Scott A. Thompson
Executive Director

OKLAHOMA Environmental Quality

Kevin Stitt
Governor

July 12, 2023

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

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

Dear Ms. Parker-Witt:

The Oklahoma Department of Environmental Quality received the Alternate Source Demonstration (ASD) dated May 24, 2023 for lithium, barium, and fluoride detected in SP-10 during the June 14, 2022 sampling event at the bottom ash pond (BAP). The Lower Confidence Levels (LCL) for lithium, barium, and fluoride exceeded the Groundwater Protection Standards (GWPS). The detected concentrations for each constituent also exceeded their respective LCL.

On October 29, 2019, DEQ approved the revised ASD for lithium detected in monitoring well SP-10 for the BAP. The ASD proposed that naturally occurring lithium was the source of the statistically significant level (SSL) above the GWPS in SP-10 during the 2018 sampling events. On June 3, 2021, DEQ approved an ASD for fluoride exceedances detected in SP-10 for the BAP.

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

The ASD for barium in SP-10 was approved in a letter dated September 20, 2022. The ASD attributes barium concentrations to the clay minerals in the shale lenses observed within the screened interval of SP-10. The barium concentrations observed in the BAP pore water are nearly an order of magnitude lower than the barium observed in SP-10. A comparison of the BAP pore water and extractable barium samples with SP-10 groundwater samples using Piper diagrams also showed dissimilar fingerprinting signatures.

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

The ASD for barium, fluoride, and lithium exceedances in SP-10 is accepted as submitted. If you have any questions, please contact Kaylee Daneshmand at (405) 702-5196 or at 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

May 24, 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 March 9, 2023, in which ODEQ accepted the ASD for the lithium, fluoride, and barium detected in SP-10 during the June 14, 2022, sampling event. ODEQ indicated that if lithium, fluoride, and barium 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; June 4, 2021, ASD approval for fluoride; and to the March 9, 2023, ASD approval for barium and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B).

On February 23, 2023, the statistical evaluation of the second semi-annual 2022 assessment monitoring event (November 8, 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 (0.240 mg/L) exceeded the GWPS (a calculated Upper Tolerance Limit (UTL)) of 0.163 mg/L at SP-10. The actual detected lithium concentration in SP-10 was 0.242 mg/l.

The LCL for fluoride (5.31 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 6.8 mg/L.

The LCL for barium (3.98 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 5.05 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: rdjones2@aep.com or by phone at: (737) 330-3725.

Sincerely,

Rebecca D Jones

Rebecca D. Jones, P.G.

AEP, Environmental Specialist

Attachments

Geosyntec consultants

500 W. Wilson Bridge Rd, Suite 250
Worthington, Ohio 43085
PH 614.468.0421
www.geosyntec.com

Memorandum

Date:	May 22, 2023
To:	Rebecca Jones, American Electric Power (AEP)
From:	Beth Gross, PhD, PE (OK) and Allison Kreinberg, Geosyntec
Subject:	Alternative Source Demonstration Update Northeastern Power Station Bottom Ash Pond Oologah, Rogers County, Oklahoma

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 November 8, 2022, in accordance with the assessment monitoring requirements of Oklahoma Administrative Code (OAC) 252:517-9-6. Analysis of the November 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 0.163 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 (5.31 mg/L).
- The LCL for barium exceeded the GWPS of 2.60 mg/L at SP-10 (3.98 mg/L).

As described in previous alternative source demonstrations (ASDs) (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023), concentrations of lithium, fluoride, and barium in the BAP water (including pore water) and BAP sediments lower than concentrations 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 feet 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.

The Oklahoma Department of Environmental Quality (DEQ) previously noted in a letter to the NPS dated June 4, 2021, that "[i]f 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 the barium exceedance in SP-10 of the GWPS if conditions do not change. AEP may refer to the ASD approval for barium 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 November 2022 monitoring event at SP-10 contained a lithium concentration of 0.242 mg/L, fluoride concentration of 6.8 mg/L, and barium concentration of 5.05 mg/L. The lithium concentration (**Figure 1**) and fluoride concentration (**Figure 2**) are consistent with previous results collected during the assessment monitoring period and continue to show no statistically significant positive trends. This is an indication that conditions have not changed substantially since the preceding ASD was submitted (Geosyntec 2023), and the arguments presented in the previous ASDs are still valid. Thus, the lithium and fluoride concentrations at SP-10 during the November 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**), the holistic geochemistry at monitoring well SP-10 does not change over time in a manner indicative of a release from the BAP.[1] The November 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 that 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.

The information above, as well as the information presented in previous ASDs (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023), continues 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

[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 November 2022 sampling event, precluding the use of a Piper diagram to show the results of the most recent sampling event.

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.

******

REFERENCES

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

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

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

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

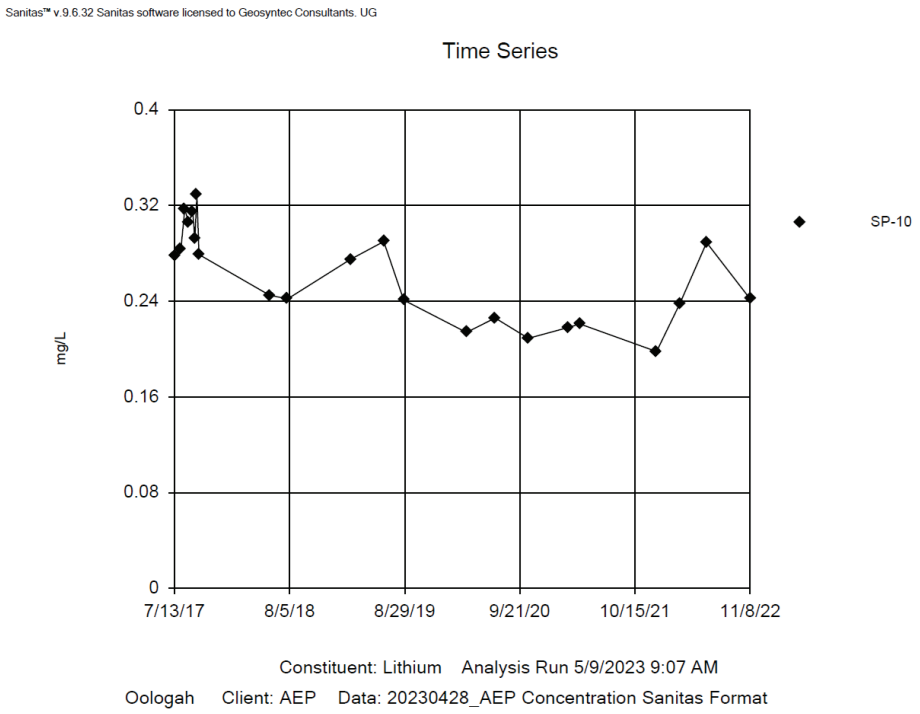
Geosyntec. 2021b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

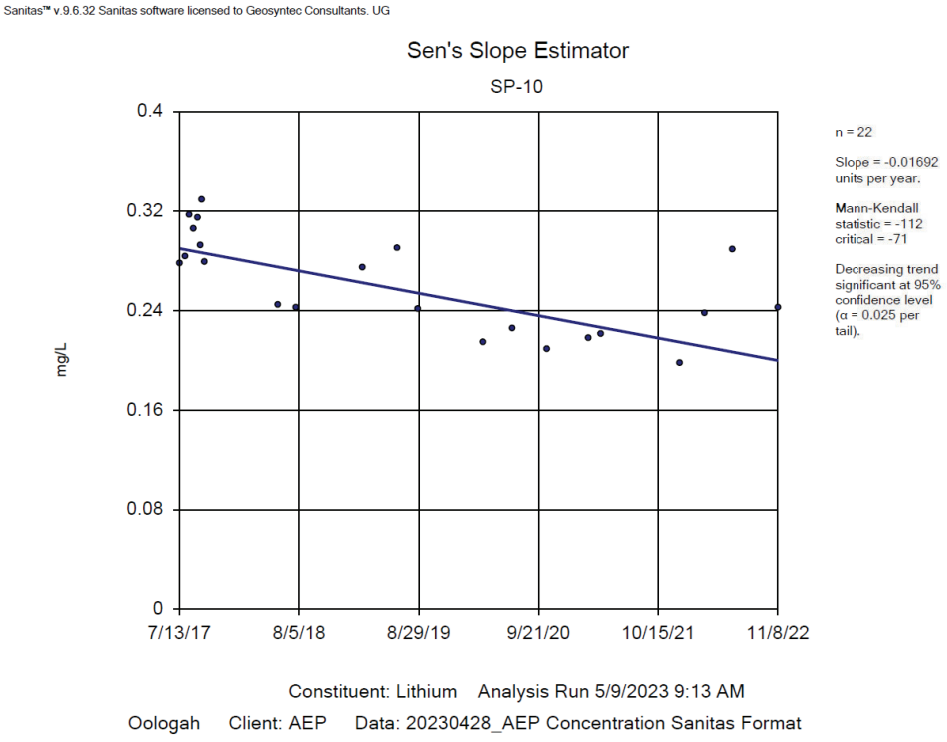
Geosyntec. 2021c. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. October.

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

Geosyntec. 2023. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. January.

FIGURES





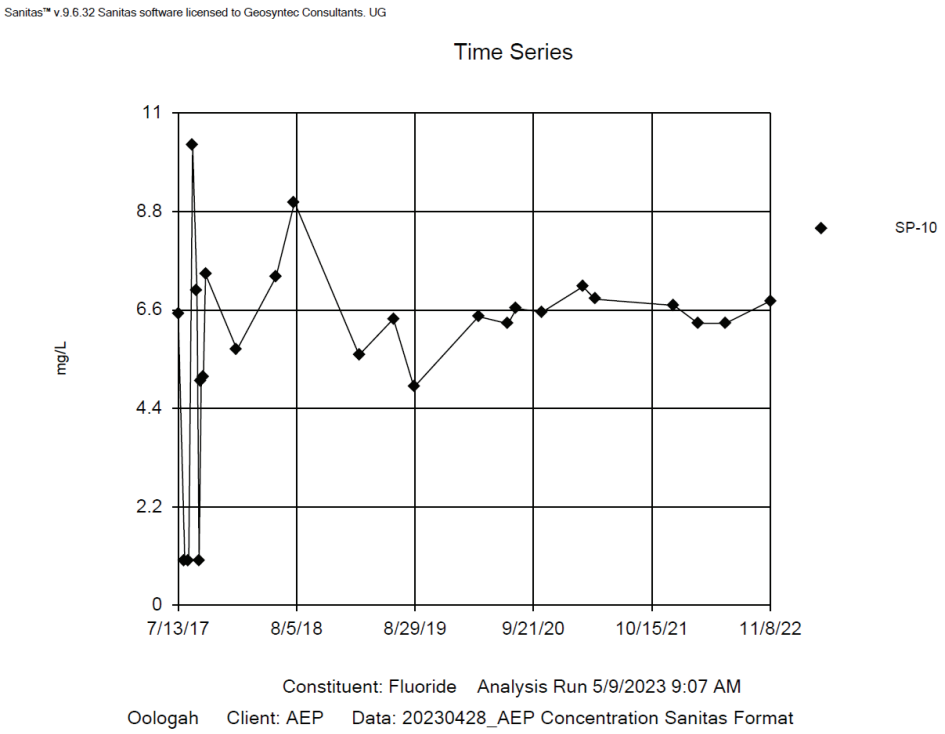
Notes: Lithium results from monitoring well SP-10 are displayed on the plots.

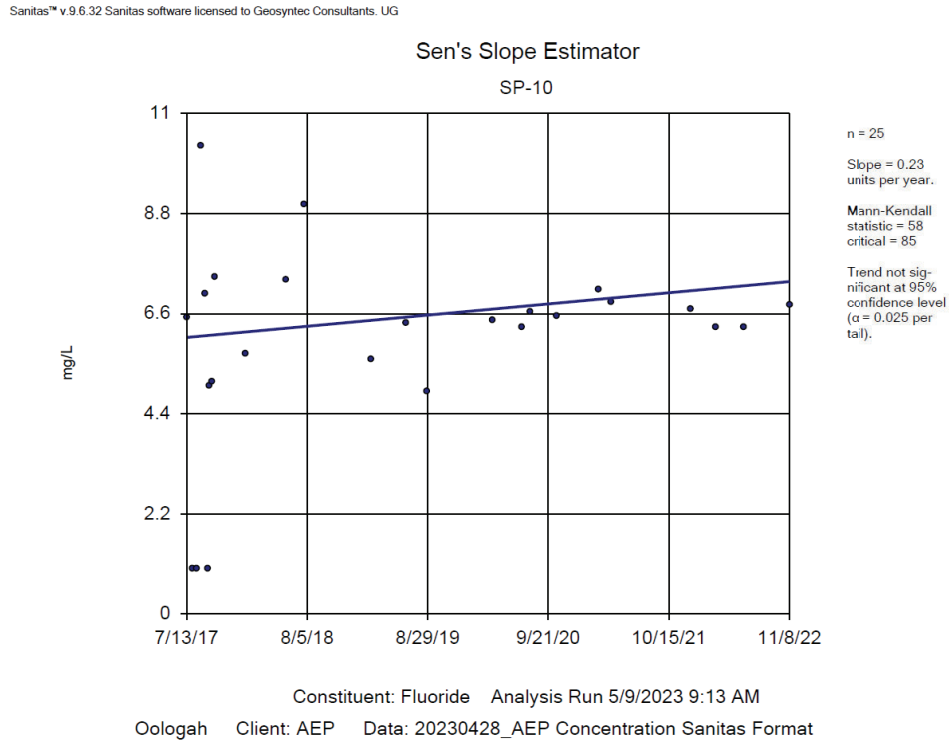
AEP: American Electric Power
mg/L: milligrams per liter

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

Geosyntec consultants | AMERICAN ELECTRIC POWER | Figure 1

Columbus, Ohio | May 11, 2023





Notes: Fluoride results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
mg/L: milligrams per liter

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

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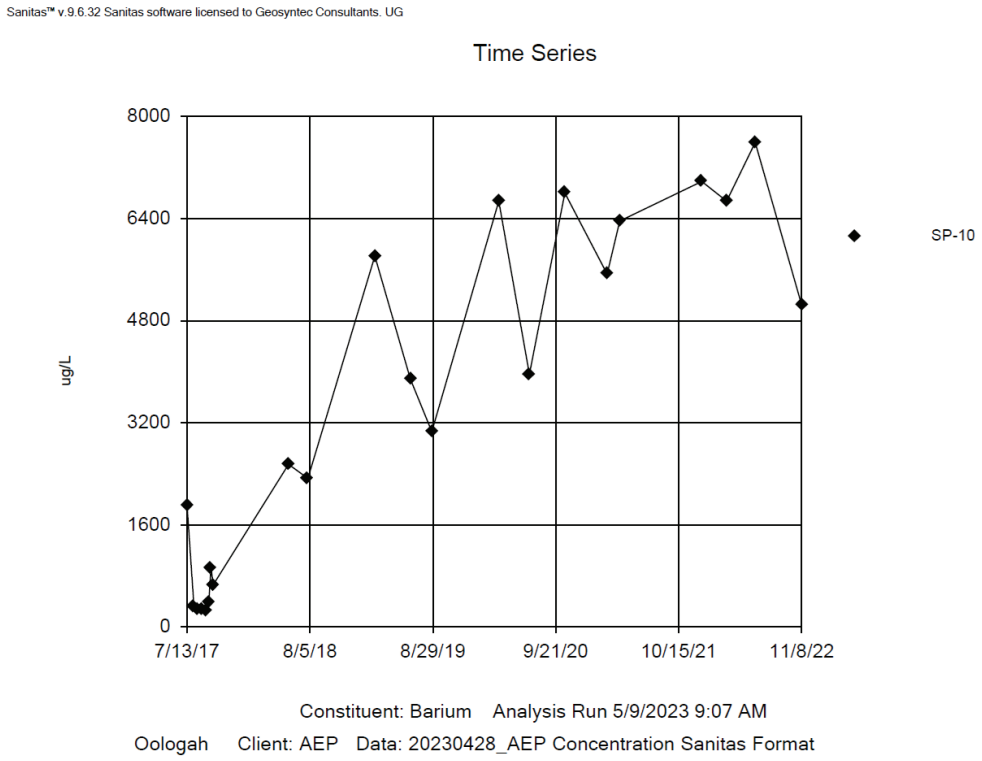
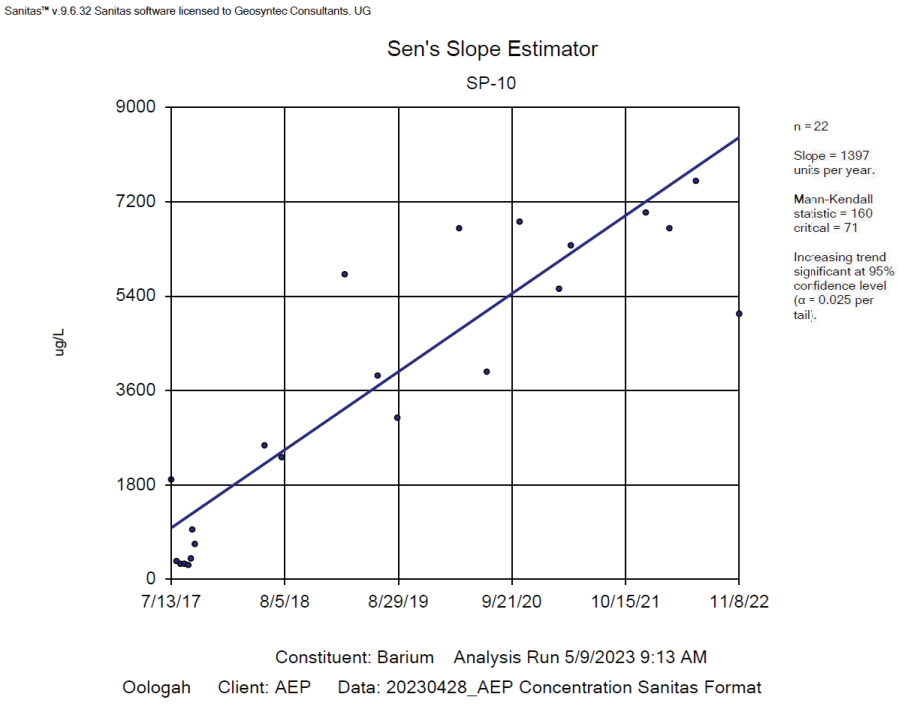
Figure **2**





Notes: Barium results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
ug/L: micrograms per liter

Barium Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

Geosyntec consultants

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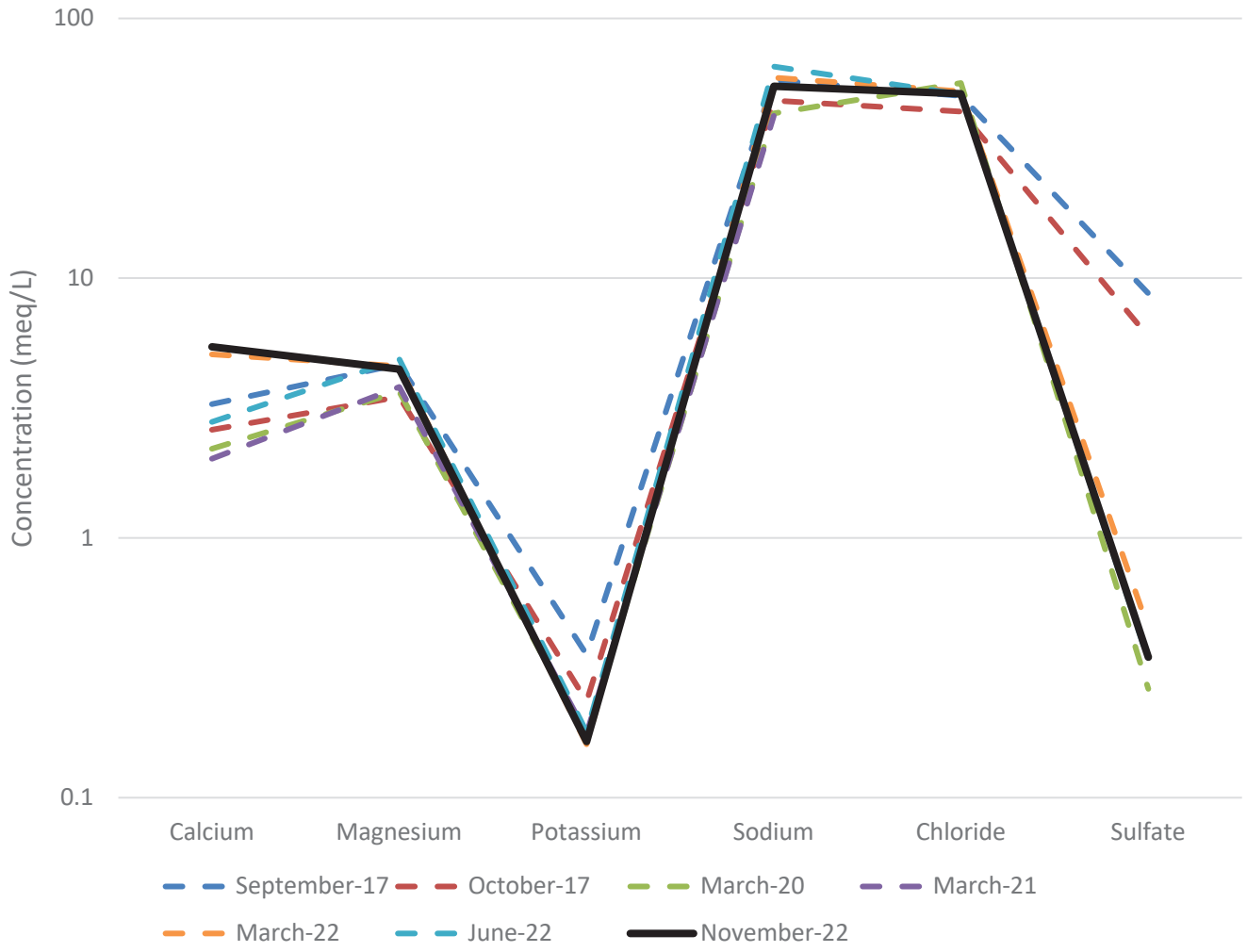
Figure 3

Columbus, Ohio

May 11, 2023



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 November 2022, is displayed as the bold black line.

SP-10 Schoeller Diagram
Northeastern Bottom Ash Pond

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Columbus, Ohio | May 11, 2023

Figure **4**

TABLES

Table 1. Summary of Key Analytical Data
Alternative Source Demonstration Update Memorandum
Northeastern Power Station Bottom Ash Pond, Oologah, Oklahoma

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 November 2022 Result	11/8/2022	0.242	6.8	5.05

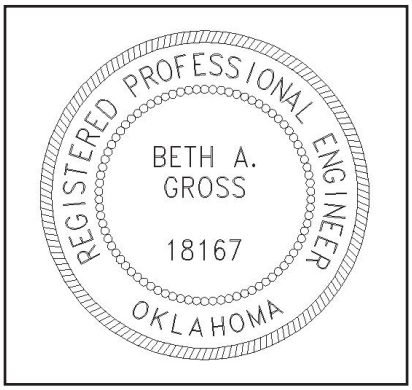
Notes:
1. Nondetect results are shown as less than the reporting limit.
BAP: Bottom Ash Pond
mg/L: milligram per liter
NA: not analyzed
SPLP: synthetic precipitation leaching procedure

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	May 22, 2023
License Number	Licensing State	Date

* * * * *

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ATTACHMENT B

Assessment Statistics Report

2022 Second Semiannual Event

Geosyntec consultants

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STATISTICAL ANALYSIS SUMMARY

BOTTOM ASH POND

Northeastern Power Station

Oologah, Oklahoma

Prepared for

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Prepared by

Geosyntec Consultants, Inc.
500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 432085

Project Number: CHA8500B

February 23, 2023

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ACRONYMS AND ABBREVIATIONS

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
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NELAP	National Environmental Laboratory Accreditation Program
NPS	Northeastern Power Station
ODEQ	Oklahoma Department of Environmental Quality
OAC	Oklahoma Administrative Code
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
SU	Standard Units
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1 EXECUTIVE SUMMARY

In accordance with the Oklahoma Department of Environmental Quality (ODEQ) and Oklahoma administrative code (OAC) regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (OAC 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power 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 assessment monitoring was initiated. An assessment monitoring event was conducted at the BAP in June 2022, in accordance with OAC 252:517-9-6(d). During the June 2022 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, 2023); thus the unit remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in November 2022, in accordance with OAC 252:517-9-6(d). The results of the November 2022 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. GWPSs were re-established for the Appendix B parameters. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs of Appendix B parameters were present above the GWPS. SSLs were identified for barium, fluoride, and lithium. Thus, either the unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A. The statistical analysis and certification of the selected methods were completed within 90 days of obtaining the data.

SECTION 2 BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, one set of samples was collected in November 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.9.6.36 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

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

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

2.2.1 Background Date Range Evaluation

All wells were sampled on an approximately monthly basis in 2017 in order to establish the initial background limits. Since 2017, samples have been collected on a roughly semiannual basis; see time series graphs provided in Attachment B.

A lack of temporal independence can result in background limits which do not fully represent natural variation in groundwater quality. Given the close temporal proximity of the initial background samples, rank von Neumann serial correlation tests were completed to evaluate whether the samples collected in 2017 were statistically independent or whether temporal correlation was present amongst the measurements. The rank von Neumann test is recommended in the Unified Guidance to evaluate temporal autocorrelation due to its ease of use and strength for both normal or non-normal distributions (United States Environmental Protection Agency [USEPA], 2007). Where significant temporal correlation was identified, the datasets were truncated to remove earlier measurements and statistical limits were constructed using only more recent data that better represent independent samples. The results of the rank von Neumann tests and a list of well-parameter pairs where the dataset was truncated is provided in Attachment B.

2.2.2 Establishment of GWPSs

A GWPS was established for each Appendix B parameter in accordance with OAC 252:517-9-6(h) and the *Statistical Analysis Plan* (Geosyntec, 2021). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in OAC 252:517-9-6(h) for each Appendix B parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for antimony, cadmium, and chromium. Non-parametric tolerance limits were calculated for arsenic, barium, beryllium, cobalt, combined radium, fluoride, lead, lithium, molybdenum and selenium due to apparent non-normal distributions and for mercury and thallium due to a high non-detect frequency. Upper tolerance limits and the final GWPSs are summarized in Table 2.

2.2.3 Evaluation of Potential Appendix B SSLs

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

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium exceeded the GWPS of 2.60 mg/L at SP-10 (3.98 mg/L).
- The LCL for fluoride exceeded the GWPS of 4.39 mg/L at SP-10 (5.31 mg/L).
- The LCL for lithium exceeded the GWPS of 0.163 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.

2.2.4 Establishment of Appendix A Prediction Limits

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

Mann-Whitney (Wilcoxon rank-sum) tests were performed to determine whether the newer data reflect a release from the BAP. Because the interwell Appendix A limits and the Appendix B GWPSs are based on data from upgradient wells which we would not expect to have been impacted by a release, these tests were used for intrawell Appendix A tests only. Mann-Whitney tests were used to compare the medians of historical data (January 2017 – June 2020) to the new compliance samples (October 2020 – June 2022) for calcium. Results were evaluated to determine if the medians of the two groups were similar at the 99% confidence level. Where no significant difference was found, the new compliance data were added to the background dataset. Where a statistically significant difference was found between the medians of the two groups, the data were reviewed to evaluate the cause of the difference and to determine if adding newer data to the background dataset, replacing the background dataset with the newer data, or continuing to use the existing background dataset was most appropriate. If the differences appeared to have been caused by a release, then the previous background dataset would have continued to be used.

The complete Mann-Whitney test results and a summary of the significant findings can be found in Attachment B. While a statistically significant difference was observed for calcium at compliance well SP-1, the entire dataset was used because the results were within the range of historic concentrations and inclusion of all observations resulted in a prediction limit that was more conservative (i.e., lower). Thus, the background datasets for calcium were updated to include all available data through June 2022.

Prediction limits for the interwell tests were calculated using data collected during the 2022 assessment monitoring events. New upgradient well data were tested for outliers prior to being added to the background dataset. Upgradient well data were also evaluated for statistically significant trends using the Sen's Slope/Mann-Kendall trend test, and the results are included in Attachment B.

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

Interwell UPLs were updated for boron, chloride, fluoride, pH, sulfate, and TDS and interwell LPLs were updated for pH using all historical data through November 2022 (except as noted in Attachment B) to represent background values. The intrawell UPLs for calcium were updated using all historical data through June 2022 (except as noted in Attachment B) to represent background values. The updated prediction limits are summarized in Table 3. The prediction limits were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, or in the case of pH, is neither less than the LPL nor greater than the

UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL, or in the case of pH, is neither less than the LPL nor greater than the UPL, a second sample will not be collected. The retesting procedures allowed achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.2.5 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 November 2022 assessment monitoring event from each compliance well were compared to the 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 0.503 mg/L at SP-10 (0.967 mg/L) and SP-11 (0.510 mg/L).
- Chloride concentrations exceeded the interwell UPL of 834 mg/L at SP-10 (1,820 mg/L).
- Fluoride concentrations exceeded the interwell UPL of 4.39 mg/L at SP-10 (6.8 mg/L).
- Sulfate concentrations exceeded the interwell UPL of 81.9 mg/L at SP-11 (356 mg/L).
- TDS concentrations exceeded the interwell UPL of 1,640 mg/L at SP-10 (3,330 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the November 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 semiannual assessment monitoring event was conducted in November 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 November 2022 data. GWPSs were re-established for the Appendix B parameters. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval exceeded the 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

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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	11/8/2022	11/8/2022	11/8/2022	11/8/2022	11/8/2022	11/8/2022
Antimony	µg/L	0.80	1.17	0.23	0.16	0.05 J1	0.12
Arsenic	µg/L	0.69	1.21	0.92	14.2	0.61	2.29
Barium	µg/L	157	872	214	2,070	5,050	146
Beryllium	µg/L	0.054	0.048 J1	0.053	0.066	0.036 J1	0.027 J1
Boron	mg/L	0.147	0.108	0.354	0.256	0.967	0.510
Cadmium	µg/L	0.055	0.328	0.059	0.108	0.017 J1	0.009 J1
Calcium	mg/L	102 M1	103	97.6	90.2	109	113
Chloride	mg/L	16.3	695	447	1,010	1,820	97.3
Chromium	µg/L	1.30	2.12	1.19	0.75	0.47	0.46
Cobalt	µg/L	0.684	0.186	0.345	0.511	0.061	1.76
Combined Radium	pCi/L	5.68	6.75	6.29	9.37	19.09	3.32
Fluoride	mg/L	0.85	2.7	3.23	3.28	6.8	1.3
Lead	µg/L	0.15 J1	0.33	0.38	4.34	0.06 J1	0.11 J1
Lithium	mg/L	0.00558	0.0308	0.0579	0.120	0.242	0.0157
Mercury	µg/L	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1
Molybdenum	µg/L	28.8	22.1	3.5	0.8	0.3 J1	1.7
Selenium	µg/L	15.4	2.36	0.39 J1	0.11 J1	0.5 U1	0.15 J1
Sulfate	mg/L	54.1	18.1	81.9	2.8	16.7	356
Thallium	µg/L	0.07 J1	0.2 U1	0.2 U1	0.2 U1	0.2 U1	0.2 U1
Total Dissolved Solids	mg/L	400	1,480	1,150	1,940	3,330	1,060
pH	SU	7.33	7.31	7.41	7.36	7.42	7.22

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U1: Non-detected at or above the method detection limit (MDL). For statistical analysis, parameters which were not detected were replaced with the reporting limit.
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.

