

# **Annual Groundwater Monitoring Report**

Public Service Company of Oklahoma

Northeastern 3&4 Power Station

## **Bottom Ash Pond CCR Management Unit**

7300 E HWY 88

Oologah, Oklahoma

**January 2020**

Prepared by:

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An **AEP** Company

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BOUNDLESS ENERGY™

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## **I. Overview**

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year for an existing CCR unit at Public Service Company of Oklahoma's (PSO's), a wholly-owned subsidiary of American Electric Power Company (AEP), Northeastern 3&4 Power Station. 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, 2020.

In general, the following activities were completed:

- Groundwater samples were collected 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* (2016);
- Semi-annual groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units;
- Groundwater Monitoring Statistical Evaluation Reports to evaluate groundwater data were prepared in accordance with OAC 252:517-9-4 and certified. The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance", USEPA, 2009).
- Statistically significant Levels (SSLs) were determined for lithium in SP-10.
- A successful alternate source demonstration (ASD) was conducted for the lithium SSL.
- This CCR Unit remains in assessment monitoring.

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 CCR management unit(s), all groundwater monitoring wells and monitoring well identification numbers;
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened;
- 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 I;
- 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 IV).

- Other information required to be included in the annual report such as alternate source demonstration or assessment of corrective measures, 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.

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



### **III. Monitoring Wells Installed or Decommissioned**

During 2<sup>nd</sup> half 2018, no monitoring wells were installed or decommissioned.

During 2019, no monitoring wells were installed or decommissioned.

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

Appendix I 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 I. Groundwater velocity and groundwater flow direction were not determined since the wells are not screened within an interconnected aquifer as presented in the Alternate Source Demonstration (May 2019).

The sampling events conducted 5/30/18 and 6/20/19 satisfy the requirement of 252:517-9-6(b).

The semi-annual groundwater sampling events conducted 7/30/2018, 2/27/2019, and 8/28/2019 satisfy the requirement of 252:517-9-6(d).

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

### **V. Statistical Evaluation Completed in 2019**

- January 2019: a SSL above the GWPS was determined for lithium in SP-10 for the 2<sup>nd</sup> half 2018 sampling event conducted July 30, 2018. Additionally, SSIs were determined for boron, chloride, fluoride, pH, total dissolved solids.
- July 2019: a SSL above the GWPS was determined for lithium in SP-10 for the 1<sup>st</sup> half 2019 groundwater sampling event conducted February 27, 2019. Additionally, SSIs were determined for boron, chloride, fluoride, sulfate, total dissolved solids.
- December 2019: a SSL above the GWPS was determined for lithium in SP-10 for the 2<sup>nd</sup> half 2019 groundwater sampling event conducted in August 26, 2019. Additionally, SSIs were determined for boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids.

Appendix II contains the Statistical Evaluation reports complete in 2019.

**VI. Alternate Source Demonstrations Completed in 2019**

An alternate source investigation was conducted for the SSL of lithium, which was submitted to ODEQ in May 2019. ODEQ reviewed the alternate source demonstration (ASD) and in correspondence dated July 8, 2019 found the ASD to be deficient.

In September 2019, NPS submitted an ASD response to ODEQ for further consideration.

On October 29, 2019 ODEQ approved the lithium ASD.

ASD demonstrations are found in Appendix III.

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

The SSL caused the transition in groundwater assessment monitoring program to assessment of corrective measures with assessment monitoring (OAC 252:517-9-7).

On November 4, 2019, ODEQ issued correspondence stating that this CCR unit was no longer required to initiate the assessment of corrective measures because the ASD dated September 13, 2019 was approved (see ODEQ's October 29, 2019 correspondence.)

This CCR Unit remains in assessment monitoring.

The notifications relative to this reporting period are presented in Appendix IV.

**VIII. Other Information Required**

Financial Assurance – Corporate Financial Test was accepted by ODEQ in correspondence dated April, 5, 2019.

An Alternative Closure Requirements notification was approved by ODEQ in correspondence dated April 11, 2019.

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

**IX. Description of Any Problems Encountered in 2019 and Actions Taken**

No significant problems were encountered.

**X. A Projection of Key Activities for the Upcoming Year**

Key activities for 2020 include:

- As required by OAC 252:517-9-6 assessment monitoring of the groundwater for the CCR unit;
- Submit Financial Assurance;
- Evaluation of the assessment monitoring results from a statistical analysis viewpoint, looking for SSLs above GWPS;
- Responding to any new data received in light of CCR rule requirements;
- Continue to work toward obtaining a permit;
- Preparation of the next annual groundwater report.

## APPENDIX I

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
- Bottom Ash Pond
- Impoundment
- Landfill
- Slurry Wall

**Notes**

- Monitoring well coordinates and water level data (collected on 2/27/2019) provided by AEP.
- Groundwater elevation units are feet above mean sea level (ft. msl).
- Potentiometric contours are not applicable as the wells are not screened within an interconnected aquifer. Refer to Alternative Source Demonstration Report State CCR Rule (Geosyntec, May 2019), Alternate Source Demonstration (ASD) for Lithium -Bottom Ash Pond (AEP, September 2019), and ODEQ Letter approving ASD (ODEQ, October 2019).
- SP-3 was not gauged during the February 2019 event



**Potentiometric Elevations  
CCR Compliance Wells  
February 2019**

AEP Northeastern Power Plant - Bottom Ash Pond  
Oologah, Oklahoma

**Geosyntec**  
consultants

Columbus, Ohio

2019/12/26

Figure

**1**





- Legend**
- ⊕ Groundwater Monitoring Well
  - ▭ Bottom Ash Pond
  - ▭ Impoundment
  - ▭ Landfill
  - ▭ Slurry Wall

**Notes**

- Monitoring well coordinates and water level data (collected on 6/20/2019) provided by AEP.
- Groundwater elevation units are feet above mean sea level (ft. msl).
- Potentiometric contours are not applicable as the wells are not screened within an interconnected aquifer. Refer to Alternative Source Demonstration Report State CCR Rule (Geosyntec, May 2019), Alternate Source Demonstration (ASD) for Lithium -Bottom Ash Pond (AEP, September 2019), and ODEQ Letter approving ASD (ODEQ, October 2019).
- SP-3 was not gauged during the June 2019 event



<b>Potentiometric Elevations CCR Compliance Wells June 2019</b> AEP Northeastern Power Plant - Bottom Ash Pond Oologah, Oklahoma		<b>Figure 2</b>
Columbus, Ohio	2019/12/26	





**Legend**

-  Groundwater Monitoring Well
-  Bottom Ash Pond
-  Impoundment
-  Landfill
-  Slurry Wall

**Notes**

- Monitoring well coordinates and water level data (collected on 8/26/2019) provided by AEP.
- Groundwater elevation units are feet above mean sea level (ft. msl).
- Potentiometric contours are not applicable as the wells are not screened within an interconnected aquifer. Refer to Alternative Source Demonstration Report State CCR Rule (Geosyntec, May 2019), Alternate Source Demonstration (ASD) for Lithium -Bottom Ash Pond (AEP, September 2019), and ODEQ Letter approving ASD (ODEQ, October 2019).



**Potentiometric Elevations  
CCR Compliance Wells  
August 2019**

AEP Northeastern Power Plant - Bottom Ash Pond  
Oologah, Oklahoma

**Geosyntec**  
consultants

Columbus, Ohio

2019/12/26

Figure

**3**



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

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.298	111	60	<1 U	7.5	514	66
3/13/2017	Background	0.186	117	548	4	--	480	30
4/27/2017	Background	0.202	108	83	1.02	7.6	496	60
5/18/2017	Background	0.284	131	104	1.3	--	574	60
6/16/2017	Background	0.242	115	50	0.6437 J	9.3	478	48
6/28/2017	Background	0.232	113	19	0.582 J	11.1	424	48
7/13/2017	Background	0.287	122	70	0.6283 J	9.8	504	56
8/4/2017	Background	0.299	125	20	0.542 J	8.7	394	52
8/17/2017	Background	--	--	--	--	7.9	--	--
8/30/2017	Background	0.250	120	34	0.581 J	7.7	456	59
9/13/2017	Background	0.369	119	62	0.4042 J	8.2	536	54
9/20/2017	Background	0.331	129	22	<0.083 U	7.3	440	62
10/11/2017	Detection	0.350	152	136	1.4051	7.4	676	58
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 J	7.0	1060	63
2/4/2019	Assessment	0.354	150	--	--	--	--	--
2/27/2019	Assessment	0.200	122	42.7	0.8	7.3	532	87.1
6/20/2019	Assessment	0.198	126	25.2	0.77	7.1	452	61.4
8/26/2019	Assessment	0.124	120	9	0.525 J	9.0	438	48.0

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Due to limited groundwater volume, pH values for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
1/25/2017	Background	<5 U	<5 U	211	<1 U	<1 U	<1 U	<5 U	3.48	<1 U	<5 U	0.006	<0.025 U	11.0	<5 U	<2 U
3/13/2017	Background	<5 U	<5 U	146	<1 U	<1 U	<1 U	<5 U	3.014	4	<5 U	0.007	<0.025 U	16.0	<5 U	<2 U
4/27/2017	Background	2.75 J	1.91 J	195	0.1 J	<0.07 U	0.84 J	2.42 J	4.71	1.02	0.94 J	0.00789	<0.005 U	19.92	4.85 J	<0.86 U
5/18/2017	Background	6.85	5.48	243	0.26 J	0.22 J	2.55	2.55 J	4.12	1.3	1.63 J	0.00853	0.023 J	16.77	6.51	<0.86 U
6/16/2017	Background	1.14 J	<1.05 U	183	0.04 J	<0.07 U	<0.23 U	0.77 J	2.096	0.6437 J	<0.68 U	0.00407	0.009 J	7.02	2.54 J	<0.86 U
6/28/2017	Background	<0.93 U	<1.05 U	187	<0.02 U	<0.07 U	<0.23 U	0.77 J	14.29	0.582 J	<0.68 U	0.00334	<0.005 U	6.42	2.77 J	<0.86 U
7/13/2017	Background	1.25 J	<1.05 U	217	0.09 J	<0.07 U	0.62 J	1.34 J	4.01	0.6283 J	1.24 J	0.00395	<0.005 U	8.14	5.21	0.89 J
8/4/2017	Background	<0.93 U	2.11 J	298	0.1 J	<0.07 U	0.78 J	1.33 J	3.41	0.542 J	0.94 J	0.00577	0.009 J	19.96	11.96	<0.86 U
8/30/2017	Background	2.09 J	1.34 J	218	0.14 J	<0.07 U	0.55 J	1.75 J	4.15	0.581 J	<0.68 U	0.00468	<0.005 U	12.08	3.51 J	<0.86 U
9/13/2017	Background	<0.93 U	<1.05 U	210	0.09 J	0.08 J	0.31 J	1.07 J	2.584	0.4042 J	<0.68 U	0.00548	<0.005 U	14.65	4.13 J	<0.86 U
9/20/2017	Background	<0.93 U	<1.05 U	168	0.05 J	0.11 J	<0.23 U	1.15 J	4.53	<0.083 U	<0.68 U	0.00318	<0.005 U	5.32	<0.99 U	<0.86 U
5/30/2018	Assessment	<0.93 U	<1.05 U	190	<0.02 U	<0.07 U	<0.23 U	0.53 J	3.64	1.2525	<0.68 U	0.00785	<0.005 U	16.39	4.23 J	2.00
7/30/2018	Assessment	0.69	0.93	174	0.06 J	0.08 J	1.83	0.676	3.056	0.9863 J	0.354	0.00615	<0.005 U	17.1	5.8	0.09 J
2/27/2019	Assessment	0.6 J	0.7 J	168	<0.2 U	<0.1 U	2.72	<0.2 U	3.056	0.800	0.2 J	0.00641	<0.005 U	10 J	2.8	<1 U
6/20/2019	Assessment	0.93	1.44	242	0.2 J	0.1 J	0.7 J	5.54	2.745	0.770	0.650	0.03 J	0.01 J	12.1	9.9	<0.5 U
8/26/2019	Assessment	0.43	0.73	160	0.08 J	0.0900	1.49	0.481	2.75	0.525 J	0.835	0.00285	<0.005 U	5.86	3.4	0.1 J

Notes:  
µg/L: micrograms per liter  
SU: standard unit  
<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.  
J: Estimated value. Parameter was detected at concentration below the reporting limit  
--: Not analyzed  
pCi/L: picocuries per liter  
Due to limited groundwater volume, radium samples for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.274	108	607	3	6.4	1786	21
3/13/2017	Background	0.251	82.6	37	1	--	1340	70
4/27/2017	Background	0.152	62.0	527	2.82	6.5	1242	27
5/18/2017	Background	0.336	117	1240	3.00	--	2214	15
6/16/2017	Background	0.303	108	888	2.96	8.3	1912	61
6/28/2017	Background	0.292	98.5	883	2.8408	7.4	1872	58
7/13/2017	Background	0.339	111	863	3.581	7.9	1846	58
8/4/2017	Background	0.280	147	1064	2.788	7.2	2132	57
8/17/2017	Background	--	--	--	--	7.6	--	--
8/30/2017	Background	0.275	86.8	1001	4.0998	7.5	2192	47
9/13/2017	Background	0.311	91.8	930	3.196	7.0	1956	43
9/20/2017	Background	0.300	129	856	1.726	6.9	1778	37
10/11/2017	Detection	0.307	91.9	970	3.5881	7.3	2076	41
1/22/2018	Detection	--	--	975	--	7.0	1910	--
5/30/2018	Assessment	--	--	--	3.4972	7.5	--	--
7/30/2018	Assessment	0.276	117	268	2.6556	7.5	1006	30
2/27/2019	Assessment	0.116	94.0	351	2.68	7.6	932	26.1
6/20/2019	Assessment	0.109	58.2	357	2.69	6.8	1044	28.5
8/26/2019	Assessment	0.173	211	1072	2.685	8.5	2246	14.0

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Due to limited groundwater volume, pH values for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
1/25/2017	Background	<5 U	11	1460	<1 U	<1 U	3	<5 U	6.89	3	<5 U	0.098	<0.025 U	19	<5 U	<2 U
3/13/2017	Background	<5 U	5	1130	<1 U	<1 U	1	<5 U	9.96	1	<5 U	0.073	<0.025 U	23	<5 U	<2 U
4/27/2017	Background	2.09 J	2.08 J	760	0.04 J	<0.07 U	0.24 J	0.87 J	8.98	2.82	<0.68 U	0.05305	<0.005 U	24.67	2.04 J	<0.86 U
5/18/2017	Background	8.71	9.02	3130	0.26 J	0.18 J	2.87	2.77 J	26.48	3.00	2.02 J	0.11100	0.006 J	11.63	6.16	<0.86 U
6/16/2017	Background	11.34	5.50	1710	0.18 J	<0.07 U	2.04	2.51 J	22.16	2.96	<0.68 U	0.103	0.005 J	29.57	37.83	<0.86 U
6/28/2017	Background	5.15	1.4 J	1560	0.06 J	<0.07 U	1.29	1.82 J	--	2.8408	<0.68 U	0.09272	<0.005 U	29.62	22.41	<0.86 U
7/13/2017	Background	4.74 J	2.51 J	1540	0.07 J	<0.07 U	0.59 J	1.23 J	--	3.581	1.41 J	0.0961	<0.005 U	33.32	23.23	<0.86 U
8/4/2017	Background	3.51 J	2.54 J	1010	0.09 J	0.07 J	1.07	1.08 J	16.34	2.788	<0.68 U	0.09164	0.014 J	39.4	23.36	<0.86 U
8/30/2017	Background	2.95 J	1.25 J	1120	0.12 J	<0.07 U	<0.23 U	0.8 J	14.48	4.0998	<0.68 U	0.0931	<0.005 U	33.86	11.86	<0.86 U
9/13/2017	Background	2.67 J	1.83 J	992	0.11 J	<0.07 U	<0.23 U	0.87 J	14.89	3.196	<0.68 U	0.09207	0.006 J	37.61	9.87	<0.86 U
9/20/2017	Background	2.64 J	3.05 J	1150	0.2 J	0.09 J	3.46	2.55 J	--	1.726	0.91 J	0.09111	<0.005 U	39.39	9.87	<0.86 U
5/30/2018	Assessment	1.3 J	<1.05 U	869	<0.02 U	<0.07 U	<0.23 U	0.55 J	7.85	3.4972	<0.68 U	0.04039	<0.005 U	26.46	2.16 J	<0.86 U
7/30/2018	Assessment	1.21	1.42	656	0.05 J	0.08 J	<40 U	0.400	9.61	2.6556	0.245	0.0346	<0.005 U	26.1	2.9	0.06 J
2/27/2019	Assessment	1.39	1.29	841	<0.2 U	<0.1 U	4.30	<0.2 U	5.76	2.68	0.3 J	0.0329	<0.005 U	25.8	3.7	<1 U
6/20/2019	Assessment	1.34	1.43	868	0.1 J	0.09 J	0.9 J	0.434	7.94	2.69	0.4 J	0.062	<0.005 U	25.0	2.9	<0.5 U
8/26/2019	Assessment	1.22	1.53	1220	0.07 J	0.0500	0.701	0.568	8.72	2.685	0.334	0.0582	<0.005 U	22.3	3.7	0.1 J

Notes:

µg/L: micrograms per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

pCi/L: picocuries per liter

Due to limited groundwater volume, radium samples for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		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	1122	37
3/15/2017	Background	0.399	67.0	52	4	--	1128	38
4/27/2017	Background	0.442	58.8	459	3.20	7.0	1128	41
5/18/2017	Background	0.411	296	232	2.10	--	846	50
6/16/2017	Background	0.395	118	475	3.34	8.3	1164	36
6/28/2017	Background	0.388	110	471	3.2489	8.1	1388	37
7/13/2017	Background	0.420	648	489	3.863	8.1	1128	36
8/4/2017	Background	0.412	1920	469	3.078	7.7	1150	50
8/17/2017	Background	0.493	793	460	3.049	7.8	1132	75
8/30/2017	Background	0.392	612	576	4.086	7.6	1400	74
9/13/2017	Background	0.387	810	450	3.199	7.7	1236	88
9/20/2017	Background	0.477	630	440	1.747	7.2	1208	90
10/11/2017	Detection	0.425	206	431	3.7702	7.4	1200	78
5/30/2018	Assessment	--	--	--	4.169	7.4	--	--
7/30/2018	Assessment	0.399	164	521	<0.083 U	7.6	1180	70
2/27/2019	Assessment	0.370	85.6	470	3.26	7.4	1122	61.5
6/20/2019	Assessment	0.325	56.4	450	3.24	7.1	1128	58
8/26/2019	Assessment	0.365	182	458	2.99	8.8	1170	61

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Due to limited groundwater volume, pH values for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
1/25/2017	Background	<5 U	<5 U	398	<1 U	<1 U	<1 U	<5 U	4	3	<5 U	0.072	<0.025 U	<5 U	<5 U	<2 U
3/15/2017	Background	<5 U	<5 U	477	<1 U	<1 U	<1 U	<5 U	3.57	4	<5 U	0.073	<0.025 U	<5 U	<5 U	<2 U
4/27/2017	Background	1.36 J	1.72 J	578	0.03 J	0.1 J	0.64 J	1.01 J	2.566	3.20	<0.68 U	0.06973	<0.005 U	1.5 J	<0.99 U	1.21 J
5/18/2017	Background	2.04 J	5.50	762	0.56 J	0.57 J	10.73	5.49	6.37	2.10	3.65 J	0.07998	0.015 J	1.02 J	<0.99 U	<0.86 U
6/16/2017	Background	1.74 J	4.59 J	633	0.34 J	<0.07 U	4.04	4.63 J	4.18	3.34	1.39 J	0.07422	<0.005 U	0.65 J	1.67 J	<0.86 U
6/28/2017	Background	<0.93 U	2.01 J	576	0.24 J	<0.07 U	2.98	5.29	9.64	3.2489	0.96 J	0.07041	<0.005 U	0.46 J	<0.99 U	<0.86 U
7/13/2017	Background	2.66 J	10.65	1340	1.28	1.37	22.48	10.64	5.79	3.863	8.47	0.09243	0.01 J	<0.29 U	<0.99 U	<0.86 U
8/4/2017	Background	3.87 J	44.98	4590	4.97	6.55	84.15	40.69	4.04	3.078	36.63	0.1360	0.058	5.03	4.99 J	<0.86 U
8/17/2017	Background	<0.93 U	19.31	2310	2.12	2.05	41.82	17.86	6.71	3.049	10.7	0.1110	0.030	4.23 J	1.04 J	<0.86 U
8/30/2017	Background	2.45 J	9.13	1490	1.26	1.66	25.81	12.06	8.09	4.086	7.11	0.0962	0.021 J	4.61 J	1.86 J	<0.86 U
9/13/2017	Background	<0.93 U	16.34	1910	1.71	2.47	30.83	17.71	5.92	3.199	8.92	0.1040	0.029	6.21	1.65 J	<0.86 U
9/20/2017	Background	2.3 J	13.95	1930	1.77	1.90	34.55	16.32	--	1.747	9.60	0.1010	0.014 J	7.02	<0.99 U	<0.86 U
5/30/2018	Assessment	5.14	<1.05 U	268	<0.02 U	<0.07 U	<0.23 U	0.49 J	3.186	4.169	<0.68 U	0.06851	<0.005 U	3.7 J	<0.99 U	1.62 J
7/30/2018	Assessment	0.37	1.14	303	0.078	0.07	0.562	0.497	4.85	<0.083 U	0.356	0.0627	0.006 J	3.63	0.7	0.05 J
2/27/2019	Assessment	0.3 J	1 J	276	<0.2 U	<0.1 U	5.71	<0.2 U	3.144	3.26	<0.2 U	0.0602	<0.005 U	<4 U	0.6 J	<1 U
6/20/2019	Assessment	0.3 J	0.83	337	<0.1 U	0.07 J	1.06	0.388	3.751	3.24	1.07	0.0680	0.007 J	2 J	0.4 J	<0.5 U
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 U	2 J	0.6	<0.1 U

Notes:

µg/L: micrograms per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

pCi/L: picocuries per liter

Due to limited groundwater volume, radium samples for several sampling events were collected the day prior to collection of analytical samples for other parameters.



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

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		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	1354	10
3/15/2017	Background	0.236	61.7	62	4	--	1420	10
4/27/2017	Background	0.245	53.8	674	3.06	7.5	1436	9
5/18/2017	Background	0.319	79.1	1834	4.00	--	3008	8
6/16/2017	Background	0.231	57.1	607	3.00	8.3	1368	7
6/28/2017	Background	0.224	53.0	636	2.835	8.2	1156	8
7/13/2017	Background	0.261	53.8	640	3.156	8.2	1388	7
8/4/2017	Background	0.256	61.3	638	2.889	7.9	1372	8
8/17/2017	Background	0.293	52.0	661	3.258	8.2	1378	6
8/30/2017	Background	0.252	57.3	652	3.5698	7.7	1424	7
9/13/2017	Background	0.232	55.6	644	2.797	8.4	1452	6
9/20/2017	Background	0.257	53.7	729	1.535	7.4	1312	6
10/11/2017	Detection	0.610	71.0	630	3.7844	7.5	1368	5
5/30/2018	Assessment	--	--	--	4.1115	7.6	--	--
7/30/2018	Assessment	0.246	131	793	4.3905	8.0	1480	4
2/27/2019	Assessment	0.233	72.8	739	3.08	7.7	1530	1.6
6/20/2019	Assessment	0.202	48.5	675	3.06	7.3	1428	0.9 J
8/26/2019	Assessment	0.220	128	697	2.789	8.8	1450	3.00

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Due to limited groundwater volume, pH values for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
1/25/2017	Background	<5 U	12	1650	<1 U	<1 U	<1 U	<5 U	10.09	3	<5 U	0.114	<0.025 U	<5 U	<5 U	<2 U
3/15/2017	Background	<5 U	13	1590	<1 U	<1 U	1.00	<5 U	9.65	4	<5 U	0.112	<0.025 U	<5 U	<5 U	<2 U
4/27/2017	Background	<0.93 U	17.03	1610	0.03 J	<0.07 U	0.33 J	0.88 J	10.27	3.06	<0.68 U	0.112	0.016 J	1.16 J	<0.99 U	<0.86 U
5/18/2017	Background	<0.93 U	29.42	2270	0.23 J	<0.07 U	3.41	2.32 J	15.3	4.00	2.36 J	0.163	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/16/2017	Background	2.02 J	13.70	2050	0.11 J	<0.07 U	1.42	1.44 J	10.27	3.00	<0.68 U	0.109	0.016 J	<0.29 U	<0.99 U	<0.86 U
6/28/2017	Background	<0.93 U	12.65	1790	0.02 J	<0.07 U	0.3 J	1.01 J	15.84	2.835	0.76 J	0.100	<0.005 U	<0.29 U	<0.99 U	<0.86 U
7/13/2017	Background	<0.93 U	17.24	1880	0.06 J	<0.07 U	0.5 J	1.1 J	12.21	3.156	0.9 J	0.111	<0.005 U	<0.29 U	1.14 J	<0.86 U
8/4/2017	Background	<0.93 U	21.60	1800	0.09 J	<0.07 U	1.69	1.32 J	11.6	2.889	1.44 J	0.119	0.015 J	1.27 J	<0.99 U	<0.86 U
8/17/2017	Background	1.63 J	19.11	1890	0.04 J	<0.07 U	<0.23 U	1 J	10.95	3.258	<0.68 U	0.106	<0.005 U	<0.29 U	<0.99 U	<0.86 U
8/30/2017	Background	<0.93 U	19.47	1930	0.11 J	<0.07 U	1.16	1.2 J	12.47	3.5698	<0.68 U	0.112	0.009 J	<0.29 U	<0.99 U	<0.86 U
9/13/2017	Background	<0.93 U	20.36	1930	0.1 J	0.16 J	0.62 J	1 J	10.62	2.797	<0.68 U	0.110	<0.005 U	<0.29 U	<0.99 U	<0.86 U
9/20/2017	Background	<0.93 U	20.77	1880	0.05 J	<0.07 U	<0.23 U	0.97 J	10.5	1.535	1.06 J	0.111	<0.005 U	<0.29 U	<0.99 U	<0.86 U
5/30/2018	Assessment	1.21 J	28.86	1760	<0.02 U	<0.07 U	<0.23 U	0.88 J	9.15	4.1115	<0.68 U	0.102	<0.005 U	<0.29 U	<0.99 U	<0.86 U
7/30/2018	Assessment	0.05 J	47.3	2140	0.052	0.02 J	0.082	0.482	11.28	4.3905	0.415	0.0946	<0.005 U	1.17	0.1	0.02 J
2/27/2019	Assessment	<0.2 U	25.7	2130	<0.2 U	<0.1 U	2 J	0.3 J	6.702	3.08	0.7 J	0.102	<0.005 U	<4 U	<0.3 U	<1 U
6/20/2019	Assessment	<0.1 U	59.9	2410	<0.1 U	<0.05 U	0.8 J	0.598	12.977	3.06	0.701	0.111	0.008 J	<2 U	<0.2 U	<0.5 U
8/26/2019	Assessment	0.06 J	49.3	2340	0.06 J	0.02 J	0.335	0.485	11.56	2.789	0.545	0.0928	<0.005 U	1 J	0.1 J	<0.1 U

Notes:  
µg/L: micrograms per liter  
SU: standard unit  
<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.  
J: Estimated value. Parameter was detected at concentration below the reporting limit  
- -: Not analyzed  
pCi/L: picocuries per liter  
Due to limited groundwater volume, radium samples for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
7/13/2017	Background	0.965	53.0	1844	6.502	6.7	3416	294
8/4/2017	Background	1.08	83.1	1616	<0.083 U	7.6	5142	761
8/17/2017	Background	1.09	91.4	1700	<0.083 U	7.8	5678	915
8/30/2017	Background	1.09	81.8	1932	10.2663	7.6	5264	834
9/13/2017	Background	1.10	76.9	1592	7.028	8.3	5168	738
9/20/2017	Background	1.08	64.6	1946	<0.083 U	7.1	4424	544
9/27/2017	Background	1.07	65.7	1784	5.00	7.8	4516	419
10/4/2017	Background	1.10	52.3	1553	5.11	7.4	3660	286
10/11/2017	Detection	1.03	58.4	1934	7.3938	7.0	4060	188
1/22/2018	Detection	1.08	--	1630	5.71	7.0	3236	63.1
5/30/2018	Assessment	--	--	--	7.333	7.8	--	--
7/30/2018	Assessment	1.17	227	2283	8.9991	7.6	3632	75.0
2/4/2019	Assessment	1.17	144	--	--	--	--	--
2/27/2019	Assessment	1.16	92.6	1740	5.59	7.8	3504	6.9
6/20/2019	Assessment	0.916	50.3	1780	6.4	7.8	3512	30.3
8/26/2019	Assessment	1.03	216	1939	4.874	8.9	3446	29.0

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Due to limited groundwater volume, pH values for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
7/13/2017	Background	4.62 J	<1.05 U	1900	<0.02 U	<0.07 U	110	5.96	17.23	6.502	<0.68 U	0.278	0.006 J	934	5.67	<0.86 U
8/4/2017	Background	2.51 J	2.43 J	330	0.03 J	<0.07 U	2.44	4.74 J	1.153	<0.083 U	<0.68 U	0.284	0.029	129	8.82	<0.86 U
8/17/2017	Background	<0.93 U	<1.05 U	282	<0.02 U	<0.07 U	<0.23 U	<0.14 U	0.995	<0.083 U	<0.68 U	0.317	0.027	45.43	<0.99 U	<0.86 U
8/30/2017	Background	<0.93 U	5.66	279	0.06 J	<0.07 U	1.09	4.27 J	0.763	10.2663	<0.68 U	0.306	0.019 J	30.35	2.56 J	<0.86 U
9/13/2017	Background	<0.93 U	9.42	266	0.07 J	<0.07 U	0.46 J	2.41 J	0.774	7.028	<0.68 U	0.315	0.013 J	16.28	3.11 J	<0.86 U
9/20/2017	Background	1.16 J	13.92	399	0.03 J	<0.07 U	0.72 J	2.19 J	1.062	<0.083 U	<0.68 U	0.292	0.016 J	13.58	2.38 J	<0.86 U
9/27/2017	Background	1.57 J	15.31	928	0.04 J	<0.07 U	2.07	3.71 J	1.723	5.00	<0.68 U	0.329	0.013 J	35.93	3.84 J	<0.86 U
10/4/2017	Background	1.27 J	4.3 J	664	0.03 J	<0.07 U	0.36 J	4.02 J	3.226	5.11	0.87 J	0.279	0.015 J	29.19	<0.99 U	<0.86 U
5/30/2018	Assessment	<0.93 U	8.90	2550	<0.02 U	<0.07 U	<0.23 U	0.83 J	6.06	7.333	<0.68 U	0.245	<0.005 U	2.94 J	2.26 J	<0.86 U
7/30/2018	Assessment	0.34	7.61	2330	0.043	0.02 J	0.06 J	2.16	7.89	8.9991	0.102	0.242	0.006 J	18.50	0.09 J	0.04 J
2/27/2019	Assessment	2 J	3.48	5810	<0.4 U	<0.2 U	1 J	<0.4 U	15.35	5.59	<0.4 U	0.275	<0.005 U	<8 U	<0.6 U	<2 U
6/20/2019	Assessment	0.65	3.66	3880	<0.1 U	<0.05 U	8.76	0.743	26.4	6.40	0.3 J	0.290	0.01 J	9 J	<0.2 U	<0.5 U
8/26/2019	Assessment	0.61	3.00	3060	0.08 J	0.03 J	1.61	1.06	8.11	4.874	0.449	0.241	<0.005 U	8.22	0.4	<0.1 U

Notes:  
µg/L: micrograms per liter  
SU: standard unit  
<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.  
J: Estimated value. Parameter was detected at concentration below the reporting limit  
- -: Not analyzed  
pCi/L: picocuries per liter  
Due to limited groundwater volume, radium samples for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
7/13/2017	Background	0.839	742	568	2.386	7.4	2880	798
8/4/2017	Background	0.543	272	567	3.355	7.9	3076	870
8/17/2017	Background	0.453	171	789	4.52	6.9	3308	741
8/30/2017	Background	0.428	161	683	4.1325	7.6	2732	541
9/13/2017	Background	0.447	190	628	3.359	7.2	2420	515
9/20/2017	Background	0.469	1220	690	2.016	7.2	2336	329
9/27/2017	Background	0.447	1170	759	3.00	7.2	2428	332
10/4/2017	Background	0.531	1110	744	2.90	7.5	2288	305
10/11/2017	Detection	0.446	479	824	4.4661	7.0	2322	223
1/22/2018	Detection	--	--	470	2.96	6.9	1544	222
5/30/2018	Assessment	--	--	--	3.574	7.5	--	--
7/30/2018	Assessment	0.280	124	234	3.7832	7.7	996	79
2/27/2019	Assessment	0.375	49.6	241	3.44	7.7	1168	95.1
6/20/2019	Assessment	0.550	65.6	137	1.67	6.8	1000	203
8/26/2019	Assessment	0.304	139	129	2.225	8.9	970	122

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Due to limited groundwater volume, pH values for several sampling events were collected the day prior to collection of analytical samples for other parameters.

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

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
7/13/2017	Background	9.43	3.99 J	194	0.22 J	1.40	18.52	9.76	--	2.386	5.16	0.04698	0.009 J	61.27	5.95	<0.86 U
8/4/2017	Background	4.7 J	1.82 J	98.74	0.07 J	0.44 J	5.25	6.52	25.367	3.355	2.01 J	0.0877	0.023 J	66.41	6.26	<0.86 U
8/17/2017	Background	<0.93 U	<1.05 U	83.42	<0.02 U	<0.07 U	<0.23 U	<0.14 U	0.947	4.52	<0.68 U	0.08931	0.007 J	51.50	<0.99 U	<0.86 U
8/30/2017	Background	4.29 J	1.2 J	93.07	0.07 J	0.34 J	2.76	3.85 J	0.438	4.1325	1.23 J	0.08933	0.008 J	44.33	2.49 J	<0.86 U
9/13/2017	Background	2.4 J	3.66 J	108	0.08 J	0.09 J	2.57	3.21 J	2.685	3.359	<0.68 U	0.105	0.009 J	36.16	1.55 J	<0.86 U
9/20/2017	Background	7.73	12.14	240	0.39 J	2.70	31.3	14.62	4.20	2.016	8.16	0.13	0.027	46.9	5.46	<0.86 U
9/27/2017	Background	6.89	7.50	269	0.39 J	3.01	32.71	14.37	--	3.00	8.58	0.129	0.048	48.61	7.47	<0.86 U
10/4/2017	Background	4.44 J	8.47	347	0.35 J	2.49	29.49	11.99	2.817	2.90	7.05	0.146	0.047	42.14	3.27 J	<0.86 U
5/30/2018	Assessment	<0.93 U	5.30	160	<0.02 U	<0.07 U	0.34 J	1.61 J	1.334	3.574	<0.68 U	0.04956	<0.005 U	3.27 J	1.43 J	<0.86 U
7/30/2018	Assessment	0.35	4.22	539	0.029	0.04	0.379	5.12	0.95	3.7832	0.404	0.037	0.005 J	8.85	0.7	0.03 J
2/27/2019	Assessment	<0.2 U	8.83	529	<0.2 U	<0.1 U	0.7 J	0.72	1.81	3.44	0.2 J	0.058	<0.005 U	6 J	<0.3 U	<1 U
6/20/2019	Assessment	0.3 J	4.18	169	<0.1 U	0.06 J	6.71	0.948	0.81	1.67	0.719	0.047	0.01 J	<2 U	0.3 J	<0.5 U
8/26/2019	Assessment	0.37	6.30	492	0.04 J	0.13	1.47	2.73	1.623	2.225	0.764	0.0337	<0.005 U	5.7	0.8	<0.1 U

Notes:  
µg/L: micrograms per liter  
SU: standard unit  
<: Non-detect value. Parameters which were not detected are shown as less than the reporting limit for the January and March 2017 events and less than the method detection limit (MDL) for all subsequent events followed by a 'U' flag.  
J: Estimated value. Parameter was detected at concentration below the reporting limit  
--: Not analyzed  
pCi/L: picocuries per liter  
Due to limited groundwater volume, radium samples for several sampling events were collected the day prior to collection of analytical samples for other parameters.

## **APPENDIX II**

Where applicable, show in this appendix the results from statistical analyses, and a description of the statistical analysis method chosen. These statistical analyses are to be conducted separately for each constituent in each monitoring well.

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

*Submitted to*



1 Riverside Plaza  
Columbus, Ohio 43215-2372

*Submitted by*



engineers | scientists | innovators

941 Chatham Lane  
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January 8, 2019

CHA8473



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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
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Level
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
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.

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. pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. An alternate source was not identified at the time, so two assessment monitoring events were conducted at the BAP in 2018, in accordance with OAC 252:517-9-6.

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. Groundwater protection standards (GWPSs) were established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. An SSL was identified for lithium. Thus, either the unit will move to an assessment of corrective measures or an alternative source demonstration (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.

## SECTION 2

### BOTTOM ASH POND EVALUATION

#### 2.1 Data Validation & QA/QC

During the assessment monitoring program, two sets of samples were collected for analysis from each upgradient and downgradient well to meet the requirements of OAC 252:517-9-6(b) and 252:517-9-6(d)(1). Samples from the initial sampling event were analyzed for the Appendix IV parameters, and samples from the second event were analyzed for both the Appendix III and Appendix IV parameters. A summary of data collected during assessment monitoring 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.9.5 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 January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained to meet the requirements of OAC 252:517-9-6(b) and 252:517-9-6(d)(1) were screened for potential outliers. The reported cadmium value of 0.00655 milligrams per liter (mg/L) for the August 4, 2017 sampling event at SP-4 was identified as an outlier and removed from the database without replacement. Outliers for Appendix III parameters identified from the background and detection monitoring events conducted through January 2018 were summarized in a previous report (Geosyntec, 2018).

##### 2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with OAC 252:517-9-6(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or

regional screening level (RSL) for each Appendix IV 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. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for arsenic, cobalt, combined radium, fluoride, and lithium. Non-parametric tolerance limits were calculated for antimony, barium, cadmium, mercury, molybdenum, and selenium due to apparent non-normal distributions; for thallium due to a high non-detect frequency; and for beryllium, chromium, and lead due to both apparent non-normal distributions and high non-detect frequencies. Tolerance limits and the final GWPSs are summarized in Table 2.

### **2.2.2 Evaluation of Potential Appendix IV SSLs**

A confidence interval was constructed for each Appendix IV 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 SSL was identified at the Northeastern BAP:

- An LCL for lithium exceeded the GWPS of 0.15 mg/L at SP-10 (0.242 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.

### **2.3 Conclusions**

Two assessment monitoring events were conducted in 2018 in accordance with OAC 252:517-9. 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 2018 data. GWPSs were established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. An SSL was identified for lithium.

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**

American Electric Power (AEP). 2017. Statistical Analysis Plan – Northeastern Plant. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Stations 3 and 4 Bottom Ash Pond, Northeastern Power Station, Oologah, Oklahoma. January 15, 2018.

# TABLES

**Table 1 – Groundwater Data Summary  
Northeastern – Bottom Ash Pond**

Parameter	Unit	SP-1		SP-2		SP-4		SP-5		SP-10		SP-11	
		5/30/2018	7/30/2018	5/30/2018	7/30/2018	5/30/2018	7/30/2018	5/30/2018	7/30/2018	5/30/2018	7/30/2018	5/30/2018	7/30/2018
Antimony	mg/L	0.005 U	0.000690	0.00130 J	0.00121	0.00514	0.000370	0.00121 J	0.0000500 J	0.005 U	0.000340	0.005 U	0.000350
Arsenic	mg/L	0.005 U	0.000930	0.005 U	0.00142	0.005 U	0.00114	0.0289	0.0473	0.00890	0.00761	0.00530	0.00422
Barium	mg/L	0.190	0.174	0.869	0.656	0.268	0.303	1.76	2.14	2.55	2.33	0.160	0.539
Beryllium	mg/L	0.001 U	0.0000600 J	0.001 U	0.0000500 J	0.001 U	0.0000780	0.001 U	0.0000520	0.001 U	0.0000430	0.001 U	0.0000290
Boron	mg/L	-	0.397	-	0.276	-	0.399	-	0.246	-	1.17	-	0.280
Cadmium	mg/L	0.001 U	0.0000800 J	0.001 U	0.0000800 J	0.001 U	0.0000700	0.001 U	0.0000200 J	0.001 U	0.0000200 J	0.001 U	0.0000400
Calcium	mg/L	-	130	-	117	-	164	-	131	-	227	-	124
Chloride	mg/L	-	46.0	-	268	-	521	-	793	-	2280	-	234
Chromium	mg/L	0.001 U	0.00183	0.001 U	0.04 U	0.001 U	0.000562	0.001 U	0.0000820	0.001 U	0.0000600 J	0.000340 J	0.000379
Cobalt	mg/L	0.000530 J	0.000676	0.000550 J	0.000400	0.000490 J	0.000497	0.000880 J	0.000482	0.000830 J	0.00216	0.00161 J	0.00512
Combined Radium	pCi/L	3.64	3.06	7.85	9.61	3.19	4.85	9.15	11.3	6.06	7.89	1.33	0.950
Fluoride	mg/L	1.25	0.986 J	3.50	2.66	4.17	1 U	4.11	4.39	7.33	9.00	3.57	3.78
Lead	mg/L	0.005 U	0.000354	0.005 U	0.000245	0.005 U	0.000356	0.005 U	0.000415	0.005 U	0.000102	0.005 U	0.000404
Lithium	mg/L	0.00785	0.00615	0.0404	0.0346	0.0685	0.0627	0.102	0.0946	0.245	0.242	0.0496	0.0370
Mercury	mg/L	0.000025 U	0.000025 U	0.000025 U	0.000025 U	0.000025 U	0.00000600 J	0.000025 U	0.000025 U	0.000025 U	0.00000600 J	0.000025 U	0.00000500 J
Molybdenum	mg/L	0.0164	0.0171	0.0265	0.0261	0.00370 J	0.00363	0.005 U	0.00117	0.00294 J	0.0185	0.00327 J	0.00885
Selenium	mg/L	0.00423 J	0.00580	0.00216 J	0.00290	0.005 U	0.000700	0.005 U	0.000100	0.00226 J	0.0000900 J	0.00143 J	0.000700
Total Dissolved Solids	mg/L	-	1060	-	1010	-	1180	-	1480	-	3630	-	996
Sulfate	mg/L	-	63.0	-	30.0	-	70.0	-	4.00	-	75.0	-	79.0
Thallium	mg/L	0.00200	0.0000900 J	0.002 U	0.0000600 J	0.00162 J	0.0000500 J	0.002 U	0.0000200 J	0.002 U	0.0000400 J	0.002 U	0.0000300 J
pH	SU	7.27	7.04	7.45	7.45	7.39	7.55	7.58	8.02	7.84	7.62	7.49	7.74

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit

J: Estimated value. Parameter was detected in concentrations below the reporting limit

-: Not sampled



**Table 2: Groundwater Protection Standards  
Northeastern Plant - Bottom Ash Pond**

Constituent Name	MCL	RSL	Background Limit
Antimony, Total (mg/L)	0.006		0.0051
Arsenic, Total (mg/L)	0.01		0.049
Barium, Total (mg/L)	2		4.59
Beryllium, Total (mg/L)	0.004		0.005
Cadmium, Total (mg/L)	0.005		0.0025
Chromium, Total (mg/L)	0.1		0.084
Cobalt, Total (mg/L)	n/a	0.006	0.046
Combined Radium, Total (pCi/L)	5		16.85
Fluoride, Total (mg/L)	4		5
Lead, Total (mg/L)	n/a	0.015	0.037
Lithium, Total (mg/L)	n/a	0.04	0.15
Mercury, Total (mg/L)	0.002		0.000058
Molybdenum, Total (mg/L)	n/a	0.1	0.007
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.002

Notes:

Grey cell indicates calculated UTL is higher than MCL.

MCL = Maximum Contaminant Level

RSL = Regional Screening Level

Calculated UTL (Upper Tolerance Limit) represents site-specific background values.

The higher of the calculated UTL or MCL/RSL is used as the GWPS.

# 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

License Number

OKLAHOMA

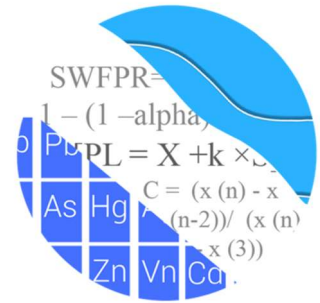
Licensing State

01.08.19

Date

**ATTACHMENT B**  
**Statistical Analysis Output**

## GROUNDWATER STATS CONSULTING



December 13, 2018

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

Re: Northeastern BAP  
Assessment Monitoring Event – July 2018

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis of the July 2018 data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5; and
- **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 CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) - boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

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

Time series plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record. Values previously flagged during the screening as outliers may be seen in a lighter font and disconnected symbol on the time series graphs.

### **Evaluation of Appendix III Parameters**

Interwell prediction limits combined with a 1-of-2 verification strategy were constructed for boron, chloride, fluoride, pH, sulfate and TDS; and intrawell prediction limits combined with a 1-of-2 verification strategy were constructed for calcium. The statistical method selected for each parameter was determined based on the results of the screening analysis performed in January 2018.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one additional sample to determine whether the initial exceedance is confirmed. When the resample confirms the initial exceedance, a statistically significant increase (SSI) is identified and further research would be required to identify the cause of the exceedance (i.e. impact from the site, natural variation, or an off-site source). If the resample falls within the statistical limit, the initial exceedance is considered a false positive result and, therefore, no further action is necessary.

Calcium was found to exceed its intrawell prediction limit in downgradient well SP-10, and also exceeded for this event in upgradient well SP-5. Additionally, the reported concentration levels in well SP-10 are comparable to historical levels in both upgradient wells. Upgradient well SP-4 exhibited increasing concentration levels for a period of time, which is an indication that groundwater is changing naturally unrelated to the site for this constituent. Downgradient water quality will continue to be monitored for similar patterns which may occur at downgradient wells as future samples are collected.

Boron, chloride, fluoride and TDS were found to exceed their respective interwell prediction limits for well SP-10; however, concentration levels are stable over time for these constituents at this well. As mentioned above, further research would be required to determine whether the concentrations at this well relative to those reported upgradient are due to natural variation. That study is beyond the scope of this analysis. The Prediction Limit Summary tables following this letter.

When a statistically significant increase is identified, the data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing or stable. Upgradient wells are included in the trend analyses to identify whether similar patterns exist upgradient of the site which is an indication of natural variability in groundwater unrelated to practices at the site.

No statistically significant increasing or decreasing trends were found for any of the downgradient well/parameter pairs with prediction limit exceedances. A statistically significant increasing trend was noted for chloride in upgradient well SP-5. A Trend Test summary table follows this letter.

### **Evaluation of Appendix IV Parameters**

Parametric tolerance limits were used to calculate background limits from pooled upgradient well data for Appendix IV parameters with a target of 95% confidence and 95% coverage to determine the Alternate Contaminant Level (ACL). The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and Regional Screening Levels (RSLs) 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.

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters using the highest limit of either the MCL, RSL, or ACL as discussed above. Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence intervals exceedances were found except for lithium in well SP-10. A summary of the confidence interval results follows this letter.

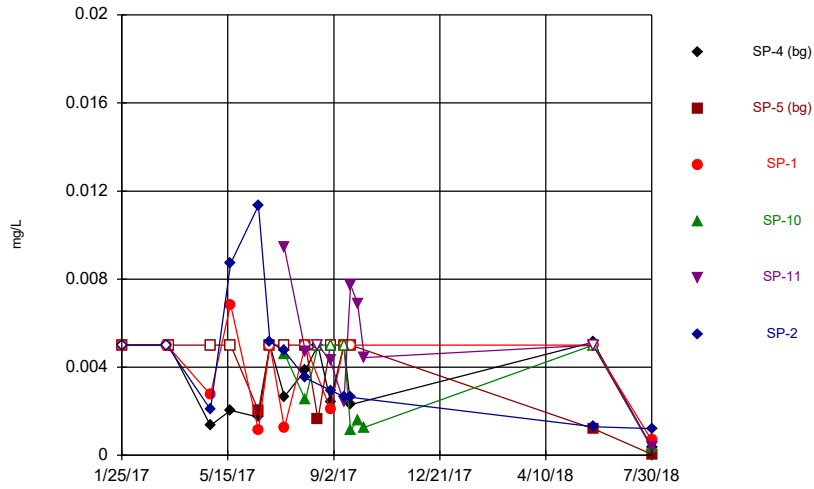
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,



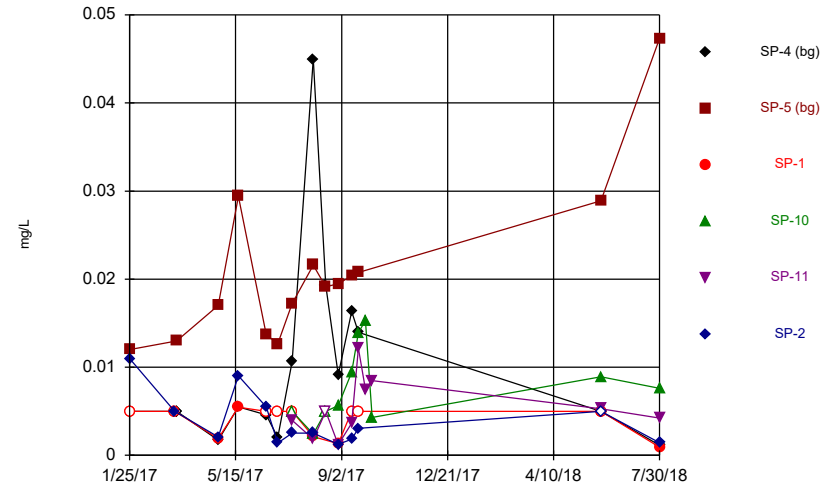
Kristina L. Rayner  
Groundwater Statistician

Time Series



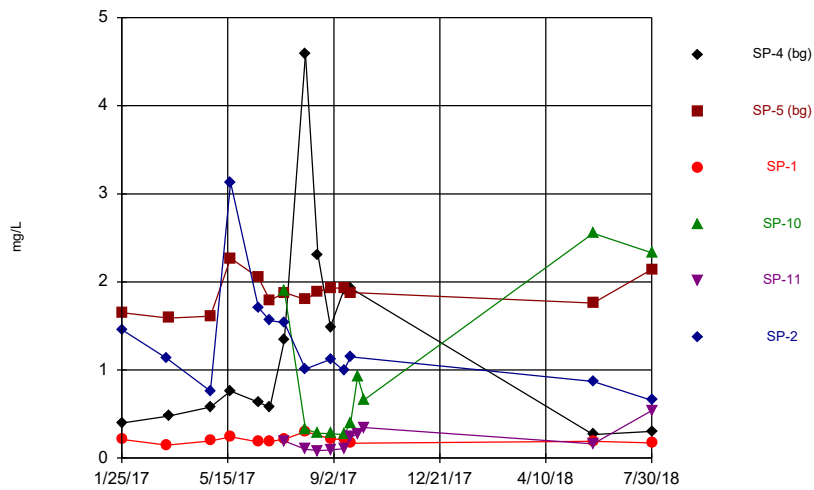
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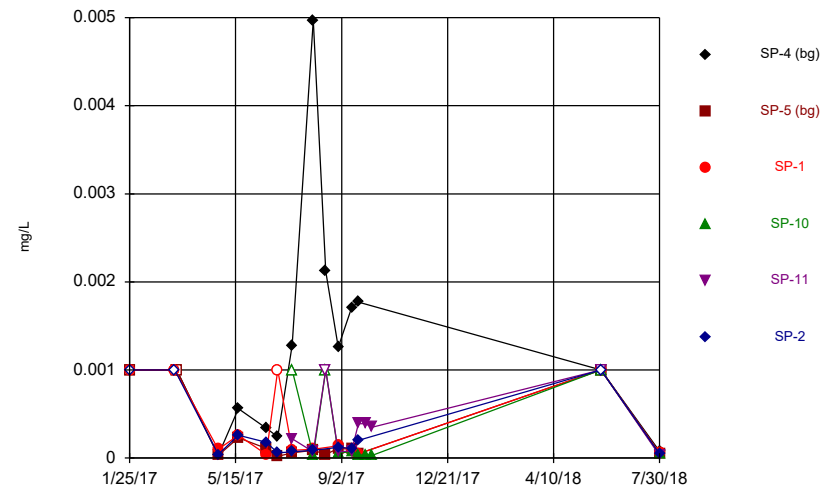
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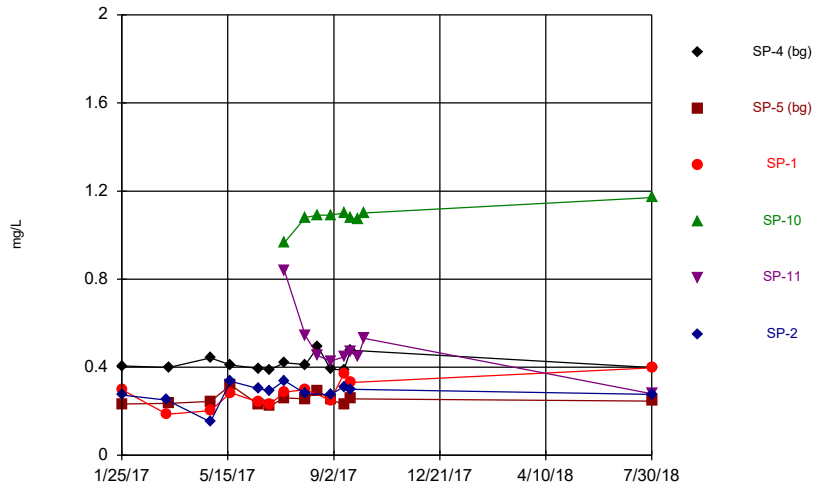
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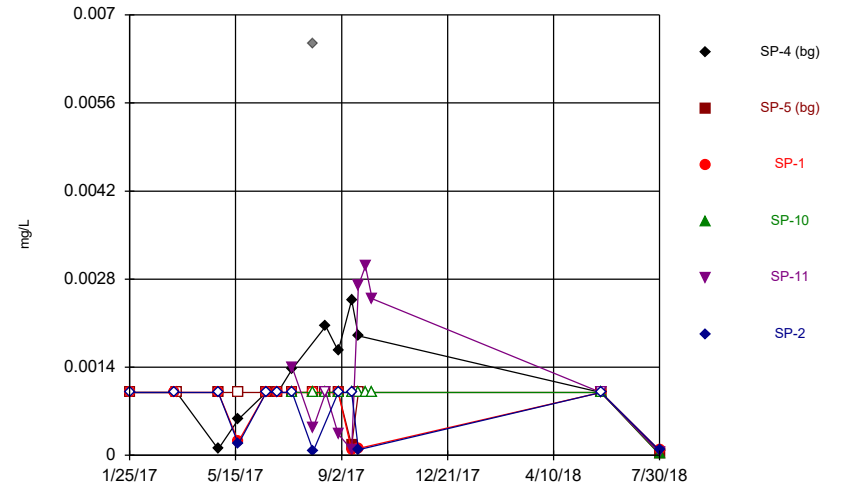


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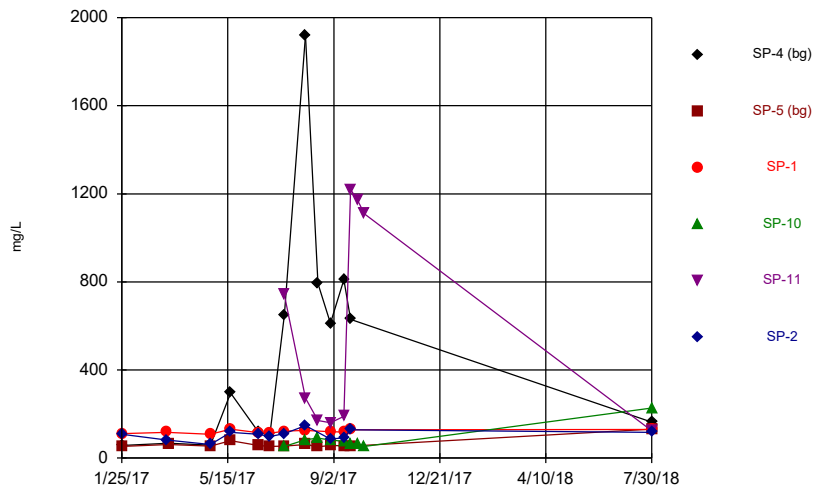
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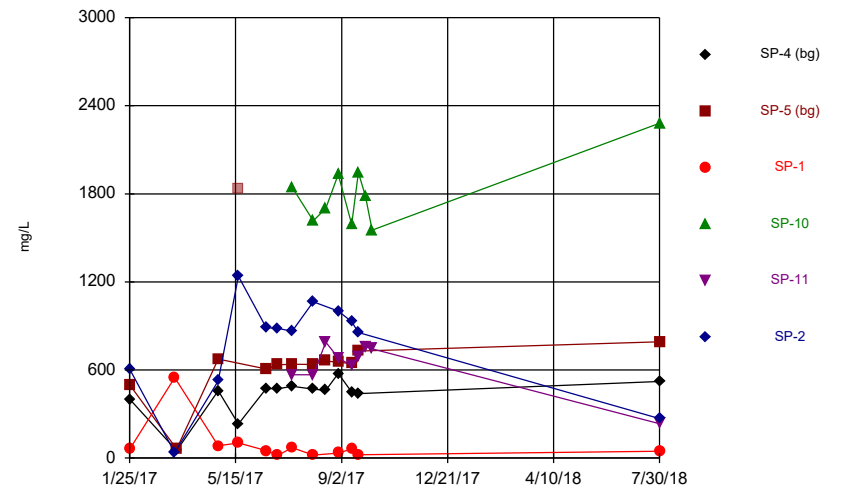
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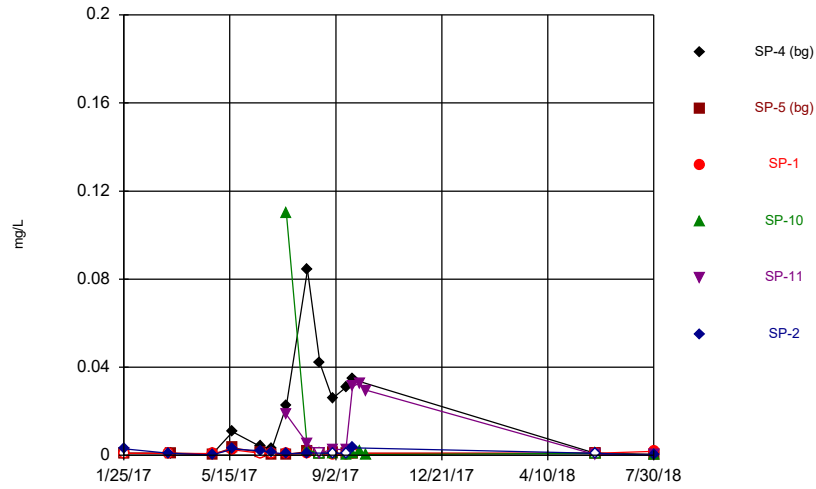
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Time Series



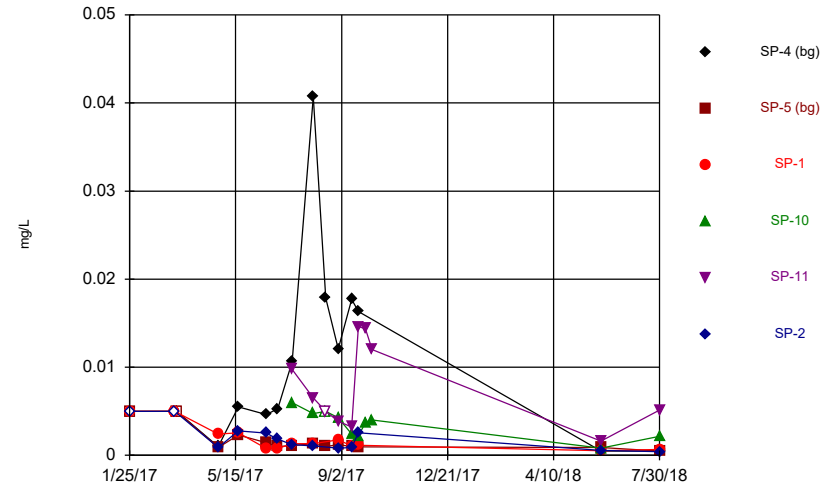
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### Time Series



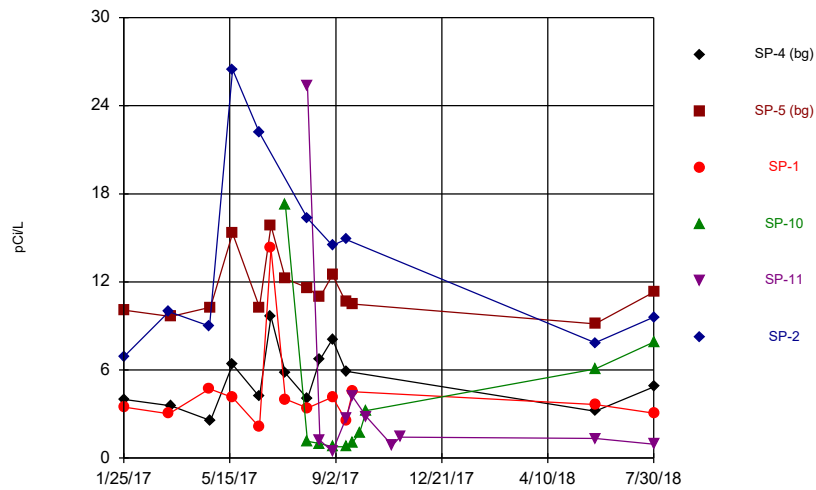
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### Time Series



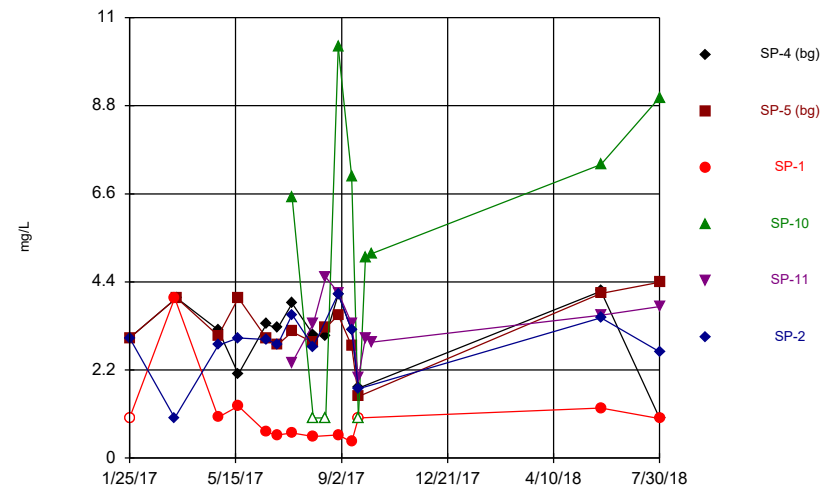
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### Time Series



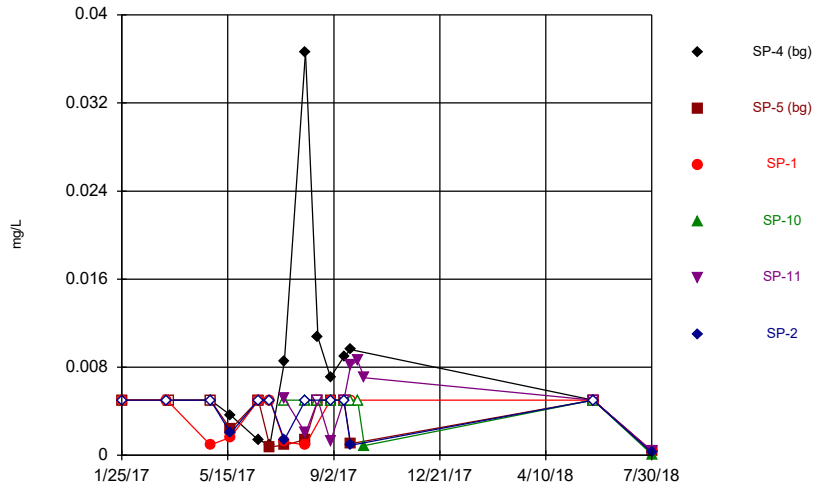
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### Time Series



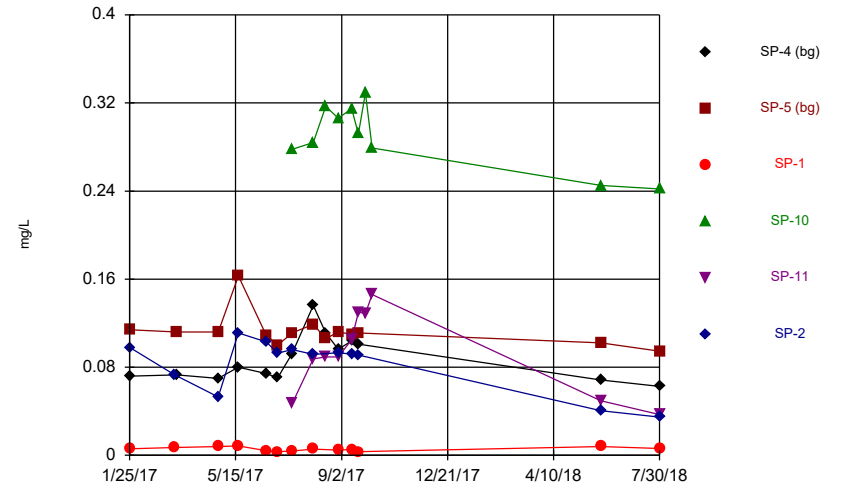
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Time Series



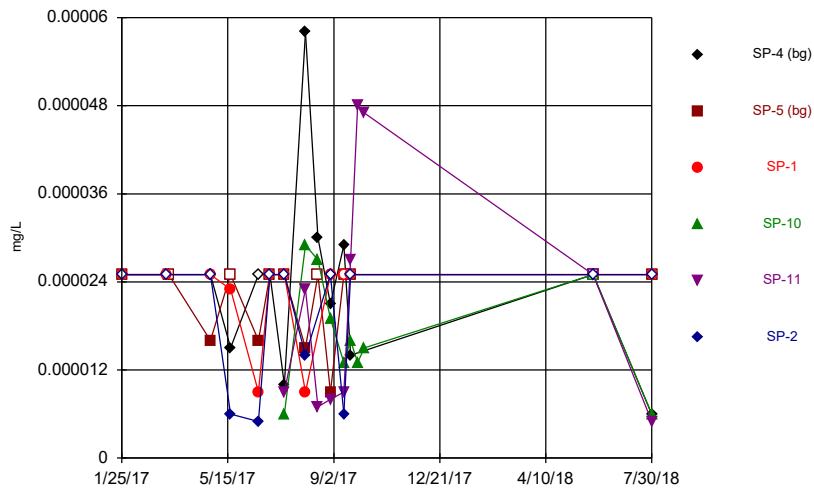
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Time Series



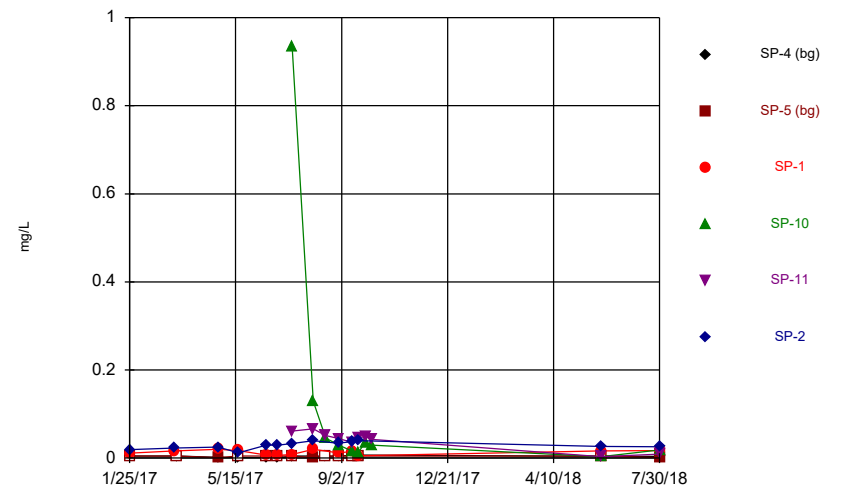
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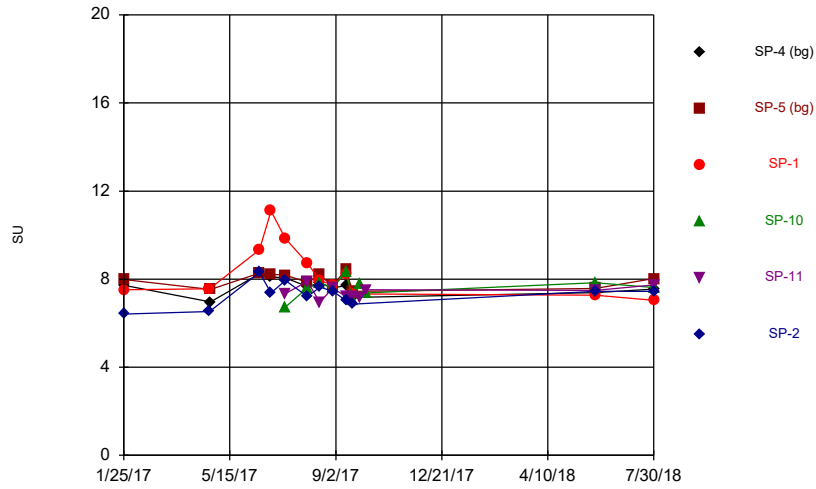
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Time Series



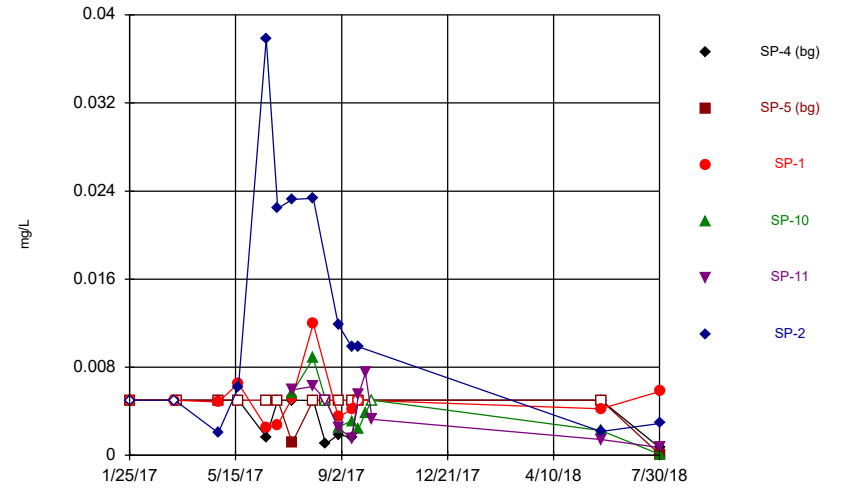
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Time Series



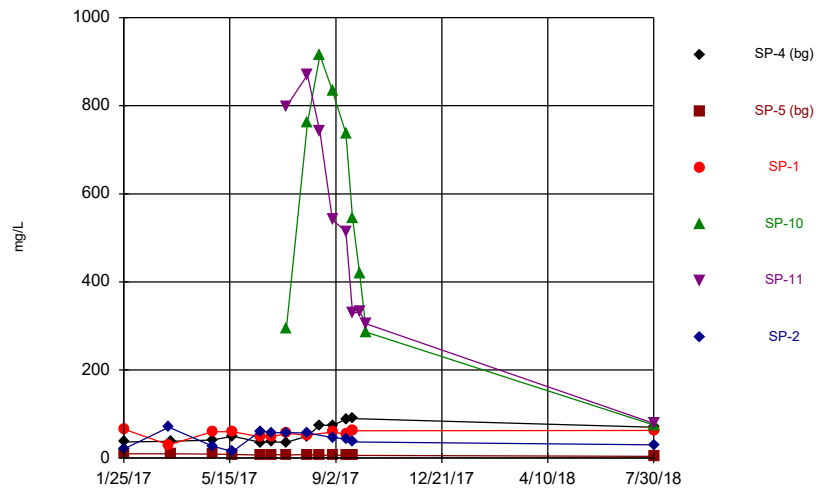
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Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



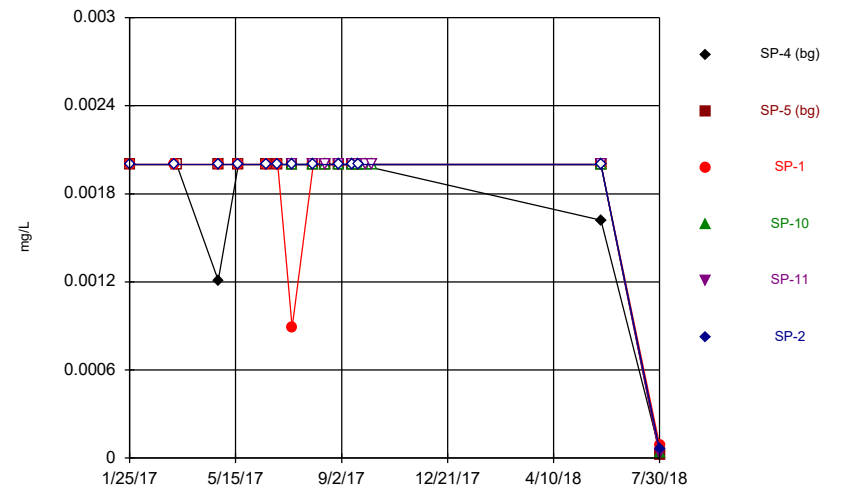
Constituent: Selenium Analysis Run 12/2/2018 8:41 AM View: Descriptive  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



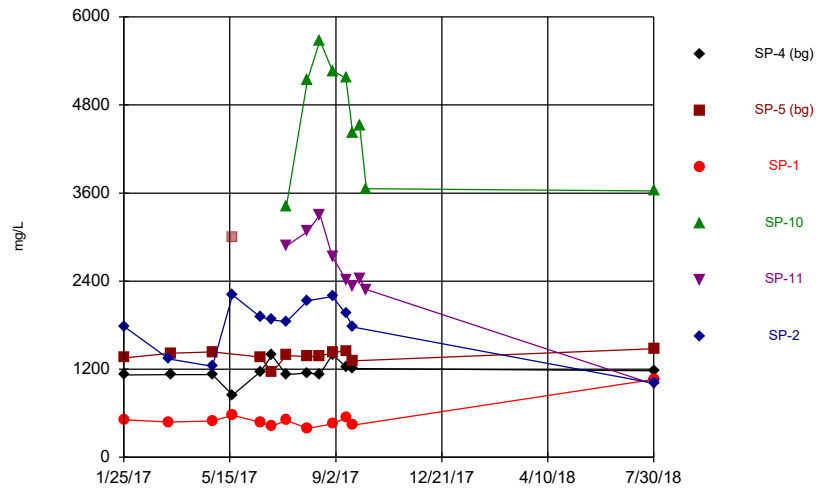
Constituent: Sulfate Analysis Run 12/2/2018 8:41 AM View: Descriptive  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



Constituent: Thallium Analysis Run 12/2/2018 8:41 AM View: Descriptive  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 12/2/2018 8:41 AM View: Descriptive  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Interwell Prediction Limit Summary Table - Significant Results

Northeastern BAP    Client: Geosyntec    Data: Northeastern BAP    Printed 12/2/2018, 8:32 AM

Constituent	Well	Upper Lim.	Lower LimDate	Observ.	Sig. Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method	
Boron (mg/L)	SP-10	0.493	n/a	7/30/2018	1.17	Yes 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
Chloride (mg/L)	SP-10	768.8	n/a	7/30/2018	2280	Yes 25	291209	156656	0	None	x^2	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	SP-10	4.712	n/a	7/30/2018	9	Yes 28	3.167	0.8157	3.571	None	No	0.00188	Param Inter 1 of 2
pH, field (SU)	SP-1	8.528	7.09	7/30/2018	7.04	Yes 24	7.809	0.3732	0	None	No	0.0009398	Param Inter 1 of 2
Total Dissolved Solids [TDS] (mg/L)	SP-10	1565	n/a	7/30/2018	3630	Yes 25	1270	154	0	None	No	0.00188	Param Inter 1 of 2



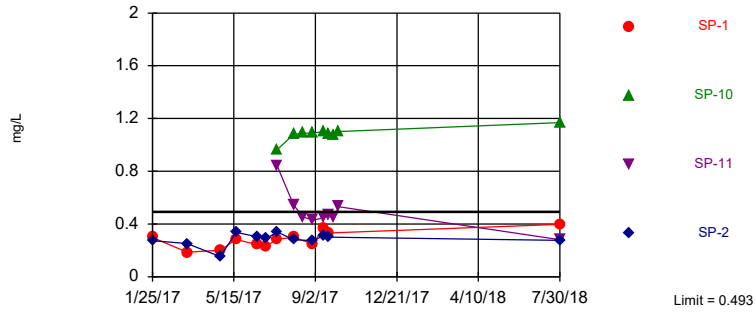
# Interwell Prediction Limit Summary Table - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 8:32 AM

Constituent	Well	Upper Lim.	Lower LimDate	Observ.	Sig. Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method	
Boron (mg/L)	SP-1	0.493	n/a	7/30/2018	0.397	No 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
<b>Boron (mg/L)</b>	<b>SP-10</b>	<b>0.493</b>	<b>n/a</b>	<b>7/30/2018</b>	<b>1.17</b>	<b>Yes 26</b>	<b>n/a</b>	<b>n/a</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.00258</b>	<b>NP Inter (normality) ...</b>
Boron (mg/L)	SP-11	0.493	n/a	7/30/2018	0.28	No 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
Boron (mg/L)	SP-2	0.493	n/a	7/30/2018	0.276	No 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
Chloride (mg/L)	SP-1	768.8	n/a	7/30/2018	46	No 25	291209	156656	0	None	x^2	0.00188	Param Inter 1 of 2
<b>Chloride (mg/L)</b>	<b>SP-10</b>	<b>768.8</b>	<b>n/a</b>	<b>7/30/2018</b>	<b>2280</b>	<b>Yes 25</b>	<b>291209</b>	<b>156656</b>	<b>0</b>	<b>None</b>	<b>x^2</b>	<b>0.00188</b>	<b>Param Inter 1 of 2</b>
Chloride (mg/L)	SP-11	768.8	n/a	7/30/2018	234	No 25	291209	156656	0	None	x^2	0.00188	Param Inter 1 of 2
Chloride (mg/L)	SP-2	768.8	n/a	7/30/2018	268	No 25	291209	156656	0	None	x^2	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	SP-1	4.712	n/a	7/30/2018	0.986	No 28	3.167	0.8157	3.571	None	No	0.00188	Param Inter 1 of 2
<b>Fluoride (mg/L)</b>	<b>SP-10</b>	<b>4.712</b>	<b>n/a</b>	<b>7/30/2018</b>	<b>9</b>	<b>Yes 28</b>	<b>3.167</b>	<b>0.8157</b>	<b>3.571</b>	<b>None</b>	<b>No</b>	<b>0.00188</b>	<b>Param Inter 1 of 2</b>
Fluoride (mg/L)	SP-11	4.712	n/a	7/30/2018	3.78	No 28	3.167	0.8157	3.571	None	No	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	SP-2	4.712	n/a	7/30/2018	2.66	No 28	3.167	0.8157	3.571	None	No	0.00188	Param Inter 1 of 2
<b>pH, field (SU)</b>	<b>SP-1</b>	<b>8.528</b>	<b>7.09</b>	<b>7/30/2018</b>	<b>7.04</b>	<b>Yes 24</b>	<b>7.809</b>	<b>0.3732</b>	<b>0</b>	<b>None</b>	<b>No</b>	<b>0.0009398</b>	<b>Param Inter 1 of 2</b>
pH, field (SU)	SP-10	8.528	7.09	7/30/2018	7.62	No 24	7.809	0.3732	0	None	No	0.0009398	Param Inter 1 of 2
pH, field (SU)	SP-11	8.528	7.09	7/30/2018	7.74	No 24	7.809	0.3732	0	None	No	0.0009398	Param Inter 1 of 2
pH, field (SU)	SP-2	8.528	7.09	7/30/2018	7.45	No 24	7.809	0.3732	0	None	No	0.0009398	Param Inter 1 of 2
Sulfate (mg/L)	SP-1	90	n/a	7/30/2018	63	No 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
Sulfate (mg/L)	SP-10	90	n/a	7/30/2018	75	No 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
Sulfate (mg/L)	SP-11	90	n/a	7/30/2018	79	No 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
Sulfate (mg/L)	SP-2	90	n/a	7/30/2018	30	No 26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) ...
Total Dissolved Solids [TDS] (mg/L)	SP-1	1565	n/a	7/30/2018	1060	No 25	1270	154	0	None	No	0.00188	Param Inter 1 of 2
<b>Total Dissolved Solids [TDS] (mg/L)</b>	<b>SP-10</b>	<b>1565</b>	<b>n/a</b>	<b>7/30/2018</b>	<b>3630</b>	<b>Yes 25</b>	<b>1270</b>	<b>154</b>	<b>0</b>	<b>None</b>	<b>No</b>	<b>0.00188</b>	<b>Param Inter 1 of 2</b>
Total Dissolved Solids [TDS] (mg/L)	SP-11	1565	n/a	7/30/2018	996	No 25	1270	154	0	None	No	0.00188	Param Inter 1 of 2
Total Dissolved Solids [TDS] (mg/L)	SP-2	1565	n/a	7/30/2018	1010	No 25	1270	154	0	None	No	0.00188	Param Inter 1 of 2

Exceeds Limit: SP-10

Prediction Limit  
Interwell Non-parametric

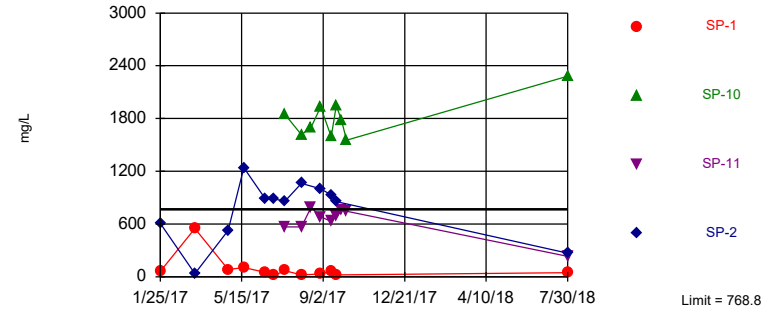


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 26 background values. Annual per-constituent alpha = 0.02045. Individual comparison alpha = 0.00258 (1 of 2). Comparing 4 points to limit.

Constituent: Boron Analysis Run 12/2/2018 8:31 AM View: PL's - Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit: SP-10

Prediction Limit  
Interwell Parametric

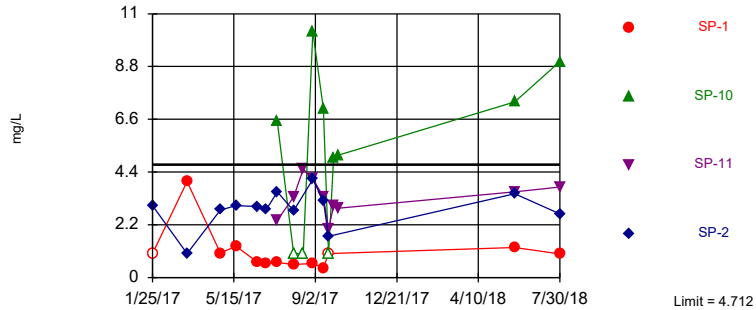


Background Data Summary (based on square transformation): Mean=291209, Std. Dev.=156656, n=25. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.959, critical = 0.888. Kappa = 1.914 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Comparing 4 points to limit.

Constituent: Chloride Analysis Run 12/2/2018 8:31 AM View: PL's - Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit: SP-10

Prediction Limit  
Interwell Parametric

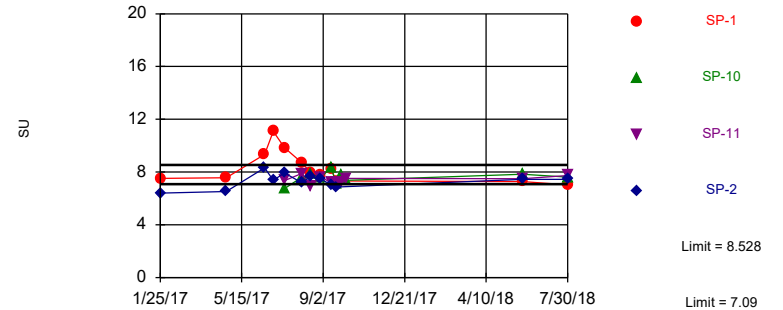


Background Data Summary: Mean=3.167, Std. Dev.=0.8157, n=28, 3.571% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9102, critical = 0.896. Kappa = 1.894 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Comparing 4 points to limit.

Constituent: Fluoride Analysis Run 12/2/2018 8:31 AM View: PL's - Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limits: SP-1

Prediction Limit  
Interwell Parametric

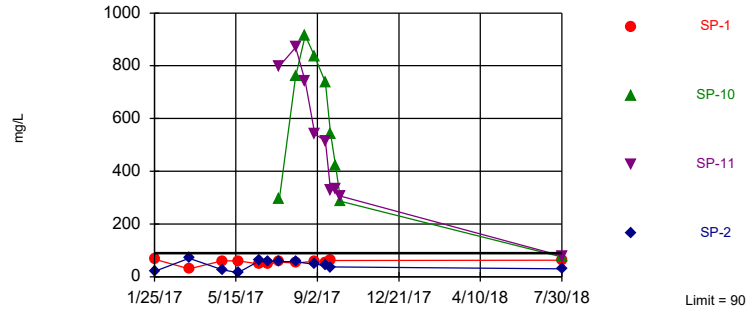


Background Data Summary: Mean=7.809, Std. Dev.=0.3732, n=24. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9695, critical = 0.884. Kappa = 1.927 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.0009398. Comparing 4 points to limit.

Constituent: pH, field Analysis Run 12/2/2018 8:31 AM View: PL's - Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Interwell Non-parametric

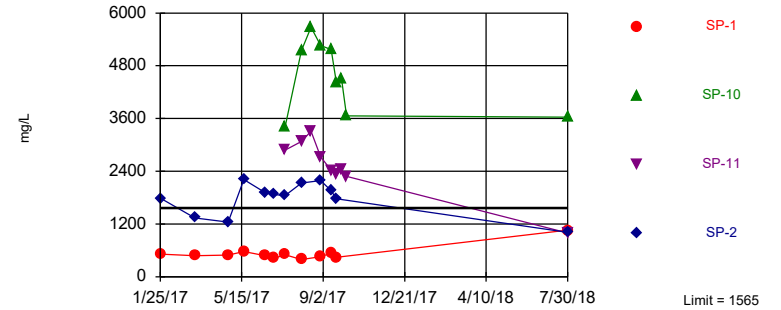


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 26 background values. Annual per-constituent alpha = 0.02045. Individual comparison alpha = 0.00258 (1 of 2). Comparing 4 points to limit.

Constituent: Sulfate Analysis Run 12/2/2018 8:31 AM View: PL's - Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit: SP-10

Prediction Limit  
Interwell Parametric



Background Data Summary: Mean=1270, Std. Dev.=154, n=25. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8924, critical = 0.888. Kappa = 1.914 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Comparing 4 points to limit.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/2/2018 8:31 AM View: PL's - Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Intrawell Prediction Limit Summary Table - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 8:36 AM

Constituent	Well	Upper Lim.	Lower LimDate	Observ.	Sig. Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method	
Calcium (mg/L)	SP-5	79.1	n/a	7/30/2018	131	Yes 12	n/a	n/a	0	n/a	n/a	0.01077	NP (normality) 1 of 2
Calcium (mg/L)	SP-10	108.8	n/a	7/30/2018	227	Yes 8	71.1	14.43	0	None	No	0.00188	Param 1 of 2

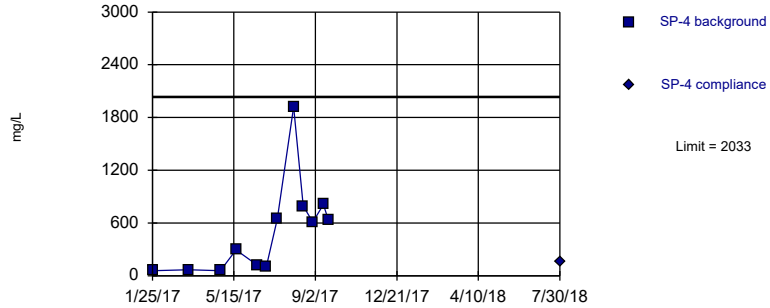
# Intrawell Prediction Limit Summary Table - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 8:36 AM

Constituent	Well	Upper Lim.	Lower LimDate	Observ.	Sig. Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method	
Calcium (mg/L)	SP-4	2033	n/a	7/30/2018	164	No 12	19.81	11.32	0	None	sqrt(x)	0.00188	Param 1 of 2
<b>Calcium (mg/L)</b>	<b>SP-5</b>	<b>79.1</b>	<b>n/a</b>	<b>7/30/2018</b>	<b>131</b>	<b>Yes 12</b>	<b>n/a</b>	<b>n/a</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.01077</b>	NP (normality) 1 of 2
Calcium (mg/L)	SP-1	135.8	n/a	7/30/2018	130	No 11	119.1	7.286	0	None	No	0.00188	Param 1 of 2
<b>Calcium (mg/L)</b>	<b>SP-10</b>	<b>108.8</b>	<b>n/a</b>	<b>7/30/2018</b>	<b>227</b>	<b>Yes 8</b>	<b>71.1</b>	<b>14.43</b>	<b>0</b>	<b>None</b>	<b>No</b>	<b>0.00188</b>	Param 1 of 2
Calcium (mg/L)	SP-11	1894	n/a	7/30/2018	124	No 8	629.5	483.3	0	None	No	0.00188	Param 1 of 2
Calcium (mg/L)	SP-2	157.3	n/a	7/30/2018	117	No 11	103.8	23.28	0	None	No	0.00188	Param 1 of 2

Within Limit

Prediction Limit  
Intrawell Parametric

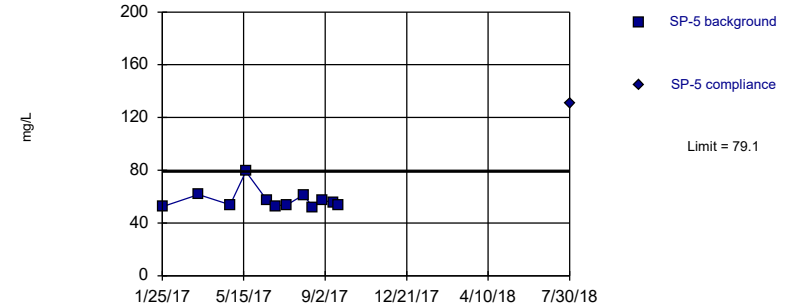


Background Data Summary (based on square root transformation): Mean=19.81, Std. Dev.=11.32, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8858, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 12/2/2018 8:35 AM View: PL's - Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit

Prediction Limit  
Intrawell Non-parametric

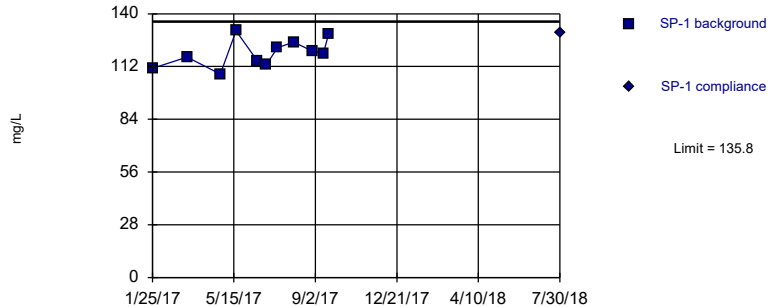


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2).

Constituent: Calcium Analysis Run 12/2/2018 8:35 AM View: PL's - Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell Parametric

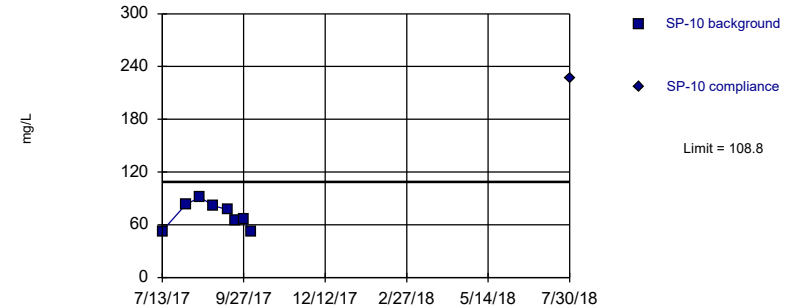


Background Data Summary: Mean=119.1, Std. Dev.=7.286, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9766, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 12/2/2018 8:35 AM View: PL's - Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit

Prediction Limit  
Intrawell Parametric

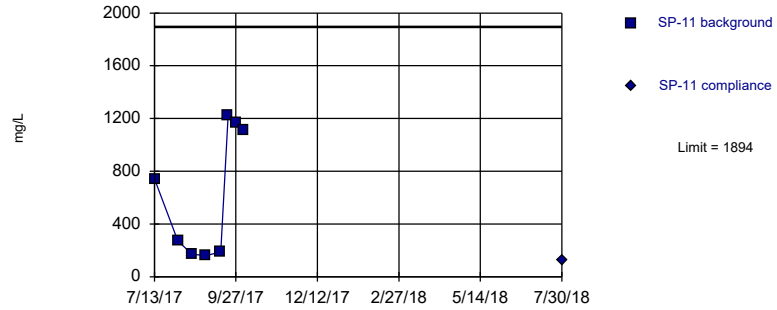


Background Data Summary: Mean=71.1, Std. Dev.=14.43, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9303, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 12/2/2018 8:35 AM View: PL's - Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell Parametric

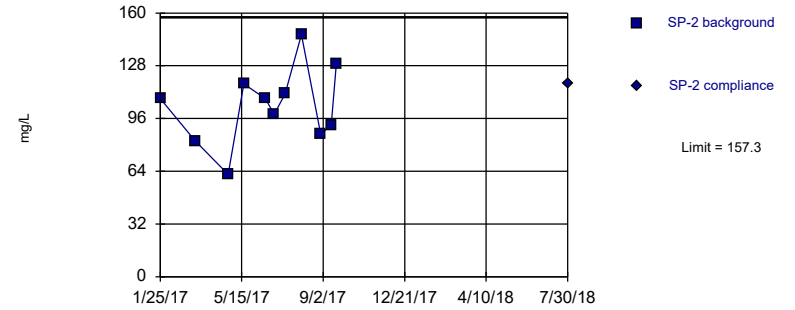


Background Data Summary: Mean=629.5, Std. Dev.=483.3, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 12/2/2018 8:35 AM View: PL's - Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell Parametric



Background Data Summary: Mean=103.8, Std. Dev.=23.28, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9891, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 12/2/2018 8:35 AM View: PL's - Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Trend Test Summary Table - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 9:10 AM

<u>Constituent</u>	<u>Well</u>	<u>Slope</u>	<u>Calc.</u>	<u>Critical</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Normality</u>	<u>Xform</u>	<u>Alpha</u>	<u>Method</u>
<b>Chloride (mg/L)</b>	<b>SP-5 (bg)</b>	<b>207.8</b>	<b>42</b>	<b>38</b>	<b>Yes</b>	<b>12</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.01</b>	<b>NP</b>



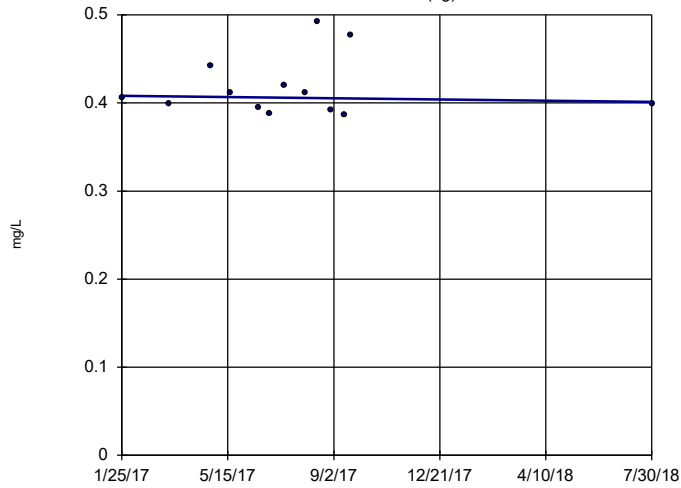
# Trend Test Summary Table - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 9:10 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron (mg/L)	SP-4 (bg)	-0.004689	-3	-43	No	13	0	n/a	n/a	0.01	NP
Boron (mg/L)	SP-5 (bg)	0.011	10	43	No	13	0	n/a	n/a	0.01	NP
Boron (mg/L)	SP-10	0.1046	17	25	No	9	0	n/a	n/a	0.01	NP
Calcium (mg/L)	SP-4 (bg)	964.5	38	43	No	13	0	n/a	n/a	0.01	NP
Calcium (mg/L)	SP-5 (bg)	1.708	5	43	No	13	0	n/a	n/a	0.01	NP
Calcium (mg/L)	SP-10	-37.41	-4	-25	No	9	0	n/a	n/a	0.01	NP
Chloride (mg/L)	SP-4 (bg)	80.24	24	43	No	13	0	n/a	n/a	0.01	NP
<b>Chloride (mg/L)</b>	<b>SP-5 (bg)</b>	<b>207.8</b>	<b>42</b>	<b>38</b>	<b>Yes</b>	<b>12</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.01</b>	<b>NP</b>
Chloride (mg/L)	SP-10	384.9	4	25	No	9	0	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-4 (bg)	-0.4498	-7	-48	No	14	7.143	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-5 (bg)	0.1065	5	48	No	14	0	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-10	3.405	14	30	No	10	30	n/a	n/a	0.01	NP
pH, field (SU)	SP-4 (bg)	-0.4904	-26	-38	No	12	0	n/a	n/a	0.01	NP
pH, field (SU)	SP-5 (bg)	-0.2231	-10	-38	No	12	0	n/a	n/a	0.01	NP
pH, field (SU)	SP-1	-1.344	-28	-38	No	12	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (m...	SP-4 (bg)	75.32	37	43	No	13	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (m...	SP-5 (bg)	51.25	18	38	No	12	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (m...	SP-10	-1970	-12	-25	No	9	0	n/a	n/a	0.01	NP

### Sen's Slope Estimator

SP-4 (bg)

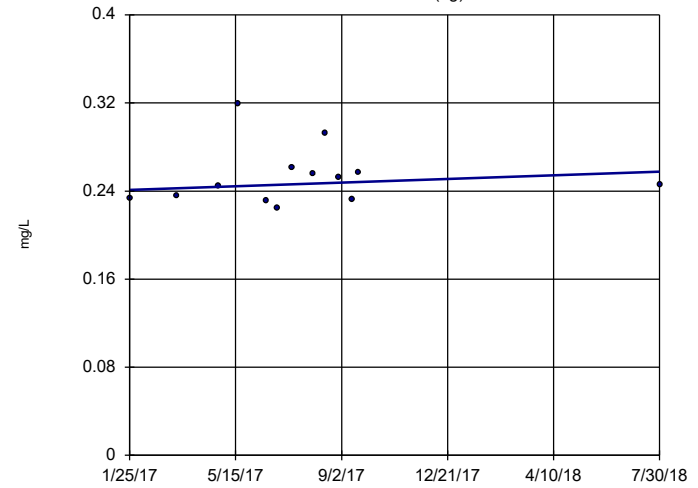


n = 13  
 Slope = -0.004689  
 units per year.  
 Mann-Kendall  
 statistic = -3  
 critical = -43  
 Trend not sig-  
 nificant at 99%  
 confidence level  
 ( $\alpha = 0.005$  per  
 tail).

Constituent: Boron Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-5 (bg)

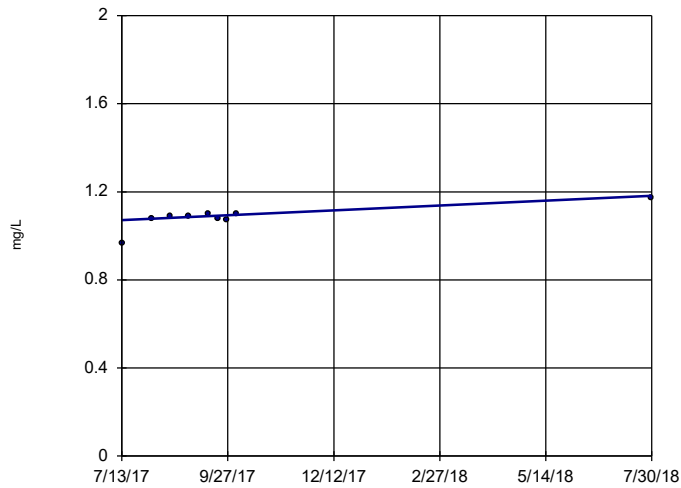


n = 13  
 Slope = 0.011  
 units per year.  
 Mann-Kendall  
 statistic = 10  
 critical = 43  
 Trend not sig-  
 nificant at 99%  
 confidence level  
 ( $\alpha = 0.005$  per  
 tail).

Constituent: Boron Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-10

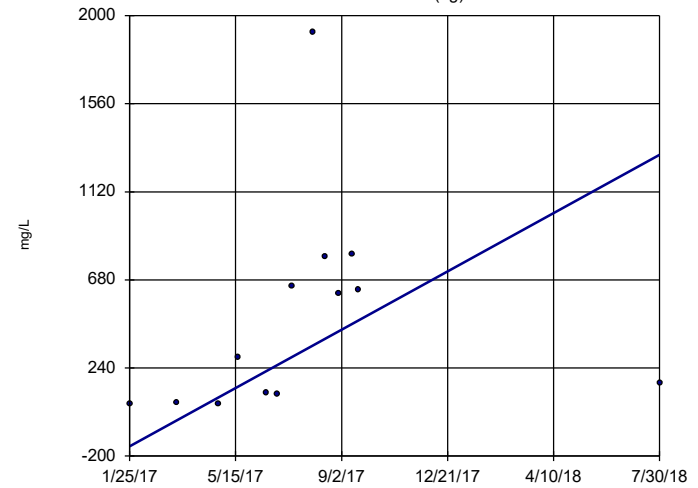


n = 9  
 Slope = 0.1046  
 units per year.  
 Mann-Kendall  
 statistic = 17  
 critical = 25  
 Trend not sig-  
 nificant at 99%  
 confidence level  
 ( $\alpha = 0.005$  per  
 tail).

Constituent: Boron Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

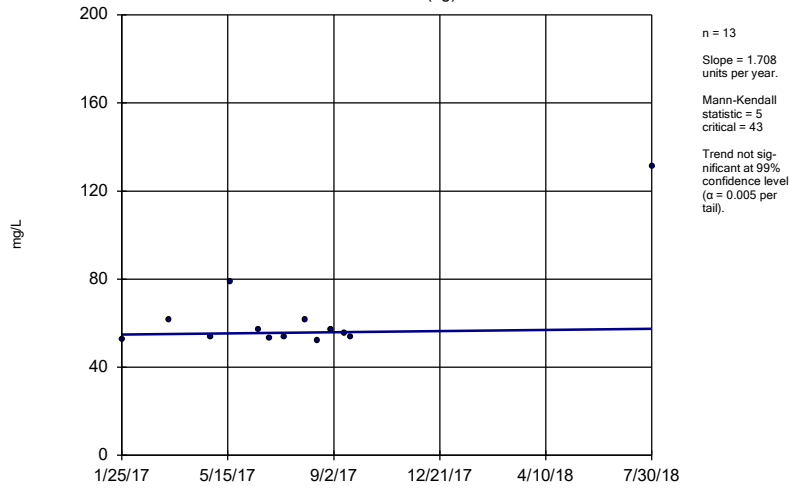
SP-4 (bg)



n = 13  
 Slope = 964.5  
 units per year.  
 Mann-Kendall  
 statistic = 38  
 critical = 43  
 Trend not sig-  
 nificant at 99%  
 confidence level  
 ( $\alpha = 0.005$  per  
 tail).

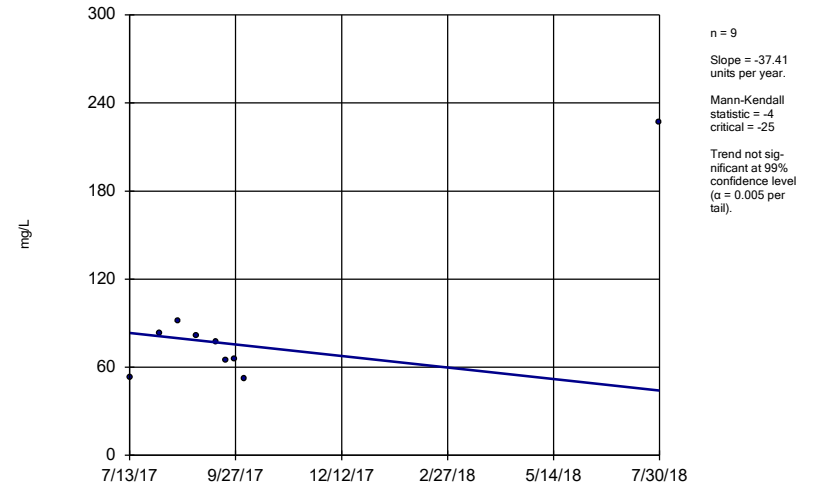
Constituent: Calcium Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator SP-5 (bg)



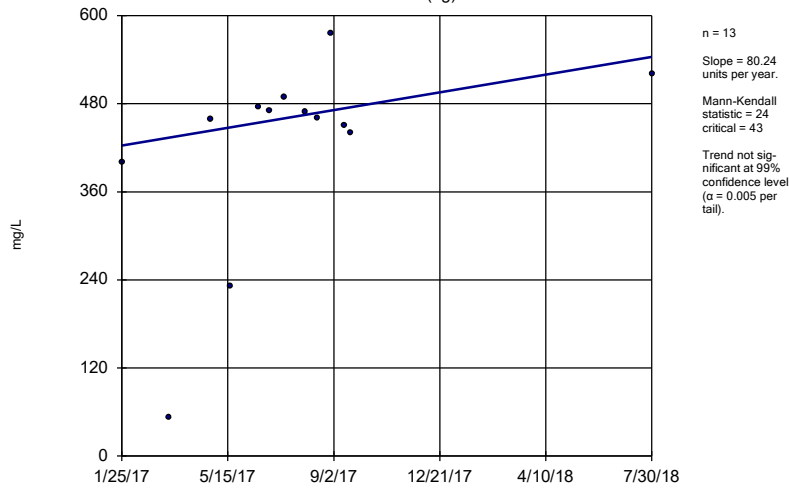
Constituent: Calcium Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator SP-10



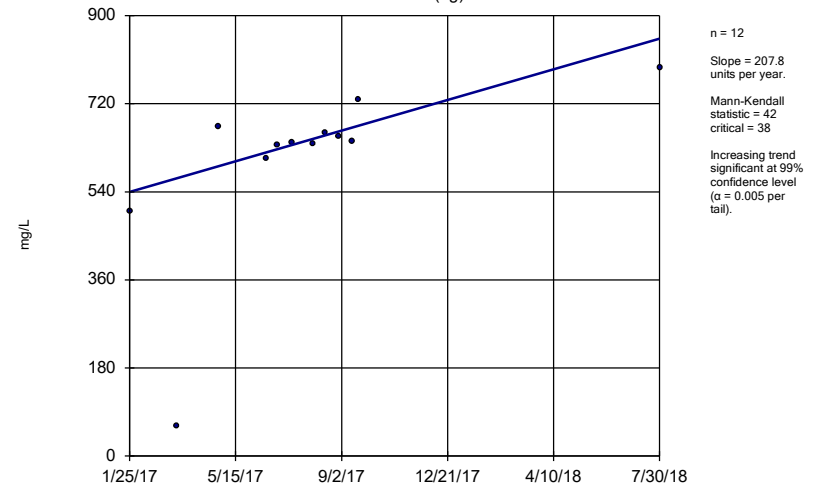
Constituent: Calcium Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator SP-4 (bg)



Constituent: Chloride Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

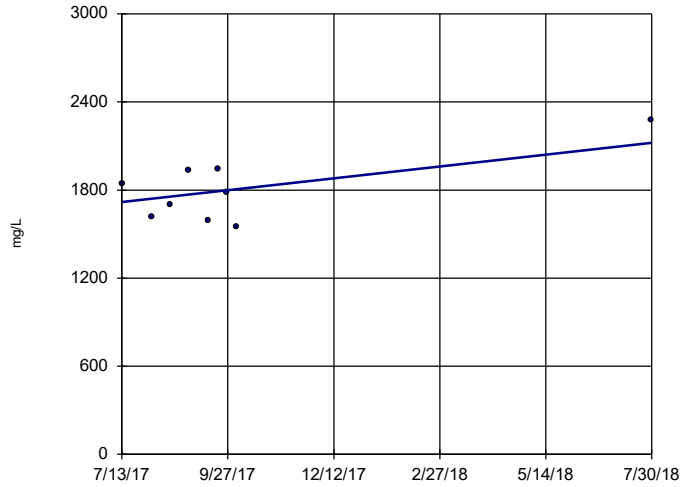
### Sen's Slope Estimator SP-5 (bg)



Constituent: Chloride Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-10



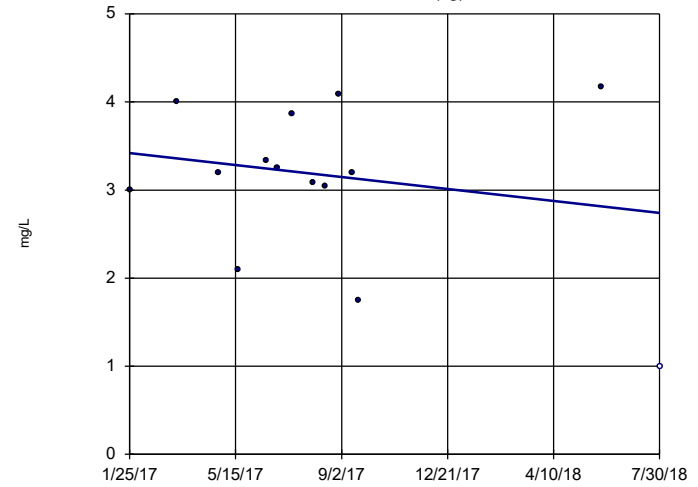
n = 9  
 Slope = 384.9 units per year.  
 Mann-Kendall statistic = 4  
 critical = 25  
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Hollow symbols indicate censored values.

### Sen's Slope Estimator

SP-4 (bg)

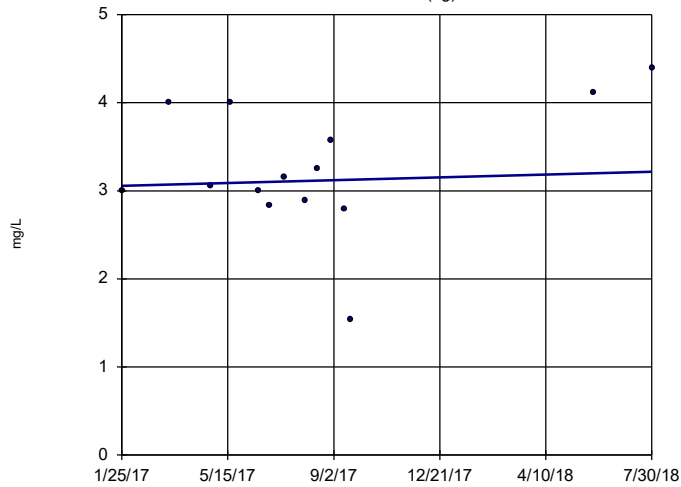


n = 14  
 Slope = -0.4498 units per year.  
 Mann-Kendall statistic = -7  
 critical = -48  
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-5 (bg)



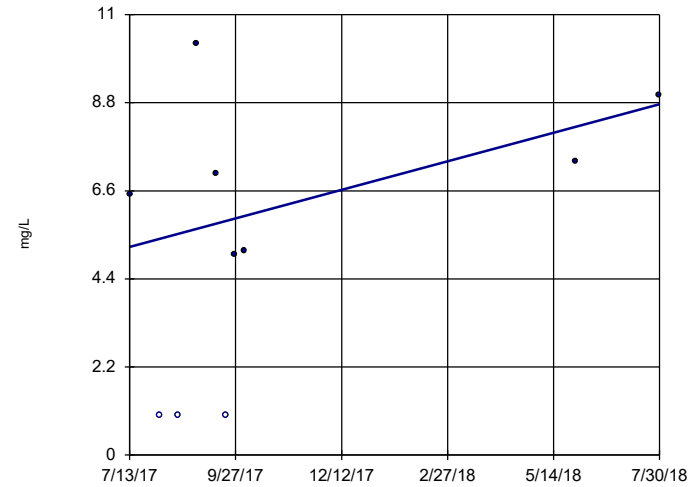
n = 14  
 Slope = 0.1065 units per year.  
 Mann-Kendall statistic = 5  
 critical = 48  
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Hollow symbols indicate censored values.

### Sen's Slope Estimator

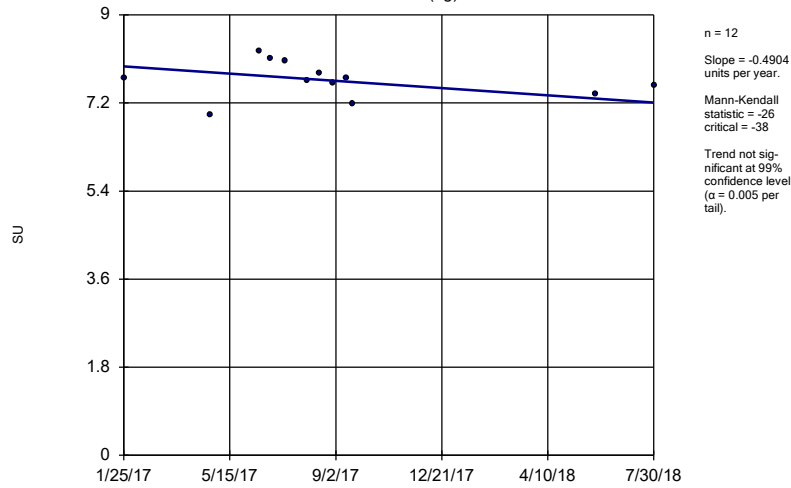
SP-10



n = 10  
 Slope = 3.405 units per year.  
 Mann-Kendall statistic = 14  
 critical = 30  
 Trend not significant at 99% confidence level (α = 0.005 per tail).

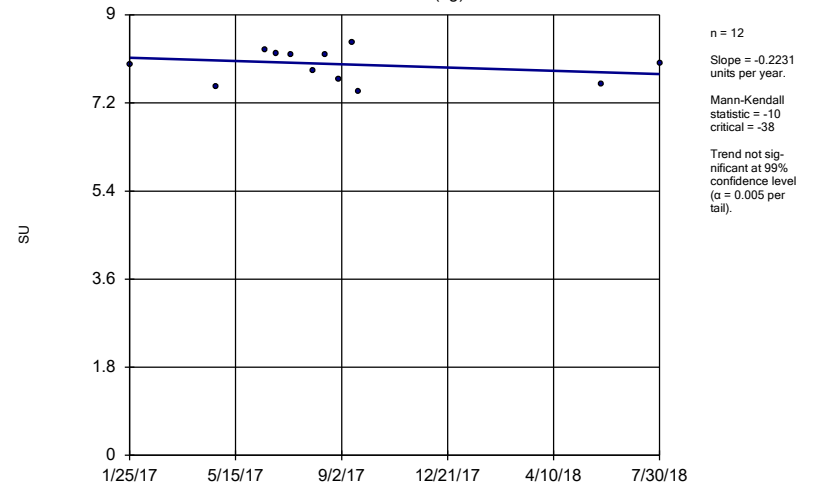
Constituent: Fluoride Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-4 (bg)



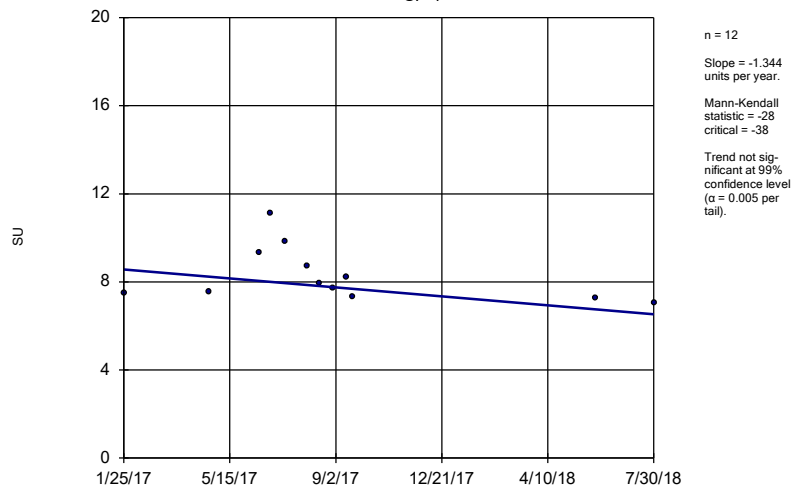
Constituent: pH, field Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-5 (bg)



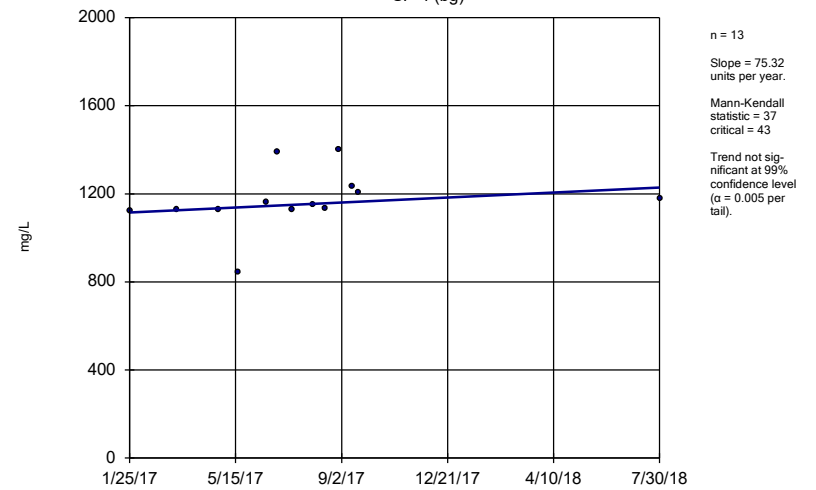
Constituent: pH, field Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-1



Constituent: pH, field Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

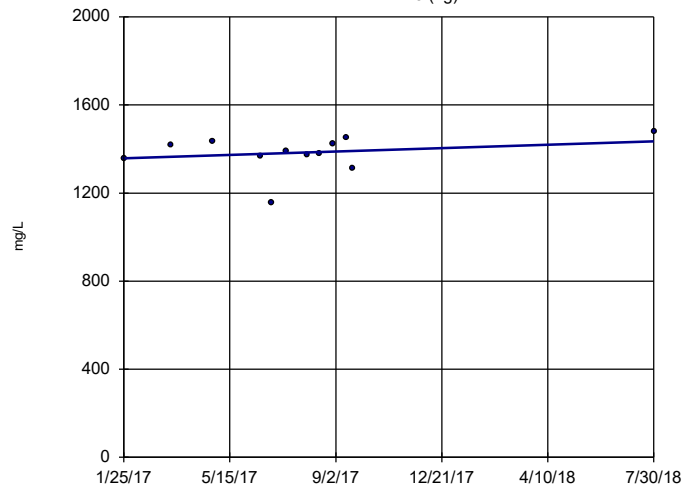
Sen's Slope Estimator  
SP-4 (bg)



Constituent: Total Dissolved Solids [TDS] Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-5 (bg)

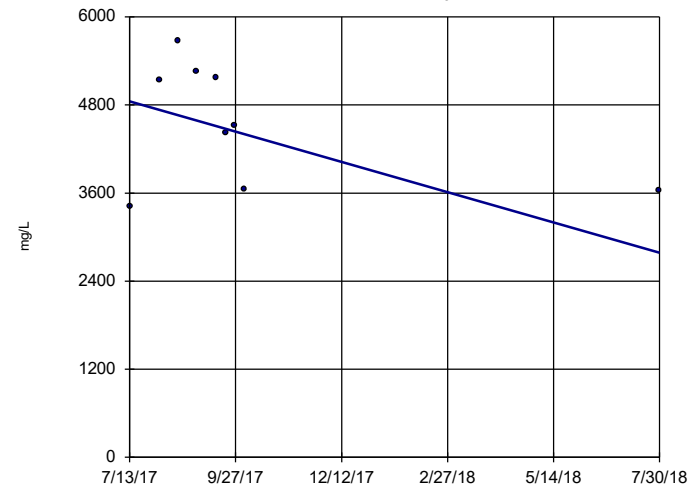


n = 12  
Slope = 51.25  
units per year.  
Mann-Kendall  
statistic = 18  
critical = 38  
Trend not sig-  
nificant at 99%  
confidence level  
( $\alpha = 0.005$  per  
tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-10



n = 9  
Slope = -1970  
units per year.  
Mann-Kendall  
statistic = -12  
critical = -25  
Trend not sig-  
nificant at 99%  
confidence level  
( $\alpha = 0.005$  per  
tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/2/2018 9:08 AM View: Trend Tests  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Upper Tolerance Limits

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 8:45 AM

Constituent	Upper Lim.	Bg.N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	0.00514	28	n/a	n/a	53.57	n/a	n/a	0.2378	NP Inter(normality)
Arsenic (mg/L)	0.04878	28	0.1163	0.04651	10.71	None	sqrt(x)	0.05	Inter
Barium (mg/L)	4.59	28	n/a	n/a	0	n/a	n/a	0.2378	NP Inter(normality)
Beryllium (mg/L)	0.00497	28	n/a	n/a	21.43	n/a	n/a	0.2378	NP Inter(Cohens/xform)
Cadmium (mg/L)	0.00247	27	n/a	n/a	62.96	n/a	n/a	0.2503	NP Inter(normality)
Chromium (mg/L)	0.08415	28	n/a	n/a	25	n/a	n/a	0.2378	NP Inter(Cohens/xform)
Cobalt (mg/L)	0.0464	28	-5.915	1.265	14.29	None	ln(x)	0.05	Inter
Combined Radium 226 + 228 (pCi/L)	16.85	27	8.487	3.696	0	None	No	0.05	Inter
Fluoride (mg/L)	5.002	28	3.167	0.8157	3.571	None	No	0.05	Inter
Lead (mg/L)	0.03663	28	n/a	n/a	42.86	n/a	n/a	0.2378	NP Inter(Cohens/xform)
Lithium (mg/L)	0.1502	28	0.09953	0.02253	0	None	No	0.05	Inter
Mercury (mg/L)	0.000058	28	n/a	n/a	57.14	n/a	n/a	0.2378	NP Inter(normality)
Molybdenum (mg/L)	0.00702	28	n/a	n/a	50	n/a	n/a	0.2378	NP Inter(normality)
Selenium (mg/L)	0.005	28	n/a	n/a	71.43	n/a	n/a	0.2378	NP Inter(normality)
Thallium (mg/L)	0.002	28	n/a	n/a	85.71	n/a	n/a	0.2378	NP Inter(NDs)

# Confidence Intervals - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 9:07 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Lithium (mg/L)	SP-10	0.3149	0.2625	0.15	Yes	10	0	No	0.01	Param.



# Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 9:07 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00685	0.00114	0.006	No	13	53.85	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.005	0.00034	0.006	No	10	40	No	0.011	NP (normality)
Antimony (mg/L)	SP-11	0.007325	0.002721	0.006	No	10	20	No	0.01	Param.
Antimony (mg/L)	SP-2	0.00871	0.0013	0.006	No	13	15.38	No	0.01	NP (Cohens/xfm)
Arsenic (mg/L)	SP-1	0.00548	0.00134	0.049	No	13	61.54	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.01153	0.002668	0.049	No	10	20	No	0.01	Param.
Arsenic (mg/L)	SP-11	0.008248	0.002412	0.049	No	10	10	No	0.01	Param.
Arsenic (mg/L)	SP-2	0.005753	0.001816	0.049	No	13	7.692	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-1	0.2314	0.1748	4.59	No	13	0	No	0.01	Param.
Barium (mg/L)	SP-10	1.535	0.2955	4.59	No	10	0	ln(x)	0.01	Param.
Barium (mg/L)	SP-11	0.3417	0.08478	4.59	No	10	0	No	0.01	Param.
Barium (mg/L)	SP-2	1.703	0.8814	4.59	No	13	0	sqrt(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.001	0.00005	0.005	No	13	30.77	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.001	0.00003	0.005	No	10	30	No	0.011	NP (normality)
Beryllium (mg/L)	SP-11	0.001	0.000029	0.005	No	10	20	No	0.011	NP (Cohens/xfm)
Beryllium (mg/L)	SP-2	0.001	0.00005	0.005	No	13	23.08	No	0.01	NP (Cohens/xfm)
Cadmium (mg/L)	SP-1	0.001	0.00011	0.005	No	13	69.23	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.001	0.00002	0.005	No	10	90	No	0.011	NP (NDs)
Cadmium (mg/L)	SP-11	0.002245	0.0002566	0.005	No	10	20	No	0.01	Param.
Cadmium (mg/L)	SP-2	0.001	0.00008	0.005	No	13	69.23	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.00183	0.00055	0.1	No	13	46.15	No	0.01	NP (Cohens/xfm)
Chromium (mg/L)	SP-10	0.00244	0.00006	0.1	No	10	20	No	0.011	NP (Cohens/xfm)
Chromium (mg/L)	SP-11	0.02229	0.0009677	0.1	No	10	10	x^(1/3)	0.01	Param.
Chromium (mg/L)	SP-2	0.00217	0.0002485	0.1	No	13	23.08	No	0.01	Param.
Cobalt (mg/L)	SP-1	0.00255	0.000676	0.046	No	13	15.38	No	0.01	NP (Cohens/xfm)
Cobalt (mg/L)	SP-10	0.004942	0.002116	0.046	No	10	10	No	0.01	Param.
Cobalt (mg/L)	SP-11	0.01184	0.003374	0.046	No	10	10	No	0.01	Param.
Cobalt (mg/L)	SP-2	0.00277	0.00055	0.046	No	13	15.38	No	0.01	NP (Cohens/xfm)
Combined Radium 226 + 228 (pCi/L)	SP-1	4.71	2.584	16.85	No	13	0	No	0.01	NP (normality)
Combined Radium 226 + 228 (pCi/L)	SP-10	5.997	0.8426	16.85	No	10	0	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	5.201	0.7041	16.85	No	10	0	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	19.54	7.986	16.85	No	10	0	No	0.01	Param.
Fluoride (mg/L)	SP-1	1.3	0.542	5	No	13	15.38	No	0.01	NP (Cohens/xfm)
Fluoride (mg/L)	SP-10	8.541	0.5886	5	No	10	30	No	0.01	Param.
Fluoride (mg/L)	SP-11	3.982	2.622	5	No	10	0	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.444	2.275	5	No	13	0	No	0.01	Param.
Lead (mg/L)	SP-1	0.005	0.00094	0.037	No	13	61.54	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.005	0.000102	0.037	No	10	80	No	0.011	NP (NDs)
Lead (mg/L)	SP-11	0.007261	0.002258	0.037	No	10	30	No	0.01	Param.
Lead (mg/L)	SP-2	0.005	0.00091	0.037	No	13	69.23	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.007009	0.004358	0.15	No	13	0	No	0.01	Param.
<b>Lithium (mg/L)</b>	<b>SP-10</b>	<b>0.3149</b>	<b>0.2625</b>	<b>0.15</b>	<b>Yes</b>	<b>10</b>	<b>0</b>	<b>No</b>	<b>0.01</b>	<b>Param.</b>
Lithium (mg/L)	SP-11	0.1246	0.05738	0.15	No	10	0	No	0.01	Param.
Lithium (mg/L)	SP-2	0.09956	0.06878	0.15	No	13	0	x^2	0.01	Param.
Mercury (mg/L)	SP-1	0.000025	0.000023	0.002	No	13	76.92	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.00002413	0.000009671	0.002	No	10	10	No	0.01	Param.
Mercury (mg/L)	SP-11	0.00003373	0.000007232	0.002	No	10	10	sqrt(x)	0.01	Param.
Mercury (mg/L)	SP-2	0.000025	0.000006	0.002	No	13	69.23	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-1	0.01696	0.009316	0.1	No	13	0	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.1314	0.008821	0.1	No	10	0	ln(x)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.05916	0.02273	0.1	No	10	0	No	0.01	Param.
Molybdenum (mg/L)	SP-2	0.03483	0.02266	0.1	No	13	0	No	0.01	Param.
Selenium (mg/L)	SP-1	0.00651	0.00277	0.05	No	13	23.08	No	0.01	NP (Cohens/xfm)
Selenium (mg/L)	SP-10	0.006779	0.001766	0.05	No	10	20	No	0.01	Param.
Selenium (mg/L)	SP-11	0.006069	0.001847	0.05	No	10	10	No	0.01	Param.

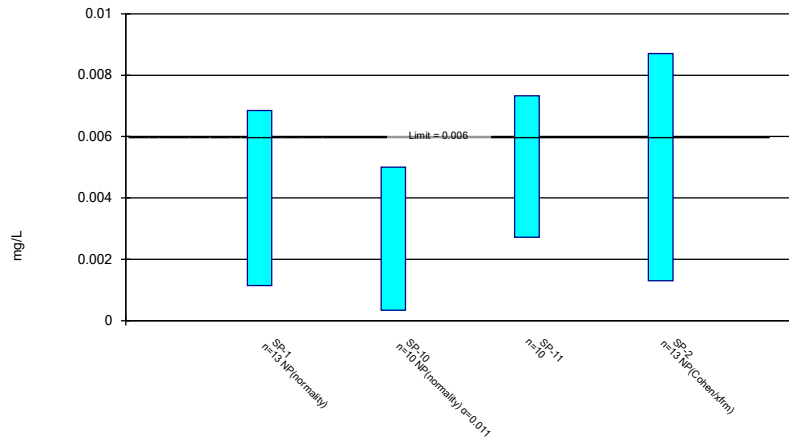
# Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/2/2018, 9:07 AM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Compliance</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Selenium (mg/L)	SP-2	0.02336	0.00216	0.05	No	13	15.38	No	0.01	NP (Cohens/xfm)
Thallium (mg/L)	SP-1	0.002	0.00089	0.002	No	13	76.92	No	0.01	NP (NDs)
Thallium (mg/L)	SP-10	0.002	0.00004	0.002	No	10	90	No	0.011	NP (NDs)
Thallium (mg/L)	SP-11	0.002	0.00003	0.002	No	10	90	No	0.011	NP (NDs)
Thallium (mg/L)	SP-2	0.002	0.00006	0.002	No	13	92.31	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

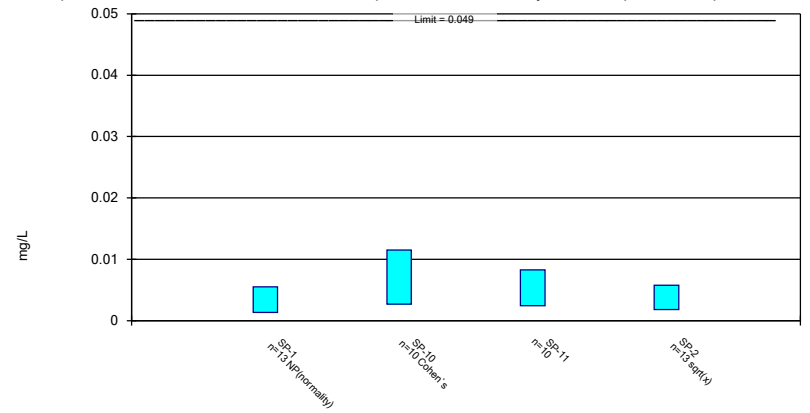
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

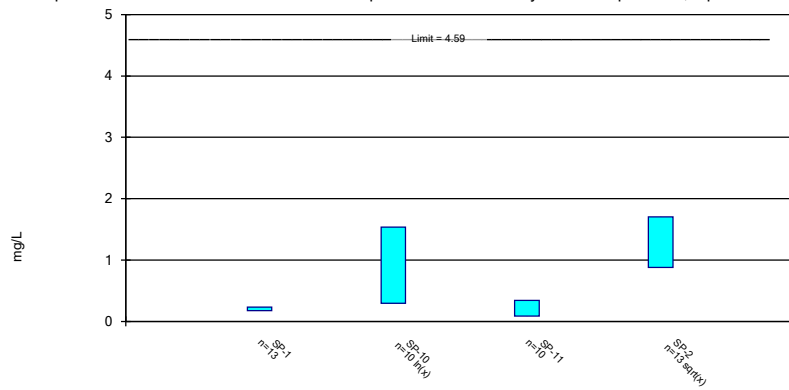
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

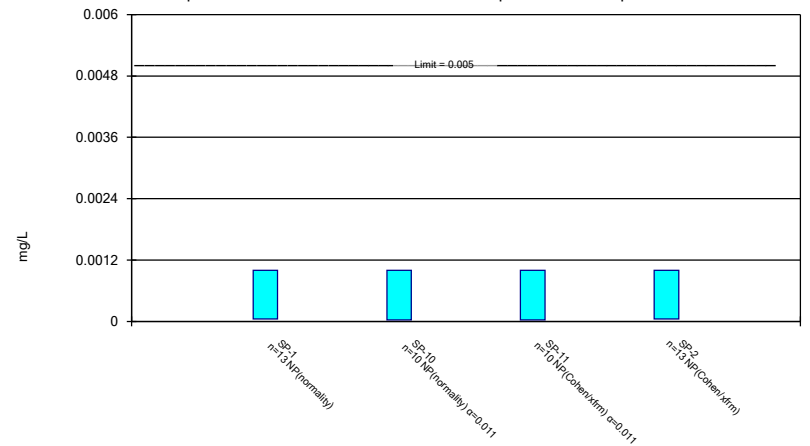
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

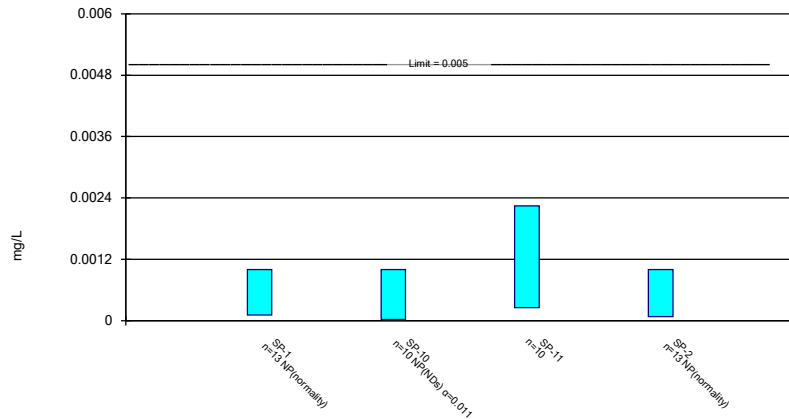
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted.



Constituent: Beryllium Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

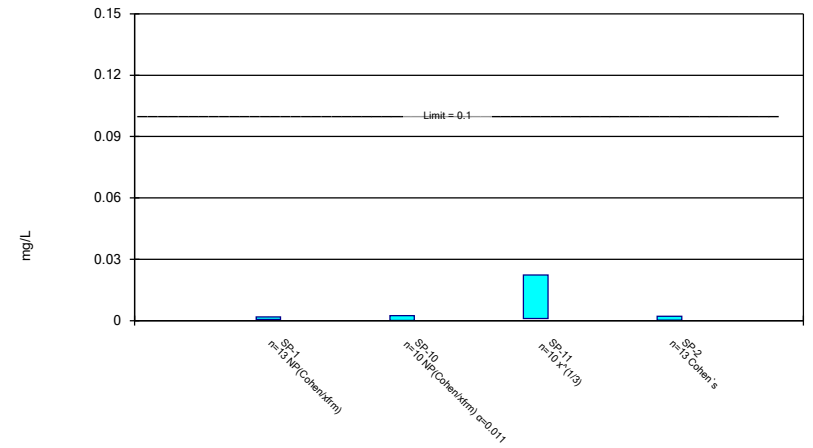
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

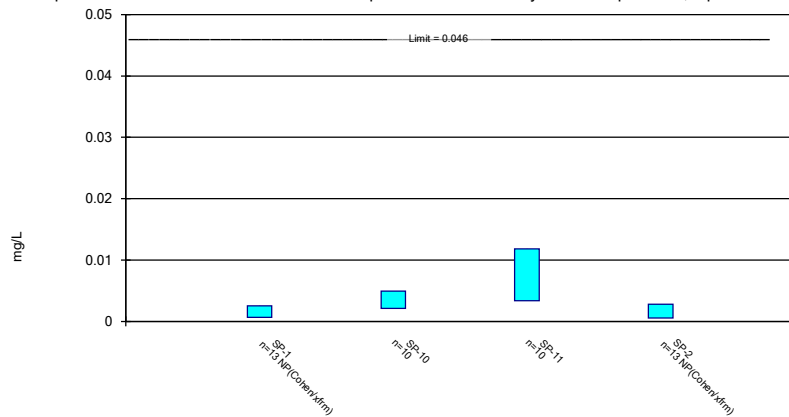
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

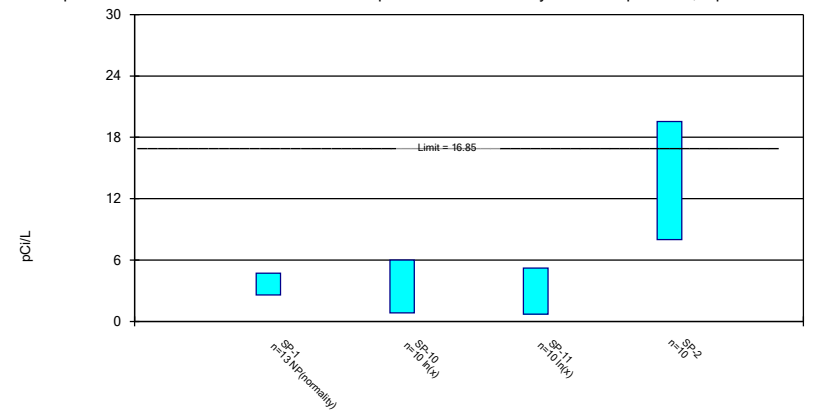
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

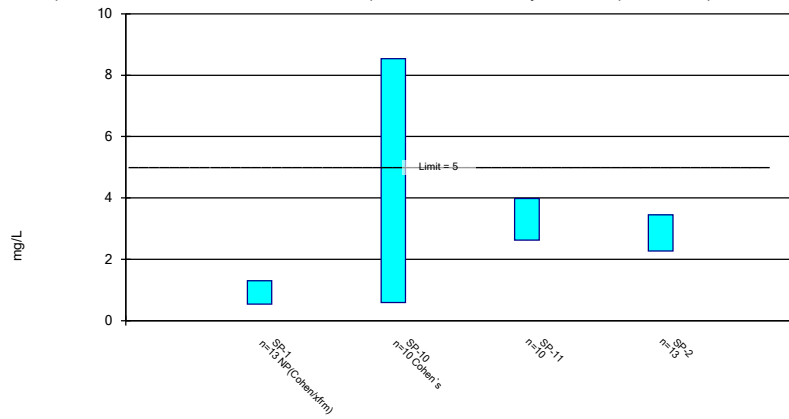
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals -  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

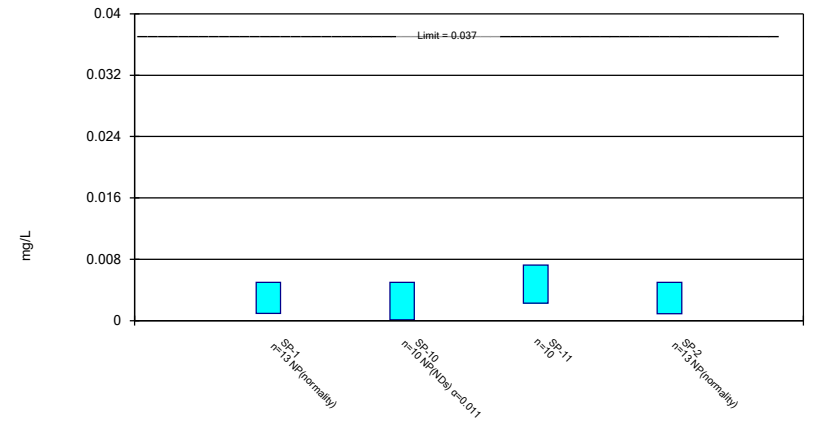
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

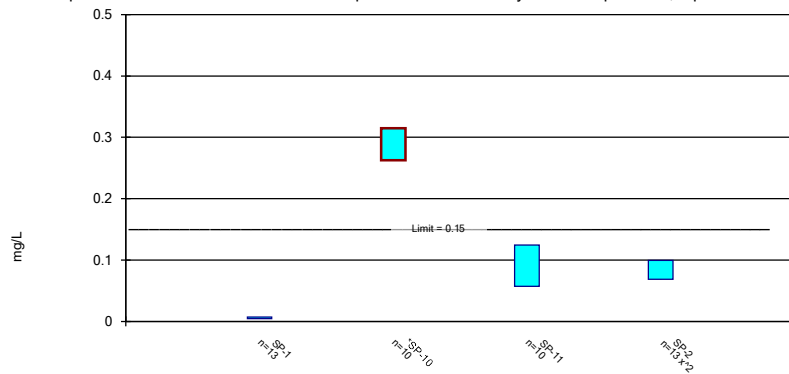
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lead Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

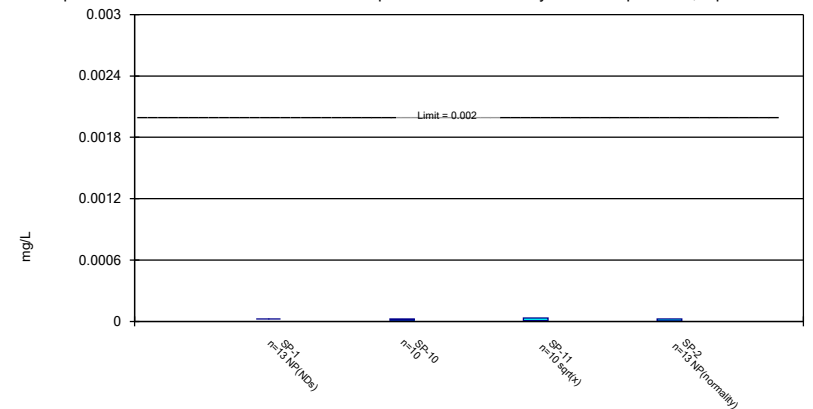
Compliance limit is exceeded.\* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

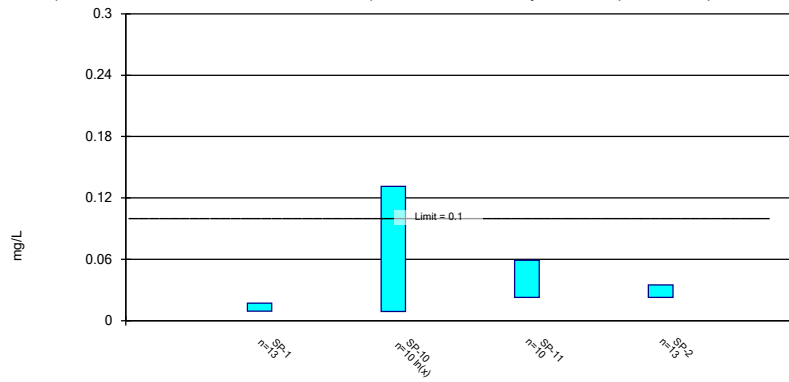
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Mercury Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

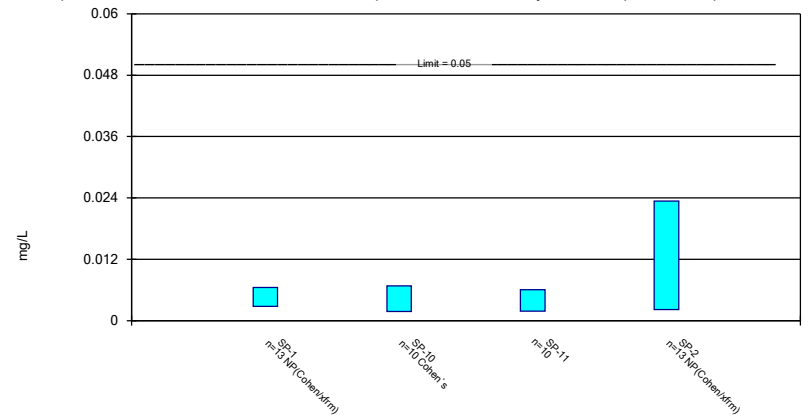
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

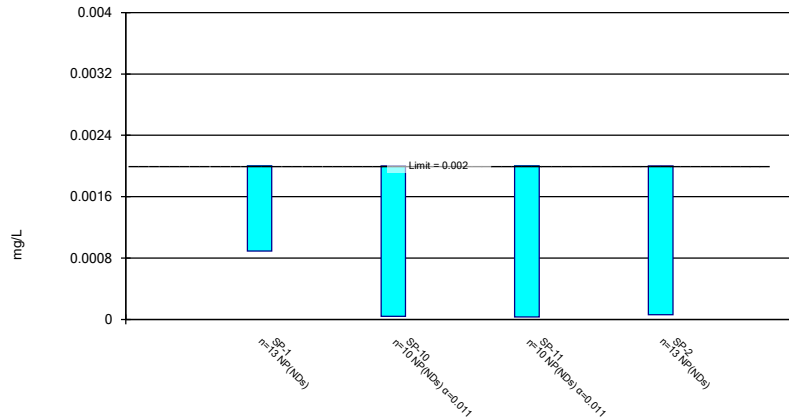
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Non-Parametric Confidence Interval

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



Constituent: Thallium Analysis Run 12/2/2018 9:02 AM View: Confidence Intervals - App 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*



engineers | scientists | innovators

941 Chatham Lane  
Suite 103  
Columbus, Ohio 43221

July 12, 2019

CHA8473

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## LIST OF ATTACHMENTS

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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
LRB	Laboratory Reagent Blanks
LPL	Lower Prediction Limit
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Level
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
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 Plant located in Northeastern Power Station located in Oologah, Oklahoma.

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. pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. An alternative source was not identified at the time, so two assessment monitoring events were conducted at the BAP in 2018, in accordance with OAC 252:517-9-6. A semi-annual assessment monitoring event was also completed in February 2019, with the results of the February 2019 event documented in this report.

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. Groundwater protection standards (GWPSs) were re-established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. An SSL was identified for lithium. Thus, either the unit will move to an assessment of corrective measures or an alternative source demonstration (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.

## 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(b) and 252:517-9-6(d)(1). Samples from the February 2019 semi-annual sampling event were analyzed for the Appendix III and Appendix IV 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.9.6.14 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 January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained to meet the requirements of OAC 252:517-9-6(b) and 252:517-9-6(d)(1) were screened for potential outliers. No outliers were identified.

##### 2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with OAC 252:517-9-6(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or regional screening level (RSL) for each Appendix IV 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. Generally, tolerance limits were calculated parametrically with 95% coverage and 95% confidence. Non-parametric tolerance limits were calculated for antimony, barium, cadmium,

cobalt, lead, mercury, molybdenum, and selenium due to apparent non-normal distributions, for thallium due to a high non-detect frequency, and for beryllium and cobalt due to both apparent non-normal distributions and high non-detect frequencies. Tolerance limits and the final GWPSs are summarized in Table 2.

### **2.2.2 Evaluation of Potential Appendix IV SSLs**

A confidence interval was constructed for each Appendix IV 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 SSL was identified at the Northeastern BAP:

- An LCL for lithium exceeded the GWPS of 0.15 mg/L at SP-10 (0.275 mg/L).

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

### **2.2.3 Evaluation of Potential Appendix III SSIs**

While SSLs were identified, a review of the Appendix III results were also completed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations. Prediction limits were calculated for the Appendix III parameters to represent background values. As described in the January 2018 *Statistical Analysis Summary* report (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.

Prediction limits for the interwell tests were recalculated using data collected during the February 2019 assessment monitoring event. Four data points (i.e., one sample from four background wells) were added to the background dataset for each interwell test. New data were tested for outliers prior to being added to the background dataset. The updated prediction limits were calculated for a one-of-two retesting procedure, as during detection monitoring. The values of the updated prediction limits were similar to the values of the prediction limits calculated during detection monitoring. The revised interwell prediction limits were used to evaluate potential SSIs for boron, calcium, chloride, fluoride, sulfate, and pH.

For the intrawell tests, limited data made it possible to add only one data point (i.e., one sample from each compliance well) to each background dataset. Because one sample result is insufficient to compare against the existing background dataset, the prediction limits were not updated for the

intrawell tests at this time. The intrawell prediction limits calculated during detection monitoring were used to evaluate potential SSIs for calcium.

Data collected during March 2019 assessment monitoring event from each compliance well were compared to the 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 upper prediction limits (UPLs) were noted:

- Boron concentrations exceeded the interwell UPL of 0.493 mg/L at SP-10 (1.16 mg/L).
- Chloride concentrations exceeded the interwell UPL of 775 mg/L at SP-10 (1740 mg/L).
- Fluoride concentrations exceeded the interwell UPL of 4.39 mg/L at SP-10 (5.59 mg/L).
- Sulfate concentrations exceeded the interwell UPL of 90 mg/L at SP-11 (95.1 mg/L).
- TDS concentrations exceeded the interwell UPL of 1577 mg/L at SP-10 (3504 mg/L).

While the prediction limits were calculated assuming a 1-of-2 testing procedure, it was conservatively assumed that an SSI was identified if the initial sample exceeded either the UPL based on previous results. Based on these results, concentrations of Appendix III parameters 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 accordance with the OAC 252:517-9. 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 February 2019 data. GWPSs were re-established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. An SSLs was identified for lithium. Appendix III parameters were also evaluated, 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**

American Electric Power (AEP). 2017. Statistical Analysis Plan – Northeastern Plant. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Stations 3 and 4 Bottom Ash Pond, Northeastern Power Station, Oologah, Oklahoma. January 15, 2018.

Geosyntec. 2019. Alternative Source Demonstration Report – State CCR Rule. Northeastern Power Station Bottom Ash Pond. April.

# TABLES

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

Parameter	Unit	SP-1	SP-2	SP-4	SP-5	SP-10	SP-11
		2/27/2019	2/27/2019	2/27/2019	2/27/2019	2/27/2019	2/27/2019
Antimony	µg/L	0.600 J	1.39	0.300 J	1.00 U	2.00 J	1.00 U
Arsenic	µg/L	0.700 J	1.29	1.00 J	25.7	3.48	8.83
Barium	µg/L	168	841	276	2130	5810	529
Beryllium	µg/L	1.00 U	1.00 U	1.00 U	1.00 U	2.00 U	1.00 U
Boron	mg/L	0.200	0.116	0.370	0.233	1.16	0.375
Cadmium	µg/L	0.500 U	0.500 U	0.500 U	0.500 U	1.00 U	0.500 U
Calcium	mg/L	122	94.0	85.6	72.8	92.6	49.6
Chloride	mg/L	42.7	351	470	739	1740	241
Chromium	µg/L	2.72	4.30	5.71	2.00 J	1.00 J	0.700 J
Cobalt	µg/L	0.500 U	0.500 U	0.500 U	0.300 J	1.00 U	0.720
Combined Radium	pCi/L	3.06	5.76	3.14	6.70	15.4	1.81
Fluoride	mg/L	0.800	2.68	3.26	3.08	5.59	3.44
Lead	µg/L	0.200 J	0.300 J	1.00 U	0.700 J	2.00 U	0.200 J
Lithium	mg/L	0.00641	0.0329	0.0602	0.102	0.275	0.0580
Mercury	mg/L	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U
Molybdenum	µg/L	10.0 J	25.8	20.0 U	20.0 U	40.0 U	6.00 J
Selenium	µg/L	2.80	3.70	0.600 J	2.00 U	4.00 U	2.00 U
Total Dissolved Solids	mg/L	532	932	1120	1530	3500	1170
Sulfate	mg/L	87.1	26.1	61.5	1.60	6.90	95.1
Thallium	µg/L	5.00 U	5.00 U	5.00 U	5.00 U	10.0 U	5.00 U
pH	SU	7.34	7.62	7.37	7.70	7.79	7.74

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 sampled



**Table 2: Groundwater Protection Standards  
Northeastern Plant - Bottom Ash Pond**

Constituent Name	MCL	RSL	Background Limit
Antimony, Total (mg/L)	0.006		0.0051
Arsenic, Total (mg/L)	0.01		0.049
Barium, Total (mg/L)	2		4.59
Beryllium, Total (mg/L)	0.004		0.005
Cadmium, Total (mg/L)	0.005		0.0025
Chromium, Total (mg/L)	0.1		0.084
Cobalt, Total (mg/L)	n/a	0.006	0.041
Combined Radium, Total (pCi/L)	5		16.53
Fluoride, Total (mg/L)	4		4.56
Lead, Total (mg/L)	n/a	0.015	0.037
Lithium, Total (mg/L)	n/a	0.04	0.15
Mercury, Total (mg/L)	0.002		0.000058
Molybdenum, Total (mg/L)	n/a	0.1	0.020
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.005

Notes:

Grey cell indicates calculated UTL is higher than MCL.

MCL = Maximum Contaminant Level

RSL = Regional Screening Level

Calculated UTL (Upper Tolerance Limit) represents site-specific background values.

The higher of the calculated UTL or MCL/RSL is used as the GWPS.

**Table 3: Appendix III Data Summary  
Northeastern Plant - Bottom Ash Pond**

Parameter	Units	Description	SP-1	SP-10	SP-11	SP-2
			2/27/2019	2/27/2019	2/27/2019	2/27/2019
Boron	mg/L	Interwell Background Value (UPL)	0.493			
		Detection Monitoring Result	0.2	<b>1.16</b>	0.375	0.116
Calcium	mg/L	Intrawell Background Value (UPL)	136	109	1894	157
		Detection Monitoring Result	122	92.6	49.6	94
Chloride	mg/L	Interwell Background Value (UPL)	775			
		Detection Monitoring Result	42.7	<b>1740</b>	241	351
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Detection Monitoring Result	0.8	<b>5.59</b>	3.44	2.68
pH	SU	Interwell Background Value (UPL)	8.5			
		Interwell Background Value (LPL)	7.1			
		Detection Monitoring Result	7.3	7.8	7.7	7.6
Sulfate	mg/L	Interwell Background Value (UPL)	90			
		Detection Monitoring Result	87.1	6.9	<b>95.1</b>	26.1
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1577			
		Detection Monitoring Result	532	<b>3504</b>	1168	932

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

\*: Designates results for a duplicate sample

-: Not Sampled

**Background 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

License Number

OKLAHOMA

Licensing State

07.12.19

Date

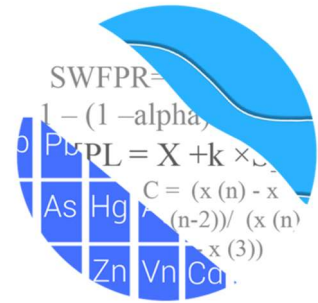


**ATTACHMENT B**  
**Statistical Analysis Output**

## GROUNDWATER STATS CONSULTING

July 10, 2019

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



Re: Northeastern BAP  
Assessment Monitoring Event – February 2019

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis of the February 2019 data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

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

- **Upgradient wells:** SP-4 and SP-5; and
- **Downgradient wells:** SP-1, SP-2, 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 CCR program consists of the following constituents:

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

Time series plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figure A). Values previously flagged during the screening as outliers may be seen in a lighter font and disconnected symbol on the time series graphs, and a summary of those values follows this letter (Figure B).

### **Evaluation of Appendix III Parameters**

Interwell prediction limits combined with a 1-of-2 verification strategy were constructed for boron, chloride, fluoride, pH, sulfate and TDS; and intrawell prediction limits combined with a 1-of-2 verification strategy were constructed for calcium (Figures C and D, respectively). The statistical method selected for each parameter was determined based on the results of the evaluation performed in December 2017; and all proposed background data were screened for outliers and trends at that time. 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. All values flagged as outliers may be seen on the Outlier Summary report following this letter. No obvious trending patterns were observed in the upgradient wells.

Intrawell prediction limits utilize the background data set that was originally screened in 2017. As recommended in the EPA Unified Guidance (2009), the background data set will be tested for the purpose of updating statistical limits using the Mann-Whitney two-sample test when an additional four to eight measurements are available.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one additional sample to determine whether the initial exceedance is confirmed. When the resample confirms the initial exceedance, a statistically significant increase (SSI) is identified and further research would be required to identify the cause of the exceedance (i.e. impact from the site, natural variation, or an off-site source). If the resample falls within the statistical limit, the initial exceedance is considered a false positive result and, therefore, no further action is necessary.

Calcium was found to have no exceedances of its intrawell prediction limits. Downgradient water quality will continue to be monitored for similar patterns which may occur at downgradient wells as future samples are collected.

Boron, chloride, fluoride and TDS were found to exceed their respective interwell prediction limits for well SP-10; however, concentration levels are stable over time for these constituents at this well. Sulfate also was found to exceed its interwell prediction limit for well SP-11. As mentioned above, further research would be required to determine whether the concentrations at this well relative to those reported upgradient are due to natural variation. That study is beyond the scope of this analysis. The Prediction Limit Summary tables following this letter.

When a statistically significant increase is identified, the data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing or stable. Upgradient wells are included in the trend analyses to identify whether similar patterns exist upgradient of the site which is an indication of natural variability in groundwater unrelated to practices at the site.

No statistically significant increasing trends were noted in the downgradient wells. Statistically significant decreasing trends were identified for sulfate in upgradient well SP-5 and in downgradient well SP-11. A statistically significant increasing trend was noted for chloride in upgradient well SP-5. When trends are noted in upgradient wells, it is generally an indication of naturally changing groundwater concentrations unrelated to the facility. A Trend Test summary table follows this letter (Figure E).

### **Evaluation of Appendix IV Parameters**

Interwell Tolerance limits were used to calculate background limits from all available pooled upgradient well data for Appendix IV parameters to determine the Alternate Contaminant Level (ACL) for each constituent (Figure F). Background data are screened for outliers and extreme trending patterns that would lead to artificially elevated statistical limits. Any flagged values may be seen on the Outlier Summary following this letter.

Parametric limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels 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).

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters using the highest limit of either the MCL, CCR-rule specified level, or ACL as discussed above. Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence



intervals exceedances were found except for lithium in well SP-10. A summary of the confidence interval results follows this letter (Figure H).

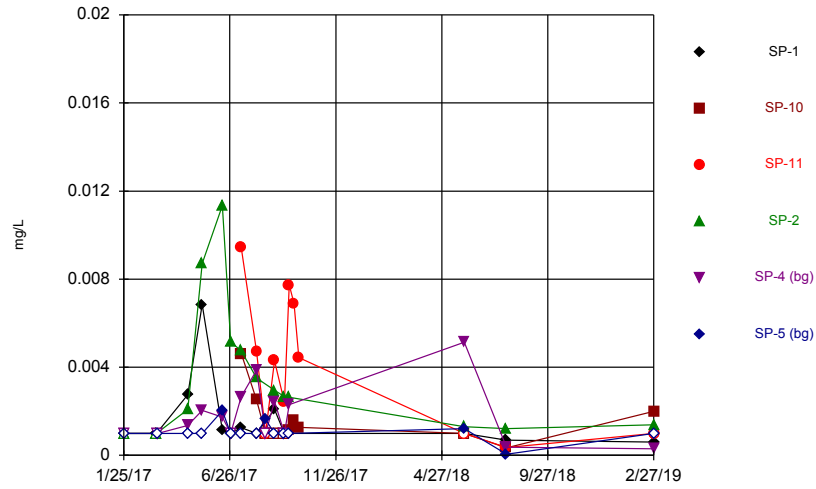
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

A handwritten signature in cursive script that reads "Kristina Rayner". The signature is written in black ink and is positioned below the typed name.

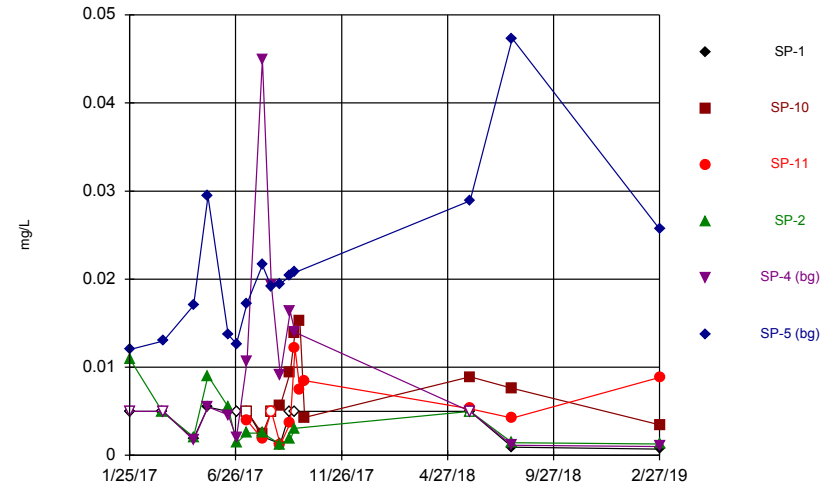
Kristina L. Rayner  
Groundwater Statistician

Time Series



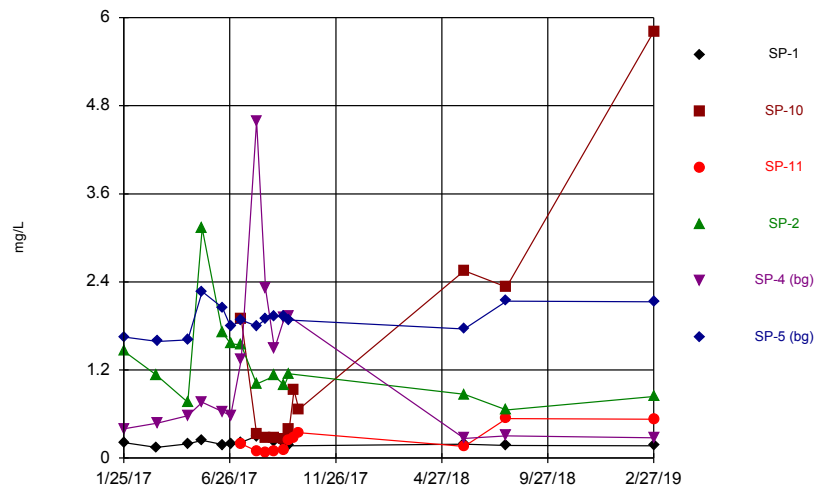
Constituent: Antimony Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



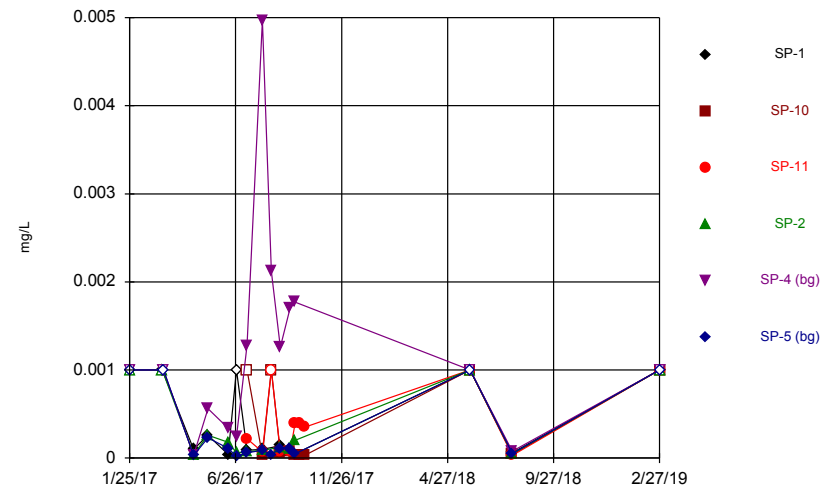
Constituent: Arsenic Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



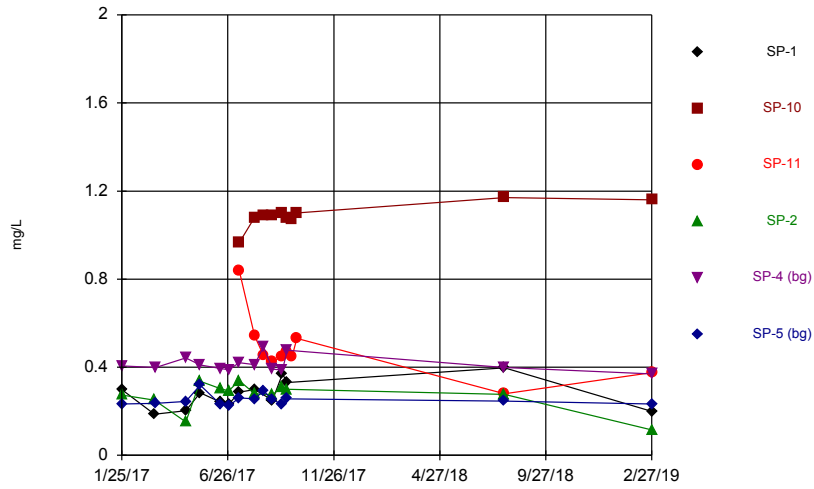
Constituent: Barium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



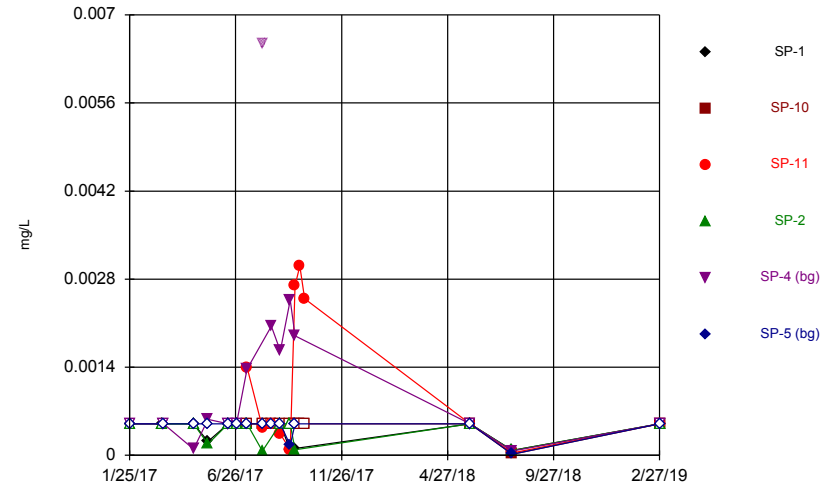
Constituent: Beryllium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



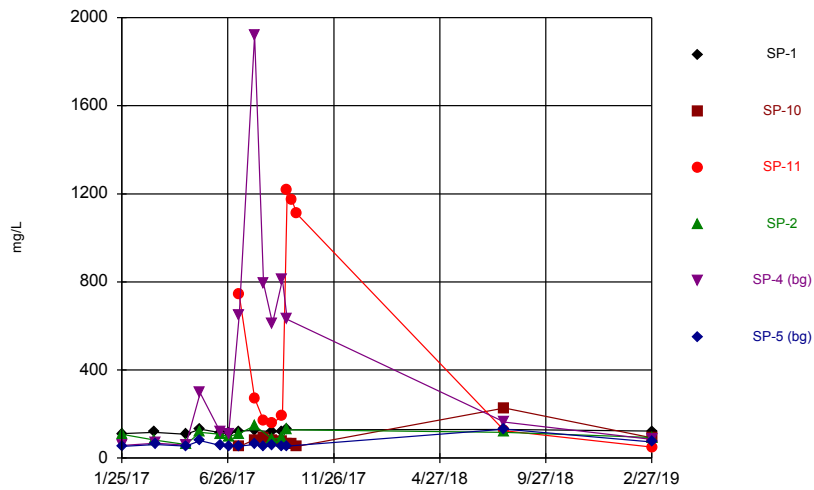
Constituent: Boron Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



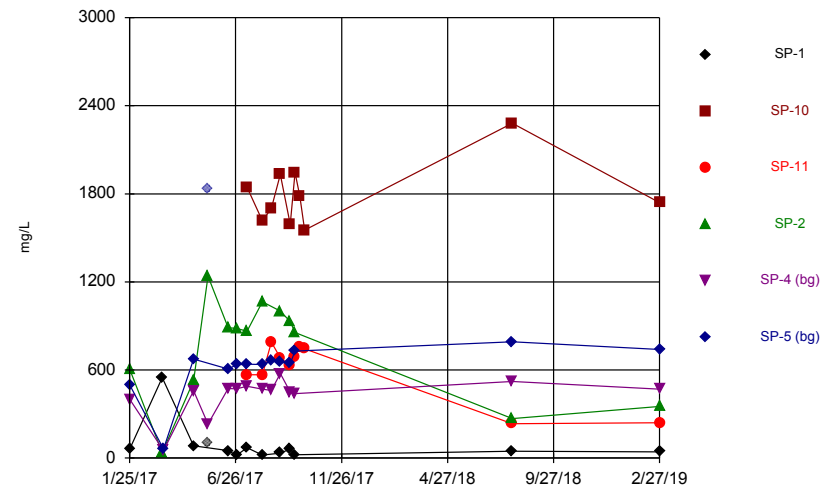
Constituent: Cadmium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



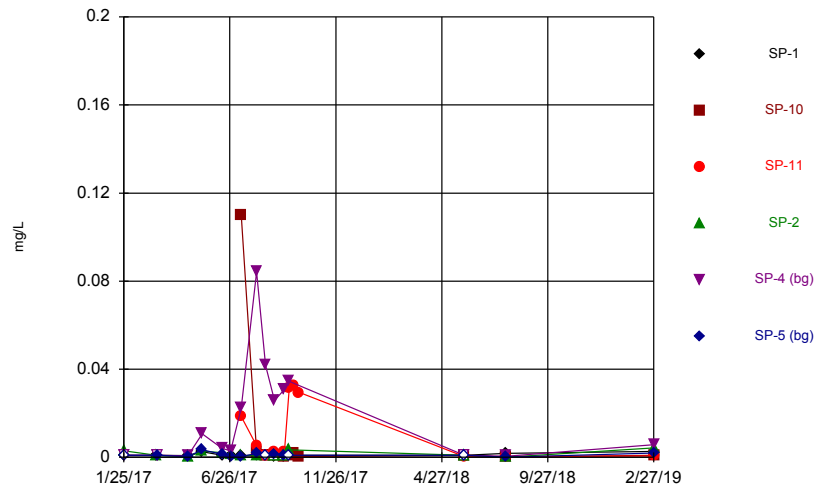
Constituent: Calcium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



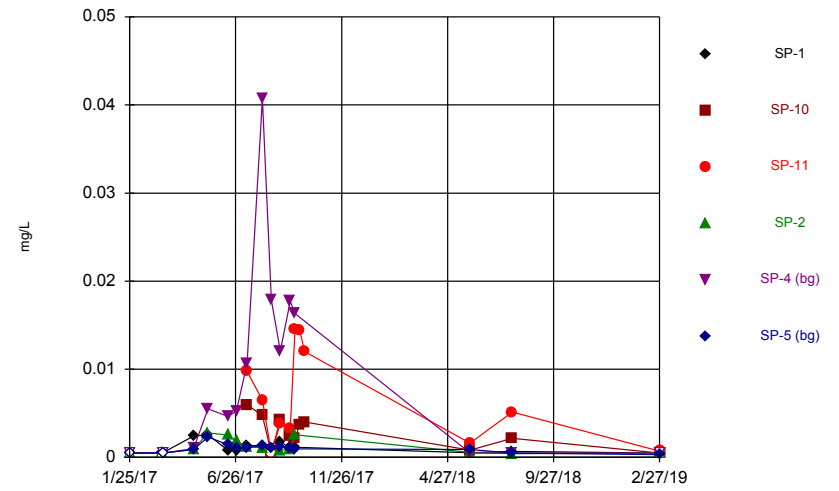
Constituent: Chloride Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



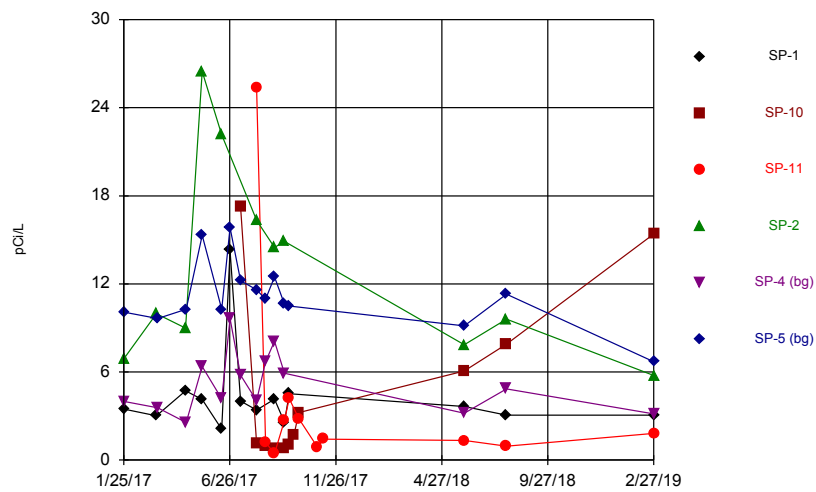
Constituent: Chromium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



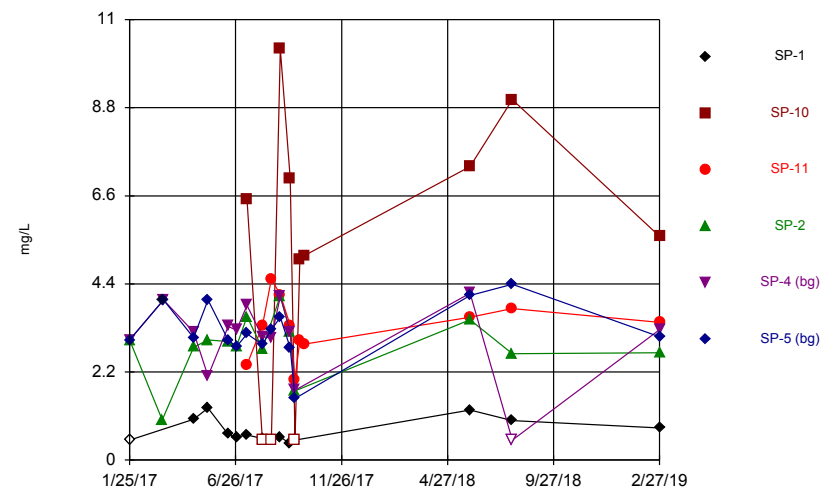
Constituent: Cobalt Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



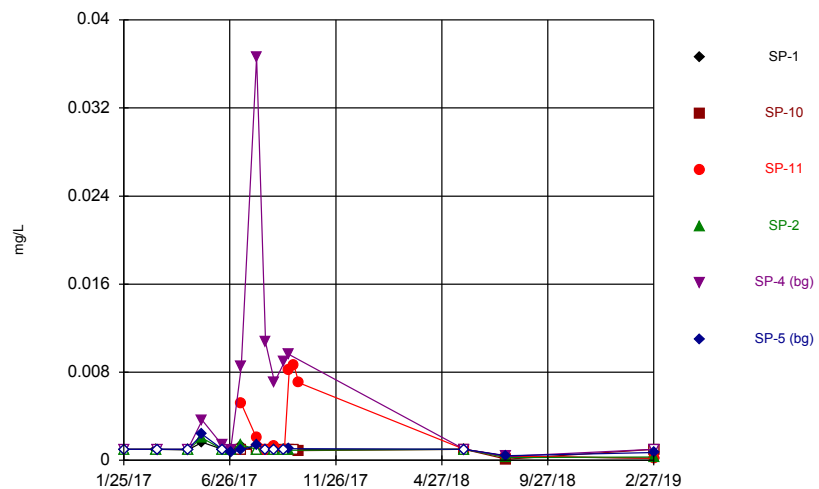
Constituent: Combined Radium 226 + 228 Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



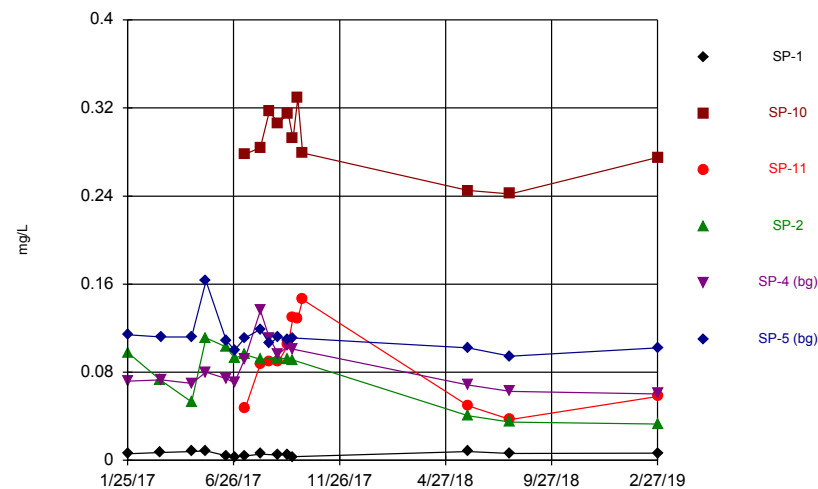
Constituent: Fluoride Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



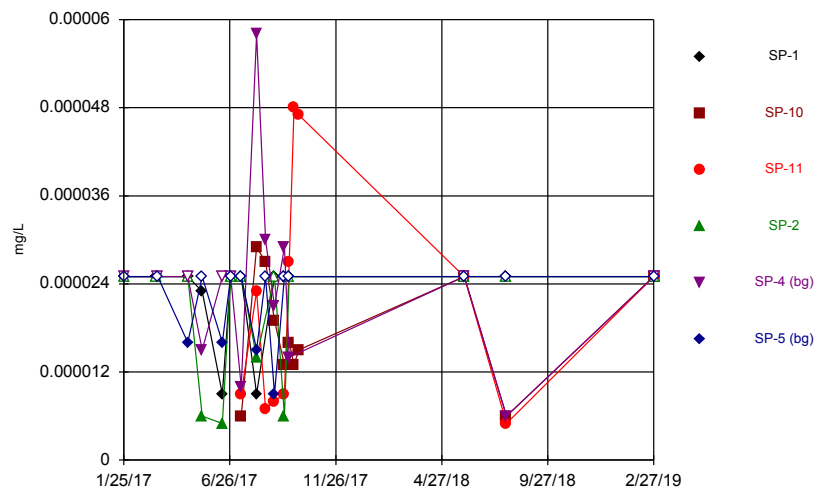
Constituent: Lead Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



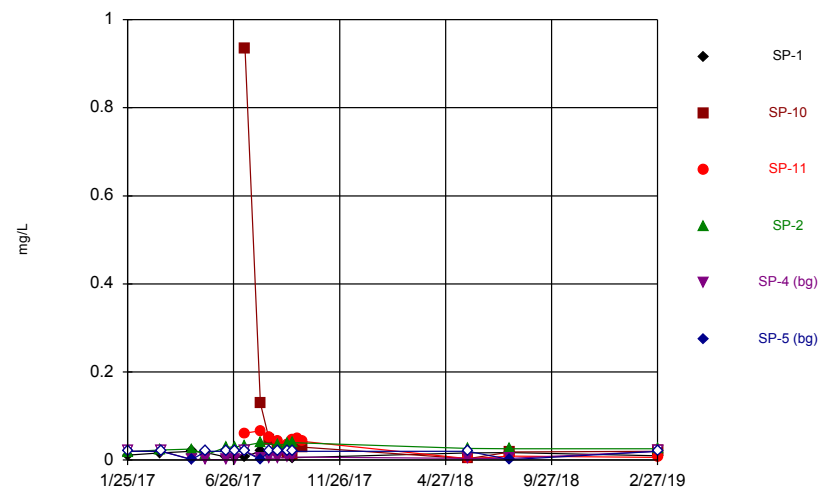
Constituent: Lithium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



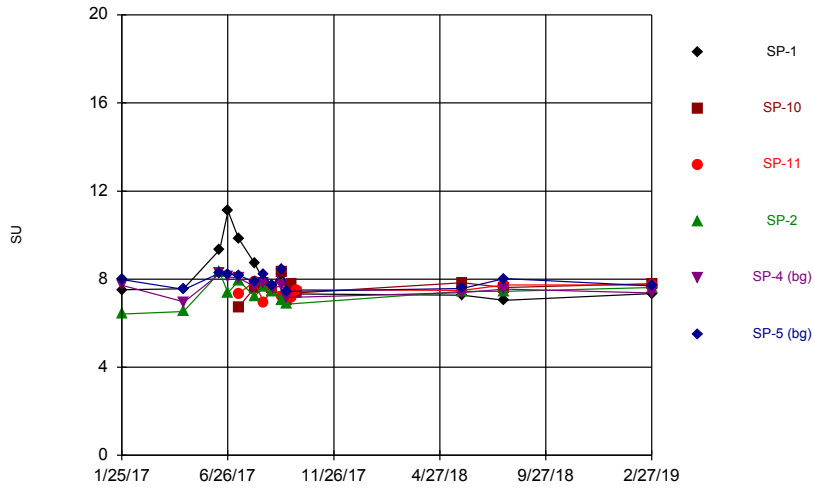
Constituent: Mercury Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



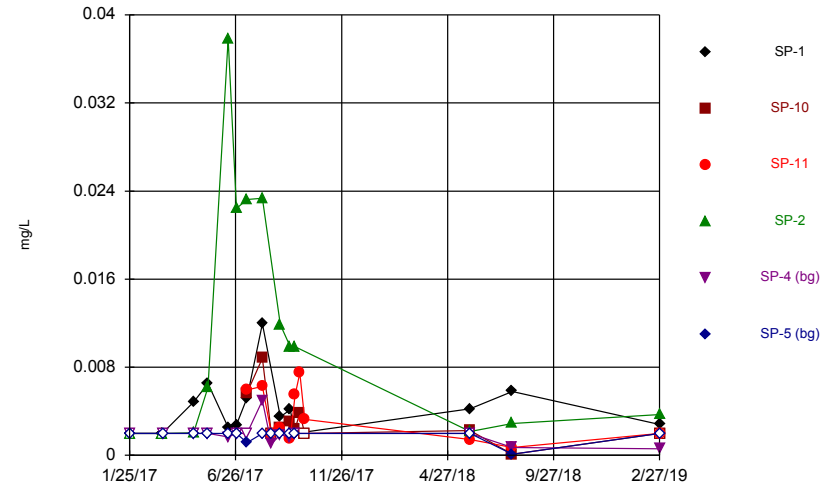
Constituent: Molybdenum Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



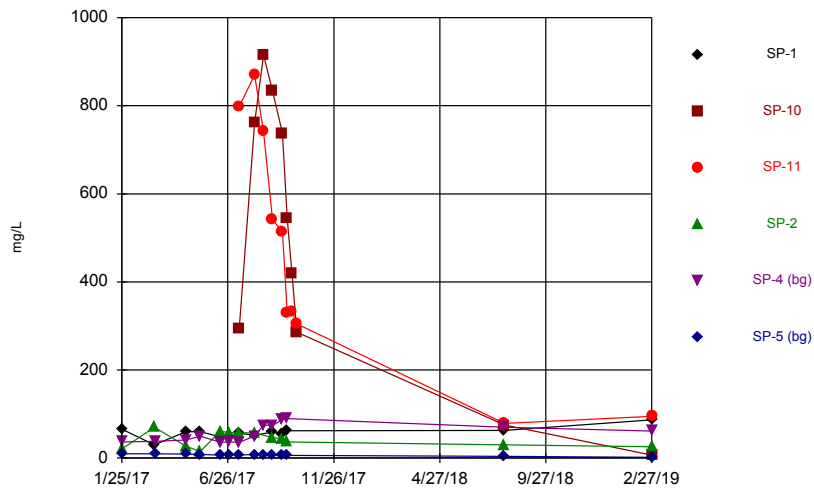
Constituent: pH, field Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



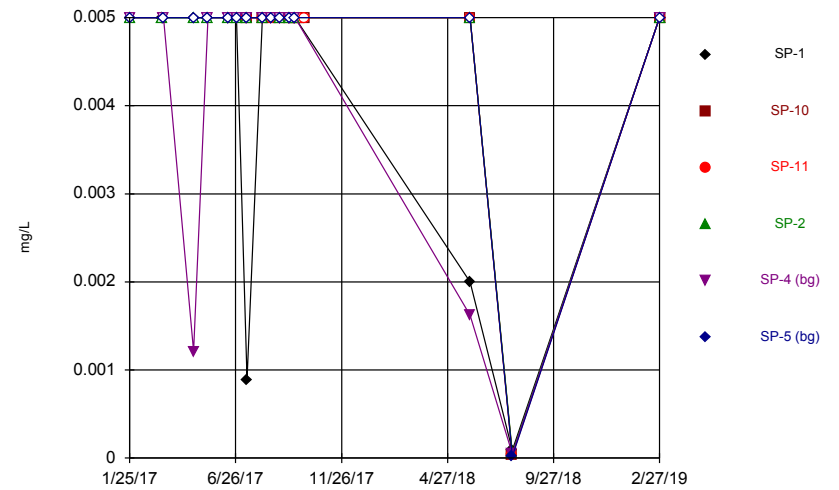
Constituent: Selenium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



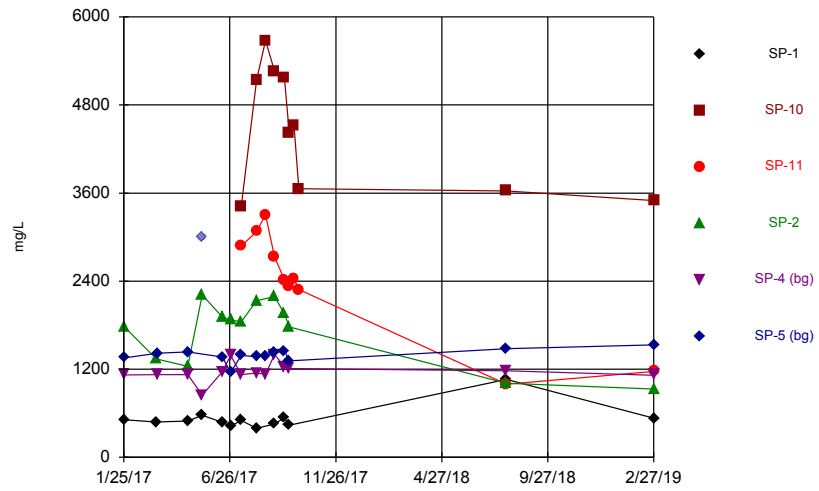
Constituent: Sulfate Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



Constituent: Thallium Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 6/26/2019 4:10 PM View: App III & IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/1/2019, 6:48 AM

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	SP-4 Cadmium (mg/L)	SP-5 Chloride (mg/L)	SP-1 Chloride (mg/L)	SP-1 Fluoride (mg/L)	SP-5 Total Dissolved Solids [TDS] (mg/L)
3/13/2017				4 (o)	
5/18/2017		1834 (o)	104 (o)		3008 (o)
8/4/2017	0.00655 (o)				



# Interwell Prediction Limit Summary Table - Significant Results

Northeastern BAP    Client: Geosyntec    Data: Northeastern BAP    Printed 6/26/2019, 4:16 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Date</u>	<u>Observ.</u>	<u>Sig.</u>	<u>Bg N</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Boron (mg/L)	SP-10	0.493	n/a	2/27/2019	1.16	Yes	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
Chloride (mg/L)	SP-10	774.8	n/a	2/27/2019	1740	Yes	27	0	None	x^2	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	SP-10	4.387	n/a	2/27/2019	5.59	Yes	30	3.333	None	x^2	0.00188	Param Inter 1 of 2
Sulfate (mg/L)	SP-11	90	n/a	2/27/2019	95.1	Yes	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	SP-10	1577	n/a	2/27/2019	3500	Yes	27	0	None	No	0.00188	Param Inter 1 of 2

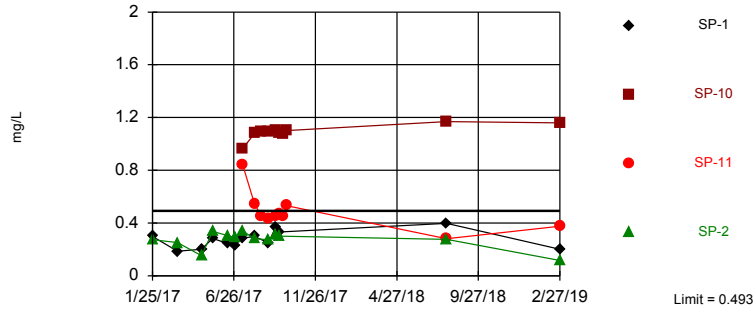
# Interwell Prediction Limit Summary Table - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:16 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	SP-1	0.493	n/a	2/27/2019	0.2	No	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
<b>Boron (mg/L)</b>	<b>SP-10</b>	<b>0.493</b>	<b>n/a</b>	<b>2/27/2019</b>	<b>1.16</b>	<b>Yes</b>	<b>28</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.002268</b>	<b>NP Inter (normality) 1 of 2</b>
Boron (mg/L)	SP-11	0.493	n/a	2/27/2019	0.375	No	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
Boron (mg/L)	SP-2	0.493	n/a	2/27/2019	0.116	No	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
Chloride (mg/L)	SP-1	774.8	n/a	2/27/2019	42.7	No	27	0	None	x^2	0.00188	Param Inter 1 of 2
<b>Chloride (mg/L)</b>	<b>SP-10</b>	<b>774.8</b>	<b>n/a</b>	<b>2/27/2019</b>	<b>1740</b>	<b>Yes</b>	<b>27</b>	<b>0</b>	<b>None</b>	<b>x^2</b>	<b>0.00188</b>	<b>Param Inter 1 of 2</b>
Chloride (mg/L)	SP-11	774.8	n/a	2/27/2019	241	No	27	0	None	x^2	0.00188	Param Inter 1 of 2
Chloride (mg/L)	SP-2	774.8	n/a	2/27/2019	351	No	27	0	None	x^2	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	SP-1	4.387	n/a	2/27/2019	0.8	No	30	3.333	None	x^2	0.00188	Param Inter 1 of 2
<b>Fluoride (mg/L)</b>	<b>SP-10</b>	<b>4.387</b>	<b>n/a</b>	<b>2/27/2019</b>	<b>5.59</b>	<b>Yes</b>	<b>30</b>	<b>3.333</b>	<b>None</b>	<b>x^2</b>	<b>0.00188</b>	<b>Param Inter 1 of 2</b>
Fluoride (mg/L)	SP-11	4.387	n/a	2/27/2019	3.44	No	30	3.333	None	x^2	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	SP-2	4.387	n/a	2/27/2019	2.68	No	30	3.333	None	x^2	0.00188	Param Inter 1 of 2
pH, field (SU)	SP-1	8.491	7.085	2/27/2019	7.34	No	26	0	None	No	0.0009398	Param Inter 1 of 2
pH, field (SU)	SP-10	8.491	7.085	2/27/2019	7.79	No	26	0	None	No	0.0009398	Param Inter 1 of 2
pH, field (SU)	SP-11	8.491	7.085	2/27/2019	7.74	No	26	0	None	No	0.0009398	Param Inter 1 of 2
pH, field (SU)	SP-2	8.491	7.085	2/27/2019	7.62	No	26	0	None	No	0.0009398	Param Inter 1 of 2
Sulfate (mg/L)	SP-1	90	n/a	2/27/2019	87.1	No	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
Sulfate (mg/L)	SP-10	90	n/a	2/27/2019	6.9	No	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
<b>Sulfate (mg/L)</b>	<b>SP-11</b>	<b>90</b>	<b>n/a</b>	<b>2/27/2019</b>	<b>95.1</b>	<b>Yes</b>	<b>28</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.002268</b>	<b>NP Inter (normality) 1 of 2</b>
Sulfate (mg/L)	SP-2	90	n/a	2/27/2019	26.1	No	28	0	n/a	n/a	0.002268	NP Inter (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	SP-1	1577	n/a	2/27/2019	532	No	27	0	None	No	0.00188	Param Inter 1 of 2
<b>Total Dissolved Solids [TDS] (mg/L)</b>	<b>SP-10</b>	<b>1577</b>	<b>n/a</b>	<b>2/27/2019</b>	<b>3500</b>	<b>Yes</b>	<b>27</b>	<b>0</b>	<b>None</b>	<b>No</b>	<b>0.00188</b>	<b>Param Inter 1 of 2</b>
Total Dissolved Solids [TDS] (mg/L)	SP-11	1577	n/a	2/27/2019	1170	No	27	0	None	No	0.00188	Param Inter 1 of 2
Total Dissolved Solids [TDS] (mg/L)	SP-2	1577	n/a	2/27/2019	932	No	27	0	None	No	0.00188	Param Inter 1 of 2

Exceeds Limit: SP-10

Prediction Limit  
Interwell Non-parametric

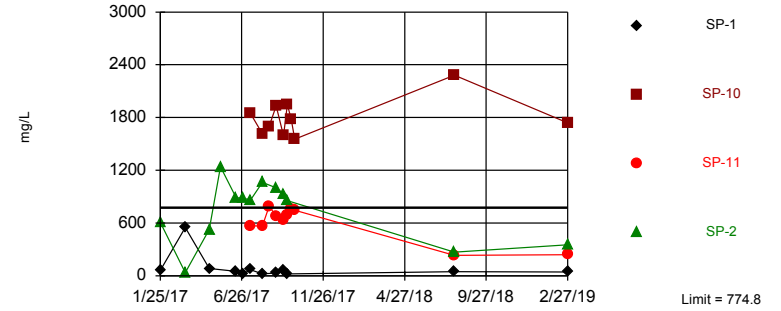


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 28 background values. Annual per-constituent alpha = 0.018. Individual comparison alpha = 0.002268 (1 of 2). Comparing 4 points to limit.

Constituent: Boron Analysis Run 6/26/2019 4:13 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit: SP-10

Prediction Limit  
Interwell Parametric

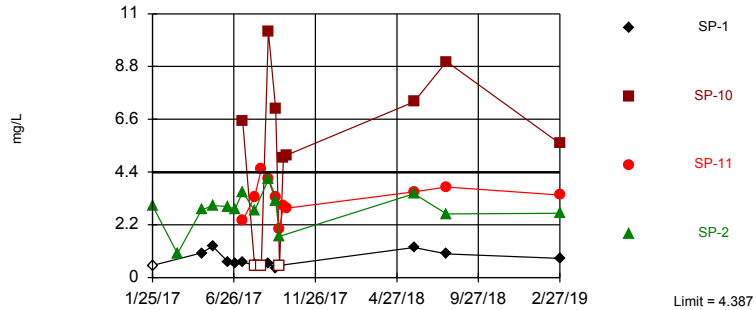


Background Data Summary (based on square transformation): Mean=298047, Std. Dev.=159041, n=27. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9577, critical = 0.894. Kappa = 1.9 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Comparing 4 points to limit.

Constituent: Chloride Analysis Run 6/26/2019 4:13 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit: SP-10

Prediction Limit  
Interwell Parametric

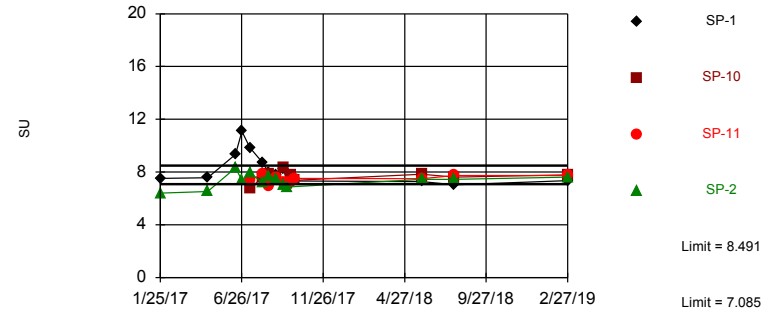


Background Data Summary (based on square transformation): Mean=10.61, Std. Dev.=4.597, n=30, 3.333% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9417, critical = 0.9. Kappa = 1.88 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Comparing 4 points to limit.

Constituent: Fluoride Analysis Run 6/26/2019 4:13 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limits

Prediction Limit  
Interwell Parametric

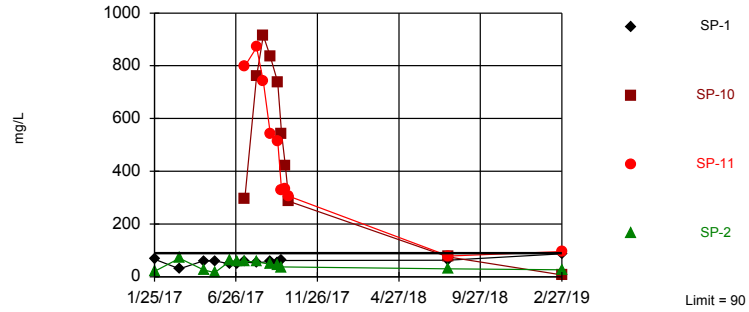


Background Data Summary: Mean=7.788, Std. Dev.=0.3685, n=26. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9734, critical = 0.891. Kappa = 1.907 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.0009398. Comparing 4 points to limit.

Constituent: pH, field Analysis Run 6/26/2019 4:13 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit: SP-11

Prediction Limit  
Interwell Non-parametric

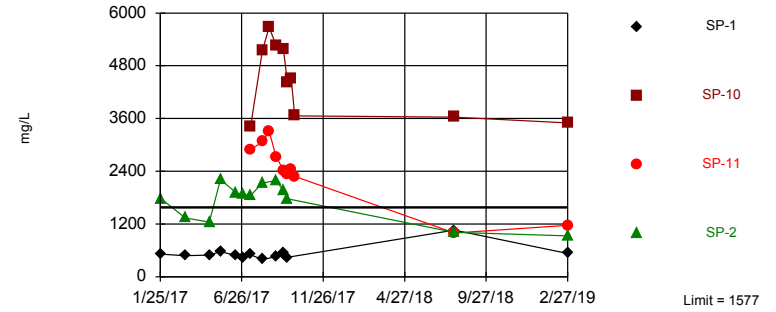


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 28 background values. Annual per-constituent alpha = 0.018. Individual comparison alpha = 0.002268 (1 of 2). Comparing 4 points to limit.

Constituent: Sulfate Analysis Run 6/26/2019 4:13 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Exceeds Limit: SP-10

Prediction Limit  
Interwell Parametric



Background Data Summary: Mean=1274, Std. Dev.=159.2, n=27. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9137, critical = 0.894. Kappa = 1.9 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Comparing 4 points to limit.

Constituent: Total Dissolved Solids [TDS] Analysis Run 6/26/2019 4:13 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

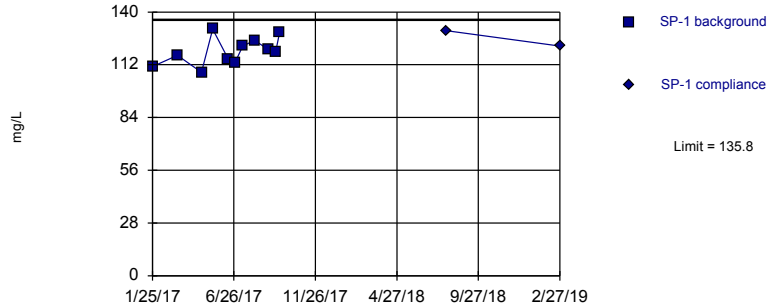
# Intrawell Prediction Limit Summary Table - All Results (No Significant)

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:32 PM

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	135.8	n/a	2/27/2019	122	No	11	119.1	7.286	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-10	108.8	n/a	2/27/2019	92.6	No	8	71.1	14.43	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-11	1894	n/a	2/27/2019	49.6	No	8	629.5	483.3	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-2	157.3	n/a	2/27/2019	94	No	11	103.8	23.28	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-4	2033	n/a	2/27/2019	85.6	No	12	19.81	11.32	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-5	79.1	n/a	2/27/2019	72.8	No	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2

Within Limit

Prediction Limit  
Intrawell Parametric

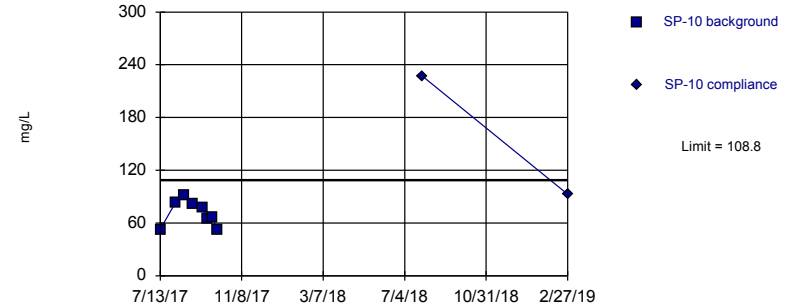


Background Data Summary: Mean=119.1, Std. Dev.=7.286, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9766, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 6/26/2019 4:27 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell Parametric

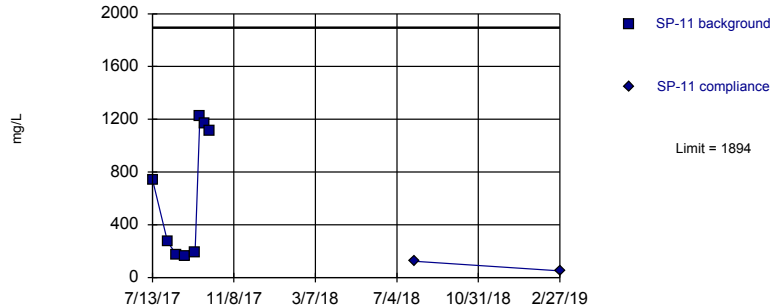


Background Data Summary: Mean=71.1, Std. Dev.=14.43, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9303, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 6/26/2019 4:27 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell Parametric

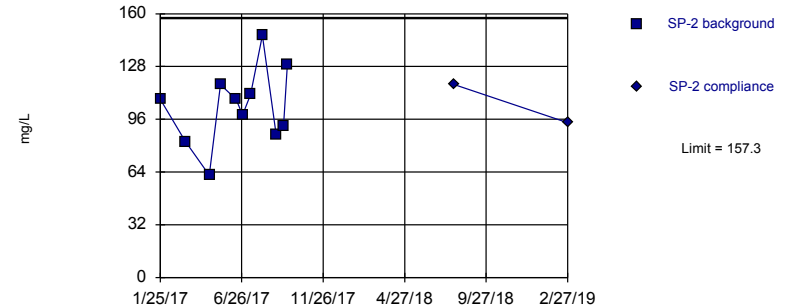


Background Data Summary: Mean=629.5, Std. Dev.=483.3, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 6/26/2019 4:27 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell Parametric

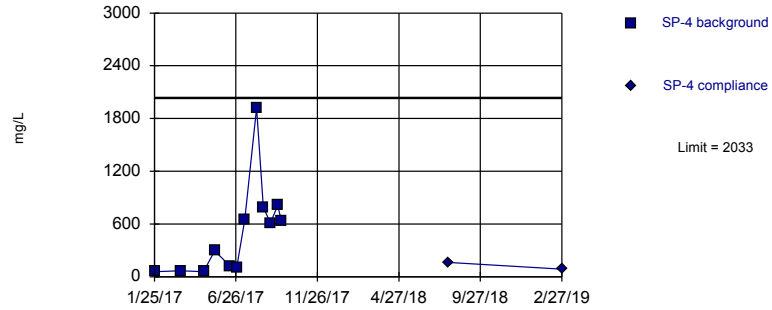


Background Data Summary: Mean=103.8, Std. Dev.=23.28, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9891, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 6/26/2019 4:27 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell Parametric

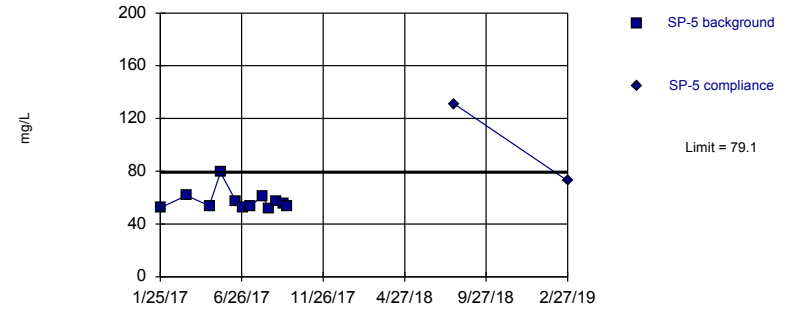


Background Data Summary (based on square root transformation): Mean=19.81, Std. Dev.=11.32, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8858, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188.

Constituent: Calcium Analysis Run 6/26/2019 4:27 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Within Limit

Prediction Limit  
Intrawell 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 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2).

Constituent: Calcium Analysis Run 6/26/2019 4:27 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Trend Tests Summary Table - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:58 PM

<u>Constituent</u>	<u>Well</u>	<u>Slope</u>	<u>Calc.</u>	<u>Critical</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Normality</u>	<u>Xform</u>	<u>Alpha</u>	<u>Method</u>
Chloride (mg/L)	SP-5 (bg)	161.6	52	43	Yes	13	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	SP-11	-1408	-39	-30	Yes	10	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	SP-5 (bg)	-4.74	-73	-48	Yes	14	0	n/a	n/a	0.01	NP

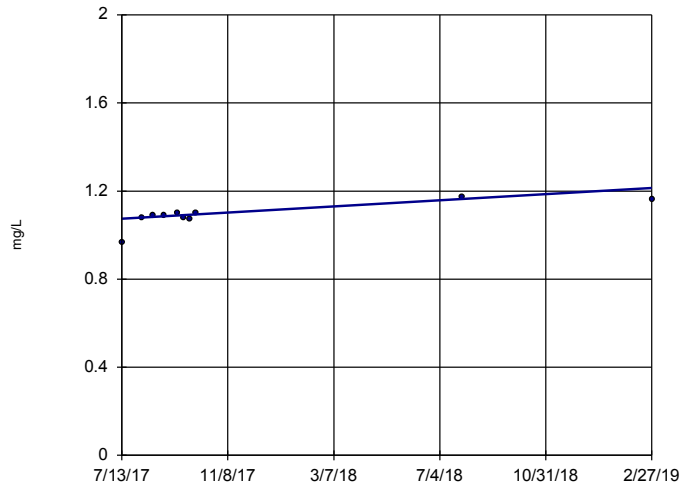


# Trend Tests Summary Table - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:58 PM

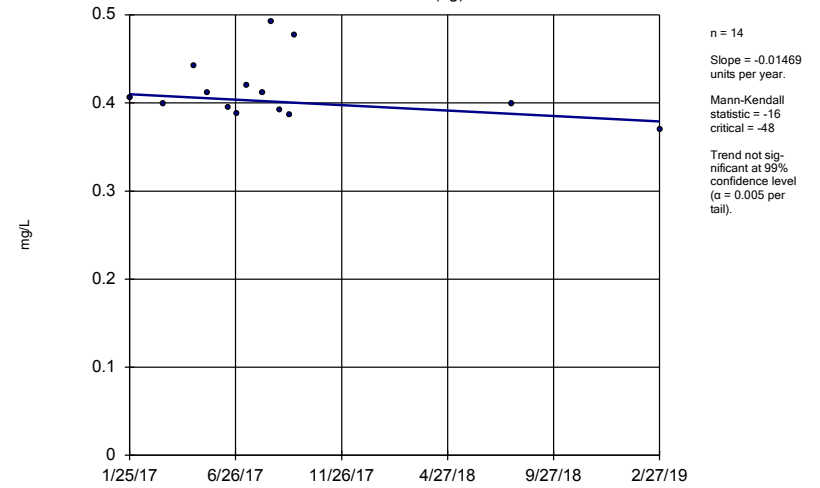
Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron (mg/L)	SP-10	0.08545	24	30	No	10	0	n/a	n/a	0.01	NP
Boron (mg/L)	SP-4 (bg)	-0.01469	-16	-48	No	14	0	n/a	n/a	0.01	NP
Boron (mg/L)	SP-5 (bg)	0.0007952	4	48	No	14	0	n/a	n/a	0.01	NP
Chloride (mg/L)	SP-10	79.13	3	30	No	10	0	n/a	n/a	0.01	NP
Chloride (mg/L)	SP-4 (bg)	59.81	27	48	No	14	0	n/a	n/a	0.01	NP
<b>Chloride (mg/L)</b>	<b>SP-5 (bg)</b>	<b>161.6</b>	<b>52</b>	<b>43</b>	<b>Yes</b>	<b>13</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.01</b>	<b>NP</b>
Fluoride (mg/L)	SP-10	2.387	14	34	No	11	27.27	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-4 (bg)	-0.04702	-3	-53	No	15	6.667	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-5 (bg)	0.03827	5	53	No	15	0	n/a	n/a	0.01	NP
<b>Sulfate (mg/L)</b>	<b>SP-11</b>	<b>-1408</b>	<b>-39</b>	<b>-30</b>	<b>Yes</b>	<b>10</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.01</b>	<b>NP</b>
Sulfate (mg/L)	SP-4 (bg)	30.85	44	48	No	14	0	n/a	n/a	0.01	NP
<b>Sulfate (mg/L)</b>	<b>SP-5 (bg)</b>	<b>-4.74</b>	<b>-73</b>	<b>-48</b>	<b>Yes</b>	<b>14</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.01</b>	<b>NP</b>
Total Dissolved Solids [TDS] (mg/L)	SP-10	-1179	-19	-30	No	10	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-4 (bg)	44.69	26	48	No	14	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-5 (bg)	67.52	30	43	No	13	0	n/a	n/a	0.01	NP

### Sen's Slope Estimator SP-10



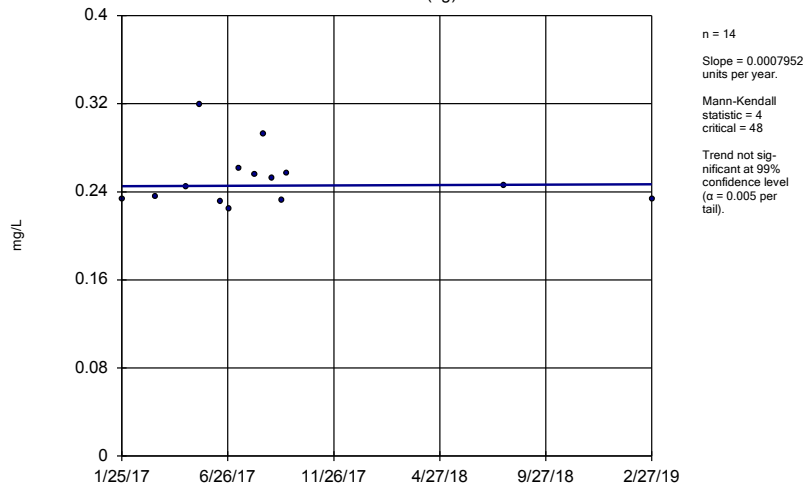
Constituent: Boron Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator SP-4 (bg)



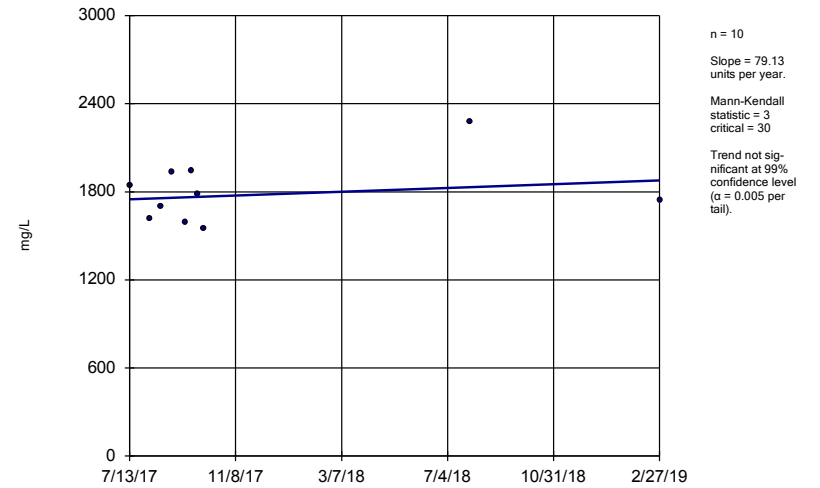
Constituent: Boron Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator SP-5 (bg)



Constituent: Boron Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

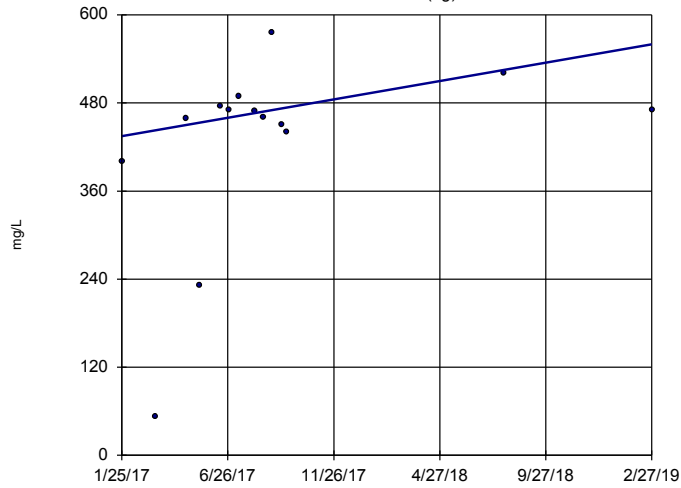
### Sen's Slope Estimator SP-10



Constituent: Chloride Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-4 (bg)

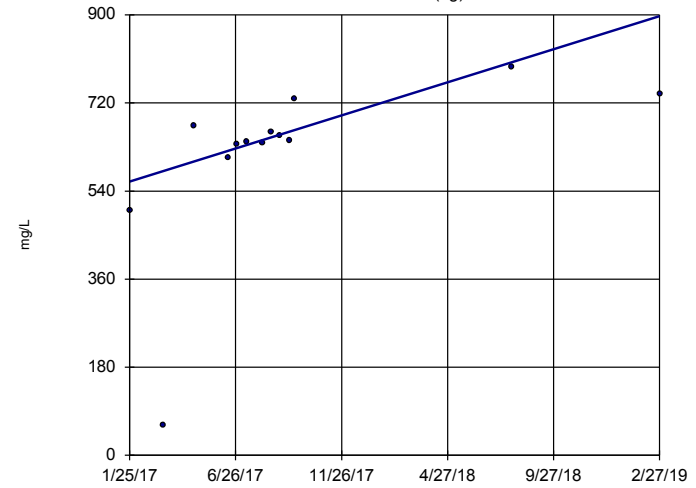


n = 14  
 Slope = 59.81 units per year.  
 Mann-Kendall statistic = 27  
 critical = 48  
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride Analysis Run 6/26/2019 4:55 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-5 (bg)

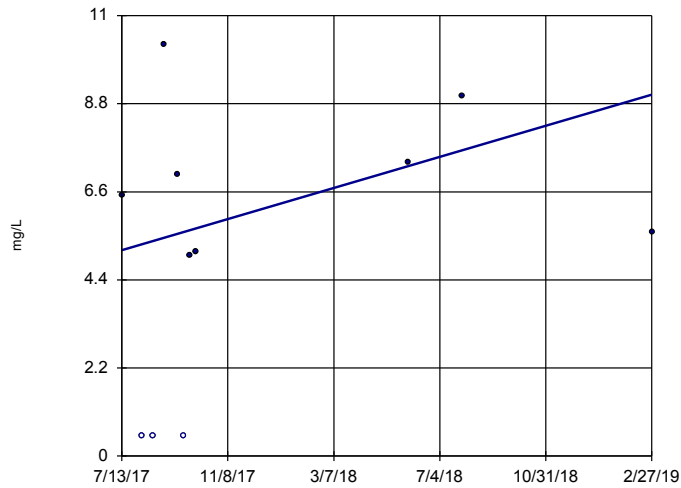


n = 13  
 Slope = 161.6 units per year.  
 Mann-Kendall statistic = 52  
 critical = 43  
 Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride Analysis Run 6/26/2019 4:55 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-10

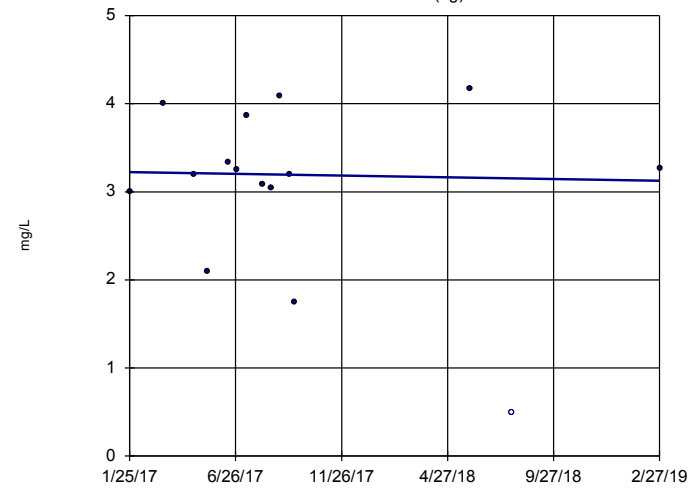


n = 11  
 Slope = 2.387 units per year.  
 Mann-Kendall statistic = 14  
 critical = 34  
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 6/26/2019 4:55 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

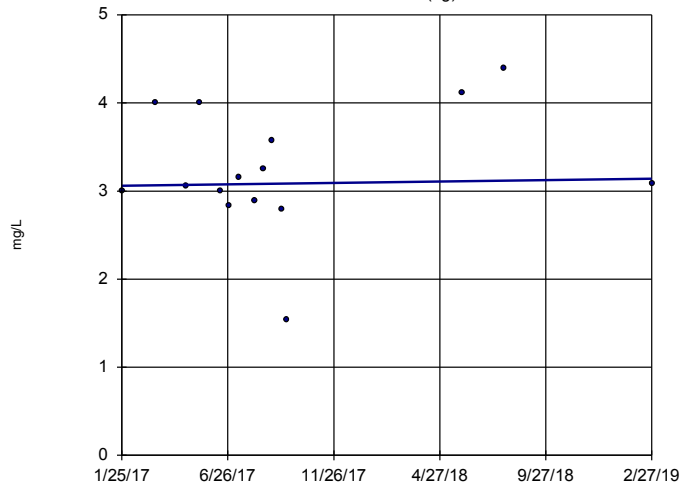
SP-4 (bg)



n = 15  
 Slope = -0.04702 units per year.  
 Mann-Kendall statistic = -3  
 critical = -53  
 Trend not significant at 99% confidence level (α = 0.005 per tail).

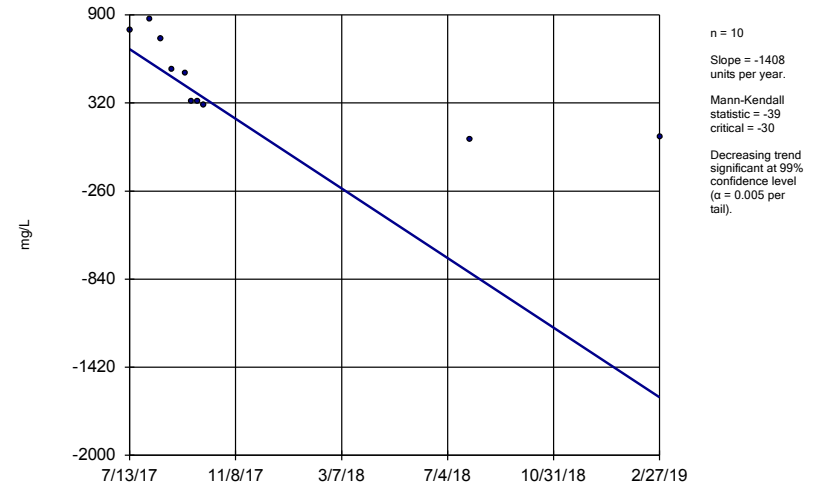
Constituent: Fluoride Analysis Run 6/26/2019 4:55 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-5 (bg)



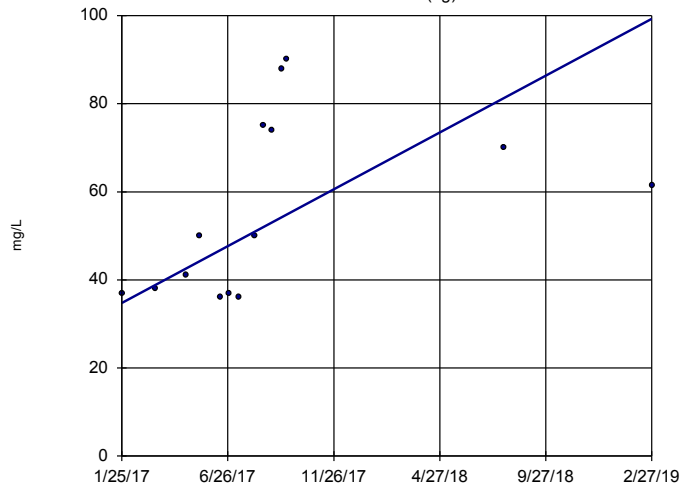
Constituent: Fluoride Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-11



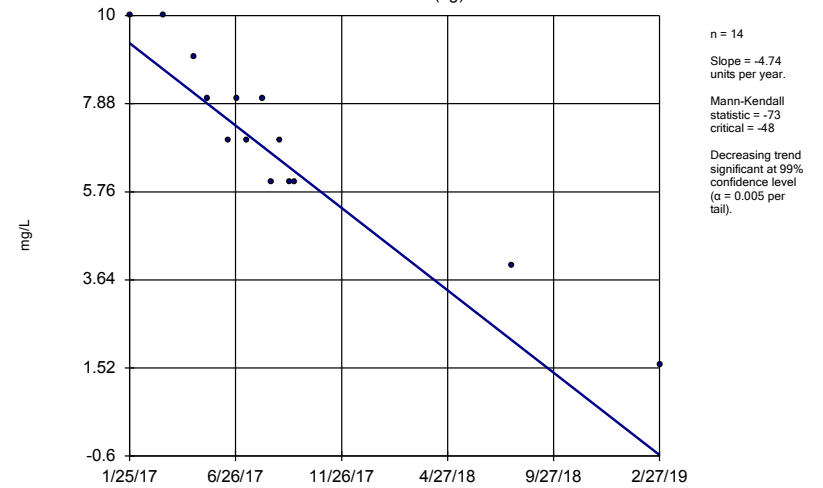
Constituent: Sulfate Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-4 (bg)



Constituent: Sulfate Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

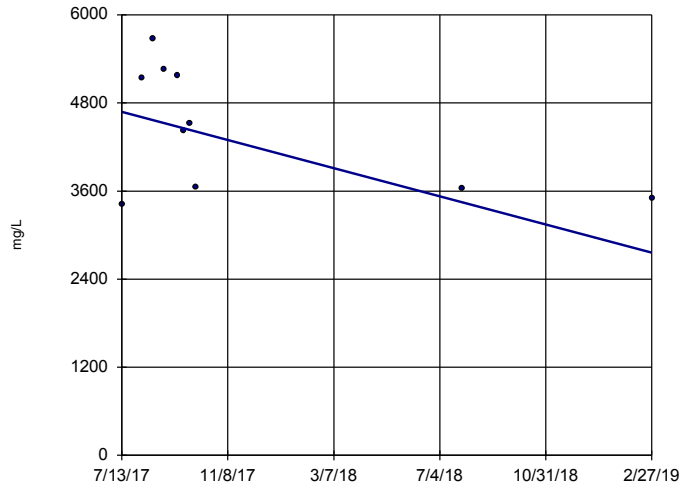
Sen's Slope Estimator  
SP-5 (bg)



Constituent: Sulfate Analysis Run 6/26/2019 4:55 PM View: App III  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-10

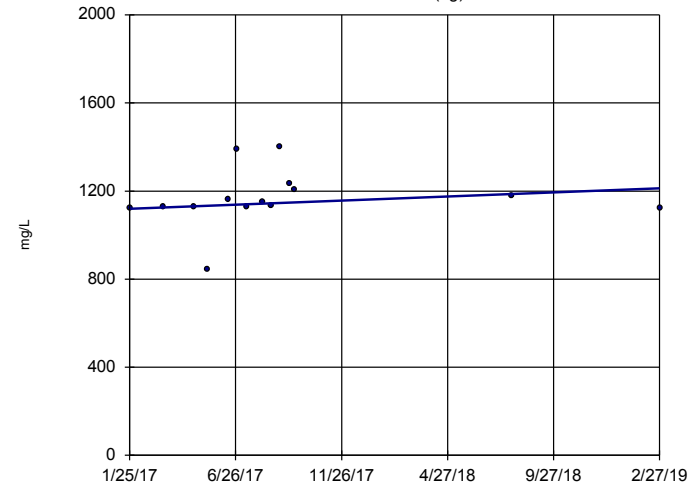


n = 10  
 Slope = -1179  
 units per year.  
 Mann-Kendall  
 statistic = -19  
 critical = -30  
 Trend not sig-  
 nificant at 99%  
 confidence level  
 ( $\alpha = 0.005$  per  
 tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 6/26/2019 4:55 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-4 (bg)

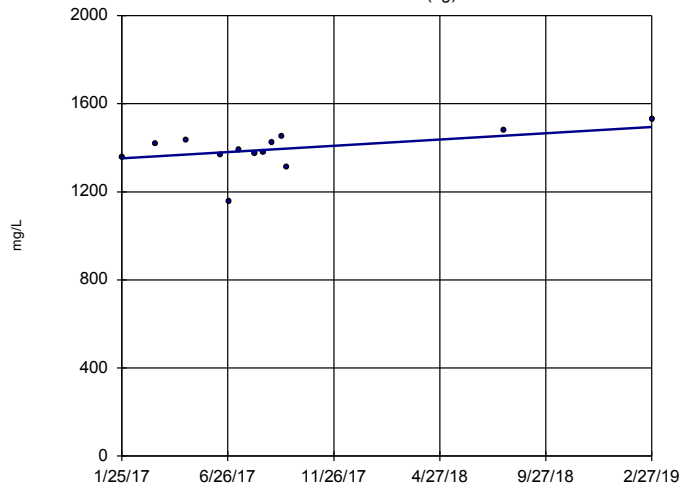


n = 14  
 Slope = 44.69  
 units per year.  
 Mann-Kendall  
 statistic = 26  
 critical = 48  
 Trend not sig-  
 nificant at 99%  
 confidence level  
 ( $\alpha = 0.005$  per  
 tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 6/26/2019 4:55 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-5 (bg)



n = 13  
 Slope = 67.52  
 units per year.  
 Mann-Kendall  
 statistic = 30  
 critical = 43  
 Trend not sig-  
 nificant at 99%  
 confidence level  
 ( $\alpha = 0.005$  per  
 tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 6/26/2019 4:55 PM View: App III  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Upper Tolerance Limits - Appendix IV

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:37 PM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	0.00514	30	n/a	n/a	53.33	n/a	n/a	0.2146	NP Inter(normality)
Arsenic (mg/L)	0.04927	30	0.1149	0.04823	10	None	sqrt(x)	0.05	Inter
Barium (mg/L)	4.59	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Beryllium (mg/L)	0.00497	30	n/a	n/a	26.67	n/a	n/a	0.2146	NP Inter(Cohens/x...
Cadmium (mg/L)	0.00247	29	n/a	n/a	65.52	n/a	n/a	0.2259	NP Inter(normality)
Chromium (mg/L)	0.08415	30	n/a	n/a	23.33	n/a	n/a	0.2146	NP Inter(Cohens/x...
Cobalt (mg/L)	0.04069	30	n/a	n/a	16.67	n/a	n/a	0.2146	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	16.53	29	8.241	3.709	0	None	No	0.05	Inter
Fluoride (mg/L)	4.562	30	10.61	4.597	3.333	None	x^2	0.05	Inter
Lead (mg/L)	0.03663	30	n/a	n/a	43.33	n/a	n/a	0.2146	NP Inter(normality)
Lithium (mg/L)	0.1491	30	0.0983	0.0229	0	None	No	0.05	Inter
Mercury (mg/L)	0.000058	30	n/a	n/a	60	n/a	n/a	0.2146	NP Inter(normality)
Molybdenum (mg/L)	0.02	30	n/a	n/a	53.33	n/a	n/a	0.2146	NP Inter(normality)
Selenium (mg/L)	0.00499	30	n/a	n/a	70	n/a	n/a	0.2146	NP Inter(normality)
Thallium (mg/L)	0.005	30	n/a	n/a	86.67	n/a	n/a	0.2146	NP Inter(NDs)

# Confidence Intervals - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:47 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Compliance</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Lithium (mg/L)	SP-10	0.3109	0.264	0.15	Yes	11	0	No	0.01	Param.

# Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:47 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00209	0.00069	0.006	No	14	50	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.00251	0.001	0.006	No	11	36.36	No	0.006	NP (Cohens/xfrm)
Antimony (mg/L)	SP-11	0.006557	-0.00005032	0.006	No	11	27.27	No	0.01	Param.
Antimony (mg/L)	SP-2	0.005128	0.00152	0.006	No	14	14.29	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-1	0.00548	0.00134	0.049	No	14	57.14	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.01081	0.002726	0.049	No	11	18.18	No	0.01	Param.
Arsenic (mg/L)	SP-11	0.008379	0.002917	0.049	No	11	9.091	No	0.01	Param.
Arsenic (mg/L)	SP-2	0.005212	0.00175	0.049	No	14	7.143	x^(1/3)	0.01	Param.
Barium (mg/L)	SP-1	0.2273	0.1738	4.59	No	14	0	No	0.01	Param.
Barium (mg/L)	SP-10	2.283	0.3079	4.59	No	11	0	x^(1/3)	0.01	Param.
Barium (mg/L)	SP-11	0.3625	0.1101	4.59	No	11	0	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-2	1.611	0.8808	4.59	No	14	0	x^(1/3)	0.01	Param.
Beryllium (mg/L)	SP-1	0.001	0.00006	0.005	No	14	35.71	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.001	0.00003	0.005	No	11	36.36	No	0.006	NP (normality)
Beryllium (mg/L)	SP-11	0.001	0.00007	0.005	No	11	27.27	No	0.006	NP (Cohens/xfrm)
Beryllium (mg/L)	SP-2	0.001	0.00006	0.005	No	14	28.57	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.0005	0.00011	0.005	No	14	71.43	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.0005	0.0005	0.005	No	11	90.91	No	0.006	NP (NDs)
Cadmium (mg/L)	SP-11	0.0027	0.00009	0.005	No	11	27.27	No	0.006	NP (Cohens/xfrm)
Cadmium (mg/L)	SP-2	0.0005	0.00009	0.005	No	14	71.43	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.00183	0.00062	0.1	No	14	42.86	No	0.01	NP (Cohens/xfrm)
Chromium (mg/L)	SP-10	0.00244	0.00036	0.1	No	11	18.18	No	0.006	NP (normality)
Chromium (mg/L)	SP-11	0.01648	0.0008389	0.1	No	11	9.091	ln(x)	0.01	Param.
Chromium (mg/L)	SP-2	0.002485	0.0003201	0.1	No	14	21.43	No	0.01	Param.
Cobalt (mg/L)	SP-1	0.00175	0.0005	0.041	No	14	21.43	No	0.01	NP (Cohens/xfrm)
Cobalt (mg/L)	SP-10	0.004426	0.0008491	0.041	No	11	18.18	No	0.01	Param.
Cobalt (mg/L)	SP-11	0.01099	0.002148	0.041	No	11	9.091	No	0.01	Param.
Cobalt (mg/L)	SP-2	0.00251	0.0005	0.041	No	14	21.43	No	0.01	NP (Cohens/xfrm)
Combined Radium 226 + 228 (pCi/L)	SP-1	4.53	3.014	16.53	No	14	0	No	0.01	NP (normality)
Combined Radium 226 + 228 (pCi/L)	SP-10	7.241	0.9902	16.53	No	11	0	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	4.618	0.785	16.53	No	11	0	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	18.54	7.536	16.53	No	11	0	No	0.01	Param.
Fluoride (mg/L)	SP-1	1.098	0.6188	4.56	No	13	15.38	No	0.01	Param.
Fluoride (mg/L)	SP-10	8.162	1.303	4.56	No	11	27.27	No	0.01	Param.
Fluoride (mg/L)	SP-11	3.918	2.711	4.56	No	11	0	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.383	2.31	4.56	No	14	0	No	0.01	Param.
Lead (mg/L)	SP-1	0.002	0.000354	0.037	No	14	57.14	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.002	0.00087	0.037	No	11	81.82	No	0.006	NP (NDs)
Lead (mg/L)	SP-11	0.00816	0.000404	0.037	No	11	27.27	No	0.006	NP (Cohens/xfrm)
Lead (mg/L)	SP-2	0.00202	0.00091	0.037	No	14	64.29	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006957	0.004515	0.15	No	14	0	No	0.01	Param.
<b>Lithium (mg/L)</b>	<b>SP-10</b>	<b>0.3109</b>	<b>0.264</b>	<b>0.15</b>	<b>Yes</b>	<b>11</b>	<b>0</b>	<b>No</b>	<b>0.01</b>	<b>Param.</b>
Lithium (mg/L)	SP-11	0.1189	0.05708	0.15	No	11	0	No	0.01	Param.
Lithium (mg/L)	SP-2	0.09779	0.06935	0.15	No	14	0	x^3	0.01	Param.
Mercury (mg/L)	SP-1	0.000025	0.000023	0.002	No	14	78.57	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.00002651	0.00001082	0.002	No	11	18.18	No	0.01	Param.
Mercury (mg/L)	SP-11	0.00003405	0.000008311	0.002	No	11	18.18	No	0.01	Param.
Mercury (mg/L)	SP-2	0.000025	0.000006	0.002	No	14	71.43	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-1	0.01646	0.009366	0.1	No	14	0	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.1082	0.00973	0.1	No	11	9.091	ln(x)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.05614	0.01939	0.1	No	11	0	No	0.01	Param.
Molybdenum (mg/L)	SP-2	0.03413	0.02294	0.1	No	14	0	No	0.01	Param.
Selenium (mg/L)	SP-1	0.0058	0.002	0.05	No	14	21.43	No	0.01	NP (Cohens/xfrm)
Selenium (mg/L)	SP-10	0.00567	0.002	0.05	No	11	27.27	No	0.006	NP (Cohens/xfrm)
Selenium (mg/L)	SP-11	0.005442	0.0009195	0.05	No	11	18.18	No	0.01	Param.



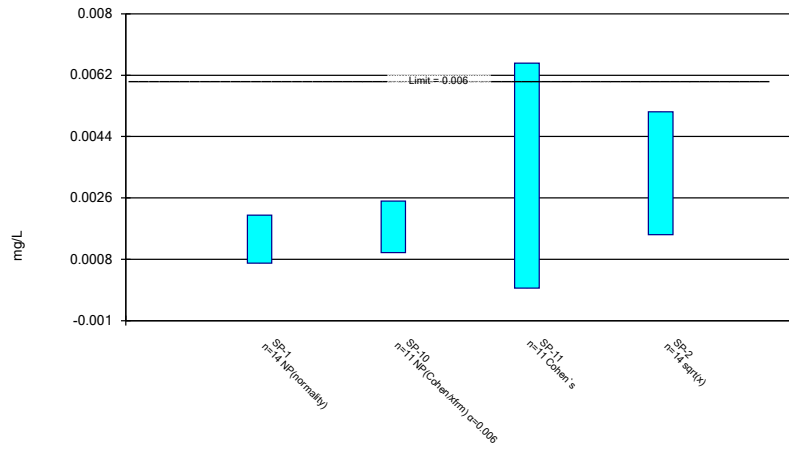
# Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 6/26/2019, 4:47 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Compliance</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Selenium (mg/L)	SP-2	0.01707	0.003542	0.05	No	14	14.29	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.005	0.002	0.005	No	14	78.57	No	0.01	NP (NDs)
Thallium (mg/L)	SP-10	0.005	0.005	0.005	No	11	90.91	No	0.006	NP (NDs)
Thallium (mg/L)	SP-11	0.005	0.005	0.005	No	11	90.91	No	0.006	NP (NDs)
Thallium (mg/L)	SP-2	0.005	0.00006	0.005	No	14	92.86	No	0.01	NP (NDs)

### Parametric and Non-Parametric (NP) Confidence Interval

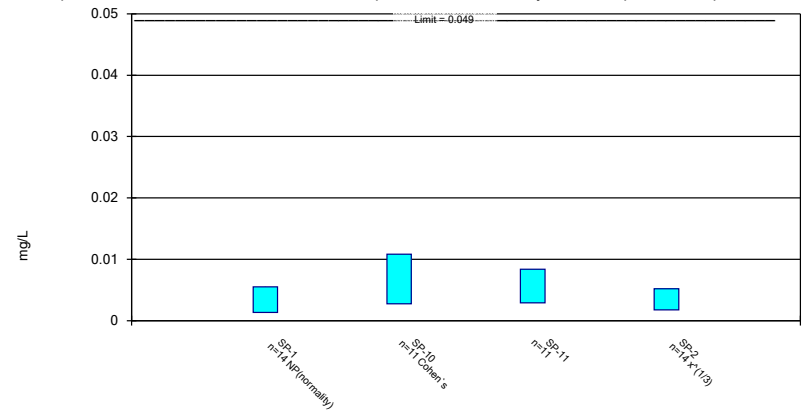
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

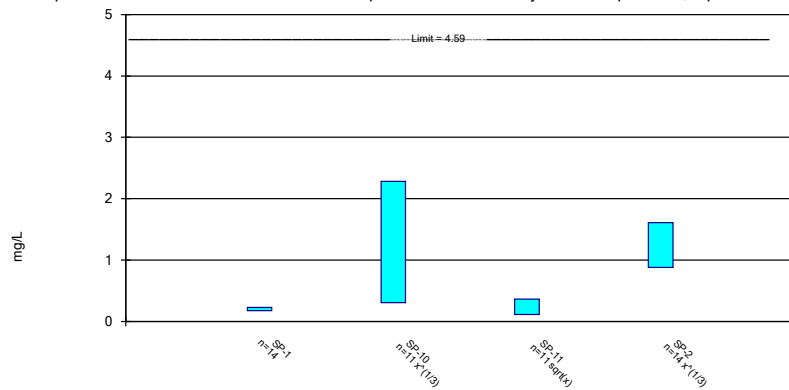
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

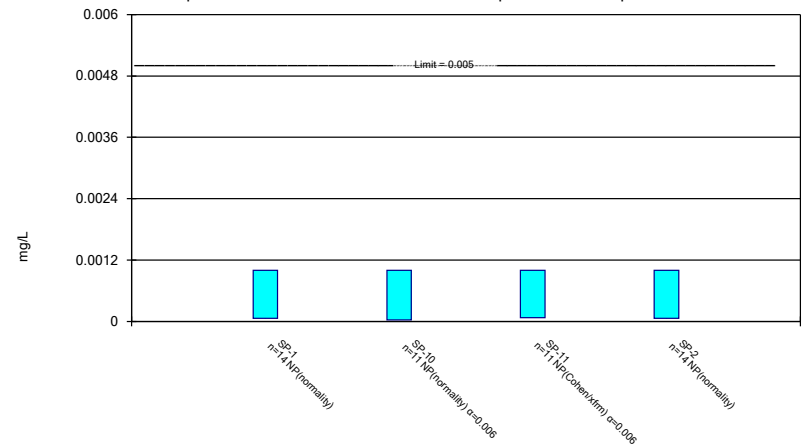
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Non-Parametric Confidence Interval

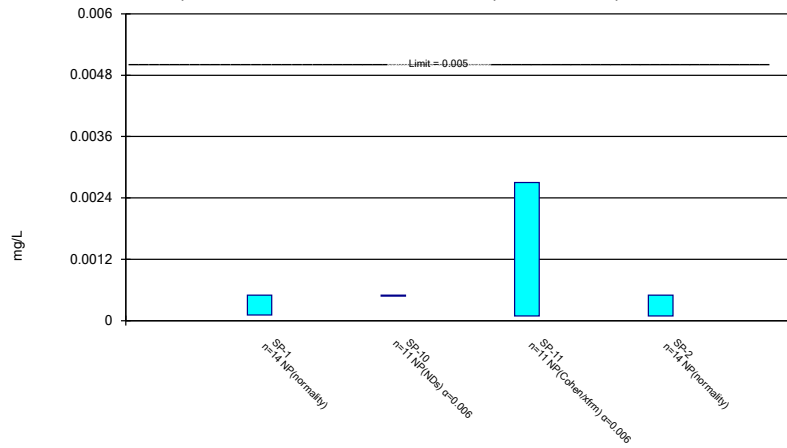
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted.



