**Scott A. Thompson**
Executive Director

OKLAHOMA Environmental Quality

**Kevin Stitt**
Governor

March 9, 2023

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

Re: Alternate Source Demonstration for Fluoride and Lithium Exceedance –Bottom Ash Pond
Public Service Company of Oklahoma (PSO) – Northeastern Power Station (NPS)
Bottom Ash Pond (BAP), Rogers County
Solid Waste Permit No. None

Dear Ms. Parker-Witt:

On July 15, 2021, the Oklahoma Department of Environmental Quality (DEQ) approved the revised alternate source demonstration (ASD) for lithium and fluoride detected in monitoring well SP-10 for the Bottom Ash Pond (BAP). On January 10, 2023, DEQ received from NPS an Alternate Source Demonstration (ASD) for barium at SP-10.

During the first semi-annual 2022 assessment monitoring event for the BAP, potential statistically significant levels (SSLs) were identified for lithium, fluoride, and barium at SP-10. Barium (7.59 mg/L) in SP-10 had a statistical exceedance of the groundwater protection standard (GWPS) of 2.60 mg/L.

A Mann-Kendall statistical analysis of the time series plot determined that concentrations at SP-10 display a statistically significant increasing trend. However, a Schoeller diagram showing select events where major cations and anions were sampled, the holistic geochemistry at SP-10 does not change over time as would be expected if a release occurred from the BAP. Moving forward, samples from SP-10 will be collected and analyzed for the full suite of major ion chemistry. Concentrations of barium in sediment and porewater collected from the BAP were roughly an order of magnitude lower than barium concentrations collected from monitoring well SP-10.

The release of lithium is attributed to the clay minerals in the shale lens locate at 46 ft below ground surface in the screened interval of SP-10. Analytical results suggest that naturally occurring barium and fluoride are also associated with the shale lenses and are contributing to barium and fluoride concentrations at SP-10. DEQ suggests that a split sample of water from SP-10 be filtered prior to acidification and analysis to obtain the dissolved concentrations of Appendix B parameters for comparison to the total concentrations. If the dissolved (filtered) concentrations are much less than the totals, then it would provide additional supporting evidence that the high lithium, barium and fluoride concentrations are from entrained solids in the water sample sourced by the shale lens and not from a BAP release.

If lithium, fluoride, and barium continue to exceed their relative GWPS at SP-10 in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium, the June 4, 2021 ASD approval for fluoride, and this ASD approval for barium and continue assessment monitoring for the BAP in accordance with Oklahoma Administrative Code 252:517-9-6(g)(3)(B).

The ASD for barium is approved. If you have any questions, please contact Kaylee Daneshmand at (405) 702-5196 or Kaylee.daneshmand@deq.ok.gov.

Sincerely,

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

HY/kd

**American Electric Power**
502 North Allen Avenue
Shreveport, LA 71101
AEP.com

January 5, 2023

**Via 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)
Bottom Ash Pond (BAP)
Public Service Company of Oklahoma (PSO) - Northeastern Power Station (NPS)
Roger County
Solid Waste Permit No. Pending

Dear Ms. Young,

AEP/PSO received ODEQ's correspondence dated June 4, 2021, in which ODEQ accepted the ASD for the lithium and fluoride detected in SP-10 during the October 28, 2020, sampling event. ODEQ indicated that if lithium and fluoride continue to exceed the groundwater protection standards (GWPS) in the future and conditions have not changed, NPS may refer to the October 24, 2019, ASD approval for lithium and June 4, 2021, ASD approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B).

On October 7, 2022, the statistical evaluation of the first semi-annual 2022 assessment monitoring event (June 14, 2022) for the BAP was certified and in that statistical evaluation report, potential SSLs were identified for lithium, fluoride, and barium at SP-10.

The statistical findings are summarized as follows:

The Lower Confidence Level (LCL) for lithium (0.24 mg/L) exceeded the GWPS (a calculated Upper Tolerance Limit (UTL)) of 0.14 mg/L at SP-10. The actual detected lithium concentration in SP-10 was 0.289 mg/l.

The LCL for fluoride (5.17 mg/L) exceeded the GWPS (UTL of 4.39 mg/L) was exceeded as at SP-10. The actual detected fluoride concentration in SP-10 was 6.3 mg/L.

The LCL for barium (3.46 mg/L) exceeded the GWPS (UTL of 2.60 mg/L) was exceeded as at SP-10. The actual detected barium concentration in SP-10 was 7.59 mg/L.

Attached are the alternative source demonstrations for your review outlining the lines of evidence that these exceedances are the result of natural variations occurring in the groundwater at SP-10 and that the conditions at the BAP have not changed.

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 or by phone at: (318) 673-3816.

Sincerely,

Jill Parker-Witt

Jill Parker-Witt, P.E.
AEP, Engineer Principal

Attachments

Geosyntec consultants

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Worthington, Ohio 43085
PH 614.468.0421
www.geosyntec.com

# Memorandum

| | |
|---|---|
| Date: | January 4, 2023 |
| To: | Jill Parker-Witt, American Electric Power (AEP) |
| From: | Beth Gross, Ph.D., P.E. (OK) and Allison Kreinberg, Geosyntec |
| Subject: | Alternative Source Demonstration Update<br>Northeastern Power Station Bottom Ash Pond<br>Oologah, Rogers County, Oklahoma |

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The Bottom Ash Pond (BAP) is a regulated coal combustion residual (CCR) management unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. A semiannual assessment monitoring event was completed at the BAP on June 14, 2022 in accordance with the assessment monitoring requirements of Oklahoma Administrative Code OAC 252:517-9-6. Analysis of the June 2022 data identified statistically significant levels (SSLs) above the groundwater protection standards (GWPSs) for lithium, fluoride, and barium at SP-10 (Attachment B). The following SSLs were identified at the Northeastern BAP:

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

As described in previous ASDs (Geosyntec, 2019; Geosyntec, 2021a,b,c; Geosyntec, 2022), lower concentrations of lithium, fluoride, and barium in the BAP water (including pore water) and BAP sediments than those observed at SP-10 suggest that the BAP is not the source of these exceedances. Key analytical results for samples collected from the BAP and from SP-10 are provided in **Table 1**. Instead, the release of lithium from the clay minerals in the shale lens located at 46 ft below ground surface in the screened interval of SP-10 is the likely source of lithium in groundwater at that location. Analytical results suggest that naturally occurring barium and fluoride are also associated with the shale lenses and are contributing to aqueous barium and fluoride concentrations at SP-10.

Oklahoma Department Environmental Quality (DEQ) previously noted in a letter to the NPS dated June 4, 2021 that "If lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and this *(June 4, 2021)* approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (DEQ, 2021). DEQ provided a similar letter to the NPS dated September 20, 2022 that indicated that "The *(July 14, 2022)* ASD is applicable for Ba exceedance in SP-10 of the GWPS if conditions do not change. AEP may refer to the ASD approval for Ba and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B)" (DEQ, 2022). This ASD update presents an evaluation of the BAP for changing conditions that may affect previously approved ASDs for lithium, fluoride, and barium exceedances at SP-10.

The sample collected from the June 2022 monitoring event at SP-10 contained a lithium concentration of 0.289 mg/L, fluoride concentration of 6.30 mg/L, and barium concentration of 7.59 mg/L. The lithium and fluoride concentrations are consistent with previous results collected during the assessment monitoring period and continue to show no statistically significant positive trends (**Figure 1** and **Figure 2**, respectively). This is an indication that conditions have not changed substantially since the preceding ASD was submitted (Geosyntec, 2022) and the arguments presented in the previous ASDs are still valid. Thus, the lithium and fluoride concentrations at SP-10 during the June 2022 assessment monitoring event are not attributed to a release from the BAP.

A time series plot of the barium concentrations at SP-10 and a Mann-Kendall statistical analysis of the reported barium results over time is shown in **Figure 3**. The analysis determined that barium concentrations at SP-10 display a statistically significant increasing trend. However, based on a Schoeller diagram showing select events where major cations and anions were sampled (**Figure 4**)[1], the holistic geochemistry at monitoring well SP-10 does not change over time in a manner indicative of a release from the BAP. The June 2022 sample is displayed on the plot as the bold black line. **Figure 4** demonstrates that the geochemistry of SP-10 has remained consistent over the past several years, indicating conditions at SP-10 have not changed. Moving forward, samples from SP-10 will be collected and analyzed for the full suite of major ion chemistry. This will facilitate the preparation of more robust data visuals such as Piper plots and Stiff diagrams to better support the finding that groundwater at SP-10 is geochemically stable in future ASD memoranda.

[1] Piper diagrams were previously used to visualize the geochemical composition of SP-10 over time (Geosyntec, 2019; Geosyntec, 2021a; Geosyntec, 2022). Alkalinity data was unavailable for the June 2022 sampling event, precluding the use of a Piper diagram to show the results of the most recent sampling event.

As mentioned in the previous ASD completed for barium at SP-10 (Geosyntec, 2022), concentrations of barium in sediment and porewater collected from the BAP were roughly an order of magnitude lower than barium concentrations collected from monitoring well SP-10 (**Table 1**). An additional porewater sample was collected from the BAP on August 25, 2022. This porewater sample contained a large component of solids and was unable to be analyzed as an aqueous sample, although the solid component of this sample was separated and submitted for synthetic precipitation leaching procedure (SPLP) to evaluate the leachable component of barium in the solid phase. Leachable barium was reported as 0.22 mg/L from this sample (Attachment C), which is more than an order of magnitude less than the most recent concentration detected in SP-10 groundwater (7.59 mg/L) or the GWPS (2.60 mg/L). This result is consistent with the previously reported concentration of leachable barium in the BAP solids of 0.352 mg/L. Based on this result and previous samples collected from the BAP, the BAP does not appear to be the source for elevated barium concentrations in SP-10 groundwater.

The information above, as well as the information presented in previous ASDs (Geosyntec, 2019; Geosyntec, 2021a,b,c; Geosyntec, 2022), continue to support the position that barium, fluoride, and lithium concentrations are a result of natural variation in the underlying lithology, including the presence of shale lenses containing barium, fluoride, and 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 memorandum by a qualified professional engineer is in Attachment A.

******

Geosyntec Consultants, 2019. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. April.

Geosyntec Consultants, 2021a. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. January.

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

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

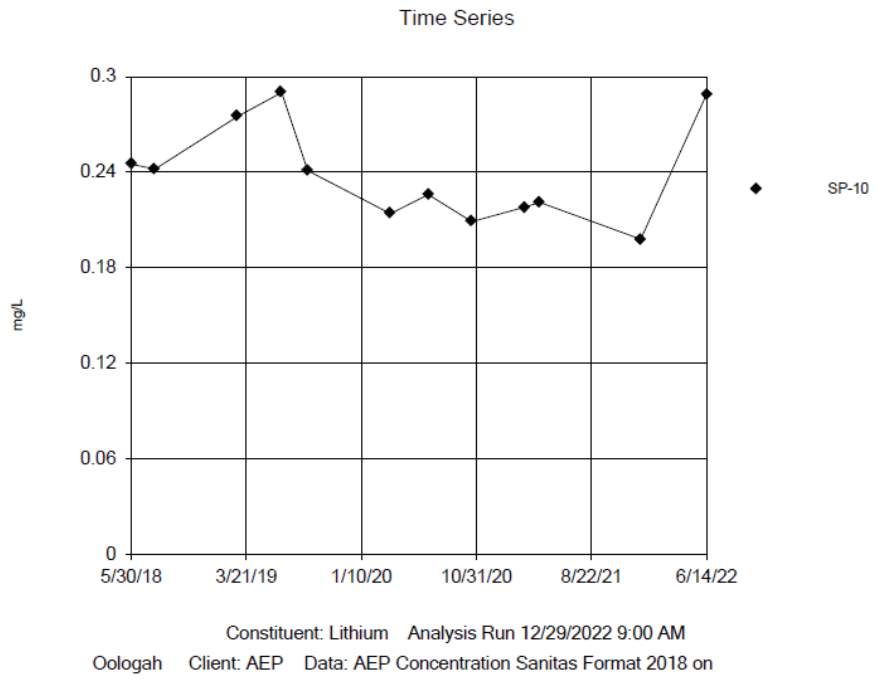
Geosyntec Consultants, 2022. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. July.

Oklahoma Department of Environmental Quality. 2021. Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond, Public Service Company of Oklahoma Northeastern Power Station, Rogers County. June 4.

Oklahoma Department of Environmental Quality, 2022. Alternative Source Demonstration for Barium, Fluoride, and Lithium Exceedances – Bottom Ash Pond, Public Service Company of Oklahoma - Northeastern Power Station, Rogers County. September 20.