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		0.00570	0.00600
Arsenic, Total (mg/L)	0.0100		0.0599	0.0599
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		0.00207	0.00500
Chromium, Total (mg/L)	0.100		0.00342	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	0.163	0.163
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
			11/8/2022	11/8/2022	11/8/2022	11/8/2022
Boron	mg/L	Interwell Background Value (UPL)	0.503			
		Analytical Result	0.147	0.108	**0.967**	**0.510**
Calcium	mg/L	Intrawell Background Value (UPL)	141	167	227	156
		Analytical Result	102	103	109	113
Chloride	mg/L	Interwell Background Value (UPL)	834			
		Analytical Result	16.3	695	**1,820**	97.3
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.85	2.7	**6.8**	1.3
pH	SU	Interwell Background Value (UPL)	9.1			
		Interwell Background Value (LPL)	7.0			
		Analytical Result	7.3	7.3	7.4	7.2
Sulfate	mg/L	Interwell Background Value (UPL)	81.9			
		Analytical Result	54.1	18.1	16.7	**356**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,640			
		Analytical Result	400	1,480	**3,330**	1,060

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	02.24.2023
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

February 15, 2023

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

Re: Northeastern BAP (Bottom Ash Pond)
Background Update & Assessment Monitoring Statistics – November 2022

Dear Ms. Kreinberg,

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

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

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

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

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

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

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. For calculating intrawell prediction limits, the substitution is performed for individual wells and may differ across wells. This generally gives the most conservative limit in each case.

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

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

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

Summary of Statistical Method – Appendix A Parameters

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

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

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

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

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

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

Summary of Appendix A Background Screening and Updates

December 2017 – Initial Background Screening

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

Background Update Summaries

December 2020

<u>Outlier Analysis</u>

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

outliers for Appendix A parameters, which included chloride and TDS. These values were flagged accordingly in the database.

Mann-Whitney Test

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

Trend Test

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

March 2022

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

Outlier Analysis

Prior to updating interwell prediction limits, Tukey's outlier test and visual screening were used to re-evaluate data through December 2021 at all upgradient wells for boron, chloride, fluoride, pH, sulfate, and TDS. Tukey's outlier test on pooled upgradient well data confirmed previously identified values for chloride and TDS, and no new values were flagged. No changes to values flagged in previous background updates occurred. As mentioned above, any flagged data are displayed in a lighter font and as a disconnected

symbol on the time series reports, as well as in a lighter font on the accompanying data pages.

Intrawell - Prediction Limits

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

Interwell – Trend Test Evaluation

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

Increasing:

- Sulfate: SP-4

Decreasing:

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

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

Interwell – Prediction Limits

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells through October 2021 for boron, chloride, fluoride, pH, sulfate, and TDS. Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent.

February 2023

During this analysis, Tukey's outlier test and visual screening were used to evaluate data through June 2022 at all wells for calcium, which is tested using intrawell prediction limits, and through November 2022 at upgradient wells for boron, chloride, fluoride, pH, sulfate, and TDS, which are tested using interwell prediction limits (Figure C).

Additionally, prior to updating statistical limits, the Rank Von Neumann serial correlation test was used to evaluate earlier calcium data at all wells and boron, chloride, fluoride, pH, sulfate, and TDS data at upgradient wells as described below.

Outlier Analysis

Tukey's outlier test did not identify any outliers for calcium; therefore, no values were flagged. Tukey's outlier test on pooled upgradient well data confirmed previously identified values for chloride and TDS, but no new values were flagged. No changes to values flagged in previous background updates occurred. As mentioned above, any flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. A summary table of all flagged outliers follows this report (Figure C).

Rank Von Neumann

All wells were sampled approximately on a monthly basis in 2017 in order to establish initial baseline limits. After that time, sampling was performed on a semi-annual basis to ensure collection of independent groundwater samples as recommended in the EPA Unified Guidance (2009). During this analysis, the Rank Von Neumann serial correlation test was used to evaluate whether the measurements collected during 2017 represented independent samples, or whether serial correlation was present among the measurements which can result in limits which do not fully represent natural variation in groundwater quality (Figure D). The test was used to evaluate calcium at all wells and the remaining Appendix A constituents at upgradient wells. Significant serial correlation was identified for the following Appendix A well/constituent pairs:

- Calcium: SP-4 (upgradient)
- Sulfate: SP-4 and SP-5R (both upgradient)

As a result, the records for these well/constituent pairs were truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples. Results of the Rank Von Neumann test follow this report.

Intrawell – Mann-Whitney Test

For calcium which is tested using intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through August 2020 to the new compliance samples at each well through June 2022 to evaluate whether the groups are statistically similar at the 99% confidence level, in which case background data may be updated with compliance data (Figure E). A statistically significant difference was identified for the following well/constituent pair:

- Calcium: SP-1

Although a statistically significant difference was identified, most compliance data were within the range of historic concentrations and including these observations resulted in a statistical limit that is more conservative (i.e., lower) form a regulatory perspective. Additionally, while a significant result was not identified by the Mann-Whitney test, the record for calcium at well SP-11 was slightly truncated to exclude elevated historical concentrations and use stable concentrations representative of present-day groundwater quality conditions for constructing statistical limits. Therefore, all data sets for calcium were updated with compliance samples through June 2022.

Intrawell - Prediction Limits

Intrawell prediction limits, combined with a 1-of-2 resample plan, are constructed using historical data through June 2022 for calcium at all wells. A summary table of the limits follows this report (Figure F). A list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table). No comparison of the November 2022 observation was performed in this analysis.

Interwell – Trend Test Evaluation

For parameters tested using interwell analyses (boron, chloride, fluoride, pH, sulfate, and TDS) the Sen's Slope/Mann-Kendall trend test was used on upgradient wells to determine whether concentrations are statistically increasing, decreasing or stable at the 99% confidence level (Figure G). Statistically significant trends were identified for the following upgradient well/constituent pairs:

Increasing:

- Sulfate: SP-4
- Chloride: SP-5R

Decreasing:

- Boron: SP-4 and SP-5R

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

Interwell – Prediction Limits

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells through November 2022 for boron, chloride, fluoride, pH, sulfate, and TDS (Figure H). Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent. A summary table of the updated limits may be found following this letter in the Prediction Limit Summary Tables. No comparison of the November 2022 observation was performed in this analysis.

Evaluation of Appendix B Parameters – November 2022

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

Outlier Analysis

For the current analysis, Tukey's outlier test on pooled upgradient well data identified outliers for fluoride, lead, mercury, and selenium and confirmed previously flagged values. Several of the values identified by Tukey's test were either similar to concentrations upgradient of the facility or were lower than the respective Maximum Contaminant Level (MCL); therefore, the values were not flagged as outliers. A summary of previously flagged outliers follows this report (Figure C).

During previous screenings, due to no variation in the data, Tukey's outlier test was not performed for cadmium in well SP-5R, mercury in all wells, selenium in well SP-5R, and thallium in all wells. Among upgradient wells, high values for cadmium, lead, and selenium were identified by Tukey's outlier test. Only the highest values for cadmium and lead were flagged as outliers to maintain statistical limits that are conservative from a regulatory

perspective. Substantially high values were identified for upgradient well SP-4 on 8/4/17 through visual screening and the highest values for arsenic, beryllium, cobalt, and mercury were flagged. This step will result in upper tolerance limits that are conservative (lower) from a regulatory perspective. More recent concentrations for barium in downgradient well SP-10 were noted to be significantly higher than historical concentrations. Therefore, earlier concentrations were previously deselected prior to constructing confidence intervals in order to evaluate present-day groundwater concentrations of barium at this well. As mentioned above, list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

Additionally, downgradient well data through November 2022 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is particular justification for excluding them. No additional outliers among downgradient wells were flagged during this analysis. Previously a high value for combined radium 226 + 228 in well SP-1 was flagged as an outlier. The following additional values were flagged as outliers as they did not adequately represent the populations at their respective wells: chromium in well SP-10; combined radium 226 + 228 in well SP-11; lithium in well SP-1; and molybdenum in well SP-10.

Rank Von Neumann

As mentioned above, background samples were collected approximately on a monthly basis during 2017 at all wells for Appendix B constituents. Since the EPA Unified Guidance recommends collection of independent groundwater samples, the Rank Von Neumann test for serial correlation was used to determine whether serial correlation was present among these earlier samples (Figure D). Significant serial correlation was identified for the following Appendix B well/constituent pairs:

- Barium: SP-4 (upgradient) and SP-11
- Cadmium: SP-4 and SP-5R (both upgradient), SP-1, and SP-10
- Chromium: SP-4 (upgradient)
- Lead: SP-10
- Lithium: SP-4 (upgradient) and SP-11
- Molybdenum: SP-2
- Selenium: SP-5R (upgradient) and SP-2
- Thallium: SP-4 and SP-5R (both upgradient), SP-1, SP-2, SP-10, and SP-11

As a result, the records for these well/constituent pairs were truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples. Results of the Rank Von Neumann test follow this report.

Tolerance Limits

Parametric tolerance limits were used to calculate background limits from pooled upgradient well data through November 2022 for Appendix B parameters with a target of 95% confidence and 95% coverage to determine background limits. These limits will be updated on an annual basis at the end of each year. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the MCLs and background limits in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure I).

Groundwater Protection Standards

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

Confidence Intervals

Confidence intervals were constructed on downgradient wells with data through November 2022 for each of the Appendix B parameters and then compared to the GWPS, i.e., the highest limit of the MCL, CCR Rule-Specified level, or background limit as discussed above (Figure K). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. Complete graphical results of the confidence intervals follow this letter. Exceedances were identified for the following well/constituent pairs:

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

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

For Groundwater Stats Consulting,

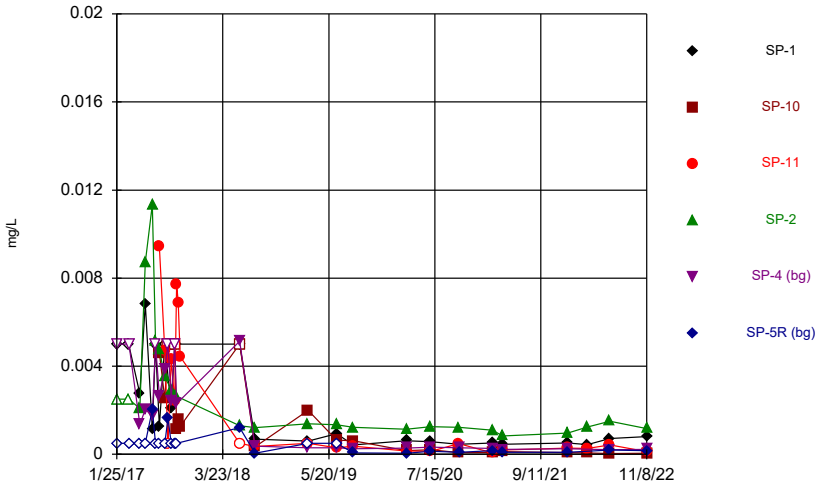
Andrew T. Collins
Project Manager

Kristina L. Rayner
Senior Statistician

FIGURE A
Time Series

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

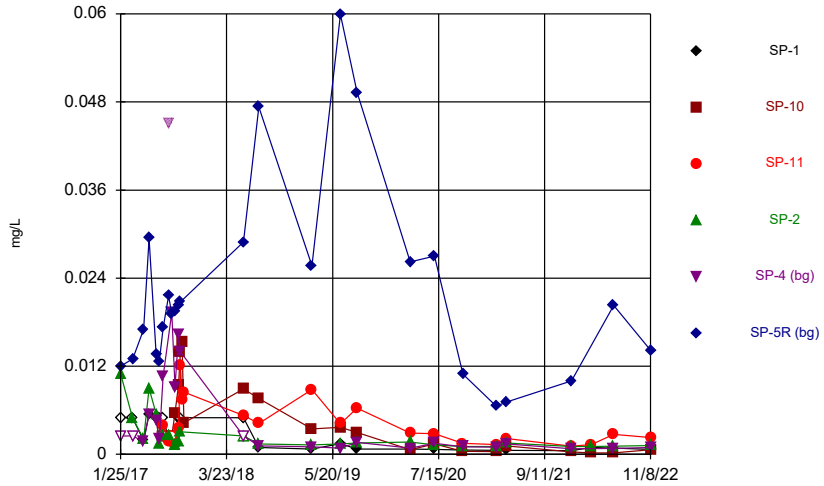
Time Series



Constituent: Antimony Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

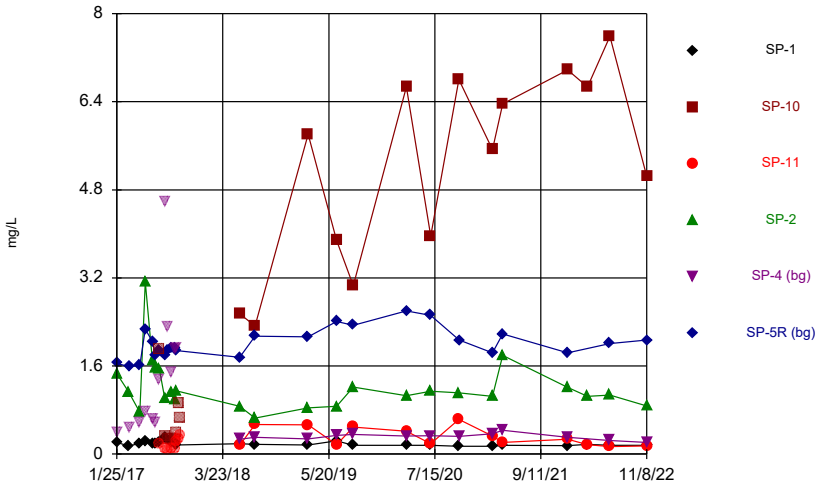
Time Series



Constituent: Arsenic Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

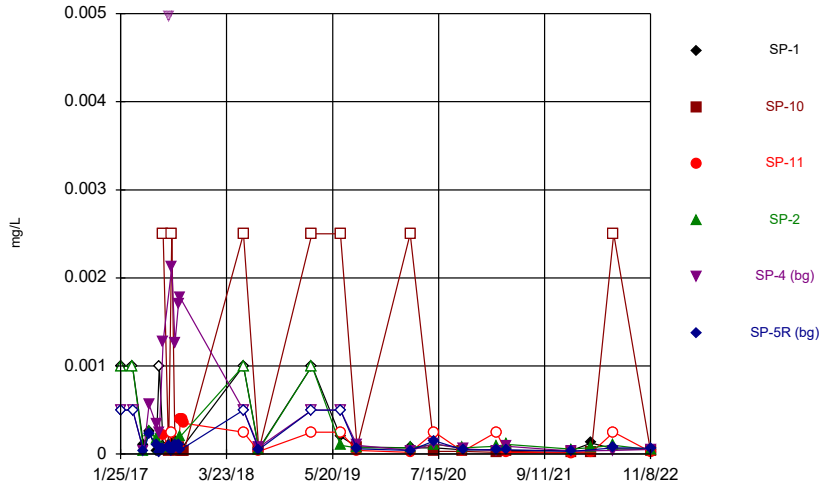
Time Series



Constituent: Barium Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

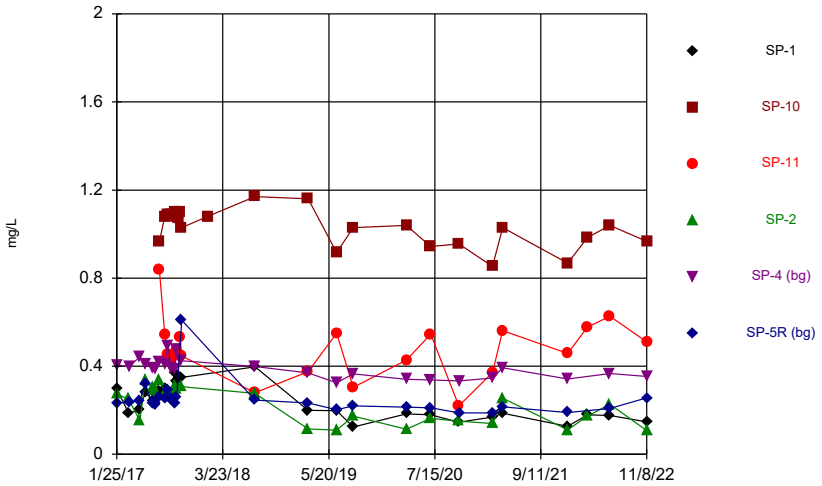
Time Series



Constituent: Beryllium Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Time Series



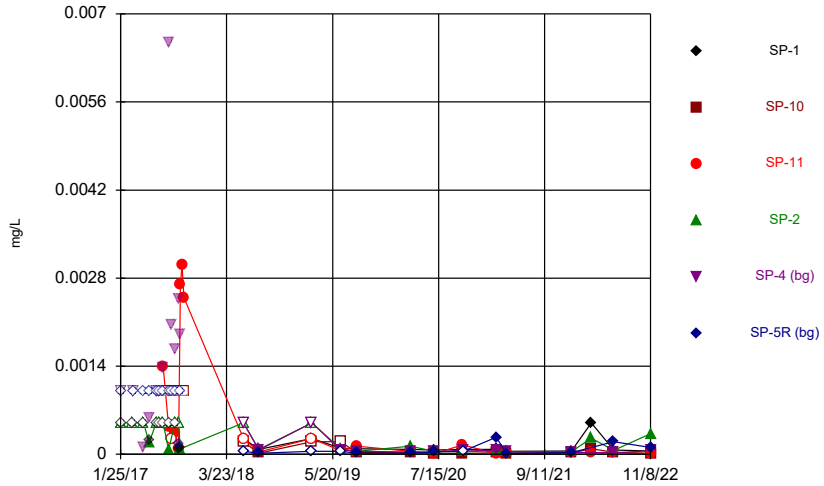
Constituent: Boron Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Time Series

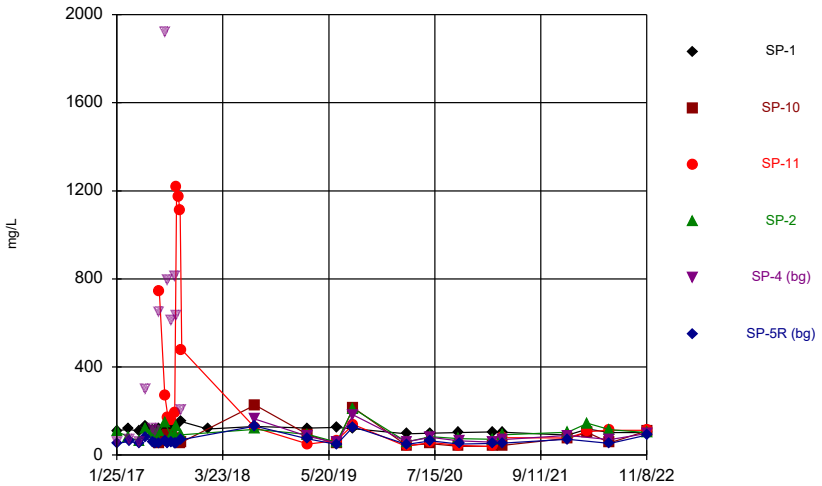


Constituent: Cadmium Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Time Series

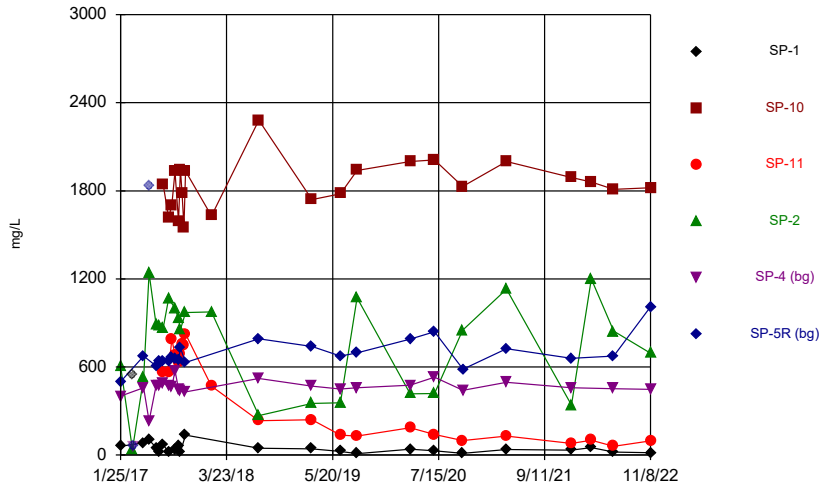


Constituent: Calcium Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Time Series

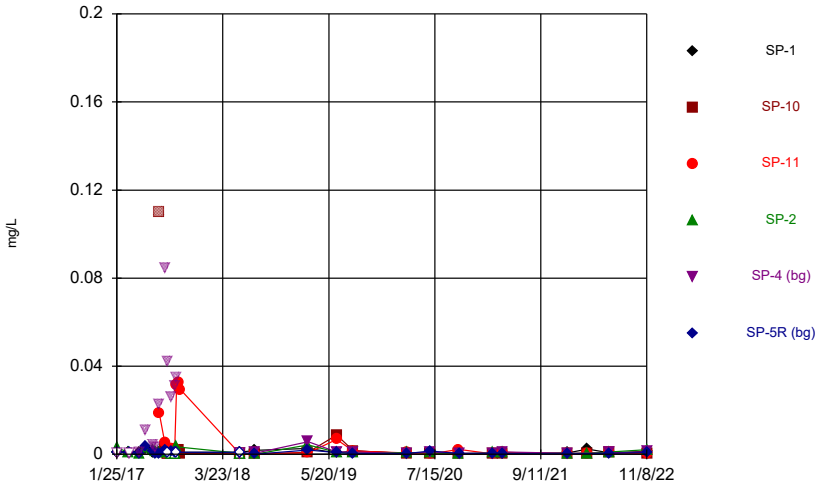


Constituent: Chloride Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

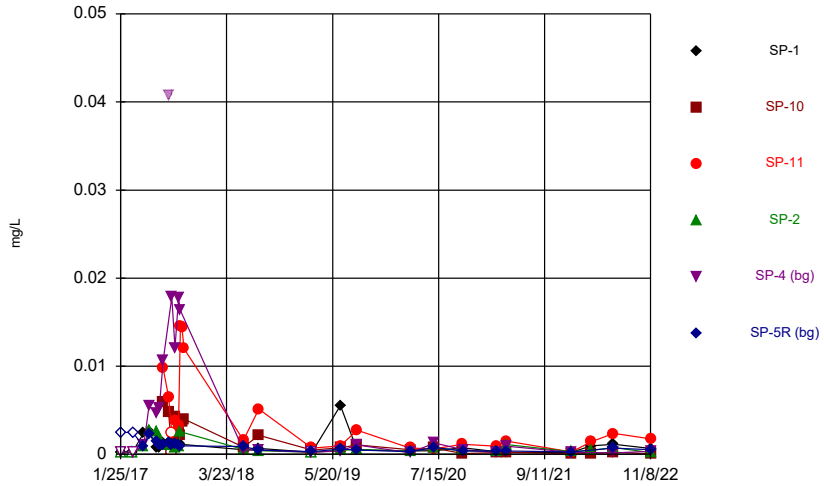
Time Series



Constituent: Chromium Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

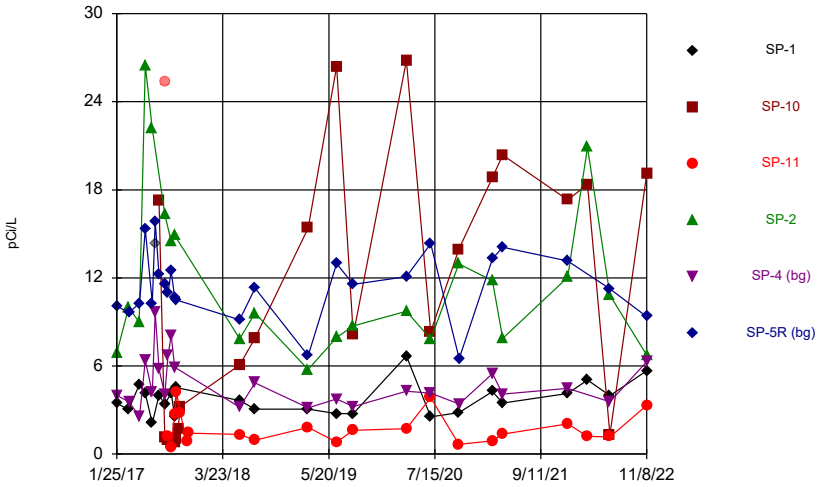
Time Series



Constituent: Cobalt Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

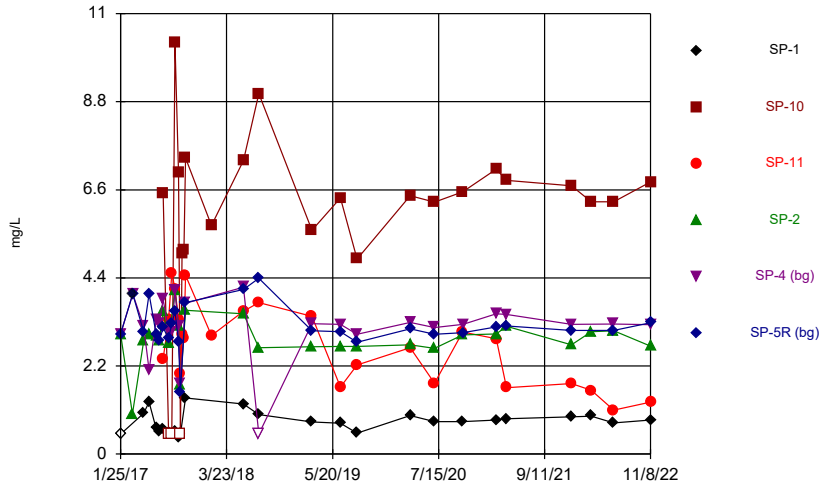
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

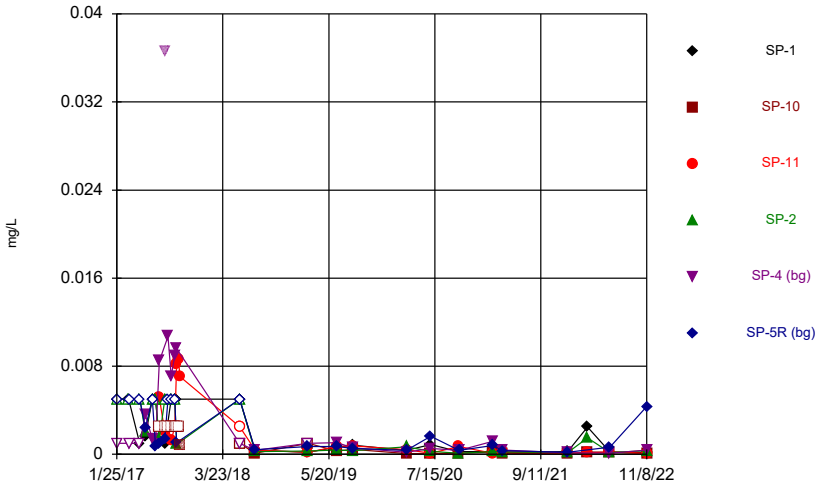
Time Series



Constituent: Fluoride Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

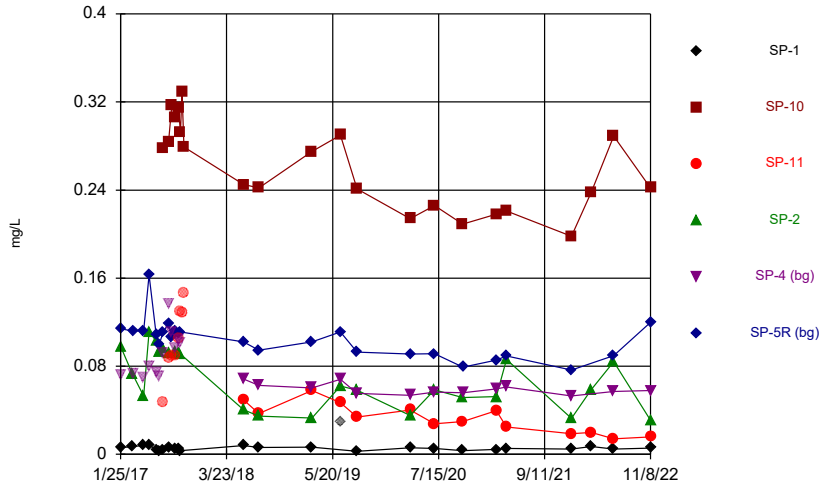
Time Series



Constituent: Lead Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

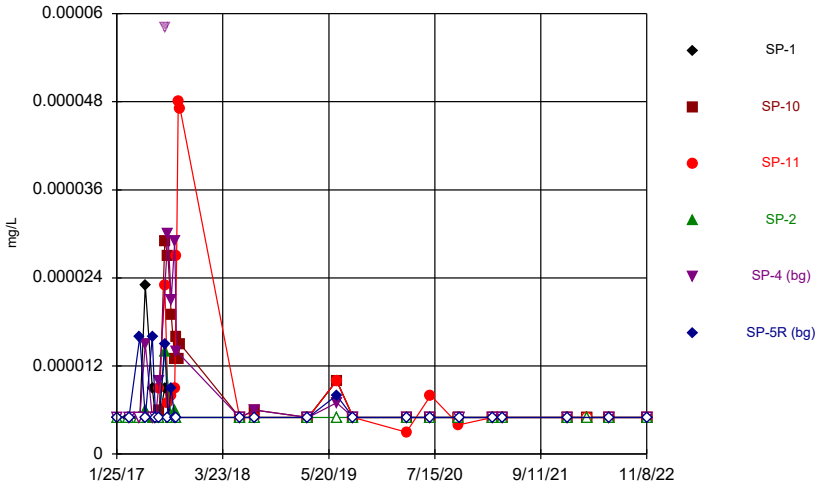
Time Series



Constituent: Lithium Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

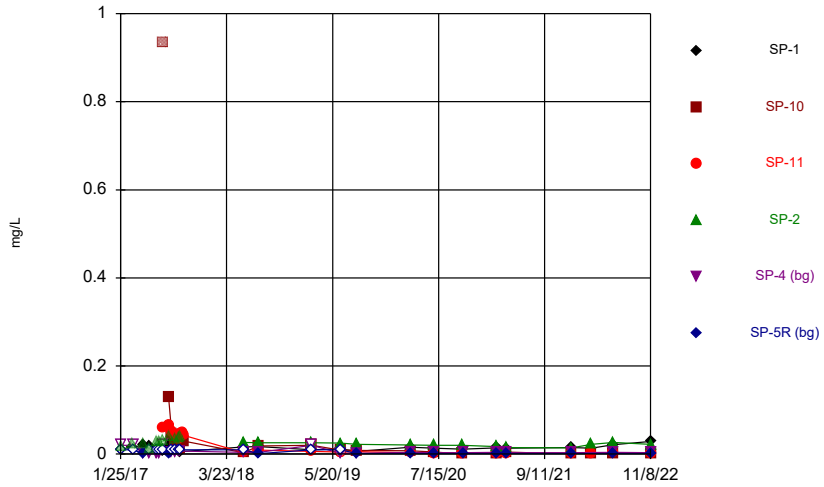
Time Series



Constituent: Mercury Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

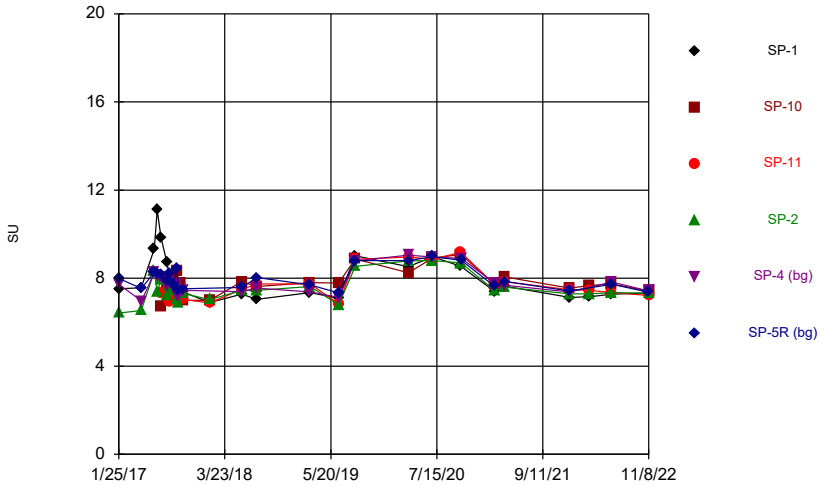
Time Series



Constituent: Molybdenum Analysis Run 2/10/2023 11:53 AM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Time Series