Constituent: Beryllium Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Non-Parametric Confidence Interval

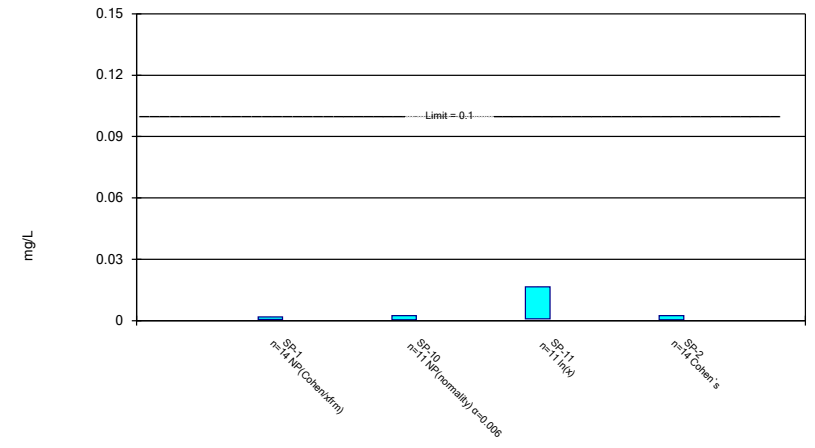
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted.



Constituent: Cadmium Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

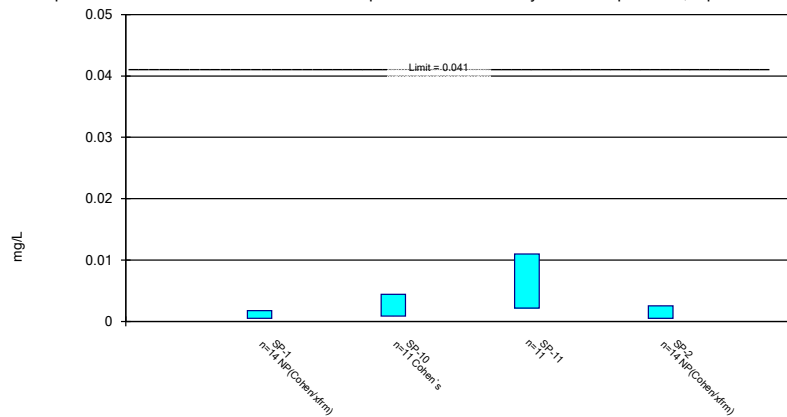
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

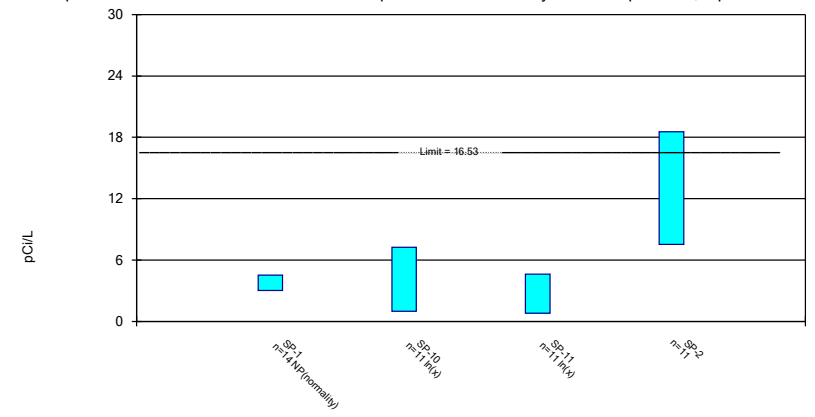
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

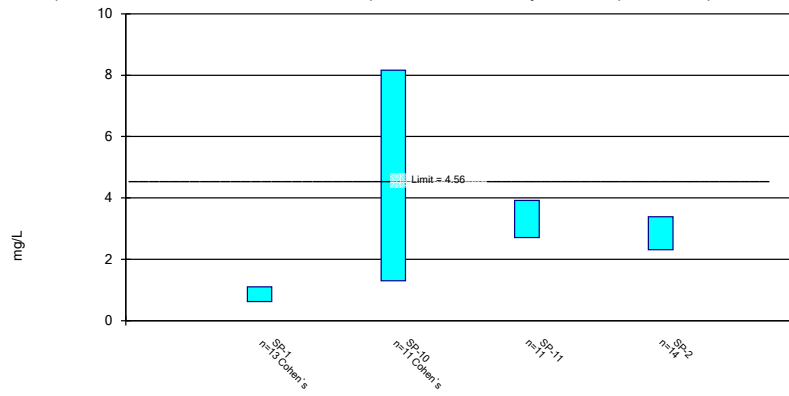
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

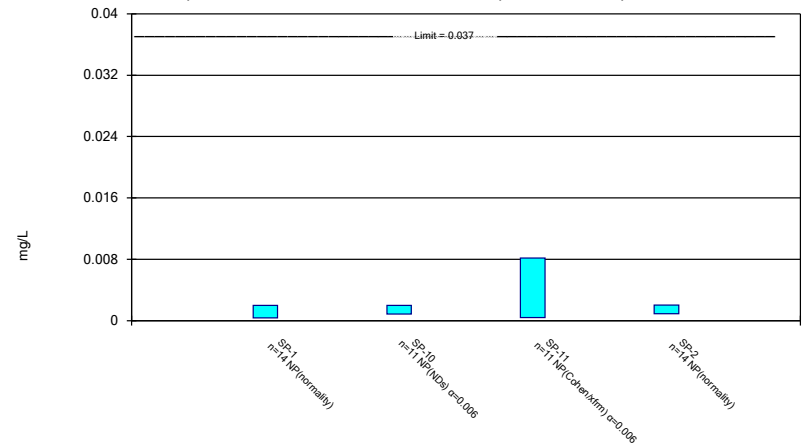
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 6/26/2019 4:44 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Non-Parametric Confidence Interval

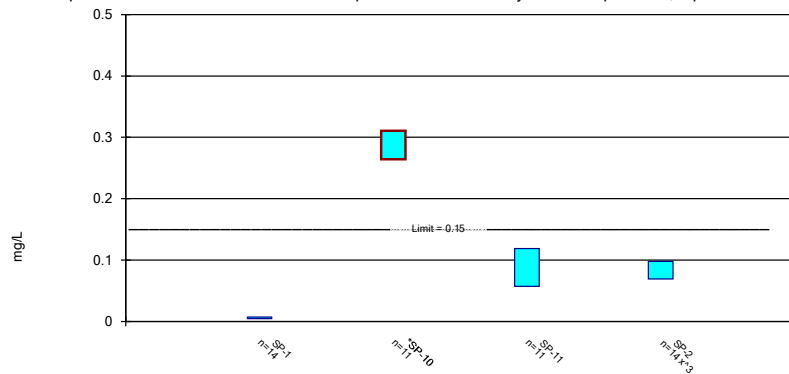
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted.



Constituent: Lead Analysis Run 6/26/2019 4:45 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

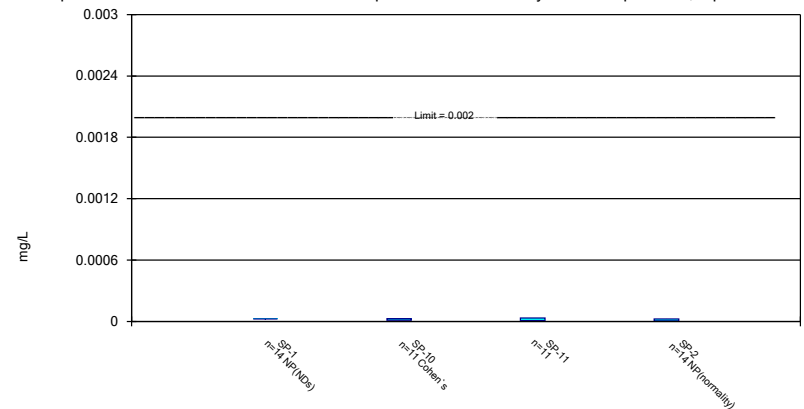
Compliance limit is exceeded.\* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 6/26/2019 4:45 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

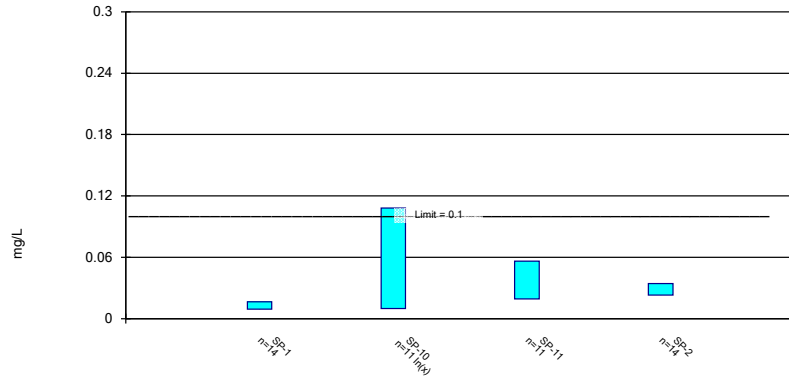
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Mercury Analysis Run 6/26/2019 4:45 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

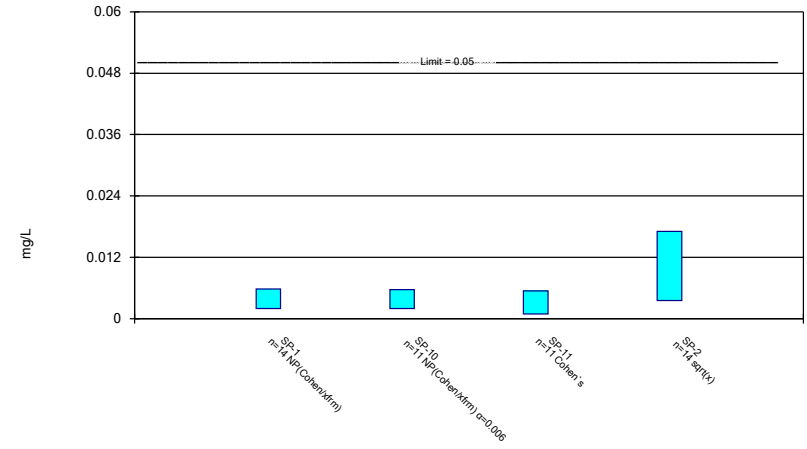
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 6/26/2019 4:45 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

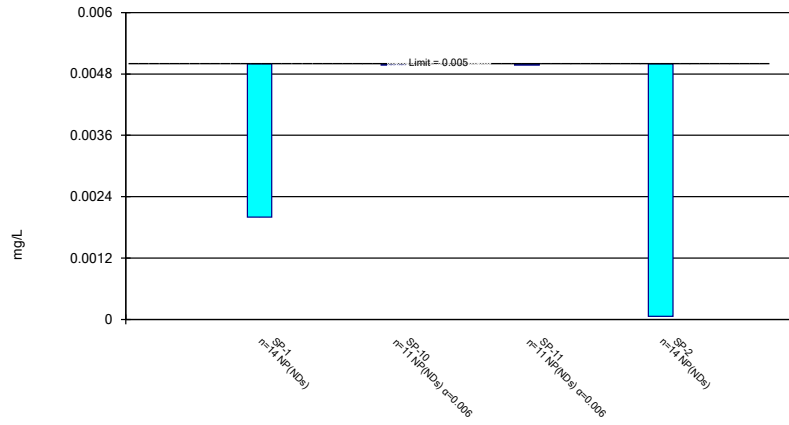
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 6/26/2019 4:45 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Non-Parametric Confidence Interval

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



Constituent: Thallium Analysis Run 6/26/2019 4:45 PM View: App IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

*Submitted to*



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Attachment C	Laboratory Analytical Reports
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## LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternate 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
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
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
USEPA	United States Environmental Protection Agency
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 Plant located in Oologah, Oklahoma.

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. Also, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. An alternative source was not identified at the time, so the BAP initiated an assessment monitoring program. Groundwater protection standards (GWPS) were set in accordance with OAC 252:517-9-6(h). While a lithium exceedance at SP-10 was observed above the GWPS, an alternate source demonstration (ASD) submitted to ODEQ on May 1, 2019 attributed the elevated lithium concentrations at SP-10 to natural variation (Geosyntec, 2019). On October 29, 2019, ODEQ provided a letter to AEP documenting acceptance of the ASD (ODEQ, 2019). Thus, the BAP remained in assessment monitoring. Two assessment monitoring events were conducted at the BAP in June and August 2019, in accordance with OAC 252:517-9-6(b) and OAC 252:517-9-6(d), respectively. Results of these events are documented in this report.

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. Groundwater protection standards (GWPSs) were re-established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. An SSL was identified for 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.

## SECTION 2

### BOTTOM ASH POND EVALUATION

#### 2.1 Data Validation & QA/QC

During the assessment monitoring program, two sets of samples were collected for analysis from each upgradient and downgradient well to meet the requirements of OAC 252.:517-9-6(b) (June 2019) and 252:517-9-6(d)(1) (August 2019). Samples from both sampling events were analyzed for the Appendix III and Appendix IV parameters. A summary of data collected during these assessment monitoring events may be found in Table 1. The field sampling forms and laboratory analytical reports are provided in Attachment B and Attachment C, respectively.

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.9.6.23 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 January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment D.

The data obtained in June and August 2019 were screened for potential outliers. The June 2017 value for combined radium at SP-1 was identified as an outlier and removed from the dataset. While the June 2019 lithium value at SP-1 was not flagged as an outlier by Tukey's test, it was removed from the dataset as it did not appear to represent the population of data at that well. The reported lithium value of 0.03 mg/L was J-flagged (estimated). Additional values collected during previous sampling events which were not identified as outliers but were removed from the dataset as they were not representative of the population include the July 2017 results for chromium and molybdenum at SP-10 and the August 2017 results for combined radium at SP-11. Multiple results for the August 2017 sampling event at SP-4 appeared substantially higher than subsequent events and these values were removed from the dataset as outliers.

### 2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with OAC 252:517-9-6(h) and the *Statistical Analysis Plan* (AEP, 2017). 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 IV 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. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for arsenic, combined radium, fluoride, and lithium. Non-parametric tolerance limits were calculated for antimony, barium, cadmium, chromium, cobalt, lead, mercury, molybdenum, and selenium due to apparent non-normal distributions, for thallium due to a high non-detect frequency, and for beryllium due to both an apparent non-normal distribution and a high non-detect frequency. Tolerance limits and the final GWPSs are summarized in Table 2.

### 2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV 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 D.

The following SSL was identified at the Northeastern BAP:

- The LCL for lithium exceeded the GWPS of 0.15 mg/L at SP-10 (0.241 mg/L).

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

### 2.2.3 Evaluation of Potential Appendix III SSIs

While SSLs were identified, a review of the Appendix III results were also completed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations. Prediction limits were calculated for the Appendix III parameters to represent background values. As described in the January 2018 *Statistical Analysis Summary* report (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.

Prediction limits for the interwell tests were recalculated using data collected during the June and August 2019 assessment monitoring events. Eight data points (i.e., two samples from four background wells) were added to the background dataset for each interwell test. New data were

tested for outliers prior to being added to the background dataset. The updated prediction limits were calculated using a one-of-two retesting procedure, as during detection monitoring. This resulted in updated prediction limits similar to the values of the prediction limits calculated during detection monitoring. Therefore, the revised interwell prediction limits were used to evaluate potential SSIs for boron, chloride, fluoride, sulfate, TDS and pH.

For the intrawell tests, limited data made it possible to add only one data point (i.e., one sample from each compliance well) to each background dataset. Because one sample result is insufficient to compare against the existing background dataset, the prediction limits were not updated for the intrawell tests at this time. The intrawell prediction limits calculated during detection monitoring were used to evaluate potential SSIs for calcium.

Data collected during the August 2019 assessment monitoring events from each compliance well were compared to the prediction limits to evaluate results above background values. The results from these recent events and the newly or formerly established prediction limits are summarized in Table 4. The following exceedances were noted:

- Boron concentrations exceeded the interwell UPL of 0.610 mg/L at SP-10 (1.03 mg/L).
- Calcium concentrations exceeded the intrawell UPL of 157 mg/L at SP-2 (211 mg/L) and the intrawell UPL of 109 mg/L at SP-10 (216 mg/L).
- Chloride concentrations exceeded the interwell UPL of 769 mg/L at SP-2 (1070 mg/L) and SP-10 (1940 mg/L).
- Fluoride concentrations exceeded the interwell UPL of 4.39 mg/L at SP-10 (4.87 mg/L).
- The pH measurement exceeded the interwell UPL of 8.5 SU for the August measurements at SP-1 (9.0 SU), SP-10 (8.9 SU), and SP-11 (8.9 SU).
- Sulfate concentrations exceeded the interwell UPL of 90.0 mg/L at SP-11 (122 mg/L).
- TDS concentrations exceeded the interwell UPL of 1570 mg/L at SP-2 (2250 mg/L) and SP-10 (3450 mg/L).

Based on these results, concentrations of Appendix III parameters exceeded background levels at compliance wells at the Northeastern BAP during assessment monitoring.

### **2.3 Conclusions**

Assessment monitoring was conducted in accordance with the OAC 252:517-9. 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 and August 2019 data. GWPSs were re-established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. An SSL was identified for lithium. Appendix III parameters were also evaluated, with exceedances identified for boron, calcium, chloride, fluoride, pH, 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**

American Electric Power (AEP). 2017. Statistical Analysis Plan – Northeastern Power Station. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Bottom Ash Pond, Northeastern Power Station, Oologah, Oklahoma. January 15, 2018.

Geosyntec. 2019. Alternative Source Demonstration Report – State CCR Rule. Northeastern Power Station Bottom Ash Pond. April.

Oklahoma Department of Environmental Quality. 2019. Letter Transmittal – Alternate Source Demonstration for Lithium – Bottom Ash Pond. October.

# TABLES

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

Component	Unit	SP-1		SP-2		SP-4		SP-5		SP-10		SP-11	
		6/20/2019	8/26/2019	6/20/2019	8/28/2019	6/20/2019	8/26/2019	6/20/2019	8/26/2019	6/20/2019	8/26/2019	6/20/2019	8/26/2019
Antimony	µg/L	0.930	0.430	1.34	1.22	0.300 J	0.250	0.500 U	0.0600 J	0.650	0.610	0.300 J	0.370
Arsenic	µg/L	1.44	0.730	1.43	1.53	0.830	1.64	59.9	49.3	3.66	3.00	4.18	6.30
Barium	µg/L	242	160	868	1220	337	359	2410	2340	3880	3060	169	492
Beryllium	µg/L	0.200 J	0.0800 J	0.100 J	0.0700 J	0.500 U	0.101	0.500 U	0.0600 J	0.500 U	0.0800 J	0.500 U	0.0400 J
Boron	mg/L	0.198	0.124	0.109	0.173	0.325	0.365	0.202	0.220	0.916	1.03	0.550	0.304
Cadmium	µg/L	0.100 J	0.0900	0.0900 J	0.0500	0.0700 J	0.0500	0.200 U	0.0200 J	0.200 U	0.0300 J	0.0600 J	0.130
Calcium	mg/L	126	120	58.2	211	56.4	182	48.5	128	50.3	216	65.6	139
Chloride	mg/L	25.2	9.00	357	1070	450	458	675	697	1780	1940	137	129
Chromium	µg/L	0.700 J	1.49	0.900 J	0.701	1.06	1.01	0.800 J	0.335	8.76	1.61	6.71	1.47
Cobalt	µg/L	5.54	0.481	0.434	0.568	0.388	1.07	0.598	0.485	0.743	1.06	0.948	2.73
Combined Radium	pCi/L	2.75	2.75	7.94	8.72	3.75	3.24	13.0	11.6	26.4	8.11	0.810	1.62
Fluoride	mg/L	0.770	0.525 J	2.69	2.69	3.24	2.99	3.06	2.79	6.40	4.87	1.67	2.23
Lead	µg/L	0.650	0.835	0.400 J	0.334	1.07	0.596	0.701	0.545	0.300 J	0.449	0.719	0.764
Lithium	mg/L	0.0300 J	0.00285	0.0620	0.0582	0.0680	0.0554	0.111	0.0928	0.290	0.241	0.0470	0.0337
Mercury	mg/L	0.0000100 J	0.0000250 U	0.0000250 U	0.0000250 U	0.0000700 J	0.0000250 U	0.0000800 J	0.0000250 U	0.0000100 J	0.0000250 U	0.0000100 J	0.0000250 U
Molybdenum	µg/L	12.1	5.86	25.0	22.3	2.00 J	2.00 J	10.0 U	1.00 J	9.00 J	8.22	10.0 U	5.70
Selenium	µg/L	9.90	3.40	2.90	3.70	0.400 J	0.600	1.00 U	0.100 J	1.00 U	0.400	0.300 J	0.800
Total Dissolved Solids	mg/L	452	438	1040	2250	1130	1170	1430	1450	3510	3450	1000	970
Sulfate	mg/L	61.4	48.0	28.5	14.0	58.0	61.0	0.900 J	3.00	30.3	29.0	203	122
Thallium	µg/L	2.00 U	0.100 J	2.00 U	0.100 J	2.00 U	0.500 U	2.00 U	0.500 U	2.00 U	0.500 U	2.00 U	0.500 U
pH	SU	7.09	9.01	6.79	8.54	7.12	8.78	7.33	8.80	7.78	8.87	6.84	8.86

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit

J: Estimated value. Parameter was detected in concentrations below the reporting limit



**Table 2: Groundwater Protection Standards  
Northeastern Plant - Bottom Ash Pond**

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL
Antimony, Total (mg/L)	0.006		0.0051
Arsenic, Total (mg/L)	0.01		0.06
Barium, Total (mg/L)	2		2.41
Beryllium, Total (mg/L)	0.004		0.002
Cadmium, Total (mg/L)	0.005		0.0025
Chromium, Total (mg/L)	0.1		0.042
Cobalt, Total (mg/L)	n/a	0.006	0.018
Combined Radium, Total (pCi/L)	5		16.52
Fluoride, Total (mg/L)	4		4.47
Lead, Total (mg/L)	n/a	0.015	0.011
Lithium, Total (mg/L)	n/a	0.04	0.15
Mercury, Total (mg/L)	0.002		0.00003
Molybdenum, Total (mg/L)	n/a	0.1	0.01
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.002

Notes:

Grey cell indicates calculated UTL is higher than MCL or CCR Rule-specified value.

MCL = Maximum Contaminant Level

Calculated UTL (Upper Tolerance Limit) represents site-specific background values.

The higher of the calculated UTL or MCL/Rule-Specified Level is used as the GWPS.

**Table 3: Appendix III Data Summary  
Northeastern Plant - Bottom Ash Pond**

Parameter	Unit	Description	SP-1		SP-2		SP-10		SP-11	
			6/20/2019*	8/26/2019	6/20/2019*	8/26/2019	6/20/2019*	8/26/2019	6/20/2019*	8/26/2019
Boron	mg/L	Interwell Background Value (UPL)	0.610							
		Detection Monitoring Result	0.198	0.124	0.109	0.173	0.916	<b>1.03</b>	0.550	0.304
Calcium	mg/L	Intrawell Background Value (UPL)	136		157		109		1894	
		Detection Monitoring Result	126	120	58.2	<b>211</b>	50.3	<b>216</b>	65.6	139
Chloride	mg/L	Interwell Background Value (UPL)	769							
		Detection Monitoring Result	25.2	9.00	357	<b>1070</b>	1780	<b>1940</b>	137	129
Fluoride	mg/L	Interwell Background Value (UPL)	4.39							
		Detection Monitoring Result	0.770	0.525	2.69	2.69	6.40	<b>4.87</b>	1.67	2.23
pH	SU	Interwell Background Value (UPL)	8.5							
		Interwell Background Value (LPL)	7.1							
		Detection Monitoring Result	7.1	<b>9.0</b>	6.8	8.5	7.8	<b>8.9</b>	6.8	<b>8.9</b>
Sulfate	mg/L	Interwell Background Value (UPL)	90.0							
		Detection Monitoring Result	61.4	48.0	28.5	14.0	30.3	29.0	203	<b>122</b>
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1570							
		Detection Monitoring Result	452	438	1040	<b>2250</b>	3510	<b>3450</b>	1000	970

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

**Bold values exceed the background value.**

**\*252:517-9-6(b) sampling event**

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

License Number

OKLAHOMA

Licensing State

12.18.19

Date

**ATTACHMENT B**  
**Field Sampling Forms**

# NORTHEASTERN POWER PLANT GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDermid

DATE: 06/20/19

Well Identification Number	SP-1	SP-2	SP-4	SP-5	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)	16.88	23.31	22.53	4.82	12.32	4.72
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.)	21.11	14.88	15.77	73.18	41.78	29.79
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.44	2.43	2.57	11.93	6.81	4.86
Water Removed From Well (gallons)	12.0	6.25	4.0	24.0	18.75	8.25
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	Yes	Yes	Yes	Yes	Yes
pH (standard units)	7.09	6.79	7.12	7.33	7.78	6.84
Temperature (°C)	20.0	19.6	20.5	21.2	19.8	21.7
Conductivity (µmhos/cc)	690	3040	1710	6620	7270	1420
Turbidity (NTU)	28.7	40.2	57.1	20.7	101	113
Appearance	Clean	Clean	Slightly Turbid	Clean	Slightly Turbid	Slightly Turbid
Odor	None	None	None	None	None	None
Ohio Containers	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3
Shreveport Containers	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3
Sample Time	1620	1555	1650	1715	1515	1535
Sample Date	06/20/19	06/20/19	06/20/19	06/20/19	06/20/19	06/20/19

DUPLICATE

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



# NORTHEASTERN POWER PLANT GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenn & McDonald

DATE: 06/20-21/19

Well Identification Number	SP-6	SP-7			
Activities	Gauge	Gauge			
Samples	Appendix III & IV	Appendix III & IV			
Depth to Water (ft)	59.07	32.84			
Water Level Elevation (ft. NGVD)					
Measured Depth Total Depth of Well (ft.)	73.93	84.02			
Height of Water Column (ft.)	14.86	51.18			
Well Size (I.D.) (inches)	2	2			
Volume of Water in Well (gallons)	2.42	8.34			
Water Removed From Well (gallons)	2.0	7.0			
Method of Removal	Pump	Pump			
Was Well Purged Dry?	YES	YES			
pH (standard units)	6.78	6.83			
Temperature (°C)	20.7	22.8			
Conductivity (µmhos/cc)	19030	21220			
Turbidity (NTU)	78.2	50.6			
Appearance	CLEAR	CLEAR			
Odor	NONE	NONE			
Ohio Containers	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3			
Shreveport Containers	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3			
Sample Time	1430	1450			
Sample Date	06/21/19	06/21/19			

METALS ONLY	METALS+WA
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: 08/26/19

Well Identification Number	SP-1	SP-2	SP-4	SP-5	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)	17.51	28.43	25.00	6.39	3.85	14.60
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.)	20.48	9.76	13.30	71.61	50.25	19.91
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.34	1.59	2.17	11.67	8.19	3.25
Water Removed From Well (gallons)	12.0	4.0	6.0	28.25	18.25	5.0
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	Yes	Yes	Yes	Yes	Yes
pH (standard units)	9.01	8.54	8.78	8.80	8.87	8.86
Temperature (°C)	21.91	23.35	22.81	23.24	23.02	22.69
Conductivity (µmhos/cc)	899	4390	2200	2930	6620	1560
Turbidity (NTU)	78.1	146	899	935	24.4	128
Appearance	Clean	Clean	Slightly Turbid	Clean	Clean Slight Deaerating	Slightly Turbid
Odor	None	None	None	None	None	None
Ohio Containers	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3
Shreveport Containers	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3
Sample Time	1650	1640	1705	1720	1622	1635
Sample Date	08/26/19	08/26/19	08/26/19	08/26/19	08/26/19	08/26/19

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

BAP  
Duplicate



# NORTHEASTERN POWER PLANT GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald / MITT HAMILTON DATE: 08/26/19

Well Identification Number	SP-3					
Activities	Gauge					
Samples	NA					
Depth to Water (ft)	16.28					
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	37.90					
Height of Water Column (ft.)	21.62					
Well Size (I.D.) (inches)	2					
Volume of Water in Well (gallons)	3.52					
Water Removed From Well (gallons)	—					
Method of Removal	—					
Was Well Purged Dry?	—					
pH (standard units)	—					
Temperature (°C)	—					
Conductivity (µmhos/cc)	—					
Turbidity (NTU)	—					
Appearance	—					
Odor	—					
Ohio Containers	—					
Shreveport Containers	—					
Sample Time	—					
Sample Date	—					

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

ATTACHMENT C  
Laboratory Analytical Reports



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40009 <b>Date Received:</b> 06/24/2019	<b>Company:</b> SEP - Environmental (JP-W) <b>Contact:</b> Jill Parker-Witt <b>Phone:</b> (318) 673-3816	<b>Address:</b> 502 N. Allen Avenue Shreveport, LA 71101 <b>Fax:</b> (318) 673-3960
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<b>AEP Sample ID</b> : 226451 <b>Cust Sample ID:</b> SP-1 <b>Sample Desc.:</b>	<b>Collected Date:</b> 06/20/2019 <b>Location:</b> Northeastern PP CCR	<b>By:</b> KM <b>Matrix:</b> Water
--	---	---------------------------------------

<b>Metals (226451)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	0.00001	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:15	J	LNM

<b>Water (226451)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	452	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD

<b>AEP Sample ID</b> : 226452 <b>Cust Sample ID:</b> SP-2 <b>Sample Desc.:</b>	<b>Collected Date:</b> 06/20/2019 <b>Location:</b> Northeastern PP CCR	<b>By:</b> KM <b>Matrix:</b> Water
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<b>Metals (226452)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:25	U	LNM

<b>Water (226452)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	1044	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD

<b>AEP Sample ID</b> : 226453 <b>Cust Sample ID:</b> SP-4 <b>Sample Desc.:</b>	<b>Collected Date:</b> 06/20/2019 <b>Location:</b> Northeastern PP CCR	<b>By:</b> KM <b>Matrix:</b> Water
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<b>Metals (226453)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	0.000007	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:28	J	LNM

<b>Water (226453)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	1128	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40009 <b>Date Received:</b> 06/24/2019	<b>Company:</b> SEP - Environmental (JP-W) <b>Contact:</b> Jill Parker-Witt <b>Phone:</b> (318) 673-3816	<b>Address:</b> 502 N. Allen Avenue Shreveport, LA 71101 <b>Fax:</b> (318) 673-3960
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<b>AEP Sample ID</b> : 226454 <b>Cust Sample ID:</b> SP-5 <b>Sample Desc.:</b>	<b>Collected Date:</b> 06/20/2019 <b>Location:</b> Northeastern PP CCR	<b>By:</b> KM <b>Matrix:</b> Water
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Metals (226454)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	0.000008	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:32	J	LNM

Water (226454)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	1428	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD

<b>AEP Sample ID</b> : 226455 <b>Cust Sample ID:</b> SP-10 <b>Sample Desc.:</b>	<b>Collected Date:</b> 06/20/2019 <b>Location:</b> Northeastern PP CCR	<b>By:</b> KM <b>Matrix:</b> Water
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Metals (226455)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	0.00001	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:35	J	LNM

Water (226455)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	3512	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD

<b>AEP Sample ID</b> : 226456 <b>Cust Sample ID:</b> SP-11 <b>Sample Desc.:</b>	<b>Collected Date:</b> 06/20/2019 <b>Location:</b> Northeastern PP CCR	<b>By:</b> KM <b>Matrix:</b> Water
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Metals (226456)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	0.00001	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:38	J	LNM

Water (226456)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	1000	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40009	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/24/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 226457	<b>Collected Date:</b> 06/20/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> Duplicate BAP	<b>Location:</b> Northeastern PP CCR	<b>Matrix:</b> Water
<b>Sample Desc.:</b>		

Metals (226457)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	0.000007	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:41	J	LNM

Water (226457)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	466	mg/L	2	1	SM 2540 C-2011	06/26/2019 13:56		JTD

<b>AEP Sample ID</b> : 226458	<b>Collected Date:</b> 06/20/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> Equipment Blank BAP	<b>Location:</b> Northeastern PP CCR	<b>Matrix:</b> Water
<b>Sample Desc.:</b>		

Metals (226458)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:44	U	LNM

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*	%			
6/27/2019	Mercury	226449.1	<0.00000	0.001	0.00096	96.0	0.001	0.0009542	95.4		0.4	LNM
6/24/2019	Solids, Total Dissolved (TDS)		<2	100.6	96	95.4	1022	1010	98.8		4.6	JTD
6/26/2019	Solids, Total Dissolved (TDS)	226457	<2	100.6	92	91.5	1000	1002	100.2		1.7	JTD

**Code Code Description**

- J Concentration estimated. Analyte was detected between the Method Detection Limit (MDL) and Minimum Quantitation Limit (MQL).
- U Analyte concentration below MDL.

\_\_\_\_\_  
 Quality Assurance Officer

17-Jul-19  
 Report Date



**Shreveport Chemical Laboratory (SCL)**

502 N. Allen Ave.  
 Shreveport, LA 71101  
 Jonathan Barnhill (318-673-3803)  
 Contacts: John Davis (318-673-3811)

**Chain of Custody Record**

Program: Coal Combustion Residuals (CCR)

Site Contact:

Date:

For Lab Use Only:  
 CCR/Order #: **DOC #**

*RS*  
*06-24-19*

*40009*

Project Name: Northeastern PP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816  
 Sampler(s): Kenneth McDonald

Analysis Turnaround Time (In Calendar Days)  
 Need Results by July 12

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Analytes				Sample Specific Notes	
							Mercury	Field-filter 500 mL bottle, then pH<2, HNO3	250 mL bottle, Cool, 0-6C	Three (six every 10th) L bottles, pH<2, HNO3		
SP-1	6/20/2019	1620	G	GW	2		X		X			226451.1 - 226451.2
SP-2	6/20/2019	1555	G	GW	2		X		X			226452.1 - 226452.2
SP-4	6/20/2019	1650	G	GW	2		X		X			226453.1 - 226453.2
SP-5	6/20/2019	1715	G	GW	2		X		X			226454.1 - 226454.2
SP-10	6/20/2019	1515	G	GW	2		X		X			226455.1 - 226455.2
SP-11	6/20/2019	1535	G	GW	2		X		X			226456.1 - 226456.2
DUPLICATE BAP	6/20/2019	1620	G	GW	2		X		X			226457.1 - 226457.2
EQUIPMENT BLANK BAP	6/20/2019	1725	G	W	1		X					226458

\* Six 7L Bottles must be collected for Radium for every 10th sample.

Special Instructions/QC Requirements & Comments:

**\*\*\*\* NEED RESULTS BY JULY 12**

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
<i>Hand</i>	<i>Carroll</i>	<i>06/24/19 1008</i>		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
			<i>Howie Johnson</i>	<i>06/24/19 10:15</i>



SHREVEPORT CHEMICAL LABORATORY

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

## PROJECT RECEIPT FORM

Container Type				Delivery Type			
<input checked="" type="radio"/> Ice Chest	<input type="radio"/> Bag	<input type="radio"/> Action Pak	<input type="radio"/> PCB Mailer	<input type="radio"/> UPS	<input type="radio"/> FEDEX	<input type="radio"/> US Mail	<input checked="" type="radio"/> Walk in
Other _____				Other _____			
Tracking # _____							

Client Jill Parker - Witt

Received By Roseella Johnson

Received Date 06-24-2019

Open Date 06-24-2019

Sample Matrix

DGA     PCB Oil     Water     Oil     Soil

Solid     Liquid     Other \_\_\_\_\_

Container Temp    Read 1    Project I.D. \_\_\_\_\_

Correction Factor +1.2    Thermometer Serial #F04103

Corrected Temp 2.2    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     NO

Were samples labeled properly?     YES     NO

Were correct containers used?     YES     NO

Were the pH's of samples appropriately checked?     YES     NO

Total number of sample containers    15

Was any corrective action taken?     NO

Person Contacted \_\_\_\_\_

Date & Time \_\_\_\_\_

Comments \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 7/12/2019**

**SP-1**

**Sample Number: 192190-001**

**Date Collected: 06/20/2019 16:20**

**Date Received: 6/25/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.198	mg/L		0.1	0.02	DAM	07/09/2019 16:23	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	126	mg/L		0.3	0.04	DAM	07/09/2019 16:23	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.03	mg/L	J	0.03	0.009	DAM	07/09/2019 16:23	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.93	ug/L		0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.44	ug/L		0.5	0.2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Barium, Ba	242	ug/L		0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.2	ug/L	J	0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.1	ug/L	J	0.2	0.05	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.7	ug/L	J	1	0.2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	5.54	ug/L		0.2	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.650	ug/L		0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	12.1	ug/L		10	2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Selenium, Se	9.9	ug/L		1	0.2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	25.2	mg/L		0.04	0.01	CRJ	06/27/2019 00:44	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.77	mg/L		0.06	0.01	CRJ	06/27/2019 00:44	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	61.4	mg/L		0.4	0.06	CRJ	06/27/2019 00:44	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.033	pCi/L	0.18	0.52	ttp	7/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	0.712	pCi/L	0.12	0.14	sdw	7/9/2019	SW-846 9315-1986, Rev. 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.*



SP-2

Sample Number: 192190-002

Date Collected: 06/20/2019 15:55

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.109	mg/L		0.1	0.02	DAM	07/09/2019 16:26	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	58.2	mg/L		0.3	0.04	DAM	07/09/2019 16:26	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.062	mg/L		0.03	0.009	DAM	07/09/2019 16:26	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	1.34	ug/L		0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.43	ug/L		0.5	0.2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Barium, Ba	868	ug/L		0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.1	ug/L	J	0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.09	ug/L	J	0.2	0.05	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.9	ug/L	J	1	0.2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.434	ug/L		0.2	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.4	ug/L	J	0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	25.0	ug/L		10	2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Selenium, Se	2.9	ug/L		1	0.2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	357	mg/L		1	0.3	CRJ	06/26/2019 20:31	EPA 300.1-1997, Rev. 1.0
Fluoride, F	2.69	mg/L		0.2	0.04	CRJ	06/27/2019 01:07	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	28.5	mg/L		1	0.2	CRJ	06/27/2019 01:07	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	4.47	pCi/L	0.19	0.44	ttp	7/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	3.47	pCi/L	0.25	0.12	sdw	7/9/2019	SW-846 9315-1986,Rev. 0

The carrier recovery (125.22%) is outside the established range of 30-110%.

*\*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.*

Sp-4

Sample Number: 192190-003

Date Collected: 06/20/2019 16:50

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.325	mg/L		0.1	0.02	DAM	07/09/2019 16:53	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	56.4	mg/L		0.3	0.04	DAM	07/09/2019 16:53	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.068	mg/L		0.03	0.009	DAM	07/09/2019 16:53	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.3	ug/L	J	0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.83	ug/L		0.5	0.2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Barium, Ba	337	ug/L		0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
The MS/MSD is outside the acceptable range of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.07	ug/L	J	0.2	0.05	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.06	ug/L		1	0.2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.388	ug/L		0.2	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Lead, Pb	1.07	ug/L		0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	2	ug/L	J	10	2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.4	ug/L	J	1	0.2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	450	mg/L		1	0.3	CRJ	06/26/2019 20:54	EPA 300.1-1997, Rev. 1.0
Fluoride, F	3.24	mg/L		0.2	0.04	CRJ	06/27/2019 01:52	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	58.0	mg/L		1	0.2	CRJ	06/27/2019 01:52	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.931	pCi/L	0.19	0.51	ttp	7/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	0.82	pCi/L	0.12	0.11	sdw	7/9/2019	SW-846 9315-1986, Rev. 0

The carrier recovery (124.33%) is outside the established range of 30-110%.

*\*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.*

SP-5

Sample Number: 192190-004

Date Collected: 06/20/2019 17:15

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.202	mg/L		0.1	0.02	DAM	07/09/2019 16:57	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	48.5	mg/L		0.3	0.04	DAM	07/09/2019 16:57	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.111	mg/L		0.03	0.009	DAM	07/09/2019 16:57	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Arsenic, As	59.9	ug/L		0.5	0.2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2410	ug/L		0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.05	ug/L	U	0.2	0.05	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.8	ug/L	J	1	0.2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.598	ug/L		0.2	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.701	ug/L		0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 2	ug/L	U	10	2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.2	ug/L	U	1	0.2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	675	mg/L		1	0.3	CRJ	06/26/2019 21:17	EPA 300.1-1997, Rev. 1.0
Fluoride, F	3.06	mg/L		0.2	0.04	CRJ	06/27/2019 02:15	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	0.9	mg/L	J	1	0.2	CRJ	06/27/2019 02:15	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.967	pCi/L	0.23	0.54	ttp	7/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	7.01	pCi/L	0.54	0.23	sdw	7/9/2019	SW-846 9315-1986,Rev. 0

The carrier recovery (111.55%) is outside the established range of 30-110%.

*\*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.*

SP-10

Sample Number: 192190-005

Date Collected: 06/20/2019 15:15

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.916	mg/L		0.1	0.02	DAM	07/09/2019 17:01	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	50.3	mg/L		0.3	0.04	DAM	07/09/2019 17:01	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.290	mg/L		0.03	0.009	DAM	07/09/2019 17:01	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.65	ug/L		0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.66	ug/L		0.5	0.2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3880	ug/L		0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.05	ug/L	U	0.2	0.05	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	8.76	ug/L		1	0.2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.743	ug/L		0.2	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.3	ug/L	J	0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	9	ug/L	J	10	2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.2	ug/L	U	1	0.2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	1780	mg/L		5	2	CRJ	06/26/2019 22:03	EPA 300.1-1997, Rev. 1.0
Fluoride, F	6.40	mg/L		0.3	0.07	CRJ	06/27/2019 03:01	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	30.3	mg/L		2	0.3	CRJ	06/27/2019 03:01	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.4	pCi/L	0.14	0.39	ttp	7/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	25	pCi/L	1.1	0.25	sdw	7/9/2019	SW-846 9315-1986, Rev. 0

The carrier recovery (145.83%) is outside the established range of 30-110%.

*\*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.*

SP-11

Sample Number: 192190-006

Date Collected: 06/20/2019 15:35

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.550	mg/L		0.1	0.02	DAM	07/09/2019 17:13	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	65.6	mg/L		0.3	0.04	DAM	07/09/2019 17:13	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.047	mg/L		0.03	0.009	DAM	07/09/2019 17:13	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.3	ug/L	J	0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Arsenic, As	4.18	ug/L		0.5	0.2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Barium, Ba	169	ug/L		0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.06	ug/L	J	0.2	0.05	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	6.71	ug/L		1	0.2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.948	ug/L		0.2	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.719	ug/L		0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 2	ug/L	U	10	2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.3	ug/L	J	1	0.2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	137	mg/L		1	0.3	CRJ	06/26/2019 22:26	EPA 300.1-1997, Rev. 1.0
Fluoride, F	1.67	mg/L		0.2	0.04	CRJ	06/27/2019 03:24	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	203	mg/L		10	2	CRJ	06/26/2019 22:26	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.42	pCi/L	0.18	0.61	ttp	7/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	0.39	pCi/L	0.11	0.20	sdw	7/9/2019	SW-846 9315-1986,Rev. 0

The carrier recovery (147.78%) is outside the established range of 30-110%.

*\*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.*

Duplicate BAP

Sample Number: 192190-007

Date Collected: 06/20/2019 16:20

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.208	mg/L		0.1	0.02	DAM	07/09/2019 17:42	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	119	mg/L		0.3	0.04	DAM	07/09/2019 17:42	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.034	mg/L		0.03	0.009	DAM	07/09/2019 17:42	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.91	ug/L		0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.31	ug/L		0.5	0.2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Barium, Ba	216	ug/L		0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.2	ug/L	J	0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.1	ug/L	J	0.2	0.05	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.7	ug/L	J	1	0.2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	4.87	ug/L		0.2	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.600	ug/L		0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	11.1	ug/L		10	2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Selenium, Se	8.7	ug/L		1	0.2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	28.9	mg/L		0.1	0.03	CRJ	06/26/2019 19:23	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.82	mg/L		0.2	0.04	CRJ	06/26/2019 19:23	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	63.6	mg/L		1	0.2	CRJ	06/26/2019 19:23	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

Equipment Blank BAP

Sample Number: 192190-008

Date Collected: 06/20/2019 17:25

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	< 0.02	mg/L	U	0.1	0.02	DAM	07/09/2019 17:46	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	0.07	mg/L	J	0.3	0.04	DAM	07/09/2019 17:46	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.03	mg/L	J	0.03	0.009	DAM	07/09/2019 17:46	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	< 0.02	ug/L	U	0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Arsenic, As	< 0.03	ug/L	U	0.1	0.03	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Barium, Ba	0.41	ug/L		0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.02	ug/L	U	0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.01	ug/L	U	0.05	0.01	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.07	ug/L	J	0.2	0.04	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.02	ug/L	U	0.05	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.02	ug/L	U	0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 0.4	ug/L	U	2	0.4	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.03	ug/L	U	0.2	0.03	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
 J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*



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**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40446 <b>Date Received:</b> 08/29/2019	<b>Company:</b> SEP - Environmental (JP-W) <b>Contact:</b> Jill Parker-Witt <b>Phone:</b> (318) 673-3816	<b>Address:</b> 502 N. Allen Avenue Shreveport, LA 71101 <b>Fax:</b> (318) 673-3960
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<b>AEP Sample ID</b> : 228531 <b>Cust Sample ID:</b> SP-1 <b>Sample Desc.:</b> CCR	<b>Collected Date:</b> 08/26/2019 <b>Location:</b> Northeastern PP	<b>By:</b> KM/MH <b>Matrix:</b> Water
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<b>Metals (228531)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 12:59	U	LNM

<b>Water (228531)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	9	mg/L	0.219	1	EPA 300.0	09/01/2019 11:12		GB
Fluoride	0.525	mg/L	0.083	1	EPA 300.0	09/01/2019 11:12	J	GB
Solids, Total Dissolved (TDS)	438	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	48	mg/L	0.140	1	EPA 300.0	09/01/2019 11:12		GB

<b>AEP Sample ID</b> : 228532 <b>Cust Sample ID:</b> SP-2 <b>Sample Desc.:</b> CCR	<b>Collected Date:</b> 08/26/2019 <b>Location:</b> Northeastern PP	<b>By:</b> KM/MH <b>Matrix:</b> Water
--	---	--

<b>Metals (228532)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 13:02	U	LNM

<b>Water (228532)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	1072	mg/L	0.219	1:10	EPA 300.0	09/01/2019 14:00		GB
Fluoride	2.685	mg/L	0.083	1	EPA 300.0	09/01/2019 13:41		GB
Solids, Total Dissolved (TDS)	2246	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	14	mg/L	0.140	1	EPA 300.0	09/01/2019 13:41		GB





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 228533	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-4	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228533)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:29	U	LNM

<b>Water (228533)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	458	mg/L	0.219	1:10	EPA 300.0	09/01/2019 15:15		GB
Fluoride	2.990	mg/L	0.083	1	EPA 300.0	09/01/2019 14:56		GB
Solids, Total Dissolved (TDS)	1170	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	61	mg/L	0.140	1	EPA 300.0	09/01/2019 14:56		GB

<b>AEP Sample ID</b> : 228534	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-5	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228534)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:32	U	LNM

<b>Water (228534)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	697	mg/L	0.219	1:10	EPA 300.0	09/01/2019 15:53		GB
Fluoride	2.789	mg/L	0.083	1	EPA 300.0	09/01/2019 15:34		GB
Solids, Total Dissolved (TDS)	1450	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	3	mg/L	0.140	1	EPA 300.0	09/01/2019 15:34		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 228535	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-10	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228535)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:35	U	LNM

<b>Water (228535)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	1939	mg/L	0.219	1:10	EPA 300.0	09/01/2019 16:30		GB
Fluoride	4.874	mg/L	0.083	1:10	EPA 300.0	09/01/2019 16:30		GB
Solids, Total Dissolved (TDS)	3446	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	29	mg/L	0.140	1	EPA 300.0	09/01/2019 16:11		GB

<b>AEP Sample ID</b> : 228536	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-11	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228536)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:38	U	LNM

<b>Water (228536)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	129	mg/L	0.219	1:10	EPA 300.0	09/01/2019 17:08		GB
Fluoride	2.225	mg/L	0.083	1	EPA 300.0	09/01/2019 16:49		GB
Solids, Total Dissolved (TDS)	970	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	122	mg/L	0.140	1:10	EPA 300.0	09/01/2019 17:08		GB

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEPAnalytical Chemistry Services.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 228537	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> Duplicate BAP	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228537)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:41	U	LNM

<b>Water (228537)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	1922	mg/L	0.219	1:10	EPA 300.0	09/01/2019 17:45		GB
Fluoride	4.791	mg/L	0.083	1:10	EPA 300.0	09/01/2019 17:45		GB
Solids, Total Dissolved (TDS)	3498	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	30	mg/L	0.140	1	EPA 300.0	09/01/2016 17:26		GB

<b>AEP Sample ID</b> : 228538	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> Equipment Blank BAP	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228538)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:44	U	LNM



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

### 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*	%			
9/1/2019	Chloride	228531		25	23	92.0	25	25	100.0		0.0	GB
9/1/2019	Chloride		<0.219									GB
9/1/2019	Chloride	228539.1		25	23	92.0	25	33	132.0		0.0	GB
9/1/2019	Fluoride	228531		6	5.8	96.7	6	5.9	98.3		0.0	GB
9/1/2019	Fluoride		<0.083									GB
9/1/2019	Fluoride	228539.1		6	5.8	96.7	6	6.1	101.7		0.0	GB
9/6/2019	Mercury	228512.2	<0.00000	0.001	0.0009894	98.9	0.001	0.0012053	120.5		1.9	JDB
9/6/2019	Mercury	228502.2	<0.00000	0.001	0.00104	104.0	0.001	0.0011859	118.6		0.8	JDB
9/6/2019	Mercury	228492.2	<0.00000	0.001	0.00104	104.0	0.001	0.0009299	93.0		9.5	JDB
9/6/2019	Mercury	228522.2	0.0000068	0.001	0.0010355	103.6	0.001	0.001099	109.9		3.5	JDB
9/6/2019	Mercury	228552.1	<0.00000	0.001	0.0009375	93.7	0.001	0.0009907	99.1		1.3	JDB
9/6/2019	Mercury	228532.2	0.0000068	0.001	0.0010355	103.6	0.001	0.0011589	115.9		4.2	JDB
8/30/2019	Solids, Total Dissolved (TDS)	228494	<2	50	46	92.0	1018	1008	99.0		1.8	JTD
9/1/2019	Sulfate	228539.1		25	23	92.0	50	59	118.0		0.0	GB
9/1/2019	Sulfate	228531		25	23	92.0	25	27	108.0		2.0	GB
9/1/2019	Sulfate		<0.140									GB

Date required: 10/12/19

**Code Code Description**

- J Concentration estimated. Analyte was detected between the Method Detection Limit (MDL) and Minimum Quantitation Limit (MQL).
- U Analyte concentration below MDL.

\_\_\_\_\_  
 Quality Assurance Officer

10-Oct-19  
 Report Date

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

### Chain of Custody Record

Project Name: Northeastern PP CCR  
Contact Name: Jill Parker-Witt  
Contact Phone: 318-673-3816  
Sampler(s): Kenneth McDonald/Matt Hamilton

Analysis Turnaround Time (in Calendar Days)  
**RESULTS DUE OCTOBER 12**

Program: Coal Combustion Residuals (CCR)

Site Contact: \_\_\_\_\_ Date: \_\_\_\_\_  
COC/Order #: \_\_\_\_\_  
For Lab Use Only: \_\_\_\_\_

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Mercury	dissolved Fe and Mn	CHLORIDE, FLUORIDE, SULFATE, TDS	Ra-226, Ra-228	Sample Specific Notes:
SP-1	8/26/2019	1650	G	GW	2		X		X		228531.14.2
SP-2	8/26/2019	1640	G	GW	2		X		X		228532.14.2
SP-4	8/26/2019	1705	G	GW	2		X		X		228533.14.2
SP-5	8/26/2019	1720	G	GW	2		X		X		228534.14.2
SP-10	8/26/2019	1622	G	GW	2		X		X		228535.14.2
SP-11	8/26/2019	1635	G	GW	2		X		X		228536.14.2
DUPLICATE BAP	8/26/2019	1622	G	GW	2		X		X		228537.14.2
EQUIPMENT BLANK BAP	8/26/2019	1700	G	W	1		X				228538

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ; F= filter in field  
\* Six 1L Bottles must be collected for Radium for every 10th sample.

**\*\*\*\*\* RESULTS DUE OCTOBER 12**

Special Instructions/QC Requirements & Comments:

Relinquished by: <i>[Signature]</i>	Company: <i>East</i>	Date/Time: <i>8-25-19 11:40</i>	Received by: _____	Date/Time: _____
Relinquished by: _____	Company: _____	Date/Time: _____	Received by: <i>[Signature]</i>	Date/Time: <i>8-29-19 11:45</i>



SHREVEPORT CHEMICAL LABORATORY

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

### PROJECT RECEIPT FORM

<b>Container Type</b> <input checked="" type="radio"/> Ice Chest    Bag    Action Pak    PCB Mailer <input checked="" type="radio"/> Bottle Other _____				<b>Delivery Type</b> UPS    FEDEX    US Mail <input checked="" type="radio"/> Walk in    Shuttle Other _____			
Tracking # _____							

Client Bill Parker with  
 Received By SANDRA WALLACE    DGA    PCB Oil     Water    Oil    Soil  
 Received Date 8-29-19  
 Open Date 8-29-19    Solid    Liquid    Other \_\_\_\_\_

Container Temp    Read 3.5    Project I.D. Coc. 4044b  
Thermometer Serial #F04103  
 Correction Factor 1.2  
 Corrected Temp 4.7    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    NO \_\_\_\_\_

Were samples labeled properly?     YES    NO \_\_\_\_\_

Were correct containers used?     YES    NO \_\_\_\_\_

Were the pH's of samples appropriately checked?     YES    NO \_\_\_\_\_

Total number of sample containers    15    \_\_\_\_\_

Was any corrective action taken?     NO    Person Contacted \_\_\_\_\_  
 Date & Time \_\_\_\_\_

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Sample ID	Analysis	pH	Preservative Added / Lot #		
SP-1	metals	< 2	/		
SP-2	↓	↓	/		
<del>SP-3</del>			/		
SP-4			/		
SP-5			/		
SP-10			/		
SP-11			/		
Duplicate BAG			/		
Equipment Blank BAG			↓	↓	/
					/
					/
			/		
			/		
			/		
			/		
			/		
			/		
			/		
			/		

SW.  
8/29/19





Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 10/10/2019**

**SP-1**

**Sample Number: 192952-001**

**Date Collected: 08/26/2019 16:50**

**Date Received: 9/4/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.43	ug/L		0.1	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.73	ug/L		0.1	0.03	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Barium, Ba	160	ug/L		0.2	0.05	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.08	ug/L	J	0.1	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.09	ug/L		0.05	0.01	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.49	ug/L		0.2	0.04	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.481	ug/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.835	ug/L		0.2	0.05	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	5.86	ug/L		2	0.4	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Selenium, Se	3.4	ug/L		0.2	0.03	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.1	ug/L	J	0.5	0.1	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Boron, B	0.124	mg/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	120	mg/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00285	mg/L		0.0002	0.00005	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.41	pCi/L	0.16	0.47	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	1.34	pCi/L	0.20	0.18	sdw	9/10/2019	SW-846 9315-1986,Rev. 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.*



SP-2

Sample Number: 192952-002

Date Collected: 08/26/2019 16:40

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.22	ug/L		0.1	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.53	ug/L		0.1	0.03	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Barium, Ba	1220	ug/L		1	0.2	KAN	09/23/2019 16:11	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.07	ug/L	J	0.1	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.05	ug/L		0.05	0.01	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.701	ug/L		0.2	0.04	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.568	ug/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.334	ug/L		0.2	0.05	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	22.3	ug/L		2	0.4	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Selenium, Se	3.7	ug/L		0.2	0.03	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.1	ug/L	J	0.5	0.1	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Boron, B	0.173	mg/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	211	mg/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0582	mg/L		0.0002	0.00005	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.62	pCi/L	0.22	0.52	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	3.1	pCi/L	0.26	0.13	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

Sp-4

Sample Number: 192952-003

Date Collected: 08/26/2019 17:05

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.25	ug/L		0.1	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.64	ug/L		0.1	0.03	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Barium, Ba	359	ug/L		0.2	0.05	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
The MS/MSD is outside the acceptable limit of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Beryllium, Be	0.101	ug/L		0.1	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.05	ug/L		0.05	0.01	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.01	ug/L		0.2	0.04	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.07	ug/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.596	ug/L		0.2	0.05	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	2	ug/L	J	2	0.4	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.6	ug/L		0.2	0.03	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Boron, B	0.365	mg/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	182	mg/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
The MS is outside the acceptable limit of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Lithium, Li	0.0554	mg/L		0.0002	0.00005	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.23	pCi/L	0.18	0.52	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	1.01	pCi/L	0.16	0.18	sdw	9/10/2019	SW-846 9315-1986,Rev. 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.*

SP-5R

Sample Number: 192952-004

Date Collected: 08/26/2019 17:20

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.06	ug/L	J	0.1	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Arsenic, As	49.3	ug/L		0.1	0.03	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2340	ug/L		1	0.2	KAN	09/23/2019 16:21	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.06	ug/L	J	0.1	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.02	ug/L	J	0.05	0.01	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.335	ug/L		0.2	0.04	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.485	ug/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.545	ug/L		0.2	0.05	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	1	ug/L	J	2	0.4	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.1	ug/L	J	0.2	0.03	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Boron, B	0.220	mg/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	128	mg/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0928	mg/L		0.0002	0.00005	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.99	pCi/L	0.20	0.41	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	5.57	pCi/L	0.36	0.15	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

SP-10

Sample Number: 192952-005

Date Collected: 08/26/2019 16:22

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.61	ug/L		0.1	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.00	ug/L		0.1	0.03	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3060	ug/L		1	0.2	KAN	09/23/2019 16:26	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.08	ug/L	J	0.1	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.03	ug/L	J	0.05	0.01	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.61	ug/L		0.2	0.04	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.06	ug/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.449	ug/L		0.2	0.05	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	8.22	ug/L		2	0.4	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.4	ug/L		0.2	0.03	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Boron, B	1.03	mg/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	216	mg/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.241	mg/L		0.0002	0.00005	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.17	pCi/L	0.13	0.38	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	6.94	pCi/L	0.39	0.14	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The RPD between the sample and duplicate result exceed 25%. The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

SP-11

Sample Number: 192952-006

Date Collected: 08/26/2019 16:35

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.37	ug/L		0.1	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Arsenic, As	6.30	ug/L		0.1	0.03	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Barium, Ba	492	ug/L		0.2	0.05	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.04	ug/L	J	0.1	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.13	ug/L		0.05	0.01	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.47	ug/L		0.2	0.04	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	2.73	ug/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.764	ug/L		0.2	0.05	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	5.70	ug/L		2	0.4	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.8	ug/L		0.2	0.03	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Boron, B	0.304	mg/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	139	mg/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0337	mg/L		0.0002	0.00005	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.583	pCi/L	0.15	0.48	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	1.04	pCi/L	0.16	0.16	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

Duplicate BAP

Sample Number: 192952-007

Date Collected: 08/26/2019 16:22

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.38	ug/L		0.1	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Arsenic, As	2.93	ug/L		0.1	0.03	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3190	ug/L		1	0.2	KAN	09/23/2019 18:14	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.04	ug/L	J	0.1	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.01	ug/L	J	0.05	0.01	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.836	ug/L		0.2	0.04	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.369	ug/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.1	ug/L	J	0.2	0.05	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	4.01	ug/L		2	0.4	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.1	ug/L	J	0.2	0.03	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Boron, B	1.06	mg/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	213	mg/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.249	mg/L		0.0002	0.00005	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

Equipment Blank

Sample Number: 192952-008

Date Collected: 08/26/2019 17:00

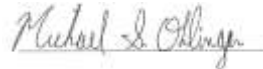
Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.02	ug/L	U	0.1	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Arsenic, As	< 0.03	ug/L	U	0.1	0.03	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Barium, Ba	0.26	ug/L		0.2	0.05	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.02	ug/L	U	0.1	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.01	ug/L	U	0.05	0.01	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.04	ug/L	J	0.2	0.04	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.02	ug/L	U	0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.05	ug/L	U	0.2	0.05	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 0.4	ug/L	U	2	0.4	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.03	ug/L	J	0.2	0.03	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Boron, B	0.087	mg/L		0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	0.03	mg/L	J	0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00009	mg/L	J	0.0002	0.00005	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
 J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

BAP CCR



**Michael Ohlinger, Chemist**

Email msohlinger@aep.com Tel.

Fax 614-836-4168 Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

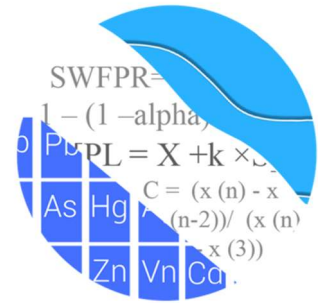
**ATTACHMENT D**  
**Statistical Analysis Output**



# GROUNDWATER STATS CONSULTING

December 9, 2019

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



Re: Northeastern BAP  
Assessment Monitoring Event – December 2019

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis of the February 2019 data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

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

- **Upgradient wells:** SP-4 and SP-5; and
- **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 CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) - boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

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

Time series and box plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figures A & B respectively). Values previously flagged during the screening as outliers may be seen in a lighter font and disconnected symbol on the time series graphs (Figure C).

### **Evaluation of Appendix III Parameters**

Intrawell prediction limits combined with a 1-of-2 verification strategy were constructed for calcium and interwell prediction limits combined with a 1-of-2 verification strategy were constructed for boron, chloride, fluoride, pH, sulfate and TDS (Figures D & E). In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one additional sample to determine whether the initial exceedance is confirmed. When the resample confirms the initial exceedance, a statistically significant increase (SSI) is identified and further research would be required to identify the cause of the exceedance (i.e. impact from the site, natural variation, or an off-site source). If the resample falls within the statistical limit, the initial exceedance is considered a false positive result and, therefore, no further action is necessary. The statistical method selected for each parameter was determined based on the results of the screening analysis performed in January 2018.

The Sen's Slope/Mann Kendall trend test was used to evaluate upgradient well data for constituents tested with interwell prediction limits for the purpose of updating (Figure F). No statistically significant trends were found except for a decreasing trend for sulfate in upgradient well SP-5. While concentrations are lower than historical concentrations in this well, the entire record of measurements is significantly lower than those reported in upgradient well SP-4. Therefore, no adjustment was required to this record. A summary table of trend test results follows this letter.

Intrawell prediction limits utilize background through October 2017 until a minimum of 4 new samples are available. Background data will be tested for updating when sufficient samples are available.

## Evaluation of Appendix IV Parameters

Parametric tolerance limits were used to calculate background limits from pooled upgradient well data for Appendix IV parameters with a target of 95% confidence and 95% coverage to determine the Alternate Contaminant Level (ACL) (Figure G). The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels 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.

Background data are screened for outliers and extreme trending patterns that would lead to artificially elevated statistical limits. Tukey's outlier test on downgradient wells only identified a high value for combined radium 226 + 228 in well SP-1, which was flagged as an outlier. Additional values not identified by Tukey's test were flagged as outliers as they did not represent the populations of their respective wells are chromium in well SP-10, combined radium in well SP-11, lithium in well SP-1 and molybdenum in well SP-10.

Substantially high values were identified across many Appendix IV parameters for upgradient well SP-4 on 8/4/17 through visual screening. Since they appear as laboratory or sampling issues, they have been flagged as outliers but will be re-evaluated after further confirmation. Any flagged values may be seen on the Outlier Summary following this letter.

Parametric limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels 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 were then constructed on downgradient wells for each of the Appendix IV parameters using the highest limit of the MCL, RSL, or ACL 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. No confidence intervals exceedances were found except for lithium in well SP-10. A summary of the confidence interval results follows this letter.

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,

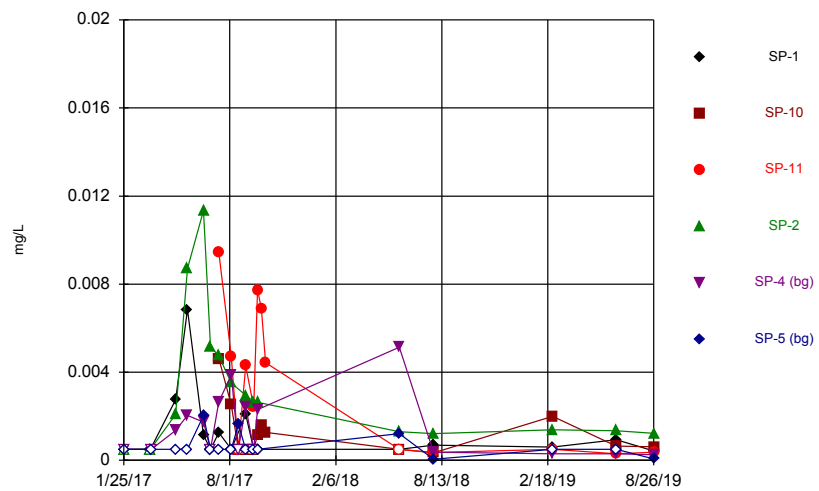


Andrew T. Collins  
Groundwater Analyst



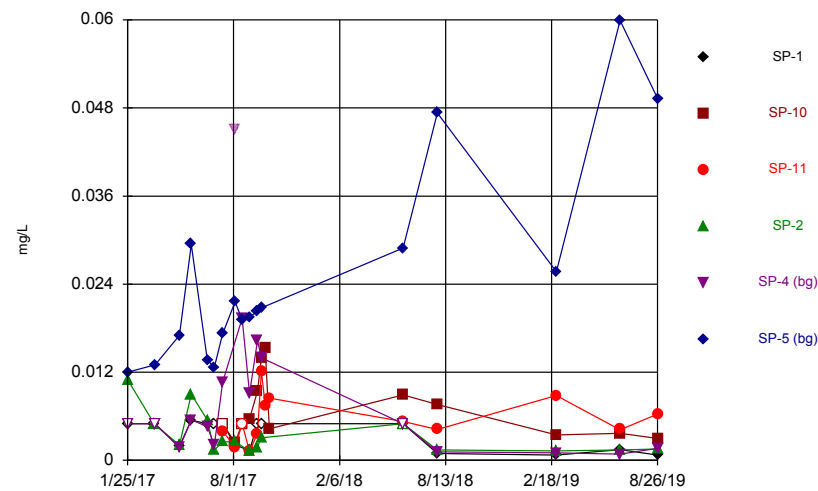
Kristina L. Rayner  
Groundwater Statistician

Time Series



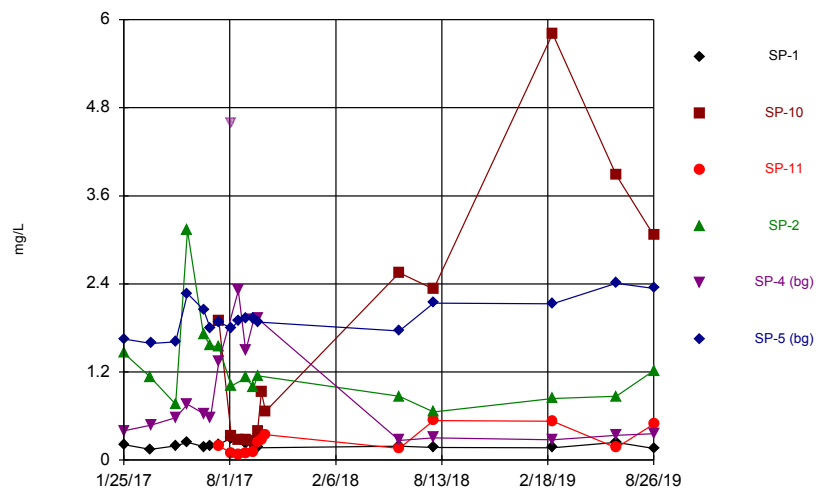
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Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



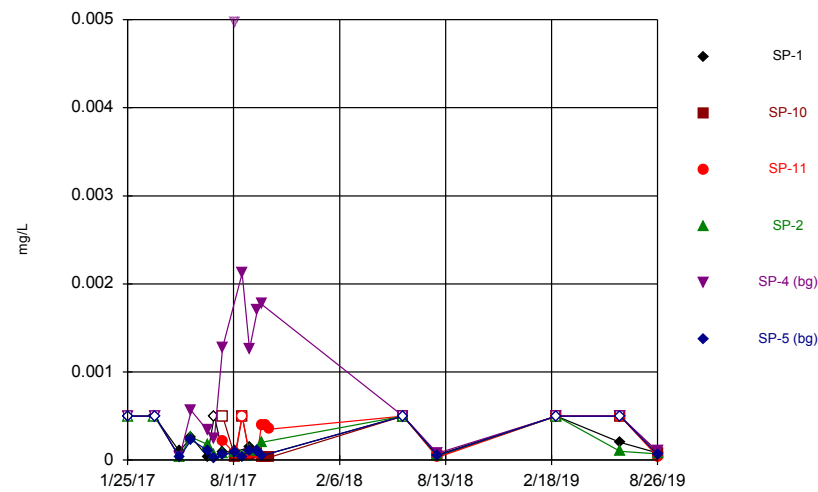
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Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



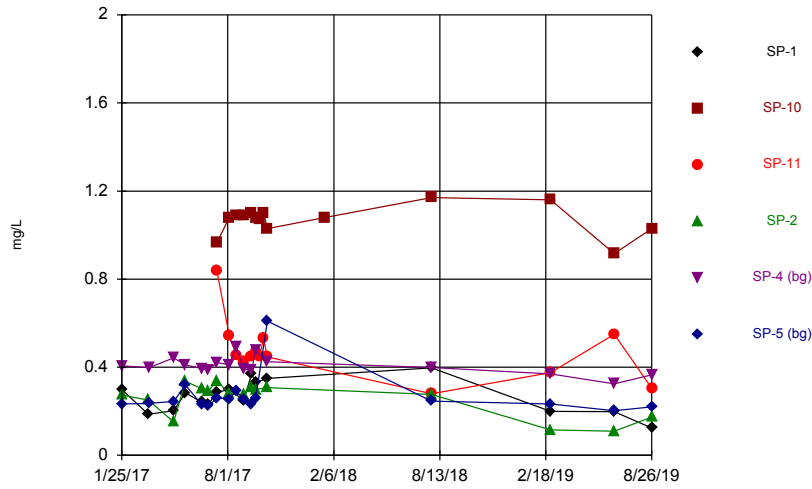
Constituent: Barium Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



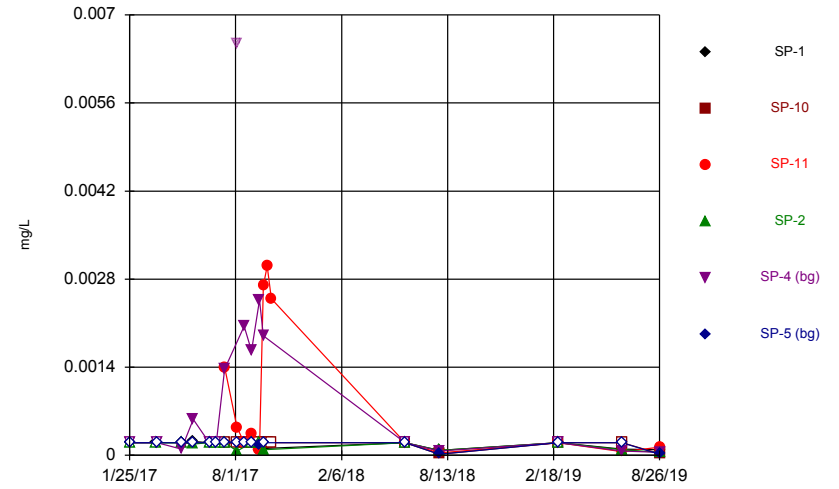
Constituent: Beryllium Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



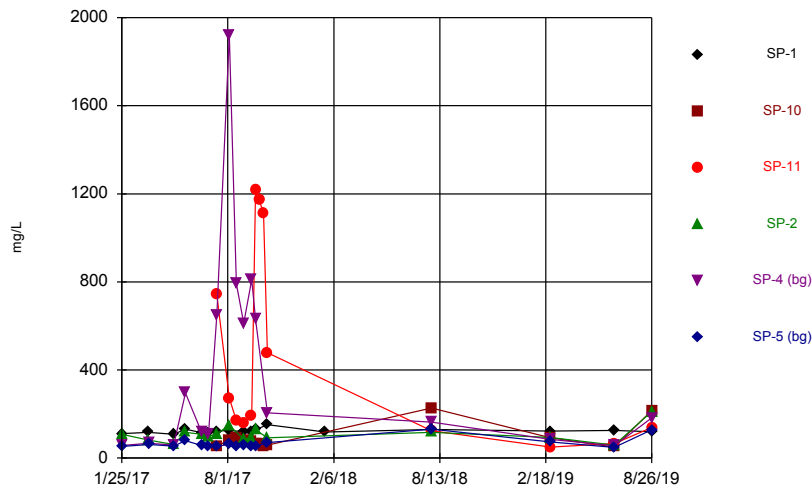
Constituent: Boron Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



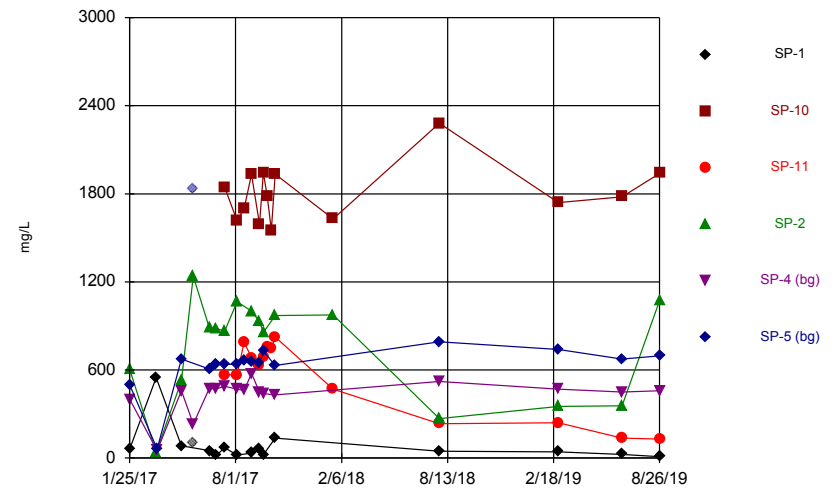
Constituent: Cadmium Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



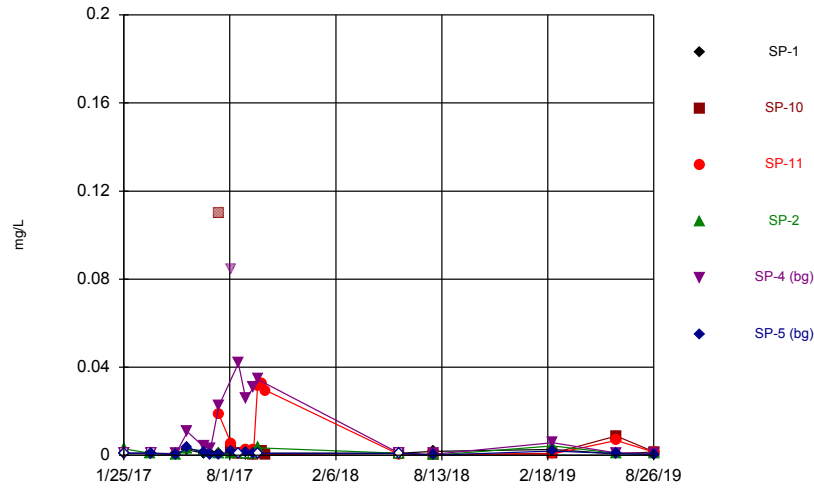
Constituent: Calcium Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



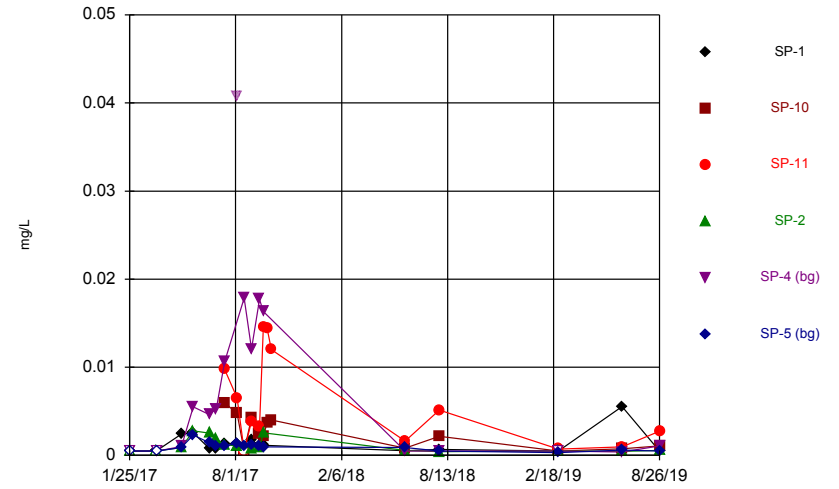
Constituent: Chloride Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



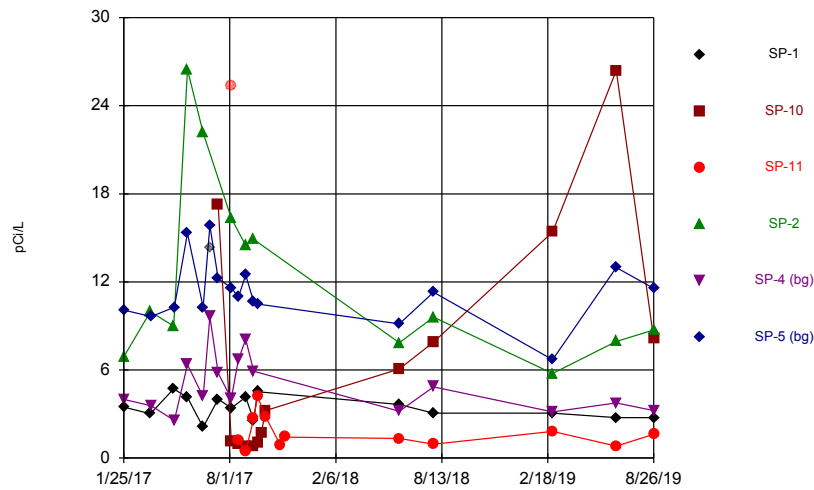
Constituent: Chromium Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



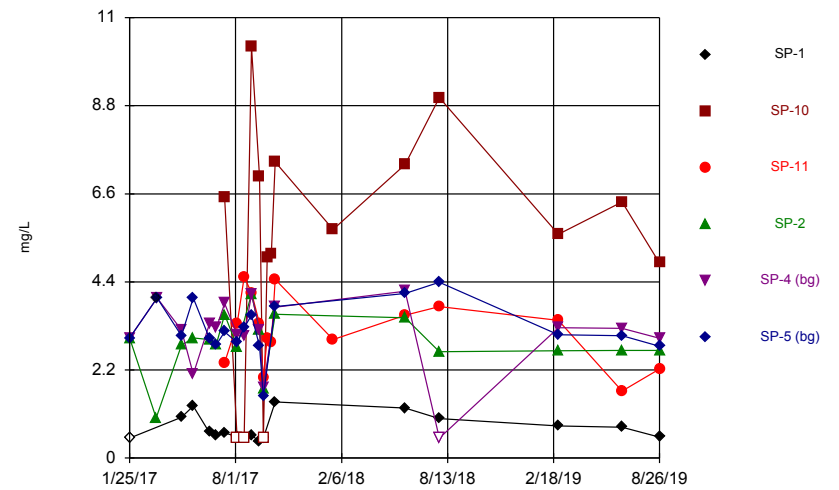
Constituent: Cobalt Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



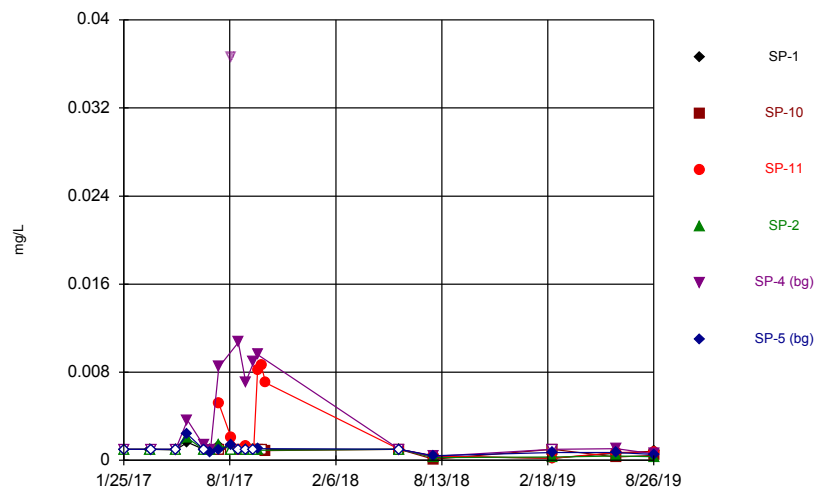
Constituent: Combined Radium 226 + 228 Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



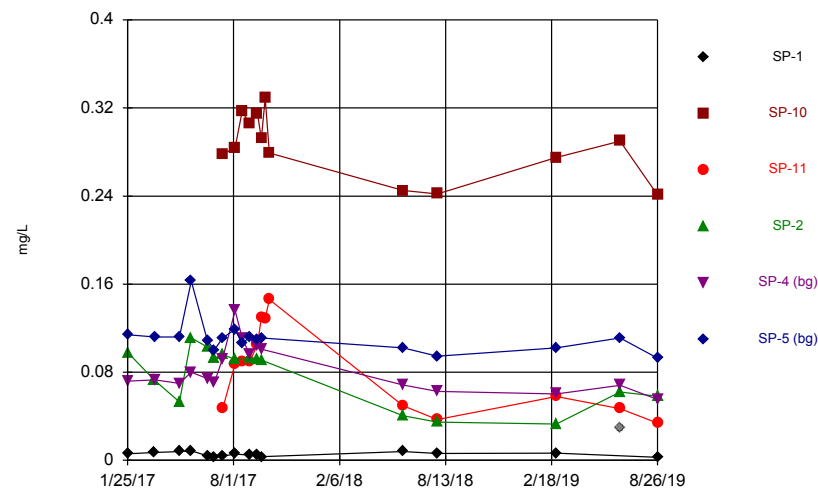
Constituent: Fluoride Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



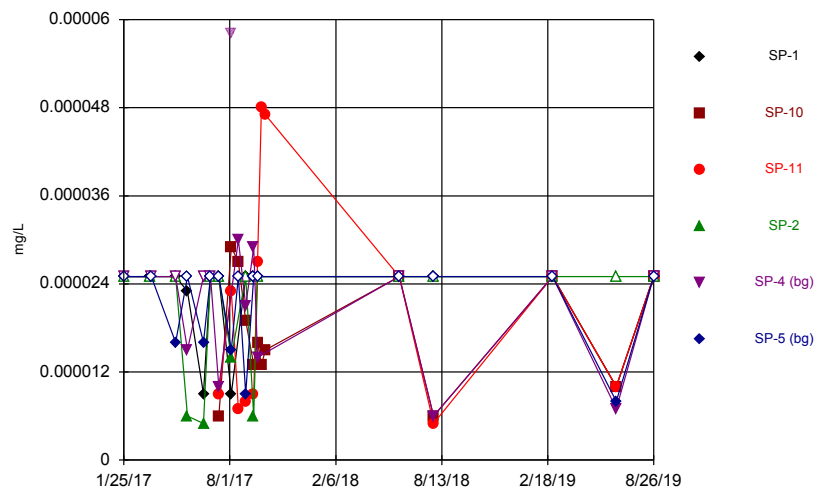
Constituent: Lead Analysis Run 12/9/2019 11:54 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



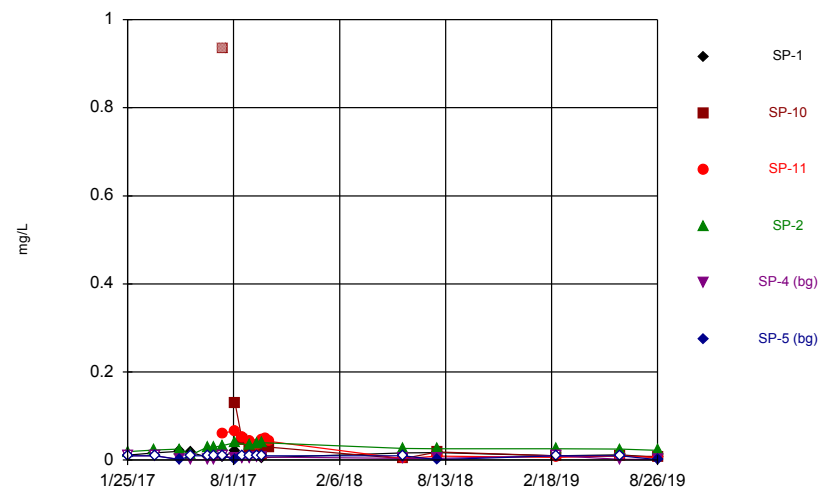
Constituent: Lithium Analysis Run 12/9/2019 11:54 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



Constituent: Mercury Analysis Run 12/9/2019 11:54 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

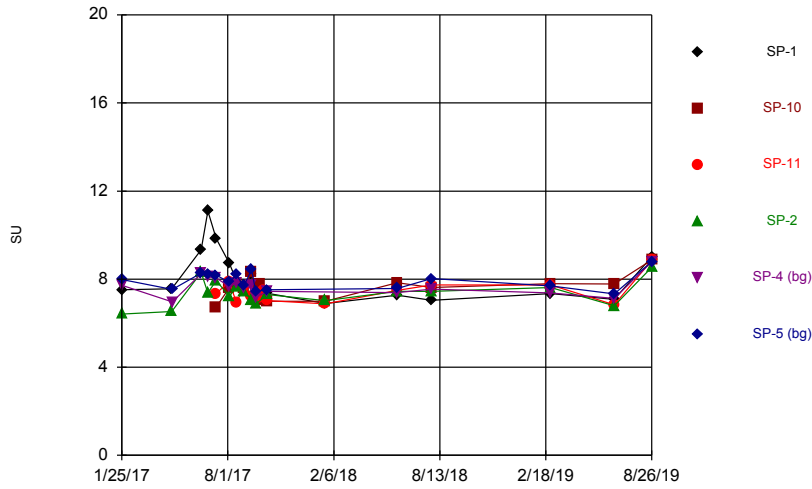
Time Series



Constituent: Molybdenum Analysis Run 12/9/2019 11:54 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

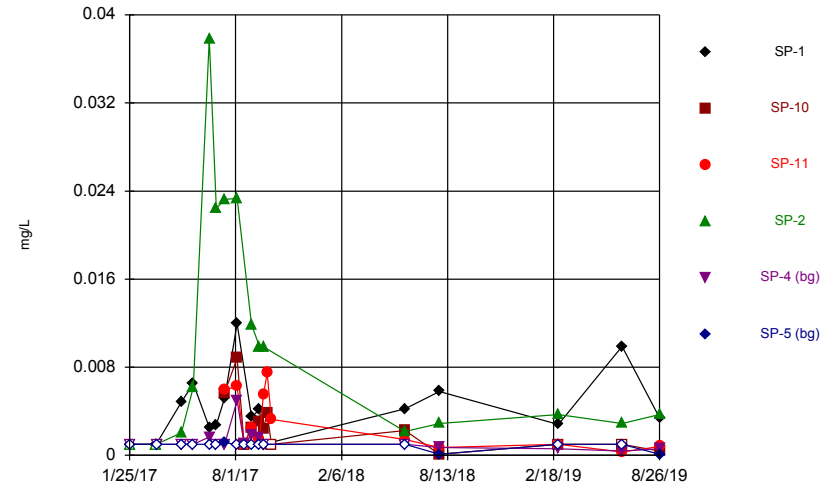


Time Series



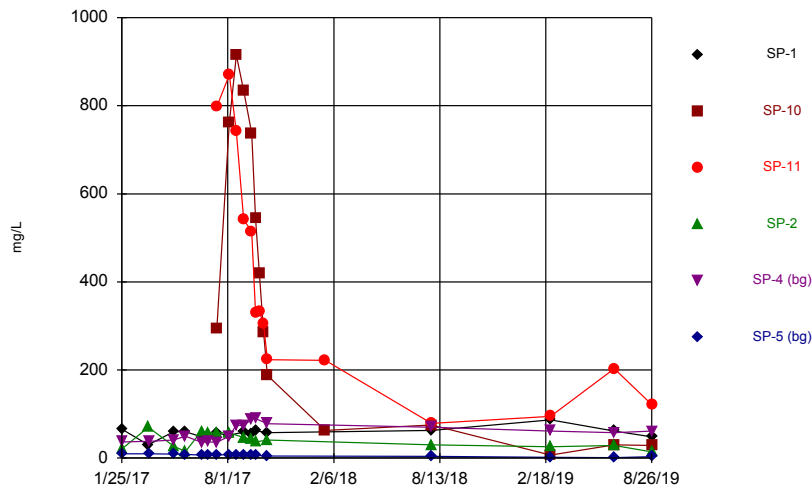
Constituent: pH, field Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



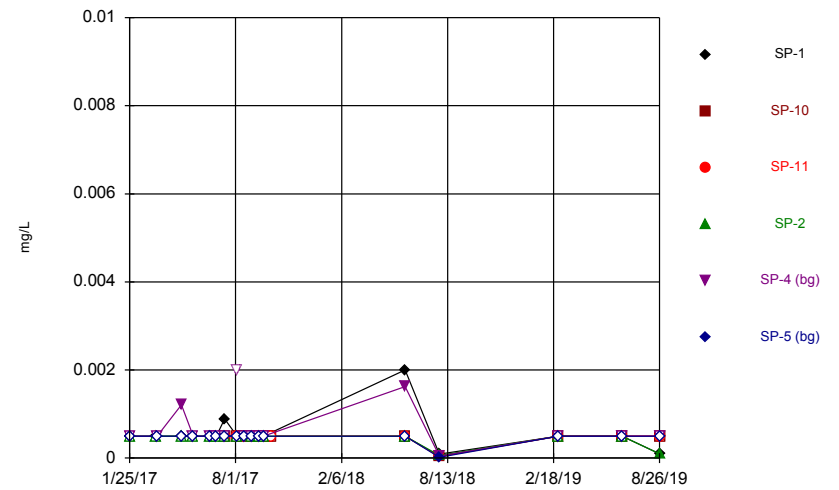
Constituent: Selenium Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



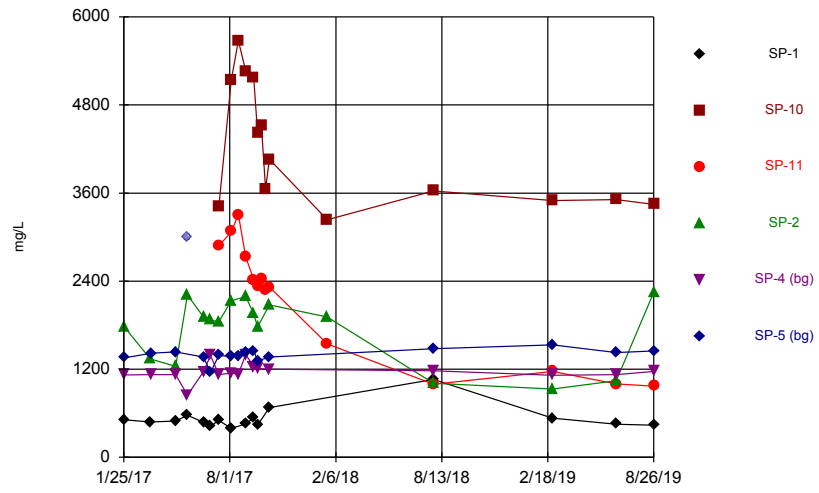
Constituent: Sulfate Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



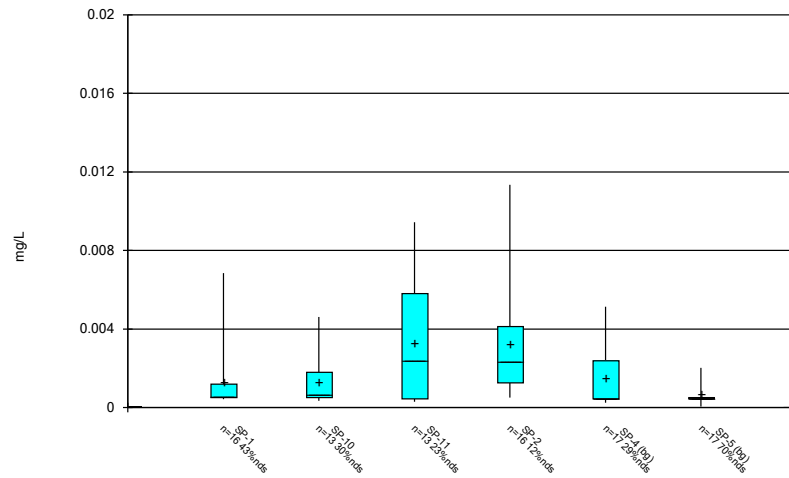
Constituent: Thallium Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Time Series



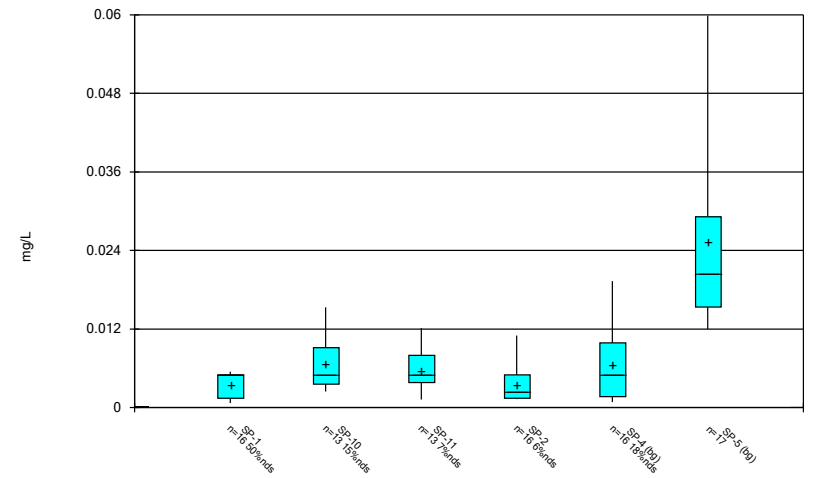
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/9/2019 11:54 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



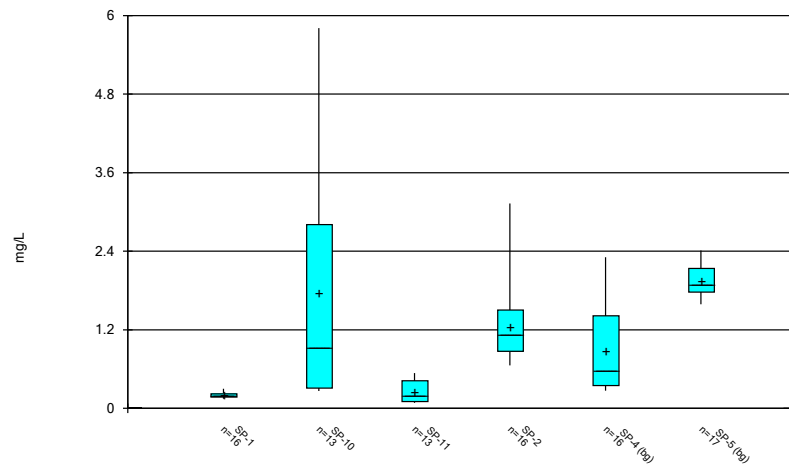
Constituent: Antimony Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



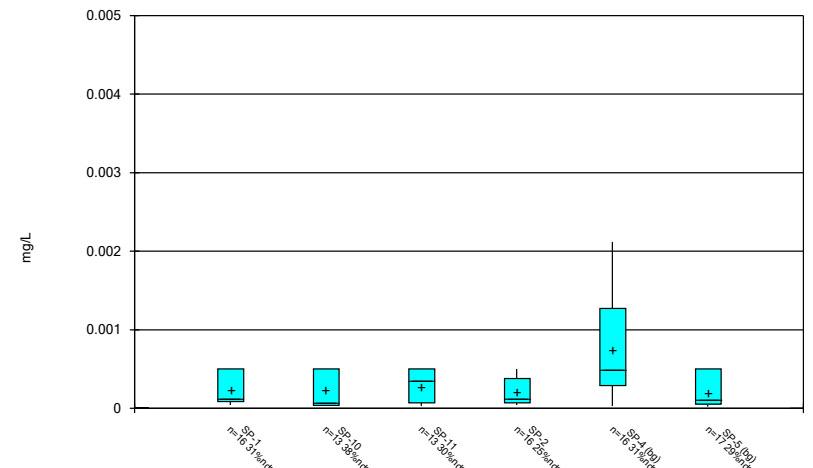
Constituent: Arsenic Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



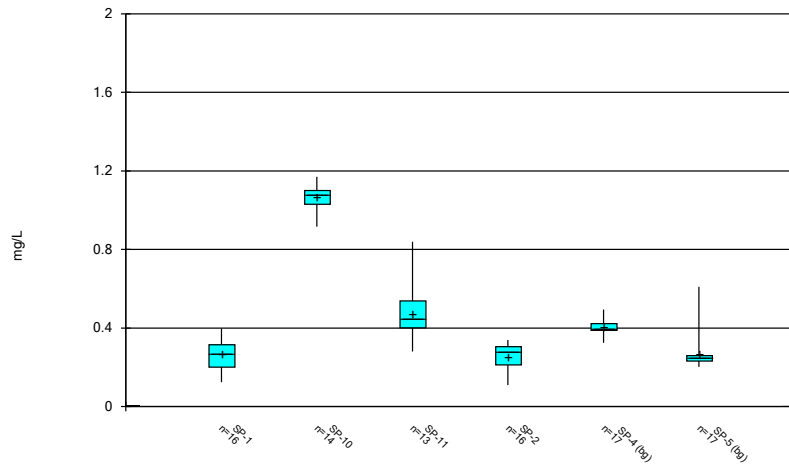
Constituent: Barium Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



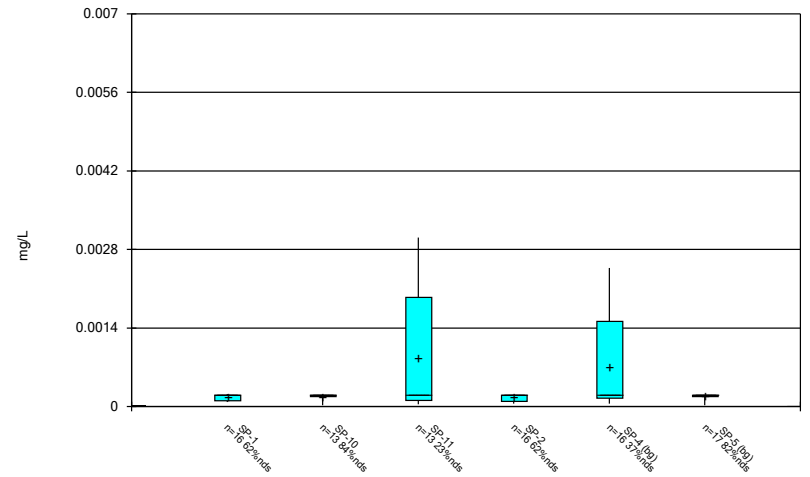
Constituent: Beryllium Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



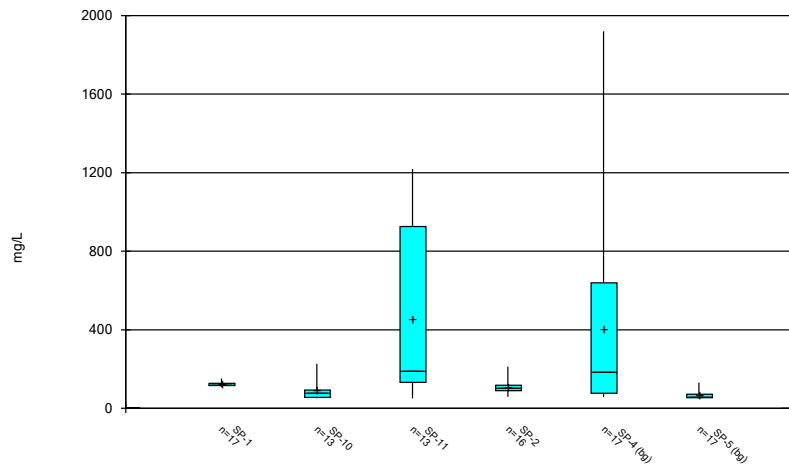
Constituent: Boron Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



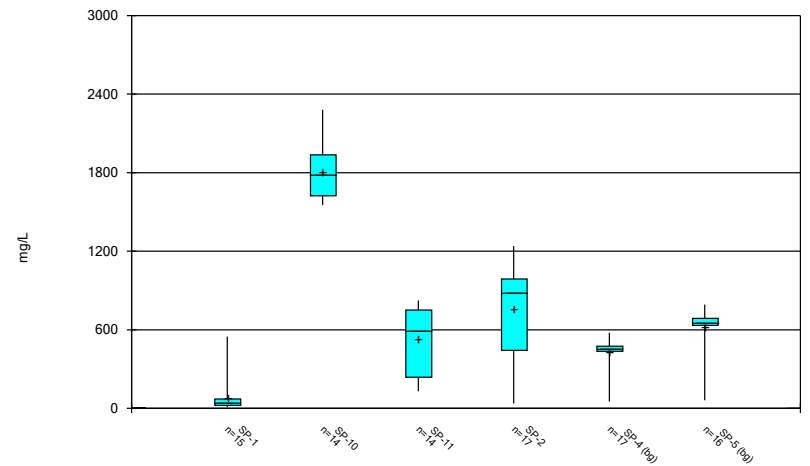
Constituent: Cadmium Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



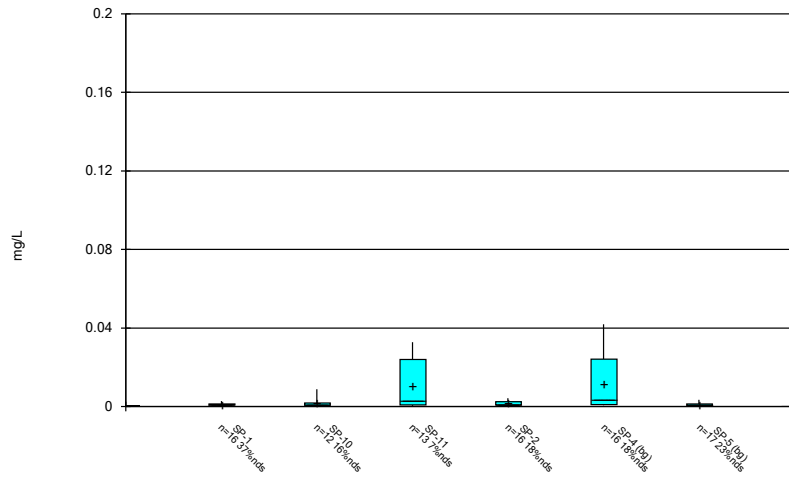
Constituent: Calcium Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



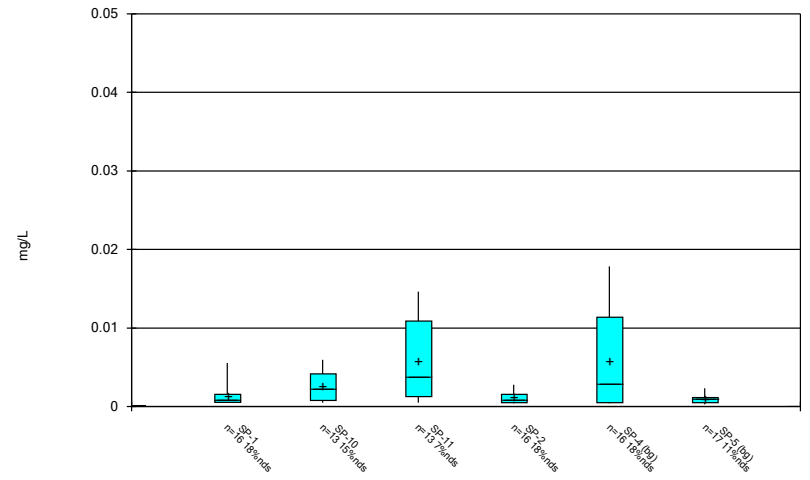
Constituent: Chloride Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



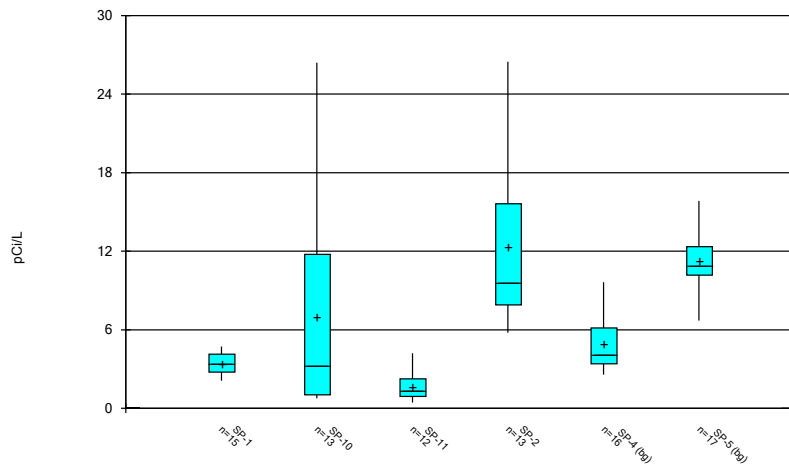
Constituent: Chromium Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



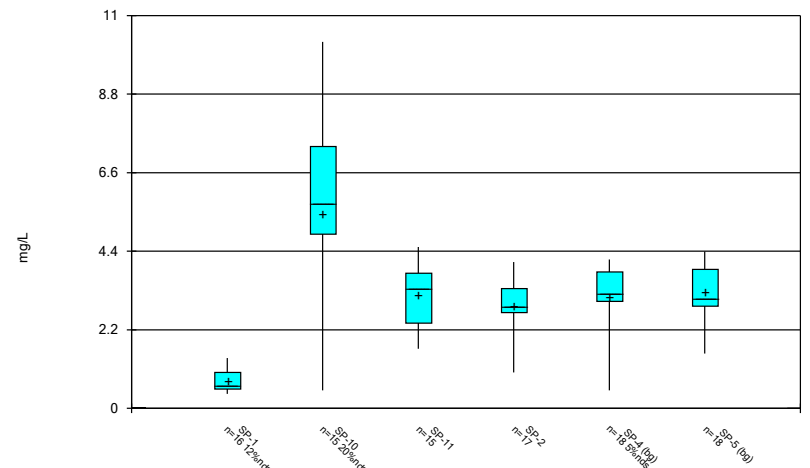
Constituent: Cobalt Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



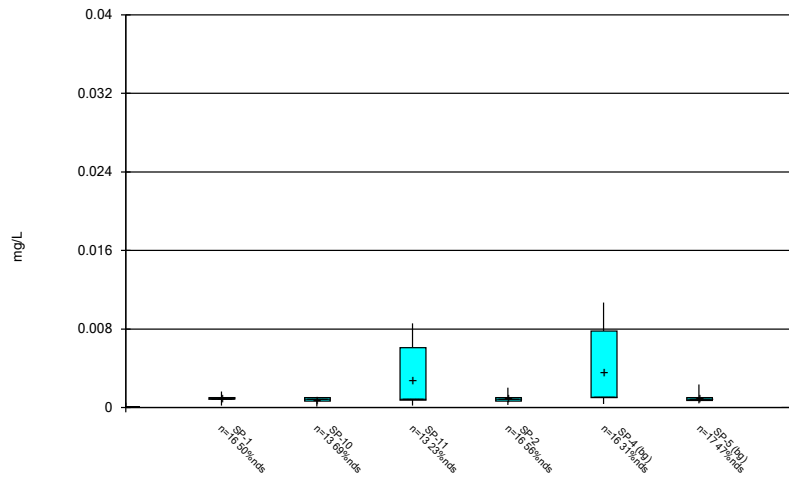
Constituent: Combined Radium 226 + 228 Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



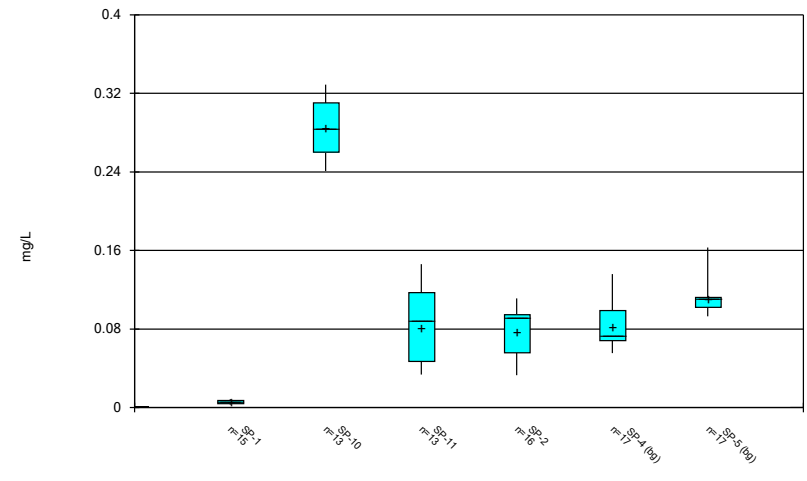
Constituent: Fluoride Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



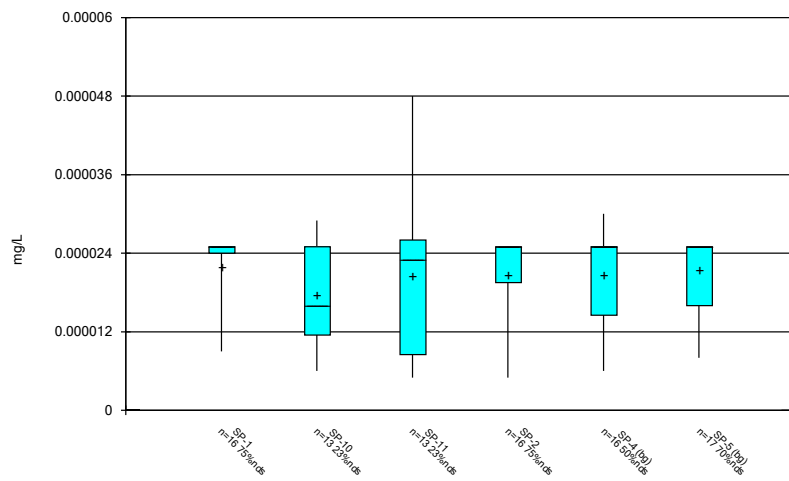
Constituent: Lead Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



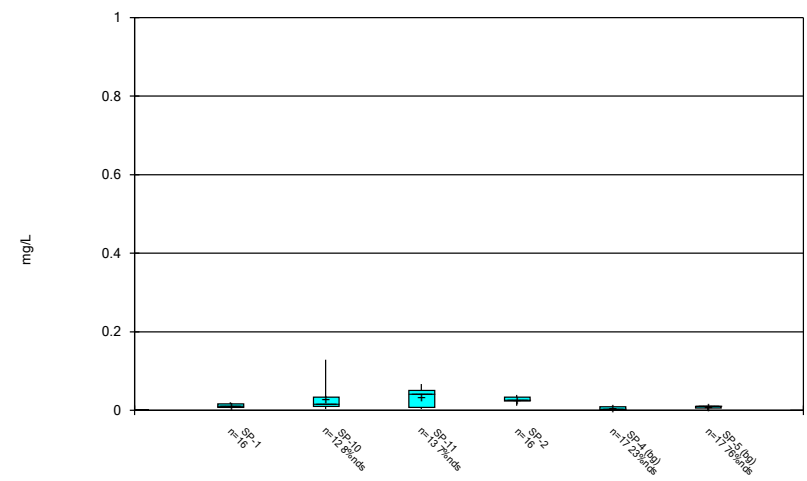
Constituent: Lithium Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



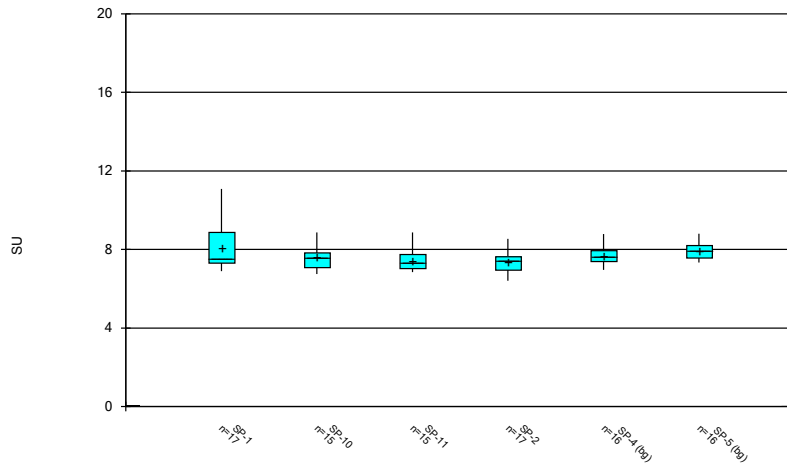
Constituent: Mercury Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



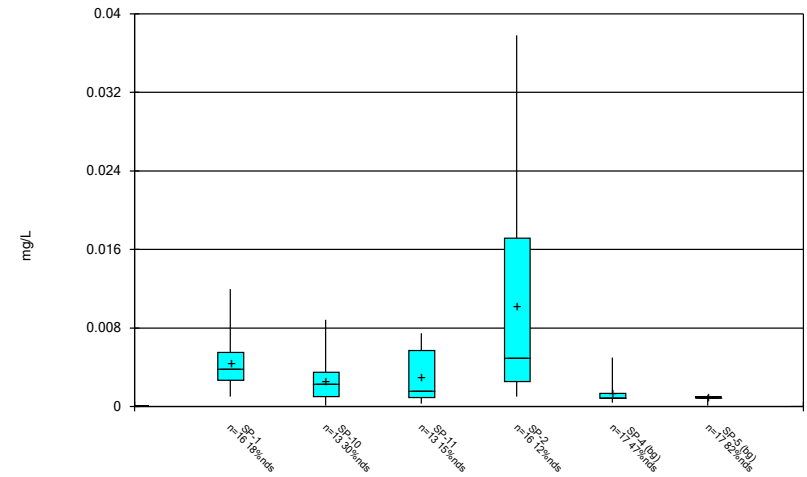
Constituent: Molybdenum Analysis Run 12/9/2019 11:55 AM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Box & Whiskers Plot



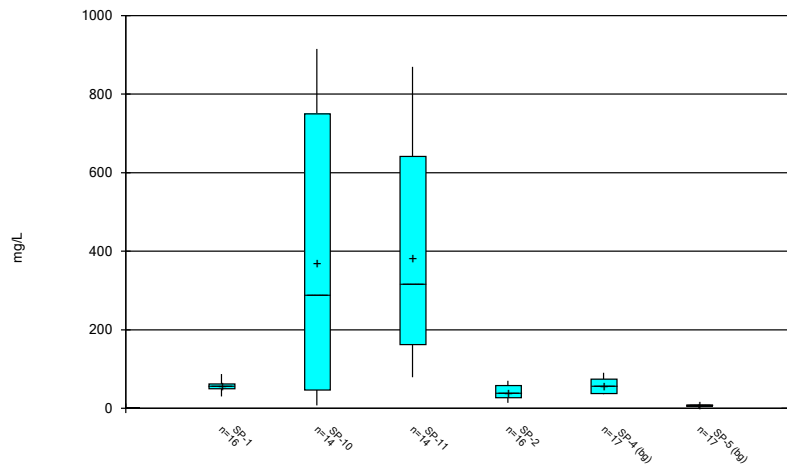
Constituent: pH, field Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Box & Whiskers Plot



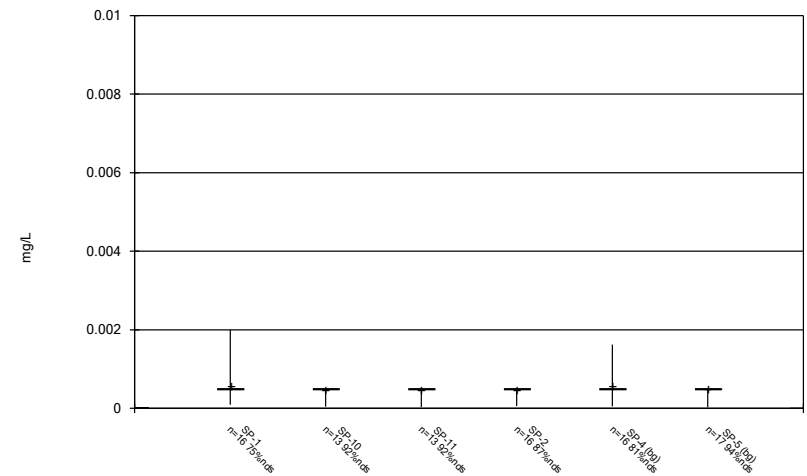
Constituent: Selenium Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Box & Whiskers Plot



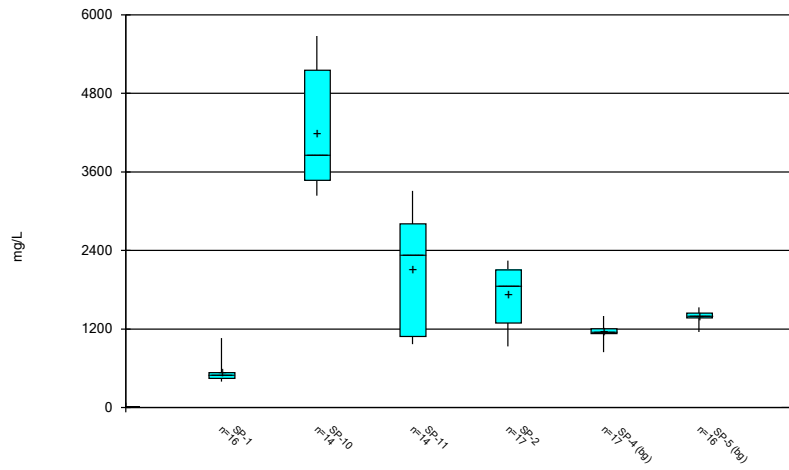
Constituent: Sulfate Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Box & Whiskers Plot



Constituent: Thallium Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 12/9/2019 11:55 AM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



# Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/9/2019, 4:09 PM

Date	SP-4 Arsenic (mg/L)	SP-4 Barium (mg/L)	SP-4 Beryllium (mg/L)	SP-4 Cadmium (mg/L)	SP-1 Chloride (mg/L)	SP-5 Chloride (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)
3/13/2017										
5/18/2017					104 (o)	1834 (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)	
6/20/2019										

Date	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-5 Total Dissolved Solids [TDS] (mg/L)
3/13/2017								
5/18/2017								3008 (o)
6/27/2017								
7/13/2017						0.934 (o)		
8/4/2017	25.367 (o)		0.03663 (o)		5.8E-05 (o)		<0.002 (o)	
6/20/2019				0.03 (J,o)				

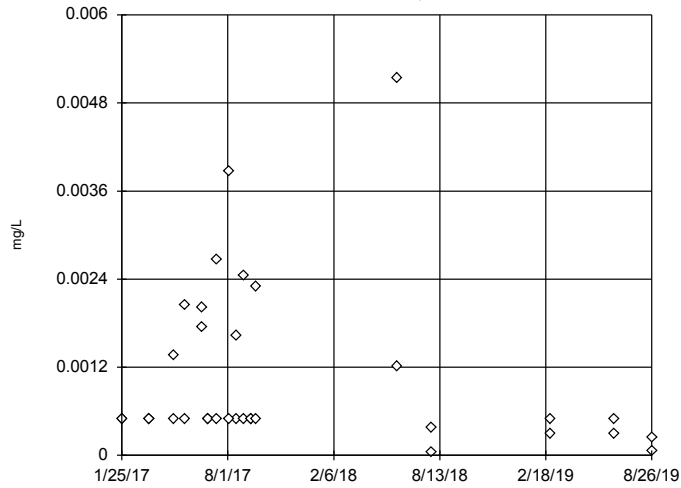
# Upgradient Outlier Analysis - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:06 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.001066	0.001141	ln(x)	ShapiroWilk
Arsenic (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.0167	0.01515	$x^{(1/3)}$	ShapiroWilk
Barium (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	1.517	0.909	sqrt(x)	ShapiroWilk
Beryllium (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.0006003	0.0009429	ln(x)	ShapiroWilk
Boron (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.3369	0.09923	$x^{(1/3)}$	ShapiroWilk
Cadmium (mg/L)	SP-4,SP-5	n/a	n/a	NP	NaN	34	0.0006194	0.001226	unknown	ShapiroWilk
<b>Chloride (mg/L)</b>	<b>SP-4,SP-5</b>	<b>Yes</b>	<b>52,62,1834</b>	<b>NP</b>	<b>NaN</b>	<b>34</b>	<b>562.2</b>	<b>280.7</b>	<b>sqrt(x)</b>	<b>ShapiroWilk</b>
Chromium (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.008442	0.01735	ln(x)	ShapiroWilk
Cobalt (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.004423	0.008256	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	SP-4,SP-5	No	n/a	NP	NaN	33	8.197	3.807	normal	ShapiroWilk
Fluoride (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	36	3.171	0.7808	$x^2$	ShapiroWilk
<b>Lead (mg/L)</b>	<b>SP-4,SP-5</b>	<b>Yes</b>	<b>0.03663</b>	<b>NP</b>	<b>NaN</b>	<b>34</b>	<b>0.003275</b>	<b>0.006578</b>	<b>ln(x)</b>	<b>ShapiroWilk</b>
Lithium (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.09636	0.02338	sqrt(x)	ShapiroWilk
Mercury (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.00002218	0.00009233	$x^{(1/3)}$	ShapiroWilk
Molybdenum (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	0.006372	0.003953	$x^{(1/3)}$	ShapiroWilk
pH, field (SU)	SP-4,SP-5	No	n/a	NP	NaN	32	7.796	0.449	ln(x)	ShapiroWilk
Selenium (mg/L)	SP-4,SP-5	n/a	n/a	NP	NaN	34	0.001084	0.0007727	unknown	ShapiroWilk
Sulfate (mg/L)	SP-4,SP-5	No	n/a	NP	NaN	34	31.97	29.27	ln(x)	ShapiroWilk
Thallium (mg/L)	SP-4,SP-5	n/a	n/a	NP	NaN	34	0.0005265	0.0002563	unknown	ShapiroWilk
<b>Total Dissolved Solids [TDS] (mg/L)</b>	<b>SP-4,SP-5</b>	<b>Yes</b>	<b>3008</b>	<b>NP</b>	<b>NaN</b>	<b>34</b>	<b>1328</b>	<b>333.4</b>	<b>ln(x)</b>	<b>ShapiroWilk</b>

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

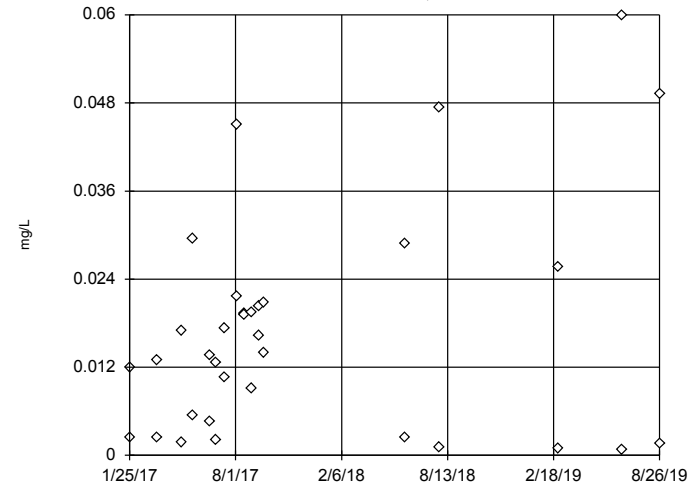


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.06435, low cutoff = 0.00001309, based on IQR multiplier of 3.

