

Purpose of Statistical Analysis Summary Report

During the initial phase of ground water monitoring, the CCR rule requires AEP to collect at least eight independent samples from at least one up-gradient and three downgradient wells for 21 substances listed in the CCR rule. The CCR rule also requires us to select a statistical method that will be used to evaluate the samples in the later phases of the ground water monitoring program. The Statistical Plan, which has been posted to AEP's CCR website, describes the methods selected by AEP. *See AEP's Statistical Analysis Plans.*

Each **Statistical Analysis Summary Report** is based on the results of the 8 independent samples that were collected by October 17, 2017, and reported in the Annual Groundwater Monitoring Report. Using the statistical methods chosen by AEP, the samples were evaluated to eliminate outliers, determine variability and general trends in the data, and establish background values for: boron, calcium chloride, fluoride, pH, sulfate, and total dissolved solids. Appendix IV substances were evaluated for purposes of identifying outliers and understanding data trends.

A subsequent sample taken during the first detection monitoring sampling event was also compared using the proper statistical methods to the background values that were established for these seven substances from the eight independent samples. A second or third re-sampling event occurred, and the results compared using the same methods. This work is reported in the memorandum included in attachment A. If confirmed, AEP will be required to enter the next phase of monitoring. The results of future sampling will be further analyzed to target any specific substances for which ongoing monitoring or potential corrective action is required.

STATISTICAL ANALYSIS SUMMARY STATIONS 3 AND 4 LANDFILL Northeastern Power Station Oologah, Oklahoma

Submitted to



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Attachment A	Evaluation of Detection Monitoring Data
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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ANOVA	Analysis of Variance
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Value
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
NELAP	National Environmental Laboratory Accreditation Program
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SWFPR	Site-Wide False-Positive Rate
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Stations 3 and 4 Landfill, an existing CCR unit at the Northeastern Power Station located in Oologah, Oklahoma.

Eight to twelve monitoring events were completed prior to October 17, 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. 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. The background data were reviewed for outliers, which were removed (when appropriate) prior to calculating upper prediction limits (UPLs) for each Appendix III parameter to represent background values. Oversight on the use of statistical calculations was provided by Dr. Kirk Cameron of MacStat Consulting, Ltd.

A groundwater sampling event was completed on October 11, 2017 at the landfill. This sampling event obtained the first sample for the 1-of-2 prediction interval statistical test used for detection monitoring. The results of this sampling event are included in this report.

SECTION 2

LANDFILL EVALUATION

2.1 Data Validation & QA/QC

During the background monitoring program, eight to twelve sets of samples were collected for analysis from each background and compliance well. A summary of data collected during background and the first sample for the 1-of-2 prediction interval statistical test used for detection monitoring may be found in Table 1.

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

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.5.32 statistics software. The export 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

The groundwater analytical data (background data) used to establish background groundwater quality for each constituent required in detection monitoring are summarized in Table 1. Statistical analyses for the landfill were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Results for all completed statistical tests are provided in Attachment A.

Time series plots of Appendix III and IV parameters are included in Attachment A. Mann-Kendall analyses ($\alpha = 0.01$) were conducted to evaluate trends in the background data. The following statistically significant trends were observed:

- Calcium was found to be significantly increasing at background well MW-7D.
- Chloride was found to be significantly decreasing at compliance wells MW-3D and MW-15.
- Total dissolved solids (TDS) was found to be significantly increasing at background wells MW-7D and MW-8D.

No other significant increasing or decreasing trends were observed for other Appendix III parameters or at other monitoring wells.

2.2.1 Background Outlier Evaluation

Potential outliers were identified using Tukey's outlier test; i.e., data points were considered potential outliers if they met one of the following criteria:

$$x_i < \tilde{x}_{0.25} - 3 \times IQR \quad (1)$$

or

$$x_i > \tilde{x}_{0.75} + 3 \times IQR \quad (2)$$

where:

$$\begin{aligned} x_i &= \text{individual data point} \\ \tilde{x}_{0.25} &= \text{first quartile} \\ \tilde{x}_{0.75} &= \text{third quartile} \\ IQR &= \text{the interquartile range} = \tilde{x}_{0.75} - \tilde{x}_{0.25} \end{aligned}$$

Data that were evaluated as potential outliers are summarized in Attachment A. Tukey's outlier test indicated four potential outliers for Appendix III parameters, which are summarized in Table 2. Next, the data were reviewed to identify possible sources of errors or discrepancies, including data recording errors, unusual sampling conditions, laboratory quality, or inconsistent sample turbidity. The findings of this data review are summarized below.

For two outliers, the primary sample concentration was replaced with that of a duplicate sample. The reported boron concentration of 3.52 mg/L for the primary June 28, 2017 sample collected at compliance well MW-3D was replaced with the reported boron concentration of 0.84 mg/L for the duplicate sample also collected at MW-3D. The reported total dissolved solids (TDS) concentration of 2320 mg/L for the primary August 4, 2017 sample at compliance well MW-6D was replaced with the reported TDS concentration of 1022 mg/L for the duplicate sample also collected at MW-6D. The statistical analysis was rerun using the duplicate results. The duplicate samples were considered more representative based on the reported concentrations from the other background sampling events.

The reported chloride concentrations of 111 mg/L for the May 18, 2017 sample collected at compliance well MW-15 and 23 mg/L for the August 17, 2017 sample collected at compliance well MW-3D were both identified as potential outliers. Because these outliers were anomalously high, their removal would result in the generation of more conservative (i.e., lower) background values, should intrawell tests be used for chloride, and removing these outliers is recommended by USEPA's *Unified Guidance* (USEPA, 2009). These two outliers were removed from the dataset.

2.2.2 Establishment of Background Levels

Analysis of variance (ANOVA) was conducted to determine whether spatial variation was present between the two background wells (Attachment A). ANOVA indicated no significant variation between the two background wells for pH. Consequently, interwell tests were used for pH. Significant variation was observed for boron, calcium, chloride, fluoride, sulfate, and TDS. Therefore, the appropriateness of using intrawell tests was evaluated for these parameters at the Northeastern Landfill.

Intrawell tests presume that the groundwater quality in the compliance wells was not initially impacted by the CCR unit. To test this presumption, the data from the background wells were pooled, and the data from each compliance well were compared to a pooled background value. Tolerance limits were calculated using the pooled background data for boron, calcium, chloride, fluoride, sulfate, and TDS. Parametric tolerance limits with 99% confidence and 95% coverage were calculated for boron and calcium; non-parametric tolerance limits were calculated for chloride, fluoride, sulfate, and TDS, given the non-normal distribution of data observed for these four parameters. Confidence intervals were calculated for each of these six parameters at each compliance monitoring well. If the lower confidence limit from a compliance well exceeded the upper tolerance limit for the pooled background data, it was concluded that groundwater concentrations at compliance wells were above background concentrations. In these instances, intrawell tests would not be appropriate. However, these analyses indicated no significant exceedances for calcium, chloride, fluoride, sulfate, and TDS; elevated concentrations of boron were observed. (Non-parametric analyses also indicated elevated boron concentrations and no significant exceedances for calcium in compliance wells.) Therefore, intrawell tests were used to evaluate potential statistically significant increases (SSIs) for calcium, chloride, fluoride, sulfate, and TDS. Interwell tests were used to evaluate potential SSIs for boron and pH.

After equality of variance was tested and identified outliers were removed (where appropriate), a parametric or non-parametric analysis was selected based on the distribution of the data and the frequency of non-detect data. Estimated results less than the practical quantitation limit (PQL) – i.e., “J-flagged” data – were considered detections and the estimated results were used in the statistical analyses. Non-parametric analyses were selected for datasets with at least 50% non-detect data or datasets that could not be normalized. Parametric analyses were selected for datasets (either transformed or untransformed) that passed the Shapiro-Wilk / Shapiro-Francia 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 A.

Upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. A lower prediction limit (LPL) was also calculated for pH. To conduct the intrawell tests for calcium, chloride, fluoride, sulfate, and TDS, a separate UPL was calculated for each compliance well for each of these parameters. To conduct the interwell tests for boron and

pH, a single prediction interval was calculated for each of these parameters using pooled data from the two background wells. The background data used for the UPL calculations are summarized in Table 1; the calculated UPLs are summarized in Table 3.

Although significant decreasing trends in chloride concentrations were observed at compliance wells MW-3D and MW-15, the intrawell UPLs were calculated as if no trends were present; i.e., the datasets were not limited to more recent data nor were the prediction intervals constructed around trendlines. This was done because (a) the background samples were collected over a period that was less than a year and may reflect a seasonal variation in chloride concentrations and (b) the magnitudes of the trends were low relative to absolute concentrations observed at these wells. The possibility of seasonal patterns or ongoing decreases and the need for truncating the datasets for chloride at MW-3D and MW-15 will be reevaluated after additional data are collected.

UPLs 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, then it can be concluded that an SSI has not occurred. In practice, where initial results did not exceed the UPL, a second sample was not collected. The one-of-two retesting procedure allowed achieving an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less. Power curves were constructed for the interwell and intrawell parametric tests and are compared with the EPA Reference Power Curve in Attachment A. The power curves associated with the statistical tests for the Landfill exceed the EPA Reference Power Curve at 3 and 4 standard deviations; this is considered a "good" level of statistical power according to USEPA's *Unified Guidance* (USEPA, 2009).

2.2.3 Certification by Qualified Professional Engineer

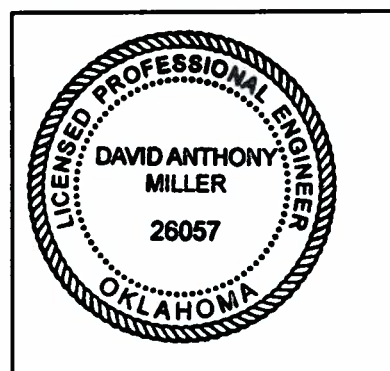
I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern Stations 3 & 4 Landfill CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



26057

License Number

OKLAHOMA

Licensing State

01.15.18

Date

2.3 Conclusions

Eight to twelve background monitoring events and the first sample for the 1-of-2 prediction interval statistical test used for detection were completed 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 four potential outliers, with two values removed from the dataset without replacement. Prediction intervals were constructed based on the remaining background data and a one-of-two retesting procedure. Interwell tests were selected for boron and pH, whereas intrawell tests were selected for calcium, chloride, fluoride, sulfate, and TDS.

SECTION 3

REFERENCES

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

United States Environmental Protection Agency (USEPA). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March 2009.

TABLES

Table 1: Groundwater Data Summary
Northeastern Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	MW-3D												
		1/25/2017	3/14/2017	4/25-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	7/12/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	10/11/2017
		Background												Detection
Antimony	mg/L	0.005U*	0.005U*	0.005U	0.005U	0.00144J	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.00163J	-
Arsenic	mg/L	0.005U*	0.005U*	0.0033J	0.01064	0.00148J	0.005U	0.005U	0.005U	0.005U	0.0026J	0.00452J	0.00114J	-
Barium	mg/L	0.111	0.1	0.08964	1.04	0.15	0.09764	0.118	0.124	0.274	0.244	0.43	0.267	-
Beryllium	mg/L	0.001U*	0.001U*	0.001U	0.00092J	0.00008J	0.00009J	0.00005J	0.00007J	0.00017J	0.00016J	0.00035J	0.00017J	-
Boron	mg/L	0.919	0.913	0.972	0.789	0.873	0.84	0.864	0.856	0.841	0.84	0.877	0.853	0.878
Cadmium	mg/L	0.001U*	0.001U*	0.00026J	0.00061J	0.00022J	0.00045J	0.00008J	0.00021J	0.00024J	0.00033J	0.00049J	0.00021J	-
Calcium	mg/L	111	120	110	163	137	194	129	135	138	136	152	139	134
Chloride	mg/L	16	14	14	12	12	13	13	12	23	12	11	11	13
Chromium	mg/L	0.002	0.001U*	0.00035J	0.01806	0.00123	0.0048	0.00041J	0.00082J	0.00311	0.00236	0.00632	0.00274	-
Cobalt	mg/L	0.005U*	0.005U*	0.0013J	0.00532	0.00109J	0.00269J	0.00082J	0.00084J	0.00183J	0.00154J	0.00297J	0.00141J	-
Combined Radium	pCi/L	2.153	1.456	0.419	2.443	1.706	2.431	14.283	2.242	2.328	2.215	1.566	2.162	
Fluoride	mg/L	1U*	1	0.77J	1U	0.8472J	0.7591J	1U	0.7381J	1U	0.7144J	1U	1U	1U
Lead	mg/L	0.005U*	0.005U*	0.005U	0.00324J	0.00083J	0.00299J	0.005U	0.0008J	0.005U	0.005U	0.00155J	0.005U	-
Lithium	mg/L	0.017	0.016	0.01508	0.01943	0.01451	0.01836	0.01435	0.01344	0.01495	0.01465	0.01639	0.01508	-
Mercury	mg/L	0.000025U*	0.000025U*	0.000025U	0.00001J	0.000025U	0.000007J	0.000025U	0.000013J	0.000025U	0.000025U	0.000025U	0.000025U	-
Molybdenum	mg/L	0.005U*	0.005U*	0.00197J	0.00415J	0.00304J	0.07928	0.00322J	0.00308J	0.00291J	0.00268J	0.00274J	0.00333J	-
Selenium	mg/L	0.005U*	0.005U*	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.001J	0.005U	0.005U	0.005U	-
Total Dissolved Solids	mg/L	658	648	662	598	742	766	728	710	728	696	848	724	722
Sulfate	mg/L	174	175	181	192	225	232	210	227	213	216	212	214	218
Thallium	mg/L	0.002U*	0.002U*	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.00102J	0.002U	-
pH	SU	7.46	-	7.94	-	7.33	7.29	6.86	6.74	6.81	6.85	6.79	6.94	6.92

Notes:
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit
*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit
J: Estimated value. Component was detected in concentrations below the reporting limit
-: Not sampled

Table 1: Groundwater Data Summary
Northeastern Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	MW-6D								
		6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	10/11/2017
		Background								
Antimony	mg/L	0.005U	0.00128J	0.005U	0.005U	0.00126J	0.005U	0.005U	0.00118J	-
Arsenic	mg/L	0.00199J	0.005U	0.005U	0.005U	0.00118J	0.00206J	0.00119J	0.00193J	-
Barium	mg/L	0.113	0.17	0.107	0.128	0.09954	0.103	0.109	0.07504	-
Beryllium	mg/L	0.00018J	0.00006J	0.00022J	0.00022J	0.00019J	0.00022J	0.00031J	0.00014J	-
Boron	mg/L	3.51	0.877	3.49	3.64	3.55	3.41	2.96	3.81	3.74
Cadmium	mg/L	0.0008J	0.00037J	0.00056J	0.00093J	0.00044J	0.00036J	0.00049J	0.00022J	-
Calcium	mg/L	201	133	218	222	211	210	237	196	165
Chloride	mg/L	28	29	30	31	30	30	32	32	29
Chromium	mg/L	0.00599	0.00086J	0.00682	0.00662	0.00677	0.00668	0.00815	0.00386	-
Cobalt	mg/L	0.00373J	0.00109J	0.00382J	0.00339J	0.00307J	0.00303J	0.00371J	0.00227J	-
Combined Radium	pCi/L	1.822	1.917	1.784	1.115	1.155	1.057	1.377	1.43	-
Fluoride	mg/L	0.8054J	0.7596J	1U	0.7656J	0.729J	0.7158J	0.5406J	1U	0.9597J
Lead	mg/L	0.00348J	0.00076J	0.005	0.00496J	0.00325J	0.0025J	0.00328J	0.00233J	-
Lithium	mg/L	0.02203	0.01356	0.02244	0.01921	0.01925	0.01829	0.02105	0.01701	-
Mercury	mg/L	0.000012J	0.000025U	0.000007J	0.000016J	0.000011J	0.000025U	0.000025U	0.000025U	-
Molybdenum	mg/L	0.08501	0.00279J	0.06181	0.08211	0.08132	0.08575	0.058	0.081	-
Selenium	mg/L	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	-
Total Dissolved Solids	mg/L	1054	1024	1044	1022	1016	986	1140	1008	1032
Sulfate	mg/L	508	524	504	532	509	522	521	505	545
Thallium	mg/L	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-
pH	SU	7.49	7.89	7.29	6.35	6.91	7.19	7.05	7.05	6.91

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

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

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

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

-: Not sampled

Table 1: Groundwater Data Summary
Northeastern Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	MW-7D									
		6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	10/4/2017	10/11/2017
		Background									Detection
Antimony	mg/L	0.00188J	0.005U	0.005U	0.00106J	0.005U	0.00284J	0.00211J	0.005U	0.00128J	-
Arsenic	mg/L	0.01324	0.01008	0.01051	0.00368J	0.01354	0.00928	0.01314	0.07314	0.01431	-
Barium	mg/L	0.101	0.136	0.14	0.158	0.307	0.503	0.773	3.84	0.751	-
Beryllium	mg/L	0.00014J	0.00019J	0.00025J	0.00057J	0.00053J	0.00076J	0.00114	0.0055	0.00118	-
Boron	mg/L	1.18	1.22	1.4	1.39	1.2	1.15	1.07	1.05	0.99	1.01
Cadmium	mg/L	0.001U	0.00017J	0.00017J	0.00015J	0.00031J	0.00049J	0.00089J	0.0053	0.00129	-
Calcium	mg/L	94.5	126	121	133	130	181	236	918	297	392
Chloride	mg/L	171	196	299	383	489	525	56	662	418	733
Chromium	mg/L	0.0036	0.00607	0.006	0.00911	0.01436	0.0203	0.03056	0.146	0.02994	-
Cobalt	mg/L	0.00273J	0.00245J	0.00268J	0.00541	0.00451J	0.00658	0.00891	0.04905	0.01028	-
Combined Radium	pCi/L	2.97	3.86	3.087	2.937	2.356	2.31	3.79	-	3.55	-
Fluoride	mg/L	0.9374J	1U	1.828	2.024	2.273	3.2484	2.3942	0.59J	2.07	3.2363
Lead	mg/L	0.00118J	0.00289J	0.00318J	0.00323J	0.00714	0.00755	0.01044	0.07031	0.01337	-
Lithium	mg/L	0.118	0.151	0.116	0.08759	0.118	0.134	0.153	0.226	0.166	-
Mercury	mg/L	0.000007J	0.00001J	0.000025U	0.000023J	0.000009J	0.000017J	0.000022J	0.000054	0.000028	-
Molybdenum	mg/L	0.02696	0.02077	0.02545	0.02841	0.02914	0.04849	0.04291	0.05095	0.03257	-
Selenium	mg/L	0.00283J	0.00187J	0.0028J	0.00401J	0.00164J	0.01845	0.01677	0.01941	0.01615	-
Total Dissolved Solids	mg/L	1700	1874	2116	2258	2698	3090	3672	3837	2965	4312
Sulfate	mg/L	635	698	725	841	872	1118	156	1632	1257	1548
Thallium	mg/L	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-
pH	SU	6.72	8.28	7.84	6.93	7.28	7.39	7.2	7.12	7.16	7.48

Notes:
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit
*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit
J: Estimated value. Component was detected in concentrations below the reporting limit
-: Not sampled

Table 1: Groundwater Data Summary
Northeastern Plant - Landfill

Parameter	Unit	MW-8D											
		1/25/2017	3/15/2017	4/24-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	10/11/2017
		Background											
Antimony	mg/L	0.005U*	0.005	0.00256J	0.00713	0.02028	0.00467J	0.00328J	0.00232J	0.00794	0.00508	0.00378J	-
Arsenic	mg/L	0.007	0.005U*	0.00448J	0.01029	0.01341	0.00178J	0.0027J	0.0043J	0.0058	0.00952	0.00704	-
Barium	mg/L	1.17	1.66	2.32	7.14	7.37	5.29	3.72	1.9	2.38	3.86	4.51	-
Beryllium	mg/L	0.001U*	0.001U*	0.00012J	0.00046J	0.00074J	0.00008J	0.00013J	0.00017J	0.00022J	0.00075J	0.00045J	-
Boron	mg/L	1.31	1.29	1.28	1.27	1.34	1.29	1.36	1.35	1.35	1.36	1.36	1.32
Cadmium	mg/L	0.001	0.002	0.00093J	0.00507	0.00826	0.00254	0.00141	0.00097J	0.00139	0.00275	0.00182	-
Calcium	mg/L	446	417	376	529	861	416	381	416	450	586	479	445
Chloride	mg/L	11967	13217	11159	14606	10221	11171	11796	11757	11314	12305	12331	11582
Chromium	mg/L	0.004	0.001	0.001U	0.00894	0.01536	0.00059J	0.001U	0.00102	0.00175	0.0143	0.00662	-
Cobalt	mg/L	0.005U*	0.005U*	0.00145J	0.00592	0.01078	0.00385J	0.00235J	0.00265J	0.00273J	0.00653	0.0043J	-
Combined Radium	pCi/L	7.48	4.66	5.29	5.583	5.37	-	-	9.67	6.39	5.979	-	-
Fluoride	mg/L	1U*	1U*	0.24J	1U	1U	1U	1U	1U	1U	1U	1U	1U
Lead	mg/L	0.005U*	0.005U*	0.0009J	0.00659	0.0056	0.00231J	0.00214J	0.00282J	0.00217J	0.00511	0.00289J	-
Lithium	mg/L	1.44	1.1	1.07	1.3	1.22	1.14	1.19	1.08	1.12	1.19	1.23	-
Mercury	mg/L	0.000025U*	0.000025U*	0.00001J	0.000022J	0.000025	0.000012J	0.000015J	0.000012J	0.000025U	0.000029	0.00003	-
Molybdenum	mg/L	0.005U*	0.005U*	0.00091J	0.00243J	0.00281J	0.0012J	0.00168J	0.0019J	0.00191J	0.0034J	0.00453J	-
Selenium	mg/L	0.006	0.005U*	0.00391J	0.0037J	0.00371J	0.00134J	0.00578	0.00603	0.00605	0.00474J	0.00466J	-
Total Dissolved Solids	mg/L	20832	19020	20810	22342	20104	20996	21074	22200	22396	22968	23012	21896
Sulfate	mg/L	144	72	58	112	122	116	128	113	103	112	126	300
Thallium	mg/L	0.002U*	0.002U*	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-
pH	SU	7.1	-	7.34	-	7.21	7.04	7.15	6.98	6.94	6.99	6.89	6.9

Notes:
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit
*: Parameter was not present in concentrations above method detection limit and is reported as the method detection limit
J: Estimated value. Component was detected in concentrations below the reporting limit
-: Not sampled

Table 1: Groundwater Data Summary
Northeastern Plant - Landfill

Parameter	Unit	MW-9D										
		6/15-6/16/2017	6/27-6/28/2017	7/12/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	10/4/2017	10/11/2017	10/31/2017	11/8/2017
		Background								Detection	Background	
Antimony	mg/L	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	-	-	-
Arsenic	mg/L	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	-	-	-
Barium	mg/L	0.188	0.05815	0.06989	0.132	0.196	0.323	0.399	0.41	-	-	-
Beryllium	mg/L	0.00032J	0.001U	0.00005J	0.00017J	0.00022J	0.00037J	0.0004J	0.00043J	-	-	-
Boron	mg/L	7.09	7.01	7.63	7.59	7.46	6.93	6.78	6.68	7.07	-	-
Cadmium	mg/L	0.00081J	0.00026J	0.001U	0.00054J	0.00025J	0.00091J	0.00068J	0.0024		-	-
Calcium	mg/L	229	191	244	337	328	354	366	304	288	-	-
Chloride	mg/L	100	232	98	60	216	64	293	180	314	-	-
Chromium	mg/L	0.01234	0.00089J	0.00409	0.00715	0.00952	0.02006	0.01334	0.01479	-	-	-
Cobalt	mg/L	0.00618	0.00714	0.00569	0.00734	0.00817	0.01508	0.01288	0.00838	-	-	-
Combined Radium	pCi/L	0.931	-	-	-	-	-	-	-	-	0.683	2.59
Fluoride	mg/L	0.9857J	0.8986J	2.191	0.6947J	0.681J	1U	0.37J	1U	1.5191	-	-
Lead	mg/L	0.00702	0.00124J	0.00236J	0.00426J	0.00533	0.00927	0.00828	0.00969	-	-	-
Lithium	mg/L	0.02386	0.01647	0.02221	0.02155	0.02401	0.02964	0.03257	0.03222	-	-	-
Mercury	mg/L	0.000009J	0.000025U	0.000025U	0.000017J	0.000011J	0.000016J	0.000016J	0.000015J	-	-	-
Molybdenum	mg/L	0.173	0.166	0.151	0.117	0.09819	0.09384	0.07839	0.07377	-	-	-
Selenium	mg/L	0.005	0.005U	0.00132J	0.00357J	0.00353J	0.00294J	0.0028J	0.00383J	-	-	-
Total Dissolved Solids	mg/L	1458	1114	2146	2256	2486	2392	2826	2296	2188	-	-
Sulfate	mg/L	781	876	1048	1217	1193	1192	1244	1079	1075	-	-
Thallium	mg/L	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-	-	-
pH	SU	7.13	7.65	7.41	7.04	7.1	7.28	7.18	7.26	7.09	-	-

Notes:
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Parameter was not present in concentrations above method
detection limit and is reported as the reporting limit
*: Parameter was not present in concentrations above method
detection limit and is reported as the method detection limit
J: Estimated value. Component was detected in concentrations below the reporting limit
-: Not sampled

Table 1: Groundwater Data Summary
Northeastern Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	MW-15												
		1/25/2017	3/13/2017	4/25-4/27/2017	5/18/2017	6/15-6/16/2017	6/27-6/28/2017	7/12-7/13/2017	8/4/2017	8/17/2017	8/30/2017	9/13/2017	9/20/2017	10/11/2017
		Background												Detection
Antimony	mg/L	0.005U*	0.005U*	0.00131J	0.00138J	0.005U	0.005U	0.00163J	0.00156J	0.00099J	0.005U	0.005U	0.005U	-
Arsenic	mg/L	0.005U*	0.005U*	0.00285J	0.01361	0.00756	0.0044J	0.00377J	0.00373J	0.00444J	0.00632	0.00418J	0.00387J	-
Barium	mg/L	0.107	0.1	0.05573	0.05206	0.212	0.09867	0.15	0.09419	0.133	0.06487	0.05434	0.04923	-
Beryllium	mg/L	0.001U*	0.001U*	0.001U	0.001U	0.00025J	0.00002J	0.00012J	0.00008J	0.00009J	0.00004J	0.00003J	0.001U	-
Boron	mg/L	9.45	8.23	9.44	10.2	9.74	9.75	9.87	9.66	9.53	9.59	9.13	9.65	9.62
Cadmium	mg/L	0.001U*	0.001U*	0.001U	0.00026J	0.00064J	0.001U	0.00009J	0.00009J	0.001U	0.001U	0.001U	0.001U	-
Calcium	mg/L	87	104	73.1	52.2	126	79.2	110	86.3	93.1	64.9	68	67.6	80.1
Chloride	mg/L	19	28	78	111	24	22	19	19	18	17	17	15	46
Chromium	mg/L	0.003	0.003	0.00023J	0.00096J	0.00857	0.00179	0.00403	0.00151	0.0033	0.00086J	0.001U	0.00023J	-
Cobalt	mg/L	0.005U*	0.005U*	0.00064J	0.00062J	0.00396J	0.00129J	0.00264J	0.0014J	0.00169J	0.00078J	0.00066J	0.00077J	-
Combined Radium	pCi/L	0.505	1.241	0.203	1.097	1.215	1.652	0.287	0.914	0.649	0.393	1.07	0.887	-
Fluoride	mg/L	2	2	1.83	2	1.96	1.8739	1.894	1.759	1.691	2.0289	1.671	0.642J	1.9468
Lead	mg/L	0.005U*	0.005U*	0.005U	0.0017J	0.00525	0.00242J	0.00287J	0.00136J	0.00144J	0.005U	0.005U	0.005U	-
Lithium	mg/L	0.012	0.01	0.00786	0.00834	0.01148	0.00722	0.0091	0.00752	0.00823	0.00629	0.00635	0.00621	-
Mercury	mg/L	0.000025U*	0.000025U*	0.000025U	0.000022J	0.00002J	0.000022J	0.000009J	0.000021J	0.000015J	0.00001J	0.000008J	0.000025U	-
Molybdenum	mg/L	0.643	0.55	0.614	0.605	0.662	0.644	0.668	0.647	0.642	0.656	0.638	0.652	-
Selenium	mg/L	0.005U*	0.005U*	0.00183J	0.02228	0.01246	0.00576	0.009	0.006	0.00595	0.00924	0.00145J	0.00377J	-
Total Dissolved Solids	mg/L	1112	1110	1128	1092	1060	1072	1076	1032	1110	1038	1080	1036	1124
Sulfate	mg/L	530	551	558	596	559	616	632	612	572	590	584	543	593
Thallium	mg/L	0.002U*	0.002U*	0.00105J	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	-
pH	SU	7.98	-	7.64	-	7.94	8.54	8.21	7.6	7.83	6.73	8.58	7.47	7.64

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

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

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

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

-: Not sampled

Table 2: Outlier Analysis Summary
Northeastern Plant - Landfill

Geosyntec Consultants, Inc.

Location	Well ID	Sample Date	Parameter	Reported Value	Units	Conclusions
Downgradient	MW-3D	6/28/2017	Boron	3.52	mg/L	This value was replaced with 0.84 mg/L, the reported boron value for the duplicate sample collected at MW-3D.
Downgradient	MW-15	5/18/2017	Chloride	111	mg/L	This value was conservatively removed from the dataset as an outlier, per USEPA's <i>Unified Guidance</i> .
Downgradient	MW-3D	8/17/2017	Chloride	23	mg/L	This value was conservatively removed from the dataset as an outlier, per USEPA's <i>Unified Guidance</i> .
Downgradient	MW-6D	8/4/2017	Total Dissolved Solids	2320	mg/L	This value was replaced with 1022 mg/L, the reported total dissolved solids value for the duplicate sample collected at MW-6D.

Table 3: Background Level Summary
Northeastern Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Units	Description	MW-3D	MW-6D	MW-9D	MW-15
Boron	mg/L	Interwell Background Value (UPL)	1.497			
Calcium	mg/L	Intrawell Background Value (UPL)	190.3	285.1	463.1	131.8
Chloride	mg/L	Intrawell Background Value (UPL)	16.15	33.88	382.8	78
Fluoride	mg/L	Intrawell Background Value (UPL)	1	0.9414	2.28	2.243
pH	SU	Interwell Background Value (UPL)	8.28			
	SU	Interwell Background Value (LPL)	6.72			
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	852.8	1159	3591	1152
Sulfate	mg/L	Intrawell Background Value (UPL)	251.3	542.8	1524	649.4

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

ATTACHMENT A

Evaluation of Detection Monitoring Data

Memorandum

Date: February 26, 2018

To: David Miller (AEP)

Copies to: Jill Parker-Witt (AEP)

From: Allison Kreinberg and Bruce Sass, Ph.D. (Geosyntec)

Subject: Evaluation of Detection Monitoring Data at
Northeastern Plant's Landfill (LF)

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), detection monitoring events were completed on October 11, 2017 and January 22, 2018 at the Landfill (LF), an existing CCR unit at the Northeastern Power Plant located in Oologah, Oklahoma.

Eight to twelve background monitoring events were conducted at the Northeastern LF prior to these detection monitoring events, and upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. A lower prediction limit (LPL) was also calculated for pH. Details on the calculation of these background values are described in Geosyntec's *Statistical Analysis Summary* report, dated January 15, 2018.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is only concluded if both samples in a series of two exceeds the UPL. In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are summarized in Table 1. Boron concentrations exceeded the interwell UPL of 1.497 mg/L in both the initial (3.74 mg/L) and second (4.24 mg/L) samples collected at MW-6D, in both the initial (7.07 mg/L) and second (7.43 mg/L) samples collected at MW-9D, and in both the initial (9.62 mg/L) and second (9.16 mg/L) samples collected at MW-15. Therefore, an SSI over background is concluded for boron at

MW-6D, MW-9D, and MW-15. As a result, the Northeastern LF CCR unit will conduct an alternate source demonstration.

No other exceedances of UPLs were observed during these detection monitoring events.

* * * * *

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

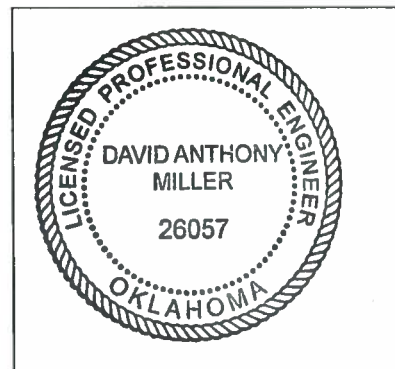
I certify that the selected statistical method, described above and in the January 15, 2018 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Northeastern LF CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



26057

License Number

OKLAHOMA

Licensing State

02.27.18

Date

Table 1: Detection Monitoring Data Evaluation
Northeastern Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Units	Description	MW-3D	MW-6D		MW-9D		MW-15	
			10/11/2017	10/11/2017	1/22/2018	10/11/2017	1/22/2018	10/11/2017	1/22/2018
Boron	mg/L	Interwell Background Value (UPL)	1.497						
	mg/L	Detection Monitoring Result	0.878	3.74	4.24	7.07	7.43	9.62	9.16
Calcium	mg/L	Intrawell Background Value (UPL)	190	285		463		132	
	mg/L	Detection Monitoring Result	134	165	-	288	-	80.1	-
Chloride	mg/L	Intrawell Background Value (UPL)	16.2	33.9		383		78	
	mg/L	Detection Monitoring Result	13	29	-	314	-	46	-
Fluoride	mg/L	Intrawell Background Value (UPL)	1	0.941		2.28		2.243	
	mg/L	Detection Monitoring Result	0.083	0.9597	0.76	1.5191	-	1.9468	-
pH	SU	Interwell Background Value (UPL)	8.28						
	SU	Interwell Background Value (LPL)	6.72						
	SU	Detection Monitoring Result	6.92	6.91	6.85	7.09	7.14	7.64	7.24
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	853	1159		3591		1152	
	mg/L	Detection Monitoring Result	722	1032	-	2188	-	1124	-
Sulfate	mg/L	Intrawell Background Value (UPL)	251	543		1524		649	
	mg/L	Detection Monitoring Result	218	545	494	1075	-	593	-

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

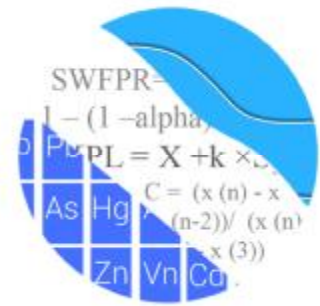
-: Not Sampled

Bold values exceed the background value.

Background values are shaded gray.

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING



January 7, 2018

Geosyntec Consultants
Attn: Mr. Bruce Sass
150 E. Wilson Bridge Rd., #232
Worthington, OH 43085

Dear Mr. Sass,

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

Sampling began at the Northeastern Landfill for the CCR program in 2016, and 8 background samples have been collected at each of the groundwater monitoring wells. The monitoring well network, as provided by Geosyntec Consultants, consists of the following: upgradient wells MW-7D and MW-8D; and downgradient wells MW-3D, MW-6D, MW-9D, and MW-15.

Data were sent electronically to Groundwater Stats Consulting, and the statistical analysis was reviewed by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to Groundwater Stats Consulting.

The following constituents were evaluated: Appendix III parameters – boron, calcium, chloride, fluoride, pH, sulfate, and TDS; and Appendix IV parameters - antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 & 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium.

Time series plots for Appendix III and IV parameters at all wells are provided for the purpose of screening data at these wells (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). 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.

Data at all wells were evaluated for the following: 1) outliers; 2) trends; 3) most appropriate statistical method for Appendix III parameters based on site characteristics of groundwater data upgradient of the facility; and 4) eligibility of downgradient wells when intrawell statistical methods are recommended. Power curves are provided to demonstrate that the selected statistical methods for Appendix III parameters comply with the USEPA Unified Guidance recommendations as discussed below.

Summary of Statistical Method:

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

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 nondetects, a nonparametric test is utilized. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. While the false positive rate associated with the parametric limits is based on an annual 10% as recommended by the EPA Unified Guidance (2009), the false positive rate associated with the nonparametric limits is dependent upon the available background sample size, number of future comparisons, and verification resample plan. 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.

- No statistical analyses are required on wells and analytes containing 100% nondetects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% nondetects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for nondetects is the practical quantification limit (PQL) as reported by the laboratory.

- When data contain between 15-50% nondetects, the Kaplan-Meier nondetect 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% nondetects.

Background Screening

Outlier Evaluation

Time series plots are used to identify suspected outliers, or extreme values that would result in limits that are not conservative from a regulatory perspective, in proposed background data. Suspected outliers at all wells for Appendix III and Appendix IV parameters were formally tested using Tukey's box plot method and, when identified, flagged in the computer database with "o" and deselected prior to construction of statistical limits (Figure C).

Tukey's outlier test noted a handful of outliers in downgradient wells, as may be seen on the Outlier Summary Table. All values identified were flagged in the database, except for the value of 1140 mg/L in well MW-6D which was similar to reported concentrations in this well and neighboring wells, and considerably lower than reported measurements in upgradient wells. A substitution of the most recent reporting limit was applied when varying detection limits existed in data.

No true seasonal patterns were observed on the time series plots for any of the detected data; therefore, no deseasonalizing adjustments were made to the data. When seasonal patterns are observed, data may be deseasonalized so that the resulting limits will correctly account for the seasonality as a predictable pattern rather than random variation or a release. It was noted that for each constituent evaluated, the highest concentrations are reported in the upgradient wells.

While trends may be visual, a quantification of the trend and its significance is needed. The Sen's Slope/Mann Kendall trend test was used to evaluate all data at each well to identify statistically significant increasing or decreasing trends (Figure D). In the absence of suspected contamination, significant trending data are typically not included as part of the background data used for construction of prediction limits. This step serves to eliminate the trend and, thus, reduce variation in background. When statistically significant decreasing trends are present, earlier data are evaluated to determine

whether earlier concentration levels are significantly different than current reported concentrations and will be deselected as necessary. When the historical records of data are truncated for the reasons above, a summary report will be provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed several statistically significant increasing trends, primarily in upgradient wells; and a few statistically significant decreasing trends, as may be seen on the Trend Test Summary table. No adjustments were made to the datasets at this time, since the majority of trends were noted in upgradient wells. This is generally an indication that concentrations are changing due to natural variation. However, as more data are collected, if it is determined that earlier measurements are no longer representative of present-day water quality, the records will be re-evaluated for possible truncation of earlier concentrations.

Appendix III – Determination of Spatial Variation

The Analysis of Variance (ANOVA) was used to statistically evaluate differences in average concentrations among upgradient wells, which assists in identifying the most appropriate statistical approach (Figure E). Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when average concentrations are similar across upgradient wells. Intrawell tests, which compare compliance data from a single well to screened historical data within the same well, are appropriate when upgradient wells exhibit spatial variation; when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; and when downgradient water quality is unimpacted compared to upgradient water quality for the same parameter.

The ANOVA identified variation for all Appendix III parameters except pH. Therefore, interwell prediction limits are recommended for pH and all other parameters were further evaluated as described for the appropriateness of intrawell prediction limits to accommodate the groundwater quality. A summary table of the ANOVA results is included with the reports.

Appendix III - Statistical Limits

Intrawell limits constructed from carefully screened background data from within each well serve to provide statistical limits that are conservative (i.e. lower) from a regulatory perspective, and that will rapidly identify a change in more recent compliance data from within a given well. This statistical method removes the element of variation from across wells and eliminates the chance of mistaking natural spatial variation for a release

from the facility. Prior to performing intrawell prediction limits, several steps are required to reasonably demonstrate downgradient water quality does not have existing impacts from the practices of the facility.

Exploratory data analysis was used as a general comparison of concentrations in downgradient wells for all Appendix III parameters recommended for intrawell analyses to concentrations reported in upgradient wells. Upper tolerance limits are used in conjunction with confidence intervals to determine whether the estimated averages in downgradient wells are higher than observed levels upgradient of the facility. The upper tolerance limits were constructed to represent the extreme upper range of possible background levels at the site.

In cases where downgradient average concentrations are higher than observed concentrations upgradient for a given constituent, an independent study and hydrogeological investigation would be required to identify local geochemical conditions and expected groundwater quality for the region to justify an intrawell approach. Such an assessment is beyond the scope of services provided by Groundwater Stats Consulting. When there is not an obvious explanation for observed concentration differences in downgradient wells relative to reported concentrations in upgradient wells, interwell prediction limits will initially be selected for the statistical method until further evidence shows that concentrations are due to natural variation rather than a result of the facility.

Parametric tolerance limits were constructed with a target of 99% confidence and 95% coverage using pooled upgradient well data for each of the Appendix III parameters (Figure F). The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. As more data are collected, the background population is better represented and the confidence and coverage levels increase.

Confidence intervals were constructed on downgradient wells for each of the Appendix III parameters, using the tolerance limits discussed above, to determine intrawell eligibility (Figure G). When the entire confidence interval is above a background standard for a given parameter, interwell methods are initially recommended as the statistical method. Therefore, only parameters with confidence intervals which did not exceed background standards are eligible for intrawell prediction limits.

Confidence intervals for the above parameters were found to be within their respective background limits for all parameters except for boron. Therefore, intrawell methods are recommended for calcium, chloride, fluoride, sulfate, and TDS; and interwell methods

are initially recommended for boron and pH. As mentioned earlier, if a demonstration supports natural variation in groundwater, intrawell methods will be considered for all parameters.

All available data through November 2017 at each well were used to establish intrawell background limits based on a 1-of-2 resample plan that will be used for future comparisons (Figure H). Interwell prediction limits, combined with a 1-of-2 resample plan, were constructed from pooled upgradient well data for boron and pH (Figure I). Downgradient measurements will be compared to these background limits during each subsequent semi-annual sampling event.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a BAP, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits will be necessary to accommodate these types of changes. In the interwell case, newer data will be included in background when a minimum of 2 new samples are available. In the intrawell case, data for all wells and constituents are 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 some cases, the earlier portion of data are deselected prior to construction of limits in order to provide sensitive limits that will rapidly detect 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.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one additional sample to determine whether the initial exceedance is confirmed. If the resample falls within the statistical limit, the initial exceedance is considered to be a false positive result and, therefore, no further action is necessary. A summary table of the background prediction limits follows this letter.

Appendix IV – Assessment Monitoring Program

During an Assessment Monitoring program confidence intervals are constructed at all wells for detected Appendix IV parameters. A minimum of 4 samples is required to construct confidence intervals; however, 8 samples are generally recommended for better representation of the true average population. Established Maximum Contaminant Levels (MCLs) are used as the GWPS comparisons, unless background limits are higher as discussed below. Parametric confidence intervals are constructed with 99% confidence when data follow a normal or transformed-normal distribution. For all other cases, nonparametric confidence intervals are constructed, with the

confidence level based on the number of samples available. The GWPS is exceeded only when the entire confidence interval exceeds its respective GWPS.

Background limits are established for the Appendix IV parameters using upper tolerance limits constructed with 95% confidence/95% coverage using pooled upgradient well data, for comparison against established MCLs. When background limits, or Alternate Contaminant Levels (ACLs), are higher than established MCLs, the CCR Rule recommends using these ACLs as the GWPS for the confidence interval comparisons. Additionally, tolerance limits are also recommended to establish ACLs for Appendix IV parameters, cobalt, lithium, and molybdenum, which do not have established MCLs. Since the scope of this project included screening and development of background limits for Appendix III Detection Monitoring statistics, comparison of the Appendix IV parameters with confidence intervals was not included in this report.

Recommendations

In summary, as a result of the background screening described in this letter, intrawell prediction limits combined with a 1-of-2 resample plan are recommended for calcium, chloride, fluoride, sulfate, and TDS; and interwell prediction limits combined with a 1-of-2 resample plan are recommended for boron and pH. The statistical analyses will be constructed according to the USEPA Unified Guidance, based on 7 Appendix III parameters and 4 downgradient wells.

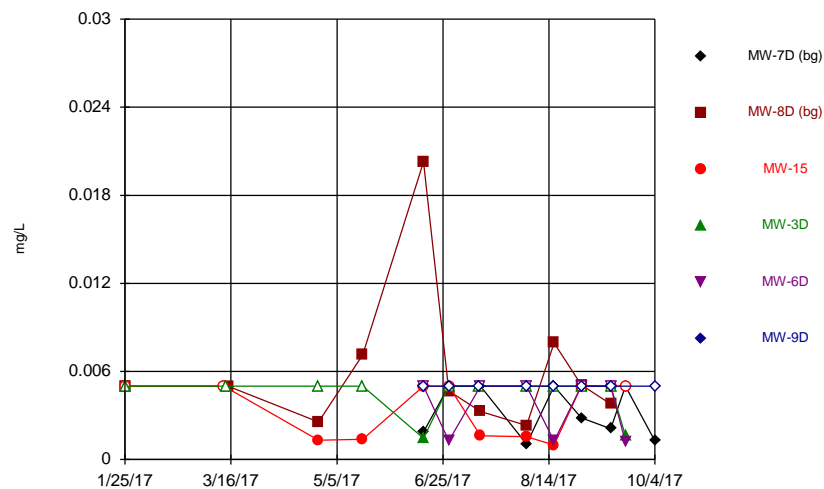
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern Landfill. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

A handwritten signature in dark ink, reading "Kristina Rayner". The signature is fluid and cursive, with the first name "Kristina" and last name "Rayner" clearly distinguishable.