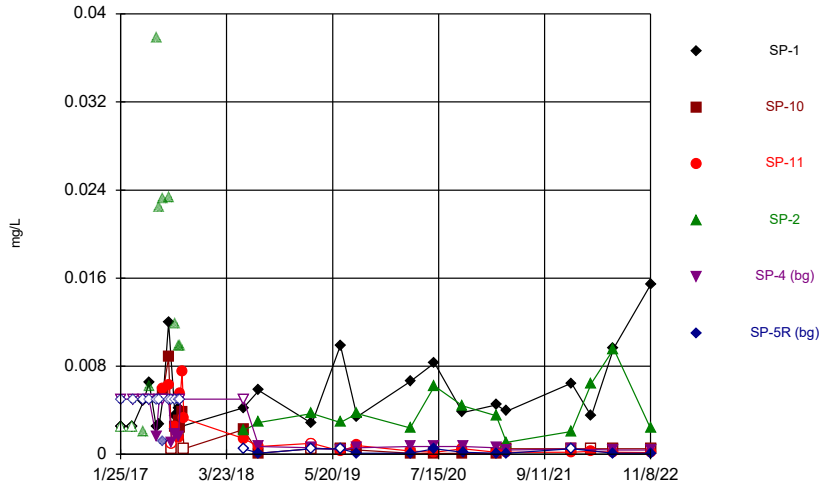
Constituent: pH, field Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Time Series

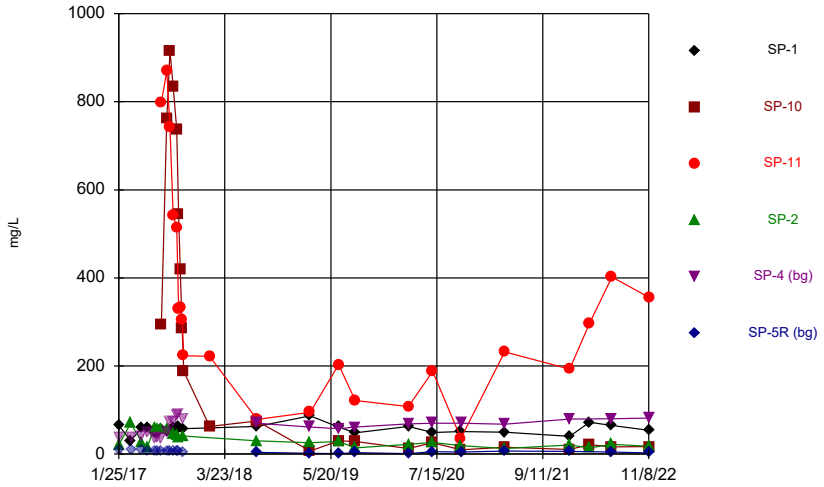


Constituent: Selenium Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Time Series



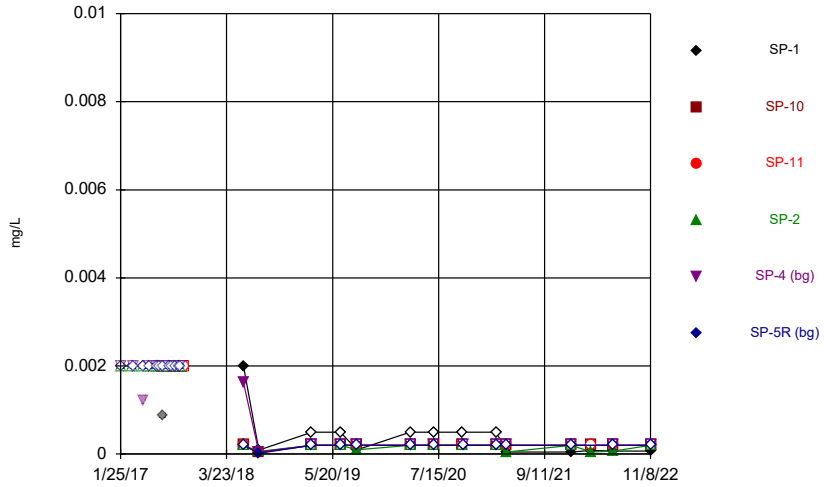
Constituent: Sulfate Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

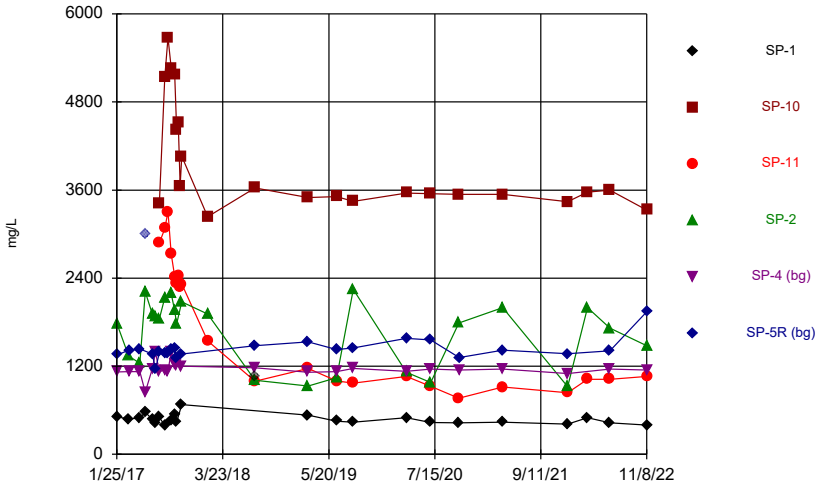
Time Series



Constituent: Thallium Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Time Series



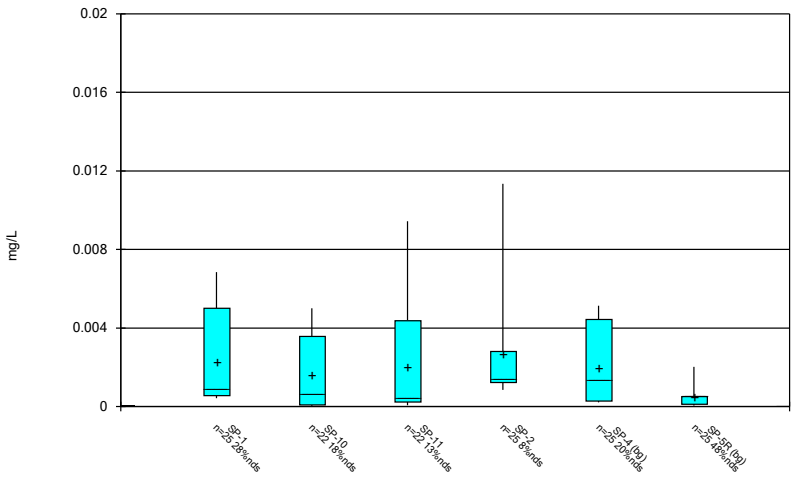
Constituent: Total Dissolved Solids [TDS] Analysis Run 2/10/2023 11:53 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE B
Box Plots

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Box & Whiskers Plot

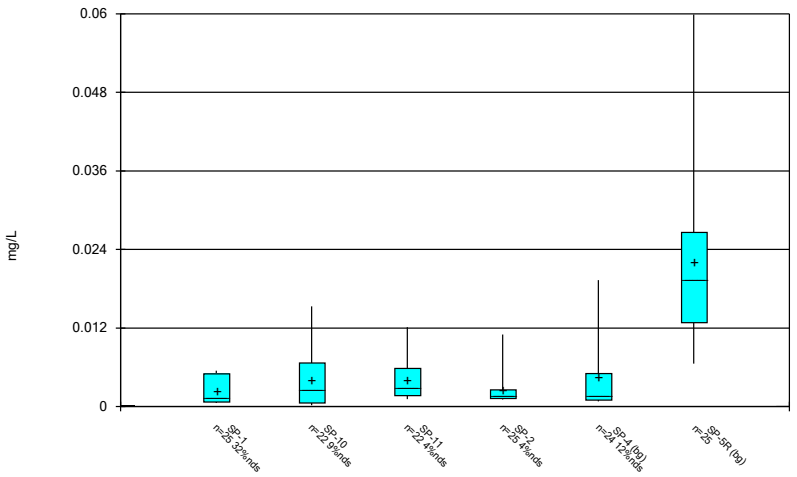


Constituent: Antimony Analysis Run 2/10/2023 1:10 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Box & Whiskers Plot

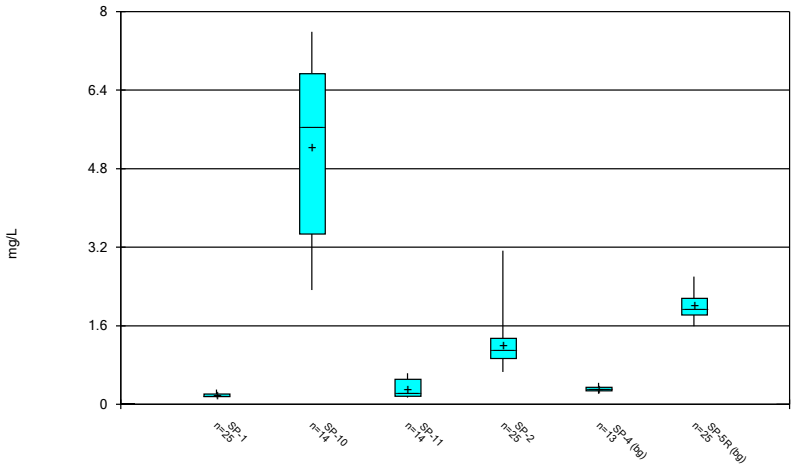


Constituent: Arsenic Analysis Run 2/10/2023 1:10 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Box & Whiskers Plot

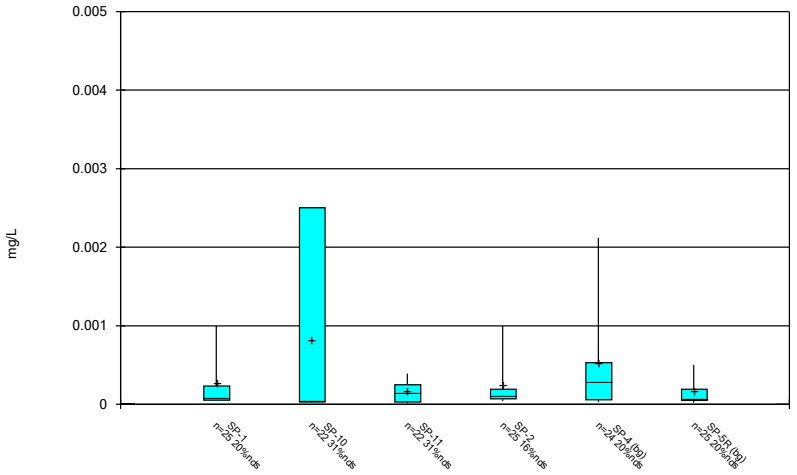


Constituent: Barium Analysis Run 2/10/2023 1:10 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

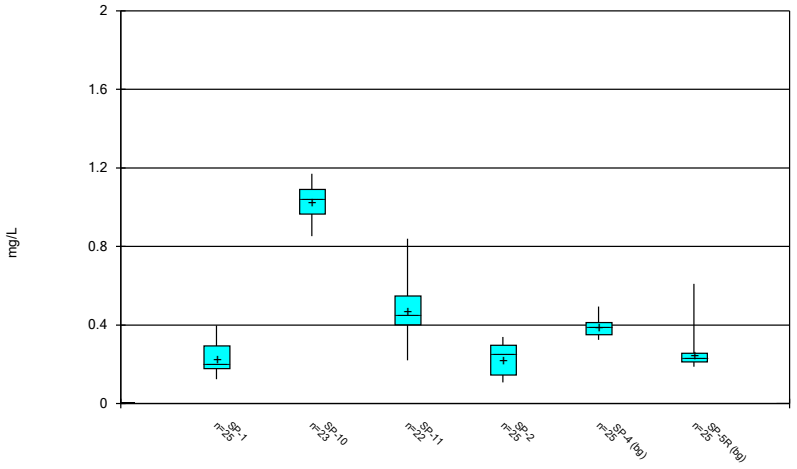
Box & Whiskers Plot



Constituent: Beryllium Analysis Run 2/10/2023 1:10 PM

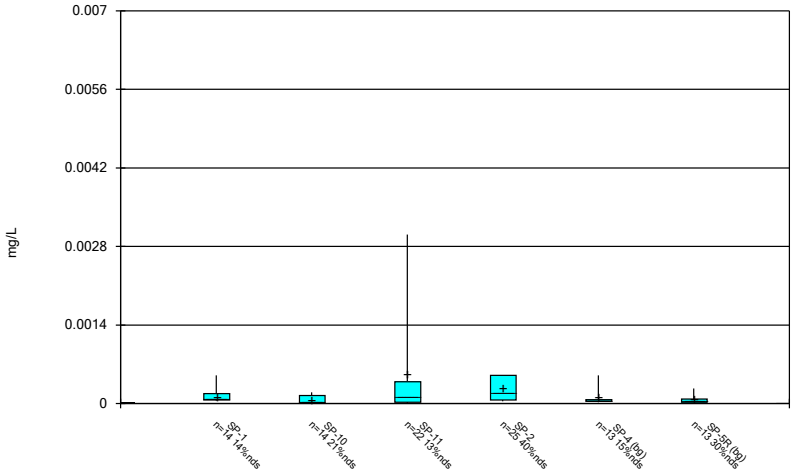
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



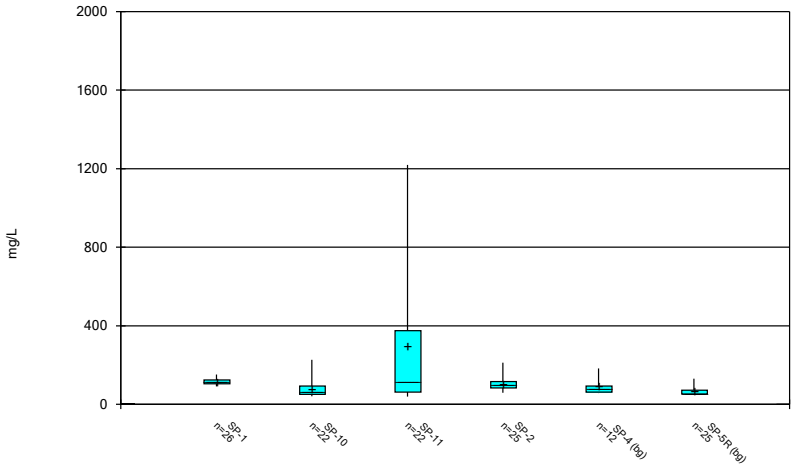
Constituent: Boron Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



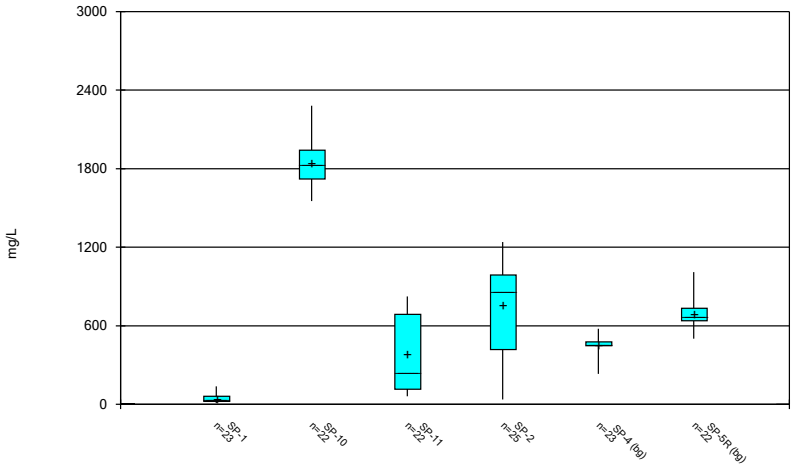
Constituent: Cadmium Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



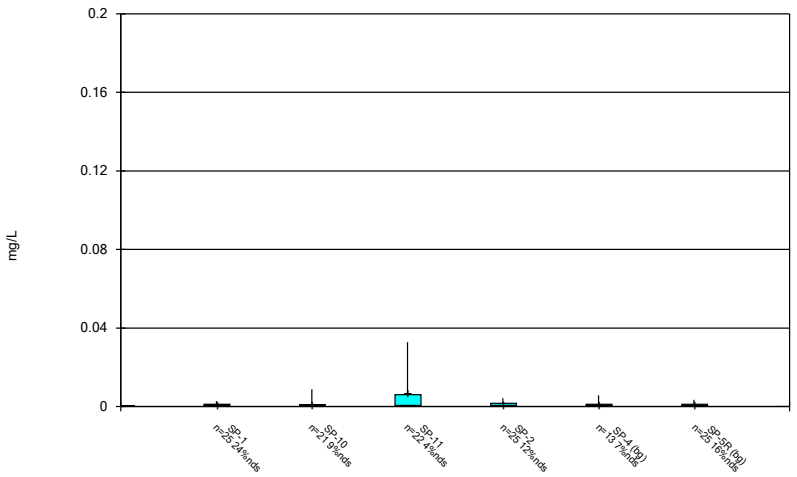
Constituent: Calcium Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Chloride Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

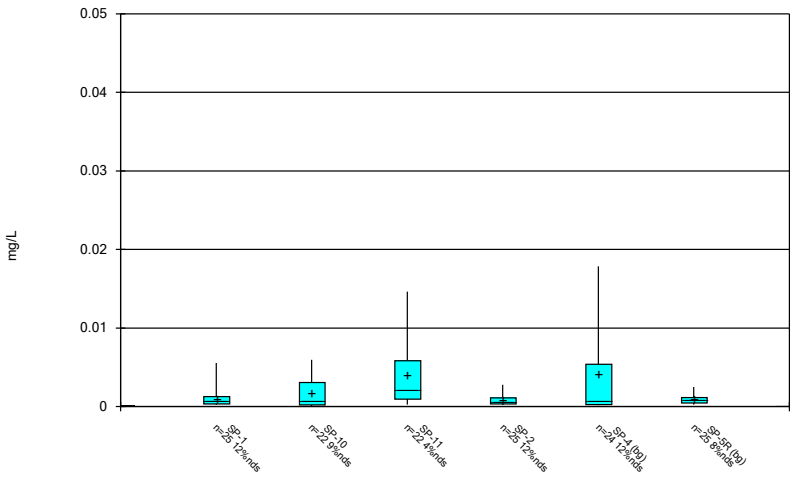
Box & Whiskers Plot



Constituent: Chromium Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

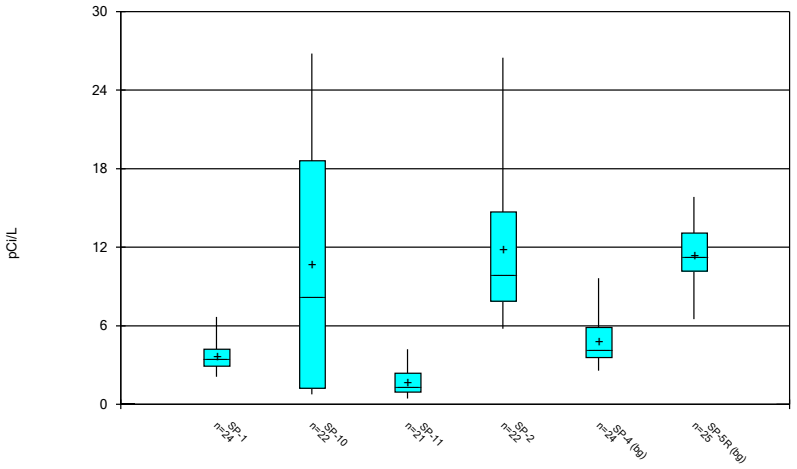
Box & Whiskers Plot



Constituent: Cobalt Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

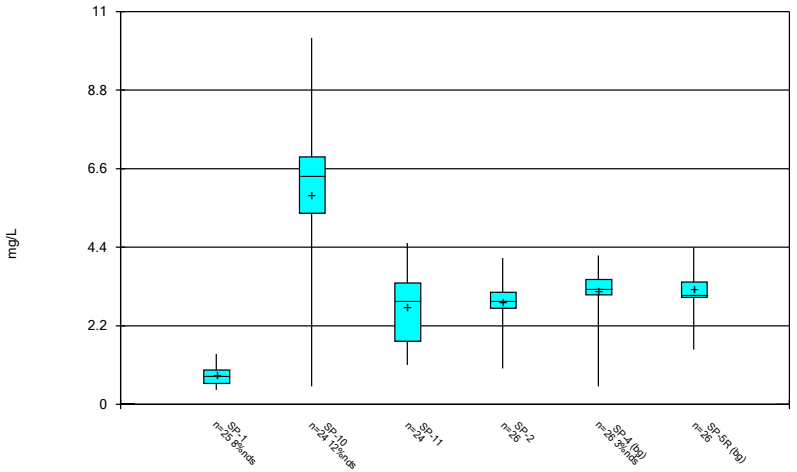
Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

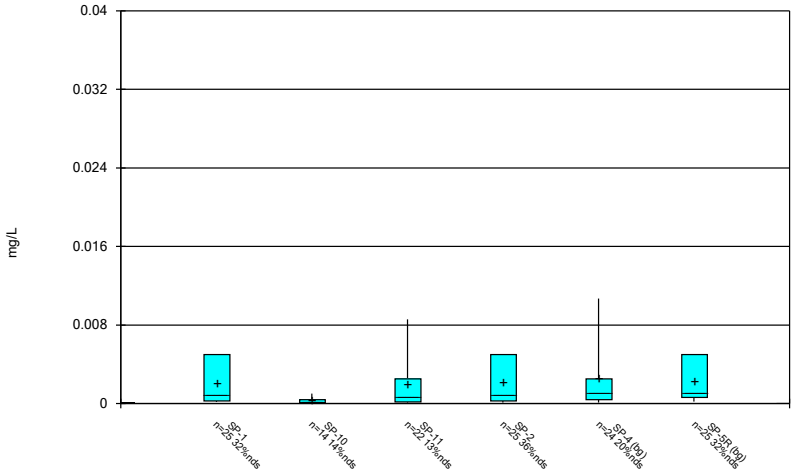
Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Box & Whiskers Plot



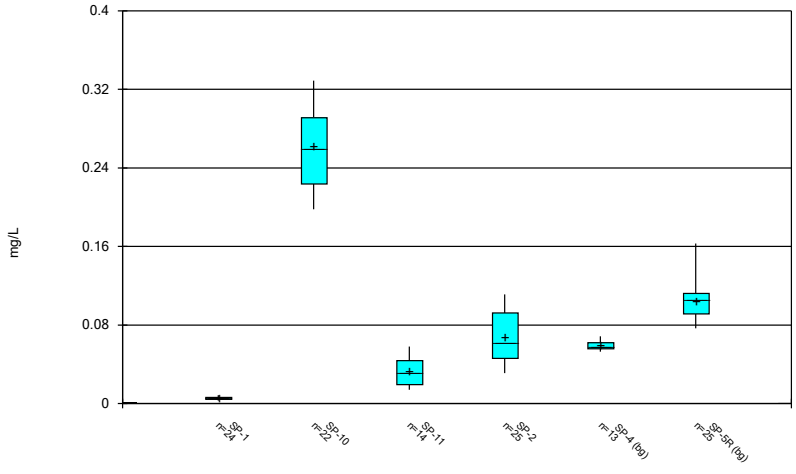
Constituent: Fluoride Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



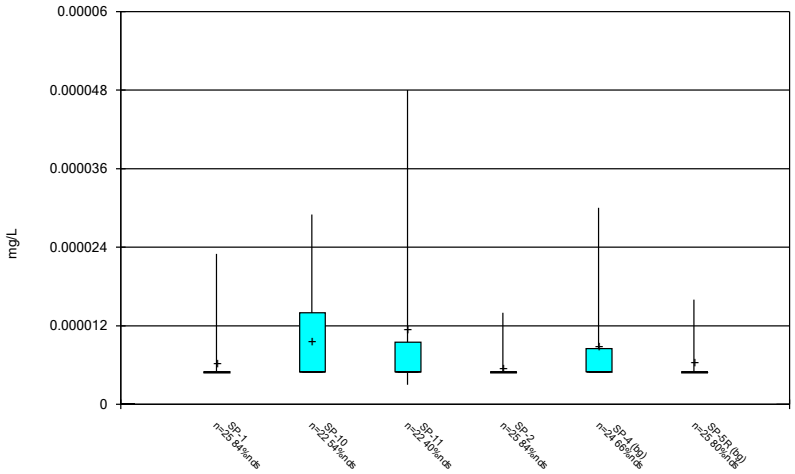
Constituent: Lead Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



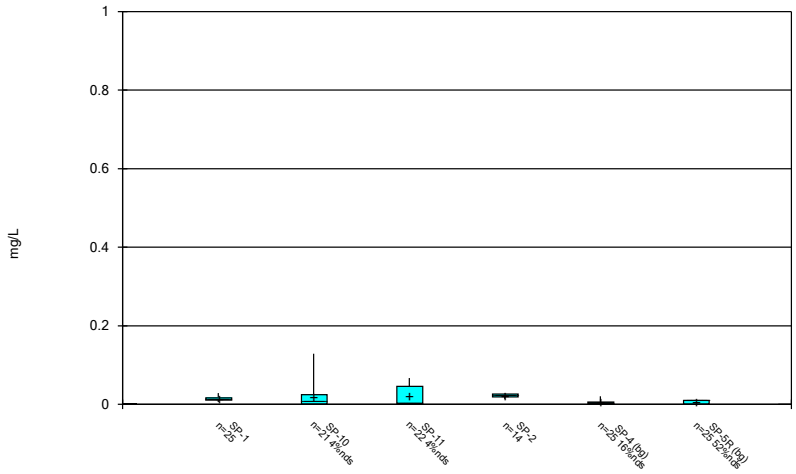
Constituent: Lithium Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



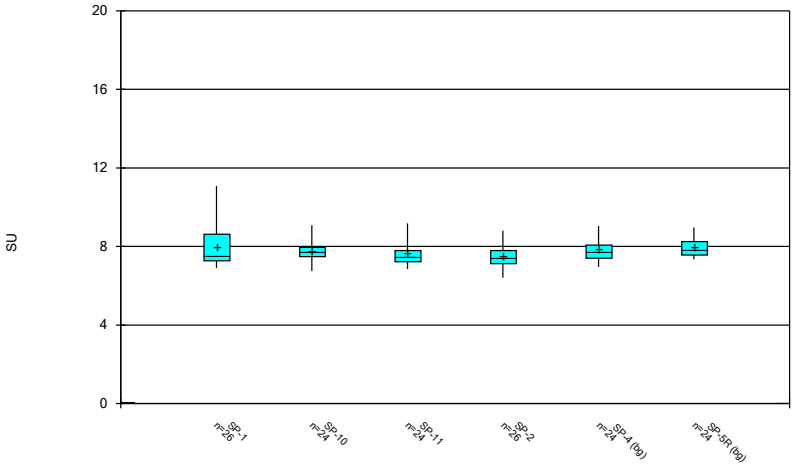
Constituent: Mercury Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Molybdenum Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