Constituent: Antimony Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

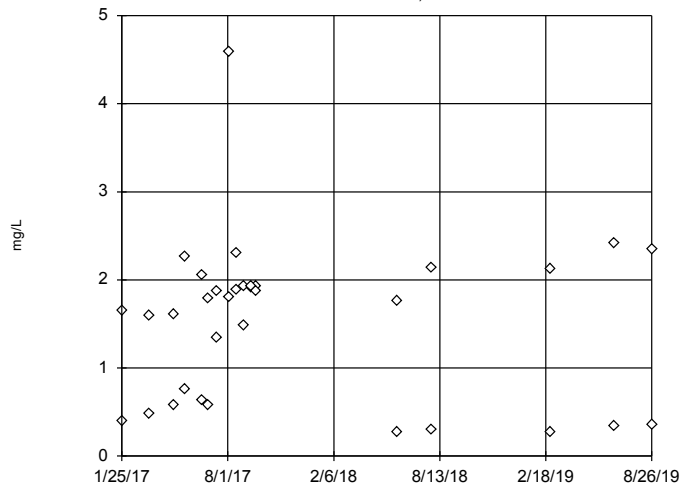


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.3424, low cutoff = -0.02368, based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

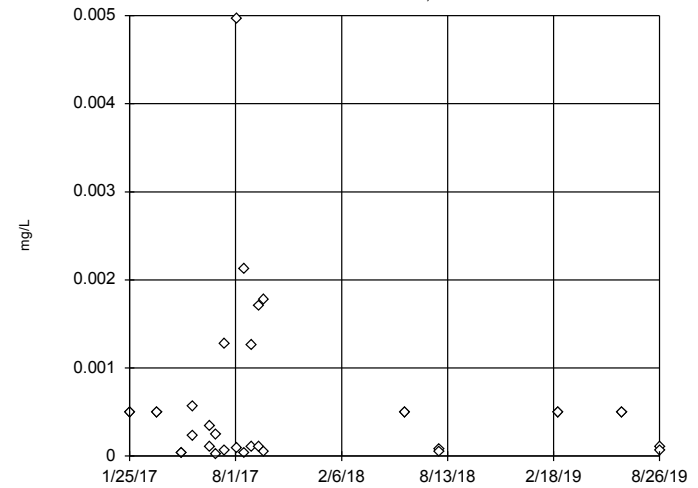


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were square root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 11.31, low cutoff = -1.424, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

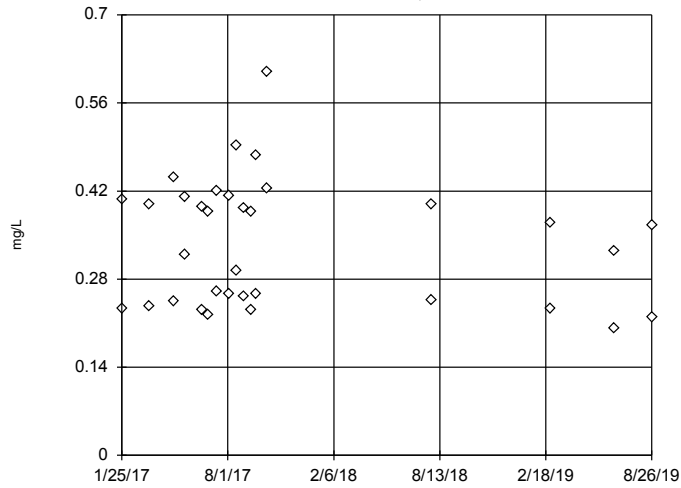


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.1952, low cutoff = 1.8e-7, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

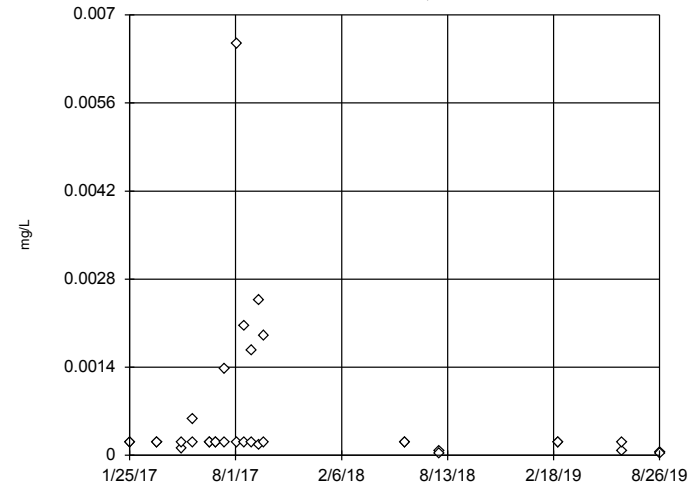


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 1.34, low cutoff = 0.01787, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

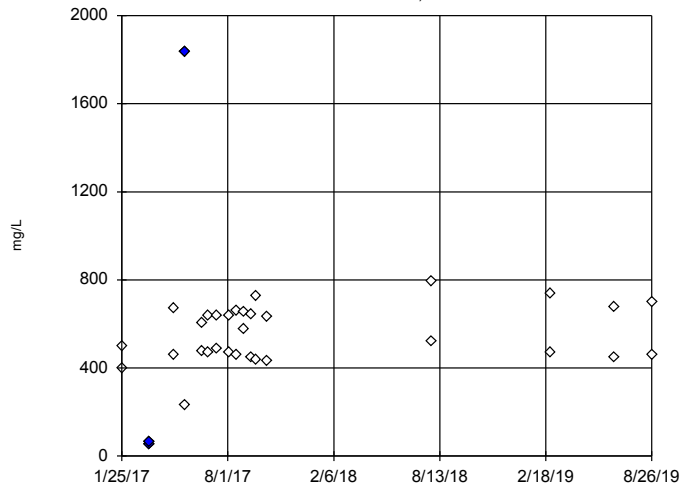


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Cadmium Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

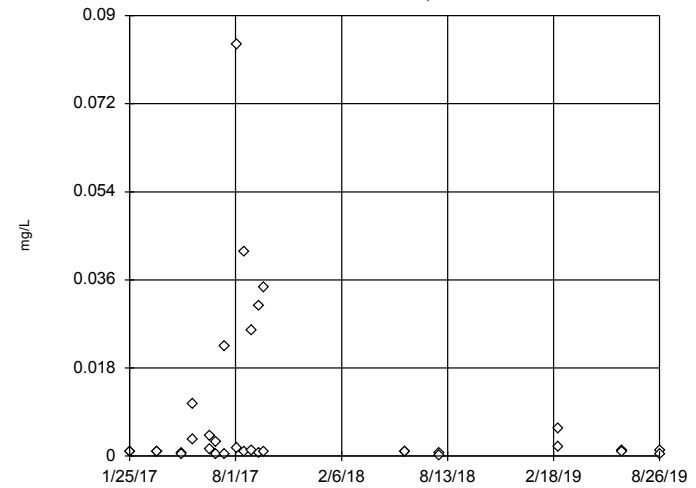


n = 34  
 Outliers are drawn as solid.  
 Tukey's method selected by user.  
 Data were square root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 1487, low cutoff = 69.92, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening, Pooled Background

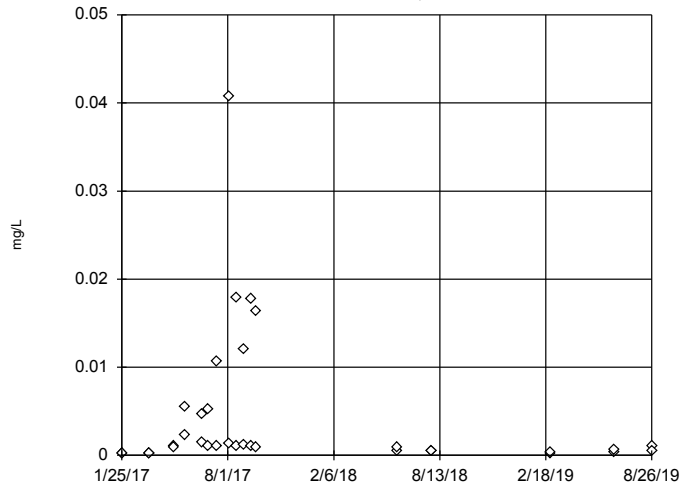
SP-4,SP-5



n = 34  
 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 = 1.453, low cutoff = 0.000002366, based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

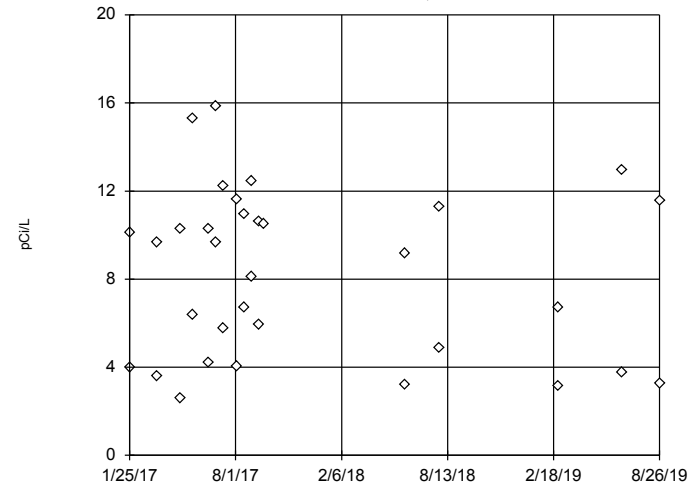
### Tukey's Outlier Screening, Pooled Background SP-4,SP-5



n = 34  
 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 = 5.308, low cutoff =  $4.5e-7$ , based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

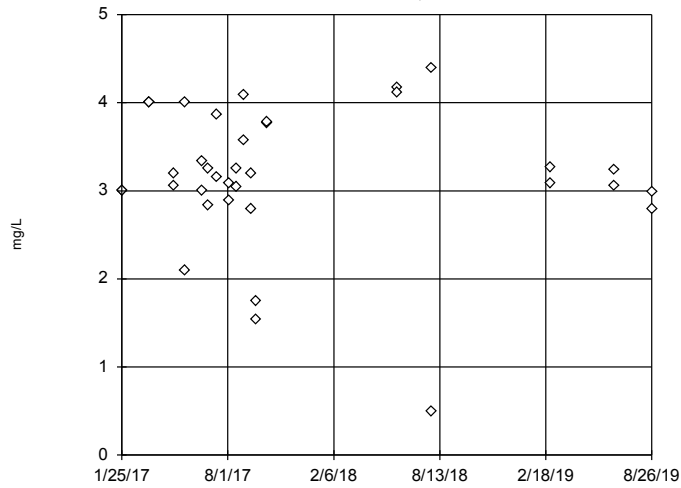
### Tukey's Outlier Screening, Pooled Background SP-4,SP-5



n = 33  
 No outliers found.  
 Tukey's method selected by user.  
 Ladder of Powers transformations did not improve normality; analysis run on raw data.  
 High cutoff = 32.17, low cutoff = -16.94, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

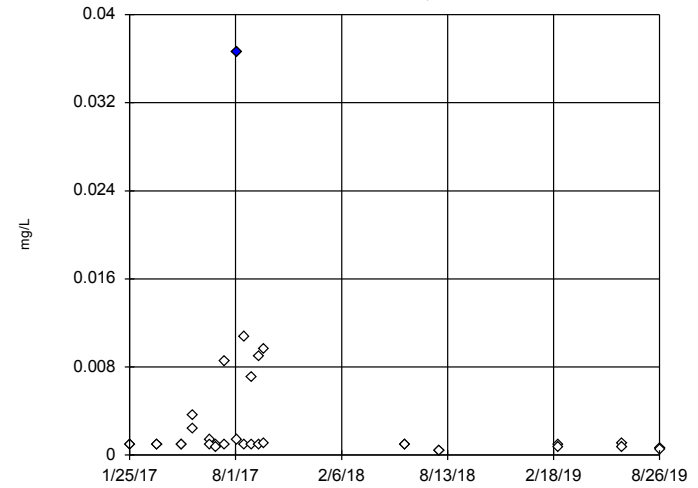
### Tukey's Outlier Screening, Pooled Background SP-4,SP-5



n = 36  
 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 = 5.492, low cutoff = -2.631, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening, Pooled Background SP-4,SP-5

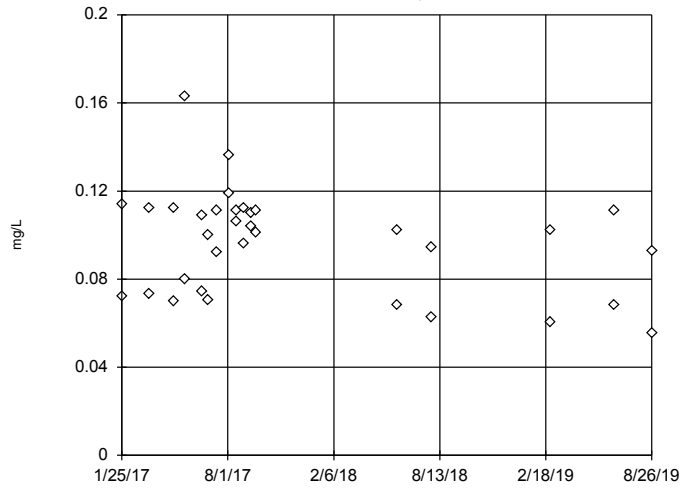


n = 34  
 Outlier is drawn as solid.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.01438, low cutoff = 0.0001192, based on IQR multiplier of 3.

Constituent: Lead Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

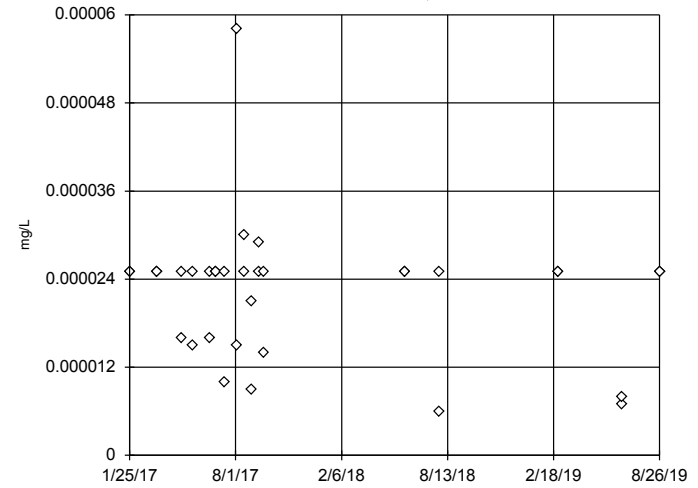


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were square root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.2755, low cutoff = 0.00601, based on IQR multiplier of 3.

Constituent: Lithium Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

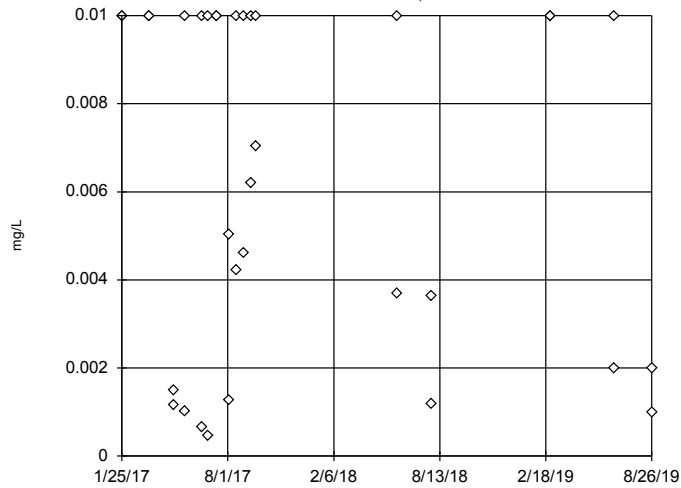


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.00007499, low cutoff = 0.00001728, based on IQR multiplier of 3.

Constituent: Mercury Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

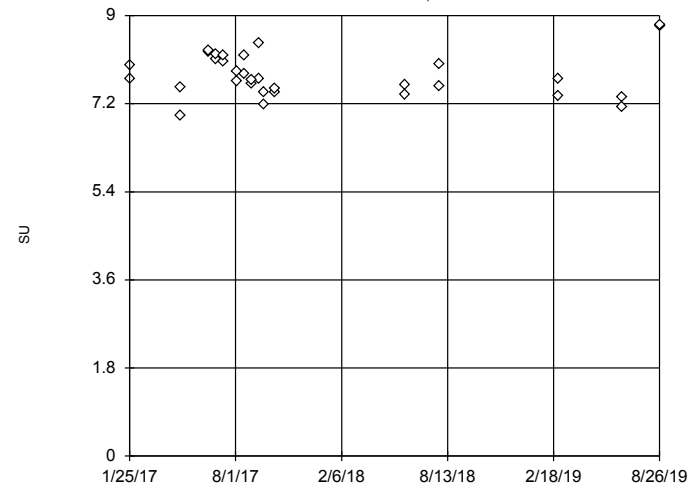


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.1258, low cutoff = -0.004525, based on IQR multiplier of 3.

Constituent: Molybdenum Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

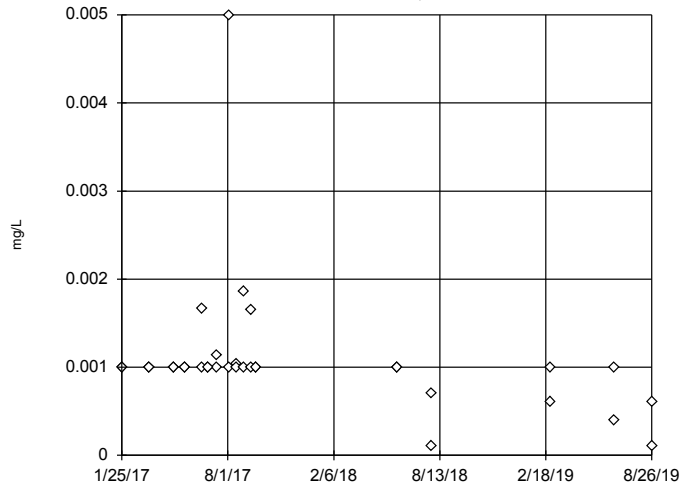


n = 32  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 10.49, low cutoff = 5.804, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

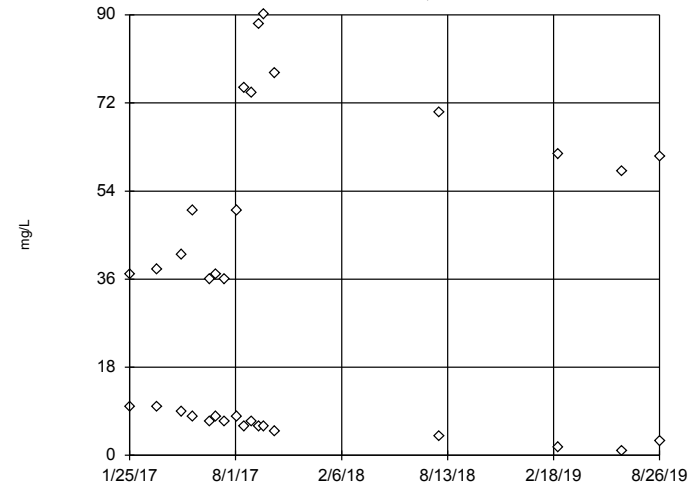


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Selenium Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

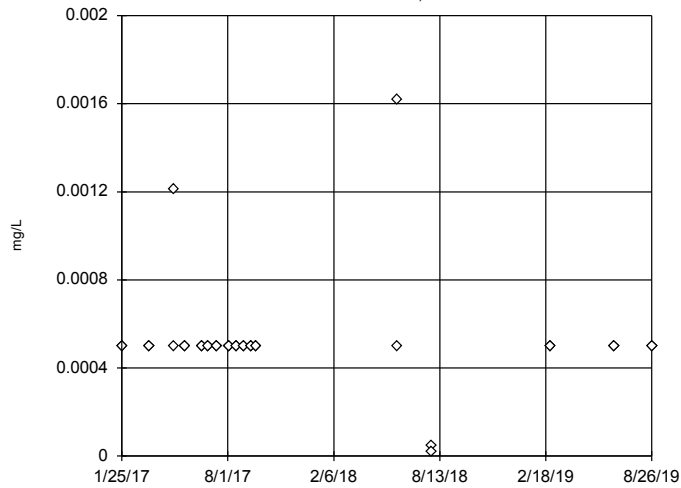


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 45988, low cutoff = 0.008382, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5

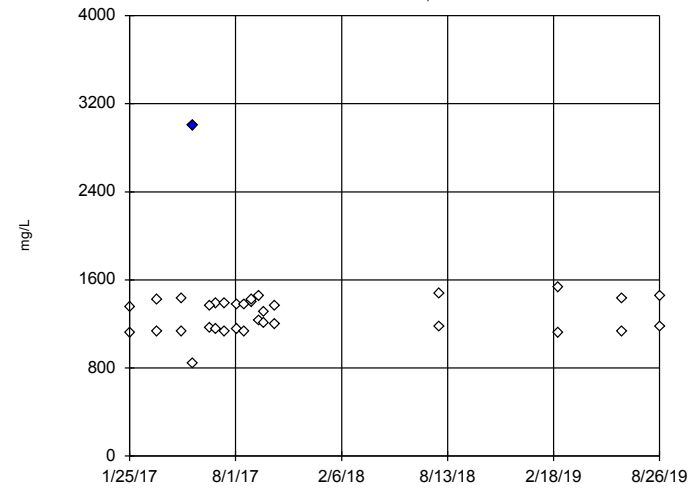


n = 34  
 No outliers found.  
 Tukey's method selected by user.  
 Data were square root transformed to achieve best W statistic (graph shown in original units).  
 The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Thallium Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5



n = 34  
 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 = 2753, low cutoff = 589.4, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/5/2019 7:05 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Outlier Analysis - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:09 PM

<u>Constituent</u>	<u>Well</u>	<u>Outlier</u>	<u>Value(s)</u>	<u>Method</u>	<u>Alpha</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Distribution</u>	<u>Normality Test</u>
Combined Radium 226 + 228 (pCi/L)	SP-1	Yes	14.29	NP	NaN	16	4.103	2.814	In(x)	ShapiroWilk



# Outlier Analysis - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:09 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony (mg/L)	SP-1	No	n/a	NP	NaN	16	0.003233	0.002181	x^(1/3)	ShapiroWilk
Antimony (mg/L)	SP-10	No	n/a	NP	NaN	13	0.002672	0.001941	ln(x)	ShapiroWilk
Antimony (mg/L)	SP-11	No	n/a	NP	NaN	13	0.003377	0.003125	x^(1/3)	ShapiroWilk
Antimony (mg/L)	SP-2	No	n/a	NP	NaN	16	0.003766	0.002879	ln(x)	ShapiroWilk
Arsenic (mg/L)	SP-1	No	n/a	NP	NaN	16	0.003415	0.001954	ln(x)	ShapiroWilk
Arsenic (mg/L)	SP-10	No	n/a	NP	NaN	13	0.006745	0.004118	ln(x)	ShapiroWilk
Arsenic (mg/L)	SP-11	No	n/a	NP	NaN	13	0.005585	0.003026	sqrt(x)	ShapiroWilk
Arsenic (mg/L)	SP-2	No	n/a	NP	NaN	16	0.003491	0.002932	ln(x)	ShapiroWilk
Barium (mg/L)	SP-1	No	n/a	NP	NaN	16	0.2006	0.03818	ln(x)	ShapiroWilk
Barium (mg/L)	SP-10	No	n/a	NP	NaN	13	1.744	1.731	x^(1/3)	ShapiroWilk
Barium (mg/L)	SP-11	No	n/a	NP	NaN	13	0.2556	0.169	ln(x)	ShapiroWilk
Barium (mg/L)	SP-2	No	n/a	NP	NaN	16	1.251	0.5881	ln(x)	ShapiroWilk
Beryllium (mg/L)	SP-1	No	n/a	NP	NaN	16	0.0003881	0.0004295	ln(x)	ShapiroWilk
Beryllium (mg/L)	SP-10	No	n/a	NP	NaN	13	0.0002218	0.0002294	ln(x)	ShapiroWilk
Beryllium (mg/L)	SP-11	No	n/a	NP	NaN	13	0.0002799	0.000199	sqrt(x)	ShapiroWilk
Beryllium (mg/L)	SP-2	No	n/a	NP	NaN	16	0.0003344	0.0004011	ln(x)	ShapiroWilk
Cadmium (mg/L)	SP-1	No	n/a	NP	NaN	16	0.000355	0.0001958	ln(x)	ShapiroWilk
Cadmium (mg/L)	SP-10	n/a	n/a	NP	NaN	13	0.0001731	0.00006575	unknown	ShapiroWilk
Cadmium (mg/L)	SP-11	No	n/a	NP	NaN	13	0.0009385	0.001086	ln(x)	ShapiroWilk
Cadmium (mg/L)	SP-2	No	n/a	NP	NaN	16	0.0003475	0.000205	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-1	No	n/a	NP	NaN	17	122.3	10.05	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-10	No	n/a	NP	NaN	13	93.32	58.74	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-11	No	n/a	NP	NaN	13	453.3	447.6	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-2	No	n/a	NP	NaN	16	107.1	35.8	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-4 (bg)	No	n/a	NP	NaN	17	400.9	478.9	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-5 (bg)	No	n/a	NP	NaN	17	67.18	24.87	ln(x)	ShapiroWilk
Chromium (mg/L)	SP-1	No	n/a	NP	NaN	16	0.001149	0.0006792	ln(x)	ShapiroWilk
Chromium (mg/L)	SP-10	No	n/a	NP	NaN	13	0.01004	0.03012	ln(x)	ShapiroWilk
Chromium (mg/L)	SP-11	No	n/a	NP	NaN	13	0.01025	0.01287	ln(x)	ShapiroWilk
Chromium (mg/L)	SP-2	No	n/a	NP	NaN	16	0.001531	0.001234	x^(1/3)	ShapiroWilk
Cobalt (mg/L)	SP-1	No	n/a	NP	NaN	16	0.001367	0.001295	ln(x)	ShapiroWilk
Cobalt (mg/L)	SP-10	No	n/a	NP	NaN	13	0.002623	0.001741	x^(1/3)	ShapiroWilk
Cobalt (mg/L)	SP-11	No	n/a	NP	NaN	13	0.006188	0.004931	x^(1/3)	ShapiroWilk
Cobalt (mg/L)	SP-2	No	n/a	NP	NaN	16	0.001122	0.0008247	ln(x)	ShapiroWilk
<b>Combined Radium 226 + 228 (pCi/L)</b>	<b>SP-1</b>	<b>Yes</b>	<b>14.29</b>	<b>NP</b>	<b>NaN</b>	<b>16</b>	<b>4.103</b>	<b>2.814</b>	<b>ln(x)</b>	<b>ShapiroWilk</b>
Combined Radium 226 + 228 (pCi/L)	SP-10	No	n/a	NP	NaN	13	6.984	8.061	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	SP-11	No	n/a	NP	NaN	13	3.502	6.649	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	SP-2	No	n/a	NP	NaN	13	12.31	6.281	ln(x)	ShapiroWilk
Fluoride (mg/L)	SP-1	No	n/a	NP	NaN	17	0.9669	0.8403	ln(x)	ShapiroWilk
Fluoride (mg/L)	SP-10	No	n/a	NP	NaN	15	5.447	2.95	x^2	ShapiroWilk
Fluoride (mg/L)	SP-11	No	n/a	NP	NaN	15	3.185	0.8592	normal	ShapiroWilk
Fluoride (mg/L)	SP-2	No	n/a	NP	NaN	17	2.871	0.7089	x^2	ShapiroWilk
Lead (mg/L)	SP-1	No	n/a	NP	NaN	16	0.002924	0.002167	ln(x)	ShapiroWilk
Lead (mg/L)	SP-10	No	n/a	NP	NaN	13	0.001517	0.0007715	x^(1/3)	ShapiroWilk
Lead (mg/L)	SP-11	No	n/a	NP	NaN	13	0.003791	0.00305	sqrt(x)	ShapiroWilk
Lead (mg/L)	SP-2	No	n/a	NP	NaN	16	0.003164	0.002194	ln(x)	ShapiroWilk
Lithium (mg/L)	SP-1	No	n/a	NP	NaN	16	0.007072	0.006362	ln(x)	ShapiroWilk
Lithium (mg/L)	SP-10	No	n/a	NP	NaN	13	0.2841	0.02877	x^3	ShapiroWilk
Lithium (mg/L)	SP-11	No	n/a	NP	NaN	13	0.08066	0.03839	x^(1/3)	ShapiroWilk
Lithium (mg/L)	SP-2	No	n/a	NP	NaN	16	0.07643	0.02586	x^3	ShapiroWilk
Mercury (mg/L)	SP-1	n/a	n/a	NP	NaN	16	0.00002194	0.000006277	unknown	ShapiroWilk
Mercury (mg/L)	SP-10	No	n/a	NP	NaN	13	0.00001762	0.000007974	normal	ShapiroWilk
Mercury (mg/L)	SP-11	No	n/a	NP	NaN	13	0.00002062	0.00001449	ln(x)	ShapiroWilk
Mercury (mg/L)	SP-2	No	n/a	NP	NaN	16	0.00002069	0.000007939	normal	ShapiroWilk
Molybdenum (mg/L)	SP-1	No	n/a	NP	NaN	16	0.01242	0.004984	normal	ShapiroWilk

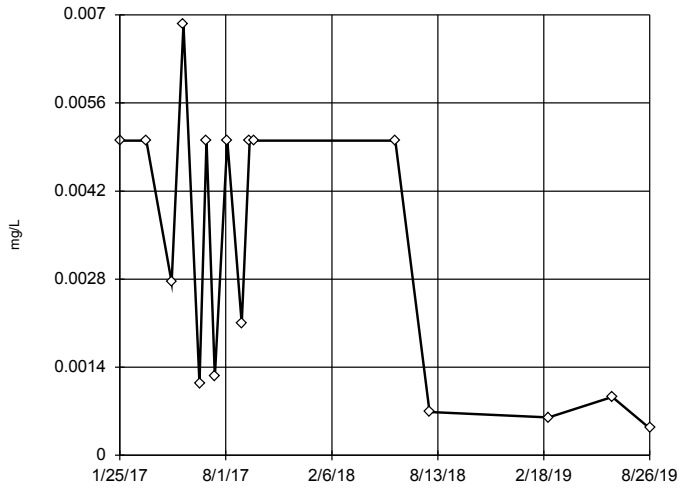
# Outlier Analysis - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:09 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Molybdenum (mg/L)	SP-10	No	n/a	NP	NaN	13	0.09942	0.2528	ln(x)	ShapiroWilk
Molybdenum (mg/L)	SP-11	No	n/a	NP	NaN	13	0.03278	0.02353	x^2	ShapiroWilk
Molybdenum (mg/L)	SP-2	No	n/a	NP	NaN	16	0.02792	0.007558	normal	ShapiroWilk
Selenium (mg/L)	SP-1	No	n/a	NP	NaN	16	0.005163	0.002543	ln(x)	ShapiroWilk
Selenium (mg/L)	SP-10	No	n/a	NP	NaN	13	0.002548	0.00244	x^(1/3)	ShapiroWilk
Selenium (mg/L)	SP-11	No	n/a	NP	NaN	13	0.003052	0.002409	x^(1/3)	ShapiroWilk
Selenium (mg/L)	SP-2	No	n/a	NP	NaN	16	0.01075	0.01048	ln(x)	ShapiroWilk
Thallium (mg/L)	SP-1	n/a	n/a	NP	NaN	16	0.001693	0.000682	unknown	ShapiroWilk
Thallium (mg/L)	SP-10	n/a	n/a	NP	NaN	13	0.0004646	0.0001276	unknown	ShapiroWilk
Thallium (mg/L)	SP-11	n/a	n/a	NP	NaN	13	0.0004638	0.0001304	unknown	ShapiroWilk
Thallium (mg/L)	SP-2	n/a	n/a	NP	NaN	16	0.00176	0.0006558	unknown	ShapiroWilk

### Tukey's Outlier Screening

SP-1

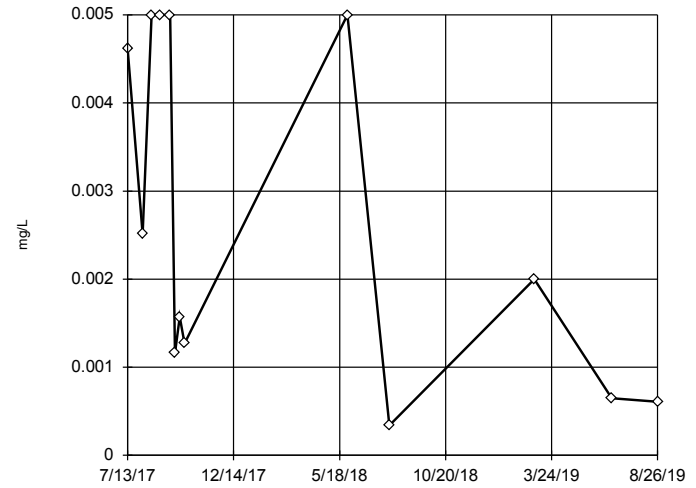


n = 16  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.05525,  
 low cutoff = -0.001289,  
 based on IQR multiplier of 3.

Constituent: Antimony Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-10

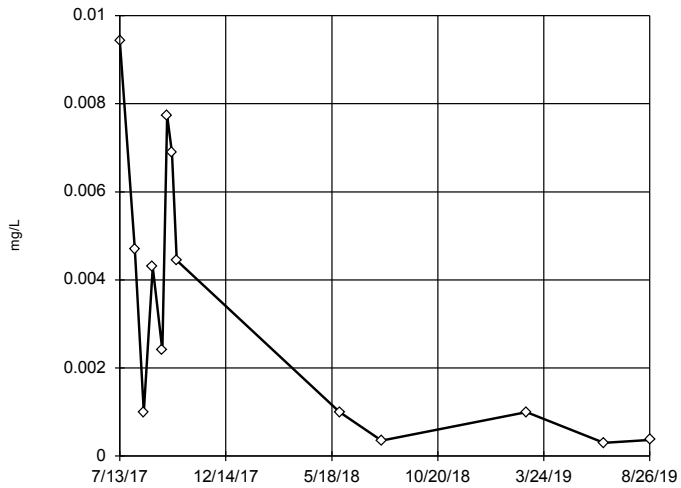


n = 13  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.9546,  
 low cutoff = 0.00004548,  
 based on IQR multiplier of 3.

Constituent: Antimony Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-11

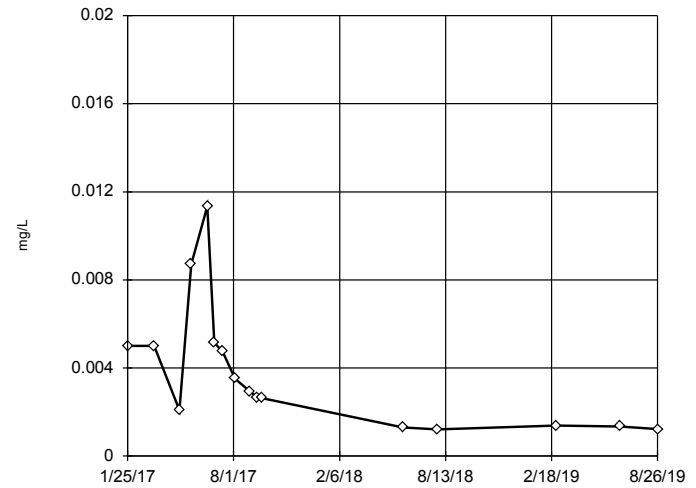


n = 13  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.09601,  
 low cutoff = -0.007201,  
 based on IQR multiplier of 3.

Constituent: Antimony Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

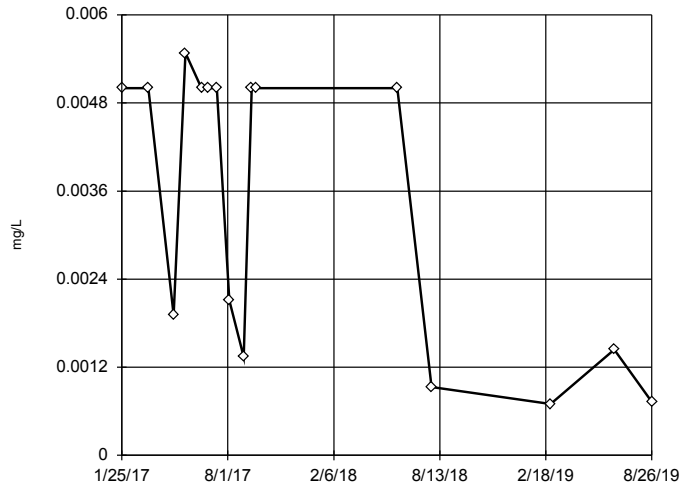
SP-2



n = 16  
 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 = 0.2459,  
 low cutoff = 0.00002775,  
 based on IQR multiplier of 3.

Constituent: Antimony Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

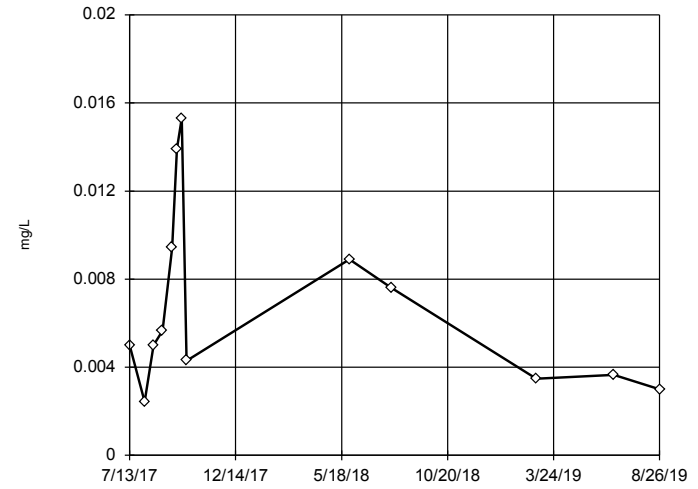
Tukey's Outlier Screening  
SP-1



n = 16  
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 = 0.2332, low cutoff = 0.0002979, based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

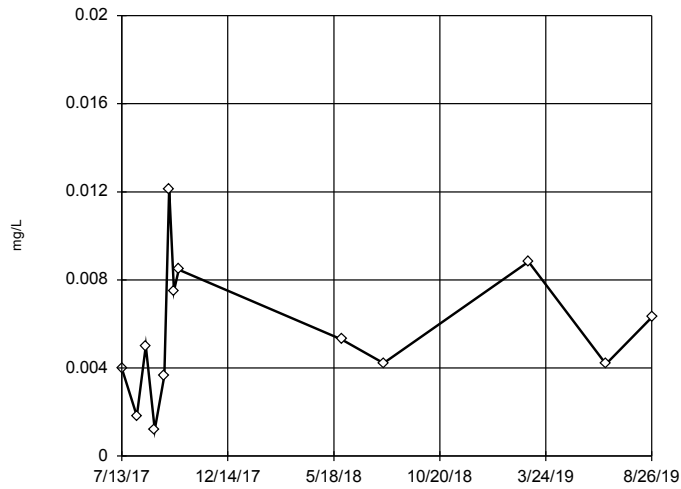
Tukey's Outlier Screening  
SP-10



n = 13  
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 = 0.1546, low cutoff = 0.0002113, based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

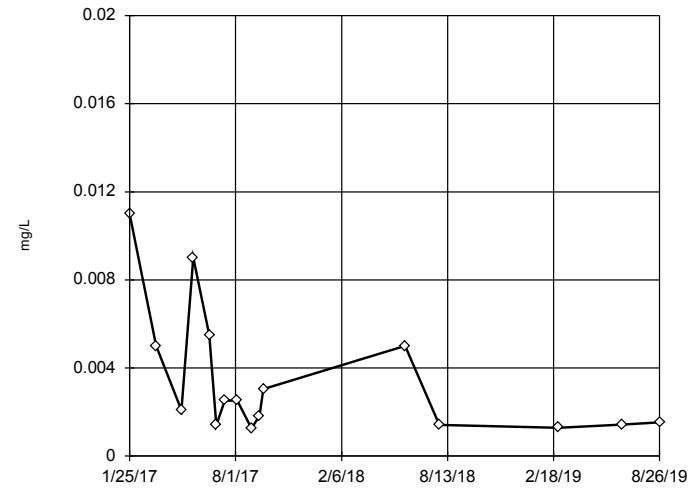
Tukey's Outlier Screening  
SP-11



n = 13  
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 = 0.02951, low cutoff = -0.0004253, based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening  
SP-2

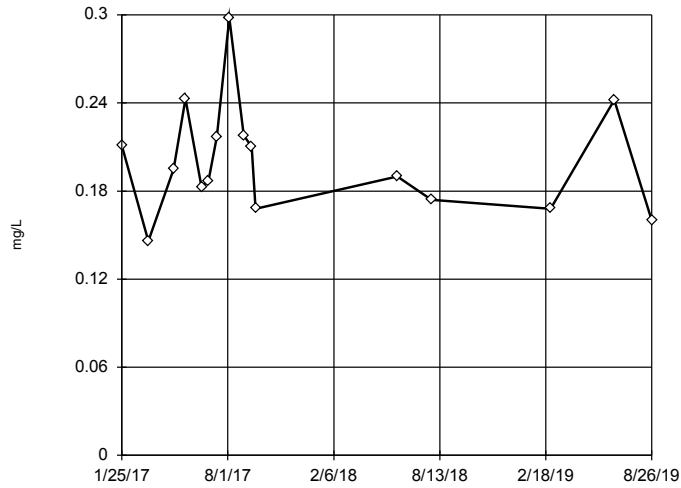


n = 16  
No outliers found. Tukey's method selected by user.  
Data were natural log transformed to achieve best W statistic (graph shown in original units).  
High cutoff = 0.216, low cutoff = 0.0003299, based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-1



n = 16

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

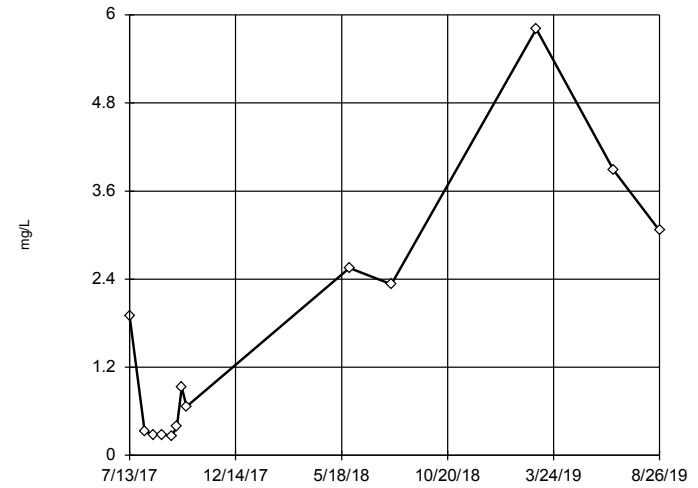
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.4478, low cutoff = 0.08305, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-10



n = 13

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

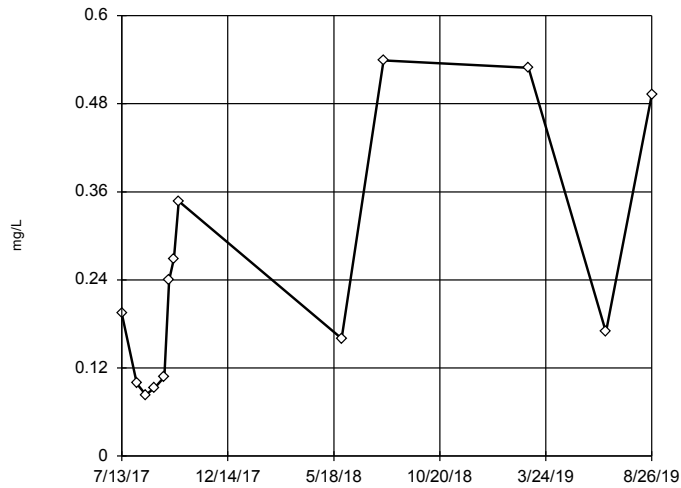
Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 47.27, low cutoff = -3.605, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-11



n = 13

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

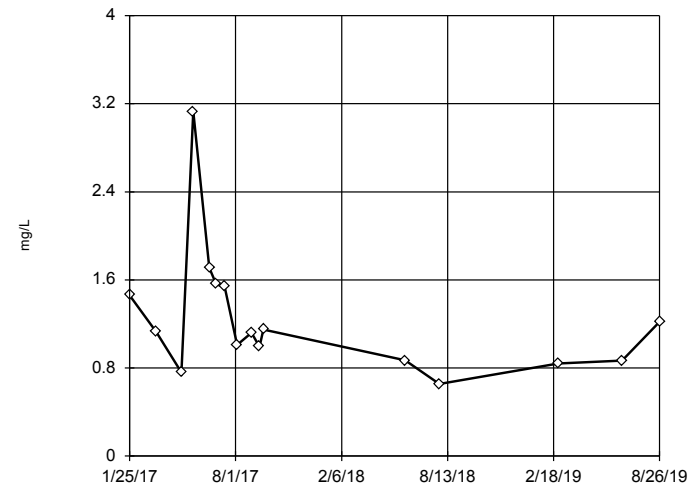
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 26.47, low cutoff = 0.001612, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-2



n = 16

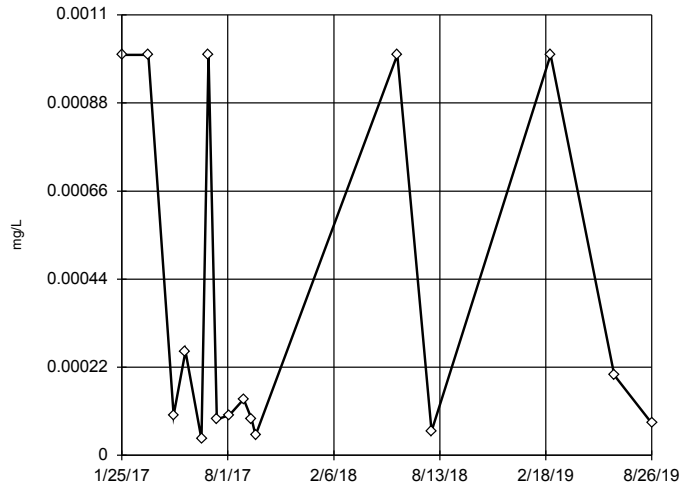
No outliers found. Tukey's method selected by user.

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

High cutoff = 7.717, low cutoff = 0.1688, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

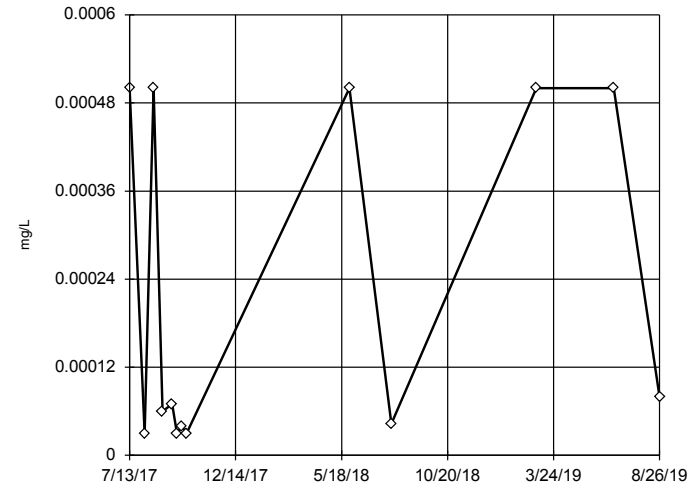
Tukey's Outlier Screening  
SP-1



n = 16  
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 = 1.637, low cutoff = 5.2e-8, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

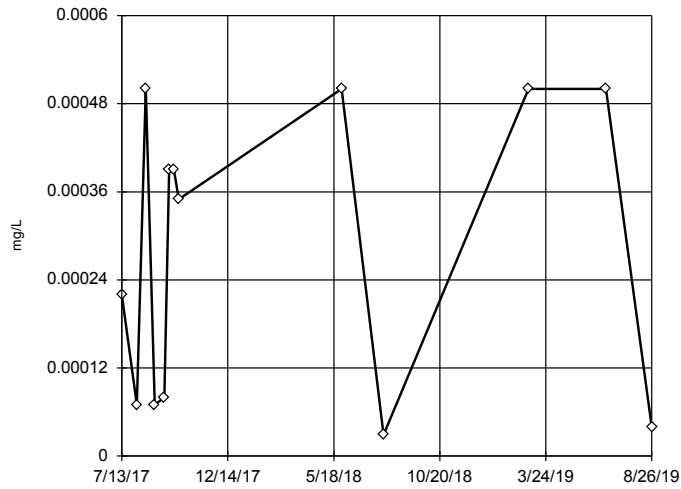
Tukey's Outlier Screening  
SP-10



n = 13  
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 = 1.504, low cutoff = 1.2e-8, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

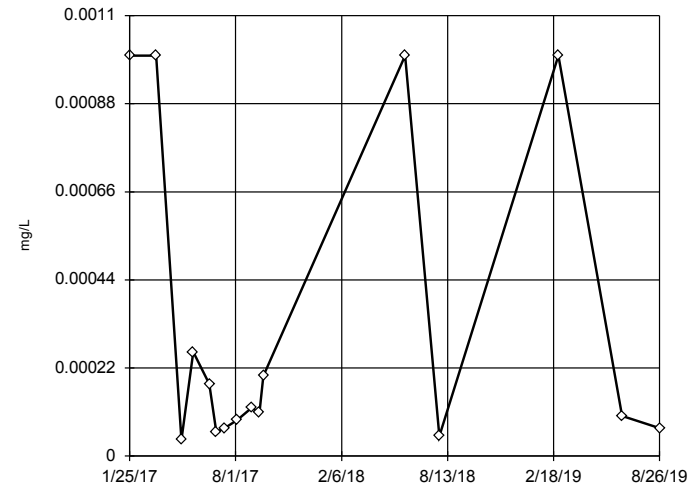
Tukey's Outlier Screening  
SP-11



n = 13  
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 = 0.00414, low cutoff = -0.00113, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

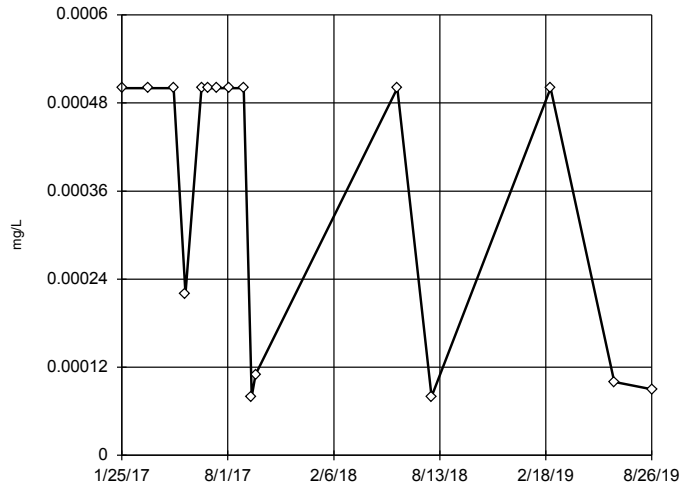
Tukey's Outlier Screening  
SP-2



n = 16  
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 = 0.1971, low cutoff = 1.8e-7, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

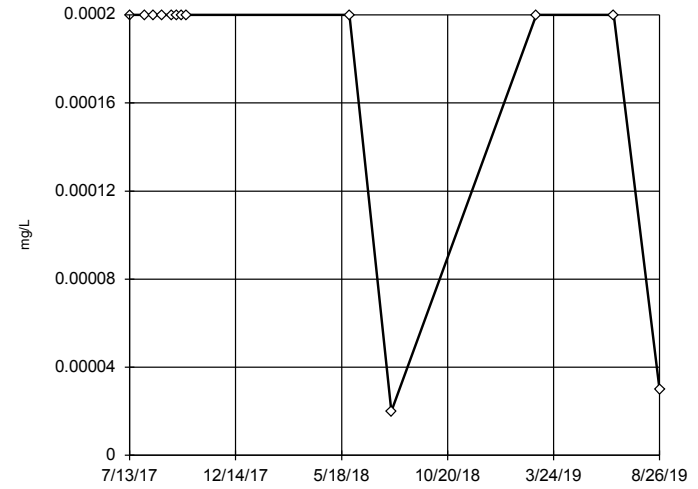
Tukey's Outlier Screening  
SP-1



n = 16  
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 = 0.05417, low cutoff = 9.7e-7, based on IQR multiplier of 3.

Constituent: Cadmium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

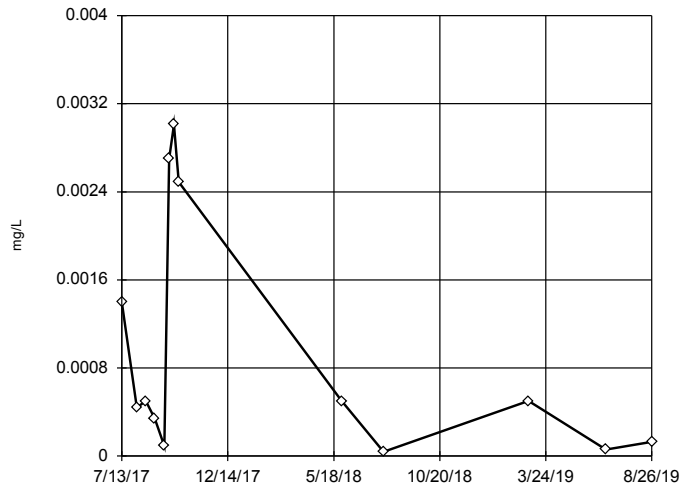
Tukey's Outlier Screening  
SP-10



n = 13  
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: Cadmium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

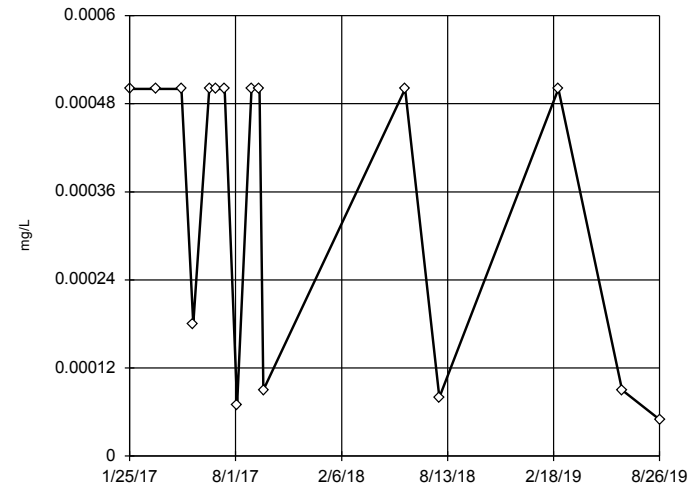
Tukey's Outlier Screening  
SP-11



n = 13  
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 = 9.602, low cutoff = 2.1e-8, based on IQR multiplier of 3.

Constituent: Cadmium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening  
SP-2

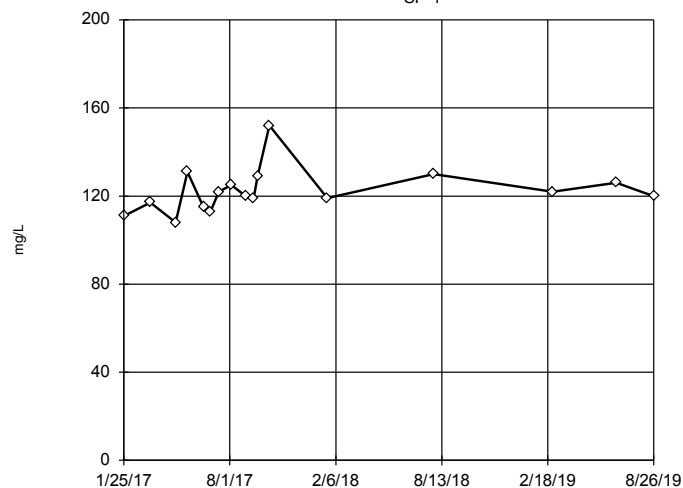


n = 16  
No outliers found. Tukey's method selected by user.  
Data were natural log transformed to achieve best W statistic (graph shown in original units).  
High cutoff = 0.08573, low cutoff = 5.2e-7, based on IQR multiplier of 3.

Constituent: Cadmium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-1

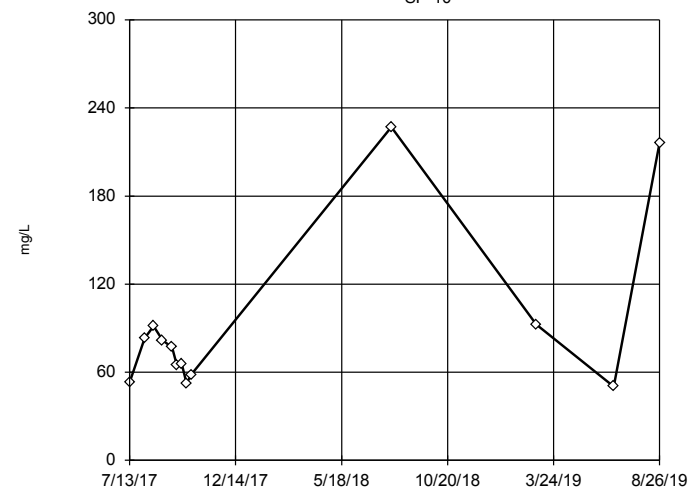


n = 17  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 169.3, low cutoff = 87.36, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-10

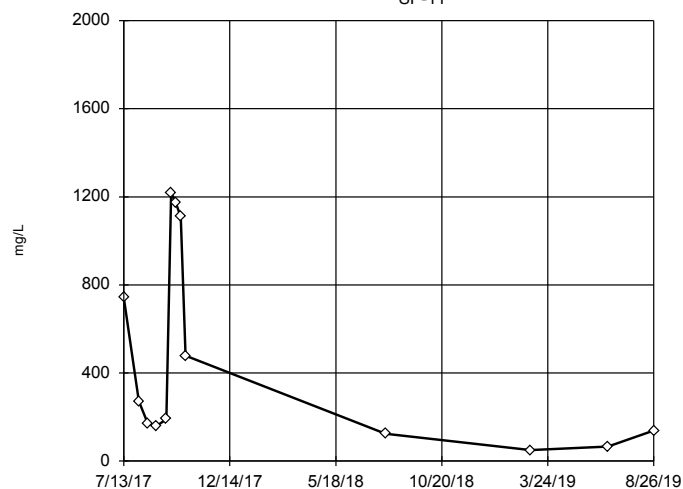


n = 13  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 416, low cutoff = 12.3, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-11

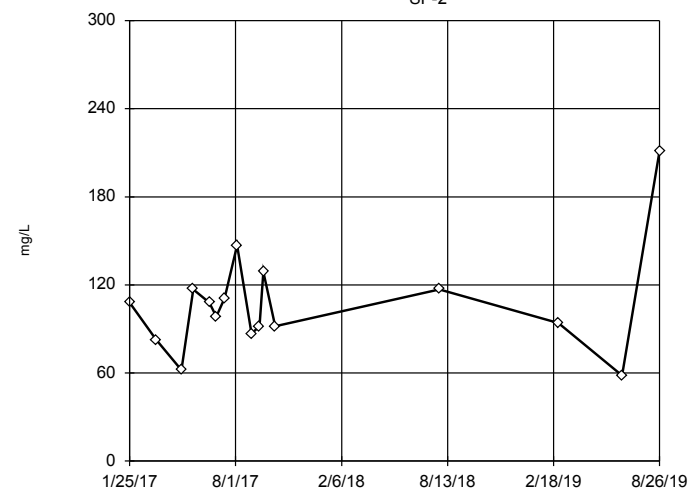


n = 13  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 299778, low cutoff = 0.3975, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-2

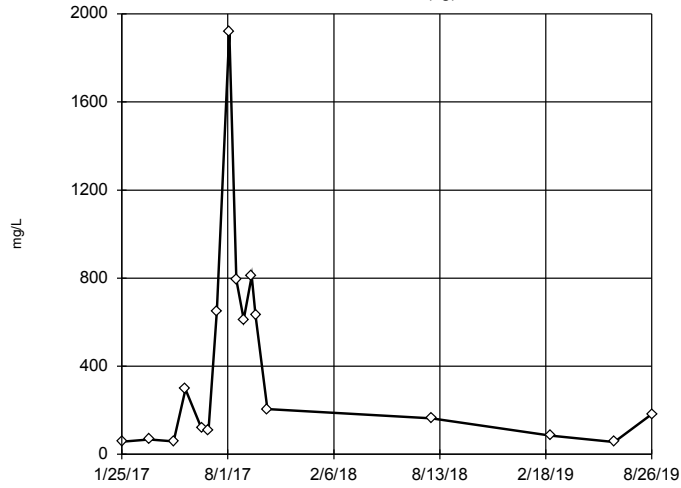


n = 16  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 263.5, low cutoff = 39.64, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP



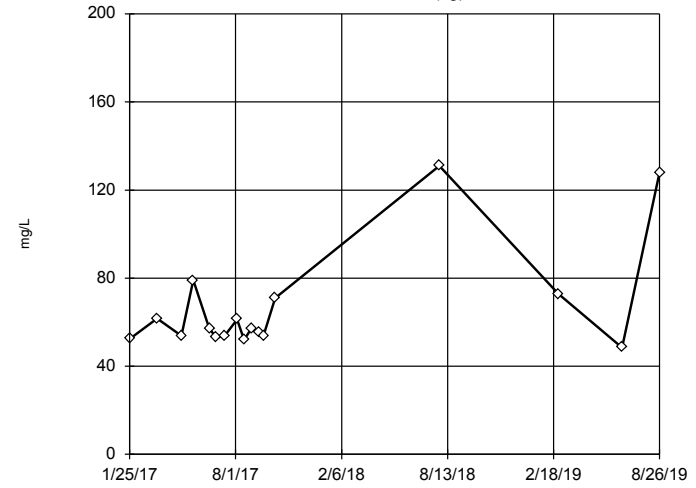
### Tukey's Outlier Screening SP-4 (bg)



n = 17  
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 = 383715, low cutoff = 0.1261, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

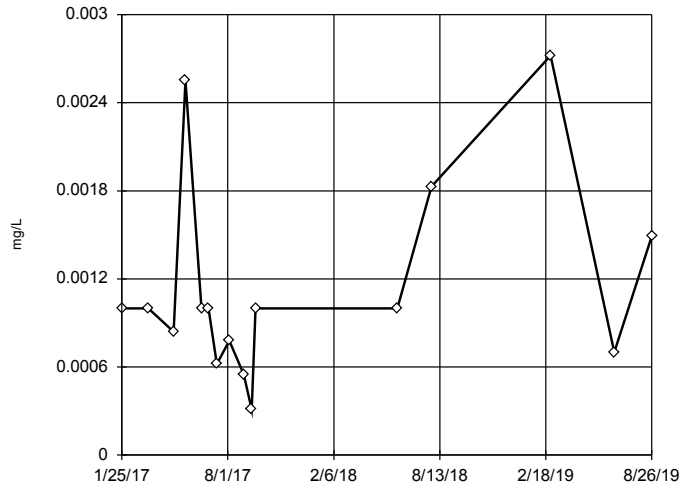
### Tukey's Outlier Screening SP-5 (bg)



n = 17  
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 = 176, low cutoff = 21.8, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

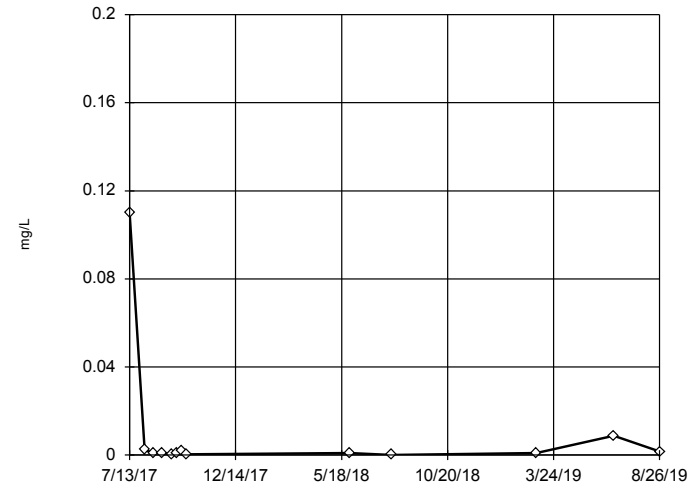
### Tukey's Outlier Screening SP-1



n = 16  
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 = 0.005503, low cutoff = 0.0001639, based on IQR multiplier of 3.

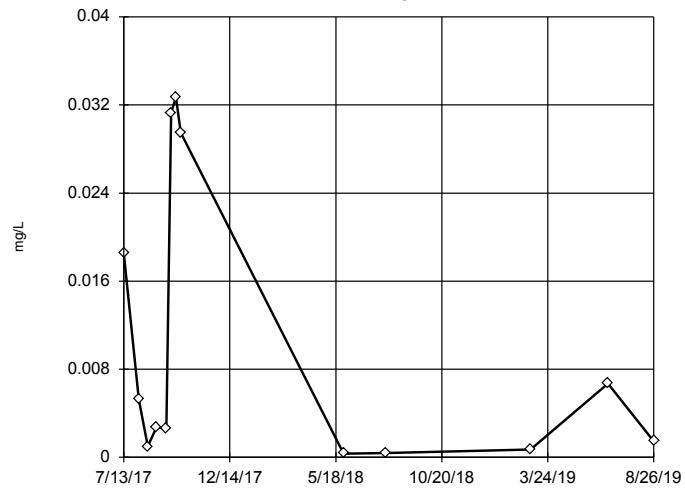
Constituent: Chromium Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening SP-10



### Tukey's Outlier Screening

SP-11

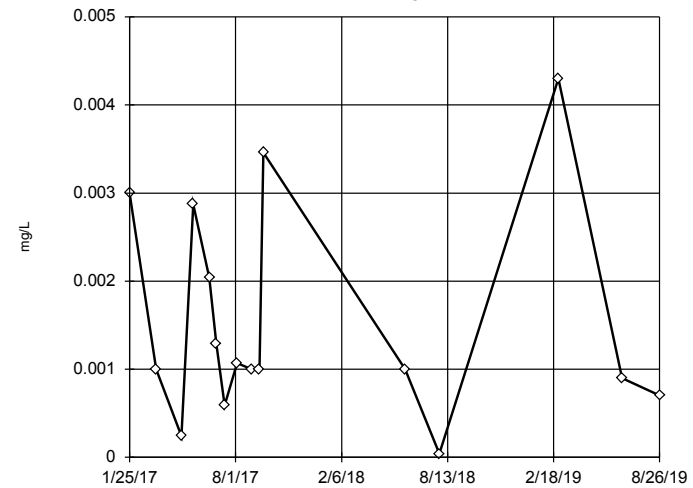


n = 13  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 509.3, low cutoff = 3.8e-8, based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-2

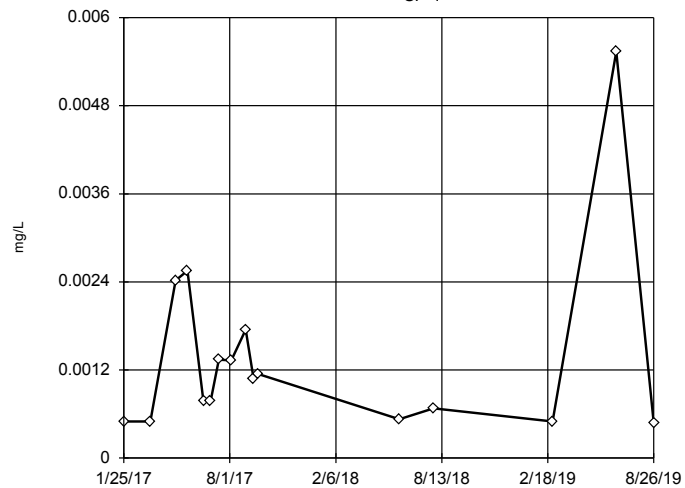


n = 16  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.01754, low cutoff = -0.0003478, based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-1

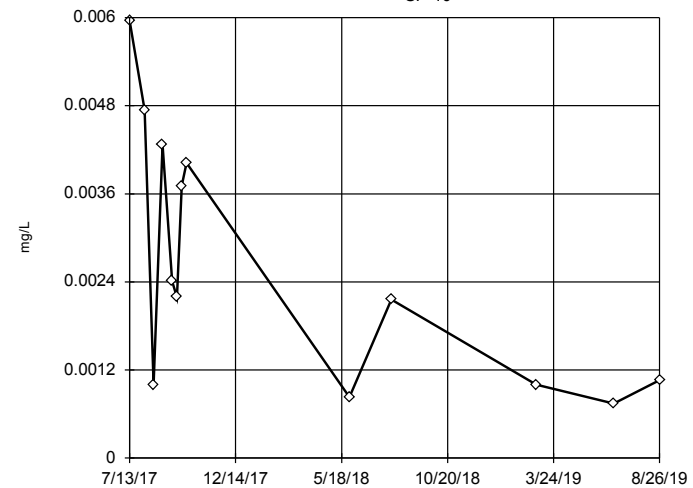


n = 16  
 No outliers found.  
 Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.04031, low cutoff = 0.00001956, based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-10

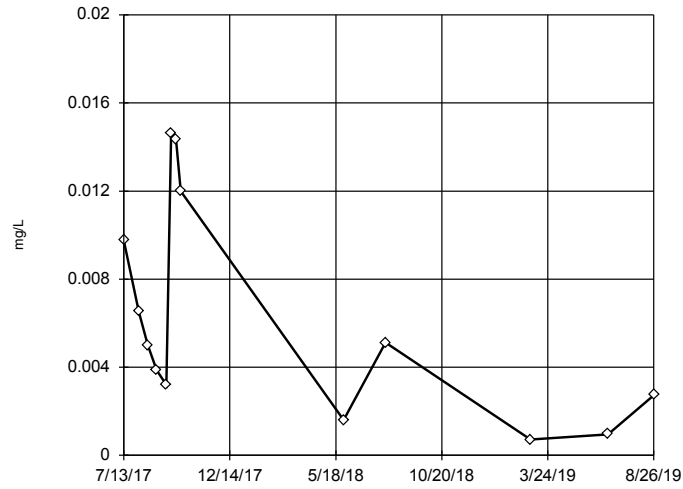


n = 13  
 No outliers found.  
 Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.04017, low cutoff = -0.0005485, based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-11

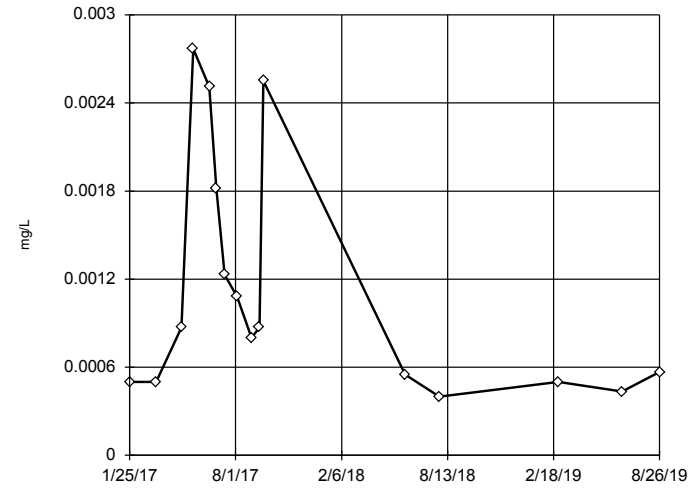


n = 13  
 No outliers found. Tukey's method selected by user.  
 Data were cube root transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.1248, low cutoff = -0.003371, based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-2

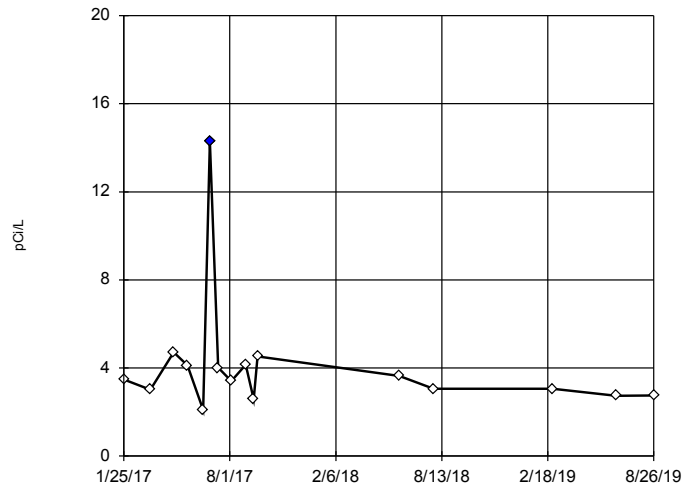


n = 16  
 No outliers found. Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.04009, low cutoff = 0.00001866, based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-1

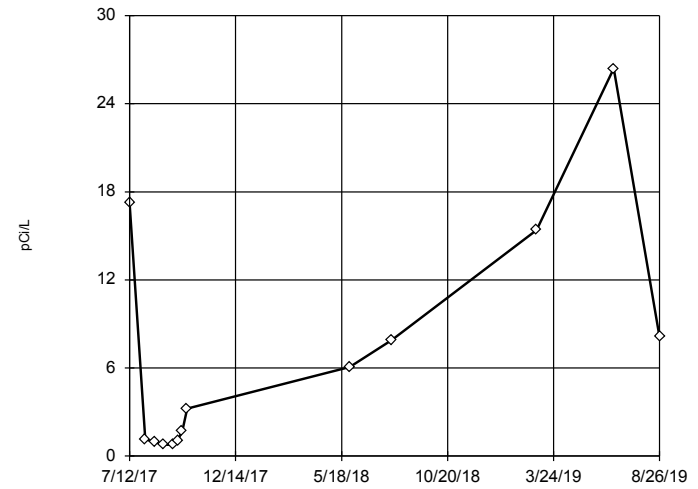


n = 16  
 Outlier is drawn as solid. Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 12.25, low cutoff = 0.9717, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

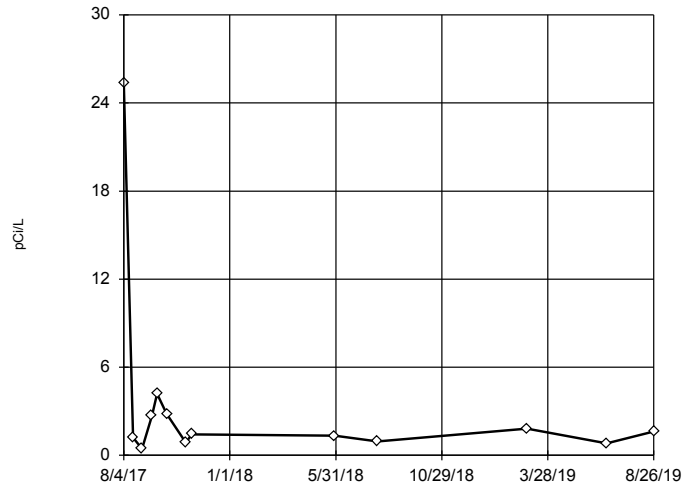
SP-10



n = 13  
 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 = 14360, low cutoff = 0.0008, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

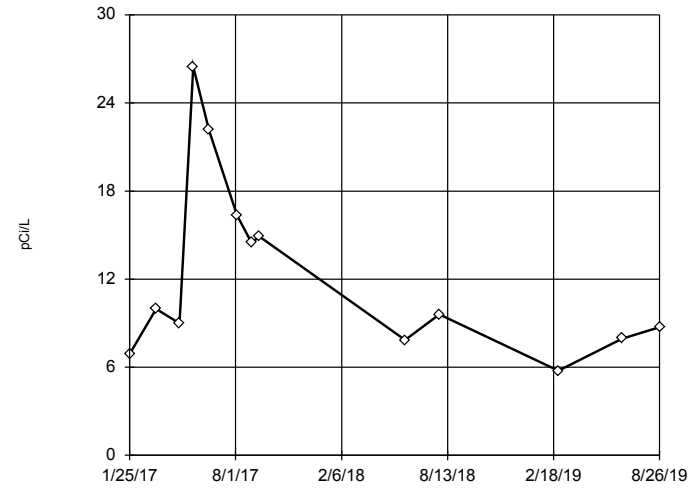
Tukey's Outlier Screening  
SP-11



n = 13  
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 = 77.88, low cutoff = 0.03186, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

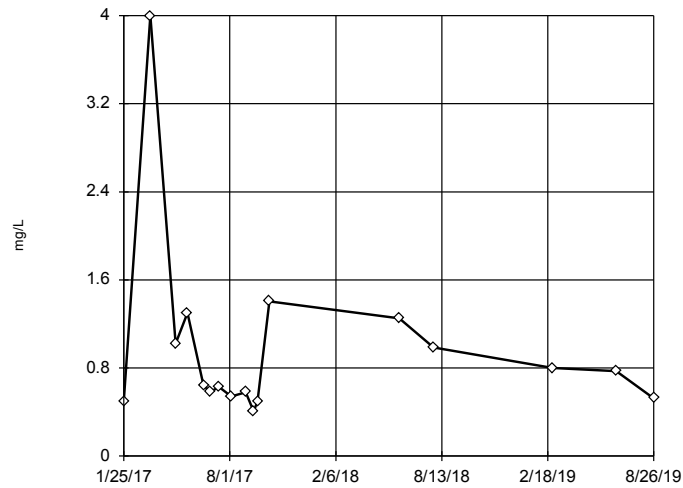
Tukey's Outlier Screening  
SP-2



n = 13  
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 = 120.3, low cutoff = 1.024, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

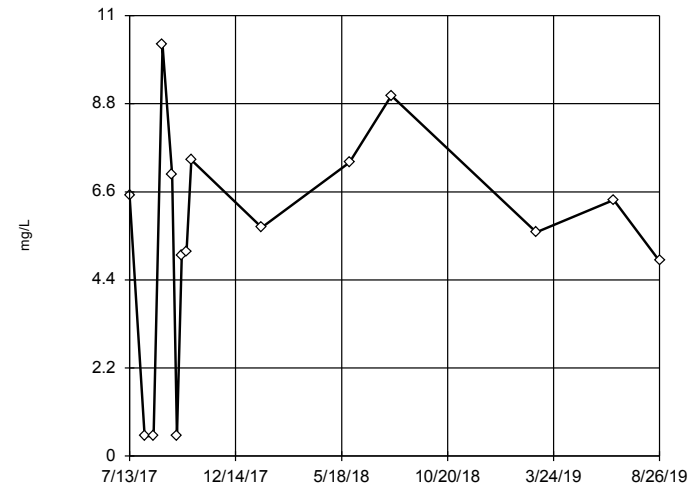
Tukey's Outlier Screening  
SP-1



n = 17  
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 = 10.71, low cutoff = 0.05624, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening  
SP-10

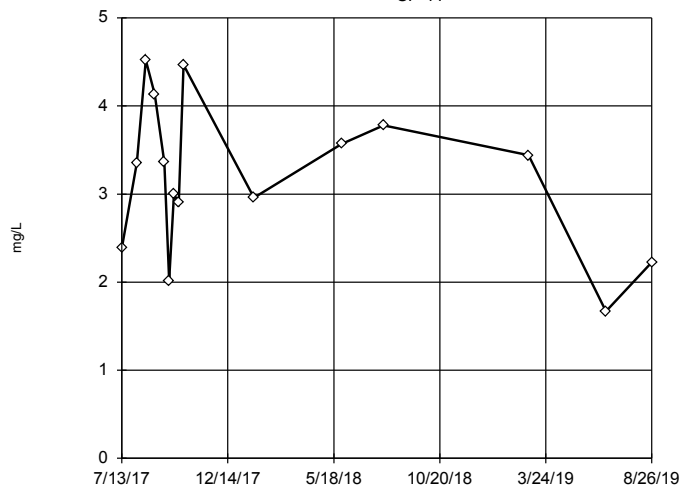


n = 15  
No outliers found. Tukey's method selected by user.  
Data were square transformed to achieve best W statistic (graph shown in original units).  
High cutoff = 11.99, low cutoff = -8.134, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 12/5/2019 7:07 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-11

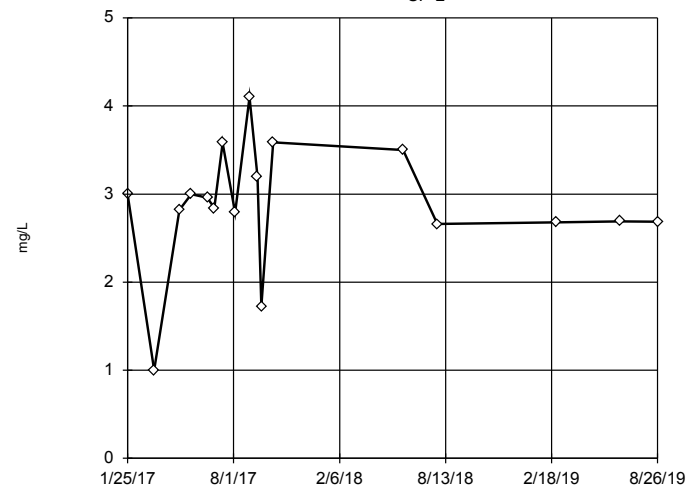


n = 15  
 No outliers found. Tukey's method selected by user.  
 Ladder of Powers transformations did not improve normality; analysis run on raw data.  
 High cutoff = 7.962, low cutoff = -1.796, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-2

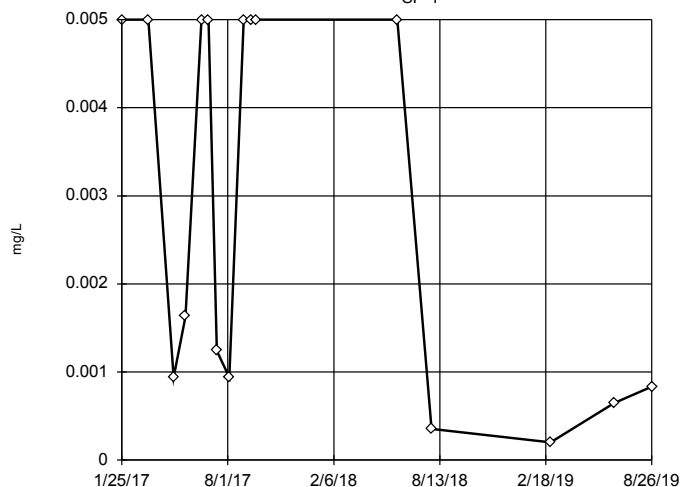


n = 17  
 No outliers found. Tukey's method selected by user.  
 Data were square transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 4.831, low cutoff = -2.217, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-1

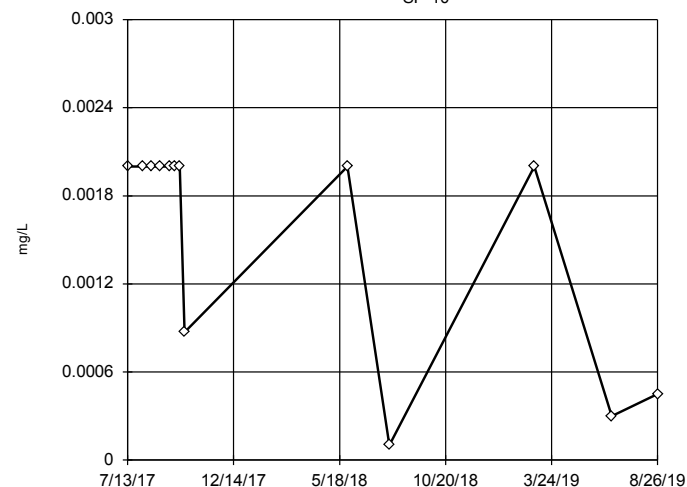


n = 16  
 No outliers found. Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.8988, low cutoff = 0.000004929, based on IQR multiplier of 3.

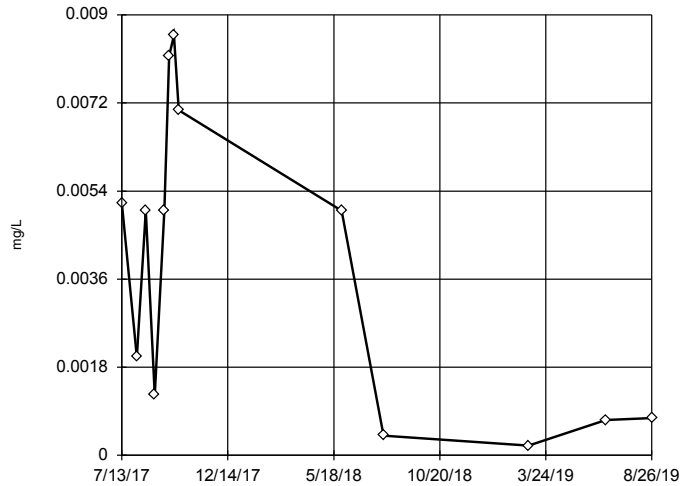
Constituent: Lead Analysis Run 12/5/2019 7:07 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-10



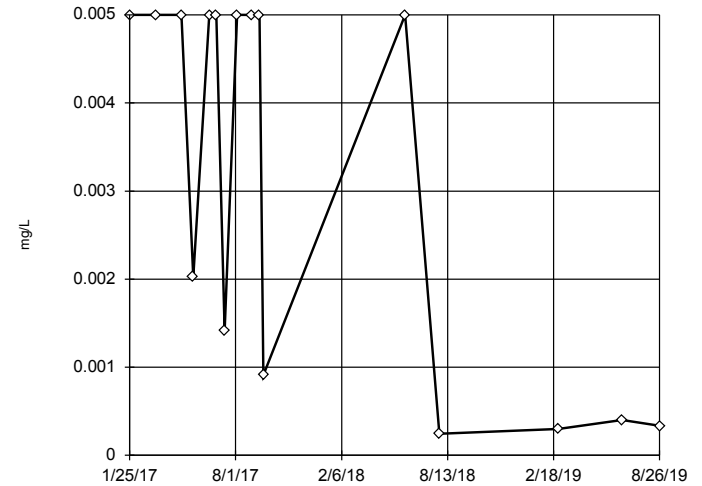
Tukey's Outlier Screening  
SP-11



n = 13  
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 = 0.05286, low cutoff = -0.01557, based on IQR multiplier of 3.

Constituent: Lead Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

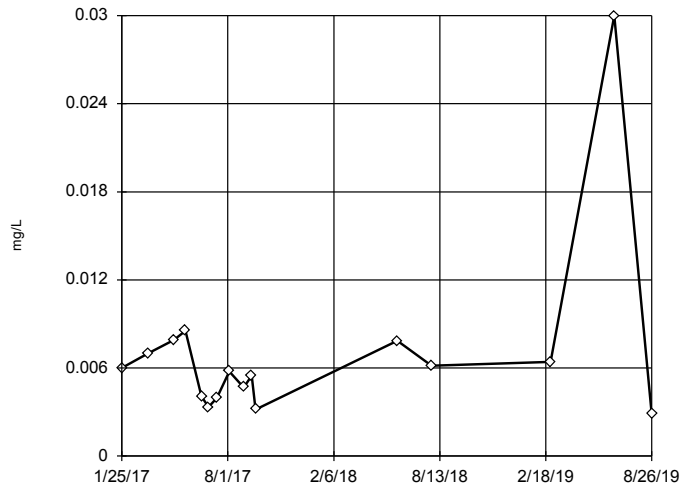
Tukey's Outlier Screening  
SP-2



n = 16  
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 = 2.846, low cutoff = 0.0000106, based on IQR multiplier of 3.

Constituent: Lead Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

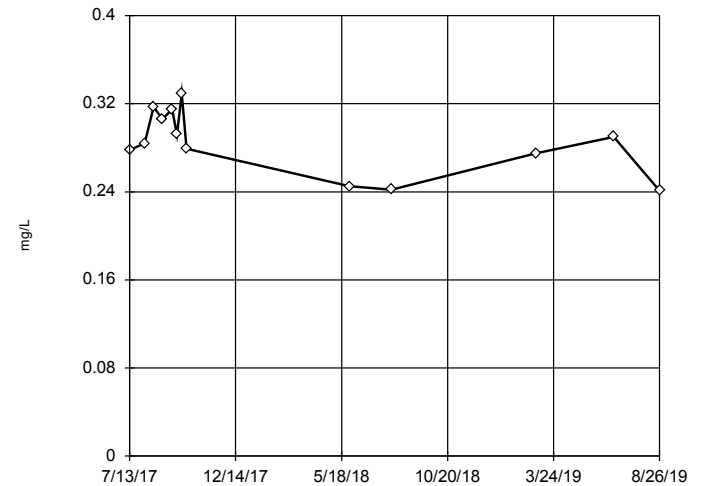
Tukey's Outlier Screening  
SP-1



n = 16  
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 = 0.04684, low cutoff = 0.0006345, based on IQR multiplier of 3.

Constituent: Lithium Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening  
SP-10

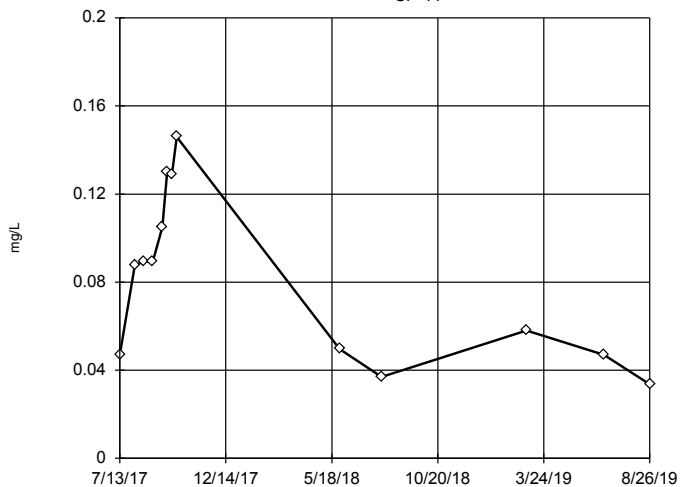


n = 13  
No outliers found. Tukey's method selected by user.  
Data were cube transformed to achieve best W statistic (graph shown in original units).  
High cutoff = 0.4053, low cutoff = -0.2652, based on IQR multiplier of 3.

Constituent: Lithium Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-11



n = 13  
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 = 0.662, low cutoff = -0.0001086, based on IQR multiplier of 3.

Constituent: Lithium Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-2

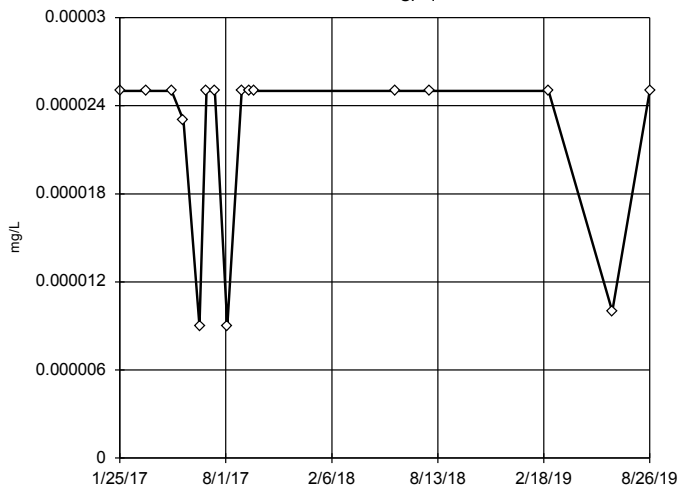


n = 16  
No outliers found.  
Tukey's method selected by user.  
Data were cube transformed to achieve best W statistic (graph shown in original units).  
High cutoff = 0.1421, low cutoff = -0.1227, based on IQR multiplier of 3.

Constituent: Lithium Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-1

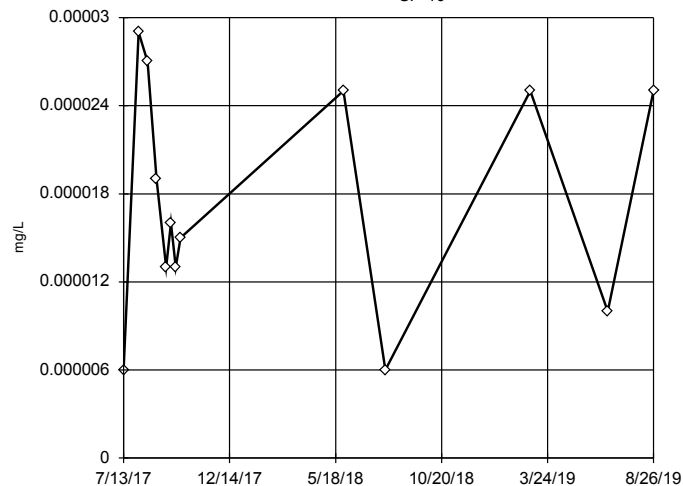


n = 16  
No outliers found.  
Tukey's method selected by user.  
Data were x\*4 transformed to achieve best W statistic (graph shown in original units).  
The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Mercury Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-10

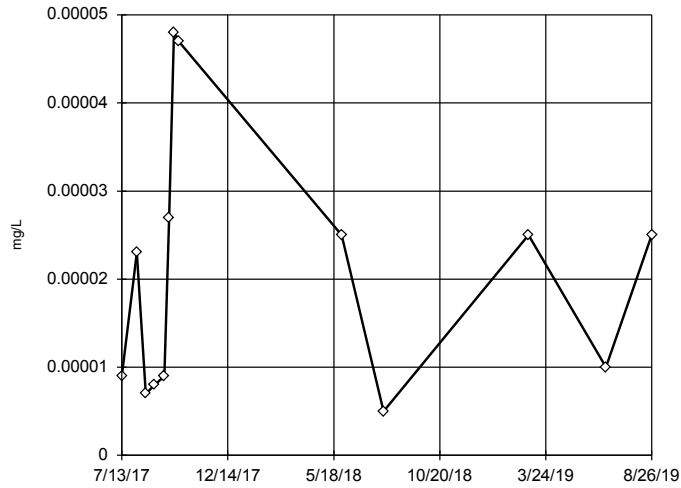


n = 13  
No outliers found.  
Tukey's method selected by user.  
Ladder of Powers transformations did not improve normality; analysis run on raw data.  
High cutoff = 0.0000655, low cutoff = -0.000029, based on IQR multiplier of 3.

Constituent: Mercury Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

SP-11

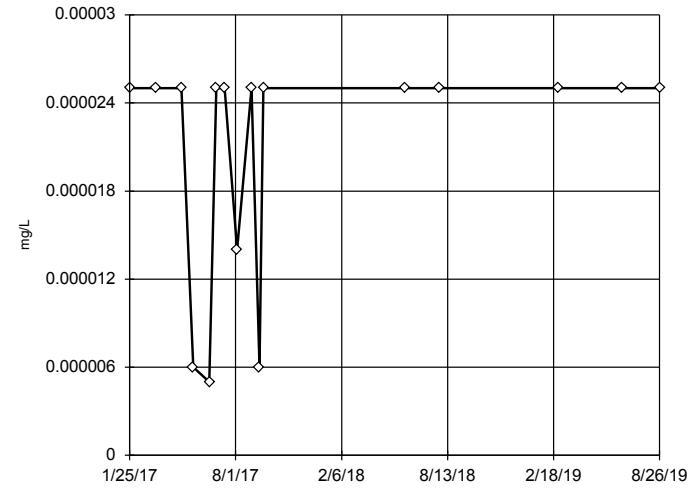


n = 13  
 No outliers found. Tukey's method selected by user.  
 Data were natural log transformed to achieve best W statistic (graph shown in original units).  
 High cutoff = 0.0007458, low cutoff = 3.0e-7, based on IQR multiplier of 3.

Constituent: Mercury Analysis Run 12/5/2019 7:08 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening

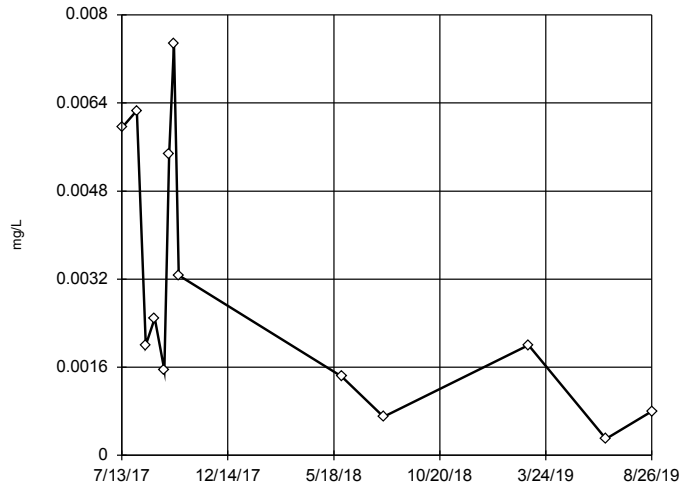
SP-2







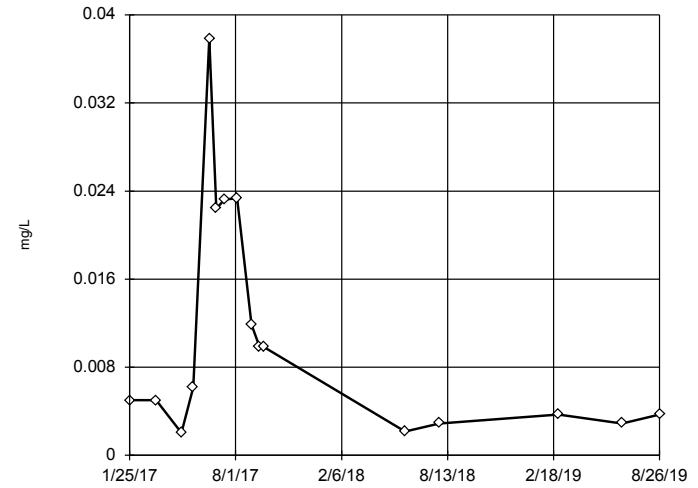
Tukey's Outlier Screening  
SP-11



n = 13  
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 = 0.0671, low cutoff = -0.001951, based on IQR multiplier of 3.

Constituent: Selenium Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

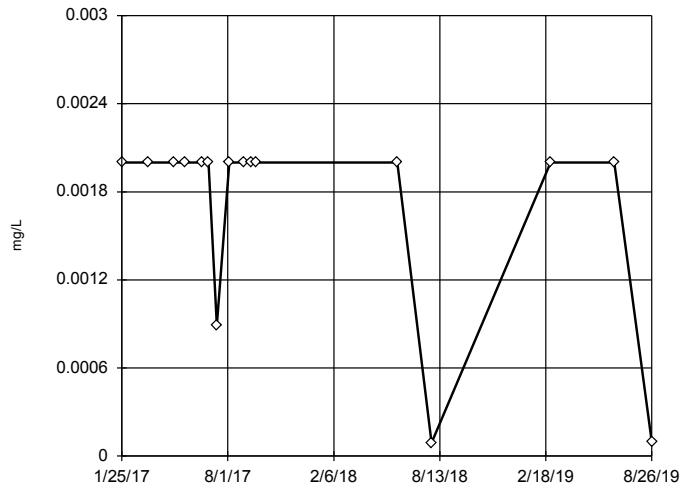
Tukey's Outlier Screening  
SP-2



n = 16  
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 = 2.01, low cutoff = 0.00002657, based on IQR multiplier of 3.

Constituent: Selenium Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

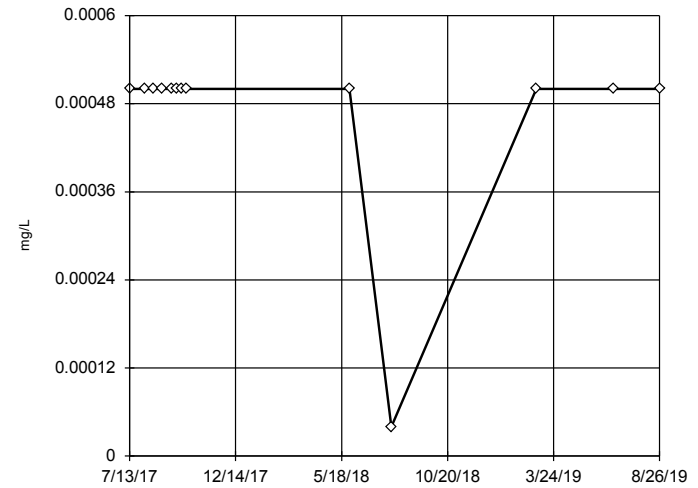
Tukey's Outlier Screening  
SP-1



n = 16  
No outliers found. Tukey's method selected by user.  
Ladder of Powers transformations did not improve normality, analysis run on raw data.  
The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Thallium Analysis Run 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

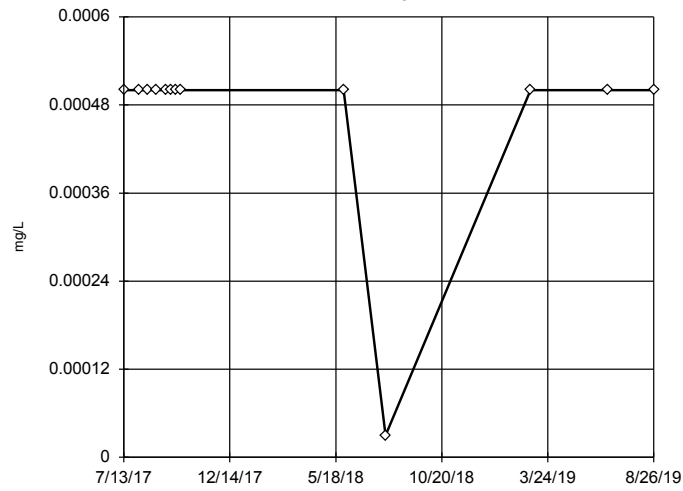
Tukey's Outlier Screening  
SP-10



n = 13  
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 12/5/2019 7:08 PM  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

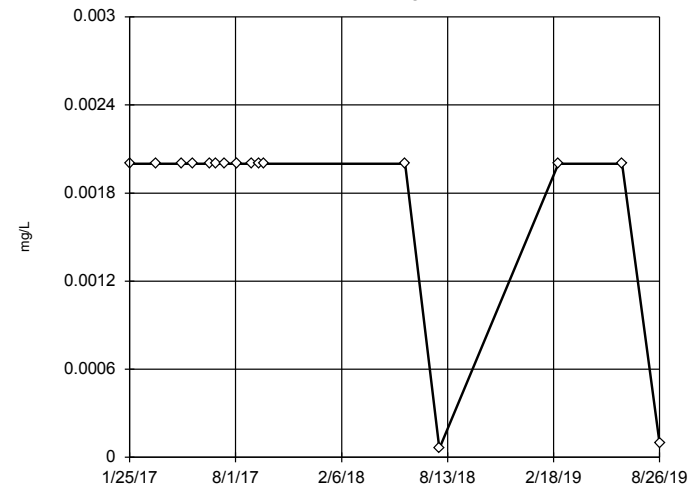
### Tukey's Outlier Screening SP-11



n = 13  
 No outliers found.  
 Tukey's method selected by user.  
 Data were x<sup>4</sup> 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 12/5/2019 7:08 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Tukey's Outlier Screening SP-2



n = 16  
 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.

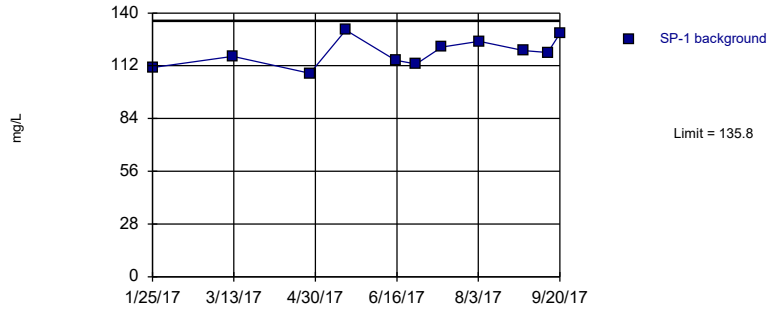
Constituent: Thallium Analysis Run 12/5/2019 7:08 PM  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Intrawell Prediction Limit Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/9/2019, 4:21 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Sig.</u>	<u>Bg N</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Calcium (mg/L)	SP-1	135.8	n/a	n/a	11	119.1	7.286	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-10	108.8	n/a	n/a	8	71.1	14.43	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-11	1894	n/a	n/a	8	629.5	483.3	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-2	157.3	n/a	n/a	11	103.8	23.28	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-4	2033	n/a	n/a	12	19.81	11.32	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-5	79.1	n/a	n/a	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2

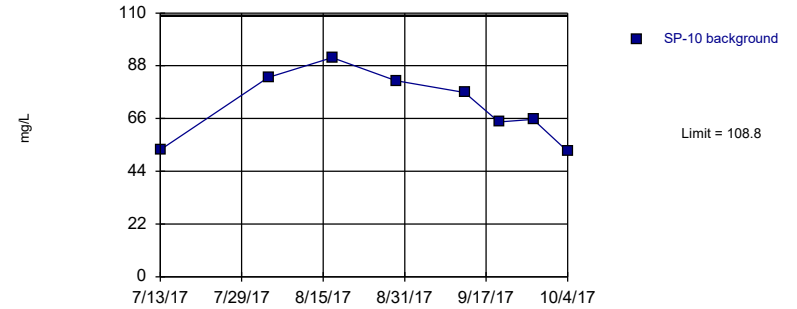
Prediction Limit  
Intrawell Parametric, SP-1



Background Data Summary: Mean=119.1, Std. Dev.=7.286, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9766, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 12/9/2019 4:20 PM View: PLs Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

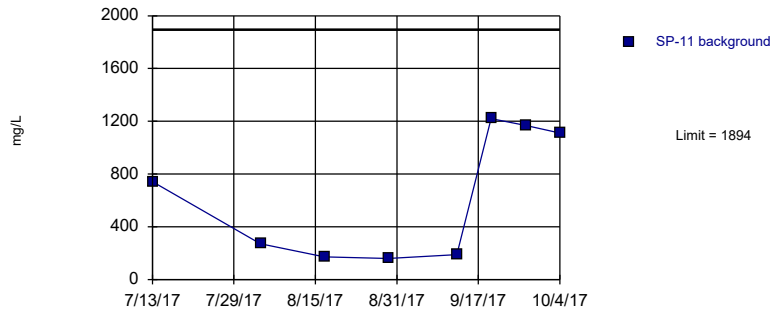
Prediction Limit  
Intrawell Parametric, SP-10



Background Data Summary: Mean=71.1, Std. Dev.=14.43, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9303, 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 12/9/2019 4:20 PM View: PLs Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

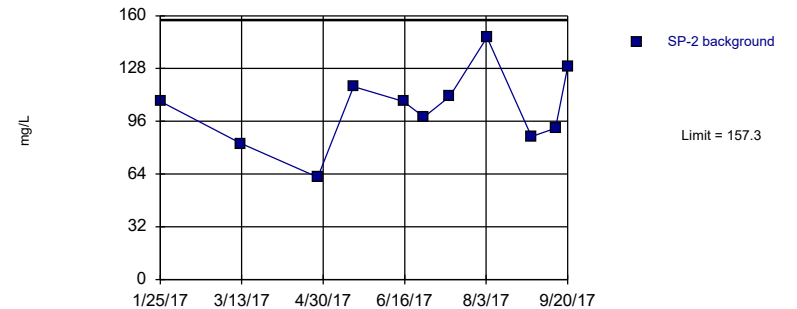
Prediction Limit  
Intrawell Parametric, SP-11



Background Data Summary: Mean=629.5, Std. Dev.=483.3, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8, 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 12/9/2019 4:20 PM View: PLs Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

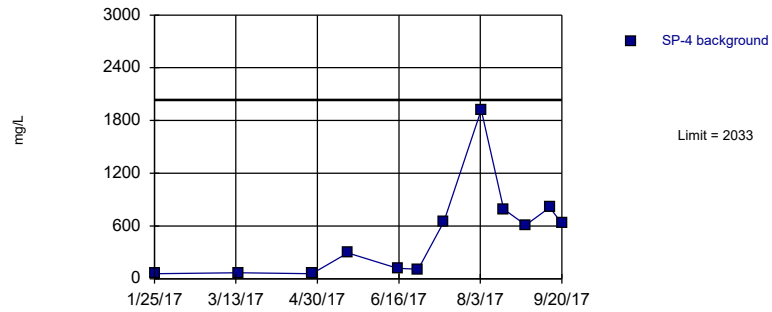
Prediction Limit  
Intrawell Parametric, SP-2



Background Data Summary: Mean=103.8, Std. Dev.=23.28, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9891, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 12/9/2019 4:20 PM View: PLs Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

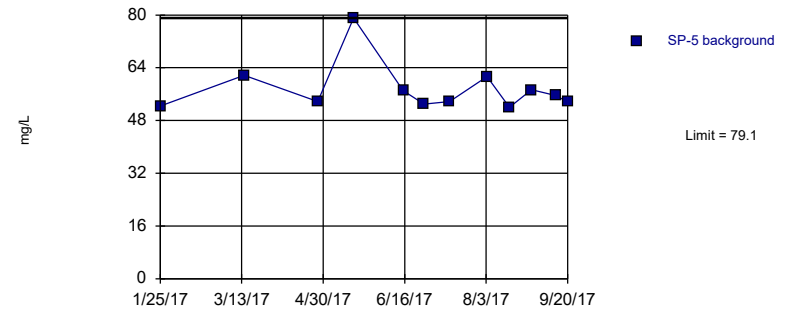
Prediction Limit  
Intrawell Parametric, SP-4 (bg)



Background Data Summary (based on square root transformation): Mean=19.81, Std. Dev.=11.32, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8858, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 12/9/2019 4:20 PM View: PLs Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit  
Intrawell Non-parametric, SP-5 (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 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 12/9/2019 4:20 PM View: PLs Intrawell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Interwell Prediction Limit Summary Table - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/9/2019, 2:42 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Date</u>	<u>Observ.</u>	<u>Sig.</u>	<u>Bg N</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Boron (mg/L)	n/a	0.61	n/a	n/a	4 future	n/a	30	n/a	n/a	0	n/a	n/a	0.001957	NP Inter (normality) 1 of 2
Chloride (mg/L)	n/a	769.2	n/a	n/a	4 future	n/a	29	297583	155841	0	None	x^2	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	n/a	4.394	n/a	n/a	4 future	n/a	32	10.84	4.537	3.125	None	x^2	0.00188	Param Inter 1 of 2
pH, field (SU)	n/a	8.455	7.077	n/a	4 future	n/a	28	7.766	0.3639	0	None	No	0.0009398	Param Inter 1 of 2
Sulfate (mg/L)	n/a	90	n/a	n/a	4 future	n/a	30	n/a	n/a	0	n/a	n/a	0.001957	NP Inter (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	n/a	1567	n/a	n/a	4 future	n/a	29	1275	155	0	None	No	0.00188	Param Inter 1 of 2

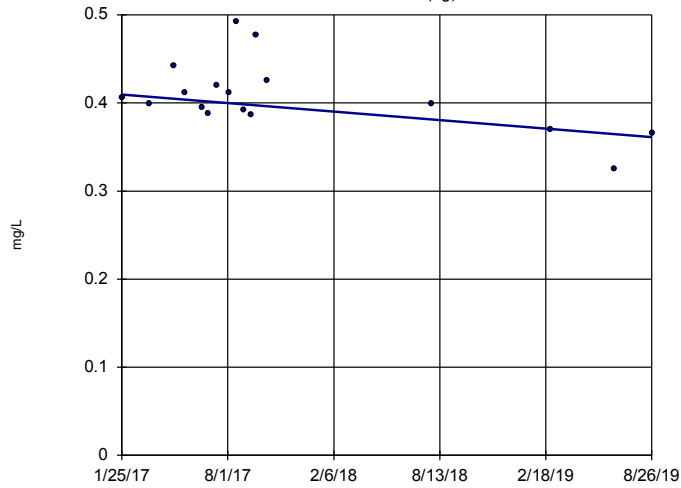
# Trend Tests Summary Table - Upgradient Wells

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 11/19/2019, 4:21 PM

<u>Constituent</u>	<u>Well</u>	<u>Slope</u>	<u>Calc.</u>	<u>Critical</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Normality</u>	<u>Xform</u>	<u>Alpha</u>	<u>Method</u>
Boron (mg/L)	SP-4 (bg)	-0.01864	-41	-63	No	17	0	n/a	n/a	0.01	NP
Boron (mg/L)	SP-5 (bg)	-0.00634	-15	-63	No	17	0	n/a	n/a	0.01	NP
Chloride (mg/L)	SP-4 (bg)	1.949	3	58	No	16	0	n/a	n/a	0.01	NP
Chloride (mg/L)	SP-5 (bg)	60.83	53	53	No	15	0	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-4 (bg)	-0.04271	-9	-68	No	18	5.556	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-5 (bg)	-0.004101	-4	-68	No	18	0	n/a	n/a	0.01	NP
pH, field (SU)	SP-4 (bg)	-0.2636	-38	-58	No	16	0	n/a	n/a	0.01	NP
pH, field (SU)	SP-5 (bg)	-0.1811	-18	-58	No	16	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	SP-4 (bg)	15.77	53	63	No	17	0	n/a	n/a	0.01	NP
<b>Sulfate (mg/L)</b>	<b>SP-5 (bg)</b>	<b>-3.975</b>	<b>-114</b>	<b>-63</b>	<b>Yes</b>	<b>17</b>	<b>0</b>	<b>n/a</b>	<b>n/a</b>	<b>0.01</b>	<b>NP</b>
Total Dissolved Solids [TDS] (mg/L)	SP-4 (bg)	18.3	26	63	No	17	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-5 (bg)	37.26	43	58	No	16	0	n/a	n/a	0.01	NP

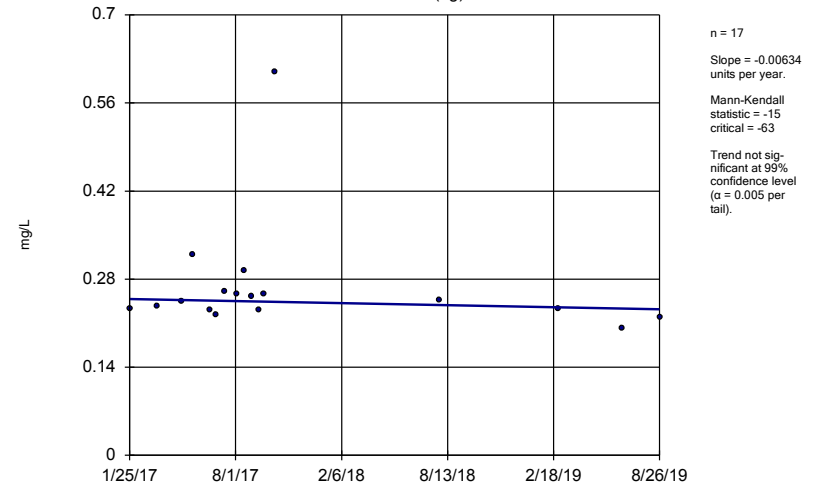


Sen's Slope Estimator  
SP-4 (bg)



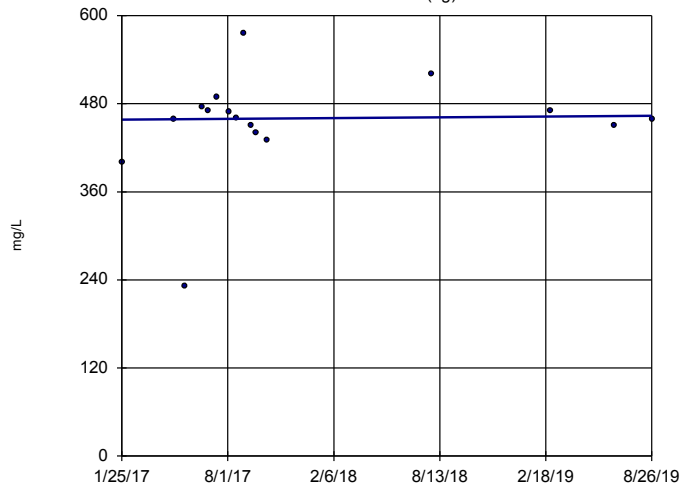
Constituent: Boron Analysis Run 11/19/2019 4:20 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-5 (bg)



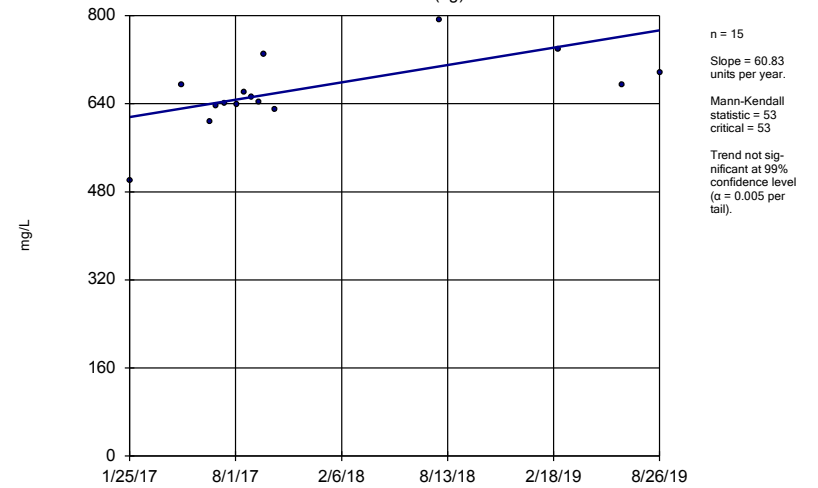
Constituent: Boron Analysis Run 11/19/2019 4:20 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-4 (bg)



Constituent: Chloride Analysis Run 11/19/2019 4:20 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

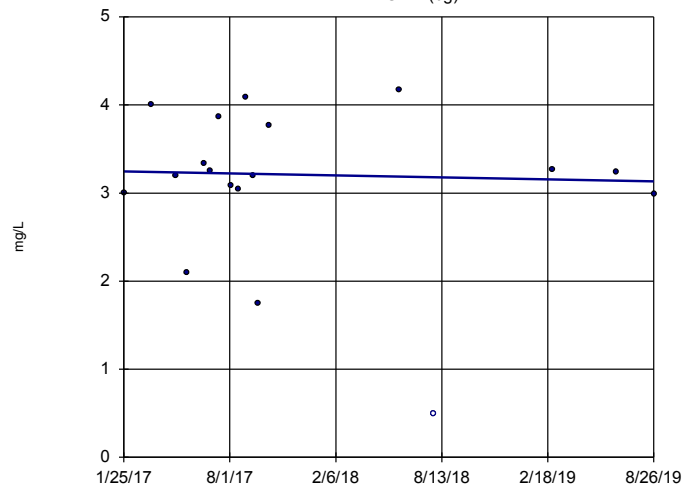
Sen's Slope Estimator  
SP-5 (bg)



Constituent: Chloride Analysis Run 11/19/2019 4:20 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-4 (bg)

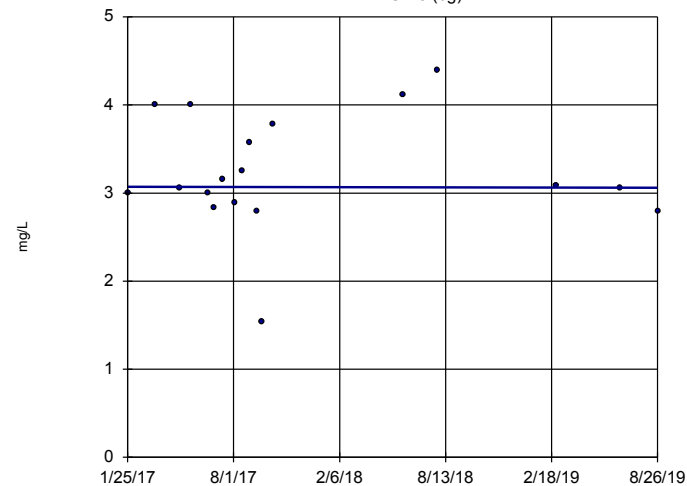


n = 18  
Slope = -0.04271  
units per year.  
Mann-Kendall  
statistic = -9  
critical = -68  
Trend not sig-  
nificant at 99%  
confidence level  
( $\alpha = 0.005$  per  
tail).