# FIGURES

Sanitas™ v.9.6.32 Sanitas software licensed to Geosyntec Consultants. UG

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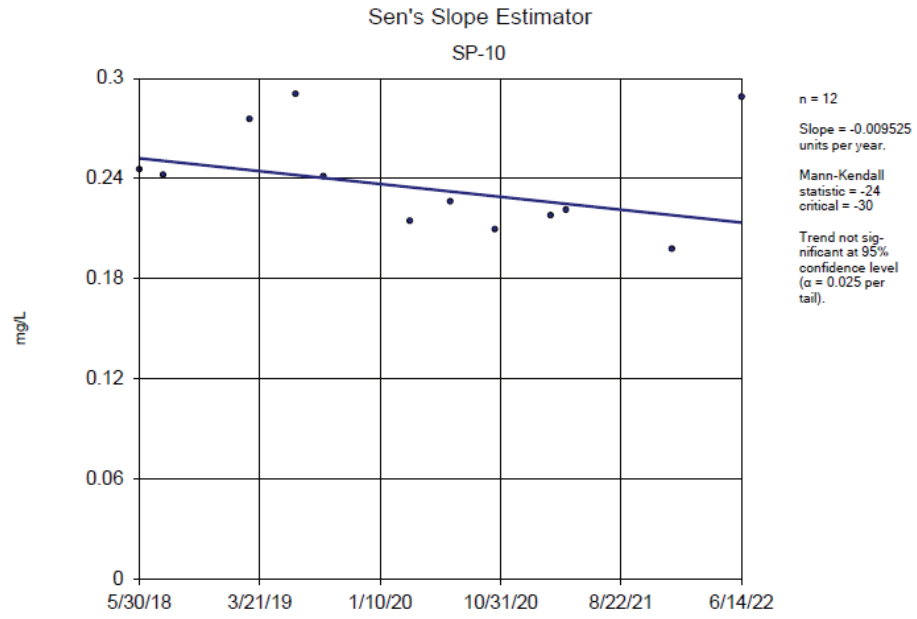


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**Lithium Time Series and Trend Test – SP-10**
Northeastern Bottom Ash Pond

| Geosyntec consultants | AMERICAN ELECTRIC POWER | Figure 1 |
|---|---|---|
| Columbus, Ohio | December 29, 2022 | |

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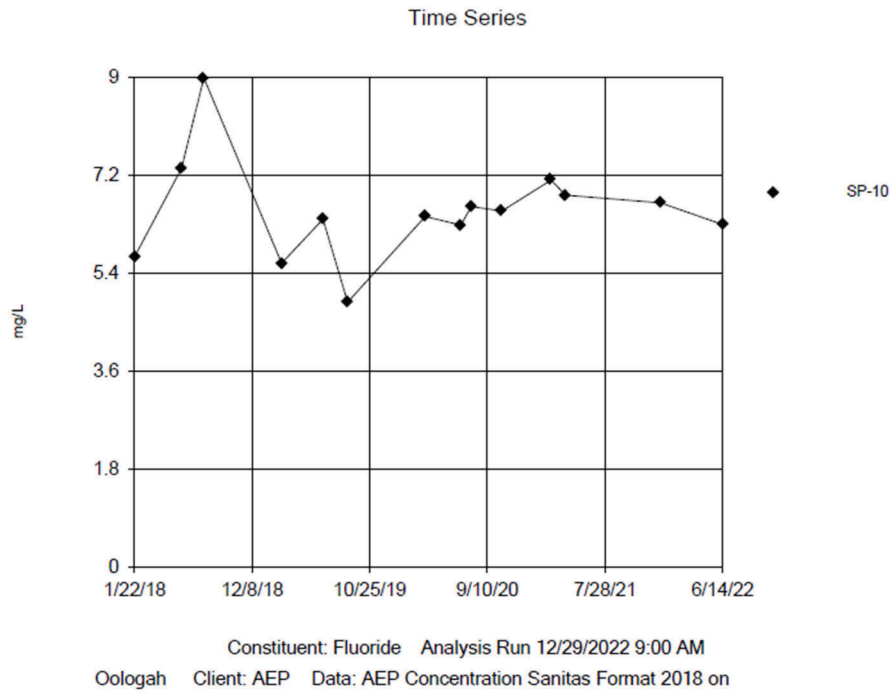


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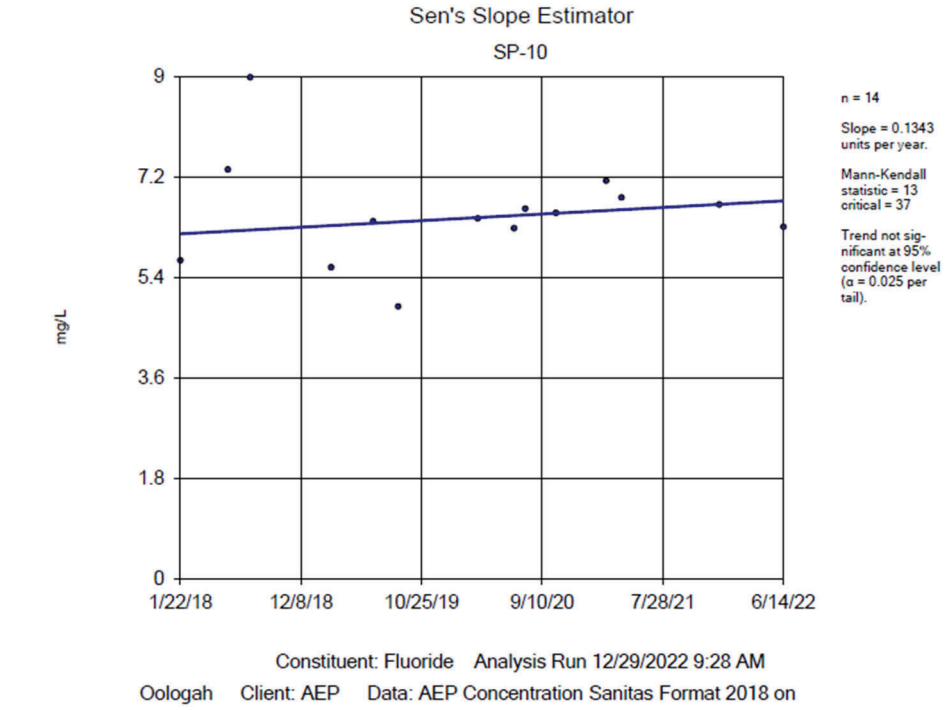


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**Fluoride Time Series and Trend Test – SP-10**
Northeastern Bottom Ash Pond

| Geosyntec consultants | AMERICAN ELECTRIC POWER | Figure 2 |
|---|---|---|
| Columbus, Ohio | December 29, 2022 | |

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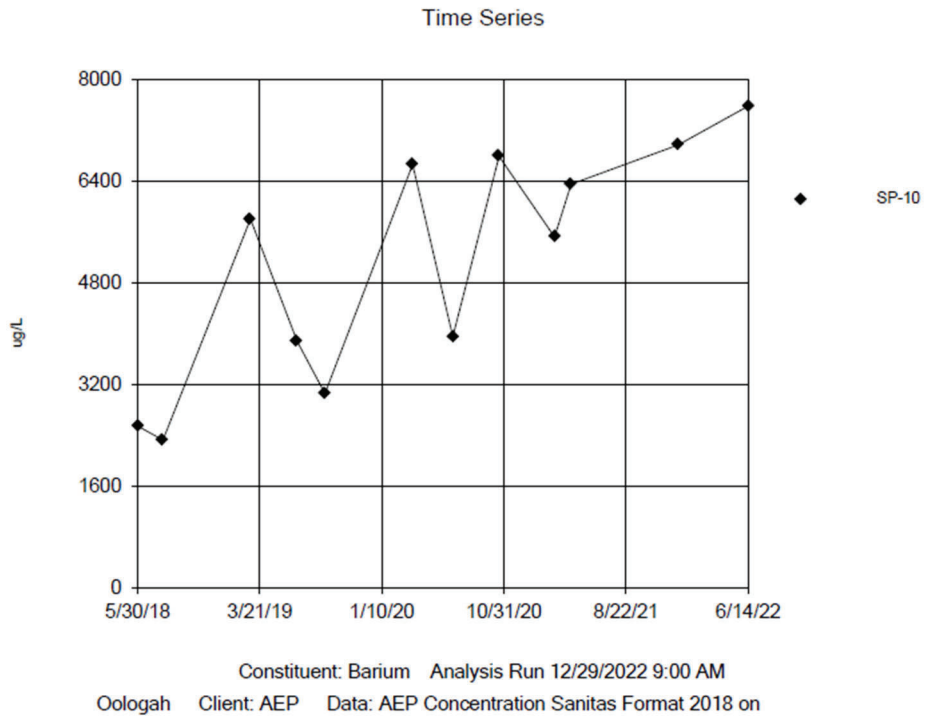


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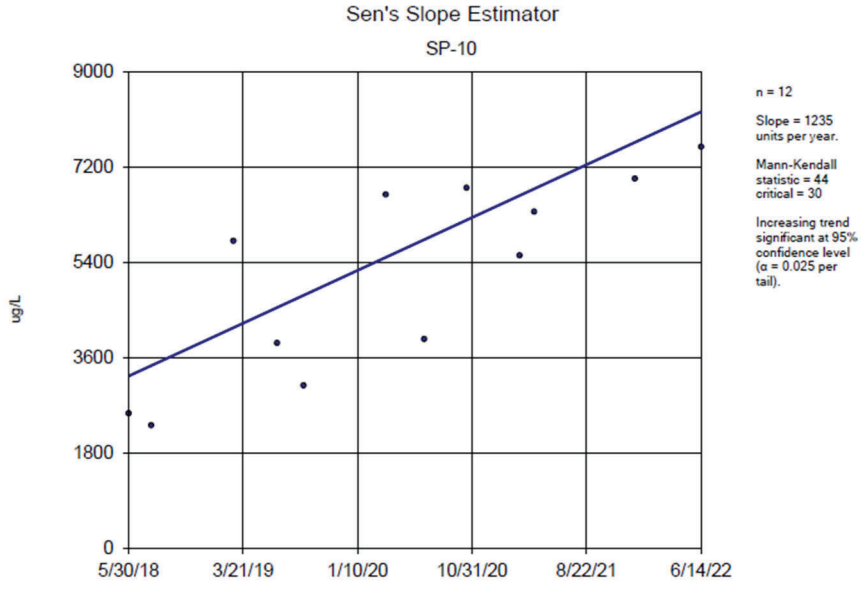
Sanitas™ v.9.6.32 Sanitas software licensed to Geosyntec Consultants. UG

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Oologah Client: AEP Data: AEP Concentration Sanitas Format 2018 on

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**Barium Time Series and Trend Test – SP-10**

Northeastern Bottom Ash Pond

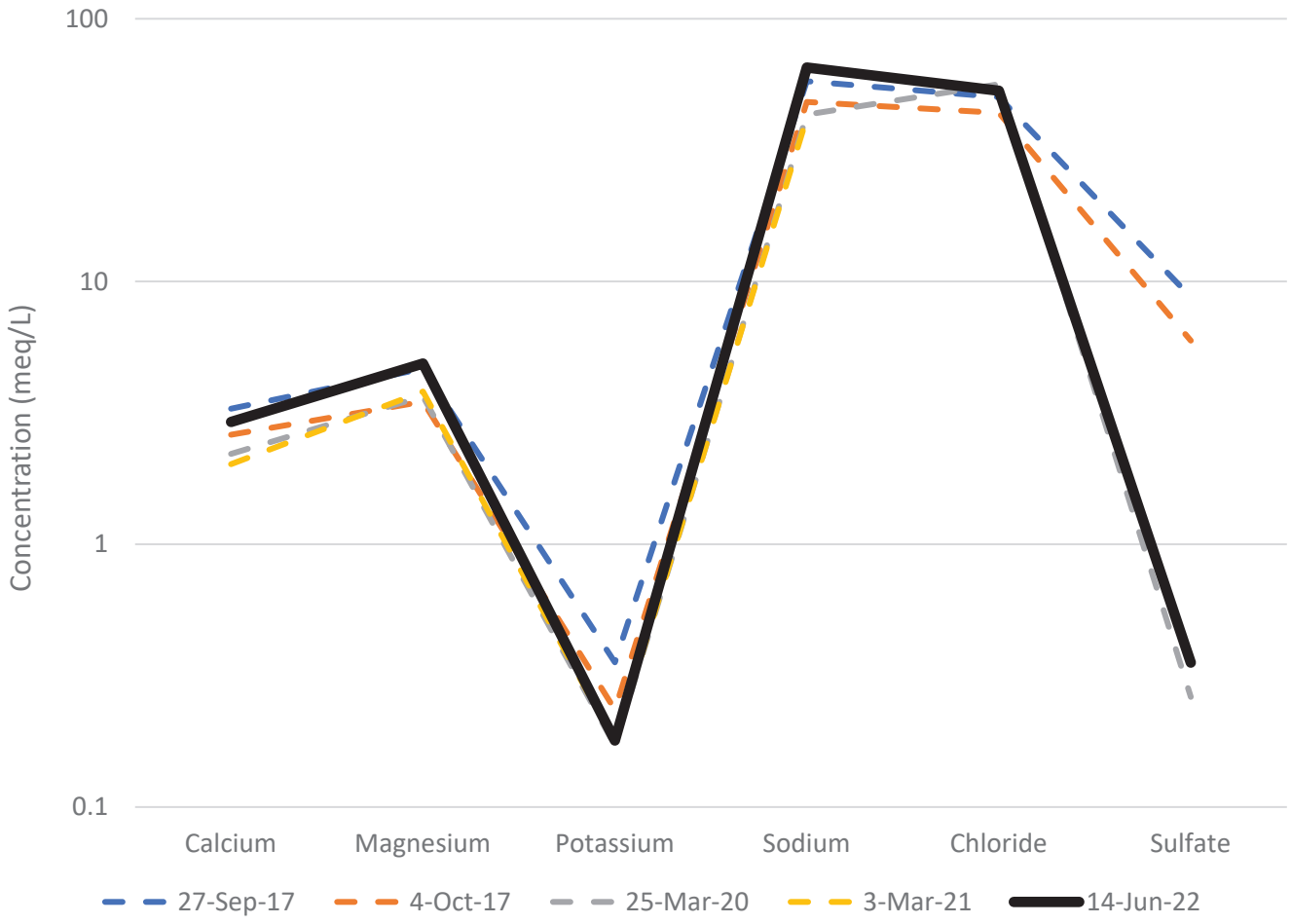
Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure 3

Columbus, Ohio

December 29, 2022




Notes: Groundwater results from monitoring well SP-10 are displayed on the plot. Concentrations of all parameters are displayed in units of milliequivalents per liter (meq/L). The most recent sample, collected in June 2022, is displayed as the bold black line.