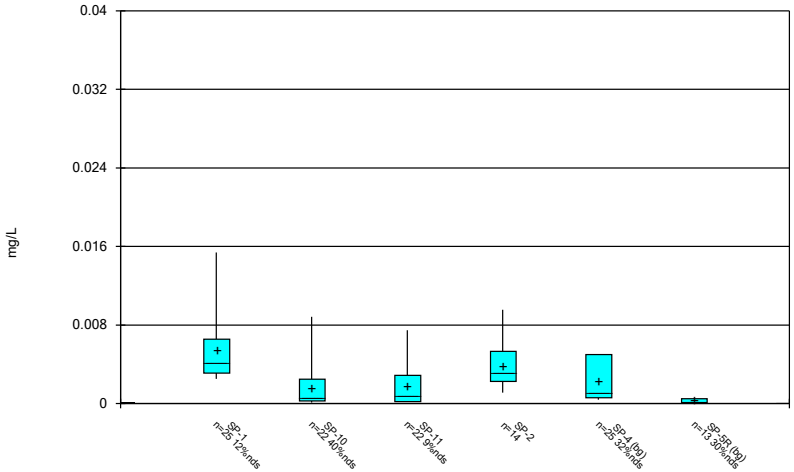
Box & Whiskers Plot



Constituent: pH, field Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

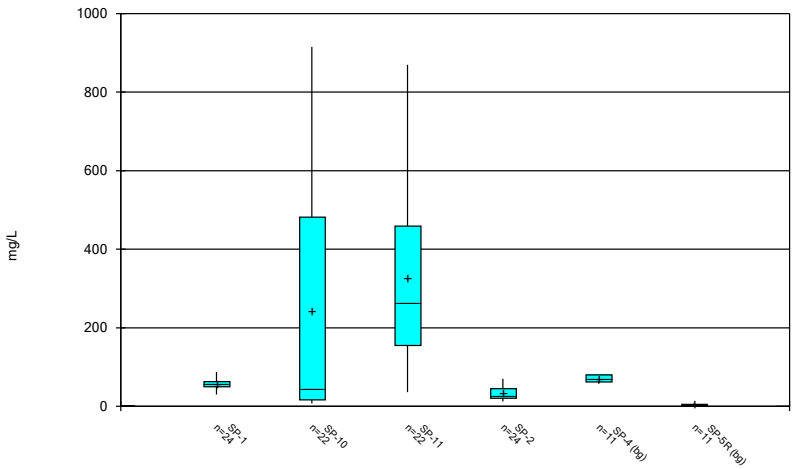
Box & Whiskers Plot



Constituent: Selenium Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

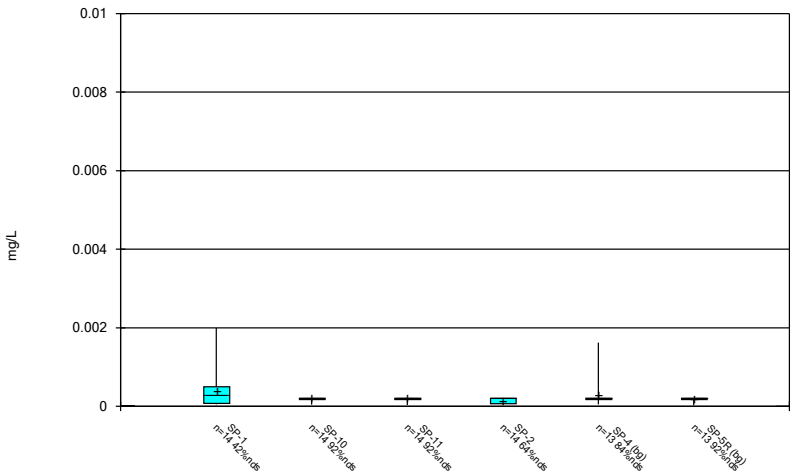
Box & Whiskers Plot



Constituent: Sulfate Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

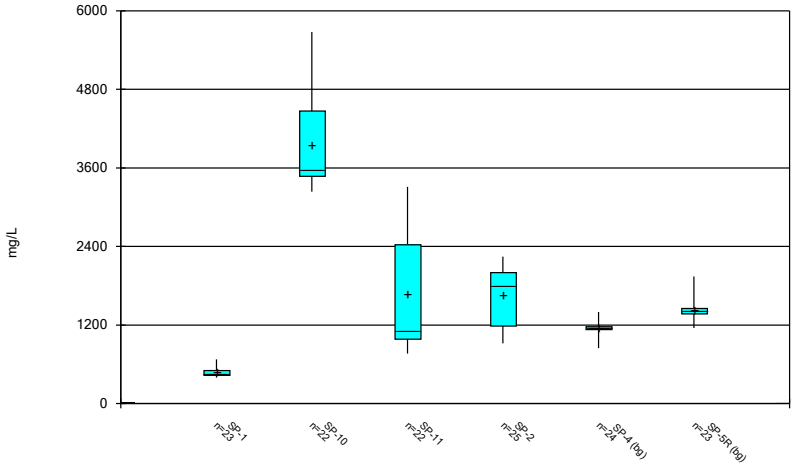
Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium Analysis Run 2/10/2023 1:10 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 2/10/2023 1:10 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE C

Outlier Summary and Tukey's Outlier Test

Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:15 PM

	SP-4 Arsenic (mg/L)	SP-4 Beryllium (mg/L)	SP-1 Chloride (mg/L)	SP-4 Chloride (mg/L)	SP-5R Chloride (mg/L)	SP-10 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			548 (o)							4 (o)
3/15/2017				52 (o)	62 (o)					
5/18/2017					1834 (o)					
6/27/2017								14.29 (o)		
7/13/2017						0.11 (o)				
8/4/2017	0.04498 (o)	0.00497 (o)					0.04069 (o)		25.367 (o)	
7/30/2018										
6/20/2019										

	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)	SP-10 Molybdenum (mg/L)	SP-1 Total Dissolved Solids [TDS] (mg/L)	SP-5R Total Dissolved Solids [TDS] (mg/L)
3/13/2017						
3/15/2017						
5/18/2017					3008 (o)	
6/27/2017						
7/13/2017				0.934 (o)		
8/4/2017	0.03663 (o)		5.8E-05 (o)			
7/30/2018					1060 (o)	
6/20/2019		0.03 (J,o)				

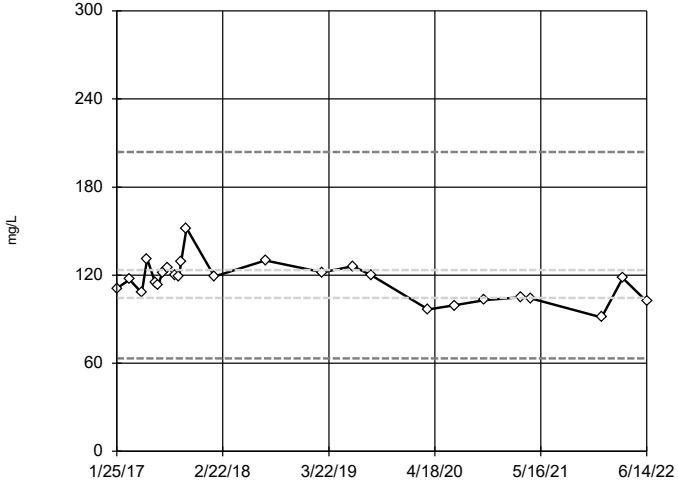
Tukey's Outlier Test - All Results (No Significant)

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:14 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Calcium (mg/L)	SP-1	No	n/a	NP	NaN	25	115.9	13.21	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-10	No	n/a	NP	NaN	21	79.44	50.65	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-11	No	n/a	NP	NaN	21	307.2	396.2	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-2	No	n/a	NP	NaN	24	102.5	33.2	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-4 (bg)	No	n/a	NP	NaN	11	89.13	43.03	ln(x)	ShapiroWilk
Calcium (mg/L)	SP-5R (bg)	No	n/a	NP	NaN	24	64.08	21.76	ln(x)	ShapiroWilk

Tukey's Outlier Screening

SP-1



n = 25

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

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

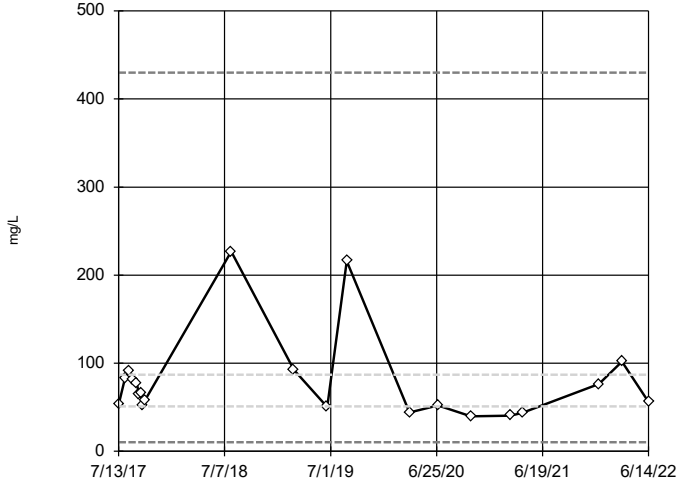
High cutoff = 203.8, low cutoff = 63.32, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 2/10/2023 1:14 PM View: Outlier Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

SP-10



n = 21

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

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

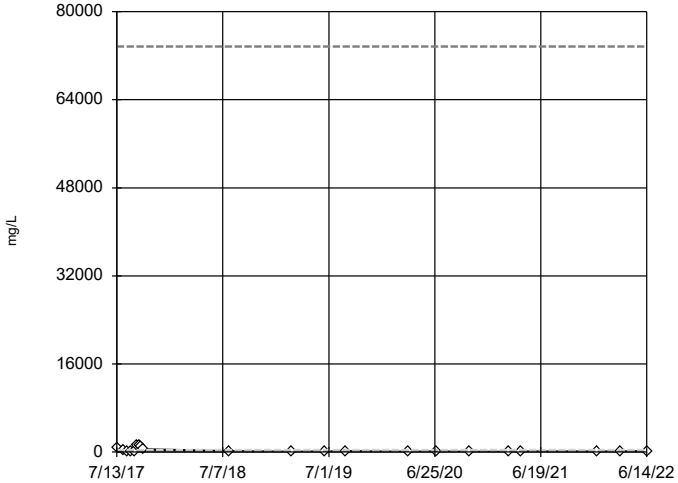
High cutoff = 430, low cutoff = 10.38, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 2/10/2023 1:14 PM View: Outlier Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

SP-11



n = 21

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

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

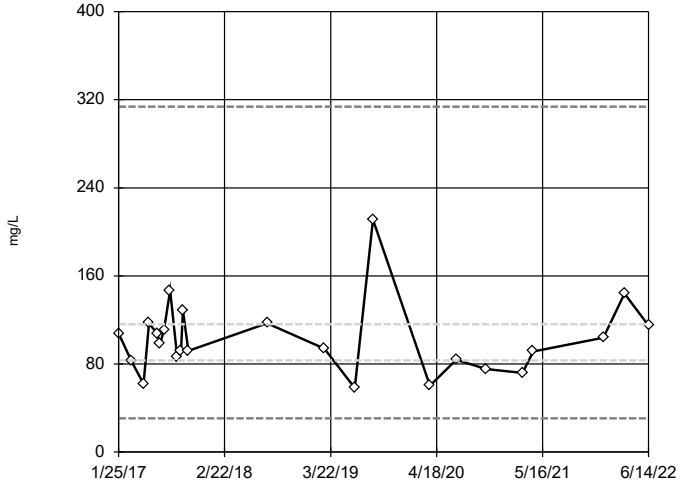
High cutoff = 73658, low cutoff = 0.3004, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 2/10/2023 1:14 PM View: Outlier Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

SP-2



n = 24

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

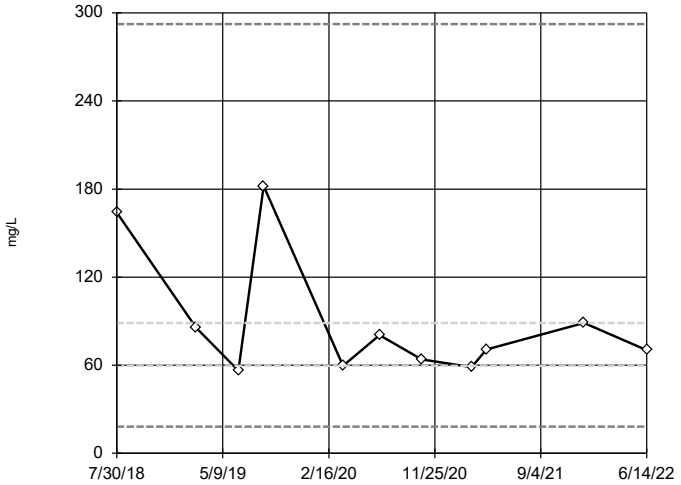
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 313.8, low cutoff = 30.77, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 2/10/2023 1:14 PM View: Outlier Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening

SP-4 (bg)



n = 11

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

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

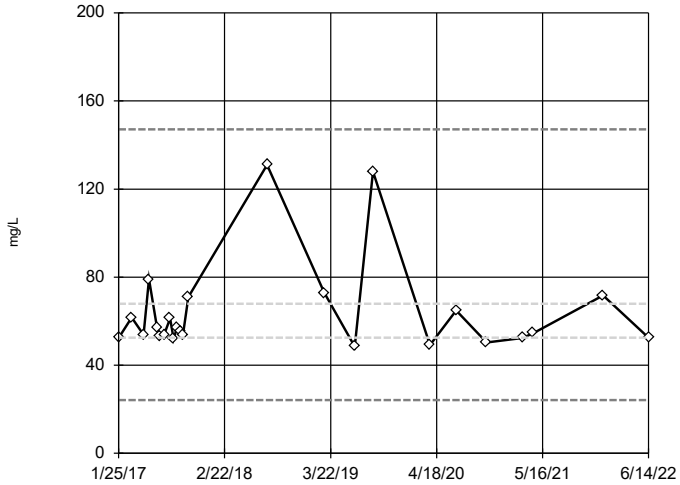
High cutoff = 292.4, low cutoff = 18.08, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 2/10/2023 1:14 PM View: Outlier Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

SP-5R (bg)



n = 24

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

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

High cutoff = 147.2, low cutoff = 24.2, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 2/10/2023 1:14 PM View: Outlier Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Test - Upgradient Wells - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:13 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Chloride (mg/L)	**SP-4,SP-5R**	**Yes**	**52,62,1834**	**NP**	**NaN**	**48**	**577.1**	**254**	**sqrt(x)**	**ShapiroWilk**
Fluoride (mg/L)	**SP-4,SP-5R**	**Yes**	**0.5**	**NP**	**NaN**	**52**	**3.184**	**0.6516**	**x^2**	**ShapiroFrancia**
Lead (mg/L)	**SP-4,SP-5R**	**Yes**	**0.03663**	**NP**	**NaN**	**50**	**0.002466**	**0.005558**	**ln(x)**	**ShapiroFrancia**
Mercury (mg/L)	**SP-4,SP-5R**	**Yes**	**0.000058,0.00003,0.000029**	**NP**	**NaN**	**50**	**0.00000868**	**0.000009222**	**ln(x)**	**ShapiroFrancia**
Selenium (mg/L)	**SP-4,SP-5R**	**Yes**	**0.00499**	**NP**	**NaN**	**38**	**0.000665**	**0.0008285**	**ln(x)**	**ShapiroWilk**
Total Dissolved Solids [TDS] (mg/L)	**SP-4,SP-5R**	**Yes**	**3008**	**NP**	**NaN**	**48**	**1328**	**306.5**	**ln(x)**	**ShapiroWilk**

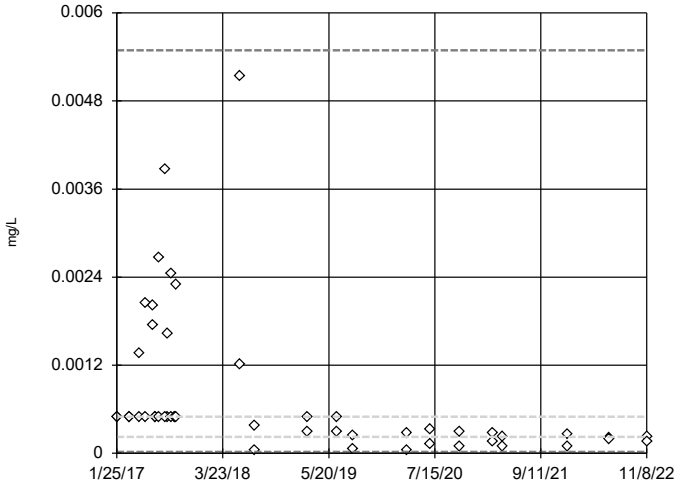
Tukey's Outlier Test - Upgradient Wells - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:13 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	50	0.000786	0.001025	ln(x)	ShapiroFrancia
Arsenic (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	50	0.01397	0.01404	x^(1/3)	ShapiroFrancia
Barium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	38	1.428	0.8429	x^3	ShapiroWilk
Beryllium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	50	0.0004279	0.0008146	ln(x)	ShapiroFrancia
Boron (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	50	0.3188	0.09559	ln(x)	ShapiroFrancia
Cadmium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	26	0.00006058	0.00005613	ln(x)	ShapiroWilk
Chloride (mg/L)	**SP-4,SP-5R**	**Yes**	**52,62,1834**	**NP**	**NaN**	**48**	**577.1**	**254**	**sqrt(x)**	**ShapiroWilk**
Chromium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	38	0.0009132	0.001008	ln(x)	ShapiroWilk
Cobalt (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	50	0.003158	0.007029	ln(x)	ShapiroFrancia
Combined Radium 226 + 228 (pCi/L)	SP-4,SP-5R	No	n/a	NP	NaN	49	8.172	3.909	sqrt(x)	ShapiroWilk
Fluoride (mg/L)	**SP-4,SP-5R**	**Yes**	**0.5**	**NP**	**NaN**	**52**	**3.184**	**0.6516**	**x^2**	**ShapiroFrancia**
Lead (mg/L)	**SP-4,SP-5R**	**Yes**	**0.03663**	**NP**	**NaN**	**50**	**0.002466**	**0.005558**	**ln(x)**	**ShapiroFrancia**
Lithium (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	38	0.08877	0.02587	sqrt(x)	ShapiroWilk
Mercury (mg/L)	**SP-4,SP-5R**	**Yes**	**0.000058,0.00003,0.000029**	**NP**	**NaN**	**50**	**0.00000868**	**0.000009222**	**ln(x)**	**ShapiroFrancia**
Molybdenum (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	50	0.005028	0.003874	ln(x)	ShapiroFrancia
pH, field (SU)	SP-4,SP-5R	No	n/a	NP	NaN	48	7.896	0.5467	ln(x)	ShapiroWilk
Selenium (mg/L)	**SP-4,SP-5R**	**Yes**	**0.00499**	**NP**	**NaN**	**38**	**0.000665**	**0.0008285**	**ln(x)**	**ShapiroWilk**
Sulfate (mg/L)	SP-4,SP-5R	No	n/a	NP	NaN	22	36.85	34.38	ln(x)	ShapiroWilk
Thallium (mg/L)	SP-4,SP-5R	n/a	n/a	NP	NaN	26	0.0002419	0.0002846	unknown	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	**SP-4,SP-5R**	**Yes**	**3008**	**NP**	**NaN**	**48**	**1328**	**306.5**	**ln(x)**	**ShapiroWilk**

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

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

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

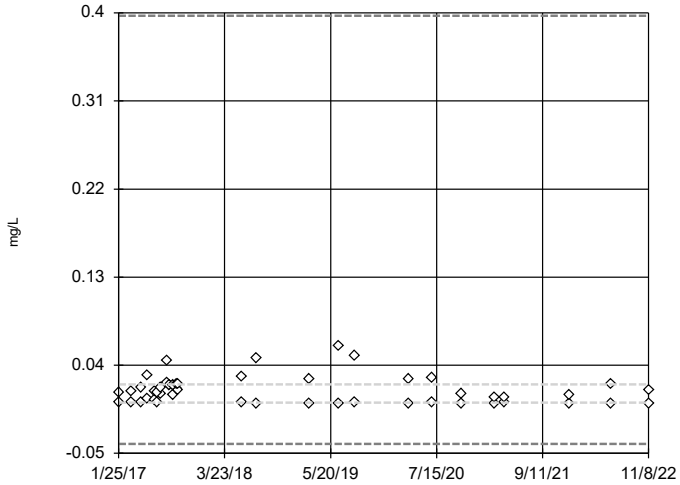
High cutoff = 0.005491, low cutoff = 0.00002048, based on IQR multiplier of 3.

Constituent: Antimony Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

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

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

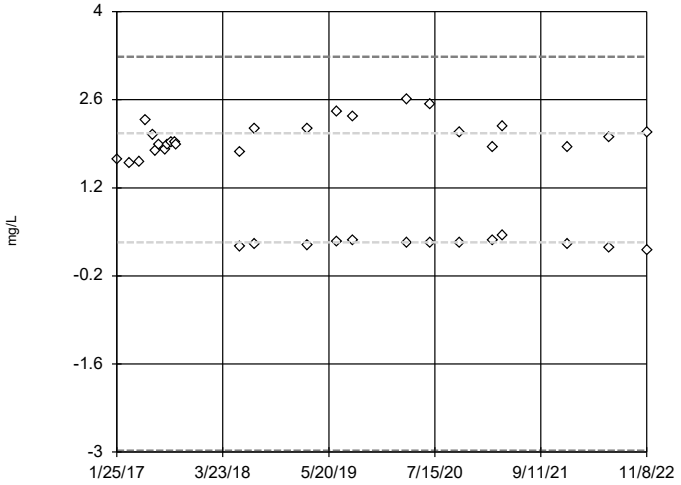
High cutoff = 0.3972, low cutoff = -0.04046, based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 38

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

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

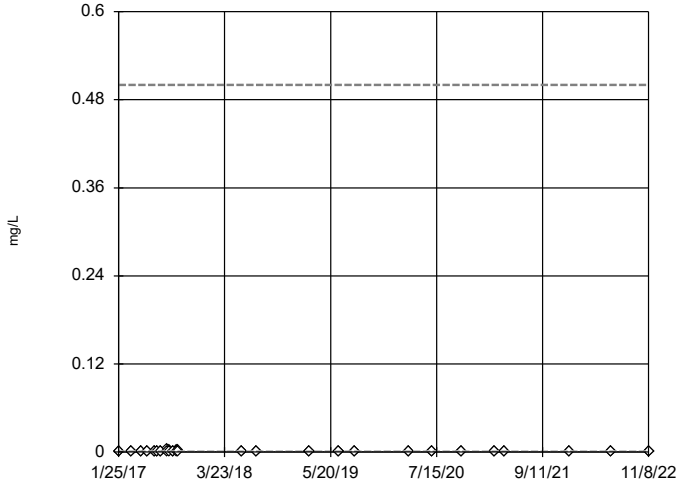
High cutoff = 3.282, low cutoff = -2.98, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

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

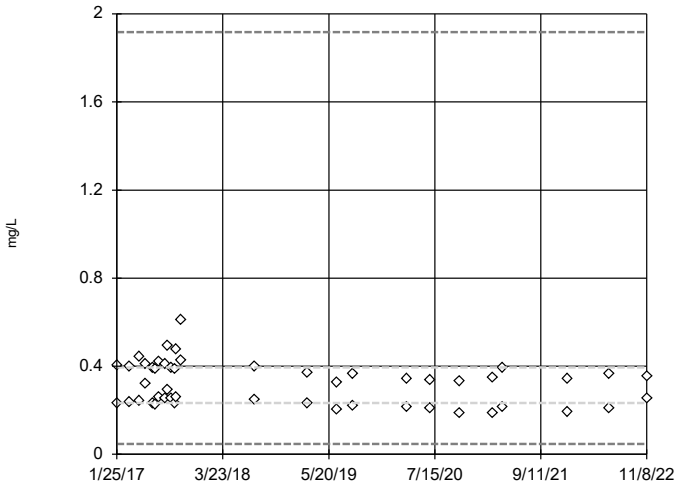
Data were natural log transformed to achieve best W statistic (graph shown in original units).

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

Constituent: Beryllium Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

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

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

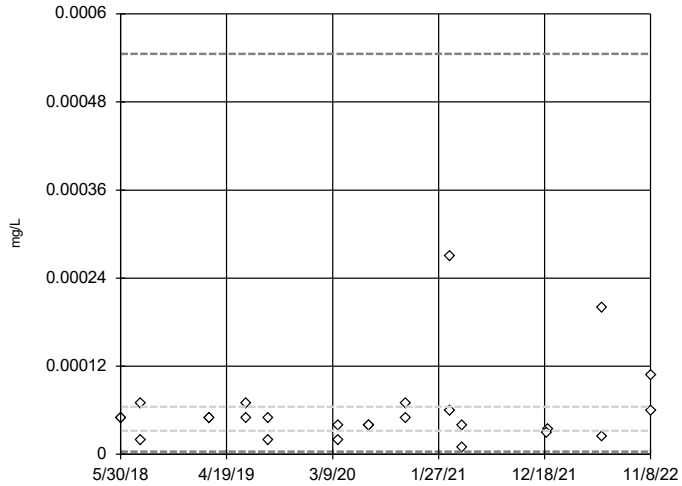
High cutoff = 1.917, low cutoff = 0.04778, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 26

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

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

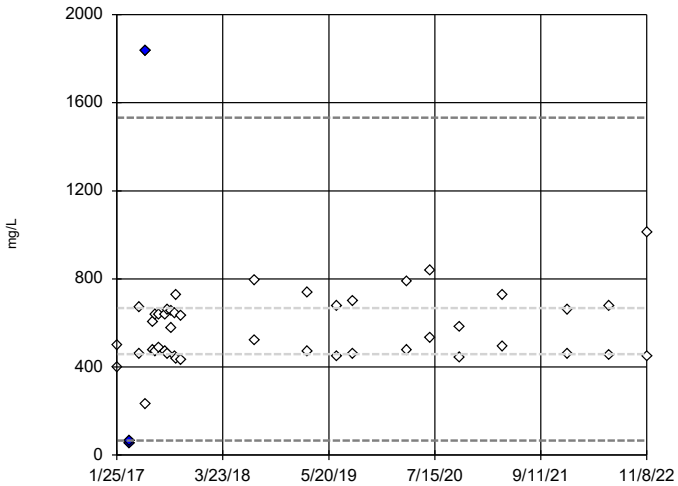
High cutoff = 0.0005455, low cutoff = 0.000003785, based on IQR multiplier of 3.

Constituent: Cadmium Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 48

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

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

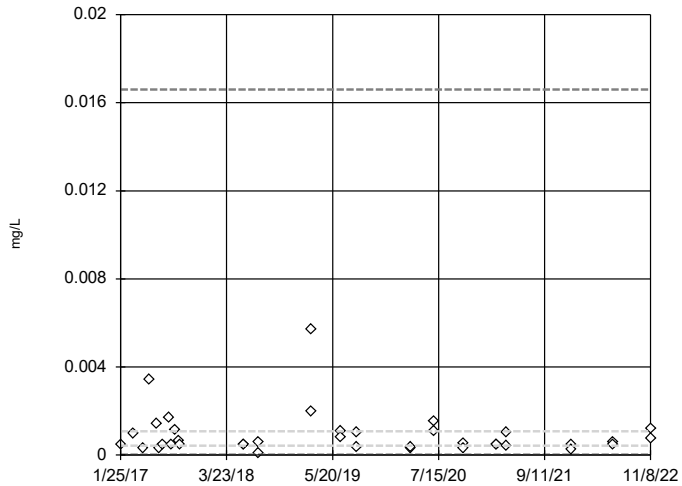
High cutoff = 1532, low cutoff = 65.55, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 38

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

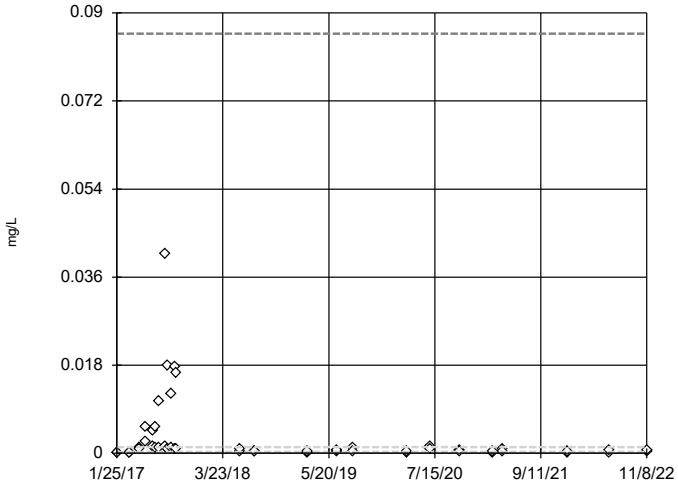
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.0166, low cutoff = 0.00002796, based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 2/10/2023 1:11 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

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

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

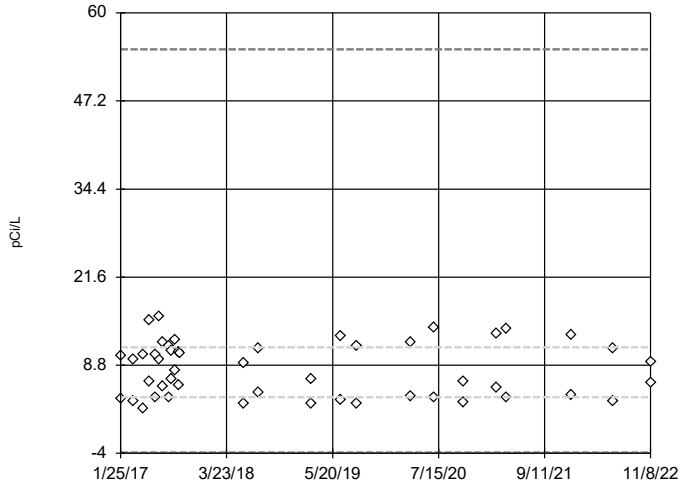
High cutoff = 0.08573, low cutoff = 0.000004878, based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 49

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

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

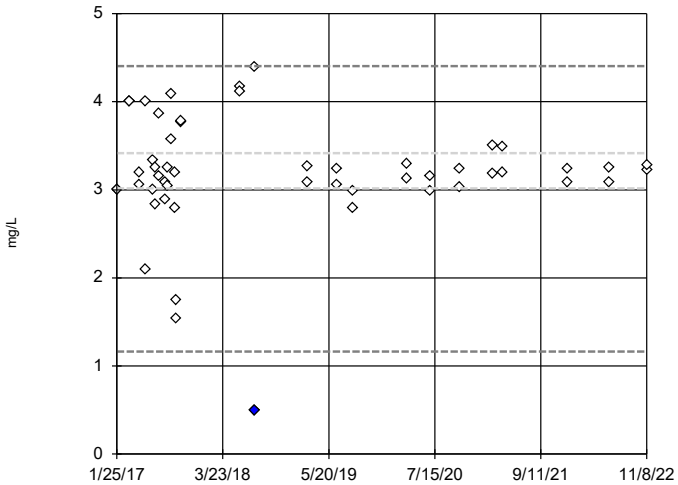
High cutoff = 54.71, low cutoff = -3.897, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 52

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

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

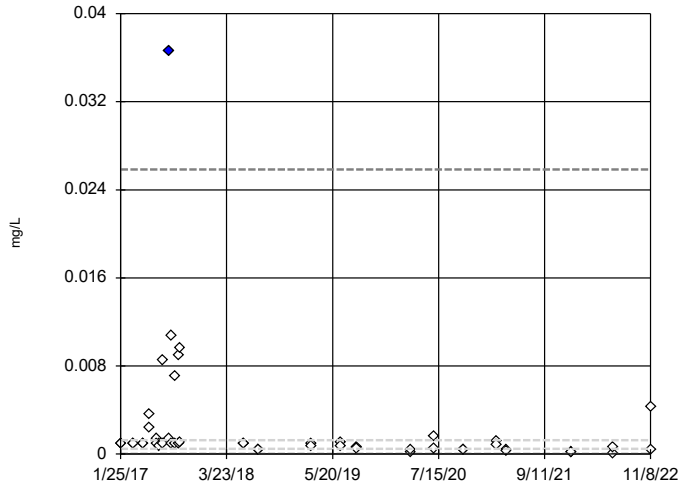
High cutoff = 4.405, low cutoff = 1.165, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

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

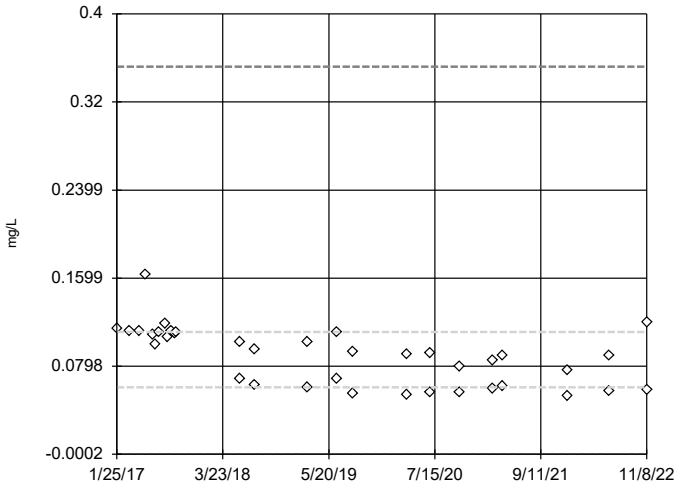
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.02586, low cutoff = 0.00002306, based on IQR multiplier of 3.