Constituent: Fluoride Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-5 (bg)

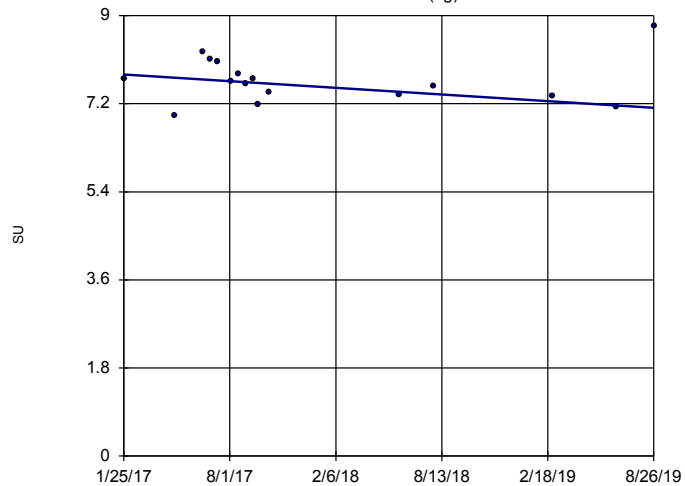


n = 18  
Slope = -0.004101  
units per year.  
Mann-Kendall  
statistic = -4  
critical = -68  
Trend not sig-  
nificant at 99%  
confidence level  
( $\alpha = 0.005$  per  
tail).

Constituent: Fluoride Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

SP-4 (bg)

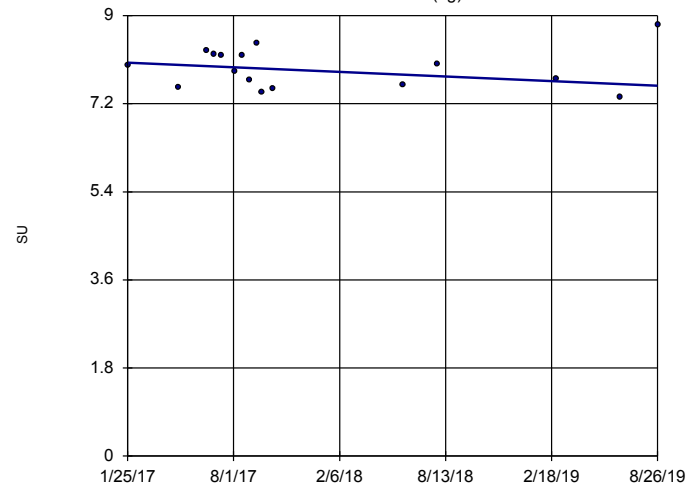


n = 16  
Slope = -0.2636  
units per year.  
Mann-Kendall  
statistic = -38  
critical = -58  
Trend not sig-  
nificant at 99%  
confidence level  
( $\alpha = 0.005$  per  
tail).

Constituent: pH, field Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Sen's Slope Estimator

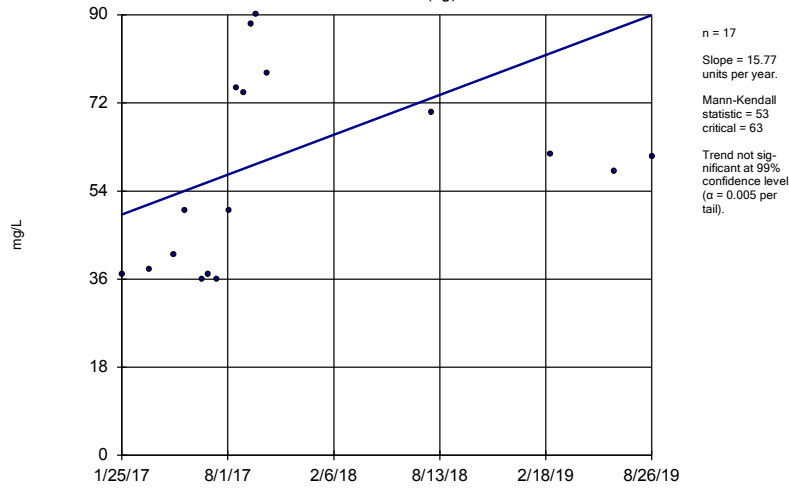
SP-5 (bg)



n = 16  
Slope = -0.1811  
units per year.  
Mann-Kendall  
statistic = -18  
critical = -58  
Trend not sig-  
nificant at 99%  
confidence level  
( $\alpha = 0.005$  per  
tail).

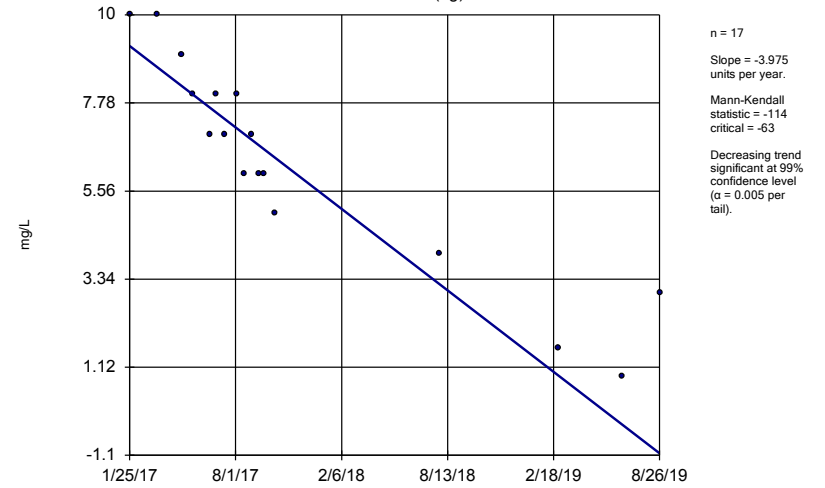
Constituent: pH, field Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-4 (bg)



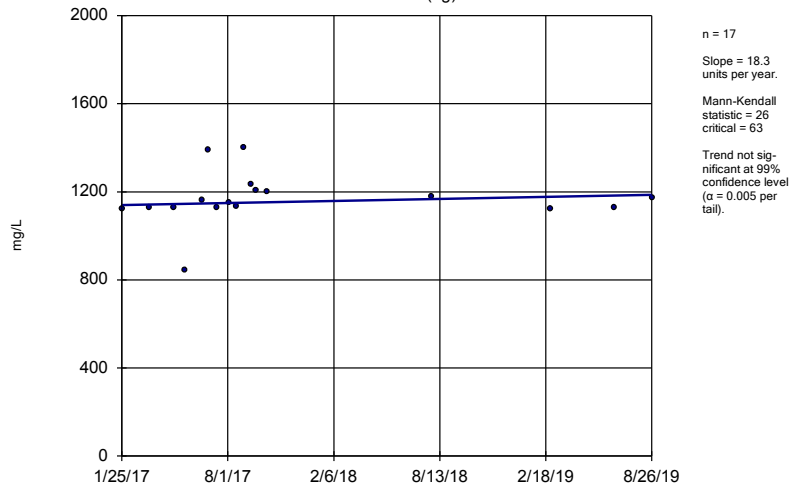
Constituent: Sulfate Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-5 (bg)



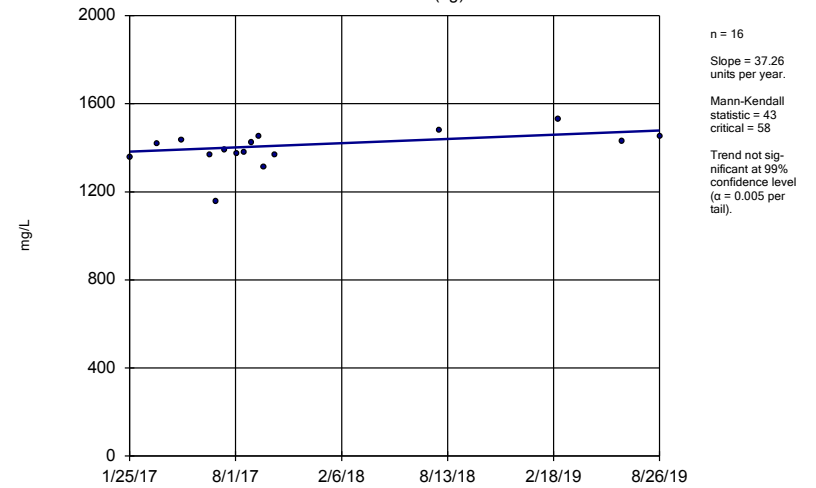
Constituent: Sulfate Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-4 (bg)



Constituent: Total Dissolved Solids [TDS] Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator  
SP-5 (bg)



Constituent: Total Dissolved Solids [TDS] Analysis Run 11/19/2019 4:21 PM View: Interwell  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

# Upper Tolerance Limits - App IV

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:36 PM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	0.00514	34	n/a	n/a	50	n/a	n/a	0.1748	NP Inter(normality)
Arsenic (mg/L)	0.05675	33	0.1124	0.05752	9.091	None	sqrt(x)	0.05	Inter
Barium (mg/L)	2.41	33	n/a	n/a	0	n/a	n/a	0.184	NP Inter(normality)
Beryllium (mg/L)	0.00212	33	n/a	n/a	30.3	n/a	n/a	0.184	NP Inter(Cohens/xform)
Cadmium (mg/L)	0.00247	33	n/a	n/a	60.61	n/a	n/a	0.184	NP Inter(normality)
Chromium (mg/L)	0.04182	33	n/a	n/a	21.21	n/a	n/a	0.184	NP Inter(normality)
Cobalt (mg/L)	0.01786	33	n/a	n/a	15.15	n/a	n/a	0.184	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	16.52	33	8.197	3.807	0	None	No	0.05	Inter
Fluoride (mg/L)	4.468	36	10.65	4.316	2.778	None	x^2	0.05	Inter
Lead (mg/L)	0.0107	33	n/a	n/a	39.39	n/a	n/a	0.184	NP Inter(normality)
Lithium (mg/L)	0.1472	34	0.09636	0.02338	0	None	No	0.05	Inter
Mercury (mg/L)	0.00003	33	n/a	n/a	60.61	n/a	n/a	0.184	NP Inter(normality)
Molybdenum (mg/L)	0.01	34	n/a	n/a	50	n/a	n/a	0.1748	NP Inter(normality)
Selenium (mg/L)	0.00499	34	n/a	n/a	64.71	n/a	n/a	0.1748	NP Inter(normality)
Thallium (mg/L)	0.00162	33	n/a	n/a	87.88	n/a	n/a	0.184	NP Inter(NDs)

<b>NORTHEASTERN BAP GWPS</b>				
<b>Constituent Name</b>	<b>MCL</b>	<b>CCR Rule-Specified</b>	<b>Background Limit</b>	<b>GWPS</b>
Antimony, Total (mg/L)	0.006		0.0051	0.006
Arsenic, Total (mg/L)	0.01		0.06	0.06
Barium, Total (mg/L)	2		2.41	2.41
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		16.52	16.52
Fluoride, Total (mg/L)	4		4.47	4.47
Lead, Total (mg/L)	0.015		0.011	0.015
Lithium, Total (mg/L)	n/a	0.04	0.15	0.15
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		0.002	0.002

*\*Grey cell indicates ACL is higher than MCL.*

*\*MCL = Maximum Contaminant Level*

*\*RSL = Regional Screening Level*

# Confidence Intervals - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:39 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Compliance</u>	<u>Sig. N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>TransformAlpha</u>	<u>Method</u>
Lithium (mg/L)	SP-10	0.3055	0.2627	0.15	Yes 13	0.2841	0.02877	0	None	No	0.01 Param.

# Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:39 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	TransformAlpha	Method
Antimony (mg/L)	SP-1	0.00209	0.00069	0.006	No	16	0.001483	0.001536	43.75	None	No	0.01 NP (normality)
Antimony (mg/L)	SP-10	0.00251	0.00061	0.006	No	13	0.001441	0.001118	30.77	None	No	0.01 NP (Cohens/xfrm)
Antimony (mg/L)	SP-11	0.00564	-0.00003259	0.006	No	13	0.003377	0.003125	23.08	Cohen's	No	0.01 Param.
Antimony (mg/L)	SP-2	0.003973	0.001465	0.006	No	16	0.003266	0.002973	12.5	None	ln(x)	0.01 Param.
Arsenic (mg/L)	SP-1	0.005	0.00093	0.06	No	16	0.003415	0.001954	50	None	No	0.01 NP (normality)
Arsenic (mg/L)	SP-10	0.01392	0.003	0.06	No	13	0.006745	0.004118	15.38	None	No	0.01 NP (Cohens/xfrm)
Arsenic (mg/L)	SP-11	0.007836	0.003335	0.06	No	13	0.005585	0.003026	7.692	None	No	0.01 Param.
Arsenic (mg/L)	SP-2	0.0055	0.0014	0.06	No	16	0.003491	0.002932	6.25	None	No	0.01 NP (normality)
Barium (mg/L)	SP-1	0.2255	0.1758	2.41	No	16	0.2006	0.03818	0	None	No	0.01 Param.
Barium (mg/L)	SP-10	2.706	0.4788	2.41	No	13	1.744	1.731	0	None	sqrt(x)	0.01 Param.
Barium (mg/L)	SP-11	0.3622	0.1293	2.41	No	13	0.2556	0.169	0	None	sqrt(x)	0.01 Param.
Barium (mg/L)	SP-2	1.528	0.9	2.41	No	16	1.251	0.5881	0	None	x^(1/3)	0.01 Param.
Beryllium (mg/L)	SP-1	0.0005	0.00006	0.004	No	16	0.0002319	0.0001945	31.25	None	No	0.01 NP (normality)
Beryllium (mg/L)	SP-10	0.0005	0.00003	0.004	No	13	0.0002218	0.0002294	38.46	None	No	0.01 NP (normality)
Beryllium (mg/L)	SP-11	0.0005	0.00004	0.004	No	13	0.0002799	0.000199	30.77	None	No	0.01 NP (normality)
Beryllium (mg/L)	SP-2	0.0005	0.00006	0.004	No	16	0.0002094	0.0001827	25	None	No	0.01 NP (Cohens/xfrm)
Cadmium (mg/L)	SP-1	0.00022	0.00009	0.005	No	16	0.0001675	0.00005323	62.5	None	No	0.01 NP (normality)
Cadmium (mg/L)	SP-10	0.0002	0.00003	0.005	No	13	0.0001731	0.00006575	84.62	None	No	0.01 NP (NDs)
Cadmium (mg/L)	SP-11	0.0027	0.00006	0.005	No	13	0.0008692	0.001124	23.08	None	No	0.01 NP (Cohens/xfrm)
Cadmium (mg/L)	SP-2	0.0002	0.00008	0.005	No	16	0.00016	0.00005933	62.5	None	No	0.01 NP (normality)
Chromium (mg/L)	SP-1	0.00183	0.00062	0.1	No	16	0.001149	0.0006792	37.5	None	No	0.01 NP (Cohens/xfrm)
Chromium (mg/L)	SP-10	0.00244	0.00036	0.1	No	12	0.001714	0.002323	16.67	None	No	0.01 NP (Cohens/xfrm)
Chromium (mg/L)	SP-11	0.01504	0.001187	0.1	No	13	0.01025	0.01287	7.692	None	x^(1/3)	0.01 Param.
Chromium (mg/L)	SP-2	0.003	0.00059	0.1	No	16	0.001531	0.001234	18.75	None	No	0.01 NP (Cohens/xfrm)
Cobalt (mg/L)	SP-1	0.00242	0.0005	0.018	No	16	0.001367	0.001295	18.75	None	No	0.01 NP (Cohens/xfrm)
Cobalt (mg/L)	SP-10	0.003919	0.0008215	0.018	No	13	0.002546	0.001827	15.38	Cohen's	No	0.01 Param.
Cobalt (mg/L)	SP-11	0.009689	0.001996	0.018	No	13	0.005842	0.005173	7.692	None	No	0.01 Param.
Cobalt (mg/L)	SP-2	0.00251	0.0005	0.018	No	16	0.001122	0.0008247	18.75	None	No	0.01 NP (Cohens/xfrm)
Combined Radium 226 + 228 (pCi/L)	SP-1	3.939	2.909	16.52	No	15	3.424	0.7606	0	None	No	0.01 Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	11.03	1.405	16.52	No	13	6.984	8.061	0	None	sqrt(x)	0.01 Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.519	0.8399	16.52	No	12	1.679	1.07	0	None	No	0.01 Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	16.29	7.817	16.52	No	13	12.31	6.281	0	None	sqrt(x)	0.01 Param.
Fluoride (mg/L)	SP-1	0.9569	0.5669	4.47	No	16	0.7773	0.3186	12.5	None	sqrt(x)	0.01 Param.
Fluoride (mg/L)	SP-10	7.478	2.988	4.47	No	15	5.447	2.95	20	Cohen's	No	0.01 Param.
Fluoride (mg/L)	SP-11	3.768	2.603	4.47	No	15	3.185	0.8592	0	None	No	0.01 Param.
Fluoride (mg/L)	SP-2	3.316	2.427	4.47	No	17	2.871	0.7089	0	None	No	0.01 Param.
Lead (mg/L)	SP-1	0.002	0.00065	0.015	No	16	0.001424	0.0006727	50	None	No	0.01 NP (normality)
Lead (mg/L)	SP-10	0.002	0.0003	0.015	No	13	0.001517	0.0007715	69.23	None	No	0.01 NP (normality)
Lead (mg/L)	SP-11	0.00816	0.000404	0.015	No	13	0.003098	0.003036	23.08	None	No	0.01 NP (Cohens/xfrm)
Lead (mg/L)	SP-2	0.00202	0.000334	0.015	No	16	0.001476	0.0007506	56.25	None	No	0.01 NP (normality)
Lithium (mg/L)	SP-1	0.006777	0.00431	0.15	No	15	0.005543	0.001821	0	None	No	0.01 Param.
<b>Lithium (mg/L)</b>	<b>SP-10</b>	<b>0.3055</b>	<b>0.2627</b>	<b>0.15</b>	<b>Yes</b>	<b>13</b>	<b>0.2841</b>	<b>0.02877</b>	<b>0</b>	<b>None</b>	<b>No</b>	<b>0.01 Param.</b>
Lithium (mg/L)	SP-11	0.1092	0.05211	0.15	No	13	0.08066	0.03839	0	None	No	0.01 Param.
Lithium (mg/L)	SP-2	0.09406	0.06395	0.15	No	16	0.07643	0.02586	0	None	x^2	0.01 Param.
Mercury (mg/L)	SP-1	0.000025	0.00001	0.002	No	16	0.00002194	0.000006277	75	None	No	0.01 NP (normality)
Mercury (mg/L)	SP-10	0.00002628	0.00001173	0.002	No	13	0.00001762	0.000007974	23.08	Cohen's	No	0.01 Param.
Mercury (mg/L)	SP-11	0.000047	0.000007	0.002	No	13	0.00002062	0.00001449	23.08	None	No	0.01 NP (Cohens/xfrm)
Mercury (mg/L)	SP-2	0.000025	0.000014	0.002	No	16	0.00002069	0.000007939	75	None	No	0.01 NP (normality)
Molybdenum (mg/L)	SP-1	0.01566	0.009179	0.1	No	16	0.01242	0.004984	0	None	No	0.01 Param.
Molybdenum (mg/L)	SP-10	0.04589	0.007288	0.1	No	12	0.02862	0.03426	8.333	None	sqrt(x)	0.01 Param.
Molybdenum (mg/L)	SP-11	0.05198	0.02165	0.1	No	13	0.03278	0.02353	7.692	None	x^2	0.01 Param.
Molybdenum (mg/L)	SP-2	0.03284	0.02301	0.1	No	16	0.02792	0.007558	0	None	No	0.01 Param.
Selenium (mg/L)	SP-1	0.00651	0.00254	0.05	No	16	0.004413	0.003054	18.75	None	No	0.01 NP (Cohens/xfrm)
Selenium (mg/L)	SP-10	0.00567	0.0004	0.05	No	13	0.002548	0.00244	30.77	None	No	0.01 NP (Cohens/xfrm)
Selenium (mg/L)	SP-11	0.00626	0.0007	0.05	No	13	0.002898	0.002509	15.38	None	No	0.01 NP (Cohens/xfrm)

# Confidence Intervals - All Results

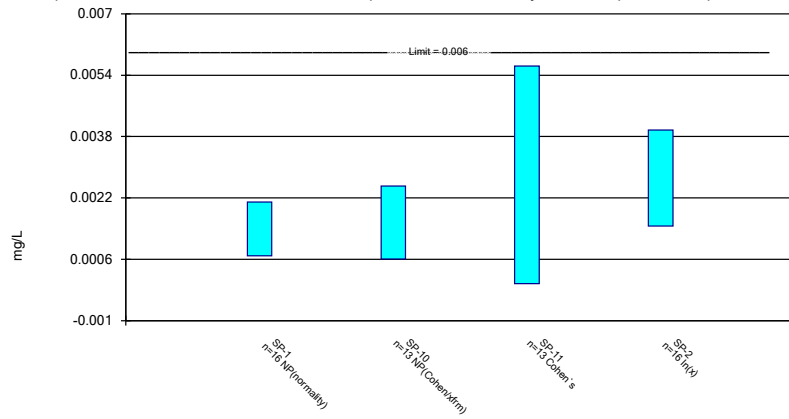
Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 12/5/2019, 7:39 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	TransformAlpha	Method
Selenium (mg/L)	SP-2	0.01476	0.003135	0.05	No	16	0.01025	0.01085	12.5	None	sqrt(x)	0.01 Param.
Thallium (mg/L)	SP-1	0.00089	0.0001	0.002	No	16	0.0005675	0.0004209	75	None	No	0.01 NP (normality)
Thallium (mg/L)	SP-10	0.0005	0.00004	0.002	No	13	0.0004646	0.0001276	92.31	None	No	0.01 NP (NDs)
Thallium (mg/L)	SP-11	0.0005	0.00003	0.002	No	13	0.0004638	0.0001304	92.31	None	No	0.01 NP (NDs)
Thallium (mg/L)	SP-2	0.0005	0.0001	0.002	No	16	0.0004475	0.0001436	87.5	None	No	0.01 NP (NDs)



Parametric and Non-Parametric (NP) Confidence Interval

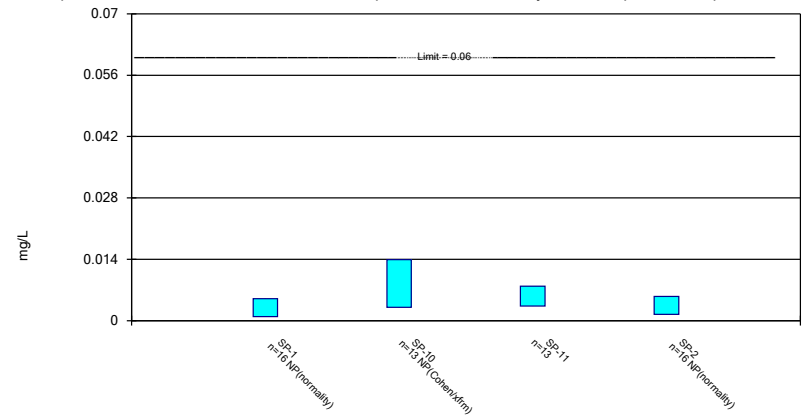
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

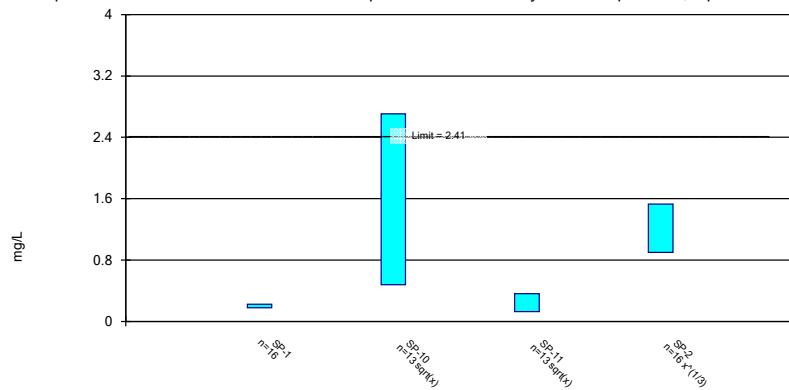
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

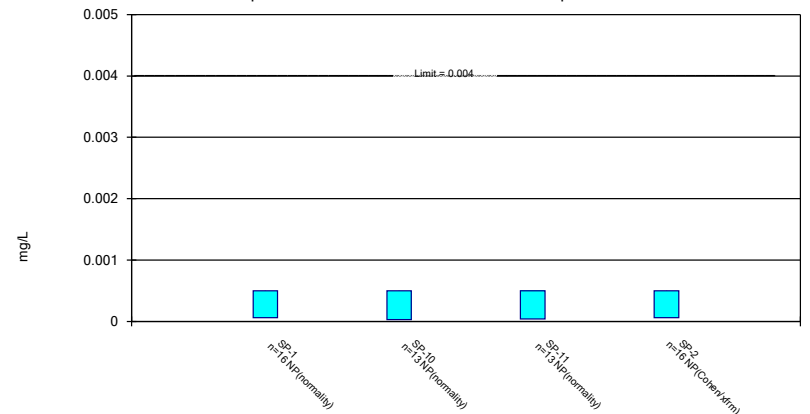
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



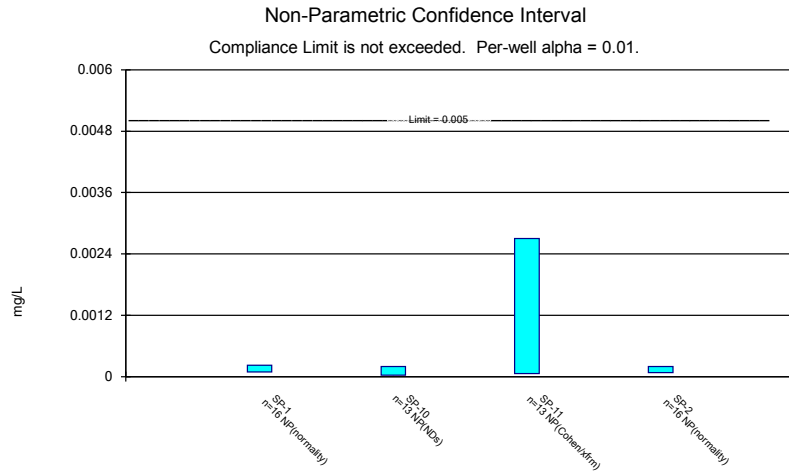
Constituent: Barium Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

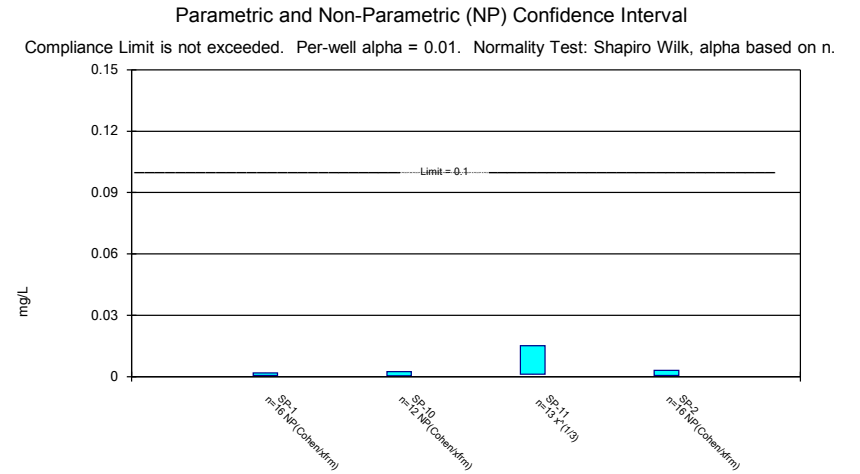
Compliance Limit is not exceeded. Per-well alpha = 0.01.



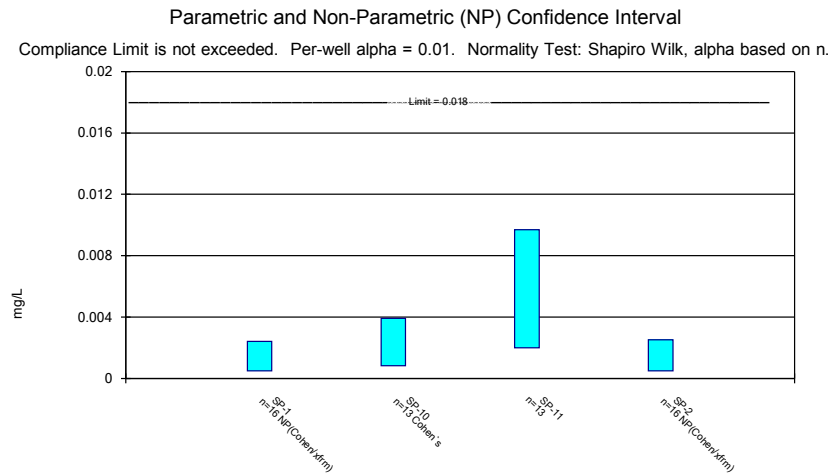
Constituent: Beryllium Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



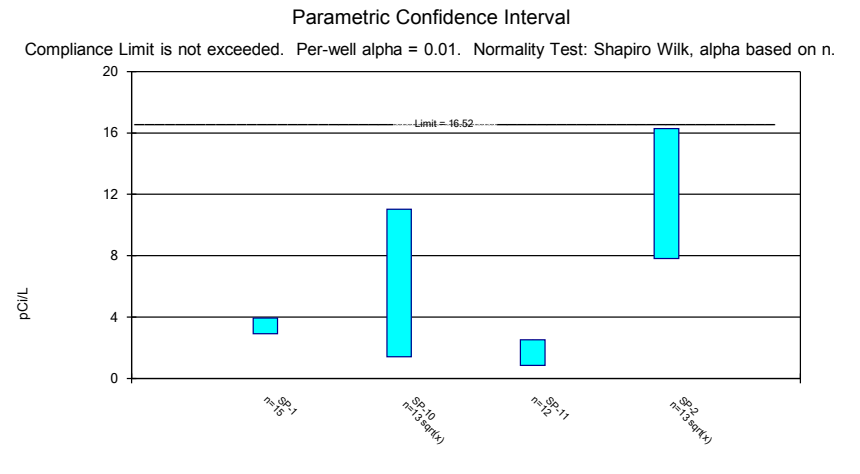
Constituent: Cadmium Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP



Constituent: Chromium Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP



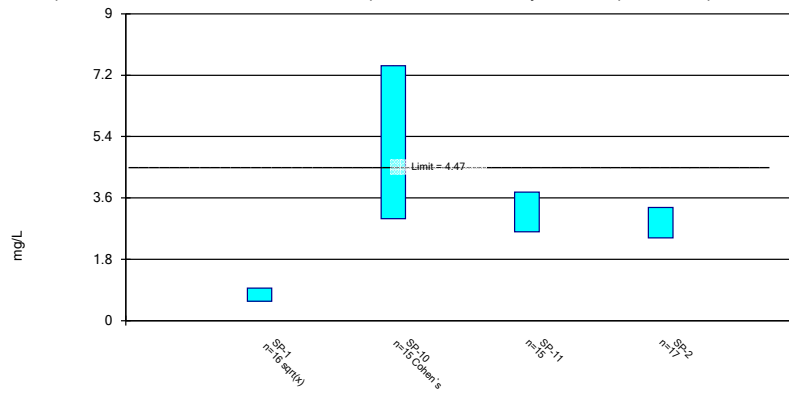
Constituent: Cobalt Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP



Constituent: Combined Radium 226 + 228 Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

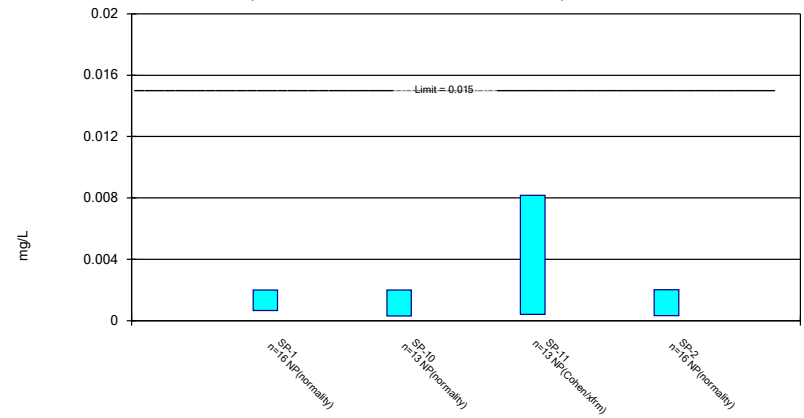
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Non-Parametric Confidence Interval

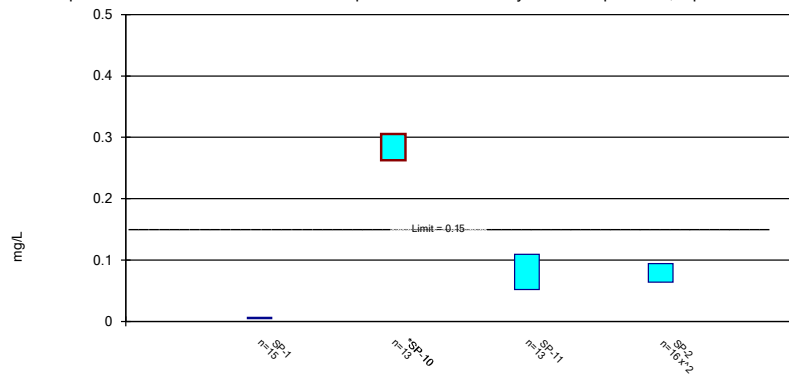
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Lead Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

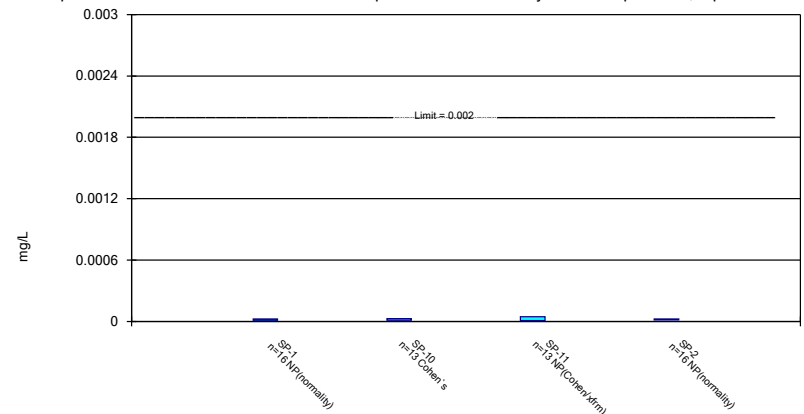
Compliance limit is exceeded.\* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

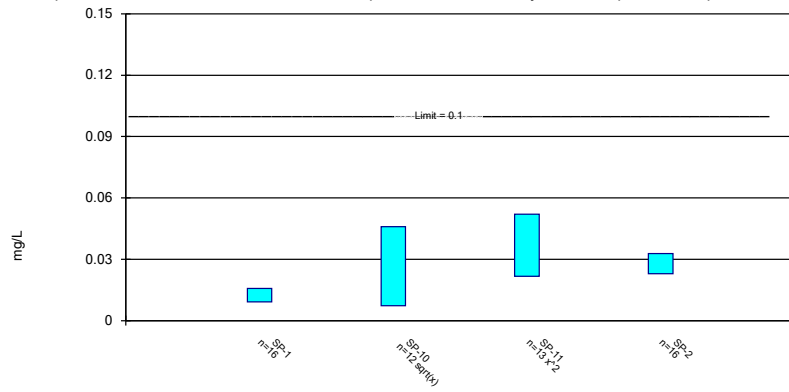
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Mercury Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric Confidence Interval

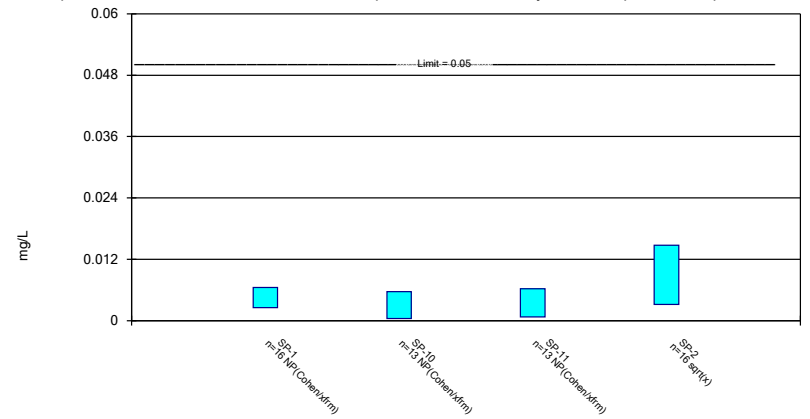
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

### Parametric and Non-Parametric (NP) Confidence Interval

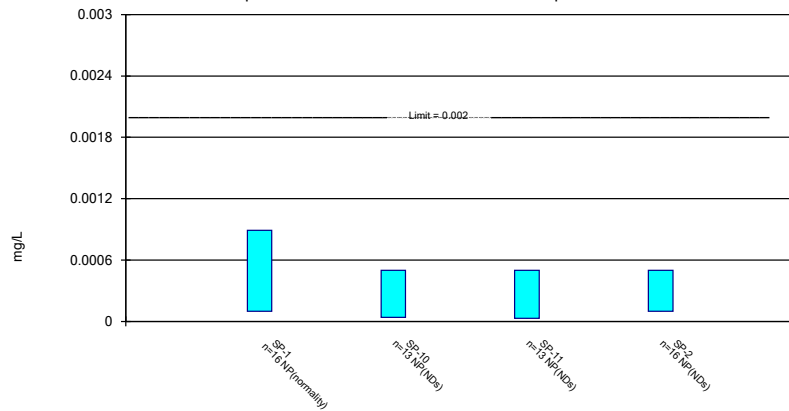
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 12/5/2019 7:38 PM View: Appendix IV  
 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 12/5/2019 7:38 PM View: Appendix IV  
 Northeastern BAP Client: Geosyntec Data: Northeastern BAP

## **APPENDIX III**

Alternate source demonstrations are included in this appendix. Alternate sources are sources or reasons that explain that statistically significant increases over background or statistically significant levels above the groundwater protection standard are not attributable to the CCR unit.



American Electric Power  
502 North Allen Avenue  
Shreveport, LA 71101  
AEP.com

May 1, 2019

Hillary Young, P.E.  
Oklahoma Department of Environmental Quality  
707 N Robinson  
Oklahoma City, OK 73102

Subject: Northeastern Power Station  
252:517 - Coal Combustion Residual  
Alternate Source Demonstration – Bottom Ash Pond

Dear Ms. Young:

In accordance with 252:517-9-6-(g)(3)(B) American Electric Power is submitting a report documenting the demonstration of an alternate source for the statistically significant level of lithium detected at the facility referenced above for your approval. This report has been certified by a qualified professional engineer. This report is being submitted within the required time frame which includes the 30 day extension granted by ODEQ in correspondence dated March 19, 2019.

Based on the alternate source demonstration the Bottom Ash Pond will continue to operate under the assessment monitoring program. This alternate source demonstration will be included in the annual 2019 groundwater monitoring and corrective action report in accordance with OAC 252:517-9-1(e).

If you have any questions regarding these submittals, you can contact me at 318-673-3816, or by email at [jcparker-witt@aep.com](mailto:jcparker-witt@aep.com).

Sincerely,

A handwritten signature in blue ink that reads "Jill Parker-Witt".

Jill Parker-Witt  
AEP Environmental Services

**ALTERNATIVE SOURCE  
DEMONSTRATION REPORT  
STATE CCR RULE**

**Northeastern Power Station  
Bottom Ash Pond  
Oologah, Oklahoma**

*Submitted to*



1 Riverside Plaza  
Columbus, Ohio 43215-2372

*Submitted by*



engineers | scientists | innovators

941 Chatham Lane  
Suite 103  
Columbus, OH 43221

April 24, 2019

CHA8462

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## ATTACHMENTS

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Attachment B	BAP-B1 Photolog
Attachment C	Mineralogical Analysis Laboratory Report
Attachment D	BAP Water Laboratory Analytical Data
Attachment E	Certification by a Qualified Professional Engineer



## LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
ASL	Alternate Screening Level
BAP	Bottom Ash Pond
CCR	Coal Combustion Residuals
CEC	Cation Exchange Capacity
CFR	Code of Federal Regulations
EPRI	Electric Power Research Institute
GSC	Groundwater Stats Consulting, LLC
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
MCL	Maximum Contaminant Level
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
OGS	Oklahoma Geological Survey
QA	Quality Assurance
QC	Quality Control
SSL	Statistically Significant Level
UTL	Upper Tolerance Limit
USEPA	United States Environmental Protection Agency
XRD	X-Ray Diffraction
XRF	X-Ray Fluorescence

## SECTION 1

### INTRODUCTION AND SUMMARY

The Northeastern Power Station has two regulated coal combustion residuals (CCR) management units, including the Bottom Ash Pond (BAP). In 2018, two assessment monitoring events were conducted at the BAP in accordance with OAC 252:517-9-6. The monitoring data were submitted to Groundwater Stats Consulting, LLC (GSC) for statistical analysis. Groundwater protection standards (GWPSs) were established for each Appendix IV parameter in accordance with United States Environmental Protection Agency's (USEPA) *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* (Unified Guidance; USEPA, 2009). The established GWPSs were determined as the greater of the background concentration and the maximum contaminant level (MCL) or alternate screen level (ASL) for each Appendix IV 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.

Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (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). An SSL was identified for lithium at SP-10 at the BAP (Geosyntec, 2019). The LCL for lithium at SP-10 of 0.263 milligram/liter (mg/L) exceeded the GWPS of 0.15 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 alternative source demonstration 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 Alternative Source Demonstration (ASD) report to document that the SSL identified for 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 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 SSL identified for lithium was based on a Type IV cause at SP-10 and not by a release from the BAP.

## SECTION 2

### ALTERNATIVE SOURCE DEMONSTRATION

In accordance with OAC 252:517-9-6(g)(3)(B), the owner or operator of a CCR unit has 90 days from the determination of an SSL to demonstrate that a source other than the CCR unit caused the SSL. On March 19, 2019 ODEQ granted a 30-day extension for completion of this demonstration. Initial review of site groundwater geochemistry, historical data, and laboratory QA/QC did not identify alternative sources due to Type I (sampling), Type II (laboratory), or Type III (statistical evaluation) issues. As described below, the SSL has been attributed to natural variation in the underlying geology and geochemistry, which are Type IV issues.

#### 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 (5YR7/2) to medium gray (N5) 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 member is approximately 2-feet thick about 13 miles south of the Site (OGS, 2005 and Woodruff, 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 Higginville 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**

According to the groundwater monitoring network report for the BAP (Terracon, 2017), the Site is underlain by a limestone unit from ground surface to approximately 30 to 50 feet below ground surface (ft bgs), with a shale unit underlying the limestone. The wells within the CCR compliance network (SP-1, SP-2, SP-4, SP-5R, SP-10, and SP-11) were selected to monitor the upper limestone unit, which was determined to contain the shallow aquifer at the site. Wells set at deeper intervals (SP-3, SP-6, SP-7, SP-8, SP-9) were not selected for inclusion in the CCR compliance monitoring well network, as they were believed to be screened within the lower shale unit.

A subsequent review of the boring logs for co-located wells SP-9 (shale) and SP-10 (limestone) indicates a discrepancy regarding the upper elevation of the limestone-shale interface. The SP-9 boring log identified shale with interbedded limestone beginning at approximately 40 ft bgs, whereas the SP-10 boring log identified limestone to approximately 51.5 ft bgs, with increasing frequency of interbedded shale at greater depths. The two borings were logged using cuttings, which can obscure lithologic changes. To clarify the site geology, Geosyntec advanced two additional borings at the Site in early 2019 (Figure 1). Boring BAP-B1 was advanced to a depth of 186 ft bgs.

The following is a general summary of the geologic units encountered at BAP-B1:

<b>Geologic Unit</b>	<b>Depth (ft bgs)</b>	<b>Elevation (ft amsl)<sup>1</sup></b>
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 boring log for BAP-B1 is provided in Attachment A and a photolog documenting the observed lithology is provided in Attachment B. Based on this and logs for other borings near the BAP, it appears that all wells near the BAP are set within the upper limestone unit. This limestone unit appears representative of the Oologah Formation and 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 were identified from elevations of approximately 25 to 75 ft bgs.

Boring BAP-B2 was advanced in the vicinity of SP-10 to relog that location and provide clarity regarding the geology of the well at the screened interval. The boring log for BAP-B2 is provided in Attachment A. A thin shale horizon was observed at 46 ft bgs, which is within the screened interval of SP-10.

Samples were collected from four intervals at boring BAP-B2 for laboratory analysis, as summarized below:

<b>Sample Depth (ft bgs)</b>	<b>Sample ID</b>	<b>Description</b>
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

The samples were submitted to Mineralogy, Inc. (Tulsa, Oklahoma) for mineralogical analysis, including bulk analysis by X-ray diffraction (XRD), X-ray fluorescence (XRF), cation exchange capacity (CEC), and thin section petrography. A portion of each sample was submitted to Accurate Environmental Laboratories (Tulsa, Oklahoma) for acid digestion and analysis of total lithium by USEPA Method 6020A.

The XRD analysis confirmed that limestone is present at depths to at least 72 ft bgs, which is deeper than expected based on the previous monitoring well network report and boring logs. The analyses also confirmed the horizon observed at 46 ft bgs is a shale parting, with clay minerals including illite and smectite (Table 1). The mineralogy report is provided as Attachment C.

### **2.3 Site Hydrogeology**

A review of groundwater conditions across the Site suggests that groundwater is not significantly present or laterally contiguous within the shallow limestone unit. Many of the wells in the vicinity of the BAP, including wells SP-2, SP-4, and SP-11 within the monitoring well network, typically have insufficient water for sampling (less than 0.5 feet of water in the well). Static water level measurements have shown significant variability between wells during each measurement event (typically on the order of approximately 30 feet), significant variation at individual wells over time, and inconsistent trend variation between wells over time. A time series graph illustrating groundwater elevation data over time shows chaotic fluctuations both within and between wells (Figure 2).

The petrographic analysis identified minimal porosity in the limestone fraction (Attachment C). Optical analysis of the sample collected at 32 ft bgs noted that porosity accounted for approximately 0.5-1.0% of the bulk volume of the sample. The deeper limestone samples collected at 46 ft bgs and 72 ft bgs were both described as non-porous. It was noted that the shale sample collected at 46 ft bgs had minor to trace amounts of micro-crack porosity. Thus, the geology at the site is generally non-porous, and indicates that there is little groundwater within the limestone.

These results suggest groundwater in the shallow limestone unit likely resides in discrete non-connected and poorly defined features (i.e., joints, fractures, cavities, or bedding planes).

### **2.4 Site Geochemistry**

A review of groundwater geochemistry at the Site generally supports the conceptual site model that groundwater in the shallow limestone unit resides in discrete, non-connected, and poorly defined features. Groundwater chemistry indicates different water types are present at the Site, as illustrated by the observed variability in both Schoeller and Piper diagrams (Figures 3 and 4, respectively). The Schoeller diagram illustrates data from one representative sampling event at each well, whereas the Piper plot depicts all available data over several sampling events. These different water types include calcium-carbonate, sodium-chloride, and sodium-chloride-sulfate groundwaters, as described below.

Groundwater in contact with limestone typically reaches equilibrium with carbonates such as calcite ( $\text{CaCO}_3$ ) or dolomite [ $\text{CaMg}(\text{CO}_3)_2$ ] due to relatively fast reaction kinetics. Equilibrium with carbonate minerals controls the concentration of calcium, alkalinity, and pH in the groundwater. This equilibrium results in a calcium-carbonate type groundwater signature, which is high in both calcium and carbonate. While all of the wells at the Site are believed to be screened in the upper limestone unit as described in Section 2.2, only SP-1 and SP-8 groundwater appears to represent calcium-carbonate type water (Figure 5). For instance, the presence of relatively high

magnesium at SP-1 suggests that dolomitic limestone is in close proximity to the well screen, whereas the low concentration of magnesium at SP-8 suggests the limestone is predominantly calcite near that well screen. There appears to be no hydraulic connection between these two wells, and no indications of mixing, which would be represented by similar magnesium concentrations at each well.

While carbonate is present in all the wells near the BAP, several of the wells appear to be dominated by a sodium-chloride type of water (SP-2, SP-3, SP-4, SP-5). Wells SP-6, SP-7, and SP-9 also are sodium-chloride type water; however, the concentration of total dissolved solids (TDS) concentrations are over an order of magnitude higher than SP2, SP-3, SP-4 and SP-5. The increase in TDS is the result of higher concentrations of sodium and chloride (Figure 3). These elevated sodium and chloride concentrations may indicate the presence of mineral salts in some parts of the aquifer. SP-10 and SP-11 are also sodium-chloride type waters, although they contain bicarbonate and sulfate anions as well (Figure 5).

This variability in groundwater chemistry suggests that the groundwater in the wells across the Site are not connected by a common aquifer. The different water types seem to be distributed randomly throughout the BAP unit, instead of being grouped according to physical location (Figure 6). On a constituent basis, sodium appears to correlate with the depth of the well screen interval, with higher concentrations detected at lower elevations (Figure 7). This suggests that the groundwater at locations with deeper screened intervals (i.e., SP-7, SP-9) may be influenced by the interbedded shale partings within the limestone, which generally become more prevalent at depth. The shale partings are a potential source of sodium, as shale contains clay fractions which can release sodium and other cations by ion exchange.

Mineralogical analysis of a sample from a shale lens at BAP-B2 (46 ft bgs) indicates that clay minerals such as illite and smectite comprised more than half of the sample material (Table 1). Smectite has a very high CEC, which includes a significant number of labile cations that populate its interlayer region. Additionally, this shale fraction has detectable levels of exchangeable cations (potassium and sodium), at higher concentrations than the limestone samples, suggesting that it is a source of cations to the groundwater (Table 2).

Some deeper wells (i.e., SP-8, SP-10) do not have high chloride concentrations as would be predicted based on the depth of their screened interval and the relationship noted above. This could be due to a lower prevalence of shale lenses within the screened interval at these locations compared to wells with higher chloride concentrations. The multiple types of groundwater and their limited relationship to spatial location or depth suggests that groundwater composition is highly variable at the site. This variability provides evidence that groundwater geochemistry at each well is influenced by localized geology (i.e., carbonate type, presence or absence of shale lenses) and indicates a lack of groundwater communication or mixing between wells.



### 2.4.1 Lithium Distribution at the Site

Lithium concentrations at the Site are also variable. While SP-10 has the highest lithium concentrations of the wells included in the monitoring network, other wells located near the BAP have significantly higher lithium concentrations (Figure 8). SP-9, which is co-located with SP-10 but screened approximately 20 feet deeper, has lithium concentrations which are approximately an order of magnitude higher. If lithium in groundwater was due to a release from the pond, we would expect to see higher concentrations at the shallower intervals closer to the source. Additionally, SP-6, which is east of the Pond also has concentrations that are much higher than those observed at SP-10.

Lithium at the Site appears to be correlated with the concentrations of major cations and anions, including sodium (Figure 9) and chloride (Figure 10). If lithium were elevated at a well due to a unique source (such as a release from the BAP), the ratio of lithium to other constituents would likely change due to differential mixing. However, the approximately linear relationship between lithium and other alkali metals, especially sodium and potassium, suggests that the lithium is a minor constituent of the saline source which is consistent across the Site.

As discussed in Section 2.4, the concentration of sodium is generally correlated with screen depth. A similar relationship is observed for lithium (Figure 11), with the same hypothesis that this increase in lithium with depth is due to the increasing frequency of shale lenses. Figure 12 compares the distribution of the exchangeable species in sample SP-10-LOG-2 with the concentration of the same group of cations in groundwater at SP-10. Based on their respective concentrations, calcium is preferentially taken up by exchange sites on clay minerals. This is apparent in the figure showing calcium occupying half the number of exchanges sites (upper graph), while dissolved calcium represents a relatively smaller fraction of the groundwater (lower graph). The clay's preference for calcium can be quantified using the values in Table 2. The ratio of exchangeable sodium to exchangeable calcium is 0.55/1, whereas the ratio of dissolved sodium to dissolved calcium in groundwater is 13/1, indicating a much higher proportion (factor of 24) of exchangeable calcium in the interlayer spaces than in the groundwater. The greater affinity for calcium in the interlayer region is mainly due to its divalent positive charge, whereas sodium and other alkali metals have a single positive charge.

Note that exchangeable cations were quantified for sodium, potassium, calcium and magnesium, whereas exchangeable lithium was too low to be detected by the standard laboratory method. Based on the slope of the relationship between lithium and sodium, the ratio of dissolved sodium to dissolved lithium is about 1400/1 (Figure 9). Using this ratio, exchangeable lithium is not likely to be present above the detection limit based on the concentration of exchangeable sodium observed (Table 2). While the laboratory results do not provide sufficient evidence for the release of lithium from the clay shale layers due to the relationship between the expected aqueous lithium concentration and the detection limit, total lithium was identified at a concentration of 76 mg/kg dry weight in the sample collected from the shale fraction at BAP-B2 (intended to serve as re-logging for SP-10) and analyzed following total digestion.

The process by which groundwater reaches equilibrium with the host rock can be described in the following conceptual model. Recharge surface water coming into contact with limestone becomes enriched in calcium as the water equilibrates with calcite. The magnesium concentration will also increase during this process if dolomite is present. As limestone minerals equilibrate with the groundwater solution, dissolved calcium then interacts with clay minerals in the shale zones which results in calcium displacing sodium (or other alkali metals such as lithium and potassium) on exchange sites. The presence of lithium within the shale fraction at BAP-B2 provides evidence that this process is occurring within SP-10 groundwater.

## **2.5 Pond Chemistry**

The BAP has much lower concentrations of lithium than those observed at SP-10, with one sample reporting an estimated lithium concentration of 0.00874 mg/L (Attachment D), which is approximately 20 times less than the GWPS for lithium of 0.15 mg/L. Additionally, a review of the chemistry of the BAP as compared to SP-10 groundwater chemistry illustrates that they have very different chemical compositions (Figure 13). This supports the hydrogeologic conceptual model presented in Section 2.3, which suggests that unless the Pond is directly connected to SP-10 through a fracture in the limestone, it is unlikely to affect groundwater chemistry at the well.

## **2.6 Proposed Alternative Source**

The presence of naturally occurring lithium in shale lenses in the monitored zone, limited possibility of transport from the BAP to the screened interval at SP-10, and the low concentration of lithium in the pond suggest the BAP is not the source of lithium at SP-10. A review of the hydrogeology of the Site provides evidence that groundwater in the shallow limestone unit likely resides in discrete non-connected features such as joints or fractures instead of as a discrete aquifer. Thus, the groundwater composition at each well is likely controlled by its immediate geology. As discussed above, lithium appears to be naturally occurring at the Site and correlated with the shale lenses that are present with increasing frequency with depth. The release of lithium from the clay minerals within the shale lens located at 46 ft bgs within the screened interval of SP-10 is the likely source of lithium in groundwater at that location.

## **2.7 Sampling Requirements**

As the ASD described above supports the position that the identified SSL is not due to a release from the BAP, the unit will remain in the assessment monitoring program. Groundwater at the unit will continue to be sampled for Appendix IV parameters on a semi-annual basis.

### **SECTION 3**

#### **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 SSL of lithium at SP-10 identified during assessment monitoring in 2018 was not due to a release from the BAP. The identified SSL was, instead, attributed to natural variation in the underlying lithology including the presence of shale lenses containing lithium 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 E.

## SECTION 4

### REFERENCES

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- Geosyntec Consultants, 2019. Statistical Analysis Summary Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Oologah, Oklahoma. January.
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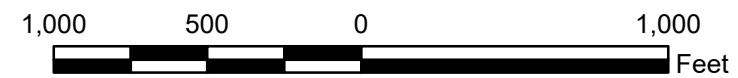
# FIGURES





- Legend**
- ◆ Monitoring Well Location
  - 2019 Boring Location
  - ▭ Bottom Ash Pond

**Notes**  
 - Aerial imagery obtained from ESRI



**Soil Boring and Monitoring Well Location Map**  
 Northeastern Bottom Ash Pond

**Geosyntec**  
 consultants

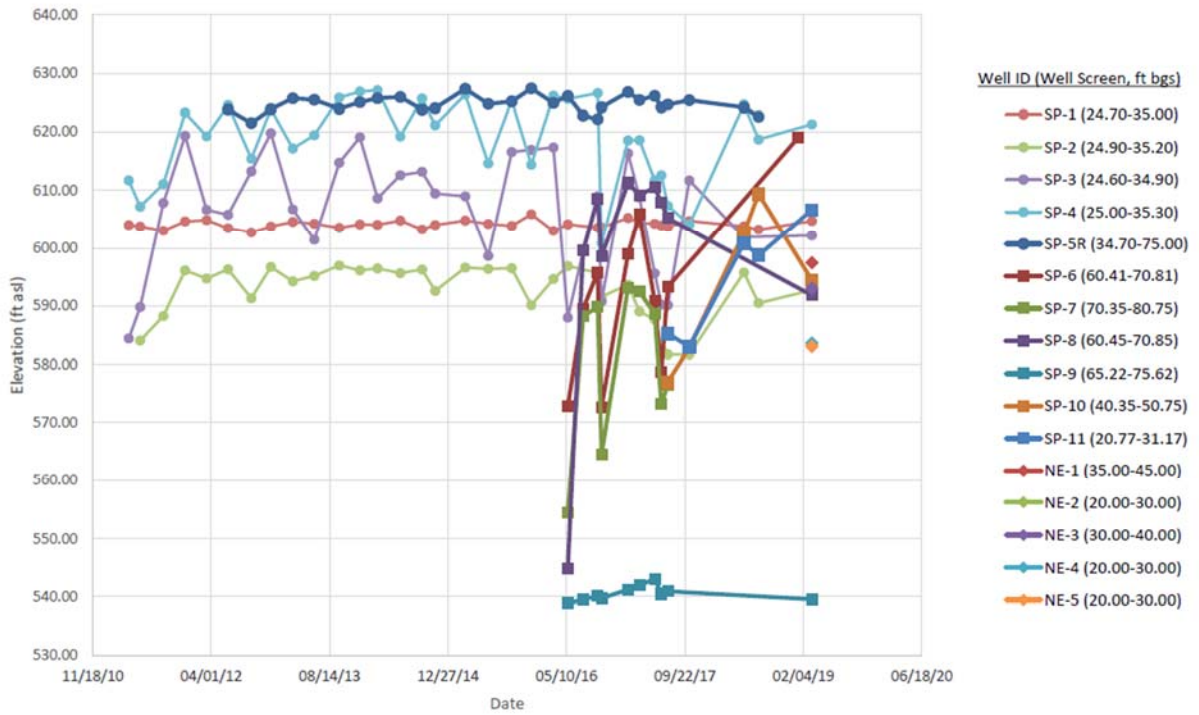
Columbus, Ohio

2019/04/17

Figure

**1**





Notes:  
 ft asl: feet above mean sea level  
 ft bgs: feet below ground surface

### Water Level Time Series Graph

Northeastern Bottom Ash Pond

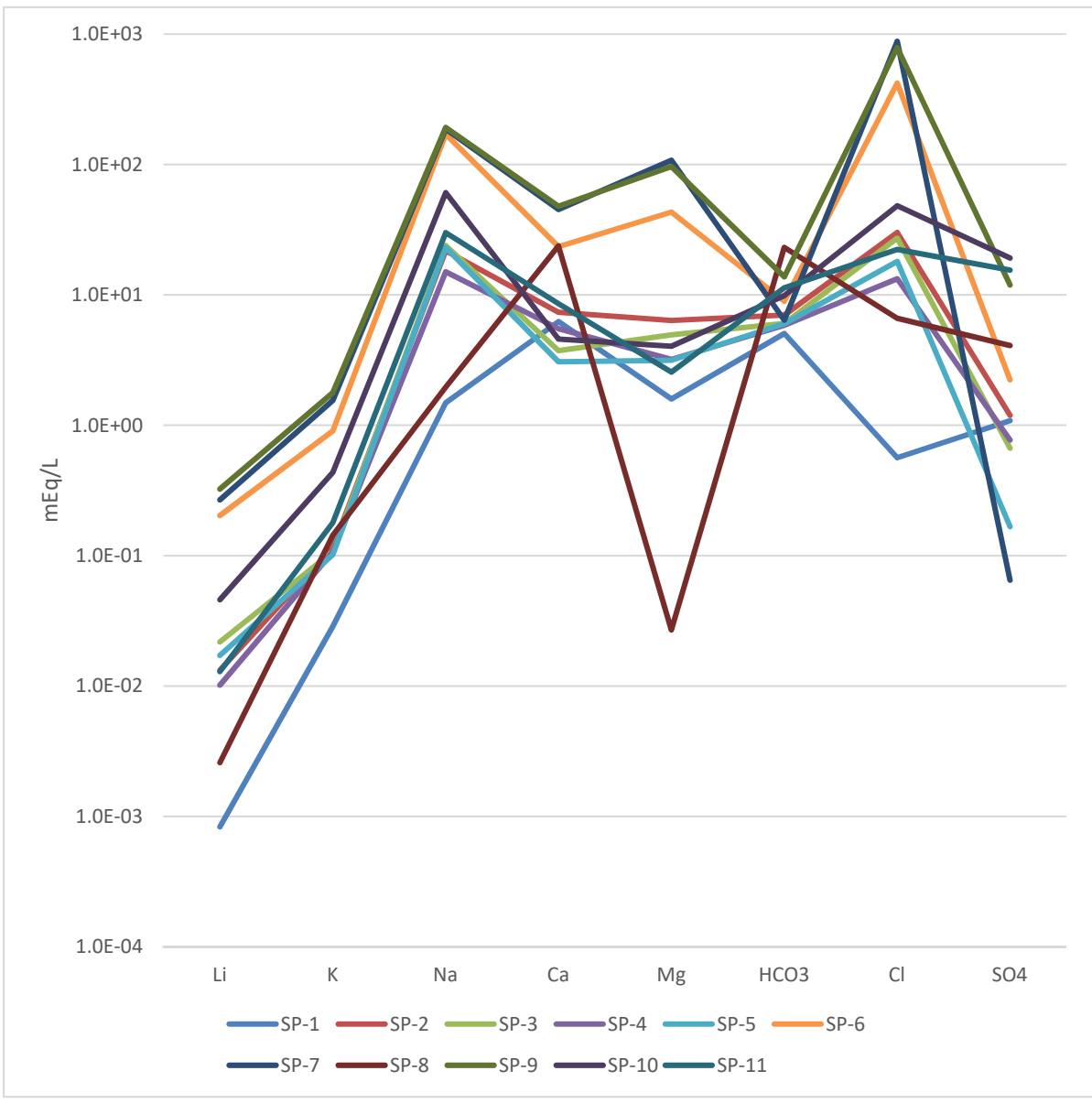
Geosyntec  
 consultants



Figure  
 2

Columbus, Ohio

16-Apr-2019



Notes: One representative sample for each well was graphed. Data for all wells were selected for sampling events between July and September 2017.

**Schoeller Diagram**  
Northeastern Bottom Ash Pond

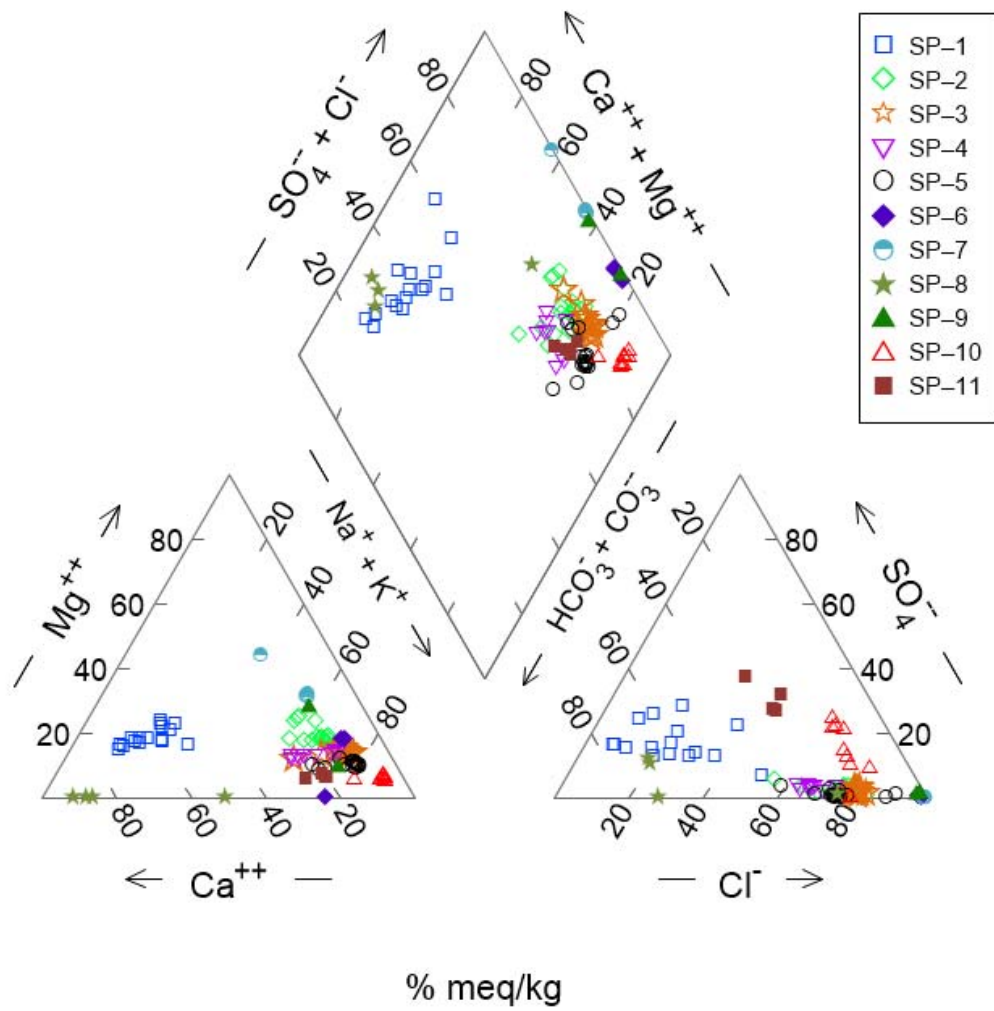


Figure  
**3**

Columbus, Ohio

02-Apr-2019





Notes: Multiple events for each well are graphed where data were available.

**Piper Plot**  
Northeastern Bottom Ash Pond

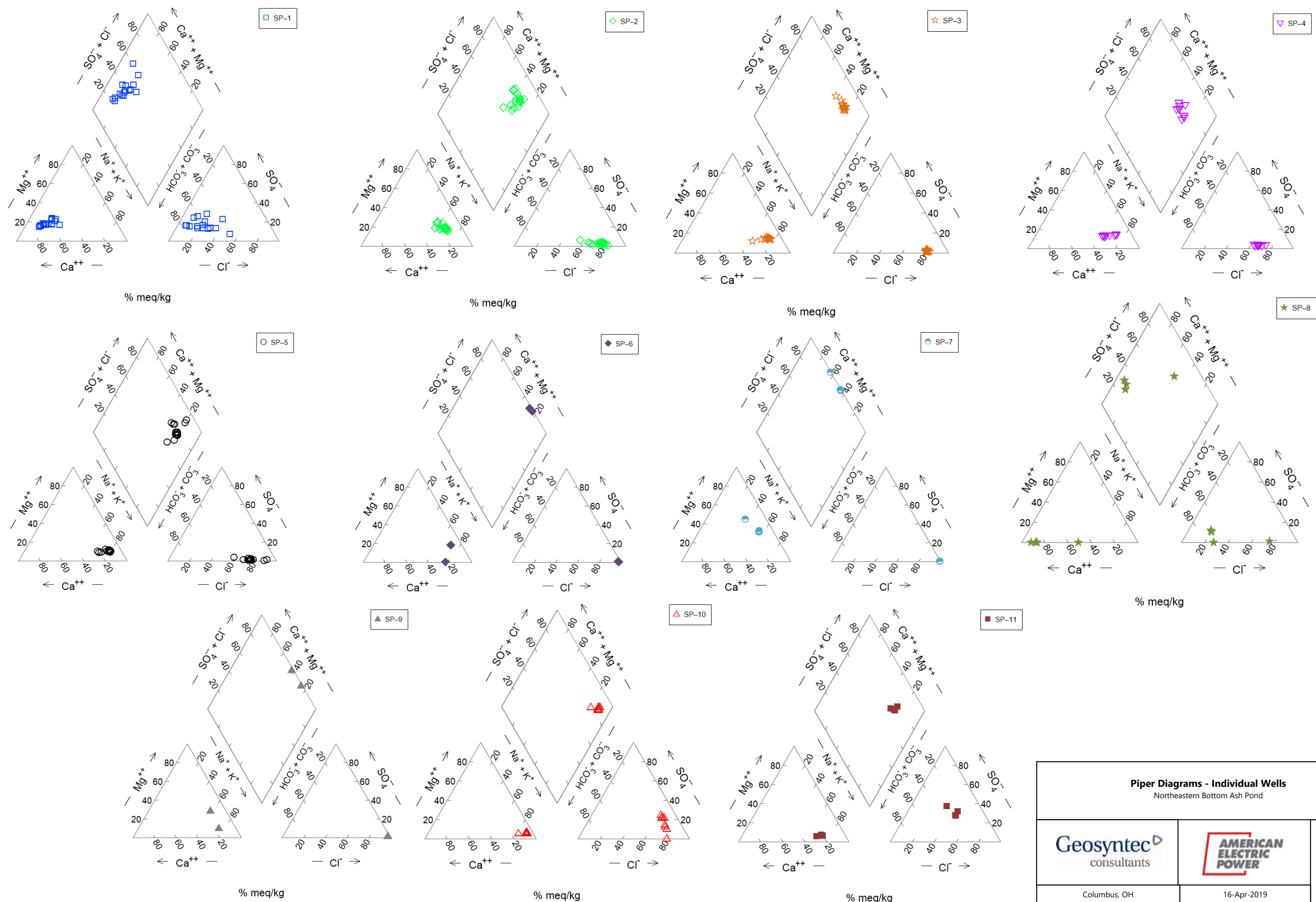
Geosyntec  
consultants





Columbus, Ohio

02-Apr-2019

Figure  
4



**Piper Diagrams - Individual Wells**  
Northeastern Bottom Ash Pond

		Figure <b>5</b>
Columbus, OH	16-Apr-2019	

Internal info path, date revised, author





**Legend**

- ◆ Na-Cl
- ◆ Na-Cl-SO4
- ◆ Na-Cl Brine
- ◆ Limestone
- Bottom Ash Pond
- Landfill
- Impoundment
- Slurry Wall

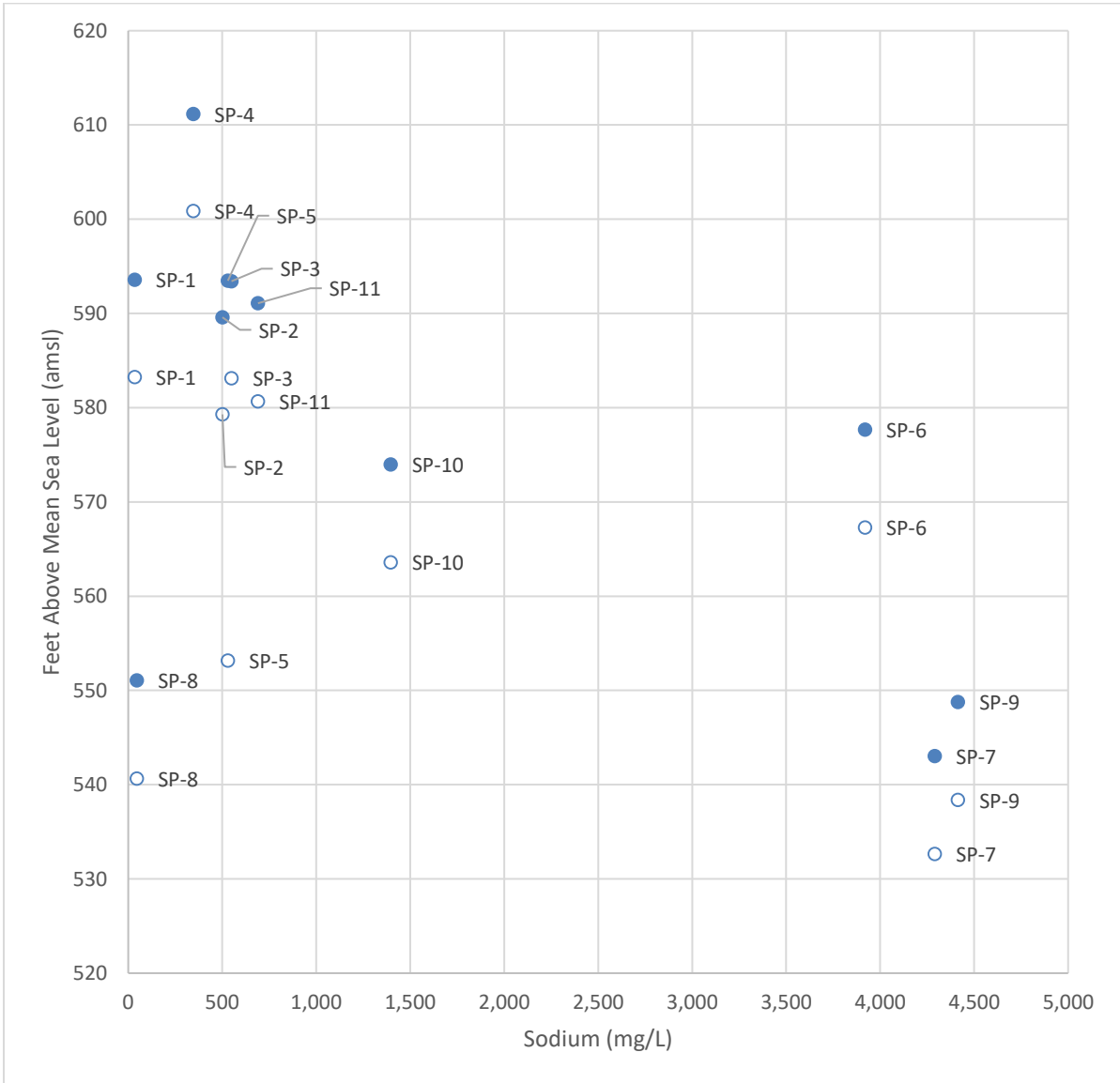
**Notes**

- Monitoring well coordinates provided by AEP.
- Site features based on information available in Groundwater Monitoring Network for CCR Compliance reports (Terracon, 2016).
- Na: Sodium
- Cl: Chloride
- SO4: Sulfate



<b>Spatial Distribution of Groundwater Types</b> Northeastern Bottom Ash Pond	
Columbus, Ohio	2019/04/04
<b>Figure 6</b>	





**Notes:**

Filled circles represent the elevation of the top of the well screen for the identified well. Hollow circles represent the bottom of the well screen for the identified well.

**Sodium v. Well Screen Interval**

Northeastern Bottom Ash Pond

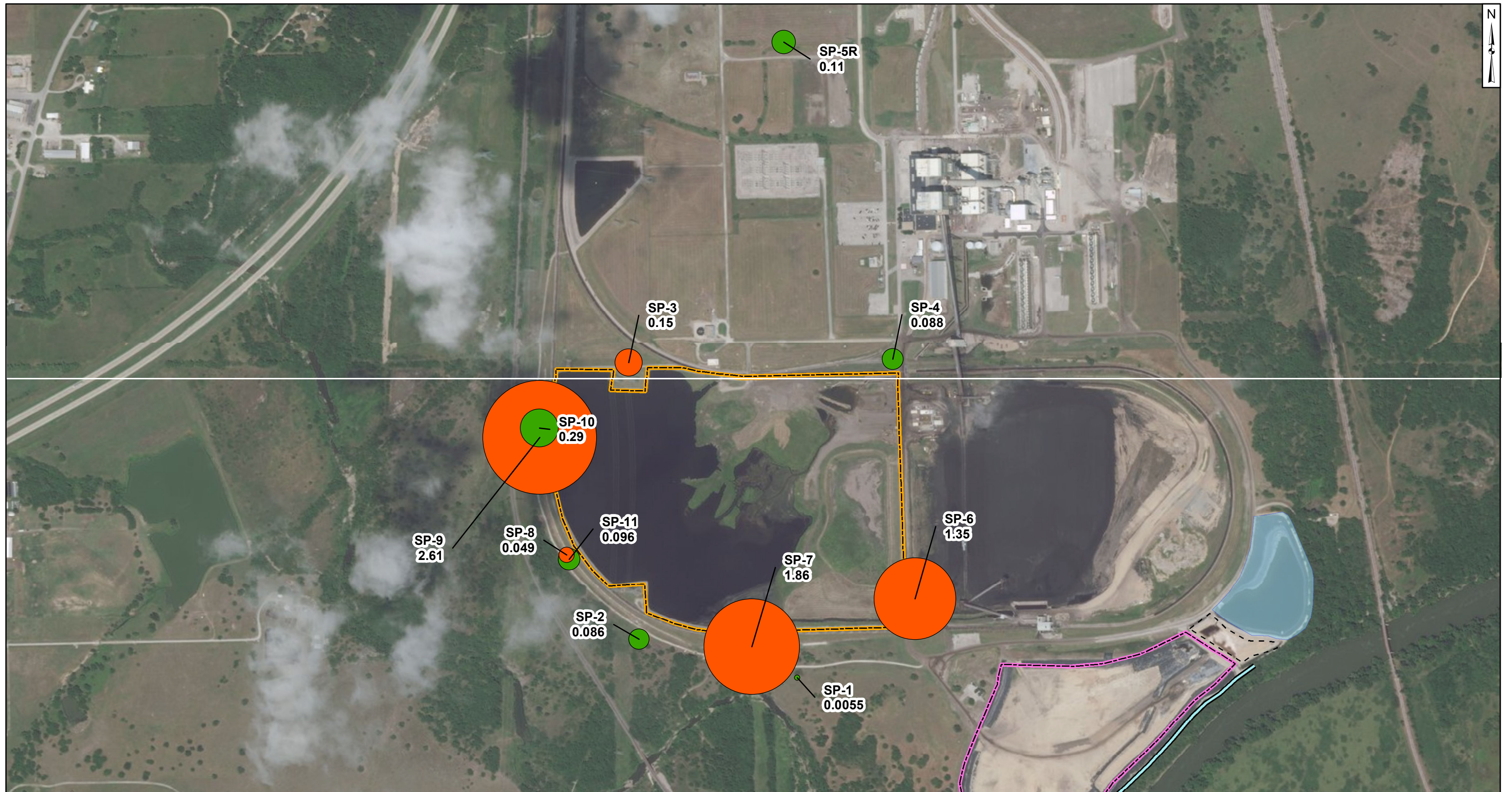


Figure  
**7**

Columbus, Ohio

16-Apr-2019





**Legend**

- Bottom Ash Pond
- Landfill
- Impoundment
- Slurry Wall

**Notes**

- Monitoring well coordinates provided by AEP.
- Site features based on information available in Groundwater Monitoring Network for CCR Compliance reports (Terracon, 2016).
- Lithium concentrations shown are an average of available data.
- Lithium concentrations shown in milligrams per liter (mg/L).
- In-Network monitoring wells are indicated with green symbology. Out-of-Network monitoring wells are shown with orange symbology.

600 300 0 600  
Feet

**Spatial Distribution of Lithium**

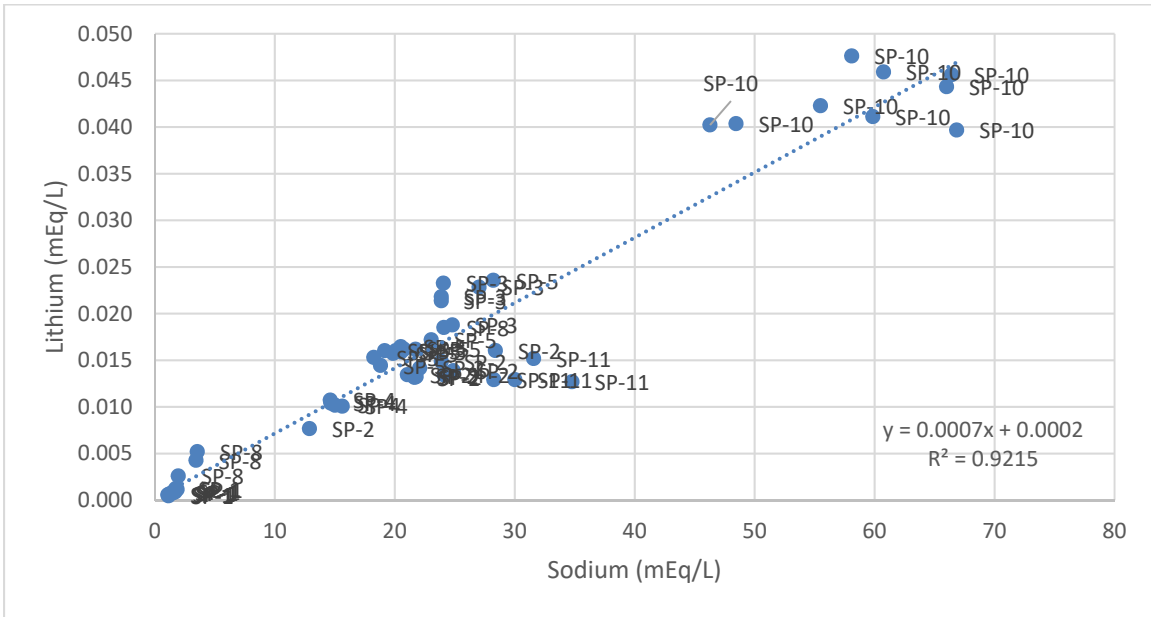
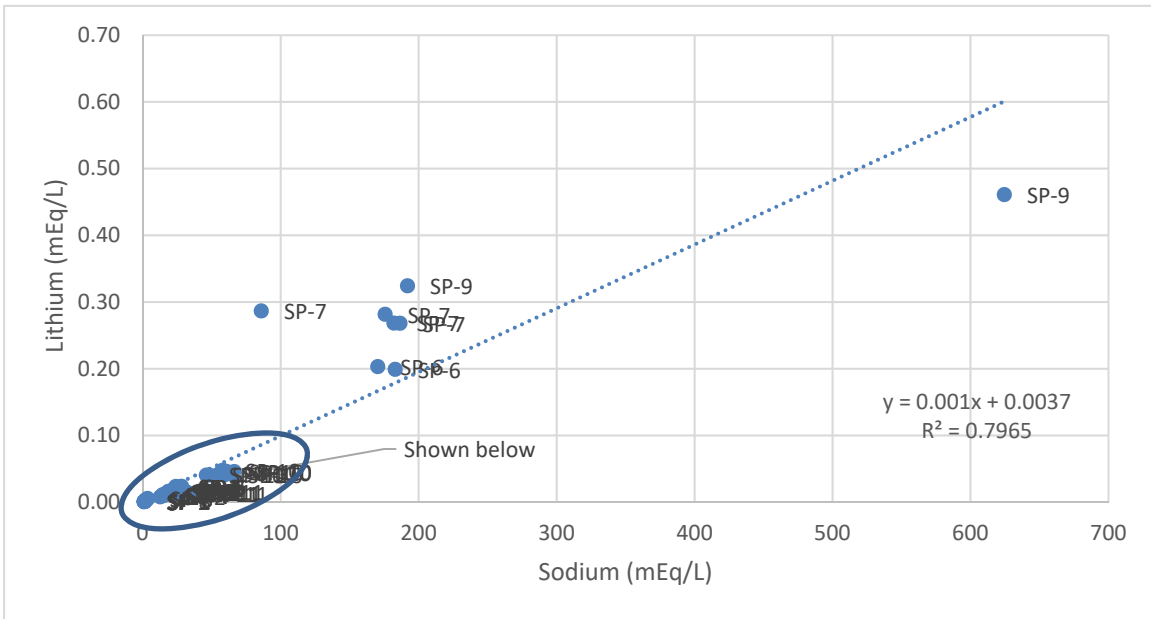
AEP Northeastern Power Plant - Bottom Ash Pond  
Oologah, Oklahoma

**Geosyntec**  
consultants

Columbus, Ohio      2019/04/16

**Figure 8**





**Notes:**

All results are shown in milliequivalents per liter (mEq/L). The top graph shows all data, whereas the bottom graph excludes wells SP-6, SP-7, and SP-9, which have significantly higher concentrations of both lithium and sodium.

**Sodium v. Lithium Concentrations**

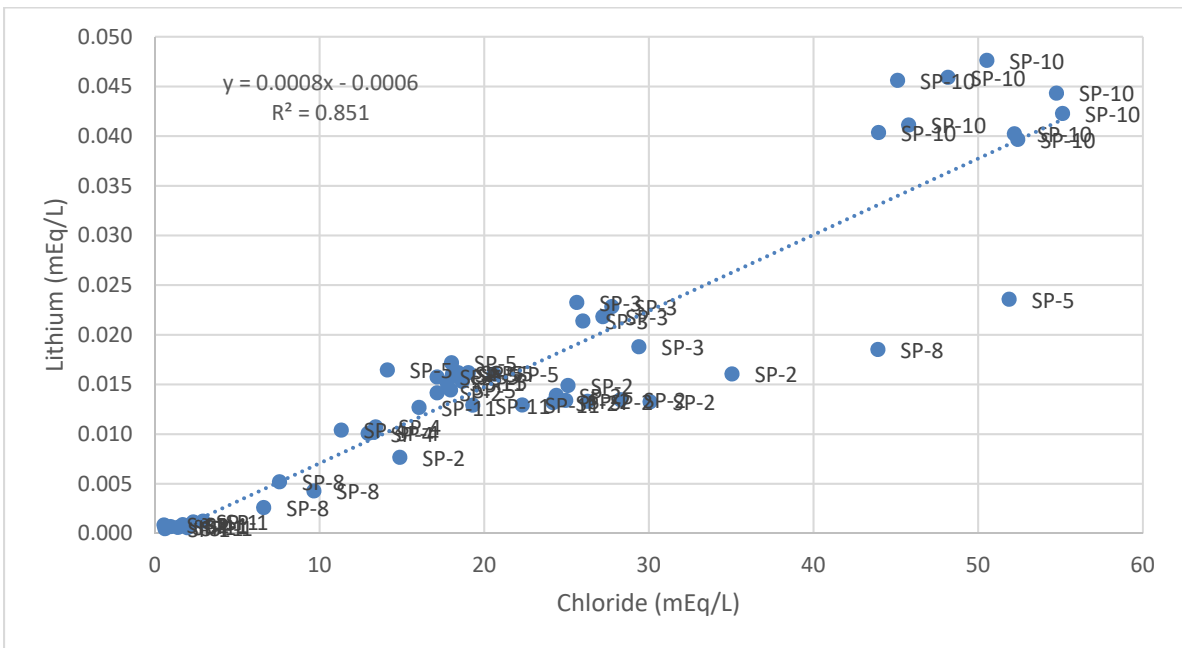
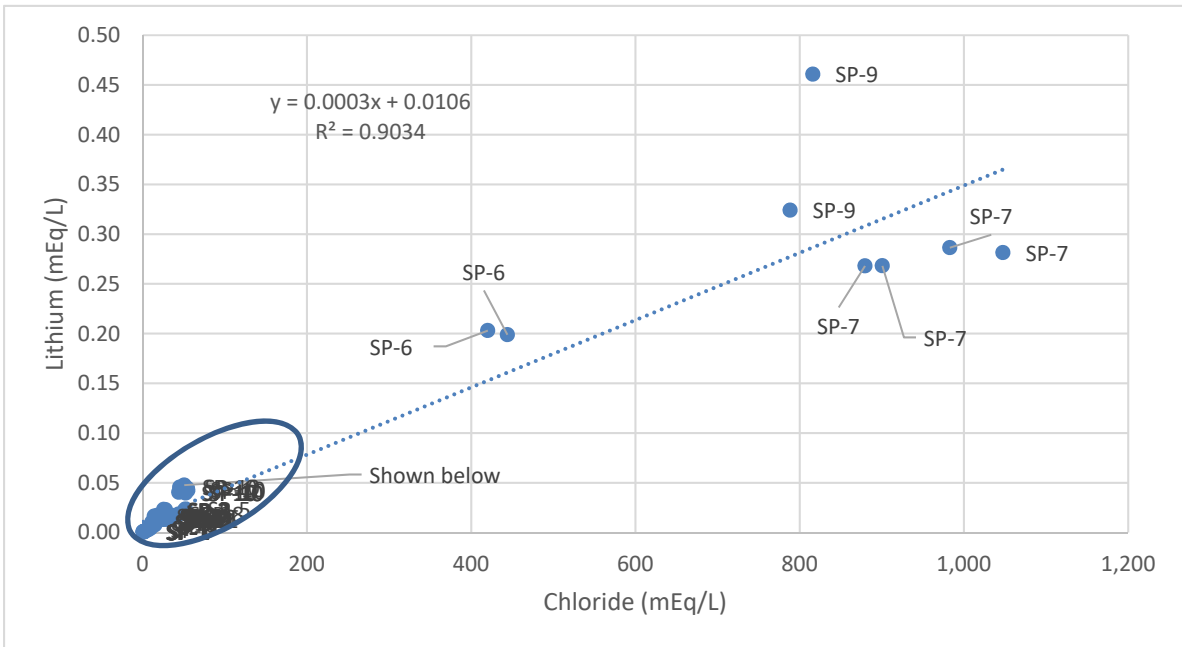
Northeastern Bottom Ash Pond



Figure  
**9**

Columbus, Ohio

16-Apr-2019



**Notes:**

All results are shown in milliequivalents per liter (mEq/L). The top graph shows all data, whereas the bottom graph excludes wells SP-6, SP-7, and SP-9, which have significantly higher concentrations of both lithium and chloride.

**Chloride v. Lithium Concentrations**

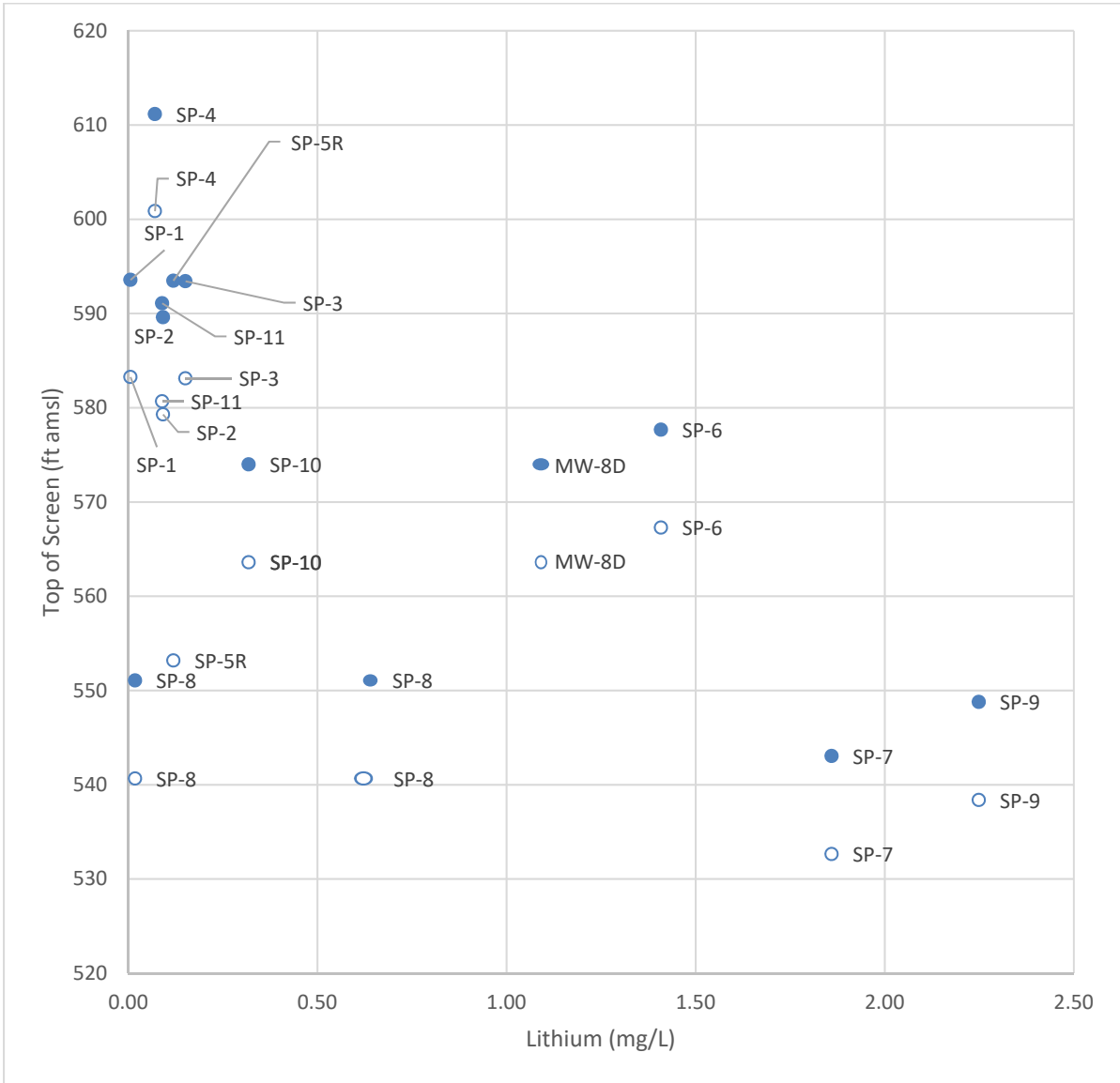
Northeastern Bottom Ash Pond



Figure  
**10**

Columbus, Ohio

16-Apr-2019



**Notes:**

Filled circles represent the elevation of the top of the well screen for the identified well. Hollow circles represent the bottom of the well screen for the identified well.

**Lithium v. Well Screen Interval**

Northeastern Bottom Ash Pond

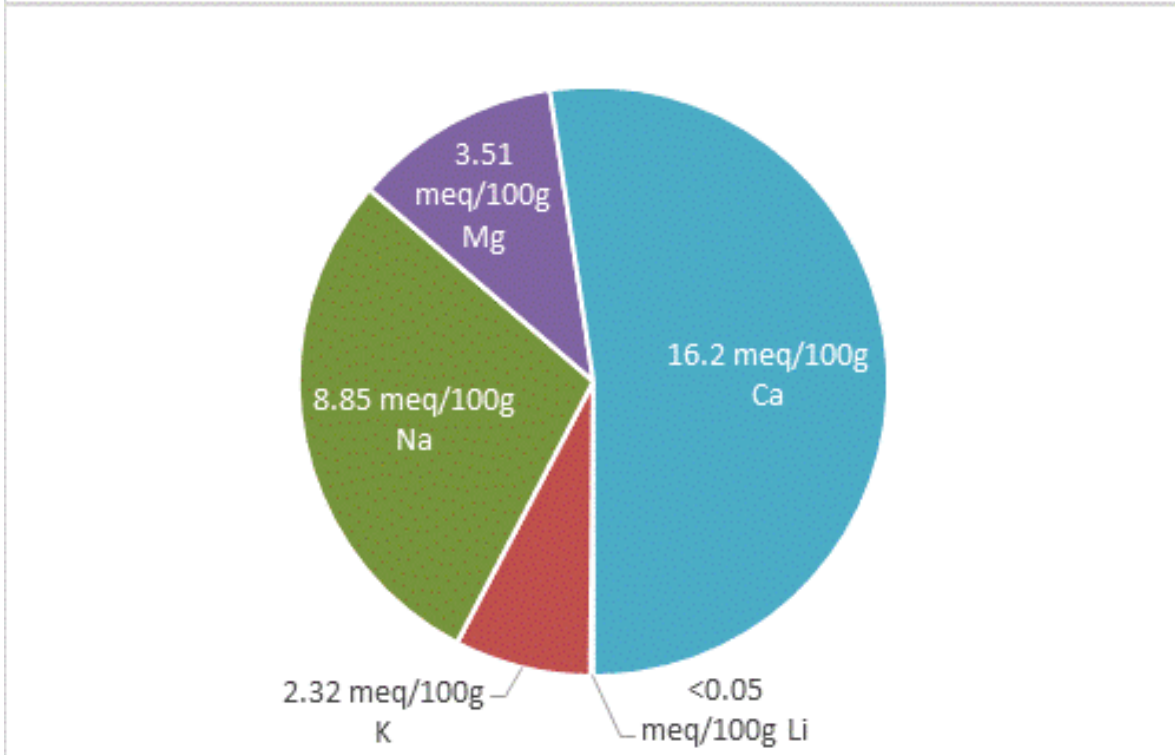
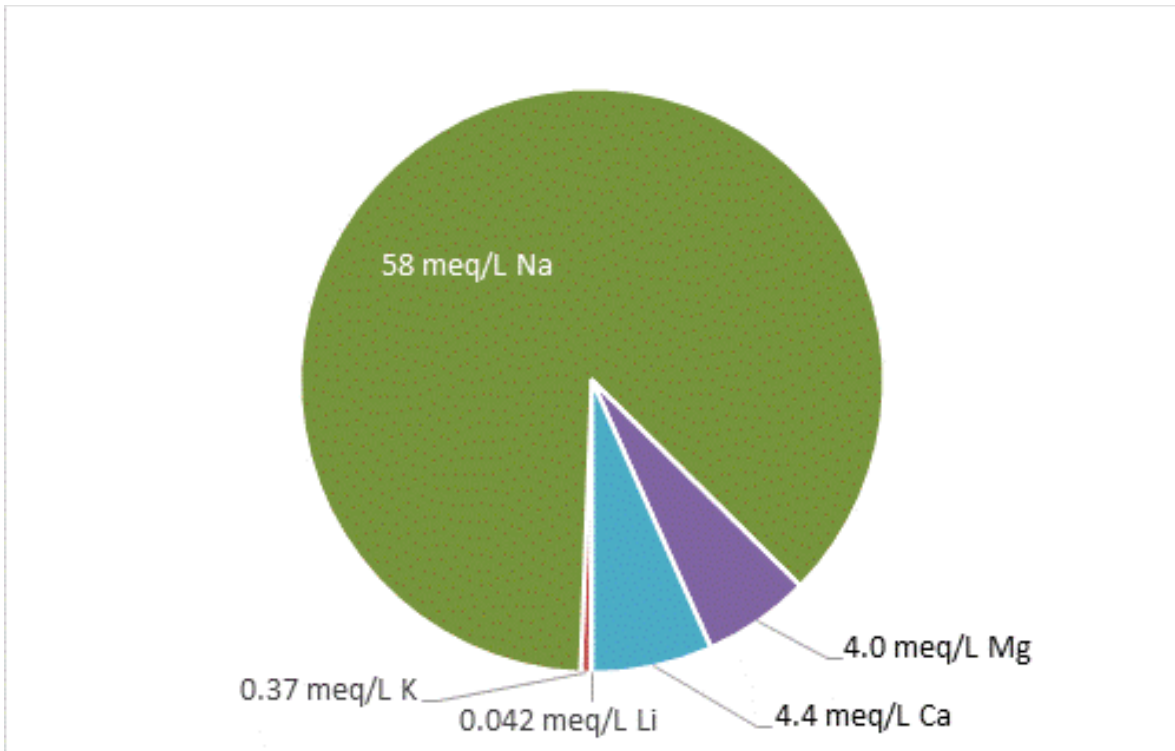


Figure  
11

Columbus, Ohio

16-Apr-2019





Notes: The top graph shows the concentration of exchangeable cations in the shale sample (SP-LOG-10-2) in meq/100g, while the bottom graph shows concentrations of these cations in time-averaged SP-10 groundwater (in meq/L).

**Cation Distribution**  
Northeastern Bottom Ash Pond

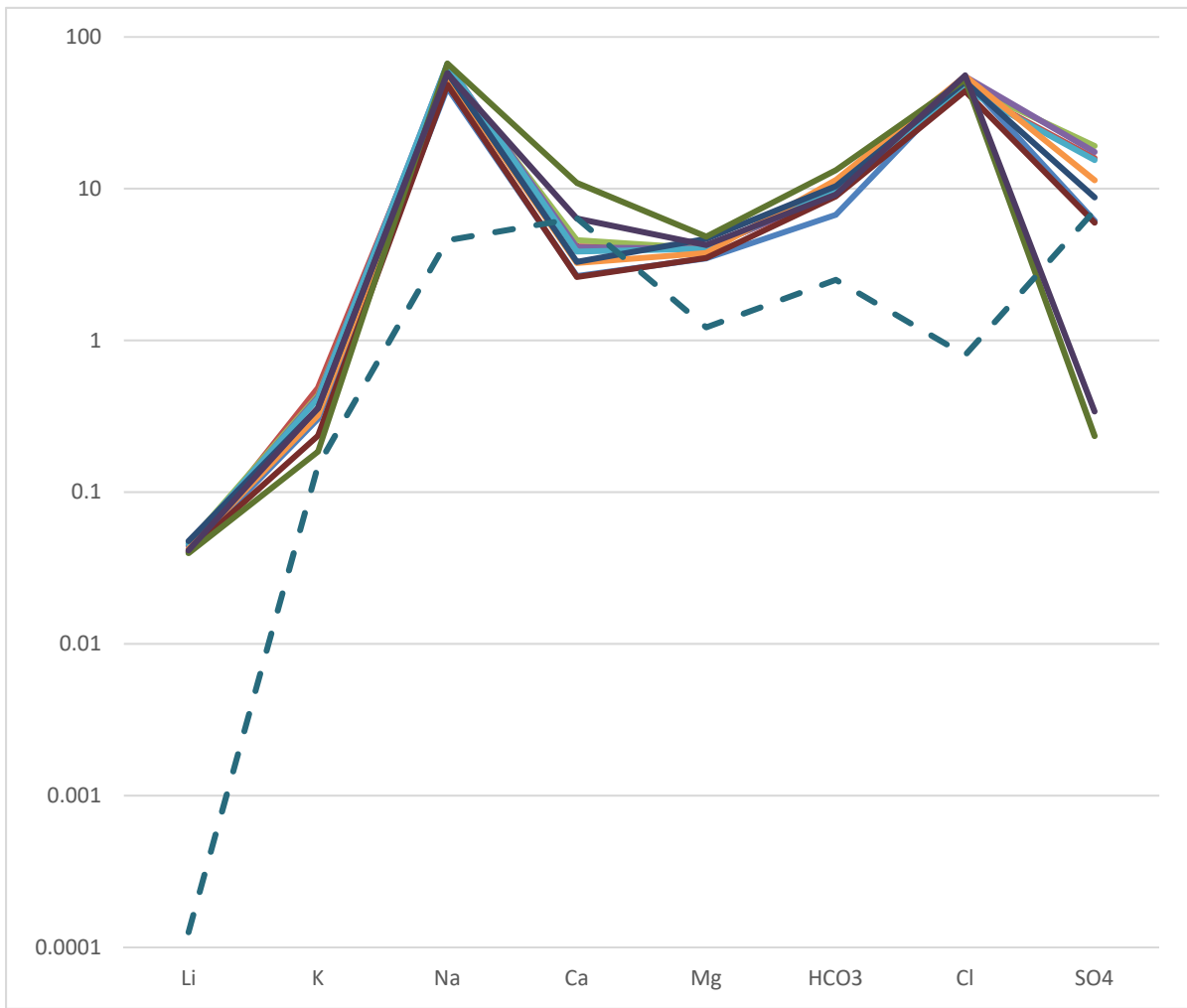
Geosyntec  
consultants



Figure  
12

Columbus, Ohio

16-Apr-2019



Notes: The dashed line represents a surface water sample collected from the bottom ash pond on February 5, 2019. All other lines represent individual sampling events at SP-10 between 2017 and 2019.

**Bottom Ash Pond Schoeller Diagram**  
Northeastern Bottom Ash Pond

Geosyntec  
consultants



Figure  
**13**

Columbus, Ohio

16-Apr-2019

# 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	46.0-47.0	46.0-47.0	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
<i>% Illite Layers in ML I/S</i>	<i>N/A</i>	<i>75</i>	<i>75</i>	<i>BDL</i>

Notes:

Results are shown as percentage of the bulk material.

ND: not detected

N/A: not applicable

BDL: below detection limit

**Table 2: Cation Exchange Capacity and Total Lithium Analytical  
Northeastern Plant Bottom Ash Pond**

Sample ID	Sample Depth	Description	Total Lithium (mg/kg dry wt)	Exchangeable Lithium (mEq/100g)	Exchangeable Calcium (mEq/100g)	Exchangeable Magnesium (mEq/100g)	Exchangeable Potassium (mEq/100g)	Exchangeable Sodium (mEq/100g)
SP-10-LOG-1	32.0-32.4'	Upper limestone	<10.0	<0.05	20	0.567	<0.10	0.226
SP-10-LOG-2	46.0-47.0'	Shale lens within screened interval of SP-10	76	<0.05	16.2	3.51	2.32	8.85
SP-20-LOG-3	46.0-47.0'	Limestone within screened interval of SP-10	<10.0	<0.05	21.6	0.642	0.250	0.896
SP-10-LOG-4	72.0-72.4'	Limestone within screened interval of SP-9	<10.0	<0.05	21.1	1.16	0.313	0.822

Notes:

mg/kg dry weight: milligram of lithium per kilogram dry weight of material

mEq/100g: milliequivalent per 100 gram of material

ATTACHMENT A  
Boring Logs

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
0				SS1			1.0		(0') LEAN CLAY (CL), brown, low plasticity to non-plastic, some organics (roots), medium, moist.	0
				CB2			3.0	21%	(1') LIMESTONE, strong, medium gray (N5), crystalline to fine-grained calcite fossil infill, bedding not apparent to thick, slightly decomposed at fractures, intensely fractured (fractures-joints at 1.6 and 2.3 ft, sub horizontal to 50°, tight to wide, surface oxidation and soil filled, rough, wet), fossiliferous.  (1.8') Roots.  (3') Wavy crinoid debris layer at fractured interval 0.2 ft thick.	5
5				CB3			5.0	100%	(6') Moderately fractured and thickly bedded with approximately 0.3-ft thick intervals of darker wavy bedding with crinoid debris abundant, isolated chert interval with chaotic bedding (at 9.5, 10.3, and 11 ft), isolated other fossil debris. Wavy beds occur at 0.5 to 1 ft intervals, fractures less weathered, very little soil infill.	10
10				CB4			5.0	100%	(11') Changes to slightly fractured, darker wavy beds (N3), crinoid fossils less abundant.  (14.5-16') Tight, healed vertical fracture. Interval of trace pits and small vugs with mineral fill.	15
15				CB5			5.0	96%	(16') Changes to thinner dark wavy beds (less than 0.1 ft). Lighter colored intervals (N5) characterized by chaotic fossil debris texture. Non-solid recovery from 16-16.25 ft due to core barrel slipping.	20

NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
20									20	
		CB6			5.0	100%	Isolated chaotic cherty intervals (at 21.7, 22.5, 23.3, 24.1, and 24.6 ft), pits and vugs continue.  (22.8' and 25') Approximately 30° inclined fractures associated with dark bedding planes.			
25		CB7			5.0	100%	(26.6-26.7') Chaotic cherty layer above wavy dark bedding. (27.5') Chaotic cherty layer interbedded with dark wavy bedding, tight 30° fracture. (27.7-31.8') Color changes to medium-dark gray (N4-N3) and very dark gray, interbedded, algal/crinoid fossils abundant, wavy bedding, thinly bedded.		25	
30		CB8			3.75	75%	(31.8') Distinctive cherty, wavy, crinoid debris layer with associated dark wavy bedding from 31.8-31.9 ft, moderately fractured. (31.9-32.8') Significant vertical fracture with little to no healing/weathering. (32.8-33.4') Color changes to N3 below a thin dark wavy bed, significant vertical fractures. (32.9') Notable fossil demineralized vug.		30	
35		CB9			5.0	100%	(34.2') Color changes to N5-N4 below wavy dark bed. (36.7 and 37.7') Darker wavy beds.		35	
40							(38.7') Grades to N3-N4 limestone at 39.2 ft. (39.2') Interval of thinly bedded limestone (N3)		40	

NOTES: Boring backfilled to surface with Portland cement.



Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7"1/3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)	
				Sample Type	Date & Time	Blow Counts	Recovery (ft)				N Value
40	[Lithology pattern: brick-like]		[Boring completion: hatched]	CB10			4.9	91%	and shaly limestone (N2) from 39.2-41 ft. Fossil debris noted at 39.5 ft. (41') Interval of fine-grained wackestone with fossil debris. (42.3') 0.1-ft thick interval of fine sandstone with crinoid debris above a thin shaly/wavy bed. (42.4') Grades from fine to crystalline limestone (N5-N4). (42.9') Color changes to medium dark gray to dark gray (N4-N3). (43.8-45.15') Significant fracture, vertical, mostly healed with calcite, tight. (44.2-44.75') Interval of thinly bedded shale/limestone. (46') Interbedded argillaceous limestone and calcareous shale, limestone is (N4-N3) and shale (N2) occur at 0.5 to 1 ft intervals, fossils trace to not present, core preferentially breaks at shale beds, shale is strong and not friable.	Core broken in one place, likely mechanical.	40
				CB11			5.0	100%			45
				CB12			5.0	100%			50
				CB13			5.0	100%			55
60											

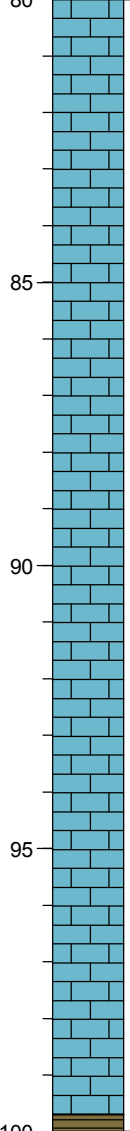

NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)	
				Sample Type	Date & Time	Blow Counts	Recovery (ft)				N Value
60	[Patterned Lithology]			CB14			5.0	100%	(60.2') Interval of sand/shale lens interbedding.	Core broken in one place, likely mechanical.	60
				CB15			5.0	100%	(61-77.4') Interbedded argillaceous limestone (N3) and calcareous shale (N2), shale layers 0.2 to 0.4 ft thick, trace crinoid debris.		
				CB16			5.0	100%	(62.4-62.6') Re-mineralized vertical fracture.		
				CB17			5.0	100%	(63.1-63.2') Re-mineralized vug/fracture.		
75									(77.4-77.6') Sandy limestone shell debris layer.		75
80									(77.6-82.2') Limestone, strong, medium gray (N5), some fine sand, fossils absent.		80

NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
80										80
				CB18			5.0	100%	(82.2-82.5') Interval of fine sandstone, medium gray to medium dark gray, thinly bedded, bedding lenticular.	
									(82.5-95.1') Sandy limestone with some shaly beds, color generally uniform (N4-N3).	
85				CB19			5.0	100%	(83.9') Notable ammonite fossil (approximately 1 cm), fossils largely absent otherwise.	
				CB20			5.0	100%		
				CB21			5.0	100%	(95.1') Grades into fine-grained limestone, matrix color same as above (N4-N3), abundant whole fossils and debris (crinoid and brachiopod), wackestone/packstone texture.	
									(95.9') Grades into shale (calcareous) matrix within argillaceous limestone beds, fossils still abundant and calcareous, bedding not apparent (massive).	
									(98.2-98.4') Interbedded fossiliferous argillaceous limestone interval within massive shale.	
100										100

NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7"1/3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
100				CB22			5.0	94%	(98.4-98.6') Interval of N5 limestone/carbonate mudstone. (99.6-99.7') Wackestone limestone, abundant fossils, distinct contact with below interval. (99.7') SHALE, moderate strength, grayish black (N2), massive, no decomposition, no disintegration, unfractured except for bedding plane mechanical breaks, pyritic with trace small crinoids. (101') With trace brachiopod fossils observed, some grayish brown lenses, shale has waxy/greasy/soapy texture.	100
				CB23			5.0	98%	(106') Sandy sediment present, friable when broken.	
				CB24			4.7	88%	(111') Pyrite largely absent.	
				CB25			5.0	91%	(114.9 and 115.4') Small intervals of fat clay, possible artifact from drilling. (114.95 and 115.15') Notable round/tube fossils, possible bryozoan sediment and mineral filled (quartz). (116') Lacks fossils.  (118.8 and 118.9') Medium brown fine sandstone with thinly bedded shale.	
120										120

NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
120								(119.1-119.2') Sandstone horizon.	End of 3/12/2019	120
				CB26			5.0	100%		(122.1-122.2') Fine brown sandstone horizon.
										(123.2') Color varies between grayish black/black/brownish-black, thinly bedded, planar.
125				CB27			5.0	100%		(129.75-129.8') Thinly bedded shaly fine sand horizon, brown/grayish brown.
										(133.45-133.6') Horizon of fine sandstone (grayish brown).
									(134.6-134.7') Horizon of fine sandstone.	
130				CB28			5.0	100%	(136') Thinly bedded shale.	
									(137.65-137.75') Fine sandstone.	
									(137.75') Bedding becomes less obvious (homogenous color, black to grayish black).	
135				CB29			5.0	93%	(139.4-139.5') Fine sandstone.	
140										140

NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
140				CB30			5.0	100%	(141.35') Sandstone with pyrite nodule.	140
145				CB31			5.0	77%		145
150				CB32			5.0	81%	(149.75') Fractures with friable shale, peels easily into small pieces, disintegrated, decomposed. (150.15-150.5') Intensely fractured shale. (150.25') Thin bed of re-mineralized calcite possible healed fracture or bedding plane. (151-156') Horizons of cross-bedded shaly sandstone occur at 0.5 to 1 ft intervals.	150
155				CB33			5.0	74%	(156') Same shale as above, moderately fractured (mechanical breaks accentuated by drilling process), some fossils. (156.55-156.6') Thin laminated shaly sandstone.  (158.6-158.7') Thinly laminated shaly sandstone lens, pyritic.	155
160										160


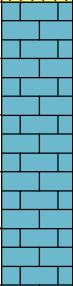
NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7 1/3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
160				CB34			5.0	96%	(161') Sandier horizons have brownish hue, occur at 1-2 ft intervals and are less than 0.1 ft thick. (161.7') Laminated shaly sandstone. (162.95-163.05') Layer of laminated shaly sandstone.	160
165				CB35			5.0	100%	(164.35-164.45') Thinly cross bedded shaly sandstone overlying shale bed with flame structures and a mollusk fossil. (165.5') 0.1-ft thick lens of laminated shaly sandstone. (166') Same shale as above, laminated shaly sandstone intervals.	165
170				CB36			5.0	99%	(171') SHALE, moderate strength (breaks by hand along bedding planes), grayish black to brownish-black, crystalline, massively bedded visually and thinly bedded structurally, fresh, competent, unfractured except mechanical breaks, trace crinoid/mollusk debris throughout. (171.4-171.5') Fossiliferous sandy lens. (172.2-172.8') Fossiliferous sandy shale interval, fossils (crinoid, mollusk debris).	170
175				CB37			4.9	89%		175
180									(178.9') 0.5-inch pyritic nodule. (179.3') 0.5-inch pyritic nodule.	180

NOTES: Boring backfilled to surface with Portland cement.

Drilling Start Date: <b>3/11/2019</b>	Boring Depth (ft): <b>186</b>
Drilling End Date: <b>3/14/2019</b>	Boring Diameter (in): <b>7"/3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>625.8</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2644286.365, 524133.353</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
180								(180.1') Shaly SANDSTONE, fossiliferous, fine-grained, some limestone and shale thin interbeds/lenses, wavy/chaotic texture, pyritic, moderately fractured (mechanical).		180
185				CB38			5.0	100%	(181') LIMESTONE, strong, brownish gray at top grading through medium gray to light gray at base, microcrystalline, bedding chaotic to wavy and medium bedded, no decomposition, no disintegration, unfractured to slightly fractured at wavy bedding planes (mechanical joints), fossiliferous (crinoid, brachiopod, algae), wavy bedding is more argillaceous than matrix.	185
190								(186') Boring terminated.		190

NOTES: Boring backfilled to surface with Portland cement.

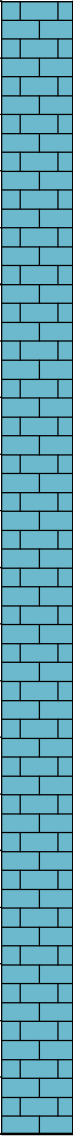



Drilling Start Date: <b>2/18/2019</b>	Boring Depth (ft): <b>90</b>
Drilling End Date: <b>2/19/2019</b>	Boring Diameter (in): <b>7 1/3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>612.1</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2642411.069, 525028.743</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
0				SS1			1.5		(0') LEAN CLAY (CL), dark brown, low plasticity to non-plastic, trace red iron stained specks, stiff, moist, organics at surface (grass/roots).	0
				SS2			0.9		(2') Trace limestone gravel in shoe.	
				SS3			0.2		(3') Very little recovery, augered through weathered limestone bedrock.	SS refusal
				CB4			1.0	0%	(4') LIMESTONE, very strong, medium gray (N5), crystalline, thickly bedded with wavy bedding, slightly decomposed at fractures, competent, intensely to moderately fractured, fractures are narrow to very narrow, joints and mechanical breaks, not healed, rough, surface oxidation reacts vigorously with HCl.	Begin coring with NQ2 (3 inch)
5				CB5			4.8	59%	(5.3') Soil filled fracture (joint, 0.05 foot).	5
				CB6			5.0	92%	(10') Changes to slightly fractured along bedding planes, mechanical fractures or joints, changes to medium bedded at the top of run, abundant crinoid pieces near dark wavy beds and scattered throughout, pieces of brachiopods throughout.	10
15				CB7			5.0	92%	(15') Very few fractures, all tight, slight weathering at fractures.	15
20										20

NOTES:

Drilling Start Date: <b>2/18/2019</b>	Boring Depth (ft): <b>90</b>
Drilling End Date: <b>2/19/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>612.1</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2642411.069, 525028.743</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)
				Sample Type	Date & Time	Blow Counts	Recovery (ft)			
20				CB8			5.0	96%		20
25				CB9			5.0	100%	(25.6') Begin trace pits and vugs with partial mineral fill, vugs not cemented.	25
30				CB10			5.0	100%	(28') Prominent darker bedding, wavy, every 1-1.5 feet, 1-2 inch thick section of thin wavy bedding. (30.5') Healed fracture (possible pyrite and quartz fill).	30
35				CB11			5.0	100%	(33.4') Changes to gray (N3/N2) intervals of thin wavy bedded, darker bedding at 33.4, 34, 34.6 feet, intervals are thicker (approximately 2-4 inch). (33.8') Color changes to medium dark gray (N4). (35') Changes to thinly bedded.	35
40									(37.5') Thicker section of darker (N4) limestone, fossil still present, whole shell and debris.	40

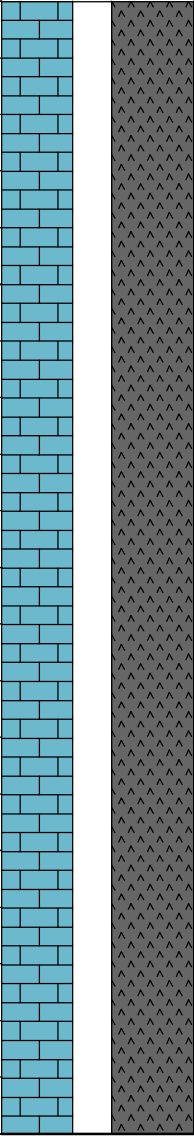
NOTES:

Drilling Start Date: <b>2/18/2019</b>	Boring Depth (ft): <b>90</b>
Drilling End Date: <b>2/19/2019</b>	Boring Diameter (in): <b>7 1/3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>612.1</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2642411.069, 525028.743</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)	
				Sample Type	Date & Time	Blow Counts	Recovery (ft)				N Value
40				CB12			5.0	98%	(41') Possible natural fracture aggravated by drilling break along darker wavy bedding plane, 30-40° from horizontal, slight weathering.		40
45		CB13			5.0	83%	(45') Texture change with obvious grains, more mottled in color (N5), abundant fossil (whole and debris), intensely fractured (horizontal, joints). (45.8') 1 inch shale, grayish black, friable, thinly bedded, weak, followed by approximately 2 inches of mottled limestone, underlain by approximately 2 inch section of same shale. (46.2') Grades back into more uniform alternating darker/lighter (N3/N4) wavy beds, moderately fractured, abundant fossil debris, strong, breaks along darker bedding, still react strongly with HCl.	Driller noted hydrocarbon odor in drilling water	45		
50		CB14			5.0	85%	(47.5') Possible concretion or fossil infill (light gray). (50') Darker limestone present with alternating lighter gray sediments with chaotic texture, whole fossils and debris, intensely fractured from 50-51 feet. Grayish black (N2) shaly limestone, joints and bedding planes. (51') Changes to medium dark gray (N4) and dark gray (N3) limestone.		50		
55		CB15			5.0	96	(55') Crinoid/brachiopod debris present.		55		
60										60	

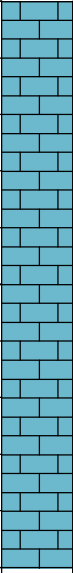

NOTES:

Drilling Start Date: <b>2/18/2019</b>	Boring Depth (ft): <b>90</b>
Drilling End Date: <b>2/19/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>612.1</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2642411.069, 525028.743</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)	
				Sample Type	Date & Time	Blow Counts	Recovery (ft)				N Value
60				CB16			5.0	100%	(60') Unfractured.		60
65				CB17			5.0	100%	(65') Alternating limestone and shale. Notable brachiopod fossil.  (67.8') Healed fracture infilled with quartz possibly pyrite (3mm aperture) and shaly matrix.		65
70				CB18			5.0	100%	(72') Alternating limestone and shale, isolated fossils (crinoid debris), limestone beds lighter and have wavy bedding in places, HCl reacts strongly with lighter beds and picks out thin beds on darker rock.		70
75				CB19			5.0	100%	(75') Same interbedded shale and argillaceous limestone, limestones are medium-very dark gray, calcareous shales are grayish-black, scattered fossils (crinoid debris).	Core broken in one place	75
80											80

NOTES:

Drilling Start Date: <b>2/18/2019</b>	Boring Depth (ft): <b>90</b>
Drilling End Date: <b>2/19/2019</b>	Boring Diameter (in): <b>7" / 3"</b>
Drilling Company: <b>Geotechnology</b>	Sampling Method(s): <b>SS/NQ2</b>
Drilling Method: <b>HSA/Air Rotary</b>	DTW During Drilling (ft):
Drilling Equipment: <b>HSA/Air Rotary</b>	DTW After Drilling (ft):
Driller: <b>C. Steiner</b>	Ground Surface Elev. (ft): <b>612.1</b>
Logged By: <b>M. Bizjack</b>	Location (X,Y): <b>2642411.069, 525028.743</b>

DEPTH (ft)	LITHOLOGY	WATER LEVEL	BORING COMPLETION	COLLECT				SOIL/ROCK VISUAL DESCRIPTION	REMARKS	DEPTH (ft)	
				Sample Type	Date & Time	Blow Counts	Recovery (ft)				N Value
80				CB20			5.0	100%	(80') Same interbedded shaly limestone/calcareous shale, light or dark gray limestones generally chaotically bedded, 0.5-1 foot in size, shaly intervals are generally thinner or massive beds and 0.5-1 foot in size, isolated rare fossil debris.		80
85				CB21			4.4	95%	(85') Same alternating shale/limestone, dark thinly bedded shaly lime/limey shale intervals alternating with chaotic paler (dark gray) limestones with chaotic bedding and often fossils.  (88.4') Notable ammonite in fossil debris bed.	Core broken in one place	85
90									(90') Boring terminated.		90
95											95

NOTES:

**ATTACHMENT D**  
**BAP-B1 Photolog**



Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 1

Date: 3/12/2019

Direction: BAP-B1

Comments:  
1-12.5 feet (ft) below  
ground surface (bgs)



Photograph 2

Date: 3/12/2019

Direction: BAP-B1

Comments:  
12.5-21.9 ft bgs



Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 3

Date: 3/12/2019

Direction: BAP-B1

Comments: 21-26 ft bgs



Photograph 4

Date: 3/12/2019

Direction: BAP-B1

Comments: 26-31 ft bgs





Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 5

Date: 3/14/2019

Direction: BAP-B1

Comments:  
31.4-41 ft bgs



Photograph 6

Date: 3/14/2019

Direction: BAP-B1

Comments:  
41-50.75 ft bgs



Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 7

Date: 3/14/2019

Direction: BAP-B1

Comments:  
50.75-60.55 ft bgs



Photograph 8

Date: 3/12/2019

Direction: BAP-B1

Comments: 61-66 ft bgs





Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 9

Date: 3/12/2019

Direction: BAP-B1

Comments: 66-71 ft bgs



Photograph 10

Date: 3/12/2019

Direction: BAP-B1

Comments: 71-76 ft bgs



Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 11

Date: 3/12/2019

Direction: BAP-B1

Comments: 76-81 ft bgs



Photograph 12

Date: 3/12/2019

Direction: BAP-B1

Comments: 81-86 ft bgs





Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 13

Date: 3/12/2019

Direction: BAP-B1

Comments: 86-91 ft bgs



Photograph 14

Date: 3/12/2019

Direction: BAP-B1

Comments: 91-96ft bgs



Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 15

Date: 3/12/2019

Direction: BAP-B1

Comments: 96-101 ft bgs



Photograph 16

Date: 3/12/2019

Direction: BAP-B1

Comments:  
101-106 ft bgs





Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 17

Date: 3/12/2019

Direction: BAP-B1

Comments:  
106-111 ft bgs



Photograph 18

Date: 3/13/2019

Direction: BAP-B1

Comments:  
108.8-118.5 ft bgs



Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 19

Date: 3/13/2019

Direction: BAP-B1

Comments:  
118.5-128.2 ft bgs



Photograph 20

Date: 3/13/2019

Direction: BAP-B1

Comments:  
128.2-138 ft bgs





Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 21

Date: 3/13/2019

Direction: BAP-B1

Comments:  
138-148 ft bgs



Photograph 22

Date: 3/13/2019

Direction: BAP-B1

Comments:  
148-158 ft bgs





Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

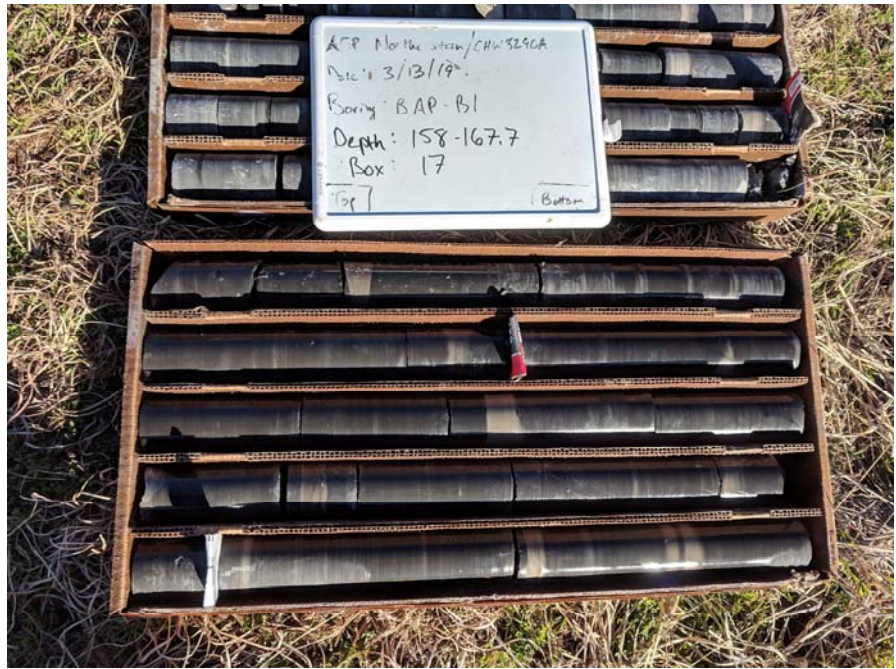
Site Location: Oologah, OK

Photograph 23

Date: 3/13/2019

Direction: BAP-B1

Comments:  
158-167.7 ft bgs



Photograph 24

Date: 3/13/2019

Direction: BAP-B1

Comments:  
167.7-176 ft bgs



Geosyntec Consultants  
Photographic Record

Client: AEP

Project Number: CHW8193

Site Name: Northeastern Plant

Site Location: Oologah, OK

Photograph 25

Date: 3/13/2019

Direction: BAP-B1

Comments:  
177-186 ft bgs



## ATTACHMENT C

O kpgtcnqi kecn'Cpcn{uku'Ncdqtcvqty Report

# CHA8462/10/01

Requested by:  
Alison Kreinberg  
Geosyntec Consultants

Mineralogy, Inc. Number 19051

Date:  
March 21, 2019

Submitted by:



Timothy B. Murphy

**Mineralogy, Inc.**  
3321 East 27th Street  
Tulsa, Oklahoma 74114  
USA  
+1 (918) 744.8284

[www.mineralogy-inc.com](http://www.mineralogy-inc.com)



## Table of Contents

### [Conditions & Qualifications](#)

<b>Section I</b>	<a href="#">Introduction</a>
<b>Appendix I</b>	<a href="#">X-ray Diffraction Analysis</a>
	<a href="#">X-ray Fluorescence</a>
	<a href="#">Cation Exchange Capacity</a>

<b>Sample ID</b>		<b>Petrographic Data</b>	<b>Thin Section Images</b>
SP-10-LOG 1 (32-32.4')	19051-01	• —	• —
SP-10-LOG 2 (46')	19051-02	• —	• —
SP-10-LOG 3 (46')	19051-03	• —	• —
SP-10-LOG 4 (72-72.4')	19051-04	• —	• —



## **CONDITIONS AND QUALIFICATIONS**

*Mineralogy, Inc. will endeavor to provide accurate and reliable laboratory measurements of the samples provided by the client. The results of any x-ray diffraction, petrographic or core analysis test are necessarily influenced by the condition and selection of the samples to be analyzed. It should be recognized that geological samples are commonly heterogeneous and lack uniform properties. Mineralogical, geochemical and/or petrographic data obtained for a specific sample provides compositional data pertinent to that specific sampling location. Such “site-specific data” may fail to provide adequate characterization of the range of compositional variability possible within a given project area, thus the “projection” of these laboratory findings and values to adjoining, “untested” areas of the formation or project area is inherently risky, and exceeds the scope of the laboratory work request. Hence, Mineralogy, Inc. shall not assume any liability risk or responsibility for any loss or potential failure associated with the application of “site or sample-specific laboratory data” to “untested” areas of the formation or project area. Unless otherwise directed, the samples selected for analysis will be chosen to reflect a visually representative portion of the bulk sample submitted for analysis. Where provided, the interpretation of x-ray diffraction, petrographic or core analysis results constitutes the best geological judgment of Mineralogy, Inc., and is subject to the sampling limitations described above, and the detection limits inherent to semi-quantitative and/or qualitative mineralogical and microscopic analysis. Mineralogy, Inc. assumes no responsibility nor offers any guarantee of the productivity, suitability or performance of any oil or gas well, hydrocarbon recovery process, dimension stone, and/or ore material based upon the data or conclusions presented in this report.*





## Introduction

Four selected core intervals have been submitted for a combination of mineralogical, chemical, and petrographic analysis. The results of the x-ray diffraction mineralogical analysis are summarized in Table I. X-ray fluorescence chemical analysis data for these samples are presented in Table II. Results of the cation exchange capacity analysis (CEC) are summarized in Table III. The CEC results provide exchange capacities for a series of selected cation species, including: lithium, calcium, potassium, magnesium and sodium ions. The results of the thin section petrographic analysis are summarized in the individual thin section descriptions presented following Table III. The descriptive summaries include thin section photomicrographs that offer representative images of the micro-fabric for these core samples.

Sample ID	Mineralogy, Inc. No.	Analysis Requested
SP-10-LOG 1 (32-32.4')	19051-01	XRD / XRF / CEC / TSP
SP-10-LOG 2 (46')	19051-02	XRD / XRF / CEC / TSP
SP-10-LOG 3 (46')	19051-03	XRD / XRF / CEC / TSP
SP-10-LOG 4 (72-72.4')	19051-04	XRD / XRF / CEC / TSP

XRD = X-ray Diffraction | XRF = X-ray Fluorescence | CEC = Cation Exchange Capacity | TSP = Thin Section Petrography





## X-ray Diffraction

Client:	Geosyntec Consultants	MI#:	19051
Project:	CHA8462/10/01	Date:	03/21/19
Location:	N/A	Method:	X-ray Diffraction

	Sample ID	SP-10-LOG 1	SP-10-LOG 2	SP-10-LOG 4	SP-10-LOG 4
	Depth (ft)	32-32.4	46	46	72-72.4
	MI#	19051-01	19051-02	19051-03	19051-04
Mineral Constituent	Relative Abundance (%)				
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	
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	
% Illite Layers in ML I/S		75%	75%	BDL	

\*ND = Not Detected

BDL = Below Detection Limit



## X-ray Fluorescence

Client:	Geosyntec Consultants	MI#:	19051
Project:	CHA8462/10/01	Date:	03/21/19
Location:	N/A	Method:	X-ray Fluorescence

	Sample ID	SP-10-LOG 1	SP-10-LOG 2	SP-10-LOG 4	SP-10-LOG 4
	Depth (ft)	32-32.4	46	46	72-72.4
	MI#	19051-01	19051-02	19051-03	19051-04
Compound	Results (mass %)				
Na <sub>2</sub> O	ND	0.1895	0.115	0.1679	
MgO	0.8658	0.8691	0.6868	1.2152	
Al <sub>2</sub> O <sub>3</sub>	0.229	2.623	2.8345	1.8392	
SiO <sub>2</sub>	1.8268	9.8542	11.7333	15.4175	
P <sub>2</sub> O <sub>5</sub>	0.1167	0.2455	0.1844	0.1426	
S	0.0281	0.5322	0.3903	0.1484	
Cl	0.0366	0.0313	0.0366	0.0309	
K <sub>2</sub> O	0.0729	0.5631	0.36	0.4304	
CaO	95.2326	80.3021	79.7826	78.3752	
TiO <sub>2</sub>	ND	0.1647	0.0679	0.1096	
MnO	0.0797	0.1224	0.1512	0.1627	
Fe <sub>2</sub> O <sub>3</sub>	0.7094	2.596	1.912	1.2662	
Sr	0.5788	0.8884	0.922	0.3485	
Y	ND	ND	0.0116	ND	
BaO	0.0758	0.0597	0.056	0.0598	

\*ND = Not Detected



## Cation Exchange Capacity

Client:	Geosyntec Consultants	MI#:	19051
Project:	CHA8462/10/01	Date:	03/21/19
Location:	N/A	Method:	C.E.C.

Sample ID	Lithium		Calcium		Magnesium		Potassium		Sodium	
	Results	PQL**	Results	PQL**	Results	PQL**	Results	PQL**	Results	PQL**
	(meg/100g)		(meg/100g)		(meg/100g)		(meg/100g)		(meg/100g)	
SP-10-LOG 1	BPQL	0.05	20.0	0.100	0.567	0.100	BPQL	0.100	0.226	0.100
32 - 32.4'										
SP-10-LOG 2	BPQL	0.05	16.2	0.100	3.51	0.100	2.32	0.100	8.85	0.100
46'										
SP-10-LOG 3	BPQL	0.05	21.6	0.100	0.642	0.100	0.250	0.100	0.896	0.100
46'										
SP-10-LOG 4	BPQL	0.05	21.1	0.100	1.16	0.100	0.313	0.100	0.822	0.100
72 - 72.4'										

*Method Reference: 40 CFR 136, 261, Method for Chemical Analysis of Water and Waste EPA-600/4-79-020 March 1983*

*CEC Method Reference: Method of Soil Analysis, Chemical and Microbiological Properties, 2nd Ed.; American Society of Agronomy, Inc.*

*Soil Science Society of America, Inc. page 160.*

*\*CEC analysis provided by Accurate Laboratories & Training Center; Stillwater, OK*

*\*\*PQL = Practical Quantitation Limit | BPQL = Below Practical Quantitation Limit*



## SP-10-LOG 1 (32-32.4'); MI#19051-01 Petrographic Data

This core interval is comprised of non-porous, partially recrystallized, slightly dolomitic, mollusk lime wackstone. Some characteristics of the limestone framework and micro-fabric are noted as follows:

- The limestone is extensively crystalized and exhibits a grain assemblage that includes recrystallized mollusk shells and gastropod fragments, undifferentiated skeletal debris (recrystallized skeletal grains partially to completely replaced with calcite spar and/or dolomite cement), foram tests, and ostracod fragments.
- The sedimentary fabric is burrow mottled and exhibits localized evidence of geopetal sheltering adjoining selected shell fragments. The sheltered portions of the limestone fabric exhibit contrasts in the matrix packing density & the distribution of some secondary cements within this interval.
- The groundmass of this sample is dominated by microcrystalline calcite. Portions of the matrix have been locally replaced with very finely crystalline calcite spar +/- dolomite cement owing to aggrading neomorphism.
- Traces of microcrystalline chert cement are locally present as a late stage secondary cement occupying patches of sheltered inter-crystalline porosity that adjoin the mollusk shell fragments. The chert cement is visually estimated to account for <1% of the mineral volume in this interval.
- Porosity accounts for ~0.5-1.0% of the bulk volume. Void types include scattered secondary dissolution voids (associated with the dolomite-replaced mollusk shell fragments), and traces of inter-crystalline microporosity.

### Mineralogical Data

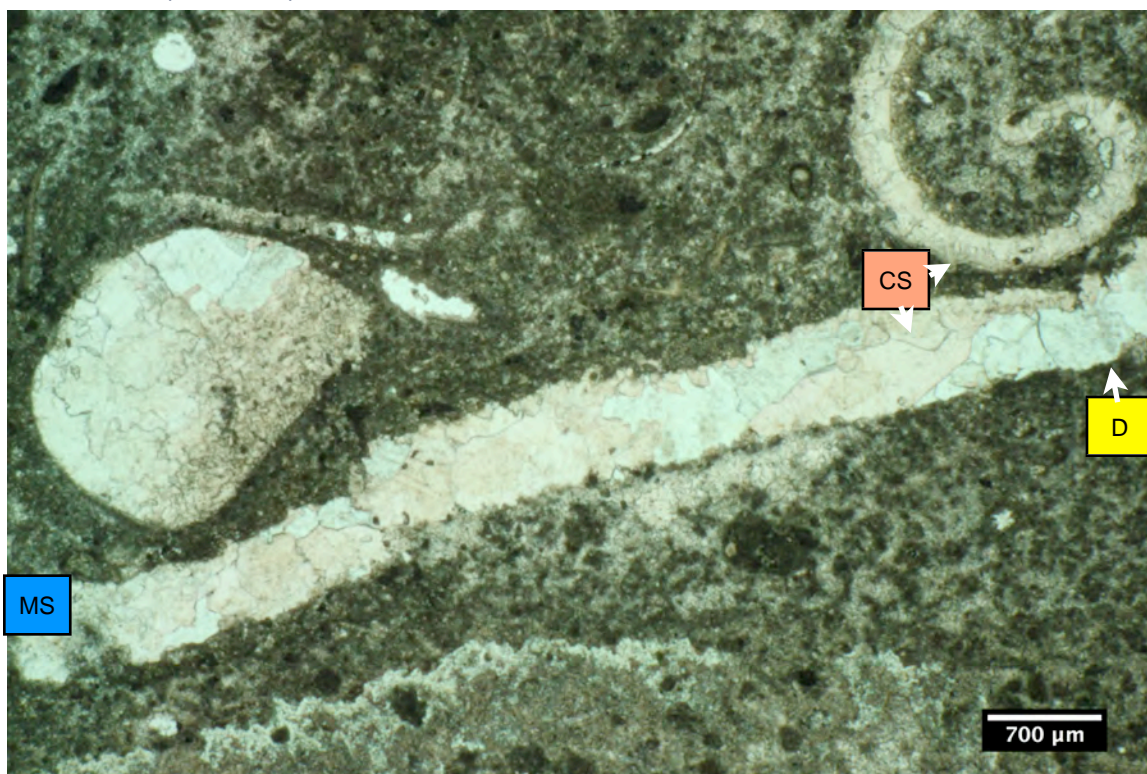
Mineral Constituents	Concentration (%)
Quartz	1
Calcite	95
Ferroan Dolomite	4

### Photo Tags

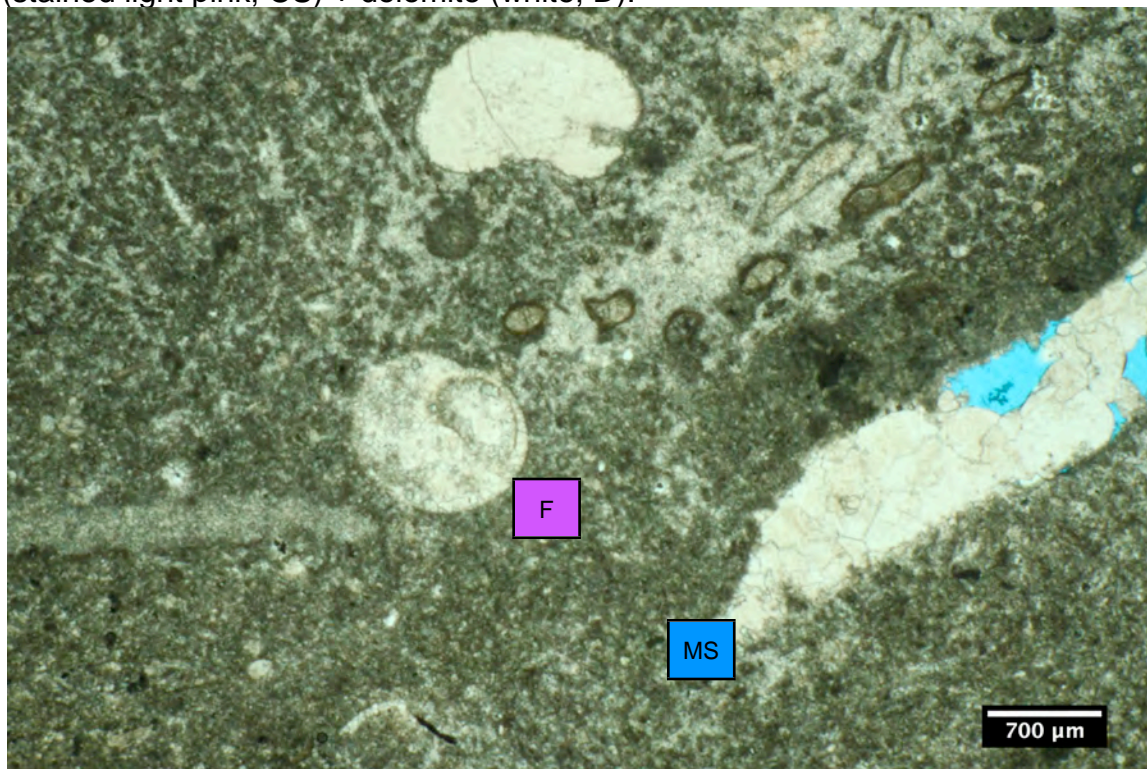
Calcite spar cement	CS
Dolomite	D
Mollusk shell fragments	MS
Foram test	F



SP-10-LOG 1 (32-32.4'); MI#19051-01



1A. Mollusk shell fragments (MS) recrystallized and replaced with calcite spar (stained light pink; CS) + dolomite (white; D).

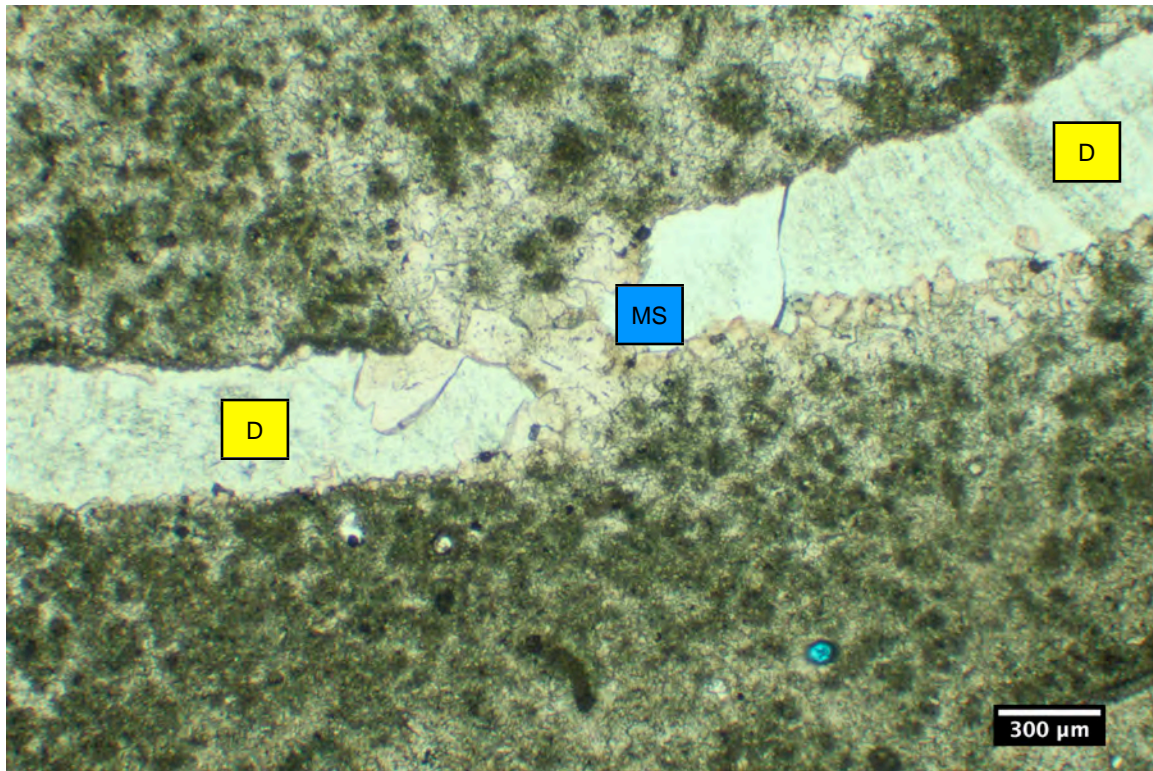


1B. Secondary intraparticle dissolution macroporosity (blue) associated with a leached mollusk shell fragment (MS). Recrystallized foram (?) test (F).

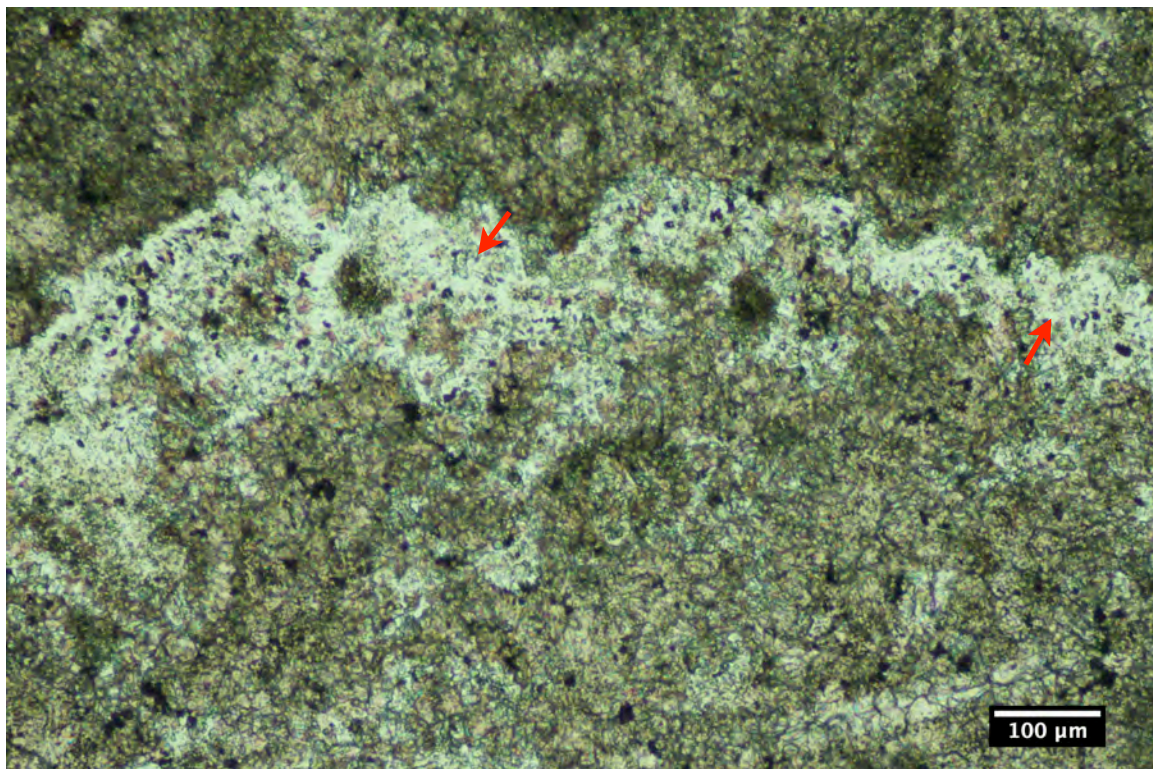




SP-10-LOG 1 (32-32.4'); MI#19051-01



1C. Dolomite replacement (D) within a re-crystallized mollusk shell fragment (MS).



1D. Chert cement (red arrows) replacing portions of the lime mud groundmass within this limestone sample.



## SP-10-LOG 2 (46'); MI#19051-02 Petrographic Data

This core sample is characterized as a parallel-bedded, organic matter-rich, calcareous and fossiliferous, silty shale. The fabric and mineralogy of this core interval is noted as follows:

- The silty shale groundmass is densely packed & exhibits parallel-bedded lamina of organic matter-rich detrital clay interbedded with limestone skeletal fragments and lens-shaped concentrations of quartz-rich silt. The clay matrix fraction accounts for ~ 67% of the mineral volume & includes illite/mica, mixed-layered illite/smectite, kaolinite and chlorite.
- The silty shale is interbedded with clay matrix-rich skeletal lime wackstone. The interbedded limestone materials are burrow mottled, fossiliferous, and incorporate common lenses of organic-rich clay. The matrix materials locally drape the carbonate grains and fill intercrystalline voids of the limestone. Skeletal allochems include very poorly preserved mollusk shell fragments, calcareous algae plates, and foram tests. Most of the carbonate grains have been completely recrystallized and replaced with calcite spar cement.
- Burial compaction and deformation of the interbedded matrix materials has contributed to the development of pressure solution artifacts including low amplitude stylolites.
- Minor to trace amounts of micro-crack porosity are present within the organic-rich silty-shale materials. The fracture voids are parallel to bedding and likely represent artifacts related to fabric relaxation.

### Mineralogical Data

Mineral Constituents	Concentration (%)
Quartz	20
Albite	4
Microcline	1
Calcite	2
Siderite	1
Pyrite	5
Kaolinite	2
Chlorite	3
Illite/Mica	38
Mixed-Layered Illite/Smectite	24

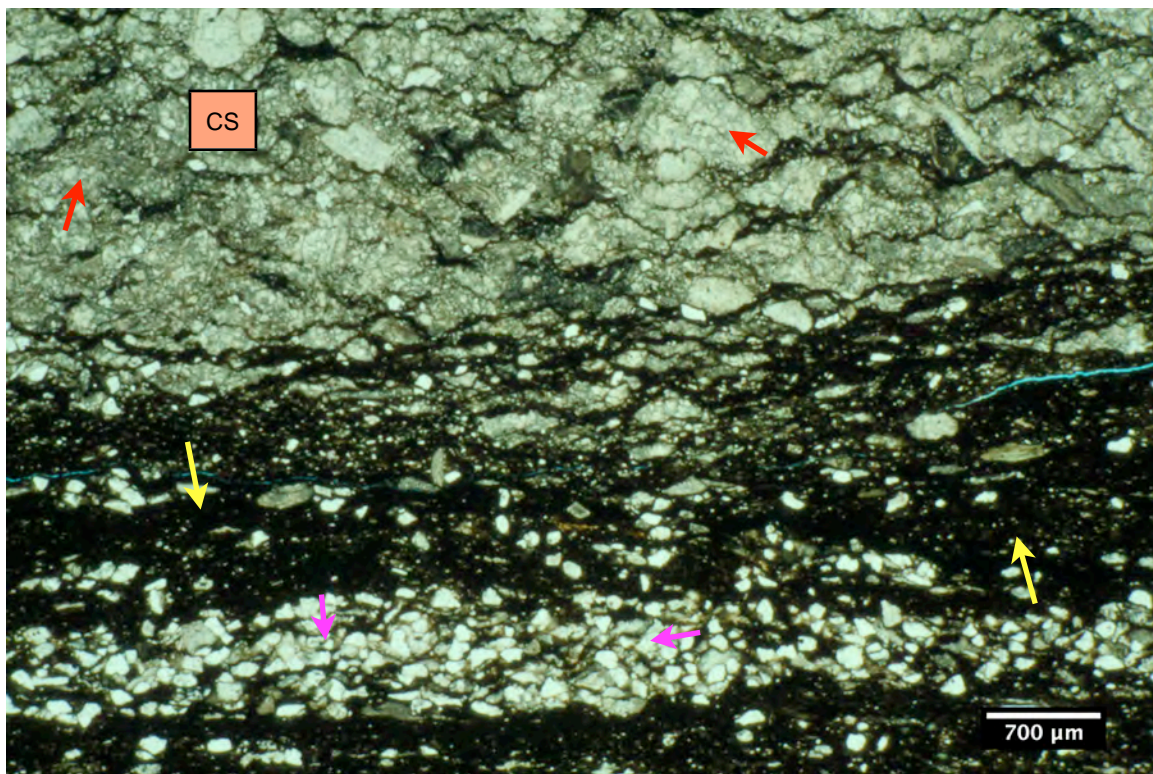
### Photo Tags

Calcite spar cement	CS
Dolomite	D
Mollusk shell fragments	MS
Foram test	F

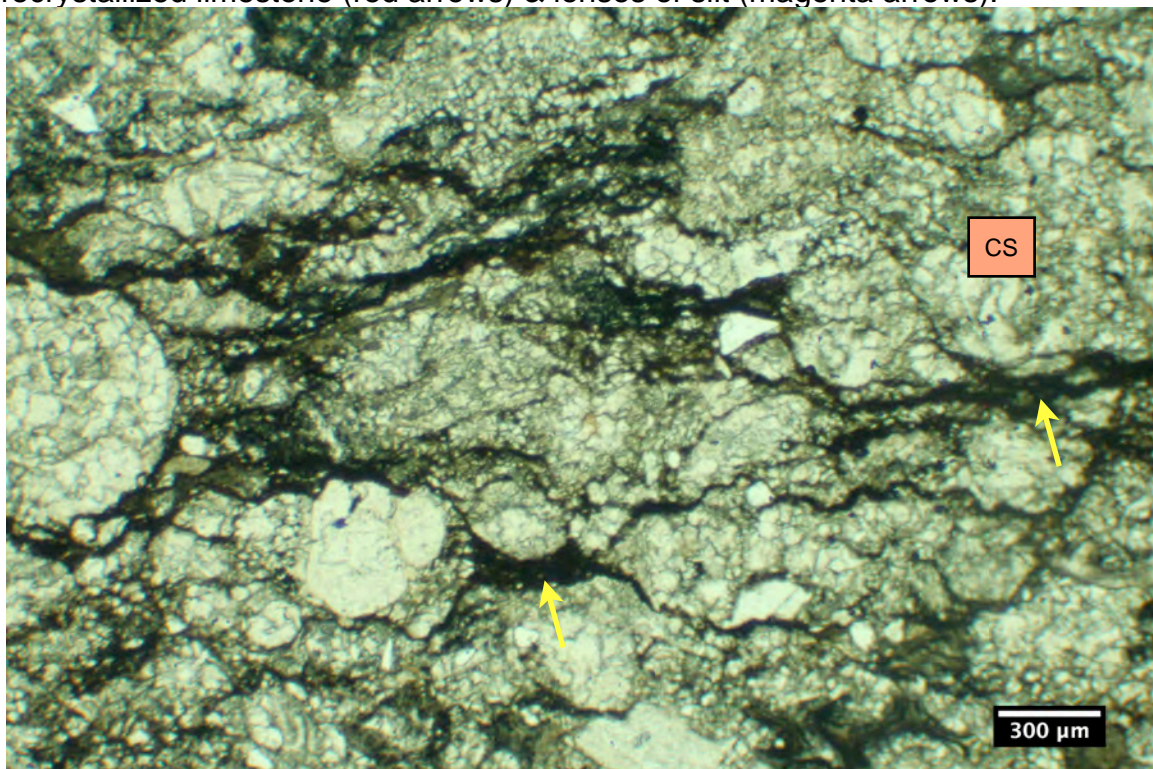




SP-10-LOG 2 (46'); MI#19051-02



2A. The silty shale (yellow arrows) is organic matter-rich & contains interbeds of recrystallized limestone (red arrows) & lenses of silt (magenta arrows).

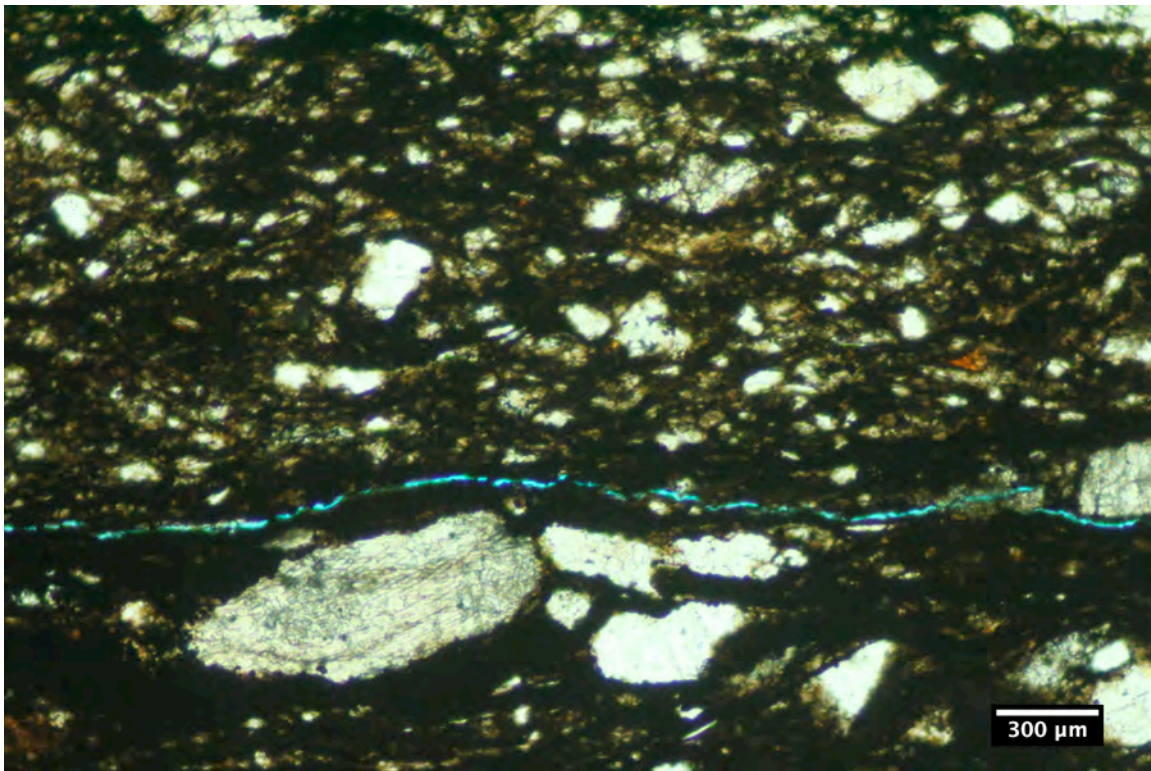


2B. The limestone interbed is flaser-bedded & exhibits lenses of black-colored, organic-rich matrix (yellow arrows) draping the calcite crystals (CS).

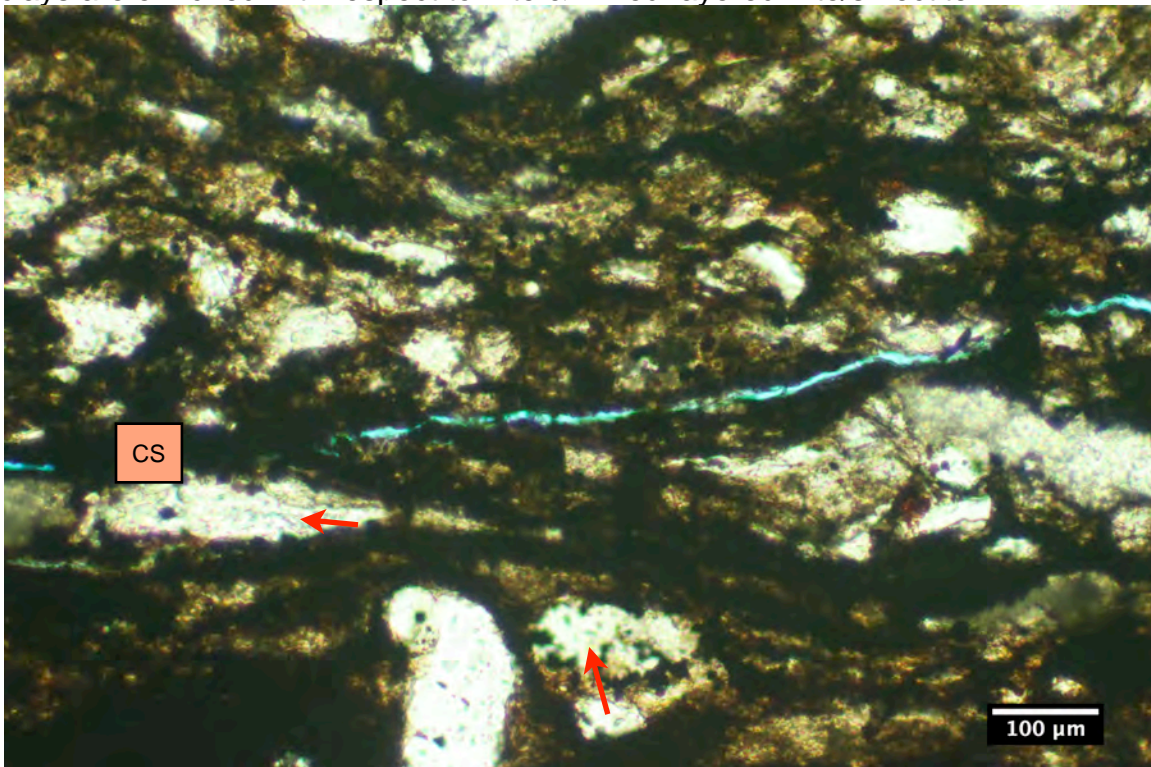




SP-10-LOG 2 (46'); MI#19051-02



2C. Micro-crack (blue) attributed to fabric relaxation of the compressed shale. The clays are enriched with respect to illite & mixed-layered illite/smectite.



2D. Nearly all of the available intergranular space is choked with organic-rich detrital clay of carbonate cement (red arrows).



## SP-10-LOG 3 (46'); MI#19051-03 Petrographic Data

This core sample is characterized as an organic matter and clay matrix-rich skeletal lime packstone. The limestone is non-porous and exhibits wavy or flaser bedding, with detrital clay matrix locally concentrated in the 'troughs' of the fabric. Clay lenses and lamina are locally deformed along low amplitude pressure solution seams.

- The limestone mineralogy is dominated by calcite (~93%), together with modest amounts of quartz (3%), pyrite (1%), and clay matrix minerals (~3%). The clay mineral suite for this sample includes a mix of illite/mica, mix-layered illite/smectite, kaolinite, and traces of chlorite.
- Skeletal allochems include: undifferentiated and locally recrystallized skeletal grains, mollusk shell fragments, foram tests, intraclasts (lime wackstone and lime mudstone), bryozoan fronds, gastropod fragments, and traces of quartz-rich silt and sand.
- Pyrite cement occurs as a common replacement for organic matter.

### Mineralogical Data

Mineral Constituents	Concentration (%)
Quartz	3
Calcite	93
Pyrite	1
Kaolinite	1
Chlorite	<0.5
Illite/Mica	1
Mixed-Layered Illite/Smectite	1

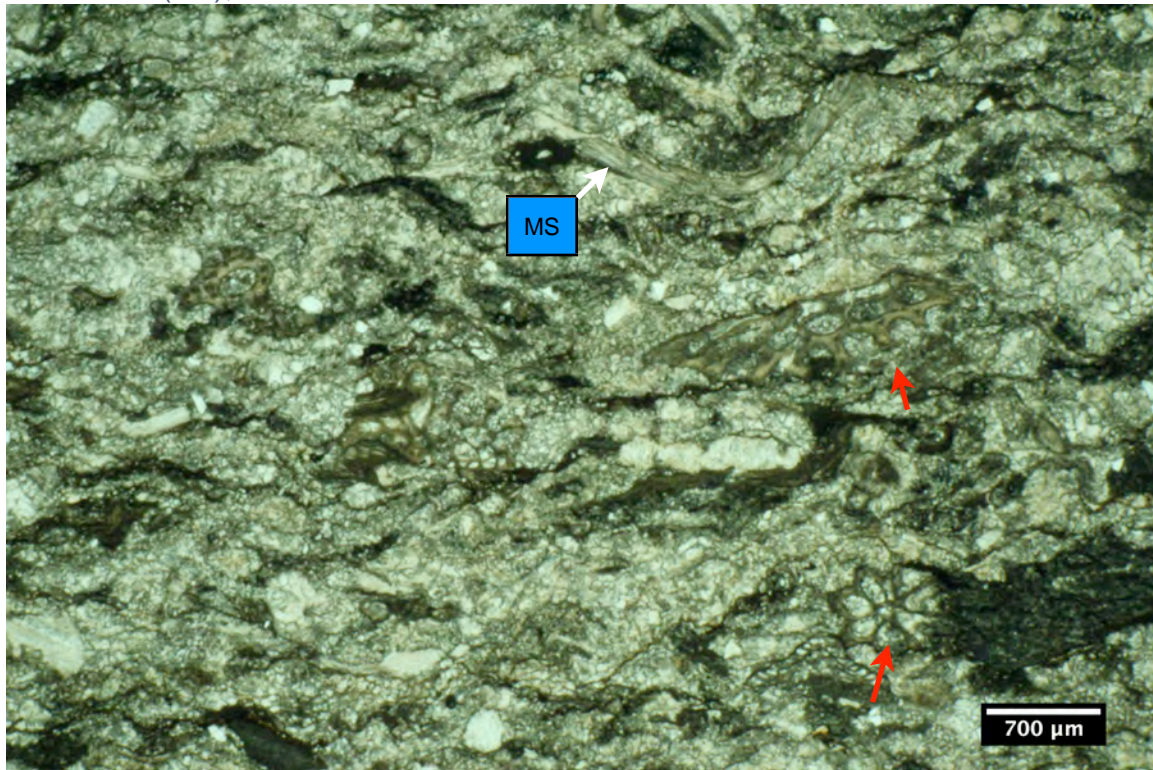
### Photo Tags

Calcite spar cement	CS
Dolomite	D
Mollusk shell fragments	MS
Foram test	F

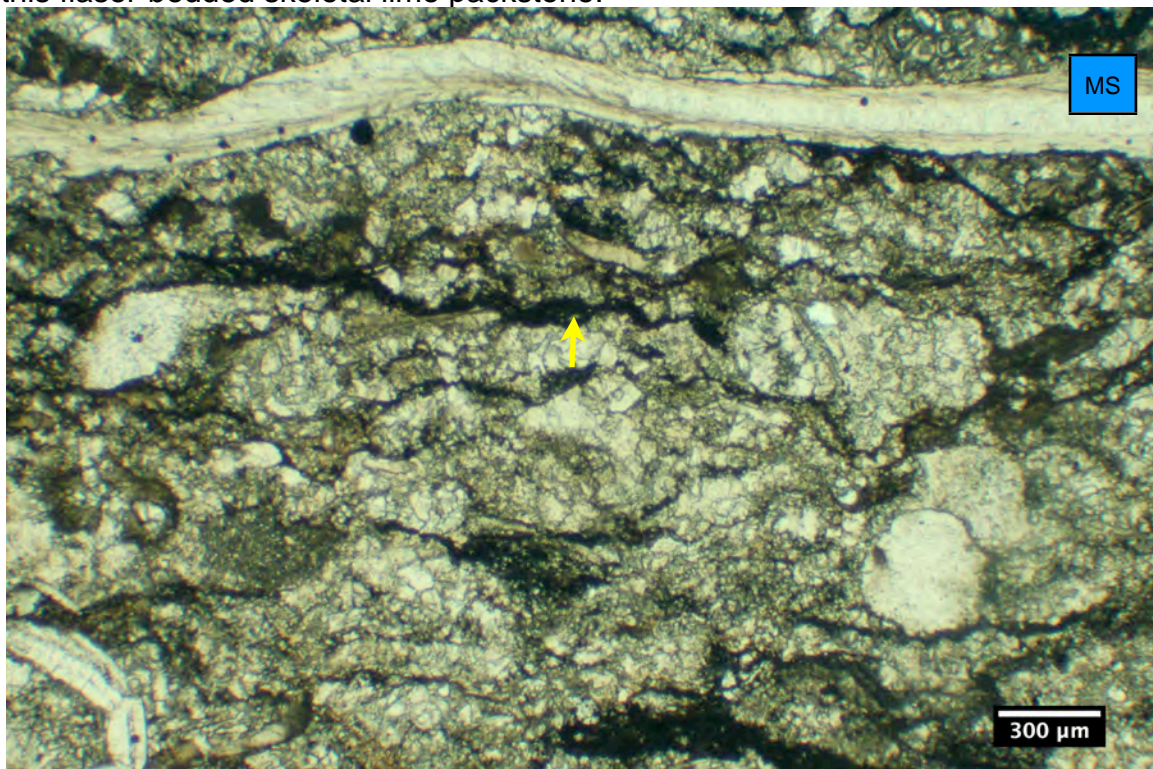




SP-10-LOG 3 (46'); MI#19051-03



3A. Bryozoan fronds (red arrows) + poorly preserved mollusk shell fragments (MS) in this flaser-bedded skeletal lime packstone.

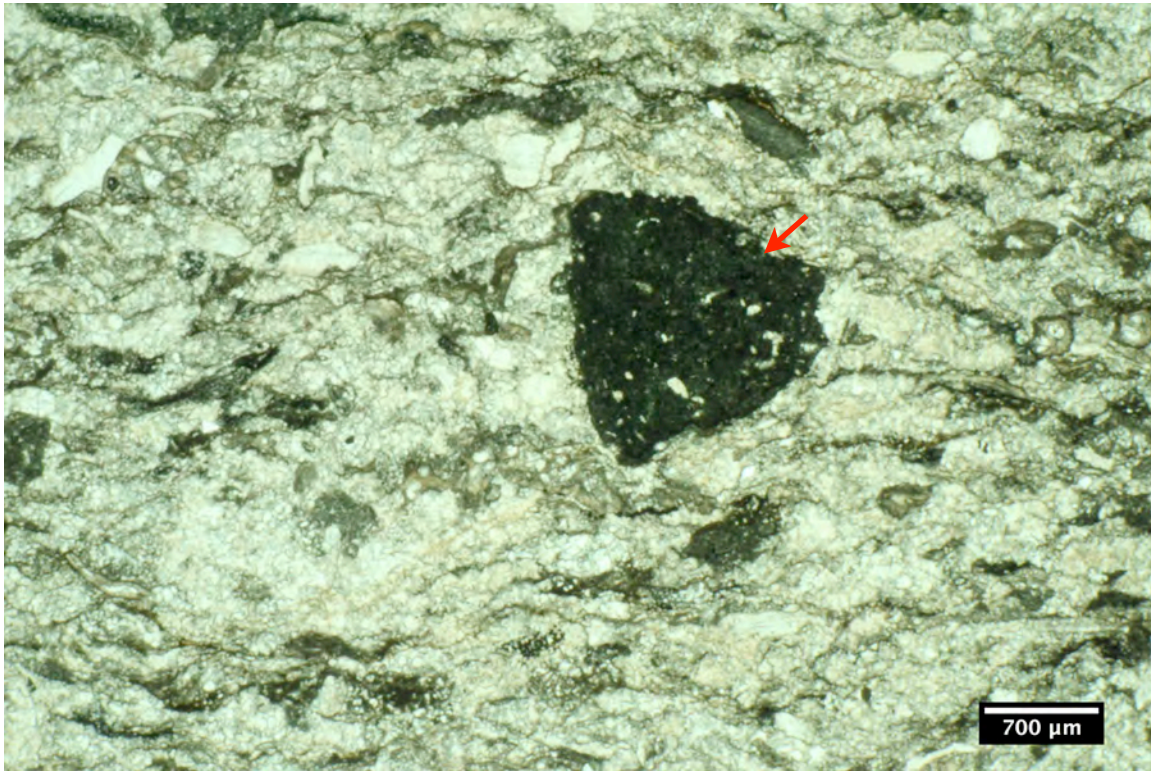


3B. Mollusk shell fragment (MS) + undifferentiated & skeletal fragments. Note the mechanically deformed & compacted matrix lenses (yellow arrow).

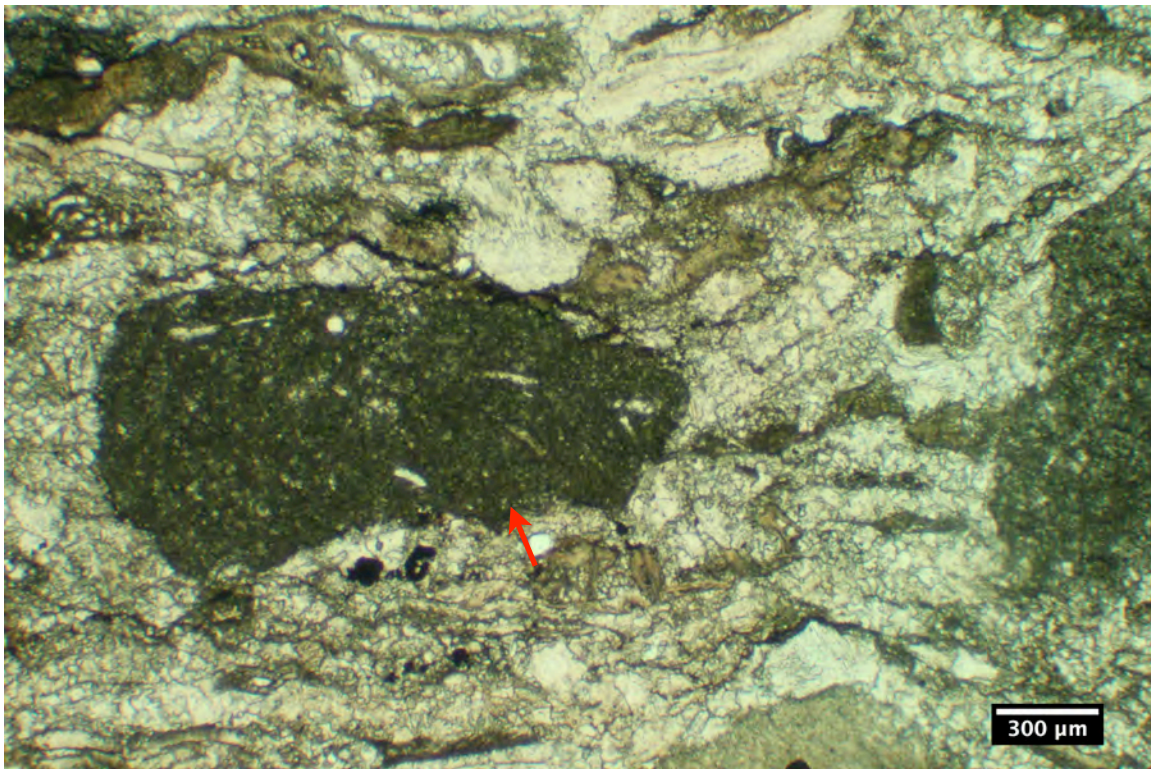




SP-10-LOG 3 (46'); MI#19051-03



3C. Intraclast of lime wackestone (red arrow). The limestone fabric is non-porous.



3D. Intraclast (red arrow) within this extensively recrystallized skeletal lime packstone.



## SP-10-LOG 4 (72-72.4'); MI#19051-04 Petrographic Data

This core interval is comprised of densely-crystallized, burrow mottled, skeletal lime packstone/wackstone. The mineralogy and fabric properties for this sample are noted as follows:

- The sample fabric is parallel-bedded and burrow mottled. The skeletal grain assemblage is comprised of very poorly preserved and locally re-crystallized sponge spicules, calcareous algae plates, pelloids, and undifferentiated skeletal fragments.
- The limestone is locally interbedded with parallel bedded lamina of organic matter-rich silty-shale.
- The mineralogy of the limestone is dominated by calcite (91%), coupled with significant amounts of quartz-rich silt and sand (~6%), ferroan dolomite (~2%), and clay matrix minerals (~1%). The XRD analysis of the clay matrix fraction indicates a mineralogy dominated by illite/mica coupled with minor to accessory amounts of mixed-layered illite/smectite and kaolinite.
- The limestone fabric is described as non-porous and extensively recrystallized. Very finely crystalline calcite spar and patches of dolomite cement are common replacements for skeletal grains present in this sample.

### Mineralogical Data

Mineral Constituents	Concentration (%)
Quartz	6
Calcite	91
Ferroan Dolomite	2
Kaolinite	<0.5
Illite/Mica	1
Mixed-Layered Illite/Smectite	<0.5

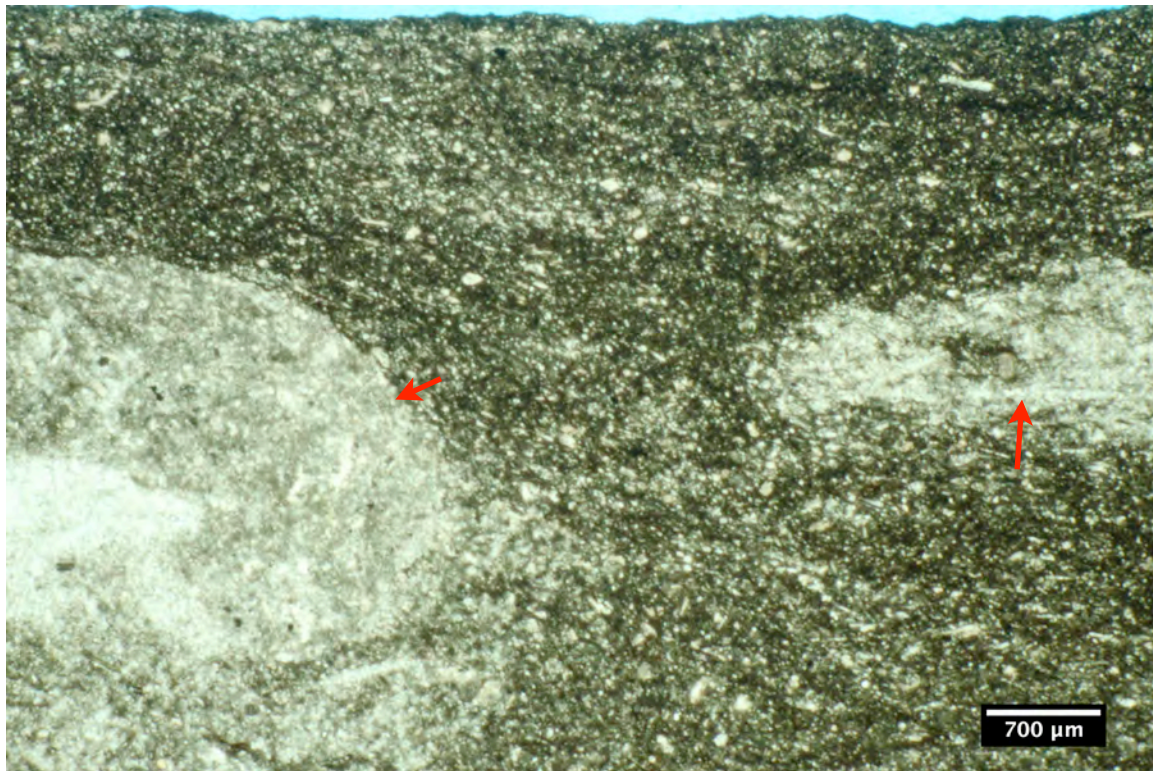
### Photo Tags

Calcite spar cement	CS
Dolomite	D
Mollusk shell fragments	MS
Foram test	F

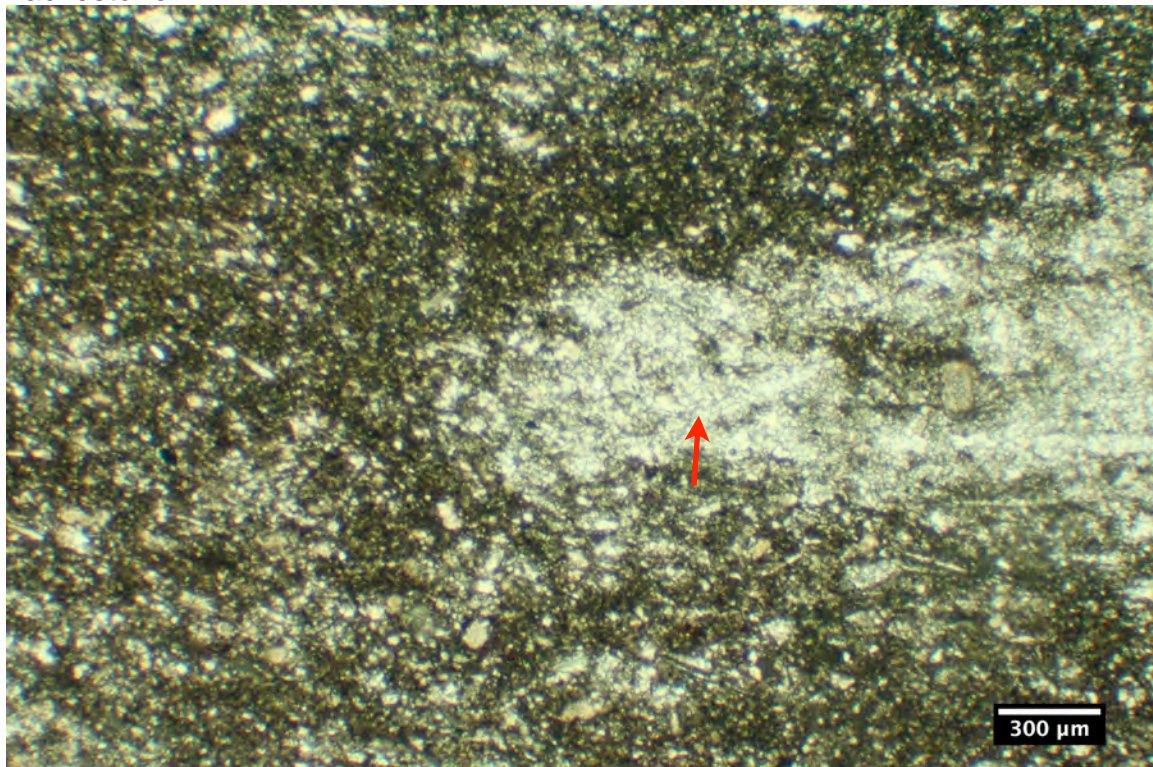




SP-10-LOG 4 (72-72.4'); MI#19051-04



4A. Burrow molds (red arrows) within this sponge spicule-rich lime packstone/wackestone.

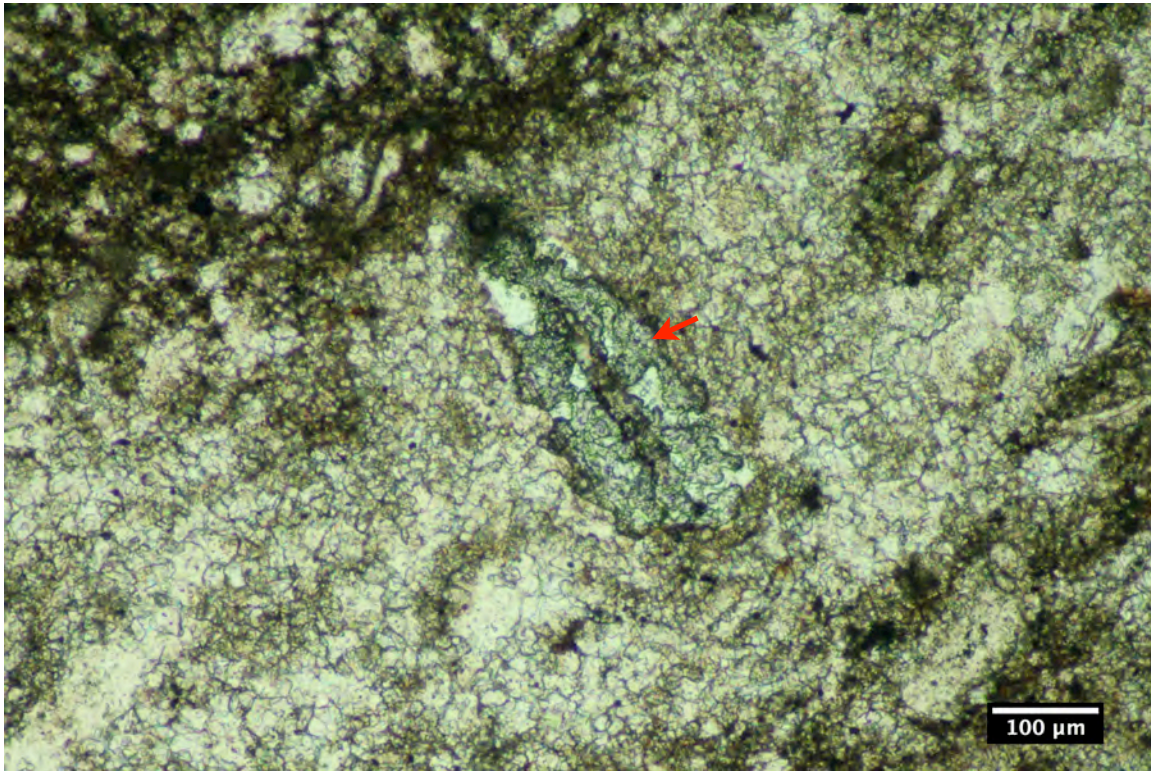


4B. The groundmass of this sample is enriched with respect to lime mud & contains recrystallized skeletal fragments that include sponge fragments, calcareous algae, pelloids, and undifferentiated skeletal fragments.

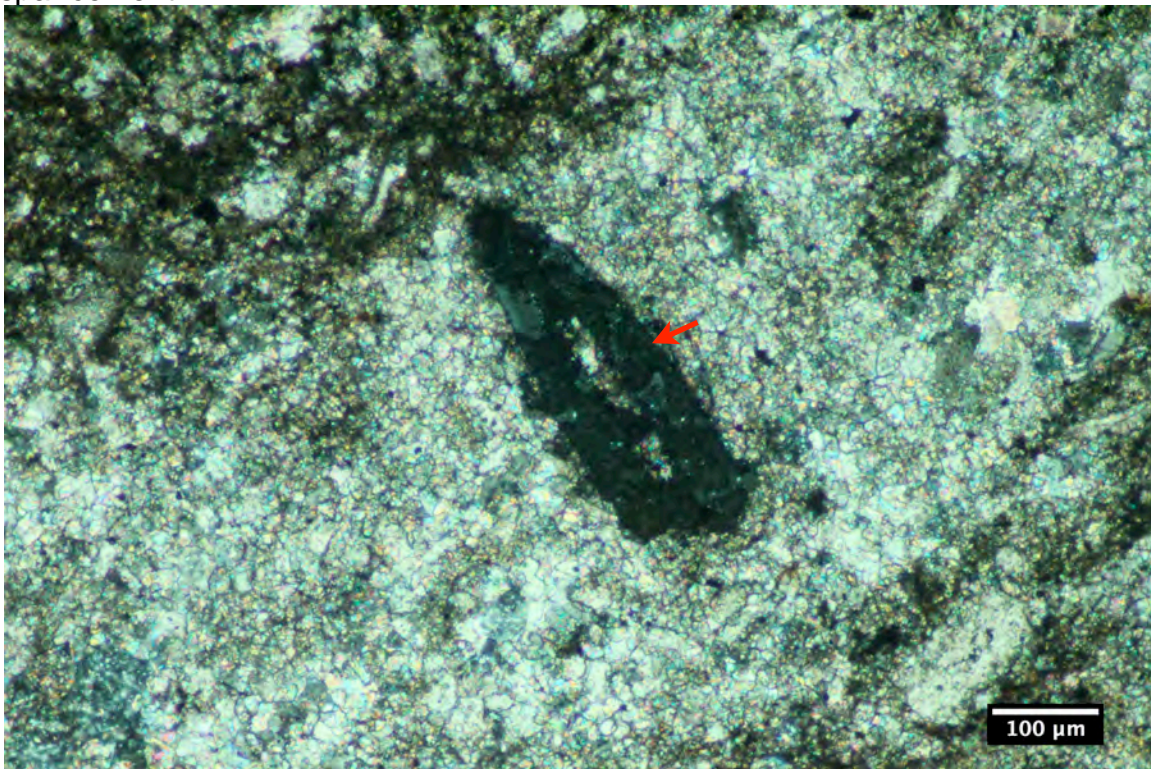




SP-10-LOG 4 (72-72.4'); MI#19051-04



4C. A phosphatic bone fragment (red arrows) surrounded by recrystallized calcite spar cement.



4D. As in Figure 4C, with cross polarized light.



March 08, 2019

Client: Mineralogy Inc.

3321 East 27th Street

Tulsa, OK 74114

**Requested By:** Kristopher Murphy



National  
Environmental  
Laboratory  
Accreditation  
Program  
Kansas CERT # E-10219

**Sample Project Name:** 19051

**Date Samples Received:** February 25, 2019      Time: 9:15      sample temp upon arrival at lab = 19°C

**Matrix:** Solid

**Lab Log Numbers:**      **BB25007-01**      **BB25007-02**      **BB25007-03**      **BB25007-04**

**Work Order:** BB25007

**Report #** BB25007-0308191045

**EPA Lab ID#'s:** **Stillwater OK00092**    **Tulsa OK00983**    **OKC OK00129**    **ICR OK 001**

**Oklahoma Certification:** Stillwater WasteWater, DEQ 8316/ Drinking Water, DEQ D9602  
Tulsa WasteWater, DEQ 9905 / Drinking Water, DEQ D9901  
Oklahoma City WasteWater DEQ 7202 / Drinking Water, DEQ D9937

**Kansas Certification:** Stillwater NELAP CERT # E-10219  
Oklahoma City NELAP CERT # E-10414

**New Hampshire Cert.:** Oklahoma City Drinking Water NH ELAP Lab ID # 2072

**Texas Certification:** Stillwater Drinking Water NELAP CERT # T105704533-14-1

**Method Reference:** 40 CFR 136, 141, and 261 Methods for Chemical Analysis of Water and Wastes EPA-600/4-79-020, March 1983. Test Methods for Evaluating Solid Wastes, SW-846, Final Update III. Standard Methods 1998 (20th Edition), Standard Methods 2005 (21st Edition) and Standard Methods 2011 (22nd Edition) for the Examination of Water and Wastewater.

**Analysis Reference:**

If qualifiers present in "Prep Info" or "Analysis Info", then analysis performed as follows: @= Tulsa Lab and \* = OKC Lab. If no qualifiers present, then analysis performed at Stillwater Lab.

Accurate Environmental Laboratories certify that the test results performed at the Stillwater lab meet all requirements of NELAP. Any exceptions to this can be found in the report footer or Quality Control Section of the report.

This report is to only be replicated in its entirety.

Accurate Environmental sampling protocol was followed for any sampling performed by Accurate Field Services.



Sample: 19051-01

Location Code:

PWSID#:

Collection Type: Grab

Sample Time: 2/25/19 0:00

Lab Log# BB25007-01

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Lithium (Li) EPA 6020A	Lithium	BPQL mg/kg dry		10.0	03/04/19 10:15 LF	03/06/19 11:26 LF
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Calcium	20.0 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:17 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Magnesium	0.567 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:17 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Potassium	BPQL meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:17 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Sodium	0.226 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:17 RW

Sample: 19051-02

Location Code:

PWSID#:

Collection Type: Grab

Sample Time: 2/25/19 0:00

Lab Log# BB25007-02

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Lithium (Li) EPA 6020A	Lithium	76.0 mg/kg dry		10.0	03/04/19 10:15 LF	03/06/19 11:30 LF
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Calcium	16.2 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:21 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Magnesium	3.51 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:21 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Potassium	2.32 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:21 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Sodium	8.85 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:21 RW

Sample: 19051-03

Location Code:

PWSID#:

Collection Type: Grab

Sample Time: 2/25/19 0:00

Lab Log# BB25007-03

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Lithium (Li) EPA 6020A	Lithium	BPQL mg/kg dry		10.0	03/04/19 10:15 LF	03/06/19 11:35 LF
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Calcium	21.6 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:24 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Magnesium	0.642 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:24 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Potassium	0.250 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:24 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Sodium	0.896 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:24 RW

Sample: 19051-04

Location Code:

PWSID#:

Collection Type: Grab

Sample Time: 2/25/19 0:00

Lab Log# BB25007-04

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Lithium (Li) EPA 6020A	Lithium	BPQL mg/kg dry		10.0	03/04/19 10:15 LF	03/06/19 11:39 LF
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Calcium	21.1 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:28 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Magnesium	1.16 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:28 RW

**Sample:**

**Location Code:**

**PWSID#:**

**Collection Type:** Grab

**Sample Time:** 2/25/19 0:00

**Lab Log#** BB25007-04

Method/Parameter	Test	Result	Notes	PQL#	Prep Info	Analysis Info
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Potassium	0.313 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:28 RW
Exchangeable Cations EPA 9081 (No Cert. Avail.)	Sodium	0.822 meq/100g		0.100	02/28/19 09:30 LF	03/01/19 13:28 RW

### Notes and Definitions

MCL Analyte concentration may exceed Maximum Contaminant Limit (MCL) for EPA Primary or Secondary Drinking Water Regulations.

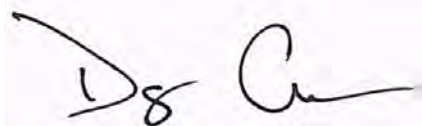
### Analyte concentration may exceed regulatory limit.

PQL Practical Quantitation Limit - the method reporting limit (MRL) adjusted for any dilutions or other changes made to the sample to deal with interferences/matrix effects

BPQL Below Practical Quantitation Limit (if applicable).

The "Prep Date" of the QC analysis coincides with the characters of the appropriate QC Lab ID. (Example: 19 A 02 15 - BLK = 2019, Jan 2, Batch #15 - Blank)

*Lab Manager*



## Quality Control Data

### Blank Data

QC Lab #	Test Group	Test	Result	PQL	Flags
19C0429-BLK1	Lithium (Li) EPA 6020A	Lithium	BPQL mg/kg dry	10.0	

### Duplicate Sample Data

QC Lab #	Test Group	Test Name	Source	Dup Result	Samp Result	% RPD	RPD Limit	Flags
19B2864-DUP1	Exchangeable Cations EPA 9081 (No Cert. Avail.)	Calcium	BB25007-04	21.7	21.1	3	20	
19B2864-DUP1	Exchangeable Cations EPA 9081 (No Cert. Avail.)	Magnesium	BB25007-04	1.19	1.16	3	20	
19B2864-DUP1	Exchangeable Cations EPA 9081 (No Cert. Avail.)	Potassium	BB25007-04	0.318	0.313	2	20	
19B2864-DUP1	Exchangeable Cations EPA 9081 (No Cert. Avail.)	Sodium	BB25007-04	0.896	0.822	9	20	

### Laboratory Control Sample Data

Lab QC#	Test Group	Test Name	LCS Result	Spike Level	Units	% Rec.	Control Limits	Flags
19C0429-BS1	Lithium (Li) EPA 6020A	Lithium	491	495.0	mg/kg dry	99	85 - 115	

### Matrix Spike Data

QC Lab #	Test Group	Test Name	Source Sample	Sample Result	Units	Spike Result	Spike Level	% Rec.	Acceptance Limits	Flags
19C0429-MS1	Lithium (Li) EPA 6020A	Lithium	BB25007-04	5.29	mg/kg dry	484	478.7	100	85 - 115	

### Matrix Spike Duplicate Data

QC Lab #	Test Group	Test Name	Sample Result	Spike Result	Spike Level	Units	% Rec.	Rec. Limits	% RPD	RPD Limit	Flags
19C0429-MSD1	Lithium (Li) EPA 6020A	Lithium	5.29	482	490.2	ng/kg dr	97	85-115	0.5	20	



# MINERALOGY-INC

3321 East 27th Street Tulsa, Oklahoma 74114

BB25007

**DATE:**  
Feb 25, 2019

**P.O.#**

**PROJECT:**  
19051

MI NUMBER  
**19051**  
**DATE REQUESTED:**  
Standard

**BILL TO:**

Mineralogy, Inc.  
3321 E 27th ST  
Tulsa, OK 74114  
[mickala@mineralogy-inc.com](mailto:mickala@mineralogy-inc.com)  
[kris@mineralogy-inc.com](mailto:kris@mineralogy-inc.com)

**PROJECT INFORMATION:**  
19051

M.I.#	SAMPLE ID	LOCATION	TYPE	ANALYSIS
- 01	19051-01			CEC
- 02	19051-02			CEC
- 03	19051-03			CEC
- 04	19051-04			CEC

No sample date/time provided to Mineralogy.

19.5°C

**SPECIAL INSTRUCTIONS / COMMENTS**

**RELINQUISHED BY**  
*Austin Shaemake*  
**RECEIVED BY**  
*Lutwyche*

**DATE/TIME**  
2/25/19 0915  
**DATE/TIME**  
2/25/19 0915

02/25/19

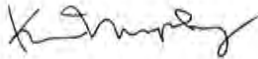
Accurate Labs  
505 S. Lowry St.  
Stillwater, OK 74074  
Attn: Dr. Ali Fazel

Re: C.E.C. analysis (MI#19051-01 - 19051-04)

Dr. Fazel:

Please provide C.E.C. + leachate analysis for the included samples. The standard protocol you've used for our samples in the past would be great (i.e., calcium, sodium, potassium, magnesium). Results can be sent to kris@mineralogy-inc.com. If you have any questions, please feel free to call or write. Thanks as always for the continued service.

Best regards,



Kristopher Murphy  
Mineralogy, Inc.

## ATTACHMENT D

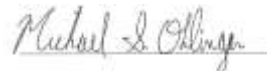
### Bottom Ash Pond Water Laboratory Analytical Data

**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.



**Michael Ohlinger, Chemist**

Email [msohlinger@aep.com](mailto:msohlinger@aep.com)

Tel.

Fax 614-836-4168

Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

## ATTACHMENT E

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  
8217 Shoal Creek Blvd., Suite 200  
Austin, TX 78757

Oklahoma Firm Certificate of  
Authorization No. 1996  
Exp. 6/30/2020

18167  
License Number

Oklahoma  
Licensing State

4/24/2019  
Date



SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

July 8, 2019

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

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

Dear Ms. Parker-Witt:

Monitoring Well SP-10 is currently in the assessment monitoring program. Lithium was detected in SP-10 at concentrations of 0.245 mg/L on May 30, 2018 and 0.242 mg/L on July 30, 2018. A statistically significant level (SSL) was determined, on January 8, 2019, when the lower confidence limit (LCL) for lithium (0.263 mg/L) exceeded the groundwater protection standard (0.15 mg/L). Oklahoma Administrative Code (OAC) 252:517-9-6(g)(3)(B) allows AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) to demonstrate that a source other than the coal combustion residuals (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.

On March 12, 2019, by email, DEQ approved a 30-day extension for submittal of the alternate source demonstration (ASD) so that NPS could receive sample analyses from the lab and to gather additional information on the Bandera shale formation from analyses of cores from two (2) new boreholes drilled at the site. On May 1, 2019, the Department of Environmental Quality (DEQ) received, by email, an ASD for lithium in monitoring well SP-10 from NPS. The ASD was presented to DEQ by NPS in a meeting on May 29, 2019. DEQ requested revised figures and cross-sections that were presented during the meeting. A revised Figure 4 and Figure 12 were received by email on June 4, 2019. The cross-sections were received by email on June 5, 2019.

The ASD asserts that the statistically significant level (SSL) exceeding the groundwater protection standards is a natural variation in groundwater quality due to the release of lithium from the clay minerals within the shale lens underlying the Bottom Ash Pond (BAP) and is not due to a release from the BAP itself. Additionally, NPS contends that the low concentration of lithium in the surface water in the BAP and limited transport from the BAP to the screened interval in SP-10 do not support a release.

Ms. Jill Parker-Witt, P.E.  
American Electric Power  
July 8, 2019  
Page 2 of 2

DEQ reviewed the ASD and made the following determination:

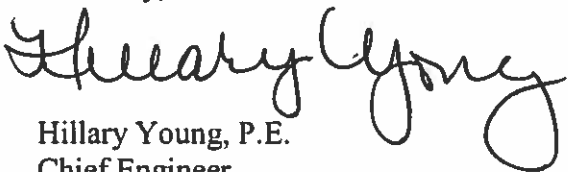
Elevated lithium concentrations were detected in downgradient monitoring well SP-10; however, lithium was not detected in elevated levels in upgradient monitoring well SP-5R even though boring logs from SP-5R show the monitoring well contains interbeds of dark limey shale within the screened interval. Also, SP-8, located near SP-10, and screened across a lower zone shale exhibits low concentrations of lithium. If the lithium at SP-10 was due to the presence of shale lenses within the screened interval of SP-10, then both SP-5R and SP-8 should exhibit elevated levels of lithium. The conceptual model that NPS proposed does not fit the actual groundwater sampling data.

NPS collected and analyzed a surface water sample from the BAP for comparison to data collected from SP-10 to support the claim that unless the BAP is directly connected to SP-10 through a fracture in the limestone, it is unlikely to affect the lithium concentration detected in SP-10. NPS did not sample and analyze the sediment in the BAP for lithium or other constituents to compare that data to the data collected from SP-10. The surface water sample may have a lower concentration of lithium than water that percolates through the sediment in the BAP and potentially reaches SP-10. DEQ does not believe enough data was presented to accept NPS's conclusion that the lithium at SP-10 was not due to a release from the BAP.

Should additional information be attained to support a revised ASD, DEQ will re-evaluate such a submittal. NPS is now required by OAC 252:517-9-6(g)(4) to initiate the assessment of corrective measures (ACM) as required by OAC 252:517-9-7. Please submit the proposed ACM plan and schedule for analyzing the lithium release and developing corrective action to address the release within ninety (90) days of receipt of this letter. Assessment monitoring for the BAP will continue.

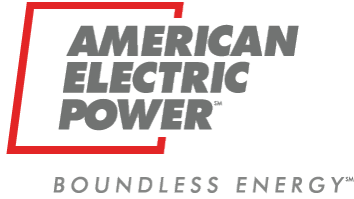
If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,



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

HY/ckh



American Electric Power  
502 North Allen Avenue  
Shreveport, LA 71101  
AEP.com

September 11, 2019

**Via U.S. and electronic mail**

Ms. Hillary Young  
Oklahoma Department of Environmental Quality (“ODEQ”)  
707 North Robinson, P.O. Box 1677  
Oklahoma City, OK 73101-1677

Re: Alternate Source Demonstration (“ASD”) for lithium- Bottom Ash Pond  
Public Service Company of Oklahoma  
Northeastern Power Station (NPS)

Dear Ms. Young,

PSO received ODEQ’s correspondence dated July 8, 2019 communicating that ODEQ could not conclude that NPS’s bottom ash pond (“BAP”) was not the source of lithium detected in the groundwater above the Groundwater Protective Standard (GWPS) based on the data presented. We appreciate ODEQ’s consideration of PSO’s ASD and understand that at this time, ODEQ has not approved the ASD. ODEQ’s correspondence identified possible deficiencies in the ASD that could be developed further and ODEQ inferred that it would reconsider the ASD in light of additional information. PSO would like to provide clarification as well as additional data and information for ODEQ’s reconsideration that an alternate source exists for lithium other than the BAP.

This letter will present the following lines of evidence in support of the existence of naturally occurring concentrations of groundwater lithium at the Site:

- Upgradient wells contain higher lithium concentrations than EPA's Regional Screening Levels (0.04 mg/L)
- Upgradient well SP-5R contains higher concentrations of lithium than upgradient well SP-4, even though SP-5R is farther from the BAP than SP-4
- Detection of a higher lithium concentration in the mineral formation (76 mg/kg) than in the BAP solids (15 mg/kg)
- Detection of a lower lithium concentration in the BAP sluiced water and BAP pore water than in the groundwater
- Leachability of the BAP sediments produced a lithium concentration equal to the method detection level (0.001 mg/L)
- The water chemistries of the BAP sediment, pore water, and pond water are similar but they are very different from SP-10's water chemistry, indicating the waters are not from the same source
- The spatial distribution of lithium in the groundwater indicates there is an increasing lithium concentration with depth and distance from the BAP, which does not conform to the principles of contaminate transport

A. Clarification of ASD submittal

After reviewing ODEQ's letter, PSO realized certain information in the ASD may not have been as evident and would benefit from further clarification. Specifically, PSO would like to provide additional clarification and information to address certain statements made by ODEQ in their letter.

The paragraph and statements for which PSO will provide further clarification are on page 2 of ODEQ's July 8, 2019 letter:

Elevated lithium concentrations were detected in down gradient monitoring well SP-10; however, *lithium was not detected in elevated levels in upgradient, monitoring well SP - 5R even though boring logs from SP-5R show the monitoring well contains interbeds of dark limy shale within the screened interval. Also SP-8, located near SP-10, and*

*screened across a lower zone shale exhibits low concentrations of lithium.* If the lithium at SP-10 was due to the presence of shale lenses within the screened interval of SP-10, then both SP-5R and SP-8 should exhibit elevated levels of lithium. The conceptual model that NPS proposed does not fit the actual ground water sampling data. [emphasis added]

First, PSO would like to provide context to the statement: "...lithium was not detected in elevated levels in upgradient monitoring well SP-5R..." PSO is not certain what lithium concentration ODEQ is using but in the ASD PSO relies on EPA's Regional Screening level (RSL, 4-2019) for lithium which is 0.04 mg/L that supersedes the former EPA Region 3 (RBC Table), Region 6 (HHMSSL Table), and 9 (PRG Table) (see attached table). SP-5R is located approximately 2,000 feet upgradient (77 yrs travel time, given the estimated groundwater velocity of 0.071 ft/day or 26 ft/yr) from the BAP. During the collection of groundwater background data, SP-5R had lithium concentrations that ranged from 0.100 mg/L to 0.163 mg/L. Additionally during the collection of background data, SP-4 (located 100 feet upgradient of the BAP) had lithium concentrations that ranged from 0.0697 mg/l to 0.136 mg/L, less than that found in SP-5R. The lithium concentrations in these wells are 1.75 to 4 times greater than EPA's RSL. Therefore, PSO interprets the naturally occurring lithium concentrations in these upgradient, background wells to be "elevated" as compared to the EPA's RSL. The presence of "elevated" lithium in the upgradient wells, which has produced a GWPS of 0.15 mg/L (3.75 times the EPA's RLS), particularly with greater concentrations of lithium detected farther from the BAP, supports the conclusion that lithium is naturally occurring within the groundwater at the site.

ODEQ continues with the phrase: "...even though boring logs from SP-5R show that the monitoring well contains interbeds of dark limey shale within the screened interval." SP-5R was drilled initially to a depth of 35 ft but did not produce water therefore the well was re-drilled to a total depth of 75 feet with a screen interval of 34-75 ft bgs. [Top of sand pack at 31 ft bgs]. Moisture was encountered around 61 feet. The boring logs for SP-5R show the limey shale present at 4ft -12 ft bgs and then again from 30-35 ft bgs. The re-drilled log also indicates that SP-5R's screen interval contains very little limey shale and there is no mention in the re-drilled

log that the frequency of limey shale layers increasing with depth. The SP-5R boring log differs to the boring log for SP-10 that states that the frequency of shale layers does appear to increase with depth. Laboratory analysis of the limey shale material shows that it contains 76 mg/kg lithium (solids expressed in mg/kg; groundwater expressed as mg/L).

Therefore, lower groundwater lithium concentrations in SP-5R (ranging from 0.100 mg/L to 0.163 mg/L) can be expected with the presence of less lithium containing material within the screened interval of SP-5R than those concentrations detected in SP-10 (ranging from 0.278 mg/L to 0.329 mg/L) which was observed to have more lithium containing material. Even though it is not possible to identify the actual location where groundwater encounters the limey shale, this evidence further verifies that lithium resides in the geological formation and the lithium concentrations in groundwater vary based on the amount of mineral content of the formation within the screened intervals of the wells.

Finally, ODEQ states, “SP-8, located near SP-10, and screened across a lower zone shale exhibits low concentrations of lithium.” SP-8 is located approximately 750 feet from SP-10 and is “nested” with SP-11. SP-10 is “nested” with SP-9. See figure below.



Since SP-8 is not within the CCR groundwater well network, SP-8 is not sampled on a regular basis. The available concentrations of lithium detected in SP-8 are listed below.

	Sample Date	Li (mg/l)
SP-8	11/03/16	0.337
SP-8	5/18/2017	0.128
SP-8	6/15/2017	0.0295*
SP-8	6/27/2017	0.0179*
SP-8	7/12/2017	0.0359*
SP-8	3/14/2019	0.780

The “lower concentrations” of lithium (denoted in the table by an asterisk) occurred during a time period when samples were collected temporally close together (12-28 days) only allowing enough time for groundwater to travel less than 2 feet through the lithology (given a groundwater velocity of 0.071 ft/day). The variation of groundwater lithium concentrations in SP-8 is attributed to the time allotted for the dissolution of lithium from the solid formation material into the groundwater. The longer the period between sampling events results in detecting higher lithium concentrations in SP-8 than those detected in SP-10, which is part of the CCR monitoring well network and is sampled more regularly.

As mentioned above, SP-8 (screen interval 59-71 ft bgs) is nested with SP-11(screen interval is 16-19 ft bgs) and these wells can be used to compare the lithium concentrations in the upper and lower groundwater bearing zones. Samples collected from these nested wells on 3/14/19 show the lithium concentrations in SP-11 (the shallower well) as 0.094 mg/L and in SP-8 (the deeper well) as 0.780 mg/L.

As noted above, SP-10 (screen interval of 40-50 ft bgs) is nested with SP-9 (screen interval of 65-75 ft. bgs). SP-9 is also not within the groundwater monitoring well network so it is not sampled on a regular basis. However, samples collected from SPs 9 and 10 on 3/14-15/19 show



that the shallower well SP-10 contained 0.286 mg/L lithium and the deeper well SP-9 contained 2.75 mg/L in the groundwater.

Because wells SPs 6 thru 9 were logged by reviewing the cuttings, the ability to accurately identify the lithology is limited. Therefore, borings BAP-B1 (total depth of 186 ft bgs) and BAP-B2 (total depth of 90 ft bgs) were advanced to clearly identify the vertical lithologies, which were presented in the ASD. BAP-B2 was located within 150 feet from SP-8 and screened between 59-71 ft bgs (which is the same screen interval of SP-8). Unfractured limestone was observed with alternating limestone and shale, not a uniform shale unit as described from SP-8's cuttings. The BAP-B1 boring demonstrates that limestone with interbedded clay material extends to 100 ft bgs at which point a shale unit was encountered.

Based on the principles of contaminate hydrogeology, the predominate transport mechanism is advection, where solutes are transported along with groundwater in the direction of decreasing hydraulic gradient. Additionally, solutes are transported through diffusion, where a solute in water moves from an area of greater concentration towards an area of less concentration, as long as a concentration gradient exists, even if the groundwater is not moving. Therefore, a release from a unit would produce a more concentrated zone of lithium closer to the source, and the concentration would decrease with distance. The extremely low groundwater flow velocity and low effective porosity at the Site would produce this type of contaminate distribution with higher concentrations of lithium in wells that have their screen interval set at the elevation closer to that of the BAP's bottom, if a release of lithium had occurred. However, the lithium concentration detected in the shallower zone (in wells SP 10 and 11) is less than that found in the deeper zone, (SPs 8 and 9).

Even though the deeper screened wells SP-6 (60-70 ft bgs) and SP-7 (70-80 ft bgs) are not nested with shallower screened wells SPs 1 and 2 (both at 24-35 ft bgs), they also provide evidence that the spatial distribution of groundwater lithium concentrations do not reflect the principles of contaminate transport. During the collection of the background data, the lithium concentration in shallow well SP-1 ranged from 0.003 mg/L to 0.009 mg/L and in SP-2 ranged from 0.05 mg/L to 0.11 mg/L. These concentrations are three (3) orders of magnitude lower than the lithium

concentrations detected in the deeper wells SP-6 (1.55 mg/L and 1.89 mg/L) and SP-7 (2.02 mg/L and 3.83 mg/L).

Additionally well MW-8D, which is located approximately 300 feet south and side gradient to groundwater flow from the BAP and 900 feet upgradient from the fly ash landfill, has a screen interval (50-60 ft bgs) which is approximately the same elevation as SP-10 screen interval. The soil boring for MW- 8D indicates that the shale beds become thicker after 29 ft bgs. Since MW-8D is located much farther from the BAP than SP-10, PSO expected that MW-8D's lithium concentration would be less than SP-10 even if a release from the BAP had occurred. However, the lithium concentrations detected in MW-8D during the collection of background data, ranged from 1.07-1.44 mg/L, which is an order of magnitude greater than what has been detected in SP-10.

All this spatially distributed data demonstrates that the shallow groundwater zones contain less lithium than the deeper zones and provides further support that the BAP is not the source of lithium detected in the groundwater monitoring well network.

#### B. New Information

ODEQ also stated that "NPS did not sample and analyze the sediment in the BAP for lithium or other constituents to compare that data to the data collected in SP-10." Therefore, PSO recently collected a sediment sample from the bottom of the BAP near SP-10. The sediment was evaluated using EPA test method 1312/6010B for the leachability of the sediment and EPA test method 6010B for the contents of the pore water. The results indicated that the sediment leached 0.001 mg/L lithium and the pore water contained 0.003 mg/L lithium. These concentrations are two (2) orders of magnitude below the concentrations of lithium detected in SP-10. See attached laboratory report. Additionally, the total lithium detected in the bottom ash solids was 15 mg/kg, which is much less than the lithium detected in the lithological minerals (78 mg/kg). The differences in these concentration also supports that the BAP is not the source of lithium detected within the groundwater monitoring well network. This new information was added to the piper diagrams presented in the ASD and demonstrates that the water chemistries of the BAP

sediment, pore water, and pond water are similar but they are very different from SP-10 water chemistry, indicating the waters are not from the same source.

These lines of evidence support the conclusion that the groundwater lithium concentrations are not due to a release from the BAP. The spatially distributed lithium concentrations detected within the groundwater monitoring well network demonstrate a natural variation in the groundwater more associated with a release of lithium from the minerals within the lithological shale lenses that are present within the screened intervals of the monitoring wells.

Based on these additional clarifications and the new information provided in this letter, PSO requests that ODEQ reconsider the agencies' conclusion that "the conceptual model that NPS proposed does not fit the actual groundwater sampling data."

Please do not hesitate to contact me if you have any questions or would like to discuss. I can be reached by email at: [jcparker-witt@aep.com](mailto:jcparker-witt@aep.com) or by phone at: (318) 673-3816.

Sincerely,



Jill Parker-Witt, P.E.

AEP, Engineer Principle

Attachments



SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

July 8, 2019

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

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

Dear Ms. Parker-Witt:

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Ms. Jill Parker-Witt, P.E.  
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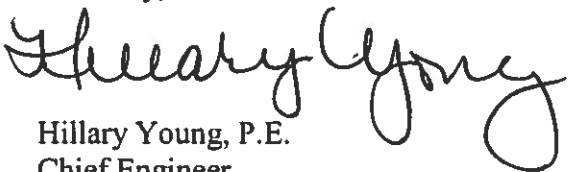
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Sincerely,

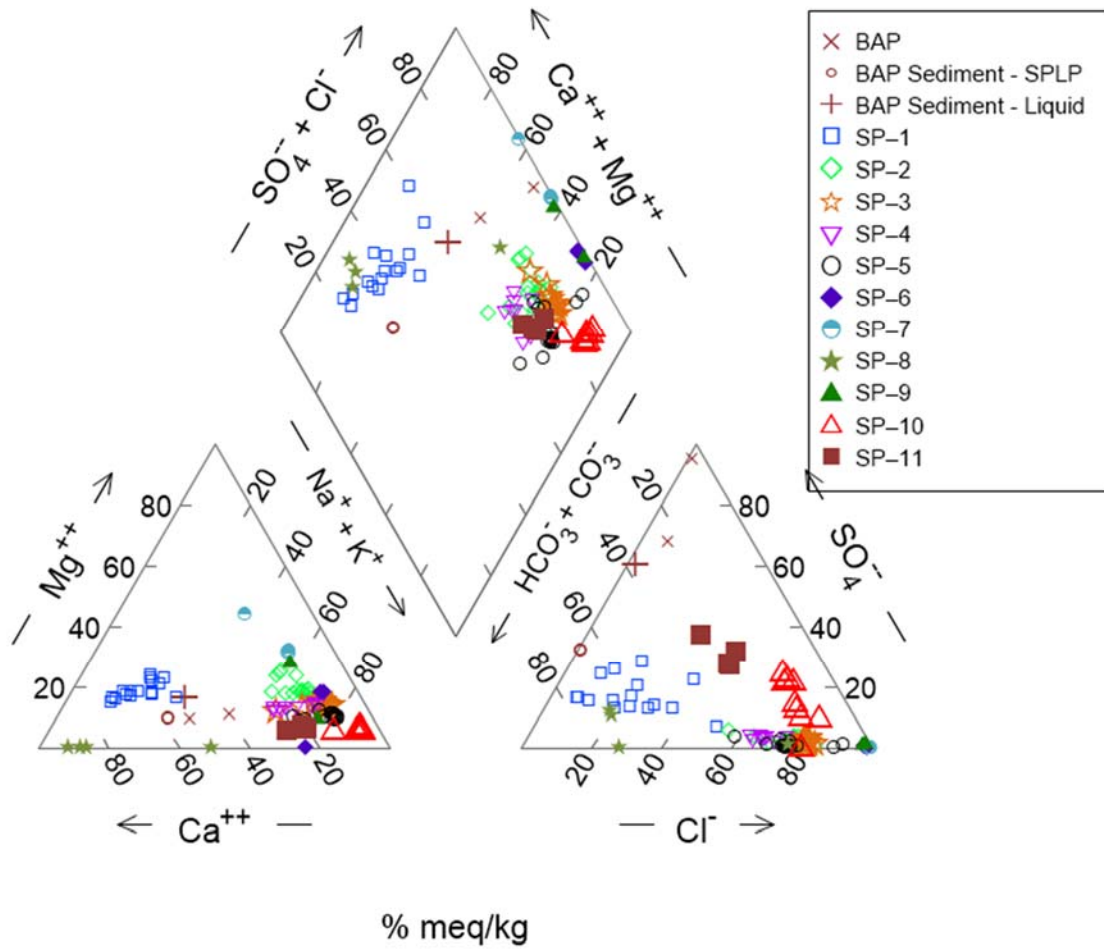


Hillary Young, P.E.  
Chief Engineer  
Land Protection Division

HY/ckh

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied; c = cancer; n = noncancer; \* = where n SL < 100X c SL; \*\* = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information											Contaminant		Screening Levels										Protection of Ground Water SSLs							
SFO (mg/kg-day) <sup>-1</sup>	k <sub>e</sub> (y)	IUR (ug/m <sup>3</sup> ) <sup>-1</sup>	k <sub>e</sub> (y)	RfD <sub>o</sub> (mg/kg-day)	k <sub>e</sub> (y)	RC <sub>1</sub> (mg/m <sup>3</sup> )	k <sub>e</sub> (y)	Volat	Mutagen	GIABS	ABS <sub>2</sub>	C <sub>sat</sub> (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m <sup>3</sup> )	key	Industrial Air (ug/m <sup>3</sup> )	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)		
				4.0E-04	P		7.0E-01	I	V		1	0.1	Hexamethylphosphoramide	680-31-9	2.5E+01	n	3.3E+02	n			7.3E+02	n	3.1E+03	n	8.0E+00	n		1.8E-03	n	
				2.0E+00	P						1	1.4E+02	Hexane, N-Hexanedioic Acid	110-54-3	6.1E+02	ns	2.5E+03	ns									1.0E+01	n		
9.5E-03	P			7.0E-02	P	4.0E-04	P	V			1		Hexanal, 1,2-ethyl- (2-Ethyl-1-hexanol)	124-04-9	1.3E+05	nm	1.0E+06	nm									9.9E+00	n		
				5.0E-03	I	3.0E-02	I	V			1	3.3E+03	Hexanone, 2-Hexazinone	104-76-7	7.3E+01	c*	3.4E+02	c	4.2E-01	n	1.8E+00	n	3.8E-01	n			8.8E-03	n		
				3.3E-02	I						1	0.1	Hexazinone	591-78-6	2.0E+02	n	1.3E+03	n	3.1E+01	n	1.3E+02	n	3.8E+01	n			3.0E-01	n		
				2.5E-02	I						1	0.1	Hexythiazox	51235-04-2	2.1E+03	n	2.7E+04	n										8.8E-03	n	
3.0E+00	I	4.9E-03	I								1	1.1E+05	Hydramethylnon	78587-05-0	1.6E+03	n	2.1E+04	n										5.0E-01	n	
3.0E+00	I	4.9E-03	I								1	1.1E+05	Hydrazine	67485-29-4	1.1E+03	n	1.4E+04	n										1.2E+05	n	
				4.0E-02	C	1.4E-02	C	V			1		Hydrazine Sulfate	302-01-2	3.2E-02	c*	1.4E-01	c*	5.7E-04	c*	2.5E-03	c*	1.1E-03	c*			2.2E-07	c*		
				2.0E-02	I	V					1		Hydrogen Chloride	10034-93-2	2.3E-01	c	1.1E+00	c	5.7E-04	c	2.5E-03	c	2.6E-02	c						
				1.4E-02	C	V					1		Hydrogen Fluoride	7647-01-0	2.8E+07	nm	1.2E+08	nm	2.1E+01	n	8.8E+01	n	4.2E+01	n						
				2.0E-03	I	V					1		Hydrogen Sulfide	7783-06-4	2.8E+06	nm	1.2E+07	nm	2.1E+00	n	8.8E+00	n	4.2E+00	n						
6.0E-02	P			4.0E-02	P						1	0.1	Hydroquinone	123-31-9	9.0E+00	c	3.8E+01	c										8.7E-04	c	
6.1E-02	O			2.5E-03	O						1	0.1	Imazalil	35554-44-0	8.9E+00	c*	3.8E+01	c*										1.5E-02	c*	
				2.5E-01	I						1	0.1	Imazaquin	81335-37-7	1.6E+04	n	2.1E+05	nm										2.4E+01	n	
				2.5E+00	O						1	0.1	Imazethapyr	81335-77-5	1.6E+05	nm	2.1E+06	nm										4.1E+01	n	
				1.0E-02	A						1		Iodine	7553-56-2	7.8E+02	n	1.2E+04	n										1.2E+01	n	
				4.0E-02	I						1	0.1	Iprodione	36734-19-7	2.5E+03	n	3.3E+04	n										2.2E-01	n	
				7.0E-01	P						1		Iron	7439-89-6	5.5E+04	n	8.2E+05	nm										3.5E+02	n	
				3.0E-01	I				V		1	1.0E+04	Isobutyl Alcohol	78-83-1	2.3E+04	ns	3.5E+05	s										1.2E+00	n	
9.5E-04	I			2.0E-01	I	2.0E+00	C				1	0.1	Isophorone	78-59-1	5.7E+02	c*	2.4E+03	c*	2.1E+03	n	8.8E+03	n	7.8E+01	c*			2.6E-02	c*		
				1.5E-02	I				V		1		Isopropalin	33820-53-0	1.2E+03	n	1.8E+04	n										9.2E-01	n	
				2.0E+00	P	2.0E-01	P	V			1	1.1E+05	Isopropanol	67-63-0	5.6E+03	n	2.4E+04	n	2.1E+02	n	8.8E+02	n	4.1E+02	n				8.4E-02	n	
				1.0E-01	I						1	0.1	Isopropyl Methyl Phosphonic Acid	1832-54-8	6.3E+03	n	8.2E+04	n										4.3E-01	n	
				5.0E-02	I						1	0.1	Isoxaben	82558-50-7	3.2E+03	n	4.1E+04	n										2.0E+00	n	
				3.0E-01	A	V					1		JP-7	E1737665	4.3E+08	nm	1.8E+09	nm	3.1E+02	n	1.3E+03	n	6.3E+02	n						
				8.0E-03	O						1	0.1	Lactofen	77501-63-4	5.1E-02	n	6.6E+03	n										1.0E+02	n	
				2.0E-04	X						1	0.1	Lactonitrile	78-97-7	1.3E+01	n	1.6E+02	n										4.0E+00	n	
				5.0E-05	P						1		Lanthanum	7439-91-0	3.9E+00	n	5.8E+01	n										1.0E+00	n	
				2.1E-05	P						1	0.1	Lanthanum Acetate Hydrate	100587-90-4	1.3E+00	n	1.7E+01	n										4.2E-01	n	
				1.9E-05	P						1		Lanthanum Chloride Heptahydrate	10025-84-0	1.5E+00	n	2.2E+01	n										3.7E-01	n	
				2.8E-05	P						1		Lanthanum Chloride, Anhydrous	10099-58-8	2.2E+00	n	3.3E+01	n										5.7E-01	n	
				1.6E-05	P						1		Lanthanum Nitrate Hexahydrate	10277-43-7	1.3E+00	n	1.9E+01	n										3.2E-01	n	
8.5E-03	C	1.2E-05	C								1		Lead Compounds																	
8.5E-03	C	1.2E-05	C								1	0.1	~Lead Phosphate	7446-27-7	8.2E+01	c	3.8E+02	c	2.3E-01	c	1.0E+00	c	9.1E+00	c						
8.5E-03	C	1.2E-05	C								1	0.1	~Lead acetate	301-04-2	6.4E+01	c	2.7E+02	c	2.3E-01	c	1.0E+00	c	9.2E+00	c		15	1.8E-03	c	1.4E+01	
8.5E-03	C	1.2E-05	C								1	0.1	~Lead and Compounds	7439-92-1	4.0E+02	G	8.0E+02	G	1.5E-01	G										
8.5E-03	C	1.2E-05	C								1	0.1	~Lead subacetate	1335-32-6	6.4E+01	c	2.7E+02	c	2.3E-01	c	1.0E+00	c	9.2E+00	c				2.0E-03	c	
				1.0E-07	I				V		1	2.4E+00	~Tetraethyl Lead	78-00-2	7.8E-03	n	1.2E-01	n										1.3E-03	n	
				5.0E-06	P				V		1	3.8E+02	Lewisite	541-25-3	3.9E-01	n	5.8E+00	n										9.0E-02	n	
				7.7E-03	O						1	0.1	Linuron	330-55-2	4.9E+02	n	6.3E+03	n										1.3E+02	n	
				2.0E-03	P						1		Lithium	7439-93-2	1.6E+02	n	2.3E+03	n											4.0E+01	n
				5.0E-04	I						1	0.1	MCPA	94-74-6	3.2E+01	n	4.1E+02	n										7.5E+00	n	
				4.4E-03	O						1	0.1	MCPB	94-81-5	2.8E+02	n	3.6E+03	n										6.5E+01	n	
				1.0E-03	I						1	0.1	MCPP	93-65-2	6.3E+01	n	8.2E+02	n										1.6E+01	n	
				2.0E-02	I						1	0.1	Malathion	121-75-5	1.3E+03	n	1.6E+04	n										3.9E+02	n	
				1.0E-01	I	7.0E-04	C				1	0.1	Maleic Anhydride	108-31-6	6.3E+03	n	8.0E+04	n	7.3E-01	n	3.1E+00	n	1.9E+03	n				3.8E-01	n	
				5.0E-01	I						1	0.1	Maleic Hydrazide	123-33-1	3.2E+04	n	4.1E+05	nm										1.0E+04	n	
				1.0E-04	P						1	0.1	Malononitrile	109-77-3	6.3E+00	n	8.2E+01	n										2.0E+00	n	
				3.0E-02	H						1	0.1	Mancozeb	8018-01-7	1.9E+03	n	2.5E+04	n										5.4E+02	n	
				5.0E-03	I						1	0.1	Manganese	12427-38-2	3.2E+02	n	4.1E+03	n										9.8E+01	n	
				1.4E-01	I	5.0E-05	I				1		Manganese (Diet)	7439-96-5	1.8E+03	n	2.6E+04	n	5.2E-02	n	2.2E-01	n	4.3E+02	n				2.8E+01	n	
				2.4E-02																										



Notes: Multiple events for each well are graphed where data are available.