**SP-10 Schoeller Diagram**
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | January 2023

Figure **4**

internal info: path, date revised, author

# TABLES

**Table 1: Summary of Key Analytical Data**
**Bottom Ash Pond - Northeastern Power Station**

| Sample | Sample Date | Lithium Concentration (mg/L) | Fluoride Concentration (mg/L) | Barium Concentration (mg/L) |
|---|---|---|---|---|
| SPLP Leachate of Bottom Ash | 7/10/2019 | 0.001 | 0.458 | 0.352 |
| | 8/25/2022 | < 0.5 | NA | 0.22 |
| BAP Surface Water | 2/5/2019 | 0.00874 | 0.37 | 0.315 |
| BAP Pore Water | 7/10/2019 | 0.003 | < 0.83 | 0.083 |
| SP-10 June 2022 Result | 6/14/2022 | 0.289 | 6.3 | 7.59 |

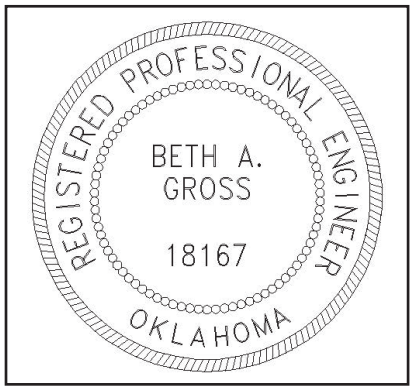
Notes:
NA - not analyzed
mg/L - milligram per liter
BAP - Bottom Ash Pond
SPLP - Synthetic precipitation leaching procedure
Non-detect results are shown as less than the reporting limit.

# ATTACHMENT A

## Certification by Qualified Professional Engineer

## CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

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




Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature

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

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

| 18167 | Oklahoma | January 5, 2023 |
|---|---|---|
| License Number | Licensing State | Date |

* * * * *

# ATTACHMENT B
# Assessment Statistics Report
# 2022 First Semiannual Event

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

*Submitted to*

1 Riverside Plaza
Columbus, Ohio 43215-2372

*Submitted by*

Geosyntec consultants

engineers | scientists | innovators

500 West Wilson Bridge Road
Suite 250
Worthington, Ohio 43085

October 7, 2022

CHA8500B

# TABLE OF CONTENTS



## LIST OF TABLES



## LIST OF ATTACHMENTS

## LIST OF ACRONYMS AND ABBREVIATIONS

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

# SECTION 1

# EXECUTIVE SUMMARY

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

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

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

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

# SECTION 2

# BOTTOM ASH POND EVALUATION

## 2.1 Data Validation & QA/QC

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

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

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

## 2.2 Statistical Analysis

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

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

### 2.2.1 Evaluation of Potential Appendix B SSLs

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

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

The following SSLs were identified at the Northeastern BAP:

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

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

### 2.2.2 Evaluation of Potential Appendix A SSIs

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

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

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

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

## 2.3 Conclusions

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

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

# SECTION 3

# REFERENCES

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

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

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

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

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

# TABLES

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

*Geosyntec Consultants, Inc.*

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

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

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

*Geosyntec Consultants, Inc.*

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

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

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

*Geosyntec Consultants, Inc.*

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

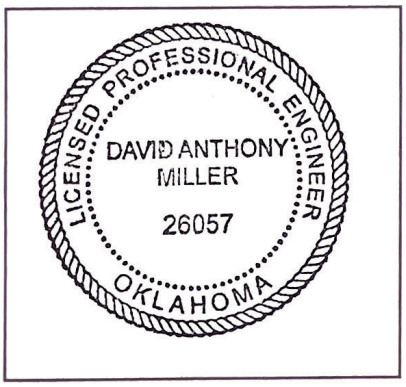
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
**Bold values exceed the background value.**
Background values are shaded gray.

# ATTACHMENT A

## Certification by Qualified Professional Engineer

**Certification by Qualified Professional Engineer**

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




DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

| 26057 | OKLAHOMA | 10.07.22 |
|---|---|---|
| License Number | Licensing State | Date |

# ATTACHMENT B
# Statistical Analysis Output

GROUNDWATER STATS CONSULTING

August 31, 2022

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

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

Dear Ms. Kreinberg,

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

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

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

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

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

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

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

**Summary of Background Screening**

Outlier Screening

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

**Evaluation of Appendix B Parameters – June 2022**

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

Interwell Upper Tolerance Limits

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

Groundwater Protection Standards

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

Confidence Intervals

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

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

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

For Groundwater Stats Consulting,

Tristan Clark
Groundwater Analyst

Andrew Collins
Project Manager

# Date Ranges



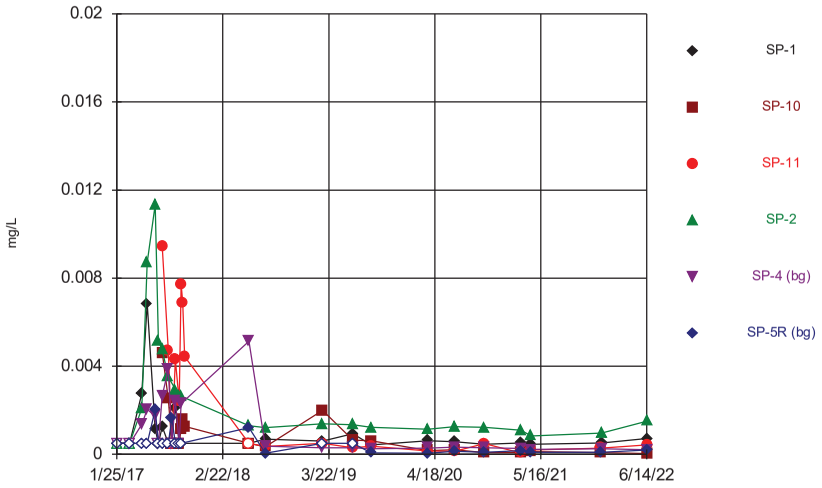
Date: 8/8/2022 3:09 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