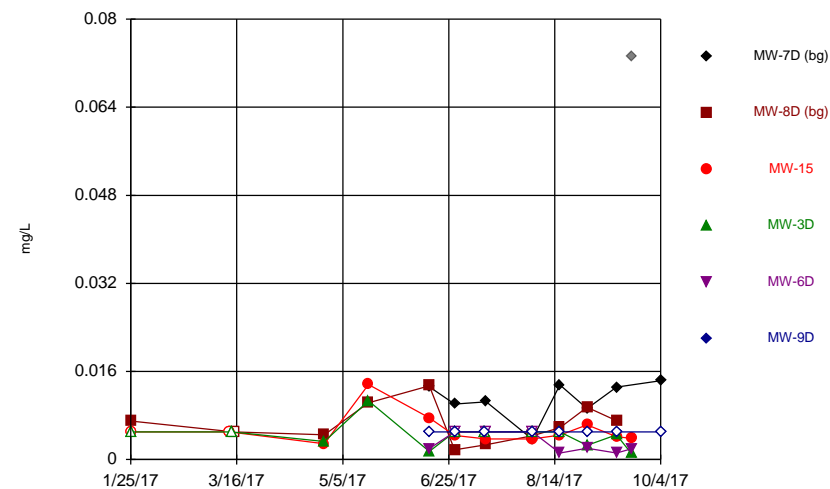
Kristina L. Rayner
Groundwater Statistician

Time Series



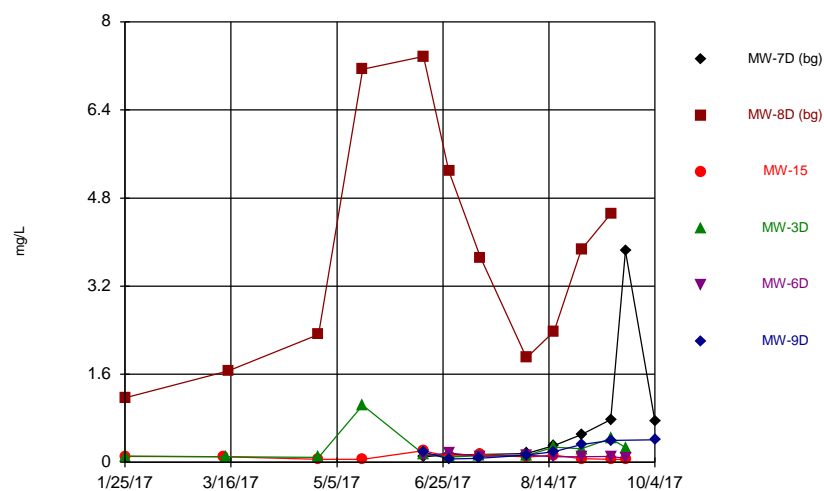
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Time Series



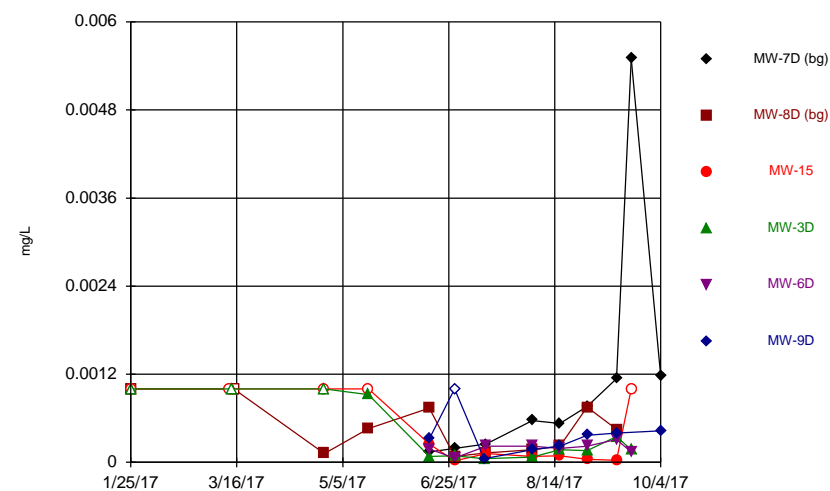
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Time Series



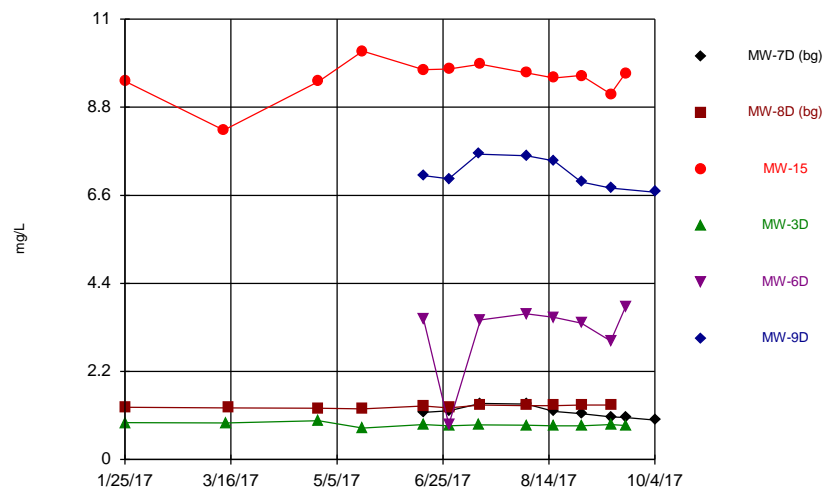
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Time Series

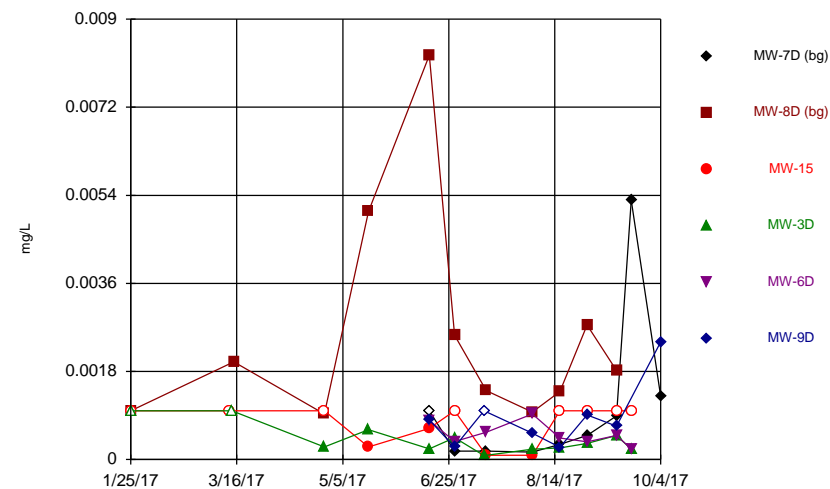


Constituent: Beryllium Analysis Run 1/3/2018 6:52 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

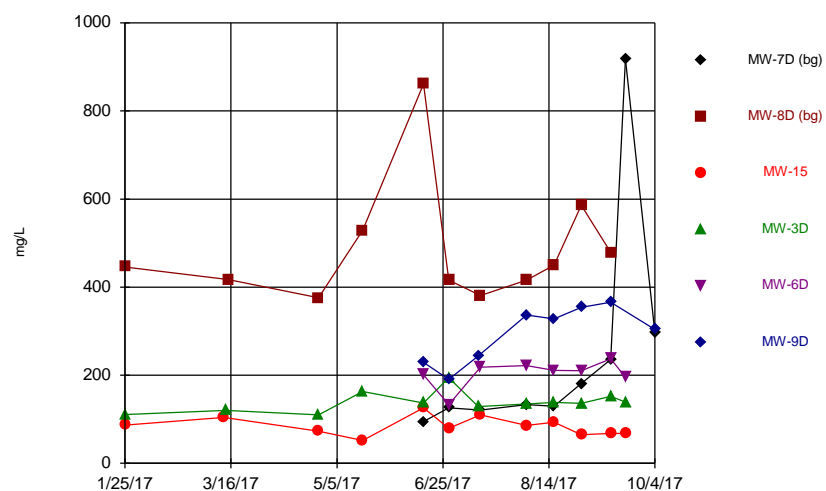
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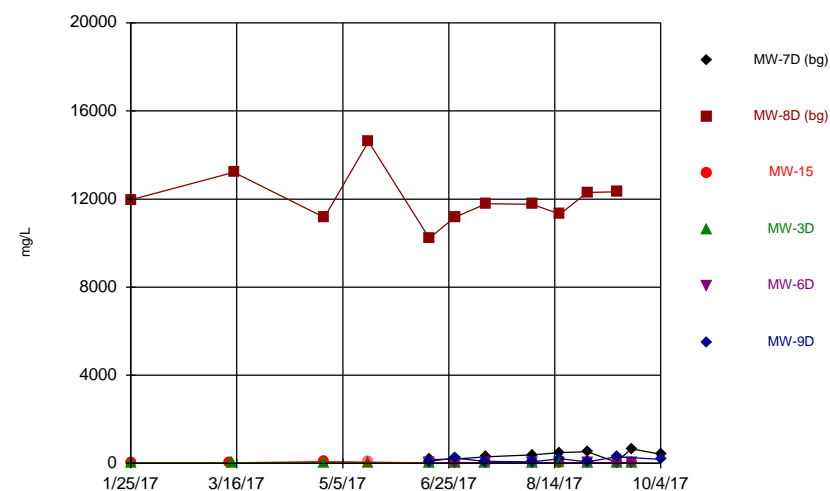
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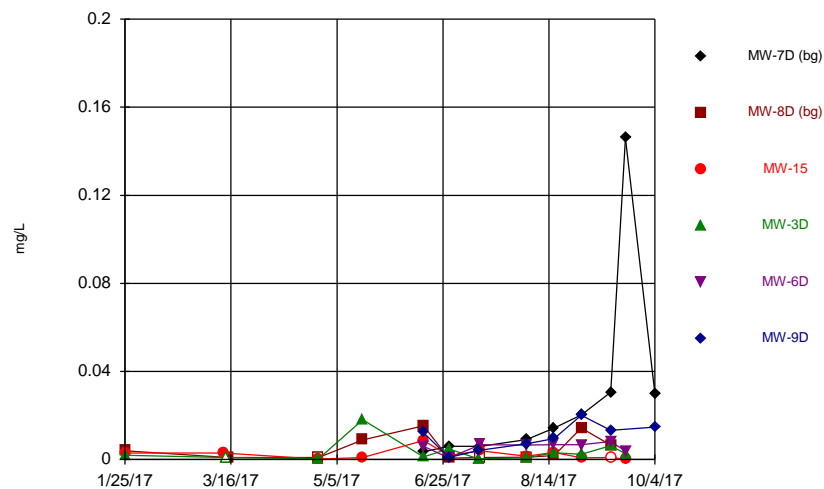
Time Series



Time Series

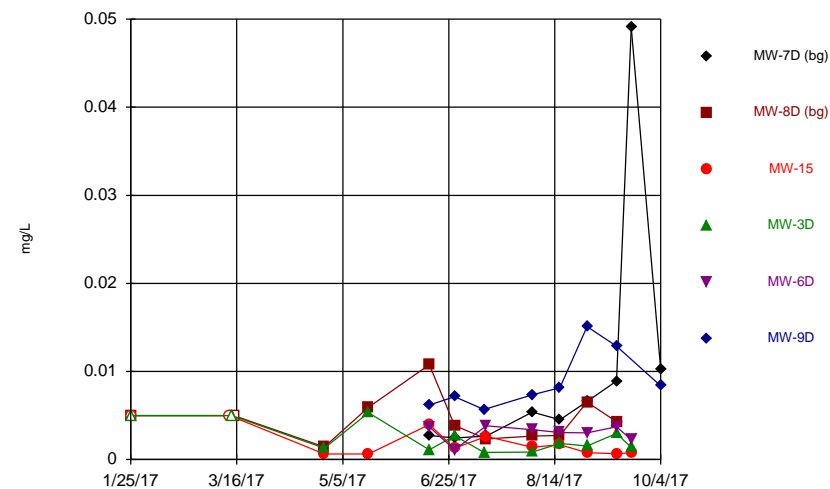


Time Series



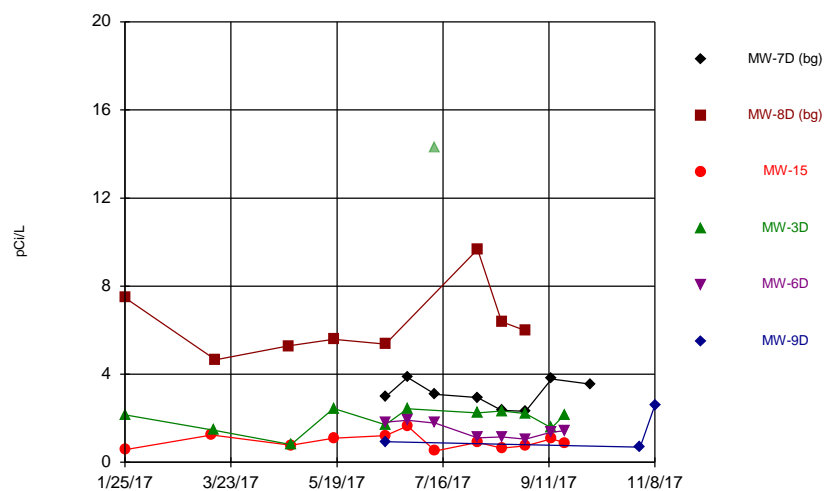
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Time Series



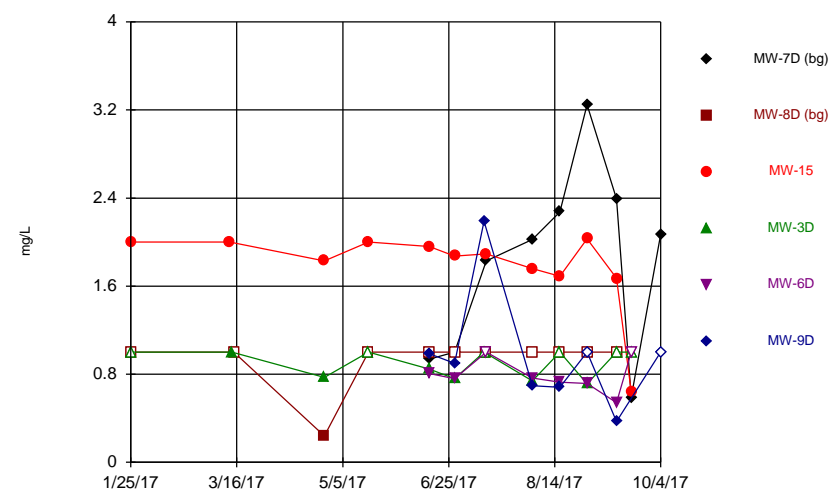
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Time Series



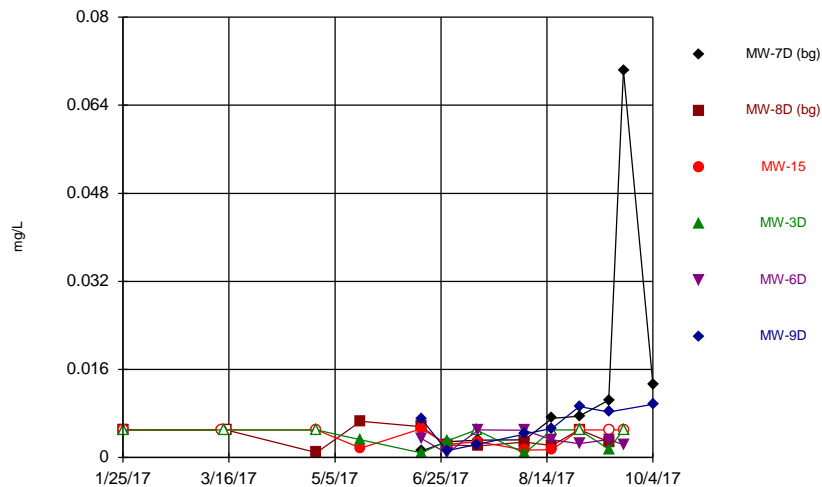
Constituent: Combined Radium 226 + 228 Analysis Run 1/3/2018 6:52 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Time Series



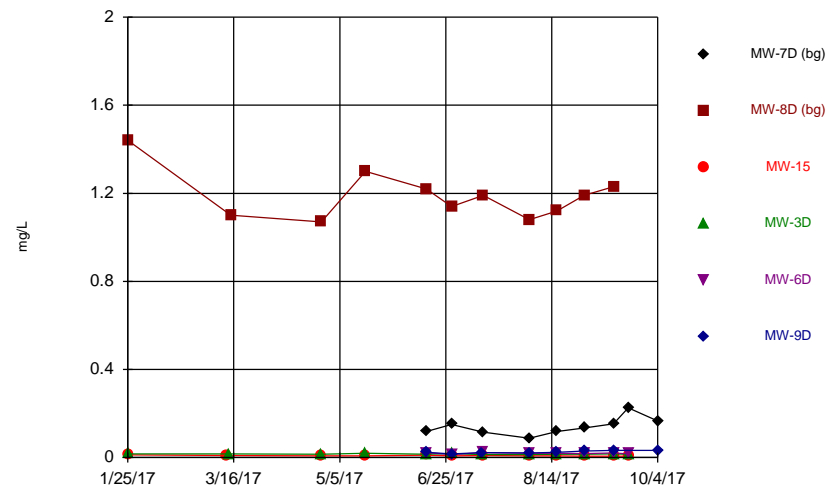
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Time Series



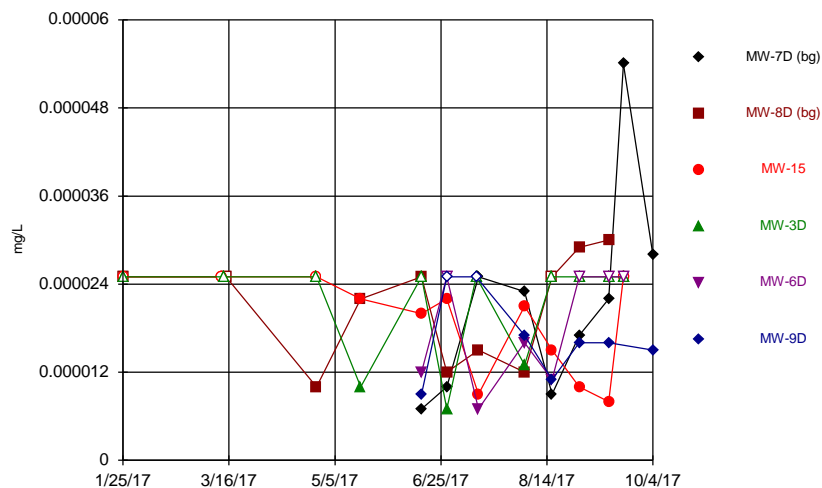
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Time Series



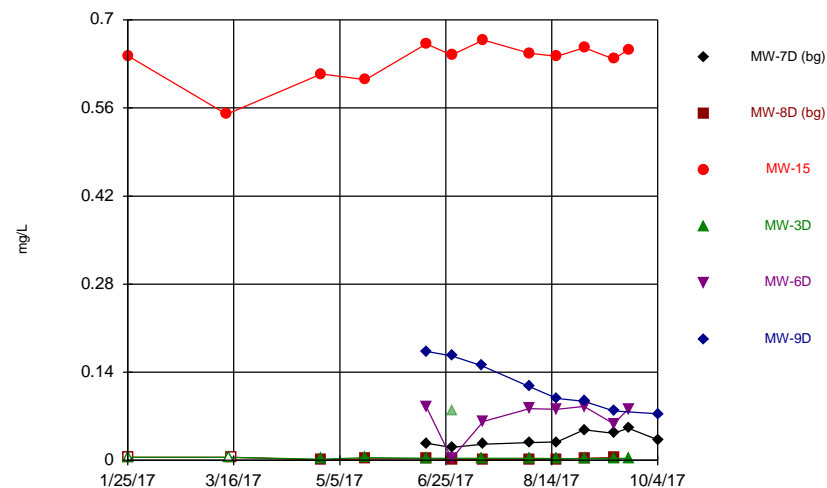
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Time Series

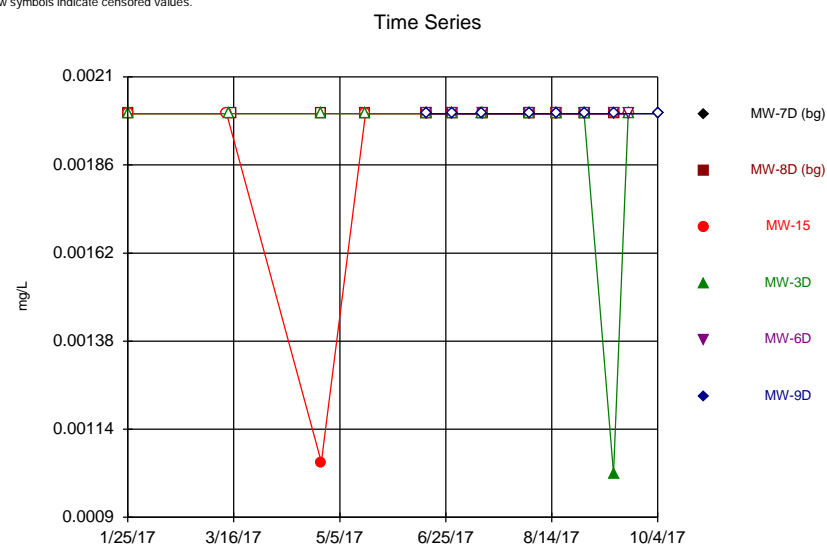
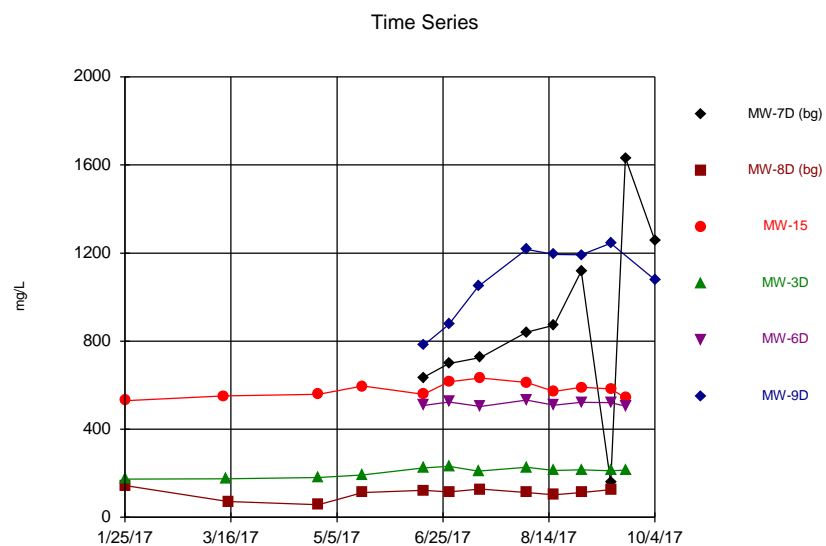
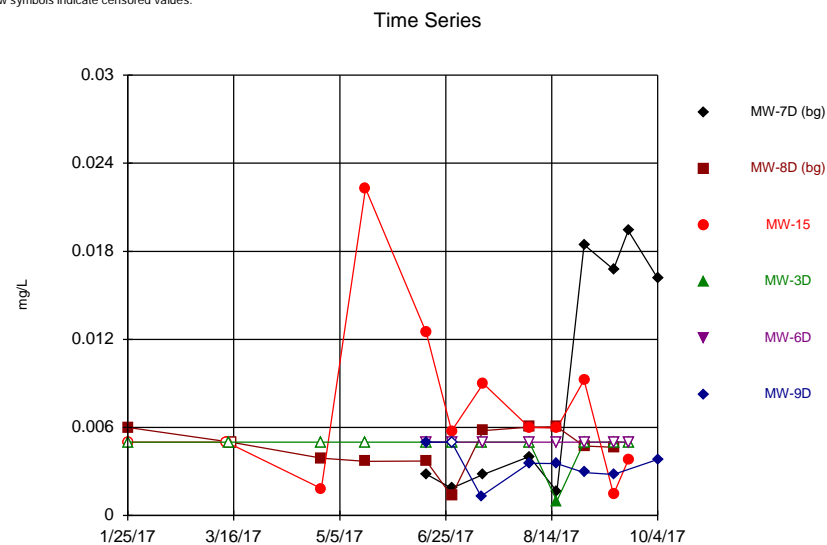
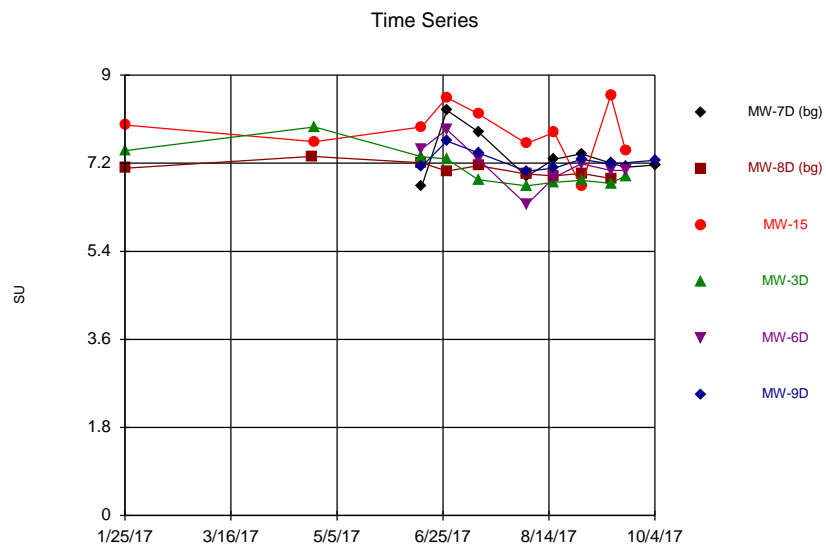


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Northeastern LF Client: Geosyntec Data: Northeastern LF

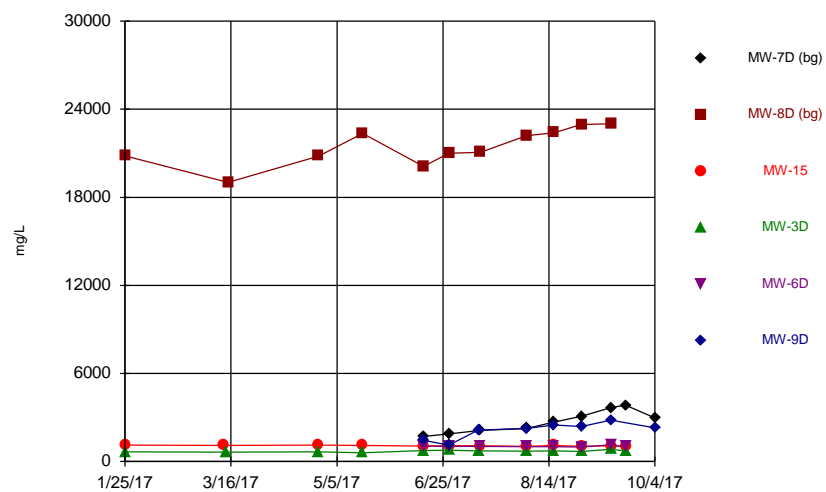
Time Series



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Northeastern LF Client: Geosyntec Data: Northeastern LF

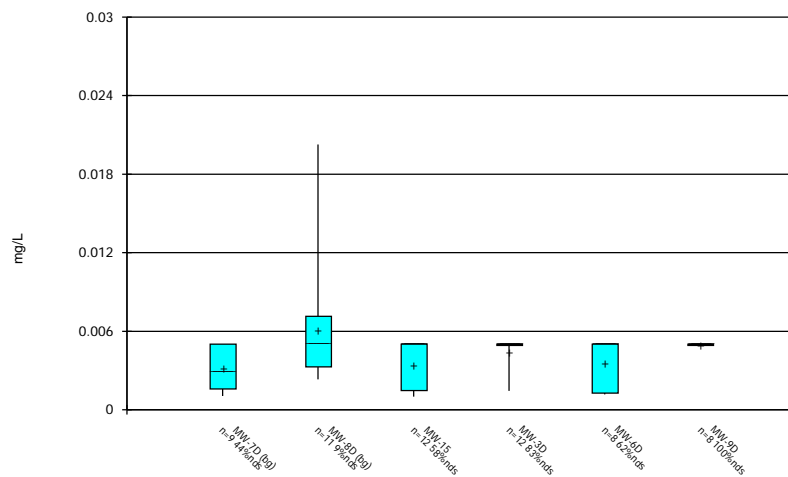


Time Series



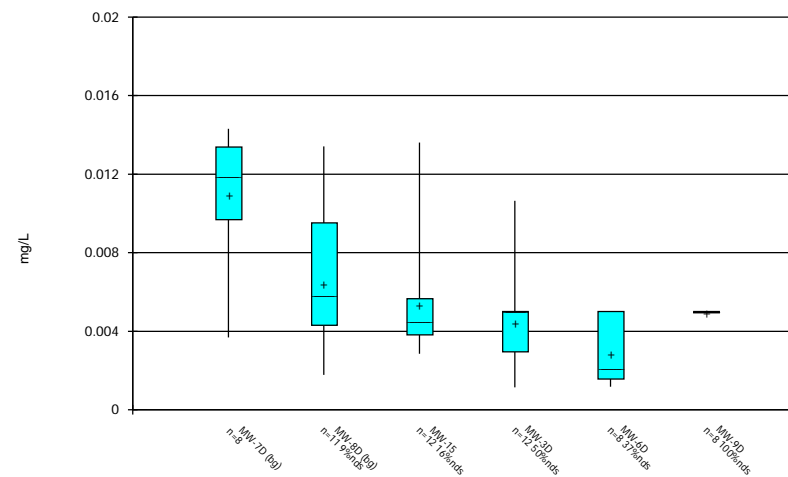
Constituent: Total Dissolve Solids [TDS] Analysis Run 1/7/2018 8:55 AM
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Box & Whiskers Plot



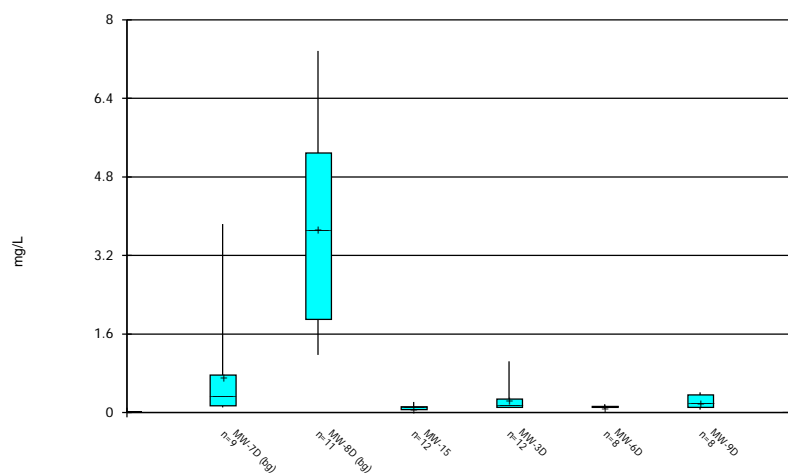
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Box & Whiskers Plot



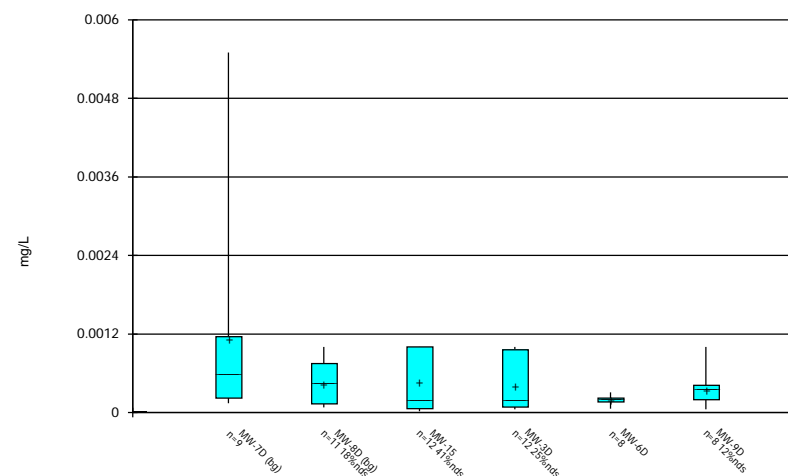
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



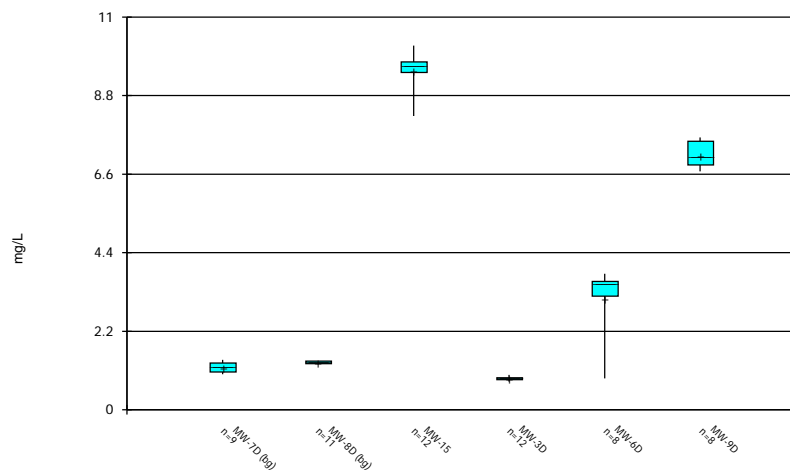
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



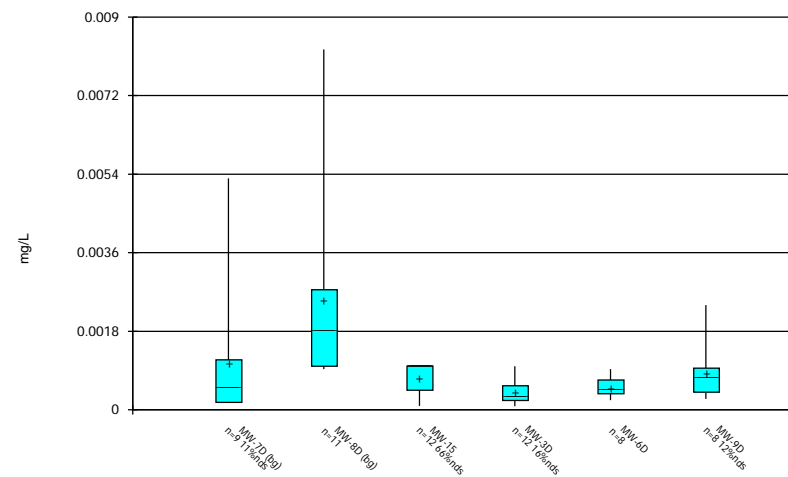
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Box & Whiskers Plot



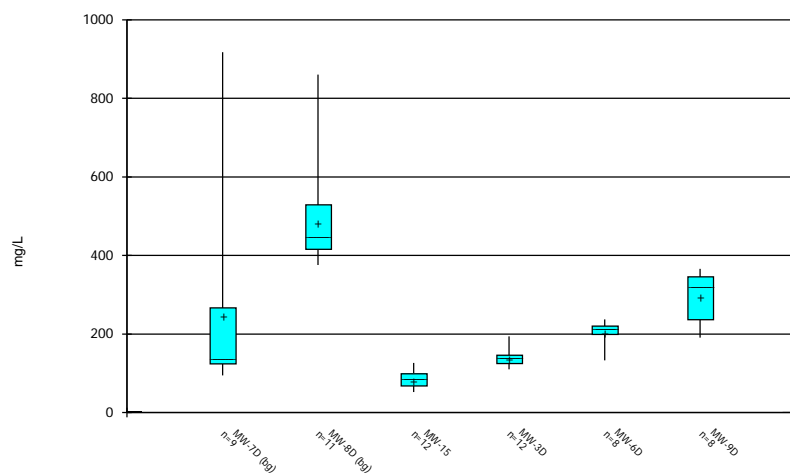
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



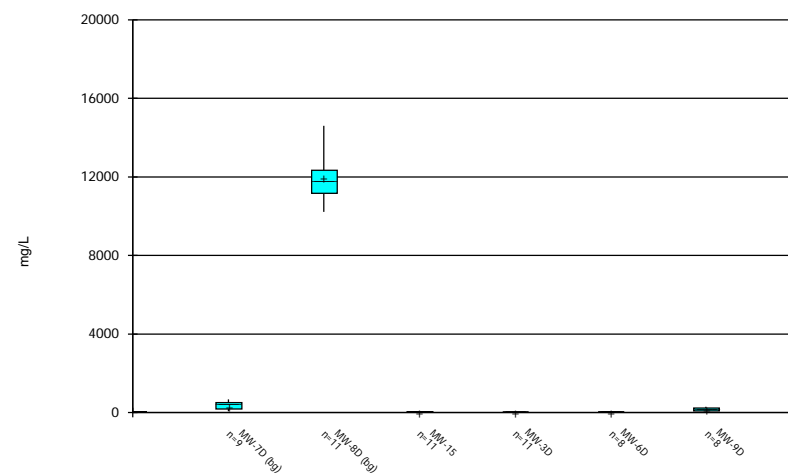
Constituent: Cadmium Analysis Run 1/7/2018 9:15 AM
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



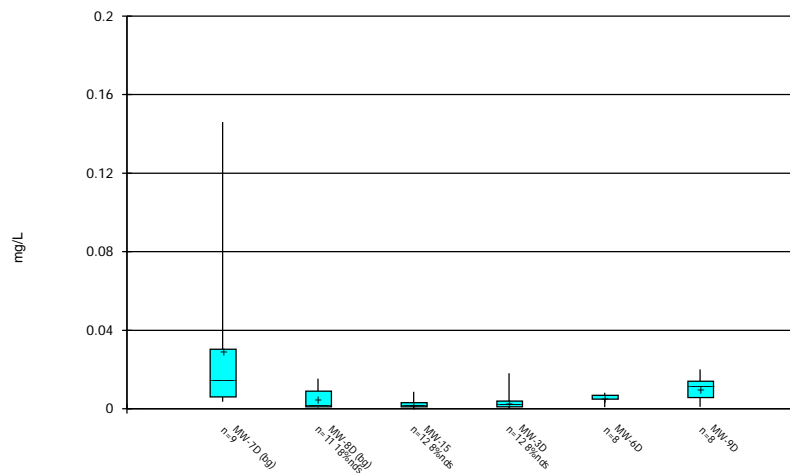
Constituent: Calcium Analysis Run 1/7/2018 9:15 AM
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



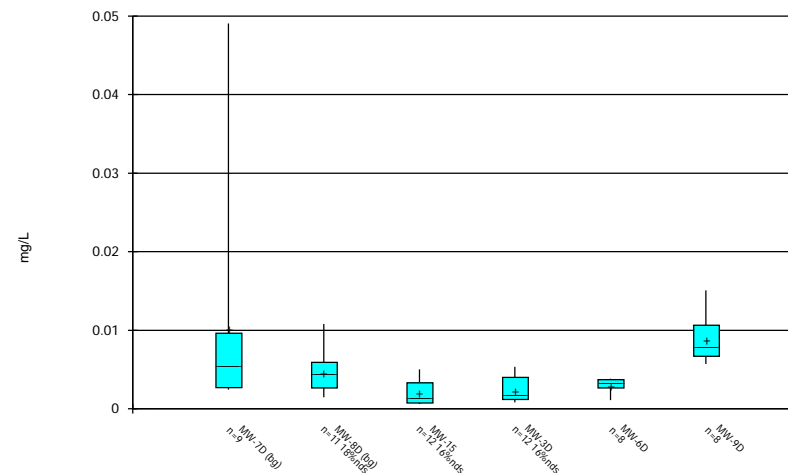
Constituent: Chloride Analysis Run 1/7/2018 9:15 AM
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



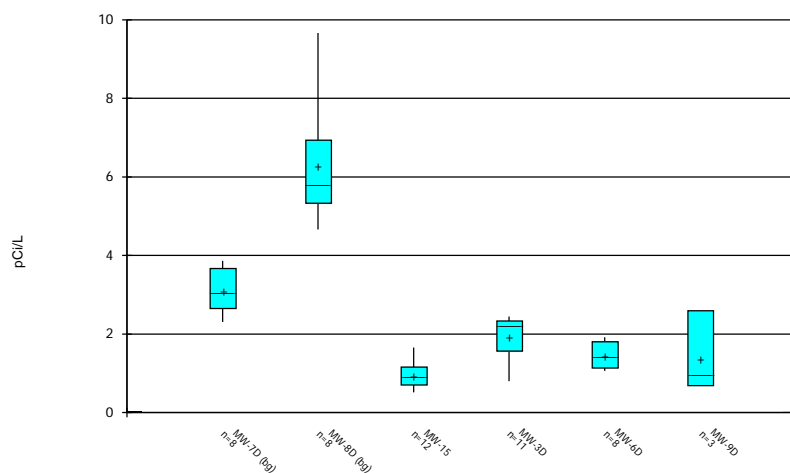
Constituent: Chromium Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



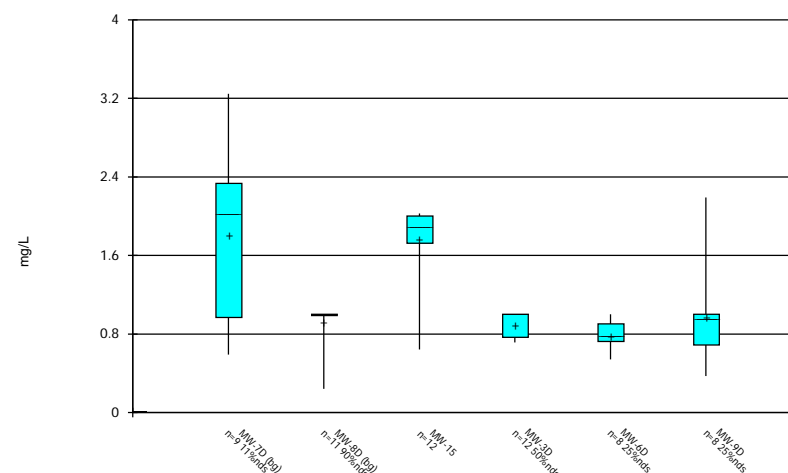
Constituent: Cobalt Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



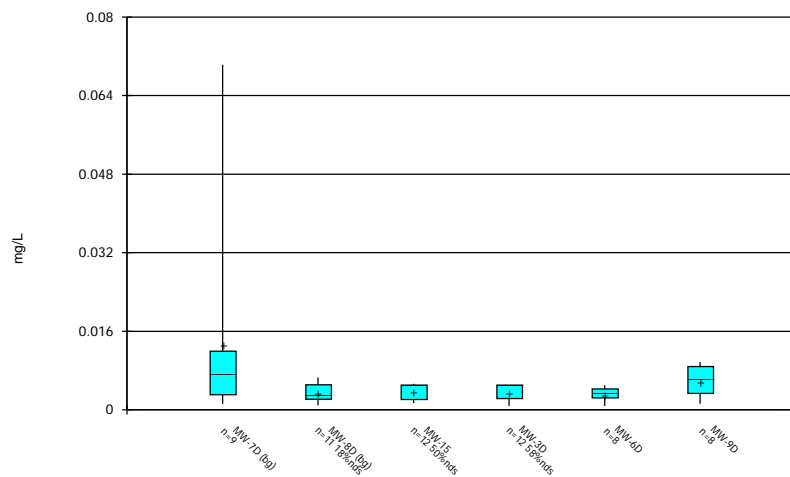
Constituent: Combined Radium 226 + 228 Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



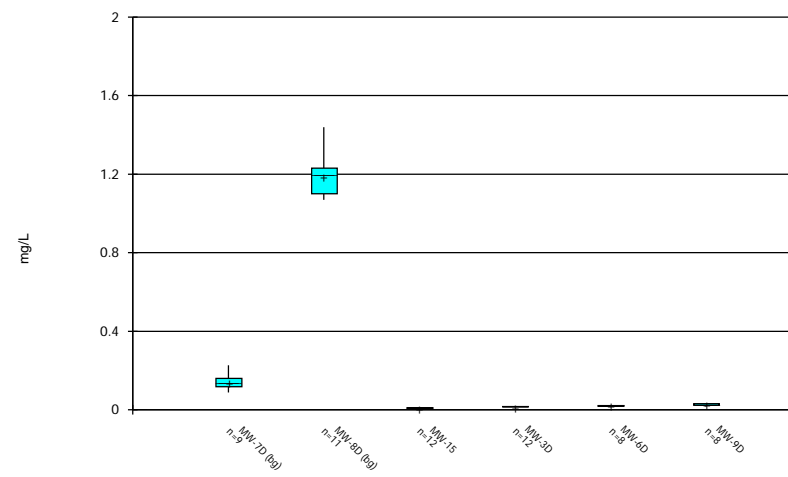
Constituent: Fluoride Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



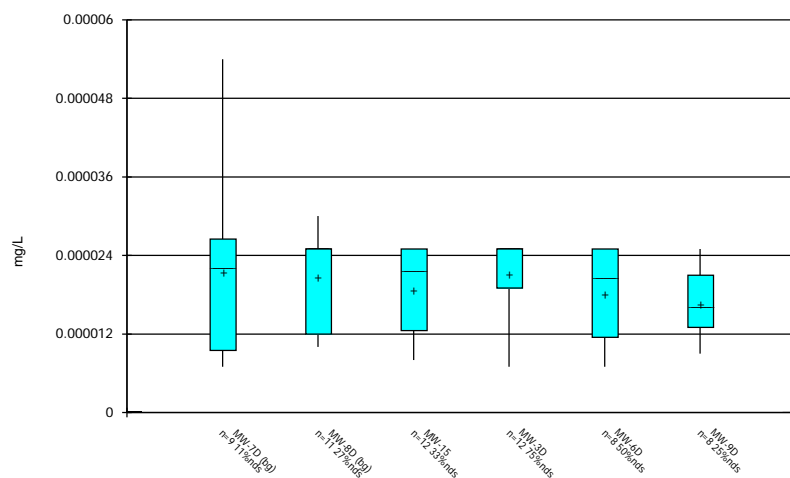
Constituent: Lead Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



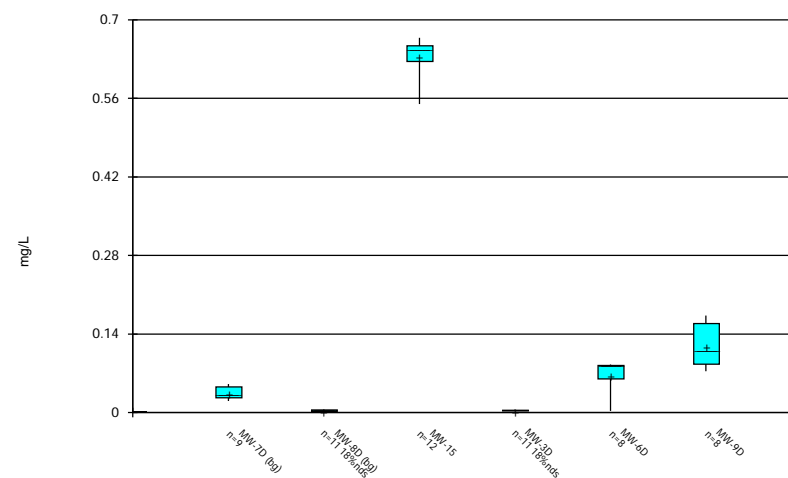
Constituent: Lithium Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



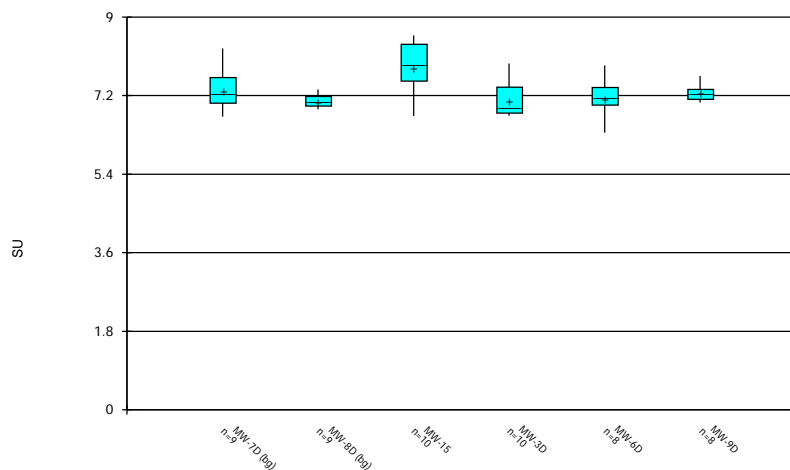
Constituent: Mercury Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



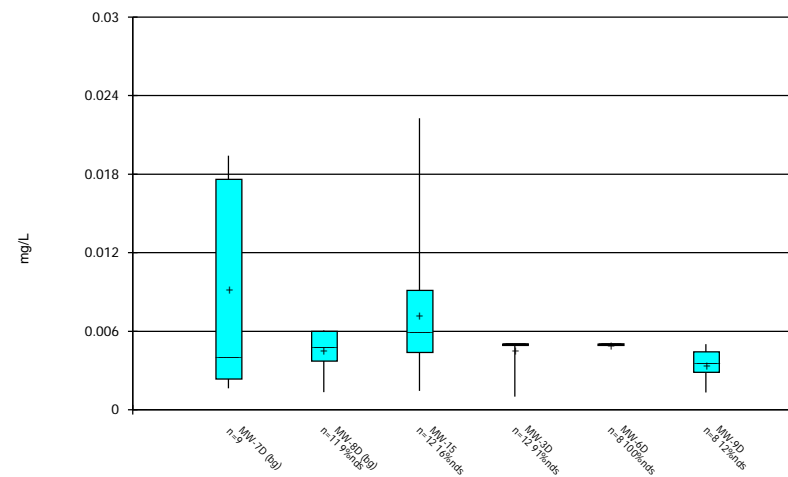
Constituent: Molybdenum Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



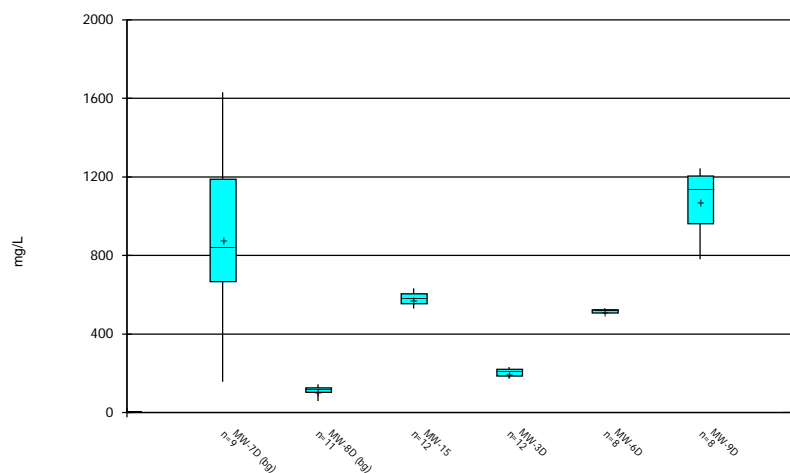
Constituent: pH, field Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