**Piper Plot – SPLP Results**  
Northeastern Bottom Ash Pond

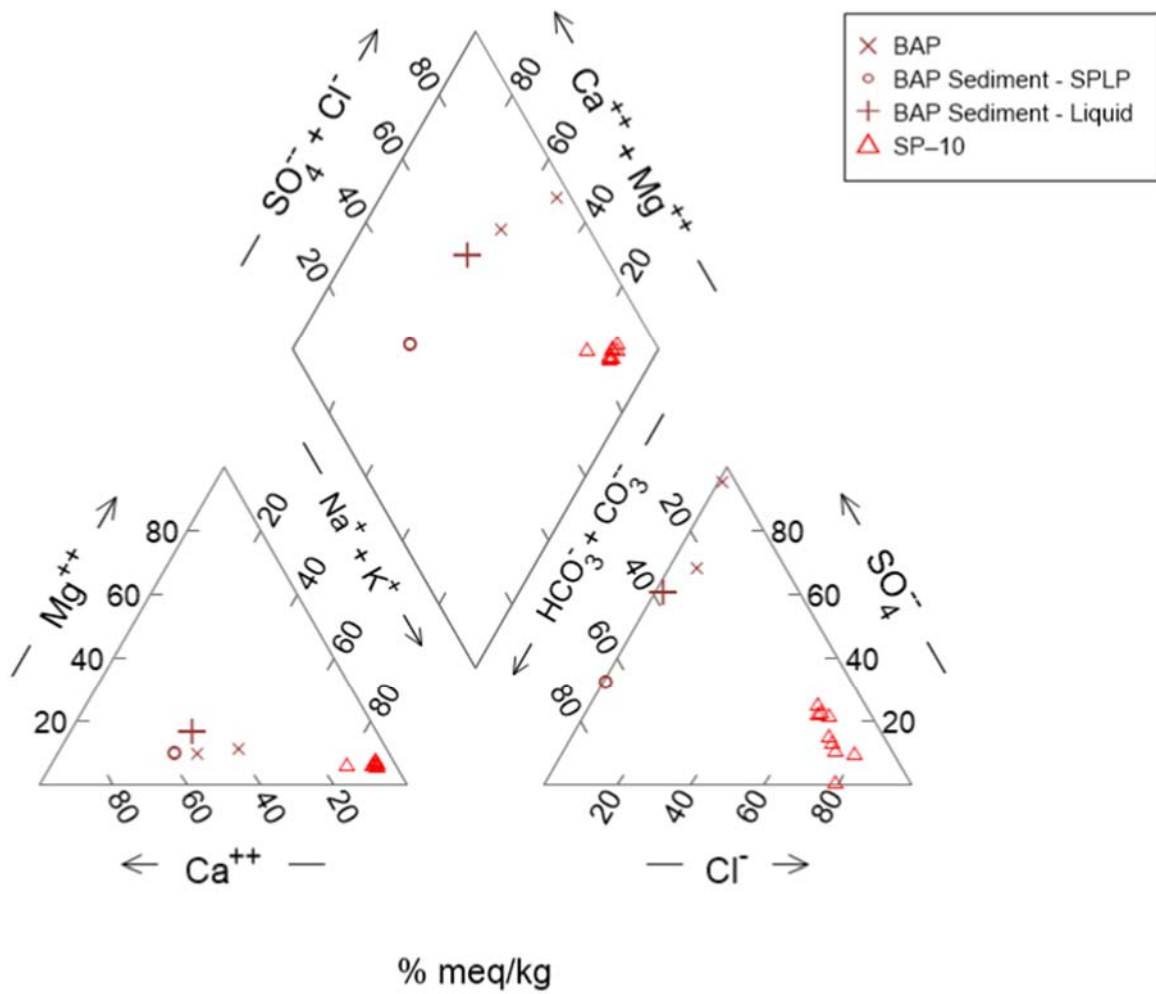


Figure  
**1a**

Columbus, Ohio

09-Aug-2019

internal info; path, data revised; author



Notes: Multiple events for the BAP and SP-10 are included.

**Piper Plot – SP-10**  
Northeastern Bottom Ash Pond

Geosyntec  
consultants



Figure  
**1b**

Columbus, Ohio

09-Aug-2019





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004

502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

<b>Report ID</b> : 40115	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 07/12/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 226939	<b>Collected Date:</b> 07/10/2019	<b>By:</b> BW
<b>Cust Sample ID:</b> Sediment	<b>Location:</b> NE BAP Sediment Sample	<b>Matrix:</b> Liquid
<b>Sample Desc.:</b> BAP Sediment SPLP		

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

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004

502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

<b>Report ID</b> : 40115		<b>Company:</b> SEP - Environmental (JP-W)			<b>Address:</b> 502 N. Allen Avenue			
<b>Date Received:</b> 07/12/2019		<b>Contact:</b> Jill Parker-Witt			Shreveport, LA 71101			
		<b>Phone:</b> (318) 673-3816			<b>Fax:</b> (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
<b>Water (226939)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
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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<b>Date Received:</b> 07/12/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 226940	<b>Collected Date:</b> 07/10/2019	<b>By:</b> BW
<b>Cust Sample ID:</b> Liquid portion	<b>Location:</b> NE BAP Sediment Sample	<b>Matrix:</b> Liquid
<b>Sample Desc.:</b> BAP Sediment		

<b>Metals (226940)</b>								
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

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40115	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 07/12/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (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

<b>Water (226940)</b>								
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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## Analysis Report

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**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

### 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

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEP Analytical Chemistry Services.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

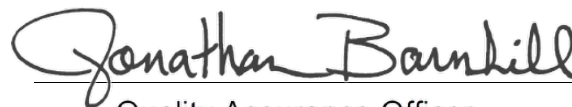
<b>Report ID</b> : 40115	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 07/12/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

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



Quality Assurance Officer

08-Aug-19

Report Date

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEP Analytical Chemistry Services.

# Chain of Custody Record

508 7-15-19

## Program: Coal Combustion Residuals (CCR)

Shreveport Chemical Laboratory (SCL)

502 N. Allen Ave.

Shreveport, LA 71101

Contacts: Jonathan Barnhill (318-673-3803)

Analysis Turnaround Time (in Calendar Days) -

**RUSH**

Project Name: NE BAP Sediment sample  
 Contact Name: Bryan White  
 Contact Phone: 8-719-0873

Sampler(s): **BRYAN WHITE**

Sample Identification

**BAP Sediment**

Sample Date: **7-10-19**  
 Sample Time: **16:00**  
 Sample Type (C=Comp, G=Grab): **grab**  
 Matrix: **solid/w ater**  
 # of Cont.: **1L**

Sampler(s) Initials

**L**

SP/LP on the sediment particles, also run Li analysis of pore water

Sample Specific Notes:

Site Contact:

Date:

COC/Order #:

For Lab Use Only:

**40115**

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:

*Jill Parker-Witt*

Company:

**AEP-150**

Date/Time:

**7/11/19 10:05**

Received by:

*[Signature]*

Date/Time:

**7/12/19 14:34**

Relinquished by:

Company:

Date/Time:

Received in Laboratory by:

Date/Time:

*[Signature]*





SHREVEPORT CHEMICAL LABORATORY

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

PROJECT RECEIPT

SHREVEPORT CHEMICAL LABORATORY  
502 N ALLEN AVE

SHREVEPORT LA 71101  
P: RED S: OUT I: 42  
NICO - 4528 X  
12735472 129914 5561 1500  
FID1YFS LASHR04 JUL 19 08:36:33 2019  
19 7110 MID 19 B 09 FEB00PT410

Container Type					Delivery Type				
Ice Chest	Bag	Action Pak	PCB Mailer	Bottle	UPS	FEDEX	US Mail	Walk in	Shuttle
Other <u>Box</u>					Other _____				
Tracking # _____									

Client Bryan White  
Received By STD  
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 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 WJF  
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. JOB 7-12-19





Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 2/25/2019**

**BA Sluice Water A**

**Sample Number: 190503-001**

**Date Collected: 02/11/2019 13:10**

**Date Received: 2/13/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.60	ug/L		0.5	0.1	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.96	ug/L		0.5	0.2	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Barium, Ba	583	ug/L		0.5	0.1	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.2	ug/L	J	0.5	0.1	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.08	ug/L	J	0.2	0.05	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	6.87	ug/L		1	0.2	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.41	ug/L		0.2	0.1	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Lead, Pb	1.46	ug/L		0.5	0.1	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	20.7	ug/L		10	2	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Selenium, Se	4.8	ug/L		1	0.2	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Boron, B	0.778	mg/L		0.02	0.005	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	98.4	mg/L		0.1	0.02	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Iron, Fe	2.14	mg/L		0.05	0.01	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00587	mg/L		0.001	0.00005	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	16.3	mg/L		0.05	0.01	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Sodium, Na	106	mg/L		0.2	0.05	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Manganese, Mn	15.5	ug/L		0.5	0.1	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Potassium, K	5.90	mg/L		0.2	0.05	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4
Strontium, Sr	1.24	mg/L		0.001	0.0002	GES	02/19/2019 14:42	EPA 200.8-1994, Rev. 5.4

**BA Sluice Water B**

**Sample Number: 190503-002**

**Date Collected: 02/11/2019 13:10**

**Date Received: 2/13/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Alkalinity, as CaCO3	156	mg/L		10	3	GES	02/15/2019 13:38	SM 2320B-2011
Bromide, Br	0.3	mg/L	J	0.5	0.1	CRJ	02/20/2019 22:21	EPA 300.1-1997, Rev. 1.0
Chloride, Cl	27.2	mg/L		0.1	0.03	CRJ	02/20/2019 22:21	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.42	mg/L		0.2	0.04	CRJ	02/20/2019 22:21	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	726	mg/L		40	10	KAL	02/18/2019	SM 2540C-2011
Sulfate, SO4	351	mg/L		10	2	CRJ	02/20/2019 21:12	EPA 300.1-1997, Rev. 1.0

**SP-10 -20190314**

Sample Number: 190984-004

Date Collected: 03/14/2019 15:45

Date Received: 3/19/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	5.10	ug/L		4	0.8	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Arsenic, As	4.45	ug/L		4	1	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Barium, Ba	6780	ug/L		4	0.8	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.8	ug/L	U	4	0.8	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.4	ug/L	U	2	0.4	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	2300	ug/L		8	2	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	25.8	ug/L		2	0.8	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Lead, Pb	54.5	ug/L		4	0.8	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	95.3	ug/L		80	20	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 1	ug/L	U	8	1	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 4	ug/L	U	20	4	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Boron, B	1.14	mg/L		0.2	0.04	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	127	mg/L		0.8	0.1	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.286	mg/L		0.008	0.0004	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	51.5	mg/L		0.4	0.08	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Sodium, Na	1320	mg/L		2	0.4	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Potassium, K	14.0	mg/L		2	0.4	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Strontium, Sr	17.8	mg/L		0.008	0.001	CTK	04/05/2019 20:32	EPA 200.8-1994, Rev. 5.4
Alkalinity, as CaCO3	520	mg/L		10	3	GES	03/21/2019 10:40	SM 2320B-2011
Bromide, Br	8.37	mg/L		1	0.2	CRJ	04/04/2019 17:49	EPA 300.1-1997, Rev. 1.0
Chloride, Cl	1970	mg/L		2	0.6	CRJ	04/04/2019 17:24	EPA 300.1-1997, Rev. 1.0
Fluoride, F	6.90	mg/L		0.3	0.07	CRJ	04/04/2019 17:49	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	4230	mg/L		80	20	KAL	03/20/2019	SM 2540C-2011
Sulfate, SO4	16.3	mg/L		2	0.3	CRJ	04/04/2019 17:49	EPA 300.1-1997, Rev. 1.0

**SP-10 Dissolved -20190314**

**HNO3 was added to the dissolved metals sample upon arrival.**

Sample Number: 190984-004A

Date Collected: 03/14/2019 15:45

Date Received: 3/19/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Iron, Fe	0.08	mg/L	J	0.4	0.08	CTK	04/05/2019 20:37	EPA 200.8-1994, Rev. 5.4
Manganese, Mn	33.6	ug/L		4	0.8	CTK	04/05/2019 20:37	EPA 200.8-1994, Rev. 5.4

**HNO3 was added to the dissolved metals sample upon arrival.**

SP-9 -20190315

Acid was added tot the metals sample upon arrival.

Sample Number: 190984-013

Date Collected: 03/15/2019 10:20

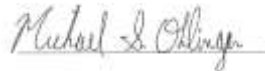
Date Received: 3/19/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	2.25	ug/L		2	0.4	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Arsenic, As	9.33	ug/L		2	0.6	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Barium, Ba	686	ug/L		2	0.4	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 2	ug/L	U	10	2	CTK	04/08/2019 16:27	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	5.12	ug/L		1	0.2	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	22.9	ug/L		4	0.8	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	16.4	ug/L		1	0.4	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Lead, Pb	22.8	ug/L		10	2	CTK	04/08/2019 16:27	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 8	ug/L	U	40	8	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Selenium, Se	10.7	ug/L		4	0.6	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 10	ug/L	U	50	10	CTK	04/08/2019 16:27	EPA 200.8-1994, Rev. 5.4
Boron, B	1.76	mg/L		0.1	0.02	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	2980	mg/L		0.4	0.06	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Lithium, Li	2.75	mg/L		0.02	0.001	CTK	04/08/2019 16:27	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	1280	mg/L		0.2	0.04	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Sodium, Na	17400	mg/L		1	0.2	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Potassium, K	53.7	mg/L		1	0.2	CTK	04/05/2019 17:02	EPA 200.8-1994, Rev. 5.4
Strontium, Sr	264	mg/L		0.08	0.01	CTK	04/08/2019 16:17	EPA 200.8-1994, Rev. 5.4
Alkalinity, as CaCO3	918	mg/L		10	3	GES	03/21/2019 10:40	SM 2320B-2011
Bromide, Br	110	mg/L		5	1	CRJ	04/05/2019 02:31	EPA 300.1-1997, Rev. 1.0
Chloride, Cl	27200	mg/L		50	20	CRJ	04/05/2019 00:01	EPA 300.1-1997, Rev. 1.0
Fluoride, F	1.88	mg/L		2	0.4	CRJ	04/05/2019 02:31	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	44400	mg/L		400	100	KAL	03/20/2019	SM 2540C-2011
Sample was analyzed with 5mL (20x dilution) but the residue weight still exceeds 0.2000g. Sample will not be re-analyzed. Sdw032519								
Sulfate, SO4	613	mg/L		10	2	CRJ	04/05/2019 02:31	EPA 300.1-1997, Rev. 1.0

Acid was added tot the metals sample upon arrival.

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.



Michael Ohlinger, Chemist

Email msohlinger@aep.com Tel.

Fax 614-836-4168 Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**



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T: 614-836-4221, Audinet 210-4221  
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<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 6/14/2019**

**SP-6**  
**Sample Number: 191628-001**                      **Date Collected: 05/07/2019 14:10**                      **Date Received: 5/10/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	12.2	ug/L		2	0.4	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Arsenic, As	2.06	ug/L		2	0.6	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Barium, Ba	38100	ug/L		2	0.4	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.4	ug/L	U	2	0.4	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.4	ug/L	J	1	0.2	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	4	ug/L	J	4	0.8	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	8.86	ug/L		1	0.4	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Lead, Pb	1	ug/L	J	2	0.4	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	75.8	ug/L		40	8	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Selenium, Se	1	ug/L	J	4	0.6	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 2	ug/L	U	10	2	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Boron, B	1.59	mg/L		0.1	0.02	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	1240	mg/L		0.4	0.06	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4
Lithium, Li	1.55	mg/L		0.004	0.0002	GES	06/04/2019 15:36	EPA 200.8-1994, Rev. 5.4

**SP-7**  
**Sample Number: 191628-002**                      **Date Collected: 05/07/2019 13:40**                      **Date Received: 5/10/2019**

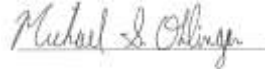
Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.25	ug/L		0.5	0.1	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.30	ug/L		0.5	0.2	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Barium, Ba	244000	ug/L		0.5	0.1	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.05	ug/L	U	0.2	0.05	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.6	ug/L	J	1	0.2	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.95	ug/L		0.2	0.1	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Lead, Pb	1	ug/L	J	4	0.8	GES	06/10/2019 15:41	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	17.0	ug/L		10	2	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.2	ug/L	U	1	0.2	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 4	ug/L	U	20	4	GES	06/10/2019 15:41	EPA 200.8-1994, Rev. 5.4
Boron, B	1.33	mg/L		0.02	0.005	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	2470	mg/L		0.1	0.02	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Lithium, Li	2.02	mg/L		0.001	0.00005	GES	06/04/2019 15:41	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	30900	mg/L		50	20	CRJ	05/22/2019 15:34	EPA 300.1-1997, Rev. 1.0
Fluoride, F	1	mg/L	J	2	0.4	CRJ	05/21/2019 17:49	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	3	mg/L	J	10	2	CRJ	05/21/2019 17:49	EPA 300.1-1997, Rev. 1.0

**Location: Northeastern Station**

**Report Date: 6/14/2019**

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.



**Michael Ohlinger, Chemist**

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Tel.

Fax 614-836-4168

Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**



Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 7/17/2019**

**SP-6**  
**Sample Number: 192191-001**                      **Date Collected: 06/21/2019 14:30**                      **Date Received: 6/25/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1	ug/L	J	2	0.4	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.88	ug/L		2	0.6	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Barium, Ba	29600	ug/L		2	0.4	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.4	ug/L	U	2	0.4	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.4	ug/L	J	1	0.2	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	< 0.8	ug/L	U	4	0.8	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	4.88	ug/L		1	0.4	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.8	ug/L	J	2	0.4	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	9	ug/L	J	40	8	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Selenium, Se	1	ug/L	J	4	0.6	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 2	ug/L	U	10	2	GES	07/15/2019 15:07	EPA 200.8-1994, Rev. 5.4
Boron, B	1.15	mg/L		0.1	0.02	DAM	07/15/2019 14:07	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	351	mg/L		0.3	0.04	DAM	07/15/2019 14:07	EPA 200.7-1994, Rev. 4.4
Lithium, Li	1.89	mg/L		0.03	0.009	DAM	07/15/2019 14:07	EPA 200.7-1994, Rev. 4.4

**SP-7**  
**Sample Number: 192191-002**                      **Date Collected: 06/21/2019 14:50**                      **Date Received: 6/25/2019**

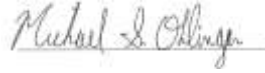
Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.8	ug/L	J	2	0.4	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Arsenic, As	9.77	ug/L		2	0.6	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Barium, Ba	292000	ug/L		2	0.4	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.4	ug/L	U	2	0.4	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.2	ug/L	U	1	0.2	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1	ug/L	J	4	0.8	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	2.85	ug/L		1	0.4	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.4	ug/L	U	2	0.4	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 8	ug/L	U	40	8	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.6	ug/L	U	4	0.6	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 2	ug/L	U	10	2	GES	07/15/2019 15:12	EPA 200.8-1994, Rev. 5.4
Boron, B	1.25	mg/L		0.1	0.02	DAM	07/15/2019 14:11	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	716	mg/L		0.3	0.04	DAM	07/15/2019 14:11	EPA 200.7-1994, Rev. 4.4
Lithium, Li	3.83	mg/L		0.03	0.009	DAM	07/15/2019 14:11	EPA 200.7-1994, Rev. 4.4
Chloride, Cl	30200	mg/L		50	20	CRJ	06/26/2019 17:51	EPA 300.1-1997, Rev. 1.0
Fluoride, F	1.72	mg/L		2	0.4	CRJ	06/26/2019 18:14	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	< 2	mg/L	U	10	2	CRJ	06/26/2019 18:14	EPA 300.1-1997, Rev. 1.0

**Location: Northeastern Station**

**Report Date: 7/17/2019**

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.



**Michael Ohlinger, Chemist**

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Tel.

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Audinet 8-210-

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**Laboratory Report Number:** L19012057

Dave Conover  
DOLAN LABORATORY  
4001 Bixby Road  
Groveport, OH 43125

Please find enclosed the analytical results for the samples you submitted to Microbac Laboratories. Review and compilation of your report was completed by Microbac's Ohio Valley Division (OVD). If you have any questions, comments, or require further assistance regarding this report, please contact your service representative listed below.

Laboratory Contact:  
Stephanie Mossburg – Team Chemist/Data Specialist  
(740) 373-4071  
Stephanie.Mossburg@microbac.com

*I certify that all test results meet all of the requirements of the accrediting authority listed below. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of Microbac Laboratories. The reported results are related only to the samples analyzed as received.*

This report was certified on February 07 2019

Leslie Bucina – Laboratory Manager

State of Origin: OH  
Accrediting Authority: N/A ID:OH00218  
QAPP: Microbac OVD





## Record of Sample Receipt and Inspection

### Comments/Discrepancies

This is the record of the shipment conditions and the inspection records for the samples received and reported as a sample delivery group (SDG). All of the samples were inspected and observed to conform to our receipt policies, except as noted below.

There were no discrepancies.

Discrepancy	Resolution

### Coolers

Cooler #	Temperature Gun	Temperature	COC #	Airbill #	Temp Required?
00115915	I	0.0		1Z5235750354470648	X

### Inspection Checklist

#	Question	Result
1	Were shipping coolers sealed?	Yes
2	Were custody seals intact?	NA
3	Were cooler temperatures in range of 0-6?	Yes
4	Was ice present?	Yes
5	Were COC's received/information complete/signed and dated?	Yes
6	Were sample containers intact and match COC?	Yes
7	Were sample labels intact and match COC?	Yes
8	Were the correct containers and volumes received?	Yes
9	Were samples received within EPA hold times?	Yes
10	Were correct preservatives used? (water only)	NA
11	Were pH ranges acceptable? (voa's excluded)	NA
12	Were VOA samples free of headspace (less than 6mm)?	NA

**Lab Report #:** L19012057

**Lab Project #:** 2490.001

**Project Name:** DOLAN LABS

**Lab Contact:** Stephanie Mossburg

**Samples Received**

Client ID	Laboratory ID	Date Collected	Date Received
190312-001	L19012057-01	01/28/2019 10:20	01/31/2019 10:58

## Certificate of Analysis

<b>Sample #:</b> L19012057-01	<b>PrePrep Method:</b> N/A	<b>Instrument:</b> ICP-THERMO1
<b>Client ID:</b> 190312-001	<b>Prep Method:</b> 3051A	<b>Prep Date:</b> 02/04/2019 07:21
<b>Matrix:</b> Solidwaste	<b>Analytical Method:</b> 6010B	<b>Cal Date:</b> 02/05/2019 13:13
<b>Workgroup #:</b> WG694836	<b>Analyst:</b> PDM	<b>Run Date:</b> 02/05/2019 17:20
<b>Collect Date:</b> 01/28/2019 10:20	<b>Dilution:</b> 1	<b>File ID:</b> T1.020519.172058
<b>Sample Tag:</b> 01	<b>Units:</b> mg/kg	

Analyte	CAS #	Result	Qual	RL	MDL
Lithium, Total	7439-93-2	15.0		4.95	2.47

METHOD BLANK SUMMARY

Login Number: L19012057  
 Blank File ID: T1.020519.163605  
 Prep Date: 02/04/19 07:21  
 Analyzed Date: 02/05/19 16:36  
 Analyst: PDM

Work Group: WG694836  
 Blank Sample ID: WG694609-03  
 Instrument ID: ICP-THERMO1  
 Method: 6010B

This Method Blank Applies To The Following Samples:

Client ID	Lab Sample ID	Lab File ID	Time Analyzed	TAG
LCS	WG694609-04	T1.020519.163905	02/05/19 16:39	01
190312-001	L19012057-01	T1.020519.172058	02/05/19 17:20	01

Report Name: BLANK\_SUMMARY  
 PDF File ID: 6292203  
 Report generated 02/06/2019 14:00



Microbac Laboratories Inc.  
METHOD BLANK REPORT

Login Number: L19012057 Prep Date: 02/04/19 07:21 Sample ID: WG694609-03  
Instrument ID: ICP-THERMO1 Run Date: 02/05/19 16:36 Prep Method: 3051A  
File ID: T1.020519.163605 Analyst: PDM Method: 6010B  
Workgroup (AAB#): WG694836 Matrix: Soil Units: mg/kg  
Contract #: \_\_\_\_\_ Cal ID: ICP-TH-05-FEB-19

Analytes	MDL	RL	Concentration	Dilution	Qualifier
Lithium, Total	2.50	5.00	2.50	1	U

MDL Method Detection Limit  
RL Reporting/Practical Quantitation Limit  
ND Analyte Not detected at or above reporting limit  
\* |Analyte concentration| > RL

Report Name: BLANK  
PDF ID: 6292204  
06-FEB-2019 14:00



Microbac Laboratories Inc.  
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L19012057 Run Date: 02/05/2019 Sample ID: WG694609-04  
Instrument ID: ICP-THERMO1 Run Time: 16:39 Prep Method: 3051A  
File ID: T1.020519.163905 Analyst: PDM Method: 6010B  
Workgroup (AAB#): WG694836 Matrix: Soil Units: mg/kg  
QC Key: STD Lot#: STD91905 Cal ID: ICP-TH-05-FEB-19

Analytes	Expected	Found	% Rec	LCS Limits	Q
Lithium, Total	25.0	26.4	106	80 - 120	

LCS - Modified 03/06/2008  
PDF File ID: 6292205  
Report generated: 02/06/2019 14:00



## MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

Loginnum: L19012057                      Cal ID: ICP-THERMO1 -                      Worknum: WG694836  
 Instrument ID: ICP-THERMO1              Contract #: \_\_\_\_\_                      Method: 6010B  
 Parent ID: WG694609-01              File ID: T1.020519.164201      Dil: 1                      Matrix: SOLID  
 Sample ID: WG694609-05 MS      File ID: T1.020519.165441      Dil: 1                      Units: mg/kg  
 Sample ID: WG694609-06 MSD      File ID: T1.020519.165803      Dil: 1

Analyte	Parent	MS Spiked	MS Found	MS %Rec	MSD Spiked	MSD Found	MSD %Rec	%RPD	%Rec Limits	RPD Limit	Q
Lithium	9.64	19.0	26.1	86.3	18.2	28.8	105	10.2	80 - 120	20	

\* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

Microbac Laboratories Inc.  
Ohio Valley Division Analyst List  
February 7, 2019

---

001 - BIO-CHEM TESTING WVDEP 220	002 - REIC Consultants, Inc. WVDEP 060
003 - Sturm Environmental	004 - MICROBAC PITTSBURGH
005 - ES LABORATORIES	006 - ALCOSAN LABORATORIES
007 - ALS LABORATORIES	008 - BENCHMARK LABORATORIES
010 - MICROBAC CHICAGOLAND	AC - AMBER R. CARMICHAEL
ACG - ALEX C. GEDON	ADC - ANTHONY D. CANTER
ADG - APRIL D. GREENE	ADW - ALICIA D. WALKER
ALS - ADRIANE L. STEED	APH - ANDREW P. HOUT
AT - Asa R. Timmons	ATK - ALEX T. KLINTWORTH
AWE - ANDREW W. ESSIG	AZH - AFTER HOURS
BLG - BRENDA L. GREENWALT	BRG - BRENDA R. GREGORY
CAS - Craig A. Smith	CEB - CHAD E. BARNES
CLC - CHRYS L. CRAWFORD	COR - Corporate IT
CPD - CHAD P. DAVIS	CSH - CHRIS S. HILL
DIH - DEANNA I. HESSON	DLB - DAVID L. BUMGARNER
DLP - DOROTHY L. PAYNE	DSM - DAVID S. MOSSOR
ECL - ERIC C. LAWSON	EEA - EMILY E. ALLEN
EGS - EMILY G. SHILLING	EPT - ETHAN P. TIDD
ERP - ERIN R. PORTER	JAO - Jeff A. Ogle
JDH - JUSTIN D. HESSON	JDS - JARED D. SMITH
JDW - JAMES D. WRIGHT	JKP - JACQUELINE K. PARSONS
JLR - JIMMY L. RUSH	JRH - Justin R. Hill
JST - JOSHUA S. TAYLOR	JTP - JOSHUA T. PEMBERTON
JWR - JOHN W. RICHARDS	JYH - JI Y. HU
KAK - KATHY A. KIRBY	KEB - KATIE E. BARNES
KEH - Katelyn E. Hoover	KFR - KARISSA F. REYNOLDS
KHR - KIM H. RHODES	KKB - KERRI K. BUCK
KMC - KAYLA M. CHEVALIER	KMG - KALEN M. GANDOR
KRA - KATHY R. ALBERTSON	KRP - KATHY R. PARSONS
KWD - Kurtis W. Decker	LLS - LARRY L. STEPHENS
LSB - LESLIE S. BUCINA	LSJ - LAURA S. JONES
MAP - MARLA A. PORTER	MES - MARY E. SCHILLING
MMB - MAREN M. BEERY	MRT - MICHELLE R. TAYLOR
PDM - PIERCE D. MORRIS	PIT - MICROBAC WARRENDALE
RLB - BOB BUCHANAN	RNM - Rene N. Miller
RNP - RICK N. PETTY	SAV - SARAH A. VANDENBERG
SCB - SARAH C. BOGOLIN	SLM - STEPHANIE L. MOSSBURG
TB - TODD BOYLE	TMM - TAMMY M. MORRIS
VC - VICKI COLLIER	WTD - WADE T. DELONG
XXX - UNAVAILABLE OR SUBCONTRACT	ZTB - ZACH T. BARNES



Qualkey: STD\_ND=U

Qualifier	Description
*	Surrogate or spike compound out of range
+	Correlation coefficient for the MSA is less than 0.995
<	Result is less than the associated numerical value.
>	Result is greater than the associated numerical value.
A	See the report narrative
B	Analyte present in method blank
B1	Target analyte detected in method blank at or above the method reporting limit
B3	Target analyte detected in calibration blank at or above the method reporting limit
B4	The BOD unseeded dilution water blank exceeded 0.2 mg/L
C	Confirmed by GC/MS
CG	Confluent growth
CT1	The cooler temperature at receipt exceeded regulatory guidance.
DL	Surrogate or spike compound was diluted out
E	Estimated concentration due to sample matrix interference
EDL	Elevated sample reporting limits, presence of non-target analytes
EMPC	Estimated Maximum Possible Concentration
F, S	Estimated result below quantitation limit; method of standard additions(MSA)
FL	Free Liquid
FP1	Did not ignite.
H1	Sample analysis performed past holding time.
I	Semiquantitative result (out of instrument calibration range)
J	The analyte was positively identified, but the quantitation was below the RL
J,B	Analyte detected in both the method blank and sample above the MDL.
J,CT1	Estimated. The cooler temperature at receipt exceeded the regulatory guidance.
J,H1	The analyte was positively identified, but the quantitation was below the RL. Sample analysis performed past holding time
J,P	Estimate; columns don't agree to within 40%
J,S	Estimated concentration; analyzed by method of standard addition (MSA)
L	Sample reporting limits elevated due to matrix interference
L1	The associated blank spike (LCS) recovery was above the laboratory acceptance limits.
L2	The associated blank spike (LCS) recovery was below the laboratory acceptance limits.
M	Matrix effect; the concentration is an estimate due to matrix effect.
N	Tentatively identified compound(TIC)
NA	Not applicable
ND, S	Not detected; analyzed by method of standard addition (MSA)
ND,L	Not detected; sample reporting limit (RL) elevated due to interference
NF	Not found by library search
NFL	No free liquid
NI	Non-ignitable
NR	Analyte is not required to be analyzed
NS	Not spiked
P	Concentrations >40% difference between the two GC columns
Q	One or more quality control criteria failed. See narrative.
QNS	Quantity of sample not sufficient to perform analysis
RA	Reanalysis confirms reported results
RE	Reanalysis confirms sample matrix interference
S	Analyzed by method of standard addition (MSA)
SMI	Sample matrix interference on surrogate
SP	Reported results are for spike compounds only
TIC	Library Search Compound
TNTC	Too numerous to count
U	Not detected at or above adjusted sample detection limit
U,CT1	Not detected. The cooler temperature at receipt exceeded regulatory guidance.
U,H1	Not detected; sample analysis performed past holding time.
UJ	Undetected; the MDL and RL are estimated due to quality control discrepancies.
W	Post-digestion spike for furnace AA out of control limits
X	Exceeds regulatory limit
X, S	Exceeds regulatory limit; method of standard additions (MSA)
Y	This analyte is not on the laboratory's current scope of accreditation.
Z	Cannot be resolved from isomer - see below







**Table 1: Groundwater Data Summary  
Northeastern Plant - Landfill**

Parameter	Unit	MW-8D											
		1/25/2017	3/15/2017	4/24-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	10/11/2017
		Background											
Antimony	mg/L	<0.00093 U	0.00500	0.00256 J	0.00713	0.0203	0.00467 J	0.00328 J	0.00232 J	0.00794	0.00508	0.00378 J	-
Arsenic	mg/L	0.00700	<0.00105 U	0.00448 J	0.0103	0.0134	0.00178 J	0.00270 J	0.00430 J	0.00580	0.00952	0.00704	-
Barium	mg/L	1.17	1.66	2.32	7.14	7.37	5.29	3.72	1.90	2.38	3.86	4.51	-
Beryllium	mg/L	<0.00002 U	<0.00002 U	0.000120 J	0.000460 J	0.000740 J	0.0000800 J	0.000130 J	0.000170 J	0.000220 J	0.000750 J	0.000450 J	-
Boron	mg/L	1.31	1.29	1.28	1.27	1.34	1.29	1.36	1.35	1.35	1.36	1.36	1.32
Cadmium	mg/L	0.00100	0.00200	0.000930 J	0.00507	0.00826	0.00254	0.00141	0.000970 J	0.00139	0.00275	0.00182	-
Calcium	mg/L	446	417	376	529	861	416	381	416	450	586	479	445
Chloride	mg/L	12000	13200	11200	14600	10200	11200	11800	11800	11300	12300	12300	11600
Chromium	mg/L	0.00400	0.00100	<0.00023 U	0.00894	0.0154	0.000590 J	<0.00023 U	0.00102	0.00175	0.0143	0.00662	-
Cobalt	mg/L	<0.00014 U	<0.00014 U	0.00145 J	0.00592	0.0108	0.00385 J	0.00235 J	0.00265 J	0.00273 J	0.00653	0.00430 J	-
Combined Radium	pCi/L	7.48	4.66	5.29	5.58	5.37	-	-	9.67	6.39	5.98	-	-
Fluoride	mg/L	<0.083 U	<0.083 U	0.240 J	<0.083 U	<0.083 U	<0.083 U	<0.083 U	<0.083 U	<0.083 U	<0.083 U	<0.083 U	<0.083 U
Lead	mg/L	<0.00068 U	<0.00068 U	0.000900 J	0.00659	0.00560	0.00231 J	0.00214 J	0.00282 J	0.00217 J	0.00511	0.00289 J	-
Lithium	mg/L	1.44	1.10	1.07	1.30	1.22	1.14	1.19	1.08	1.12	1.19	1.23	-
Mercury	mg/L	<0.000005 U	<0.000005 U	0.0000100 J	0.0000220 J	0.0000250	0.0000120 J	0.0000150 J	0.0000120 J	<0.000005 U	0.0000290	0.0000300	-
Molybdenum	mg/L	<0.005 U	<0.005 U	0.000910 J	0.00243 J	0.00281 J	0.00120 J	0.00168 J	0.00190 J	0.00191 J	0.00340 J	0.00453 J	-
Selenium	mg/L	0.00600	<0.00099 U	0.00391 J	0.00370 J	0.00371 J	0.00134 J	0.00578	0.00603	0.00605	0.00474 J	0.00466 J	-
Total Dissolved Solids	mg/L	20800	19000	20800	22300	20100	21000	21100	22200	22400	23000	23000	21900
Sulfate	mg/L	144	72.0	58.0	112	122	116	128	113	103	112	126	300
Thallium	mg/L	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	<0.00086 U	-
pH	SU	7.10	-	7.34	-	7.21	7.04	7.15	6.98	6.94	6.99	6.89	6.90

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL).

J: Estimated value. Parameter was detected in concentrations below the reporting limit

-: Not sampled

For statistical analysis, parameters which were not detected were replaced with the reporting limit.

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

Parameter	Unit	SP-1												
		1/25/2017	3/13/2017	4/24-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	10/11/2017
		Background												Detection
Antimony	mg/L	0.005U*	0.005U*	0.00275J	0.00685	0.00114J	0.005U	0.00125J	0.005U	-	0.00209J	0.005U	0.005U	-
Arsenic	mg/L	0.005U*	0.005U*	0.00191J	0.00548	0.005U	0.005U	0.005U	0.00211J	-	0.00134J	0.005U	0.005U	-
Barium	mg/L	0.211	0.146	0.195	0.243	0.183	0.187	0.217	0.298	-	0.218	0.21	0.168	-
Beryllium	mg/L	0.001U*	0.001U*	0.0001J	0.00026J	0.00004J	0.001U	0.00009J	0.0001J	-	0.00014J	0.00009J	0.00005J	-
Boron	mg/L	0.298	0.186	0.202	0.284	0.242	0.232	0.287	0.299	-	0.25	0.369	0.331	0.35
Cadmium	mg/L	0.001U*	0.001U*	0.001U	0.00022J	0.001U	0.001U	0.001U	0.001U	-	0.001U	0.00008J	0.00011J	-
Calcium	mg/L	111	117	108	131	115	113	122	125	-	120	119	129	152
Chloride	mg/L	60	548	83	104	50	19	70	20	-	34	62	22	136
Chromium	mg/L	0.001U*	0.001U*	0.00084J	0.00255	0.001U	0.001U	0.00062J	0.00078J	-	0.00055J	0.00031J	0.001U	-
Cobalt	mg/L	0.005U*	0.005U*	0.00242J	0.00255J	0.00077J	0.00077J	0.00134J	0.00133J	-	0.00175J	0.00107J	0.00115J	-
Combined Radium	pCi/L	3.48	3.014	4.71	4.12	2.096	14.29	4.01	3.41	-	4.15	2.584	4.53	-
Fluoride	mg/L	1U*	4	1.02	1.3	0.6437J	0.582J	0.6283J	0.542J	-	0.581J	0.4042J	1U	1.4051
Lead	mg/L	0.005U*	0.005U*	0.00094J	0.00163J	0.005U	0.005U	0.00124J	0.00094J	-	0.005U	0.005U	0.005U	-
Lithium	mg/L	0.006	0.007	0.00789	0.00853	0.00407	0.00334	0.00395	0.00577	-	0.00468	0.00548	0.00318	-
Mercury	mg/L	0.000025U*	0.000025U*	0.000025U	0.000023J	0.000009J	0.000025U	0.000025U	0.000009J	-	0.000025U	0.000025U	0.000025U	-
Molybdenum	mg/L	0.011	0.016	0.01992	0.01677	0.00702	0.00642	0.00814	0.01996	-	0.01208	0.01465	0.00532	-
Selenium	mg/L	0.005U*	0.005U*	0.00485J	0.00651	0.00254J	0.00277J	0.00521	0.01196	-	0.00351J	0.00413J	0.005U	-
Total Dissolved Solids	mg/L	514	480	496	574	478	424	504	394	-	456	536	440	676
Sulfate	mg/L	66	30	60	60	48	48	56	52	-	59	54	62	58
Thallium	mg/L	0.002U*	0.002U*	0.002U	0.002U	0.002U	0.002U	0.00089J	0.002U	-	0.002U	0.002U	0.002U	-
pH	SU	7.52	-	7.56	-	9.34	11.09	9.84	8.72	7.94	7.73	8.19	7.33	7.36

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit

\*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit

J: Estimated value. Component was detected in concentrations below the reporting limit

-: Not sampled

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

Parameter	Unit	SP-2												
		1/25/2017	3/13/2017	4/24-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	6/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	10/11/2017
		Background												Detection
Antimony	mg/L	0.005U*	0.005U*	0.00209J	0.00871	0.01134	0.00515	0.00474J	0.00351J	-	0.00295J	0.00267J	0.00264J	-
Arsenic	mg/L	0.011	0.005	0.00208J	0.00902	0.0055	0.0014J	0.00251J	0.00254J	-	0.00125J	0.00183J	0.00305J	-
Barium	mg/L	1.46	1.13	0.76	3.13	1.71	1.56	1.54	1.01	-	1.12	0.992	1.15	-
Beryllium	mg/L	0.001U*	0.001U*	0.00004J	0.00026J	0.00018J	0.00006J	0.00007J	0.00009J	-	0.00012J	0.00011J	0.0002J	-
Boron	mg/L	0.274	0.251	0.152	0.336	0.303	0.292	0.339	0.28	-	0.275	0.311	0.3	0.307
Cadmium	mg/L	0.001U*	0.001U*	0.001U	0.00018J	0.001U	0.001U	0.001U	0.00007J	-	0.001U	0.001U	0.00009J	-
Calcium	mg/L	108	82.6	62	117	108	98.5	111	147	-	86.8	91.8	129	91.9
Chloride	mg/L	607	37	527	1240	888	883	863	1064	-	1001	930	856	970
Chromium	mg/L	0.003	0.001	0.00024J	0.00287	0.00204	0.00129	0.00059J	0.00107	-	0.001U	0.001U	0.00346	-
Cobalt	mg/L	0.005U*	0.005U*	0.00087J	0.00277J	0.00251J	0.00182J	0.00123J	0.00108J	-	0.0008J	0.00087J	0.00255J	-
Combined Radium	pCi/L	6.89	9.96	8.98	26.48	22.16	-	-	16.34	-	14.48	14.89	-	-
Fluoride	mg/L	3	1	2.82	3	2.96	2.8408	3.581	2.788	-	4.0998	3.196	1.726	3.5881
Lead	mg/L	0.005U*	0.005U*	0.005U	0.00202J	0.005U	0.005U	0.00141J	0.005U	-	0.005U	0.005U	0.00091J	-
Lithium	mg/L	0.098	0.073	0.05305	0.111	0.103	0.09272	0.0961	0.09164	-	0.0931	0.09207	0.09111	-
Mercury	mg/L	0.000025U*	0.000025U*	0.000025U	0.000006J	0.000005J	0.000025U	0.000025U	0.000014J	-	0.000025U	0.000006J	0.000025U	-
Molybdenum	mg/L	0.019	0.023	0.02467	0.01163	0.02957	0.02962	0.03332	0.0394	-	0.03386	0.03761	0.03939	-
Selenium	mg/L	0.005U*	0.005U*	0.00204J	0.00616	0.03783	0.02241	0.02323	0.02336	-	0.01186	0.00987	0.00987	-
Total Dissolved Solids	mg/L	1786	1340	1242	2214	1912	1872	1846	2132	-	2192	1956	1778	2076
Sulfate	mg/L	21	70	27	15	61	58	58	57	-	47	43	37	41
Thallium	mg/L	0.002U*	0.002U*	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-	0.002U	0.002U	0.002U	-
pH	SU	6.41	-	6.53	-	8.31	7.38	7.94	7.21	7.64	7.46	7.04	6.86	7.3

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit

\*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit

J: Estimated value. Component was detected in concentrations below the reporting limit

-: Not sampled

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

Parameter	Unit	SP-4												
		1/25/2017	3/15/2017	4/25-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30-8/31/2017	9/13/2017	9/20/2017	10/11/2017
		Background												
Antimony	mg/L	0.005U*	0.005U*	0.00136J	0.00204J	0.00174J	0.005U	0.00266J	0.00387J	0.005U	0.00245J	0.005U	0.0023J	-
Arsenic	mg/L	0.005U*	0.005U*	0.00172J	0.0055	0.00459J	0.00201J	0.01065	0.04498	0.01931	0.00913	0.01634	0.01395	-
Barium	mg/L	0.398	0.477	0.578	0.762	0.633	0.576	1.34	4.59	2.31	1.49	1.91	1.93	-
Beryllium	mg/L	0.001U*	0.001U*	0.00003J	0.00056J	0.00034J	0.00024J	0.00128	0.00497	0.00212	0.00126	0.00171	0.00177	-
Boron	mg/L	0.406	0.399	0.442	0.411	0.395	0.388	0.42	0.412	0.493	0.392	0.387	0.477	0.425
Cadmium	mg/L	0.001U*	0.001U*	0.0001J	0.00057J	0.001U	0.001U	0.00137	0.00655	0.00205	0.00166	0.00247	0.0019	-
Calcium	mg/L	57.7	67	58.8	296	118	110	648	1920	793	612	810	630	206
Chloride	mg/L	401	52	459	232	475	471	489	469	460	576	450	440	431
Chromium	mg/L	0.001U*	0.001U*	0.00064J	0.01073	0.00404	0.00298	0.02248	0.08415	0.04182	0.02581	0.03083	0.03455	-
Cobalt	mg/L	0.005U*	0.005U*	0.00101J	0.00549	0.00463J	0.00529	0.01064	0.04069	0.01786	0.01206	0.01771	0.01632	-
Combined Radium	pCi/L	4	3.57	2.566	6.37	4.18	9.64	5.79	4.04	6.71	8.09	5.92	-	-
Fluoride	mg/L	3	4	3.2	2.1	3.34	3.2489	3.863	3.078	3.049	4.086	3.199	1.747	3.7702
Lead	mg/L	0.005U*	0.005U*	0.005U	0.00365J	0.00139J	0.00096J	0.00847	0.03663	0.0107	0.00711	0.00892	0.0096	-
Lithium	mg/L	0.072	0.073	0.06973	0.07998	0.07422	0.07041	0.09243	0.136	0.111	0.0962	0.104	0.101	-
Mercury	mg/L	0.000025U*	0.000025U*	0.000025U	0.000015J	0.000025U	0.000025U	0.00001J	0.000058	0.00003	0.000021J	0.000029	0.000014J	-
Molybdenum	mg/L	0.005U*	0.005U*	0.0015J	0.00102J	0.00065J	0.00046J	0.005U	0.00503	0.00423J	0.00461J	0.00621	0.00702	-
Selenium	mg/L	0.005U*	0.005U*	0.005U	0.005U	0.00167J	0.005U	0.005U	0.00499J	0.00104J	0.00186J	0.00165J	0.005U	-
Total Dissolved Solids	mg/L	1122	1128	1128	846	1164	1388	1128	1150	1132	1400	1236	1208	1200
Sulfate	mg/L	37	38	41	50	36	37	36	50	75	74	88	90	78
Thallium	mg/L	0.002U*	0.002U*	0.00121J	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-
pH	SU	7.72	-	6.96	-	8.25	8.1	8.05	7.66	7.82	7.61	7.71	7.17	7.44

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit

\*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit

J: Estimated value. Component was detected in concentrations below the reporting limit

-: Not sampled

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

Parameter	Unit	SP-5												
		1/25/2017	3/15/2017	4/25-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	10/11/2017
		Background												Detection
Antimony	mg/L	0.005U*	0.005U*	0.005U	0.005U	0.00202J	0.005U	0.005U	0.005U	0.00163J	0.005U	0.005U	0.005U	-
Arsenic	mg/L	0.012	0.013	0.01703	0.02942	0.0137	0.01265	0.01724	0.0216	0.01911	0.01947	0.02036	0.02077	-
Barium	mg/L	1.65	1.59	1.61	2.27	2.05	1.79	1.88	1.8	1.89	1.93	1.93	1.88	-
Beryllium	mg/L	0.001U*	0.001U*	0.00003J	0.00023J	0.00011J	0.00002J	0.00006J	0.00009J	0.00004J	0.00011J	0.0001J	0.00005J	-
Boron	mg/L	0.233	0.236	0.245	0.319	0.231	0.224	0.261	0.256	0.293	0.252	0.232	0.257	0.61
Cadmium	mg/L	0.001U*	0.001U*	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.00016J	0.001U	-
Calcium	mg/L	52.4	61.7	53.8	79.1	57.1	53	53.8	61.3	52	57.3	55.6	53.7	71
Chloride	mg/L	500	62	674	1834	607	636	640	638	661	652	644	729	630
Chromium	mg/L	0.001U*	0.001	0.00033J	0.00341	0.00142	0.0003J	0.0005J	0.00169	0.001U	0.00116	0.00062J	0.001U	-
Cobalt	mg/L	0.005U*	0.005U*	0.00088J	0.00232J	0.00144J	0.00101J	0.0011J	0.00132J	0.001J	0.0012J	0.001J	0.00097J	-
Combined Radium	pCi/L	10.09	9.65	10.27	15.3	10.27	15.84	12.21	11.6	10.95	12.47	10.62	10.5	-
Fluoride	mg/L	3	4	3.06	4	3	2.835	3.156	2.889	3.258	3.5698	2.797	1.535	3.7844
Lead	mg/L	0.005U*	0.005U*	0.005U	0.00236J	0.005U	0.00076J	0.0009J	0.00144J	0.005U	0.005U	0.005U	0.00106J	-
Lithium	mg/L	0.114	0.112	0.112	0.163	0.109	0.1	0.111	0.119	0.106	0.112	0.11	0.111	-
Mercury	mg/L	0.000025U*	0.000025U*	0.000016J	0.000025U	0.000016J	0.000025U	0.000025U	0.000015J	0.000025U	0.000009J	0.000025U	0.000025U	-
Molybdenum	mg/L	0.005U*	0.005U*	0.00116J	0.005U	0.005U	0.005U	0.005U	0.00127J	0.005U	0.005U	0.005U	0.005U	-
Selenium	mg/L	0.005U*	0.005U*	0.005U	0.005U	0.005U	0.005U	0.00114J	0.005U	0.005U	0.005U	0.005U	0.005U	-
Total Dissolved Solids	mg/L	1354	1420	1436	3008	1368	1156	1388	1372	1378	1424	1452	1312	1368
Sulfate	mg/L	10	10	9	8	7	8	7	8	6	7	6	6	5
Thallium	mg/L	0.002U*	0.002U*	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-
pH	SU	7.99	-	7.54	-	8.28	8.22	8.18	7.86	8.19	7.69	8.43	7.44	7.52

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit

\*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit

J: Estimated value. Component was detected in concentrations below the reporting limit

-: Not sampled



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

Parameter	Unit	SP-10										SP-11									
		7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	9/27/2017	10/4/2017	10/11/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	9/27/2017	10/4/2017	10/11/2017	10/31/2017	11/8/2017
		Background										Detection									
Antimony	mg/L	0.00462J	0.00251J	0.005U	0.005U	0.005U	0.00116J	0.00157J	0.00127J	-	0.00943	0.0047J	0.005U	0.00429J	0.0024J	0.00773	0.00689	0.00444J	-	-	-
Arsenic	mg/L	0.005U	0.00243J	0.005U	0.00566	0.00942	0.01392	0.01531	0.0043J	-	0.00399J	0.00182J	0.005U	0.0012J	0.00366J	0.01214	0.0075	0.00847	-	-	-
Barium	mg/L	1.9	0.33	0.282	0.279	0.266	0.399	0.928	0.664	-	0.194	0.09874	0.08342	0.09307	0.108	0.24	0.269	0.347	-	-	-
Beryllium	mg/L	0.001U	0.00003J	0.001U	0.00006J	0.00007J	0.00003J	0.00004J	0.00003J	-	0.00022J	0.00007J	0.001U	0.00007J	0.00008J	0.00039J	0.00039J	0.00035J	-	-	-
Boron	mg/L	0.965	1.08	1.09	1.09	1.1	1.08	1.07	1.1	1.03	0.839	0.543	0.453	0.428	0.447	0.469	0.447	0.531	0.446	-	-
Cadmium	mg/L	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	-	0.0014	0.00044J	0.001U	0.00034J	0.00009J	0.0027	0.00301	0.00249	-	-	-
Calcium	mg/L	53	83.1	91.4	81.8	76.9	64.6	65.7	52.3	58.4	742	272	171	161	190	1220	1170	1110	479	-	-
Chloride	mg/L	1844	1616	1700	1932	1592	1946	1784	1553	1934	568	567	789	683	628	690	759	744	824	-	-
Chromium	mg/L	0.11	0.00244	0.001U	0.00109	0.00046J	0.00072J	0.00207	0.00036J	-	0.01852	0.00525	0.001U	0.00276	0.00257	0.0313	0.03271	0.02949	-	-	-
Cobalt	mg/L	0.00596	0.00474J	0.005U	0.00427J	0.00241J	0.00219J	0.00371J	0.00402J	-	0.00976	0.00652	0.005U	0.00385J	0.00321J	0.01462	0.01437	0.01199	-	-	-
Combined Radium	pCi/L	17.23	1.153	0.995	0.763	0.774	1.062	1.723	3.226	-	-	25.367	0.947	0.438	2.685	4.2	-	2.817	-	0.857	1.423
Fluoride	mg/L	6.502	1U	1U	10.2663	7.028	1U	5	5.11	7.3938	2.386	3.355	4.52	4.1325	3.359	2.016	3	2.9	4.4661	-	-
Lead	mg/L	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.00087J	-	0.00516	0.00201J	0.005U	0.00123J	0.005U	0.00816	0.00858	0.00705	-	-	-
Lithium	mg/L	0.278	0.284	0.317	0.306	0.315	0.292	0.329	0.279	-	0.04698	0.0877	0.08931	0.08933	0.105	0.13	0.129	0.146	-	-	-
Mercury	mg/L	0.000006J	0.000029	0.000027	0.000019J	0.000013J	0.000016J	0.000013J	0.000015J	-	0.000009J	0.000023J	0.000007J	0.000008J	0.000009J	0.000027	0.000048	0.000047	-	-	-
Molybdenum	mg/L	0.934	0.129	0.04543	0.03035	0.01628	0.01358	0.03593	0.02919	-	0.06127	0.06641	0.0515	0.04433	0.03616	0.0469	0.04861	0.04214	-	-	-
Selenium	mg/L	0.00567	0.00882	0.005U	0.00256J	0.00311J	0.00238J	0.00384J	0.005U	-	0.00595	0.00626	0.005U	0.00249J	0.00155J	0.00546	0.00747	0.00327J	-	-	-
Total Dissolved Solids	mg/L	3416	5142	5678	5264	5168	4424	4516	3660	4060	2880	3076	3308	2732	2420	2336	2428	2288	2322	-	-
Sulfate	mg/L	294	761	915	834	738	544	419	286	188	798	870	741	541	515	329	332	305	223	-	-
Thallium	mg/L	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-	-	-
pH	SU	6.74	7.6	7.82	7.58	8.34	7.07	7.77	7.37	6.99	7.35	7.89	6.94	7.61	7.21	7.24	7.18	7.52	7.03	-	-

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit

\*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit

J: Estimated value. Component was detected in concentrations below the reporting limit

-: Not sampled

**TABLE 2**  
 NORTHEASTERN STATION 3 & 4  
 NON-HAZARDOUS INDUSTRIAL WASTE (NHIW) LANDFILL  
 MONITORING WELL/PIEZOMETER CONSTRUCTION DETAILS

Well Number	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Borehole Depth ft. bls	Date Installed	Screen Material	Well Diameter inches	Top of Screen Depth ft. bls	Top of Screen Elevation ft. msl	Bottom of Screen Depth ft. bls	Bottom of Screen Elevation ft. msl
MW-3D	36° 25' 00.14299"	95° 41' 44.01366"	627.66	630.65	60	2/21/2008	PVC	2	49.7	580.95	60	567.66
MW-6D	36° 24' 54.41869"	95° 41' 51.01306"	633.72	636.66	55	10/23/2008	PVC	2	44.92	591.74	55.22	578.50
MW-7D	36° 25' 06.30327"	95° 41' 47.03123"	623.74	626.46	55	10/22/2008	PVC	2	45.25	581.21	55.55	568.19
MW-8D	36° 25' 04.35228"	95° 42' 10.11303"	626.04	629.32	60	10/21/2008	PVC	2	49.95	579.37	60.25	565.79
MW-9D	36° 24' 50.88110"	95° 41' 54.22530"	633.90	637.04	60	4/6/2010	PVC	2	49.7	587.34	60	573.90
MW-15	36° 24' 48.0816"	95° 41' 56.4658"	634.34	637.71	71	2/23/2016	PVC	2	61.05	576.66	71.45	562.89

**TABLE 2**  
 NORTHEASTERN STATION 3 & 4  
 BOTTOM ASH POND  
**MONITORING WELL/PIEZOMETER CONSTRUCTION DETAILS**

Well Number	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Borehole Depth ft. bls	Date Installed	Screen Material	Well Diameter inches	Top of Screen Depth ft. bls	Top of Screen Elevation ft. msl	Bottom of Screen Depth ft. bls	Bottom of Screen Elevation ft. msl
SP-1	36° 25' 03.77705"	95° 42' 14.44814"	618.26	621.26	35	4/5/2011	PVC	2	24.7	596.56	35	583.26
SP-2	36° 25' 06.44515"	95° 42' 26.73557"	614.49	617.49	35	4/5/2011	PVC	2	24.9	592.59	35.2	579.29
SP-3	36° 25' 23.91757"	95° 42' 27.02763"	618.02	621.02	35	4/5/2011	PVC	2	24.6	596.42	34.9	583.12
SP-4	36° 25' 23.73526"	95° 42' 06.38375"	636.16	639.16	35	4/6/2011	PVC	2	25	614.16	35.3	600.86
SP-5	36° 25' 43.92075"	95° 42' 14.32901"	628.17	631.17	35	4/6/2011	PVC	2	24.9	606.27	35.2	592.97
SP-5R*	36° 25' 43.92075"	95° 42' 14.32901"	628.17	631.17	75	4/11/2012	PVC	2	34.7	596.47	75	553.17
SP-6	36° 25' 08.5783"	95° 42' 05.0916"	638.08	641.35	71	3/3/2016	PVC	2	60.41	580.94	70.81	567.27
SP-7	36° 25' 05.8073"	95° 42' 17.9217"	613.39	616.84	81	3/7/2016	PVC	2	70.35	546.49	80.75	532.64
SP-8	36° 25' 11.8762"	95° 42' 32.2316"	611.51	614.89	71	3/8/2016	PVC	2	60.45	554.44	70.85	540.66
SP-9	36° 25' 19.3270"	95° 42' 34.0978"	614.00	617.24	75	3/10/2016	PVC	2	65.22	552.02	75.62	538.38

\* SP-5R replaced SP-5



SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

October 29, 2019

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

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

Dear Ms. Parker-Witt:

On July 8, 2019, DEQ denied the alternate source demonstration (ASD) for lithium in the Bottom Ash Pond (BAP) that was submitted by AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) to demonstrate that a source other than the coal combustion residuals (CCR) unit caused the lithium statistically significant level (SSL) detected in monitoring well SP-10. DEQ stated in the letter that if additional information was attained to support a revised ASD, DEQ would re-evaluate the revised ASD.

On September 13, 2019, NPS submitted a revised ASD that addressed concerns DEQ had with the ASD which proposed naturally occurring concentrations of lithium in groundwater are the source of the SSL in SP-10.

In the revised ASD, NPS questioned DEQ's statement in the July 8, 2019 letter that the lithium concentration in monitoring well SP-5R was "not elevated". To clarify, DEQ's meaning of elevated level in the July 8, 2019 letter meant the concentration of lithium detected in SP-5R was not elevated when compared to lithium levels in the lower zone as measured in SP-6, SP-7 and SP-10. Similarly lithium in SP-8, which is screened in the lower zone, was not elevated leading DEQ to question the conceptual model which proposes the clay mineral in lower zone shales is the source of elevated lithium.

NPS sampled and analyzed the sediment, leachate and pore water in the BAP to compare to the data collected from SP-10. The results showed lithium in the sediment leachate and pore water measured 1 µg/L and 3 µg/L, respectively, compared to 286 µg/L measured in SP-10 on March 14, 2019. The lithium concentration of the sluice water (5.87 µg/L) entering the BAP was also much lower than that in SP-10. DEQ agrees that the low concentration of lithium in the BAP as well as the different water chemistry as depicted in the Piper diagram furthers the proposal that the BAP is not a direct source of the lithium SSL in SP-10.



Ms. Jill Parker-Witt, P.E.  
American Electric Power  
October 29, 2019  
Page 2 of 2

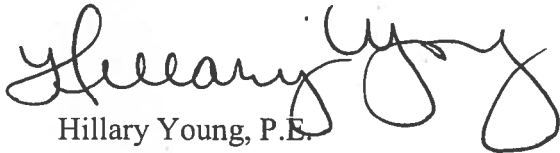
DEQ reviewed the additional information concerning SP-5R and SP-8 provided in the revised ASD. DEQ accepts that the elevated lithium concentration detected in SP-10 may be produced from the shale lenses within the screened interval of SP-10.

The new data presented in both ASDs depicts a new conceptual model that still does not completely fit with all of the groundwater sampling data. Please contact DEQ to arrange a time to discuss modifying the groundwater monitoring network.

DEQ accepts the revised ASD as submitted. The BAP may return to assessment monitoring in accordance with OAC 252:517-9-6(g)(3)(B). NPS must include the revised ASD in the annual groundwater monitoring and corrective action report required by OAC 252:517-9-1(e).

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

A handwritten signature in black ink, appearing to read "Hillary Young", written in a cursive style.

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

HY/ckh

## **APPENDIX IV**

Notices of groundwater monitoring programs are included in this appendix.



An **AEP** Company

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## Northeastern Power Station

### Notice of Initiating an Assessment of Corrective Measures

#### CCR Unit – Bottom Ash Pond

As required by OAC 252:517-9-6(g)(5), this is a notification that an Assessment of Corrective Measures was initiated on July 8, 2019 for Northeastern Power Station's Bottom Ash Pond due to the statistically significant level detected above the established groundwater protection standard for lithium. This notification is being placed in the plant's operating record, as required by OAC 252:517-19-1(h)(9).

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Rev 1 - Rescinded by ODEQ on November 4, 2019

## Northeastern Power Station

### Notice of Initiating an Assessment of Corrective Measures

#### CCR Unit – Bottom Ash Pond

As required by OAC 252:517-9-6(g)(5), this is a notification that an Assessment of Corrective Measures was initiated on July 8, 2019 for Northeastern Power Station's Bottom Ash Pond due to the statistically significant level detected above the established groundwater protection standard for lithium. This notification is being placed in the plant's operating record, as required by OAC 252:517-19-1(h)(9).

**BOUNDLESS ENERGY**<sup>SM</sup>





SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

November 4, 2019

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

Re: Assessment of Corrective Measures Plan and Schedule for Analyzing an Environmental Release for Lithium –Bottom Ash Pond  
Public Service Company of Oklahoma  
Northeastern Power Station  
Rogers County  
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

On July 8, 2019, the Oklahoma Department of Environmental Quality (DEQ) denied the May 1, 2019 alternate source demonstration (ASD) for lithium in the Bottom Ash Pond (BAP). Accordingly, AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) submitted, by email on October 5, 2019, the Assessment of Corrective Measures Plan and Schedule for Analyzing an Environmental Release (ACM)" as required by Oklahoma Administrative Code (OAC) 252:517-9-6(g)(4).

On September 13, 2019, NPS submitted a revised ASD that addressed concerns DEQ had with the May 1, 2019 ASD. In a letter dated October 29, 2019, DEQ approved the revised ASD.

With the approval of the revised ASD, OAC 252:517-9-6(g)(3)(B) allows NPS to continue monitoring in accordance with the assessment monitoring program. NPS is no longer required to initiate the assessment of corrective measures requirements; therefore, the ACM is withdrawn.

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

A handwritten signature in black ink that reads "Hillary Young".

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

HY/ckh

**APPENDIX V**

Field Sheets and Laboratory Report for this reporting period

# NORTHEASTERN POWER PLANT GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: KMcDonald

DATE: 5/30/18

Well Identification Number	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6
Sample Identification	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Elevation of Top of Casing (ft. NGVD)	621.26	617.49	621.02	639.16	631.17	641.35
Depth to Water (ft)	16.69	22.15	18.38	15.29	5.80	26.98
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	37.99	38.19	37.90	38.30	<del>78.30</del> 78.00	<del>74.05</del> 73.93
Height of Water Column (ft.)						
Well Size (I.D.) (inches)	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	/	/	/	/	/	/
Purge Time - Begin	/	/	/	/	/	/
Purge Time - End	/	/	/	/	/	/
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: KMcDonald

DATE: 5/30/18

Well Identification Number	SP-7	SP-8	SP-9	SP-10	SP-11	
Sample Identification	Gauge	Gauge	Gauge	Gauge	Gauge	
Elevation of Top of Casing (ft. NGVD)	616.84	614.89	617.24	617.52	615.17	
Depth to Water (ft)	24.00	5.74	72.58	15.13	12.64	
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	84.02	74.06	78.82	54.10	34.51	
Height of Water Column (ft.)						
Well Size (I.D.) (inches)	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	—	—	—	—	—	
Purge Time - Begin	—	—	—	—	—	
Purge Time - End	—	—	—	—	—	
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

DATE: 07/30-31/18

Well Identification Number	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6
Sample Identification	CCP III & IV	CCP III & IV	NA	CCP III & IV	CCP III & IV	NA
Elevation of Top of Casing (ft. NGVD)	621.26	617.49	621.02	639.16	631.17	641.35
Depth to Water (ft)	18.04	27.02	—	20.41	8.53	—
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	37.99	38.19	37.90	38.30	78.00	73.93
Height of Water Column (ft.)	19.95	11.17	—	17.89	69.47	—
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.25	1.82	—	2.92	11.32	—
Water Removed From Well (gallons)	10.0	5.5	—	8.25	22.5	—
Method of Removal	Pump	Pump	—	Pump	Pump	—
Was Well Purged Dry?	No	Yes	—	Yes	Yes	—
pH (standard units)	7.04	7.45	—	7.55	8.02	—
Temperature (°C)	20.86	21.23	—	22.07	19.10	—
Conductivity (µmhos/cc)	711	1770	—	1960	2440	—
Turbidity (NTU)	28.5	20.2	—	23.2	18.5	—
Appearance	Clear	Clear	—	Clear	Clear	—
Odor	None	None	—	None	None	—
Purge Time - Begin	—	—	—	—	—	—
Purge Time - End	—	—	—	—	—	—
Sample Time	1516	1442	—	1320	1605	—
Sample Date	07/30/18	07/30/18	—	07/30/18	07/30/18	—

BAP WP

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

DATE: 07/30-31/18

Well Identification Number	SP-7	SP-8	SP-9	SP-10	SP-11	
Sample Identification	NA	NA	NA	CCC III & IV	CCC III & IV	
Elevation of Top of Casing (ft. NGVD)	616.84	614.89	617.24	617.52	615.17	
Depth to Water (ft)	—	—	—	8.13	16.41	
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	84.02	74.06	78.82	54.10	34.51	
Height of Water Column (ft.)	—	—	—	45.97	18.10	
Well Size (I.D.) (inches)	2	2	2	2	2	
Volume of Water in Well (gallons)	—	—	—	7.44	2.95	
Water Removed From Well (gallons)	—	—	—	23.0	6.75	
Method of Removal	—	—	—	pump	pump	
Was Well Purged Dry?	—	—	—	No	Yes	
pH (standard units)	—	—	—	7.62	7.74	
Temperature (°C)	—	—	—	21.08	20.53	
Conductivity (umhos/cm)	—	—	—	5610	2470	
Turbidity (NTU)	—	—	—	120	128	
Appearance	—	—	—	BLACKISH TINT	SLIGHTLY TURBID	
Odor	—	—	—	Sulfur	none	
Purge Time - Begin	—	—	—	—	—	
Purge Time - End	—	—	—	—	—	
Sample Time	—	—	—	1350	1417	
Sample Date	—	—	—	07/30/18	07/30/18	

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

DATE: 02/27/19

Well Identification Number	SP-1	SP-2	SP-4	SP-5	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)	16.58	20.86	13.09	4.81	20.12	11.15
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.)	21.41	17.33	25.21	73.19	33.98	23.36
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.49	2.82	4.11	11.93	5.54	3.81
Water Removed From Well (gallons)	13.0	7.0	9.5	26.25	20.0	9.0
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	Yes	Yes	Yes	No	Yes
pH (standard units)	7.34	7.62	7.37	7.70	7.79	7.74
Temperature (°C)	19.25	20.37	18.82	19.41	20.04	19.81
Conductivity (µmhos/cc)	812	1564	1840	3200	3722	1809
Turbidity (NTU)	20.2	30.6	21.4	8.6	74.6	128
Appearance	Clear	Clear	Clear	Clear	Clear	Slightly turbid
Odor	None	None	None	None	Sulfur then None	Slightly turbid
Ohio Containers	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3
Shreveport Containers	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3
Sample Time	1550	1515	1620	1645	1420	1445
Sample Date	02/27/19	02/27/19	02/27/19	02/27/19	02/27/19	02/27/19

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

DUPLICATE  
BAP



# NORTHEASTERN POWER PLANT GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald

DATE: 02/27/19

Well Identification Number	SP-6	SP-7				
Activities	Gauge	Gauge				
Samples	Appendix III & IV	Appendix III & IV				
Depth to Water (ft)	44.80	23.11				
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	73.93	84.02				
Height of Water Column (ft.)	29.13	60.91				
Well Size (I.D.) (inches)	2	2				
Volume of Water in Well (gallons)	4.75	9.93				
Water Removed From Well (gallons)	4.25	8.5				
Method of Removal	Pump	Pump				
Was Well Purged Dry?	Yes	Yes				
pH (standard units)	—	—				
Temperature (°C)	—	—				
Conductivity (µmhos/cc)	—	—				
Turbidity (NTU)	—	—				
Appearance	—	—				
Odor	—	—				
Ohio Containers	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3				
Shreveport Containers	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3				
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 McDermid

DATE: 06/20/19

Well Identification Number	SP-1	SP-2	SP-4	SP-5	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)	16.88	23.31	22.53	4.82	12.32	4.72
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.)	21.11	14.88	15.77	73.18	41.78	29.79
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.44	2.43	2.57	11.93	6.81	4.86
Water Removed From Well (gallons)	12.0	6.25	4.0	24.0	18.75	8.25
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	Yes	Yes	Yes	Yes	Yes
pH (standard units)	7.09	6.79	7.12	7.33	7.78	6.84
Temperature (°C)	20.0	19.6	20.5	21.2	19.8	21.7
Conductivity (µmhos/cc)	690	3040	1710	6620	7270	1420
Turbidity (NTU)	28.7	40.2	57.1	20.7	101	113
Appearance	Clean	Clean	Slightly Turbid	Clean	Slightly Turbid	Slightly Turbid
Odor	None	None	None	None	None	None
Ohio Containers	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3
Shreveport Containers	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3
Sample Time	1620	1555	1650	1715	1515	1535
Sample Date	06/20/19	06/20/19	06/20/19	06/20/19	06/20/19	06/20/19

*Duplicate*

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



# NORTHEASTERN POWER PLANT GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenn & McDonald

DATE: 06/20-21/19

Well Identification Number	SP-6	SP-7				
Activities	Gauge	Gauge				
Samples	Appendix III & IV	Appendix III & IV				
Depth to Water (ft)	59.07	32.84				
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	73.93	84.02				
Height of Water Column (ft.)	14.86	51.18				
Well Size (I.D.) (inches)	2	2				
Volume of Water in Well (gallons)	2.42	8.34				
Water Removed From Well (gallons)	2.0	7.0				
Method of Removal	Pump	Pump				
Was Well Purged Dry?	YES	YES				
pH (standard units)	6.78	6.83				
Temperature (°C)	20.7	22.8				
Conductivity (µmhos/cc)	19030	21220				
Turbidity (NTU)	78.2	50.6				
Appearance	CLEAR	CLEAR				
Odor	NONE	NONE				
Ohio Containers	250 mL Unpres 250mL HNO3 3 x 1L HNO3	250 mL Unpres 250mL HNO3 3 x 1L HNO3				
Shreveport Containers	250 mL Unpres 250mL HNO3	250 mL Unpres 250mL HNO3				
Sample Time	1430	1450				
Sample Date	06/21/19	06/21/19				

METALS ONLY	METALS+WA
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: 08/26/19

Well Identification Number	SP-1	SP-2	SP-4	SP-5	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)	17.51	28.43	25.00	6.39	3.85	14.60
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.)	20.48	9.76	13.30	71.61	50.25	19.91
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.34	1.59	2.17	11.67	8.19	3.25
Water Removed From Well (gallons)	12.0	4.0	6.0	28.25	18.25	5.0
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	Yes	Yes	Yes	Yes	Yes
pH (standard units)	9.01	8.54	8.78	8.80	8.87	8.86
Temperature (°C)	21.91	23.35	22.81	23.24	23.02	22.69
Conductivity (µmhos/cc)	899	4390	2200	2930	6620	1560
Turbidity (NTU)	78.1	146	899	935	24.4	128
Appearance	Clean	Clean	Slightly Turbid	Clean	Clean Slight Discoloration	Slightly Turbid
Odor	None	None	None	None	None	None
Ohio Containers	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3	250mL HNO3 3 x 1L HNO3
Shreveport Containers	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3	1L Unpres 250mL HNO3
Sample Time	1650	1640	1705	1720	1622	1635
Sample Date	08/26/19	08/26/19	08/26/19	08/26/19	08/26/19	08/26/19

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

BAP  
Duplicate



# NORTHEASTERN POWER PLANT GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald / Matt Hamilton DATE: 08/26/19

Well Identification Number	SP-3					
Activities	Gauge					
Samples	NA					
Depth to Water (ft)	16.28					
Water Level Elevation (ft. NGVD)						
Measured Depth Total Depth of Well (ft.)	37.90					
Height of Water Column (ft.)	21.62					
Well Size (I.D.) (inches)	2					
Volume of Water in Well (gallons)	3.52					
Water Removed From Well (gallons)	—					
Method of Removal	—					
Was Well Purged Dry?	—					
pH (standard units)	—					
Temperature (°C)	—					
Conductivity (µmhos/cc)	—					
Turbidity (NTU)	—					
Appearance	—					
Odor	—					
Ohio Containers	—					
Shreveport Containers	—					
Sample Time	—					
Sample Date	—					

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



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 216828	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-1	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

**Metals (216828)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	< 0.00093	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 5:16	U	JDB
Arsenic	< 0.00105	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 5:16	U	JDB
Barium	0.19	mg/L	0.00015	1	EPA 6010B 1996	07/11/2018 5:16		JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 5:16	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 5:16	U	JDB
Chromium	< 0.00023	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 5:16	U	JDB
Cobalt	0.00053	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 5:16	J	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 5:16	U	JDB
Lithium	0.00785	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 5:16		JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:11	U	LNM
Molybdenum	0.01639	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 5:16		JDB
Selenium	0.00423	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 5:16	J	JDB
Thallium	0.002	mg/L	0.043	1:50	EPA 6010B 1996	07/10/2018 20:40		JDB

**Water (216828)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Fluoride	1.2525	mg/L	0.083	1	EPA 300.0	06/06/2018 2:26		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 216829	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-2	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

<b>Metals (216829)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	0.0013	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 5:21	J	JDB
Arsenic	< 0.00105	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 5:21	U	JDB
Barium	0.869	mg/L	0.00015	1	EPA 6010B 1996	07/11/2018 5:21		JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 5:21	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 5:21	U	JDB
Chromium	< 0.00023	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 5:21	U	JDB
Cobalt	0.00055	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 5:21	J	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 5:21	U	JDB
Lithium	0.04039	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 5:21		JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:27	U	LNM
Molybdenum	0.02646	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 5:21		JDB
Selenium	0.00216	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 5:21	J	JDB
Thallium	< 0.043	mg/L	0.043	1:50	EPA 6010B 1996	07/10/2018 20:46	U	JDB
<b>Water (216829)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Fluoride	3.4972	mg/L	0.083	1	EPA 300.0	06/06/2018 5:15		GB

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEPAnalytical Chemistry Services.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 216830	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-4	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

<b>Metals (216830)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	0.00514	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 5:59		JDB
Arsenic	< 0.00105	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 5:59	U	JDB
Barium	0.268	mg/L	0.00015	1	EPA 6010B 1996	07/11/2018 5:59		JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 5:59	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 5:59	U	JDB
Chromium	< 0.00023	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 5:59	U	JDB
Cobalt	0.00049	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 5:59	J	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 5:59	U	JDB
Lithium	0.06851	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 5:59		JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:30	U	LNM
Molybdenum	0.0037	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 5:59	J	JDB
Selenium	< 0.00099	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 5:59	U	JDB
Thallium	0.00162	mg/L	0.00086	1	EPA 6010B 1996	07/11/2018 5:59	J	JDB

<b>Water (216830)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Fluoride	4.169	mg/L	0.083	1	EPA 300.0	06/06/2018 5:34		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 216831	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-5R	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

**Metals (216831)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	0.00121	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 6:04	J	JDB
Arsenic	0.02886	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 6:04		JDB
Barium	1.76	mg/L	0.00015	1	EPA 6010B 1996	07/11/2018 6:04		JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 6:04	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 6:04	U	JDB
Chromium	< 0.00023	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 6:04	U	JDB
Cobalt	0.00088	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 6:04	J	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 6:04	U	JDB
Lithium	0.102	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 6:04		JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:43	U	LNM
Molybdenum	< 0.00029	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 6:04	U	JDB
Selenium	< 0.00099	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 6:04	U	JDB
Thallium	< 0.043	mg/L	0.043	1:50	EPA 6010B 1996	07/10/2018 20:56	U	JDB

**Water (216831)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Fluoride	4.1115	mg/L	0.083	1	EPA 300.0	06/06/2018 5:53		GB





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 216832	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-10	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

**Metals (216832)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	< 0.00093	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 6:09	U	JDB
Arsenic	0.0089	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 6:09		JDB
Barium	2.55	mg/L	0.0075	1:50	EPA 6010B 1996	07/10/2018 21:02		JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 6:09	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 6:09	U	JDB
Chromium	< 0.00023	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 6:09	U	JDB
Cobalt	0.00083	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 6:09	J	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 6:09	U	JDB
Lithium	0.245	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 6:09		JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:45	U	LNM
Molybdenum	0.00294	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 6:09	J	JDB
Selenium	0.00226	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 6:09	J	JDB
Thallium	< 0.043	mg/L	0.043	1:50	EPA 6010B 1996	07/10/2018 21:02	U	JDB

**Water (216832)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Fluoride	7.333	mg/L	0.083	1	EPA 300.0	06/06/2018 6:12		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 216833	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-11	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

**Metals (216833)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	< 0.00093	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 6:15	U	JDB
Arsenic	0.0053	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 6:15		JDB
Barium	0.16	mg/L	0.00015	1	EPA 6010B 1996	07/11/2018 6:15		JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 6:15	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 6:15	U	JDB
Chromium	0.00034	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 6:15	J	JDB
Cobalt	0.00161	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 6:15	J	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 6:15	U	JDB
Lithium	0.04956	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 6:15		JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:48	U	LNM
Molybdenum	0.00327	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 6:15	J	JDB
Selenium	0.00143	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 6:15	J	JDB
Thallium	< 0.043	mg/L	0.043	1:50	EPA 6010B 1996	07/10/2018 21:07	U	JDB

**Water (216833)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Fluoride	3.574	mg/L	0.083	1	EPA 300.0	06/06/2018 6:30		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 216834	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> DUPLICATE BAP	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

**Metals (216834)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	< 0.00093	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 6:20	U	JDB
Arsenic	0.00995	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 6:20		JDB
Barium	2.5	mg/L	0.0075	1:50	EPA 6010B 1996	07/10/2018 21:23		JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 6:20	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 6:20	U	JDB
Chromium	< 0.00023	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 6:20	U	JDB
Cobalt	0.00118	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 6:20	J	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 6:20	U	JDB
Lithium	0.247	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 6:20		JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:51	U	LNM
Molybdenum	0.00289	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 6:20	J	JDB
Selenium	0.00193	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 6:20	J	JDB
Thallium	< 0.043	mg/L	0.043	1:50	EPA 6010B 1996	07/10/2018 21:23	U	JDB

**Water (216834)**

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Fluoride	7.4008	mg/L	0.083	1	EPA 300.0	06/06/2018 6:49		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 216835	<b>Collected Date:</b> 05/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> EQUIPMENT BLANK BAP	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCr)		

<b>Metals (216835)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Antimony	< 0.00093	mg/L	0.00093	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Arsenic	< 0.00105	mg/L	0.00105	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Barium	< 0.00015	mg/L	0.00015	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Beryllium	< 0.00002	mg/L	0.00002	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Cadmium	< 0.00007	mg/L	0.00007	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Chromium	< 0.00023	mg/L	0.00023	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Cobalt	< 0.00014	mg/L	0.00014	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Lead	< 0.00068	mg/L	0.00068	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Lithium	< 0.00013	mg/L	0.00013	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/06/2018 9:53	U	LNM
Molybdenum	< 0.00029	mg/L	0.00029	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Selenium	< 0.00099	mg/L	0.00099	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB
Thallium	< 0.00086	mg/L	0.00086	1	EPA 6010B 1996	07/11/2018 6:26	U	JDB

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

**Report ID** : 37761  
**Date Received:** 06/01/2018

**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

### 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*	%			
7/11/2018	Antimony	217448.1	<0.00093	0.8	0.7833788	97.9	0.8	0.7646954	95.6		1.2	JDB
7/11/2018	Antimony	217438.1	<0.00093	0.8	0.7863861	98.3	0.8	0.7518081	94.0		1.2	JDB
7/11/2018	Antimony	216859.1	<0.00093	0.8	0.7863861	98.3	0.8	0.7762676	97.0		0.2	JDB
7/11/2018	Antimony	216849.1	<0.00093	0.8	0.7840294	98.0	0.8	0.7162960	89.5		1.2	JDB
7/11/2018	Antimony	216839.1	<0.00093	0.8	0.7840294	98.0	0.8	0.7474474	93.4		0.5	JDB
7/11/2018	Antimony	216829.1	0.002111	0.8	0.7743853	96.8	0.8	0.7694967	96.2		1.8	JDB
7/11/2018	Antimony	216607.1	0.011666	0.8	0.80691	100.9	0.8	0.770316	96.3		1.2	JDB
7/11/2018	Arsenic	216829.1	<0.00105	0.8	0.782387	97.8	0.8	0.7688641	96.1		2.1	JDB
7/11/2018	Arsenic	216607.1	<0.00105	0.8	0.82209	102.8	0.8	0.7777993	97.2		1.9	JDB
7/11/2018	Arsenic	216839.1	<0.00105	0.8	0.7814274	97.7	0.8	0.7482348	93.5		0.5	JDB
7/11/2018	Arsenic	216849.1	<0.00105	0.8	0.7814274	97.7	0.8	0.7282816	91.0		0.2	JDB
7/11/2018	Arsenic	216859.1	<0.00105	0.8	0.7609157	95.1	0.8	0.7596461	95.0		1.1	JDB
7/11/2018	Arsenic	217438.1	<0.00105	0.8	0.7609157	95.1	0.8	0.7475921	93.4		1.0	JDB
7/11/2018	Arsenic	217448.1	<0.00105	0.8	0.7674074	95.9	0.8	0.7729410	96.6		0.4	JDB
7/11/2018	Barium	216829.1	<0.00015	0.2	0.1947964	97.4	0.2	0.1845827	92.3		2.2	JDB
7/11/2018	Barium	217448.1	<0.00015	0.2	0.1989253	99.5	0.2	0.185726	92.9		0.7	JDB
7/11/2018	Barium	216607.1	<0.00015	0.2	0.20727	103.6	0.2	0.1924270	96.2		0.3	JDB
7/11/2018	Barium	216839.1	<0.00015	0.2	0.1970746	98.5	0.2	0.1812223	90.6		0.6	JDB
7/11/2018	Barium	216849.1	<0.00015	0.2	0.1970746	98.5	0.2	0.1860327	93.0		1.0	JDB
7/11/2018	Barium	216859.1	<0.00015	0.2	0.1993587	99.7	0.2	0.18852	94.3		0.9	JDB
7/11/2018	Barium	217438.1	<0.00015	0.2	0.1993587	99.7	0.2	0.174301	87.2		1.0	JDB
7/11/2018	Beryllium	216859.1	<0.00002	0.2	0.1940843	97.0	0.2	0.1945641	97.3		0.8	JDB
7/11/2018	Beryllium	216607.1	<0.00002	0.2	0.20674	103.4	0.2	0.1968008	98.4		1.3	JDB
7/11/2018	Beryllium	216829.1	<0.00002	0.2	0.1942471	97.1	0.2	0.1962412	98.1		1.8	JDB
7/11/2018	Beryllium	217448.1	<0.00002	0.2	0.1940919	97.0	0.2	0.1934906	96.7		1.2	JDB
7/11/2018	Beryllium	216849.1	<0.00002	0.2	0.1940796	97.0	0.2	0.1873301	93.7		0.2	JDB
7/11/2018	Beryllium	217438.1	<0.00002	0.2	0.1940843	97.0	0.2	0.1922127	96.1		1.5	JDB
7/11/2018	Beryllium	216839.1	<0.00002	0.2	0.1940796	97.0	0.2	0.1927375	96.4		0.3	JDB
7/11/2018	Cadmium	216607.1	<0.00007	0.2	0.20786	103.9	0.2	0.1958449	97.9		1.2	JDB
7/11/2018	Cadmium	216829.1	<0.00007	0.2	0.1957450	97.9	0.2	0.1938799	96.9		1.9	JDB
7/11/2018	Cadmium	217448.1	<0.00007	0.2	0.192313	96.2	0.2	0.1923029	96.2		1.2	JDB
7/11/2018	Cadmium	217438.1	<0.00007	0.2	0.1929989	96.5	0.2	0.1909662	95.5		1.5	JDB

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 37761		<b>Company:</b> SEP - Environmental (JP-W)				<b>Address:</b> 502 N. Allen Avenue					
<b>Date Received:</b> 06/01/2018		<b>Contact:</b> Jill Parker-Witt				Shreveport, LA 71101					
		<b>Phone:</b> (318) 673-3816				<b>Fax:</b> (318) 673-3960					

7/11/2018	Cadmium	216859.1	<0.00007	0.2	0.1929989	96.5	0.2	0.188907	94.5		0.9	JDB
7/11/2018	Cadmium	216849.1	<0.00007	0.2	0.1944529	97.2	0.2	0.1806458	90.3		0.3	JDB
7/11/2018	Cadmium	216839.1	<0.00007	0.2	0.1944529	97.2	0.2	0.1925503	96.3		0.4	JDB
7/11/2018	Chromium	217438.1	<0.00023	0.4	0.3798332	95.0	0.4	0.3749093	93.7		1.5	JDB
7/11/2018	Chromium	217448.1	<0.00023	0.4	0.3790240	94.8	0.4	0.3807842	95.2		1.2	JDB
7/11/2018	Chromium	216859.1	<0.00023	0.4	0.3798332	95.0	0.4	0.3793229	94.8		0.8	JDB
7/11/2018	Chromium	216839.1	<0.00023	0.4	0.3813157	95.3	0.4	0.3769947	94.2		0.4	JDB
7/11/2018	Chromium	216849.1	<0.00023	0.4	0.3813157	95.3	0.4	0.3663764	91.6		0.1	JDB
7/11/2018	Chromium	216607.1	<0.00023	0.4	0.40533	101.3	0.4	0.3840149	96.0		1.3	JDB
7/11/2018	Chromium	216829.1	<0.00023	0.4	0.3823525	95.6	0.4	0.3856683	96.4		1.9	JDB
7/11/2018	Cobalt	216849.1	<0.00014	0.2	0.1930186	96.5	0.2	0.1832919	91.6		0.2	JDB
7/11/2018	Cobalt	216607.1	<0.00014	0.2	0.20521	102.6	0.2	0.1938551	96.9		1.6	JDB
7/11/2018	Cobalt	216839.1	<0.00014	0.2	0.1930186	96.5	0.2	0.1875445	93.8		0.5	JDB
7/11/2018	Cobalt	216859.1	<0.00014	0.2	0.1937297	96.9	0.2	0.1911424	95.6		0.9	JDB
7/11/2018	Cobalt	217438.1	<0.00014	0.2	0.1937297	96.9	0.2	0.1871922	93.6		1.3	JDB
7/11/2018	Cobalt	217448.1	<0.00014	0.2	0.1928593	96.4	0.2	0.1864234	93.2		1.3	JDB
7/11/2018	Cobalt	216829.1	<0.00014	0.2	0.1923129	96.2	0.2	0.1914518	95.7		2.1	JDB
6/6/2018	Fluoride			10	10	100.0						GB
6/6/2018	Fluoride	216846	<0.083	10	11	110.0	10	9.8	98.0		0.0	GB
6/6/2018	Fluoride	216828	<0.083	10	10	100.0	10	10	100.0		9.4	GB
6/6/2018	Fluoride		<0.083									GB
6/6/2018	Fluoride			10	11	110.0						GB
7/11/2018	Lead	216607.1	<0.00068	1	1.0379	103.8	1	0.9737756	97.4		1.3	JDB
7/11/2018	Lead	216829.1	<0.00068	1	0.9724599	97.2	1	0.9687459	96.9		1.9	JDB
7/11/2018	Lead	216839.1	<0.00068	1	0.9682329	96.8	1	0.9390272	93.9		0.4	JDB
7/11/2018	Lead	216849.1	<0.00068	1	0.9682329	96.8	1	0.9115634	91.2		0.5	JDB
7/11/2018	Lead	216859.1	<0.00068	1	0.9628089	96.3	1	0.9529827	95.3		0.9	JDB
7/11/2018	Lead	217448.1	<0.00068	1	0.9668009	96.7	1	0.947151	94.7		1.1	JDB
7/11/2018	Lead	217438.1	<0.00068	1	0.9628089	96.3	1	0.9349115	93.5		1.6	JDB
7/11/2018	Lithium	216607.1	<0.00013	0.2	0.20529	102.6	0.2	0.2014402	100.7		1.3	JDB
7/11/2018	Lithium	216859.1	<0.00013	0.2	0.2031312	101.6	0.2	0.2094512	104.7		0.3	JDB
7/11/2018	Lithium	216849.1	<0.00013	0.2	0.2006665	100.3	0.2	0.20681	103.4		0.4	JDB
7/11/2018	Lithium	216839.1	<0.00013	0.2	0.2006665	100.3	0.2	0.2114136	105.7		0.1	JDB
7/11/2018	Lithium	217438.1	<0.00013	0.2	0.2031312	101.6	0.2	0.2139790	107.0		1.2	JDB
7/11/2018	Lithium	216829.1	<0.00013	0.2	0.1975821	98.8	0.2	0.2088078	104.4		1.9	JDB
7/11/2018	Lithium	217448.1	<0.00013	0.2	0.2009675	100.5	0.2	0.2102503	105.1		0.3	JDB

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
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<b>Report ID</b> : 37761	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
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6/6/2018	Mercury	216848.1	<0.00000	0.001	0.000875	87.5	0.001	0.0008819	88.2		15.3	LNM
6/6/2018	Mercury	216858.1	<0.00000	0.001	0.0009016	90.2	0.001	0.0008205	82.1		4.9	LNM
6/6/2018	Mercury	216838.1	<0.00000	0.001	0.00094	94.0	0.001	0.0008853	88.5		0.3	LNM
6/6/2018	Mercury	216828.1	<0.00000	0.001	0.00094	94.0	0.001	0.0008283	82.8		2.2	LNM
7/11/2018	Molybdenum	216859.1	<0.00029	0.2	0.1906861	95.3	0.2	0.1931350	96.6		1.0	JDB
7/11/2018	Molybdenum	216849.1	<0.00029	0.2	0.1905412	95.3	0.2	0.1843829	92.2		0.5	JDB
7/11/2018	Molybdenum	216839.1	<0.00029	0.2	0.1905412	95.3	0.2	0.1867393	93.4		1.2	JDB
7/11/2018	Molybdenum	216829.1	<0.00029	0.2	0.1908355	95.4	0.2	0.1943824	97.2		1.9	JDB
7/11/2018	Molybdenum	217448.1	<0.00029	0.2	0.1895818	94.8	0.2	0.1953099	97.7		1.0	JDB
7/11/2018	Molybdenum	217438.1	<0.00029	0.2	0.1906861	95.3	0.2	0.1700057	85.0		1.0	JDB
7/11/2018	Molybdenum	216607.1	<0.00029	0.2	0.20379	101.9	0.2	0.1916946	95.8		1.0	JDB
7/11/2018	Selenium	217438.1	<0.00099	2	1.9186359	95.9	2	1.6210683	81.1		4.8	JDB
7/11/2018	Selenium	216829.1	0.001256	2	1.8985201	94.9	2	1.8805748	94.0		1.8	JDB
7/11/2018	Selenium	216839.1	<0.00099	2	1.9077373	95.4	2	1.8568667	92.8		0.2	JDB
7/11/2018	Selenium	216849.1	<0.00099	2	1.9077373	95.4	2	1.8317404	91.6		0.8	JDB
7/11/2018	Selenium	217448.1	<0.00099	2	1.9079876	95.4	2	1.8855788	94.3		1.5	JDB
7/11/2018	Selenium	216859.1	<0.00099	2	1.9186359	95.9	2	1.8739280	93.7		0.8	JDB
7/11/2018	Selenium	216607.1	0.001565	2	1.98493	99.2	2	1.8985007	94.9		1.6	JDB
7/10/2018	Thallium	216607.1	<0.043	0.4	0.41188	103.0	0.4	0.3833643	95.8		0.6	JDB
7/10/2018	Thallium	216829.1	<0.043	0.4	0.385064	96.3	0.4	0.3749285	93.7		1.4	JDB
7/10/2018	Thallium	216849.1	<0.043	0.4	0.3845709	96.1	0.4	0.3579218	89.5		0.1	JDB
7/11/2018	Thallium	217438.1	<0.00086	0.4	0.386014	96.5	0.4	0.359684	89.9		1.6	JDB
7/11/2018	Thallium	216859.1	<0.00086	0.4	0.386014	96.5	0.4	0.3752547	93.8		1.1	JDB
7/11/2018	Thallium	217448.1	<0.043	0.4	0.386145	96.5	0.4	0.3536909	88.4		1.0	JDB
7/11/2018	Thallium	216839.1	<0.00086	0.4	0.3845709	96.1	0.4	0.3594548	89.9		0.1	JDB

**Code Code Description**

- J Concentration estimated. Analyte was detected between the Method Detection Limit (MDL) and Minimum Quantitation Limit (MQL).
- U Analyte concentration below MDL.

*Sandra D. Wallace*  
 \_\_\_\_\_  
 Laboratory Manager

13-Jul-18  
 \_\_\_\_\_  
 Report Date



# Chain of Custody Record

5-14  
MSB

**Shreveport Chemical Laboratory (SCL)**  
502 N. Allen Ave.  
Shreveport, LA 71101  
Jonathan Barnhill (318-673-3803)  
Contacts: John Davis (318-673-3811)

Program: Coal Combustion Residuals (CCR)

Site Contact:

Date:

For Lab Use Only:

COC/Order #:

COC# 37761

Project Name: Northeastern PP CCR  
Contact Name: Jill Parker-Witt  
Contact Phone: 318-673-3816  
Sampler(s): Kenneth McDonald

Analysis Turnaround Time (in Calendar Days)  
Results needed by July 18, 2018

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Analytical Parameters				Sample Specific Notes	
							500 mL bottle, pH<2, HNO3	Field-filter 500 mL bottle, then pH<2, HNO3	250 mL bottle, Cool, 0-6C	Three (six every 10hr) L bottles, pH<2, HNO3		
SP-1	5/30/2018	1003	G	GW	2	X	X	X	X		216828.1-216828.2	
SP-2	5/30/2018	947	G	GW	2	X	X	X	X		216829.1-216829.2	
SP-4	5/30/2018	900	G	GW	2	X	X	X	X		216830.1-216830.2	
SP-5R	5/30/2018	1538	G	GW	2	X	X	X	X		216831.1-216831.2	
SP-10	5/30/2018	920	G	GW	2	X	X	X	X		216832.1-216832.2	
SP-11	5/30/2018	934	G	GW	2	X	X	X	X		216833.1-216833.2	
DUPLICATE BAP	5/30/2018	920	G	GW	2	X	X	X	X		216834.1-216834.2	
EQUIPMENT BLANK BAP	5/30/2018	1008	G	W	1	X					216837	
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH; 6= Other							F	F4	1	4		
* Six 1L Bottles must be collected for Radium for every 10th sample.												
Special Instructions/QC Requirements & Comments:												
***Results needed by July 18, 2018***												
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:	Received in Laboratory by:	Date/Time:						
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:	Received in Laboratory by:	Date/Time:						
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:	Received in Laboratory by:	Date/Time:						





SHREVEPORT CHEMICAL LABORATORY

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

### PROJECT RECEIPT FORM

Container Type					Delivery Type				
<input checked="" type="checkbox"/> Ice Chest	<input type="checkbox"/> Bag	<input type="checkbox"/> Action Pak	<input type="checkbox"/> PCB Mailer	<input type="checkbox"/> Bottle	<input type="checkbox"/> UPS	<input type="checkbox"/> FEDEX	<input type="checkbox"/> US Mail	<input checked="" type="checkbox"/> Walk in	<input type="checkbox"/> Shuttle
Other _____					Other _____				
Tracking # _____									

Client ME  
 Received By SAN  
 Received Date 6/11/18  
 Open Date \_\_\_\_\_

Sample Matrix  
 DGA     PCB Oil     Water     Oil     Soil  
 Solid     Liquid     Other \_\_\_\_\_

Container Temp    Read 3.0°C  
Thermometer Serial #F04103  
 Correction Factor +1.2°C  
 Corrected Temp 4.2°C

Project I.D. 37761

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     NO
- Were samples labeled properly?     YES     NO
- Were correct containers used?     YES     NO
- Were the pH's of samples appropriately checked?     YES     NO Metals pH: <2
- Total number of sample containers    15
- Was any corrective action taken?     NO    Person Contacted \_\_\_\_\_  
 Date & Time \_\_\_\_\_

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

## Water Analysis

**Location: Northeastern Station**

**Report Date: 7/18/2018**

### SP-1

**Sample Number: 181864-001**                      **Date Collected: 05/30/2018 10:03**                      **Date Received: 6/6/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.52	pCi/L	0.17	0.46	jls	7/1/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	1.12	pCi/L	0.19	0.21	jls	7/5/2018	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the established range of 30-110%.

### SP-2

**Sample Number: 181864-002**                      **Date Collected: 05/30/2018 09:47**                      **Date Received: 6/6/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	4.89	pCi/L	0.19	0.45	jls	7/1/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	2.96	pCi/L	0.29	0.18	jls	7/5/2018	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the established range of 30-110%.

### SP-4

**Sample Number: 181864-003**                      **Date Collected: 05/30/2018 09:00**                      **Date Received: 6/6/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.32	pCi/L	0.14	0.37	jls	7/1/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	0.866	pCi/L	0.18	0.23	jls	7/5/2018	SW-846 9315-1986,Rev. 0

### SP-5R

**Sample Number: 181864-004**                      **Date Collected: 05/30/2018 15:38**                      **Date Received: 6/6/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	4.79	pCi/L	0.18	0.39	jls	7/1/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	4.36	pCi/L	0.38	0.22	jls	7/5/2018	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the established range of 30-110%.

**SP-10**

Sample Number: **181864-005**

Date Collected: **05/30/2018 09:20**

Date Received: **6/6/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.16	pCi/L	0.12	0.36	jls	7/1/2018	SW-846 9320-2014, Rev. 1.0
Radium-226	4.9	pCi/L	0.39	0.19	jls	7/5/2018	SW-846 9315-1986, Rev. 0

The carrier recovery is outside the established range of 30-110%.

**SP-11**

Sample Number: **181864-006**

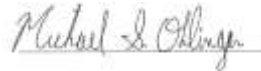
Date Collected: **05/30/2018 09:34**

Date Received: **6/6/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.812	pCi/L	0.16	0.50	jls	7/1/2018	SW-846 9320-2014, Rev. 1.0
Radium-226	0.522	pCi/L	0.13	0.20	jls	7/5/2018	SW-846 9315-1986, Rev. 0

The carrier recovery is outside the established range of 30-110%.

*\*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.*



**Michael Ohlinger, Chemist**

Email [msohlinger@aep.com](mailto:msohlinger@aep.com) Tel.

Fax 614-836-4168 Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

**Dolan Chemical Laboratory (DCL)**  
 4007 Bixby Road  
 Groveport, Ohio 43125  
**Contacts:** Michael Ohlinger (614-836-4184)  
 Dave Conover (614-836-4219)

# Chain of Custody Record

**Program: Coal Combustion Residuals (CCR)**

Site Contact: \_\_\_\_\_ Date: \_\_\_\_\_  
 For Lab Use Only:  
 COC/Order #: 181864

Analysis Turnaround Time (in Calendar Days)

Need results by July 18, 2018

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials						Hg	Sample Specific Notes					
						250 mL bottle, pH<2, HNO3	Three (six every 10hr) 1L bottles, pH<2, HNO3	1 L + 250 mL bottles, Cool, 0-6C	40 mL Glass vial or 250 mL PTFE lined bottle, HCL*, pH<2	Field-filler 250 mL bottle, then pH<2, HNO3	Date:							
SP-1	5/30/2018	1003	G	GW	3													
SP-2	5/30/2018	947	G	GW	3													
SP-4	5/30/2018	900	G	GW	3													
SP-5R	5/30/2018	1538	G	GW	3													
SP-10	5/30/2018	920	G	GW	6													
SP-11	5/30/2018	934	G	GW	3													

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

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

\*\* HCl must be Trace Metal Grade for Mercury analysis when samples cannot be delivered to the laboratory within 48 hours of sampling.

Special Instructions/QC Requirements & Comments:

\*\*\*\*NEED RESULTS BY JULY 18, 2018\*\*\*\*

Relinquished by: <i>KAM</i>	Company: <i>EAGLE</i>	Date/Time: <i>06/01/18 1400</i>	Received by: _____	Date/Time: _____
Relinquished by: _____	Company: _____	Date/Time: _____	Received by: _____	Date/Time: _____
Relinquished by: _____	Company: _____	Date/Time: _____	Received in Laboratory by: <i>Michael Ohlinger</i>	Date/Time: <i>6/6/18 4:26 PM</i>

# AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type			Delivery Type				
<input checked="" type="radio"/> Cooler	<input type="radio"/> Box	<input type="radio"/> Bag	<input type="radio"/> Envelope	<input type="radio"/> PONY	<input type="radio"/> UPS	<input checked="" type="radio"/> FedEx	<input type="radio"/> USPS
			Other _____				

Plant/Customer Northeastern Number of Plastic Containers: 21

Opened By MSO Number of Glass Containers: -

Date/Time 6/6/18 4:26 PM Number of Mercury Containers: -

Were all temperatures within 0-6°C? Y / N or  N/A Initial: \_\_\_\_\_ on ice /  no ice  
# (IR Gun Ser# 170779030 Expir. 11-06-19) - If No, specify each deviation: \_\_\_\_\_

Was container in good condition?  Y / N Comments \_\_\_\_\_

Was Chain of Custody received?  Y / N Comments \_\_\_\_\_

Requested turnaround: July 18 If **RUSH**, who was notified? \_\_\_\_\_

pH (15 min)	Cr <sup>6+</sup> (pres) (24 hr)	NO <sub>2</sub> or NO <sub>3</sub> (48 hr)	ortho-PO <sub>4</sub> (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 6/6/18

- 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# 18 1864 Initial & Date & Time: \_\_\_\_\_

Logged by MSO Comments: \_\_\_\_\_

Reviewed by RLL \_\_\_\_\_

\_\_\_\_\_

**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.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 218125	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-1	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218125)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 9:45	U	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

<b>Water (218125)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	46	mg/L	0.219	1	EPA 300.0	08/07/2018 18:36	M7	GB
Fluoride	0.9863	mg/L	0.083	1	EPA 300.0	08/07/2018 18:36	J	GB
Solids, Total Dissolved (TDS)	1060	mg/L	2	1	SM 2540 C-2011	08/02/2018 14:00		LBH
Sulfate	63	mg/L	0.140	1	EPA 300.0	08/07/2018 18:36	M7	GB

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEPAnalytical Chemistry Services.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 218126	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-2	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218126)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 9:48	U	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

<b>Water (218126)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	268	mg/L	0.219	1	EPA 300.0	08/08/2018 19:33	M7	GB
Fluoride	2.6556	mg/L	0.083	1	EPA 300.0	08/07/2018 19:33		GB
Solids, Total Dissolved (TDS)	1006	mg/L	2	1	SM 2540 C-2011	08/02/2018 14:00		LBH
Sulfate	30	mg/L	0.140	1	EPA 300.0	08/07/2018 19:33	M7	GB





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 218127	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-4	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218127)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	0.000006	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 9:51	J	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

<b>Water (218127)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	521	mg/L	0.219	1:10	EPA 300.0	08/07/2018 23:56	M7	GB
Fluoride	< 0.083	mg/L	0.083	1	EPA 300.0	08/07/2018 23:19	U	GB
Solids, Total Dissolved (TDS)	1180	mg/L	2	1	SM 2540 C-2011	08/02/2018 14:00		LBH
Sulfate	70	mg/L	0.140	1:10	EPA 300.0	08/07/2018 23:56	M7	GB

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEPAnalytical Chemistry Services.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 218128	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-5R	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218128)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 9:54	U	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

<b>Water (218128)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	793	mg/L	0.219	1:10	EPA 300.0	08/08/2018 0:53	M7	GB
Fluoride	4.3905	mg/L	0.083	1	EPA 300.0	08/08/2018 0:15		GB
Solids, Total Dissolved (TDS)	1480	mg/L	2	1	SM 2540 C-2011	08/03/2018 16:00		LBH
Sulfate	4	mg/L	0.140	1	EPA 300.0	08/08/2018 0:15	M7	GB

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 218129	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-10	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218129)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	0.000006	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 9:56	J	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

<b>Water (218129)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	2283	mg/L	0.219	1:100	EPA 300.0	08/08/2018 2:08		GB
Fluoride	8.9991	mg/L	0.083	1	EPA 300.0	08/08/2018 1:12		GB
Solids, Total Dissolved (TDS)	3632	mg/L	2	1	SM 2540 C-2011	08/03/2018 16:00		LBH
Sulfate	75	mg/L	0.140	1	EPA 300.0	08/08/2018 1:12		GB

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960
<b>AEP Sample ID</b> : 218130	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-11	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218130)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	0.000005	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 9:59	J	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

<b>Water (218130)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	234	mg/L	0.219	1:100	EPA 300.0	08/08/2018 3:42		GB
Fluoride	3.7832	mg/L	0.083	1	EPA 300.0	08/08/2018 2:46		GB
Solids, Total Dissolved (TDS)	996	mg/L	2	1	SM 2540 C-2011	08/03/2018 16:00		LBH
Sulfate	79	mg/L	0.140	1	EPA 300.0	08/08/2018 2:46		GB

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
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**Phone: (318) 673-3802**  
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<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 218131	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> Duplicate BAP	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218131)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 10:02	U	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

<b>Water (218131)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	46	mg/L	0.219	1	EPA 300.0	08/08/2018 12:52		GB
Fluoride	0.9535	mg/L	0.083	1	EPA 300.0	08/08/2018 12:52	J	GB
Solids, Total Dissolved (TDS)	438	mg/L	2	1	SM 2540 C-2011	08/03/2018 16:00		LBH
Sulfate	63	mg/L	0.140	1	EPA 300.0	08/08/2018 12:52		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
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**Fax: (318) 673-3960**

<b>Report ID</b> : 38096	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/01/2018	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 218132	<b>Collected Date:</b> 07/30/2018	<b>By:</b> KM
<b>Cust Sample ID:</b> Equipment Blank BAP	<b>Location:</b> Northeastern P.P.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (218132)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Antimony	Q18	mg/L	0.00093	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Arsenic	Q18	mg/L	0.00105	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Barium	Q18	mg/L	0.00015	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Beryllium	Q18	mg/L	0.00002	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Boron	Q18	mg/L	0.00028	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cadmium	Q18	mg/L	0.00007	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Calcium	Q18	mg/L	0.0096	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Chromium	Q18	mg/L	0.00023	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Cobalt	Q18	mg/L	0.00014	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lead	Q18	mg/L	0.00068	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Lithium	Q18	mg/L	0.00013	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	08/03/2018 10:10	U	LNM
Molybdenum	Q18	mg/L	0.00029	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Selenium	Q18	mg/L	0.00099	1	EPA 6010B 1996	08/01/2018 10:04		Q18
Thallium	Q18	mg/L	0.00086	1	EPA 6010B 1996	08/01/2018 10:04		Q18

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# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

**Report ID** : 38096  
**Date Received:** 08/01/2018

**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

### 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*	%			
8/7/2018	Chloride	218155	<0.219	20	20	100.0	20	11	55.0		0.0	GB
8/7/2018	Chloride		<0.219									GB
8/7/2018	Chloride			20	20	100.0						GB
8/8/2018	Chloride		<0.219									GB
8/8/2018	Chloride			20	20	100.0						GB
8/8/2018	Chloride	218155	<0.219	20	20	100.0	20	11	55.0		0.0	GB
8/7/2018	Fluoride			10	11	110.0						GB
8/7/2018	Fluoride		<0.083									GB
8/7/2018	Fluoride	218155	<0.083	10	11	110.0	10	10	100.0		0.0	GB
8/8/2018	Fluoride			10	11	110.0						GB
8/8/2018	Fluoride		<0.083									GB
8/8/2018	Fluoride	218155	<0.083	10	11	110.0	10	10	100.0		0.0	GB
8/3/2018	Mercury	218132.1	<0.00000	0.001	0.0008533	85.3	0.001	0.0010354	103.5		10.6	LNM
8/2/2018	Solids, Total Dissolved (TDS)	218126	<2	95.33	100	104.9	1892	1926	101.8		1.4	LBH
8/3/2018	Solids, Total Dissolved (TDS)	218133	<2	95.33	102	107.0	2212	2168	98.0		1.9	LBH
8/7/2018	Sulfate	218155	<0.140	20	18	90.0	20	11	55.0		0.0	GB
8/7/2018	Sulfate		<0.140									GB
8/7/2018	Sulfate			20	18	90.0						GB
8/8/2018	Sulfate			20	18	90.0						GB
8/8/2018	Sulfate		<0.140									GB
8/8/2018	Sulfate	218155	<0.140	20	18	90.0	20	11	55.0		0.0	GB

**Code Code Description**

- J Concentration estimated. Analyte was detected between the Method Detection Limit (MDL) and Minimum Quantitation Limit (MQL).
- M7 Matrix spike recovery was low.
- U Analyte concentration below MDL.

  
Laboratory Manager

11-Oct-18  
Report Date





Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

## Water Analysis

**Location: Northeastern Station**

**Report Date: 10/11/2018**

### SP-1

**Sample Number: 182917-001**

**Date Collected: 07/30/2018 15:16**

**Date Received: 8/23/2018**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.69	ug/L		0.2	0.05	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.93	ug/L		0.2	0.05	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Barium, Ba	174	ug/L		0.5	0.1	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.06	ug/L	J	0.1	0.02	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Boron, B	0.397	mg/L		0.02	0.005	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.08	ug/L	J	0.1	0.02	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	130	mg/L		0.1	0.02	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.83	ug/L		0.2	0.04	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.676	ug/L		0.1	0.02	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.354	ug/L		0.1	0.02	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00615	mg/L		0.001	0.0003	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	17.1	ug/L		0.5	0.1	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Selenium, Se	5.8	ug/L		0.5	0.2	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.09	ug/L	J	0.2	0.05	GES	09/26/2018 15:47	EPA 200.8-1994, Rev. 5.4

### SP-2

**Sample Number: 182917-002**

**Date Collected: 07/30/2018 14:42**

**Date Received: 8/23/2018**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.21	ug/L		0.2	0.05	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.42	ug/L		0.2	0.05	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Barium, Ba	656	ug/L		0.5	0.1	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.05	ug/L	J	0.1	0.02	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Boron, B	0.276	mg/L		0.02	0.005	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.08	ug/L	J	0.1	0.02	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	117	mg/L		0.1	0.02	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	< 0.04	ug/L	U	0.2	0.04	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.400	ug/L		0.1	0.02	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.245	ug/L		0.1	0.02	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0346	mg/L		0.001	0.0003	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	26.1	ug/L		0.5	0.1	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Selenium, Se	2.9	ug/L		0.5	0.2	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.06	ug/L	J	0.2	0.05	GES	09/26/2018 17:12	EPA 200.8-1994, Rev. 5.4

## SP-4

Sample Number: 182917-003

Date Collected: 07/30/2018 13:20

Date Received: 8/23/2018

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.37	ug/L		0.05	0.01	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.14	ug/L		0.05	0.01	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Barium, Ba	303	ug/L		0.1	0.02	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.078	ug/L		0.02	0.004	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Boron, B	0.399	mg/L		0.005	0.001	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.07	ug/L		0.02	0.005	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	164	mg/L		0.02	0.004	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.562	ug/L		0.05	0.007	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.497	ug/L		0.02	0.004	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.356	ug/L		0.02	0.004	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0627	mg/L		0.0002	0.00006	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	3.63	ug/L		0.1	0.02	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.7	ug/L		0.1	0.03	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.05	ug/L	J	0.05	0.01	GES	09/26/2018 16:27	EPA 200.8-1994, Rev. 5.4

## SP-5R

Sample Number: 182917-004

Date Collected: 07/30/2018 16:05

Date Received: 8/23/2018

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.05	ug/L	J	0.05	0.01	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Arsenic, As	47.3	ug/L		0.05	0.01	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2140	ug/L		0.1	0.02	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.052	ug/L		0.02	0.004	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Boron, B	0.246	mg/L		0.005	0.001	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.02	ug/L	J	0.02	0.005	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	131	mg/L		0.02	0.004	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.082	ug/L		0.05	0.007	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.482	ug/L		0.02	0.004	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.415	ug/L		0.02	0.004	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0946	mg/L		0.0002	0.00006	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	1.17	ug/L		0.1	0.02	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.1	ug/L		0.1	0.03	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.02	ug/L	J	0.05	0.01	GES	09/26/2018 16:32	EPA 200.8-1994, Rev. 5.4

## SP-10

Sample Number: 182917-005

Date Collected: 07/30/2018 13:50

Date Received: 8/23/2018

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.34	ug/L		0.1	0.02	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Arsenic, As	7.61	ug/L		0.1	0.02	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2330	ug/L		0.2	0.04	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.043	ug/L		0.04	0.008	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Boron, B	1.17	mg/L		0.01	0.002	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.02	ug/L	J	0.04	0.01	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	227	mg/L		0.04	0.008	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.06	ug/L	J	0.1	0.01	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	2.16	ug/L		0.04	0.008	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.102	ug/L		0.04	0.008	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.242	mg/L		0.0004	0.0001	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	18.5	ug/L		0.2	0.04	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.09	ug/L	J	0.2	0.06	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.04	ug/L	J	0.1	0.02	GES	09/26/2018 16:37	EPA 200.8-1994, Rev. 5.4

## SP-11

Sample Number: 182917-006

Date Collected: 07/30/2018 14:17

Date Received: 8/23/2018

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.35	ug/L		0.05	0.01	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Arsenic, As	4.22	ug/L		0.05	0.01	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Barium, Ba	539	ug/L		0.1	0.02	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.029	ug/L		0.02	0.004	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Boron, B	0.280	mg/L		0.005	0.001	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.04	ug/L		0.02	0.005	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	124	mg/L		0.02	0.004	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.379	ug/L		0.05	0.007	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	5.12	ug/L		0.02	0.004	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.404	ug/L		0.02	0.004	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0370	mg/L		0.0002	0.00006	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	8.85	ug/L		0.1	0.02	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.7	ug/L		0.1	0.03	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.03	ug/L	J	0.05	0.01	GES	09/26/2018 16:42	EPA 200.8-1994, Rev. 5.4

## Duplicate BAP

Sample Number: 182917-007

Date Collected: 07/30/2018 15:16

Date Received: 8/23/2018

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.68	ug/L		0.05	0.01	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.07	ug/L		0.05	0.01	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Barium, Ba	175	ug/L		0.1	0.02	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.101	ug/L		0.02	0.004	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Boron, B	0.162	mg/L		0.005	0.001	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.09	ug/L		0.02	0.005	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	151	mg/L		0.02	0.004	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.582	ug/L		0.05	0.007	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.11	ug/L		0.02	0.004	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.824	ug/L		0.02	0.004	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00561	mg/L		0.0002	0.00006	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	11.8	ug/L		0.1	0.02	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Selenium, Se	5.8	ug/L		0.1	0.03	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.062	ug/L		0.05	0.01	GES	09/26/2018 16:47	EPA 200.8-1994, Rev. 5.4

## Equipment Blank BAP

Sample Number: 182917-008

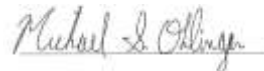
Date Collected: 07/30/2018 16:20

Date Received: 8/23/2018

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.01	ug/L	U	0.05	0.01	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.01	ug/L	J	0.05	0.01	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Barium, Ba	< 0.02	ug/L	U	0.1	0.02	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.004	ug/L	U	0.02	0.004	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Boron, B	0.013	mg/L		0.005	0.001	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.005	ug/L	U	0.02	0.005	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	< 0.004	mg/L	U	0.02	0.004	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	< 0.007	ug/L	U	0.05	0.007	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.01	ug/L	J	0.02	0.004	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.004	ug/L	U	0.02	0.004	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00009	mg/L	J	0.0002	0.00006	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	0.07	ug/L	J	0.1	0.02	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.03	ug/L	U	0.1	0.03	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.01	ug/L	J	0.05	0.01	GES	09/26/2018 16:52	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.



Michael Ohlinger, Chemist

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Tel.

Fax 614-836-4168

Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

# Chain of Custody Record

**Shreveport Chemical Laboratory (SCL)**  
 502 N. Allen Ave.  
 Shreveport, LA 71101  
 Jonathan Barnhill (318-673-3803)  
 Contacts: John Davis (318-673-3811)

Project Name: Northeastern PP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816

Sampler(s): Kenneth McDonald

Program: Coal Combustion Residuals (CCR)

Site Contact:

Date:

COC/Order #:

For Lab Use Only:

Analysis Turnaround Time (In Calendar Days)  
 Results needed by October 11, 2018

500 mL bottle, pH<2, HNO3	Field-filter 500 mL bottle, then pH<2, HNO3	1 L bottle, Cool, 0-6C	Three (six every 10th) L bottles, pH<2, HNO3
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MO# 38096

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials				Sample Specific Notes:
						B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Se, TL	dissolved Fe and Mn	TDS, F, Cl, SO4	Ra-226, Ra-228	
SP-1	7/30/2018	1516	G	GW	2	X		X		218125.1 - 218125.2
SP-2	7/30/2018	1442	G	GW	2	X		X		218126.1 - 218126.2
SP-4	7/30/2018	1320	G	GW	2	X		X		218127.1 - 218127.2
SP-5R	7/30/2018	1605	G	GW	2	X		X		218128.1 - 218128.2
SP-10	7/30/2018	1350	G	GW	2	X		X		218129.1 - 218129.2
SP-11	7/30/2018	1417	G	GW	2	X		X		218130.1 - 218130.2
DUPLICATE BAP	7/30/2018	1516	G	GW	2	X		X		218131.1 - 218131.2
EQUIPMENT BLANK BAP	7/30/2018	1620	G	W	1	X				218132

\* Six 7L Bottles must be collected for Radium for every 10th sample.