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

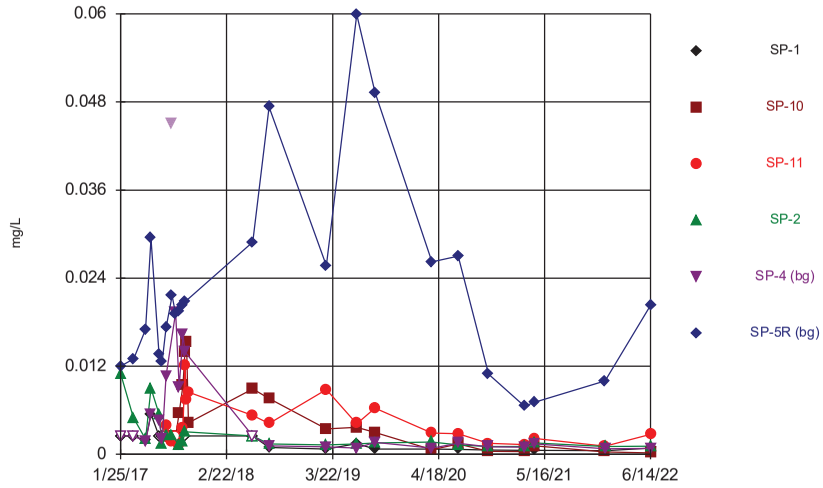
## Time Series




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

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

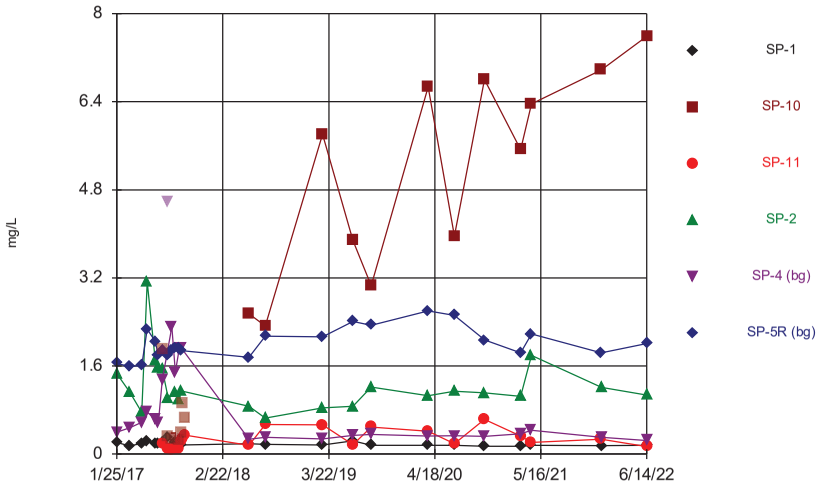
## Time Series




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

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

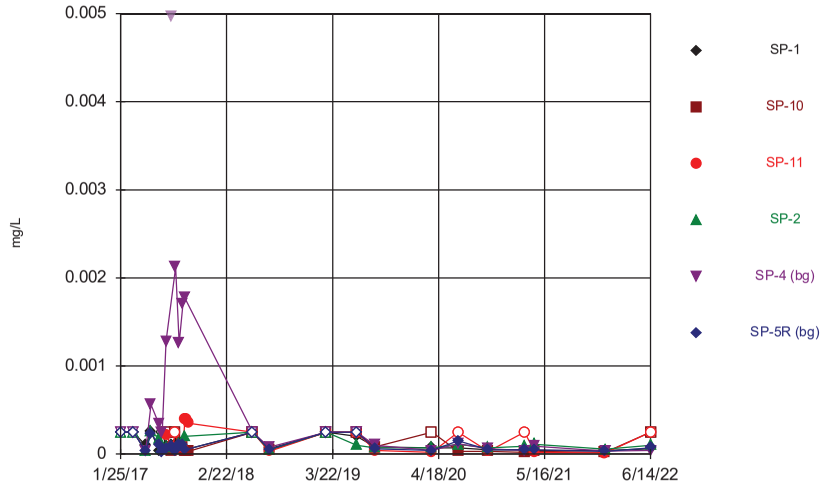
## Time Series




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

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

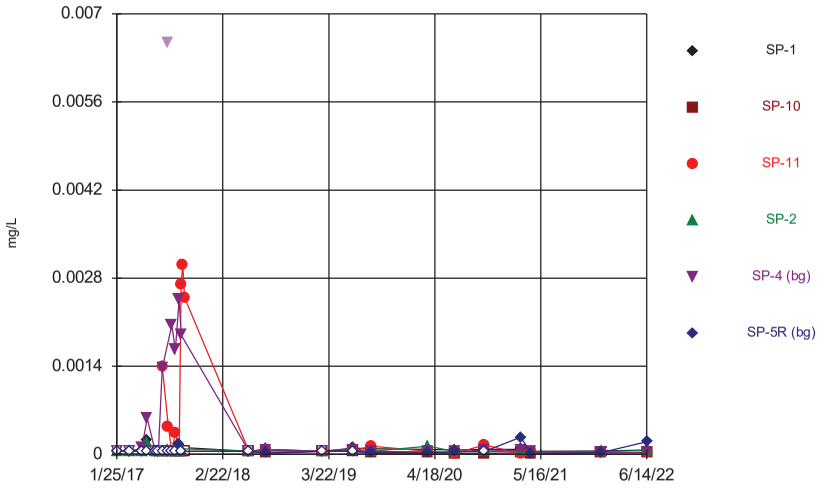
## Time Series




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

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

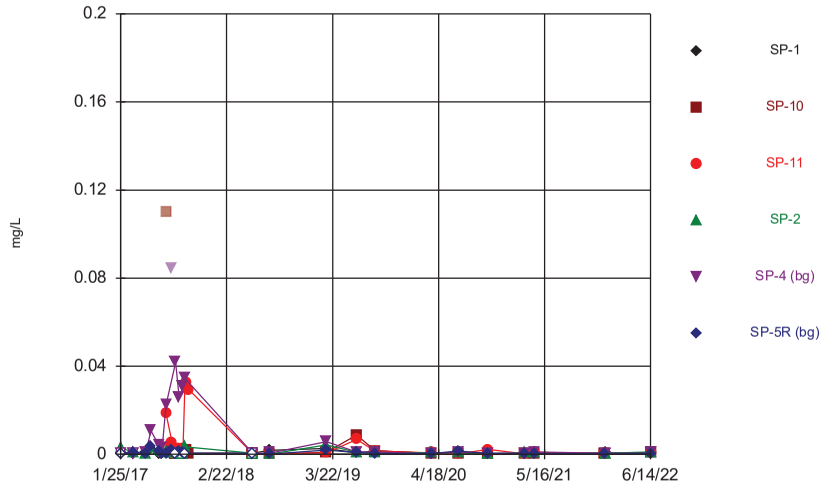
## Time Series




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

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

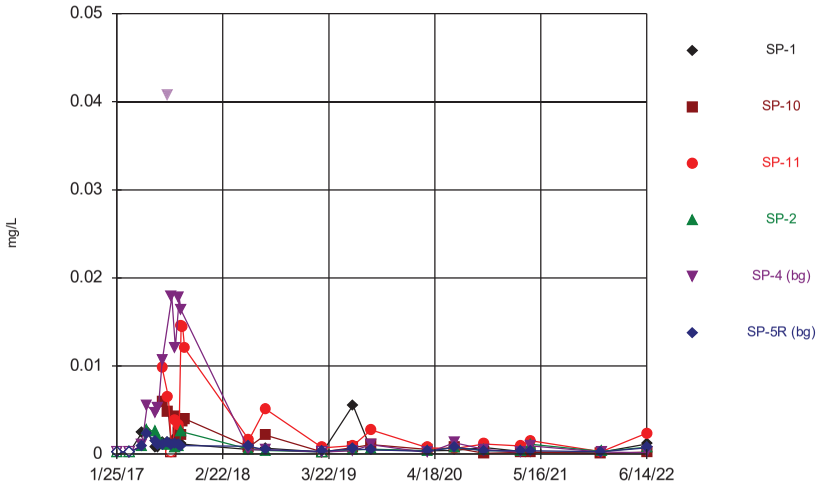
## Time Series




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

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

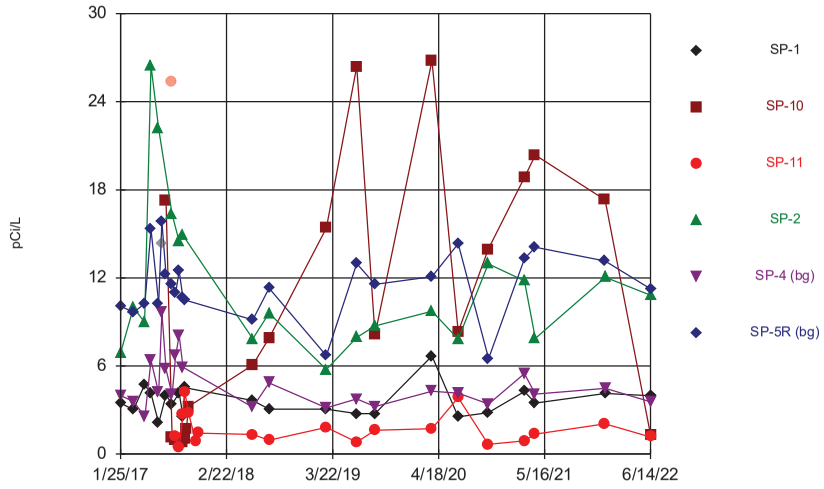
## Time Series




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

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

## Time Series




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

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

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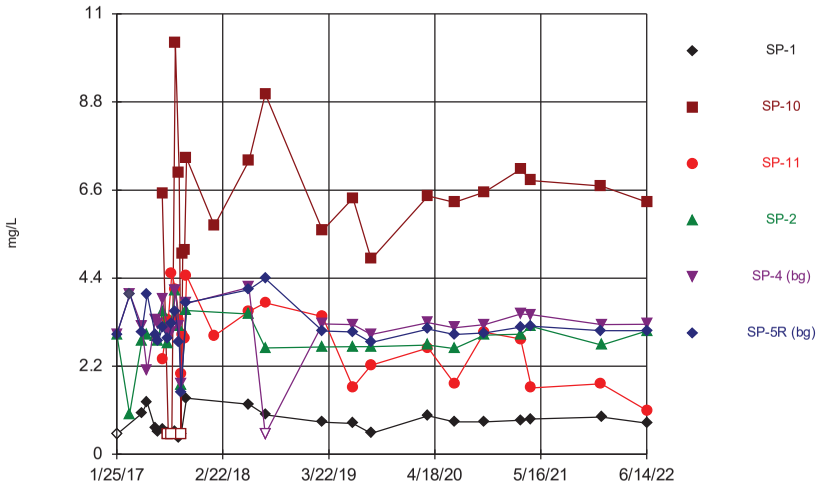


Constituent: Fluoride Analysis Run 8/30/2022 2:18 PM View: Appendix IV
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

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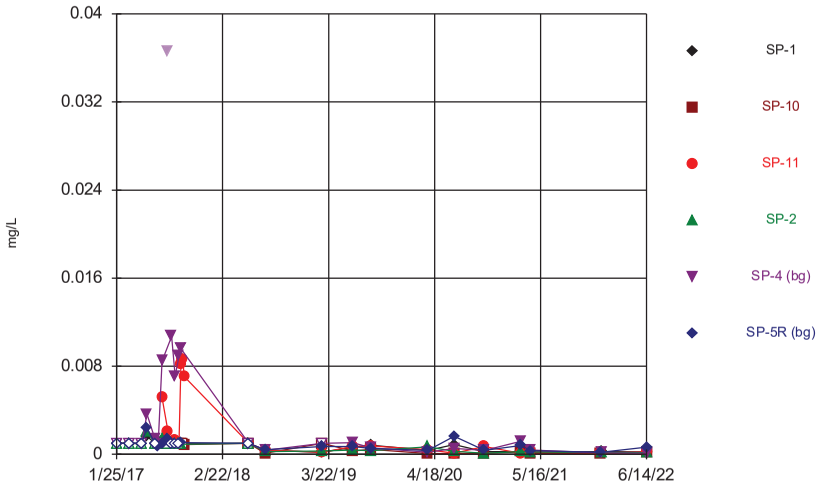


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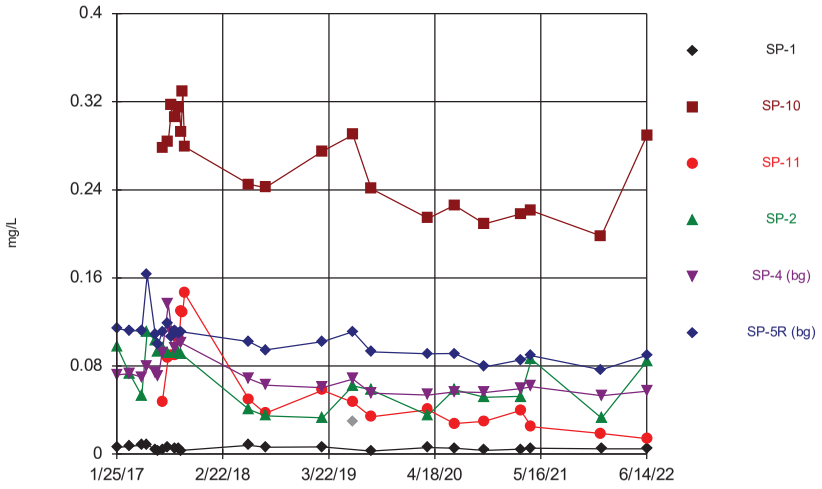
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

## Time Series




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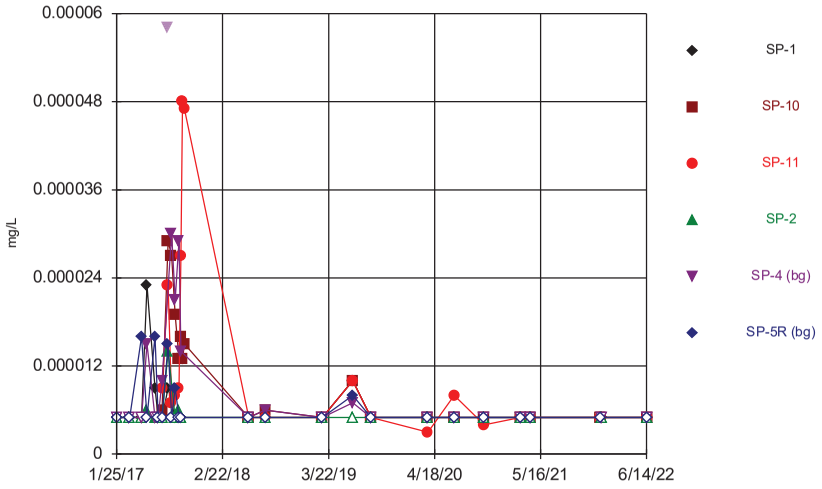
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

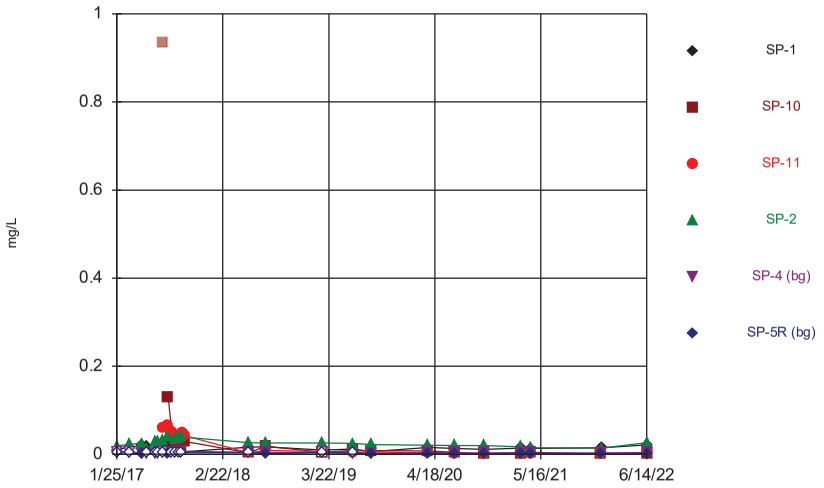
## Time Series




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

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

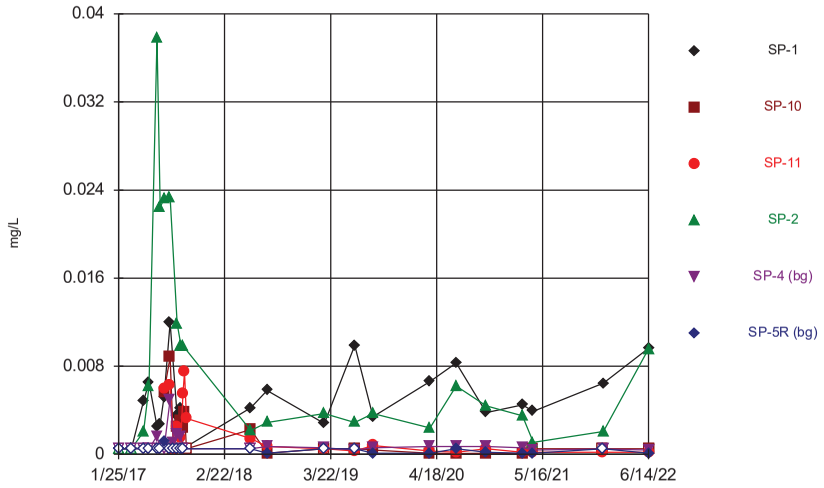
Time Series




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

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

Time Series




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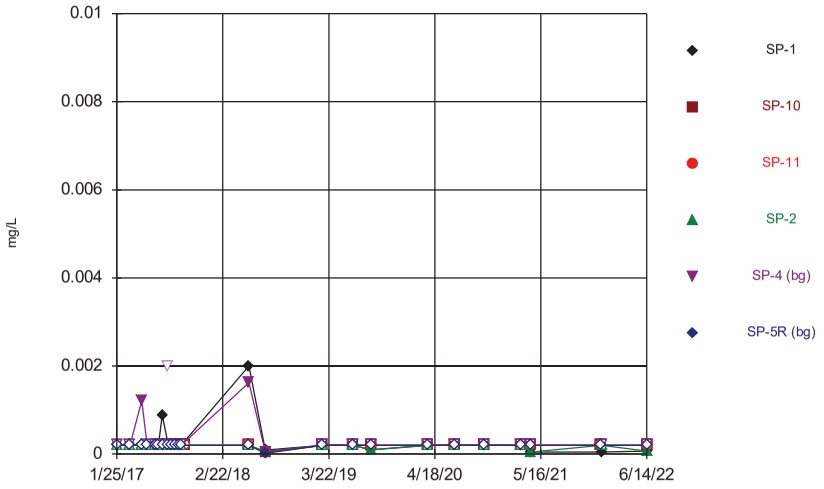
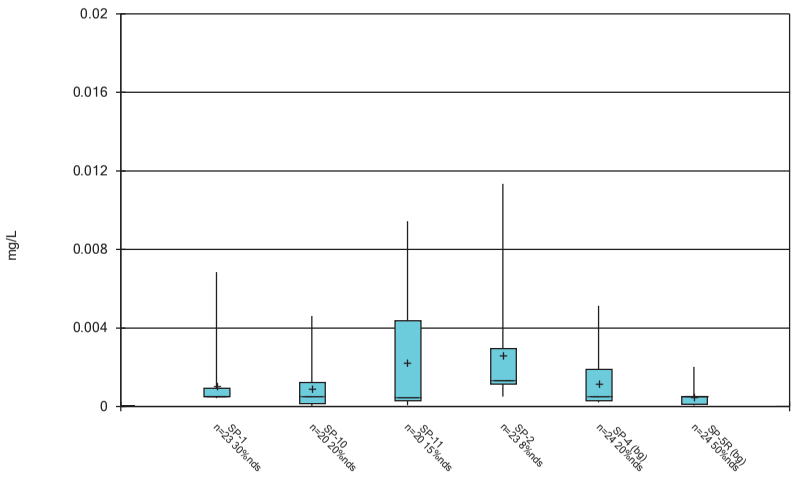
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series