Constituent: Lead Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 38

No outliers found.
Tukey's method select-ed by user.

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

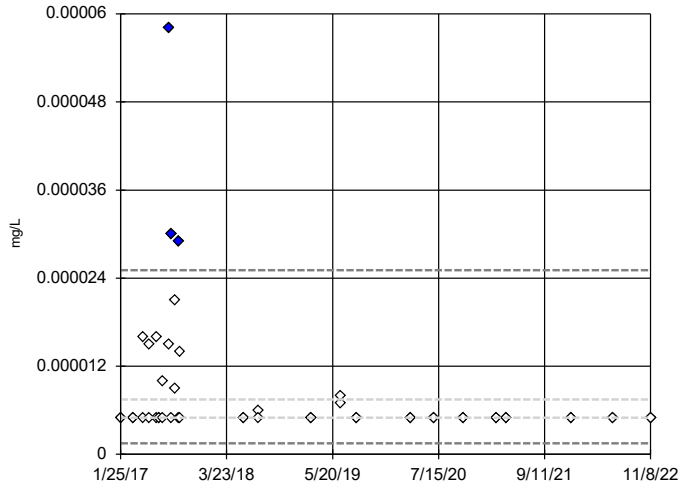
High cutoff = 0.3519, low cutoff = -0.0001852, based on IQR multiplier of 3.

Constituent: Lithium Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

Outliers are drawn as solid.
Tukey's method select-ed by user.

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

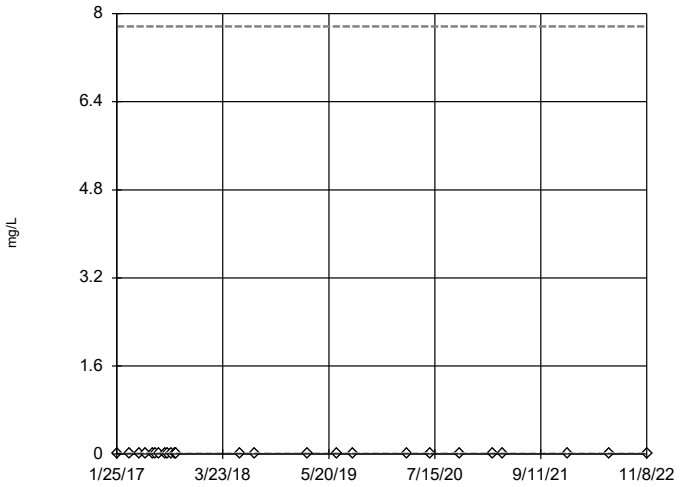
High cutoff = 0.00002509, low cutoff = 0.000001491, based on IQR multiplier of 3.

Constituent: Mercury Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 50

No outliers found.
Tukey's method select-ed by user.

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

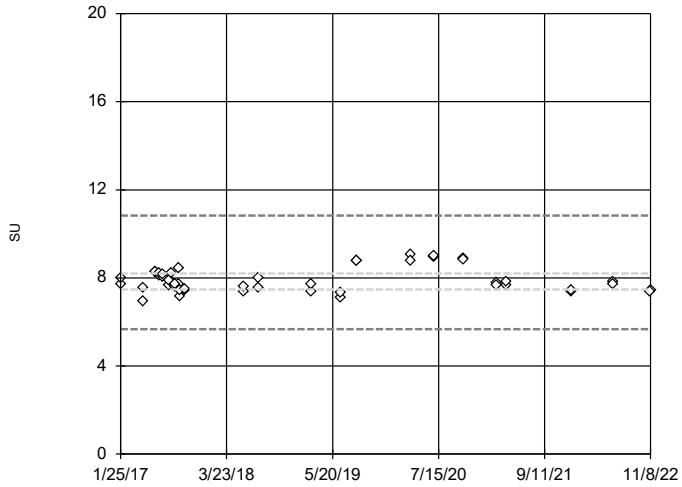
High cutoff = 7.77, low cutoff = 0.0000014, based on IQR multiplier of 3.

Constituent: Molybdenum Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 48

No outliers found.
Tukey's method select-ed by user.

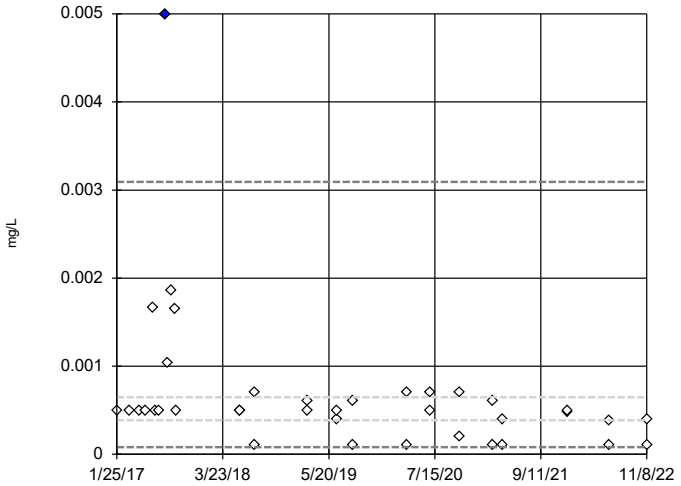
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 10.83, low cutoff = 5.667, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 38

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

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

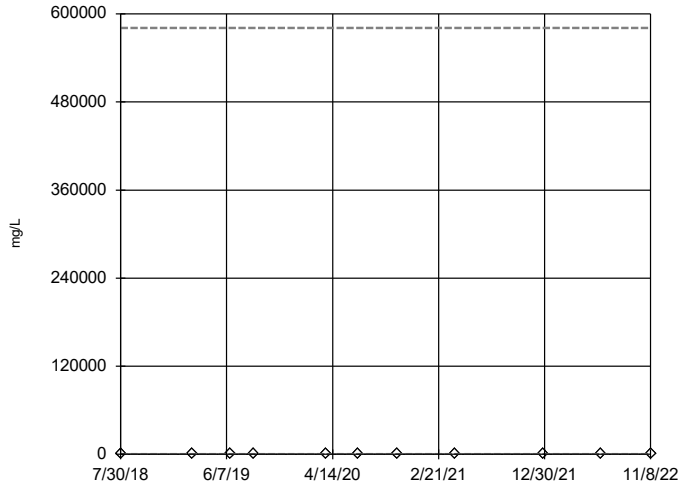
High cutoff = 0.003092, low cutoff = 0.00008069, based on IQR multiplier of 3.

Constituent: Selenium Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 22

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

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

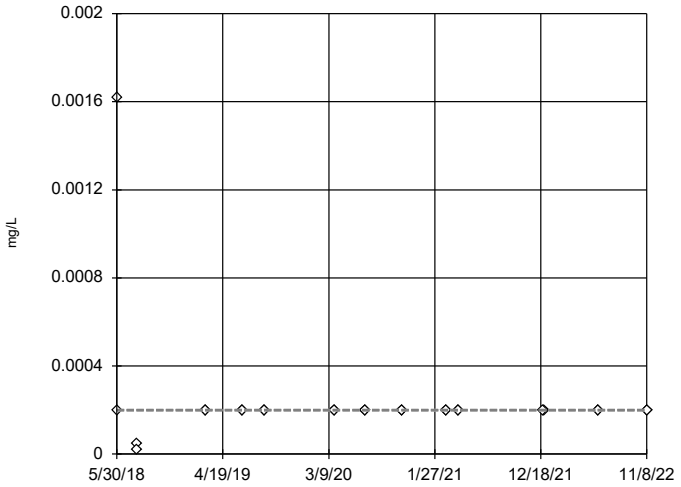
High cutoff = 580896, low cutoff = 0.000418, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 26

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

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

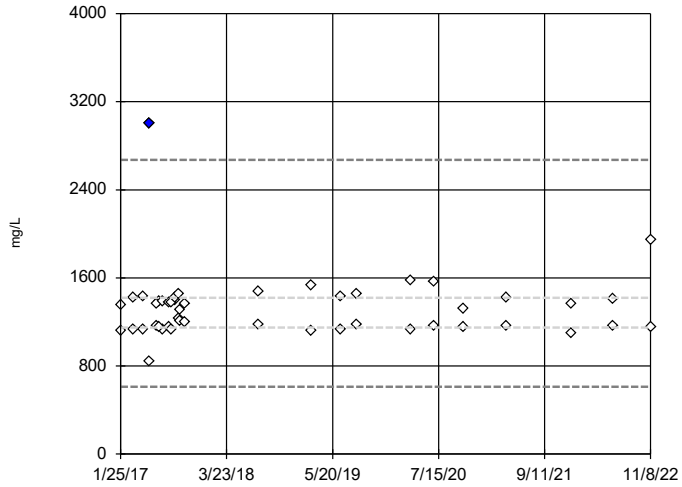
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Thallium Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tukey's Outlier Screening, Pooled Background

SP-4,SP-5R



n = 48

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

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

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

Constituent: Total Dissolved Solids [TDS] Analysis Run 2/10/2023 1:12 PM View: Outlier
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE D

Rank Von Neumann

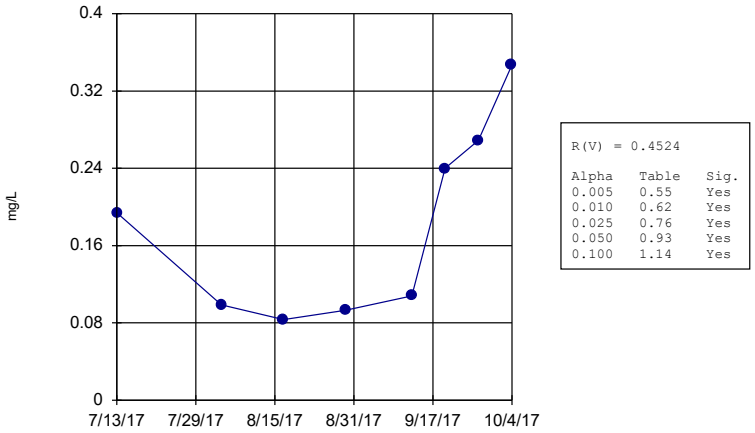
Rank Von Neumann - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/8/2023, 9:47 AM

Constituent	Well	N	R(V)	Alpha	Table	Sig.
Barium (mg/L)	**SP-11**	**8**	**0.4524**	**0.010**	**0.62**	**Yes**
Barium (mg/L)	**SP-4 (bg)**	**11**	**0.5182**	**0.010**	**0.77**	**Yes**
Cadmium (mg/L)	**SP-1**	**11**	**0.7614**	**0.010**	**0.77**	**Yes**
Cadmium (mg/L)	**SP-10**	**8**	**0**	**0.010**	**0.62**	**Yes**
Cadmium (mg/L)	**SP-4 (bg)**	**11**	**0.4705**	**0.010**	**0.77**	**Yes**
Cadmium (mg/L)	**SP-5R (bg)**	**12**	**0.5035**	**0.010**	**0.81**	**Yes**
Calcium (mg/L)	**SP-4 (bg)**	**12**	**0.8042**	**0.010**	**0.81**	**Yes**
Chromium (mg/L)	**SP-4 (bg)**	**11**	**0.5932**	**0.010**	**0.77**	**Yes**
Lead (mg/L)	**SP-10**	**8**	**0.381**	**0.010**	**0.62**	**Yes**
Lithium (mg/L)	**SP-11**	**8**	**0.3095**	**0.010**	**0.62**	**Yes**
Lithium (mg/L)	**SP-4 (bg)**	**12**	**0.7692**	**0.010**	**0.81**	**Yes**
Molybdenum (mg/L)	**SP-2**	**11**	**0.5091**	**0.010**	**0.77**	**Yes**
Selenium (mg/L)	**SP-2**	**11**	**0.75**	**0.010**	**0.77**	**Yes**
Selenium (mg/L)	**SP-5R (bg)**	**12**	**0.5035**	**0.010**	**0.81**	**Yes**
Sulfate (mg/L)	**SP-4 (bg)**	**13**	**0.5865**	**0.010**	**0.84**	**Yes**
Sulfate (mg/L)	**SP-5R (bg)**	**13**	**0.5508**	**0.010**	**0.84**	**Yes**
Thallium (mg/L)	**SP-1**	**11**	**0.55**	**0.010**	**0.77**	**Yes**
Thallium (mg/L)	**SP-10**	**8**	**0**	**0.010**	**0.62**	**Yes**
Thallium (mg/L)	**SP-11**	**8**	**0**	**0.010**	**0.62**	**Yes**
Thallium (mg/L)	**SP-2**	**11**	**0**	**0.010**	**0.77**	**Yes**
Thallium (mg/L)	**SP-4 (bg)**	**11**	**0.55**	**0.010**	**0.77**	**Yes**
Thallium (mg/L)	**SP-5R (bg)**	**12**	**0**	**0.010**	**0.81**	**Yes**

Rank Von Neumann

SP-11



R(V) = 0.4524

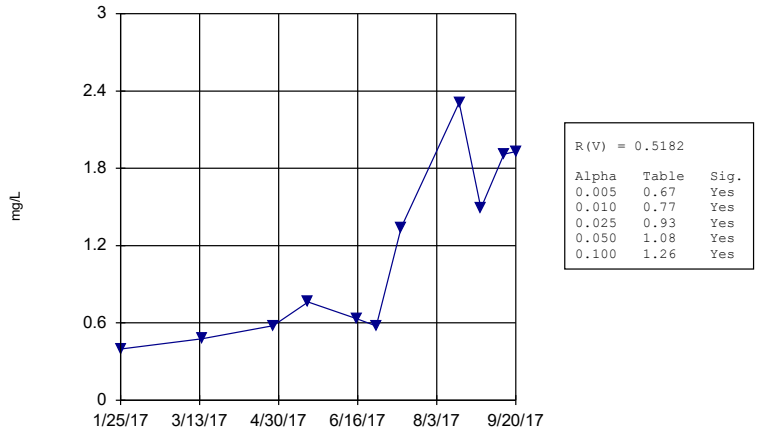
Alpha	Table	Sig.
0.005	0.55	Yes
0.010	0.62	Yes
0.025	0.76	Yes
0.050	0.93	Yes
0.100	1.14	Yes

Constituent: Barium Analysis Run 2/8/2023 9:43 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-4 (bg)



R(V) = 0.5182

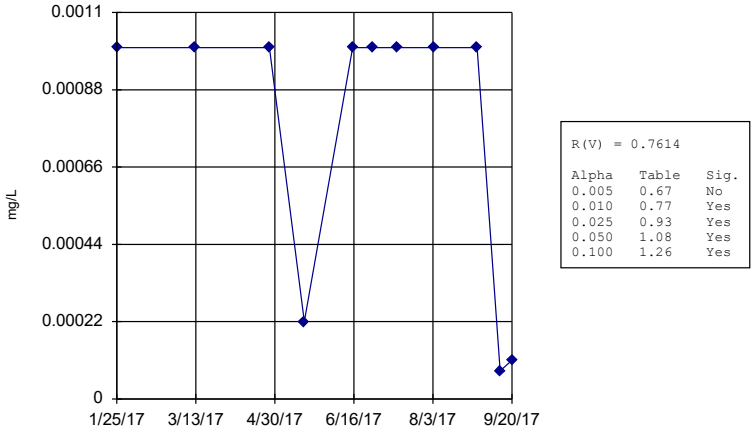
Alpha	Table	Sig.
0.005	0.67	Yes
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Barium Analysis Run 2/8/2023 9:43 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-1



R(V) = 0.7614

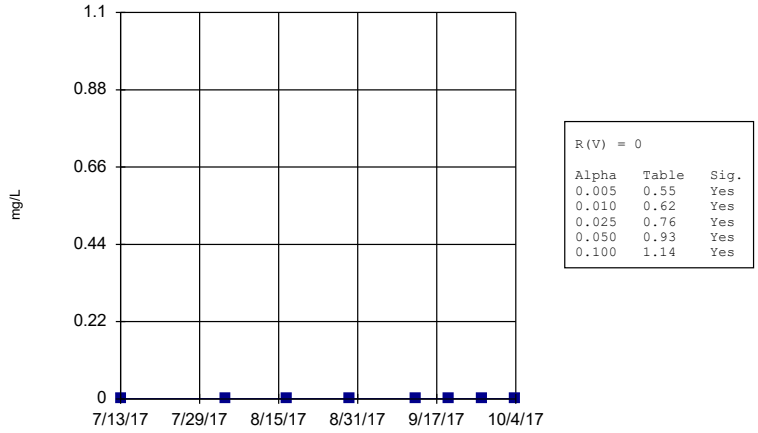
Alpha	Table	Sig.
0.005	0.67	No
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Cadmium Analysis Run 2/8/2023 9:43 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-10



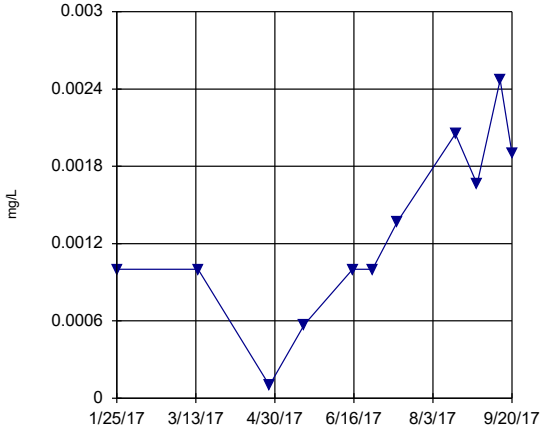
R(V) = 0

Alpha	Table	Sig.
0.005	0.55	Yes
0.010	0.62	Yes
0.025	0.76	Yes
0.050	0.93	Yes
0.100	1.14	Yes

Constituent: Cadmium Analysis Run 2/8/2023 9:43 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Rank Von Neumann

SP-4 (bg)



R(V) = 0.4705

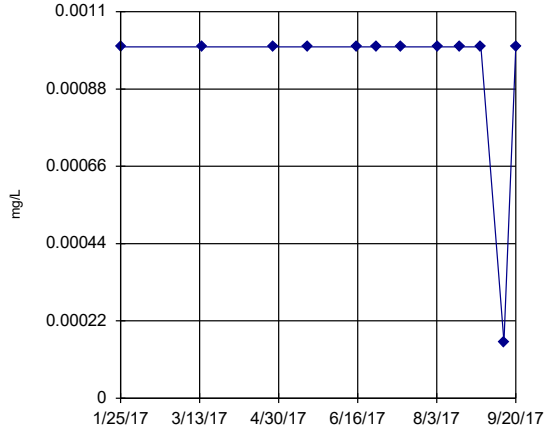
Alpha	Table	Sig.
0.005	0.67	Yes
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Cadmium Analysis Run 2/8/2023 9:43 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-5R (bg)



R(V) = 0.5035

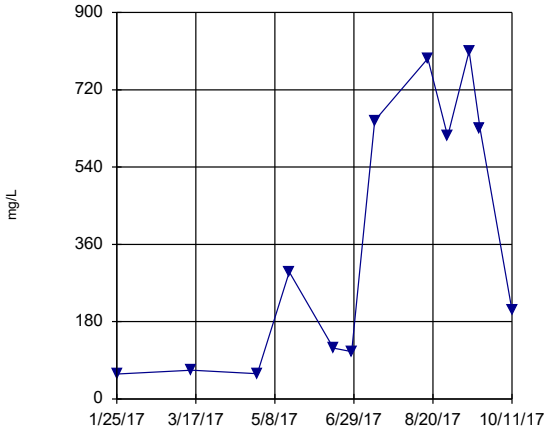
Alpha	Table	Sig.
0.005	0.71	Yes
0.010	0.81	Yes
0.025	0.96	Yes
0.050	1.11	Yes
0.100	1.29	Yes

Constituent: Cadmium Analysis Run 2/8/2023 9:43 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-4 (bg)



R(V) = 0.8042

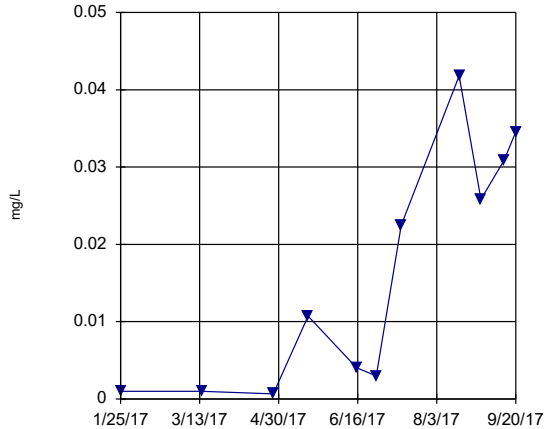
Alpha	Table	Sig.
0.005	0.71	No
0.010	0.81	Yes
0.025	0.96	Yes
0.050	1.11	Yes
0.100	1.29	Yes

Constituent: Calcium Analysis Run 2/8/2023 9:43 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-4 (bg)



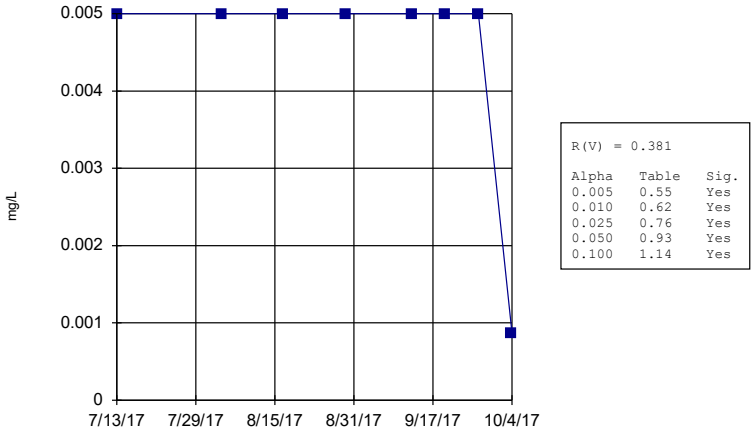
R(V) = 0.5932

Alpha	Table	Sig.
0.005	0.67	Yes
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Chromium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Rank Von Neumann

SP-10



R(V) = 0.381

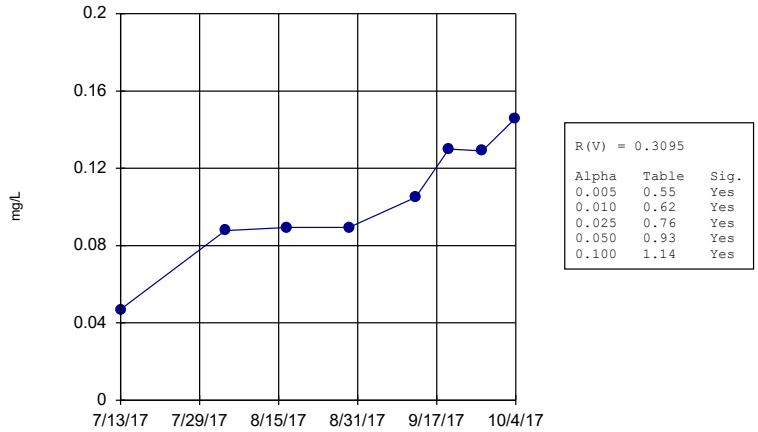
Alpha	Table	Sig.
0.005	0.55	Yes
0.010	0.62	Yes
0.025	0.76	Yes
0.050	0.93	Yes
0.100	1.14	Yes

Constituent: Lead Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-11



R(V) = 0.3095

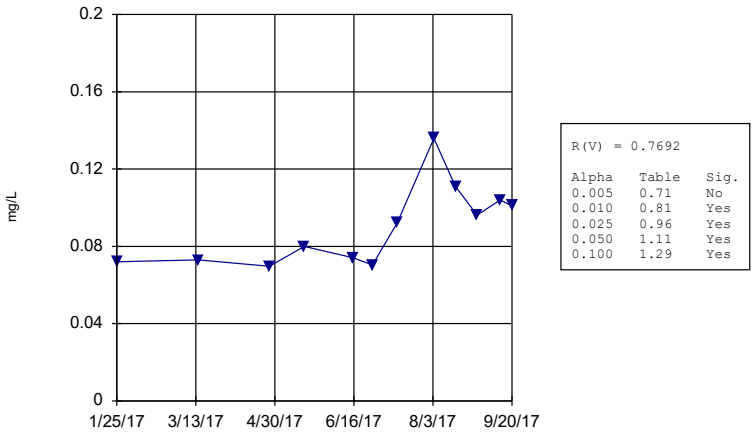
Alpha	Table	Sig.
0.005	0.55	Yes
0.010	0.62	Yes
0.025	0.76	Yes
0.050	0.93	Yes
0.100	1.14	Yes

Constituent: Lithium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-4 (bg)



R(V) = 0.7692

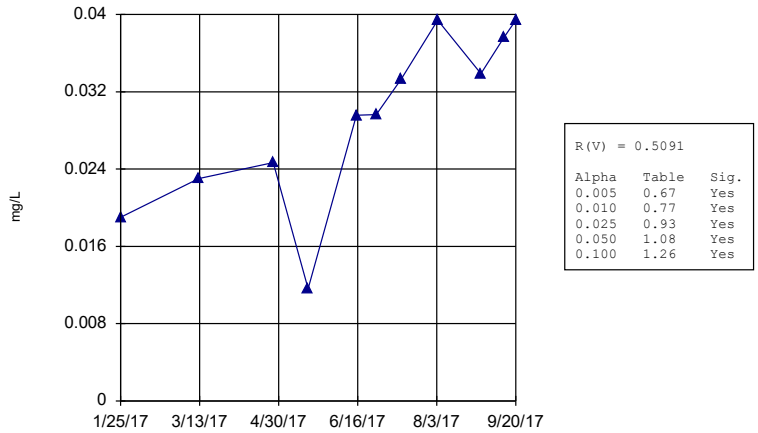
Alpha	Table	Sig.
0.005	0.71	No
0.010	0.81	Yes
0.025	0.96	Yes
0.050	1.11	Yes
0.100	1.29	Yes

Constituent: Lithium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-2



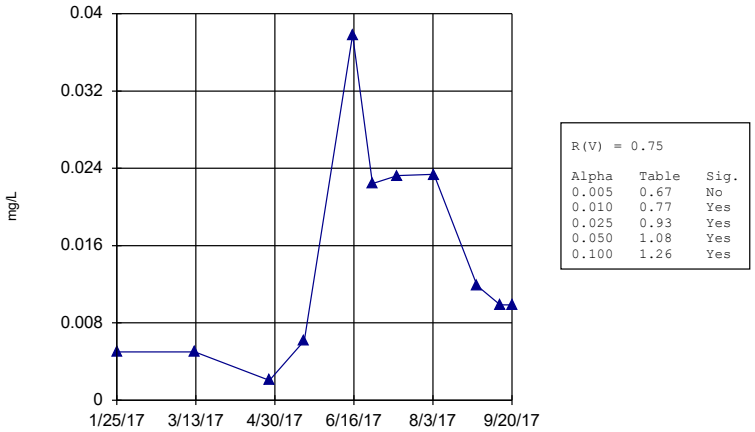
R(V) = 0.5091

Alpha	Table	Sig.
0.005	0.67	Yes
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Molybdenum Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Rank Von Neumann

SP-2



R(V) = 0.75

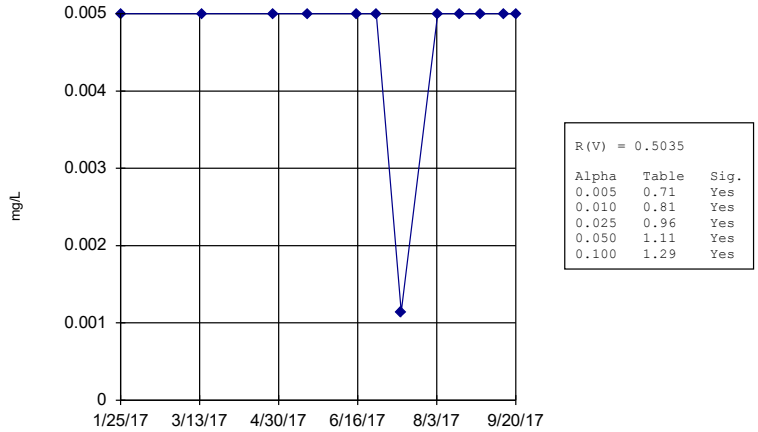
Alpha	Table	Sig.
0.005	0.67	No
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Selenium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-5R (bg)



R(V) = 0.5035

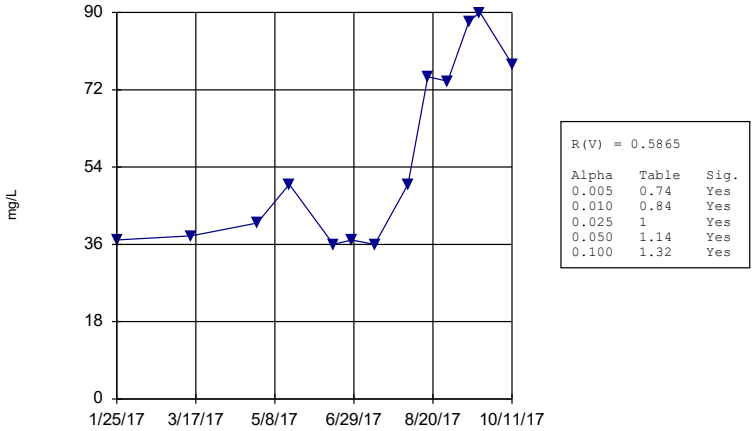
Alpha	Table	Sig.
0.005	0.71	Yes
0.010	0.81	Yes
0.025	0.96	Yes
0.050	1.11	Yes
0.100	1.29	Yes