Special Instructions/QC Requirements & Comments:

Results needed by October 11, 2018

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:	Date/Time:



SHREVEPORT CHEMICAL LABORATORY

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

## PROJECT RECEIPT FORM

Container Type					Delivery Type				
<input checked="" type="radio"/> Ice Chest	<input type="radio"/> Bag	<input type="radio"/> Action Pak	<input type="radio"/> PCB Mailer	<input type="radio"/> Bottle	<input type="radio"/> UPS	<input type="radio"/> FEDEX	<input type="radio"/> US Mail	<input type="radio"/> Walk in	<input checked="" type="radio"/> Shuttle
Other _____					Other _____				
Tracking # _____									

Client Jill Parker-Witt  
 Received By JTD  
 Received Date 8/1/18  
 Open Date \_\_\_\_\_

Sample Matrix  
 DGA     PCB Oil     Water     Oil     Soil  
 Solid     Liquid    Other \_\_\_\_\_

Container Temp    Read 3  
Thermometer Serial #F04103  
 Correction Factor +1.2  
 Corrected Temp 4.2

Project I.D. 38096

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     NO
- Were samples labeled properly?  YES     NO
- Were correct containers used?  YES     NO
- Were the pH's of samples appropriately checked?  YES     NO
- Total number of sample containers 15

Was any corrective action taken?  NO    Person Contacted \_\_\_\_\_  
 Date & Time \_\_\_\_\_

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Sample ID	Analysis	pH	Preservative Added / Lot #
Sp1	metals	22	/
Sp-2	↓	↓	/
Sp-4			/
Sp-SR			/
Sp-10			/
Sp-11			/
Duplicate Bag			/
Equipment Blank Bag			/
			/
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			/
			/





Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

## Water Analysis

**Location: Northeastern Station**

**Report Date: 10/11/2018**

### SP-1

**Sample Number: 182697-001**                      **Date Collected: 07/30/2018 15:16**                      **Date Received: 8/9/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.07	pCi/L	0.20	0.59	jls	8/27/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	0.986	pCi/L	0.15	0.13	jls	8/30/2018	SW-846 9315-1986,Rev. 0

### SP-2

**Sample Number: 182697-002**                      **Date Collected: 07/30/2018 14:42**                      **Date Received: 8/9/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	7.42	pCi/L	0.21	0.45	jls	8/27/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	2.19	pCi/L	0.19	0.12	jls	8/30/2018	SW-846 9315-1986,Rev. 0

### SP-4

**Sample Number: 182697-003**                      **Date Collected: 07/30/2018 13:20**                      **Date Received: 8/9/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	3.15	pCi/L	0.18	0.48	jls	8/27/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	1.7	pCi/L	0.20	0.14	jls	8/30/2018	SW-846 9315-1986,Rev. 0

### SP-5R

**Sample Number: 182697-004**                      **Date Collected: 07/30/2018 16:05**                      **Date Received: 8/9/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	6.62	pCi/L	0.24	0.57	jls	8/27/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	4.66	pCi/L	0.28	0.099	jls	8/30/2018	SW-846 9315-1986,Rev. 0

### SP-10

**Sample Number: 182697-005**                      **Date Collected: 07/30/2018 13:50**                      **Date Received: 8/9/2018**

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.98	pCi/L	0.17	0.54	jls	8/27/2018	SW-846 9320-2014,Rev. 1.0
Radium-226	6.91	pCi/L	0.39	0.13	jls	8/30/2018	SW-846 9315-1986,Rev. 0

SP-11

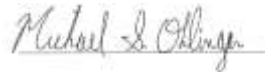
Sample Number: 182697-006

Date Collected: 07/30/2018 14:17

Date Received: 8/9/2018

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.701	pCi/L	0.16	0.50	jls	8/27/2018	SW-846 9320-2014, Rev. 1.0
Radium-226	0.249	pCi/L	0.062	0.10	jls	8/30/2018	SW-846 9315-1986, Rev. 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.*



**Michael Ohlinger, Chemist**

Email [msohlinger@aep.com](mailto:msohlinger@aep.com) Tel.

Fax 614-836-4168 Audinet 8-210-

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Dolan Chemical Laboratory (DCL)  
 4001 Bixby Road  
 Groveport, Ohio 43125  
 Michael Ohlinger (614-836-4184)  
 Contacts: Dave Conover (614-836-4219)

Project Name: Northeastern PP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816  
 Sampler(s): Kenneth McDonald

# Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Site Contact:

Analysis Turnaround Time (in Calendar Days)

Need results by October 11, 2018

Date:

For Lab Use Only:

COC/Order #:

182697

250 mL bottle, pH<2, HNO3	Three (six every 10th*) 1L bottles, pH<2, HNO3	1 L + 250 mL bottles, Cool, 0-6C	40 mL Glass vial or 250 mL PTFE lined bottle, HCL**, pH<2	Field-filter 250 mL bottle, then pH<2, HNO3
B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, Tl, and Na, K, Mg, Sr	Ra-226, Ra-228	TDS, F, Cl, SO4, and Br, Alkalinity	Hg	dissolved Fe and dissolved Mn

Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	4	4	1	2	F 4
7/30/2018	1516	G	GW	6						
7/30/2018	1442	G	GW	3						
7/30/2018	1320	G	GW	3						
7/30/2018	1605	G	GW	3						
7/30/2018	1350	G	GW	3						
7/30/2018	1417	G	GW	3						

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

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

\*\* HCl must be Trace Metal Grade for Mercury analysis when samples cannot be delivered to the laboratory within 48 hours of sampling.

Special Instructions/QC Requirements & Comments:

\*\*\*\*\*NEED RESULTS BY OCTOBER 11, 2018\*\*\*\*\*

Relinquished by: <i>KAM</i>	Company: <i>FACIL</i>	Date/Time: <i>08/07/18 1400</i>	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: <i>Stephanie C. Bechtel</i>	Date/Time: <i>8/9/2018 1445</i>

**AEP** WATER & WASTE SAMPLE RECEIPT FORM

<u>Package Type</u>				<u>Delivery Type</u>			
<input checked="" type="radio"/> Cooler	<input type="radio"/> Box	<input type="radio"/> Bag	<input type="radio"/> Envelope	<input type="radio"/> PONY	<input type="radio"/> UPS	<input checked="" type="radio"/> FedEX	<input type="radio"/> USPS
Other _____				Other _____			
Plant/Customer <u>Northeastern COR</u>				Number of Plastic Containers: <u>21</u>			
Opened By <u>SM</u>				Number of Glass Containers: _____			
Date/Time <u>8-9-18 2:45</u>				Number of Mercury Containers: _____			
Were all temperatures within 0-6°C? Y / N or <input checked="" type="radio"/> N/A Initial: <u>SM</u> on ice / no ice							
# (IR Gun Ser# <u>170779030</u> Expir. <u>11-06-19</u> ) - If No, specify each deviation: _____							
Was container in good condition? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Was Chain of Custody received? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Requested turnaround: _____ If <b>RUSH</b> , who was notified? _____							
pH (15 min)	Cr <sup>+6</sup> (pres) (24 hr)	NO <sub>2</sub> or NO <sub>3</sub> (48 hr)	ortho-PO <sub>4</sub> (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: JWB 8-9-18

- 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# 182697 Initial & Date & Time : \_\_\_\_\_

Comments: \_\_\_\_\_

Logged by JWB \_\_\_\_\_

Reviewed by MBO \_\_\_\_\_

**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.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 39173	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 02/06/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 222481	<b>Collected Date:</b> 02/04/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-1	<b>Location:</b> Northeastern P.S.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

Water (222481)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	Q18	mg/L	0.219	1	EPA 300.0	02/06/2019 14:39	Q18	Q18
Fluoride	Q18	mg/L	0.083	1	EPA 300.0	02/06/2019 14:39	Q18	Q18
Solids, Total Dissolved (TDS)	460	mg/L	2	1	SM 2540 C-2011	02/08/2019 14:00		GB
Sulfate	Q18	mg/L	0.140	1	EPA 300.0	02/06/2019 14:39	Q18	Q18

<b>AEP Sample ID</b> : 222482	<b>Collected Date:</b> 02/04/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-10	<b>Location:</b> Northeastern P.S.	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

Water (222482)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	Q18	mg/L	0.219	1:100	EPA 300.0	02/06/2019 14:39	Q18	Q18
Fluoride	< Q18	mg/L	0.083	1	EPA 300.0	02/06/2019 14:39	Q18	Q18
Solids, Total Dissolved (TDS)	3440	mg/L	2	1	SM 2540 C-2011	02/08/2019 9:45		GB
Sulfate	Q18	mg/L	0.140	1	EPA 300.0	02/06/2019 14:39	Q18	Q18

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*	%			
2/8/2019	Solids, Total Dissolved (TDS)	222448	<2	584	558	95.5					0.0	GB

**Code Code Description**

Q18 Analysis was performed by a contracted Laboratory. See attached report.

*Jonathan Barnhill*  
 Quality Assurance Officer

26-Feb-19  
 Report Date

Shreveport Chemical Laboratory (SCL)  
 502 N. Allen Ave.  
 Shreveport, LA 71101  
 Jonathan Barnhill (318-673-3803)  
 Contacts: John Davis (318-673-3811)

Chain of Custody Record

2 of 2 Sampling

Site Contact: \_\_\_\_\_ Date: *2/6/19*

For Lab Use Only: COC/Order #: *MC# 39173*

Project Name: Northeastern PP CCR

Contact Name: Jill Parker-Witt

Contact Phone: 318-673-3816

Sampler(s): Kenneth McDonald

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

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials				Sample Specific Notes:
						500 mL bottle, pH<2, HNO3	Field-filter 500 mL bottle, then pH<2, HNO3	1 L bottle, Cool, 0-6C	Three (six every 10th*) L bottles, pH<2, HNO3	
SP-1	2/4/2019	1435	G	GW	1	Mercury				<i>222481</i>
SP-10	2/4/2019	1450	G	GW	1	dissolved Fe and Mn				<i>222482</i>

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ; F= filter in field ; Six 1L Bottles must be collected for Radium for every 10th sample.

Special Instructions/QC Requirements & Comments:

Relinquished by: *JA* Company: *Eagle* Date/Time: *02/06/19 1400* Received by: *John* Date/Time: *2-6-19 1400*

Relinquished by: *John* Company: *Eagle* Date/Time: *2-6-19 1436* Received in Laboratory by: *John* Date/Time: *2/6/19 14:39*





SHREVEPORT CHEMICAL LABORATORY

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

## PROJECT RECEIPT FORM

Container Type					Delivery Type				
<input checked="" type="radio"/> Ice Chest	<input type="radio"/> Bag	<input type="radio"/> Action Pak	<input type="radio"/> PCB Mailer	<input type="radio"/> Bottle	<input type="radio"/> UPS	<input type="radio"/> FEDEX	<input type="radio"/> US Mail	<input checked="" type="radio"/> Walk in	<input type="radio"/> Shuttle
Other _____					Other _____				
Tracking # _____									

Client Bill Parker-Witt  
 Received By JTD  
 Received Date 2/6/19  
 Open Date \_\_\_\_\_

Sample Matrix  
 DGA     PCB Oil     Water     Oil     Soil  
 Solid     Liquid    Other \_\_\_\_\_

Container Temp Read 1  
Thermometer Serial #F04103  
 Correction Factor +1.2  
 Corrected Temp 2.2

Project I.D. 39173

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     NO \_\_\_\_\_

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 2 \_\_\_\_\_

Was any corrective action taken?  NO    Person Contacted \_\_\_\_\_  
 Date & Time \_\_\_\_\_

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_





Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 2/26/2019**

**SP-1 222481**

**Sample Number: 190575-001                      Date Collected: 02/04/2019 14:35                      Date Received: 2/20/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	46.6	mg/L		0.1	0.03	CRJ	02/21/2019 16:51	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.97	mg/L		0.2	0.04	CRJ	02/21/2019 16:51	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	71.4	mg/L		1	0.2	CRJ	02/21/2019 16:51	EPA 300.1-1997, Rev. 1.0

**SP-10 222482**

**Sample Number: 190575-002                      Date Collected: 02/04/2019 14:50                      Date Received: 2/20/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	1720	mg/L		2	0.6	CRJ	02/21/2019 17:37	EPA 300.1-1997, Rev. 1.0
Fluoride, F	6.08	mg/L		0.2	0.04	CRJ	02/21/2019 17:59	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	10.1	mg/L		1	0.2	CRJ	02/21/2019 17:59	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
J: Analyte was positively identified, though the quantitation was below Reporting Limit.

**Michael Ohlinger, Chemist**

Email [msohlinger@aep.com](mailto:msohlinger@aep.com) Tel.

Fax 614-836-4168 Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**



SHREVEPORT CHEMICAL LABORATORY

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

CHAIN OF CUSTODY

OPCO/PLANT NAME		FAX NO.	ANALYSIS REQUESTED					Lab Number	REMARKS											
CONTACT PERSON (Please Print)		PHONE NO.	Chloride EPA 300.1	Flouride EPA 300.1	Sulfate EPA 300.1															
SAMPLER(SIGNATURE)			NUMBER OF CONTAINERS		COC 39173															
DATE	TIME	SAMPLE SOURCE & DESCRIPTION	SAMPLE I.D.	C	O	R	A	B	P											
4-Feb-19	14:35	SP-1	222481	x	x	x	x	x	x									Due: 3/1/2019		
4-Feb-19	14:50	SP-10	222482	x	x	x	x	x	x											
RELINQUISHED BY (SIGN)		DATE/TIME	RECEIVED BY	DATE/TIME	RELINQUISHED BY (SIGN)		DATE/TIME	RECEIVED BY		DATE/TIME	RELINQUISHED BY (SIGN)		DATE/TIME	RECEIVED BY		DATE/TIME	RELINQUISHED BY (SIGN)		DATE/TIME	
<i>Jonathan Barnhill</i>		2-19-19 16:09																		
RECEIVED FOR LABORATORY					<i>S. H. H.</i>														2-20-19 7:45	

**AEP WATER & WASTE SAMPLE RECEIPT FORM**

<u>Package Type</u>				<u>Delivery Type</u>			
Cooler	Box	Bag	Envelope	PONY	UPS	FedEX	USPS
				Other _____			
Plant/Customer <u>Northeast</u>				Number of Plastic Containers: <u>2</u>			
Opened By <u>SM</u>				Number of Glass Containers: _____			
Date/Time <u>2-20-19 7:45</u>				Number of Mercury Containers: _____			
Were all temperatures within 0-6°C? <input checked="" type="radio"/> Y / <input type="radio"/> N or N/A Initial: <u>SM</u> on ice / no ice (IR Gun Ser# <u>18135443</u> ; Expir. <u>6-12-20</u> ) - If No, specify each deviation: _____							
Was container in good condition? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Was Chain of Custody received? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Requested turnaround: _____ If RUSH, who was notified? _____							
pH (15 min)	Cr <sup>+6</sup> (pres) (24 hr)	NO <sub>2</sub> or NO <sub>3</sub> (48 hr)	ortho-PO <sub>4</sub> (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: SM 2-20-19

- 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# 190575 Initial & Date & Time : \_\_\_\_\_

Logged by SM Comments: \_\_\_\_\_

Reviewed by MBO \_\_\_\_\_

**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.



Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 2/14/2019**

**SP-1**

**Sample Number: 190448-001                      Date Collected: 02/04/2019 14:35                      Date Received: 2/8/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.354	mg/L		0.05	0.009	GES	02/12/2019 20:06	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	150	mg/L		0.2	0.03	GES	02/12/2019 20:06	EPA 200.8-1994, Rev. 5.4

**SP-10**

**Sample Number: 190448-002                      Date Collected: 02/04/2019 14:50                      Date Received: 2/8/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	1.17	mg/L		0.05	0.009	GES	02/12/2019 21:36	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	144	mg/L		0.2	0.03	GES	02/12/2019 21:36	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
J: Analyte was positively identified, though the quantitation was below Reporting Limit.

**Michael Ohlinger, Chemist**

Email [msohlinger@aep.com](mailto:msohlinger@aep.com) Tel.

Fax 614-836-4168 Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

# Chain of Custody Record

2 OF 2 SAMPLING

**Dolan Chemical Laboratory (DCL)**  
 4001 Bixby Road  
 Groveport, Ohio 43125  
**Contacts: Michael Ohlinger (614-836-4184)**  
**Dave Conover (614-836-4219)**

Project Name: Northeastern PP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816

Sampler(s): Kenny McDonald

Site Contact: \_\_\_\_\_ Date: \_\_\_\_\_  
 For Lab Use Only: COC/Order #: **190448**

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

Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.
2/4/2019	1435	G	GW	1
2/4/2019	1450	G	GW	1

Sample Identification	Sampler(s) Initials	250 mL bottle, pH<2, HNO3	Field-filter 250 mL bottle, then pH<2, HNO3	1 L bottle, Cool, 0-6C	Three (six every 10th*) L bottles, pH<2, HNO3	Date	COC/Order #	For Lab Use Only
SP-1		Boron, Calcium	Dissolved B, Sb, As, Ba, Be, Ca, Cd, Cr, Co, Fe, K, Li, Mg, Mn, Mo, Na, Pb, Se, Sr, Tl	TDS, F, Cl, SO4	Ra-226, Ra-228			
SP-10		X						
		X						

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

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

Special Instructions/QC Requirements & Comments:

Relinquished by: <b>KATM</b>	Company: <b>Eagle</b>	Date/Time: <b>02/06/19 1400</b>	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: <b>Michael Ohly</b>	Date/Time: <b>2/8/19 12:30PM</b>

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**

<u>Package Type</u>		<u>Delivery Type</u>	
<input checked="" type="radio"/> Cooler	Box	PONY	UPS
	Bag		<input checked="" type="radio"/> FedEX
	Envelope		USPS
		Other _____	
Plant/Customer <u>Northeastern</u>		Number of Plastic Containers: <u>2</u>	
Opened By <u>MSO</u>		Number of Glass Containers: <u>1</u>	
Date/Time <u>2/8/19 12:30PM</u>		Number of Mercury Containers: <u>1</u>	
Were all temperatures within 0-6°C? Y / N or <input checked="" type="radio"/> N/A Initial: _____ on ice / <input checked="" type="radio"/> no ice (IR Gun Ser# <u>181354432</u> , Expir. <u>06-12-20</u> ) - If No, specify each deviation: _____			
Was container in good condition? <input checked="" type="radio"/> Y / N Comments _____			
Was Chain of Custody received? <input checked="" type="radio"/> Y / N Comments _____			
Requested turnaround: <u>Routen</u> If RUSH, who was notified? _____			
pH (15 min)	Cr <sup>+6</sup> (pres) (24 hr)	NO <sub>2</sub> or NO <sub>3</sub> (48 hr)	ortho-PO <sub>4</sub> (48 hr) Hg-diss (pres) (48 hr)
Was COC filled out properly? <input checked="" type="radio"/> Y / N Comments _____			
Were samples labeled properly? <input checked="" type="radio"/> Y / N Comments _____			
Were correct containers used? <input checked="" type="radio"/> Y / N Comments _____			
Was pH checked & Color Coding done? <input checked="" type="radio"/> Y / N or N/A Initial & Date: <u>MSO 2/8/19</u>			
- Was Add'l Preservative needed? Y / <input checked="" type="radio"/> N If Yes: By whom & when: _____ (See Prep Book)			
Is sample filtration requested? Y / <input checked="" type="radio"/> N Comments _____ (See Prep Book)			
Was the customer contacted? If Yes: Person Contacted: _____			
Lab ID# <u>190448</u>		Initial & Date & Time: _____	
Comments: <u>Plant infoj date/ time not on labels.</u>			
Logged by <u>MSO</u>			
Reviewed by <u>MLK</u>			

**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.





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

<b>Report ID</b> : 39318	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 02/28/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 223109	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-1	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

Metals (223109)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:30	U	LNM

Water (223109)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	532	mg/L	2	1	SM 2540 C-2011	03/02/2019 14:02		JTD

<b>AEP Sample ID</b> : 223110	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-2	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

Metals (223110)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:39	U	LNM

Water (223110)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	932	mg/L	2	1	SM 2540 C-2011	03/02/2019 14:02		JTD

<b>AEP Sample ID</b> : 223111	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-4	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

Metals (223111)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:42	U	LNM

Water (223111)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	1122	mg/L	2	1	SM 2540 C-2011	03/02/2019 16:00		JTD





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

<b>Report ID</b> : 39318	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 02/28/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 223112	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-5	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (223112)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:45	U	LNM

<b>Water (223112)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	1530	mg/L	2	1	SM 2540 C-2011	03/02/2019 16:00		JTD

<b>AEP Sample ID</b> : 223113	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-10	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (223113)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:48	U	LNM

<b>Water (223113)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	3504	mg/L	2	1	SM 2540 C-2011	03/02/2019 16:00		JTD

<b>AEP Sample ID</b> : 223114	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> SP-11	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

<b>Metals (223114)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:51	U	LNM

<b>Water (223114)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	1168	mg/L	2	1	SM 2540 C-2011	03/02/2019 16:00		JTD



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004

502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

<b>Report ID</b> : 39318	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 02/28/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 223115	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> Duplicate BAP	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

Metals (223115)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:54	U	LNM

Water (223115)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	3632	mg/L	2	1	SM 2540 C-2011	03/02/2019 16:00		JTD

<b>AEP Sample ID</b> : 223116	<b>Collected Date:</b> 02/27/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> Equipment Blank BAP	<b>Location:</b> Northeastern Power Plant	<b>Matrix:</b> Water
<b>Sample Desc.:</b> Coal Combustion Residuals (CCR)		

Metals (223116)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	03/06/2019 14:57	U	LNM

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*	%			
3/6/2019	Mercury	223139.2	<0.00000	0.001	0.0008521	85.2	0.001	0.000892	89.2		2.0	LNM
3/6/2019	Mercury	223107.2	<0.00000	0.001	0.00097	97.0	0.001	0.0009418	94.2		3.4	LNM
3/6/2019	Mercury	223097.2	<0.00000	0.001	0.00097	97.0	0.001	0.0008259	82.6		2.5	LNM
3/2/2019	Solids, Total Dissolved (TDS)	223111	<2	99.33	100	100.7	2806	2794	99.6		3.2	JTD
3/2/2019	Solids, Total Dissolved (TDS)	223110	<2	99.33	98	98.7	2806	2766	98.6		3.4	JTD

**Code Code Description**

U Analyte concentration below MDL.

  
Quality Assurance Officer

15-Apr-19  
Report Date

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEP Analytical Chemistry Services.

# Chain of Custody Record

**Shreveport Chemical Laboratory (SCL)**  
 502 N. Allen Ave.  
 Shreveport, LA 71101  
 Jonathan Barnhill (318-673-3803)  
 Contacts: John Davis (318-673-3811)

Program: Coal Combustion Residuals (CCR)

Date: S.W. 2-28-19

For Lab Use Only:  
 CCR/Order #

CCR# 39318

Project Name: Northeastern PP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816  
 Sampler(s): Kenneth McDonald

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

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Analytes				Sample Specific Notes	
							Mercury	dissolved Fe and Mn	TDS	Ra-226, Ra-228		
SP-1	2/27/2019	1550	G	GW	2		X		X			223109.1 - 223109.2
SP-2	2/27/2019	1515	G	GW	2		X		X			223110.1 - 223110.2
SP-4	2/27/2019	1620	G	GW	2		X		X			223111.1 - 223111.2
SP-5	2/27/2019	1645	G	GW	2		X		X			223112.1 - 223112.2
SP-10	2/27/2019	1420	G	GW	2		X		X			223113.1 - 223113.2
SP-11	2/27/2019	1445	G	GW	2		X		X			223114.1 - 223114.2
DUPPLICATE BAP	2/27/2019	1420	G	GW	2		X		X			223115.1 - 223115.2
EQUIPMENT BLANK BAP	2/27/2019	1640	G	W	1		X					223116

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

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

Special Instructions/QC Requirements & Comments:

Relinquished by: [Signature] Company: ENR Date/Time: 02/28/19 1555 Received by: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ Company: \_\_\_\_\_ Date/Time: \_\_\_\_\_ Received by: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ Company: \_\_\_\_\_ Date/Time: \_\_\_\_\_ Received in Laboratory by: [Signature] Date/Time: 2/28/19 15:55



SHREVEPORT CHEMICAL LABORATORY

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

## PROJECT RECEIPT FORM

Container Type					Delivery Type				
<input checked="" type="radio"/> Ice Chest	<input type="radio"/> Bag	<input type="radio"/> Action Pak	<input type="radio"/> PCB Mailer	<input type="radio"/> Bottle	<input type="radio"/> UPS	<input type="radio"/> FEDEX	<input type="radio"/> US Mail	<input checked="" type="radio"/> Walk in	<input type="radio"/> Shuttle
Other _____					Other _____				
Tracking # _____									

Client Bill Parker-Wirtz  
 Received By JD  
 Received Date 2/28/19  
 Open Date \_\_\_\_\_

Sample Matrix  
 DGA     PCB Oil     Water     Oil     Soil  
 Solid     Liquid     Other \_\_\_\_\_

Container Temp    Read 3  
Thermometer Serial #F04103  
 Correction Factor +1.2  
 Corrected Temp 4.2

Project I.D. 39318

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     NO
- Were samples labeled properly?     YES     NO
- Were correct containers used?     YES     NO
- Were the pH's of samples appropriately checked?     YES     NO
- Total number of sample containers    15

Was any corrective action taken?     NO    Person Contacted \_\_\_\_\_  
 Date & Time \_\_\_\_\_

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_





Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 4/15/2019**

**SP-1**

**Sample Number: 190788-001**                      **Date Collected: 02/27/2019 15:50**                      **Date Received: 3/5/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	42.7	mg/L		0.1	0.03	CRJ	03/21/2019 02:51	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.80	mg/L		0.2	0.04	CRJ	03/21/2019 02:51	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	87.1	mg/L		1	0.2	CRJ	03/21/2019 02:51	EPA 300.1-1997, Rev. 1.0

**SP-2**

**Sample Number: 190788-002**                      **Date Collected: 02/27/2019 15:15**                      **Date Received: 3/5/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	351	mg/L		1	0.3	CRJ	03/20/2019 23:48	EPA 300.1-1997, Rev. 1.0
Fluoride, F	2.68	mg/L		0.2	0.04	CRJ	03/21/2019 02:05	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	26.1	mg/L		1	0.2	CRJ	03/21/2019 02:05	EPA 300.1-1997, Rev. 1.0

**Sp-4**

**Sample Number: 190788-003**                      **Date Collected: 02/27/2019 16:20**                      **Date Received: 3/5/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	470	mg/L		1	0.3	CRJ	03/20/2019 23:25	EPA 300.1-1997, Rev. 1.0
Fluoride, F	3.26	mg/L		0.2	0.04	CRJ	03/21/2019 01:42	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	61.5	mg/L		1	0.2	CRJ	03/21/2019 01:42	EPA 300.1-1997, Rev. 1.0

**SP-5**

**Sample Number: 190788-004**                      **Date Collected: 02/27/2019 16:45**                      **Date Received: 3/5/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	739	mg/L		1	0.3	CRJ	03/20/2019 23:02	EPA 300.1-1997, Rev. 1.0
Fluoride, F	3.08	mg/L		0.2	0.04	CRJ	03/21/2019 00:33	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	1.6	mg/L		1	0.2	CRJ	03/21/2019 00:33	EPA 300.1-1997, Rev. 1.0

**SP-10**

Sample Number: **190788-005**

Date Collected: **02/27/2019 14:20**

Date Received: **3/5/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	1740	mg/L		2	0.6	CRJ	03/20/2019 22:39	EPA 300.1-1997, Rev. 1.0
Fluoride, F	5.59	mg/L		0.3	0.07	CRJ	03/21/2019 00:56	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	6.9	mg/L		2	0.3	CRJ	03/21/2019 00:56	EPA 300.1-1997, Rev. 1.0

**SP-11**

Sample Number: **190788-006**

Date Collected: **02/27/2019 14:45**

Date Received: **3/5/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	241	mg/L		1	0.3	CRJ	03/20/2019 21:30	EPA 300.1-1997, Rev. 1.0
Fluoride, F	3.44	mg/L		0.2	0.04	CRJ	03/20/2019 21:53	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	95.1	mg/L		1	0.2	CRJ	03/20/2019 21:53	EPA 300.1-1997, Rev. 1.0

**Duplicate BAP**

Sample Number: **190788-007**

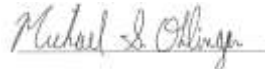
Date Collected: **02/27/2019 14:20**

Date Received: **3/5/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Chloride, Cl	1730	mg/L		5	2	CRJ	03/25/2019 16:26	EPA 300.1-1997, Rev. 1.0
Fluoride, F	5.73	mg/L		0.2	0.04	CRJ	03/20/2019 20:44	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	7.6	mg/L		1	0.2	CRJ	03/20/2019 20:44	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.



**Michael Ohlinger, Chemist**

Email [msohlinger@aep.com](mailto:msohlinger@aep.com)

Tel.

Fax 614-836-4168

Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**





**AEP WATER & WASTE SAMPLE RECEIPT FORM**

<u>Package Type</u>		<u>Delivery Type</u>			
<input checked="" type="radio"/> Cooler	Box    Bag    Envelope	PONY	UPS	<input checked="" type="radio"/> FedEx	USPS
		Other _____			
Plant/Customer <u>Northeastern</u>		Number of Plastic Containers: <u>7</u>			
Opened By <u>JWB</u>		Number of Glass Containers: <u>-</u>			
Date/Time <u>3/5/19 11:50Am</u>		Number of Mercury Containers: <u>-</u>			
Were all temperatures within 0-6°C? <input checked="" type="radio"/> Y / N or N/A Initial: <u>MSD</u> <input checked="" type="radio"/> on ice / no ice (IR Gun Ser# <u>181354432</u> , Expir. <u>06-12-20</u> ) - If No, specify each deviation: _____					
Was container in good condition? <input checked="" type="radio"/> Y / N Comments _____					
Was Chain of Custody received? <input checked="" type="radio"/> Y / N Comments _____					
Requested turnaround: <u>Route</u> If RUSH, who was notified? _____					
pH (15 min)	Cr <sup>+6</sup> (pres) (24 hr)	NO <sub>2</sub> or NO <sub>3</sub> (48 hr)	ortho-PO <sub>4</sub> (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/JWB 3/5/19

- 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# 190738 Comments: \_\_\_\_\_

Logged by MSD \_\_\_\_\_

Reviewed by MLK \_\_\_\_\_

\_\_\_\_\_

**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.



Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 4/15/2019**

**SP-1**  
**Sample Number: 190826-001**                      **Date Collected: 02/27/2019 15:50**                      **Date Received: 3/7/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.6	ug/L	J	1	0.2	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.7	ug/L	J	1	0.3	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Barium, Ba	168	ug/L		1	0.2	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.1	ug/L	U	0.5	0.1	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	2.72	ug/L		2	0.4	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.2	ug/L	U	0.5	0.2	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.2	ug/L	J	1	0.2	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	10	ug/L	J	20	4	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Selenium, Se	2.8	ug/L		2	0.3	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 1	ug/L	U	5	1	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Boron, B	0.200	mg/L		0.05	0.009	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	122	mg/L		0.2	0.03	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00641	mg/L		0.002	0.0001	CTK	04/05/2019 18:19	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.39	pCi/L	0.18	0.49	jls	4/2/2019	SW-846 9320-2014, Rev. 1.0
The LRB result (0.99 pCi/L) exceeds the critical value of 0.95 pCi/L.							
Radium-226	0.666	pCi/L	0.12	0.17	jls	3/26/2019	SW-846 9315-1986, Rev. 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.*

SP-2

Sample Number: 190826-002

Date Collected: 02/27/2019 15:15

Date Received: 3/7/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.39	ug/L		1	0.2	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.29	ug/L		1	0.3	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Barium, Ba	841	ug/L		1	0.2	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.1	ug/L	U	0.5	0.1	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	4.30	ug/L		2	0.4	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.2	ug/L	U	0.5	0.2	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.3	ug/L	J	1	0.2	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	25.8	ug/L		20	4	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Selenium, Se	3.7	ug/L		2	0.3	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 1	ug/L	U	5	1	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Boron, B	0.116	mg/L		0.05	0.009	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	94.0	mg/L		0.2	0.03	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0329	mg/L		0.002	0.0001	CTK	04/05/2019 18:24	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	3.65	pCi/L	0.19	0.49	jls	4/2/2019	SW-846 9320-2014, Rev. 1.0
The LRB result (0.99 pCi/L) exceeds the critical value of 0.95 pCi/L.							
Radium-226	2.11	pCi/L	0.22	0.14	jls	3/26/2019	SW-846 9315-1986, Rev. 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.*

Sp-4

Sample Number: 190826-003

Date Collected: 02/27/2019 16:20

Date Received: 3/7/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.3	ug/L	J	1	0.2	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1	ug/L	J	1	0.3	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Barium, Ba	276	ug/L		1	0.2	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.1	ug/L	U	0.5	0.1	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	5.71	ug/L		2	0.4	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.2	ug/L	U	0.5	0.2	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 4	ug/L	U	20	4	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.6	ug/L	J	2	0.3	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 1	ug/L	U	5	1	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Boron, B	0.370	mg/L		0.05	0.009	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	85.6	mg/L		0.2	0.03	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0602	mg/L		0.002	0.0001	CTK	04/05/2019 18:29	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.65	pCi/L	0.18	0.46	jls	4/2/2019	SW-846 9320-2014, Rev. 1.0
The LRB result (0.99 pCi/L) exceeds the critical value of 0.95 pCi/L.							
Radium-226	0.494	pCi/L	0.10	0.13	jls	3/26/2019	SW-846 9315-1986, Rev. 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.*

SP-5

Sample Number: 190826-004

Date Collected: 02/27/2019 16:45

Date Received: 3/7/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Arsenic, As	25.7	ug/L		1	0.3	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2130	ug/L		1	0.2	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.1	ug/L	U	0.5	0.1	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	2	ug/L	J	2	0.4	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.3	ug/L	J	0.5	0.2	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.7	ug/L	J	1	0.2	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 4	ug/L	U	20	4	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.3	ug/L	U	2	0.3	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 1	ug/L	U	5	1	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Boron, B	0.233	mg/L		0.05	0.009	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	72.8	mg/L		0.2	0.03	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.102	mg/L		0.002	0.0001	CTK	04/05/2019 18:34	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.472	pCi/L	0.22	0.54	jls	4/2/2019	SW-846 9320-2014,Rev. 1.0
The LRB result (0.99 pCi/L) exceeds the critical value of 0.95 pCi/L.							
Radium-226	6.23	pCi/L	0.35	0.12	jls	3/26/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the established range of 30-110%.

**\*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.**

SP-10

Sample Number: 190826-005

Date Collected: 02/27/2019 14:20

Date Received: 3/7/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	2	ug/L	J	2	0.4	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.48	ug/L		2	0.6	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Barium, Ba	5810	ug/L		2	0.4	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.4	ug/L	U	2	0.4	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1	ug/L	J	4	0.8	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.4	ug/L	U	1	0.4	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.4	ug/L	U	2	0.4	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 8	ug/L	U	40	8	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.6	ug/L	U	4	0.6	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 2	ug/L	U	10	2	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Boron, B	1.16	mg/L		0.1	0.02	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	92.6	mg/L		0.4	0.06	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.275	mg/L		0.004	0.0002	CTK	04/05/2019 18:39	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.25	pCi/L	0.14	0.43	jls	4/2/2019	SW-846 9320-2014, Rev. 1.0
The LRB result (0.99 pCi/L) exceeds the critical value of 0.95 pCi/L. The MSD recovery (58.84%) is outside the established range of 60-140%.							
Radium-226	14.1	pCi/L	0.55	0.12	jls	3/26/2019	SW-846 9315-1986, Rev. 0
The carrier recovery is outside the established range of 30-110%.							

**\*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.**



SP-11

Sample Number: 190826-006

Date Collected: 02/27/2019 14:45

Date Received: 3/7/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Arsenic, As	8.83	ug/L		1	0.3	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Barium, Ba	529	ug/L		1	0.2	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.1	ug/L	U	0.5	0.1	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.7	ug/L	J	2	0.4	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.720	ug/L		0.5	0.2	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.2	ug/L	J	1	0.2	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	6	ug/L	J	20	4	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.3	ug/L	U	2	0.3	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 1	ug/L	U	5	1	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Boron, B	0.375	mg/L		0.05	0.009	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	49.6	mg/L		0.2	0.03	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0580	mg/L		0.002	0.0001	CTK	04/05/2019 18:44	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.35	pCi/L	0.19	0.58	jls	4/2/2019	SW-846 9320-2014, Rev. 1.0
The LRB result (0.99 pCi/L) exceeds the critical value of 0.95 pCi/L.							
Radium-226	0.46	pCi/L	0.10	0.15	jls	3/26/2019	SW-846 9315-1986, Rev. 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.*

Duplicate BAP

Sample Number: 190826-007

Date Collected: 02/27/2019 14:20

Date Received: 3/7/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1	ug/L	J	2	0.4	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.20	ug/L		2	0.6	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Barium, Ba	5770	ug/L		2	0.4	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.4	ug/L	U	2	0.4	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1	ug/L	J	4	0.8	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.4	ug/L	U	1	0.4	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.7	ug/L	J	2	0.4	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 8	ug/L	U	40	8	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.6	ug/L	U	4	0.6	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 2	ug/L	U	10	2	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Boron, B	1.17	mg/L		0.1	0.02	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	91.9	mg/L		0.4	0.06	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.272	mg/L		0.004	0.0002	CTK	04/05/2019 18:49	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

Equipment Blank BAP

Sample Number: 190826-008

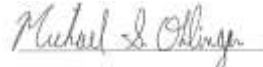
Date Collected: 02/27/2019 16:40

Date Received: 3/7/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Arsenic, As	< 0.3	ug/L	U	1	0.3	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Barium, Ba	0.7	ug/L	J	1	0.2	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.1	ug/L	U	0.5	0.1	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.5	ug/L	J	2	0.4	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.2	ug/L	U	0.5	0.2	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.2	ug/L	U	1	0.2	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 4	ug/L	U	20	4	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.3	ug/L	U	2	0.3	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 1	ug/L	U	5	1	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Boron, B	< 0.009	mg/L	U	0.05	0.009	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	0.06	mg/L	J	0.2	0.03	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4
Lithium, Li	< 0.0001	mg/L	U	0.002	0.0001	CTK	04/05/2019 18:54	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
 J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*



Michael Ohlinger, Chemist

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Fax 614-836-4168

Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

# Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

**Dolan Chemical Laboratory (DCL)**  
 4001 Bixby Road  
 Groveport, Ohio 43125  
**Contacts: Michael Ohlinger (614-836-4184)**  
**Dave Conover (614-836-4219)**

Project Name: Northeastern PP BAP CCR  
 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)

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Site Contact:				Date:	COC/Order #:	For Lab Use Only:
						250 mL bottle, pH<2, HNO3	Field-filter 250 mL bottle, then pH<2, HNO3	250 mL bottle, Cool, 0-6C	Three (six every 10th) L bottles, pH<2, HNO3			
SP-1	2/27/2019	1550	G	GW	4	B, Ca, Sb, As, Ba, Be, Se, TL	Dissolved B, Sb, As, Ba, Be, Ca, Cd, Cr, Co, Fe, K, Li, Mg, Mn, Mo, Na, Pb, Se, Sr, Ti	Fluoride, Sulfate	Ra-226, Ra-228			
SP-2	2/27/2019	1515	G	GW	4							
SP-4	2/27/2019	1620	G	GW	4							
SP-5	2/27/2019	1645	G	GW	4							
SP-10	2/27/2019	1420	G	GW	7							
SP-11	2/27/2019	1445	G	GW	4							
DUPLICATE BAP	2/27/2019	1420	G	GW	1							
EQUIPMENT BLANK BAP	2/27/2019	1640	G	GW	1							
						4	F4	1	4			

Preservation Used: 1 = Ice, 2 = HCl; 3 = H2SO4; 4 = HNO3; 5 = NaOH; 6 = Other; F = filter in field; \* Six 1L Bottles must be collected for Radium for every 10th sample.

Special Instructions/QC Requirements & Comments:

Relinquished by: <i>[Signature]</i>	Company: <i>LAGI</i>	Date/Time: 03/07/19 14:00	Received by: <i>[Signature]</i>	Date/Time: 03/07/19 11:40
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: <i>[Signature]</i>	Date/Time:

**AEP WATER & WASTE SAMPLE RECEIPT FORM**

Package Type			Delivery Type				
<input checked="" type="radio"/> Cooler	<input type="radio"/> Box	<input type="radio"/> Bag	<input type="radio"/> Envelope	<input type="radio"/> PONY	<input type="radio"/> UPS	<input type="radio"/> FedEx	<input type="radio"/> USPS
				Other _____			
Plant/Customer <u>North Eastern PP BAP car</u>				Number of Plastic Containers: <u>29</u>			
Opened By <u>Sussan</u>				Number of Glass Containers: <u>0</u>			
Date/Time <u>03/07/19 11:40</u>				Number of Mercury Containers: <u>0</u>			
Were all temperatures within 0-6°C? Y / N or <u>(N/A)</u> Initial: <u>MC-1C</u> on ice / <u>(no ice)</u> (IR Gun Ser# <u>18135443</u> Expir. <u>6-12-20</u> ) - If No, specify each deviation: _____							
Was container in good condition? <u>(Y)</u> / N Comments _____							
Was Chain of Custody received? <u>(Y)</u> / N Comments _____							
Requested turnaround: <u>Rollie</u> If RUSH, who was notified? _____							
pH (15 min)	Cr <sup>+6</sup> (pres) (24 hr)	NO <sub>2</sub> or NO <sub>3</sub> (48 hr)	ortho-PO <sub>4</sub> (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: MC-1C 03/07/19

- 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# 190826 Initial & Date & Time : \_\_\_\_\_

Comments: \_\_\_\_\_

Logged by SM \_\_\_\_\_

Reviewed by MSO \_\_\_\_\_

**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.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004

502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

<b>Report ID</b> : 40009		<b>Company:</b> SEP - Environmental (JP-W)			<b>Address:</b> 502 N. Allen Avenue			
<b>Date Received:</b> 06/24/2019		<b>Contact:</b> Jill Parker-Witt			Shreveport, LA 71101			
		<b>Phone:</b> (318) 673-3816			<b>Fax:</b> (318) 673-3960			
<b>AEP Sample ID</b> : 226451		<b>Collected Date:</b> 06/20/2019			<b>By:</b> KM			
<b>Cust Sample ID:</b> SP-1		<b>Location:</b> Northeastern PP CCR			<b>Matrix:</b> Water			
<b>Sample Desc.:</b>								
<b>Metals (226451)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Mercury	0.00001	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:15	J	LNM
<b>Water (226451)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Solids, Total Dissolved (TDS)	452	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD
<b>AEP Sample ID</b> : 226452		<b>Collected Date:</b> 06/20/2019			<b>By:</b> KM			
<b>Cust Sample ID:</b> SP-2		<b>Location:</b> Northeastern PP CCR			<b>Matrix:</b> Water			
<b>Sample Desc.:</b>								
<b>Metals (226452)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:25	U	LNM
<b>Water (226452)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Solids, Total Dissolved (TDS)	1044	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD
<b>AEP Sample ID</b> : 226453		<b>Collected Date:</b> 06/20/2019			<b>By:</b> KM			
<b>Cust Sample ID:</b> SP-4		<b>Location:</b> Northeastern PP CCR			<b>Matrix:</b> Water			
<b>Sample Desc.:</b>								
<b>Metals (226453)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Mercury	0.000007	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:28	J	LNM
<b>Water (226453)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Solids, Total Dissolved (TDS)	1128	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEP Analytical Chemistry Services.



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004

502 North Allen Ave.  
Shreveport, LA 71101  
Phone: (318) 673-3802  
Fax: (318) 673-3960

<b>Report ID</b> : 40009		<b>Company:</b> SEP - Environmental (JP-W)			<b>Address:</b> 502 N. Allen Avenue			
<b>Date Received:</b> 06/24/2019		<b>Contact:</b> Jill Parker-Witt			Shreveport, LA 71101			
		<b>Phone:</b> (318) 673-3816			<b>Fax:</b> (318) 673-3960			
<b>AEP Sample ID</b> : 226454		<b>Collected Date:</b> 06/20/2019			<b>By:</b> KM			
<b>Cust Sample ID:</b> SP-5		<b>Location:</b> Northeastern PP CCR			<b>Matrix:</b> Water			
<b>Sample Desc.:</b>								
<b>Metals (226454)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Mercury	0.000008	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:32	J	LNM
<b>Water (226454)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Solids, Total Dissolved (TDS)	1428	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD
<b>AEP Sample ID</b> : 226455		<b>Collected Date:</b> 06/20/2019			<b>By:</b> KM			
<b>Cust Sample ID:</b> SP-10		<b>Location:</b> Northeastern PP CCR			<b>Matrix:</b> Water			
<b>Sample Desc.:</b>								
<b>Metals (226455)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Mercury	0.00001	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:35	J	LNM
<b>Water (226455)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Solids, Total Dissolved (TDS)	3512	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD
<b>AEP Sample ID</b> : 226456		<b>Collected Date:</b> 06/20/2019			<b>By:</b> KM			
<b>Cust Sample ID:</b> SP-11		<b>Location:</b> Northeastern PP CCR			<b>Matrix:</b> Water			
<b>Sample Desc.:</b>								
<b>Metals (226456)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Mercury	0.00001	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:38	J	LNM
<b>Water (226456)</b>								
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Det. Limit</b>	<b>Dil./Conc.</b>	<b>Method</b>	<b>Analysis Date/Time</b>	<b>Codes</b>	<b>Tech</b>
Solids, Total Dissolved (TDS)	1000	mg/L	2	1	SM 2540 C-2011	06/24/2019 17:53		JTD

The results apply only to the samples as received in the laboratory. The analyses used to obtain the results meet NELAC requirement, if applicable. No part of this work may be altered in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - without written permission of AEP Analytical Chemistry Services.





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40009	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 06/24/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 226457	<b>Collected Date:</b> 06/20/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> Duplicate BAP	<b>Location:</b> Northeastern PP CCR	<b>Matrix:</b> Water
<b>Sample Desc.:</b>		

Metals (226457)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	0.000007	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:41	J	LNM

Water (226457)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Solids, Total Dissolved (TDS)	466	mg/L	2	1	SM 2540 C-2011	06/26/2019 13:56		JTD

<b>AEP Sample ID</b> : 226458	<b>Collected Date:</b> 06/20/2019	<b>By:</b> KM
<b>Cust Sample ID:</b> Equipment Blank BAP	<b>Location:</b> Northeastern PP CCR	<b>Matrix:</b> Water
<b>Sample Desc.:</b>		

Metals (226458)								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	06/27/2019 16:44	U	LNM

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*	%			
6/27/2019	Mercury	226449.1	<0.00000	0.001	0.00096	96.0	0.001	0.0009542	95.4		0.4	LNM
6/24/2019	Solids, Total Dissolved (TDS)		<2	100.6	96	95.4	1022	1010	98.8		4.6	JTD
6/26/2019	Solids, Total Dissolved (TDS)	226457	<2	100.6	92	91.5	1000	1002	100.2		1.7	JTD

**Code Code Description**

- J Concentration estimated. Analyte was detected between the Method Detection Limit (MDL) and Minimum Quantitation Limit (MQL).
- U Analyte concentration below MDL.

\_\_\_\_\_  
 Quality Assurance Officer

17-Jul-19  
 Report Date

# Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

**Shreveport Chemical Laboratory (SCL)**  
 502 N. Allen Ave.  
 Shreveport, LA 71101  
 Jonathan Barnhill (318-673-3803)  
 Contacts: John Davis (318-673-3811)

Site Contact:

Date:

For Lab Use Only:  
 CCR/Order #: **DOC #**  
**40009**

*RS*  
*06-24-19*

Project Name: Northeastern PP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816  
 Sampler(s): Kenneth McDonald

Analysis Turnaround Time (In Calendar Days)  
 Need Results by July 12

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Analytes				Sample Specific Notes	
							Mercury	Field-filter 500 mL bottle, then pH<2, HNO3	250 mL bottle, Cool, 0-6C	Three (six every 10th) L bottles, pH<2, HNO3		
SP-1	6/20/2019	1620	G	GW	2		X		X			226451.1 - 226451.2
SP-2	6/20/2019	1555	G	GW	2		X		X			226452.1 - 226452.2
SP-4	6/20/2019	1650	G	GW	2		X		X			226453.1 - 226453.2
SP-5	6/20/2019	1715	G	GW	2		X		X			226454.1 - 226454.2
SP-10	6/20/2019	1515	G	GW	2		X		X			226455.1 - 226455.2
SP-11	6/20/2019	1535	G	GW	2		X		X			226456.1 - 226456.2
DUPLICATE BAP	6/20/2019	1620	G	GW	2		X		X			226457.1 - 226457.2
EQUIPMENT BLANK BAP	6/20/2019	1725	G	W	1		X					226458

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

Special Instructions/QC Requirements & Comments:

**\*\*\*\* NEED RESULTS BY JULY 12**

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
<i>Hand</i>	<i>Carroll</i>	<i>06/24/19 1008</i>		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
			<i>Howie Johnson</i>	<i>06/24/19 10:15</i>



SHREVEPORT CHEMICAL LABORATORY

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

## PROJECT RECEIPT FORM

Container Type				Delivery Type			
<input checked="" type="radio"/> Ice Chest	<input type="radio"/> Bag	<input type="radio"/> Action Pak	<input type="radio"/> PCB Mailer	<input type="radio"/> UPS	<input type="radio"/> FEDEX	<input type="radio"/> US Mail	<input checked="" type="radio"/> Walk in
Other _____				Other _____			
Tracking # _____							

Client Jill Parker - Witt  
 Received By Roseella Johnson  
 Received Date 06-24-2019  
 Open Date 06-24-2019

Sample Matrix  
 DGA     PCB Oil     Water     Oil     Soil  
 Solid     Liquid     Other \_\_\_\_\_

Container Temp    Read 1  
Thermometer Serial #F04103  
 Correction Factor +1.2  
 Corrected Temp 2.2

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     NO \_\_\_\_\_

Were samples labeled properly?     YES     NO \_\_\_\_\_

Were correct containers used?     YES     NO \_\_\_\_\_

Were the pH's of samples appropriately checked?     YES     NO \_\_\_\_\_

Total number of sample containers    15

Was any corrective action taken?     NO    Person Contacted \_\_\_\_\_  
 Date & Time \_\_\_\_\_

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 7/12/2019**

**SP-1**

**Sample Number: 192190-001**

**Date Collected: 06/20/2019 16:20**

**Date Received: 6/25/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.198	mg/L		0.1	0.02	DAM	07/09/2019 16:23	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	126	mg/L		0.3	0.04	DAM	07/09/2019 16:23	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.03	mg/L	J	0.03	0.009	DAM	07/09/2019 16:23	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.93	ug/L		0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.44	ug/L		0.5	0.2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Barium, Ba	242	ug/L		0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.2	ug/L	J	0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.1	ug/L	J	0.2	0.05	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.7	ug/L	J	1	0.2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	5.54	ug/L		0.2	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.650	ug/L		0.5	0.1	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	12.1	ug/L		10	2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Selenium, Se	9.9	ug/L		1	0.2	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 22:01	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	25.2	mg/L		0.04	0.01	CRJ	06/27/2019 00:44	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.77	mg/L		0.06	0.01	CRJ	06/27/2019 00:44	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	61.4	mg/L		0.4	0.06	CRJ	06/27/2019 00:44	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.033	pCi/L	0.18	0.52	ttp	7/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	0.712	pCi/L	0.12	0.14	sdw	7/9/2019	SW-846 9315-1986, Rev. 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.*

SP-2

Sample Number: 192190-002

Date Collected: 06/20/2019 15:55

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.109	mg/L		0.1	0.02	DAM	07/09/2019 16:26	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	58.2	mg/L		0.3	0.04	DAM	07/09/2019 16:26	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.062	mg/L		0.03	0.009	DAM	07/09/2019 16:26	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	1.34	ug/L		0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.43	ug/L		0.5	0.2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Barium, Ba	868	ug/L		0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.1	ug/L	J	0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.09	ug/L	J	0.2	0.05	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.9	ug/L	J	1	0.2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.434	ug/L		0.2	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.4	ug/L	J	0.5	0.1	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	25.0	ug/L		10	2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Selenium, Se	2.9	ug/L		1	0.2	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:33	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	357	mg/L		1	0.3	CRJ	06/26/2019 20:31	EPA 300.1-1997, Rev. 1.0
Fluoride, F	2.69	mg/L		0.2	0.04	CRJ	06/27/2019 01:07	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	28.5	mg/L		1	0.2	CRJ	06/27/2019 01:07	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	4.47	pCi/L	0.19	0.44	ttp	7/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	3.47	pCi/L	0.25	0.12	sdw	7/9/2019	SW-846 9315-1986,Rev. 0

The carrier recovery (125.22%) is outside the established range of 30-110%.

*\*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.*

Sp-4

Sample Number: 192190-003

Date Collected: 06/20/2019 16:50

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.325	mg/L		0.1	0.02	DAM	07/09/2019 16:53	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	56.4	mg/L		0.3	0.04	DAM	07/09/2019 16:53	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.068	mg/L		0.03	0.009	DAM	07/09/2019 16:53	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.3	ug/L	J	0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.83	ug/L		0.5	0.2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Barium, Ba	337	ug/L		0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
The MS/MSD is outside the acceptable range of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.07	ug/L	J	0.2	0.05	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.06	ug/L		1	0.2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.388	ug/L		0.2	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Lead, Pb	1.07	ug/L		0.5	0.1	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	2	ug/L	J	10	2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.4	ug/L	J	1	0.2	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:38	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	450	mg/L		1	0.3	CRJ	06/26/2019 20:54	EPA 300.1-1997, Rev. 1.0
Fluoride, F	3.24	mg/L		0.2	0.04	CRJ	06/27/2019 01:52	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	58.0	mg/L		1	0.2	CRJ	06/27/2019 01:52	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.931	pCi/L	0.19	0.51	ttp	7/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	0.82	pCi/L	0.12	0.11	sdw	7/9/2019	SW-846 9315-1986, Rev. 0

The carrier recovery (124.33%) is outside the established range of 30-110%.

*\*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.*



SP-5

Sample Number: 192190-004

Date Collected: 06/20/2019 17:15

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.202	mg/L		0.1	0.02	DAM	07/09/2019 16:57	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	48.5	mg/L		0.3	0.04	DAM	07/09/2019 16:57	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.111	mg/L		0.03	0.009	DAM	07/09/2019 16:57	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Arsenic, As	59.9	ug/L		0.5	0.2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2410	ug/L		0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.05	ug/L	U	0.2	0.05	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.8	ug/L	J	1	0.2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.598	ug/L		0.2	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.701	ug/L		0.5	0.1	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 2	ug/L	U	10	2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.2	ug/L	U	1	0.2	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:44	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	675	mg/L		1	0.3	CRJ	06/26/2019 21:17	EPA 300.1-1997, Rev. 1.0
Fluoride, F	3.06	mg/L		0.2	0.04	CRJ	06/27/2019 02:15	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	0.9	mg/L	J	1	0.2	CRJ	06/27/2019 02:15	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.967	pCi/L	0.23	0.54	ttp	7/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	7.01	pCi/L	0.54	0.23	sdw	7/9/2019	SW-846 9315-1986, Rev. 0

The carrier recovery (111.55%) is outside the established range of 30-110%.

*\*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.*



SP-10

Sample Number: 192190-005

Date Collected: 06/20/2019 15:15

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.916	mg/L		0.1	0.02	DAM	07/09/2019 17:01	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	50.3	mg/L		0.3	0.04	DAM	07/09/2019 17:01	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.290	mg/L		0.03	0.009	DAM	07/09/2019 17:01	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.65	ug/L		0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.66	ug/L		0.5	0.2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3880	ug/L		0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.05	ug/L	U	0.2	0.05	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	8.76	ug/L		1	0.2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.743	ug/L		0.2	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.3	ug/L	J	0.5	0.1	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	9	ug/L	J	10	2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.2	ug/L	U	1	0.2	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:49	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	1780	mg/L		5	2	CRJ	06/26/2019 22:03	EPA 300.1-1997, Rev. 1.0
Fluoride, F	6.40	mg/L		0.3	0.07	CRJ	06/27/2019 03:01	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	30.3	mg/L		2	0.3	CRJ	06/27/2019 03:01	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.4	pCi/L	0.14	0.39	ttp	7/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	25	pCi/L	1.1	0.25	sdw	7/9/2019	SW-846 9315-1986, Rev. 0

The carrier recovery (145.83%) is outside the established range of 30-110%.

*\*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.*

SP-11

Sample Number: 192190-006

Date Collected: 06/20/2019 15:35

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.550	mg/L		0.1	0.02	DAM	07/09/2019 17:13	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	65.6	mg/L		0.3	0.04	DAM	07/09/2019 17:13	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.047	mg/L		0.03	0.009	DAM	07/09/2019 17:13	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.3	ug/L	J	0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Arsenic, As	4.18	ug/L		0.5	0.2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Barium, Ba	169	ug/L		0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.1	ug/L	U	0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.06	ug/L	J	0.2	0.05	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	6.71	ug/L		1	0.2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.948	ug/L		0.2	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.719	ug/L		0.5	0.1	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 2	ug/L	U	10	2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.3	ug/L	J	1	0.2	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:54	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	137	mg/L		1	0.3	CRJ	06/26/2019 22:26	EPA 300.1-1997, Rev. 1.0
Fluoride, F	1.67	mg/L		0.2	0.04	CRJ	06/27/2019 03:24	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	203	mg/L		10	2	CRJ	06/26/2019 22:26	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.42	pCi/L	0.18	0.61	ttp	7/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	0.39	pCi/L	0.11	0.20	sdw	7/9/2019	SW-846 9315-1986,Rev. 0

The carrier recovery (147.78%) is outside the established range of 30-110%.

*\*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.*

Duplicate BAP

Sample Number: 192190-007

Date Collected: 06/20/2019 16:20

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	0.208	mg/L		0.1	0.02	DAM	07/09/2019 17:42	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	119	mg/L		0.3	0.04	DAM	07/09/2019 17:42	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.034	mg/L		0.03	0.009	DAM	07/09/2019 17:42	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	0.91	ug/L		0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.31	ug/L		0.5	0.2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Barium, Ba	216	ug/L		0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.2	ug/L	J	0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.1	ug/L	J	0.2	0.05	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.7	ug/L	J	1	0.2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	4.87	ug/L		0.2	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.600	ug/L		0.5	0.1	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	11.1	ug/L		10	2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Selenium, Se	8.7	ug/L		1	0.2	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.5	ug/L	U	2	0.5	GES	06/28/2019 23:59	EPA 200.8-1994, Rev. 5.4
Chloride, Cl	28.9	mg/L		0.1	0.03	CRJ	06/26/2019 19:23	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.82	mg/L		0.2	0.04	CRJ	06/26/2019 19:23	EPA 300.1-1997, Rev. 1.0
Sulfate, SO4	63.6	mg/L		1	0.2	CRJ	06/26/2019 19:23	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

Equipment Blank BAP

Sample Number: 192190-008

Date Collected: 06/20/2019 17:25

Date Received: 6/25/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Boron, B	< 0.02	mg/L	U	0.1	0.02	DAM	07/09/2019 17:46	EPA 200.7-1994, Rev. 4.4
Calcium, Ca	0.07	mg/L	J	0.3	0.04	DAM	07/09/2019 17:46	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.03	mg/L	J	0.03	0.009	DAM	07/09/2019 17:46	EPA 200.7-1994, Rev. 4.4
Antimony, Sb	< 0.02	ug/L	U	0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Arsenic, As	< 0.03	ug/L	U	0.1	0.03	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Barium, Ba	0.41	ug/L		0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.02	ug/L	U	0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.01	ug/L	U	0.05	0.01	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.07	ug/L	J	0.2	0.04	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.02	ug/L	U	0.05	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.02	ug/L	U	0.1	0.02	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 0.4	ug/L	U	2	0.4	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Selenium, Se	< 0.03	ug/L	U	0.2	0.03	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	GES	06/29/2019 00:04	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit  
 J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*



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**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

# Chain of Custody Record

**Doian Chemical Laboratory (DCL)**  
 4001 Bixby Road  
 Groveport, Ohio 43125  
 Michael Ohlinger (614-836-4184)  
 Dave Conover (614-836-4219)

Program: Coal Combustion Residuals (CCR)

For Lab Use Only:

Project Name: Northeastern PP BAP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816  
 Samplers(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)  
 • **Need Results by July 12**

Site Contact: \_\_\_\_\_ Date: \_\_\_\_\_

COC/Order #: **192190**

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO3	Field-filter 250 mL bottle, then pH<2, HNO3	250 mL bottle, Cool, 0-6C	Three (six every 10th) L bottles, pH<2, HNO3	Sample Specific Notes:
							B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li, Mo, Se, TL	Dissolved B, Sb, As, Ba, Be, Ca, Cd, Cr, Co, Fe, K, Li, Mg, Mn, Mo, Na, Pb, Se, Sr, Ti	Fluoride, Chloride, Sulfate	Ra-226, Ra-228	
SP-1	6/20/2019	1620	G	GW	8		X			X	
SP-2	6/20/2019	1555	G	GW	4		X			X	
SP-4	6/20/2019	1650	G	GW	4		X			X	
SP-5	6/20/2019	1715	G	GW	4		X			X	
SP-10	6/20/2019	1515	G	GW	4		X			X	
SP-11	6/20/2019	1535	G	GW	4		X			X	
DUPLICATE BAP	6/20/2019	1620	G	GW	1		X				
EQUIPMENT BLANK BAP	6/20/2019	1725	G	GW	1		X				

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

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

Special Instructions/QC Requirements & Comments:

**\*\*\*\*\* NEED RESULTS BY JULY 12**

Relinquished by: *[Signature]* Company: *Epolt* Date/Time: *6/24/19 1400* Received by: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ Company: \_\_\_\_\_ Date/Time: \_\_\_\_\_ Received by: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ Company: \_\_\_\_\_ Date/Time: \_\_\_\_\_ Received in Laboratory by: *[Signature]* Date/Time: *6-25-19 10:30*

# Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

**Dolan Chemical Laboratory (DCL)**  
 4001 Bixby Road  
 Groveport, Ohio 43125  
 Michael Ohlinger (614-836-4184)  
 Dave Conover (614-836-4219)

Site Contact: \_\_\_\_\_ Date: \_\_\_\_\_

For Lab Use Only:  
 COC/Order #: \_\_\_\_\_

Project Name: Northeastern PP BAP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816

Analysis Turnaround Time (in Calendar Days)  
 Need Results by July 12

Sampler(s): Kenny McDonald

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO3	Field-filter 250 mL bottle, then pH<2, HNO3	250 mL bottle, Cool, 0-6C	Three (six every 10th*) L bottles, pH<2, HNO3	Sample Specific Notes:
SP-1	6/20/2019	1620	G	GW	1		Boron, Calcium	Dissolved B, Sb, As, Ba, Be, Ca, Cd, Cr, Co, Fe, K, Li, Mg, Mn, Mo, Na, Pb, Se, Sr, Tl	Fluoride, Chloride, Sulfate	Ra-226, Ra-228	
SP-2	6/20/2019	1555	G	GW	1				X		
SP-4	6/20/2019	1650	G	GW	1				X		
SP-5	6/20/2019	1715	G	GW	1				X		
SP-10	6/20/2019	1515	G	GW	1				X		
SP-11	6/20/2019	1535	G	GW	1				X		
DUPLICATE BAP	6/20/2019	1620	G	GW	1				X		

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

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

Special Instructions/QC Requirements & Comments:

\*\*\*\*\* NEED RESULTS BY JULY 12

Relinquished by: Kenn Company: FAGIL Date/Time: 06/24/19 1400 Received by: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ Company: \_\_\_\_\_ Date/Time: \_\_\_\_\_ Received by: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ Company: \_\_\_\_\_ Date/Time: \_\_\_\_\_ Received in Laboratory by: C. He. Se Date/Time: 6-25-19 10:30



# WATER & WASTE SAMPLE RECEIPT FORM

Package Type				Delivery Type			
Cooler	Box	Bag	Envelope	PONY	UPS	FedEX	USPS
Other _____				Other _____			
Plant/Customer <u>Northeastern</u>				Number of Plastic Containers: <u>33</u>			
Opened By <u>JAB / MK</u>				Number of Glass Containers: _____			
Date/Time <u>6-25-19 10:30</u>				Number of Mercury Containers: _____			
Were all temperatures within 0-6°C? Y / N or N/A Initial: <u>SM</u> on ice / no ice				# (IR Gun Ser# <u>181775</u> + <u>2</u> , Expir. <u>10-18-20</u> ) - If No, specify each deviation: _____			
Was container in good condition? <u>Y</u> / N Comments _____				Was Chain of Custody received? <u>Y</u> / N Comments _____			
Requested turnaround: <u>1 week</u> If RUSH, who was notified? _____				pH (15 min)      Cr <sup>6+</sup> (pres) (24 hr)      NO <sub>2</sub> or NO <sub>3</sub> (48 hr)      ortho-PO <sub>4</sub> (48 hr)      Hg-diss (pres) (48 hr)			
Was COC filled out properly? <u>Y</u> / N Comments _____				Were samples labeled properly? <u>Y</u> / N Comments _____			
Were correct containers used? <u>Y</u> / N Comments _____				Was pH checked & Color Coding done? <u>Y</u> / N or N/A Initial & Date: <u>JAB, MK 6-25-19</u>			
- Was Add'l Preservative needed? <u>Y</u> / N If Yes: By whom & when: _____ (See Prep Book)				Is sample filtration requested? <u>Y</u> / N Comments _____ (See Prep Book)			
Was the customer contacted? If Yes: Person Contacted: _____				Lab ID# <u>192190</u> Initial & Date & Time: _____			
Logged by <u>SM</u> Comments: _____				Reviewed by <u>JAB</u> _____			

**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.





Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 10/10/2019**

**SP-1**

**Sample Number: 192952-001**

**Date Collected: 08/26/2019 16:50**

**Date Received: 9/4/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.43	ug/L		0.1	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.73	ug/L		0.1	0.03	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Barium, Ba	160	ug/L		0.2	0.05	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.08	ug/L	J	0.1	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.09	ug/L		0.05	0.01	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.49	ug/L		0.2	0.04	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.481	ug/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.835	ug/L		0.2	0.05	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	5.86	ug/L		2	0.4	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Selenium, Se	3.4	ug/L		0.2	0.03	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.1	ug/L	J	0.5	0.1	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Boron, B	0.124	mg/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	120	mg/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00285	mg/L		0.0002	0.00005	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.41	pCi/L	0.16	0.47	ttp	9/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	1.34	pCi/L	0.20	0.18	sdw	9/10/2019	SW-846 9315-1986, Rev. 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.*

SP-2

Sample Number: 192952-002

Date Collected: 08/26/2019 16:40

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.22	ug/L		0.1	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.53	ug/L		0.1	0.03	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Barium, Ba	1220	ug/L		1	0.2	KAN	09/23/2019 16:11	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.07	ug/L	J	0.1	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.05	ug/L		0.05	0.01	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.701	ug/L		0.2	0.04	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.568	ug/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.334	ug/L		0.2	0.05	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	22.3	ug/L		2	0.4	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Selenium, Se	3.7	ug/L		0.2	0.03	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.1	ug/L	J	0.5	0.1	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Boron, B	0.173	mg/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	211	mg/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0582	mg/L		0.0002	0.00005	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.62	pCi/L	0.22	0.52	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	3.1	pCi/L	0.26	0.13	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

Sp-4

Sample Number: 192952-003

Date Collected: 08/26/2019 17:05

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.25	ug/L		0.1	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.64	ug/L		0.1	0.03	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Barium, Ba	359	ug/L		0.2	0.05	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
The MS/MSD is outside the acceptable limit of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Beryllium, Be	0.101	ug/L		0.1	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.05	ug/L		0.05	0.01	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.01	ug/L		0.2	0.04	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.07	ug/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.596	ug/L		0.2	0.05	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	2	ug/L	J	2	0.4	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.6	ug/L		0.2	0.03	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Boron, B	0.365	mg/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	182	mg/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
The MS is outside the acceptable limit of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Lithium, Li	0.0554	mg/L		0.0002	0.00005	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.23	pCi/L	0.18	0.52	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	1.01	pCi/L	0.16	0.18	sdw	9/10/2019	SW-846 9315-1986,Rev. 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.*

SP-5R

Sample Number: 192952-004

Date Collected: 08/26/2019 17:20

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.06	ug/L	J	0.1	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Arsenic, As	49.3	ug/L		0.1	0.03	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2340	ug/L		1	0.2	KAN	09/23/2019 16:21	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.06	ug/L	J	0.1	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.02	ug/L	J	0.05	0.01	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.335	ug/L		0.2	0.04	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.485	ug/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.545	ug/L		0.2	0.05	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	1	ug/L	J	2	0.4	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.1	ug/L	J	0.2	0.03	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Boron, B	0.220	mg/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	128	mg/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0928	mg/L		0.0002	0.00005	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.99	pCi/L	0.20	0.41	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	5.57	pCi/L	0.36	0.15	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

SP-10

Sample Number: 192952-005

Date Collected: 08/26/2019 16:22

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.61	ug/L		0.1	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.00	ug/L		0.1	0.03	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3060	ug/L		1	0.2	KAN	09/23/2019 16:26	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.08	ug/L	J	0.1	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.03	ug/L	J	0.05	0.01	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.61	ug/L		0.2	0.04	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.06	ug/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.449	ug/L		0.2	0.05	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	8.22	ug/L		2	0.4	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.4	ug/L		0.2	0.03	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Boron, B	1.03	mg/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	216	mg/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.241	mg/L		0.0002	0.00005	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.17	pCi/L	0.13	0.38	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	6.94	pCi/L	0.39	0.14	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The RPD between the sample and duplicate result exceed 25%. The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

SP-11

Sample Number: 192952-006

Date Collected: 08/26/2019 16:35

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.37	ug/L		0.1	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Arsenic, As	6.30	ug/L		0.1	0.03	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Barium, Ba	492	ug/L		0.2	0.05	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.04	ug/L	J	0.1	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.13	ug/L		0.05	0.01	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.47	ug/L		0.2	0.04	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	2.73	ug/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.764	ug/L		0.2	0.05	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	5.70	ug/L		2	0.4	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.8	ug/L		0.2	0.03	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Boron, B	0.304	mg/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	139	mg/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0337	mg/L		0.0002	0.00005	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.583	pCi/L	0.15	0.48	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	1.04	pCi/L	0.16	0.16	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

Duplicate BAP

Sample Number: 192952-007

Date Collected: 08/26/2019 16:22

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.38	ug/L		0.1	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Arsenic, As	2.93	ug/L		0.1	0.03	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3190	ug/L		1	0.2	KAN	09/23/2019 18:14	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.04	ug/L	J	0.1	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.01	ug/L	J	0.05	0.01	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.836	ug/L		0.2	0.04	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.369	ug/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.1	ug/L	J	0.2	0.05	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	4.01	ug/L		2	0.4	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.1	ug/L	J	0.2	0.03	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Boron, B	1.06	mg/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	213	mg/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.249	mg/L		0.0002	0.00005	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*



Equipment Blank

Sample Number: 192952-008

Date Collected: 08/26/2019 17:00

Date Received: 9/4/2019

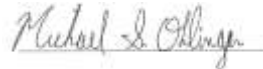
Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.02	ug/L	U	0.1	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Arsenic, As	< 0.03	ug/L	U	0.1	0.03	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Barium, Ba	0.26	ug/L		0.2	0.05	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.02	ug/L	U	0.1	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.01	ug/L	U	0.05	0.01	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.04	ug/L	J	0.2	0.04	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.02	ug/L	U	0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.05	ug/L	U	0.2	0.05	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 0.4	ug/L	U	2	0.4	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.03	ug/L	J	0.2	0.03	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Boron, B	0.087	mg/L		0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	0.03	mg/L	J	0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00009	mg/L	J	0.0002	0.00005	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

BAP CCR



**Michael Ohlinger, Chemist**

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Fax 614-836-4168 Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

**Dolan Chemical Laboratory (DCL)**

4001 Bixby Road  
 Groveport, Ohio 43125  
 Michael Ohlinger (614-836-4184)  
 Dave Conover (614-836-4219)

**Chain of Custody Record**

Program: Coal Combustion Residuals (CCR)

Site Contact:

Date:

COC/Order #:

For Lab Use Only:

Project Name: Northeastern PP BAP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816

Analysis Turnaround Time (in Calendar Days)  
**RESULTS DUE OCTOBER 12**

192952

Sampler(s): Kenny McDonald/Matt Hamilton

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO3	Field-filter 250 mL bottle, then pH<2, HNO3	250 mL bottle, Cool 0-6C	Three (six every 10hr) L bottles, pH<2, HNO3	Ra-226, Ra-228	Sample Specific Notes:	

SP-1	8/26/2019	1650	G	GW	4		X			X			
SP-2	8/26/2019	1640	G	GW	4		X			X			
SP-4	8/26/2019	1705	G	GW	4		X			X			
SP-5R	8/26/2019	1720	G	GW	4		X			X			
SP-10	8/26/2019	1622	G	GW	7		X			X			
SP-11	8/26/2019	1635	G	GW	4		X			X			
DUPLICATE BAP	8/26/2019	1622	G	GW	1		X						
EQUIPMENT BLANK BAP	8/26/2019	1700	G	GW	1		X						
Preservation Used: 1=Ica, 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:

**\*\*\*\*\* RESULTS DUE OCTOBER 12**

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
<i>[Signature]</i>	Envi	08/30/19 1900	<i>[Signature]</i>	
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
			<i>[Signature]</i>	
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
			<i>[Signature]</i>	11:50 AM

# AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type				Delivery Type					
<input checked="" type="radio"/> Cooler	<input type="radio"/> Box	<input type="radio"/> Bag	<input type="radio"/> Envelope	<input type="radio"/> PONY	<input type="radio"/> UPS	<input checked="" type="radio"/> FedEx	<input type="radio"/> USPS		
Other _____				Other _____					
Plant/Customer <u>Northwestern</u>				Number of Plastic Containers: <u>30</u>					
Opened By <u>M30</u>				Number of Glass Containers: <u>-</u>					
Date/Time <u>9/4/19 11:50 AM</u>				Number of Mercury Containers: <u>-</u>					
Were all temperatures within 0-6°C? Y/N or <u>N/A</u> Initial: _____ on ice / <u>no ice</u>									
#2 (IR Gun Ser# <u>181354432</u> , Expir. <u>06-12-20</u> ) - If No, specify each deviation: _____									
Was container in good condition? <u>Y</u> /N Comments _____									
Was Chain of Custody received? <u>Y</u> /N Comments _____									
Requested turnaround: <u>10/12/19</u> If RUSH, who was notified? _____									
pH (15 min)		Cr <sup>6+</sup> (pres) (24 hr)		NO <sub>2</sub> or NO <sub>3</sub> (48 hr)		ortho-PO <sub>4</sub> (48 hr)		Hg-diss (pres) (48 hr)	
Was COC filled out properly? <u>Y</u> /N Comments _____									
Were samples labeled properly? Y/ <u>N</u> Comments <u>no date time of collection</u>									
Were correct containers used? <u>Y</u> /N Comments _____									
Was pH checked & Color Coding done? <u>Y</u> /N or N/A Initial & Date <u>MGK SWB</u>									
- Was Add'l Preservative needed? Y/ <u>N</u> If Yes: By whom & when: _____ (See Prep Book)									
Is sample filtration requested? Y/ <u>N</u> Comments _____ (See Prep Book)									
Was the customer contacted? If Yes: Person Contacted _____									
Lab ID# <u>192952</u>				Initial & Date & Time: _____					
Logged by <u>M30</u> Comments <u>COC said "SP-SR" bottle labels say "SP-5"</u>									
Reviewed by <u>SM</u>									

**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



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 228531	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-1	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228531)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 12:59	U	LMN

<b>Water (228531)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	9	mg/L	0.219	1	EPA 300.0	09/01/2019 11:12		GB
Fluoride	0.525	mg/L	0.083	1	EPA 300.0	09/01/2019 11:12	J	GB
Solids, Total Dissolved (TDS)	438	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	48	mg/L	0.140	1	EPA 300.0	09/01/2019 11:12		GB

<b>AEP Sample ID</b> : 228532	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-2	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228532)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 13:02	U	LMN

<b>Water (228532)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	1072	mg/L	0.219	1:10	EPA 300.0	09/01/2019 14:00		GB
Fluoride	2.685	mg/L	0.083	1	EPA 300.0	09/01/2019 13:41		GB
Solids, Total Dissolved (TDS)	2246	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	14	mg/L	0.140	1	EPA 300.0	09/01/2019 13:41		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 228533	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-4	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228533)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:29	U	LMN

<b>Water (228533)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	458	mg/L	0.219	1:10	EPA 300.0	09/01/2019 15:15		GB
Fluoride	2.990	mg/L	0.083	1	EPA 300.0	09/01/2019 14:56		GB
Solids, Total Dissolved (TDS)	1170	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	61	mg/L	0.140	1	EPA 300.0	09/01/2019 14:56		GB

<b>AEP Sample ID</b> : 228534	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-5	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228534)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:32	U	LMN

<b>Water (228534)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	697	mg/L	0.219	1:10	EPA 300.0	09/01/2019 15:53		GB
Fluoride	2.789	mg/L	0.083	1	EPA 300.0	09/01/2019 15:34		GB
Solids, Total Dissolved (TDS)	1450	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	3	mg/L	0.140	1	EPA 300.0	09/01/2019 15:34		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
 502 North Allen Ave.  
 Shreveport, LA 71101  
 Phone: (318) 673-3802  
 Fax: (318) 673-3960

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 228535	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-10	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228535)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:35	U	LNM

<b>Water (228535)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	1939	mg/L	0.219	1:10	EPA 300.0	09/01/2019 16:30		GB
Fluoride	4.874	mg/L	0.083	1:10	EPA 300.0	09/01/2019 16:30		GB
Solids, Total Dissolved (TDS)	3446	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	29	mg/L	0.140	1	EPA 300.0	09/01/2019 16:11		GB

<b>AEP Sample ID</b> : 228536	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> SP-11	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228536)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:38	U	LNM

<b>Water (228536)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	129	mg/L	0.219	1:10	EPA 300.0	09/01/2019 17:08		GB
Fluoride	2.225	mg/L	0.083	1	EPA 300.0	09/01/2019 16:49		GB
Solids, Total Dissolved (TDS)	970	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	122	mg/L	0.140	1:10	EPA 300.0	09/01/2019 17:08		GB



# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

<b>AEP Sample ID</b> : 228537	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> Duplicate BAP	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228537)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:41	U	LNM

<b>Water (228537)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Chloride	1922	mg/L	0.219	1:10	EPA 300.0	09/01/2019 17:45		GB
Fluoride	4.791	mg/L	0.083	1:10	EPA 300.0	09/01/2019 17:45		GB
Solids, Total Dissolved (TDS)	3498	mg/L	2	1	SM 2540 C-2011	08/30/2019 12:00		JTD
Sulfate	30	mg/L	0.140	1	EPA 300.0	09/01/2016 17:26		GB

<b>AEP Sample ID</b> : 228538	<b>Collected Date:</b> 08/26/2019	<b>By:</b> KM/MH
<b>Cust Sample ID:</b> Equipment Blank BAP	<b>Location:</b> Northeastern PP	<b>Matrix:</b> Water
<b>Sample Desc.:</b> CCR		

<b>Metals (228538)</b>								
Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Mercury	< 0.000005	mg/L	0.000005	1	EPA 7470A 1994	09/06/2019 14:44	U	LNM





# AEP ANALYTICAL CHEMISTRY SERVICES

## Analysis Report

02004  
**502 North Allen Ave.**  
**Shreveport, LA 71101**  
**Phone: (318) 673-3802**  
**Fax: (318) 673-3960**

<b>Report ID</b> : 40446	<b>Company:</b> SEP - Environmental (JP-W)	<b>Address:</b> 502 N. Allen Avenue
<b>Date Received:</b> 08/29/2019	<b>Contact:</b> Jill Parker-Witt	Shreveport, LA 71101
	<b>Phone:</b> (318) 673-3816	<b>Fax:</b> (318) 673-3960

### 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*	%			
9/1/2019	Chloride	228531		25	23	92.0	25	25	100.0		0.0	GB
9/1/2019	Chloride		<0.219									GB
9/1/2019	Chloride	228539.1		25	23	92.0	25	33	132.0		0.0	GB
9/1/2019	Fluoride	228531		6	5.8	96.7	6	5.9	98.3		0.0	GB
9/1/2019	Fluoride		<0.083									GB
9/1/2019	Fluoride	228539.1		6	5.8	96.7	6	6.1	101.7		0.0	GB
9/6/2019	Mercury	228512.2	<0.00000	0.001	0.0009894	98.9	0.001	0.0012053	120.5		1.9	JDB
9/6/2019	Mercury	228502.2	<0.00000	0.001	0.00104	104.0	0.001	0.0011859	118.6		0.8	JDB
9/6/2019	Mercury	228492.2	<0.00000	0.001	0.00104	104.0	0.001	0.0009299	93.0		9.5	JDB
9/6/2019	Mercury	228522.2	0.0000068	0.001	0.0010355	103.6	0.001	0.001099	109.9		3.5	JDB
9/6/2019	Mercury	228552.1	<0.00000	0.001	0.0009375	93.7	0.001	0.0009907	99.1		1.3	JDB
9/6/2019	Mercury	228532.2	0.0000068	0.001	0.0010355	103.6	0.001	0.0011589	115.9		4.2	JDB
8/30/2019	Solids, Total Dissolved (TDS)	228494	<2	50	46	92.0	1018	1008	99.0		1.8	JTD
9/1/2019	Sulfate	228539.1		25	23	92.0	50	59	118.0		0.0	GB
9/1/2019	Sulfate	228531		25	23	92.0	25	27	108.0		2.0	GB
9/1/2019	Sulfate		<0.140									GB

Date required: 10/12/19

**Code Code Description**

- J Concentration estimated. Analyte was detected between the Method Detection Limit (MDL) and Minimum Quantitation Limit (MQL).
- U Analyte concentration below MDL.

\_\_\_\_\_  
 Quality Assurance Officer

10-Oct-19  
 Report Date

Shreveport Chemical Laboratory (SCL)

502 N. Allen Ave.

Shreveport, LA 71101

Contacts: Jonathan Barrhill (318-673-3803)

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Site Contact:

Date:

For Lab Use Only:

COC/Order #:

Coc # 40446

Analysis Turnaround Time (in Calendar Days)  
RESULTS DUE OCTOBER 12

*DOB*  
*8/29/19*

Project Name: Northeastern PP CCR  
Contact Name: Jill Parker-Witt  
Contact Phone: 318-673-3816  
Sampler(s): Kenneth McDonald/Matt Hamilton

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Mercury				dissolved Fe and Mn				CHLORIDE, FLUORIDE, SULFATE, TDS				Ra-226, Ra-228				Sample Specific Notes:
							250 mL bottle, pH<2, HNO3	Field-filter 500 mL bottle, then pH<2, HNO3	1 L bottle, Cool, 0-6C	Three (six every 10th) L bottles, pH<2, HNO3													
SP-1	8/26/2019	1650	G	GW	2		X				X										228531.14.2		
SP-2	8/26/2019	1640	G	GW	2		X				X										228532.14.2		
SP-4	8/26/2019	1705	G	GW	2		X				X										228533.14.2		
SP-5	8/26/2019	1720	G	GW	2		X				X										228534.14.2		
SP-10	8/26/2019	1622	G	GW	2		X				X										228535.14.2		
SP-11	8/26/2019	1635	G	GW	2		X				X										228536.14.2		
DUPPLICATE BAP	8/26/2019	1622	G	GW	2		X				X										228537.14.2		
EQUIPMENT BLANK BAP	8/26/2019	1700	G	W	1		X														228538		

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

4 F4 1 4

UAB #

Special Instructions/QC Requirements & Comments:

\*\*\*\*\* RESULTS DUE OCTOBER 12

Relinquished by: <i>Jill Parker-Witt</i>	Company: <i>East</i>	Date/Time: <i>8-25-19 11:00</i>	Received by: <i>Shirley Wallace</i>	Date/Time: <i>8-29-19 11:45</i>
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:



SHREVEPORT CHEMICAL LABORATORY

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

### PROJECT RECEIPT FORM

Container Type				Delivery Type					
<input checked="" type="radio"/> Ice Chest	<input type="radio"/> Bag	<input type="radio"/> Action Pak	<input type="radio"/> PCB Mailer	<input checked="" type="radio"/> Bottle	<input type="radio"/> UPS	<input type="radio"/> FEDEX	<input type="radio"/> US Mail	<input checked="" type="radio"/> Walk in	<input type="radio"/> Shuttle
Other _____				Other _____					
Tracking # _____									

Client Bill Parker with  
Received By SANDRA WALLACE  
Received Date 8-29-19  
Open Date 8-29-19

Sample Matrix  
 DGA     PCB Oil     Water     Oil     Soil  
 Solid     Liquid    Other \_\_\_\_\_

Container Temp    Read 3.5  
Correction Factor 1.2  
Corrected Temp 4.7

Thermometer Serial #F04103

Project I.D. Coc. 4044b

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     NO

Were samples labeled properly?  YES     NO

Were correct containers used?  YES     NO

Were the pH's of samples appropriately checked?  YES     NO

Total number of sample containers 15

Was any corrective action taken?  NO

Person Contacted \_\_\_\_\_  
Date & Time \_\_\_\_\_

Comments \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Sample ID	Analysis	pH	Preservative Added / Lot #		
SP-1	metals	< 2	/		
SP-2	↓	↓	/		
<del>SP-3</del>			/		
SP-4			/		
SP-5			/		
SP-10			/		
SP-11			/		
Duplicate BAP			/		
Equipment BLANK BAP			↓	↓	/
					/
					/
			/		
			/		
			/		
			/		
			/		
			/		
			/		
			/		
			/		

S.S.  
8-29-19



Dolan Chemical Laboratory  
4001 Bixby Road  
Groveport, OH 43125  
T: 614-836-4221, Audinet 210-4221  
F: 614-836-4168, Audinet 210-4168  
<http://aepenv/labs>

**Water Analysis**

**Location: Northeastern Station**

**Report Date: 10/10/2019**

**SP-1**

**Sample Number: 192952-001**

**Date Collected: 08/26/2019 16:50**

**Date Received: 9/4/2019**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.43	ug/L		0.1	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.73	ug/L		0.1	0.03	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Barium, Ba	160	ug/L		0.2	0.05	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.08	ug/L	J	0.1	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.09	ug/L		0.05	0.01	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.49	ug/L		0.2	0.04	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.481	ug/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.835	ug/L		0.2	0.05	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	5.86	ug/L		2	0.4	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Selenium, Se	3.4	ug/L		0.2	0.03	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.1	ug/L	J	0.5	0.1	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Boron, B	0.124	mg/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	120	mg/L		0.05	0.02	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00285	mg/L		0.0002	0.00005	KAN	09/26/2019 11:24	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.41	pCi/L	0.16	0.47	ttp	9/9/2019	SW-846 9320-2014, Rev. 1.0
Radium-226	1.34	pCi/L	0.20	0.18	sdw	9/10/2019	SW-846 9315-1986, Rev. 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.*

SP-2

Sample Number: 192952-002

Date Collected: 08/26/2019 16:40

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.22	ug/L		0.1	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.53	ug/L		0.1	0.03	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Barium, Ba	1220	ug/L		1	0.2	KAN	09/23/2019 16:11	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.07	ug/L	J	0.1	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.05	ug/L		0.05	0.01	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.701	ug/L		0.2	0.04	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.568	ug/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.334	ug/L		0.2	0.05	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	22.3	ug/L		2	0.4	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Selenium, Se	3.7	ug/L		0.2	0.03	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.1	ug/L	J	0.5	0.1	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Boron, B	0.173	mg/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	211	mg/L		0.05	0.02	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0582	mg/L		0.0002	0.00005	KAN	09/26/2019 11:29	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.62	pCi/L	0.22	0.52	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	3.1	pCi/L	0.26	0.13	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

Sp-4

Sample Number: 192952-003

Date Collected: 08/26/2019 17:05

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.25	ug/L		0.1	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.64	ug/L		0.1	0.03	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Barium, Ba	359	ug/L		0.2	0.05	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
The MS/MSD is outside the acceptable limit of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Beryllium, Be	0.101	ug/L		0.1	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.05	ug/L		0.05	0.01	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.01	ug/L		0.2	0.04	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.07	ug/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.596	ug/L		0.2	0.05	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	2	ug/L	J	2	0.4	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.6	ug/L		0.2	0.03	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Boron, B	0.365	mg/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	182	mg/L		0.05	0.02	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4
The MS is outside the acceptable limit of 75-125%. The RPD between the MS/MSD exceeds 20%.								
Lithium, Li	0.0554	mg/L		0.0002	0.00005	KAN	09/26/2019 11:34	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	2.23	pCi/L	0.18	0.52	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	1.01	pCi/L	0.16	0.18	sdw	9/10/2019	SW-846 9315-1986,Rev. 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.*



SP-5R

Sample Number: 192952-004

Date Collected: 08/26/2019 17:20

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.06	ug/L	J	0.1	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Arsenic, As	49.3	ug/L		0.1	0.03	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Barium, Ba	2340	ug/L		1	0.2	KAN	09/23/2019 16:21	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.06	ug/L	J	0.1	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.02	ug/L	J	0.05	0.01	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.335	ug/L		0.2	0.04	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.485	ug/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.545	ug/L		0.2	0.05	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	1	ug/L	J	2	0.4	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.1	ug/L	J	0.2	0.03	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Boron, B	0.220	mg/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	128	mg/L		0.05	0.02	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0928	mg/L		0.0002	0.00005	KAN	09/26/2019 11:40	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	5.99	pCi/L	0.20	0.41	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	5.57	pCi/L	0.36	0.15	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

SP-10

Sample Number: 192952-005

Date Collected: 08/26/2019 16:22

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.61	ug/L		0.1	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.00	ug/L		0.1	0.03	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3060	ug/L		1	0.2	KAN	09/23/2019 16:26	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.08	ug/L	J	0.1	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.03	ug/L	J	0.05	0.01	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.61	ug/L		0.2	0.04	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	1.06	ug/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.449	ug/L		0.2	0.05	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	8.22	ug/L		2	0.4	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.4	ug/L		0.2	0.03	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Boron, B	1.03	mg/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	216	mg/L		0.05	0.02	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.241	mg/L		0.0002	0.00005	KAN	09/26/2019 13:38	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	1.17	pCi/L	0.13	0.38	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	6.94	pCi/L	0.39	0.14	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The RPD between the sample and duplicate result exceed 25%. The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

SP-11

Sample Number: 192952-006

Date Collected: 08/26/2019 16:35

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.37	ug/L		0.1	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Arsenic, As	6.30	ug/L		0.1	0.03	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Barium, Ba	492	ug/L		0.2	0.05	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.04	ug/L	J	0.1	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.13	ug/L		0.05	0.01	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	1.47	ug/L		0.2	0.04	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	2.73	ug/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.764	ug/L		0.2	0.05	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	5.70	ug/L		2	0.4	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.8	ug/L		0.2	0.03	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Boron, B	0.304	mg/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	139	mg/L		0.05	0.02	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.0337	mg/L		0.0002	0.00005	KAN	09/26/2019 13:43	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Radiochemistry*	Result	Units	UNC* (+ / -)	MDA*	Analysis By	Analysis Date/Time	Method
Radium-228	0.583	pCi/L	0.15	0.48	ttp	9/9/2019	SW-846 9320-2014,Rev. 1.0
Radium-226	1.04	pCi/L	0.16	0.16	sdw	9/10/2019	SW-846 9315-1986,Rev. 0

The carrier recovery is outside the acceptable limit of 30-110%.

*\*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.*

Duplicate BAP

Sample Number: 192952-007

Date Collected: 08/26/2019 16:22

Date Received: 9/4/2019

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.38	ug/L		0.1	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Arsenic, As	2.93	ug/L		0.1	0.03	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Barium, Ba	3190	ug/L		1	0.2	KAN	09/23/2019 18:14	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.04	ug/L	J	0.1	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.01	ug/L	J	0.05	0.01	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.836	ug/L		0.2	0.04	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.369	ug/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.1	ug/L	J	0.2	0.05	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	4.01	ug/L		2	0.4	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.1	ug/L	J	0.2	0.03	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Boron, B	1.06	mg/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	213	mg/L		0.05	0.02	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.249	mg/L		0.0002	0.00005	KAN	09/26/2019 13:48	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

Equipment Blank

Sample Number: 192952-008

Date Collected: 08/26/2019 17:00

Date Received: 9/4/2019

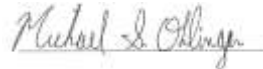
Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.02	ug/L	U	0.1	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Arsenic, As	< 0.03	ug/L	U	0.1	0.03	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Barium, Ba	0.26	ug/L		0.2	0.05	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.02	ug/L	U	0.1	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.01	ug/L	U	0.05	0.01	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.04	ug/L	J	0.2	0.04	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	< 0.02	ug/L	U	0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.05	ug/L	U	0.2	0.05	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 0.4	ug/L	U	2	0.4	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.03	ug/L	J	0.2	0.03	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.1	ug/L	U	0.5	0.1	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Boron, B	0.087	mg/L		0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	0.03	mg/L	J	0.05	0.02	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4
Lithium, Li	0.00009	mg/L	J	0.0002	0.00005	KAN	09/26/2019 13:53	EPA 200.8-1994, Rev. 5.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit

J: Analyte was positively identified, though the quantitation was below Reporting Limit.

*\*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.*

BAP CCR



**Michael Ohlinger, Chemist**

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Fax 614-836-4168 Audinet 8-210-

**THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.**

**Dolan Chemical Laboratory (DCL)**

4001 Bixby Road  
 Groveport, Ohio 43125  
 Michael Ohlinger (614-836-4184)  
 Dave Conover (614-836-4219)

**Chain of Custody Record**

Program: Coal Combustion Residuals (CCR)

Site Contact:

Date:

COC/Order #:

For Lab Use Only:

Project Name: Northeastern PP BAP CCR  
 Contact Name: Jill Parker-Witt  
 Contact Phone: 318-673-3816

Analysis Turnaround Time (in Calendar Days)  
**RESULTS DUE OCTOBER 12**

192952

Sampler(s): Kenny McDonald/Matt Hamilton

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO3	Field-filter 250 mL bottle, then pH<2, HNO3	250 mL bottle, Cool 0-6C	Three (six every 10hr) L bottles, pH<2, HNO3	Ra-226, Ra-228	Sample Specific Notes:	

SP-1	8/26/2019	1650	G	GW	4		X			X			
SP-2	8/26/2019	1640	G	GW	4		X			X			
SP-4	8/26/2019	1705	G	GW	4		X			X			
SP-5R	8/26/2019	1720	G	GW	4		X			X			
SP-10	8/26/2019	1622	G	GW	7		X			X			
SP-11	8/26/2019	1635	G	GW	4		X			X			
DUPLICATE BAP	8/26/2019	1622	G	GW	1		X						
EQUIPMENT BLANK BAP	8/26/2019	1700	G	GW	1		X						
Preservation Used: 1=Ica, 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:

**\*\*\*\*\* RESULTS DUE OCTOBER 12**

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
<i>[Signature]</i>	Emc616	08/30/19 1900	<i>[Signature]</i>	
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
			<i>[Signature]</i>	
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
			<i>[Signature]</i>	11:50 AM

**AEP WATER & WASTE SAMPLE RECEIPT FORM**

<u>Package Type</u>				<u>Delivery Type</u>			
<input checked="" type="radio"/> Cooler	<input type="radio"/> Box	<input type="radio"/> Bag	<input type="radio"/> Envelope	<input type="radio"/> PONY	<input type="radio"/> UPS	<input checked="" type="radio"/> FedEx	<input type="radio"/> USPS
				Other _____			
Plant/Customer <u>Northwestern</u>				Number of Plastic Containers: <u>30</u>			
Opened By <u>M30</u>				Number of Glass Containers: <u>-</u>			
Date/Time <u>9/4/19 11:50 AM</u>				Number of Mercury Containers: <u>-</u>			
Were all temperatures within 0-6°C? Y / N or <input checked="" type="radio"/> N/A Initial: _____ on ice / <input checked="" type="radio"/> no ice							
#2 (IR Gun Ser# <u>181354432</u> , Expir. <u>06-12-20</u> ) - If No, specify each deviation: _____							
Was container in good condition? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Was Chain of Custody received? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Requested turnaround: <u>10/12/19</u> If RUSH, who was notified? _____							
pH (15 min)		Cr <sup>+6</sup> (pres) (24 hr)		NO <sub>2</sub> or NO <sub>3</sub> (48 hr)		ortho-PO <sub>4</sub> (48 hr)	
						Hg-diss (pres) (48 hr)	
Was COC filled out properly? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Were samples labeled properly? Y / <input checked="" type="radio"/> N Comments <u>no date time of collection</u>							
Were correct containers used? <input checked="" type="radio"/> Y / <input type="radio"/> N Comments _____							
Was pH checked & Color Coding done? <input checked="" type="radio"/> Y / <input type="radio"/> N or N/A Initial & Date <u>MGK SWB</u>							
- Was Add'l Preservative needed? Y / <input checked="" type="radio"/> N If Yes: By whom & when: _____ (See Prep Book)							
Is sample filtration requested? Y / <input checked="" type="radio"/> N Comments _____ (See Prep Book)							
Was the customer contacted? If Yes: Person Contacted _____							
Lab ID# <u>192952</u>				Initial & Date & Time: _____			
Logged by <u>M30</u> Comments <u>COC said "SP-SR" bottle labels say "SP-5"</u>							
Reviewed by <u>SM</u>							

**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



**APPENDIX VI**

ODEQ Correspondence



RECEIVED MAR 25 2019

SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

March 19, 2019

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

Re: Request for a Thirty (30) Day Extension for an Alternate Source Demonstration Submittal  
Public Service Company of Oklahoma  
Northeastern Power Station - Bottom Ash Pond  
Rogers County  
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

On March 11, 2019, the Department of Environmental Quality (DEQ) received a request by email from AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) for a thirty (30) day extension for the submittal of an alternate source demonstration (ASD) for lithium in monitoring well SP-10.

NPS requested the extension since analytical results from samples sent to the lab have not been received. Additionally, NPS is drilling a boring near the Bottom Ash Pond to gather additional information on the Bandera shale formation which may contribute to the ASD.

DEQ approved the extension by email on March 12, 2019 (enclosed). This letter is a confirmation of the email.

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

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

HY/ckh

Enclosure

File Copy: Solid Waste Permit No. 3566010

## Cindy Hailes

---

**From:** Hillary Young  
**Sent:** Tuesday, March 12, 2019 11:15 AM  
**To:** Jill Parker Witt  
**Cc:** Cindy Hailes  
**Subject:** RE: ASD for Lithium at NE BAP - 30 day extension request

Hi Jill:

Your request for a 30-day extension is granted. If you have any questions, please feel free to give me or Cindy a call.

Thank you,  
Hillary Young

---

Hillary Young, P.E.  
Chief Engineer  
Land Protection Division  
Oklahoma Department of Environmental Quality  
707 N. Robinson, P.O. Box 1677  
Oklahoma City, OK 73101-1677  
Office: (405) 702-5188  
Fax: (405) 702-5101

---

**From:** Jill Parker Witt [<mailto:jcparker-witt@aep.com>]  
**Sent:** Monday, March 11, 2019 3:25 PM  
**To:** Hillary Young  
**Cc:** Cindy Hailes  
**Subject:** ASD for Lithium at NE BAP - 30 day extension request

Hillary:

We are working on an ASD for the bottom ash pond out at Northeastern PS.

At the moment our consultants have two outstanding pieces of data we need for the ASD:

- cation exchange capacity (CEC) and thin section petrography data from the mineralogy lab. These samples were delivered to the lab on 2/20/19 and we are waiting on results.
- A better understanding of where we are within the geologic column, they are mobilizing back to the site today (3/11/19) to advance an additional boring near the BAP with the hope of definitively tagging the Bandera shale formation.

We currently have the following pieces of evidence to support our ASD:

RECEIVED MAR 27 2019



SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

March 21, 2019

**CERTIFIED MAIL RETURN RECEIPT REQUESTED**

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

Re: Annual Groundwater Monitoring Report – Bottom Ash Pond  
Public Service Company of Oklahoma-Northeastern Power Station  
Rogers County  
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

On January 31, 2019, the Department of Environmental Quality (DEQ) received the Annual Groundwater Monitoring Report for the Bottom Ash Pond CCR Management Unit (Report) at Northeastern Power Station (NPS). The statistical analyses were received by email on February 21, 2019 and analytical data was received by email on March 15, 2019. Oklahoma Administrative Code (OAC) 252:517-9-1(e) requires NPS to prepare the annual groundwater monitoring and corrective action report to document the status of the coal combustion residual (CCR) surface impoundment.

Monitoring wells SP-4 and SP-5R are upgradient wells. Downgradient monitoring wells are SP-1, SP-2, SP-10 and SP-11. Groundwater velocity was calculated in the monitoring wells surrounding the BAP and ranged from 1.0 ft/yr in SP-10 to 5.8 ft/yr in SP-2 during the May 30, 2018 and July 30, 2018 sampling events respectively. This represents a range in residence times within the wells of 61.4 days to 10.6 days, respectively. Groundwater flow is in a southwesterly direction.

The statistical analysis included in the Report was for detection monitoring events conducted on October 11, 2017 and January 22, 2018. NPS conducted assessment monitoring on May 30, 2018 and July 30, 2018 and the statistical analyses summary (SAS) was submitted in a separate document on February 21, 2019.

Both detection monitoring events results were statistically analyzed and the upper prediction limit (UPL) for all constituents, and a lower prediction limit (LPL) for pH, were calculated based on a one-of-two retesting procedure. A statistically significant increase (SSI) is determined if both samples in the series of two exceed the UPL.

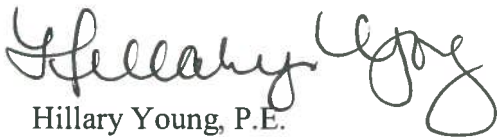
The assessment monitoring events results were statistically analyzed and groundwater protection standards (GWPS) were established for the OAC 252:517 Appendix B parameters. The data was assessed for statistically significant levels (SSLs) where the entire confidence interval exceeds the

Ms. Jill Parker-Witt, P.E.  
American Electric Power – Northeastern Power Station  
March 21, 2019  
Page 2 of 2

GWPS. An SSL for lithium (0.263 mg/L) in monitoring well SP-10 was determined and NPS notified DEQ by email on February 21, 2019. NPS is currently conducting an alternative source demonstration for the lithium SSL.

The Report and SAS are accepted as submitted. The Report, SAS and notification were placed on the facility's publicly accessible internet site. If you have any questions, please contact Ms. Cynthia Hailes, P.E. at (405) 702-5114.

Sincerely,

A handwritten signature in black ink, appearing to read "Hillary Young". The signature is fluid and cursive, with a large loop at the end.

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

HY/ckh



SCOTT A THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

April 5, 2019

Elizabeth Gunter  
Counsel for Public Service Company of Oklahoma  
Public Service Company of Oklahoma  
1 Riverside Plaza  
Columbus, OH 43215

RE: Financial Assurance – Corporate Financial Test  
Facility: Northeastern Power Station Coal Ash Landfill; Permit Number: 3566010; and Bottom Ash Pond  
(currently in the permit application process)  
Rogers County, Oklahoma

Dear Ms. Gunter:

As required by Oklahoma Administrative Code (OAC) 252:517-17-3: Duty to maintain financial assurance, this letter acknowledges that DEQ has received Public Service Company of Oklahoma's (PSO's) 2019 Corporate Financial Test mechanism. PSO is the owner/operator of the Northeastern Power Station Coal Ash Landfill (Landfill), Permit No. 3566016, and the Bottom Ash Pond. The mechanism has been determined to be satisfactory at this time. Importantly however, DEQ may require additional information at any time if it appears PSO no longer satisfies its financial assurance obligation as owner/operator of the Landfill and the Bottom Ash Pond. DEQ reserves any and all rights it has to pursue enforcement actions or proceedings under applicable law with regard to PSO's financial assurance obligations, if the obligations are found to be inadequate.

PSO has certified the following cost estimates are assured through the company's 2019 Corporate Financial Test mechanism dated March 7, 2019:

- Bottom Ash Pond:
  - Closure:  $\$9,393,690 \times 3\% = \$9,675,501$
  - Post-Closure:  $\$1,189,415 \times 3\% = \$1,225,097$
  - Total:  $\$10,900,598$
  
- Landfill (Permit No. 3566016):
  - Closure:  $\$3,969,964 \times 3\% = \$4,089,062$
  - Post-Closure:  $\$5,821,984 \times 3\% = \$5,996,644$
  - Total:  $\$10,085,706$

Thank you for ensuring PSO has met its 2019 financial assurance obligations for the Landfill and Bottom Ash Pond. If you have any questions, please contact Carol Bartlett at (405) 702-5109.

Sincerely,

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

HY/cb





SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

April 11, 2019

Ms. Jill Parker-Witt, P.E.  
American Electric Power – Northeastern Power Station  
P.O. Box 220  
Oologah, OK 74053-0220



Re: Alternative Closure Requirements  
Public Service Company of Oklahoma, Northeastern Power Station  
Rogers County

Dear Ms. Parker-Witt:

The Oklahoma Department of Environmental Quality (DEQ) received the Alternative Closure Requirements (ACR) – Bottom Ash Pond (BAP) for the existing coal combustion residuals (CCR) surface impoundment on December 10, 2018 from Public Service Company of Oklahoma’s Northeastern Power Station (NPS). In response to the DEQ letter dated November 5, 2018, it is NPS’s intent to pursue closure according to the alternate closure requirements in Oklahoma Administrative Code (OAC) 252:517-15-8(b) since the BAP did not meet the five (5) feet separation from groundwater requirement of OAC 252:517-5-1(a).

OAC 252:517-15-8 (b) allows the BAP to continue to receive CCR provided NPS certifies it will cease operation of Unit 3 and complete closure by October 17, 2028; and documents no alternative CCR disposal capacity is available on-site or off-site. The ACR states that NPS must continue to wet-sludge the bottom ash to the BAP due to the absence of alternative disposal capacity. NPS evaluated the other existing surface impoundments and determined they do not have the capacity to receive the 1.7 million gallons per day of ash management water and do not meet the construction requirements of OAC 252:517, so they cannot accept the CCR and process waters currently managed in the BAP. Further, no piping exists in which this wastewater stream could be transported to an offsite treatment facility and transporting this volume of CCR wastewater via trucking is not physically possible. Also, the on-site CCR ash landfill is not permitted to accept the process waters.

NPS is requesting approval under OAC 252:517-15-8(b) “Permanent cessation of a coal fired boiler(s) by a date certain” to continue management of CCR and non-CCR materials in the BAP until the required closure date of Unit 3, its only remaining coal fired boiler. On February 8, 2013, a settlement agreement was signed between NPS and the Department of Justice which set a closure date of December 31, 2026 for the coal-fired boiler Unit 3. Consequently, NPS certifies in the ACR that it will cease operation of Unit 3 by December 31, 2026, per the settlement agreement, and close the BAP according to OAC 252:517-15-8(b)(1) and (3).

DEQ accepts that NPS has met the requirements of OAC 252:517-15-8 and approves the ACR. With this approval, the Closure Plan of the Tier II Permit Application for the BAP, submitted to



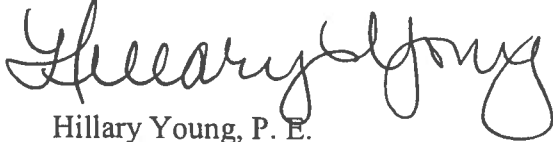


Ms. Jill Parker-Witt, P.E.  
American Electric Power – Northeastern Power Station  
April 11, 2019  
Page 2 of 2

DEQ on July 26, 2018, must be revised to reflect the alternative closure timeline and details of how closure will be completed by October 17, 2028.

If you have any questions, please contact Ms. Cindy Hailes of my staff at (405) 702-5114.

Sincerely,

A handwritten signature in black ink, appearing to read "Hillary Young". The signature is written in a cursive style with a large, looping "Y" and "G".

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

HY/ckh

cc: Christi Williams, Environmental Complaints & Local Services – Tulsa DEQ Office  
Mark Barton, Plant Manager, American Electric Power-Northeastern Power Station  
Sam Miller, American Electric Power-Northeastern Power Station



RECEIVED JUL 12 2019

SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

July 8, 2019

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

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

Dear Ms. Parker-Witt:

Monitoring Well SP-10 is currently in the assessment monitoring program. Lithium was detected in SP-10 at concentrations of 0.245 mg/L on May 30, 2018 and 0.242 mg/L on July 30, 2018. A statistically significant level (SSL) was determined, on January 8, 2019, when the lower confidence limit (LCL) for lithium (0.263 mg/L) exceeded the groundwater protection standard (0.15 mg/L). Oklahoma Administrative Code (OAC) 252:517-9-6(g)(3)(B) allows AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) to demonstrate that a source other than the coal combustion residuals (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.

On March 12, 2019, by email, DEQ approved a 30-day extension for submittal of the alternate source demonstration (ASD) so that NPS could receive sample analyses from the lab and to gather additional information on the Bandera shale formation from analyses of cores from two (2) new boreholes drilled at the site. On May 1, 2019, the Department of Environmental Quality (DEQ) received, by email, an ASD for lithium in monitoring well SP-10 from NPS. The ASD was presented to DEQ by NPS in a meeting on May 29, 2019. DEQ requested revised figures and cross-sections that were presented during the meeting. A revised Figure 4 and Figure 12 were received by email on June 4, 2019. The cross-sections were received by email on June 5, 2019.

The ASD asserts that the statistically significant level (SSL) exceeding the groundwater protection standards is a natural variation in groundwater quality due to the release of lithium from the clay minerals within the shale lens underlying the Bottom Ash Pond (BAP) and is not due to a release from the BAP itself. Additionally, NPS contends that the low concentration of lithium in the surface water in the BAP and limited transport from the BAP to the screened interval in SP-10 do not support a release.

Ms. Jill Parker-Witt, P.E.  
American Electric Power  
July 8, 2019  
Page 2 of 2

DEQ reviewed the ASD and made the following determination:

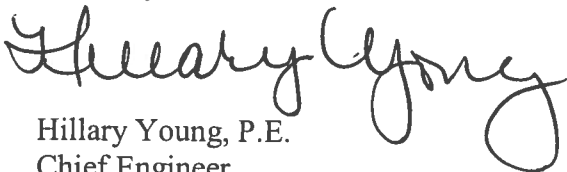
Elevated lithium concentrations were detected in downgradient monitoring well SP-10; however, lithium was not detected in elevated levels in upgradient monitoring well SP-5R even though boring logs from SP-5R show the monitoring well contains interbeds of dark limey shale within the screened interval. Also, SP-8, located near SP-10, and screened across a lower zone shale exhibits low concentrations of lithium. If the lithium at SP-10 was due to the presence of shale lenses within the screened interval of SP-10, then both SP-5R and SP-8 should exhibit elevated levels of lithium. The conceptual model that NPS proposed does not fit the actual groundwater sampling data.

NPS collected and analyzed a surface water sample from the BAP for comparison to data collected from SP-10 to support the claim that unless the BAP is directly connected to SP-10 through a fracture in the limestone, it is unlikely to affect the lithium concentration detected in SP-10. NPS did not sample and analyze the sediment in the BAP for lithium or other constituents to compare that data to the data collected from SP-10. The surface water sample may have a lower concentration of lithium than water that percolates through the sediment in the BAP and potentially reaches SP-10. DEQ does not believe enough data was presented to accept NPS's conclusion that the lithium at SP-10 was not due to a release from the BAP.

Should additional information be attained to support a revised ASD, DEQ will re-evaluate such a submittal. NPS is now required by OAC 252:517-9-6(g)(4) to initiate the assessment of corrective measures (ACM) as required by OAC 252:517-9-7. Please submit the proposed ACM plan and schedule for analyzing the lithium release and developing corrective action to address the release within ninety (90) days of receipt of this letter. Assessment monitoring for the BAP will continue.

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,



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

HY/ckh



RECEIVED OCT 18 2019

SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

October 11, 2019

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

Re: Annual CCR Fugitive Dust Control Report – OAC 252:517-13-1(b)(6)  
Public Service Company of Oklahoma  
Northeastern Power Station Ash Landfill and Bottom Ash Pond  
Rogers County  
Solid Waste Permit No. 3566010

Dear Ms. Parker-Witt:

On September 12, 2019, the Department of Environmental Quality (DEQ) received the Annual CCR Fugitive Dust Control Report (Report) from Northeastern Power Station (NPS). Oklahoma Administrative Code (OAC) 252:517-13-1(c) requires the Report to be submitted to DEQ and placed in the facility's operating record in accordance with OAC 252:517-19-1(g)(1). The Report has also been placed on the facility's publicly accessible Internet site as required by OAC 252:517-19-1(g)(2). The Landfill is a permitted CCR landfill that accepts CCR generated on-site. The Bottom Ash Pond accepts bottom ash from Unit 3 that is wet sluiced to the surface impoundment for removal and segregation. The permit application for the BAP is currently under review by DEQ.

The Report meets the requirements of OAC 252:517-13-1(c) and is accepted as submitted.

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

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

HY/ckh





RECEIVED OCT 1 8 2019

SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

October 11, 2019

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

Re: Notification of SSL – Bottom Ash Pond  
Public Service Company of Oklahoma  
Northeastern Power Station  
Rogers County  
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

In a letter dated September 9, 2019, the Oklahoma Department of Environmental Quality (DEQ) was notified by American Electric Power/Public Service Company of Oklahoma Northeastern Power Station (NPS) that a statistically significant level (SSL) for lithium for the Bottom Ash Pond (BAP) had been determined.

Oklahoma Administrative Code (OAC) 252:517-19-1(h)(8) requires NPS, within 30 days of detecting one or more constituents in OAC 252:517 Appendix B at statistically significant levels above the groundwater protection standard, to prepare and submit a notification meeting the requirements of OAC 252:517-9-6(g) to DEQ and place it in the facility operating record. NPS has met these requirements.

NPS has initiated the assessment of corrective measures as required by OAC 252:517-9-7 to address lithium exceedances of the groundwater protection standard in monitoring well SP-10.

The notification is accepted as submitted. If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

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

HY/ckh





RECEIVED OCT 18 2019

SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

October 15, 2019

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

Re: Notification of Assessment of Corrective Measures – Bottom Ash Pond  
Public Service Company of Oklahoma  
Northeastern Power Station  
Rogers County  
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

In a letter dated September 5, 2019, the Oklahoma Department of Environmental Quality (DEQ) was notified by American Electric Power/Public Service Company of Oklahoma Northeastern Power Station (NPS) that the notification of assessment of corrective measures, addressing a statistically significant level (SSL) for lithium for the Bottom Ash Pond (BAP), had been placed in the operating record on August 7, 2019.

Oklahoma Administrative Code (OAC) 252:517-19-1(h)(9) requires NPS, within 30 days of initiating the assessment of corrective measures requirements, to prepare and submit a notification meeting the requirements of OAC 252:517-9-6(g)(5) to DEQ and place it in the facility operating record. NPS has met these requirements. NPS also met the requirements of OAC 252:517-19-3(h)(7) by placing the notification on NPS's CCR website.

The notification is accepted as submitted. If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

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

HY/ckh







SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

October 29, 2019

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

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

Dear Ms. Parker-Witt:

On July 8, 2019, DEQ denied the alternate source demonstration (ASD) for lithium in the Bottom Ash Pond (BAP) that was submitted by AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) to demonstrate that a source other than the coal combustion residuals (CCR) unit caused the lithium statistically significant level (SSL) detected in monitoring well SP-10. DEQ stated in the letter that if additional information was attained to support a revised ASD, DEQ would re-evaluate the revised ASD.

On September 13, 2019, NPS submitted a revised ASD that addressed concerns DEQ had with the ASD which proposed naturally occurring concentrations of lithium in groundwater are the source of the SSL in SP-10.

In the revised ASD, NPS questioned DEQ's statement in the July 8, 2019 letter that the lithium concentration in monitoring well SP-5R was "not elevated". To clarify, DEQ's meaning of elevated level in the July 8, 2019 letter meant the concentration of lithium detected in SP-5R was not elevated when compared to lithium levels in the lower zone as measured in SP-6, SP-7 and SP-10. Similarly lithium in SP-8, which is screened in the lower zone, was not elevated leading DEQ to question the conceptual model which proposes the clay mineral in lower zone shales is the source of elevated lithium.

NPS sampled and analyzed the sediment, leachate and pore water in the BAP to compare to the data collected from SP-10. The results showed lithium in the sediment leachate and pore water measured 1 µg/L and 3 µg/L, respectively, compared to 286 µg/L measured in SP-10 on March 14, 2019. The lithium concentration of the sluice water (5.87 µg/L) entering the BAP was also much lower than that in SP-10. DEQ agrees that the low concentration of lithium in the BAP as well as the different water chemistry as depicted in the Piper diagram furthers the proposal that the BAP is not a direct source of the lithium SSL in SP-10.



Ms. Jill Parker-Witt, P.E.  
American Electric Power  
October 29, 2019  
Page 2 of 2

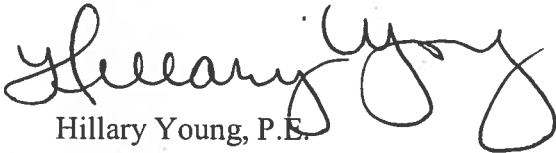
DEQ reviewed the additional information concerning SP-5R and SP-8 provided in the revised ASD. DEQ accepts that the elevated lithium concentration detected in SP-10 may be produced from the shale lenses within the screened interval of SP-10.

The new data presented in both ASDs depicts a new conceptual model that still does not completely fit with all of the groundwater sampling data. Please contact DEQ to arrange a time to discuss modifying the groundwater monitoring network.

DEQ accepts the revised ASD as submitted. The BAP may return to assessment monitoring in accordance with OAC 252:517-9-6(g)(3)(B). NPS must include the revised ASD in the annual groundwater monitoring and corrective action report required by OAC 252:517-9-1(e).

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

A handwritten signature in black ink, appearing to read "Hillary Young", written in a cursive style.

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

HY/ckh



SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

November 4, 2019

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

Re: Assessment of Corrective Measures Plan and Schedule for Analyzing an Environmental Release for Lithium –Bottom Ash Pond  
Public Service Company of Oklahoma  
Northeastern Power Station  
Rogers County  
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

On July 8, 2019, the Oklahoma Department of Environmental Quality (DEQ) denied the May 1, 2019 alternate source demonstration (ASD) for lithium in the Bottom Ash Pond (BAP). Accordingly, AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) submitted, by email on October 5, 2019, the Assessment of Corrective Measures Plan and Schedule for Analyzing an Environmental Release (ACM)" as required by Oklahoma Administrative Code (OAC) 252:517-9-6(g)(4).

On September 13, 2019, NPS submitted a revised ASD that addressed concerns DEQ had with the May 1, 2019 ASD. In a letter dated October 29, 2019, DEQ approved the revised ASD.

With the approval of the revised ASD, OAC 252:517-9-6(g)(3)(B) allows NPS to continue monitoring in accordance with the assessment monitoring program. NPS is no longer required to initiate the assessment of corrective measures requirements; therefore, the ACM is withdrawn.

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

A handwritten signature in black ink that reads "Hillary Young". The signature is written in a cursive style.

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

HY/ckh



SCOTT A. THOMPSON  
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT  
Governor

December 19, 2019

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

Re: Fugitive Dust Control Plan Revision 4 – OAC 252:517-13-1(b)(6)  
Public Service Company of Oklahoma  
Northeastern Power Station Ash Landfill and Bottom Ash Pond  
Rogers County  
Solid Waste Permit No. 3566010

Dear Ms. Parker-Witt:

On October 21, 2019, the Department of Environmental Quality (DEQ) received the Fugitive Dust Control Plan Rev. 4 from Northeastern Power Station (NPS). Oklahoma Administrative Code (OAC) 252:517-13-1(b)(6) allows amendment of the written Coal Combustion Residuals (CCR) fugitive dust control plan at any time provided the revised plan is approved by DEQ then placed in the facility's operating record in accordance with OAC 252:517-19-1(g)(1).

The August 2019 revisions are summarized in Appendix E. No regulatory or technical revisions were made.

DEQ accepts the Fugitive Dust Control Plan – Revision 4. Please notify DEQ when the revised Dust Control Plan has been placed in the operating record per OAC 252:517-19-2 (c) and on the facility's publically accessible internet site per OAC 252:517-19-3-(d).

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

A handwritten signature in black ink that reads "Hillary Young". The signature is written in a cursive style and is positioned above the printed name and title.

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

HY/ckh