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

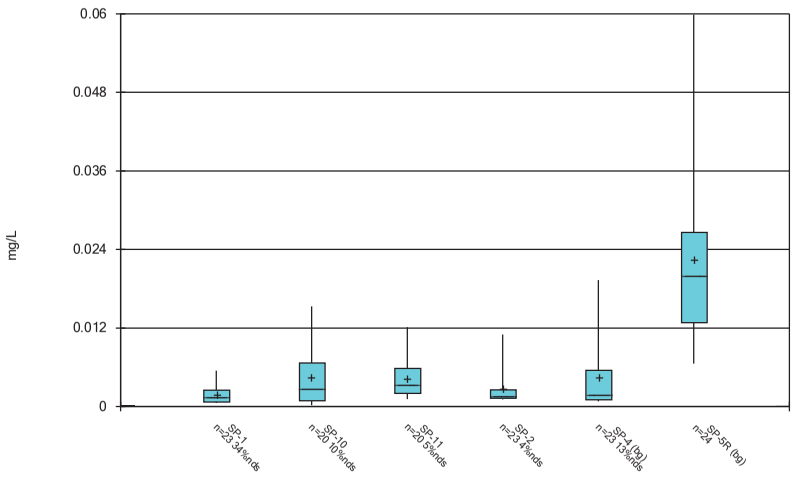
## Box & Whiskers Plot




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

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

## Box & Whiskers Plot

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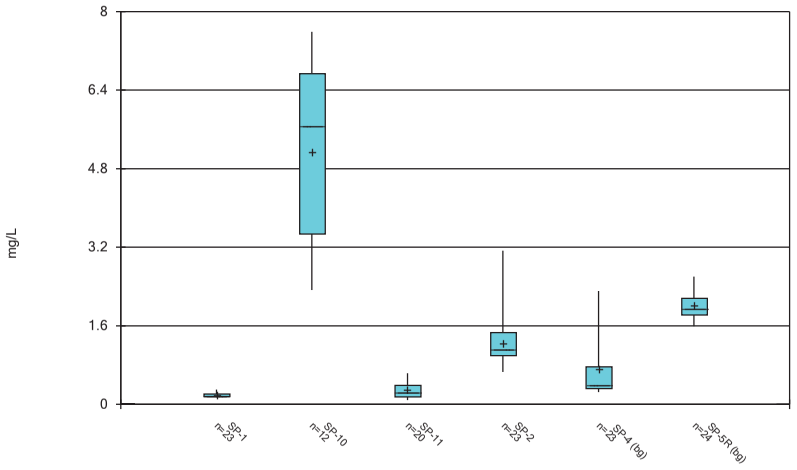
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

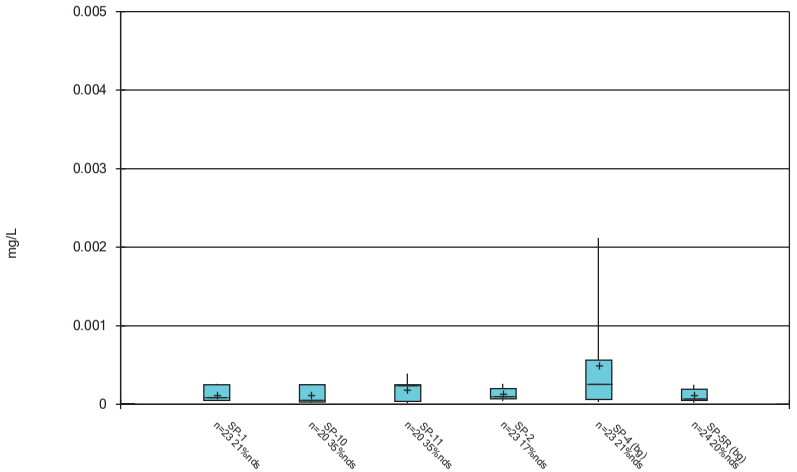
## Box & Whiskers Plot




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

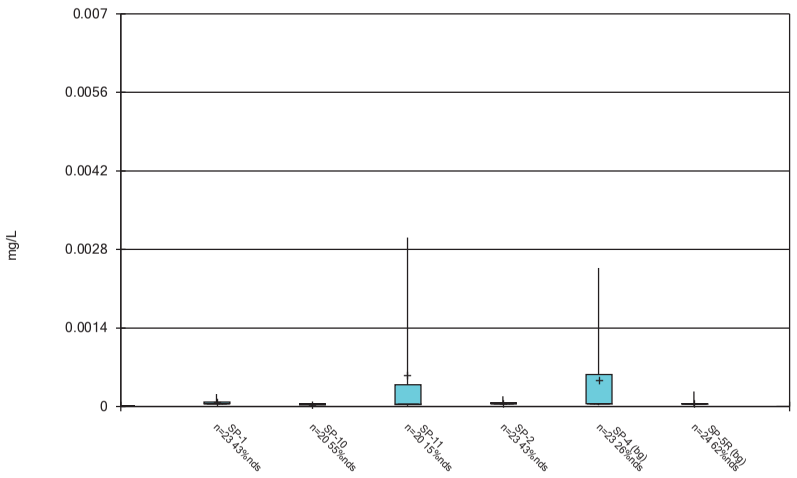
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

## Box & Whiskers Plot




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

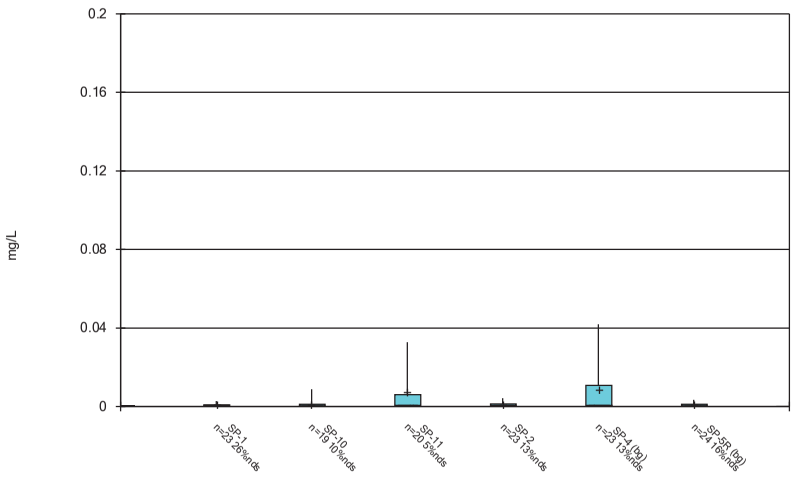
## Box & Whiskers Plot




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

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

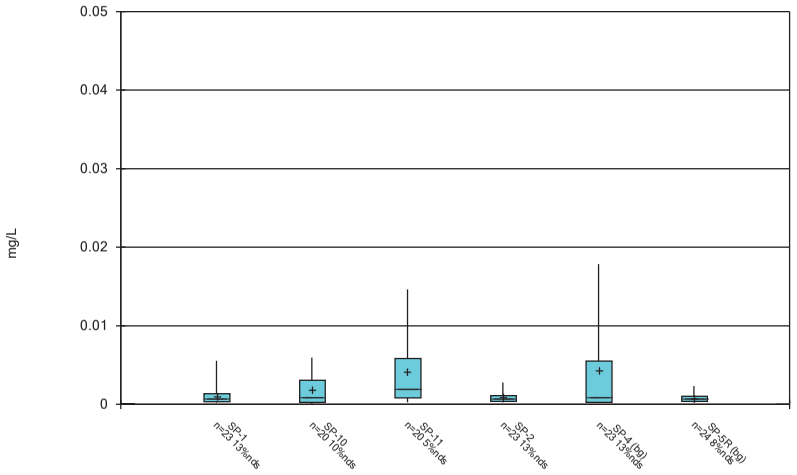
## Box & Whiskers Plot




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

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

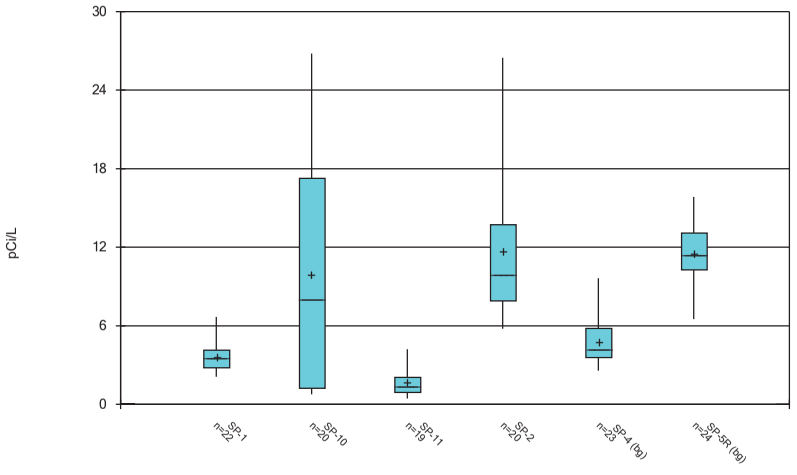
## Box & Whiskers Plot




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

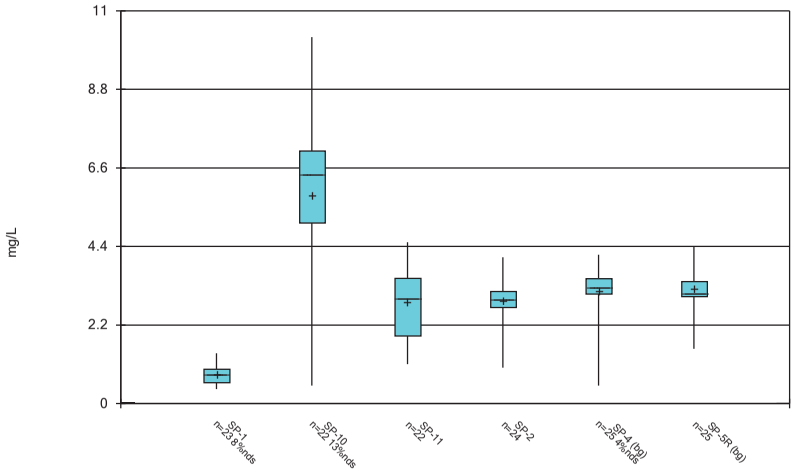
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

## Box & Whiskers Plot




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

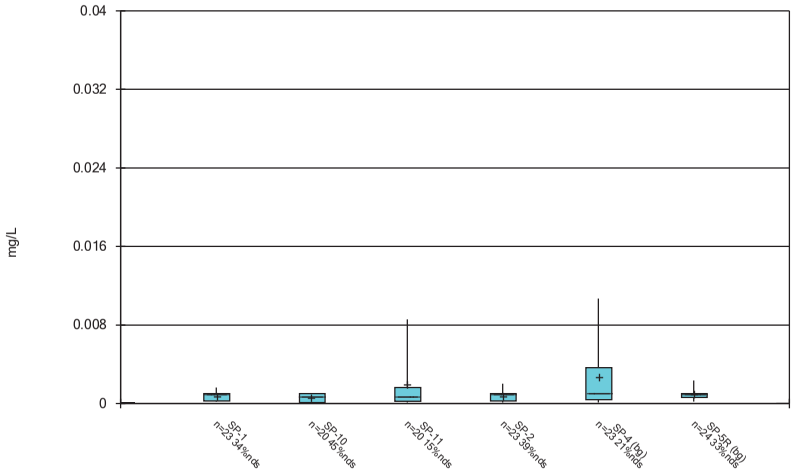
## Box & Whiskers Plot




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

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

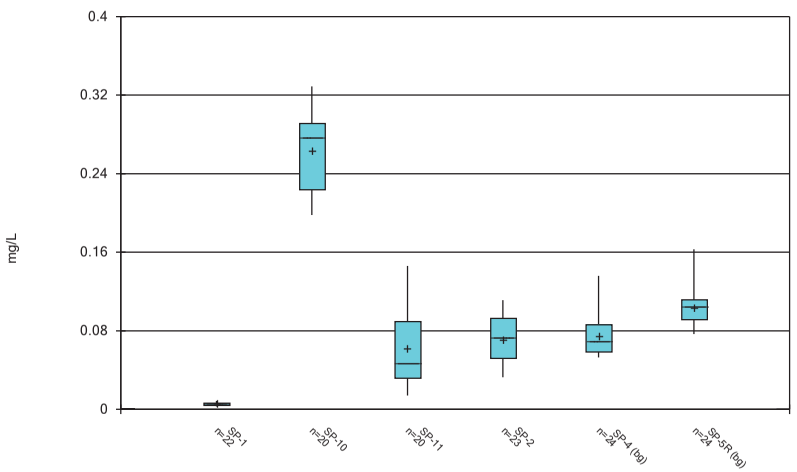
## Box & Whiskers Plot




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

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

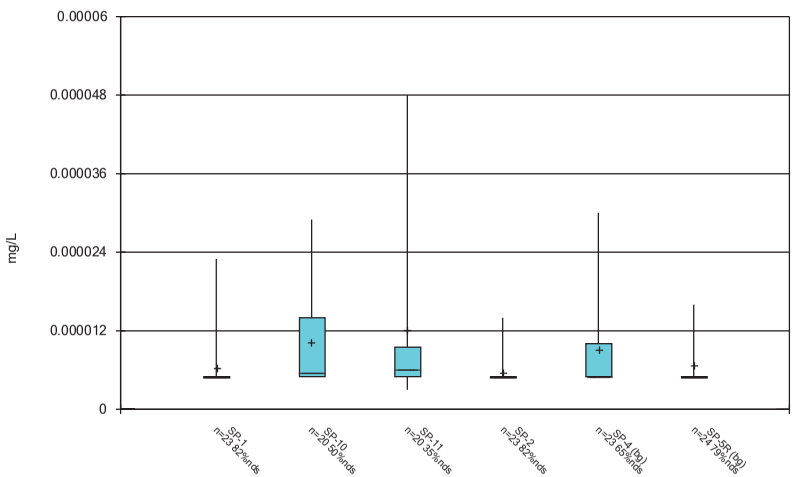
## Box & Whiskers Plot




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

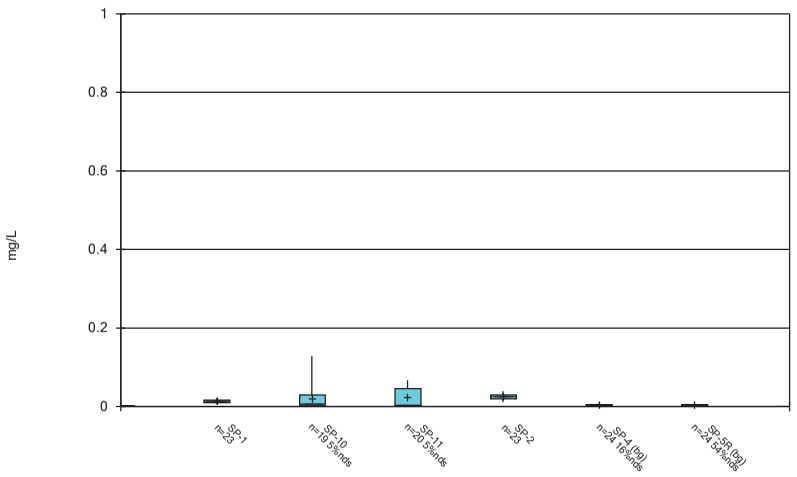
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

## Box & Whiskers Plot




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

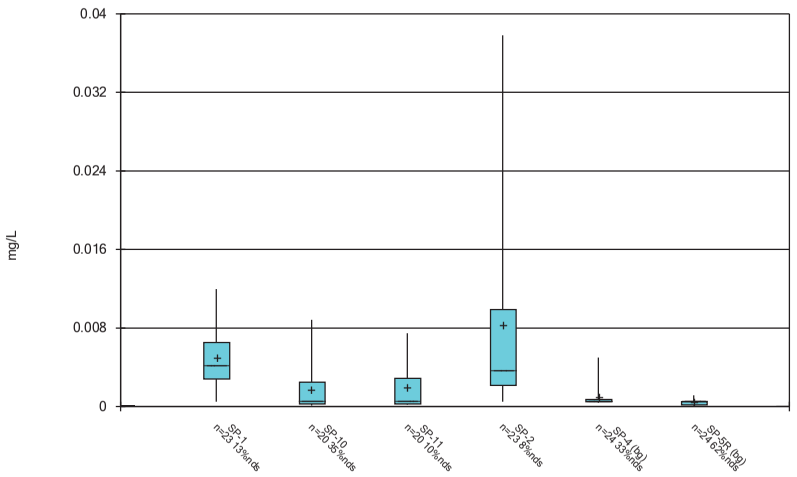
## Box & Whiskers Plot




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



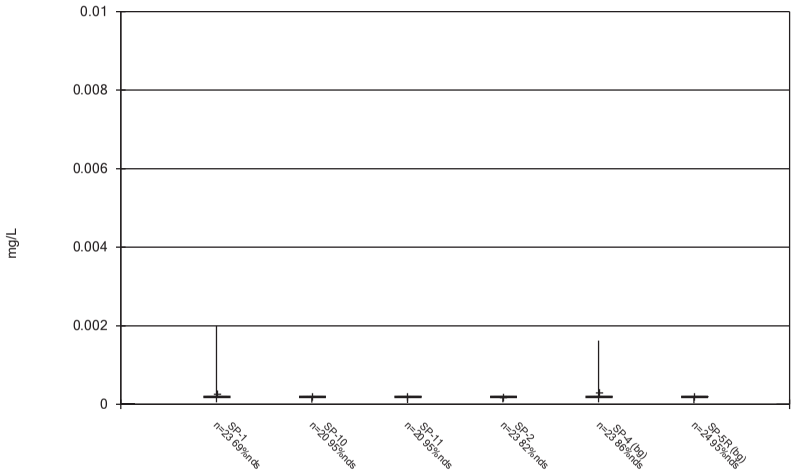
## Box & Whiskers Plot




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



## Box & Whiskers Plot




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

# Outlier Summary

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

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

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

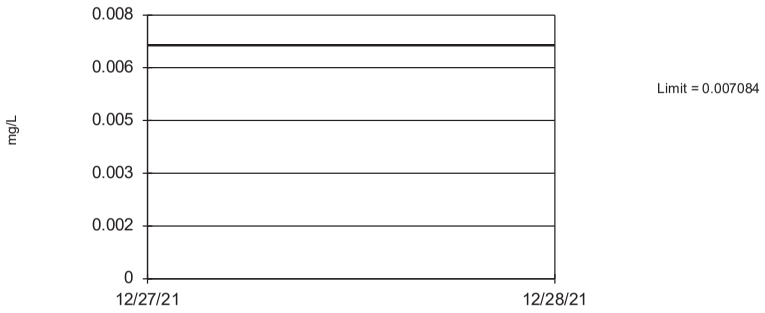
# Upper Tolerance Limits Summary Table

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

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

## Tolerance Limit

Interwell Parametric



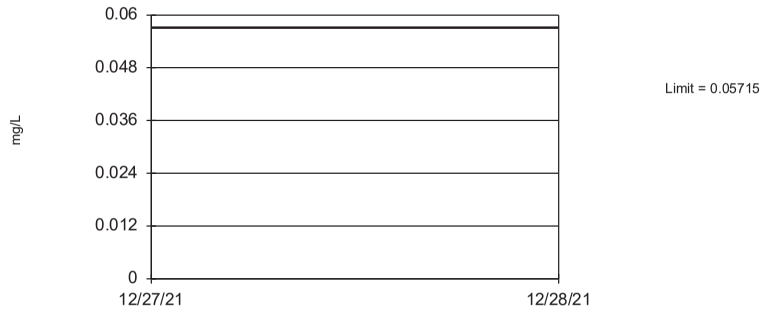

95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.866, Std. Dev.=1.398, n=46, 36.96% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9381, critical = 0.927. Report alpha = 0.05.

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Parametric



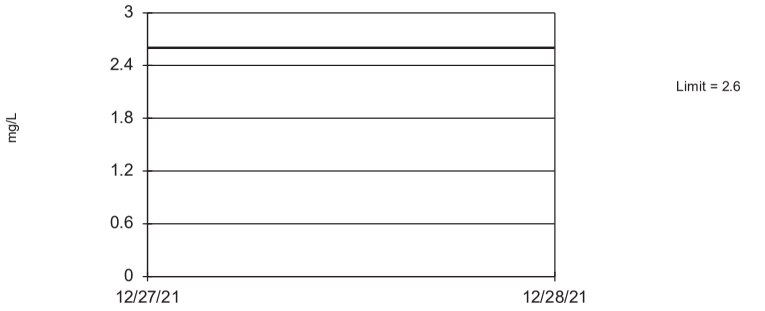

95% coverage. Background Data Summary (based on cube root transformation): Mean=0.2106, Std. Dev.=0.08347, n=45, 6.667% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9293, critical = 0.926. Report alpha = 0.05.

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Non-parametric



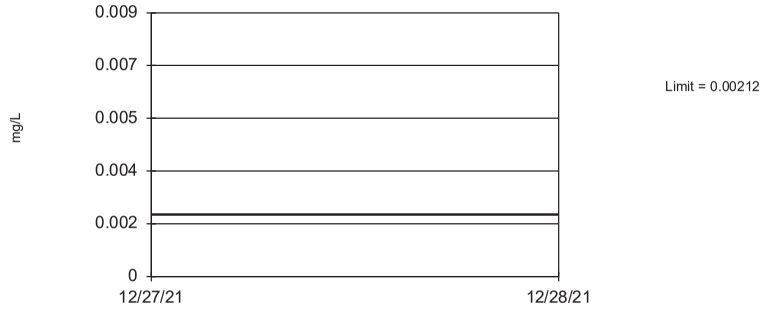

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Non-parametric

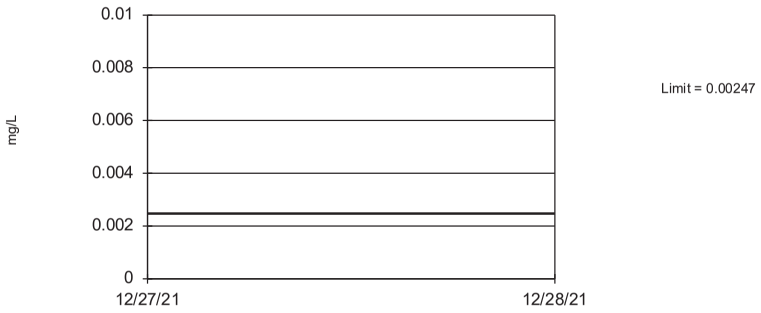



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 22.22% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

## Tolerance Limit

Interwell Non-parametric



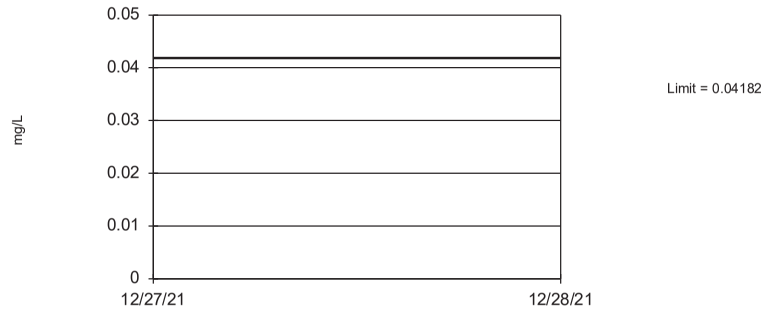

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 46.67% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Non-parametric



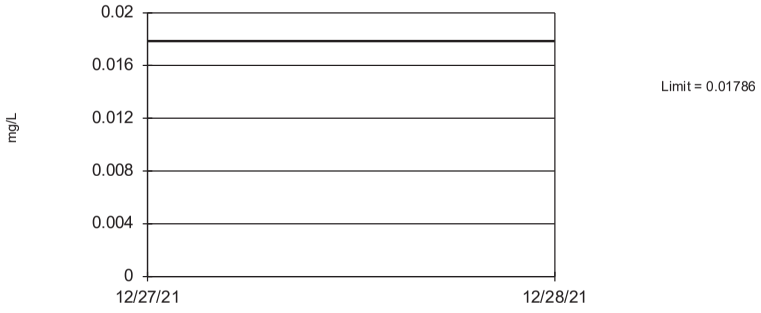

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 15.56% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Non-parametric



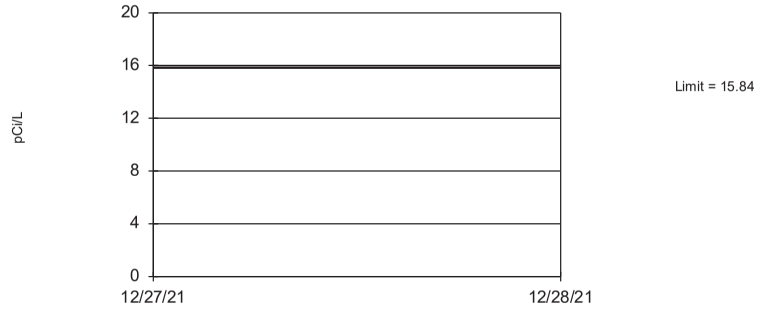

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 11.11% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Non-parametric

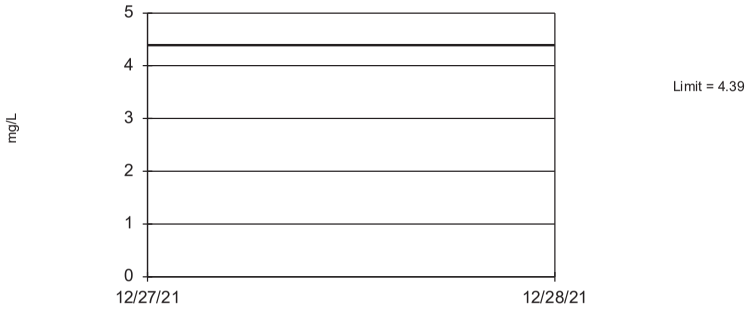



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report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

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

## Tolerance Limit

Interwell Non-parametric



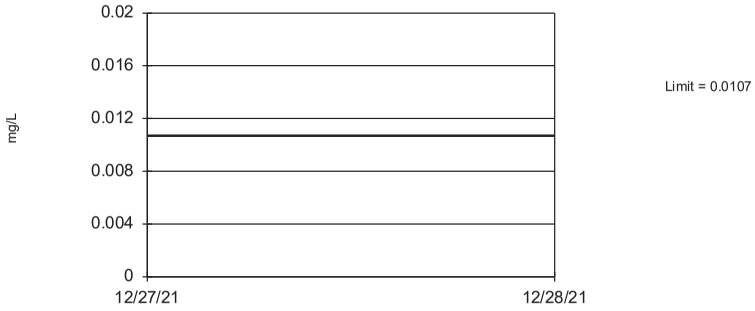

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 48 background values. 2.083% NDs. 90.82% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Non-parametric