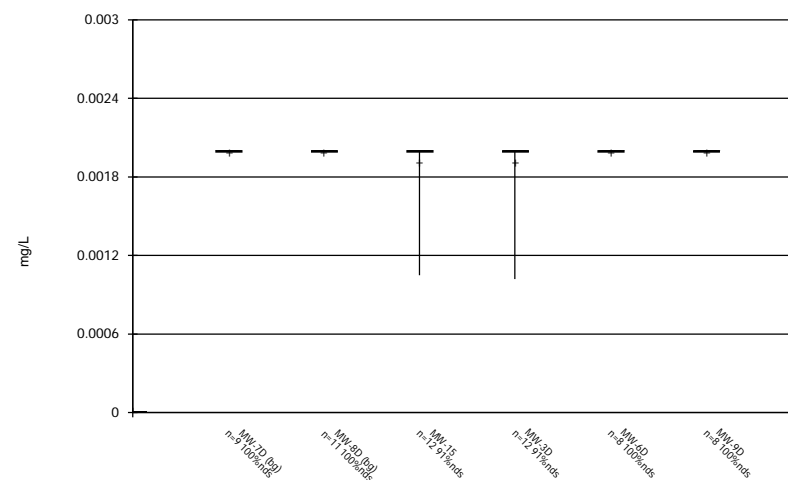
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



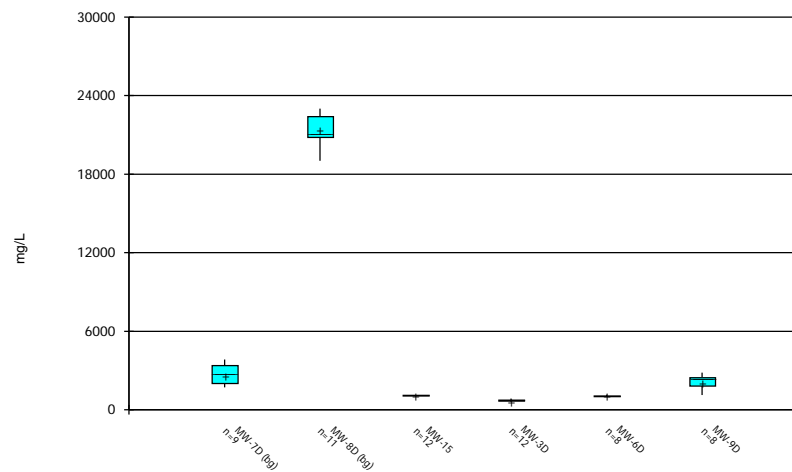
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Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



Constituent: Thallium Analysis Run 1/3/2018 9:01 PM View: Time Series
Northeastern LF Client: Geosyntec Data: Northeastern LF

Box & Whiskers Plot



Constituent: Total Dissolve Solids [TDS] Analysis Run 1/7/2018 8:56 AM
Northeastern LF Client: Geosyntec Data: Northeastern LF

Outlier Summary Table

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/7/2018, 9:35 AM

	MW-7D Arsenic (mg/L)	MW-15 Chloride (mg/L)	MW-3D Chloride (mg/L)	MW-3D Combined Radium 226 + 228 (pCi/L)	MW-3D Molybdenum (mg/L)
5/18/2017	111 (o)				
6/28/2017				0.07928 (o)	
7/12/2017			14.283 (o)		
8/17/2017		23 (o)			
9/20/2017	0.07314 (o)				

Outlier Analysis - Upgradient Wells

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/2/2018, 10:14 PM

Constituent	Well	Outlier	Value(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.00481	0.004077	ln(x)	ShapiroWilk
Arsenic (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.01161	0.01501	ln(x)	ShapiroWilk
Barium (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	2.401	2.318	x^(1/3)	ShapiroWilk
Beryllium (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.000769	0.001171	ln(x)	ShapiroWilk
Boron (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	1.261	0.1194	unknown	ShapiroWilk
Cadmium (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.001896	0.002079	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	379.7	230.8	x^(1/3)	ShapiroWilk
Chloride (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	6752	5998	unknown	ShapiroWilk
Chromium (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.01608	0.03191	ln(x)	ShapiroWilk
Cobalt (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.007158	0.01021	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	MW-7D,MW-8D	No	n/a	NP	16	4.705	2.021	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	1.33	0.7279	unknown	ShapiroWilk
Lead (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.007991	0.015	ln(x)	ShapiroWilk
Lithium (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	0.7175	0.5414	unknown	ShapiroWilk
Mercury (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.00002125	0.00001067	ln(x)	ShapiroWilk
Molybdenum (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	0.01682	0.01741	unknown	ShapiroWilk
pH, field (SU)	MW-7D,MW-8D	No	n/a	NP	18	7.198	0.3633	ln(x)	ShapiroWilk
Selenium (mg/L)	MW-7D,MW-8D	No	n/a	NP	20	0.006742	0.005823	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	457	479.2	unknown	ShapiroWilk
Thallium (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	0.002	0	unknown	ShapiroWilk
Total Dissolve Solids [TDS] (mg/L)	MW-7D,MW-8D	No	n/a	NP (nrm)	20	12998	9623	unknown	ShapiroWilk

Outlier Analysis - Significant Results Individual Upgradient Wells

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/3/2018, 6:04 PM

<u>Constituent</u>	<u>Well</u>	<u>Outlier</u>	<u>Value(s)</u>	<u>Method</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Distribution</u>	<u>Normality Test</u>
Arsenic (mg/L)	MW-7D (bg)	Yes	0.07314	NP	9	0.01788	0.02098	In(x)	ShapiroWilk

Outlier Analysis - Significant Downgradient Results

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/7/2018, 9:33 AM

<u>Constituent</u>	<u>Well</u>	<u>Outlier</u>	<u>Value(s)</u>	<u>Method</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Distribution</u>	<u>Normality Test</u>
Chloride (mg/L)	MW-15	Yes	111	NP	12	32.25	30.12	In(x)	ShapiroWilk
Chloride (mg/L)	MW-3D	Yes	23	NP	12	13.58	3.288	In(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	MW-3D	Yes	14.28	NP	12	2.982	3.592	In(x)	ShapiroWilk
Molybdenum (mg/L)	MW-3D	Yes	0.07928	NP	12	0.0097	0.02193	In(x)	ShapiroWilk

Outlier Analysis - All Downgradient Results

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/7/2018, 9:33 AM

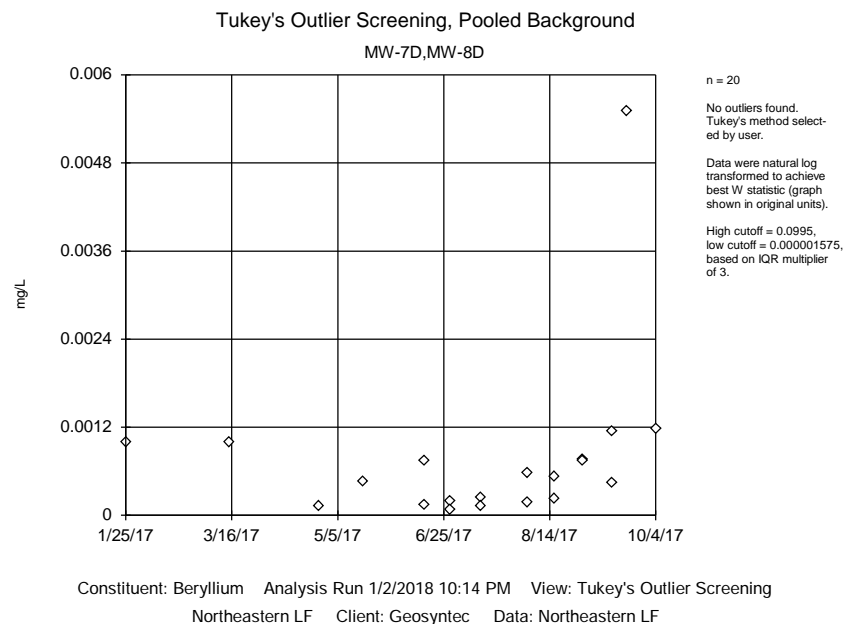
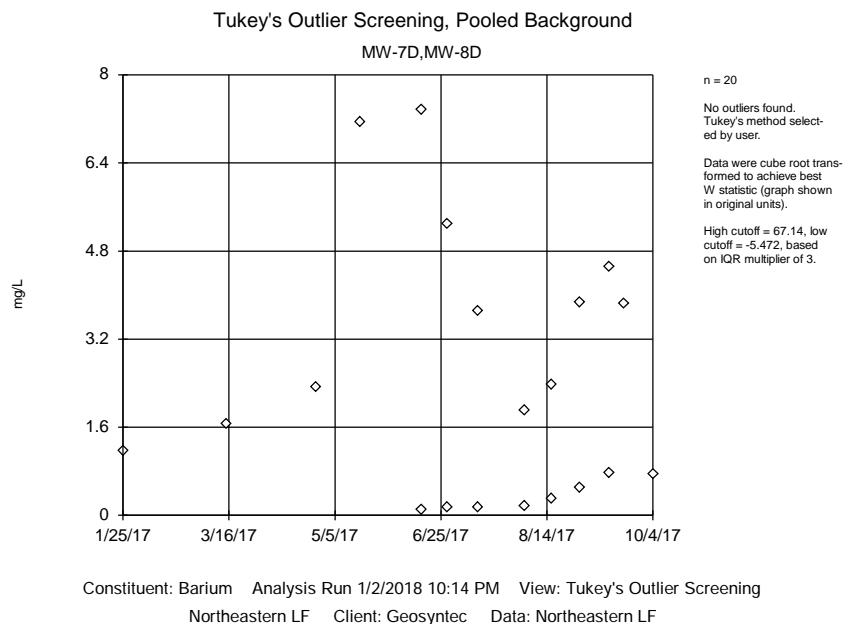
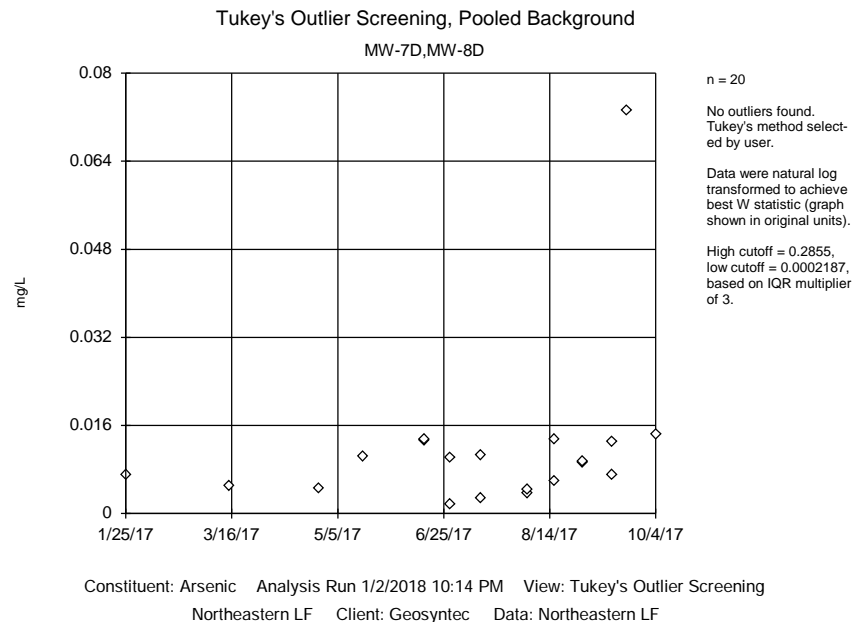
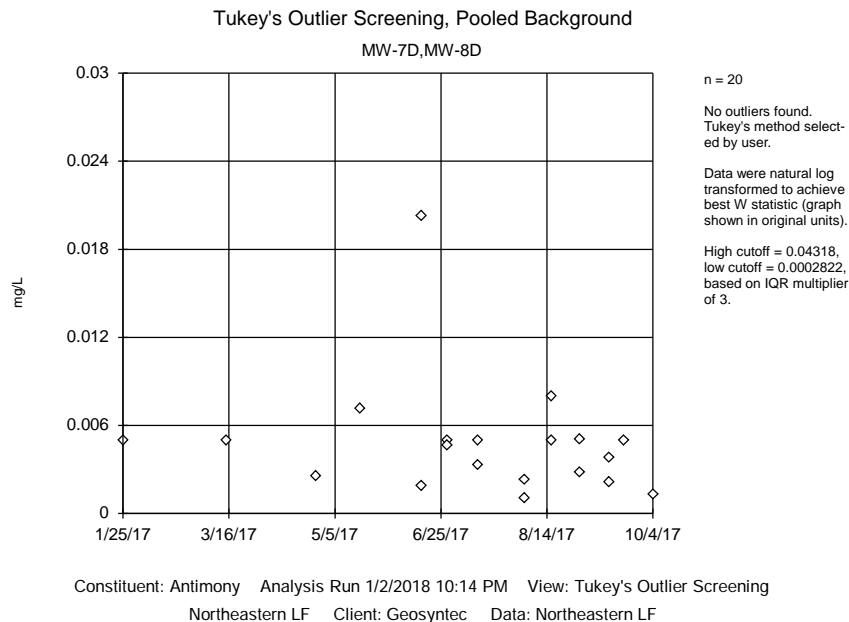
Constituent	Well	Outlier	Value(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony (mg/L)	MW-15	No	n/a	NP (nrm)	12	0.003489	0.001873	unknown	ShapiroWilk
Antimony (mg/L)	MW-3D	No	n/a	NP (nrm)	12	0.004422	0.001349	unknown	ShapiroWilk
Antimony (mg/L)	MW-6D	No	n/a	NP (nrm)	8	0.00359	0.001946	unknown	ShapiroWilk
Antimony (mg/L)	MW-9D	No	n/a	NP (nrm)	8	0.005	0	unknown	ShapiroWilk
Arsenic (mg/L)	MW-15	No	n/a	NP	12	0.005394	0.002875	ln(x)	ShapiroWilk
Arsenic (mg/L)	MW-3D	No	n/a	NP (nrm)	12	0.004473	0.002424	unknown	ShapiroWilk
Arsenic (mg/L)	MW-6D	No	n/a	NP	8	0.002919	0.001756	ln(x)	ShapiroWilk
Arsenic (mg/L)	MW-9D	No	n/a	NP (nrm)	8	0.005	0	unknown	ShapiroWilk
Barium (mg/L)	MW-15	No	n/a	NP	12	0.09759	0.0489	ln(x)	ShapiroWilk
Barium (mg/L)	MW-3D	No	n/a	NP	12	0.2538	0.2682	ln(x)	ShapiroWilk
Barium (mg/L)	MW-6D	No	n/a	NP	8	0.1131	0.02738	ln(x)	ShapiroWilk
Barium (mg/L)	MW-9D	No	n/a	NP	8	0.222	0.1398	x^(1/3)	ShapiroWilk
Beryllium (mg/L)	MW-15	No	n/a	NP (nrm)	12	0.0004692	0.0004722	unknown	ShapiroWilk
Beryllium (mg/L)	MW-3D	No	n/a	NP	12	0.0004217	0.00042	ln(x)	ShapiroWilk
Beryllium (mg/L)	MW-6D	No	n/a	NP	8	0.0001925	0.00007226	normal	ShapiroWilk
Beryllium (mg/L)	MW-9D	No	n/a	NP	8	0.00037	0.0002851	x^(1/3)	ShapiroWilk
Boron (mg/L)	MW-15	No	n/a	NP	12	9.52	0.482	x^6	ShapiroWilk
Boron (mg/L)	MW-3D	No	n/a	NP	12	0.8698	0.04713	ln(x)	ShapiroWilk
Boron (mg/L)	MW-6D	No	n/a	NP	8	3.156	0.9525	x^6	ShapiroWilk
Boron (mg/L)	MW-9D	No	n/a	NP	8	7.146	0.3683	ln(x)	ShapiroWilk
Cadmium (mg/L)	MW-15	No	n/a	NP (nrm)	12	0.0007567	0.0003841	unknown	ShapiroWilk
Cadmium (mg/L)	MW-3D	No	n/a	NP	12	0.000425	0.0003052	ln(x)	ShapiroWilk
Cadmium (mg/L)	MW-6D	No	n/a	NP	8	0.0005213	0.0002371	ln(x)	ShapiroWilk
Cadmium (mg/L)	MW-9D	No	n/a	NP	8	0.0008563	0.0006827	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-15	No	n/a	NP	12	84.28	21.28	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-3D	No	n/a	NP	12	138.7	23.13	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-6D	No	n/a	NP	8	203.5	31.18	x^6	ShapiroWilk
Calcium (mg/L)	MW-9D	No	n/a	NP	8	294.1	64.61	x^4	ShapiroWilk
Chloride (mg/L)	MW-15	Yes	111	NP	12	32.25	30.12	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-3D	Yes	23	NP	12	13.58	3.288	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-6D	No	n/a	NP	8	30.25	1.389	sqrt(x)	ShapiroWilk
Chloride (mg/L)	MW-9D	No	n/a	NP	8	155.4	86.93	sqrt(x)	ShapiroWilk
Chromium (mg/L)	MW-15	No	n/a	NP	12	0.002373	0.002321	x^(1/3)	ShapiroWilk
Chromium (mg/L)	MW-3D	No	n/a	NP	12	0.0036	0.004898	ln(x)	ShapiroWilk
Chromium (mg/L)	MW-6D	No	n/a	NP	8	0.005719	0.002302	x^3	ShapiroWilk
Chromium (mg/L)	MW-9D	No	n/a	NP	8	0.01027	0.00617	normal	ShapiroWilk
Cobalt (mg/L)	MW-15	No	n/a	NP	12	0.002037	0.001699	ln(x)	ShapiroWilk
Cobalt (mg/L)	MW-3D	No	n/a	NP	12	0.002484	0.001713	ln(x)	ShapiroWilk
Cobalt (mg/L)	MW-6D	No	n/a	NP	8	0.003014	0.0009294	x^4	ShapiroWilk
Cobalt (mg/L)	MW-9D	No	n/a	NP	8	0.008858	0.003339	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	MW-15	No	n/a	NP	12	0.9451	0.3271	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	MW-3D	Yes	14.28	NP	12	2.982	3.592	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	MW-6D	No	n/a	NP	8	1.457	0.3437	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-15	No	n/a	NP	12	1.779	0.3789	x^6	ShapiroWilk
Fluoride (mg/L)	MW-3D	No	n/a	NP (nrm)	12	0.9024	0.1244	unknown	ShapiroWilk
Fluoride (mg/L)	MW-6D	No	n/a	NP	8	0.7895	0.1518	x^(1/3)	ShapiroWilk
Fluoride (mg/L)	MW-9D	No	n/a	NP	8	0.9776	0.5368	ln(x)	ShapiroWilk
Lead (mg/L)	MW-15	No	n/a	NP (nrm)	12	0.003753	0.001635	unknown	ShapiroWilk
Lead (mg/L)	MW-3D	No	n/a	NP (nrm)	12	0.003701	0.001753	unknown	ShapiroWilk
Lead (mg/L)	MW-6D	No	n/a	NP	8	0.003195	0.001395	normal	ShapiroWilk
Lead (mg/L)	MW-9D	No	n/a	NP	8	0.005931	0.00316	normal	ShapiroWilk
Lithium (mg/L)	MW-15	No	n/a	NP	12	0.008383	0.001941	ln(x)	ShapiroWilk
Lithium (mg/L)	MW-3D	No	n/a	NP	12	0.01577	0.001757	ln(x)	ShapiroWilk
Lithium (mg/L)	MW-6D	No	n/a	NP	8	0.01911	0.00291	x^3	ShapiroWilk
Lithium (mg/L)	MW-9D	No	n/a	NP	8	0.02532	0.005668	sqrt(x)	ShapiroWilk

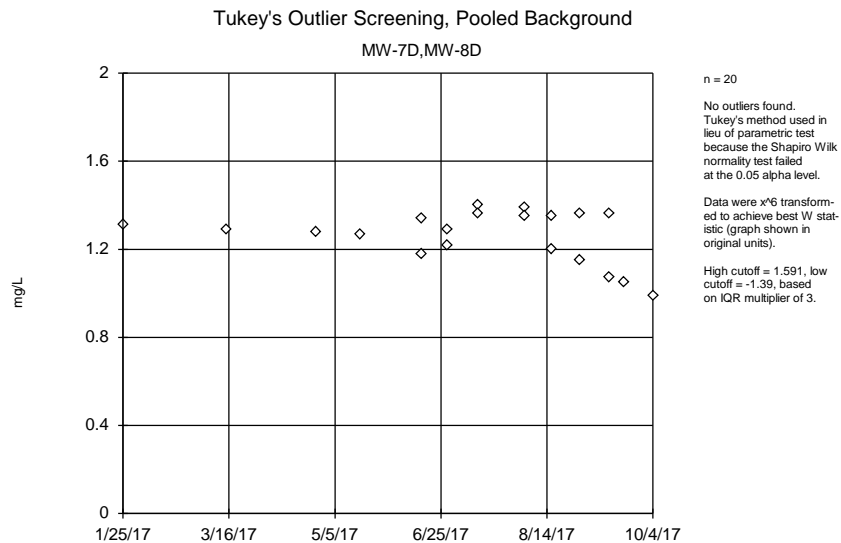
Outlier Analysis - All Downgradient Results

Page 2

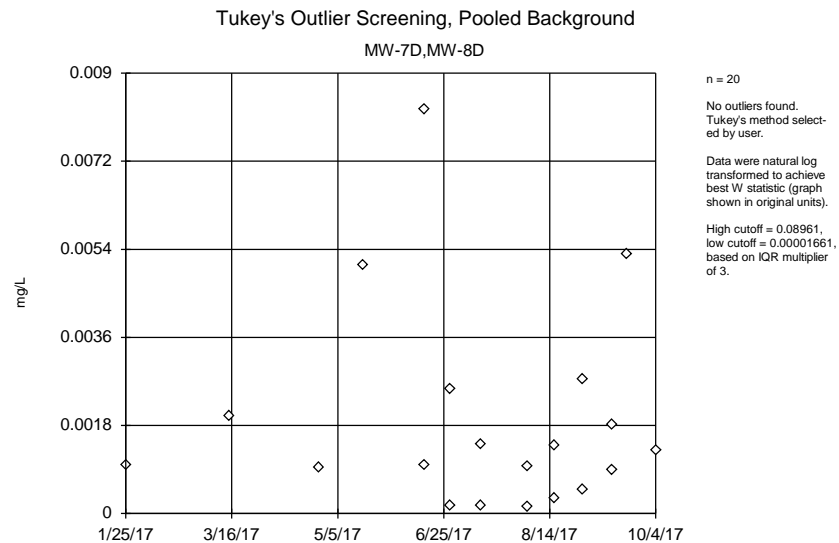
Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/7/2018, 9:33 AM

Constituent	Well	Outlier	Value(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Mercury (mg/L)	MW-15	No	n/a	NP (nrm)	12	0.00001892	0.00000664	unknown	ShapiroWilk
Mercury (mg/L)	MW-3D	No	n/a	NP (nrm)	12	0.00002125	0.000006904	unknown	ShapiroWilk
Mercury (mg/L)	MW-6D	No	n/a	NP	8	0.00001825	0.000007611	ln(x)	ShapiroWilk
Mercury (mg/L)	MW-9D	No	n/a	NP	8	0.00001675	0.000005776	ln(x)	ShapiroWilk
Molybdenum (mg/L)	MW-15	No	n/a	NP	12	0.6351	0.03228	x^6	ShapiroWilk
Molybdenum (mg/L)	MW-3D	Yes	0.07928	NP	12	0.0097	0.02193	ln(x)	ShapiroWilk
Molybdenum (mg/L)	MW-6D	No	n/a	NP (nrm)	8	0.06722	0.02812	unknown	ShapiroWilk
Molybdenum (mg/L)	MW-9D	No	n/a	NP	8	0.1189	0.03949	ln(x)	ShapiroWilk
pH, field (SU)	MW-15	No	n/a	NP	10	7.852	0.5446	x^4	ShapiroWilk
pH, field (SU)	MW-3D	No	n/a	NP	10	7.101	0.3915	ln(x)	ShapiroWilk
pH, field (SU)	MW-6D	No	n/a	NP	8	7.153	0.4475	x^2	ShapiroWilk
pH, field (SU)	MW-9D	No	n/a	NP	8	7.256	0.1972	ln(x)	ShapiroWilk
Selenium (mg/L)	MW-15	No	n/a	NP	12	0.007312	0.005647	ln(x)	ShapiroWilk
Selenium (mg/L)	MW-3D	No	n/a	NP (nrm)	12	0.004667	0.001155	unknown	ShapiroWilk
Selenium (mg/L)	MW-6D	No	n/a	NP (nrm)	8	0.005	0	unknown	ShapiroWilk
Selenium (mg/L)	MW-9D	No	n/a	NP	8	0.003499	0.001205	normal	ShapiroWilk
Sulfate (mg/L)	MW-15	No	n/a	NP	12	578.6	31.72	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-3D	No	n/a	NP	12	205.9	20.34	x^6	ShapiroWilk
Sulfate (mg/L)	MW-6D	No	n/a	NP	8	515.6	10.41	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-9D	No	n/a	NP	8	1079	170.3	x^6	ShapiroWilk
Thallium (mg/L)	MW-15	No	n/a	NP (nrm)	12	0.001921	0.0002742	unknown	ShapiroWilk
Thallium (mg/L)	MW-3D	No	n/a	NP (nrm)	12	0.001918	0.0002829	unknown	ShapiroWilk
Thallium (mg/L)	MW-6D	No	n/a	NP (nrm)	8	0.002	0	unknown	ShapiroWilk
Thallium (mg/L)	MW-9D	No	n/a	NP (nrm)	8	0.002	0	unknown	ShapiroWilk
Total Dissolve Solids [TDS] (mg/L)	MW-15	No	n/a	NP	12	1079	32.67	x^6	ShapiroWilk
Total Dissolve Solids [TDS] (mg/L)	MW-3D	No	n/a	NP	12	709	64.4	ln(x)	ShapiroWilk
Total Dissolve Solids [TDS] (mg/L)	MW-6D	No	n/a	NP	8	1037	46.63	ln(x)	ShapiroWilk
Total Dissolve Solids [TDS] (mg/L)	MW-9D	No	n/a	NP	8	2122	561.5	x^3	ShapiroWilk

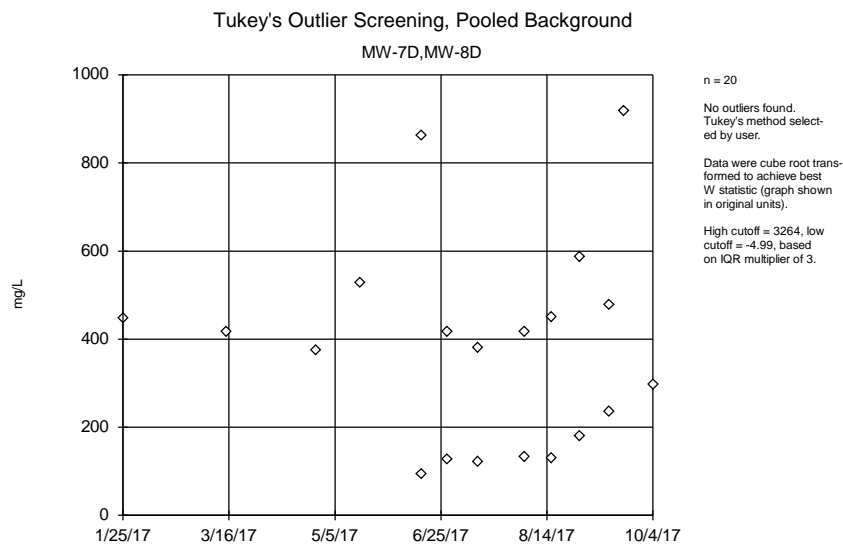




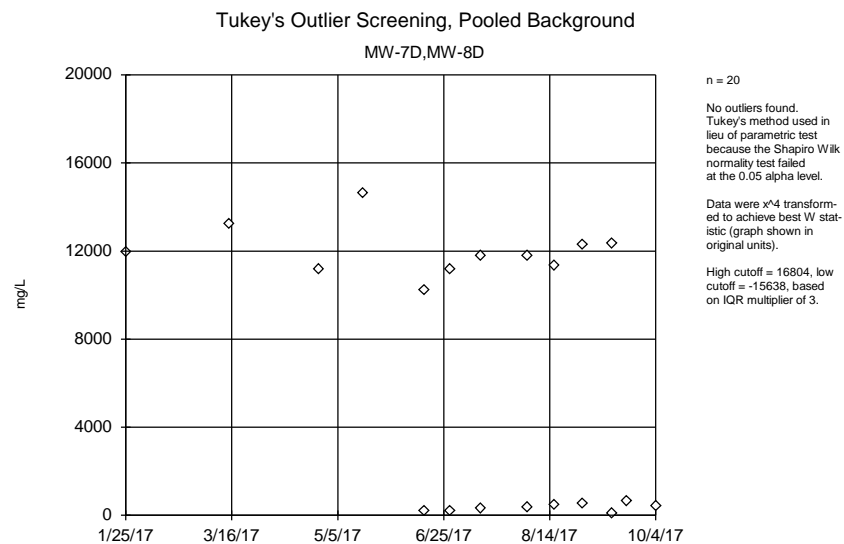
Constituent: Boron Analysis Run 1/2/2018 10:14 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



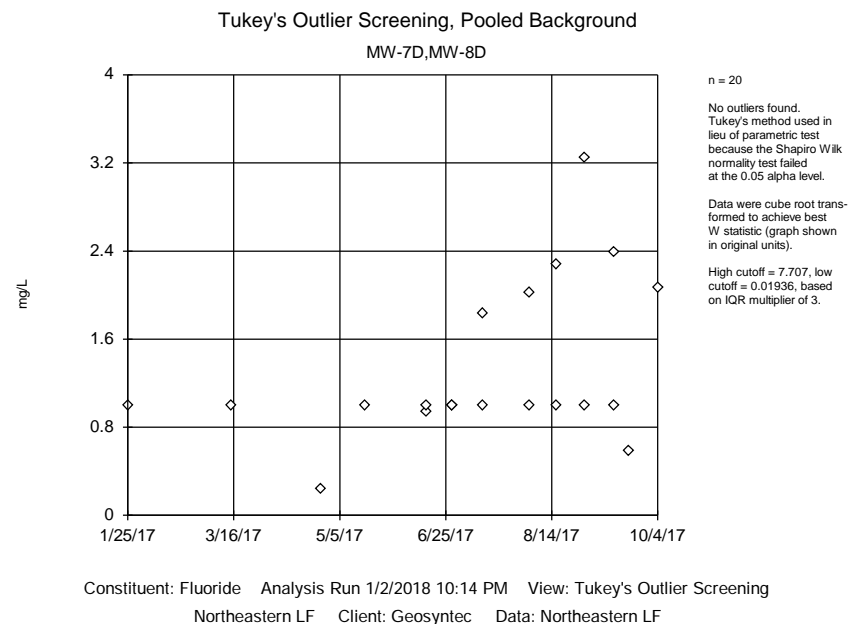
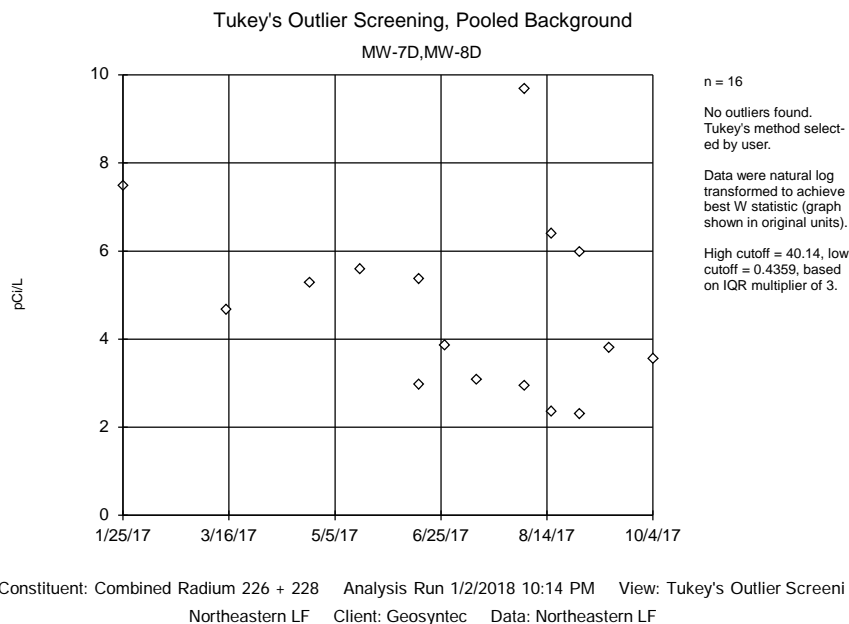
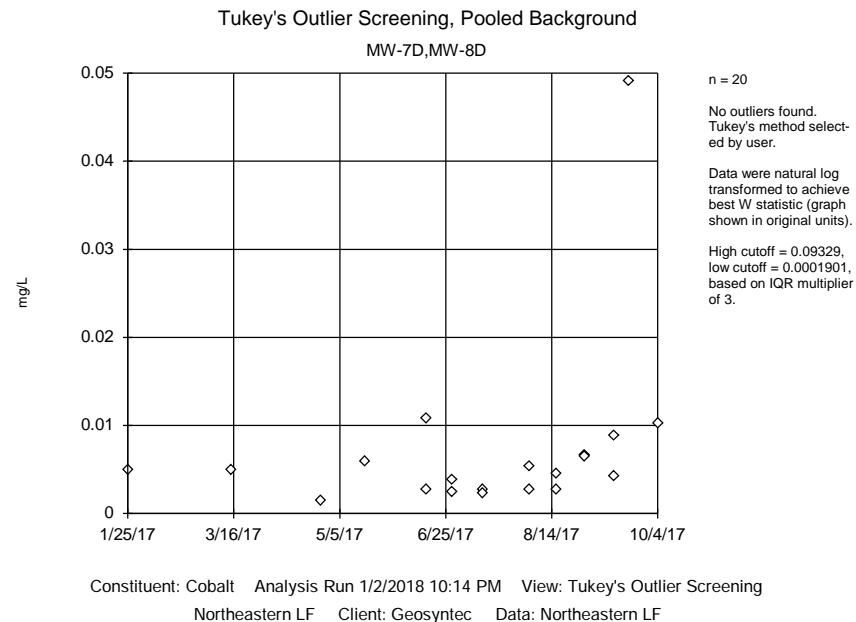
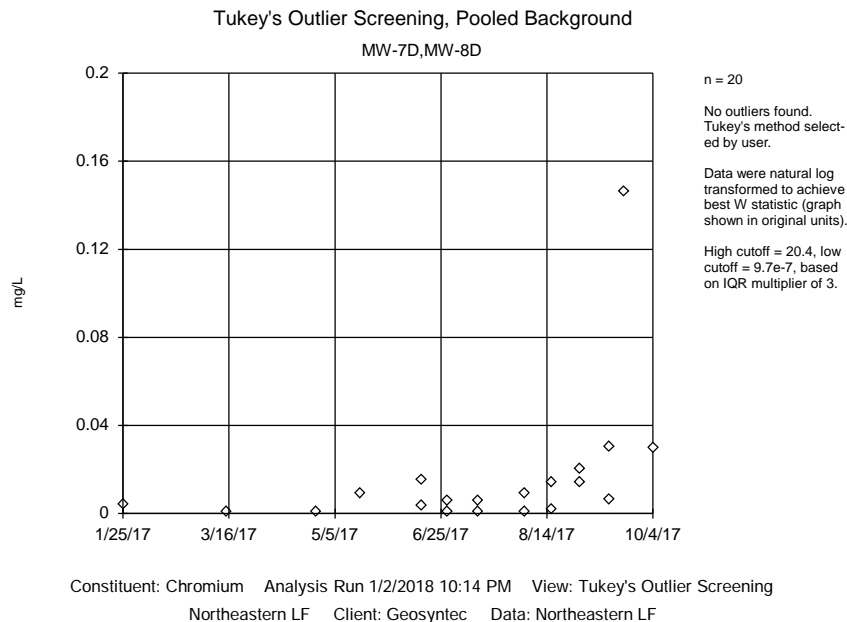
Constituent: Cadmium Analysis Run 1/2/2018 10:14 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

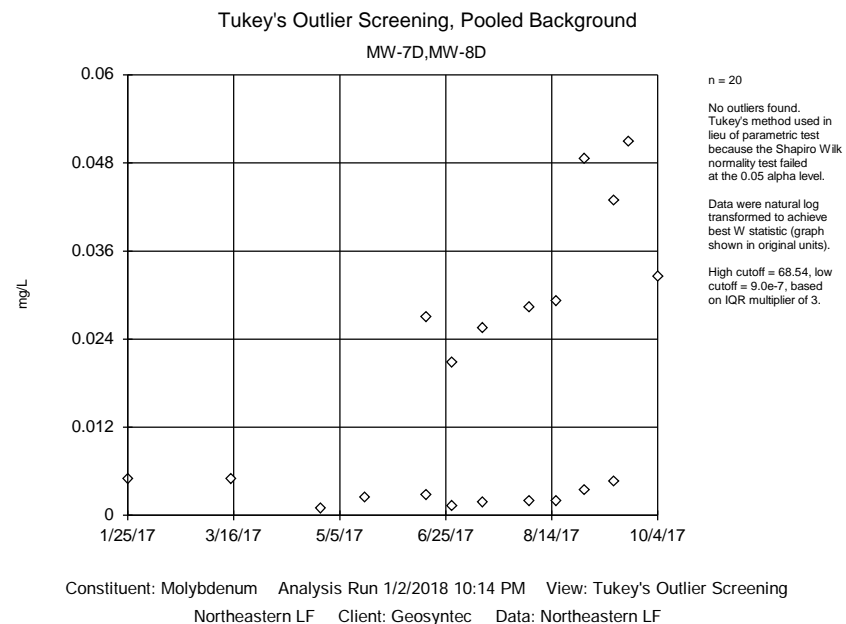
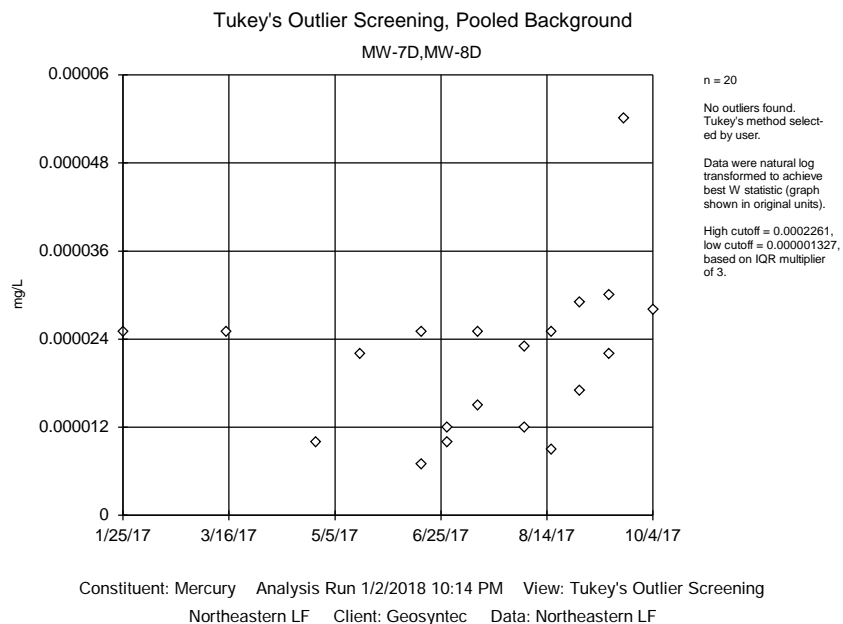
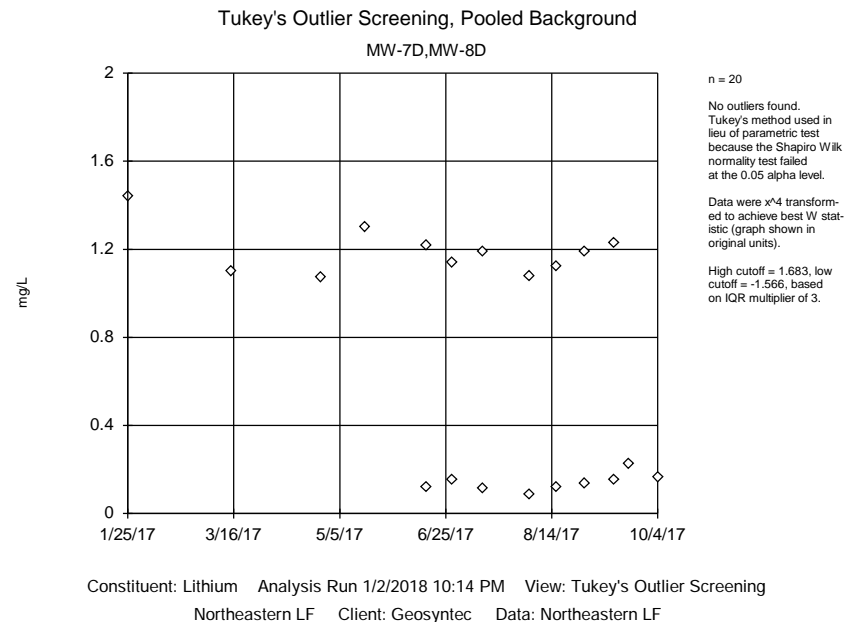
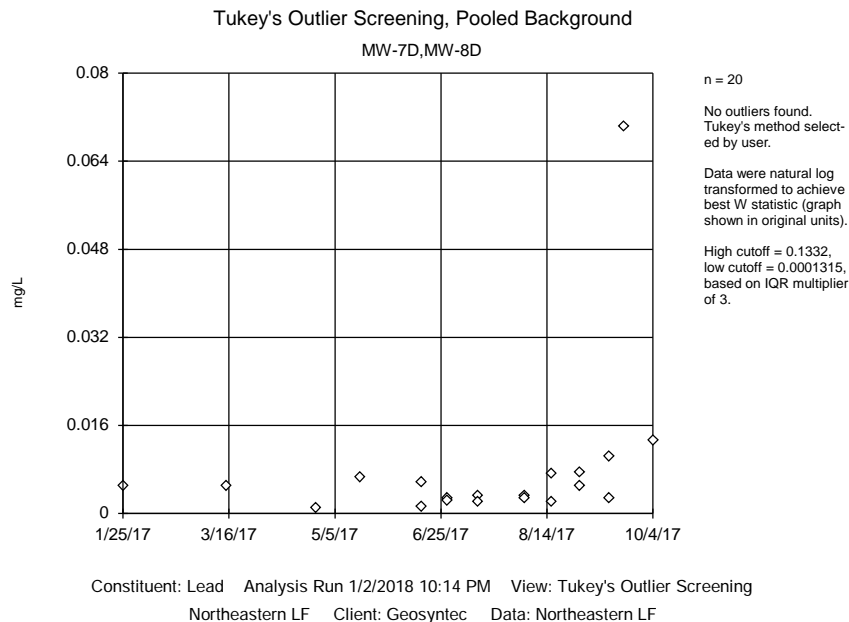


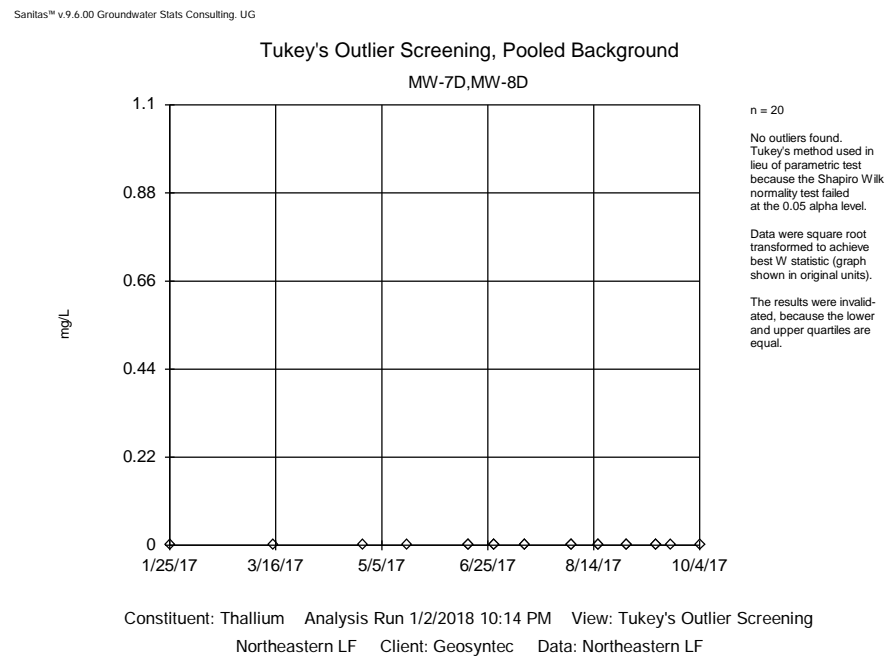
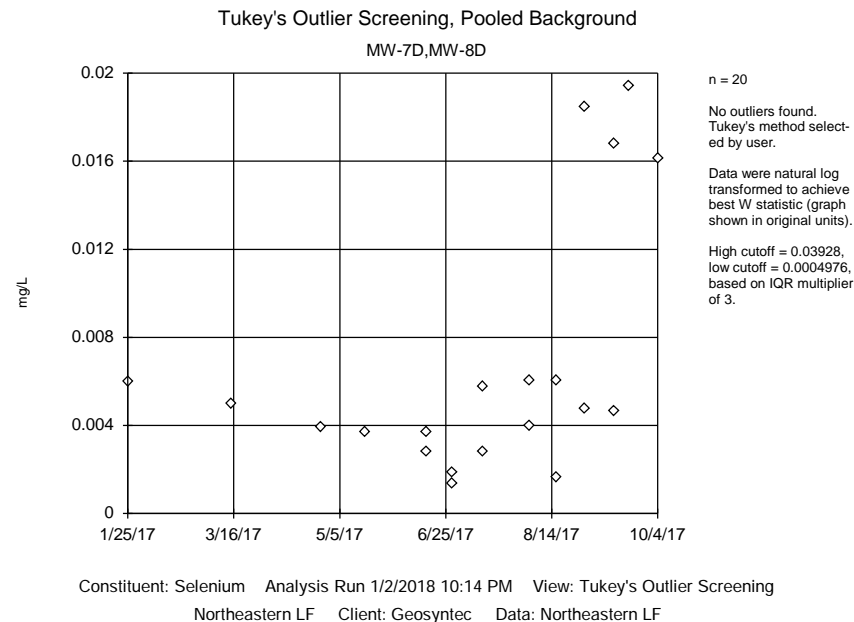
Constituent: Calcium Analysis Run 1/2/2018 10:14 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

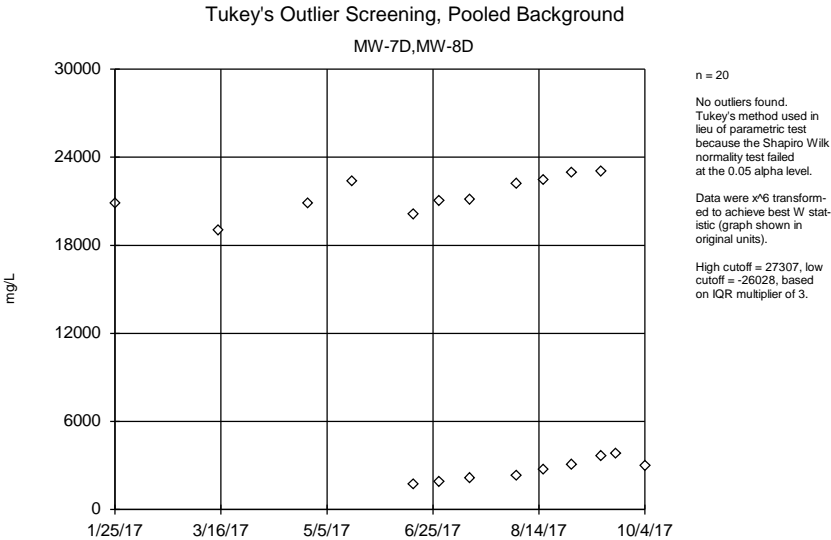


Constituent: Chloride Analysis Run 1/2/2018 10:14 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