Constituent: Selenium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-4 (bg)



R(V) = 0.5865

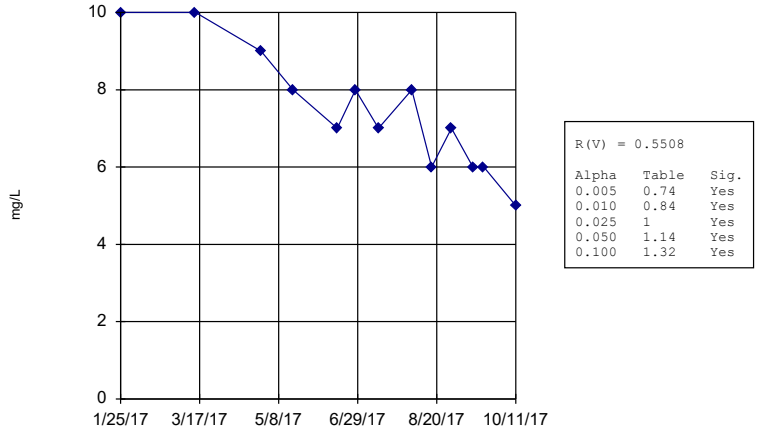
Alpha	Table	Sig.
0.005	0.74	Yes
0.010	0.84	Yes
0.025	1	Yes
0.050	1.14	Yes
0.100	1.32	Yes

Constituent: Sulfate Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-5R (bg)



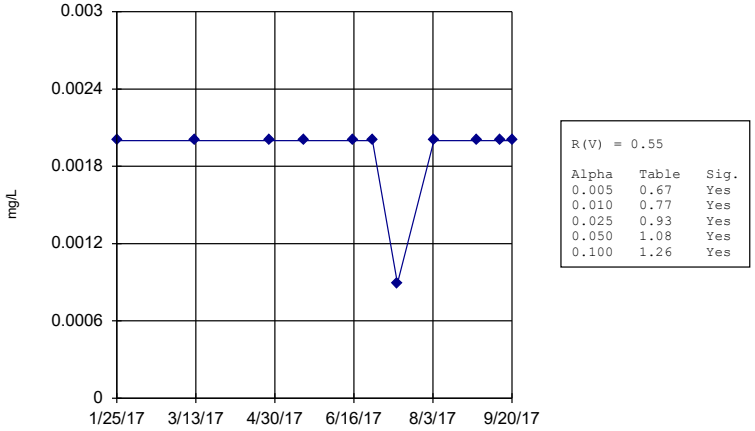
R(V) = 0.5508

Alpha	Table	Sig.
0.005	0.74	Yes
0.010	0.84	Yes
0.025	1	Yes
0.050	1.14	Yes
0.100	1.32	Yes

Constituent: Sulfate Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Rank Von Neumann

SP-1



R(V) = 0.55

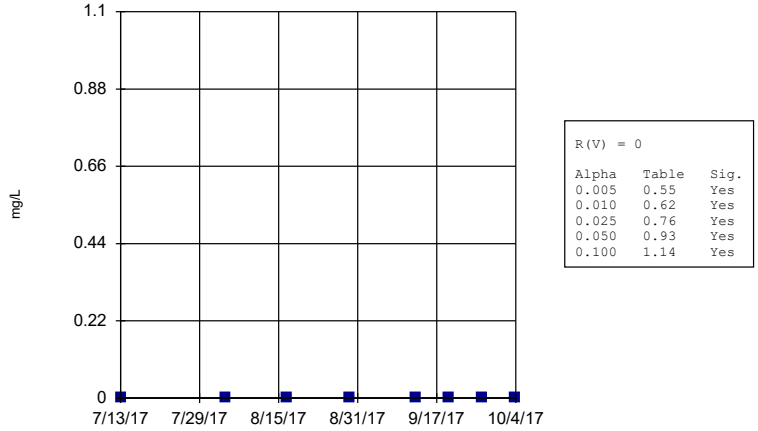
Alpha	Table	Sig.
0.005	0.67	Yes
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Thallium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-10



R(V) = 0

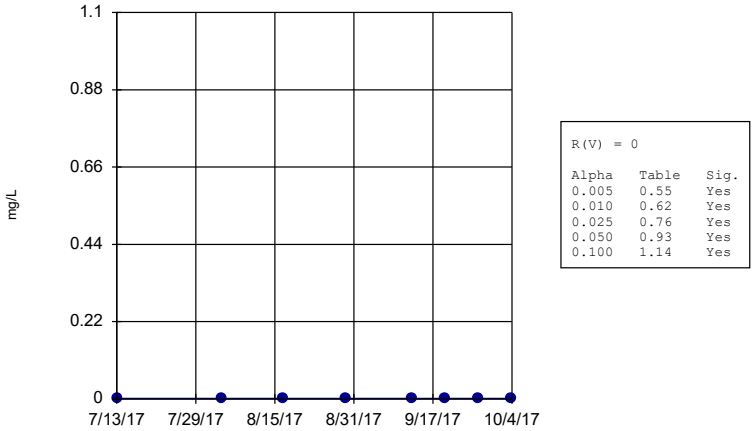
Alpha	Table	Sig.
0.005	0.55	Yes
0.010	0.62	Yes
0.025	0.76	Yes
0.050	0.93	Yes
0.100	1.14	Yes

Constituent: Thallium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-11



R(V) = 0

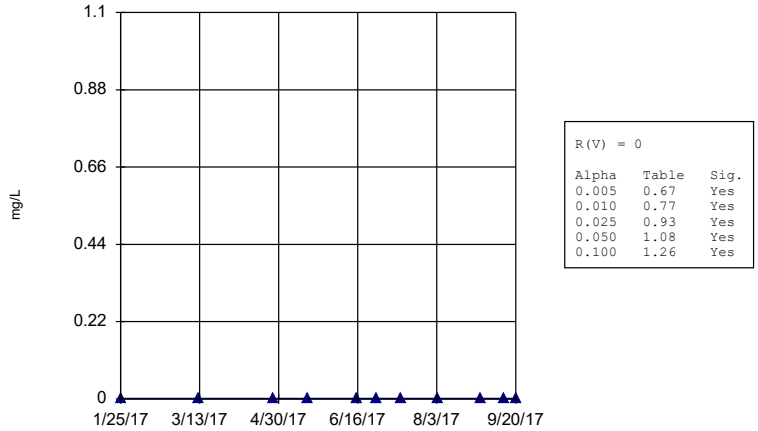
Alpha	Table	Sig.
0.005	0.55	Yes
0.010	0.62	Yes
0.025	0.76	Yes
0.050	0.93	Yes
0.100	1.14	Yes

Constituent: Thallium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-2



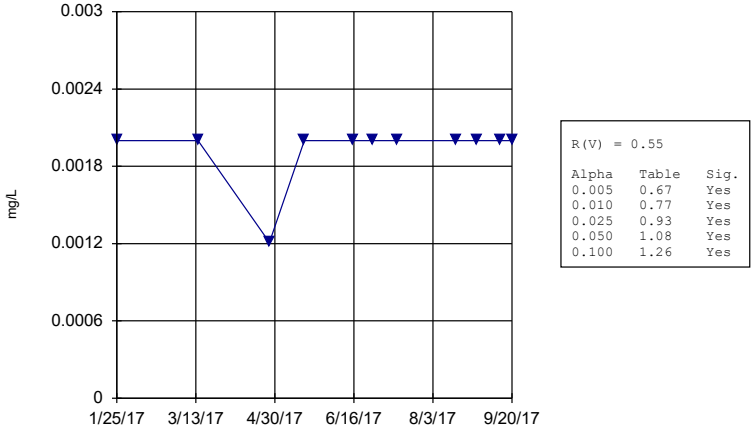
R(V) = 0

Alpha	Table	Sig.
0.005	0.67	Yes
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Thallium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Rank Von Neumann

SP-4 (bg)



R(V) = 0.55

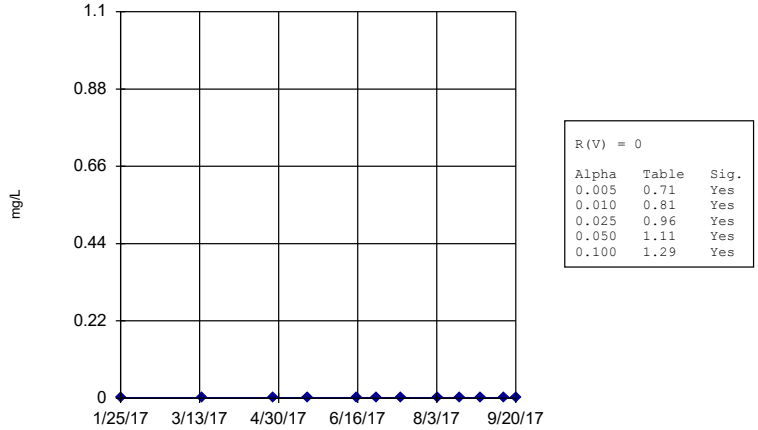
Alpha	Table	Sig.
0.005	0.67	Yes
0.010	0.77	Yes
0.025	0.93	Yes
0.050	1.08	Yes
0.100	1.26	Yes

Constituent: Thallium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Rank Von Neumann

SP-5R (bg)



R(V) = 0

Alpha	Table	Sig.
0.005	0.71	Yes
0.010	0.81	Yes
0.025	0.96	Yes
0.050	1.11	Yes
0.100	1.29	Yes

Constituent: Thallium Analysis Run 2/8/2023 9:44 AM View: Rank Von Neumann
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE E

Mann-Whitney

Welch's t-test/Mann-Whitney - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:24 PM

Constituent	Well	Calc.	0.01	Method
Calcium (mg/L)	**SP-1**	**-2.706**	**Yes**	**Mann-W**

Welch's t-test/Mann-Whitney - All Results

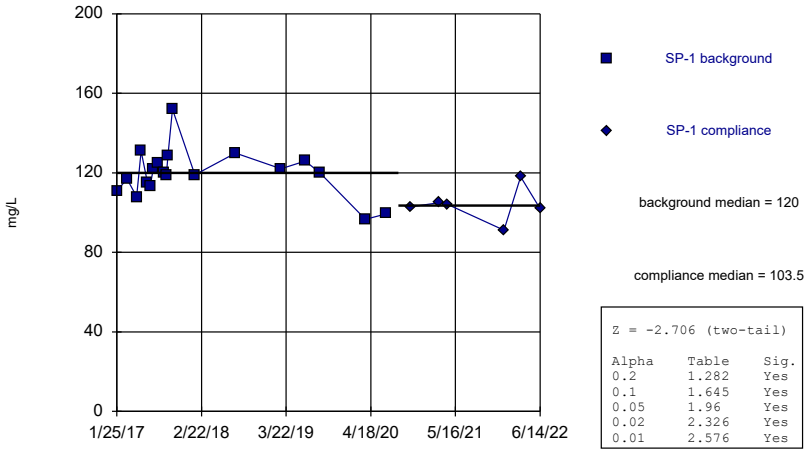
Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:24 PM

Constituent	Well	Calc.	0.01	Method
Calcium (mg/L)	**SP-1**	**-2.706**	**Yes**	**Mann-W**
Calcium (mg/L)	SP-10	-1.518	No	Mann-W
Calcium (mg/L)	SP-11	-0.9682	No	Mann-W
Calcium (mg/L)	SP-2	-0.2334	No	Mann-W
Calcium (mg/L)	SP-4 (bg)	-0.8216	No	Mann-W
Calcium (mg/L)	SP-5R (bg)	-1.102	No	Mann-W

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

SP-1



Z = -2.706 (two-tail)

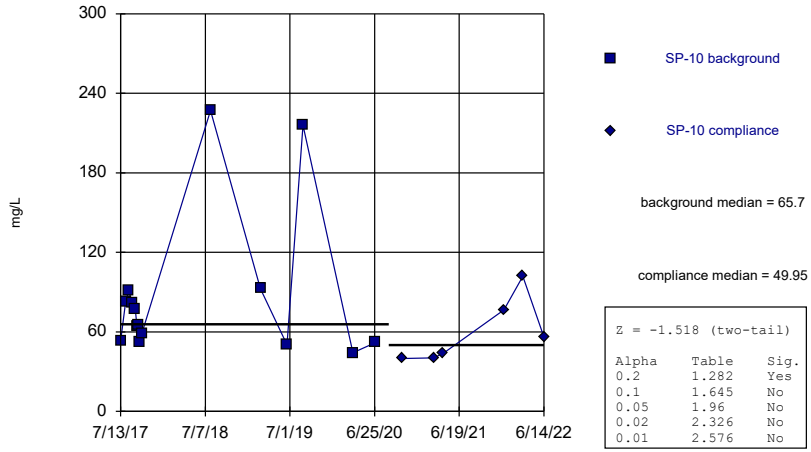
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Calcium Analysis Run 2/10/2023 1:23 PM View: Mann-Whitney
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

SP-10



Z = -1.518 (two-tail)

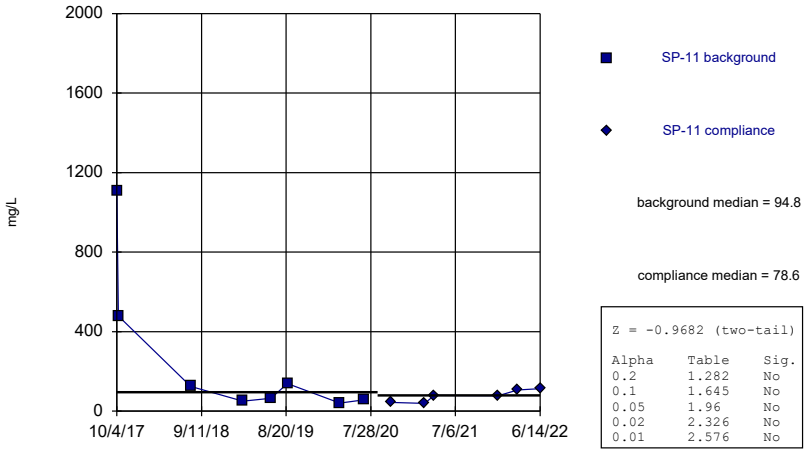
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 2/10/2023 1:23 PM View: Mann-Whitney
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

SP-11



Z = -0.9682 (two-tail)

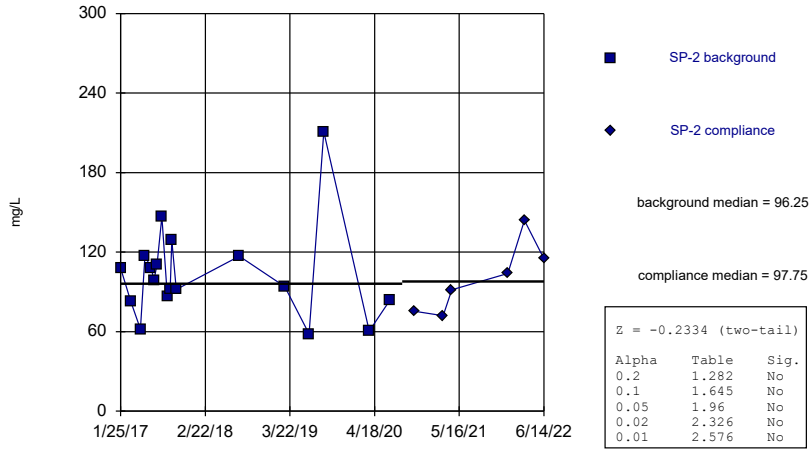
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 2/10/2023 1:23 PM View: Mann-Whitney
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

SP-2



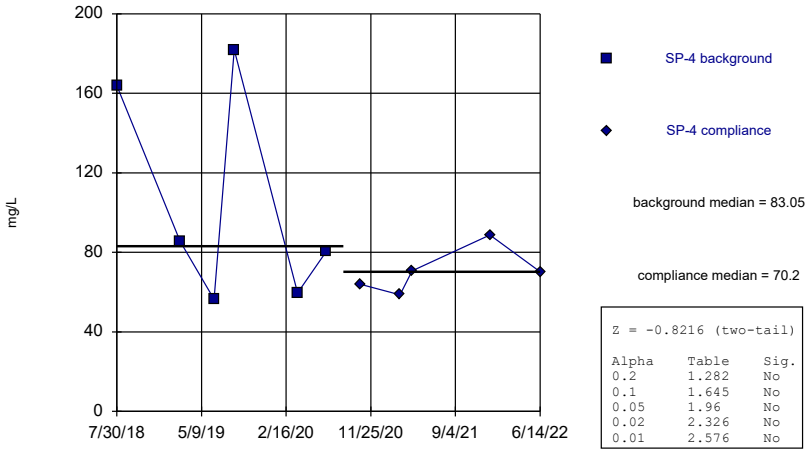
Z = -0.2334 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 2/10/2023 1:23 PM View: Mann-Whitney
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Mann-Whitney (Wilcoxon Rank Sum)

SP-4 (bg)



Z = -0.8216 (two-tail)

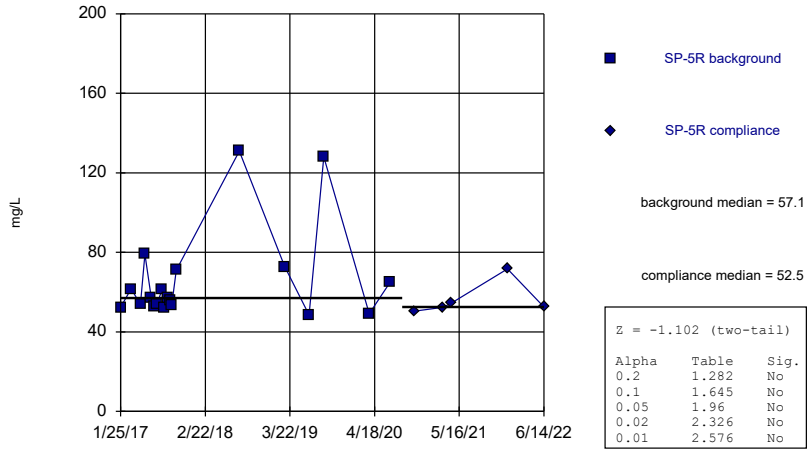
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 2/10/2023 1:23 PM View: Mann-Whitney
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

SP-5R (bg)



Z = -1.102 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 2/10/2023 1:23 PM View: Mann-Whitney
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE F

Intrawell PLs

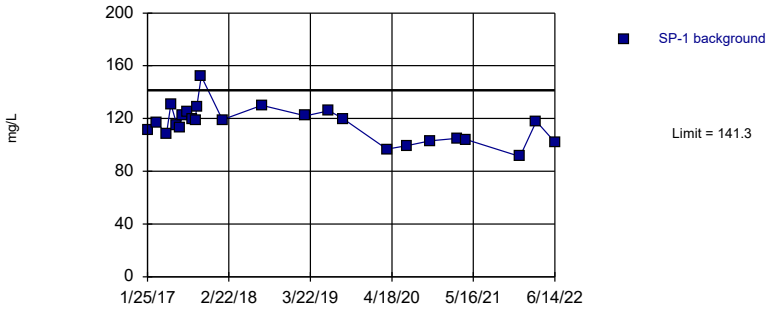
Intrawell Prediction Limits - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:33 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium (mg/L)	SP-1	141.3	n/a	n/a	1 future	n/a	25	115.9	13.21	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-10	227	n/a	n/a	1 future	n/a	21	n/a	n/a	0	n/a	n/a	0.003999	NP Intra (normality) 1 of 2
Calcium (mg/L)	SP-11	155.9	n/a	n/a	1 future	n/a	12	78	34.89	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-2	166.8	n/a	n/a	1 future	n/a	24	102.5	33.2	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-4	182	n/a	n/a	1 future	n/a	11	n/a	n/a	0	n/a	n/a	0.01276	NP Intra (normality) 1 of 2
Calcium (mg/L)	SP-5R	131	n/a	n/a	1 future	n/a	24	n/a	n/a	0	n/a	n/a	0.003124	NP Intra (normality) 1 of 2

Prediction Limit

Intrawell Parametric, SP-1

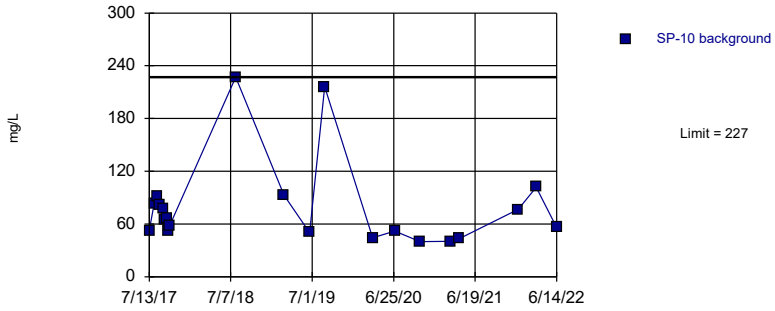


Background Data Summary: Mean=115.9, Std. Dev.=13.21, n=25. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9663, critical = 0.888. Kappa = 1.924 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 2/10/2023 1:30 PM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Intrawell Non-parametric, SP-10

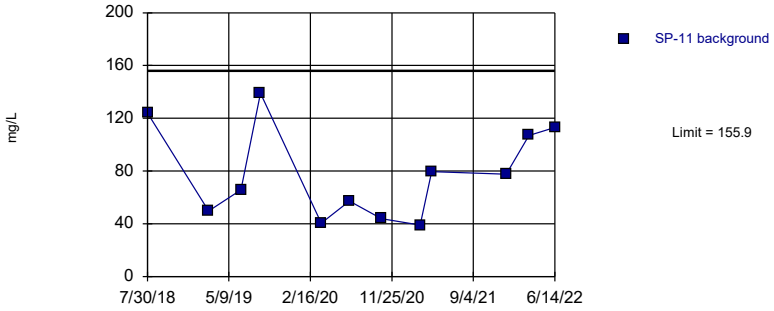


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 21 background values. Well-constituent pair annual alpha = 0.007982. Individual comparison alpha = 0.003999 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 2/10/2023 1:30 PM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Intrawell Parametric, SP-11

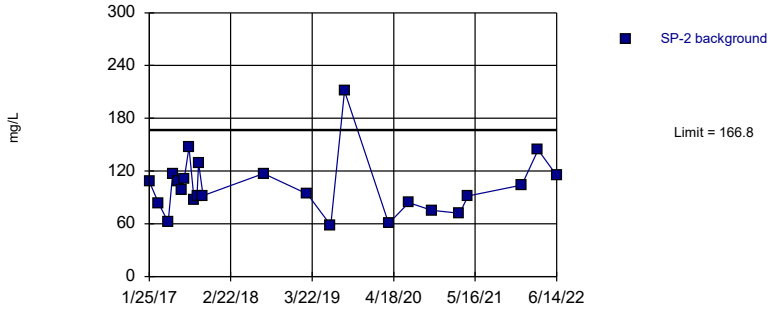


Background Data Summary: Mean=78, Std. Dev.=34.89, n=12. Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9081, critical = 0.859. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 2/10/2023 1:30 PM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Intrawell Parametric, SP-2

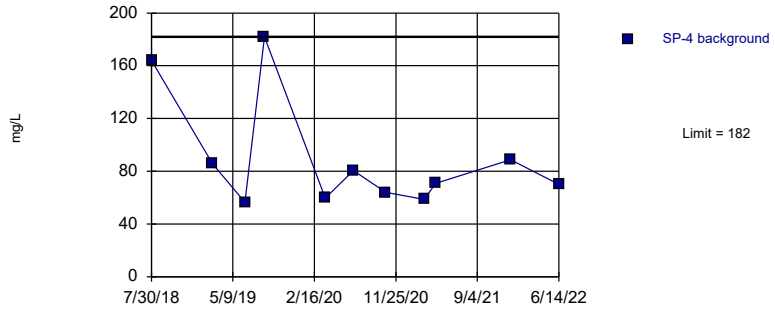


Background Data Summary: Mean=102.5, Std. Dev.=33.2, n=24. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8901, critical = 0.884. Kappa = 1.937 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 2/10/2023 1:30 PM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Intrawell Non-parametric, SP-4 (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.05 alpha level. Limit is highest of 11 background values. Well-constituent pair annual alpha = 0.02537. Individual comparison alpha = 0.01276 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 2/10/2023 1:30 PM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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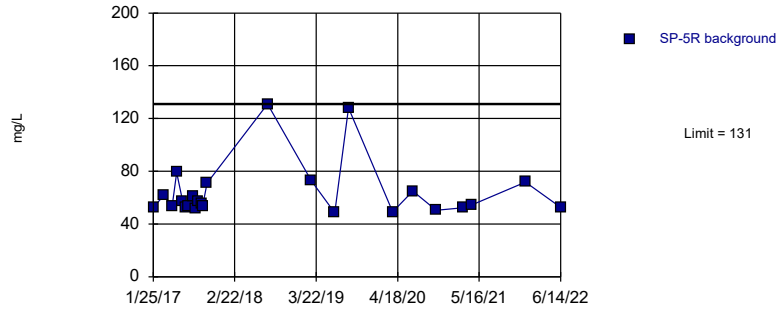
Prediction Limit

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



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 24 background values. Well-constituent pair annual alpha = 0.006238. Individual comparison alpha = 0.003124 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 2/10/2023 1:30 PM View: Intrawell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE G
Upgradient Well Trend Tests

Trend Tests - Upgradient Wells - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:42 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.0147**	**-137**	**-111**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.01018**	**-115**	**-111**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride (mg/L)	**SP-5R (bg)**	**32.49**	**100**	**92**	**Yes**	**22**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	**SP-4 (bg)**	**5.516**	**35**	**34**	**Yes**	**11**	**0**	**n/a**	**n/a**	**0.01**	**NP**

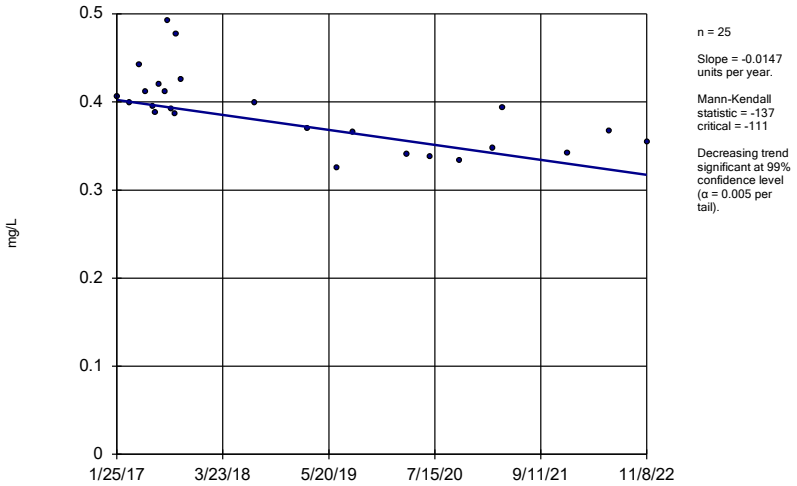
Trend Tests - Upgradient Wells - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:42 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.0147**	**-137**	**-111**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.01018**	**-115**	**-111**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride (mg/L)	SP-4 (bg)	0.4207	7	98	No	23	0	n/a	n/a	0.01	NP
Chloride (mg/L)	**SP-5R (bg)**	**32.49**	**100**	**92**	**Yes**	**22**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Fluoride (mg/L)	SP-4 (bg)	0.006073	12	118	No	26	3.846	n/a	n/a	0.01	NP
Fluoride (mg/L)	SP-5R (bg)	0.006591	15	118	No	26	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	**SP-4 (bg)**	**5.516**	**35**	**34**	**Yes**	**11**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	SP-5R (bg)	0.6152	13	34	No	11	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-4 (bg)	0.33	12	105	No	24	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-5R (bg)	34.4	73	98	No	23	0	n/a	n/a	0.01	NP

Sen's Slope Estimator

SP-4 (bg)



n = 25

Slope = -0.0147 units per year.

Mann-Kendall statistic = -137 critical = -111

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

Constituent: Boron Analysis Run 2/10/2023 1:41 PM View: Trend Tests

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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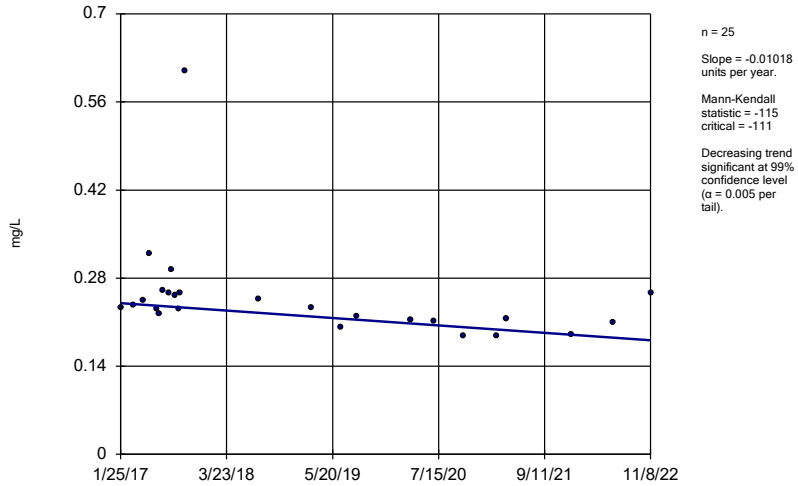
Sen's Slope Estimator

SP-5R (bg)



n = 25

Slope = -0.01018 units per year.

Mann-Kendall statistic = -115 critical = -111

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

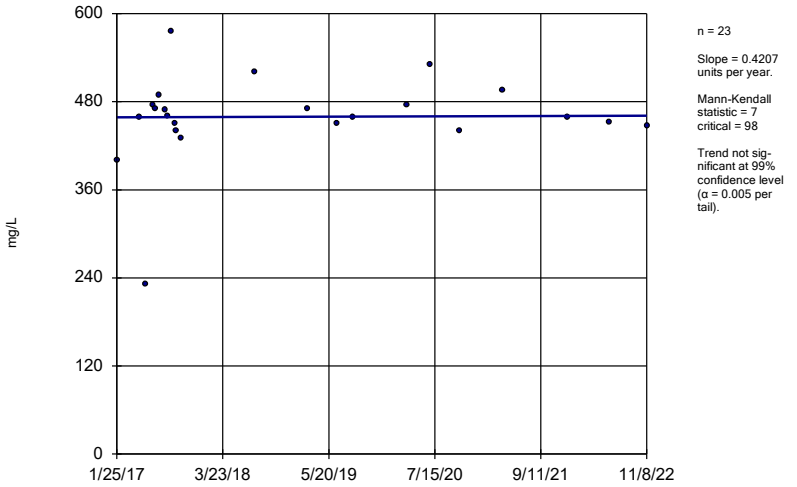
Constituent: Boron Analysis Run 2/10/2023 1:41 PM View: Trend Tests

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-4 (bg)



n = 23

Slope = 0.4207 units per year.