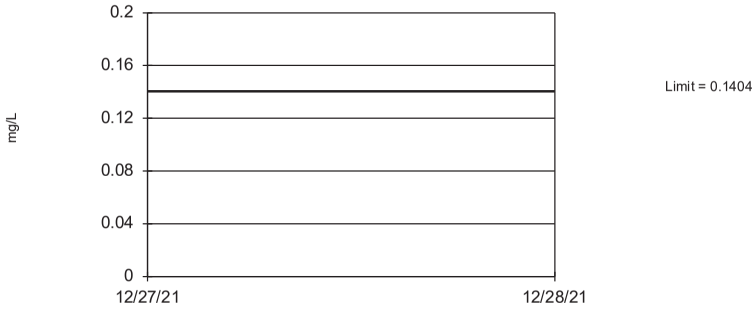

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 45 background values. 28.89% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Parametric



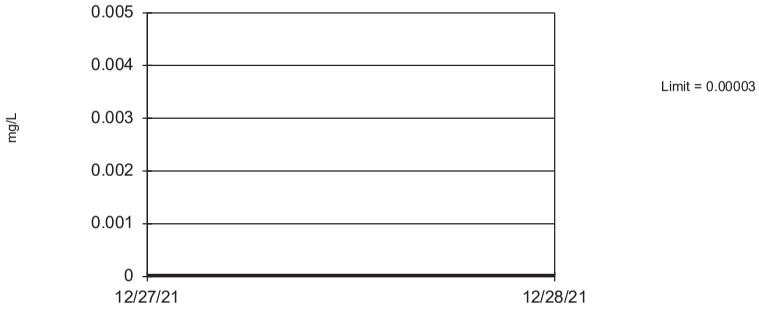

95% coverage. Background Data Summary: Mean=0.08976, Std. Dev.=0.02426, n=46. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9416, critical = 0.927. Report alpha = 0.05.

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

## Tolerance Limit

Interwell Non-parametric

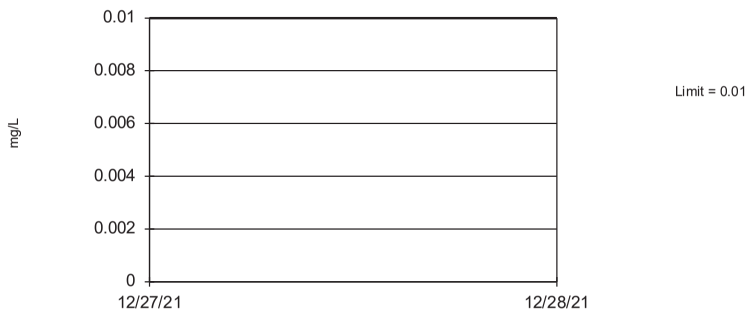



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 45 background values. 71.11% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.09944.

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

Tolerance Limit

Interwell Non-parametric



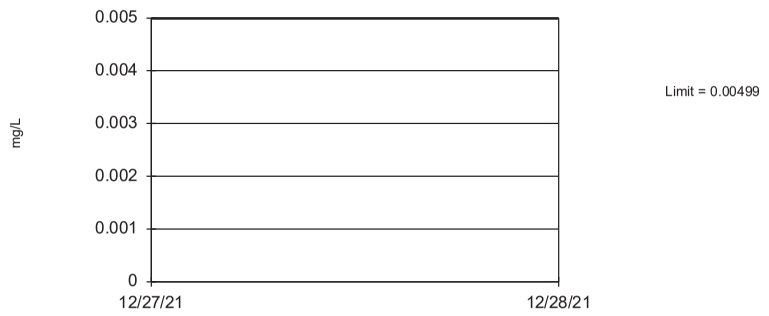

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 46 background values. 36.96% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



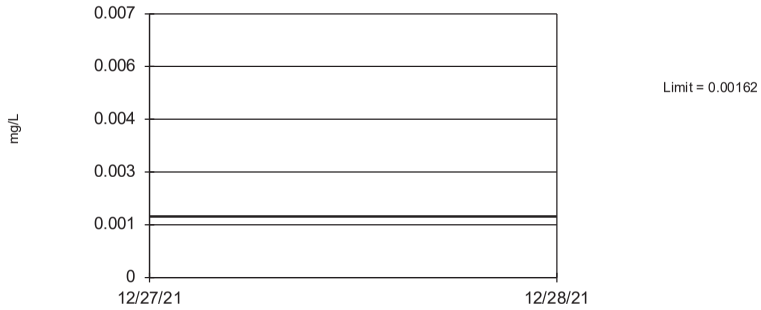

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 46 background values. 50% NDs. 90.43% coverage at alpha=0.01; 93.55% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

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

Sanitas™ v.9.6.32 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric




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

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

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

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

**GWPS = Groundwater Protection Standard*

**MCL = Maximum Contaminant Level*

**CCR = Coal Combustion Residuals*

# Confidence Interval - Significant Results

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

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

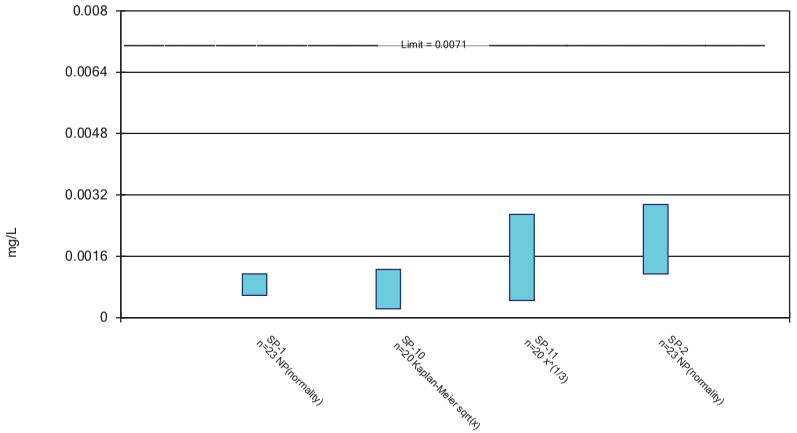
# Confidence Interval - All Results

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

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

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

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

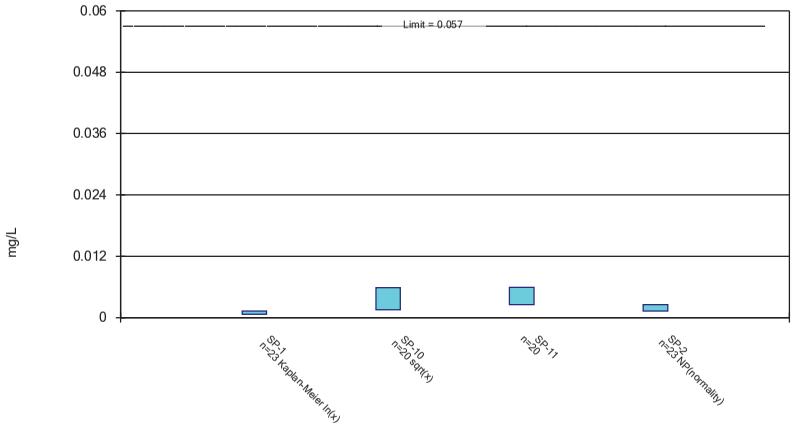



Constituent: Antimony Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



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

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

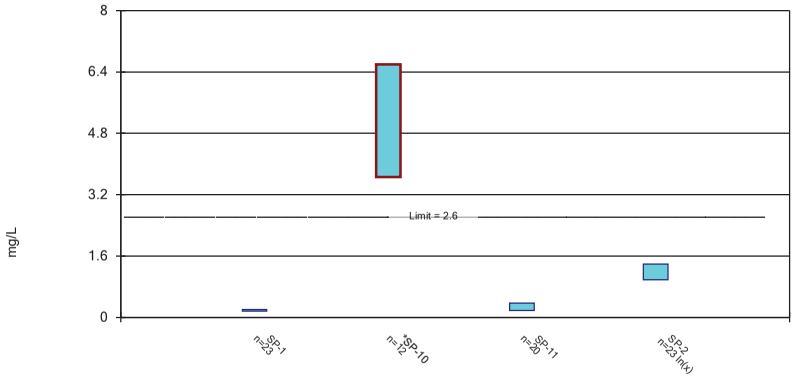



Constituent: Arsenic Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



## Parametric Confidence Interval

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

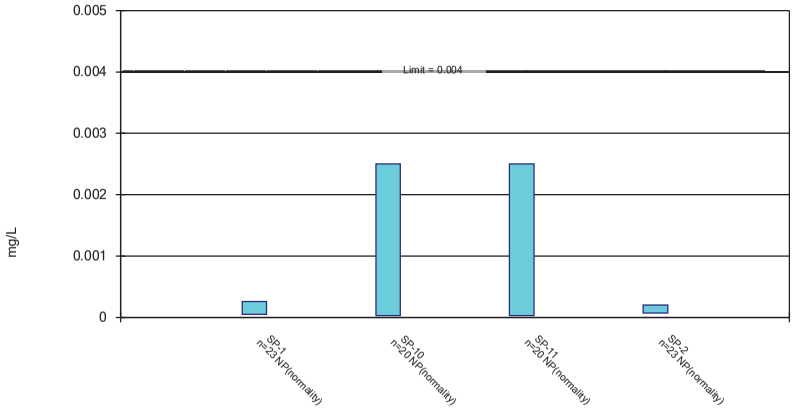



Constituent: Barium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



## Non-Parametric Confidence Interval

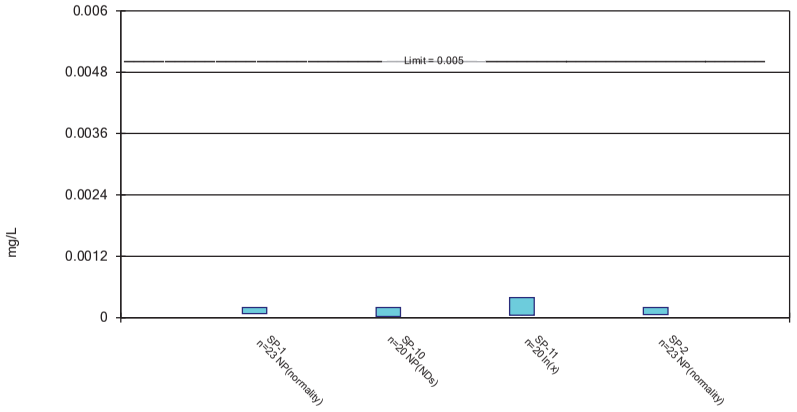
Compliance Limit is not exceeded. Per-well alpha = 0.01.




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

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

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

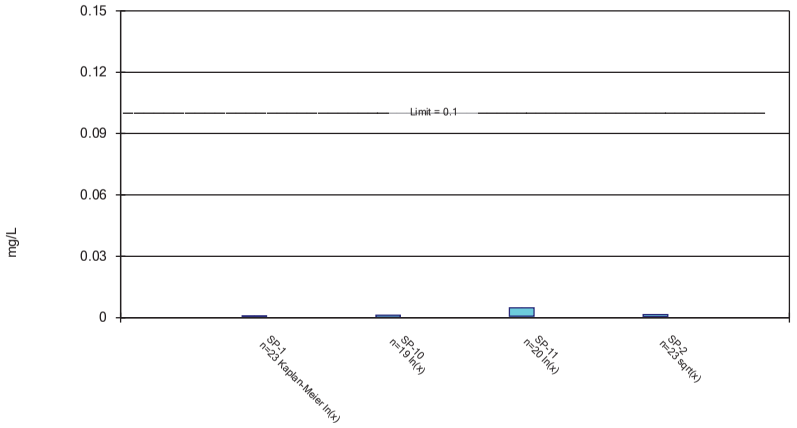



Constituent: Cadmium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

## Parametric Confidence Interval

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

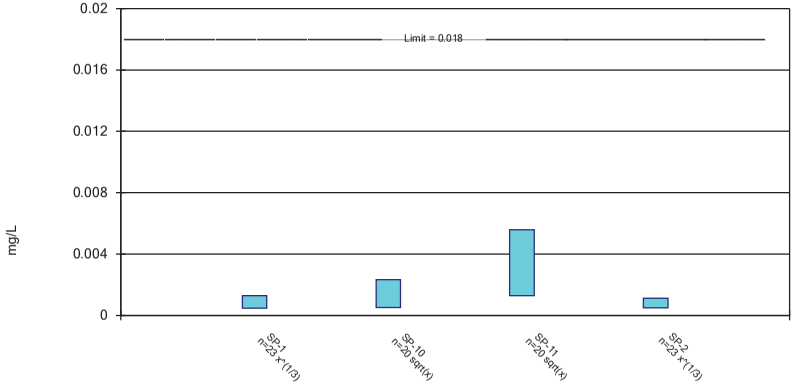



Constituent: Chromium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

## Parametric Confidence Interval

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

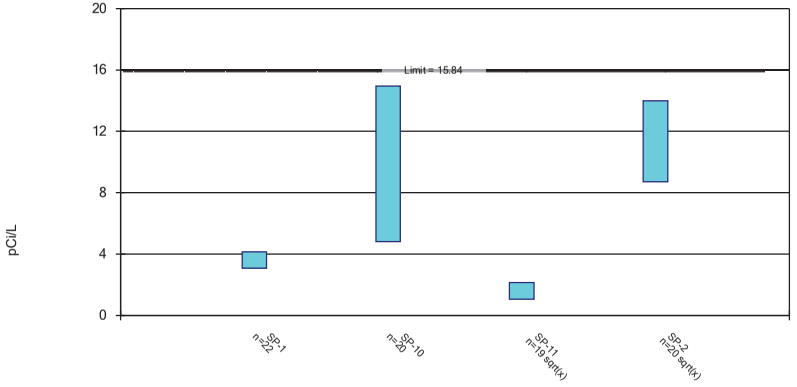



Constituent: Cobalt Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

## Parametric Confidence Interval

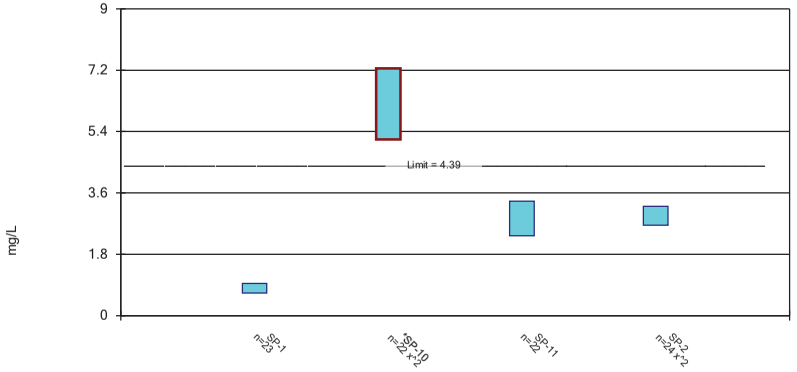
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.