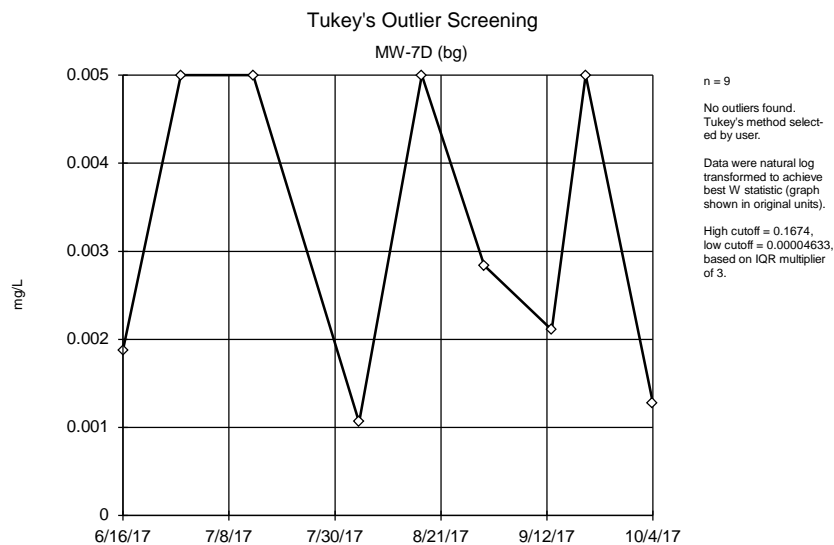




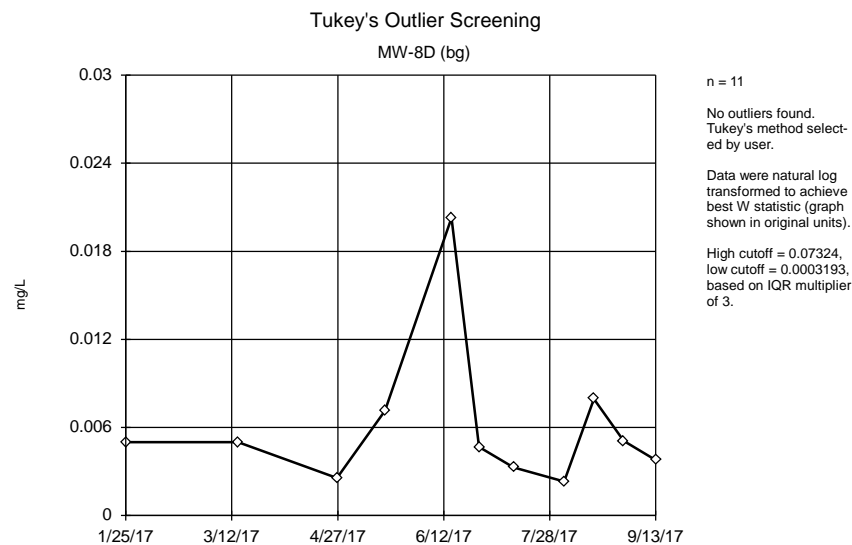




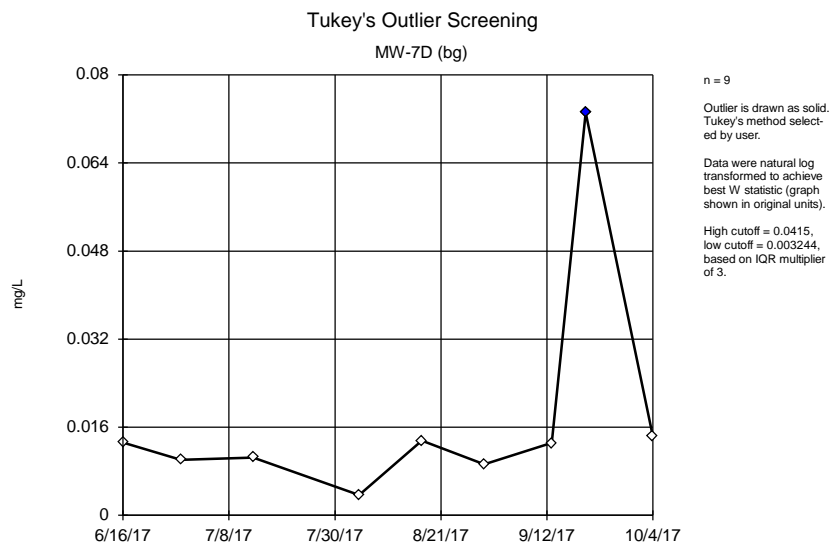
Constituent: Total Dissolve Solids [TDS] Analysis Run 1/2/2018 10:14 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



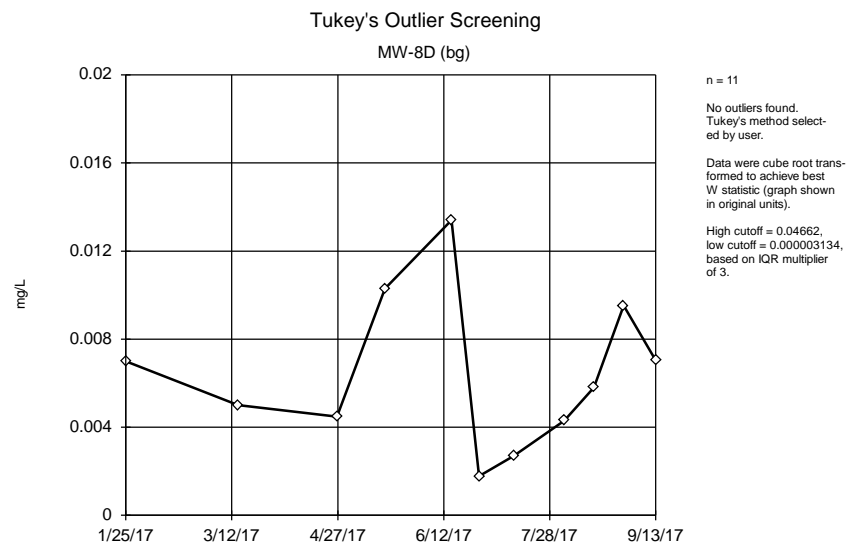
Constituent: Antimony Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Antimony Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



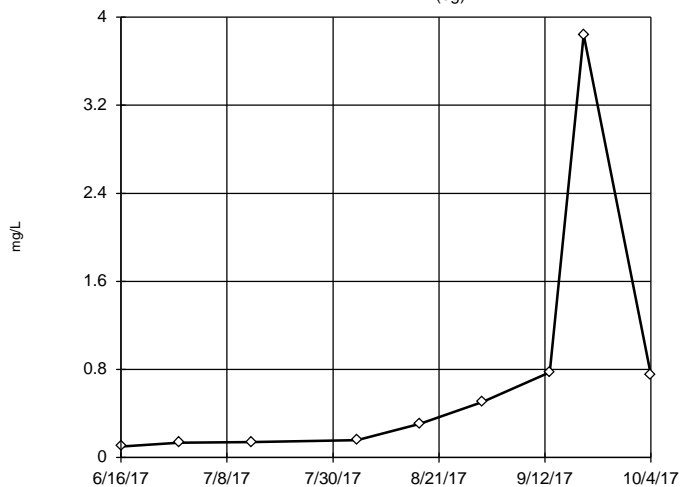
Constituent: Arsenic Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Arsenic Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

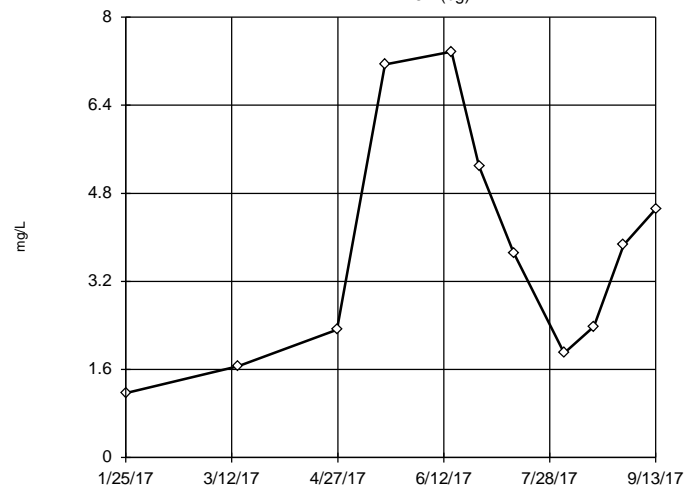
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 128.3, low cutoff = 0.0008196, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



n = 11

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

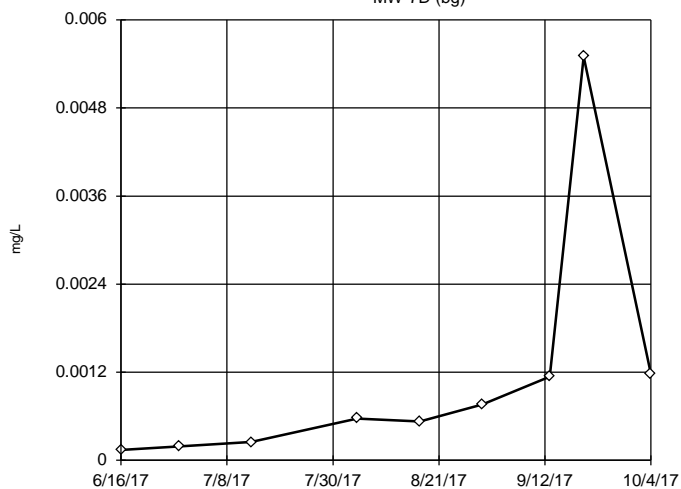
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 114.2, low cutoff = 0.08803, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

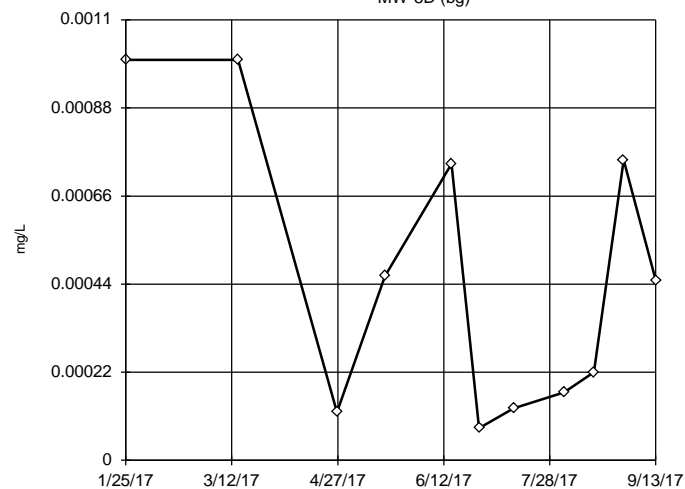
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.1748, low cutoff = 0.000001446, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



n = 11

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

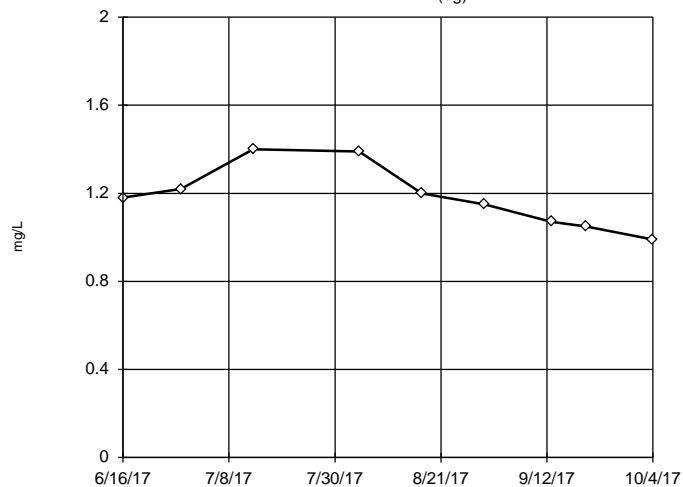
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.144, low cutoff = 6.8e-7, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

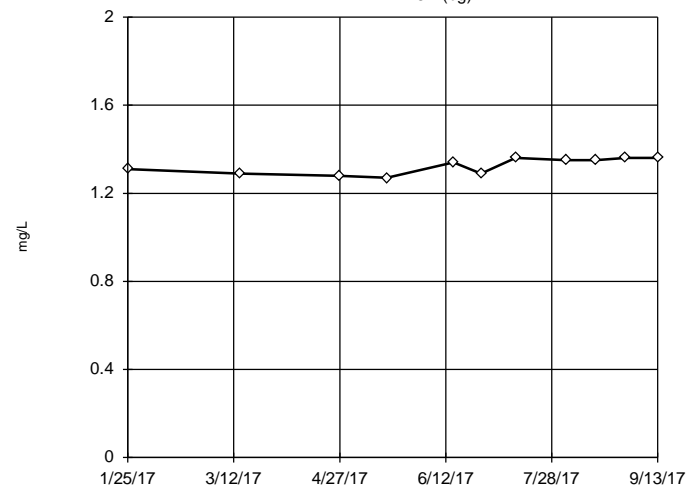
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2.415, low cutoff = 0.5716, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



n = 11

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

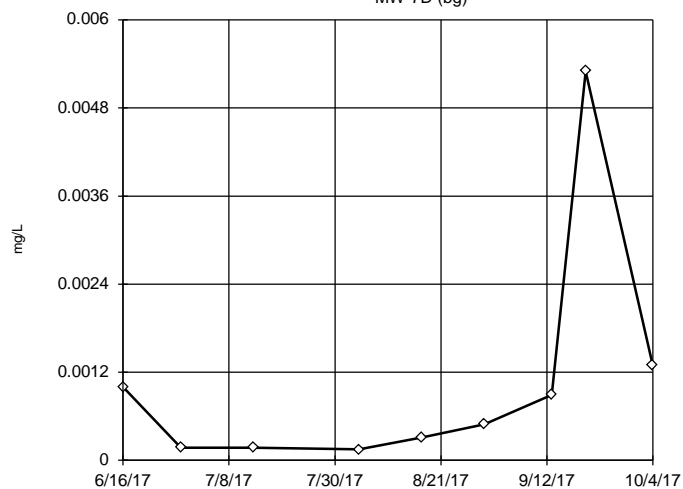
Data were cube transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1.536, low cutoff = 1.013, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

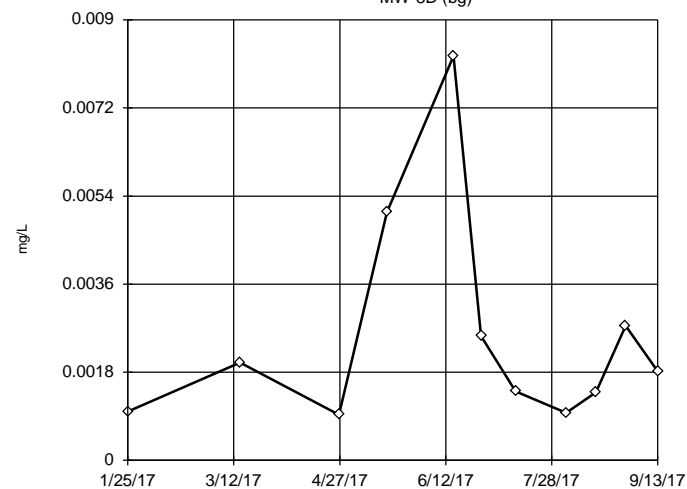
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3387, low cutoff = 5.7e-7, based on IQR multiplier of 3.

Constituent: Cadmium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



n = 11

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

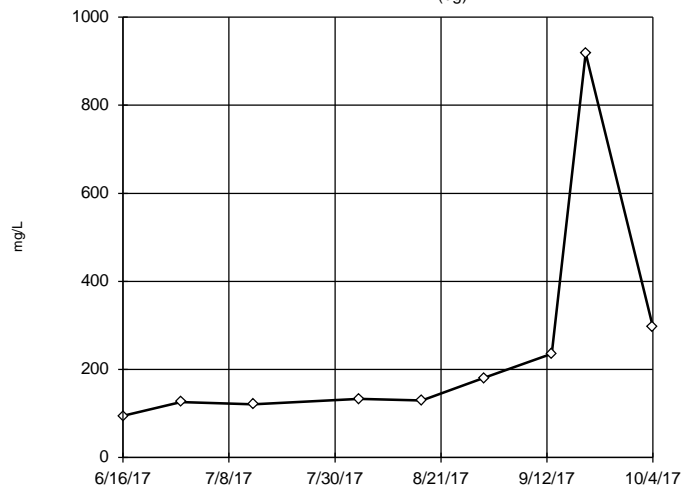
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.05719, low cutoff = 0.00004808, based on IQR multiplier of 3.

Constituent: Cadmium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

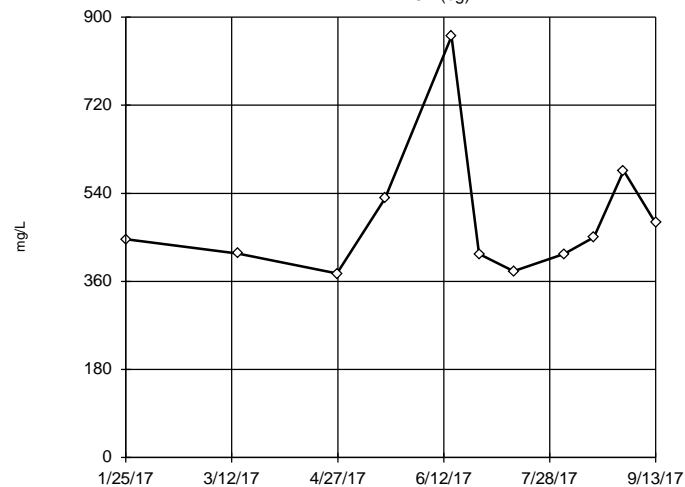
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2610, low cutoff = 12.53, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



n = 11

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

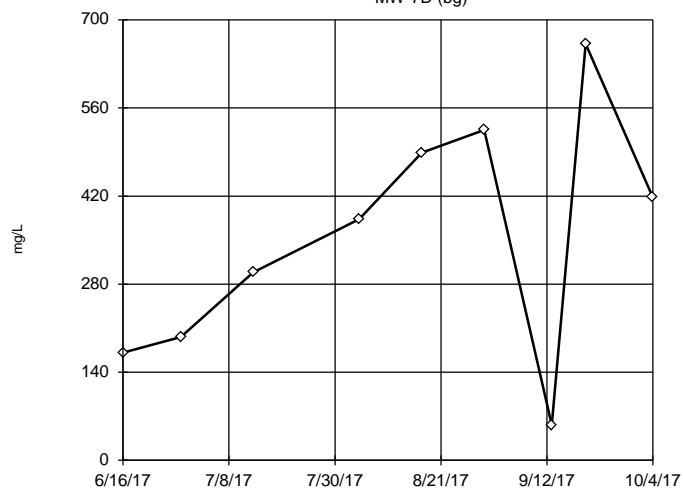
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1088, low cutoff = 202.3, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

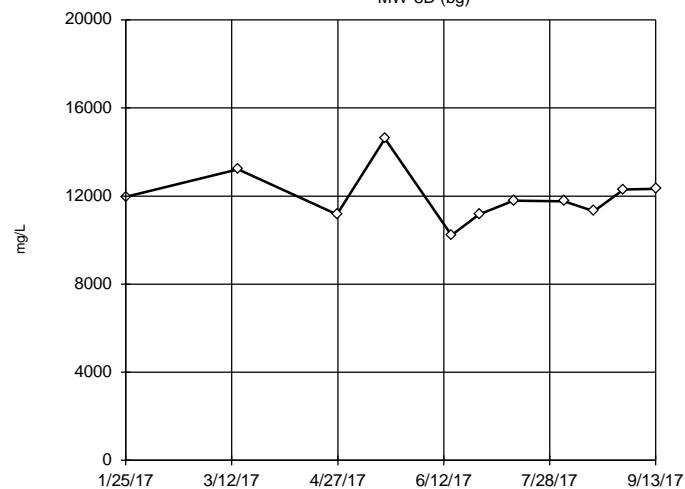
Ladder of Powers transformations did not improve normality; analysis run on raw data.

High cutoff = 1478, low cutoff = -787, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



n = 11

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

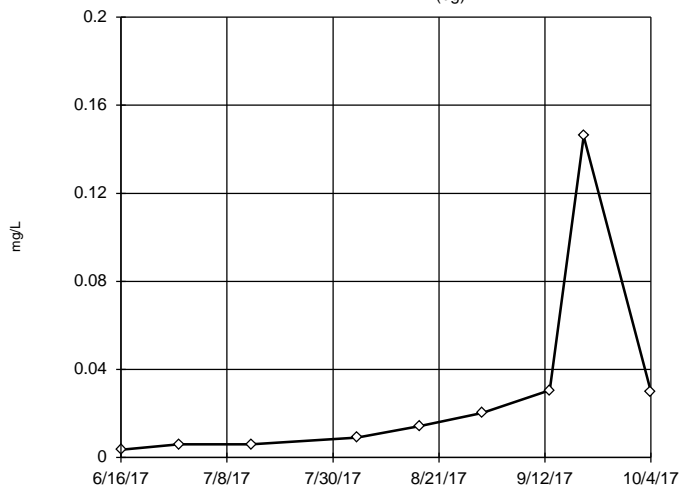
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 16585, low cutoff = 8306, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

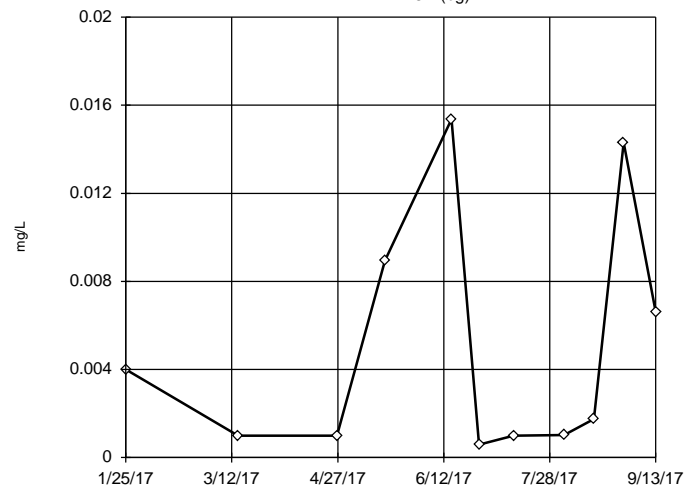
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 3.809, low cutoff = 0.00004793, based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



n = 11

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

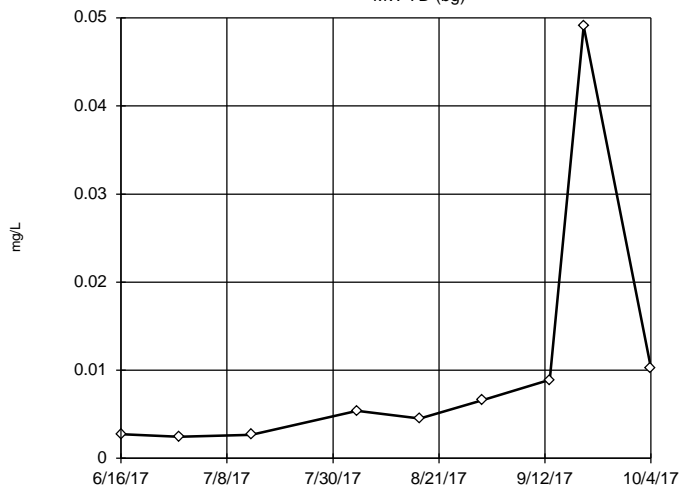
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 6.388, low cutoff = 0.0000014, based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

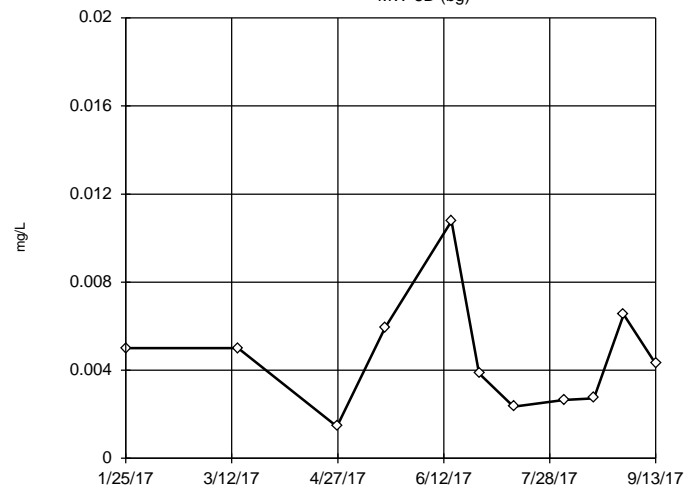
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.4239, low cutoff = 0.00006106, based on IQR multiplier of 3.

Constituent: Cobalt Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



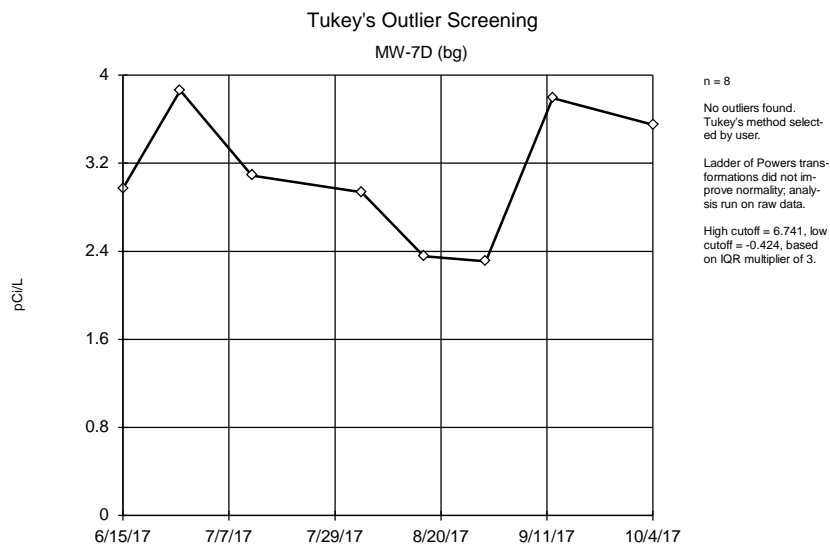
n = 11

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

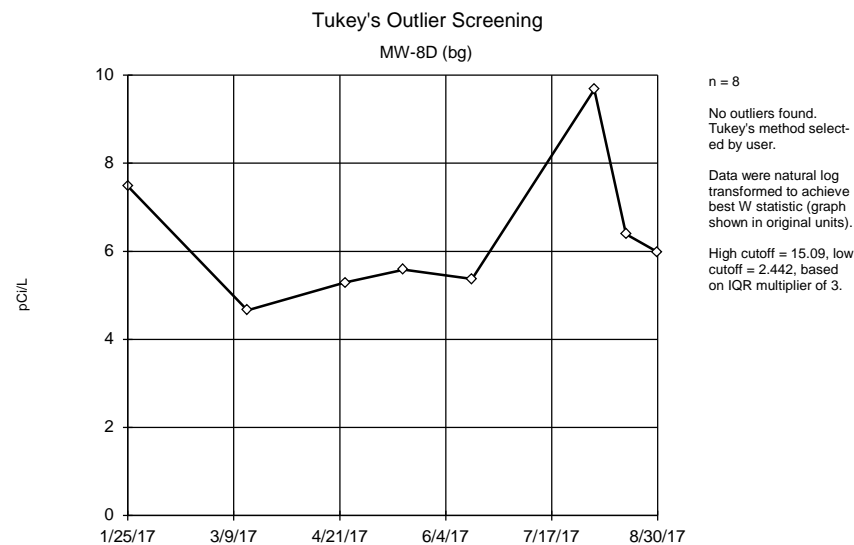
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.066, low cutoff = 0.0002377, based on IQR multiplier of 3.

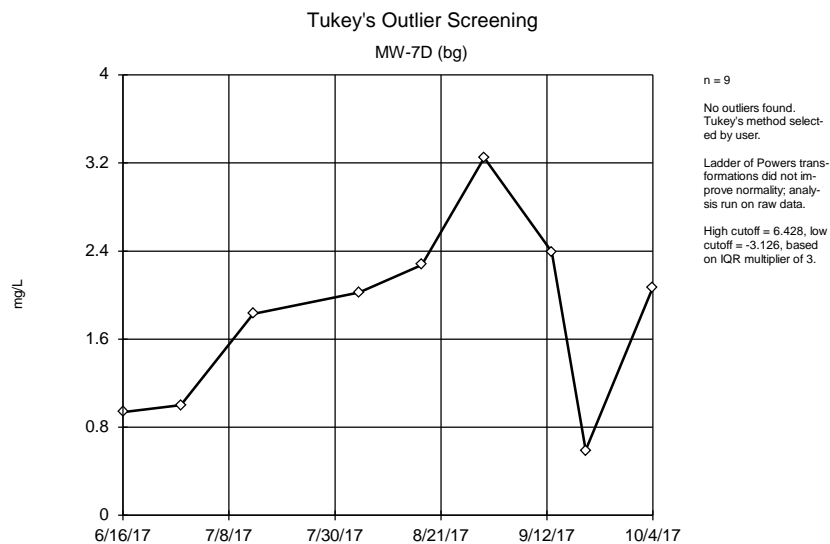
Constituent: Cobalt Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



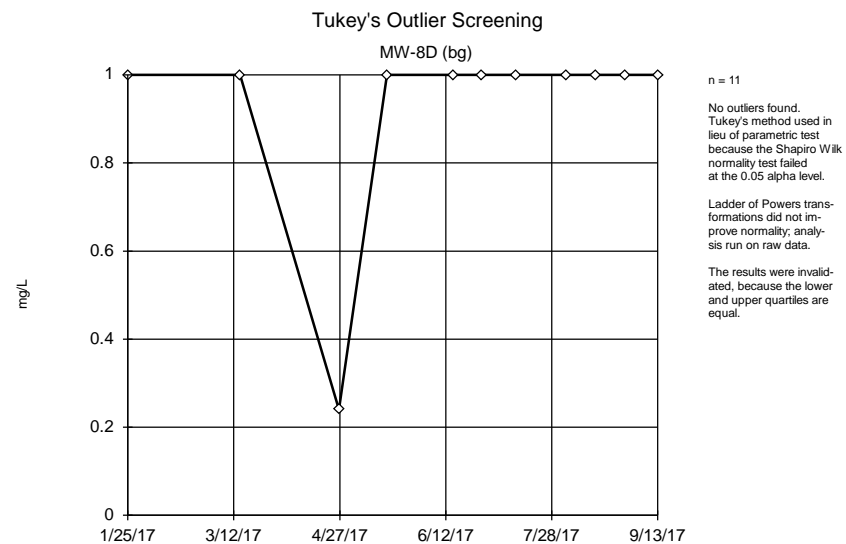
Constituent: Combined Radium 226 + 228 Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Combined Radium 226 + 228 Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



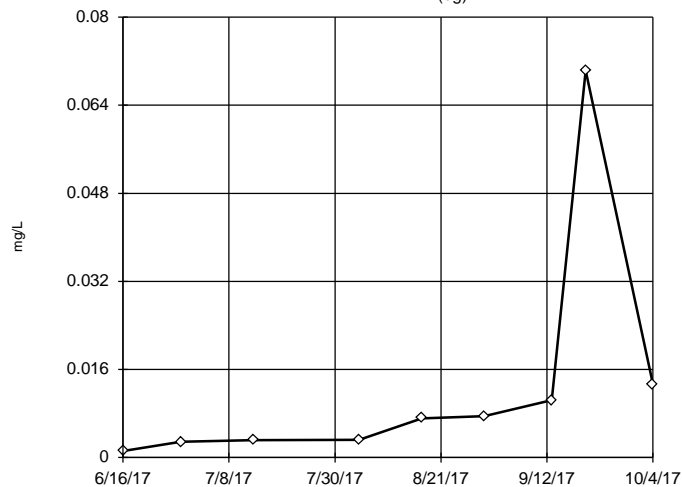
Constituent: Fluoride Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Fluoride Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

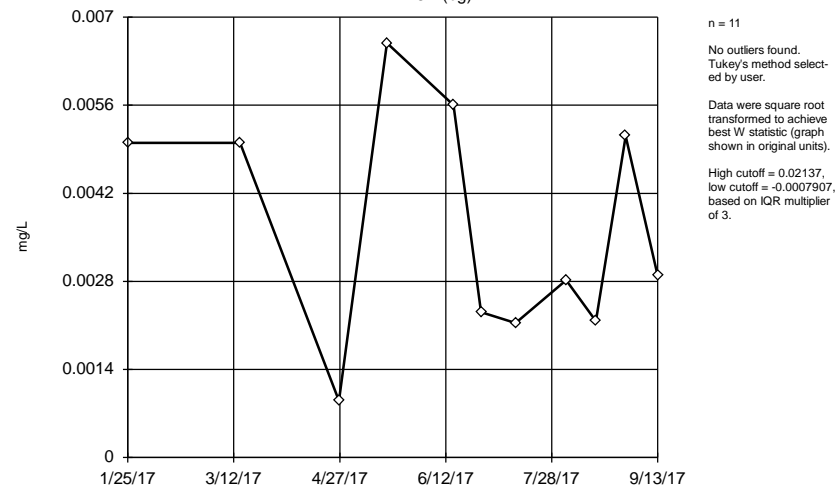
MW-7D (bg)



Constituent: Lead Analysis Run 1/3/2018 6:02 PM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

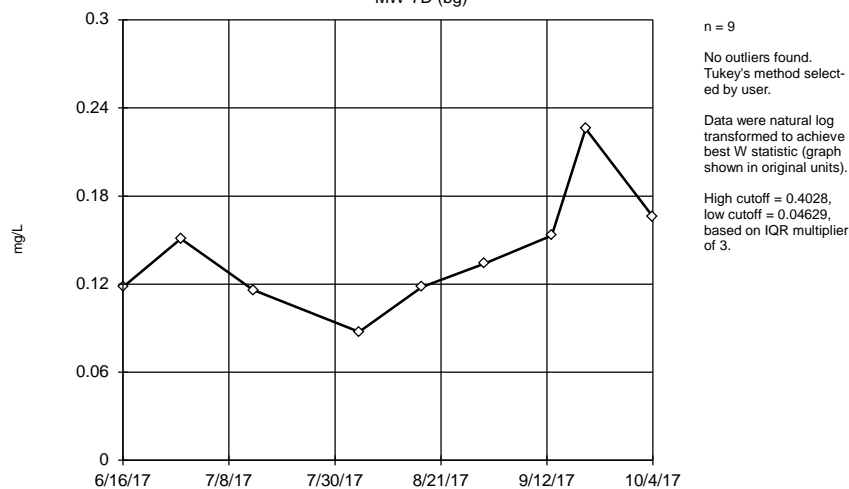
MW-8D (bg)



Constituent: Lead Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

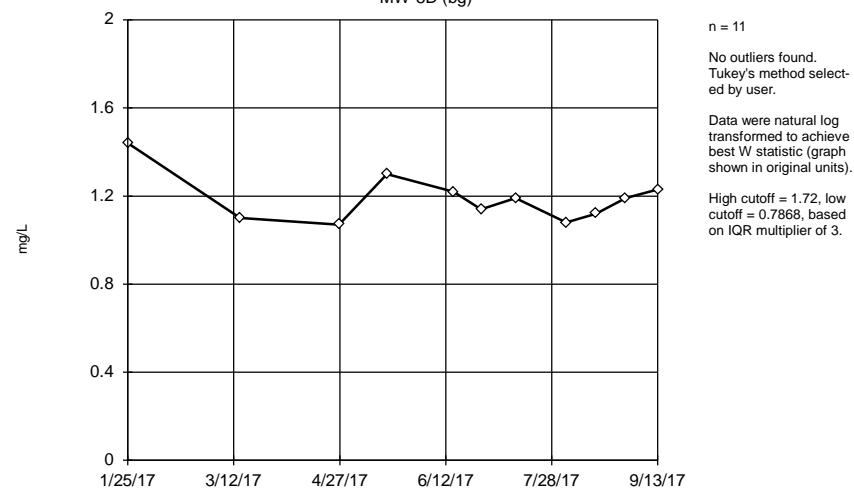
MW-7D (bg)



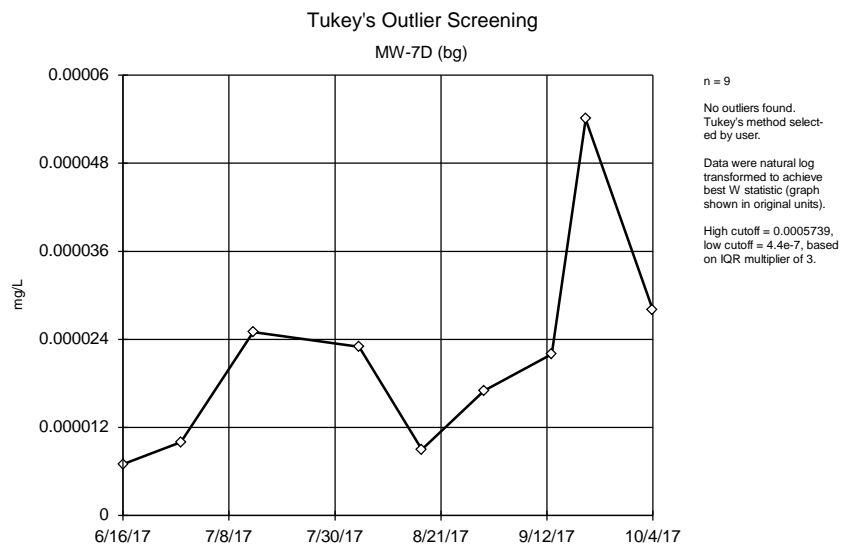
Constituent: Lithium Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

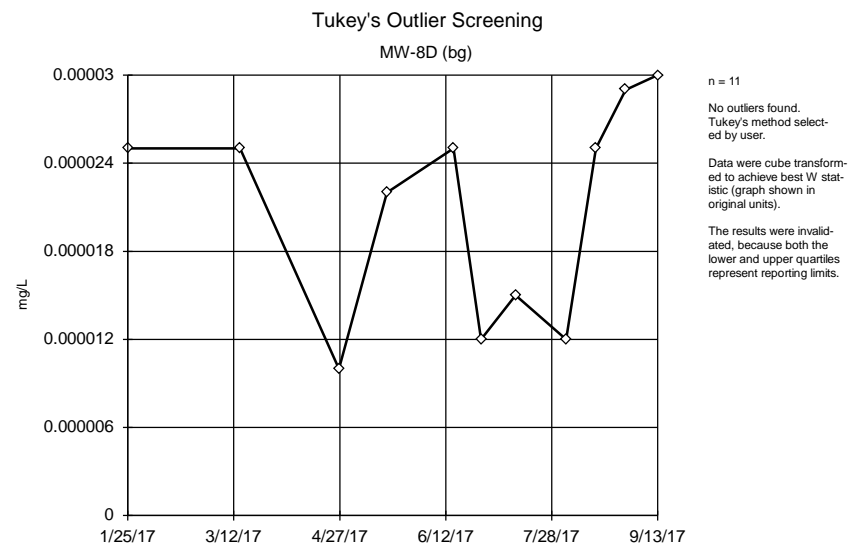
MW-8D (bg)



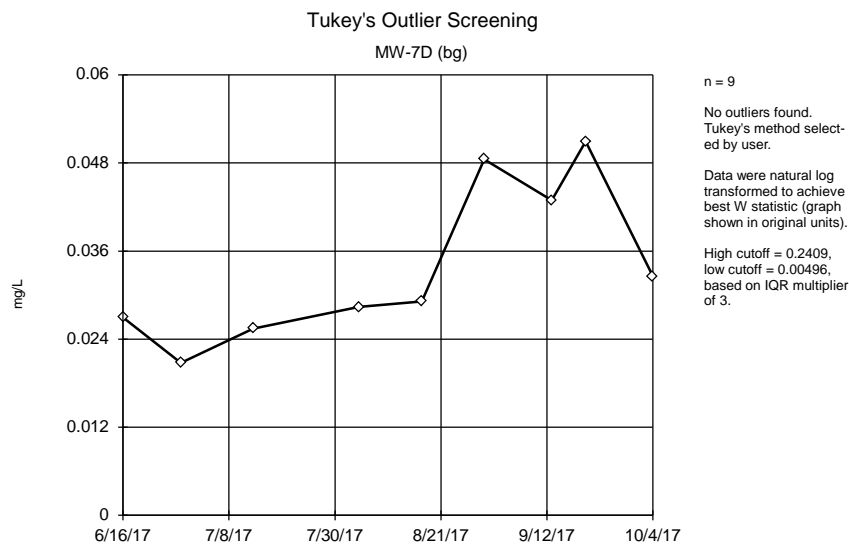
Constituent: Lithium Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF



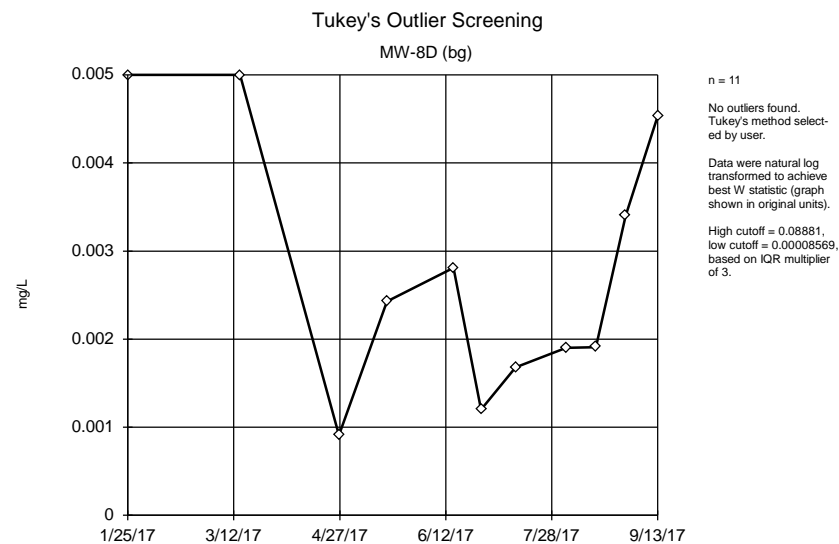
Constituent: Mercury Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



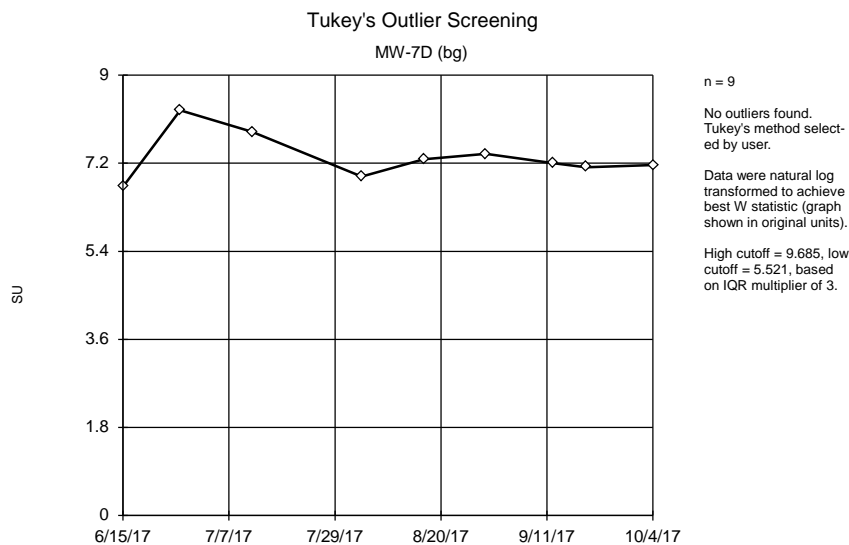
Constituent: Mercury Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



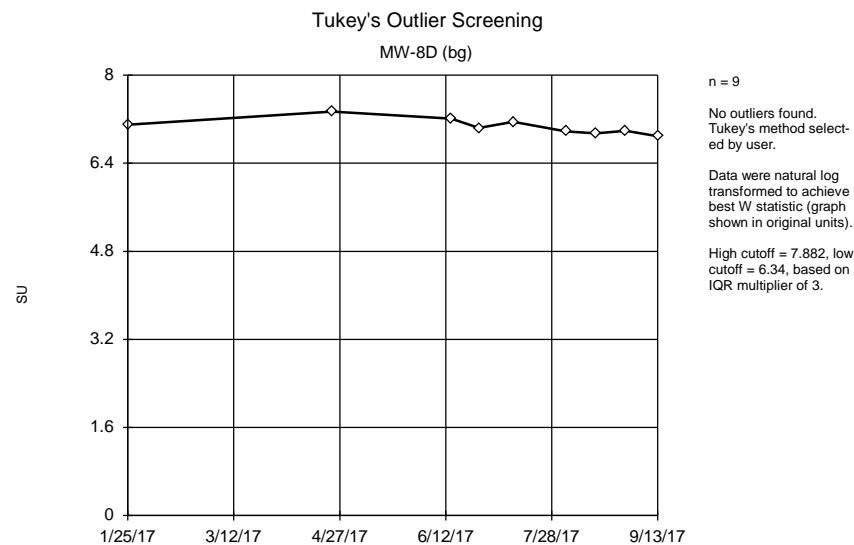
Constituent: Molybdenum Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



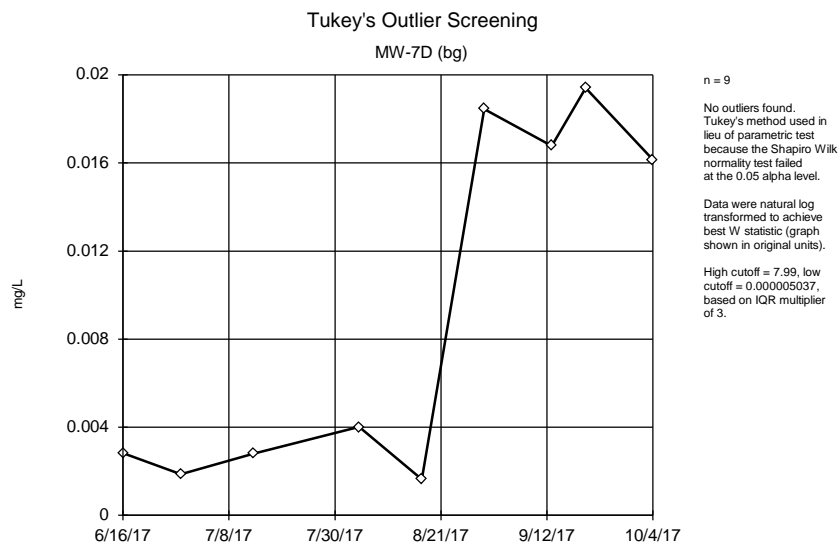
Constituent: Molybdenum Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



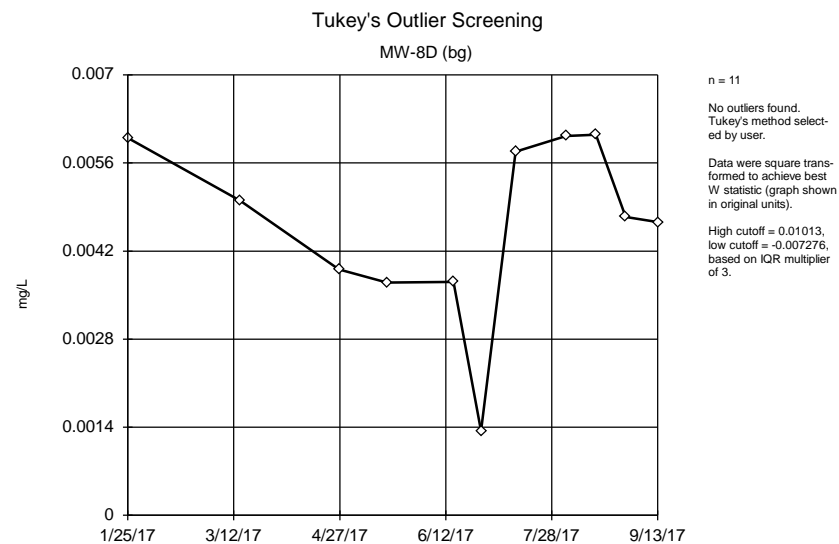
Constituent: pH, field Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



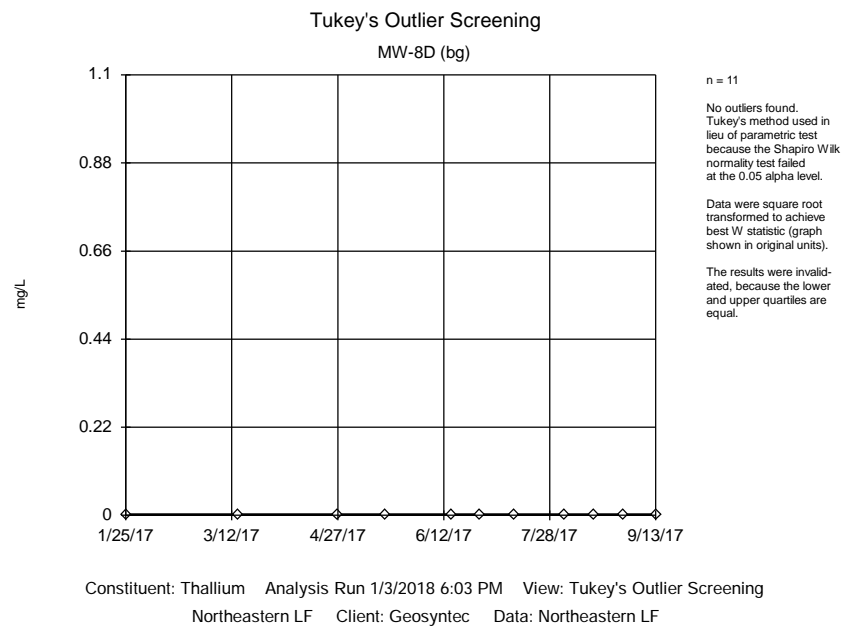
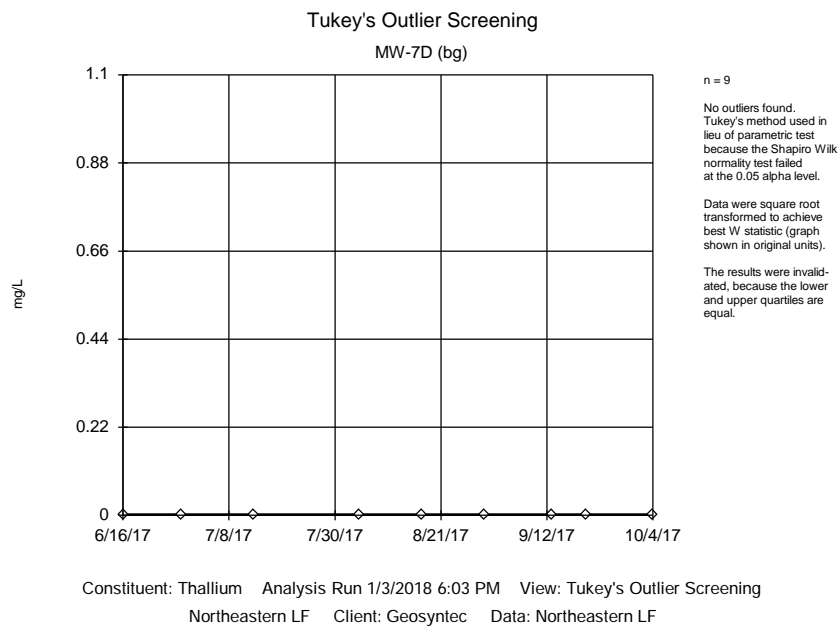
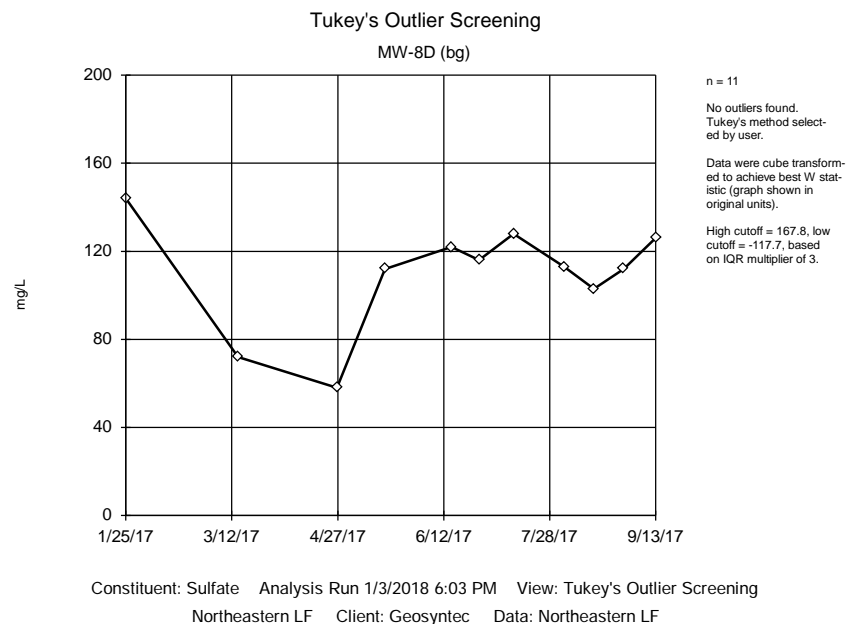
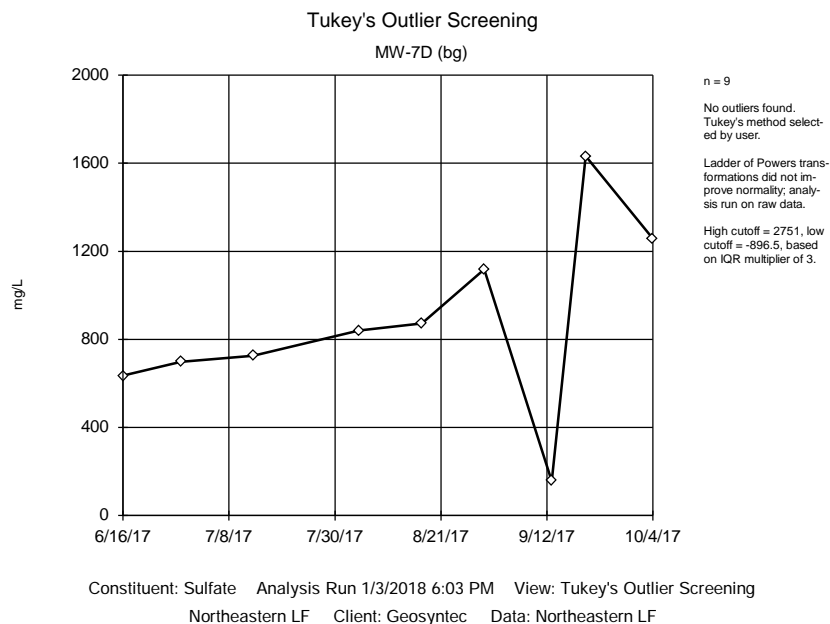
Constituent: pH, field Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Selenium Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

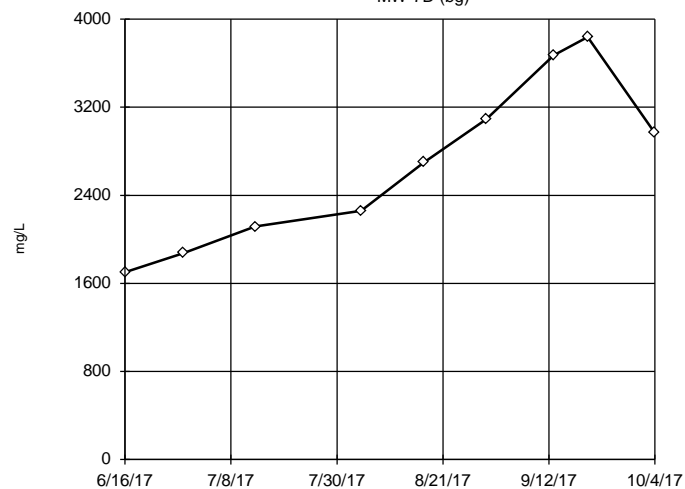


Constituent: Selenium Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Tukey's Outlier Screening

MW-7D (bg)



n = 9

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

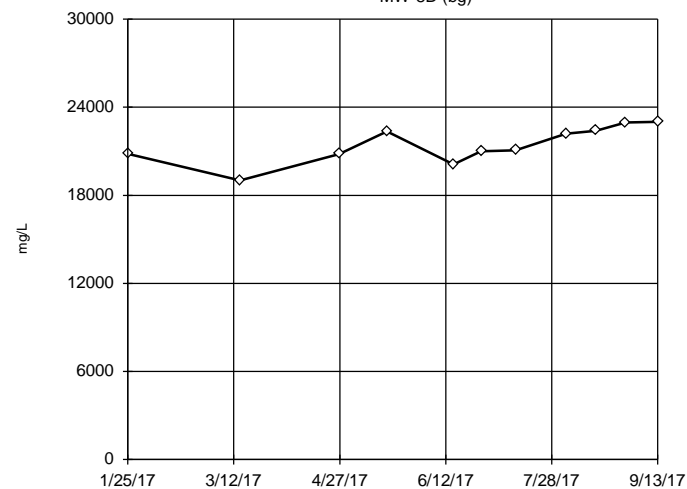
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 16304, low cutoff = 411.4, based on IQR multiplier of 3.

Constituent: Total Dissolve Solids [TDS] Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-8D (bg)



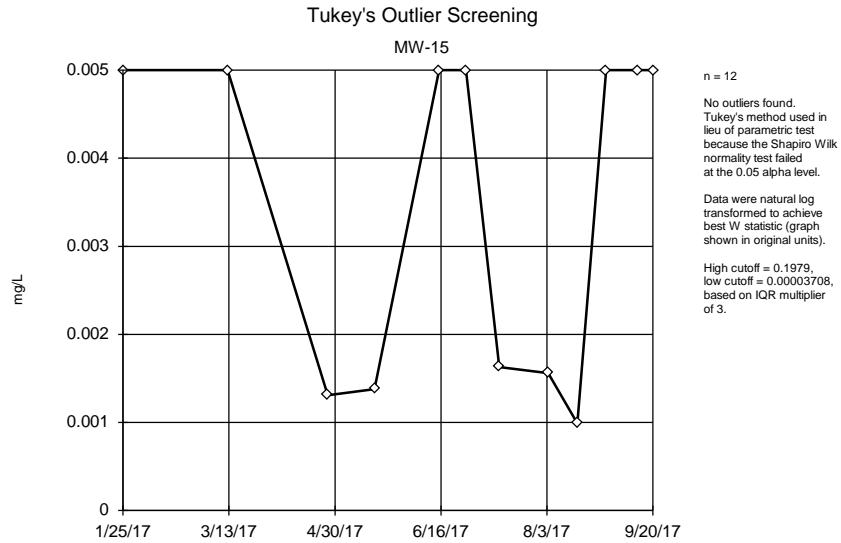
n = 11

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

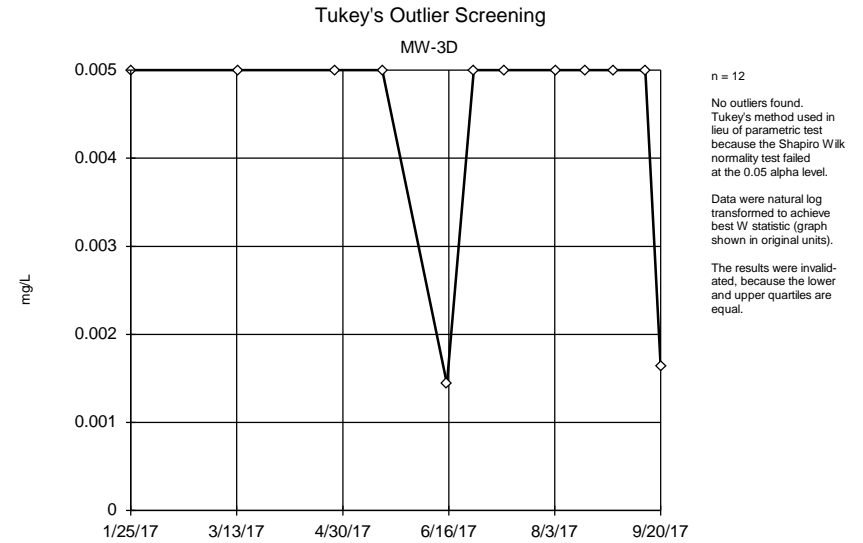
Data were x^4 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 25809, low cutoff = -8235, based on IQR multiplier of 3.

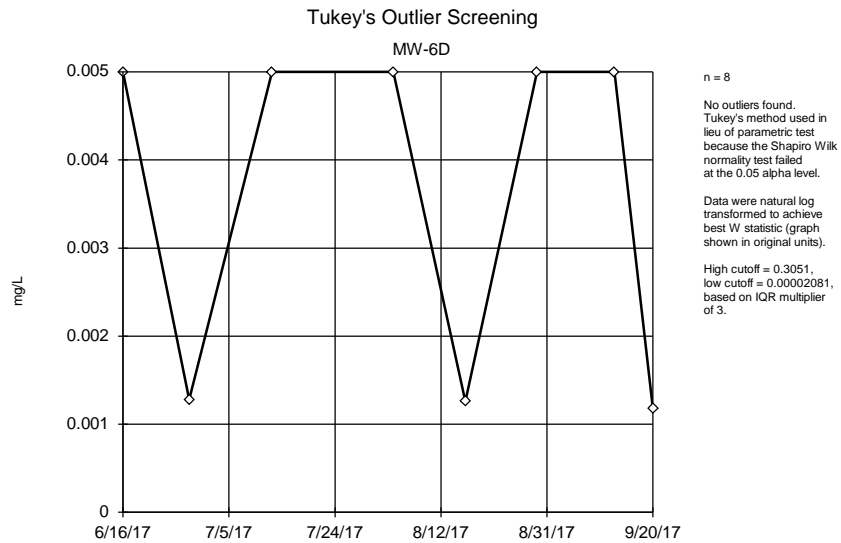
Constituent: Total Dissolve Solids [TDS] Analysis Run 1/3/2018 6:03 PM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



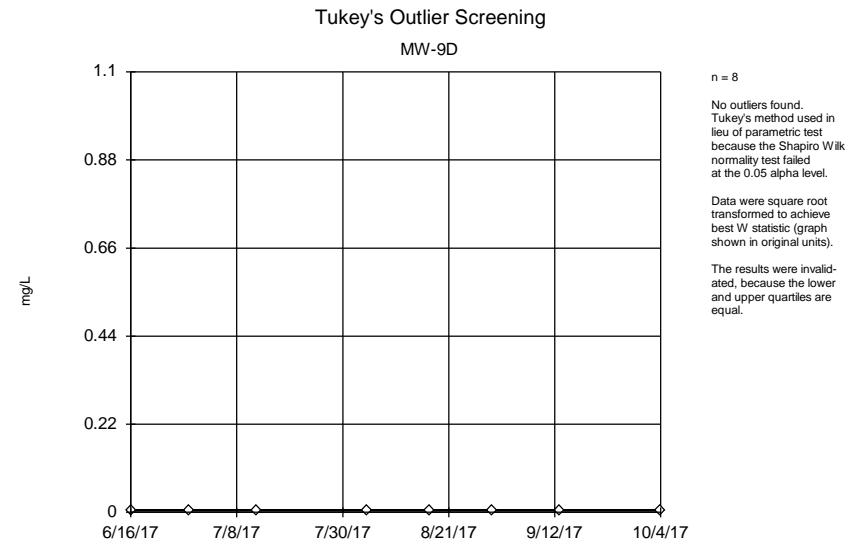
Constituent: Antimony Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Antimony Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



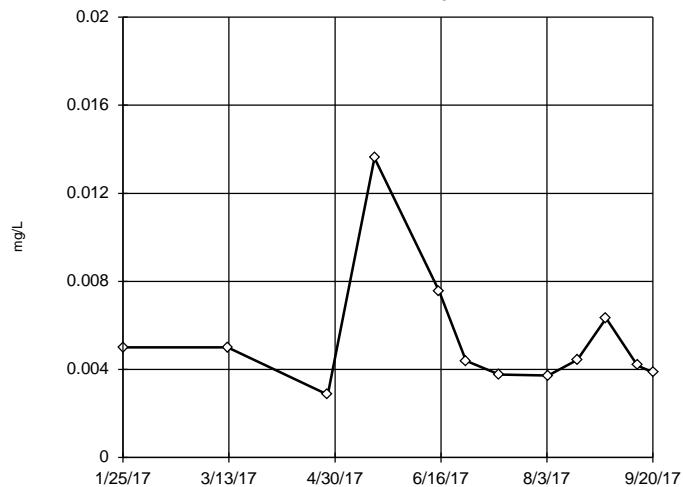
Constituent: Antimony Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Antimony Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



n = 12

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

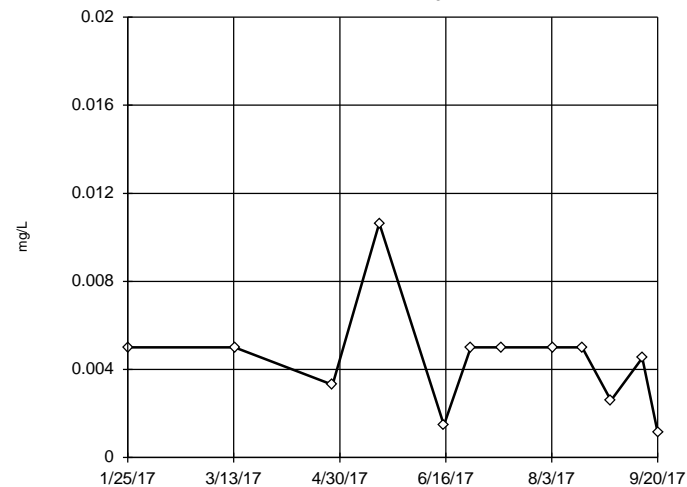
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.01792,
low cutoff = 0.001198,
based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-3D



n = 12

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

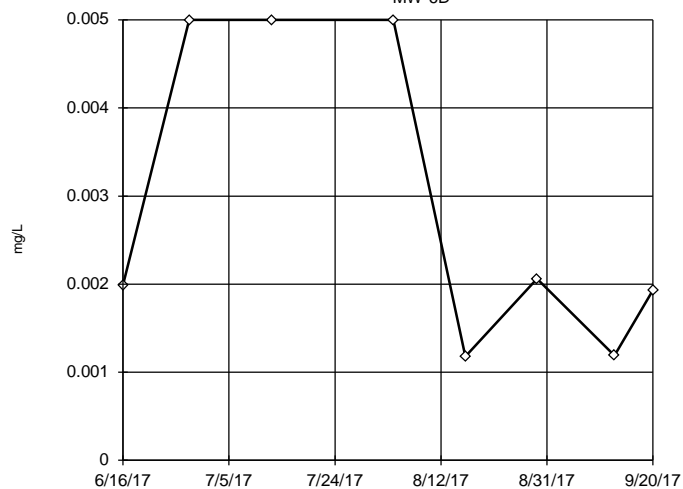
Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.01647,
low cutoff = 0.0002137,
based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-6D



n = 8

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

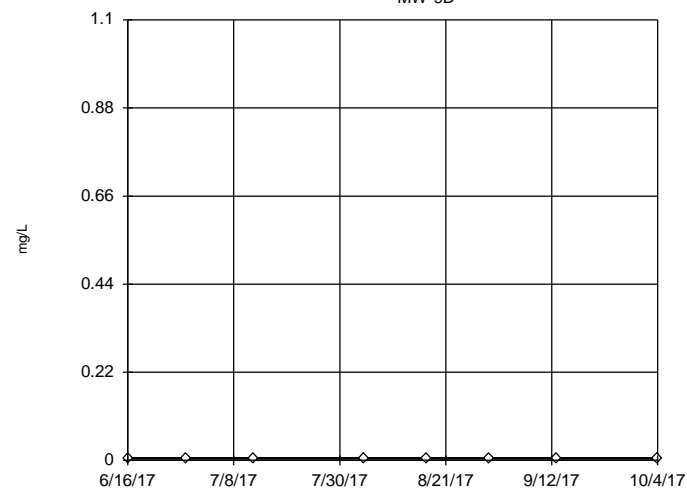
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.1796,
low cutoff = 0.0000422,
based on IQR multiplier of 3.

Constituent: Arsenic Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-9D



n = 8

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

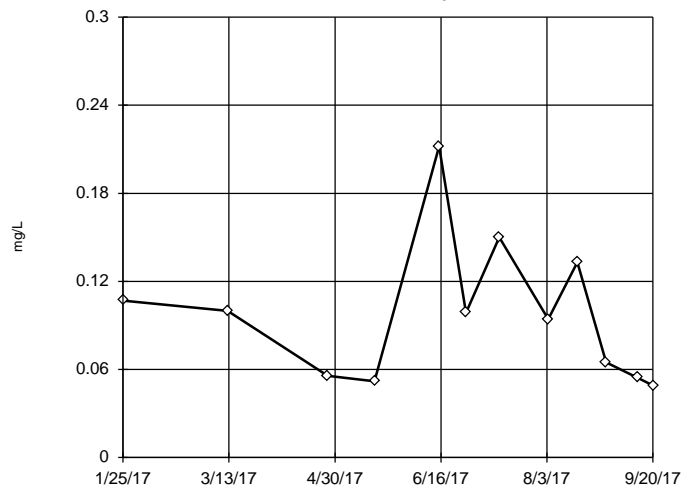
Data were square root transformed to achieve best W statistic (graph shown in original units).

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

Constituent: Arsenic Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



n = 12

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

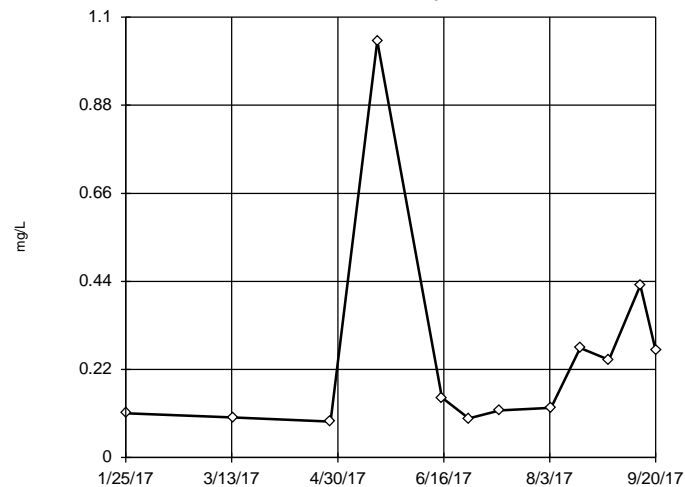
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1.215, low cutoff = 0.005402, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-3D



n = 12

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

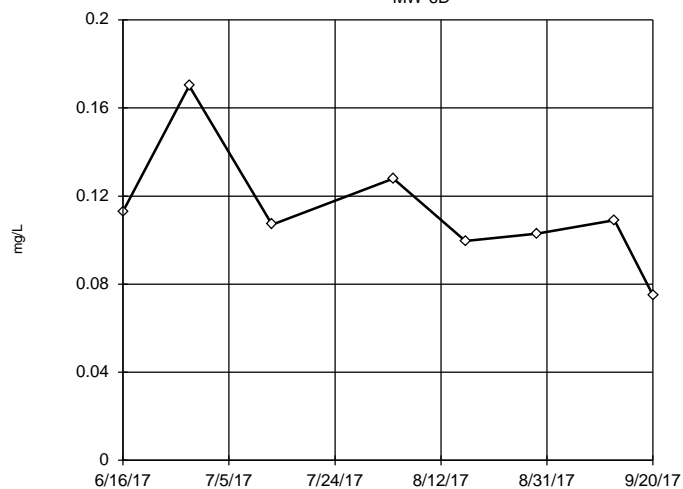
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 4.577, low cutoff = 0.006227, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-6D



n = 8

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

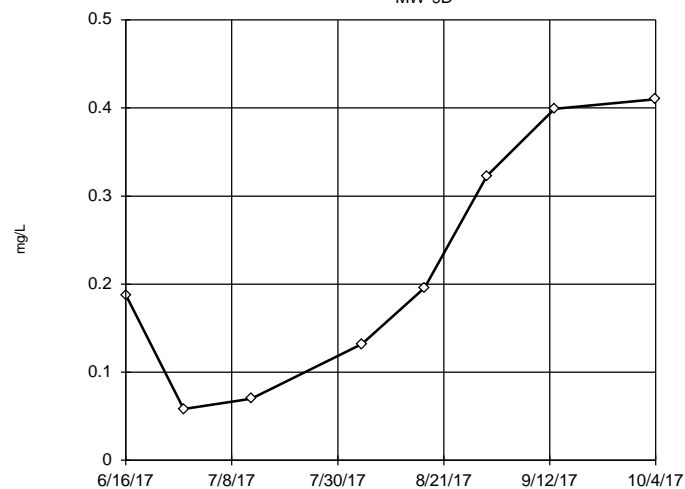
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2015, low cutoff = 0.06043, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-9D



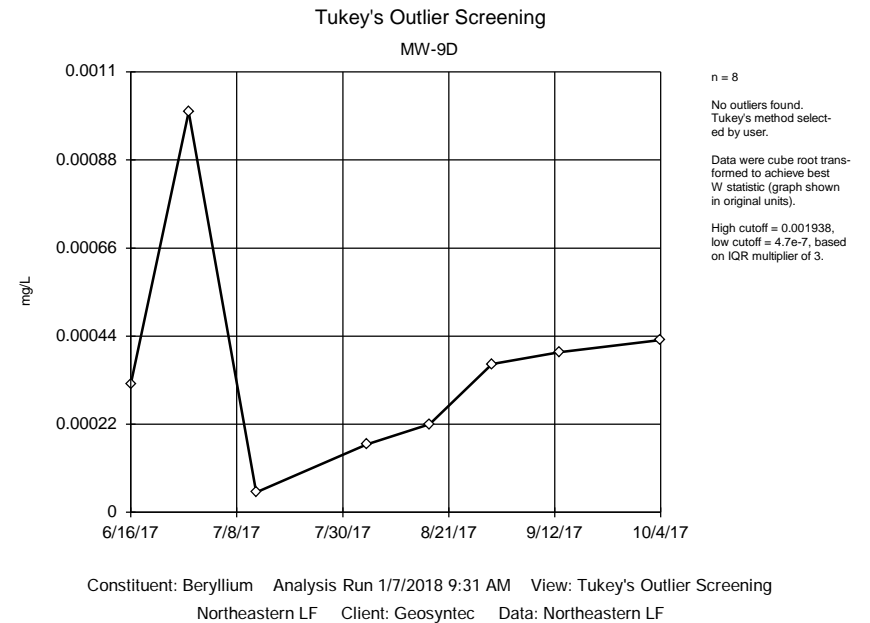
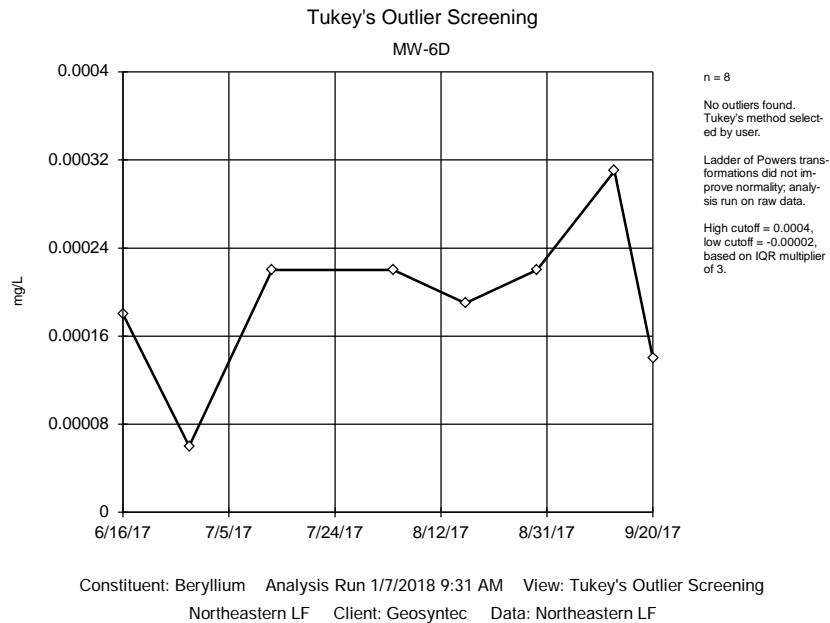
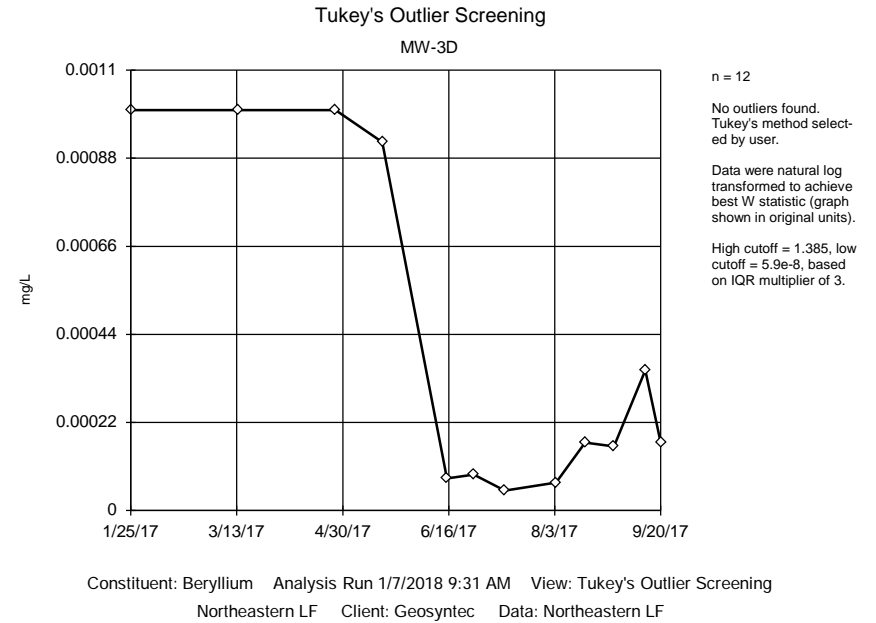
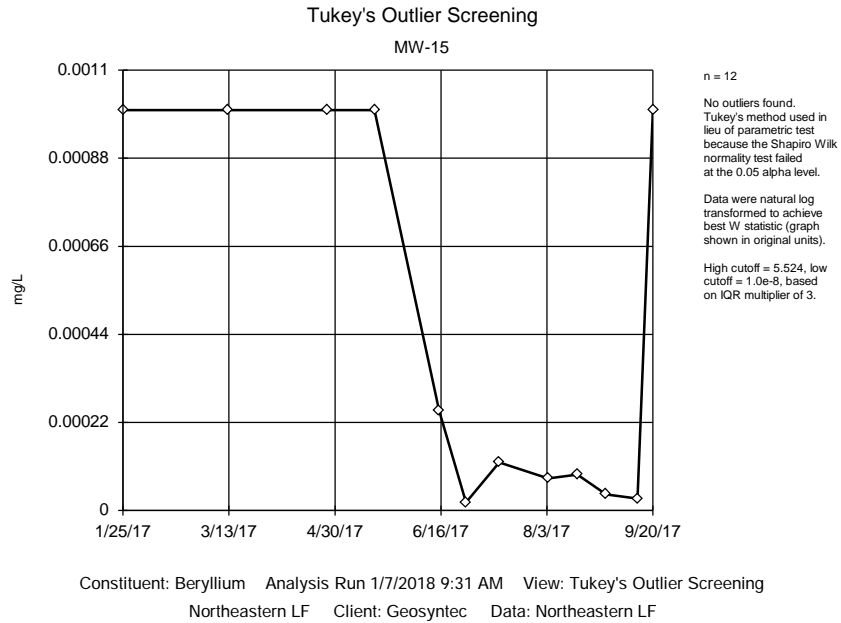
n = 8

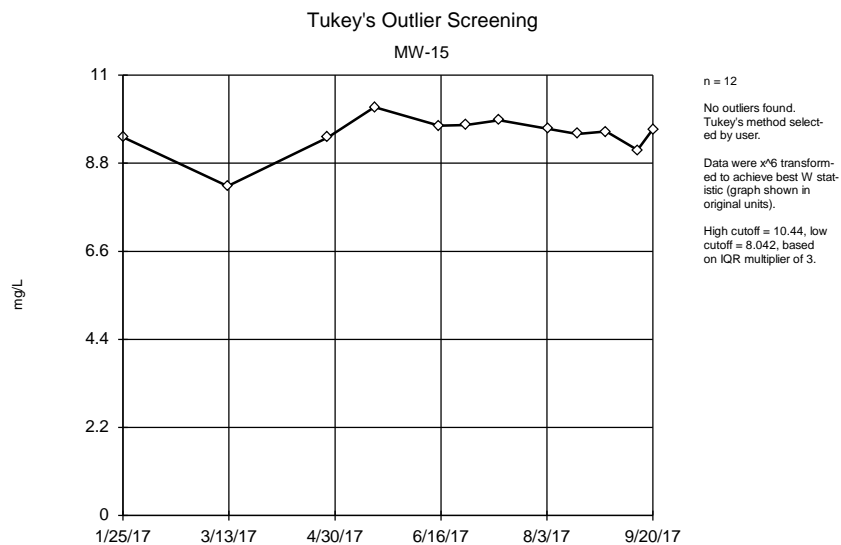
No outliers found.
Tukey's method selected by user.

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

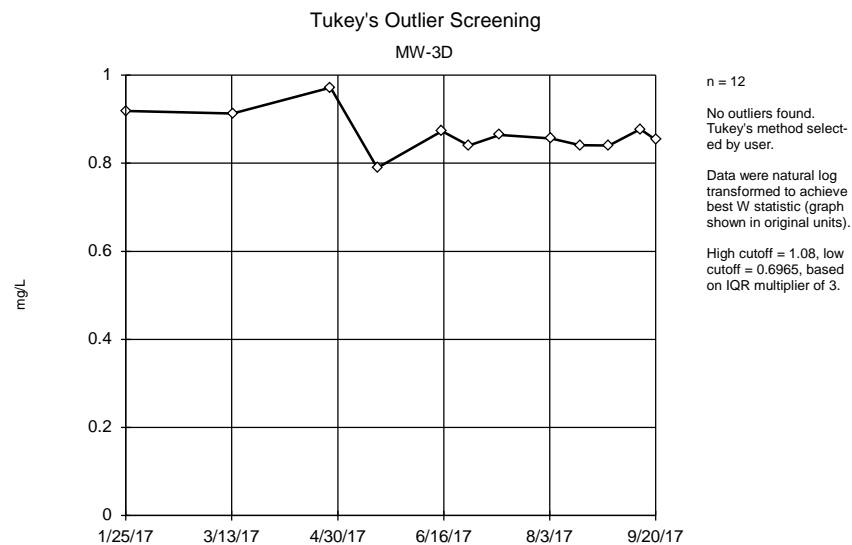
High cutoff = 3.131, low cutoff = -0.02472, based on IQR multiplier of 3.

Constituent: Barium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

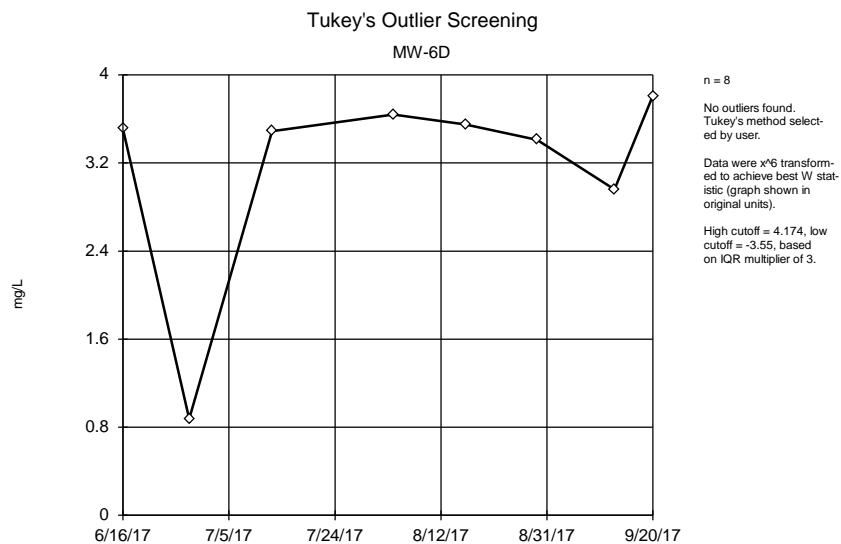




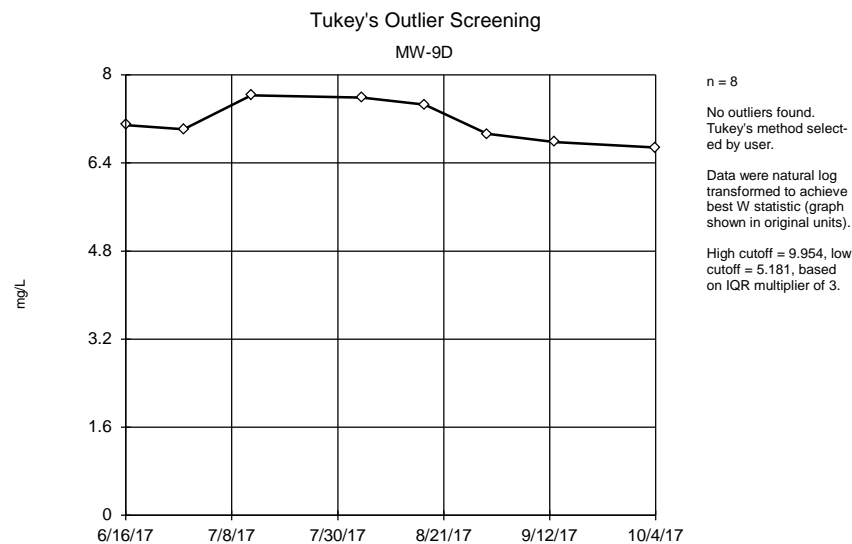
Constituent: Boron Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



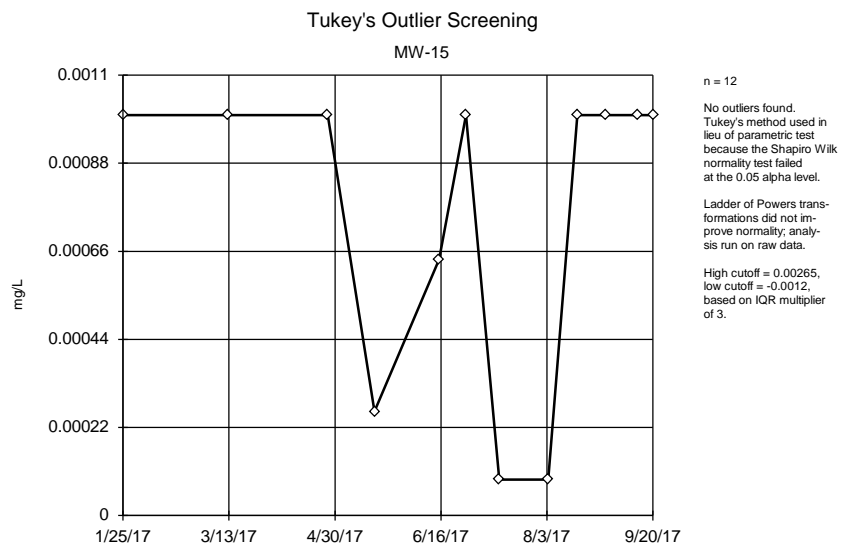
Constituent: Boron Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



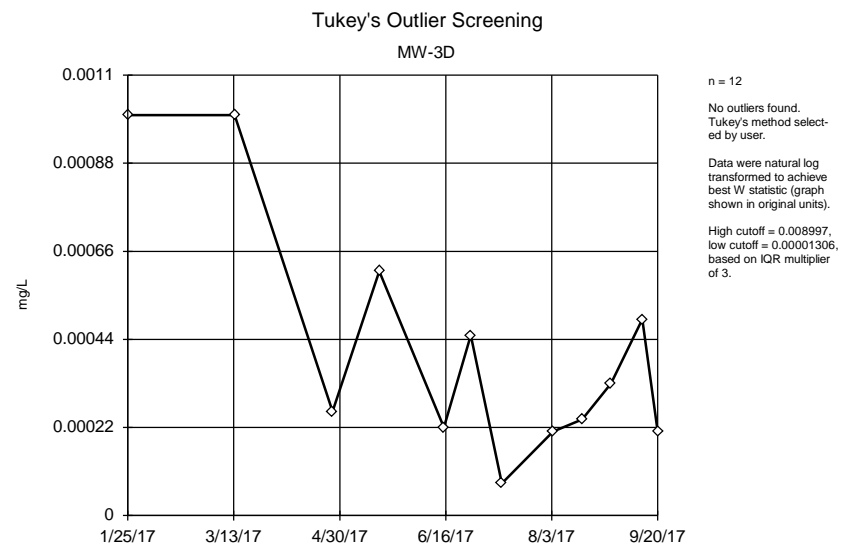
Constituent: Boron Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



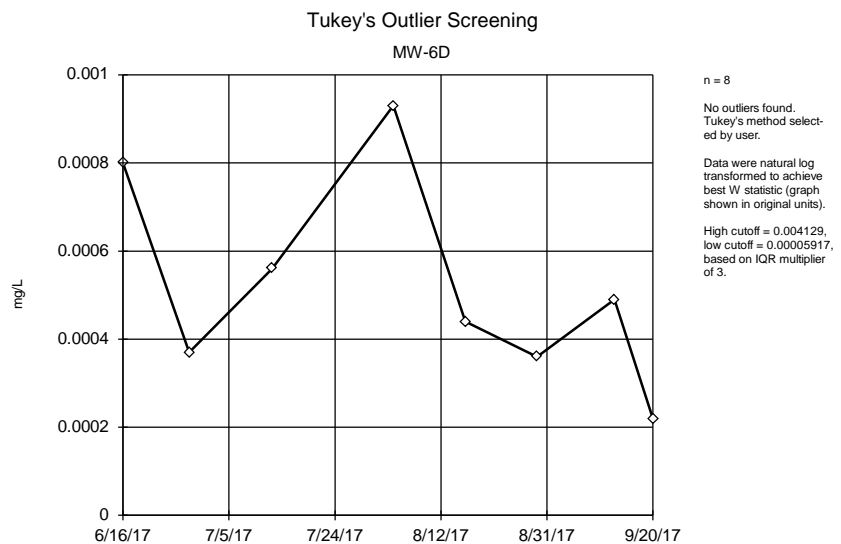
Constituent: Boron Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



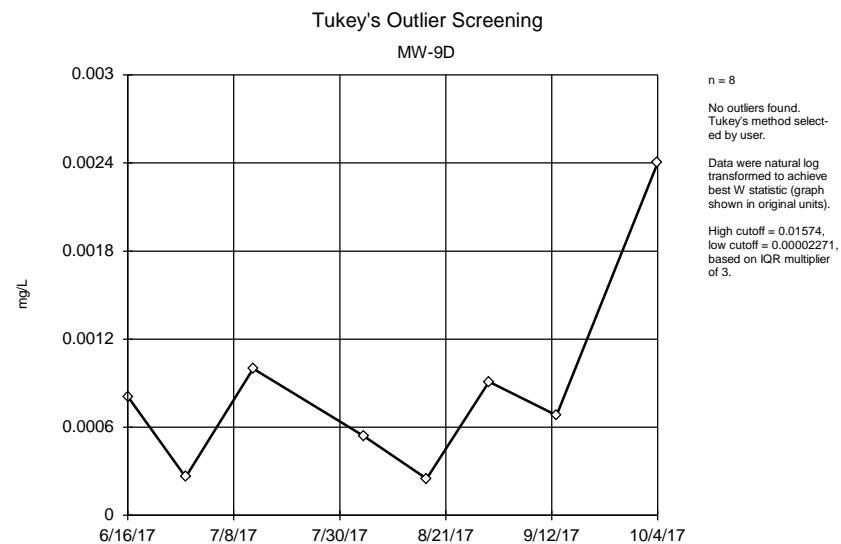
Constituent: Cadmium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Cadmium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



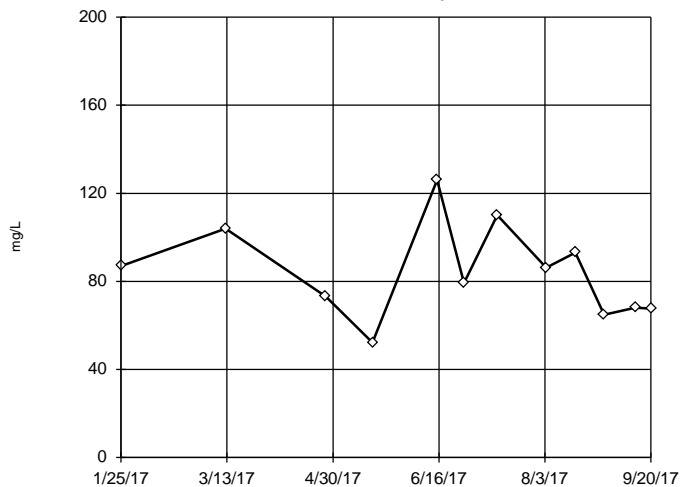
Constituent: Cadmium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Cadmium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



n = 12

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

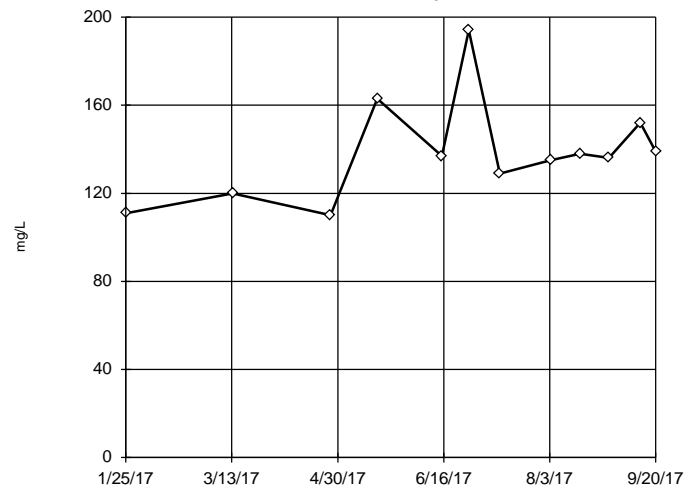
Data were natural log
transformed to achieve
best W statistic (graph
shown in original units).

High cutoff = 300.8, low
cutoff = 22.18, based
on IQR multiplier of 3.

Constituent: Calcium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-3D



n = 12

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

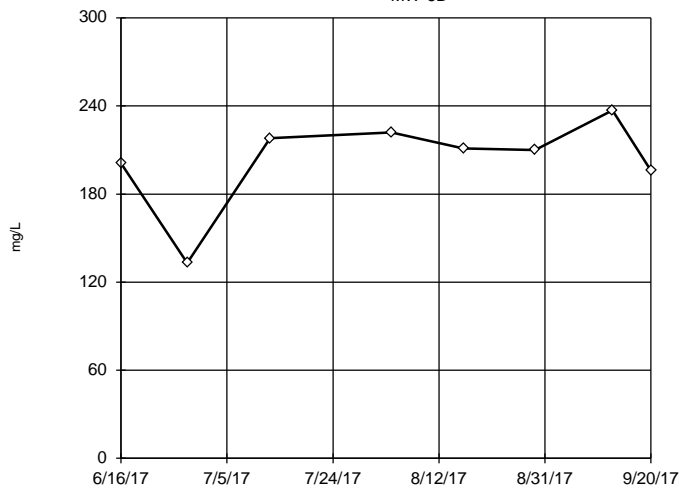
Data were natural log
transformed to achieve
best W statistic (graph
shown in original units).

High cutoff = 231.8, low
cutoff = 78.03, based
on IQR multiplier of 3.

Constituent: Calcium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-6D



n = 8

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

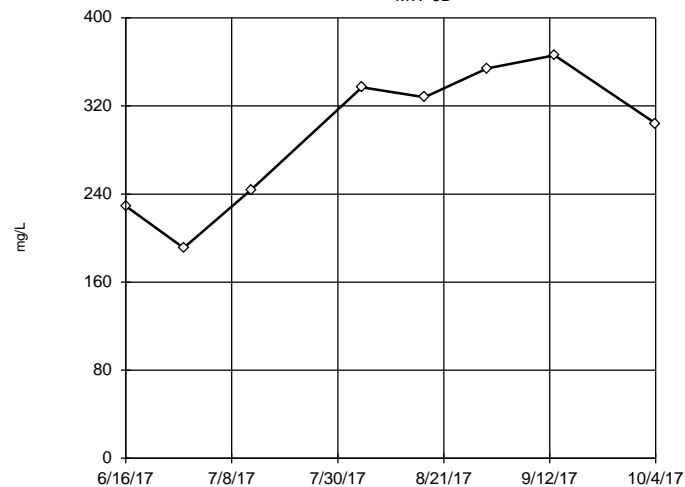
Data were x*6 transform-
ed to achieve best W stat-
istic (graph shown in
original units).

High cutoff = 254.2, low
cutoff = -213.7, based
on IQR multiplier of 3.

Constituent: Calcium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-9D



n = 8

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

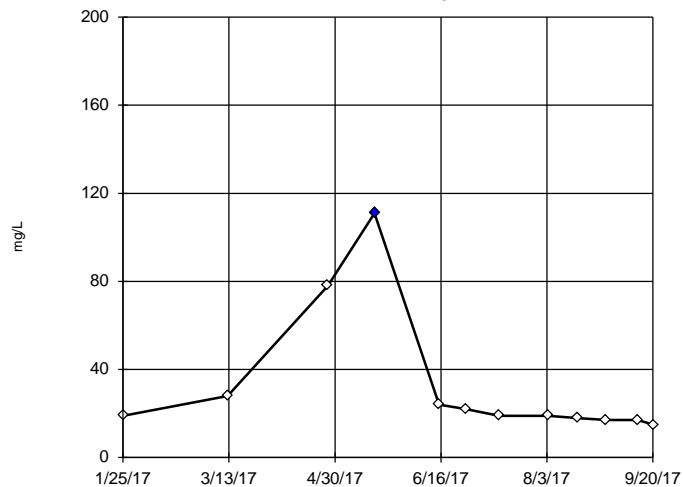
Data were x*4 transform-
ed to achieve best W stat-
istic (graph shown in
original units).

High cutoff = 467.5, low
cutoff = -417.3, based
on IQR multiplier of 3.

Constituent: Calcium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



n = 12

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

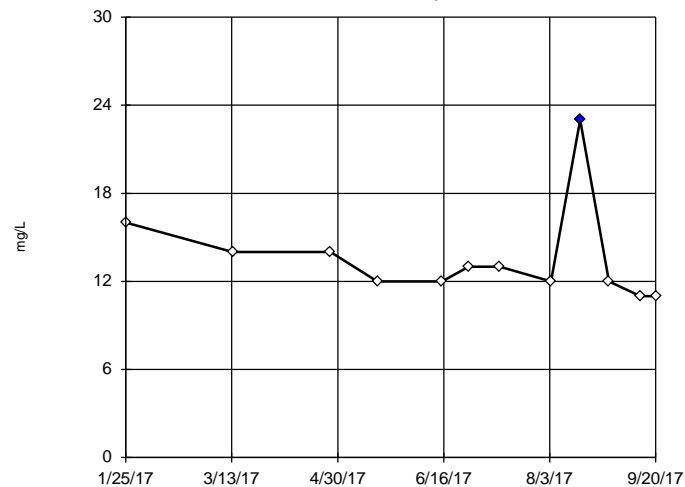
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 84.36, low cutoff = 5.375, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-3D



n = 12

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

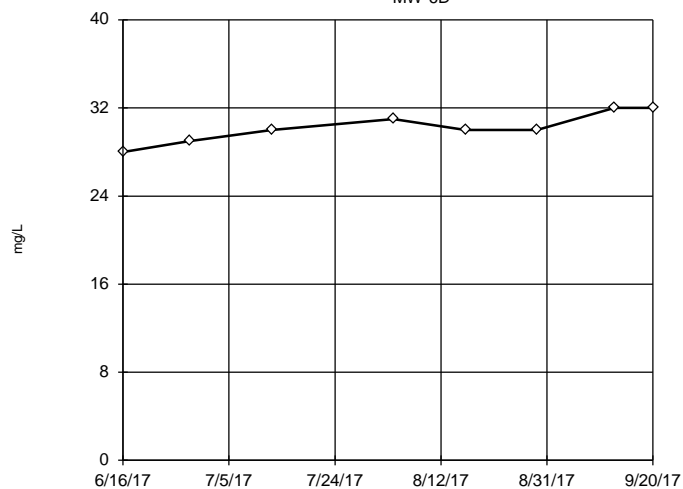
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 22.23, low cutoff = 7.557, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-6D



n = 8

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

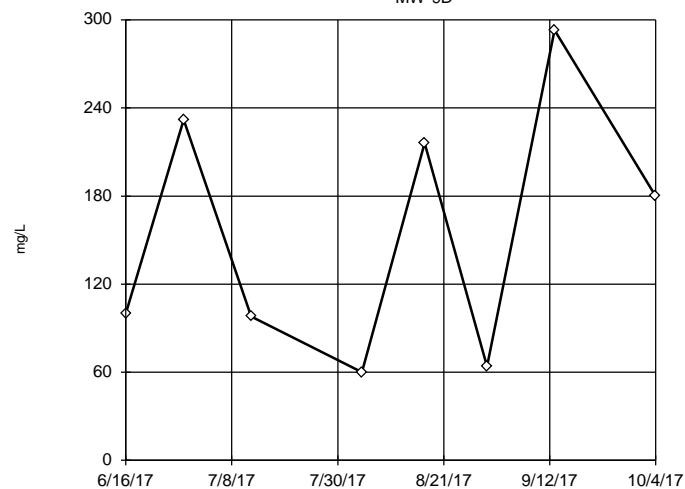
Data were square root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 37.89, low cutoff = 23.89, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-9D



n = 8

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

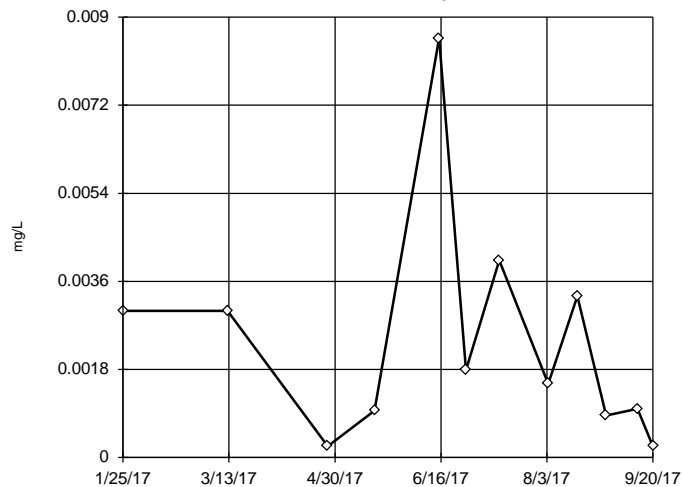
Data were square root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1090, low cutoff = -82.7, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



n = 12

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

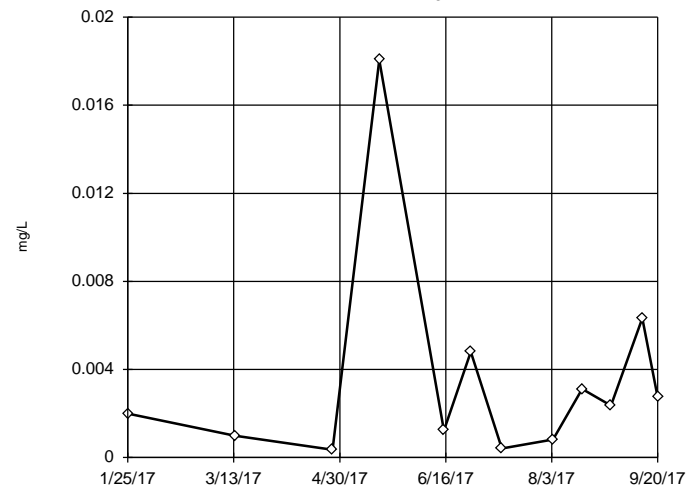
Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.02583,
low cutoff = -0.000142,
based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-3D



n = 12

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

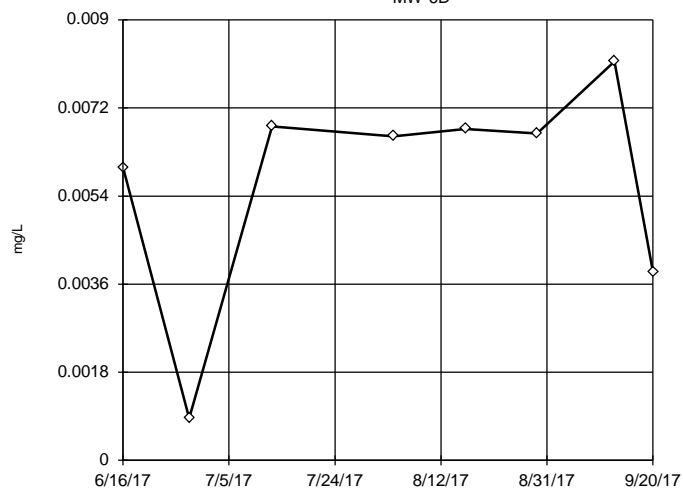
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3001,
low cutoff = 0.00001166,
based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-6D



n = 8

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

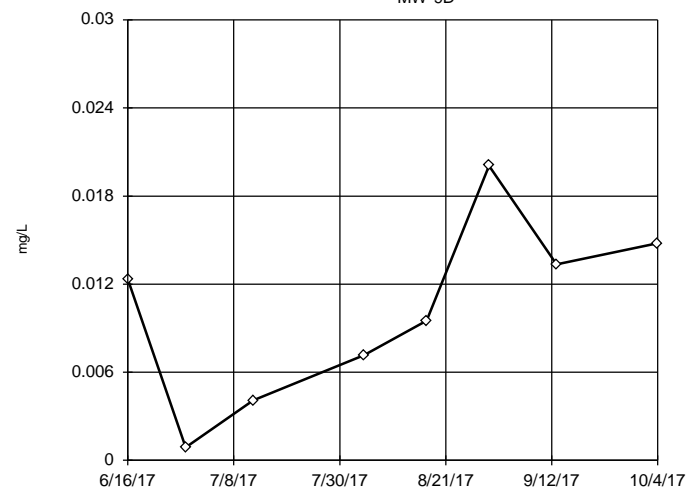
Data were cube transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.009459,
low cutoff = -0.007346,
based on IQR multiplier of 3.

Constituent: Chromium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-9D



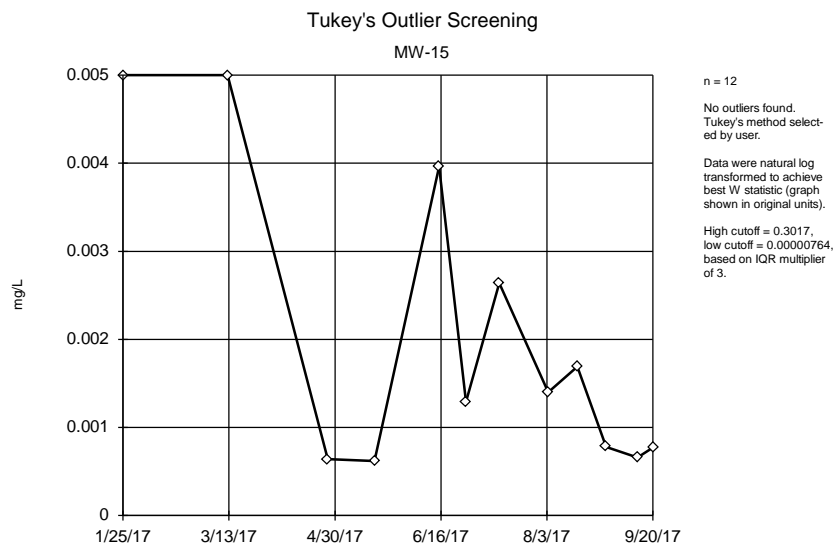
n = 8

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

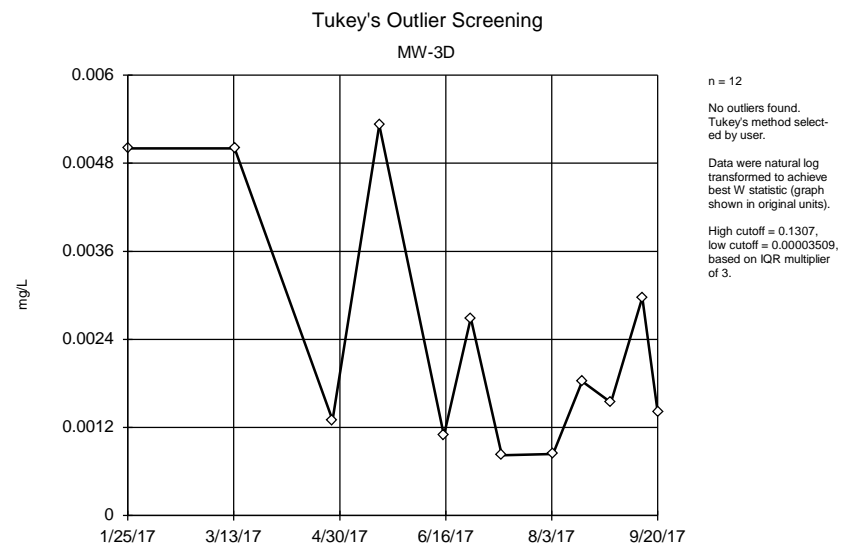
Ladder of Powers transformations did not improve normality; analysis run on raw data.

High cutoff = 0.0394,
low cutoff = -0.01972,
based on IQR multiplier of 3.

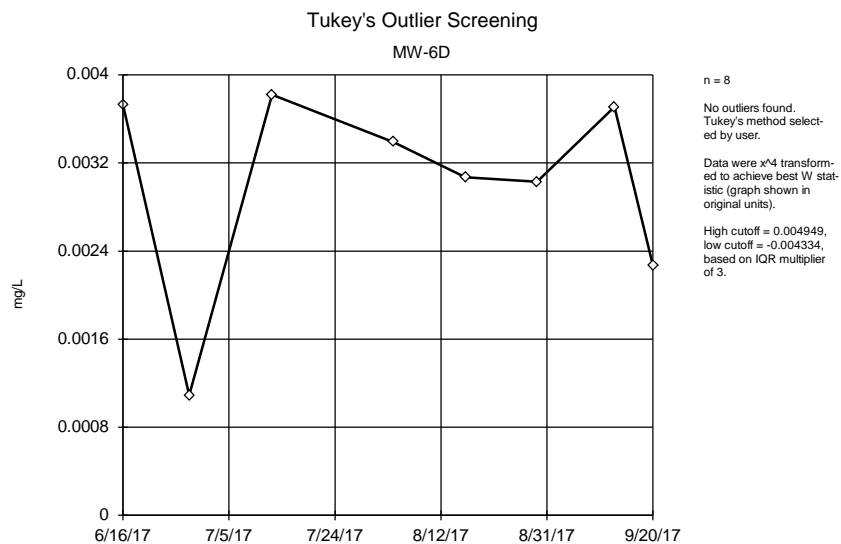
Constituent: Chromium Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



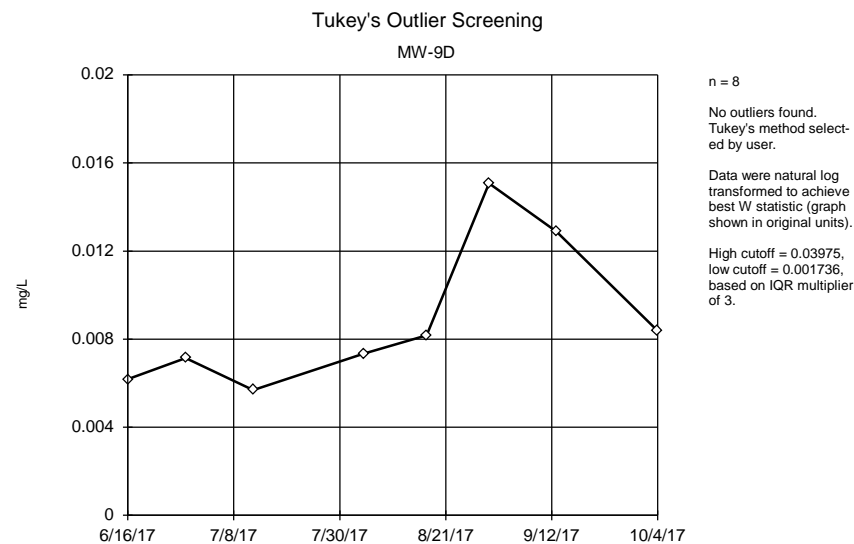
Constituent: Cobalt Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Cobalt Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



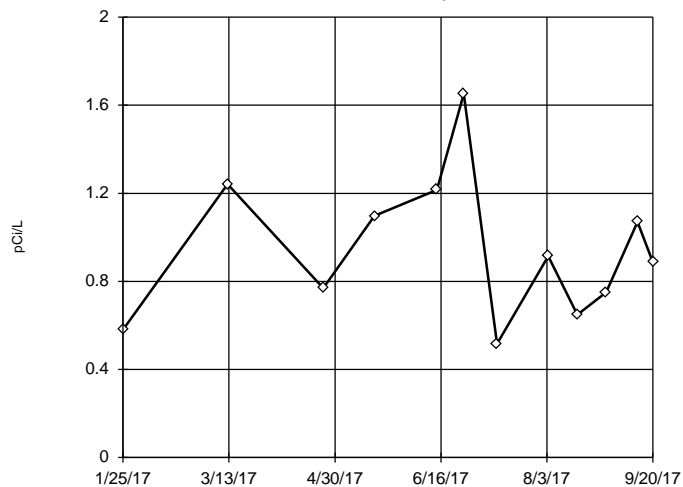
Constituent: Cobalt Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Cobalt Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



n = 12

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

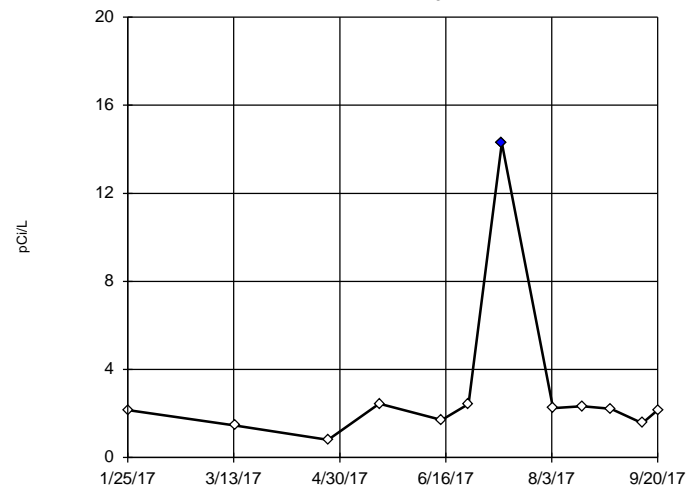
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 5.231, low cutoff = 0.154, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-3D



n = 12

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

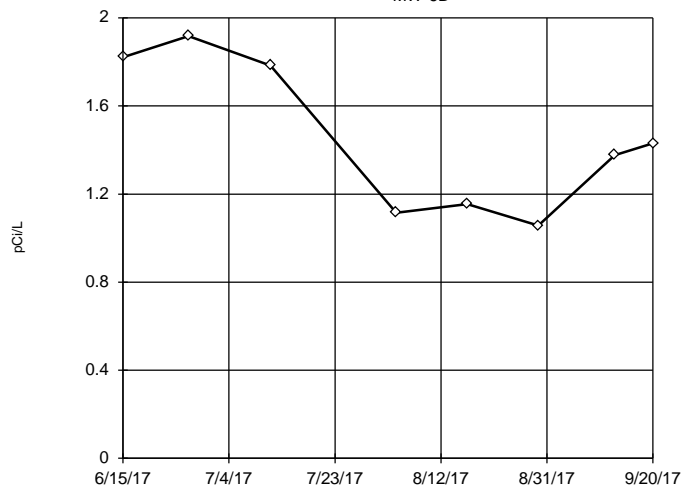
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.335, low cutoff = 0.5301, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-6D



n = 8

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

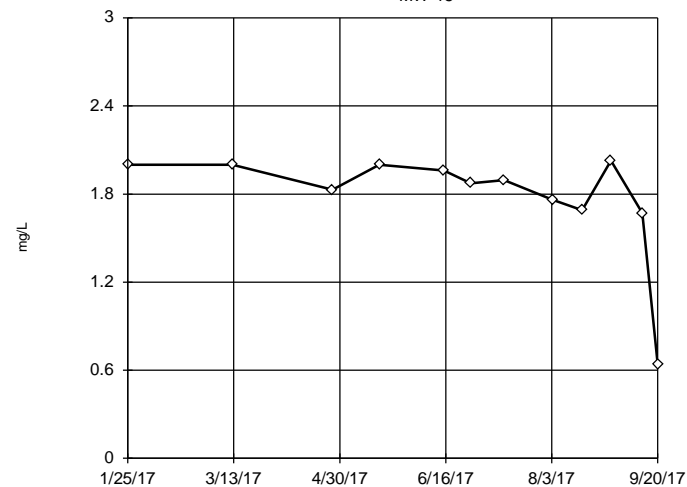
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.229, low cutoff = 0.283, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



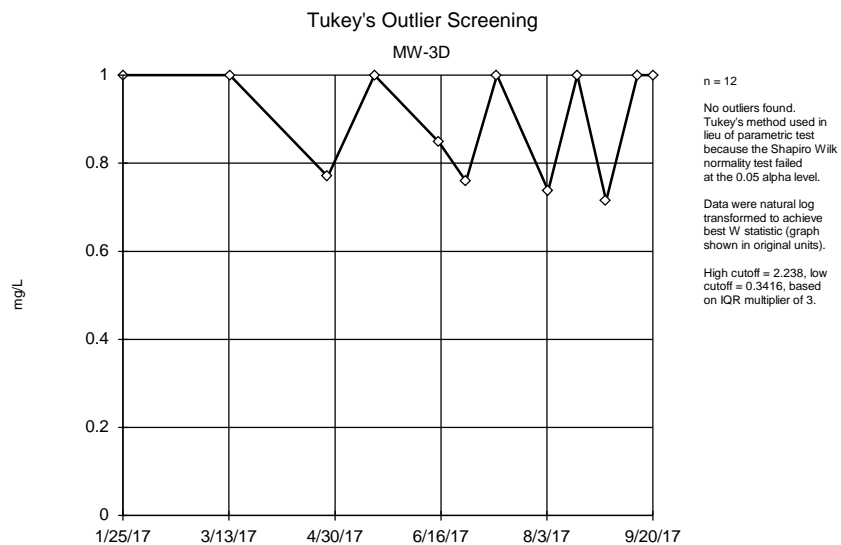
n = 12

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

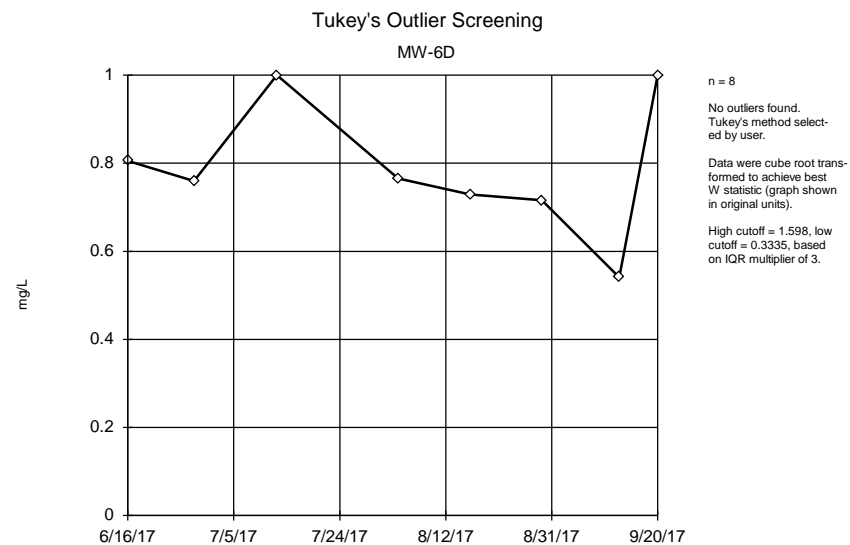
Data were x*6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2.368, low cutoff = -2.101, based on IQR multiplier of 3.

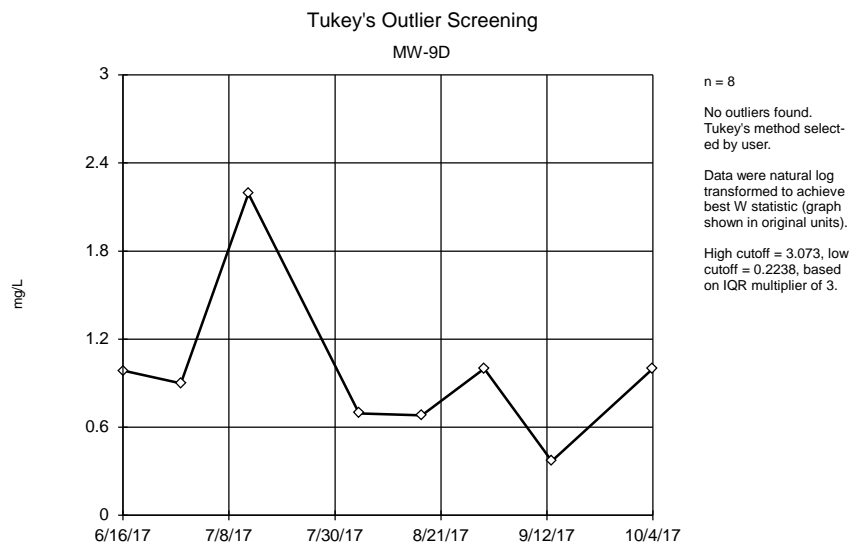
Constituent: Fluoride Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



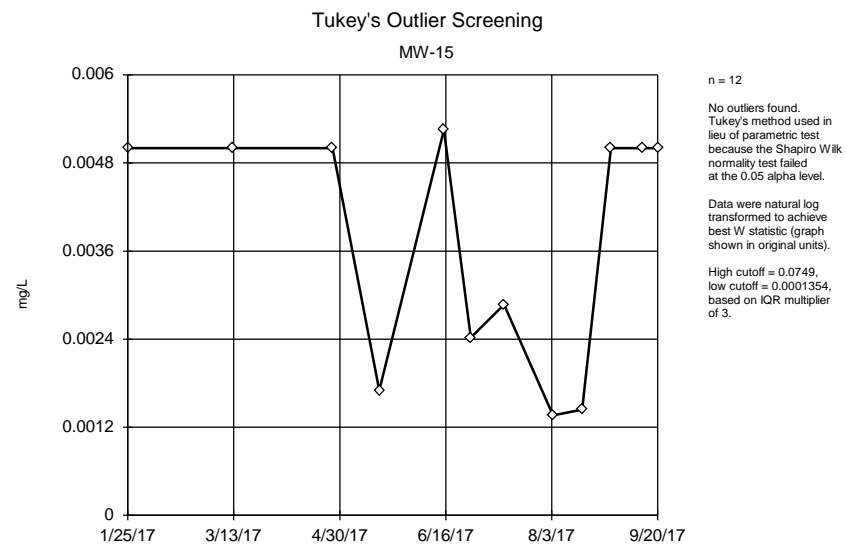
Constituent: Fluoride Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



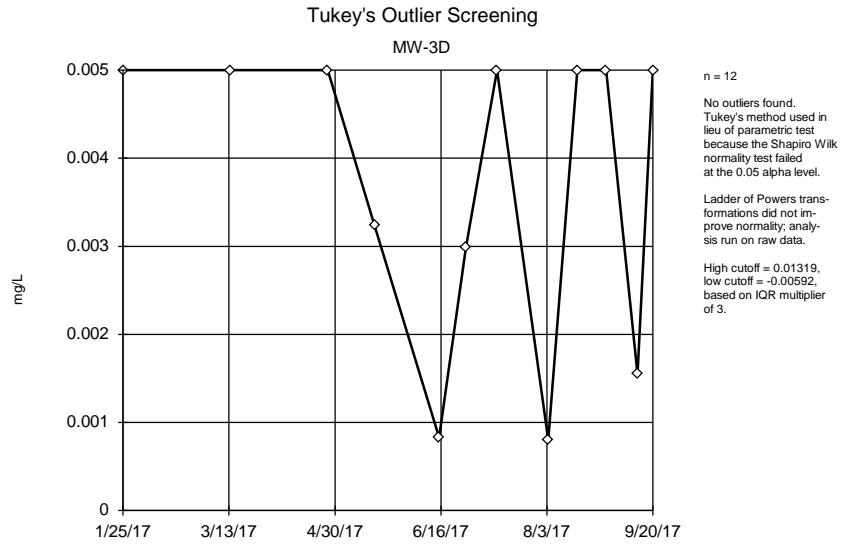
Constituent: Fluoride Analysis Run 1/7/2018 9:31 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



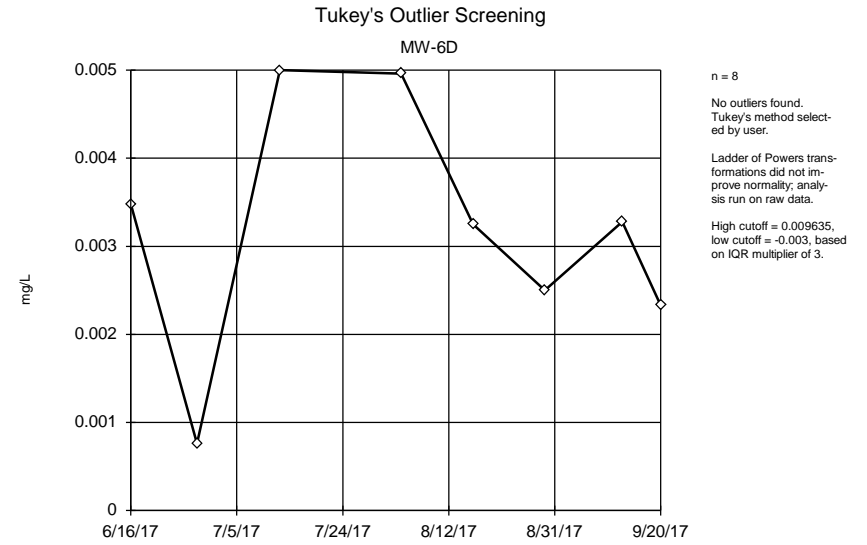
Constituent: Fluoride Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



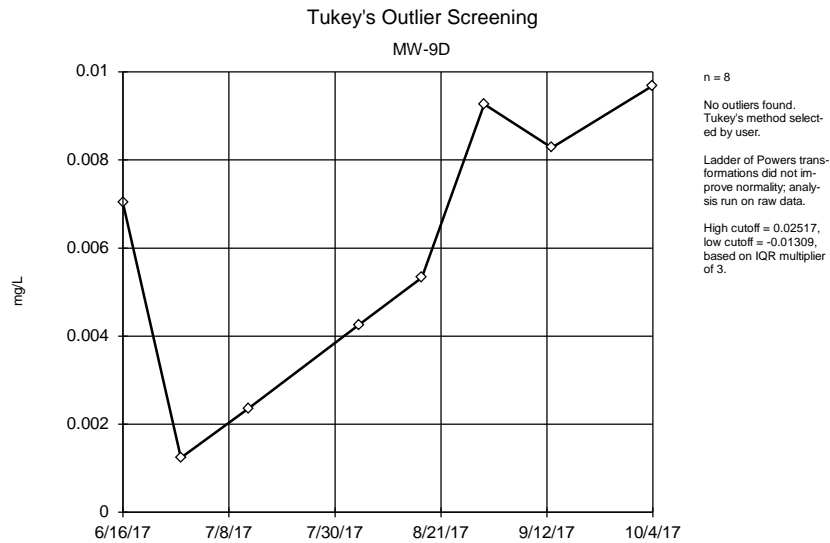
Constituent: Lead Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



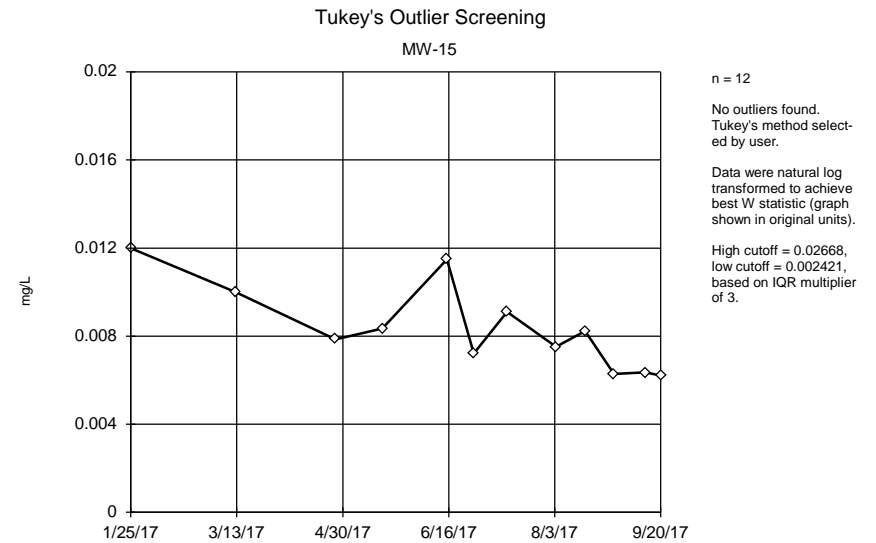
Constituent: Lead Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



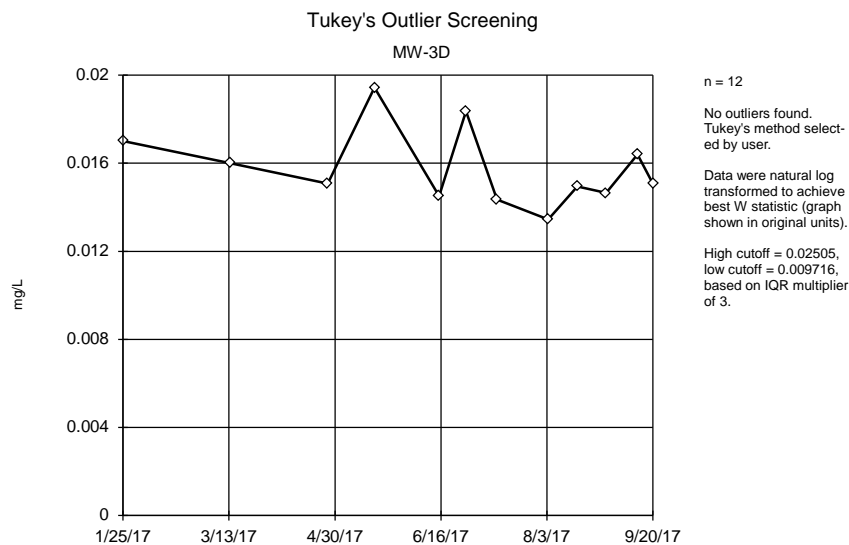
Constituent: Lead Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



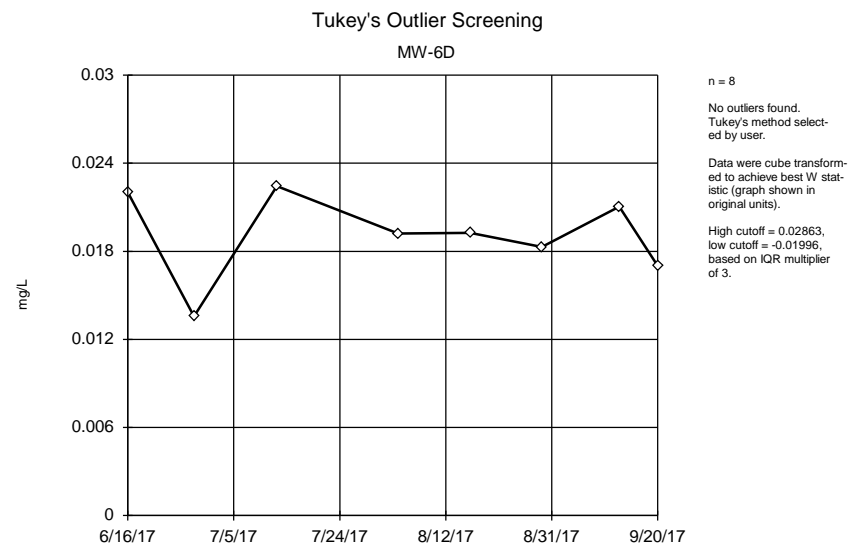
Constituent: Lead Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



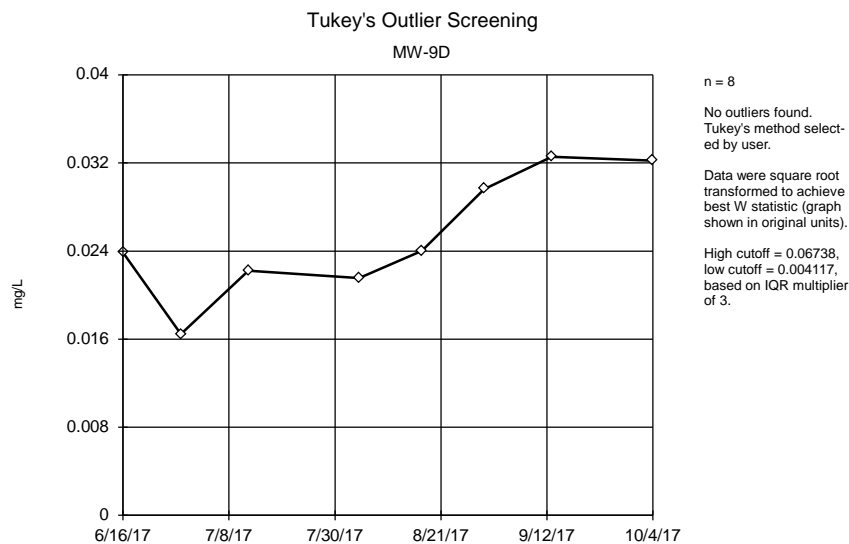
Constituent: Lithium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



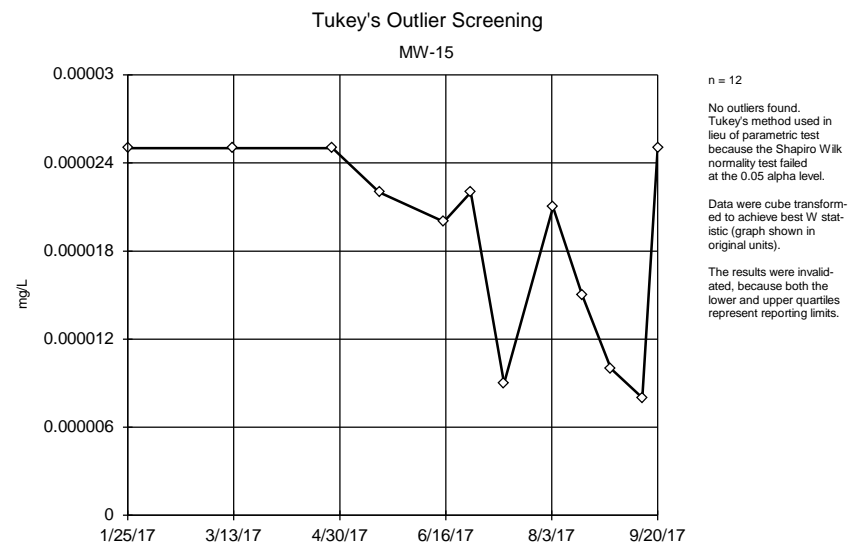
Constituent: Lithium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



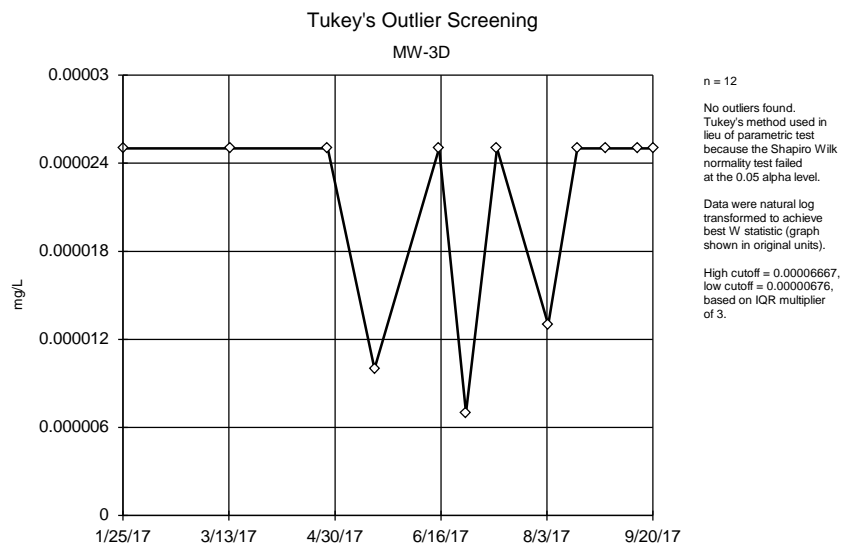
Constituent: Lithium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



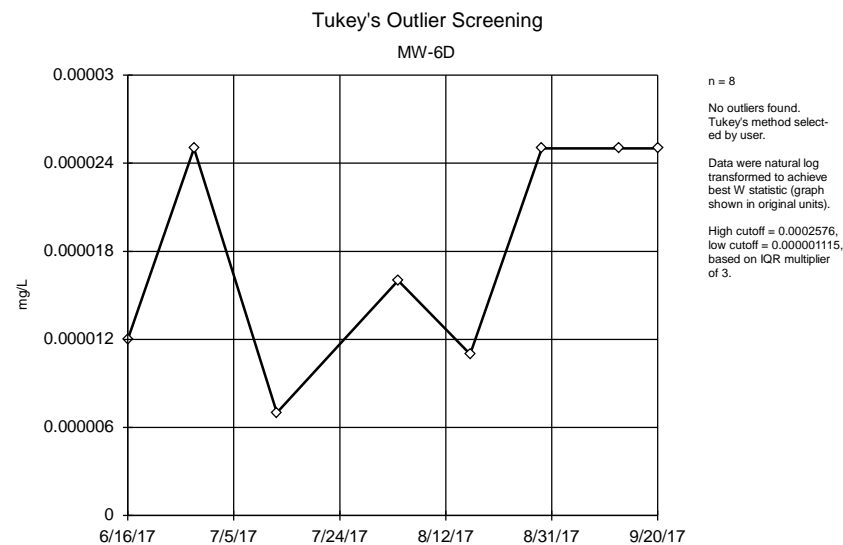
Constituent: Lithium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



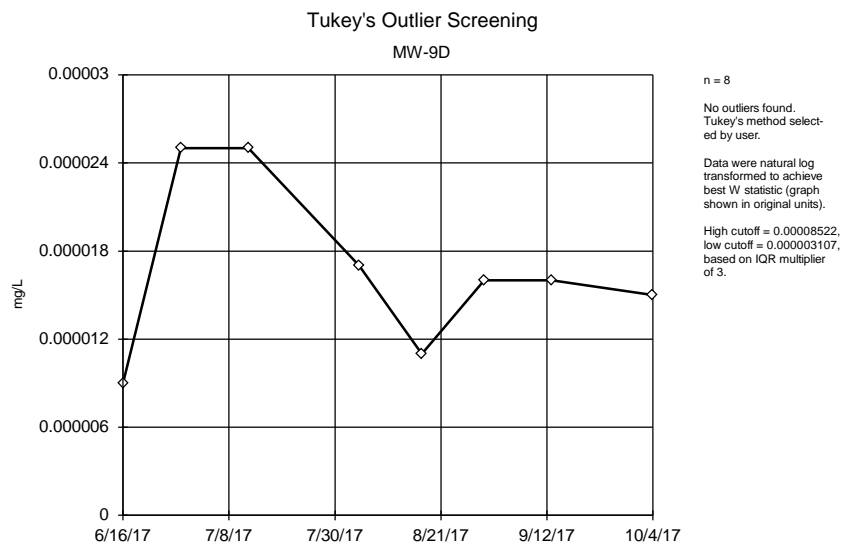
Constituent: Mercury Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



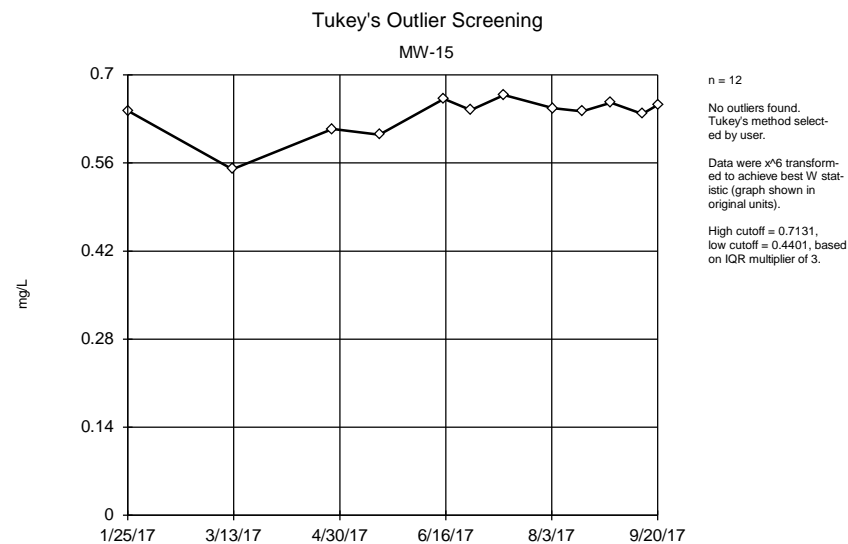
Constituent: Mercury Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Mercury Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



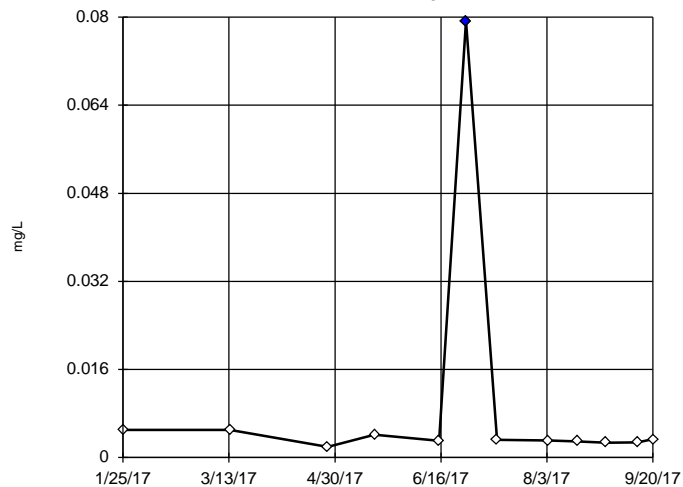
Constituent: Mercury Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Molybdenum Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

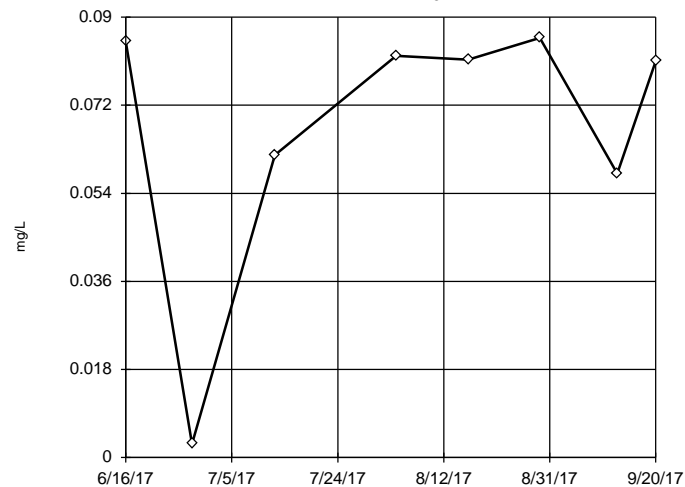
MW-3D



Constituent: Molybdenum Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

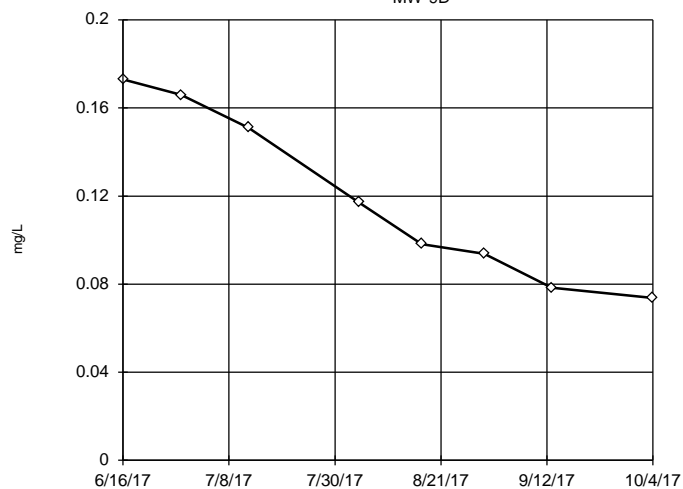
MW-6D



Constituent: Molybdenum Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

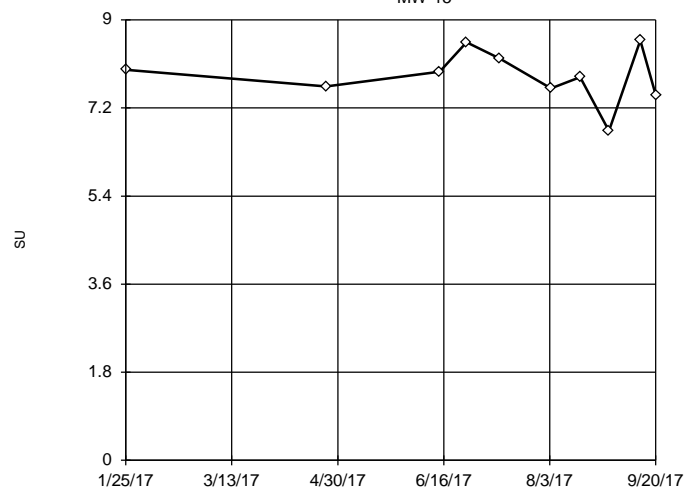
MW-9D



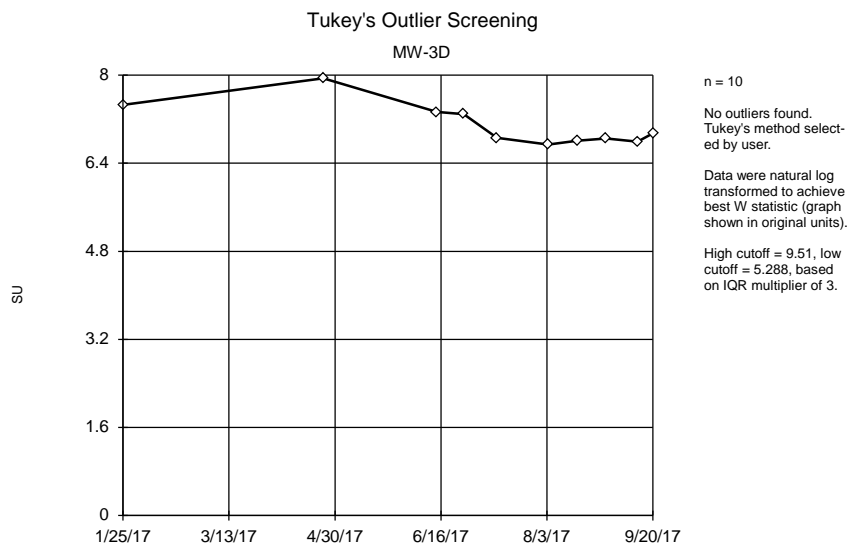
Constituent: Molybdenum Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

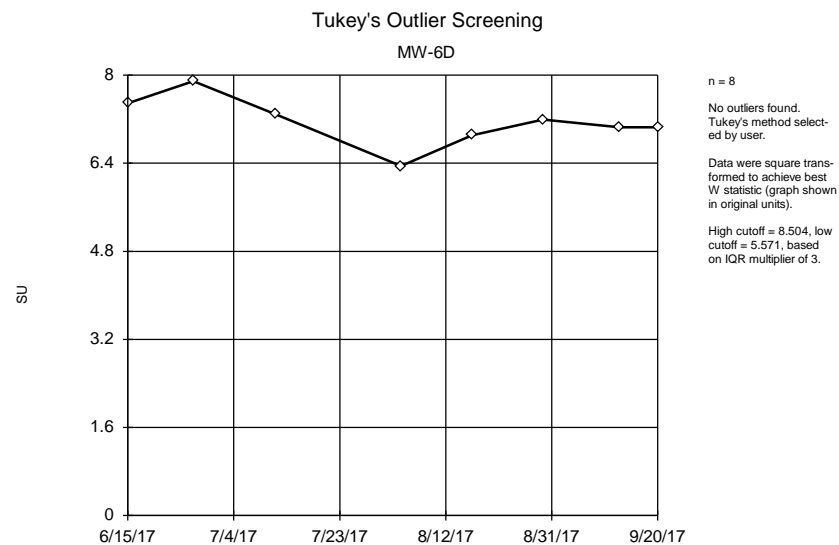
MW-15



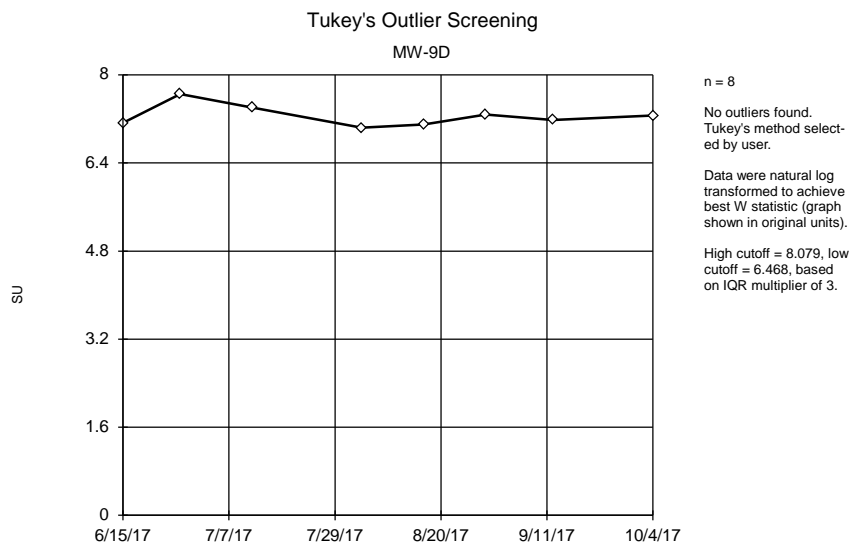
Constituent: pH, field Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
 Northeastern LF Client: Geosyntec Data: Northeastern LF



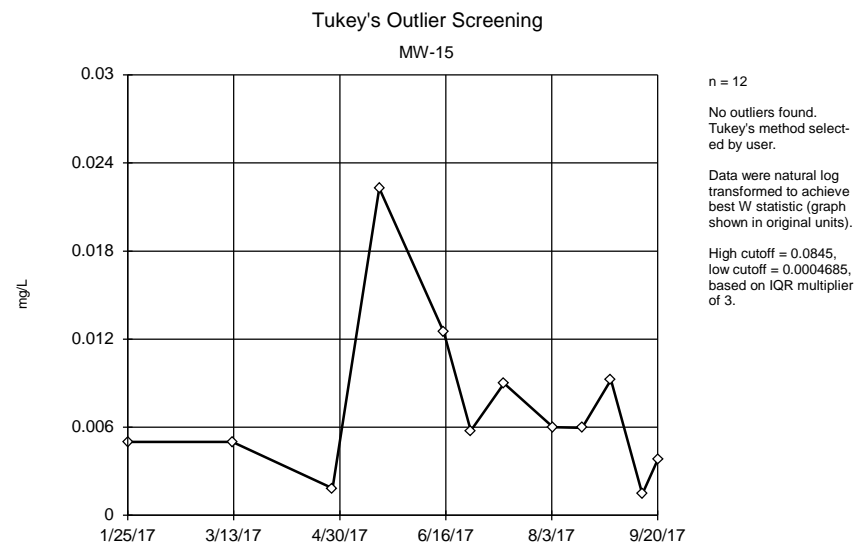
Constituent: pH, field Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



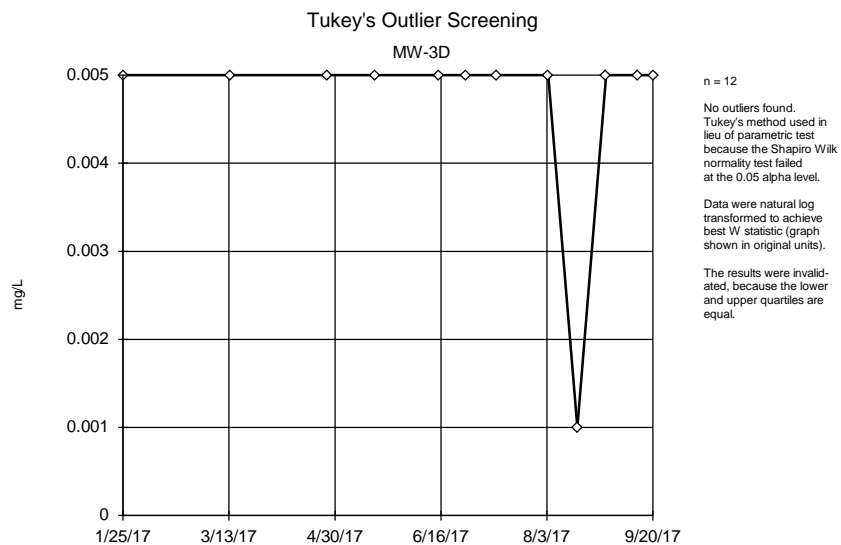
Constituent: pH, field Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



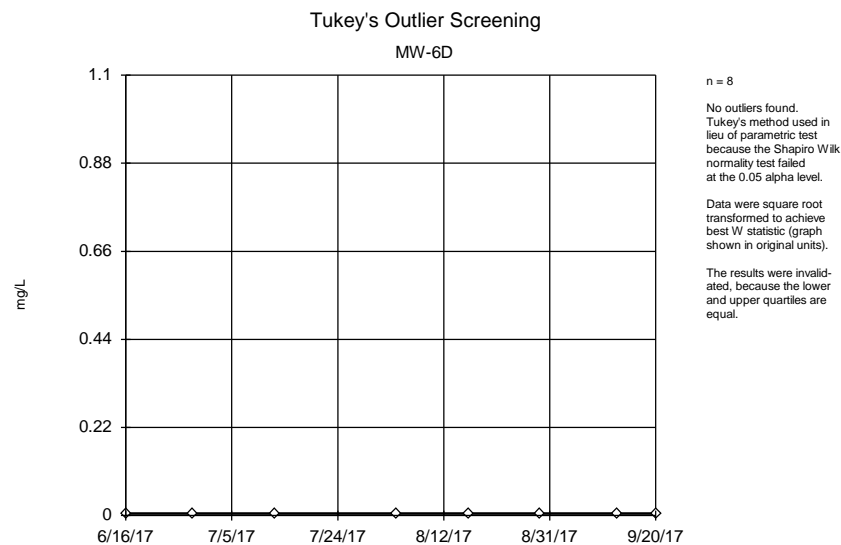
Constituent: pH, field Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



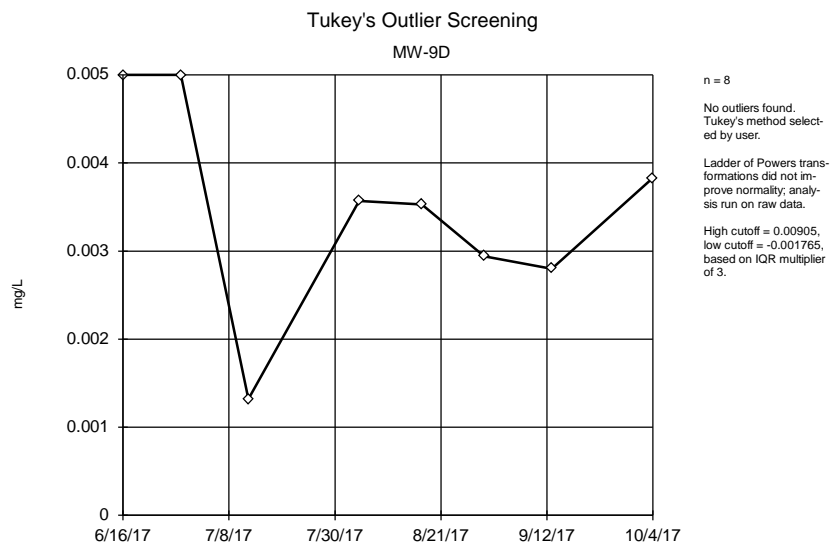
Constituent: Selenium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



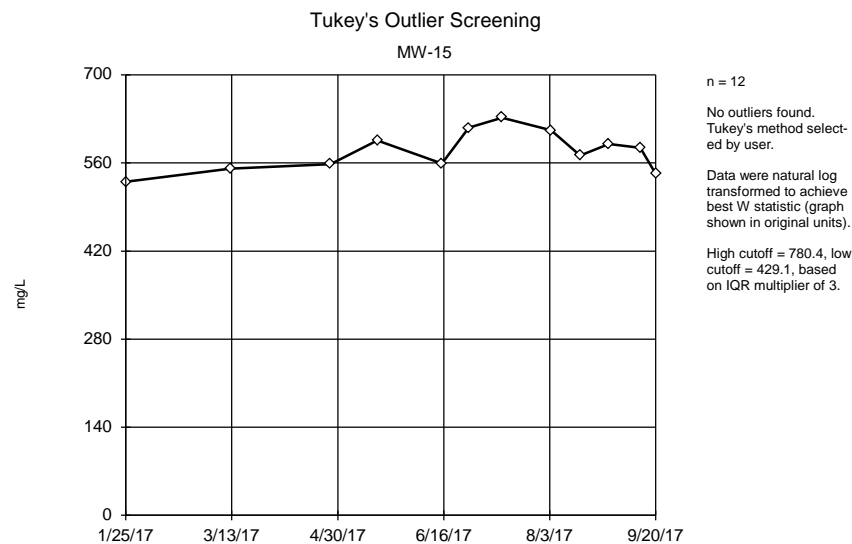
Constituent: Selenium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Selenium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



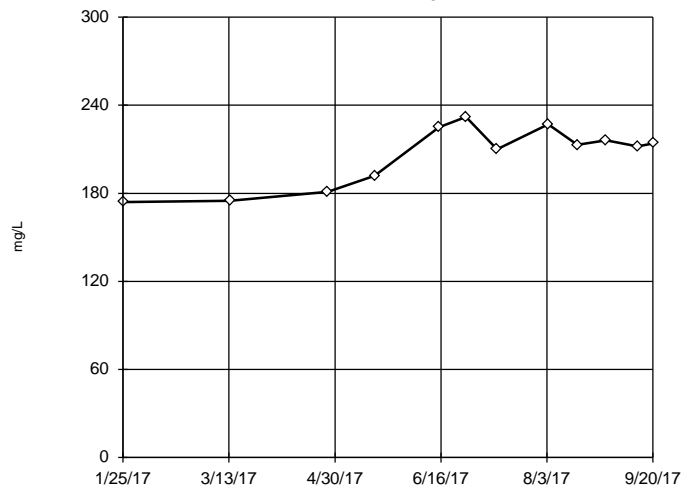
Constituent: Selenium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Sulfate Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

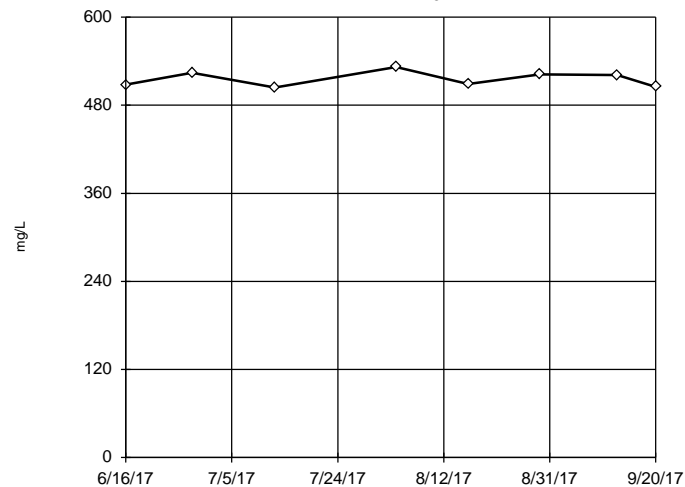
MW-3D



Constituent: Sulfate Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

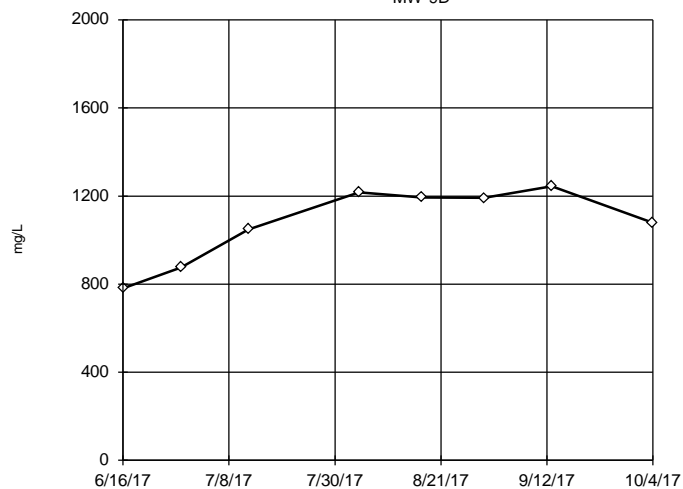
MW-6D



Constituent: Sulfate Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

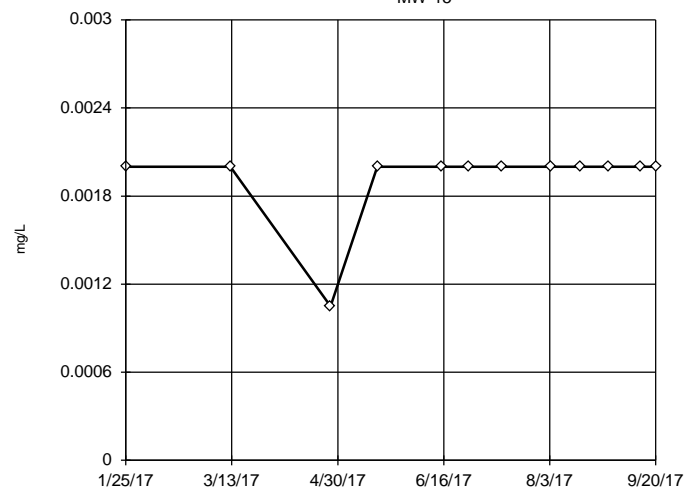
MW-9D



Constituent: Sulfate Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

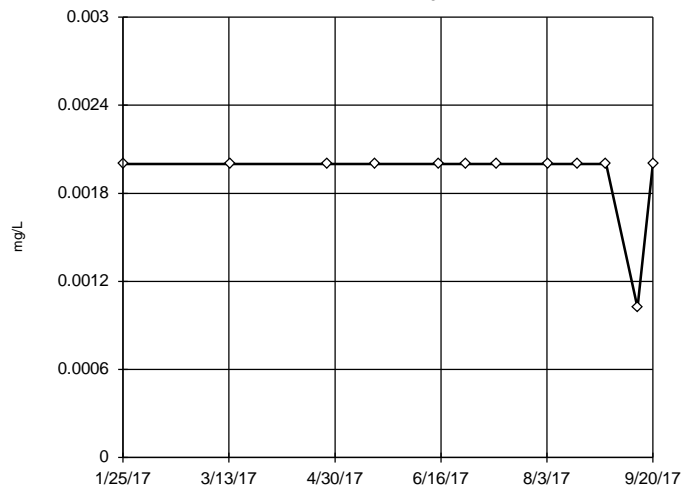
MW-15



Constituent: Thallium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-3D



n = 12

No outliers found. Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

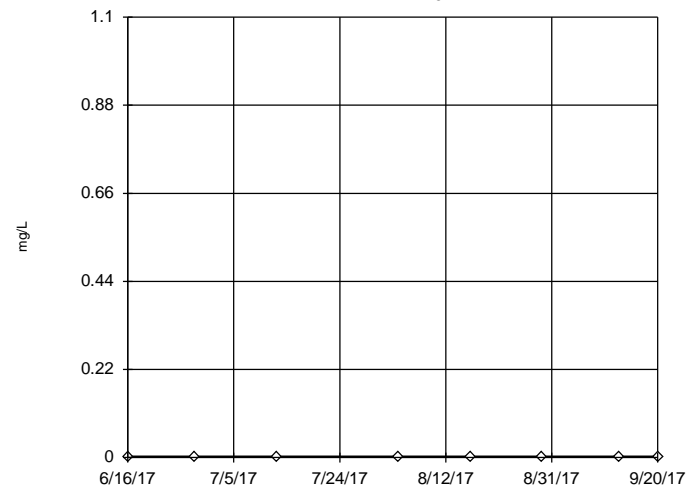
Data were cube root transformed to achieve best W statistic (graph shown in original units).

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

Constituent: Thallium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-6D



n = 8

No outliers found. Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

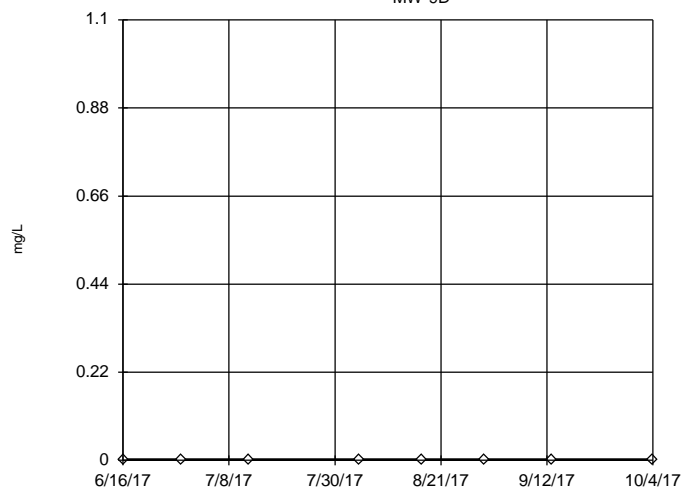
Data were square root transformed to achieve best W statistic (graph shown in original units).

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

Constituent: Thallium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-9D



n = 8

No outliers found. Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

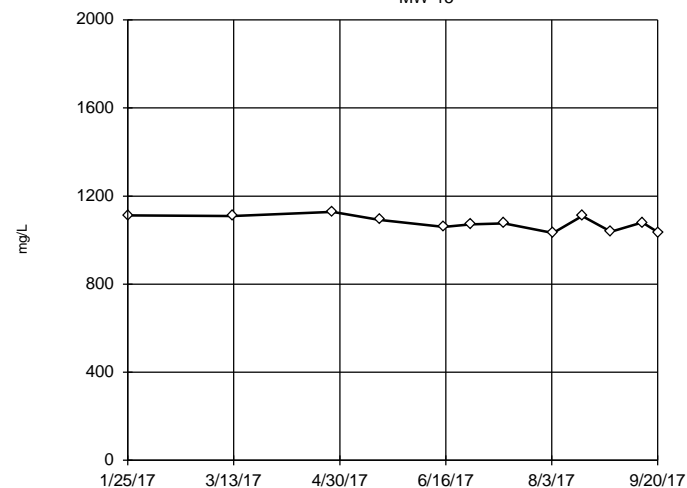
Data were square root transformed to achieve best W statistic (graph shown in original units).

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

Constituent: Thallium Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Tukey's Outlier Screening

MW-15



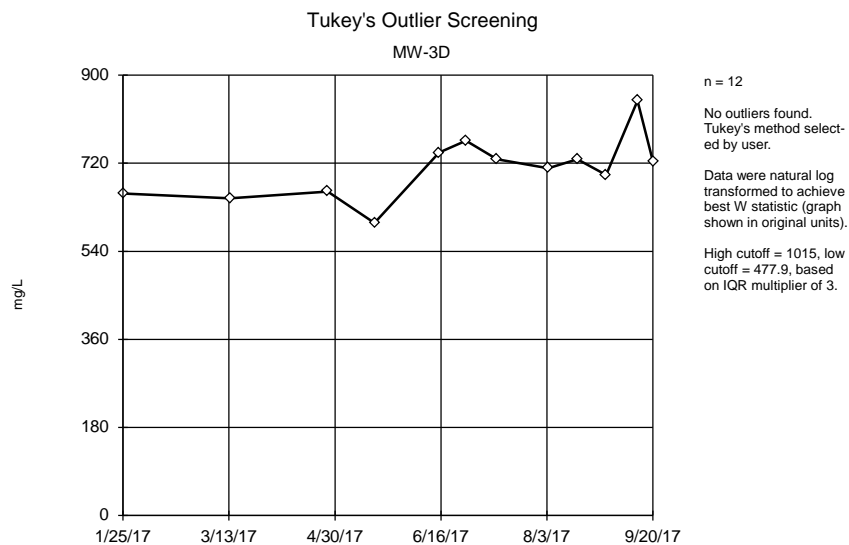
n = 12

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

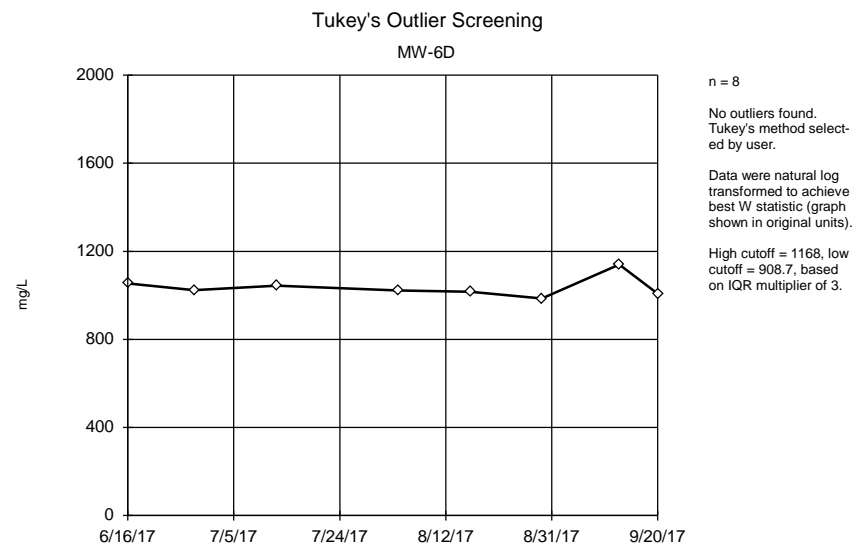
Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1231, low cutoff = -805.2, based on IQR multiplier of 3.

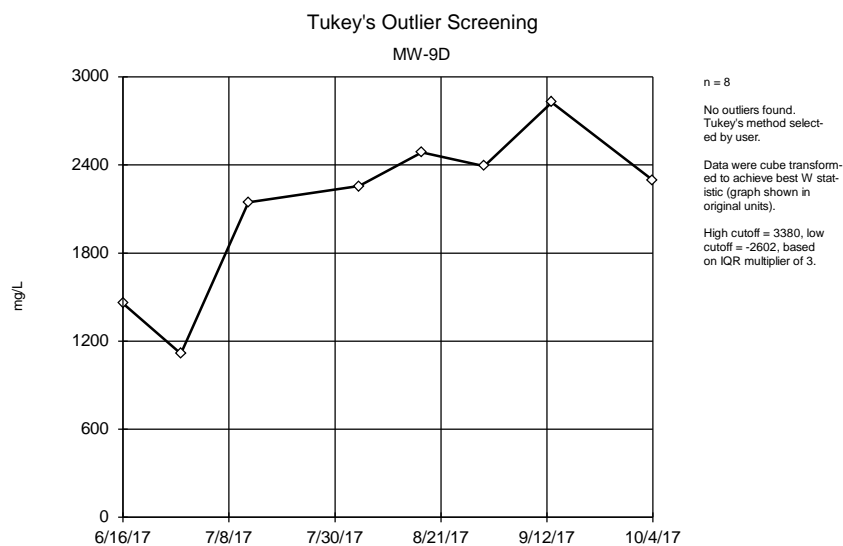
Constituent: Total Dissolve Solids [TDS] Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Total Dissolve Solids [TDS] Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Total Dissolve Solids [TDS] Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Total Dissolve Solids [TDS] Analysis Run 1/7/2018 9:32 AM View: Tukey's Outlier Screening
Northeastern LF Client: Geosyntec Data: Northeastern LF

Trend Tests Summary Table - Significant Results

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/2/2018, 10:28 PM

<u>Constituent</u>	<u>Well</u>	<u>Slope</u>	<u>Calc.</u>	<u>Critical</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Normality</u>	<u>Xform</u>	<u>Alpha</u>	<u>Method</u>
Barium (mg/L)	MW-7D (bg)	2.758	32	25	Yes	9	0	n/a	n/a	0.01	NP
Barium (mg/L)	MW-9D	1.295	22	21	Yes	8	0	n/a	n/a	0.01	NP
Beryllium (mg/L)	MW-7D (bg)	0.003984	32	25	Yes	9	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-7D (bg)	675.4	30	25	Yes	9	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-15	-26.93	-41	-34	Yes	11	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-3D	-6.518	-38	-34	Yes	11	0	n/a	n/a	0.01	NP
Chromium (mg/L)	MW-7D (bg)	0.1097	30	25	Yes	9	0	n/a	n/a	0.01	NP
Cobalt (mg/L)	MW-7D (bg)	0.02943	28	25	Yes	9	0	n/a	n/a	0.01	NP
Lead (mg/L)	MW-7D (bg)	0.04368	34	25	Yes	9	0	n/a	n/a	0.01	NP
Lithium (mg/L)	MW-15	-0.007242	-42	-38	Yes	12	0	n/a	n/a	0.01	NP
Molybdenum (mg/L)	MW-9D	-0.3866	-28	-21	Yes	8	0	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-7D (bg)	6905	30	25	Yes	9	0	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-8D (bg)	6248	39	34	Yes	11	0	n/a	n/a	0.01	NP

Trend Tests Summary Table - All Results

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/2/2018, 10:28 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Antimony (mg/L)	MW-7D (bg)	0	-4	-25	No	9	44.44	n/a	n/a	0.01	NP
Antimony (mg/L)	MW-8D (bg)	-0.0008848	-4	-34	No	11	9.091	n/a	n/a	0.01	NP
Antimony (mg/L)	MW-15	0	3	38	No	12	58.33	n/a	n/a	0.01	NP
Antimony (mg/L)	MW-3D	0	-7	-38	No	12	83.33	n/a	n/a	0.01	NP
Antimony (mg/L)	MW-6D	0	-6	-21	No	8	62.5	n/a	n/a	0.01	NP
Antimony (mg/L)	MW-9D	0	0	21	No	8	100	n/a	n/a	0.01	NP
Arsenic (mg/L)	MW-7D (bg)	0.01562	12	25	No	9	0	n/a	n/a	0.01	NP
Arsenic (mg/L)	MW-8D (bg)	0.001884	3	34	No	11	9.091	n/a	n/a	0.01	NP
Arsenic (mg/L)	MW-15	-0.001524	-13	-38	No	12	16.67	n/a	n/a	0.01	NP
Arsenic (mg/L)	MW-3D	-0.001668	-21	-38	No	12	50	n/a	n/a	0.01	NP
Arsenic (mg/L)	MW-6D	-0.004025	-9	-21	No	8	37.5	n/a	n/a	0.01	NP
Arsenic (mg/L)	MW-9D	0	0	21	No	8	100	n/a	n/a	0.01	NP
Barium (mg/L)	MW-7D (bg)	2.758	32	25	Yes	9	0	n/a	n/a	0.01	NP
Barium (mg/L)	MW-8D (bg)	3.65	15	34	No	11	0	n/a	n/a	0.01	NP
Barium (mg/L)	MW-15	-0.07315	-22	-38	No	12	0	n/a	n/a	0.01	NP
Barium (mg/L)	MW-3D	0.3013	28	38	No	12	0	n/a	n/a	0.01	NP
Barium (mg/L)	MW-6D	-0.1567	-14	-21	No	8	0	n/a	n/a	0.01	NP
Barium (mg/L)	MW-9D	1.295	22	21	Yes	8	0	n/a	n/a	0.01	NP
Beryllium (mg/L)	MW-7D (bg)	0.003984	32	25	Yes	9	0	n/a	n/a	0.01	NP
Beryllium (mg/L)	MW-8D (bg)	-0.0004205	-6	-34	No	11	18.18	n/a	n/a	0.01	NP
Beryllium (mg/L)	MW-15	-0.000982	-30	-38	No	12	41.67	n/a	n/a	0.01	NP
Beryllium (mg/L)	MW-3D	-0.001158	-20	-38	No	12	25	n/a	n/a	0.01	NP
Beryllium (mg/L)	MW-6D	0.0002463	7	21	No	8	0	n/a	n/a	0.01	NP
Beryllium (mg/L)	MW-9D	0.0007039	10	21	No	8	12.5	n/a	n/a	0.01	NP
Boron (mg/L)	MW-7D (bg)	-1.397	-24	-25	No	9	0	n/a	n/a	0.01	NP
Boron (mg/L)	MW-8D (bg)	0.1352	30	34	No	11	0	n/a	n/a	0.01	NP
Boron (mg/L)	MW-15	0.05173	0	38	No	12	0	n/a	n/a	0.01	NP
Boron (mg/L)	MW-3D	-0.1204	-23	-34	No	11	0	n/a	n/a	0.01	NP
Boron (mg/L)	MW-6D	0.797	4	21	No	8	0	n/a	n/a	0.01	NP
Boron (mg/L)	MW-9D	-1.731	-16	-21	No	8	0	n/a	n/a	0.01	NP
Cadmium (mg/L)	MW-7D (bg)	0.004366	17	25	No	9	11.11	n/a	n/a	0.01	NP
Cadmium (mg/L)	MW-8D (bg)	0.0006978	3	34	No	11	0	n/a	n/a	0.01	NP
Cadmium (mg/L)	MW-15	0	1	38	No	12	66.67	n/a	n/a	0.01	NP
Cadmium (mg/L)	MW-3D	-0.0009236	-24	-38	No	12	16.67	n/a	n/a	0.01	NP
Cadmium (mg/L)	MW-6D	-0.00166	-12	-21	No	8	0	n/a	n/a	0.01	NP
Cadmium (mg/L)	MW-9D	0.002329	6	21	No	8	12.5	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-7D (bg)	675.4	30	25	Yes	9	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-8D (bg)	124.3	10	34	No	11	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-15	-29.89	-16	-38	No	12	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-3D	44.4	26	38	No	12	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-6D	62.62	4	21	No	8	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-9D	537.8	16	21	No	8	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-7D (bg)	1721	18	25	No	9	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-8D (bg)	568.5	5	34	No	11	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-15	-26.93	-41	-34	Yes	11	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-3D	-6.518	-38	-34	Yes	11	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-6D	12.4	20	21	No	8	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-9D	160.8	2	21	No	8	0	n/a	n/a	0.01	NP
Chromium (mg/L)	MW-7D (bg)	0.1097	30	25	Yes	9	0	n/a	n/a	0.01	NP
Chromium (mg/L)	MW-8D (bg)	0.002444	12	34	No	11	18.18	n/a	n/a	0.01	NP
Chromium (mg/L)	MW-15	-0.003672	-16	-38	No	12	8.333	n/a	n/a	0.01	NP
Chromium (mg/L)	MW-3D	0.00314	14	38	No	12	8.333	n/a	n/a	0.01	NP
Chromium (mg/L)	MW-6D	0.004402	6	21	No	8	0	n/a	n/a	0.01	NP
Chromium (mg/L)	MW-9D	0.0501	16	21	No	8	0	n/a	n/a	0.01	NP
Cobalt (mg/L)	MW-7D (bg)	0.02943	28	25	Yes	9	0	n/a	n/a	0.01	NP

Trend Tests Summary Table - All Results

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Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/2/2018, 10:28 PM

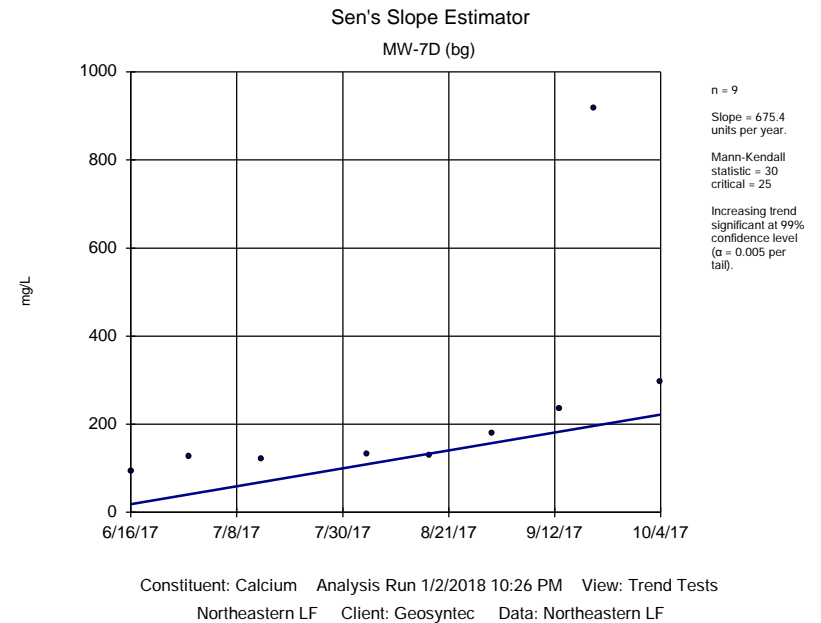
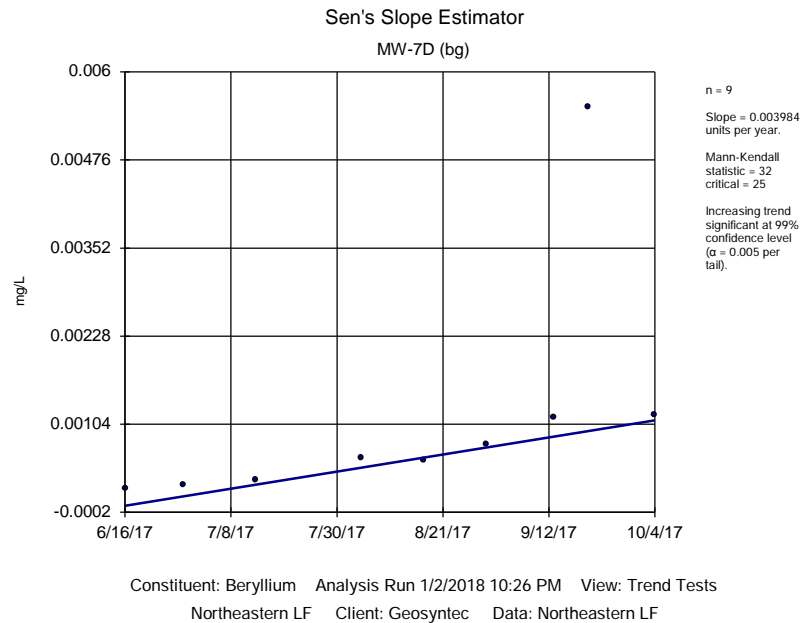
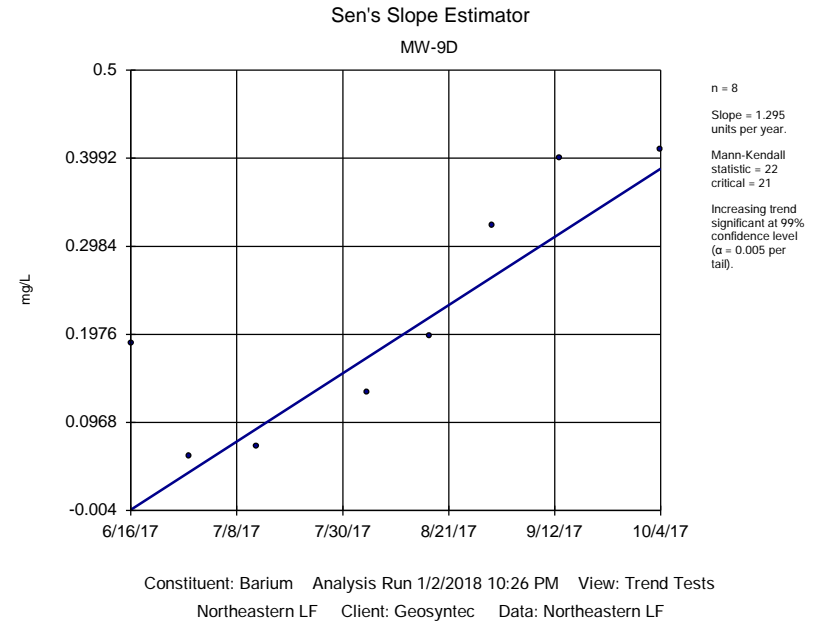
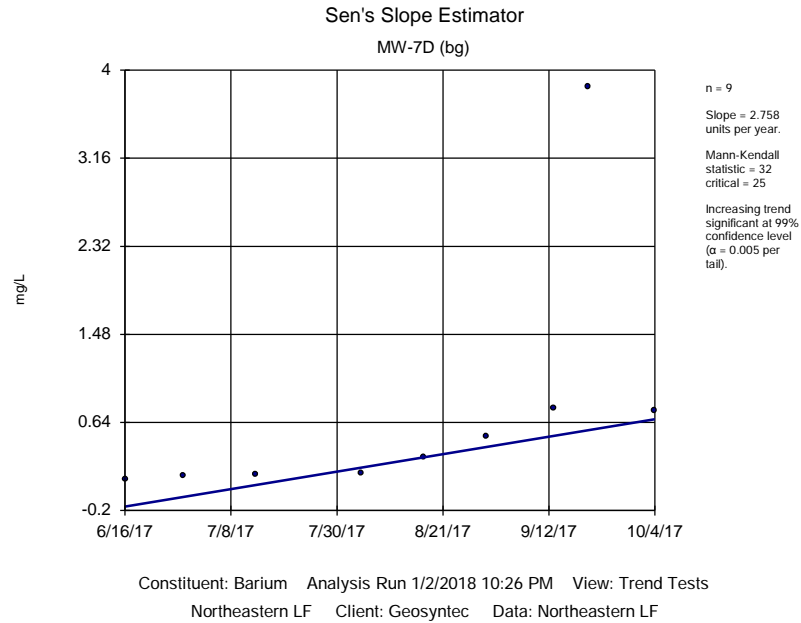
Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Cobalt (mg/L)	MW-8D (bg)	0	0	34	No	11	18.18	n/a	n/a	0.01	NP
Cobalt (mg/L)	MW-15	-0.006205	-23	-38	No	12	16.67	n/a	n/a	0.01	NP
Cobalt (mg/L)	MW-3D	-0.00392	-15	-38	No	12	16.67	n/a	n/a	0.01	NP
Cobalt (mg/L)	MW-6D	-0.00297	-8	-21	No	8	0	n/a	n/a	0.01	NP
Cobalt (mg/L)	MW-9D	0.01751	18	21	No	8	0	n/a	n/a	0.01	NP
Combined Radium 226 + 228 (pCi/L)	MW-7D (bg)	-0.7352	-4	-21	No	8	0	n/a	n/a	0.01	NP
Combined Radium 226 + 228 (pCi/L)	MW-8D (bg)	2.841	8	21	No	8	0	n/a	n/a	0.01	NP
Combined Radium 226 + 228 (pCi/L)	MW-15	-0.09224	-4	-38	No	12	0	n/a	n/a	0.01	NP
Combined Radium 226 + 228 (pCi/L)	MW-3D	0.1043	3	34	No	11	0	n/a	n/a	0.01	NP
Combined Radium 226 + 228 (pCi/L)	MW-6D	-1.969	-10	-21	No	8	0	n/a	n/a	0.01	NP
Combined Radium 226 + 228 (pCi/L)	MW-9D	4.147	NaN	NaN	No	3	0	n/a	n/a	NaN	NP
Fluoride (mg/L)	MW-7D (bg)	3.568	14	25	No	9	11.11	n/a	n/a	0.01	NP
Fluoride (mg/L)	MW-8D (bg)	0	6	34	No	11	90.91	n/a	n/a	0.01	NP
Fluoride (mg/L)	MW-15	-0.6635	-35	-38	No	12	0	n/a	n/a	0.01	NP
Fluoride (mg/L)	MW-3D	0	-7	-38	No	12	50	n/a	n/a	0.01	NP
Fluoride (mg/L)	MW-6D	-0.4033	-9	-21	No	8	25	n/a	n/a	0.01	NP
Fluoride (mg/L)	MW-9D	-1.691	-5	-21	No	8	25	n/a	n/a	0.01	NP
Lead (mg/L)	MW-7D (bg)	0.04368	34	25	Yes	9	0	n/a	n/a	0.01	NP
Lead (mg/L)	MW-8D (bg)	-0.002385	-4	-34	No	11	18.18	n/a	n/a	0.01	NP
Lead (mg/L)	MW-15	0	-5	-38	No	12	50	n/a	n/a	0.01	NP
Lead (mg/L)	MW-3D	0	-7	-38	No	12	58.33	n/a	n/a	0.01	NP
Lead (mg/L)	MW-6D	-0.003664	-8	-21	No	8	0	n/a	n/a	0.01	NP
Lead (mg/L)	MW-9D	0.03008	18	21	No	8	0	n/a	n/a	0.01	NP
Lithium (mg/L)	MW-7D (bg)	0.2229	19	25	No	9	0	n/a	n/a	0.01	NP
Lithium (mg/L)	MW-8D (bg)	-0.05141	-2	-34	No	11	0	n/a	n/a	0.01	NP
Lithium (mg/L)	MW-15	-0.007242	-42	-38	Yes	12	0	n/a	n/a	0.01	NP
Lithium (mg/L)	MW-3D	-0.00293	-15	-38	No	12	0	n/a	n/a	0.01	NP
Lithium (mg/L)	MW-6D	-0.01464	-6	-21	No	8	0	n/a	n/a	0.01	NP
Lithium (mg/L)	MW-9D	0.05519	18	21	No	8	0	n/a	n/a	0.01	NP
Mercury (mg/L)	MW-7D (bg)	0.00008047	18	25	No	9	11.11	n/a	n/a	0.01	NP
Mercury (mg/L)	MW-8D (bg)	0.00000869	14	34	No	11	27.27	n/a	n/a	0.01	NP
Mercury (mg/L)	MW-15	-0.00001855	-33	-38	No	12	33.33	n/a	n/a	0.01	NP
Mercury (mg/L)	MW-3D	0	4	38	No	12	75	n/a	n/a	0.01	NP
Mercury (mg/L)	MW-6D	0.00004557	10	21	No	8	50	n/a	n/a	0.01	NP
Mercury (mg/L)	MW-9D	-0.0000112	-6	-21	No	8	25	n/a	n/a	0.01	NP
Molybdenum (mg/L)	MW-7D (bg)	0.06326	24	25	No	9	0	n/a	n/a	0.01	NP
Molybdenum (mg/L)	MW-8D (bg)	0.0002808	2	34	No	11	18.18	n/a	n/a	0.01	NP
Molybdenum (mg/L)	MW-15	0.05851	18	38	No	12	0	n/a	n/a	0.01	NP
Molybdenum (mg/L)	MW-3D	-0.003103	-20	-34	No	11	18.18	n/a	n/a	0.01	NP
Molybdenum (mg/L)	MW-6D	0.00008302	0	21	No	8	0	n/a	n/a	0.01	NP
Molybdenum (mg/L)	MW-9D	-0.3866	-28	-21	Yes	8	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-7D (bg)	-1.4	-6	-25	No	9	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-8D (bg)	-0.8495	-24	-25	No	9	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-15	-0.6373	-9	-30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-3D	-1.376	-25	-30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-6D	-1.72	-11	-21	No	8	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-9D	-0.1912	-2	-21	No	8	0	n/a	n/a	0.01	NP
Selenium (mg/L)	MW-7D (bg)	0.05794	16	25	No	9	0	n/a	n/a	0.01	NP
Selenium (mg/L)	MW-8D (bg)	0.00008946	3	34	No	11	9.091	n/a	n/a	0.01	NP
Selenium (mg/L)	MW-15	-0.001645	-5	-38	No	12	16.67	n/a	n/a	0.01	NP
Selenium (mg/L)	MW-3D	0	-5	-38	No	12	91.67	n/a	n/a	0.01	NP
Selenium (mg/L)	MW-6D	0	0	21	No	8	100	n/a	n/a	0.01	NP
Selenium (mg/L)	MW-9D	-0.005692	-9	-21	No	8	12.5	n/a	n/a	0.01	NP
Sulfate (mg/L)	MW-7D (bg)	1994	22	25	No	9	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	MW-8D (bg)	16.4	4	34	No	11	0	n/a	n/a	0.01	NP

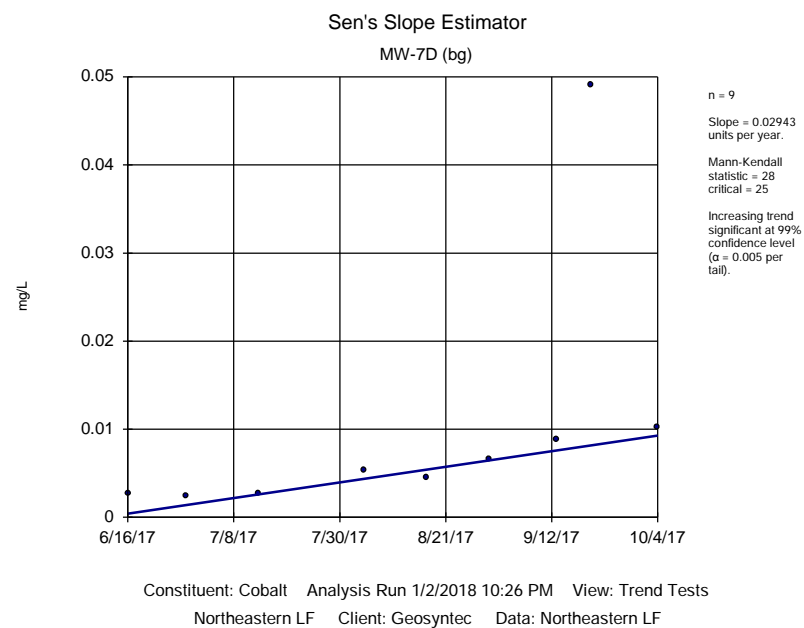
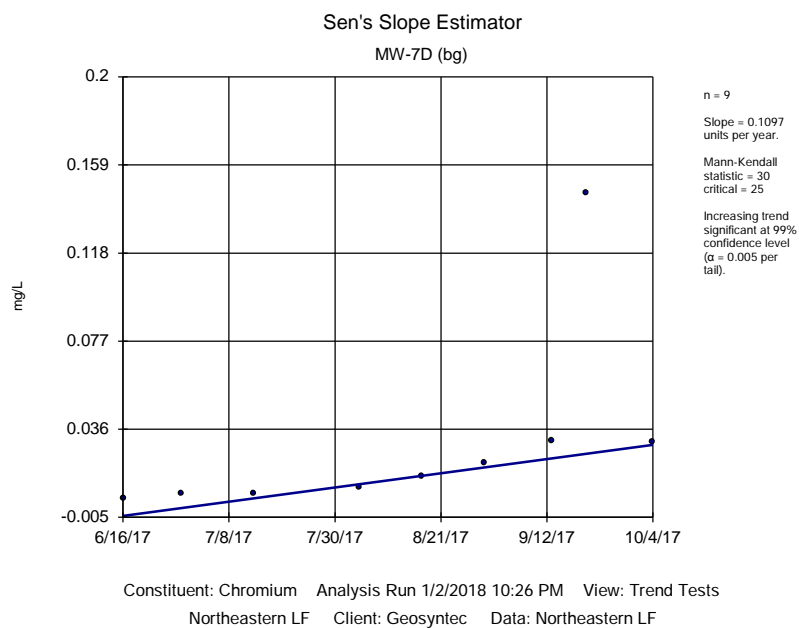
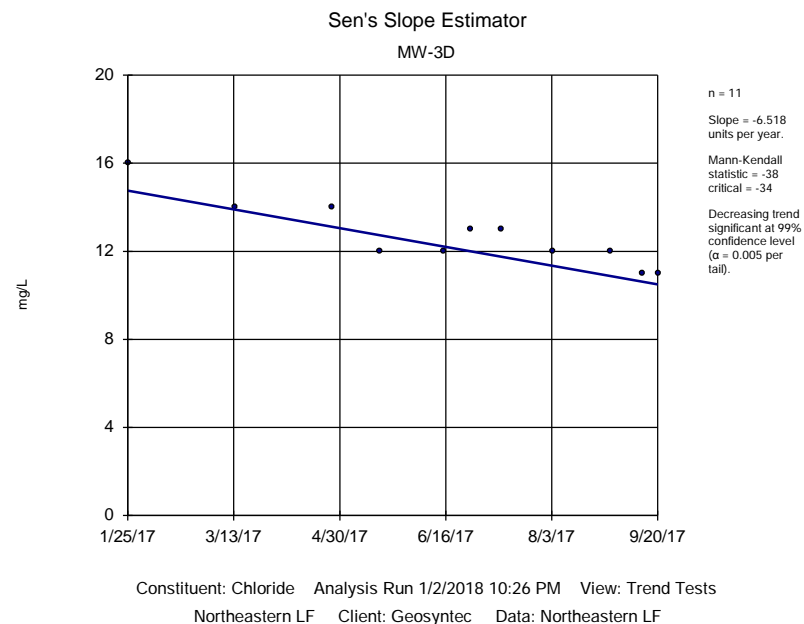
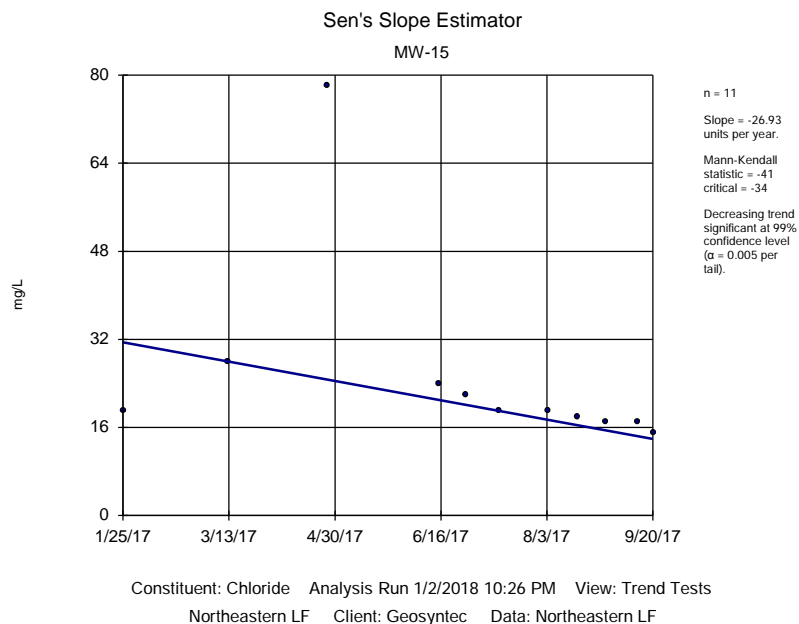
Trend Tests Summary Table - All Results

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Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/2/2018, 10:28 PM

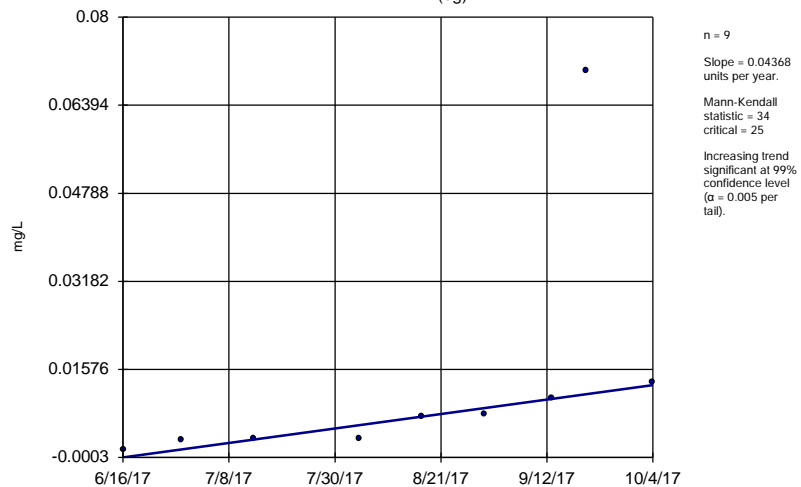
<u>Constituent</u>	<u>Well</u>	<u>Slope</u>	<u>Calc.</u>	<u>Critical</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Normality</u>	<u>Xform</u>	<u>Alpha</u>	<u>Method</u>
Sulfate (mg/L)	MW-15	66.87	14	38	No	12	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	MW-3D	70.21	30	38	No	12	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	MW-6D	-11.5	-2	-21	No	8	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	MW-9D	1246	14	21	No	8	0	n/a	n/a	0.01	NP
Thallium (mg/L)	MW-7D (bg)	0	0	25	No	9	100	n/a	n/a	0.01	NP
Thallium (mg/L)	MW-8D (bg)	0	0	34	No	11	100	n/a	n/a	0.01	NP
Thallium (mg/L)	MW-15	0	7	38	No	12	91.67	n/a	n/a	0.01	NP
Thallium (mg/L)	MW-3D	0	-9	-38	No	12	91.67	n/a	n/a	0.01	NP
Thallium (mg/L)	MW-6D	0	0	21	No	8	100	n/a	n/a	0.01	NP
Thallium (mg/L)	MW-9D	0	0	21	No	8	100	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-7D (bg)	6905	30	25	Yes	9	0	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-8D (bg)	6248	39	34	Yes	11	0	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-15	-111.8	-31	-38	No	12	0	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-3D	153.5	23	38	No	12	0	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-6D	-135.2	-7	-18	No	7	0	n/a	n/a	0.01	NP
Total Dissolve Solids [TDS] (mg/L)	MW-9D	4474	18	21	No	8	0	n/a	n/a	0.01	NP





Sen's Slope Estimator

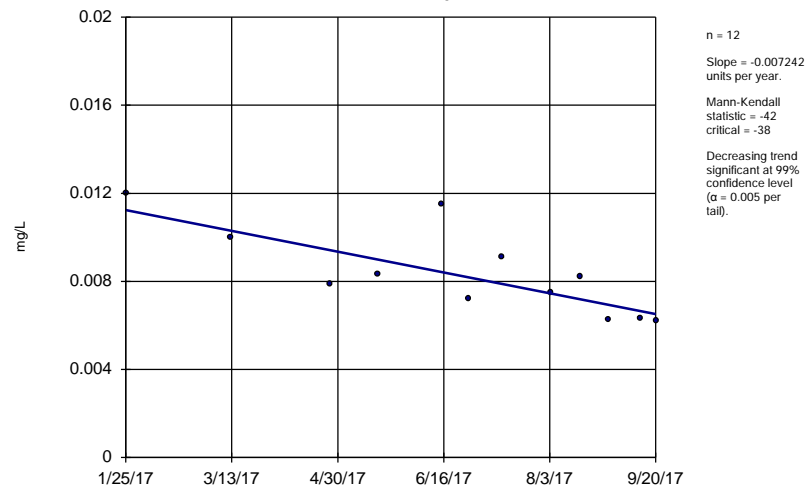
MW-7D (bg)



Constituent: Lead Analysis Run 1/2/2018 10:26 PM View: Trend Tests
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Sen's Slope Estimator

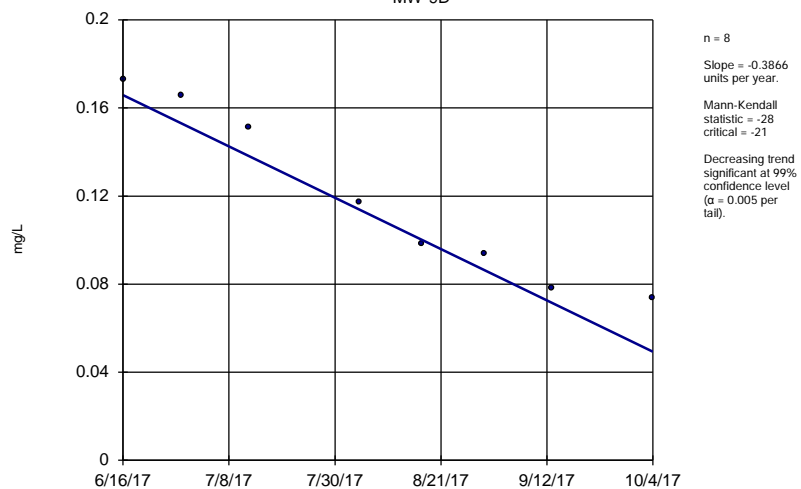
MW-15



Constituent: Lithium Analysis Run 1/2/2018 10:26 PM View: Trend Tests
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Sen's Slope Estimator

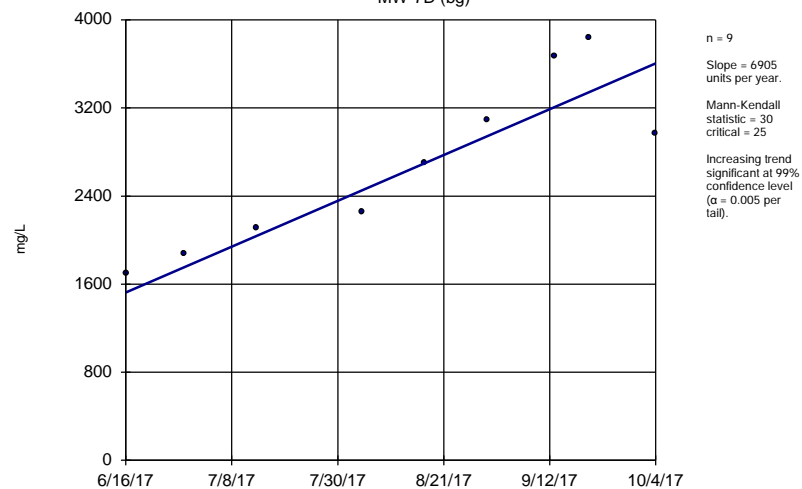
MW-9D



Constituent: Molybdenum Analysis Run 1/2/2018 10:27 PM View: Trend Tests
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Sen's Slope Estimator

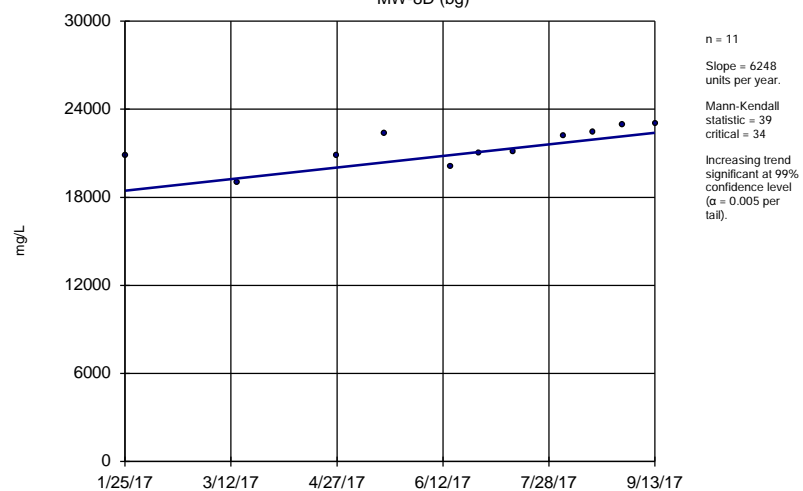
MW-7D (bg)



Constituent: Total Dissolve Solids [TDS] Analysis Run 1/2/2018 10:27 PM View: Trend Tests
 Northeastern LF Client: Geosyntec Data: Northeastern LF

Sen's Slope Estimator

MW-8D (bg)



Constituent: Total Dissolve Solids [TDS] Analysis Run 1/2/2018 10:27 PM View: Trend Tests
Northeastern LF Client: Geosyntec Data: Northeastern LF

Analysis of Variance

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/15/2018, 5:54 PM

<u>Constituent</u>	<u>Crit.</u>	<u>Sig.</u>	<u>Alpha</u>	<u>Transform</u>	<u>ANOVA Sig.</u>	<u>Calc.</u>	<u>Alpha</u>	<u>Method</u>
Boron (mg/L)	n/a	n/a	n/a	No	Yes	4.385	0.05	NP (eq. var.)
Calcium (mg/L)	n/a	n/a	n/a	No	Yes	8.562	0.05	NP (eq. var.)
Chloride (mg/L)	n/a	n/a	n/a	sqrt(x)	Yes	1387	0.05	Param.
Fluoride (mg/L)	n/a	n/a	n/a	No	Yes	4.151	0.05	NP (normality)
pH, field (SU)	n/a	n/a	n/a	ln(x)	No	2.314	0.05	Param.
Sulfate (mg/L)	n/a	n/a	n/a	No	Yes	14.15	0.05	NP (normality)
Total Dissolve Solids [TDS] (mg/L)	n/a	n/a	n/a	No	Yes	1525	0.05	Param.

Non-Parametric ANOVA

Constituent: Boron Analysis Run 1/15/2018 5:53 PM View: ANOVA
Northeastern LF Client: Geosyntec Data: Northeastern LF

For observations made between 1/25/2017 and 10/4/2017, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 4.385

Tabulated Chi-Squared value = 3.841 with 1 degree of freedom at the 5% significance level.

There were 3 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 4.365

Adjusted Kruskal-Wallis statistic (H') = 4.385

Non-Parametric ANOVA

Constituent: Calcium Analysis Run 1/15/2018 5:53 PM View: ANOVA
Northeastern LF Client: Geosyntec Data: Northeastern LF

For observations made between 1/25/2017 and 10/4/2017, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 8.562

Tabulated Chi-Squared value = 3.841 with 1 degree of freedom at the 5% significance level.

There were 1 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 8.556

Adjusted Kruskal-Wallis statistic (H') = 8.562

Parametric ANOVA

Constituent: Chloride Analysis Run 1/15/2018 5:53 PM View: ANOVA
Northeastern LF Client: Geosyntec Data: Northeastern LF

For observations made between 1/25/2017 and 10/4/2017 the parametric analysis of variance test (after square root transformation) indicates VARIATION at the 5% significance level. Because the calculated F statistic is greater than the tabulated F statistic, the hypothesis of a single homogeneous population is rejected.

Calculated F statistic = 1387

Tabulated F statistic = 4.41 with 1 and 18 degrees of freedom at the 5% significance level.

ONE-WAY PARAMETRIC ANOVA TABLE

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Between Groups	41258	1	41258	1387
Error Within Groups	535.3	18	29.74	
Total	41794	19		

The Shapiro Wilk normality test on the residuals passed after square root transformation. Alpha = 0.05, calculated = 0.9895, critical = 0.905. Levene's Equality of Variance test passed. Calculated = 0.3135, tabulated = 4.41.

Non-Parametric ANOVA

Constituent: Fluoride Analysis Run 1/15/2018 5:53 PM View: ANOVA
Northeastern LF Client: Geosyntec Data: Northeastern LF

For observations made between 1/25/2017 and 10/4/2017, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 4.151

Tabulated Chi-Squared value = 3.841 with 1 degree of freedom at the 5% significance level.

There were 1 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 3.465

Adjusted Kruskal-Wallis statistic (H') = 4.151

Parametric ANOVA

Constituent: pH, field Analysis Run 1/15/2018 5:53 PM View: ANOVA
Northeastern LF Client: Geosyntec Data: Northeastern LF

For observations made between 1/25/2017 and 10/4/2017 the parametric analysis of variance test (after natural log transformation) indicates NO VARIATION at the 5% significance level. Because the calculated F statistic is less than or equal to the tabulated F statistic, the hypothesis of a single homogeneous population is accepted.

Calculated F statistic = 2.314

Tabulated F statistic = 4.49 with 1 and 16 degrees of freedom at the 5% significance level.

ONE-WAY PARAMETRIC ANOVA TABLE

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Between Groups	0.005076	1	0.005076	2.314
Error Within Groups	0.0351	16	0.002194	
Total	0.04018	17		

The Shapiro Wilk normality test on the residuals passed after natural log transformation. Alpha = 0.05, calculated = 0.9074, critical = 0.897. Levene's Equality of Variance test passed. Calculated = 4.417, tabulated = 4.49.

Non-Parametric ANOVA

Constituent: Sulfate Analysis Run 1/15/2018 5:54 PM View: ANOVA
Northeastern LF Client: Geosyntec Data: Northeastern LF

For observations made between 1/25/2017 and 10/4/2017, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 14.15

Tabulated Chi-Squared value = 3.841 with 1 degree of freedom at the 5% significance level.

There were 1 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 14.14

Adjusted Kruskal-Wallis statistic (H') = 14.15

Parametric ANOVA

Constituent: Total Dissolve Solids [TDS] Analysis Run 1/15/2018 5:54 PM View: ANOVA
Northeastern LF Client: Geosyntec Data: Northeastern LF

For observations made between 1/25/2017 and 10/4/2017 the parametric analysis of variance test indicates VARIATION at the 5% significance level. Because the calculated F statistic is greater than the tabulated F statistic, the hypothesis of a single homogeneous population is rejected.

Calculated F statistic = 1525

Tabulated F statistic = 4.41 with 1 and 18 degrees of freedom at the 5% significance level.

ONE-WAY PARAMETRIC ANOVA TABLE

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Between Groups	1.7e9	1	1.7e9	1525
Error Within Groups	2.1e7	18	1140393	
Total	1.8e9	19		

The Shapiro Wilk normality test on the residuals passed on the raw data. Alpha = 0.05, calculated = 0.9568, critical = 0.905. Levene's Equality of Variance test passed. Calculated = 3.197, tabulated = 4.41.

Tolerance Limits - Appendix III

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/2/2018, 10:38 PM

<u>Constituent</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Bg N</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Boron (mg/L)	1.596	n/a	20	1.261	0.1194	0	None	No	0.01	Inter
Calcium (mg/L)	1028	n/a	20	379.7	230.8	0	None	No	0.01	Inter
Chloride (mg/L)	14606	n/a	20	n/a	n/a	0	n/a	n/a	0.3585	NP Inter(normality)
Fluoride (mg/L)	3.248	n/a	20	n/a	n/a	55	n/a	n/a	0.3585	NP Inter(normality)
pH, field (SU)	8.28	6.72	18	n/a	n/a	0	n/a	n/a	0.7735	NP Inter(normality)
Sulfate (mg/L)	1632	n/a	20	n/a	n/a	0	n/a	n/a	0.3585	NP Inter(normality)
Total Dissolve Solids [TDS] (mg/L)	23012	n/a	20	n/a	n/a	0	n/a	n/a	0.3585	NP Inter(normality)

Confidence Interval Summary Table - Significant Results Appendix III

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/7/2018, 9:21 AM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Compliance</u>	<u>Sig. N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Boron (mg/L)	MW-15	9.88	9.177	1.6	Yes 12	9.52	0.482	0	None	x^3	0.01	Param.
Boron (mg/L)	MW-6D	3.767	2.818	1.6	Yes 8	3.156	0.9525	0	None	x^4	0.01	Param.
Boron (mg/L)	MW-9D	7.537	6.756	1.6	Yes 8	7.146	0.3683	0	None	No	0.01	Param.

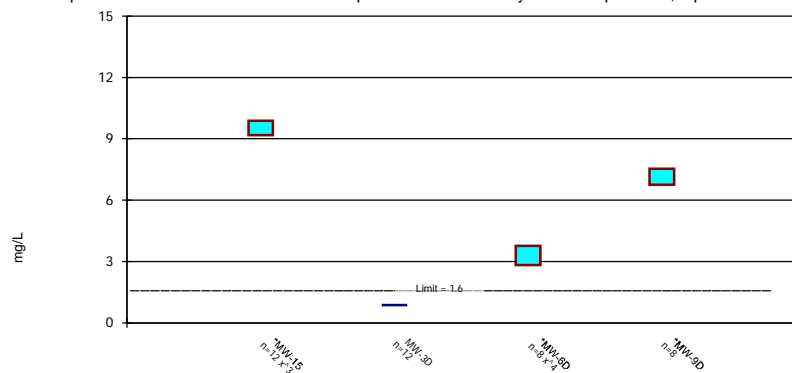
Confidence Interval Summary Table - All Results Appendix III

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/7/2018, 9:21 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig. N	Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method
Boron (mg/L)	MW-15	9.88	9.177	1.6	Yes 12	9.52	0.482	0	None	x^3	0.01	Param.
Boron (mg/L)	MW-3D	0.9067	0.8328	1.6	No 12	0.8698	0.04713	0	None	No	0.01	Param.
Boron (mg/L)	MW-6D	3.767	2.818	1.6	Yes 8	3.156	0.9525	0	None	x^4	0.01	Param.
Boron (mg/L)	MW-9D	7.537	6.756	1.6	Yes 8	7.146	0.3683	0	None	No	0.01	Param.
Calcium (mg/L)	MW-15	101	67.59	1028	No 12	84.28	21.28	0	None	No	0.01	Param.
Calcium (mg/L)	MW-3D	156.8	120.5	1028	No 12	138.7	23.13	0	None	No	0.01	Param.
Calcium (mg/L)	MW-6D	233	173.9	1028	No 8	203.5	31.18	0	None	x^2	0.01	Param.
Calcium (mg/L)	MW-9D	362.6	225.6	1028	No 8	294.1	64.61	0	None	No	0.01	Param.
Chloride (mg/L)	MW-15	28	15	14606	No 11	25.09	17.92	0	None	No	0.006	NP (normality)
Chloride (mg/L)	MW-3D	13.97	11.49	14606	No 11	12.73	1.489	0	None	No	0.01	Param.
Chloride (mg/L)	MW-6D	31.72	28.78	14606	No 8	30.25	1.389	0	None	No	0.01	Param.
Chloride (mg/L)	MW-9D	247.5	63.23	14606	No 8	155.4	86.93	0	None	No	0.01	Param.
Fluoride (mg/L)	MW-15	1.988	1.682	4	No 12	1.779	0.3789	0	None	x^4	0.01	Param.
Fluoride (mg/L)	MW-3D	1	0.7381	4	No 12	0.9024	0.1244	50	None	No	0.01	NP (normality)
Fluoride (mg/L)	MW-6D	1.013	0.6152	4	No 8	0.7895	0.1518	25	Cohen's	No	0.01	Param.
Fluoride (mg/L)	MW-9D	2.191	0.37	4	No 8	0.9776	0.5368	25	None	No	0.004	NP (Cohens/xfrm)
pH, field (SU)	MW-15	8.412	7.292	8.28	No 10	7.852	0.5446	0	None	No	0.005	Param.
pH, field (SU)	MW-3D	7.499	6.705	8.28	No 10	7.101	0.3915	0	None	sqrt(x)	0.005	Param.
pH, field (SU)	MW-6D	7.706	6.599	8.28	No 8	7.153	0.4475	0	None	No	0.005	Param.
pH, field (SU)	MW-9D	7.5	7.012	8.28	No 8	7.256	0.1972	0	None	No	0.005	Param.
Sulfate (mg/L)	MW-15	603.5	553.7	1632	No 12	578.6	31.72	0	None	No	0.01	Param.
Sulfate (mg/L)	MW-3D	221.9	190	1632	No 12	205.9	20.34	0	None	No	0.01	Param.
Sulfate (mg/L)	MW-6D	526.7	504.6	1632	No 8	515.6	10.41	0	None	No	0.01	Param.
Sulfate (mg/L)	MW-9D	1259	898.2	1632	No 8	1079	170.3	0	None	No	0.01	Param.
Total Dissolve Solids [TDS] (mg/L)	MW-15	1104	1053	23012	No 12	1079	32.67	0	None	No	0.01	Param.
Total Dissolve Solids [TDS] (mg/L)	MW-3D	759.5	658.5	23012	No 12	709	64.4	0	None	No	0.01	Param.
Total Dissolve Solids [TDS] (mg/L)	MW-6D	1140	986	23012	No 8	1037	46.63	0	None	No	0.004	NP (normality)
Total Dissolve Solids [TDS] (mg/L)	MW-9D	2717	1527	23012	No 8	2122	561.5	0	None	No	0.01	Param.

Parametric Confidence Interval

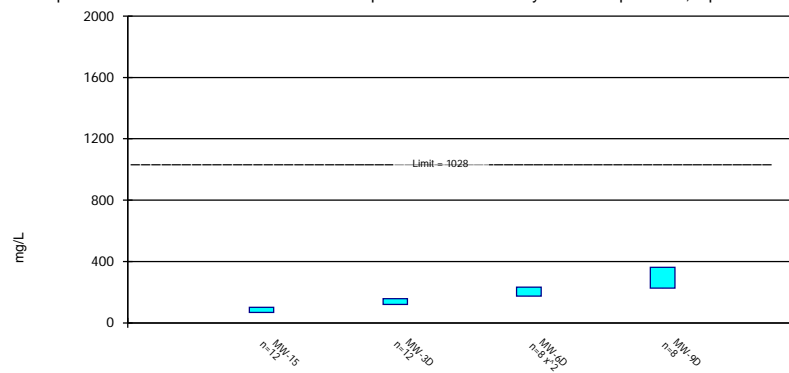
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Boron Analysis Run 1/7/2018 9:17 AM View: Confidence Intervals - App III
Northeastern LF Client: Geosyntec Data: Northeastern LF

Parametric Confidence Interval

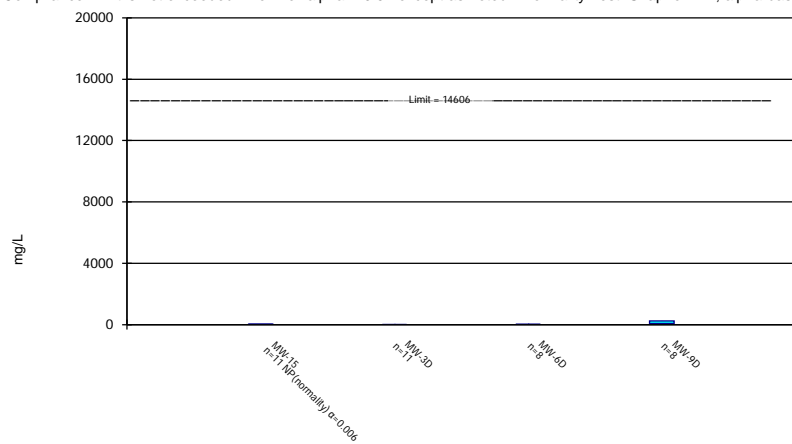
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Calcium Analysis Run 1/7/2018 9:17 AM View: Confidence Intervals - App III
Northeastern LF Client: Geosyntec Data: Northeastern LF

Parametric and Non-Parametric (NP) Confidence Interval

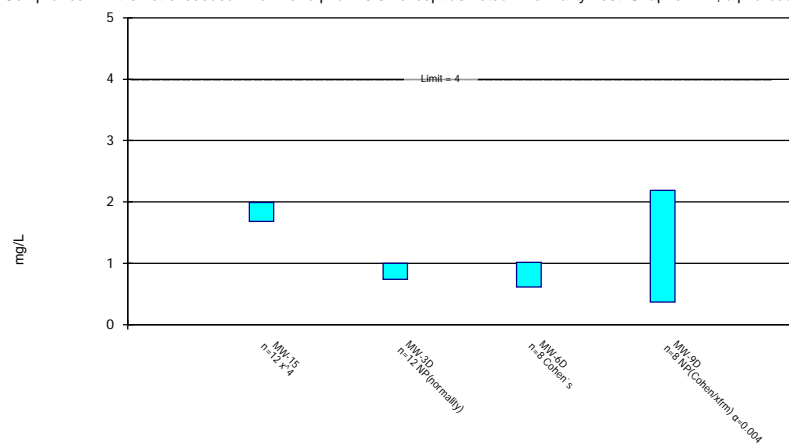
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



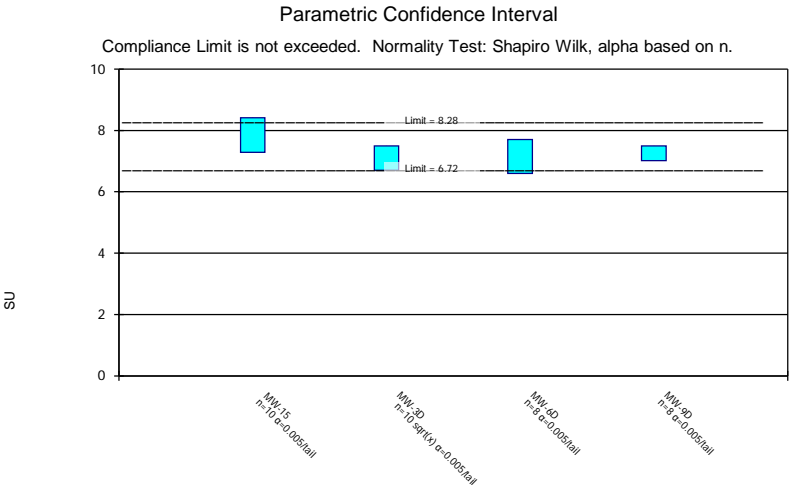
Constituent: Chloride Analysis Run 1/7/2018 9:17 AM View: Confidence Intervals - App III
Northeastern LF Client: Geosyntec Data: Northeastern LF

Parametric and Non-Parametric (NP) Confidence Interval

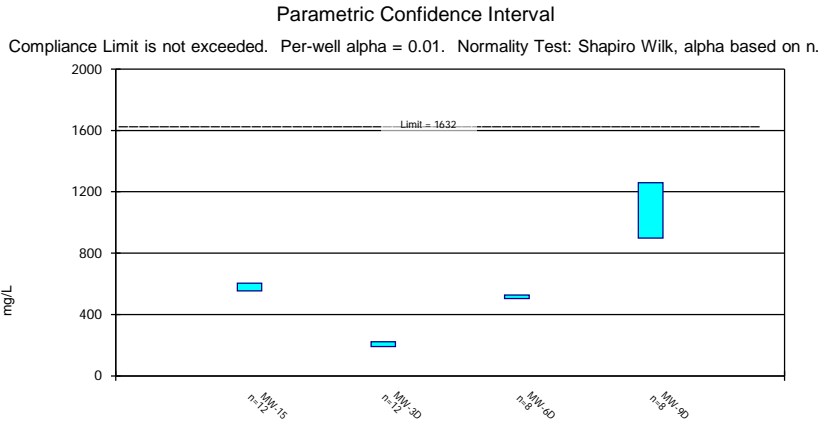
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



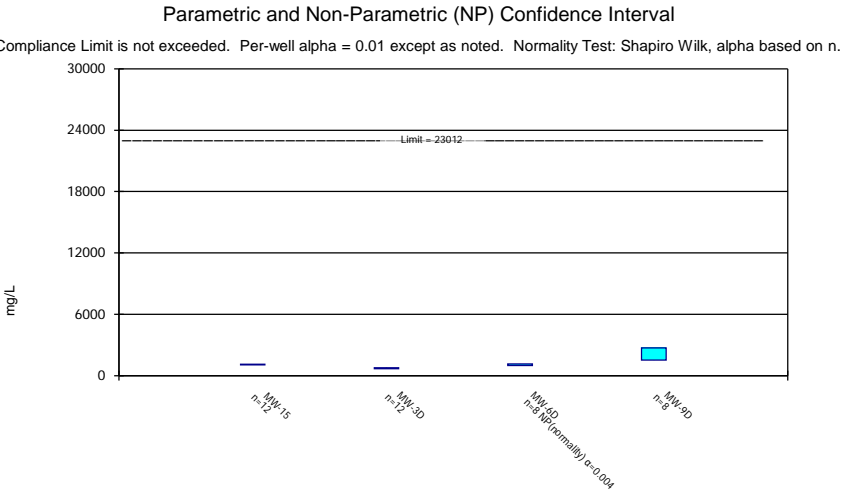
Constituent: Fluoride Analysis Run 1/7/2018 9:17 AM View: Confidence Intervals - App III
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: pH, field Analysis Run 1/7/2018 9:17 AM View: Confidence Intervals - App III
Northeastern LF Client: Geosyntec Data: Northeastern LF



Constituent: Sulfate Analysis Run 1/7/2018 9:17 AM View: Confidence Intervals - App III
Northeastern LF Client: Geosyntec Data: Northeastern LF



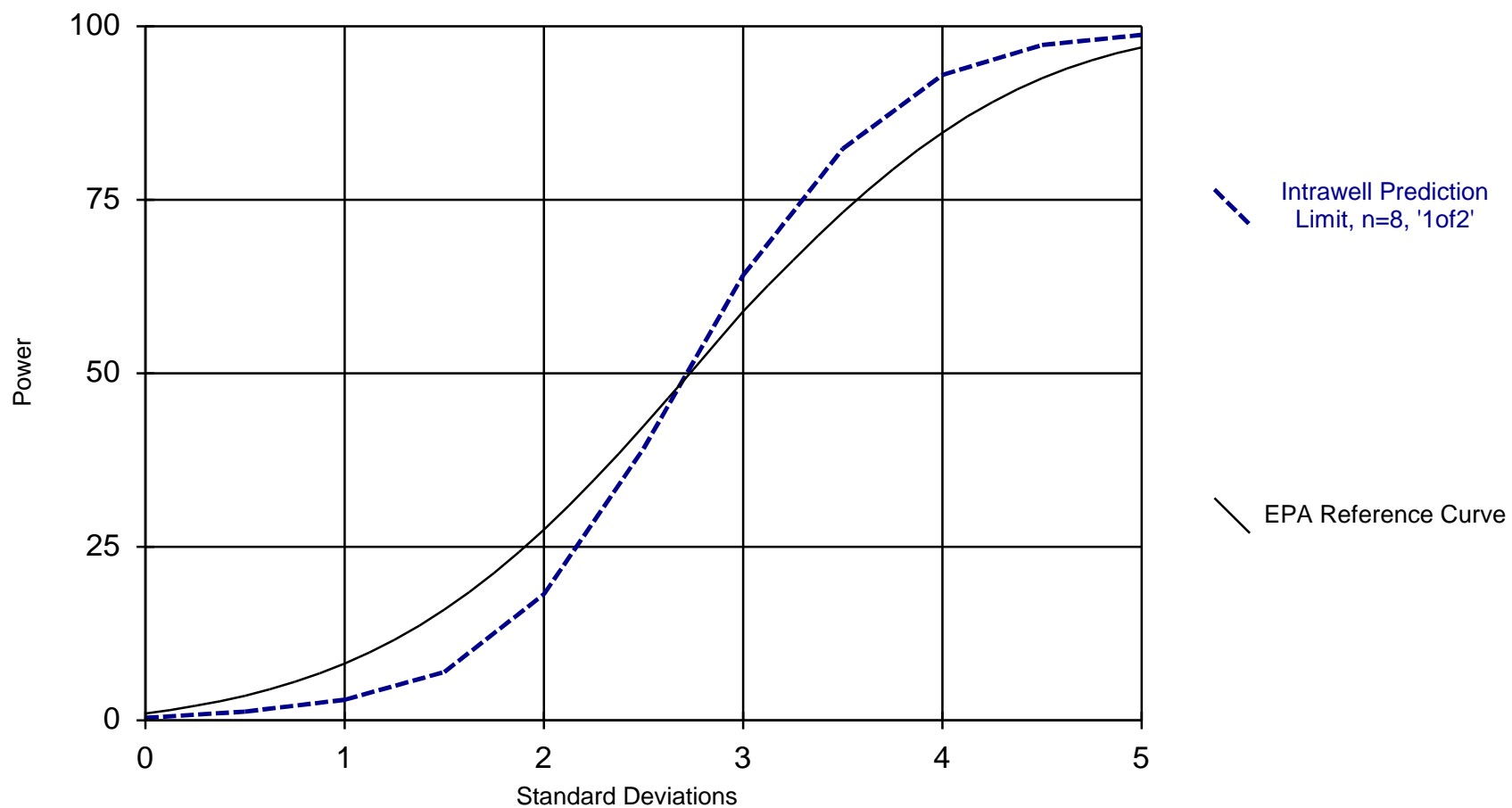
Constituent: Total Dissolve Solids [TDS] Analysis Run 1/7/2018 9:17 AM View: Confidence Intervals - App
Northeastern LF Client: Geosyntec Data: Northeastern LF

Intrawell Prediction Limit Summary Table

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/7/2018, 9:21 AM

Constituent	Well	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium (mg/L)	MW-7D	1060	9	5.235	0.6946	0	None	ln(x)	0.00188	Param 1 of 2
Calcium (mg/L)	MW-8D	813.1	11	7.815	0.6602	0	None	x^(1/3)	0.00188	Param 1 of 2
Calcium (mg/L)	MW-15	131.8	12	84.28	21.28	0	None	No	0.00188	Param 1 of 2
Calcium (mg/L)	MW-3D	190.3	12	138.7	23.13	0	None	No	0.00188	Param 1 of 2
Calcium (mg/L)	MW-6D	285.1	8	203.5	31.18	0	None	No	0.00188	Param 1 of 2
Calcium (mg/L)	MW-9D	463.1	8	294.1	64.61	0	None	No	0.00188	Param 1 of 2
Chloride (mg/L)	MW-7D	836	9	355.4	192.9	0	None	No	0.00188	Param 1 of 2
Chloride (mg/L)	MW-8D	14668	11	11986	1166	0	None	No	0.00188	Param 1 of 2
Chloride (mg/L)	MW-15	78	11	n/a	n/a	0	n/a	n/a	0.01276	NP (normality) 1 of 2
Chloride (mg/L)	MW-3D	16.15	11	12.73	1.489	0	None	No	0.00188	Param 1 of 2
Chloride (mg/L)	MW-6D	33.88	8	30.25	1.389	0	None	No	0.00188	Param 1 of 2
Chloride (mg/L)	MW-9D	382.8	8	155.4	86.93	0	None	No	0.00188	Param 1 of 2
Fluoride (mg/L)	MW-7D	3.911	9	1.818	0.8399	11.11	None	No	0.00188	Param 1 of 2
Fluoride (mg/L)	MW-8D	1	11	n/a	n/a	90.91	n/a	n/a	0.01276	NP (NDs) 1 of 2
Fluoride (mg/L)	MW-15	2.243	12	6.216	2.269	0	None	x^3	0.00188	Param 1 of 2
Fluoride (mg/L)	MW-3D	1	12	n/a	n/a	50	n/a	n/a	0.01077	NP (normality) 1 of 2
Fluoride (mg/L)	MW-6D	0.9414	8	0.7193	0.08487	25	Kaplan-Meier	No	0.00188	Param 1 of 2
Fluoride (mg/L)	MW-9D	2.28	8	0.9091	0.5239	25	Kaplan-Meier	No	0.00188	Param 1 of 2
Sulfate (mg/L)	MW-7D	1927	9	881.6	419.4	0	None	No	0.00188	Param 1 of 2
Sulfate (mg/L)	MW-8D	166.6	11	109.6	24.76	0	None	No	0.00188	Param 1 of 2
Sulfate (mg/L)	MW-15	649.4	12	578.6	31.72	0	None	No	0.00188	Param 1 of 2
Sulfate (mg/L)	MW-3D	251.3	12	205.9	20.34	0	None	No	0.00188	Param 1 of 2
Sulfate (mg/L)	MW-6D	542.8	8	515.6	10.41	0	None	No	0.00188	Param 1 of 2
Sulfate (mg/L)	MW-9D	1524	8	1079	170.3	0	None	No	0.00188	Param 1 of 2
Total Dissolve Solids [TDS] (mg/L)	MW-7D	4596	9	2690	764.7	0	None	No	0.00188	Param 1 of 2
Total Dissolve Solids [TDS] (mg/L)	MW-8D	24328	11	21432	1259	0	None	No	0.00188	Param 1 of 2
Total Dissolve Solids [TDS] (mg/L)	MW-15	1152	12	1079	32.67	0	None	No	0.00188	Param 1 of 2
Total Dissolve Solids [TDS] (mg/L)	MW-3D	852.8	12	709	64.4	0	None	No	0.00188	Param 1 of 2
Total Dissolve Solids [TDS] (mg/L)	MW-6D	1159	8	1037	46.63	0	None	No	0.00188	Param 1 of 2
Total Dissolve Solids [TDS] (mg/L)	MW-9D	3591	8	2122	561.5	0	None	No	0.00188	Param 1 of 2

Power Curve



Kappa = 2.616, based on 4 compliance wells and 7 constituents, evaluated semi-annually (this report reflects annual total).

Analysis Run 1/2/2018 10:42 PM View: Confidence Intervals - App III

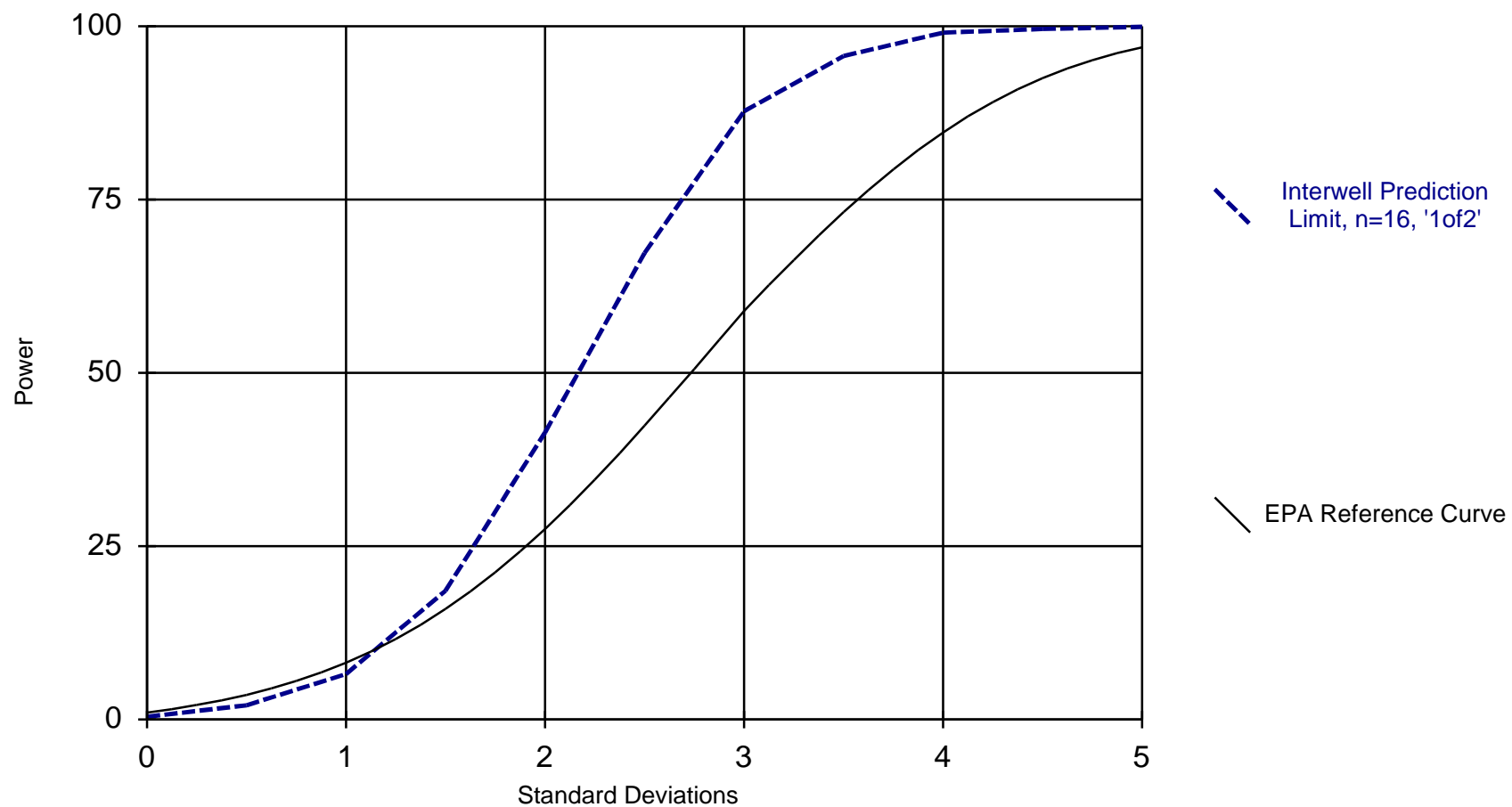
Northeastern LF Client: Geosyntec Data: Northeastern LF

Interwell Prediction Limit Summary Table

Northeastern LF Client: Geosyntec Data: Northeastern LF Printed 1/2/2018, 10:57 PM

<u>Constituent</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Bg N</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Boron (mg/L)	1.497	n/a	20	1.261	0.1194	0	None	No	0.00188	Param 1 of 2
pH, field (SU)	8.28	6.72	18	n/a	n/a	0	n/a	n/a	0.0101	NP (normality) 1 of 2

Power Curve



Kappa = 2.06, based on 4 compliance wells and 7 constituents, evaluated semi-annually (this report reflects annual total).

Analysis Run 1/2/2018 10:43 PM View: Confidence Intervals - App III

Northeastern LF Client: Geosyntec Data: Northeastern LF