Mann-Kendall statistic = 7 critical = 98

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

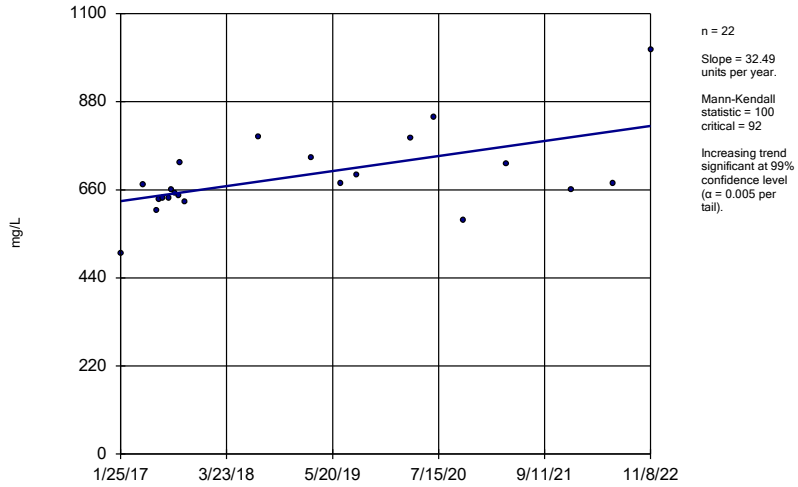
Constituent: Chloride Analysis Run 2/10/2023 1:41 PM View: Trend Tests

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 22

Slope = 32.49 units per year.

Mann-Kendall statistic = 100 critical = 92

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

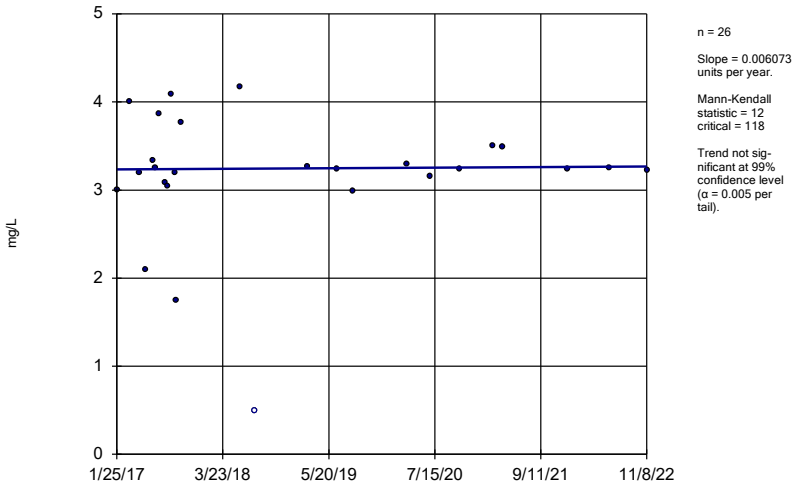
Constituent: Chloride Analysis Run 2/10/2023 1:41 PM View: Trend Tests

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 26

Slope = 0.006073 units per year.

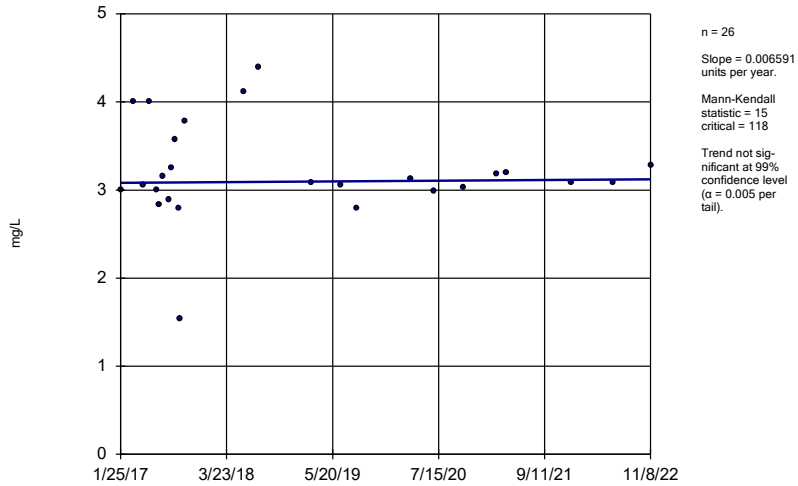
Mann-Kendall statistic = 12
critical = 118

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

Constituent: Fluoride Analysis Run 2/10/2023 1:41 PM View: Trend Tests
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 26

Slope = 0.006591 units per year.

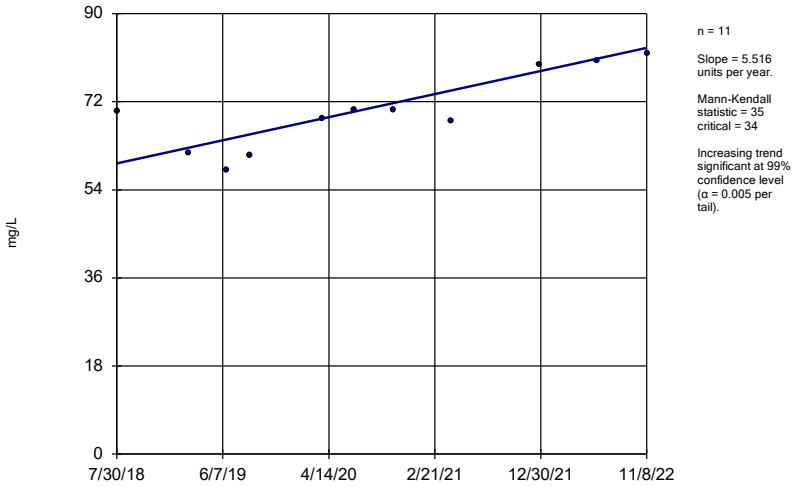
Mann-Kendall statistic = 15
critical = 118

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

Constituent: Fluoride Analysis Run 2/10/2023 1:41 PM View: Trend Tests
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 11

Slope = 5.516 units per year.

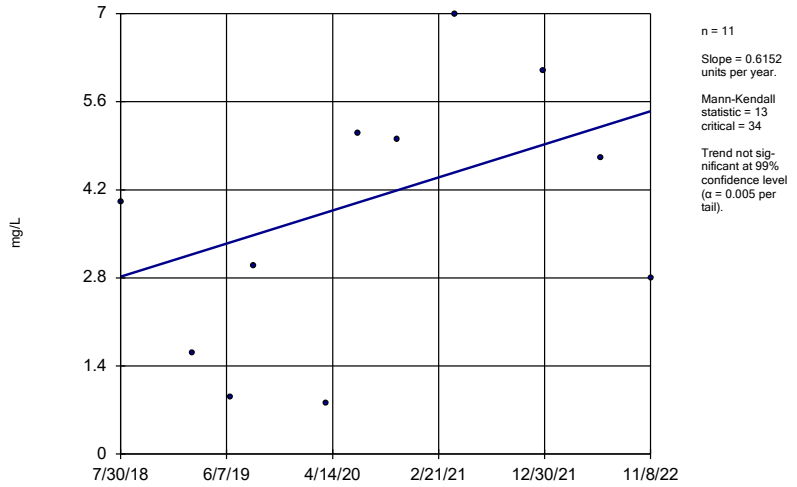
Mann-Kendall statistic = 35
critical = 34

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

Constituent: Sulfate Analysis Run 2/10/2023 1:41 PM View: Trend Tests
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 11

Slope = 0.6152 units per year.

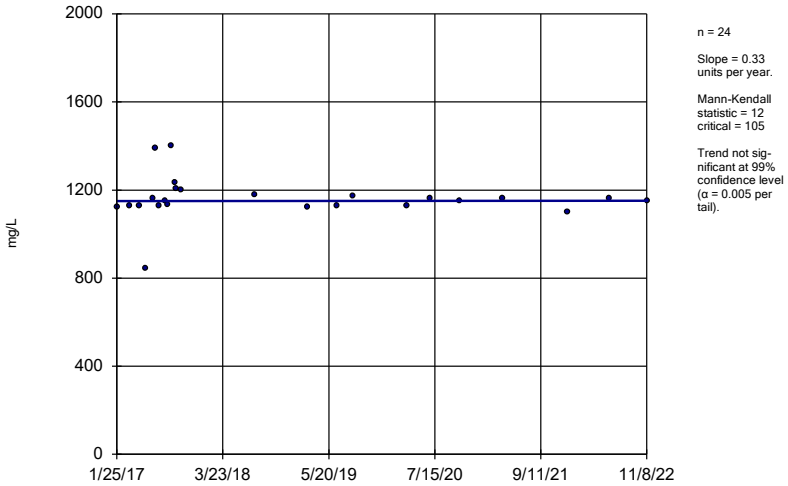
Mann-Kendall statistic = 13
critical = 34

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

Constituent: Sulfate Analysis Run 2/10/2023 1:41 PM View: Trend Tests
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 24

Slope = 0.33 units per year.

Mann-Kendall statistic = 12 critical = 105

Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 2/10/2023 1:41 PM View: Trend Tests

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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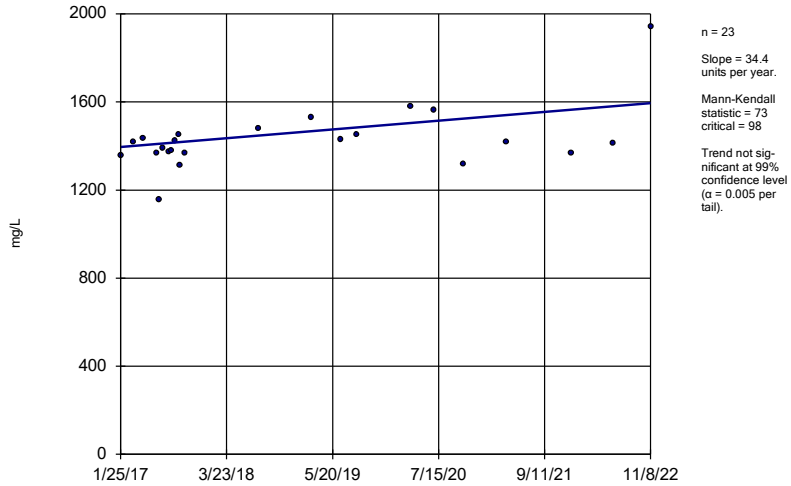
Sen's Slope Estimator

SP-5R (bg)



n = 23

Slope = 34.4 units per year.

Mann-Kendall statistic = 73 critical = 98

Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 2/10/2023 1:41 PM View: Trend Tests

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE H
Interwell PLs

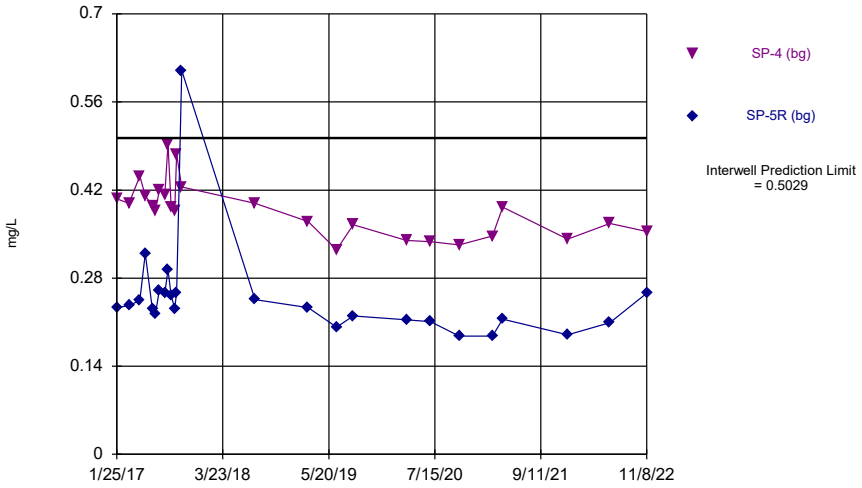
Interwell Prediction Limits - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/10/2023, 1:44 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	n/a	0.5029	n/a	n/a	4 future	n/a	50	0.5585	0.08359	0	None	sqrt(x)	0.00188	Param Inter 1 of 2
Chloride (mg/L)	n/a	833.5	n/a	n/a	4 future	n/a	45	572.2	143.9	0	None	No	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	n/a	4.39	n/a	n/a	4 future	n/a	52	n/a	n/a	1.923	n/a	n/a	0.000701	NP Inter (normality) 1 of 2
pH, field (SU)	n/a	9.05	6.96	n/a	4 future	n/a	48	n/a	n/a	0	n/a	n/a	0.001648	NP Inter (normality) 1 of 2
Sulfate (mg/L)	n/a	81.9	n/a	n/a	4 future	n/a	22	n/a	n/a	0	n/a	n/a	0.003544	NP Inter (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	n/a	1637	n/a	n/a	4 future	n/a	47	10.87	0.5051	0	None	x^(1/3)	0.00188	Param Inter 1 of 2

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

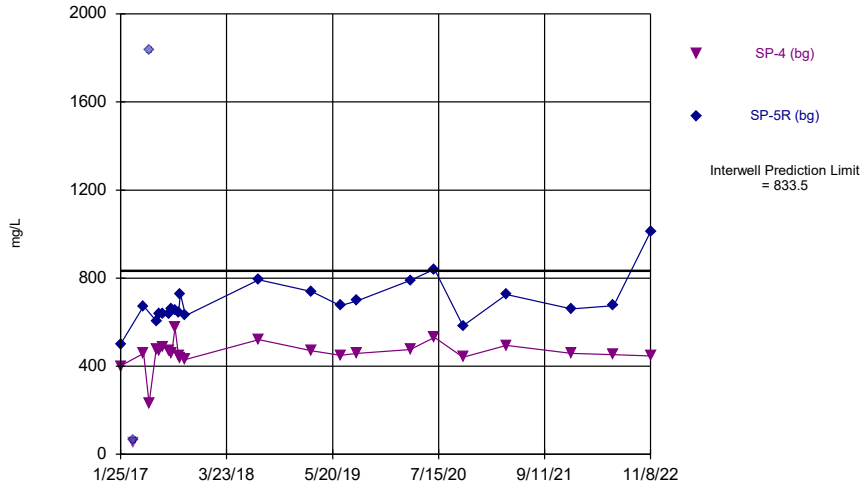
Time Series



Constituent: Boron Analysis Run 2/13/2023 1:21 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

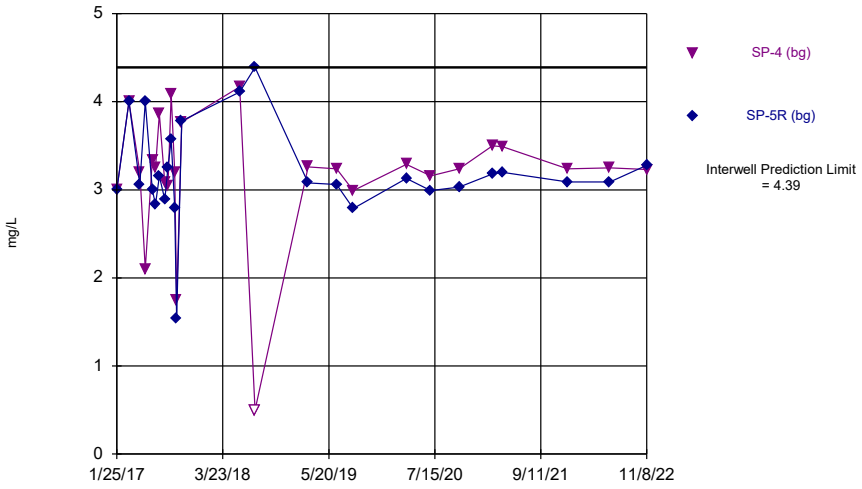
Time Series



Constituent: Chloride Analysis Run 2/13/2023 1:21 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

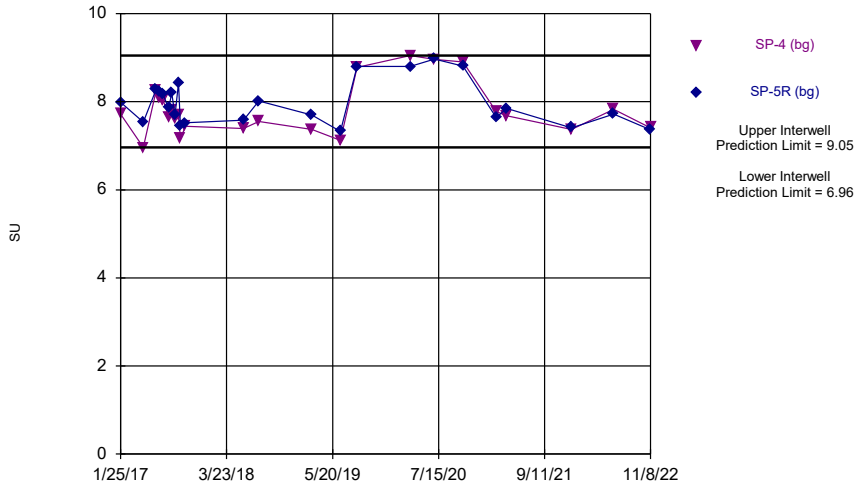
Time Series



Constituent: Fluoride Analysis Run 2/13/2023 1:21 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

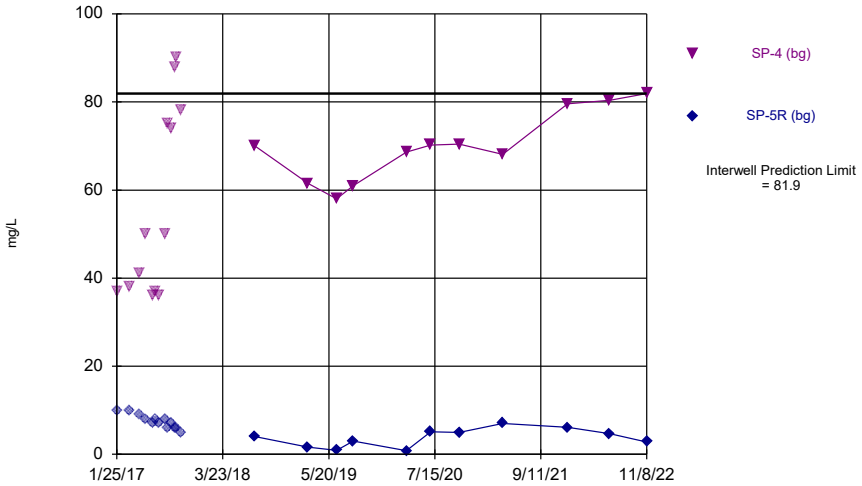
Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Time Series



Constituent: pH, field Analysis Run 2/13/2023 1:22 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

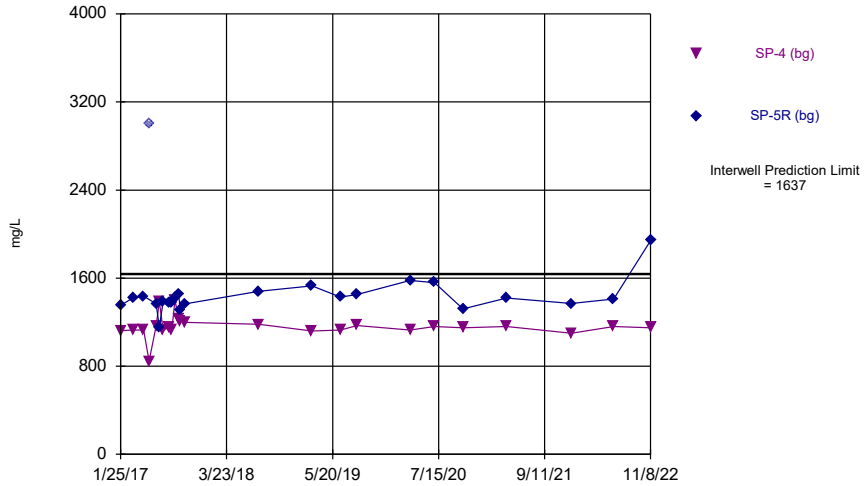
Time Series



Constituent: Sulfate Analysis Run 2/13/2023 1:23 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

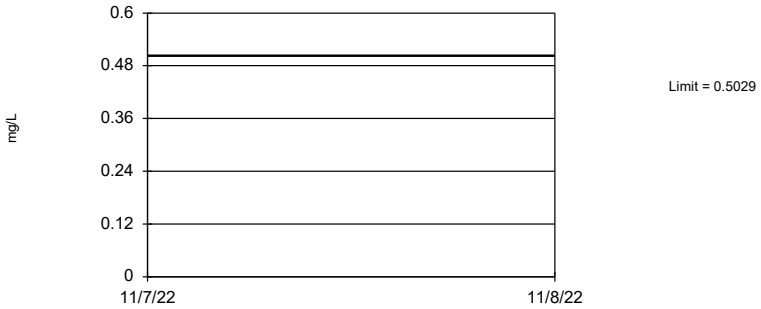
Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 2/13/2023 1:23 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Interwell Parametric



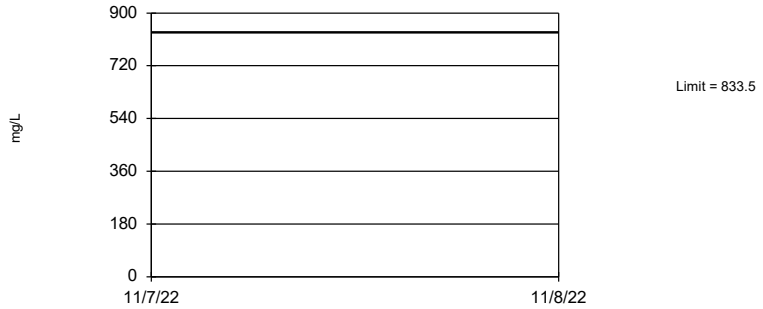
Background Data Summary (based on square root transformation): Mean=0.5585, Std. Dev.=0.08359, n=50. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9478, critical = 0.935. Kappa = 1.802 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Boron Analysis Run 2/10/2023 1:42 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Prediction Limit

Interwell Parametric



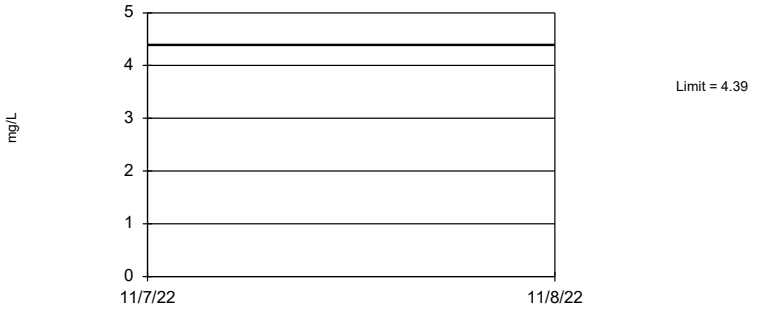
Background Data Summary: Mean=572.2, Std. Dev.=143.9, n=45. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9407, critical = 0.926. Kappa = 1.816 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Chloride Analysis Run 2/10/2023 1:42 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Prediction Limit

Interwell Non-parametric



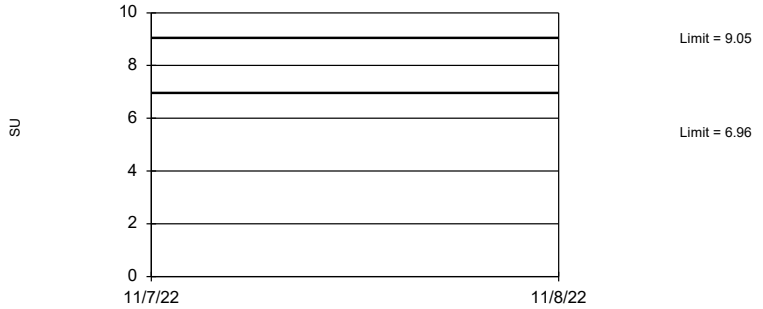
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 52 background values. 1.923% NDs. Annual per-constituent alpha = 0.005594. Individual comparison alpha = 0.000701 (1 of 2). Assumes 4 future values.

Constituent: Fluoride Analysis Run 2/10/2023 1:42 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Prediction Limit

Interwell Non-parametric

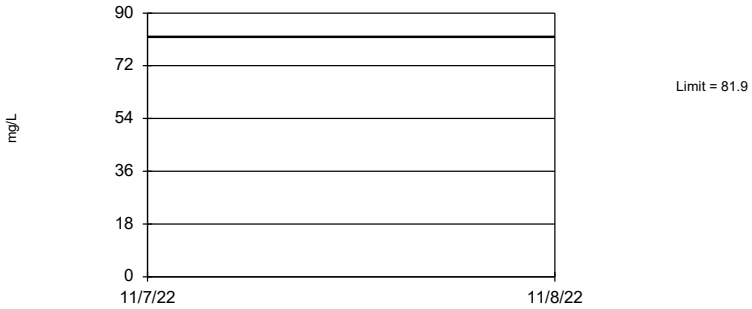


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 48 background values. Annual per-constituent alpha = 0.01315. Individual comparison alpha = 0.001648 (1 of 2). Assumes 4 future values.

Constituent: pH, field Analysis Run 2/10/2023 1:42 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Prediction Limit

Interwell Non-parametric



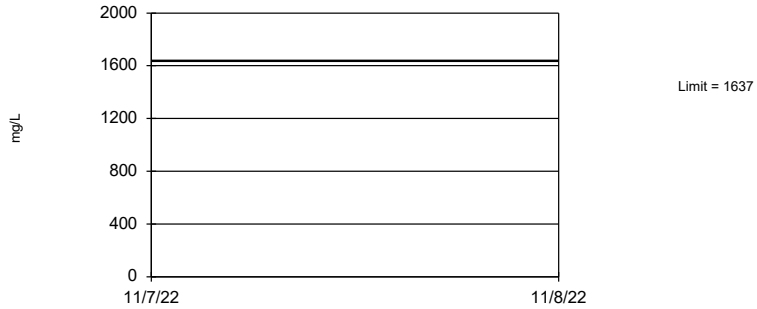
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 22 background values. Annual per-constituent alpha = 0.028. Individual comparison alpha = 0.003544 (1 of 2). Assumes 4 future values.

Constituent: Sulfate Analysis Run 2/10/2023 1:42 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Prediction Limit

Interwell Parametric



Background Data Summary (based on cube root transformation): Mean=10.87, Std. Dev.=0.5051, n=47. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9284, critical = 0.928. Kappa = 1.81 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Total Dissolved Solids [TDS] Analysis Run 2/10/2023 1:42 PM View: Interwell
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE

UTLs

Upper Tolerance Limits Summary Table

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/13/2023, 11:12 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	0.005698	n/a	n/a	n/a	n/a 50	-7.963	1.354	34	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	n/a	0.0599	n/a	n/a	n/a	n/a 49	n/a	n/a	6.122	n/a	n/a	0.08099	NP Inter(normality)
Barium (mg/L)	n/a	2.6	n/a	n/a	n/a	n/a 38	n/a	n/a	0	n/a	n/a	0.1424	NP Inter(normality)
Beryllium (mg/L)	n/a	0.00212	n/a	n/a	n/a	n/a 49	n/a	n/a	20.41	n/a	n/a	0.08099	NP Inter(normality)
Cadmium (mg/L)	n/a	0.0002066	n/a	n/a	n/a	n/a 26	-10.48	0.8742	23.08	Kaplan-Meier	ln(x)	0.05	Inter
Chromium (mg/L)	n/a	0.003419	n/a	n/a	n/a	n/a 38	-7.327	0.7698	13.16	None	ln(x)	0.05	Inter
Cobalt (mg/L)	n/a	0.01786	n/a	n/a	n/a	n/a 49	n/a	n/a	10.2	n/a	n/a	0.08099	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	n/a	15.84	n/a	n/a	n/a	n/a 49	n/a	n/a	0	n/a	n/a	0.08099	NP Inter(normality)
Fluoride (mg/L)	n/a	4.39	n/a	n/a	n/a	n/a 52	n/a	n/a	1.923	n/a	n/a	0.06944	NP Inter(normality)
Lead (mg/L)	n/a	0.0107	n/a	n/a	n/a	n/a 49	n/a	n/a	26.53	n/a	n/a	0.08099	NP Inter(normality)
Lithium (mg/L)	n/a	0.163	n/a	n/a	n/a	n/a 38	n/a	n/a	0	n/a	n/a	0.1424	NP Inter(normality)
Mercury (mg/L)	n/a	0.00003	n/a	n/a	n/a	n/a 49	n/a	n/a	73.47	n/a	n/a	0.08099	NP Inter(NDs)
Molybdenum (mg/L)	n/a	0.01	n/a	n/a	n/a	n/a 50	n/a	n/a	34	n/a	n/a	0.07694	NP Inter(normality)
Selenium (mg/L)	n/a	0.00499	n/a	n/a	n/a	n/a 38	n/a	n/a	31.58	n/a	n/a	0.1424	NP Inter(normality)
Thallium (mg/L)	n/a	0.00162	n/a	n/a	n/a	n/a 26	n/a	n/a	88.46	n/a	n/a	0.2635	NP Inter(NDs)

Tolerance Limit

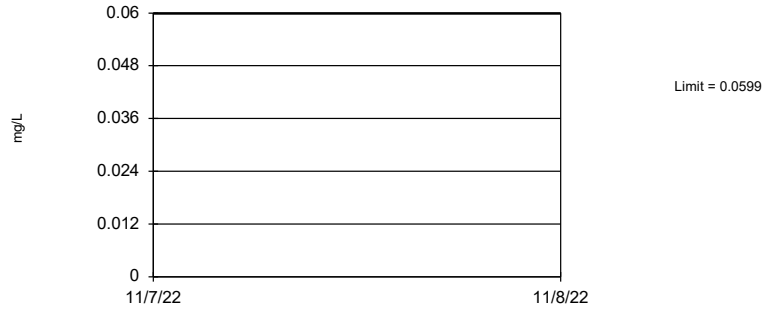
Interwell Parametric

95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.963, Std. Dev.=1.354, n=50, 34% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9543, critical = 0.935. Report alpha = 0.05.