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

## Parametric Confidence Interval

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

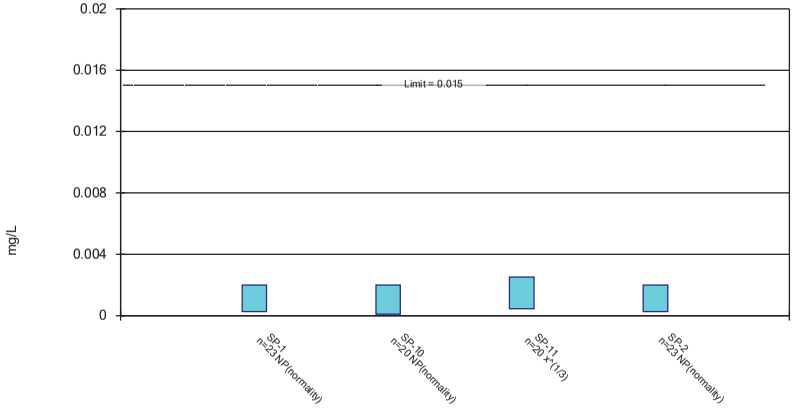



Constituent: Fluoride Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



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

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

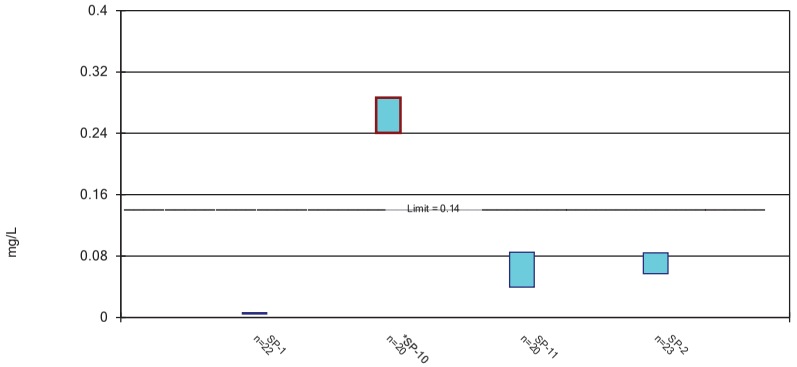



Constituent: Lead Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



## Parametric Confidence Interval

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

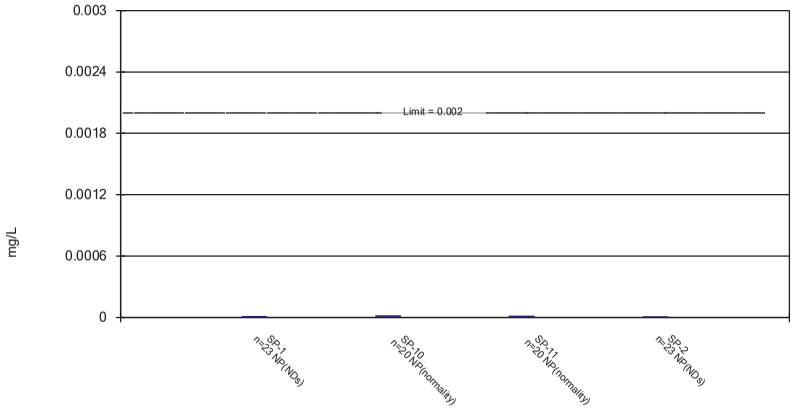



Constituent: Lithium Analysis Run 8/30/2022 2:21 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP



## Non-Parametric Confidence Interval

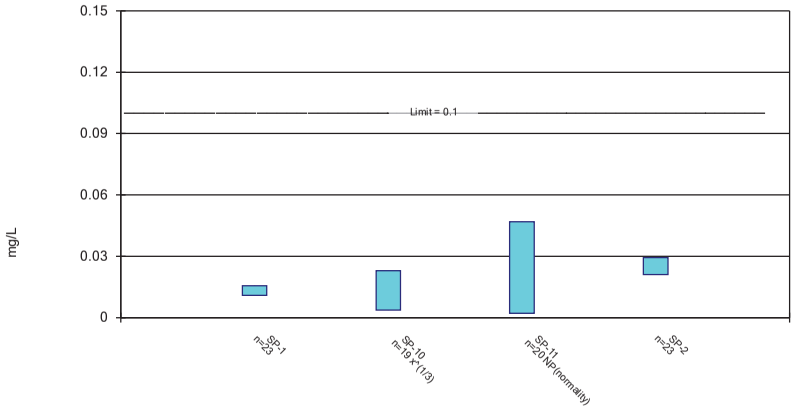
Compliance Limit is not exceeded. Per-well alpha = 0.01.




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

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

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

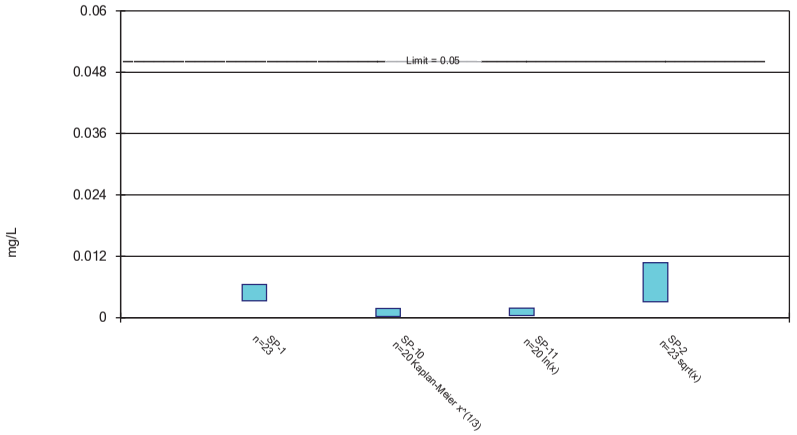



Constituent: Molybdenum Analysis Run 8/30/2022 2:22 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

## Parametric Confidence Interval

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

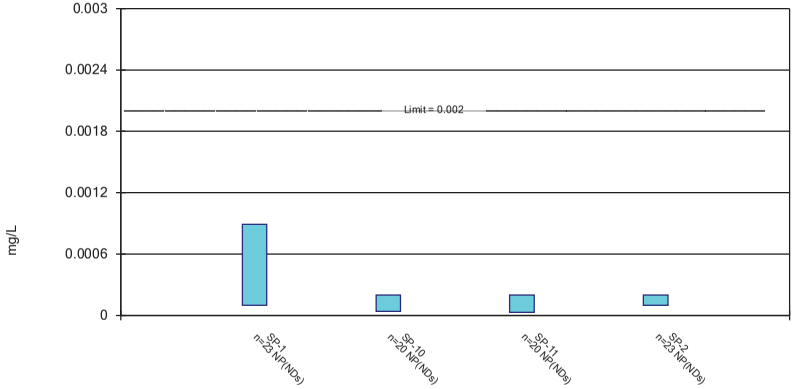



Constituent: Selenium Analysis Run 8/30/2022 2:22 PM View: Confidence Interval
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

## Non-Parametric Confidence Interval

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




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

# ATTACHMENT C

# August 2022 BAP Sediment SPLP Analysis

# Waste Analysis Report

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

**Job ID: 222808** **Customer: Northeastern 3&4 Power Stati** **Date Reported: 09/26/2022**

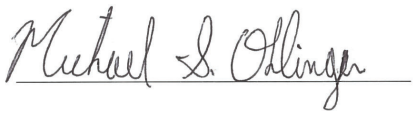
Lab Number: 222808-001
Customer Sample ID: BAP Pore Water
Customer Description:

Preparation: SPLP per SW-846 1312-1994, Rev. 0
Date Collected: 08/25/2022
Date Received: 08/31/2022

| Parameter | USEPA Limit | Dilution | Result | Units | RL | MDL | Data Qualifiers | Analyst | Analysis Date | Method |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | | 5 | <0.5 | mg/L | 0.5 | 0.1 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Antimony | | 5 | <0.25 | mg/L | 0.25 | 0.08 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Arsenic | 5 | 5 | <0.25 | mg/L | 0.25 | 0.03 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Barium | 100 | 5 | 0.22 | mg/L | 0.10 | 0.01 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Beryllium | 100 | 5 | <0.010 | mg/L | 0.010 | 0.001 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Cadmium | 1 | 5 | <0.010 | mg/L | 0.010 | 0.003 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Chromium | 5 | 5 | <0.025 | mg/L | 0.025 | 0.005 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Cobalt | 5 | 5 | <0.025 | mg/L | 0.025 | 0.005 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Lead | 5 | 5 | <0.10 | mg/L | 0.10 | 0.03 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Molybdenum | 5 | 5 | <0.05 | mg/L | 0.05 | 0.01 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Selenium | 1 | 5 | <0.25 | mg/L | 0.25 | 0.04 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |
| Thallium | 1 | 5 | <0.25 | mg/L | 0.25 | 0.05 | | SDW | 09/22/2022 | SW-846 6010D-2018, Rev. 5.0 |

## Report Verification

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



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

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
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# Waste Analysis Report

**Job ID: 222808** **Customer: Northeastern 3&4 Power Stati** **Date Reported: 09/26/2022**

## Data Qualifer Legend

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|---|---|
| B1 | Analyte detected in method blank (MB) at or above the method criteria. |
| B2 | Analyte detected in initial calibration blank (ICB) at or above the method criteria. |
| B3 | Analyte detected in continuing calibration blank (CCB) at or above the method criteria. |
| H1 | Sample was received past holding time. |
| H2 | Sample analysis performed past holding time. |
| J1 | Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. |
| J2 | Concentration estimated. Analyte exceeded calibration range. |
| L1 | The associated laboratory control sample (LCS) or labatory control sample duplicate (LCSD) recovery was outside acceptance limits. |
| M1 | The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits. |
| M2 | Analyzed by method of standard additions (MSA). |
| P1 | The precision between duplicate results was above acceptance limits. |
| P2 | The precision on the laboratory control sample duplicate (LCSD) was above acceptance limits. |
| P3 | The precision on the matrix spike duplicate (MSD) was above acceptance limits. |
| Q1 | Sample received in inappropriate sample container. |
| Q2 | Sample was received damaged. The sample was recoverable. |
| Q3 | Sample container was received damaged. Unable to recover the sample. |
| Q4 | Sample was received outside of thermal preservation range. |
| Q5 | Sample was received with improper chemical preservation. |
| Q6 | Insufficient sample was received by the laboratory to perform the requested analysis. |
| Q7 | Insufficient sample was received to meet method QC requirements. |
| Q8 | Sample was received with head space. |
| Q9 | Due to instrument malfunction, sample was invalidated. |
| Q10 | Analysis was performed by a contracted laboratory. See attached report. |
| Q11 | Sample contains free liquid. |
| Q12 | Sample does not contain free liquid. |
| Q13 | Sample did not ignite. |
| Q14 | This analyte and method are not included on the primary Laboratory Scope of TNI Accreditation. |
| Q15 | The reporting limit for oil and grease is directly affected by the collected sample volume. |
| Q16 | Analysis performed by a contract laboratory. See attached report. |
| R1 | Surrogate recovery was outside acceptance limits. |
| R2 | Carrier recovery was outside acceptance limits. |
| R3 | Internal standard recovery was outside acceptance limits. |
| U1 | Not detected at or above method detection limit (MDL). |
| V1 | The associated initial calibration verification (ICV) recovery was outside acceptance limits. |
| V2 | The associated continuing calibration verification (CCV) recovery was outside acceptance limits. |