4
Depth (ft bgs)	32-32.4	46	46	72-72.4
Description	Upper Limestone	Shale within screened interval of SP-10	Limestone within screened interval of SP-10	Limestone within screened interval of SP-9
Quartz	1	20	3	6
Albite	ND	4	ND	ND
Microcline	ND	1	ND	ND
Calcite	95	2	93	91
Ferroan Dolomite	4	ND	ND	2
Siderite	ND	1	ND	ND
Pyrite	ND	5	1	ND
Kaolinite	ND	2	1	<0.5
Chlorite	ND	3	<0.5	ND
Illite/Mica	ND	38	1	1
Mixed-Layered Illite/Smectite	ND	24	1	<0.5
% Illite Layers in ML I/S	*N/A*	*75*	*75*	*BDL*

Notes:
Results are shown as percentage of the bulk material.
ND - not detected
N/A: not applicable
BDL: below detection limit

FIGURES

Legend

- Out of Network Wells
- In Network Wells
- Soil Borings
- Bottom Ash Pond
- Impoundment

Notes
- Aerial imagery obtained from ESRI

500 250 0 500 Feet

Soil Boring and Monitoring Well Locations Map

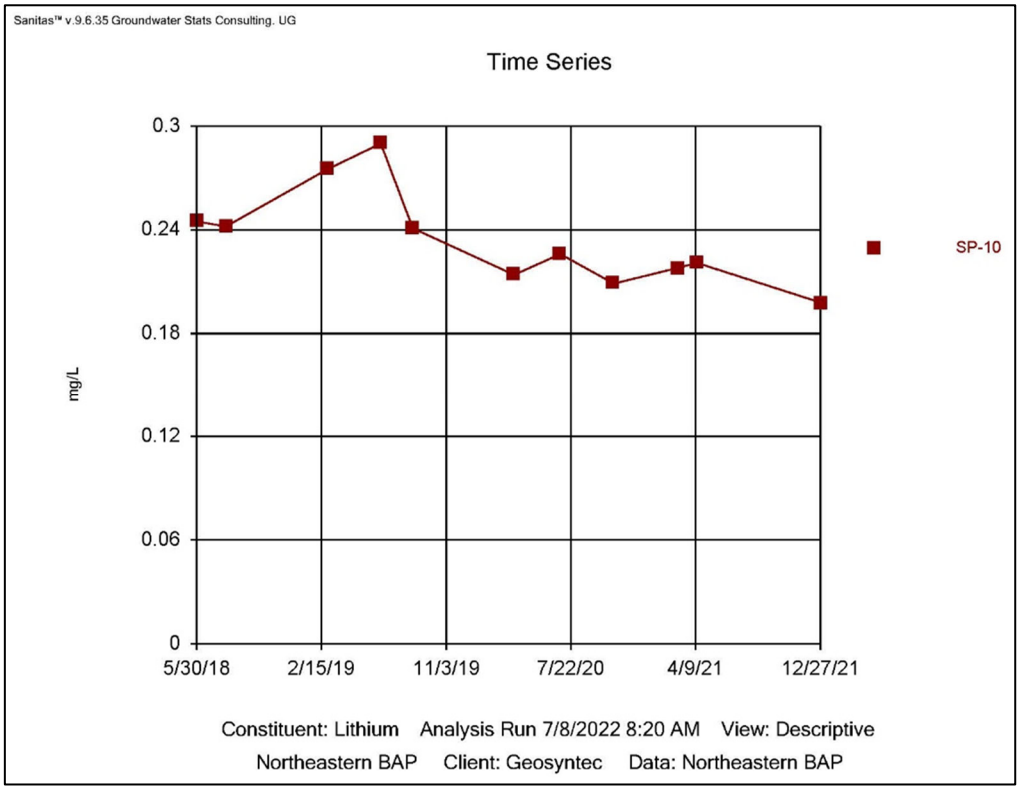
AEP Northeastern Power Plant - Bottom Ash Pond
Oologah, Oklahoma

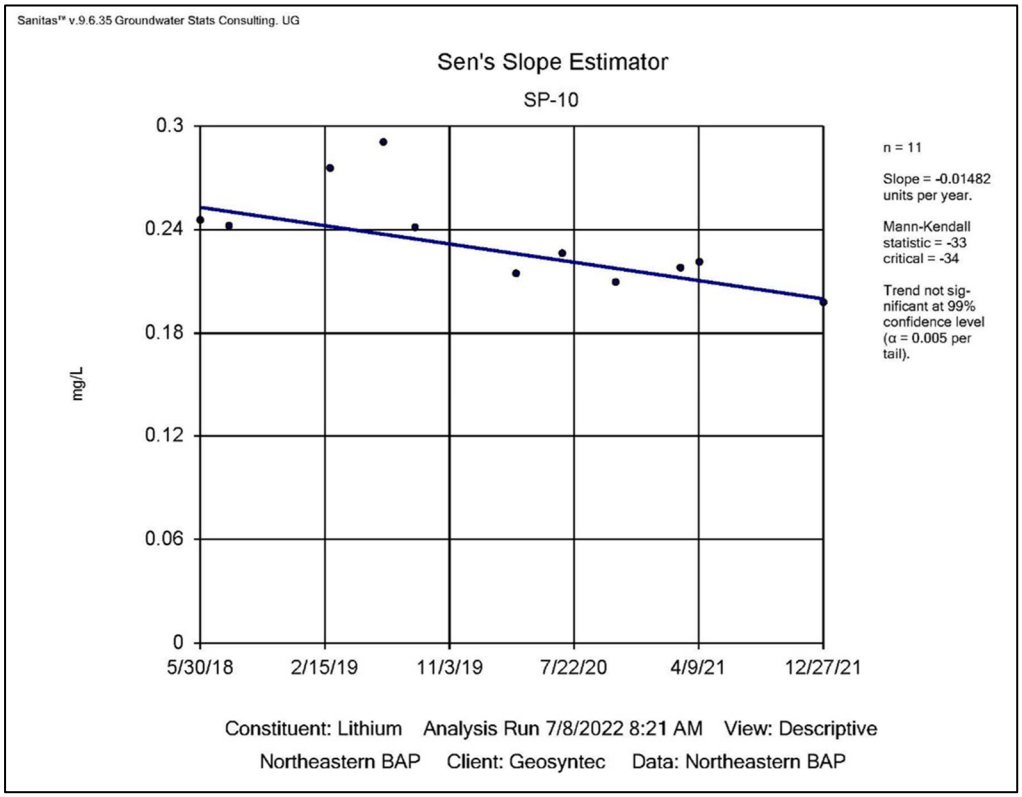
Geosyntec consultants

Columbus, Ohio | July 2022

Figure 1

P:\Projects\AEP\Legal Department - ASD Review\Northeastern\BAP\2020-11 F ASD Investigation\Figures_Tables\AEP-Northeastern_BAP_Soil Boring Locations.mxd. HDuff. 1/25/2021. Project/Phase/Task.



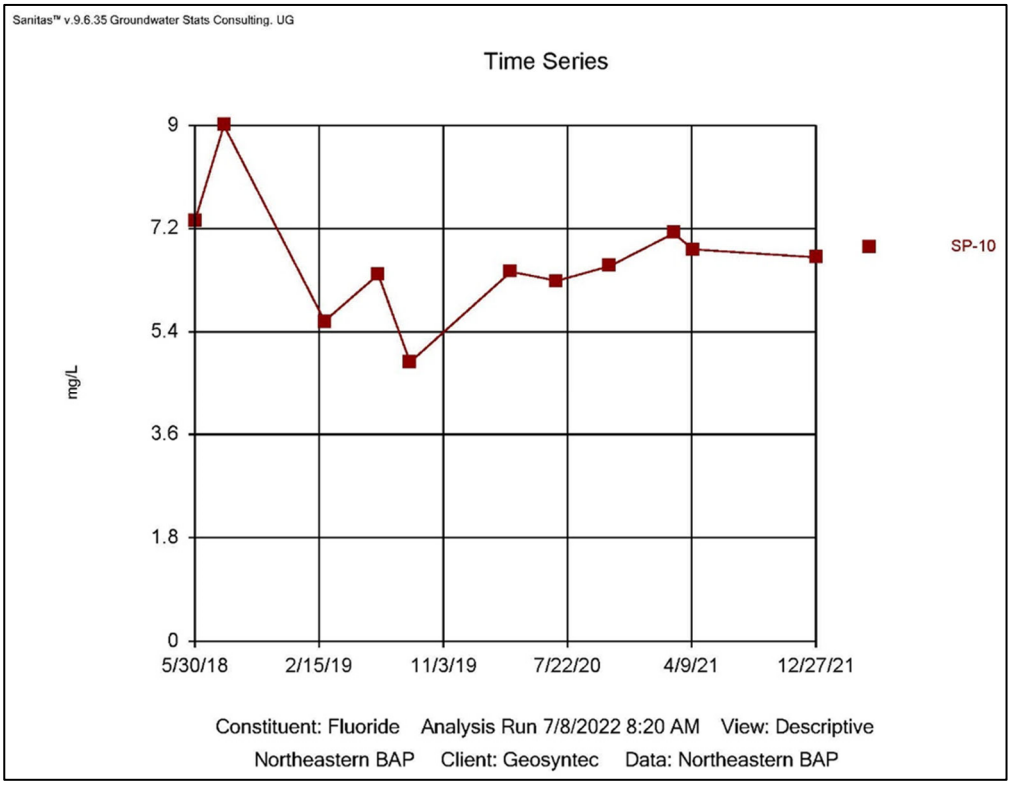


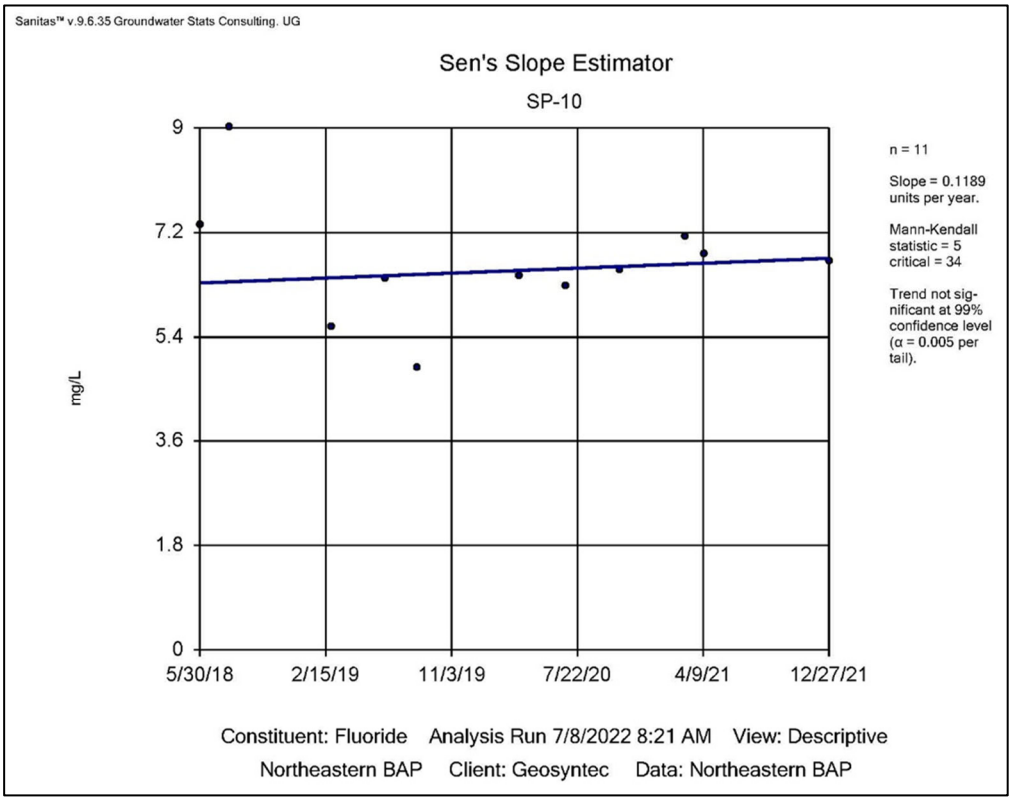
Lithium Time Series and Trend Test – SP-10

Northeastern Bottom Ash Pond

Geosyntec consultants	AMERICAN ELECTRIC POWER	Figure **2**
Columbus, Ohio	July 8, 2022	

internal info: path, date revised, author



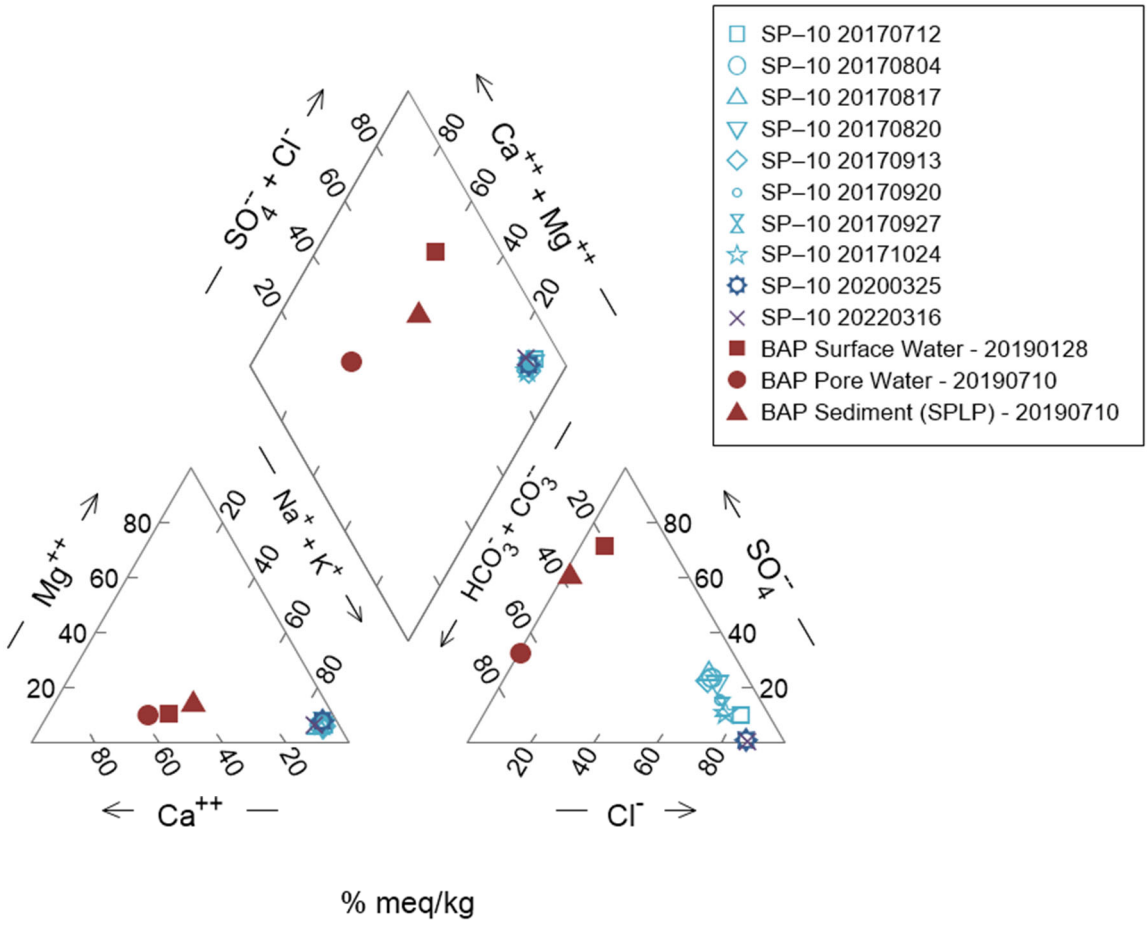


Fluoride Time Series and Trend Test – SP-10

Northeastern Bottom Ash Pond

Geosyntec consultants	AMERICAN ELECTRIC POWER	Figure 3
Columbus, Ohio	July 8, 2022	

internal info: path, date revised, author



Notes:
SPLP – Synthetic Precipitation Leaching Procedure.

Piper Diagram – SP-10 and BAP Samples
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER | Figure 4

Columbus, Ohio | July 8, 2022

internal info: path, date revised, author

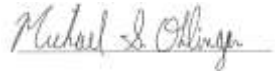
ATTACHMENT A
Analytical Laboratory Reports

BAP Surface Water

Sample Number: 190407-003 **Date Collected:** 02/05/2019 12:30 **Date Received:** 2/6/2019

Parameter	Result Units	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.57 ug/L	0.10	0.020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Arsenic, As	5.18 ug/L	0.10	0.030	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Barium, Ba	315 ug/L	0.10	0.020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.245 ug/L	0.10	0.020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.19 ug/L	0.050	0.010	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	647 ug/L	0.20	0.040	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	9.04 ug/L	0.050	0.020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Lead, Pb	3.33 ug/L	0.10	0.020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	26.7 ug/L	2.0	0.40	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Selenium, Se	4.5 ug/L	0.20	0.030	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.500 ug/L	0.50	0.10	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Boron, B	0.617 mg/L	0.0050	0.0009	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	128 mg/L	0.020	0.0030	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Iron, Fe	5.77 mg/L	0.010	0.0020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00874 mg/L	0.0002	0.00001	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	14.8 mg/L	0.010	0.0020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Sodium, Na	105 mg/L	0.050	0.010	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Manganese, Mn	292 ug/L	0.10	0.020	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Potassium, K	5.85 mg/L	0.050	0.010	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Strontium, Sr	1.25 mg/L	0.0002	0.00003	GES	02/06/2019 13:59	EPA 200.8-1994, Rev. 5.4
Alkalinity, as CaCO3	127 mg/L	10	3.0	GES	02/06/2019 16:44	SM 2320B-2011
Bromide, Br	< 0.500 mg/L	0.50	0.10	CRJ	02/06/2019 17:11	EPA 300.1-1997, Rev. 1.0
Surrogate is recovering above acceptance limits due to Chlorate being in the as-rec'd sample.						
Chloride, Cl	28.3 mg/L	0.10	0.030	CRJ	02/06/2019 17:11	EPA 300.1-1997, Rev. 1.0
Surrogate is recovering above acceptance limits due to Chlorate being in the as-rec'd sample.						
Fluoride, F	0.37 mg/L	0.15	0.035	CRJ	02/06/2019 17:11	EPA 300.1-1997, Rev. 1.0
Surrogate is recovering above acceptance limits due to Chlorate being in the as-rec'd sample.						
Residue, Filterable, TDS	694 mg/L	40	10	KAL	02/07/2019	SM 2540C-2011
Due to the reduced time allowed for analysis per the plant's request, the samples were dried at 180*C. KAL020719						
Sulfate, SO4	345 mg/L	10	1.5	CRJ	02/06/2019 14:22	EPA 300.1-1997, Rev. 1.0

Report was reissued on 2/12/19 due to a reanalysis that occurred on alkalinity.



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AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40115
Date Received: 07/12/2019

Company: SEP - Environmental (JP-W)
Contact: Jill Parker-Witt
Phone: (318) 673-3816

Address: 502 N. Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 226939
Cust Sample ID: Sediment
Sample Desc.: BAP Sediment SPLP

Collected Date: 07/10/2019
Location: NE BAP Sediment Sample

By: BW
Matrix: Liquid

SPLP (226939)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	0.777	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Antimony	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Arsenic	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Barium	0.352	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Beryllium	< 0.001	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Boron	0.389	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Cadmium	< 0.001	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Calcium	24.3	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Chromium	< 0.001	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Cobalt	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Copper	0.004	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Iron	0.1	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Lead	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Lithium	0.001	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Magnesium	2.44	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Manganese	0.01	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Molybdenum	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Nickel	< 0.025	mg/L	0.025	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Potassium	0.703	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Selenium	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Silver	< 0.001	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Sodium	14.9	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Strontium	0.327	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Thallium	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Tin	0.011	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Titanium	0.012	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB

502 North Allen Ave.
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AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40115
Date Received: 07/12/2019

Company: SEP - Environmental (JP-W)
Contact: Jill Parker-Witt
Phone: (318) 673-3816

Address: 502 N. Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Vanadium	0.023	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB
Zinc	0.067	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 21:45		JDB

Water (226939)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Alkalinity, Bicarbonate	101.24	mg/L	5	1	SM 2320 B-2011	08/06/2019 15:30	H1	JTD
Alkalinity, Carbonate	< 5	mg/L	5	1	SM 2320 B-2011	08/06/2019 15:30	H1	JTD
Alkalinity, Total	101.24	mg/L	5	1	SM 2320 B-2011	08/06/2019 15:30	H1	JTD
Chloride	0.839	mg/L	0.219	1	EPA 300.0	08/04/2019 5:20		GB
Fluoride	0.458	mg/L	0.083	1	EPA 300.0	08/04/2019 5:20		GB
Sulfate	38	mg/L	0.140	1	EPA 300.0	08/04/2019 5:20		GB

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AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40115
Date Received: 07/12/2019

Company: SEP - Environmental (JP-W)
Contact: Jill Parker-Witt
Phone: (318) 673-3816

Address: 502 N. Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 226940
Cust Sample ID: Liquid portion
Sample Desc.: BAP Sediment

Collected Date: 07/10/2019
Location: NE BAP Sediment Sample

By: BW
Matrix: Liquid

Metals (226940)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	0.076	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Antimony	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Arsenic	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Barium	0.083	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Beryllium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Boron	0.754	mg/L	0.01	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Cadmium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Calcium	85.7	mg/L	0.01	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Chromium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Cobalt	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Copper	0.004	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Iron	< 0.01	mg/L	0.01	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Lead	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Lithium	0.003	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Magnesium	17.4	mg/L	0.01	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Manganese	0.032	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Molybdenum	0.027	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Nickel	< 0.025	mg/L	0.025	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Potassium	6.94	mg/L	0.01	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Selenium	0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Silver	< 0.001	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Sodium	99.9	mg/L	0.01	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Strontium	1.22	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Thallium	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Tin	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Titanium	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB

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AEP ANALYTICAL CHEMISTRY SERVICES
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Date Received: 07/12/2019

Company: SEP - Environmental (JP-W)
Contact: Jill Parker-Witt
Phone: (318) 673-3816

Address: 502 N. Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Vanadium	0.006	mg/L	0.001	1	EPA 6010B 1996	07/25/2019 21:37		JDB
Zinc	< 0.005	mg/L	0.005	1	EPA 6010B 1996	07/25/2019 21:37		JDB

Water (226940)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Alkalinity, Bicarbonate	399.2	mg/L	5	1	SM 2320 B-2011	08/06/2019 15:30	H1	JTD
Alkalinity, Carbonate	< 5	mg/L	5	1	SM 2320 B-2011	08/06/2019 15:30	H1	JTD
Alkalinity, Total	399.2	mg/L	5	1	SM 2320 B-2011	08/06/2019 15:30	H1	JTD
Chloride	14	mg/L	0.219	1	EPA 300.0	08/04/2019 5:58		GB
Fluoride	< 0.083	mg/L	0.083	1	EPA 300.0	08/04/2019 5:58		GB
Sulfate	514	mg/L	0.140	1:10	EPA 300.0	08/04/2019 6:16		GB

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Contact: Jill Parker-Witt
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Quality Control Data

* Quality control units are the same as reported analytical results

Date	Parameter	Sample ID	Blank Value *	Standard			Spike			Surrogate % Recovery	Duplicate % Difference	Tech
				Value *	Recovery*	%	Value *	Recovery*	%			
8/6/2019	Alkalinity, Total			50	50.84	101.7						JTD
8/6/2019	Alkalinity, Total	227498	<5	50	52.62	105.2	50	47.14	94.3		2.5	JTD
7/25/2019	Aluminum	227041.1	<0.005	2	2.0229733	101.1	2	2.2242	111.2		0.0	JDB
7/25/2019	Aluminum	226939.1	<0.005	2	2.0229733	101.1	2	2.071639	103.6		0.4	JDB
7/25/2019	Antimony	227041.1	<0.005	0.8	0.8092462	101.2	0.8	0.7671843	95.9		0.5	JDB
7/25/2019	Antimony	226939.1	<0.005	0.8	0.8092462	101.2	0.8	0.8159776	102.0		0.2	JDB
7/25/2019	Arsenic	227041.1	<0.005	0.8	0.8086795	101.1	0.8	0.7758421	97.0		0.0	JDB
7/25/2019	Arsenic	226939.1	<0.005	0.8	0.8086795	101.1	0.8	0.8086275	101.1		0.1	JDB
7/25/2019	Barium	226939.1	<0.001	0.2	0.2080557	104.0	0.2	0.209543	104.8		0.1	JDB
7/25/2019	Barium	227041.1	<0.05	0.2	0.2080557	104.0	0.2	0.1829767	91.5		0.4	JDB
7/25/2019	Beryllium	226939.1	<0.001	0.2	0.2122779	106.1	0.2	0.2142832	107.1		0.3	JDB
7/25/2019	Beryllium	227041.1	<0.001	0.2	0.2122779	106.1	0.2	0.1992329	99.6		0.4	JDB
7/25/2019	Boron	226939.1	<0.01	0.3	0.2995651	99.9	0.3	0.2984183	99.5		0.7	JDB
7/25/2019	Boron	227041.1	<0.5	0.3	0.2995651	99.9	0.3	0.2855333	95.2		0.5	JDB
7/25/2019	Cadmium	227041.1	<0.001	0.2	0.2069934	103.5	0.2	0.1836838	91.8		0.6	JDB
7/25/2019	Cadmium	226939.1	<0.001	0.2	0.2069934	103.5	0.2	0.2061243	103.1		0.5	JDB
7/25/2019	Calcium	226939.1	<0.01	1	1.0087505	100.9	1	1.0243667	102.4		0.9	JDB
7/25/2019	Chromium	226939.1	<0.001	0.4	0.4116387	102.9	0.4	0.4125529	103.1		0.4	JDB
7/25/2019	Chromium	227041.1	<0.001	0.4	0.4116387	102.9	0.4	0.3867339	96.7		0.3	JDB
7/25/2019	Cobalt	226939.1	<0.005	0.2	0.2043482	102.2	0.2	0.2054714	102.7		0.4	JDB
7/25/2019	Cobalt	227041.1	<0.005	0.2	0.2043482	102.2	0.2	0.1839347	92.0		0.4	JDB
7/25/2019	Copper	227041.1	<0.001	0.3	0.3066399	102.2	0.3	0.2963301	98.8		0.1	JDB
7/25/2019	Copper	226939.1	<0.001	0.3	0.3066399	102.2	0.3	0.3109092	103.6		0.1	JDB
7/25/2019	Iron	227041.1	<0.5	3	3.1158893	103.9	150	159.28837	106.2		0.8	JDB
7/25/2019	Iron	226939.1	<0.01	3	3.1158893	103.9	3	3.1231158	104.1		1.0	JDB
7/25/2019	Lead	226939.1	<0.005	1	1.0430644	104.3	1	1.0416574	104.2		0.4	JDB
7/25/2019	Lead	227041.1	<0.005	1	1.0430644	104.3	1	0.9320653	93.2		0.6	JDB
7/25/2019	Lithium	227041.1	<0.001	0.2	0.2119096	106.0	0.2	0.2353987	117.7		0.1	JDB
7/25/2019	Lithium	226939.1	<0.001	0.2	0.2119096	106.0	0.2	0.2163799	108.2		0.4	JDB
7/25/2019	Magnesium	226939.1	<0.01	2	2.0868175	104.3	2	2.0877567	104.4		0.2	JDB
7/25/2019	Magnesium	227041.1	<0.5	2	2.0868175	104.3	2	1.9791333	99.0		0.6	JDB
7/25/2019	Manganese	227041.1	<0.001	0.2	0.2072869	103.6	0.2	0.16684	83.4		0.7	JDB

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Date Received: 07/12/2019

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Address: 502 N. Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

7/25/2019	Manganese	226939.1	<0.001	0.2	0.2072869	103.6	0.2	0.2077536	103.9		0.2	JDB
7/25/2019	Molybdenum	226939.1	<0.005	0.2	0.2067657	103.4	0.2	0.2076129	103.8		0.4	JDB
7/25/2019	Molybdenum	227041.1	<0.005	0.2	0.2067657	103.4	0.2	0.197727	98.9		0.5	JDB
7/25/2019	Nickel	227041.1	<0.025	0.5	0.5192594	103.9	0.5	0.46183	92.4		0.6	JDB
7/25/2019	Nickel	226939.1	<0.025	0.5	0.5192594	103.9	0.5	0.5209379	104.2		0.6	JDB
7/25/2019	Potassium	226939.1	<0.01	10	9.3692109	93.7	10	9.4631223	94.6		0.2	JDB
7/25/2019	Potassium	227041.1	<0.01	10	9.3692109	93.7	10	11.11754	111.2		0.3	JDB
7/25/2019	Selenium	227041.1	<0.005	2	1.9998495	100.0	2	1.991203	99.6		0.7	JDB
7/25/2019	Selenium	226939.1	<0.005	2	1.9998495	100.0	2	1.9816300	99.1		0.8	JDB
7/25/2019	Silver	227041.1	<0.001	0.075	0.0712930	95.1	0.075	0.0708639	94.5		0.2	JDB
7/25/2019	Silver	226939.1	<0.001	0.075	0.0712930	95.1	0.075	0.0714285	95.2		0.1	JDB
7/25/2019	Sodium	226939.1	<0.01	3	3.1384831	104.6	3	2.4693667	82.3		0.1	JDB
7/25/2019	Sodium	227041.1	<0.5	3	3.1384831	104.6	3	2.3746333	79.2		0.0	JDB
7/25/2019	Strontium	226939.1	<0.001	0.2	0.2059899	103.0	0.2	0.2081687	104.1		0.4	JDB
7/25/2019	Thallium	226939.1	<0.005	0.4	0.4152040	103.8	0.4	0.4171124	104.3		0.0	JDB
7/25/2019	Thallium	227041.1	<0.005	0.4	0.4152040	103.8	0.4	0.3682771	92.1		1.2	JDB
7/25/2019	Tin	226939.1	<0.005	0.7	0.6995446	99.9	0.7	0.6930628	99.0		0.2	JDB
7/25/2019	Tin	227041.1	<0.005	0.7	0.6995446	99.9	0.7	0.644164	92.0		0.2	JDB
7/25/2019	Titanium	227041.1	<0.005	0.2	0.2109341	105.5	0.2	0.2098874	104.9		0.2	JDB
7/25/2019	Titanium	226939.1	<0.005	0.2	0.2109341	105.5	0.2	0.2124567	106.2		0.1	JDB
7/25/2019	Vanadium	226939.1	<0.001	0.3	0.3076519	102.6	0.3	0.3104754	103.5		0.4	JDB
7/25/2019	Vanadium	227041.1	<0.001	0.3	0.3076519	102.6	0.3	0.2997157	99.9		0.6	JDB
7/25/2019	Zinc	226939.1	<0.005	0.2	0.2091679	104.6	0.2	0.2081374	104.1		0.3	JDB
7/25/2019	Zinc	227041.1	<0.005	0.2	0.2091679	104.6	0.2	0.1851907	92.6		0.1	JDB

On 7/30/2019, Jill asked for us to add Chloride, Fluoride, and Sulfate.

Code	***Code Description***
H1	Sample analysis performed past holding time

Jonathan Barnhill
Quality Assurance Officer

08-Aug-19
Report Date

JOB 7-15-19

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Shreveport Chemical Laboratory (SCL)
502 N. Allen Ave.
Shreveport , LA 71101
Contacts: Jonathan Barnhill (318-673-3803)

Project Name: NE BAP Sediment sample
Contact Name: Bryan White
Contact Phone: 8-719-0873
Sampler(s): BRYAN WHITE

Analysis Turnaround Time (in Calendar Days) - **RUSH**

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 4/0115

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Li							Sample Specific Notes:
BAP Sediment	7-10-19	1600	grab	solid/water	1L		X							SPLP on the sediment particles, also run Li analysis of pore water
	JOB 7-15-19													

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field

Special Instructions/QC Requirements & Comments: **Submit results to Jill Parker-Witt**

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
William Matthew Stephens	AEP-PSO	7/11/19 10:05		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
				7/12/19 14:34

SHREVEPORT CHEMICAL LABORATORY

502 N. Allen Ave.
Shreveport, LA 71101
Phone 318-673-3802
FAX 318-673-3960

PROJECT R

Container Type					Delivery Type				
Ice Chest	Bag	Action Pak	PCB Mailer	Bottle	UPS	FEDEX	US Mail	Walk in	Shuttle
(Other) Box					Other				
					Tracking #				

Client: Bryan White
Received By: JTD
Received Date: 7/12/19
Open Date:

Sample Matrix: DGA | PCB Oil | Water | Oil | Soil
Solid | (Liquid) | Other

Container Temp Read: 28 (Thermometer Serial #F04103)
Correction Factor: +1.2
Corrected Temp: 29.2

Project I.D.

Were samples received on ice? YES NO

Did container arrive in good condition? (YES) NO

Was sample documentation received? (YES) NO

Was documentation filled out properly? (YES) JTD 7/12/19 NO Date and time for collection not filled

Were samples labeled properly? (YES) NO

Were correct containers used? (YES) NO

Were the pH's of samples appropriately checked? YES (NO) N/A

Total number of sample containers: 1

Was any corrective action taken? NO

Person Contacted: Jill Parker W.T.F
Date & Time: 7-12-19 1520

Comments: Informed Jill that No Date and time was entered for collection she said she would contact the sampler and get that information. JDB 7-12-19

ATTACHMENT B
Certification by Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Bottom Ash Pond CCR management area at the Northeastern Power Station and that the requirements of OAC 252:517-9-6(g)(3)(B) have been met.

Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature

Geosyntec Consultants
2039 Centre Pointe Boulevard, Suite 103
Tallahassee, Florida 32308

Oklahoma Firm Certificate of
Authorization No. 1996
Exp. 6/30/2024

18167	Oklahoma	7/15/2022
License Number	Licensing State	Date

APPENDIX 6

Groundwater monitoring Field and Laboratory Reports

ODEQ email dated August 22, 2022, agreeing that the 252:517-9-6(b) sampling event is not needed if all Appendix A and B parameters are collected during each semi-annual sampling event.

From: Cindy Hailes
To: Jill Parker Witt
Cc: David.Cates; Anne Smith; Hillary.Young
Subject: [EXTERNAL] RE: Question on sampling events under the Assessment monitoring program - NE BAP
Date: Monday, August 22, 2022 1:18:13 PM
Attachments: image003.gif
image004.png

Hi Jill,

DEQ agrees with your approach to conducting the sampling events and approves AEP to continue collecting all constituents in both Appendices A and B during each semi-annual sampling event. Please contact me at the numbers below if you have any questions.

Cynthia K. Hailes, P.E.
Oklahoma Department of Environmental Quality
Land Protection Division
Phone: (405) 702-5114
cindy.hailes@deq.ok.gov

From: Jill Parker Witt <jcparker-witt@aep.com>
Sent: Friday, August 19, 2022 11:10 AM
To: Hillary Young <Hillary.Young@deq.ok.gov>
Cc: Cindy Hailes <Cindy.Hailes@deq.ok.gov>; David Cates <David.Cates@deq.ok.gov>
Subject: [EXTERNAL] Question on sampling events under the Assessment monitoring program - NE BAP

Hillary: Under 252:517-9-6 (b) it states: within 90 days of triggering an assessment monitoring program and annually thereafter, the owner/operator of the CCR unit must sample and analyze the gw for all constituents listed in Appendix B.

Under 252:517-9-6 (d) it states: after obtaining the results from the initial and subsequent sampling event required in paragraph (b) the owner/operator must: (1) within 90 days of obtaining the results and on at least a semiannual basis thereafter, resample all wells installed pursuant to the requirements of 252:517-9-2, conduct analyses for all parameters in Appendix A to this chapter **and for those constituents in Appendix B to this chapter that are detected in response to paragraph (b) of this Section**, and record their concentrations in the facility operating record.

The results of 252:517-9-6 (b) sampling event are not utilized in the statistical evaluation for compliance, but rather are used as a screening tool which allows the elimination of sampling for non-detected parameters during the 252:517-9-6(d) semi-annual sampling events.

Since the initiation of the Assessment monitoring program for NE's BAP, we have collected all constituents listed in Appendix A and B during each semi-annual Assessment Monitoring sampling event regardless if they are not detected. **We do not utilize the sampling results of 252:517-9-6(b) to eliminate any Appendix B constituent**. Therefore, in taking this approach we are conducting the 252:517-9-6(b) sampling event during each semi-annual sampling event. We are collecting all of Appendix B constituents twice a year, which is equal to or more than what is required under 252:517-9-6.

I would appreciate ODEQ's interpretation of us continuing to collect all constituents in both Appendices A and B during each semi-annual sampling event as meeting the requirements of both 252:517-9-6(b) and (d).

This approach combines the 517-9-6(b) and 517-9-6(d) sampling events and eliminates the need for a separate sampling event intended to collect just Appendix B parameters.

Thank you for your guidance,

Jill

JILL PARKER WITT | **ENVIRONMENTAL ENGINEER PRIN**
JCPARKER-WITT@AEP.COM | D:318.673.3816
502 N ALLEN AVE, SHREVEPORT, LA 71101-2669

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 03/16/22 .

Well Identification Number	SP-1	SP-2	SP-10	SP-11		
Activities	Gauge	Gauge	Gauge	Gauge		
Samples	Appendix IV	Appendix IV	Appendix IV	Appendix IV		
Depth to Water (ft)	16.37	29.29	11.38	7.88		
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	37.99	38.19	54.10	34.51		
Height of Water Column (ft.)	21.62	8.90	42.72	26.63		
Well Size (I.D.) (inches)	2	2	2	2		
Volume of Water in Well (gallons)	3.52	1.45	6.96	4.34		
Water Removed From Well (gallons)	12.00	5.25	22.00	9.75		
Method of Removal	Pump	Pump	Pump	Pump		
Was Well Purged Dry?	No	Yes	No	Yes		
pH (standard units)	7.16	7.28	7.66	7.44		
Temperature (°C)	17.10	17.35	17.83	16.74		
Conductivity (µmhos/cc)	776	4,650	6,140	1,630		
Turbidity (NTU)	20.6	107	29.0	92.4		
Appearance	Clear	Clear/slightly turbid	Clear	Slightly turbid		
Odor	None	None	Slight Sulphur	None		
Containers	125 mL HCL 250 mL HNO3 3 x 1L HNO3 1L Cool 0-6C	125 mL HCL 250 mL HNO3 3 x 1L HNO3 1L Cool 0-6C	125 mL HCL 250 mL HNO3 3 x 1L HNO3 1L Cool 0-6C	125 mL HCL 250 mL HNO3 3 x 1L HNO3 1L Cool 0-6C		
Sample Time	8:38	9:11	10:06	9:39		
Sample Date	3/16/2022	3/16/2022	3/16/2022	3/16/2022		

Duplicate 10:00 RA Duplicate Hinge Broken

For 2" well multiply by 0.163

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 03/16/22 .

Well Identification Number	SP-3	SP-4	SP-5R	SP-6	SP-7	SP-8	SP-9
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	NA	NA	NA	NA	NA	NA	NA
Depth to Water (ft)	11.03	21.09	5.86	22.39	25.02	5.54	56.43
Water Level Elevation (ft. NGVD)							
Measured Depth Total Depth of Well (ft.)	37.90	38.30	78.00	73.93	84.02	74.06	78.82
Height of Water Column (ft.)							
Well Size (I.D.) (inches)	2	2	2	2	2	2	2
Volume of Water in Well (gallons)							
Water Removed From Well (gallons)							
Method of Removal							
Was Well Purged Dry?							
pH (standard units)							
Temperature (°C)							
Conductivity (µmhos/cc)							
Turbidity (NTU)							
Appearance							
Odor							
Containers							
Sample Time							
Sample Date							

For 2" well multiply by 0.163

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 06/14/22 .

Well Identification Number	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Appendix III & IV	Appendix III & IV	Appendix III & IV	Appendix III & IV	Appendix III & IV	Appendix III & IV
Depth to Water (ft)	16.68	29.23	14.64	5.02	13.16	7.14
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	37.99	38.19	38.30	78.00	54.10	34.51
Height of Water Column (ft.)	21.31	8.96	23.66	72.98	40.94	27.37
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.47	1.46	3.86	11.90	6.67	4.46
Water Removed From Well (gallons)	13.00	5.00	8.50	30.25	21.00	10.25
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	No	Yes	Yes	No	Yes
pH (standard units)	7.27	7.35	7.83	7.72	7.74	7.34
Temperature (°C)	22.53	22.38	22.45	22.46	22.38	23.17
Conductivity (µmhos/cc)	745	3,010	1,970	2,650	6,840	1,660
Turbidity (NTU)	30.7	60.4	22.1	10.4	17.8	5.1
Appearance	Clear	Clear	Clear	Clear	Clear	Clear
Odor	None	None	None	None	None	None
Containers	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C
Sample Time	1145	1131	1409	900	1103	1122
Sample Date	6/14/2022	6/14/2022	6/14/2022	6/14/2022	6/14/2022	6/14/2022

BAP Dup 1400

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 06/14/22 .

Well Identification Number	SP-3	SP-6	SP-7	SP-8	SP-9	
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	
Samples	NA	NA	NA	NA	NA	
Depth to Water (ft)	17.63	21.72	25.31	5.02	54.81	
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	37.90	73.93	84.02	74.06	78.82	
Height of Water Column (ft.)	20.27	52.21	58.71	69.04	24.01	
Well Size (I.D.) (inches)	2	2	2	2	2	
Volume of Water in Well (gallons)	3.30	8.51	9.57	11.25	3.91	
Water Removed From Well (gallons)	----	----	----	----	----	
Method of Removal	----	----	----	----	----	
Was Well Purged Dry?	----	----	----	----	----	
pH (standard units)	----	----	----	----	----	
Temperature (°C)	----	----	----	----	----	
Conductivity (µmhos/cc)	----	----	----	----	----	
Turbidity (NTU)	----	----	----	----	----	
Appearance	----	----	----	----	----	
Odor	----	----	----	----	----	
Containers	------	------	-------	------	------	
Sample Time	----	----	----	----	----	
Sample Date	----	----	----	----	----	

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 11/07-08/22 .

Well Identification Number	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Appendix III & IV	Appendix III & IV	Appendix III & IV	Appendix III & IV	Appendix III & IV	Appendix III & IV
Depth to Water (ft)	18.00	23.84	14.30	9.39	Top of Casing	11.86
Measured Depth Total Depth of Well (ft.)	37.99	38.19	38.30	78.00	54.10	34.51
Height of Water Column (ft.)	19.99	14.35	24.00	68.61	54.10	22.65
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.26	2.34	3.91	11.18	8.82	3.69
Water Removed From Well (gallons)	12.50	8.00	10.00	28.75	20.00	5.00
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	No	Yes	Yes	No	Yes
pH (standard units)	7.33	7.31	7.41	7.36	7.42	7.22
Temperature (°C)	19.36	18.87	19.74	18.55	19.33	19.59
Conductivity (µmhos/cc)	754	2,320	2,080	3,780	6,440	1,500
Turbidity (NTU)	3.7	4.6	8.2	31.6	4.7	13.8
Appearance	Clear	Clear	Clear	Clear	Clear	Clear
Odor	None	None	None	None	Sulphur	None
Containers	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C
Sample Time	1002	948	1029	1317	914	938
Sample Date	11/8/2022	11/8/2022	11/8/2022	11/7/2022	11/8/2022	11/8/2022

BAP Dup 1400

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 11/07-08/22 .

Well Identification Number	SP-3	SP-6	SP-7	SP-8	SP-9	
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	
Samples	NA	NA	NA	NA	NA	
Depth to Water (ft)	Top of Casing	22.34	24.97	7.50	52.22	
Measured Depth Total Depth of Well (ft.)	37.90	73.93	84.02	74.06	78.82	
Height of Water Column (ft.)	37.90	51.59	59.05	66.56	26.60	
Well Size (I.D.) (inches)	2	2	2	2	2	
Volume of Water in Well (gallons)	6.18	8.41	9.63	10.85	4.34	
Water Removed From Well (gallons)	----	----	----	----	----	
Method of Removal	----	----	----	----	----	
Was Well Purged Dry?	----	----	----	----	----	
pH (standard units)	----	----	----	----	----	
Temperature (°C)	----	----	----	----	----	
Conductivity (µmhos/cc)	----	----	----	----	----	
Turbidity (NTU)	----	----	----	----	----	
Appearance	----	----	----	----	----	
Odor	----	----	----	----	----	
Containers	------	------	-------	------	------	
Sample Time	----	----	----	----	----	
Sample Date	----	----	----	----	----	

For 2" well multiply by	0.163
For 4" well multiply by	0.653

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 216558 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/10/2022**

Customer Sample ID: SP-5R
Customer Description:
Lab Number: 216558-001
Preparation:
Date Collected: 12/27/2021 12:31
Date Received: 12/28/2021 13:21

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	660	mg/L	50	1.0	0.5		CRJ	01/05/2022 19:20	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.09	mg/L	5	0.15	0.05		CRJ	01/05/2022 23:35	EPA 300.1 -1997, Rev. 1.0
Sulfate	6.1	mg/L	5	1.0	0.2		CRJ	01/05/2022 23:35	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1370	mg/L	2	100	40		SDW	12/29/2021 11:13	SM 2540C-2011

Customer Sample ID: SP-10
Customer Description:
Lab Number: 216558-002
Preparation:
Date Collected: 12/27/2021 15:39
Date Received: 12/28/2021 13:21

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1890	mg/L	250	5	3		CRJ	01/05/2022 19:46	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.7	mg/L	10	0.3	0.1		CRJ	01/06/2022 00:51	EPA 300.1 -1997, Rev. 1.0
Sulfate	10.4	mg/L	10	2.0	0.3		CRJ	01/06/2022 00:51	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	3440	mg/L	2	100	40		SDW	12/29/2021 11:21	SM 2540C-2011

Customer Sample ID: SP-11
Customer Description:
Lab Number: 216558-003
Preparation:
Date Collected: 12/27/2021 15:58
Date Received: 12/28/2021 13:21

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	78.9	mg/L	5	0.10	0.05		CRJ	01/05/2022 20:37	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.76	mg/L	5	0.15	0.05		CRJ	01/05/2022 20:37	EPA 300.1 -1997, Rev. 1.0
Sulfate	193	mg/L	5	1.0	0.2		CRJ	01/05/2022 20:37	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	840	mg/L	2	100	40		SDW	12/29/2021 11:21	SM 2540C-2011

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 216558 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/10/2022**

Customer Sample ID: BAP Duplicate
Customer Description:
Lab Number: 216558-004
Preparation:
Date Collected: 12/27/2021 14:00
Date Received: 12/28/2021 13:21

Ion Chromatography

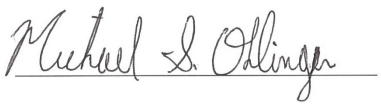
Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	664	mg/L	50	1.0	0.5		CRJ	01/05/2022 18:04	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.14	mg/L	5	0.15	0.05		CRJ	01/05/2022 18:30	EPA 300.1 -1997, Rev. 1.0
Sulfate	6.2	mg/L	5	1.0	0.2		CRJ	01/05/2022 18:30	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1380	mg/L	2	100	40		SDW	12/29/2021 11:28	SM 2540C-2011

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling

Contact Name: Jill Parker-Witt

Contact Phone: 318-673-3816

Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 216558

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, Tl	Field-filter 500 mL bottle, then pH<2, HNO_3 dissolved Fe and Mn	1 L bottle, Cool. 0-6°C TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	250 mL Glass or 125/250 mL PTFE lined bottle, HCL**, pH<2 Hg			Sample Specific Notes:
SP-5R	12/27/2021	1231	G	GW	1				X					
SP-10	12/27/2021	1539	G	GW	1				X					
SP-11	12/27/2021	1558	G	GW	1				X					
BAP DUPLICATE	12/27/2021	1400	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Michael Ohly	Date/Time: 12/28/21 1:20 PM

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
Cooler Box Bag Envelope	PONY UPS FedEX USPS
	Other _____

Plant/Customer Northeastern **Number of Plastic Containers:** 4

Opened By JABeach **Number of Glass Containers:** —

Date/Time 12/28/21 1:20pm **Number of Mercury Containers:** —

Were all temperatures within 0-6°C? (Y) / N or N/A **Initial:** JAB (on ice) / no ice

1(IR Gun Ser# 200700311, *Expir.* 06-11-22) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** JAB 12/28/21

pH paper (circle one): MQuant,PN1.09535.0001,LOT# HC904495 [OR] Lab Rat,PN4801,LOT# X000RWDG21

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 216558 Initial & Date & Time : _____

Comments: _____

Logged by MSD _____

_____

Reviewed by JAB _____

_____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 216568 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/13/2022**

Customer Sample ID: SP-1 **Customer Description:**
Lab Number: 216568-001 **Preparation:**
Date Collected: 12/28/2021 09:06 **Date Received: 12/29/2021 13:20**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	34.2	mg/L	2	0.04	0.02		CRJ	01/06/2022 03:24	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.93	mg/L	2	0.06	0.02		CRJ	01/06/2022 03:24	EPA 300.1 -1997, Rev. 1.0
Sulfate	40.0	mg/L	2	0.40	0.06		CRJ	01/06/2022 03:24	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	410	mg/L	2	100	40		SDW	12/29/2021 14:03	SM 2540C-2011

Customer Sample ID: SP-2 **Customer Description:**
Lab Number: 216568-002 **Preparation:**
Date Collected: 12/28/2021 08:40 **Date Received: 12/29/2021 13:20**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	341	mg/L	50	1.0	0.5		CRJ	01/06/2022 01:42	EPA 300.1 -1997, Rev. 1.0
Fluoride	2.73	mg/L	5	0.15	0.05		CRJ	01/06/2022 00:26	EPA 300.1 -1997, Rev. 1.0
Sulfate	20.8	mg/L	5	1.0	0.2		CRJ	01/06/2022 00:26	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	920	mg/L	2	100	40		SDW	12/29/2021 14:03	SM 2540C-2011

Customer Sample ID: SP-4 **Customer Description:**
Lab Number: 216568-003 **Preparation:**
Date Collected: 12/28/2021 12:48 **Date Received: 12/29/2021 13:20**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	458	mg/L	50	1.0	0.5		CRJ	01/06/2022 02:07	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.24	mg/L	5	0.15	0.05		CRJ	01/06/2022 02:33	EPA 300.1 -1997, Rev. 1.0
Sulfate	79.6	mg/L	5	1.0	0.2		CRJ	01/06/2022 02:33	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1100	mg/L	2	100	40		SDW	12/29/2021 14:08	SM 2540C-2011

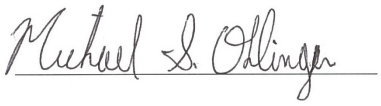
Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 216568 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/13/2022**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling
Contact Name: Jill Parker-Witt
Contact Phone: 318-673-3816
Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 216568

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3: B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, Tl	Field-filter 500 mL bottle, then pH<2, HNO_3: dissolved Fe and Mn	1 L bottle, Cool, 0-6°C: TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3: Ra-226, Ra-228	250 mL Glass or 125/250 mL PTFE lined bottle, HCL**, pH<2: Hg			Sample Specific Notes:
SP-1	12/28/2021	906	G	GW	1				X					
SP-2	12/28/2021	840	G	GW	1				X					
SP-4	12/28/2021	1248	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
KMH	EAGLE	12/28/21 1500		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
			JM Teach 12/29/21	12/29/21 1250pm

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Northeastern — Number of Plastic Containers: 3

Opened By JABeach — Number of Glass Containers: —

Date/Time 12/29/21 1250pm — Number of Mercury Containers: —

Were all temperatures within 0-6°C? (Y) / N or N/A Initial: JAB (on ice) / no ice

1(IR Gun Ser# 200700311, *Expir.* 06-11-22) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If RUSH, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A Initial & Date: JAB 12/29/21

pH paper (circle one): MQuant,PN1.09535.0001,LOT# HC904495 [OR] Lab Rat,PN4801,LOT# X000RWDG21

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Initial & Date & Time : _____

Lab ID# 2116568

Comments: _____

Logged by MSD _____

Reviewed by JAB _____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-1
Lab Number: 220019-001
Date Collected: 12/28/2021 10:06 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.51	µg/L	1	0.10	0.02		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Arsenic	0.51	µg/L	1	0.10	0.03		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Barium	155	µg/L	1	0.20	0.05		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Beryllium	0.040	µg/L	1	0.050	0.007	J1	GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Boron	0.127	mg/L	1	0.050	0.009		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Cadmium	0.051	µg/L	1	0.020	0.004		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Calcium	91.2	mg/L	1	0.05	0.02		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Chromium	0.70	µg/L	1	0.20	0.04		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Cobalt	0.246	µg/L	1	0.020	0.003		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Lead	0.24	µg/L	1	0.20	0.05		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Lithium	0.00474	mg/L	1	0.00020	0.00005		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	15.2	µg/L	1	0.5	0.1		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Selenium	6.45	µg/L	1	0.50	0.09		GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4
Thallium	0.05	µg/L	1	0.20	0.04	J1	GES	01/05/2022 15:55	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.13	pCi/L	0.20	0.22		TTP	01/12/2022 08:39	SW-846 9315-1986, Rev. 0
Carrier Recovery	97.6	%						
Radium-228	2.99	pCi/L	0.21	0.62		TTP	01/13/2022 16:12	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	78.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-2
Lab Number: 220019-002
Date Collected: 12/28/2021 09:40 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.97	µg/L	1	0.10	0.02		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Arsenic	1.08	µg/L	1	0.10	0.03		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Barium	1210	µg/L	1	0.20	0.05		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Beryllium	0.055	µg/L	1	0.050	0.007		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Boron	0.111	mg/L	1	0.050	0.009		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Cadmium	0.044	µg/L	1	0.020	0.004		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Calcium	104	mg/L	1	0.05	0.02		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Chromium	0.52	µg/L	1	0.20	0.04		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Cobalt	0.312	µg/L	1	0.020	0.003		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Lead	0.16	µg/L	1	0.20	0.05	J1	GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Lithium	0.0327	mg/L	1	0.00020	0.00005		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	13.8	µg/L	1	0.5	0.1		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Selenium	2.08	µg/L	1	0.50	0.09		GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	01/05/2022 16:00	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	5.11	pCi/L	0.42	0.19		TTP	01/12/2022 08:39	SW-846 9315-1986, Rev. 0
Carrier Recovery	117	%						
Radium-228	6.94	pCi/L	0.24	0.57		TTP	01/13/2022 16:12	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	80.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-4
Lab Number: 220019-003
Date Collected: 12/28/2021 13:48 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.26	µg/L	1	0.10	0.02		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Arsenic	0.76	µg/L	1	0.10	0.03		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Barium	304	µg/L	1	0.20	0.05		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Beryllium	0.033	µg/L	1	0.050	0.007	J1	GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Boron	0.342	mg/L	1	0.050	0.009		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Cadmium	0.035	µg/L	1	0.020	0.004		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Calcium	88.7	mg/L	1	0.05	0.02		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Chromium	0.47	µg/L	1	0.20	0.04		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Cobalt	0.240	µg/L	1	0.020	0.003		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Lead	0.14	µg/L	1	0.20	0.05	J1	GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Lithium	0.0529	mg/L	1	0.00020	0.00005		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	3.0	µg/L	1	0.5	0.1		GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Selenium	0.48	µg/L	1	0.50	0.09	J1	GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	01/05/2022 16:05	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.23	pCi/L	0.21	0.22		TTP	01/12/2022 08:39	SW-846 9315-1986, Rev. 0
Carrier Recovery	103	%						
Radium-228	3.25	pCi/L	0.20	0.56		TTP	01/13/2022 16:12	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	79.3	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-5R
Lab Number: 220019-004
Date Collected: 12/27/2021 13:31 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.09	µg/L	1	0.10	0.02	J1	GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Arsenic	10.0	µg/L	1	0.10	0.03		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Barium	1840	µg/L	2	0.4	0.1		GES	01/06/2022 15:41	EPA 200.8-1994, Rev. 5.4
Beryllium	0.031	µg/L	1	0.050	0.007	J1	GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Boron	0.190	mg/L	1	0.050	0.009		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Cadmium	0.029	µg/L	1	0.020	0.004		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Calcium	71.7	mg/L	1	0.05	0.02		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Chromium	0.26	µg/L	1	0.20	0.04		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Cobalt	0.257	µg/L	1	0.020	0.003		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Lead	0.18	µg/L	1	0.20	0.05	J1	GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Lithium	0.0766	mg/L	1	0.00020	0.00005		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.9	µg/L	1	0.5	0.1		GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	01/05/2022 16:11	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	7.65	pCi/L	0.50	0.21		TTP	01/12/2022 08:39	SW-846 9315-1986, Rev. 0
Carrier Recovery	121	%						
Radium-228	5.51	pCi/L	0.20	0.47		TTP	01/13/2022 16:12	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	90.7	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER®

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-10
Lab Number: 220019-005
Date Collected: 12/27/2021 16:39 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.08	µg/L	1	0.10	0.02	J1	GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Arsenic	0.34	µg/L	1	0.10	0.03		GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Barium	6980	µg/L	1	0.20	0.05		GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Beryllium	0.019	µg/L	1	0.050	0.007	J1	GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Boron	0.868	mg/L	1	0.050	0.009		GES	01/06/2022 17:13	EPA 200.8-1994, Rev. 5.4
Cadmium	0.021	µg/L	1	0.020	0.004		GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Calcium	76.6	mg/L	1	0.05	0.02		GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Chromium	0.19	µg/L	1	0.20	0.04	J1	GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Cobalt	0.044	µg/L	1	0.020	0.003		GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Lead	0.05	µg/L	1	0.20	0.05	J1	GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Lithium	0.198	mg/L	1	0.00020	0.00005		GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.4	µg/L	1	0.5	0.1	J1	GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	01/05/2022 17:38	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	15.70	pCi/L	0.67	0.14		TTP	01/12/2022 08:39	SW-846 9315-1986, Rev. 0
Carrier Recovery	152	%						
Radium-228	1.61	pCi/L	0.13	0.37		TTP	01/13/2022 16:12	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	104	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-11
Lab Number: 220019-006
Date Collected: 12/27/2021 16:58 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.28	µg/L	1	0.10	0.02		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Arsenic	1.11	µg/L	1	0.10	0.03		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Barium	270	µg/L	1	0.20	0.05		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Beryllium	0.013	µg/L	1	0.050	0.007	J1	GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Boron	0.459	mg/L	1	0.050	0.009		GES	01/06/2022 17:18	EPA 200.8-1994, Rev. 5.4
Cadmium	0.021	µg/L	1	0.020	0.004		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Calcium	77.6	mg/L	1	0.05	0.02		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Chromium	0.28	µg/L	1	0.20	0.04		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Cobalt	0.259	µg/L	1	0.020	0.003		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Lead	0.14	µg/L	1	0.20	0.05	J1	GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Lithium	0.0187	mg/L	1	0.00020	0.00005		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	1.8	µg/L	1	0.5	0.1		GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Selenium	0.20	µg/L	1	0.50	0.09	J1	GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	01/05/2022 17:43	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.86	pCi/L	0.17	0.20		TTP	01/12/2022 08:39	SW-846 9315-1986, Rev. 0
Carrier Recovery	109	%						
Radium-228	1.20	pCi/L	0.19	0.60		TTP	01/13/2022 16:12	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	76.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: BAP Duplicate
Lab Number: 220019-007
Date Collected: 12/27/2021 15:00 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.09	µg/L	1	0.10	0.02	J1	GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Arsenic	9.91	µg/L	1	0.10	0.03		GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Barium	1980	µg/L	1	0.20	0.05		GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Beryllium	0.031	µg/L	1	0.050	0.007	J1	GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Boron	0.186	mg/L	1	0.050	0.009		GES	01/06/2022 17:24	EPA 200.8-1994, Rev. 5.4
Cadmium	0.015	µg/L	1	0.020	0.004	J1	GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Calcium	71.0	mg/L	1	0.05	0.02		GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Chromium	0.33	µg/L	1	0.20	0.04		GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Cobalt	0.246	µg/L	1	0.020	0.003		GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Lead	0.18	µg/L	1	0.20	0.05	J1	GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Lithium	0.0746	mg/L	1	0.00020	0.00005		GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.9	µg/L	1	0.5	0.1		GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	01/05/2022 17:48	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: BAP Equipment Blank
Lab Number: 220019-008
Date Collected: 12/28/2021 09:51 EST

Customer Description:
Preparation:
Date Received: 01/04/2022 12:55 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Barium	0.22	µg/L	1	0.20	0.05		GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Boron	<0.009	mg/L	1	0.050	0.009	U1	GES	01/06/2022 17:29	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Chromium	0.36	µg/L	1	0.20	0.04		GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Cobalt	0.016	µg/L	1	0.020	0.003	J1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00005	mg/L	1	0.00020	0.00005	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	01/14/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	01/05/2022 17:53	EPA 200.8-1994, Rev. 5.4

220019
Job Comments:

Original report issued 1/17/2022. Report reissued with amended matrix spike precision calculations.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220019 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Report Verification

This report and the above data have been confirmed by the following analyst.

Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
U1 - Not detected at or above method detection limit (MDL).

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling
Contact Name: Jill Parker-Witt
Contact Phone: 318-673-3816
Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 220019

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, Tl	Field-filter 500 mL bottle, then pH<2, HNO_3 dissolved Fe and Mn	1 L bottle, Cool, 0-6°C TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	250 mL Glass or 125/250 mL PTFE lined bottle, HCL**, pH<2 Hg			Sample Specific Notes:
SP-1	12/28/2021	906	G	GW	5		X			X	X			
SP-2	12/28/2021	840	G	GW	5		X			X	X			
SP-4	12/28/2021	1248	G	GW	5		X			X	X			
SP-5R	12/27/2021	1231	G	GW	8		X			X	X			
SP-10	12/27/2021	1539	G	GW	5		X			X	X			
SP-11	12/27/2021	1558	G	GW	5		X			X	X			
BAP DUPLICATE	12/27/2021	1400	G	GW	2		X				X			
BAP EQUIPMENT BLANK	12/28/2021	851	G	W	2		X				X			
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	EAGLE	12/29/21 1200		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Date/Time: 1/4/22 12:55 PM

AEP® WATER & WASTE SAMPLE RECEIPT FORM (IR#1)

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Northeastern **Number of Plastic Containers:** 24

Opened By MSD **Number of Glass Containers:** —

Date/Time 1/4/2022 12:55PM **Number of Mercury Containers:** 8

Were all temperatures within 0-6°C? Y / N or (N/A) **Initial:** _____ on ice / (no ice)

(IR Gun Ser# 210441568, *Expir.5/27/2023)* - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine **If RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) N Comments _____

Were correct containers used? (Y) N Comments _____

Was pH checked & Color Coding done? (Y) N or N/A **Initial & Date:** JAB 1/4/2022

pH paper (circle one): MQuant pH Cat 1.09535.0001 lot HC904495 _____ [OR] (Lab rat pH Cat # LRS -4801 Lot X000RWDG21)

- Was Add'l Preservative needed? (Y) / N If Yes: By whom & when: Hg lab, * (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Initial & Date & Time : _____

Lab ID# 220019

Comments: * MW-3D, MW 5, Landfilldup Eq Blank all needed Nitric added JAB

Logged by MSD

Reviewed by JAB

Sp-2, Sp 4, Sp 10, Sp-11 Needed Nitric acid Added. JAB

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220866 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/03/2023**

Customer Sample ID: SP-1 Customer Description:
Lab Number: 220866-001 Preparation:
Date Collected: 03/16/2022 09:38 EDT Date Received: 03/17/2022 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.26	mg/L	5	0.25	0.05		CRJ	03/18/2022 19:19	EPA 300.1 -1997, Rev. 1.0
Chloride	51.9	mg/L	5	0.10	0.05		CRJ	03/18/2022 19:19	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.95	mg/L	5	0.15	0.05		CRJ	03/18/2022 19:19	EPA 300.1 -1997, Rev. 1.0
Sulfate	72.3	mg/L	5	1.0	0.2		CRJ	03/18/2022 19:19	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	326	mg/L	1	20	5		MGK	03/22/2022 17:07	SM 2320B-2011
TDS, Filterable Residue	500	mg/L	1	50	20		SDW	03/18/2022 11:02	SM 2540C-2011

Customer Sample ID: SP-2 Customer Description:
Lab Number: 220866-002 Preparation:
Date Collected: 03/16/2022 10:11 EDT Date Received: 03/17/2022 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	4.86	mg/L	5	0.25	0.05		CRJ	03/18/2022 19:46	EPA 300.1 -1997, Rev. 1.0
Chloride	1200	mg/L	100	2	1		CRJ	03/21/2022 11:10	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.06	mg/L	5	0.15	0.05		CRJ	03/18/2022 19:46	EPA 300.1 -1997, Rev. 1.0
Sulfate	14.3	mg/L	5	1.0	0.2		CRJ	03/18/2022 19:46	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	399	mg/L	1	20	5		MGK	03/22/2022 17:07	SM 2320B-2011
TDS, Filterable Residue	2000	mg/L	20	1000	400		SDW	03/21/2022 12:15	SM 2540C-2011

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220866 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/03/2023**

Customer Sample ID: SP-10 **Customer Description:**
Lab Number: 220866-003 **Preparation:**
Date Collected: 03/16/2022 11:06 EDT **Date Received: 03/17/2022 10:00 EDT**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	7.91	mg/L	5	0.25	0.05		CRJ	03/18/2022 20:39	EPA 300.1 -1997, Rev. 1.0
Chloride	1860	mg/L	250	5	3		CRJ	03/21/2022 11:37	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.30	mg/L	5	0.15	0.05		CRJ	03/18/2022 20:39	EPA 300.1 -1997, Rev. 1.0
Sulfate	21.5	mg/L	5	1.0	0.2		CRJ	03/18/2022 20:39	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	407	mg/L	1	20	5		MGK	03/22/2022 17:07	SM 2320B-2011
TDS, Filterable Residue	3570	mg/L	4	200	80		SDW	03/18/2022 11:10	SM 2540C-2011

Customer Sample ID: SP-11 **Customer Description:**
Lab Number: 220866-004 **Preparation:**
Date Collected: 03/16/2022 10:39 EDT **Date Received: 03/17/2022 10:00 EDT**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	1.80	mg/L	2	0.10	0.02		CRJ	03/18/2022 21:05	EPA 300.1 -1997, Rev. 1.0
Chloride	102	mg/L	25	0.5	0.3		CRJ	03/18/2022 15:48	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.59	mg/L	2	0.06	0.02		CRJ	03/18/2022 21:05	EPA 300.1 -1997, Rev. 1.0
Sulfate	297	mg/L	25	5.0	0.8		CRJ	03/18/2022 15:48	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	420	mg/L	1	20	5		MGK	03/22/2022 17:07	SM 2320B-2011
TDS, Filterable Residue	1020	mg/L	2	100	40		SDW	03/18/2022 11:10	SM 2540C-2011

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220866 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/03/2023**

Customer Sample ID: Duplicate
Customer Description:
Lab Number: 220866-005
Preparation:
Date Collected: 03/16/2022 11:00 EDT
Date Received: 03/17/2022 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.22	mg/L	5	0.25	0.05	J1	CRJ	03/18/2022 21:58	EPA 300.1 -1997, Rev. 1.0
Chloride	35.3	mg/L	5	0.10	0.05		CRJ	03/18/2022 21:58	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.85	mg/L	5	0.15	0.05		CRJ	03/18/2022 21:58	EPA 300.1 -1997, Rev. 1.0
Sulfate	74.6	mg/L	5	1.0	0.2		CRJ	03/18/2022 21:58	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

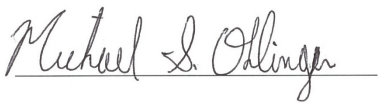
Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	314	mg/L	1	20	5		MGK	03/22/2022 17:07	SM 2320B-2011
TDS, Filterable Residue	540	mg/L	4	200	80		SDW	03/18/2022 11:20	SM 2540C-2011

220866
Job Comments:

Original report issued 4/19/2022. Report reissued with amended matrix spike precision calculations.

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220866 **Customer: Northeastern 3&4 Power Station** **Date Reported: 01/03/2023**

Data Qualifer Legend

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: Northeastern PS

Contact Name: Jill Parker-Witt

Contact Phone: 318-673-3816

Sampler(s): Kenny McDonald

Analysis Turnaround Time (In Calendar Days)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 220866

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3: B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, Tl and Na, K, Mg, Sr	Field-filter 500 mL bottle, then pH<2, HNO_3: dissolved Fe and Mn	1L bottle, Cool, 0-6°C: TDS, F, Cl, SO_4, and Br, Alkalinity	Three (six every 10th*) 1 L bottles, pH<2, HNO_3: Ra-226, Ra-228	125 mL PTFE lined bottle, HCL**, pH<2: HG			Sample Specific Notes:
SP-1	3/16/2022	838	G	GW	1				X					
SP-2	3/16/2022	911	G	GW	1				X					
SP-10	3/16/2022	1006	G	GW	1				X					
SP-11	3/16/2022	939	G	GW	1				X					
DUPLICATE	3/16/2022	1000	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	FTGLF	03/16/22 1130		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Date/Time: 3/17/22 10:00 Am

AEP WATER & WASTE SAMPLE RECEIPT FORM (IR#1)

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Northestern **Number of Plastic Containers:** 5

Opened By MSO **Number of Glass Containers:** _____

Date/Time 3/17/22 10:00AM **Number of Mercury Containers:** -

Were all temperatures within 0-6°C? (Y) / N or N/A **Initial:** MSO (on ice) / no ice

(IR Gun Ser# 210441568, *Expir.5/27/2023)* - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: _____ If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) N or N/A **Initial & Date:** MSO 3/17/22

pH paper (circle one): MQuant pH Cat 1.09535.0001 lot HC904495 [OR] Lab rat pH Cat # LRS -4801 Lot X000RWDG21

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 220866 Initial & Date & Time : _____

Comments: _____

Logged by MSO _____

Reviewed by JAB _____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-1
Lab Number: 220902-001
Date Collected: 03/16/2022 09:38 EDT

Customer Description:
Preparation:
Date Received: 03/18/2022 15:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.44	µg/L	1	0.10	0.02		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Arsenic	0.93	µg/L	1	0.10	0.03		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Barium	176	µg/L	1	0.20	0.05		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Beryllium	0.126	µg/L	1	0.050	0.007		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Boron	0.180	mg/L	1	0.050	0.009		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Cadmium	0.502	µg/L	1	0.020	0.004		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Calcium	118	mg/L	1	0.05	0.02	M1	GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Chromium	2.35	µg/L	1	0.20	0.04		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Cobalt	0.945	µg/L	1	0.020	0.003		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Lead	2.47	µg/L	1	0.20	0.05		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Lithium	0.00710	mg/L	1	0.00020	0.00005		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Magnesium	26.6	mg/L	1	0.10	0.02		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/23/2022 13:13	EPA 245.7-2005, Rev. 2.0
Molybdenum	13.3	µg/L	1	0.5	0.1		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Potassium	1.14	mg/L	1	0.10	0.02		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Selenium	3.48	µg/L	1	0.50	0.09		GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Sodium	45.5	mg/L	1	0.20	0.05	M1	GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4
Strontium	2.94	mg/L	5	0.010	0.002	M1	GES	04/06/2022 06:07	EPA 200.8-1994, Rev. 5.4
Thallium	0.08	µg/L	1	0.20	0.04	J1	GES	04/05/2022 18:08	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	3.27	pCi/L	0.38	0.27		ST	03/24/2022 08:22	SW-846 9315-1986, Rev. 0
Carrier Recovery	107	%						
Radium-228	1.78	pCi/L	0.17	0.51		TTP	03/25/2022 14:25	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	89.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-2
Lab Number: 220902-002
Date Collected: 03/16/2022 10:11 EDT

Customer Description:
Preparation:
Date Received: 03/18/2022 15:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	1.24	µg/L	1	0.10	0.02		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Arsenic	1.05	µg/L	1	0.10	0.03		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Barium	1050	µg/L	1	0.20	0.05		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Beryllium	0.075	µg/L	1	0.050	0.007		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Boron	0.174	mg/L	1	0.050	0.009		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Cadmium	0.257	µg/L	1	0.020	0.004		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Calcium	144	mg/L	1	0.05	0.02		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Chromium	0.55	µg/L	1	0.20	0.04		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Cobalt	0.468	µg/L	1	0.020	0.003		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Lead	1.50	µg/L	1	0.20	0.05		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Lithium	0.0588	mg/L	1	0.00020	0.00005		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Magnesium	70.9	mg/L	1	0.10	0.02		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/23/2022 13:15	EPA 245.7-2005, Rev. 2.0
Molybdenum	22.4	µg/L	1	0.5	0.1		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Potassium	2.72	mg/L	1	0.10	0.02		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Selenium	6.44	µg/L	1	0.50	0.09		GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4
Sodium	417	mg/L	20	4	1		GES	04/06/2022 06:22	EPA 200.8-1994, Rev. 5.4
Strontium	12.5	mg/L	20	0.040	0.008		GES	04/06/2022 06:22	EPA 200.8-1994, Rev. 5.4
Thallium	0.05	µg/L	1	0.20	0.04	J1	GES	04/05/2022 18:24	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	15.90	pCi/L	0.82	0.26		ST	03/24/2022 08:22	SW-846 9315-1986, Rev. 0
Carrier Recovery	122	%						
Radium-228	5	pCi/L	0.19	0.42		TTP	03/25/2022 14:25	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	91.0	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-10
Lab Number: 220902-003
Date Collected: 03/16/2022 11:06 EDT

Customer Description:
Preparation:
Date Received: 03/18/2022 15:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.07	µg/L	1	0.10	0.02	J1	GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Arsenic	0.20	µg/L	1	0.10	0.03		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Barium	6670	µg/L	25	5	1		GES	04/06/2022 06:28	EPA 200.8-1994, Rev. 5.4
Beryllium	0.026	µg/L	1	0.050	0.007	J1	GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Boron	0.984	mg/L	1	0.050	0.009		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Cadmium	0.089	µg/L	1	0.020	0.004		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Calcium	102	mg/L	1	0.05	0.02		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Chromium	0.54	µg/L	1	0.20	0.04		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Cobalt	0.097	µg/L	1	0.020	0.003		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Lead	0.21	µg/L	1	0.20	0.05		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Lithium	0.238	mg/L	1	0.00020	0.00005		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Magnesium	55.7	mg/L	1	0.10	0.02		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/23/2022 13:17	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.7	µg/L	1	0.5	0.1		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Potassium	6.28	mg/L	1	0.10	0.02		GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4
Sodium	1360	mg/L	25	5	1		GES	04/06/2022 06:28	EPA 200.8-1994, Rev. 5.4
Strontium	17.4	mg/L	25	0.05	0.01		GES	04/06/2022 06:28	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	04/05/2022 18:29	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	16.80	pCi/L	0.80	0.19		ST	03/24/2022 08:22	SW-846 9315-1986, Rev. 0
Carrier Recovery	138	%						
Radium-228	1.56	pCi/L	0.13	0.36		TTP	03/25/2022 14:25	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	110	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-11
Lab Number: 220902-004
Date Collected: 03/16/2022 10:39 EDT

Customer Description:
Preparation:
Date Received: 03/18/2022 15:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.27	µg/L	1	0.10	0.02		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Arsenic	1.32	µg/L	1	0.10	0.03		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Barium	172	µg/L	1	0.20	0.05		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Beryllium	0.016	µg/L	1	0.050	0.007	J1	GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Boron	0.578	mg/L	1	0.050	0.009		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Cadmium	0.028	µg/L	1	0.020	0.004		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Calcium	107	mg/L	1	0.05	0.02		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Chromium	0.43	µg/L	1	0.20	0.04		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Cobalt	1.43	µg/L	1	0.020	0.003		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Lead	0.12	µg/L	1	0.20	0.05	J1	GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Lithium	0.0199	mg/L	1	0.00020	0.00005		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Magnesium	16.1	mg/L	1	0.10	0.02		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/23/2022 13:20	EPA 245.7-2005, Rev. 2.0
Molybdenum	2.0	µg/L	1	0.5	0.1		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Potassium	3.75	mg/L	1	0.10	0.02		GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Selenium	0.26	µg/L	1	0.50	0.09	J1	GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4
Sodium	282	mg/L	5	1.0	0.3		GES	04/06/2022 06:33	EPA 200.8-1994, Rev. 5.4
Strontium	4.05	mg/L	5	0.010	0.002		GES	04/06/2022 06:33	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	04/05/2022 18:34	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.78	pCi/L	0.18	0.24		ST	03/24/2022 08:22	SW-846 9315-1986, Rev. 0
Carrier Recovery	112	%						
Radium-228	0.42	pCi/L	0.15	0.50		TTP	03/25/2022 14:25	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	83.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: Duplicate
Lab Number: 220902-005
Date Collected: 03/16/2022 11:00 EDT

Customer Description:
Preparation:
Date Received: 03/18/2022 15:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.44	µg/L	1	0.10	0.02		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Arsenic	0.76	µg/L	1	0.10	0.03		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Barium	173	µg/L	1	0.20	0.05		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Beryllium	0.077	µg/L	1	0.050	0.007		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Boron	0.183	mg/L	1	0.050	0.009		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Cadmium	0.399	µg/L	1	0.020	0.004		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Calcium	123	mg/L	1	0.05	0.02		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Chromium	1.46	µg/L	1	0.20	0.04		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Cobalt	0.573	µg/L	1	0.020	0.003		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Lead	1.19	µg/L	1	0.20	0.05		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Lithium	0.00670	mg/L	1	0.00020	0.00005		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Magnesium	27.7	mg/L	1	0.10	0.02		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/23/2022 14:41	EPA 245.7-2005, Rev. 2.0
Molybdenum	14.1	µg/L	1	0.5	0.1		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Potassium	1.0	mg/L	1	0.10	0.02		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Selenium	3.44	µg/L	1	0.50	0.09		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Sodium	47.0	mg/L	1	0.20	0.05		GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4
Strontium	2.90	mg/L	5	0.010	0.002		GES	04/06/2022 06:38	EPA 200.8-1994, Rev. 5.4
Thallium	0.07	µg/L	1	0.20	0.04	J1	GES	04/05/2022 18:39	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 220902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: Equipment Blank
Lab Number: 220902-006
Date Collected: 03/16/2022 11:12 EDT

Customer Description:
Preparation:
Date Received: 03/18/2022 15:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Barium	<0.05	µg/L	1	0.20	0.05	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Boron	<0.009	mg/L	1	0.050	0.009	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Calcium	0.02	mg/L	1	0.05	0.02	J1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Chromium	0.20	µg/L	1	0.20	0.04		GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Cobalt	0.009	µg/L	1	0.020	0.003	J1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00005	mg/L	1	0.00020	0.00005	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.02	mg/L	1	0.10	0.02	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/23/2022 14:48	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Potassium	<0.02	mg/L	1	0.10	0.02	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Sodium	<0.05	mg/L	1	0.20	0.05	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Strontium	<0.0004	mg/L	1	0.0020	0.0004	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	04/05/2022 18:44	EPA 200.8-1994, Rev. 5.4

220902
Job Comments:

Original report issued 4/20/2022. Report reissued with amended matrix spike precision calculations.

Water Analysis Report

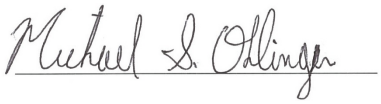
Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 220902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

M1 - The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
U1 - Not detected at or above method detection limit (MDL).
J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: Northeastern PS
Contact Name: Jill Parker-Witt
Contact Phone: 318-673-3816
Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 220902

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3	Field-filter 500 mL bottle, then pH<2, HNO_3	250 mL bottle, Cool. 0-6°C	Three (six every 10th*) 1 L bottles, pH<2, HNO_3	125 mL PTFE lined bottle, HCL**, pH<2			Sample Specific Notes:
							B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, Tl and Na, K, Mg, Sr	dissolved Fe and Mn	TDS, F, Cl, SO_4, and Br, Alkalinity	Ra-226, Ra-228	HG			
SP-1	3/16/2022	838	G	GW	5		X			X	X			
SP-2	3/16/2022	911	G	GW	8		X			X	X			
SP-10	3/16/2022	1006	G	GW	5		X			X	X			
SP-11	3/16/2022	939	G	GW	5		X			X	X			
DUPLICATE	3/16/2022	1000	G	GW	2		X				X			
EQUIPMENT BLANK	3/16/2022	1012	G	GW	2		X				X			
Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	EA&E	03/16/22 1130		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
			[signature]	3/18/22 3:00PM

Form COC-04, AEP Chain of Custody (COC) Record for Coal Combustion Residual (CCR) Sampling - Shreveport, Rev. 1, 1/10/17

AEP WATER & WASTE SAMPLE RECEIPT FORM (IR#2)

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Northeastern (304) **Number of Plastic Containers:** 21

Opened By MSD **Number of Glass Containers:** –

Date/Time 3/18/22 3:00PM **Number of Mercury Containers:** 6

Were all temperatures within 0-6°C? Y / N or (N/A) **Initial:** _____ on ice / no ice

(IR Gun Ser# 210441582, *Expir.5/27/2023)* - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** MSD 3/21/22 ✓

pH paper (circle one): MQuant pH Cat 1.09535.0001 lot HC904495 _____ [OR] Lab rat pH Cat # LRS -4801 Lot X000RWDG21 –

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 220902 Initial & Date & Time : _____

Comments: _____

Logged by MSD _____

Reviewed by JAB _____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221871 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/07/2022**

Customer Sample ID: SP-1 Customer Description:
Lab Number: 221871-001 Preparation:
Date Collected: 06/14/2022 11:45 Date Received: 06/16/2022 10:30

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	21.2	mg/L	2	0.04	0.02		CRJ	06/30/2022 22:43	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.78	mg/L	2	0.06	0.02		CRJ	06/30/2022 22:43	EPA 300.1 -1997, Rev. 1.0
Sulfate	65.2	mg/L	10	2.0	0.3		CRJ	06/30/2022 17:33	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	430	mg/L	1	50	20	L1	SDW	06/17/2022 11:00	SM 2540C-2015

Customer Sample ID: SP-2 Customer Description:
Lab Number: 221871-002 Preparation:
Date Collected: 06/14/2022 11:31 Date Received: 06/16/2022 10:30

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	844	mg/L	50	1.0	0.5		CRJ	06/30/2022 17:59	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.08	mg/L	5	0.15	0.05		CRJ	06/30/2022 23:09	EPA 300.1 -1997, Rev. 1.0
Sulfate	22.3	mg/L	5	1.0	0.2		CRJ	06/30/2022 23:09	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1720	mg/L	1	50	20	L1	SDW	06/17/2022 11:05	SM 2540C-2015

Customer Sample ID: SP-4 Customer Description:
Lab Number: 221871-003 Preparation:
Date Collected: 06/14/2022 14:09 Date Received: 06/16/2022 10:30

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	452	mg/L	50	1.0	0.5		CRJ	06/30/2022 18:24	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.25	mg/L	5	0.15	0.05		CRJ	07/01/2022 00:01	EPA 300.1 -1997, Rev. 1.0
Sulfate	80.4	mg/L	5	1.0	0.2		CRJ	07/01/2022 00:01	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1160	mg/L	1	50	20	L1	SDW	06/17/2022 11:05	SM 2540C-2015

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221871 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/07/2022**

Customer Sample ID: SP-5R **Customer Description:**
Lab Number: 221871-004 **Preparation:**
Date Collected: 06/14/2022 09:00 **Date Received: 06/16/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	675	mg/L	50	1.0	0.5		CRJ	06/30/2022 18:50	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.09	mg/L	5	0.15	0.05		CRJ	07/01/2022 00:26	EPA 300.1 -1997, Rev. 1.0
Sulfate	4.7	mg/L	5	1.0	0.2		CRJ	07/01/2022 00:26	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1410	mg/L	1	50	20	L1	SDW	06/17/2022 11:12	SM 2540C-2015

Customer Sample ID: SP-10 **Customer Description:**
Lab Number: 221871-005 **Preparation:**
Date Collected: 06/14/2022 11:03 **Date Received: 06/16/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1810	mg/L	250	5	3		CRJ	06/30/2022 19:42	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.3	mg/L	25	0.8	0.3		CRJ	07/01/2022 01:18	EPA 300.1 -1997, Rev. 1.0
Sulfate	16.3	mg/L	25	5.0	0.8		CRJ	07/01/2022 01:18	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	3600	mg/L	4	200	80	L1	SDW	06/17/2022 11:12	SM 2540C-2015

Customer Sample ID: SP-11 **Customer Description:**
Lab Number: 221871-006 **Preparation:**
Date Collected: 06/14/2022 11:22 **Date Received: 06/16/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	60.0	mg/L	5	0.10	0.05		CRJ	07/01/2022 01:44	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.10	mg/L	5	0.15	0.05		CRJ	07/01/2022 01:44	EPA 300.1 -1997, Rev. 1.0
Sulfate	402	mg/L	50	10	2		CRJ	06/30/2022 20:08	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1020	mg/L	2	100	40	L1	SDW	06/17/2022 11:19	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221871 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/07/2022**

Customer Sample ID: BAP DUPLICATE
Customer Description:
Lab Number: 221871-007
Preparation:
Date Collected: 06/14/2022 14:00
Date Received: 06/16/2022 10:30

Ion Chromatography

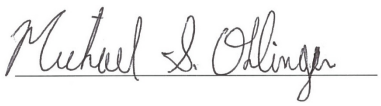
Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1960	mg/L	250	5	3		CRJ	07/01/2022 11:27	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.5	mg/L	25	0.8	0.3		CRJ	07/01/2022 11:53	EPA 300.1 -1997, Rev. 1.0
Sulfate	17.7	mg/L	25	5.0	0.8		CRJ	07/01/2022 11:53	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	3750	mg/L	1	50	20	S1	SDW	06/17/2022 11:31	SM 2540C-2015

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221871 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/07/2022**

Data Qualifer Legend

L1 - The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

S1 - Residue weight is above or below the method criteria and needs to be re-analyzed at a different dilution.

22187-1

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling

Contact Name: Jill Parker-Witt

Contact Phone: 318-673-3816

Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	B, Ca, Li, Sb, As, Be, Ba, Cd, Cr, Co, Pb, Mo, Se, Tl (250 mL bottle, pH<2, HNO_3)	dissolved Fe and Mn (Field-filter 500 mL bottle, then pH<2, HNO_3)	TDS, F, Cl, SO_4 (1 L bottle, Cool, 0-6°C)	Ra-226, Ra-228 (Three (six every 10th*) 1 L bottles, pH<2, HNO_3)	Hg (250 mL Glass or 125/250 mL PTFE lined bottle, HCl**, pH<2)			Sample Specific Notes:
SP-1	6/14/2022	1145	G	GW	1				X					
SP-2	6/14/2022	1131	G	GW	1				X					
SP-4	6/14/2022	1409	G	GW	1				X					
SP-5R	6/14/2022	900	G	GW	1				X					
SP-10	6/14/2022	1103	G	GW	1				X					
SP-11	6/14/2022	1122	G	GW	1				X					
BAP DUPLICATE	6/14/2022	1400	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company: E46LF	Date/Time: 06/15/22 1400	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time: 06/16/22 10:30

WATER & WASTE SAMPLE RECEIPT FORM (IR#1)

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS FedEX USPS
	Other _____

Plant/Customer Xlot Heatern — Number of Plastic Containers: 7

Opened By Missian/Jason — Number of Glass Containers: _____

Date/Time 06/16/22 1030 — Number of Mercury Containers: _____

Were all temperatures within 0-6°C? (Y) / N or N/A Initial: mGlc (on ice) / no ice

(IR Gun Ser# 210441568, *Expir.5/27/2023*) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: 28 days — If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** mGlc/JB 06/16/22

pH paper (circle one): MQuant pH Cat 1.09535.0001 lot HC904495 _____ [OR] Lab rat pH Cat # LRS -4801 Lot X000RWDG21 ✓

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 221871 — Initial & Date & Time : _____

Logged by RSO — Comments: _____

Reviewed by mGlc

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-1
Lab Number: 221902-001
Date Collected: 06/14/2022 12:45 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.72	µg/L	1	0.10	0.02		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Arsenic	0.84	µg/L	1	0.10	0.03		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Barium	161	µg/L	1	0.20	0.05		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Beryllium	0.061	µg/L	1	0.050	0.007		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Boron	0.176	mg/L	1	0.050	0.009		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Cadmium	0.066	µg/L	1	0.020	0.004		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Calcium	102	mg/L	1	0.05	0.02		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Chromium	0.60	µg/L	1	0.20	0.04		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Cobalt	1.14	µg/L	1	0.020	0.003		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Lead	0.22	µg/L	1	0.20	0.05		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Lithium	0.00473	mg/L	1	0.00020	0.00005		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Magnesium	21.8	mg/L	1	0.10	0.02		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	21.2	µg/L	1	0.5	0.1		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Potassium	0.88	mg/L	1	0.10	0.02		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Selenium	9.63	µg/L	1	0.50	0.09		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Sodium	34.1	mg/L	1	0.20	0.05		GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4
Thallium	0.07	µg/L	1	0.20	0.04	J1	GES	07/12/2022 04:03	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.36	pCi/L	0.18	0.14		TTP	06/29/2022 08:26	SW-846 9315-1986, Rev. 0
Carrier Recovery	93.8	%						
Radium-228	2.62	pCi/L	0.20	0.60		TTP	06/29/2022 16:20	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	69.4	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-2
Lab Number: 221902-002
Date Collected: 06/14/2022 12:31 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	1.51	µg/L	1	0.10	0.02		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Arsenic	1.11	µg/L	1	0.10	0.03		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Barium	1070	µg/L	1	0.20	0.05		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Beryllium	0.1	µg/L	20	1.0	0.1	J1	GES	07/12/2022 10:19	EPA 200.8-1994, Rev. 5.4
Boron	0.228	mg/L	1	0.050	0.009		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Cadmium	0.063	µg/L	1	0.020	0.004		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Calcium	115	mg/L	1	0.05	0.02		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Chromium	1.05	µg/L	1	0.20	0.04		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Cobalt	0.791	µg/L	1	0.020	0.003		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Lead	0.17	µg/L	1	0.20	0.05	J1	GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Lithium	0.084	mg/L	20	0.004	0.001		GES	07/12/2022 10:19	EPA 200.8-1994, Rev. 5.4
Magnesium	73.5	mg/L	20	2.0	0.4		GES	07/12/2022 04:24	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	26.5	µg/L	1	0.5	0.1		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Potassium	3.5	mg/L	20	2.0	0.4		GES	07/12/2022 04:24	EPA 200.8-1994, Rev. 5.4
Selenium	9.56	µg/L	1	0.50	0.09		GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4
Sodium	519	mg/L	20	4	1		GES	07/12/2022 04:24	EPA 200.8-1994, Rev. 5.4
Thallium	0.07	µg/L	1	0.20	0.04	J1	GES	07/12/2022 04:19	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	5.80	pCi/L	0.46	0.22		ST	06/30/2022 14:29	SW-846 9315-1986, Rev. 0
Carrier Recovery	119	%						
Radium-228	5.03	pCi/L	0.18	0.44		TTP	06/29/2022 16:20	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	95.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-4
Lab Number: 221902-003
Date Collected: 06/14/2022 15:09 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.21	µg/L	1	0.10	0.02		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Arsenic	0.80	µg/L	1	0.10	0.03		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Barium	246	µg/L	1	0.20	0.05		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Beryllium	0.04	µg/L	5	0.25	0.04	J1	GES	07/12/2022 10:24	EPA 200.8-1994, Rev. 5.4
Boron	0.367	mg/L	1	0.050	0.009		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Cadmium	0.024	µg/L	1	0.020	0.004		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Calcium	70.2	mg/L	1	0.05	0.02		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Chromium	0.56	µg/L	1	0.20	0.04		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Cobalt	0.159	µg/L	1	0.020	0.003		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Lead	0.10	µg/L	1	0.20	0.05	J1	GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Lithium	0.0571	mg/L	5	0.0010	0.0003		GES	07/12/2022 10:24	EPA 200.8-1994, Rev. 5.4
Magnesium	35.9	mg/L	1	0.10	0.02		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	3.7	µg/L	1	0.5	0.1		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Potassium	2.37	mg/L	1	0.10	0.02		GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Selenium	0.38	µg/L	1	0.50	0.09	J1	GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4
Sodium	300	mg/L	5	1.0	0.3		GES	07/12/2022 10:24	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	07/12/2022 04:29	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.50	pCi/L	0.27	0.28		ST	06/30/2022 14:29	SW-846 9315-1986, Rev. 0
Carrier Recovery	101	%						
Radium-228	2.06	pCi/L	0.15	0.43		TTP	06/29/2022 16:20	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	82.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-5R
Lab Number: 221902-004
Date Collected: 06/14/2022 10:00 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.19	µg/L	1	0.10	0.02		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Arsenic	20.3	µg/L	1	0.10	0.03		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Barium	2010	µg/L	5	1.0	0.3		GES	07/12/2022 04:39	EPA 200.8-1994, Rev. 5.4
Beryllium	0.07	µg/L	5	0.25	0.04	J1	GES	07/12/2022 10:29	EPA 200.8-1994, Rev. 5.4
Boron	0.209	mg/L	1	0.050	0.009		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Cadmium	0.200	µg/L	1	0.020	0.004		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Calcium	52.5	mg/L	1	0.05	0.02		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Chromium	0.47	µg/L	1	0.20	0.04		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Cobalt	0.699	µg/L	1	0.020	0.003		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Lead	0.66	µg/L	1	0.20	0.05		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Lithium	0.0896	mg/L	5	0.0010	0.0003		GES	07/12/2022 10:29	EPA 200.8-1994, Rev. 5.4
Magnesium	31.0	mg/L	5	0.5	0.1		GES	07/12/2022 04:39	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.9	µg/L	1	0.5	0.1		GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Potassium	2.6	mg/L	5	0.5	0.1		GES	07/12/2022 04:39	EPA 200.8-1994, Rev. 5.4
Selenium	0.1	µg/L	1	0.50	0.09	J1	GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4
Sodium	469	mg/L	5	1.0	0.3		GES	07/12/2022 04:39	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	07/12/2022 04:34	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	7.57	pCi/L	0.57	0.25		ST	06/30/2022 14:29	SW-846 9315-1986, Rev. 0
Carrier Recovery	113	%						
Radium-228	3.69	pCi/L	0.18	0.46		TTP	06/29/2022 16:20	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	92.9	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-10
Lab Number: 221902-005
Date Collected: 06/14/2022 12:03 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.03	µg/L	1	0.10	0.02	J1	GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Arsenic	0.19	µg/L	1	0.10	0.03		GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Barium	7590	µg/L	25	5	1		GES	07/12/2022 04:49	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.4	µg/L	50	2.5	0.4	U1	GES	07/12/2022 12:17	EPA 200.8-1994, Rev. 5.4
Boron	1.04	mg/L	1	0.050	0.009		GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Cadmium	0.033	µg/L	1	0.020	0.004		GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Calcium	56.1	mg/L	1	0.05	0.02		GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Chromium	0.57	µg/L	1	0.20	0.04		GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Cobalt	0.216	µg/L	1	0.020	0.003		GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Lead	0.19	µg/L	1	0.20	0.05	J1	GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Lithium	0.289	mg/L	50	0.010	0.003		GES	07/12/2022 12:17	EPA 200.8-1994, Rev. 5.4
Magnesium	59.2	mg/L	25	2.5	0.5		GES	07/12/2022 04:49	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.5	µg/L	1	0.5	0.1		GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Potassium	7.0	mg/L	25	2.5	0.5		GES	07/12/2022 04:49	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4
Sodium	1500	mg/L	25	5	1		GES	07/12/2022 04:49	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	07/12/2022 04:44	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	18.80	pCi/L	0.84	0.22	R2	ST	06/30/2022 14:29	SW-846 9315-1986, Rev. 0
Carrier Recovery	142	%						
Radium-228	1.31	pCi/L	0.11	0.33		TTP	06/29/2022 16:20	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	118	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: SP-11
Lab Number: 221902-006
Date Collected: 06/14/2022 12:22 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.43	µg/L	1	0.10	0.02		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Arsenic	2.73	µg/L	1	0.10	0.03		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Barium	139	µg/L	1	0.20	0.05		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.04	µg/L	5	0.25	0.04	U1	GES	07/12/2022 11:31	EPA 200.8-1994, Rev. 5.4
Boron	0.627	mg/L	1	0.050	0.009		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Cadmium	0.027	µg/L	1	0.020	0.004		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Calcium	113	mg/L	1	0.05	0.02		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Chromium	0.59	µg/L	1	0.20	0.04		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Cobalt	2.36	µg/L	1	0.020	0.003		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Lead	0.23	µg/L	1	0.20	0.05		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Lithium	0.0140	mg/L	5	0.0010	0.0003		GES	07/12/2022 11:31	EPA 200.8-1994, Rev. 5.4
Magnesium	15.7	mg/L	5	0.5	0.1		GES	07/12/2022 05:00	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	2.9	µg/L	1	0.5	0.1		GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Potassium	3.9	mg/L	5	0.5	0.1		GES	07/12/2022 05:00	EPA 200.8-1994, Rev. 5.4
Selenium	0.19	µg/L	1	0.50	0.09	J1	GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4
Sodium	238	mg/L	5	1.0	0.3		GES	07/12/2022 05:00	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	07/12/2022 04:54	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.17	pCi/L	0.23	0.26		ST	06/30/2022 14:29	SW-846 9315-1986, Rev. 0
Carrier Recovery	99.6	%						
Radium-228	-0.03	pCi/L	0.17	0.59		TTP	06/29/2022 16:20	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	89.9	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: BAP Duplicate
Lab Number: 221902-007
Date Collected: 06/14/2022 15:00 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.04	µg/L	1	0.10	0.02	J1	GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Arsenic	0.17	µg/L	1	0.10	0.03		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Barium	7020	µg/L	20	4	1		GES	07/12/2022 12:22	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.1	µg/L	20	1.0	0.1	U1	GES	07/12/2022 12:22	EPA 200.8-1994, Rev. 5.4
Boron	1.04	mg/L	1	0.050	0.009		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Cadmium	0.034	µg/L	1	0.020	0.004		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Calcium	60.9	mg/L	1	0.05	0.02		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Chromium	0.53	µg/L	1	0.20	0.04		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Cobalt	0.180	µg/L	1	0.020	0.003		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Lead	0.31	µg/L	1	0.20	0.05		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Lithium	0.275	mg/L	20	0.004	0.001		GES	07/12/2022 12:22	EPA 200.8-1994, Rev. 5.4
Magnesium	46.6	mg/L	1	0.10	0.02		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.5	µg/L	1	0.5	0.1		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Potassium	6.85	mg/L	1	0.10	0.02		GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4
Sodium	1250	mg/L	10	2.0	0.5		GES	07/12/2022 11:36	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	07/12/2022 05:05	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Customer Sample ID: BAP Equipment Blank
Lab Number: 221902-008
Date Collected: 06/14/2022 10:07 EDT

Customer Description:
Preparation:
Date Received: 06/17/2022 16:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Barium	0.07	µg/L	1	0.20	0.05	J1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	GES	07/12/2022 11:41	EPA 200.8-1994, Rev. 5.4
Boron	<0.009	mg/L	1	0.050	0.009	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Chromium	0.45	µg/L	1	0.20	0.04		GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Cobalt	0.016	µg/L	1	0.020	0.003	J1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00005	mg/L	1	0.00020	0.00005	U1	GES	07/12/2022 11:41	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.02	mg/L	1	0.10	0.02	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	07/08/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Potassium	<0.02	mg/L	1	0.10	0.02	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Sodium	<0.05	mg/L	1	0.20	0.05	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	07/12/2022 05:10	EPA 200.8-1994, Rev. 5.4

221902
Job Comments:

Original report issued 7/20/2022. Report reissued with amended matrix spike precision calculations as well as additions of minerals.

Water Analysis Report

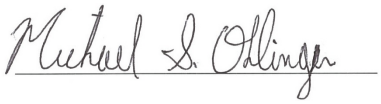
Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 221902 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/30/2022**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

U1 - Not detected at or above method detection limit (MDL).
J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
R2 - Carrier recovery was outside acceptance limits.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling

Contact Name: Jill Parker-Witt

Contact Phone: 318-673-3816

Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 221902

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, TL	Field-filter 500 mL bottle, then pH<2, HNO_3 dissolved Fe and Mn	1 L bottle, Cool, 0-6°C TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	250 mL Glass or 125/250 mL PTFE lined bottle, HCL**, pH<2 Hg			Sample Specific Notes:
SP-1	6/14/2022	1145	G	GW	5		X			X	X			
SP-2	6/14/2022	1131	G	GW	5		X			X	X			
SP-4	6/14/2022	1409	G	GW	5		X			X	X			
SP-5R	6/14/2022	900	G	GW	5		X			X	X			
SP-10	6/14/2022	1103	G	GW	8		X			X	X			
SP-11	6/14/2022	1122	G	GW	5		X			X	X			
BAP DUPLICATE	6/14/2022	1400	G	GW	2		X				X			
BAP EQUIPMENT BLANK	6/14/2022	907	G	W	2		X				X			
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company: EAGLE	Date/Time: 06/15/22 1400	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Jonathan Barnhill	Date/Time: 6-17-22 1600

WATER & WASTE SAMPLE RECEIPT FORM (IR#1)

Package Type	Delivery Type
Cooler Box Bag Envelope	PONY UPS FedEX USPS
	Other _____

Plant/Customer Northeastern Number of Plastic Containers: 29

Opened By JDB Number of Glass Containers: _____

Date/Time 6/17/22 1600 Number of Mercury Containers: 8

Were all temperatures within 0-6°C? Y / N or (N/A) Initial: _____ on ice / no ice

(IR Gun Ser# 210441568, *Expir.5/27/2023*) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** JDB 6/17/22

pH paper (circle one): MQuant pH Cat 1.09535.0001 lot HC904495 _____ [OR] Lab rat pH Cat # LRS -4801 Lot X000RWDG21 ✓

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 221902 Initial & Date & Time : _____

Comments: _____

Logged by JDB _____

Reviewed by JAB _____

_____

_____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223558 **Customer: Northeastern 3&4 Power Station** **Date Reported: 11/28/2022**

Customer Sample ID: SP-1 **Customer Description:**
Lab Number: 223558-001 **Preparation:**
Date Collected: 11/08/2022 12:02 **Date Received: 11/10/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	16.3	mg/L	5	0.10	0.05		CRJ	11/22/2022 03:40	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.85	mg/L	5	0.15	0.05		CRJ	11/22/2022 03:40	EPA 300.1 -1997, Rev. 1.0
Sulfate	54.1	mg/L	5	1.0	0.2		CRJ	11/22/2022 03:40	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	400	mg/L	1	50	20		SDW	11/14/2022 08:05	SM 2540C-2015

Customer Sample ID: SP-2 **Customer Description:**
Lab Number: 223558-002 **Preparation:**
Date Collected: 11/08/2022 11:48 **Date Received: 11/10/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	695	mg/L	100	2	1		CRJ	11/22/2022 06:57	EPA 300.1 -1997, Rev. 1.0
Fluoride	2.7	mg/L	10	0.3	0.1		CRJ	11/22/2022 09:45	EPA 300.1 -1997, Rev. 1.0
Sulfate	18.1	mg/L	10	2.0	0.3		CRJ	11/22/2022 09:45	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1480	mg/L	1	50	20		SDW	11/14/2022 08:13	SM 2540C-2015

Customer Sample ID: SP-4 **Customer Description:**
Lab Number: 223558-003 **Preparation:**
Date Collected: 11/08/2022 12:29 **Date Received: 11/10/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	447	mg/L	50	1.0	0.5		CRJ	11/22/2022 07:30	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.23	mg/L	5	0.15	0.05		CRJ	11/22/2022 10:18	EPA 300.1 -1997, Rev. 1.0
Sulfate	81.9	mg/L	5	1.0	0.2		CRJ	11/22/2022 10:18	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1150	mg/L	1	50	20		SDW	11/14/2022 08:13	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223558 **Customer: Northeastern 3&4 Power Station** **Date Reported: 11/28/2022**

Customer Sample ID: SP-5R **Customer Description:**
Lab Number: 223558-004 **Preparation:**
Date Collected: 11/08/2022 15:17 **Date Received: 11/10/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1010	mg/L	50	1.0	0.5		CRJ	11/22/2022 08:06	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.28	mg/L	5	0.15	0.05		CRJ	11/22/2022 11:24	EPA 300.1 -1997, Rev. 1.0
Sulfate	2.8	mg/L	5	1.0	0.2		CRJ	11/22/2022 11:24	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1940	mg/L	1	50	20		SDW	11/14/2022 08:20	SM 2540C-2015

Customer Sample ID: SP-10 **Customer Description:**
Lab Number: 223558-005 **Preparation:**
Date Collected: 11/08/2022 11:14 **Date Received: 11/10/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1820	mg/L	250	5	3		CRJ	11/22/2022 02:01	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.8	mg/L	10	0.3	0.1		CRJ	11/22/2022 02:34	EPA 300.1 -1997, Rev. 1.0
Sulfate	16.7	mg/L	10	2.0	0.3		CRJ	11/22/2022 02:34	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	3330	mg/L	4	200	80		SDW	11/14/2022 08:20	SM 2540C-2015

Customer Sample ID: SP-11 **Customer Description:**
Lab Number: 223558-006 **Preparation:**
Date Collected: 11/08/2022 11:38 **Date Received: 11/10/2022 10:30**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	97.3	mg/L	25	0.5	0.3		CRJ	11/22/2022 13:02	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.3	mg/L	25	0.8	0.3		CRJ	11/22/2022 13:02	EPA 300.1 -1997, Rev. 1.0
Sulfate	356	mg/L	25	5.0	0.8		CRJ	11/22/2022 13:02	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1060	mg/L	2	100	40		SDW	11/14/2022 08:27	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223558 **Customer: Northeastern 3&4 Power Station** **Date Reported: 11/28/2022**

Customer Sample ID: BAP Duplicate
Customer Description:
Lab Number: 223558-007
Preparation:
Date Collected: 11/07/2022 16:00
Date Received: 11/10/2022 10:30

Ion Chromatography

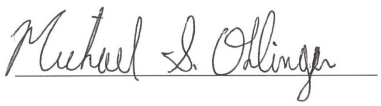
Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	2030	mg/L	500	10	5		CRJ	11/22/2022 15:33	EPA 300.1 -1997, Rev. 1.0
Fluoride	4.02	mg/L	5	0.15	0.05		CRJ	11/22/2022 11:57	EPA 300.1 -1997, Rev. 1.0
Sulfate	2.1	mg/L	5	1.0	0.2		CRJ	11/22/2022 11:57	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	3630	mg/L	2	100	40		SDW	11/14/2022 08:27	SM 2540C-2015

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR Sampling
Contact Name: Jill Parker-Witt
Contact Phone: 318-673-3816
Sampler(s): Kenny McDonald/Matt Hamilton

Analysis Turnaround Time (in Calendar Days)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 223558

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	500 mL bottle, pH<2, HNO_3 B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, TL	Field-filter 500 mL bottle, then pH<2, HNO_3 dissolved Fe and Mn	1 L bottle, Cool, 0-6°C TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	40 mL Glass vial or 250 mL PTFE lined bottle, HCL**, pH<2 Hg			Sample Specific Notes:
SP-1	11/8/2022	1002	G	GW	1				X					
SP-2	11/8/2022	948	G	GW	1				X					
SP-4	11/8/2022	1029	G	GW	1				X					
SP-5R	11/7/2022	1317	G	GW	1				X					
SP-10	11/8/2022	914	G	GW	1				X					
SP-11	11/8/2022	938	G	GW	1				X					
BAP Duplicate	11/7/2022	1400	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company: EAGLE	Date/Time: 11/09/22 1400	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time: 11/10/22 10:30 AM

WATER & WASTE SAMPLE RECEIPT FORM (Temp Gun 1)

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Northwestern **Number of Plastic Containers:** 7

Opened By MSO **Number of Glass Containers:** -

Date/Time 11/10/22 **Number of Mercury Containers:** -

Were all temperatures within 0-6°C? (Y) / N or N/A **Initial:** MSO (on ice) / no ice (IR Gun Ser# 221368900, *Expir. 3/22/2024)* - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min) Cr^{+6} (pres) (24 hr) NO_2 or NO_3 (48 hr) *ortho*-PO_4 (48 hr) Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** MSO 11/10/22

pH paper (circle one): MQuant,PN1.09535.0001,LOT# HC904495____ [OR] Lab Rat,PN4801,LOT# X000RWDG21

Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 223558 Initial & Date & Time : _____

Logged by MSO Comments: _____

Reviewed by EDL

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: SP-1 Customer Description:
Lab Number: 223586-001 Preparation:
Date Collected: 11/08/2022 11:02 EST Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.80	µg/L	1	0.10	0.02		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Arsenic	0.69	µg/L	1	0.10	0.03		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Barium	157	µg/L	1	0.20	0.05		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Beryllium	0.054	µg/L	1	0.050	0.007		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Boron	0.147	mg/L	1	0.050	0.009		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Cadmium	0.055	µg/L	1	0.020	0.004		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Calcium	102	mg/L	1	0.05	0.02	M1	GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Chromium	1.30	µg/L	1	0.20	0.04		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Cobalt	0.684	µg/L	1	0.020	0.003		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Lead	0.15	µg/L	1	0.20	0.05	J1	GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Lithium	0.00558	mg/L	1	0.00020	0.00005		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	28.8	µg/L	1	0.5	0.1		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Selenium	15.4	µg/L	1	0.50	0.09		GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4
Thallium	0.07	µg/L	1	0.20	0.04	J1	GES	11/28/2022 19:09	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.95	pCi/L	0.25	0.24		ST	11/21/2022 12:59	SW-846 9315-1986, Rev. 0
Carrier Recovery	94.1	%						
Radium-228	3.73	pCi/L	0.19	0.47		TTP	12/27/2022 14:41	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	98.4	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: SP-2 Customer Description:
Lab Number: 223586-002 Preparation:
Date Collected: 11/08/2022 10:48 EST Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	1.17	µg/L	1	0.10	0.02		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Arsenic	1.21	µg/L	1	0.10	0.03		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Barium	872	µg/L	1	0.20	0.05		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Beryllium	0.048	µg/L	1	0.050	0.007	J1	GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Boron	0.108	mg/L	1	0.050	0.009		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Cadmium	0.328	µg/L	1	0.020	0.004		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Calcium	103	mg/L	1	0.05	0.02		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Chromium	2.12	µg/L	1	0.20	0.04		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Cobalt	0.186	µg/L	1	0.020	0.003		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Lead	0.33	µg/L	1	0.20	0.05		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Lithium	0.0308	mg/L	1	0.00020	0.00005		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	22.1	µg/L	1	0.5	0.1		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Selenium	2.36	µg/L	1	0.50	0.09		GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	11/28/2022 19:25	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	5.57	pCi/L	0.38	0.17		ST	11/21/2022 12:59	SW-846 9315-1986, Rev. 0
Carrier Recovery	121	%						
Radium-228	1.18	pCi/L	0.12	0.36		TTP	11/18/2022 14:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	124	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: SP-4
Lab Number: 223586-003
Date Collected: 11/08/2022 11:29 EST

Customer Description:
Preparation:
Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.23	µg/L	1	0.10	0.02		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Arsenic	0.92	µg/L	1	0.10	0.03		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Barium	214	µg/L	1	0.20	0.05		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Beryllium	0.053	µg/L	1	0.050	0.007		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Boron	0.354	mg/L	1	0.050	0.009		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Cadmium	0.059	µg/L	1	0.020	0.004		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Calcium	97.6	mg/L	1	0.05	0.02		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Chromium	1.19	µg/L	1	0.20	0.04		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Cobalt	0.345	µg/L	1	0.020	0.003		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Lead	0.38	µg/L	1	0.20	0.05		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Lithium	0.0579	mg/L	1	0.00020	0.00005		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	3.5	µg/L	1	0.5	0.1		GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Selenium	0.39	µg/L	1	0.50	0.09	J1	GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	11/28/2022 19:30	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.26	pCi/L	0.21	0.26		ST	11/21/2022 12:59	SW-846 9315-1986, Rev. 0
Carrier Recovery	87.5	%						
Radium-228	5.03	pCi/L	0.18	0.40		TTP	11/18/2022 14:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	101	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: SP-5R
Customer Description:
Lab Number: 223586-004
Preparation:
Date Collected: 11/08/2022 14:17 EST
Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.16	µg/L	1	0.10	0.02		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Arsenic	14.2	µg/L	1	0.10	0.03		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Barium	2070	µg/L	5	1.0	0.3		GES	11/29/2022 09:19	EPA 200.8-1994, Rev. 5.4
Beryllium	0.066	µg/L	1	0.050	0.007		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Boron	0.256	mg/L	1	0.050	0.009		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Cadmium	0.108	µg/L	1	0.020	0.004		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Calcium	90.2	mg/L	1	0.05	0.02		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Chromium	0.75	µg/L	1	0.20	0.04		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Cobalt	0.511	µg/L	1	0.020	0.003		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Lead	4.34	µg/L	1	0.20	0.05		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Lithium	0.120	mg/L	1	0.00020	0.00005		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.8	µg/L	1	0.5	0.1		GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Selenium	0.11	µg/L	1	0.50	0.09	J1	GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	11/28/2022 19:35	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	6.56	pCi/L	0.38	0.16		ST	11/21/2022 12:59	SW-846 9315-1986, Rev. 0
Carrier Recovery	147	%						
Radium-228	2.81	pCi/L	0.18	0.48		TTP	11/18/2022 14:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	90.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: SP-10
Lab Number: 223586-005
Date Collected: 11/08/2022 10:14 EST

Customer Description:
Preparation:
Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.05	µg/L	1	0.10	0.02	J1	GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Arsenic	0.61	µg/L	1	0.10	0.03		GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Barium	5050	µg/L	5	1.0	0.3		GES	11/29/2022 09:24	EPA 200.8-1994, Rev. 5.4
Beryllium	0.036	µg/L	1	0.050	0.007	J1	GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Boron	0.967	mg/L	1	0.050	0.009		GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Cadmium	0.017	µg/L	1	0.020	0.004	J1	GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Calcium	109	mg/L	1	0.05	0.02		GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Chromium	0.47	µg/L	1	0.20	0.04		GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Cobalt	0.061	µg/L	1	0.020	0.003		GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Lead	0.06	µg/L	1	0.20	0.05	J1	GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Lithium	0.242	mg/L	1	0.00020	0.00005		GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.3	µg/L	1	0.5	0.1	J1	GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	11/28/2022 19:40	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	15.70	pCi/L	0.62	0.15		ST	11/21/2022 12:59	SW-846 9315-1986, Rev. 0
Carrier Recovery	148	%						
Radium-228	3.39	pCi/L	0.18	0.49		TTP	11/18/2022 14:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	104	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: SP-11
Lab Number: 223586-006
Date Collected: 11/08/2022 10:38 EST

Customer Description:
Preparation:
Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.12	µg/L	1	0.10	0.02		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Arsenic	2.29	µg/L	1	0.10	0.03		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Barium	146	µg/L	1	0.20	0.05		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Beryllium	0.027	µg/L	1	0.050	0.007	J1	GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Boron	0.510	mg/L	1	0.050	0.009		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Cadmium	0.009	µg/L	1	0.020	0.004	J1	GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Calcium	113	mg/L	1	0.05	0.02		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Chromium	0.46	µg/L	1	0.20	0.04		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Cobalt	1.76	µg/L	1	0.020	0.003		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Lead	0.11	µg/L	1	0.20	0.05	J1	GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Lithium	0.0157	mg/L	1	0.00020	0.00005		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	1.7	µg/L	1	0.5	0.1		GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Selenium	0.15	µg/L	1	0.50	0.09	J1	GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	11/28/2022 19:45	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.96	pCi/L	0.17	0.23		ST	11/21/2022 12:59	SW-846 9315-1986, Rev. 0
Carrier Recovery	96.7	%						
Radium-228	2.36	pCi/L	0.22	0.66		TTP	11/18/2022 14:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	85.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: BAP Duplicate
Customer Description:
Lab Number: 223586-007
Preparation:
Date Collected: 11/08/2022 15:00 EST
Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.07	µg/L	1	0.10	0.02	J1	GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Arsenic	14.3	µg/L	1	0.10	0.03		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Barium	2110	µg/L	5	1.0	0.3		GES	11/29/2022 09:29	EPA 200.8-1994, Rev. 5.4
Beryllium	0.066	µg/L	1	0.050	0.007		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Boron	0.255	mg/L	1	0.050	0.009		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Cadmium	0.022	µg/L	1	0.020	0.004		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Calcium	89.6	mg/L	1	0.05	0.02		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Chromium	0.66	µg/L	1	0.20	0.04		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Cobalt	0.482	µg/L	1	0.020	0.003		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Lead	0.68	µg/L	1	0.20	0.05		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Lithium	0.124	mg/L	1	0.00020	0.00005		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.8	µg/L	1	0.5	0.1		GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Selenium	0.14	µg/L	1	0.50	0.09	J1	GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	11/28/2022 19:50	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Customer Sample ID: BAP Equipment Blank
Lab Number: 223586-008
Date Collected: 11/08/2022 11:31 EST

Customer Description:
Preparation:
Date Received: 11/11/2022 13:00 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Barium	<0.05	µg/L	1	0.20	0.05	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Boron	<0.009	mg/L	1	0.050	0.009	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Chromium	0.58	µg/L	1	0.20	0.04		GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Cobalt	0.164	µg/L	1	0.020	0.003		GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00005	mg/L	1	0.00020	0.00005	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	11/27/2022 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.4	µg/L	1	0.5	0.1	J1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	11/28/2022 19:55	EPA 200.8-1994, Rev. 5.4

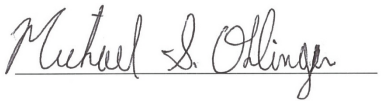
Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 223586 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/29/2022**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

M1 - The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
U1 - Not detected at or above method detection limit (MDL).

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR Sampling

Contact Name: Jill Parker-Witt

Contact Phone: 318-673-3816

Sampler(s): Kenny McDonald/Matt Hamilton

Analysis Turnaround Time (in Calendar Days)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 223586

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, TL	Field-filter 500 mL bottle, then pH<2, HNO_3 dissolved Fe and Mn	1 L bottle, Cool, 0-6°C TDS, F, Cl, SO_4, and Br, Alkalinity	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	250 mL Glass Bottle, HCL**, pH<2 HG			Sample Specific Notes:
SP-1	11/8/2022	1002	G	GW	5		X			X	X			
SP-2	11/8/2022	948	G	GW	5		X			X	X			
SP-4	11/8/2022	1029	G	GW	5		X			X	X			
SP-5R	11/7/2022	1317	G	GW	8		X			X	X			
SP-10	11/8/2022	914	G	GW	5		X			X	X			
SP-11	11/8/2022	938	G	GW	5		X			X	X			
BAP Duplicate	11/7/2022	1400	G	GW	2		X				X			
BAP EQUIPMENT BLANK	11/8/2022	1031	G	GW	2		X				X			
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company: EAGLE	Date/Time: 11/09/22 1400	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time: 11/11/22 1:00PM

WATER & WASTE SAMPLE RECEIPT FORM (Temp Gun 1)

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer NorHuaston **Number of Plastic Containers:** 29

Opened By MSO/EJL **Number of Glass Containers:** –

Date/Time 11/11/22 1:00PM **Number of Mercury Containers:** 8

Were all temperatures within 0-6°C? Y / N or (N/A) **Initial:** _____ on ice / no ice (IR Gun Ser# 221368900, *Expir. 3/22/2024)* - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Standard **If RUSH**, who was notified? _____

pH (15 min) Cr^{+6} (pres) (24 hr) NO_2 or NO_3 (48 hr) *ortho*-PO_4 (48 hr) Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) N Comments _____

Were samples labeled properly? (Y) N Comments _____

Were correct containers used? (Y) N Comments _____

Was pH checked & Color Coding done? (Y) N or N/A **Initial & Date:** EJL 11/11/22

pH paper (circle one): MQuant,PN1.09535.0001,LOT# HC904495 [OR] Lab Rat,PN4801,LOT# X000RWDG21

Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Initial & Date & Time : _____

Lab ID# 223586

Comments: _____

Logged by MSO

Reviewed by JHB

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.