Constituent: Antimony Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

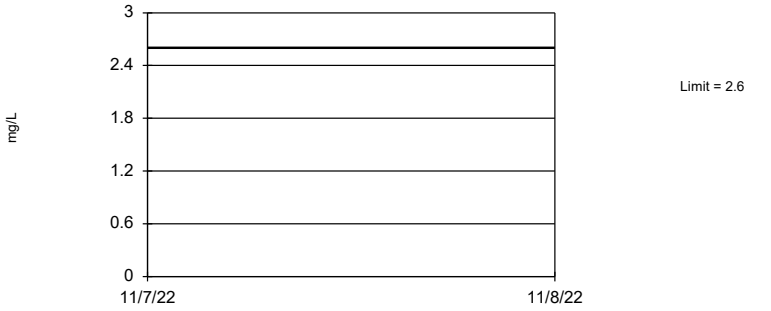


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 6.122% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Arsenic Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

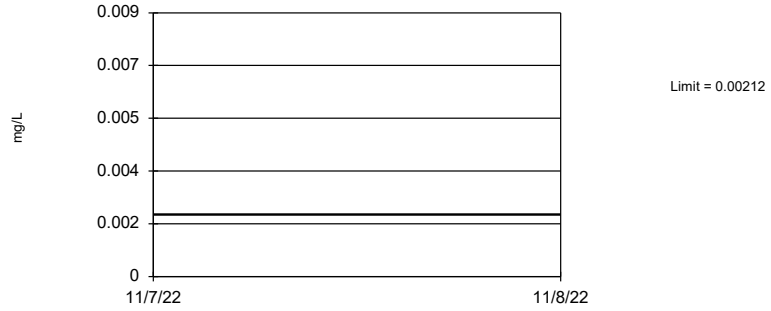


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 38 background values. 88.48% coverage at alpha=0.01; 92.38% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.1424.

Constituent: Barium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

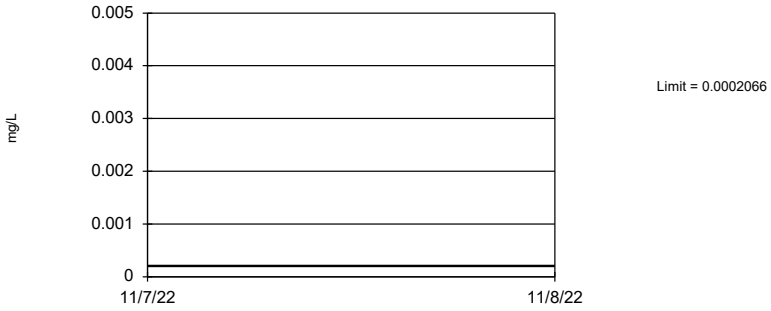


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 20.41% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Beryllium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

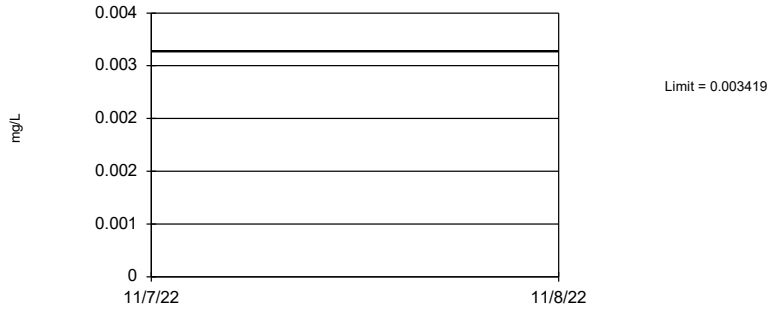


95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-10.48, Std. Dev.=0.8742, n=26, 23.08% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9372, critical = 0.891. Report alpha = 0.05.

Constituent: Cadmium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

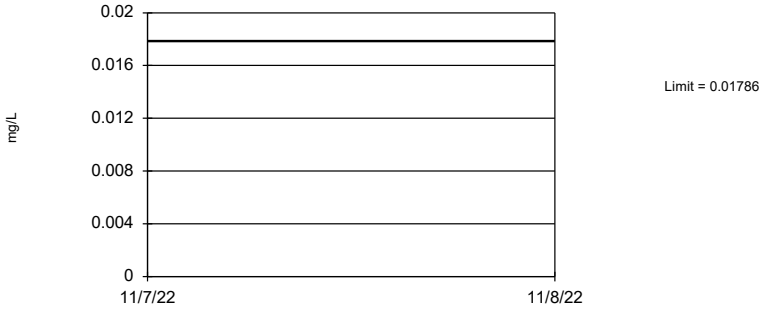


95% coverage. Background Data Summary (based on natural log transformation): Mean=-7.327, Std. Dev.=0.7698, n=38, 13.16% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9508, critical = 0.916. Report alpha = 0.05.

Constituent: Chromium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

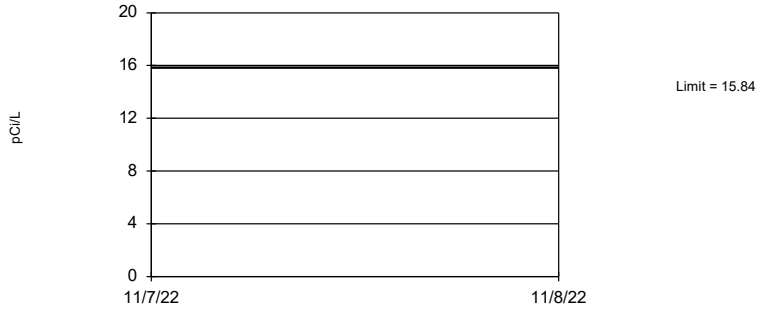


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 10.2% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Cobalt Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
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 49 background values. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Combined Radium 226 + 228 Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limit
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

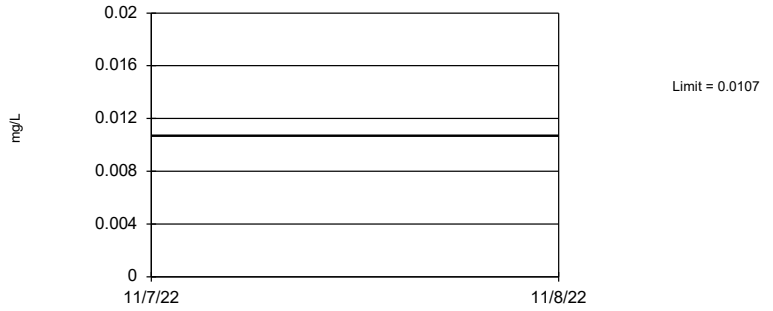
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 52 background values. 1.923% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06944.

Constituent: Fluoride Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 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 49 background values. 26.53% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Lead Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 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 38 background values. 88.48% coverage at alpha=0.01; 92.38% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.1424.

Constituent: Lithium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tolerance Limit

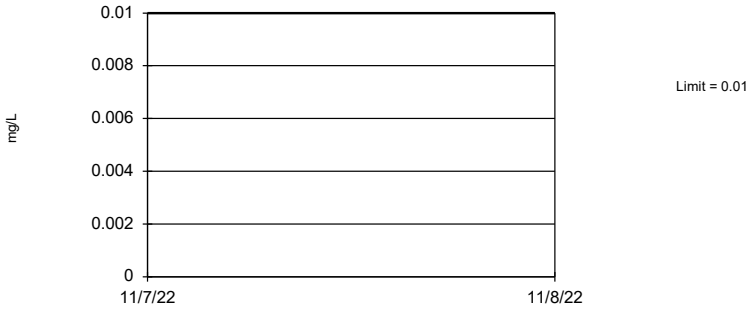
Interwell Non-parametric

Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 49 background values. 73.47% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Mercury Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
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 Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 50 background values. 34% NDs. 91.21% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.07694.

Constituent: Molybdenum Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

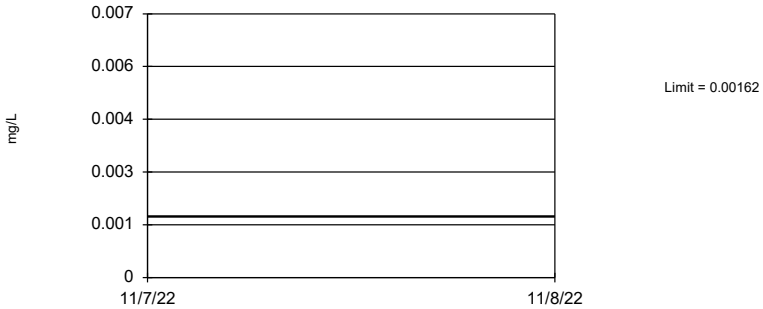
Interwell Non-parametric

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 38 background values. 31.58% NDs. 88.48% coverage at alpha=0.01; 92.38% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.1424.

Constituent: Selenium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 26 background values. 88.46% NDs. 83.79% coverage at alpha=0.01; 89.26% coverage at alpha=0.05; 97.46% coverage at alpha=0.5. Report alpha = 0.2635.

Constituent: Thallium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE J

GWPS

NORTHEASTERN BAP GWPS				
Constituent Name	**MCL**	**CCR- Rule Specified Level**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006		0.0057	0.006
Arsenic, Total (mg/L)	0.01		0.06	0.06
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		0.00021	0.005
Chromium, Total (mg/L)	0.1		0.034	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	0.16	0.16
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*

FIGURE K
Confidence Intervals

Confidence Intervals - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/13/2023, 11:23 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.485**	**3.978**	**2.6**	**Yes**	**14**	**5.231**	**1.77**	**0**	**None**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**7.192**	**5.309**	**4.39**	**Yes**	**24**	**5.877**	**2.377**	**12.5**	**None**	**x^2**	**0.01**	**Param.**
Lithium (mg/L)	**SP-10**	**0.2823**	**0.2403**	**0.16**	**Yes**	**22**	**0.2613**	**0.03909**	**0**	**None**	**No**	**0.01**	**Param.**

Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/13/2023, 11:23 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.005	0.00058	0.006	No	25	0.002273	0.002164	28	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.0007107	0.0001324	0.006	No	22	0.001619	0.001957	18.18	Kaplan-Meier	ln(x)	0.01	Param.
Antimony (mg/L)	SP-11	0.001559	0.0003001	0.006	No	22	0.002024	0.002877	13.64	None	ln(x)	0.01	Param.
Antimony (mg/L)	SP-2	0.00267	0.00121	0.006	No	25	0.002628	0.002529	8	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-1	0.005	0.0007	0.06	No	25	0.002426	0.00205	32	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.005196	0.00131	0.06	No	22	0.003998	0.00442	9.091	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.005082	0.002312	0.06	No	22	0.004009	0.002956	4.545	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-2	0.00251	0.00125	0.06	No	25	0.002578	0.002526	4	None	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.2014	0.1659	2.6	No	25	0.1848	0.03747	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	**SP-10**	**6.485**	**3.978**	**2.6**	**Yes**	**14**	**5.231**	**1.77**	**0**	**None**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.4198	0.1877	2.6	No	14	0.3136	0.1734	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-2	1.348	0.9779	2.6	No	25	1.215	0.4905	0	None	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.0002	0.000054	0.004	No	25	0.0002708	0.0003755	20	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.0025	0.00003	0.004	No	22	0.0008215	0.001174	31.82	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.00025	0.000029	0.004	No	22	0.0001598	0.0001332	31.82	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-2	0.00018	0.00007	0.004	No	25	0.0002432	0.0003408	16	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.00025	0.000055	0.005	No	14	0.0001289	0.0001258	14.29	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.0002	0.00001	0.005	No	14	0.00006429	0.0000761	21.43	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-11	0.0003193	0.00004378	0.005	No	22	0.0005352	0.0009452	13.64	None	ln(x)	0.01	Param.
Cadmium (mg/L)	SP-2	0.0005	0.000063	0.005	No	25	0.0002629	0.0002082	40	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.001131	0.0005386	0.1	No	25	0.001032	0.0006777	24	Kaplan-Meier	sqrt(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.001021	0.0003153	0.1	No	21	0.001086	0.001867	9.524	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.003875	0.0006394	0.1	No	22	0.006307	0.01088	4.545	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-2	0.00152	0.0006052	0.1	No	25	0.001211	0.00111	12	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-1	0.001235	0.000497	0.018	No	25	0.001047	0.001133	12	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.002076	0.0004679	0.018	No	22	0.001604	0.001808	9.091	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-11	0.004854	0.001412	0.018	No	22	0.004032	0.004522	4.545	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-2	0.001045	0.0004629	0.018	No	25	0.0008764	0.0007563	12	None	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.296	3.2	15.84	No	24	3.748	1.074	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	15.45	5.923	15.84	No	22	10.69	8.877	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.316	1.151	15.84	No	21	1.733	1.056	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	14.14	8.859	15.84	No	22	11.85	5.446	0	None	sqrt(x)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9392	0.6814	4.39	No	25	0.8103	0.2586	8	None	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**7.192**	**5.309**	**4.39**	**Yes**	**24**	**5.877**	**2.377**	**12.5**	**None**	**x^2**	**0.01**	**Param.**
Fluoride (mg/L)	SP-11	3.237	2.226	4.39	No	24	2.731	0.9909	0	None	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.179	2.674	4.39	No	26	2.882	0.5786	0	None	x^2	0.01	Param.
Lead (mg/L)	SP-1	0.005	0.000259	0.015	No	25	0.002073	0.002113	32	None	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.0003457	0.0000864	0.015	No	14	0.0002815	0.0003238	14.29	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-11	0.001678	0.000324	0.015	No	22	0.001997	0.002719	13.64	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-2	0.005	0.000263	0.015	No	25	0.002172	0.002212	36	None	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006209	0.004617	0.16	No	24	0.005413	0.00156	0	None	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2823**	**0.2403**	**0.16**	**Yes**	**22**	**0.2613**	**0.03909**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.04207	0.02304	0.16	No	14	0.03256	0.01344	0	None	No	0.01	Param.
Lithium (mg/L)	SP-2	0.08145	0.0556	0.16	No	25	0.06852	0.02593	0	None	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	No	25	0.00000624	0.000003778	84	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000015	0.000005	0.002	No	22	0.000009727	0.000007369	54.55	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-11	0.00001	0.000005	0.002	No	22	0.0000115	0.00001305	40.91	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	No	25	0.00000544	0.000001805	84	None	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01653	0.01116	0.1	No	25	0.01385	0.005379	0	None	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.02335	0.003624	0.1	No	21	0.01805	0.02862	4.762	None	sqrt(x)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.04433	0.002	0.1	No	22	0.02026	0.02353	4.545	None	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02461	0.01857	0.1	No	14	0.02159	0.004265	0	None	No	0.01	Param.
Selenium (mg/L)	SP-1	0.006629	0.003771	0.05	No	25	0.005487	0.003295	12	None	sqrt(x)	0.01	Param.
Selenium (mg/L)	SP-10	0.0009747	0.00015	0.05	No	22	0.001545	0.0022	40.91	Kaplan-Meier	ln(x)	0.01	Param.
Selenium (mg/L)	SP-11	0.00164	0.000394	0.05	No	22	0.001813	0.002321	9.091	None	ln(x)	0.01	Param.

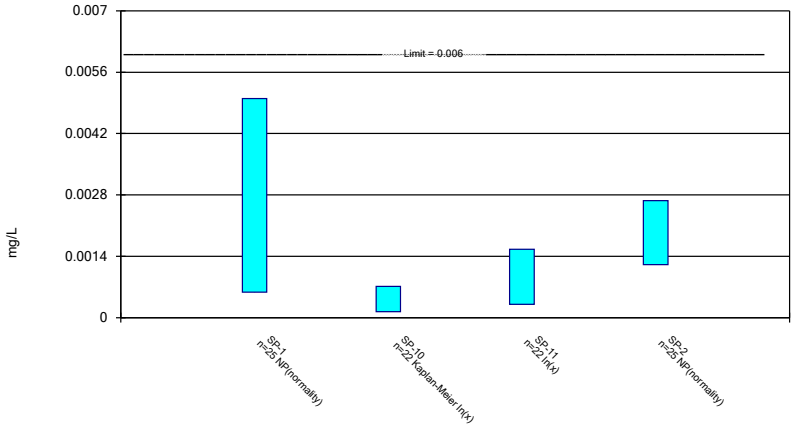
Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/13/2023, 11:23 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Selenium (mg/L)	SP-2	0.005112	0.002276	0.05	No	14	0.003814	0.002235	0	None	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.002	0.00007	0.002	No	14	0.0003936	0.0005092	42.86	None	No	0.01	NP (normality)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	No	14	0.0001886	0.00004276	92.86	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	No	14	0.0001879	0.00004543	92.86	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.00006	0.002	No	14	0.0001521	0.00006762	64.29	None	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

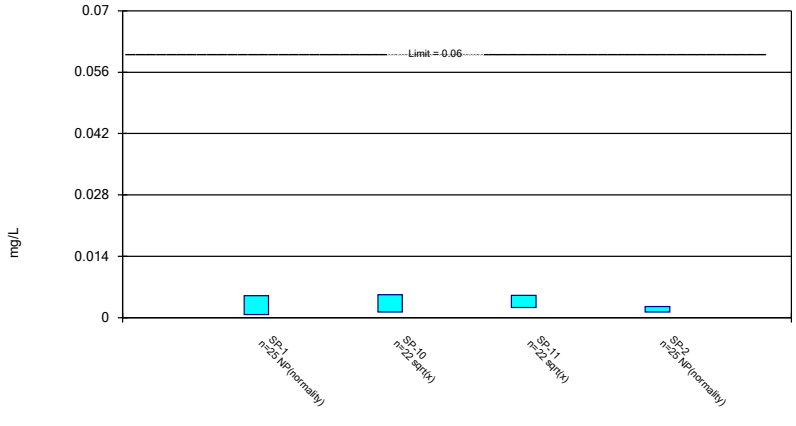
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

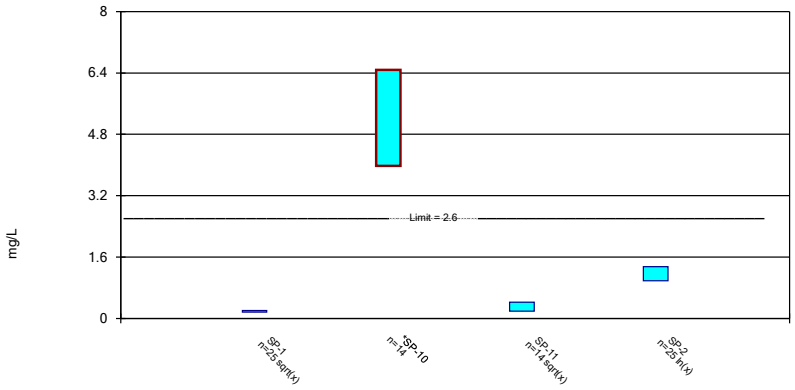
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

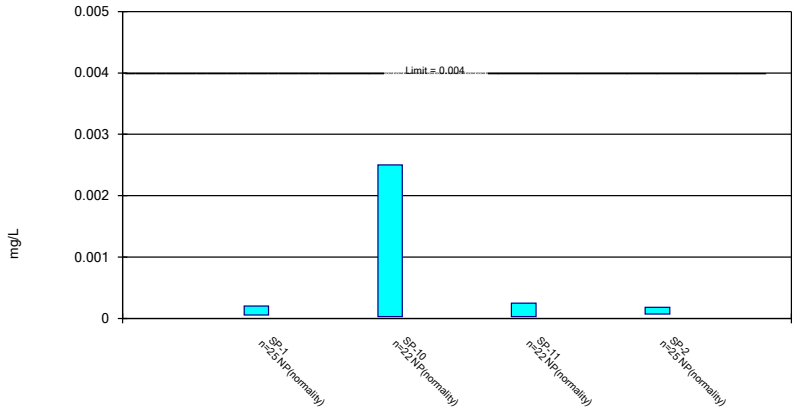
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

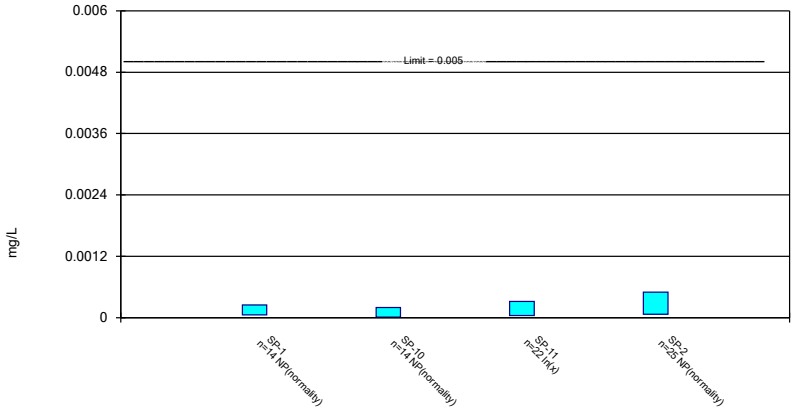
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Beryllium Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

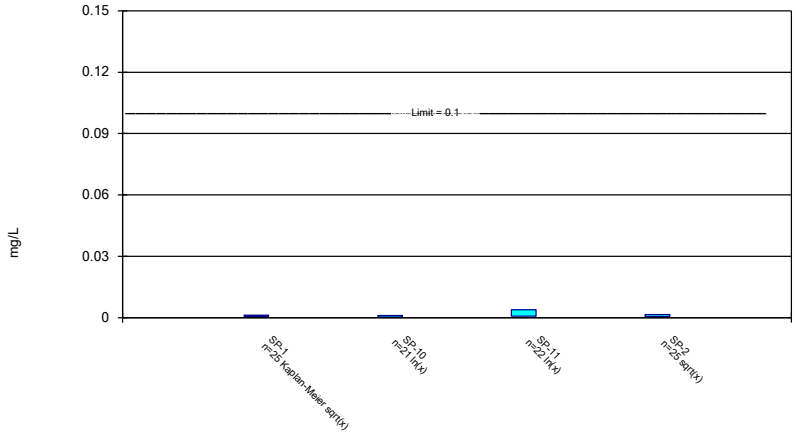
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

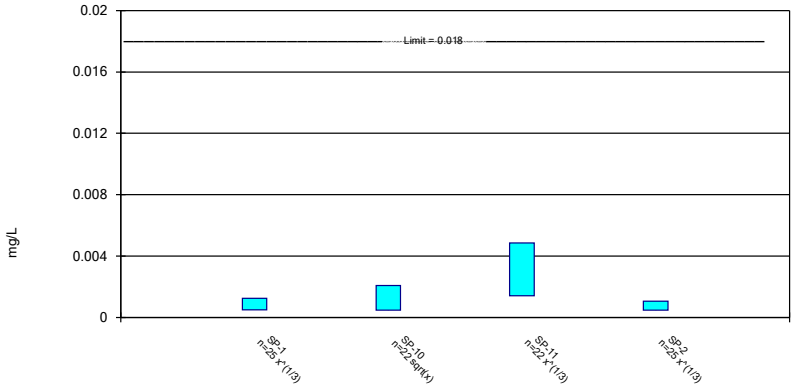
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

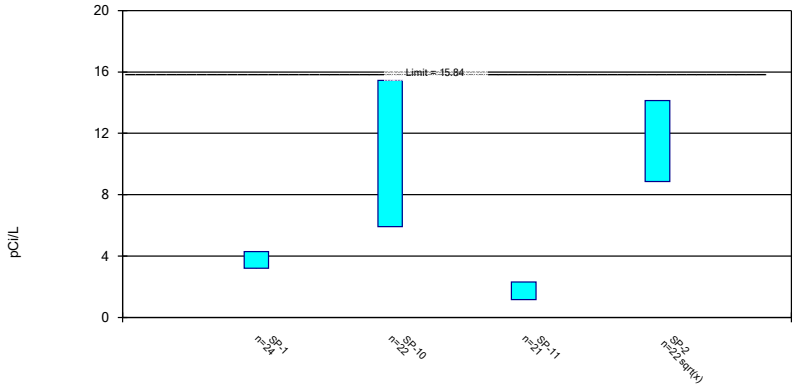
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

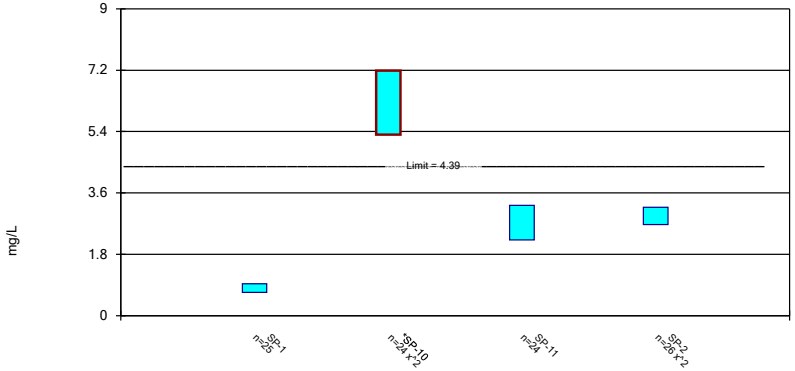
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

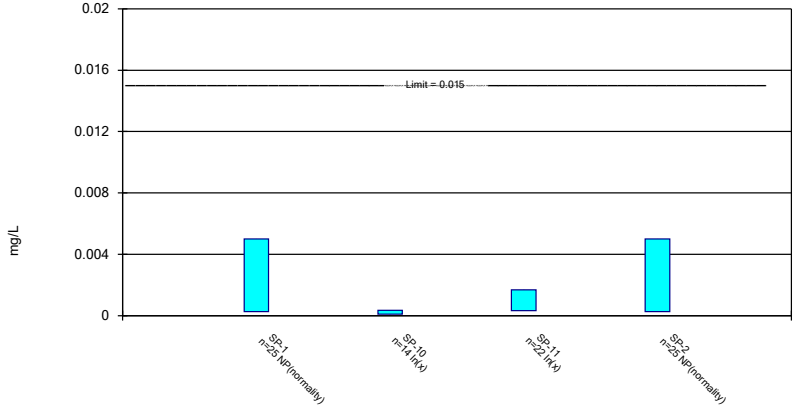
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

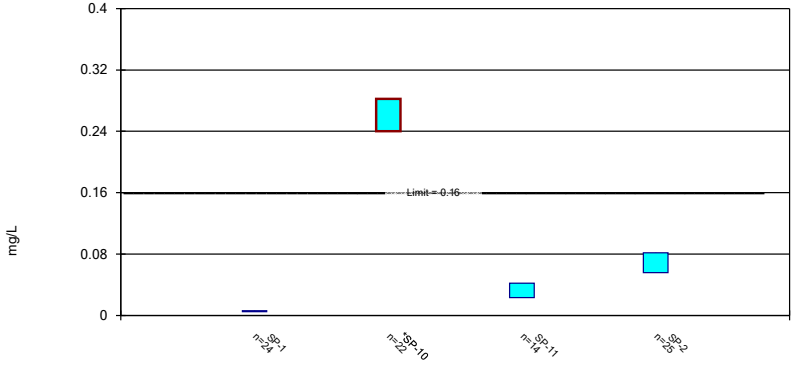
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lead Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

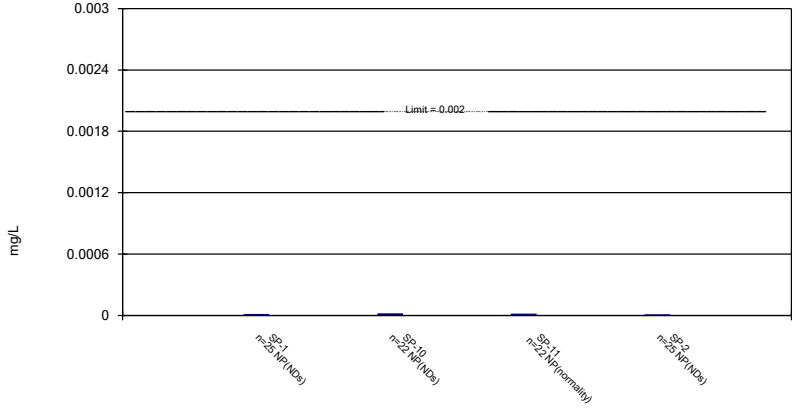
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

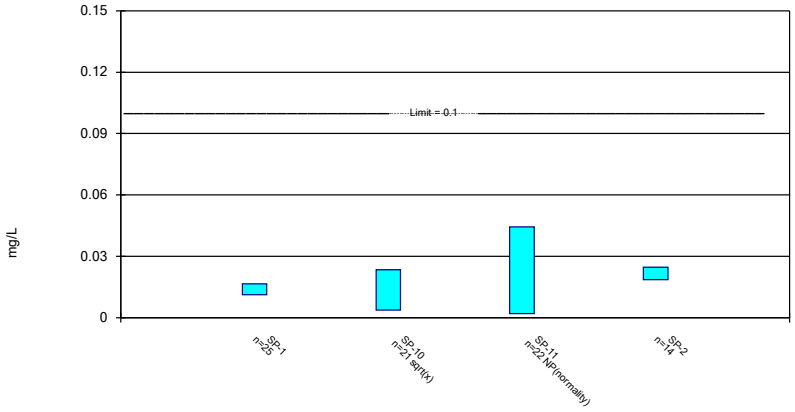
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

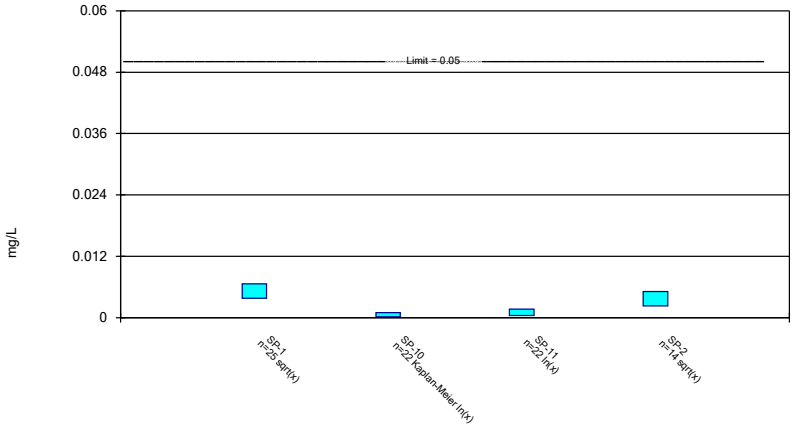
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

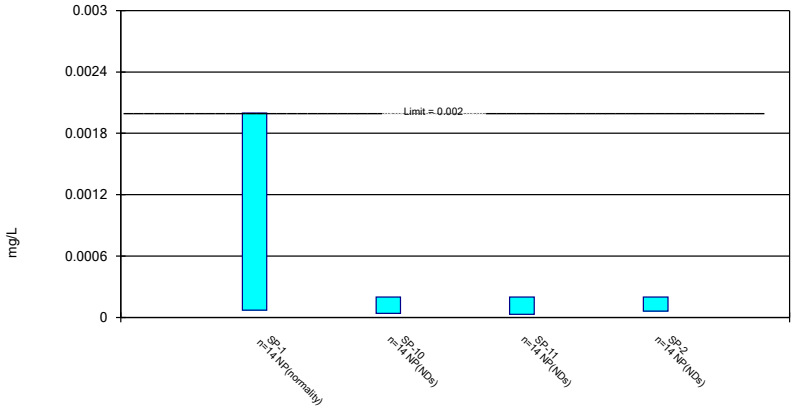
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

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



Constituent: Thallium Analysis Run 2/13/2023 11:21 AM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP