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GROUNDWATER STATISTICAL ANALYSIS REPORT FOR COAL COMBUSTION RESIDUALS (CCR)

HRP HUDSON OWNER, LLC

Former Hudson Generating Station

Van Keuren Avenue

Jersey City, New Jersey 07306

PREPARED BY

Weaver Consultants Group

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1 INTRODUCTION

On behalf of HRP Hudson Owner, LLC (HRP), Weaver Consultants Group North Central LLC (WCG) has prepared this Groundwater Statistical Analysis Report (Report) pursuant to the requirements of 40 Code of Federal Regulations (CFR) 257.90(e) for the former Hudson Generating Station located on Van Keuren Avenue in Jersey City, New Jersey (Hudson).

Effective December 21, 2018 the ownership of Hudson has been transferred from Public Service Electric and Gas (PSEG) Fossil LLC to HRP Hudson Owner, LLC, located at 111 South Wacker Drive, Suite 3000, Chicago, Illinois 60606. As a result of this acquisition, HRP is the responsible party for the groundwater monitoring and corrective action program established for the three inactive Coal Combustion Residual (CCR) units on the property. The following three inactive CCR units are located on the property (refer to **Figure 1 – Site Location Map with CCR Unit Locations**):

- North Fly Ash Pond;
- South Fly Ash Pond; and
- Bottom Ash Pond.

These units ceased receiving CCR prior to October 19, 2015 and as described in a December 8, 2017 memorandum prepared by GEI Consultants, Inc. (GEI), CCR removal from the units was completed on November 16, 2017 while Hudson was owned by PSEG. A Notice of Intent (NOI) to initiate closure of the inactive CCR units in accordance with 40 CFR Section 257.100 was posted on the PSEG CCR Rule Compliance Data and Information website on November 6, 2015. A CCR Rule Compliance Report Summary dated April 17, 2018 and prepared by GEI was posted on PSEG's website[1]. As part of CCR unit closure activities, the Initial Detection Monitoring Program was initiated in 2018.

An Annual Groundwater and Corrective Action Report dated January 31, 2019 was submitted to the New Jersey Department of Environmental Protection Division of Water Supply and Geoscience pursuant to the requirements of 40 CFR 257.90(e) which documented the first phase of the Initial Detection Monitoring Program. The report described five independent groundwater sampling events and analyses performed in 2018 including procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain of custody control, and quality assurance and quality control. Since the submittal of the Annual Groundwater and

[1] https://corporate.pseg.com/aboutpseg/companyinformation/thepsegfamilyofcompanies/psegfossilllc

Corrective Action Report dated January 31, 2019, three additional groundwater sampling events were performed at the facility. Thus, this Report includes the evaluation of a total of eight groundwater monitoring events. The reports generated for Hudson are available on HRP's website[2].

1.1 Purpose

This Report has been prepared to document the statistical methods employed to evaluate groundwater monitoring data from eight monitoring events at Hudson in accordance with 40 CFR §257.93. The statistical analysis has been conducted to establish background concentrations of the constituents listed in Appendices III and IV to 40 CFR 257. Appendix III constituents are Constituents for Detection Monitoring and Appendix IV constituents are Constituents for Assessment Monitoring. Hudson is currently implementing a Detection Monitoring Program. The facility is only required to enter an Assessment Monitoring Program if a Detection Monitoring Appendix III constituent displays a confirmed statistically significantly increasing concentration. Though Hudson is currently implementing a Detection Monitoring Program, groundwater samples from the eight monitoring events were analyzed for both Appendix III and Appendix IV constituents to be conservative.

This Report presents the methods employed to establish the background data set and statistical analyses used to evaluate potential groundwater quality impacts at Hudson. The statistical results served as indicators to evaluate whether additional groundwater evaluation may be warranted. The statistical analysis performed herein includes:

- Summary statistics of the groundwater quality data;
- Outlier testing of the groundwater quality data; and
- Selection of the appropriate statistical test for the 40 CFR 257 Appendix III and IV groundwater monitoring parameters.

1.2 Regulatory Status

According to 40 CFR §257.104(a)(2), an owner or operator of a CCR unit that elects to close a CCR unit by removing CCR as provided by §257.102(c) (as the owner has elected to do in this case) is not subject to the post-closure care criteria under 40 CFR §257.104. This Report is to be kept on

[2]https://www.hilcoredev.com/former-hudson-generating-station

file in the HRP operating record in accordance with the recordkeeping requirements of 40 CFR §257.105.

1.3 Background Information

1.3.1 Monitoring Well Network

The groundwater monitoring network at Hudson consists of nine monitoring wells: MW-1 through MW-9 (see **Figure 2 – CCR Units & Groundwater Monitoring Well Location Map**) which were installed by GEI in 2018. Eight monitoring wells (MW-1 through MW-8) were installed upgradient and downgradient of the CCR units to assess the quality of groundwater in the uppermost aquifer and to monitor potential contaminant pathways. Monitoring well MW-9 was installed in a presumed crossgradient location away from the CCR units to obtain a representation of the groundwater that has not been affected by the CCR units.

A description of the monitoring well network installation, development, and surveying is included in the Annual Groundwater and Corrective Action Report dated January 31, 2019. **Table 1 – Monitoring Well Survey Data** includes elevations and location coordinates for the monitoring wells.

1.3.2 Groundwater Sampling and Results

In accordance with 40 CFR § 257.94, eight independent groundwater samples were collected from each background and downgradient well at Hudson. Groundwater samples used for statistical evaluation were collected on the following dates:

- Event 1: July 30 - August 1, 2018;
- Event 2: September 5-6, 2018;
- Event 3: October 1-2, 2018;
- Event 4: October 31 - November 1, 2018;
- Event 5: December 3-4, 2018;
- Event 6: January 29-30, 2019;
- Event 7: March 18-19, 2019; and
- Event 8: April 1-2, 2019.

Prior to groundwater sample collection, groundwater elevation data was obtained at each monitoring well (see **Table 2 – Groundwater Elevation Measurements** and **Figures 3a through 3h – Groundwater Elevation Contour Maps**). Following groundwater elevation data collection, groundwater samples were collected using a stainless steel bladder pump with disposable Teflon

bladders and a disposable length of ¼" diameter Teflon-lined polyethylene tubing. Non-dedicated equipment such as the bladder pump and water level/interface indicator were decontaminated using a phosphate-free detergent and a distilled water rinse between well locations.

The bladder pump was used to implement low flow methodology to minimize sediment disturbance (e.g., between 100 milliliters per minute [ml/min] to 500 ml/min). Prior to sample collection, the wells were purged until the purge water exhibited stable conditions based upon field measurements of pH, specific conductivity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature. The groundwater sampling field forms for each event are included in **Appendix A – Groundwater Sampling Field Forms**.

Groundwater samples were collected in containers provided by the laboratory and preserved as necessary for their respective analyses. The sample containers were tightly capped, labeled, and placed in a cooler and surrounded with ice in order to maintain their temperature near four degrees Celsius. Each sample was logged onto a chain of custody form which is used to track the samples from the point of collection to receipt by the laboratory. The chain of custody is included with the laboratory analysis reports in **Appendix B – Laboratory Analytical Reports**.

The groundwater samples were submitted to Eurofins Lancaster Laboratories Environmental (Eurofins) for laboratory analysis of the constituents listed in Appendices III and IV of 40 CFR § 257. As presented in **Tables 3a through 3h - Groundwater Analytical Results**, laboratory results were compared to the United States Environmental Protection Agency (USEPA) Maximum Contaminant Levels (MCLs). USEPA MCLs are considered the generic standard for drinking water quality analysis in Hudson County and the state of New Jersey and were therefore used for informational purposes only. The statistics discussed in detail in **Section 4** of this report represent the applicable groundwater quality determination.

Based on the analytical data, concentrations of barium, cobalt, and/or lithium were sporadically detected above USEPA MCLs during the eight sampling events in the monitoring wells surrounding the CCR units. In addition, Radium-226 was detected above the USEPA MCL in five of the eight wells surrounding the CCR units during Event 3. However, as shown on the Mann-Kendall trend graphs included in **Appendix G**, the overall trends for barium, cobalt, lithium, and Radium-226 are downward or level. Overall, the total number of MCL exceedances per event decreased from Event 1 to Event 8 as well. No Appendix III and Appendix IV constituents were detected above USEPA MCLs from the presumed crossgradient well location MW-9.

2 OVERVIEW OF GROUNDWATER STATISTICS

In accordance with 40 CFR §257.23(g)(h), a preliminary data evaluation was conducted in order to select the appropriate statistical test. The selection of an appropriate statistical test is principally a function of the distribution of the background data for the constituent. Typically, one of three distributions are observed.

1. Normal distribution,
2. Log normal distribution, or
3. Random/No distribution.

Compounds which typically exhibit a normal or log normal distribution are naturally occurring inorganic compounds (non-anthropogenic) or indicator parameters such as temperature, total dissolved solids, and specific conductivity. Many other naturally occurring compounds exhibit no distributional relationship. The overwhelming majority of chemicals which CCR facilities are required to analyze for are man-made organics (anthropogenic) which presumably would not be present in the background water. If they are not present in the background, their distributional relationship typically cannot be determined and statistics cannot be employed.

Similarly, when the background data set contains some or many "non-detect" values, the understanding of the data distribution is clouded by this “arbitrary” detection limit. Correcting a background data set by "creating" values for samples which are non-detect (e.g. one-half the detection limit) does not provide meaningful results unless the majority of the values are detected.

Requirements to use specific statistical tests without determining the distribution of the data are scientifically flawed, and often produce indications that contamination exists when in fact it does not (i.e. false positives). Other common problems in groundwater monitoring systems include sampling numerous constituents at relatively few wells; and background information sets with insufficient data points. These problems, individually and collectively, may potentially lead to inadequate understandings of the natural spatial and temporal variations of groundwater geochemistry. These conditions can create weakened statistical power, which means the monitoring system’s ability to detect real contamination is low.

Considering the above, an examination of background well data is discussed below in **Section 3.0.** For purposes of eliminating abnormal trends (due to sampling or analysis errors) in the historical database, each monitoring well has been tested for outliers. However, outliers are only removed from the background data set if a specific reason for the high or low outlier is identified.

Otherwise, the outliers will be considered to be atypical data, but representative of background conditions. Possible reasons for excluding outliers from the background database include laboratory or sampling errors.

3 EVALUATION OF BACKGROUND DATA SET

An evaluation of the background data set was performed in order to assess the appropriate statistical analysis that will be applied to groundwater monitoring data obtained at Hudson. Based on the variable nature of the groundwater flow direction inferred from the depth to water measurements obtained as part of the eight sampling events, WCG selected an intrawell approach where each well is used as "background", rather than upgradient well(s), and the concentration trends with time at each well are used to assess if a statistically significant increase in groundwater concentration has occurred. This approach is consistent with the control chart approach cited in 40 CFR 257.93(f)(4). In our experience, intrawell statistics are generally more reliable than interwell (upgradient versus downgradient) statistics because intrawell eliminates potential issues with spatial variability between upgradient and downgradient wells.

The evaluation of the data set for each well consisted of the following:

1. Normality testing in order to determine the distributional characteristics of the data set;
2. Outlier testing for purposes of eliminating abnormal trends (due to sampling or analysis errors) in the data set; and
3. Summary statistics, which included preparation of box plots and time versus concentration plots, for assessing trends/errors, etc. in the data set.

3.1 Normality Testing and Summary Statistics

In order to choose a statistical test for purposes of assessing groundwater quality, the distributional characteristics, and percent non-detects of the background data must be evaluated. Sanitas™ v.9.6, a groundwater statistical software program, was used to calculate summary statistics and to test the normality of the data set for each Appendix III and Appendix IV constituent. Background data from each of the monitoring wells has been tested for normality. Results of the normality testing are summarized in supporting documentation from Sanitas™ included as **Appendix C – Normality Testing**.

The following settings were input into Sanitas™ for normality testing:

- An alpha of 0.01 was selected for the normality test;
- The Ladder of Powers option was selected which uses the following transformations on the data in an attempt to normalize the data for use with parametric tests:
    - x (no transformation)

- $x^{1/2}$ (square root)
- x^2 (square)
- $x^{1/3}$ (cube root)
- x^3 (cube)
- $\ln x$ (natural log)
- x^4
- x^5
- x^6

Results from the normality tests are included in **Appendix C.** According to these results, the majority of the constituents have data sets with a largely normal distribution. In general, this means that parametric statistical tests may be performed on these constituents. However, select tests indicated that some constituents had non-normal distribution. The statistical evaluation method ultimately selected (i.e., Mann Kendall Test for Trend) has no distributional assumptions associated with it and therefore, is appropriate for data that is both normally and non-normally distributed.

3.2 Outlier Testing

Outlier testing was performed using rigorous outlier test procedures to identify data which should not be included in the overall background data set. In general, for those constituents with a normal data distribution with a sample population less than 25 (n<25), Dixon's test is used. If n>25, Rosner's test is utilized. Sanitas™ automatically performs the Shapiro-Wilk normality test before identifying outliers. If the data fails the normality test at the 0.01 alpha level, Tukey's method is used in lieu of the parametric Dixon and/or Rosner's test.

Prior to eliminating an outlier identified in a particular monitoring well for a particular sampling date, the outliers identified by Sanitas™ were compared to the data analyzed at the remaining monitoring wells for the same sampling period as well as to the method detection limit to verify results of the outlier test.

A total of sixteen (16) data points were identified as outliers by Sanitas™. The outliers identified by Sanitas™ were not removed from the background data set because a specific reason for the high or low outlier was not identified. Therefore, the outliers are considered to be atypical data, but representative of background conditions.

No other outliers were identified by either Tukey's method for the nonparametric data sets or Dixon's test for the parametric data sets. Supporting documentation for the outlier testing is included in **Appendix D – Outlier Testing**.

3.3 Graphical Representation of Background Data

Summary statistics and graphical representations of the data set in the form of box plots and time series plots were also produced for the Hudson groundwater data set. Summary statistics, box plots, and time series plots are provided in **Appendix E – Summary Statistics, Box Plots, and Time Series Plots**.

According to the USEPA's Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities dated March 2009 (USEPA, 2009), graphs are an important tool for exploring and understanding patterns in any data set. Plotting the data visually depicts the structure and helps unmask possible relationships between variables affecting the data set. Box plots are one method recommended for testing homogeneity of the variances. Box plots were first developed for exploratory data analysis as a quick way to visualize the "spread" or dispersion within a data set. The idea behind a box plot is to order the data from lowest to highest and to trim off 25 percent of the observations on either end, leaving just the middle 50 percent (known as the interquartile range or IQR). The middle 50 percent is represented by the length of the box. The middle observation (i.e. the median) can also be shown as a line cutting the box in two.

Summary statistics and box plots for groundwater data from monitoring wells at Hudson have been prepared using the Sanitas™ software and are provided as **Appendix E**. The box plots indicate that a variance is present for several constituent/well combinations with detected concentrations of dissolved boron, dissolved calcium, and dissolved molybdenum. This variance is likely indicative of natural geochemical variability within the monitored aquifer.

Time versus concentration plots were prepared using the Sanitas™ software and are also provided in **Appendix E**. Analytical data from each of the monitoring wells has been plotted with the sample date on the *x*-axis and the concentration on the *y*-axis. Note that non-detect results were plotted with a hollow symbol at the respective laboratory Practical Quantitation Limit (PQL), also known as the Reporting Limit, while detected results were plotted with a solid symbol. Based on the visual inspection of these graphical displays, systematic seasonal effects were not observed in the data set.

4 MANN-KENDALL STATISTICAL ANALYSIS

In accordance with 40 CFR §257.23(g)(h), an evaluation of available statistical methods was undertaken once the appropriate statistical analyses were performed on the background data set as documented in the previous section.

Although not specifically named in 40 CFR §257, the Mann-Kendall trend test was selected as the appropriate test to determine whether or not there is a statistically significant increase over background values for each Appendix III and Appendix IV groundwater monitoring constituent. The Mann-Kendall trend test meets the 40 CFR 257.93(f)(5) alternate statistical test method option and is specifically named in USEPA's Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities dated March 2009.

The Mann-Kendall trend test is appropriate to evaluate temporal trends for data without seasonal variability. Two main advantages of this test are that, it is a non-parametric test (i.e., data does not need to conform to any particular distribution), and it can handle a relatively large percentage of non-detects. The Mann-Kendall trend test is one of the recommended methods listed in the Unified Guidance for Statistical Analysis of Groundwater at RCRA Facilities (USEPA, 2009). The Mann-Kendall trend test was performed using Sanitas™ software.

The Mann-Kendall trend test involves computing a statistic *S*, which is the difference between the number of pairs of successive data points with increased concentration and the number with decreased concentration. A large positive value of *S* suggests a statistically significant increasing (SSI) trend, a large negative value suggests a statistically significant decreasing trend, and a small (absolute) value of *S* suggests no statistically significant trend. In accordance with 40 CFR §257.93(g)(2), the Mann-Kendall trend test was applied to evaluate trends of each constituent at individual wells, at a 1% significance level (i.e., 99% confidence level) for well-constituent combinations with detections above laboratory PQLs. Non-detects were replaced with the corresponding laboratory PQL, or median PQL if multiple PQLs were used throughout the period; thus, changes in PQL did not appear as showing a significant trend.

The results of the Mann-Kendall trend testing are presented in **Appendix F - Appendix III Constituent Mann-Kendall Trend Tests** and **Appendix G – Appendix IV Constituent Mann-Kendall Trend Tests**. Pursuant to 40 CFR §257.23(g)(h), based on the results of the Mann-Kendall trend testing, out of a total of 198 trend tests performed for both Appendix III and IV constituents,

one statistically significant increase (SSI) was identified in monitoring well MW-6 for sulfate, an Appendix III Detection Monitoring constituent.

Typically, if the SSI was attributable to the CCR disposal facility, the next step in response to identification of an SSI for a detection parameter would be to implement Assessment Monitoring. In this instance, as discussed previously, Appendix IV constituents for Assessment Monitoring have already been collected and statistically evaluated in conjunction with the Appendix III constituents to be conservative. The statistical evaluation of the Appendix IV constituents did not identify any SSIs in the groundwater at Hudson.

In addition, as stated in 40 CFR 257.94(e)(2), the CCR Rule also allows an Alternative Source Demonstration (ASD) to address a number of potential causes of SSIs other than a release from the regulated unit, including errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. As shown on **Figures 3a** through **3h**, the groundwater flow direction at Hudson is variable, and monitoring well MW-6 was found to be crossgradient, upgradient, as well as downgradient from the CCR units depending on the event. This indicates the SSI in sulfate at monitoring well MW-6 is not necessarily attributable to the CCR units as it is unclear if MW-6 is downgradient from the units. It is possible that the trend in sulfate may be attributed to a natural variation in groundwater quality.

There are no Primary (i.e., enforceable) drinking water MCLs for sulfate, however, the Secondary (i.e., not enforceable) MCL for sulfate is 250 milligrams per liter (mg/L). The highest detected concentration of sulfate in MW-6 was 48.6 mg/L, which is below the secondary MCL of 250 mg/L. Therefore, additional monitoring at MW-6 does not appear to be warranted at this time. Overall, out of a total of 198 Mann-Kendall trend tests performed, 159 displayed downward or level trends, thirteen (13) of which were statistically significant downward trends. Thirty-nine (39) Mann-Kendall trend tests displayed upward trends, with one SSI. As CCR has been removed from Hudson, the large number of downward and level trends of Appendix III and Appendix IV constituents in groundwater suggests improvement in groundwater quality following the removal of CCR.

5 CONCLUSIONS

As discussed above, one SSI trend was identified within the Hudson groundwater data set at monitoring well MW-6 for sulfate. The North Fly Ash Pond, South Fly Ash Pond, and Bottom Ash Pond CCR units ceased receiving CCR prior to October 19, 2015, and CCR removal was completed on November 16, 2017 while Hudson was owned by PSEG. CCR has been removed from the units as documented in reports contained in the facility record, and groundwater quality data indicates that, with the exception of sulfate at MW-6, concentrations of 40 CFR § 257 Appendix III and Appendix IV constituents are generally stable or decreasing. Consequently, for the reasons discussed above in **Section 4**, no additional groundwater monitoring is warranted, and groundwater monitoring may be discontinued at the Hudson CCR units.

The Hudson groundwater monitoring program and statistical analysis has been implemented in accordance with 40 CFR §257.93. Pursuant to the recordkeeping requirements of 40 CFR §257.105, this report shall be kept on file in the facility's operating record.

6 CERTIFICATION

In accordance with 40 CFR 257.93(f), I certify that, based on my review of the work completed to date, that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the Hudson CCR management area.

Carolyn Cybulski, P.E.	062-059114
By (print):	Registration Number:
	February 28, 2022
By (signature):	Expiration Date:
January 26, 2022	
Date:	

7 REFERENCES

Code of Federal Regulations (CFR), Title 40. Protection of Environment, Chapter I. Environmental Protection Agency, Subchapter I. Solid Wastes, Part 257. Criteria for Classification of Solid Waste Disposal Facilities and Practices.

Hilco Redevelopment Partners. Former Hudson Generating Station, Coal Combustion Residuals (CCR) Rule Compliance Data and Information, https://www.hilcoredev.com/former-hudson-generating-station

PSEG Fossil LLC
https://corporate.pseg.com/aboutpseg/companyinformation/thepsegfamilyofcompanies/psegfossilllc

USEPA 1992a. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Addendum to Interim Final Guidance.* Washington, D.C.: Office of Solid Waste, U.S. Environmental Protection Agency. Draft.

USEPA 1992b. Statistical Training Course for Groundwater Monitoring Data Analysis, EPA/530-R-93-003.

USEPA. 2009a. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance*. EPA 530-R-09-007.

USEPA. 2009b. National Primary Drinking Water Regulations. EPA 816-F-09-004

TABLES

Table 1
Monitoring Well Survey Data
Former Hudson Generating Station
Jersey City, New Jersey

Well ID	Ground Surface Elevation (ft-msl)	TOC Elevation (ft-msl)	Protective Vault/Cover Elevation (ft-msl)	State Plane Coordinates		Latitude (North)			Longitude (West)		
				Northing	Easting	°	`	"	°	`	"
MW-1	7.31	9.88	10.20	698614.16	610025.92	40	45	2.057	74	4	27.958
MW-2	8.37	7.97	8.74	698630.02	609706.62	40	45	2.229	74	4	32.106
MW-3	8.42	11.29	11.60	699006.60	609438.39	40	45	5.963	74	4	35.568
MW-4	5.57	8.40	8.71	698889.68	609866.21	40	45	4.787	74	4	30.016
MW-5	4.89	6.88	7.50	700178.41	609252.10	40	45	17.551	74	4	37.915
MW-6	4.31	6.51	6.89	699783.85	608694.67	40	45	13.679	74	4	45.183
MW-7	4.77	7.72	7.90	700220.72	608374.95	40	45	18.011	74	4	49.311
MW-8	5.25	7.58	8.14	700547.94	608786.62	40	45	21.225	74	4	43.941
MW-9	4.41	6.75	7.04	700773.22	609262.37	40	45	23.428	74	4	37.744

Notes:

This survey was completed on July 31, 2018 utilizing the New Jersey State Plane East in units of US Survey Feet, NAVD 88 vertical datum, and GEOID 12B.

TOC - Top of Casing

ft-msl - Feet above Mean Sea Level

Table 2
Groundwater Elevation Measurements
Former Hudson Generating Station
Jersey City, New Jersey

Well ID	Total Depth (ft)	Surface Construction	Well Diameter (in)	Screen Interval (ft)	TOC Elevation (ft-msl)	Event 1		Event 2		Event 3		Event 4		Event 5		Event #6		Event #7		Event #8	
						July 30-August 1, 2018		September 5-6, 2018		October 1-2, 2018		October 31-November 1, 2018		December 3-4, 2018		January 29-30, 2019		March 18-19, 2019		April 1-2, 2019	
						Depth to Water (ft)	Groundwater Elevation (ft-msl)	Depth to Water (ft)	Groundwater Elevation (ft-msl)	Depth to Water (ft)	Groundwater Elevation (ft-msl))	Depth to Water (ft)	Groundwater Elevation (ft-msl)	Depth to Water (ft)	Groundwater Elevation (ft-msl)	Depth to Water (ft)	Groundwater Elevation (ft above MSL)	Depth to Water (ft)	Groundwater Elevation (ft above MSL)	Depth to Water (ft)	Groundwater Elevation (ft above MSL)
MW-1	30	flushmount	2	20-30	9.88	15.82	-5.94	15.55	-5.67	14.86	-4.98	14.72	-4.84	14.1	-4.22	13.61	-3.73	13.25	-3.37	13	-3.12
MW-2	35	flushmount	2	25-35	7.97	13.21	-5.24	12.82	-4.85	12.8	-4.83	12.49	-4.52	11.69	-3.72	11.3	-3.33	10.4	-2.43	10.64	-2.67
MW-3	20	stick-up	2	5-20	11.29	10.50	0.79	10.54	0.75	9.16	2.13	9.25	2.04	8.17	3.12	9.62	1.67	9.85	1.44	10.96	0.33
MW-4	20	flushmount	2	10-20	8.4	6.07	2.33	9.81	-1.41	9.71	-1.31	10.34	-1.94	8.06	0.34	6.7	1.7	12	-3.6	6.21	2.19
MW-5	15	stick-up	2	5-15	6.88	5.75	1.13	5.81	1.07	4.72	2.16	5.21	1.67	4.07	2.81	4.75	2.13	4.75	2.13	5.05	1.83
MW-6	15	stick-up	2	5-15	6.51	3.29	3.22	3.79	2.72	2.72	3.79	2.65	3.86	2.91	3.6	2.89	3.62	2.81	3.7	2.96	3.55
MW-7	10	stick-up	2	1-10	7.72	4.03	3.69	4.36	3.36	3.61	4.11	3.65	4.07	3.35	4.37	3.85	3.87	3.75	3.97	3.92	3.8
MW-8	11	stick-up	2	1-11	7.58	5.26	2.32	5.12	2.46	3.42	4.16	4.13	3.45	2.96	4.62	3.23	4.35	3.2	4.38	3.73	3.85
MW-9	15	stick-up	2	5-15	6.75	5.08	1.67	5.8	0.95	4.55	2.2	4.62	2.13	4.1	2.65	4.85	1.9	4.38	2.37	4.6	2.15

Notes:
This survey was completed utilizing the New Jersey State Plane East in units of US Survey Feet, NAVD 88 vertical datum, and GEOID 12B.
TOC - Top of Casing
ft-msl - Feet above Mean Sea Level

Table 3a
Groundwater Analytical Summary Event 1
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 7/30/18	MW-2 7/30/18	MW-3 7/31/18	MW-4 7/31/18	MW-5 7/31/18	MW-6 7/31/18	MW-7 8/1/18	MW-8 8/1/18	MW-9 8/1/18
Appendix III Analytes											
Boron	mg/L	---	1.08	0.827	0.518	1.53	0.802	1.04	0.282	0.281	0.382
Calcium	mg/L	---	396.00	442.00	41.60	164.00	185.00	160.00	37.20	34.00	93.90
Chloride	mg/L	---	6750.00	7230.00	349.00	6610.00	2910.00	2740.00	87.10	475.00	676.00
Fluoride	mg/L	4.00	<0.25	<0.25	0.33	<0.25	<0.25	<0.25	0.36	<0.25	0.26
pH	S.U.	---	7.80	7.70	8.00	7.70	7.10	7.30	8.10	727.00	7.40
Sulfate	mg/L	---	15.20	19.00	90.50	864.00	2.00	3.60	20.10	21.20	27.10
Total Dissolved Solids	mg/L	---	10200.00	10400.00	958.00	10400.00	5120.00	4290.00	361.00	916.00	1340.00
Appendix IV Analytes											
Antimony	mg/L	0.006	<0.00041	0.00052	0.0017	0.0009	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041
Arsenic	mg/L	0.01	0.0049	0.0059	0.004	0.0018	0.0012	0.0034	0.0036	0.0032	0.0037
Barium	mg/L	2.00	0.693	2.2700	0.0638	0.119	0.184	0.155	0.0586	0.0954	0.731
Beryllium	mg/L	0.004	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091
Cadmium	mg/L	0.005	0.00045	0.00054	<0.00015	0.0005	<0.00015	<0.00015	0.0002	0.0018	<0.00015
Chromium	mg/L	0.10	<0.0053	<0.0053	<0.0053	<0.0053	0.0066	<0.0053	<0.0053	<0.0053	0.0055
Cobalt	mg/L	0.006	0.0041	0.0031	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0045	<0.0015
Fluoride	mg/L	4.00	<0.25	<0.25	0.33	<0.25	<0.25	<0.25	0.36	<0.25	0.26
Lead	mg/L	0.015	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
Lithium	mg/L	0.04	0.1030	0.0891	<0.0110	0.0994	0.0443	0.0371	<0.0110	<0.0110	<0.0110
Mercury	mg/L	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	mg/L	0.100	0.0037	0.0041	0.0164	0.0076	0.00038	0.00054	0.0077	0.0061	0.0071
Selenium	mg/L	0.05	<0.021	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
Thallium	mg/L	0.002	<0.0700	<0.0700	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0700	<0.0140
Radium 228	pCi/L	5.00	2.40	4.87	<1.90	<2.25	<1.45	2.54	<1.36	<1.37	<1.54
Radium-226	pCi/L	5.00	1.42	2.71	<0.394	0.813	1.06	1.76	0.586	0.756	0.396

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

Table 3b
Groundwater Analytical Summary Event 2
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 9/6/18	MW-2 9/6/18	MW-3 9/6/18	MW-4 9/6/18	MW-5 9/5/18	MW-6 9/5/18	MW-7 9/5/18	MW-8 9/5/18	MW-9 9/5/18
Appendix III Analytes											
Boron	mg/L	---	1.11	0.912	0.74	1.14	0.471	0.969	0.268	0.337	0.62
Calcium	mg/L	---	380.00	459.00	175.00	97.90	91.80	136.00	39.90	37.50	116.00
Chloride	mg/L	---	6760.00	6970.00	1720.00	3720.00	739.00	929.00	61.50	598.00	947.00
Fluoride	mg/L	4.00	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.37	<0.25	<0.25
pH	S.U.	---	7.70	7.70	8.00	7.50	7.40	7.50	8.30	7.20	7.50
Sulfate	mg/L	---	123.00	15.80	274.00	558.00	3.40	3.30	<1.5	28.70	22.20
Total Dissolved Solids	mg/L	---	11800.00	11600.00	3180.00	7560.00	1670.00	2450.00	350.00	908.00	2200.00
Appendix IV Analytes											
Antimony	mg/L	0.006	<0.00041	<0.00041	0.00048	0.00046	<0.00041	<0.00041	<0.00041	<0.00041	0.00053
Arsenic	mg/L	0.01	0.0023	0.0047	0.0009	<0.00068	0.00086	0.003	0.001	0.0015	0.0022
Barium	mg/L	2.00	0.808	2.24	0.233	0.0815	0.0821	0.108	0.0681	0.101	0.123
Beryllium	mg/L	0.004	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091
Cadmium	mg/L	0.005	<0.00015	<0.00015	0.00016	<0.00015	<0.00015	<0.00015	<0.00015	0.00036	<0.00015
Chromium	mg/L	0.10	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
Cobalt	mg/L	0.006	0.0048	0.0035	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0068	0.0021
Fluoride	mg/L	4.00	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.37	<0.25	<0.25
Lead	mg/L	0.015	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
Lithium	mg/L	0.04	0.0431	0.0630	0.0148	0.0551	<0.0110	0.0186	<0.0110	<0.0110	<0.0110
Mercury	mg/L	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	mg/L	0.100	0.0029	0.0026	0.0073	0.0089	<0.00031	<0.00031	0.0043	0.0039	0.0018
Selenium	mg/L	0.05	<0.0210	<0.105	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
Thallium	mg/L	0.002	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140
Radium 228	pCi/L	5.00	2.27	2.47	<1.57	<1.91	2.59	4.46	<1.40	2.50	<1.91
Radium-226	pCi/L	5.00	1.11	1.65	<0.550	<0.586	0.466	0.881	<0.396	<0.573	<0.529

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

Table 3c
Groundwater Analytical Summary Event 3
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 10/2/18	MW-2 10/2/18	MW-3 10/2/18	MW-4 10/2/18	MW-5 10/1/18	MW-6 10/1/18	MW-7 10/1/18	MW-8 10/1/18	MW-9 10/1/18
Appendix III Analytes											
Boron	mg/L	---	1.09	0.912	0.61	1.38	0.679	0.822	0.197	0.331	0.473
Calcium	mg/L	---	393.00	446.00	53.40	123.00	129.00	110.00	28.90	24.90	101.00
Chloride	mg/L	---	2840.00	3770.00	587.00	1150.00	1100.00	692.00	29.20	409.00	631.00
Fluoride	mg/L	4.00	<0.25	0.40	<0.25	0.34	<0.25	0.42	0.48	<0.25	<0.25
pH	S.U.	---	7.60	7.60	7.80	7.70	7.20	7.30	7.80	7.40	7.30
Sulfate	mg/L	---	116.00	14.20	78.60	493.00	4.00	9.10	9.90	23.30	51.90
Total Dissolved Solids	mg/L	---	17600.00	15100.00	1270.00	6800.00	2940.00	1500.00	223.00	899.00	1270.00
Appendix IV Analytes											
Antimony	mg/L	0.006	0.0013	0.00053	0.0013	0.00072	<0.00041	<0.00041	<0.00041	<0.00041	0.00066
Arsenic	mg/L	0.01	0.0017	0.003	0.0045	<0.00068	0.0011	0.00075	0.00084	0.0016	0.0048
Barium	mg/L	2.00	0.672	2.15	0.0572	0.149	0.116	0.0927	0.0318	0.0657	0.0892
Beryllium	mg/L	0.004	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091
Cadmium	mg/L	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.00069	<0.00015
Chromium	mg/L	0.10	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
Cobalt	mg/L	0.006	0.0044	0.0032	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0090	<0.0015
Lead	mg/L	0.015	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
Lithium	mg/L	0.04	0.0372	0.043	<0.0110	0.0474	0.019	<0.0110	<0.0110	<0.0110	<0.0110
Mercury	mg/L	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	mg/L	0.100	0.0033	0.0027	0.0139	0.0069	0.00037	<0.00031	0.0061	0.0031	0.0058
Selenium	mg/L	0.05	<0.0210	<0.105	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
Thallium	mg/L	0.002	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140
Radium 228	pCi/L	5.00	<0.977	3.81	<1.36	<1.95	<1.59	<1.75	<1.02	<1.04	<1.44
Radium-226	pCi/L	5.00	9.90	4.70	2.68	1.92	5.02	7.72	9.21	72.80	1.87

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

Table 3d
Groundwater Analytical Summary Event 4
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 11/1/18	MW-2 11/1/18	MW-3 11/1/18	MW-4 11/1/18	MW-5 10/31/18	MW-6 10/31/18	MW-7 10/31/18	MW-8 10/31/18	MW-9 10/31/18
Appendix III Analytes											
Boron	mg/L	---	1.06	0.814	0.507	1.19	0.444	0.595	0.151	0.191	0.274
Calcium	mg/L	---	382.00	419.00	78.60	128.00	101.00	99.90	32.70	28.50	76.20
Chloride	mg/L	---	7540.00	7650.00	703.00	5370.00	849.00	434.00	44.40	349.00	291.00
Fluoride	mg/L	4.00	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.39	<0.25	0.37
pH	S.U.	---	7.40	7.70	7.70	7.50	7.10	7.50	7.50	7.30	7.20
Sulfate	mg/L	---	122.00	15.10	129.00	551.00	8.00	32.20	11.80	17.50	67.10
Total Dissolved Solids	mg/L	---	7140.00	17300.00	2720.00	9560.00	1760.00	1130.00	253.00	828.00	860.00
Appendix IV Analytes											
Antimony	mg/L	0.006	0.0016	0.00066	0.00096	0.00082	<0.00041	<0.00041	<0.00041	<0.00041	0.0017
Arsenic	mg/L	0.01	0.0020	0.0033	0.0026	0.00069	0.00087	0.0015	0.00075	0.0007	0.0058
Barium	mg/L	2.00	0.7150	1.98	0.0749	0.0997	0.0844	0.0707	0.0381	0.0618	0.0549
Beryllium	mg/L	0.004	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091
Cadmium	mg/L	0.005	0.00016	0.00024	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.00069	<0.00015
Chromium	mg/L	0.10	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
Cobalt	mg/L	0.006	0.0069	0.0047	<0.0015	0.003	<0.0015	<0.0015	<0.0015	0.0037	<0.0015
Lead	mg/L	0.015	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
Lithium	mg/L	0.04	0.0478	0.0505	0.0138	0.0497	0.015	<0.0110	<0.0110	<0.0110	<0.0110
Mercury	mg/L	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	mg/L	0.100	0.0033	0.0036	0.0115	0.0065	<0.00031	0.00032	0.0056	0.0039	0.012
Selenium	mg/L	0.05	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
Thallium	mg/L	0.002	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140
Radium 228	pCi/L	5.00	3.49	4.40	2.31	<1.19	<1.12	<1.14	<1.47	<1.50	<1.00
Radium-226	pCi/L	5.00	2.65	2.28	0.60	1.19	1.66	1.68	1.28	1.56	<0.415

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

Table 3e
Groundwater Analytical Summary Event 5
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 12/3/18	MW-2 12/3/18	MW-3 12/3/18	MW-4 12/3/18	MW-5 12/4/18	MW-6 12/4/18	MW-7 12/4/18	MW-8 12/4/18	MW-9 12/4/18
Appendix III Analytes											
Boron	mg/L	---	1.14	0.927	0.206	0.967	0.364	0.481	0.0848	0.247	0.132
Calcium	mg/L	---	390.00	467.00	56.80	81.60	99.50	95.40	19.90	23.10	64.40
Chloride	mg/L	---	7490.00	7660.00	123.00	3360.00	623.00	368.00	17.80	380.00	113.00
Fluoride	mg/L	4.00	<0.25	<0.25	<0.25	<0.25	<0.25	0.43	<0.25	<0.25	<0.25
pH	S.U.	---	7.20	7.20	7.80	7.30	6.80	7.20	7.50	7.00	7.20
Sulfate	mg/L	---	117.00	14.10	46.90	221.00	4.70	29.60	6.20	32.30	30.90
Total Dissolved Solids	mg/L	---	10800.00	10600.00	524.00	3280.00	1640.00	900.00	141.00	722.00	401.00
Appendix IV Analytes											
Antimony	mg/L	0.006	0.00076	<0.00041	0.0013	0.0005	<0.00041	<0.00041	<0.00041	<0.00041	0.0011
Arsenic	mg/L	0.01	0.002	0.0045	0.0036	<0.00068	0.00078	0.00094	<0.00068	0.0023	0.0019
Barium	mg/L	2.00	0.748	2.24	0.0322	0.229	0.087	0.058	0.0185	0.0427	0.0289
Beryllium	mg/L	0.004	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091
Cadmium	mg/L	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.0015	<0.00015
Chromium	mg/L	0.10	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
Cobalt	mg/L	0.006	0.0056	0.0041	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0081	<0.0015
Lead	mg/L	0.015	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
Lithium	mg/L	0.04	0.239	0.0709	<0.0110	0.076	0.027	0.0155	<0.0110	<0.0110	<0.0110
Mercury	mg/L	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	mg/L	0.100	0.0027	0.0032	0.0070	0.0063	<0.00031	0.0022	0.0055	0.0025	0.0028
Selenium	mg/L	0.05	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
Thallium	mg/L	0.002	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140
Radium 228	pCi/L	5.00	3.26	2.83	<1.13	<1.82	<0.979	1.49	2.91	<1.61	<1.40
Radium-226	pCi/L	5.00	<0.360	2.00	<0.343	0.459	<0.527	<0.281	0.592	2.06	<0.425

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

Table 3f
Groundwater Analytical Summary Event 6
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 1/29/19	MW-2 1/30/19	MW-3 1/30/19	MW-4 1/29/19	MW-5 1/29/19	MW-6 1/29/19	MW-7 1/29/19	MW-8 1/29/19	MW-9 1/30/19
Appendix III Analytes											
Boron	mg/L	---	1.15	0.970	0.329	0.994	0.336	0.288	0.0683	0.148	0.235
Calcium	mg/L	---	368.00	424	81.2	95.6	145	54.1	21.0	6.62	57.3
Chloride	mg/L	---	9,520	11,100	452	4,700	1,270	122	13.1	80.0	106
Fluoride	mg/L	4.00	<0.25	<0.25	<0.25	<0.25	0.35	0.52	0.41	<0.25	0.52
pH	S.U.	---	7.8	7.5	8.2	8.1	7.2	7.7	7.9	7.5	8.1
Sulfate	mg/L	---	112	13.2	40.0	227	14.1	43.6	4.8	20.3	33.3
Total Dissolved Solids	mg/L	---	11,000	12,000	988	6,100	2,700	474	141	322	480
Appendix IV Analytes											
Antimony	mg/L	0.006	0.00075	0.00057	0.00095	0.00096	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041
Arsenic	mg/L	0.01	0.0017	0.0029	0.0024	<0.00068	<0.00068	<0.00068	<0.00068	0.00078	0.0028
Barium	mg/L	2.00	0.748	2.15	0.0641	0.358	0.118	0.0275	0.0213	0.0173	0.276
Beryllium	mg/L	0.004	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091
Cadmium	mg/L	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.00043	<0.00015
Chromium	mg/L	0.10	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
Cobalt	mg/L	0.006	0.0041	0.0032	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0065	<0.0015
Lead	mg/L	0.015	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
Lithium	mg/L	0.04	0.0509	0.0697	<0.0110	0.0278	0.0467	0.023	<0.0110	<0.0110	0.0371
Mercury	mg/L	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	mg/L	0.100	0.0024	0.0032	0.0102	0.0051	<0.00031	0.0081	0.0047	0.0015	0.0074
Selenium	mg/L	0.05	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210	<0.0210
Thallium	mg/L	0.002	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140	<0.0140
Radium 228	pCi/L	5.00	1.78	2.73	<0.415	<0.372	0.789	<0.374	<0.343	<0.333	<0.351
Radium-226	pCi/L	5.00	1.32	2.07	<0.136	0.363	0.368	0.238	<0.169	0.169	0.18

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

Table 3g
Groundwater Analytical Summary Event 7
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 3/18/19	MW-2 3/19/19	MW-3 3/19/19	MW-4 3/18/19	MW-5 3/18/19	MW-6 3/18/19	MW-7 3/18/19	MW-8 3/18/19	MW-9 3/18/19
Appendix III Analytes											
Boron	mg/L	---	1.17	0.833	0.196	0.787	0.342	0.251	0.0739	0.132	0.131
Calcium	mg/L	---	361	430	39.6	94.1	140	45.3	22.2	6.76	45.1
Chloride	mg/L	---	7180	6470	61.6	1690	1430	78.9	16.3	69.9	48.7
Fluoride	mg/L	4.00	0.86	0.77	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
pH	S.U.	---	7.6	7.6	7.9	7.6	7.3	7.5	8	7.3	7.6
Sulfate	mg/L	---	113	14.6	32.5	273	10	47.6	7.8	26.6	26.9
Total Dissolved Solids	mg/L	---	11400	10600	344	7600	2370	373	141	306	293
Appendix IV Analytes											
Antimony	mg/L	0.006	0.0031	0.0022	0.0013	0.0015	0.00074	0.00047	0.00044	0.00049	<0.00041
Arsenic	mg/L	0.01	0.003	0.0044	0.0029	<0.00068	0.00082	0.00098	<0.00068	0.00081	0.0125
Barium	mg/L	2.00	0.673	1.91	0.026	0.416	0.108	0.0189	0.0178	0.0162	0.156
Beryllium	mg/L	0.004	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091	<0.000091
Cadmium	mg/L	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.00019	<0.00015
Chromium	mg/L	0.10	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
Cobalt	mg/L	0.006	0.0027	0.0037	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.008	<0.0015
Lead	mg/L	0.015	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
Lithium	mg/L	0.04	0.0765	0.0467	<0.011	0.0223	0.0233	<0.011	<0.011	<0.011	0.0268
Mercury	mg/L	0.002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	mg/L	0.100	0.0039	0.003	0.0117	0.0048	0.0024	0.0129	0.0048	0.0014	0.0073
Selenium	mg/L	0.05	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
Thallium	mg/L	0.002	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014
Radium 228	pCi/L	5.00	1.85	2.59	<0.362	1.48	1.05	<0.447	<0.476	<0.415	<0.365
Radium-226	pCi/L	5.00	1.28	2.07	<0.0808	1.07	0.514	<0.111	<0.0962	<0.112	<0.0971

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

Table 3h
Groundwater Analytical Summary Event 8
Former Hudson Generating Station
Jersey City, New Jersey

Parameter	Units	USEPA Drinking Water MCL [a]	Bottom Ash Pond				Fly Ash Ponds				Background
			MW-1 4/1/19	MW-2 4/2/19	MW-3 4/2/19	MW-4 4/2/19	MW-5 4/1/19	MW-6 4/1/19	MW-7 4/1/19	MW-8 4/1/19	MW-9 4/1/19
Appendix III Analytes											
Boron	mg/L	---	1.30	0.940	0.250	0.960	0.290	0.290	0.1100	0.160	0.120
Calcium	mg/L	---	350.00	430.00	76.00	96.00	130.00	47.00	29.00	7.60	40.00
Chloride	mg/L	---	7180.00	7370.00	250.00	3570.00	1100.00	107.00	47.30	83.80	29.80
Fluoride	mg/L	4.00	<2.5	3.00	0.77	3.00	<0.25	0.72	0.68	<0.25	0.74
pH	S.U.	---	7.40	7.20	7.70	7.30	6.80	7.20	7.40	6.70	7.50
Sulfate	mg/L	---	105.00	13.80	61.80	321.00	6.70	48.60	3.40	26.30	15.80
Total Dissolved Solids	mg/L	---	11100.00	10700.00	710.00	6300.00	2200.00	464.00	206.00	359.00	222.00
Appendix IV Analytes											
Antimony	mg/L	0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0076
Barium	mg/L	2.00	0.800	2.30	<0.2	0.310	<0.2	<0.2	<0.2	<0.2	<0.2
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	0.10	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	mg/L	0.006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	mg/L	0.015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	0.04	0.089	0.0780	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.100	<0.005	<0.005	<0.0074	<0.005	<0.005	0.0100	<0.005	<0.005	0.0100
Selenium	mg/L	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Thallium	mg/L	0.002	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Radium 228	pCi/L	5.00	2.03	2.62	<0.0308	<0.173	<0.00478	<0.423	<0.232	<0.0221	0.411
Radium-226	pCi/L	5.00	1.39	2.46	<0.144	0.478	0.495	0.208	0.118	<0.779	<1

Concentration exceeds the USEPA Drinking Water MCL

Notes:

[a] Maximum Contaminant Levels obtained from USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

--- MCL not listed in USEPA National Primary Drinking Water Regulation Table updated May 2009 or 40 CFR 257.95(h)(2).

mg/L - milligrams per liter

"<" - Parameter not detected above method detection limit or minimum detectable concentration.

pCi/l = picocuries per liter

S.U. - Standard Units

FIGURES



LEGEND

APPROXIMATE PROPERTY BOUNDARY

APPROXIMATE CCR UNIT LIMIT

N

APPROXIMATE GRAPHIC SCALE

500 0 250 500 1000

1 inch = 500 ft.

SOURCE: IMAGE ADAPTED FROM GOOGLE EARTH IMAGERY DATED NOVEMBER 2017.

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HRP HUDSON OWNER, LLC

SITE LOCATION MAP WITH COAL COMBUSTION RESIDUAL (CCR) LOCATIONS

FORMER HUDSON GENERATING STATION
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FIGURE 1



LEGEND

APPROXIMATE PROPERTY BOUNDARY

APPROXIMATE CCR UNIT LIMIT

MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

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CCR UNITS & GROUNDWATER MONITORING WELL LOCATION MAP

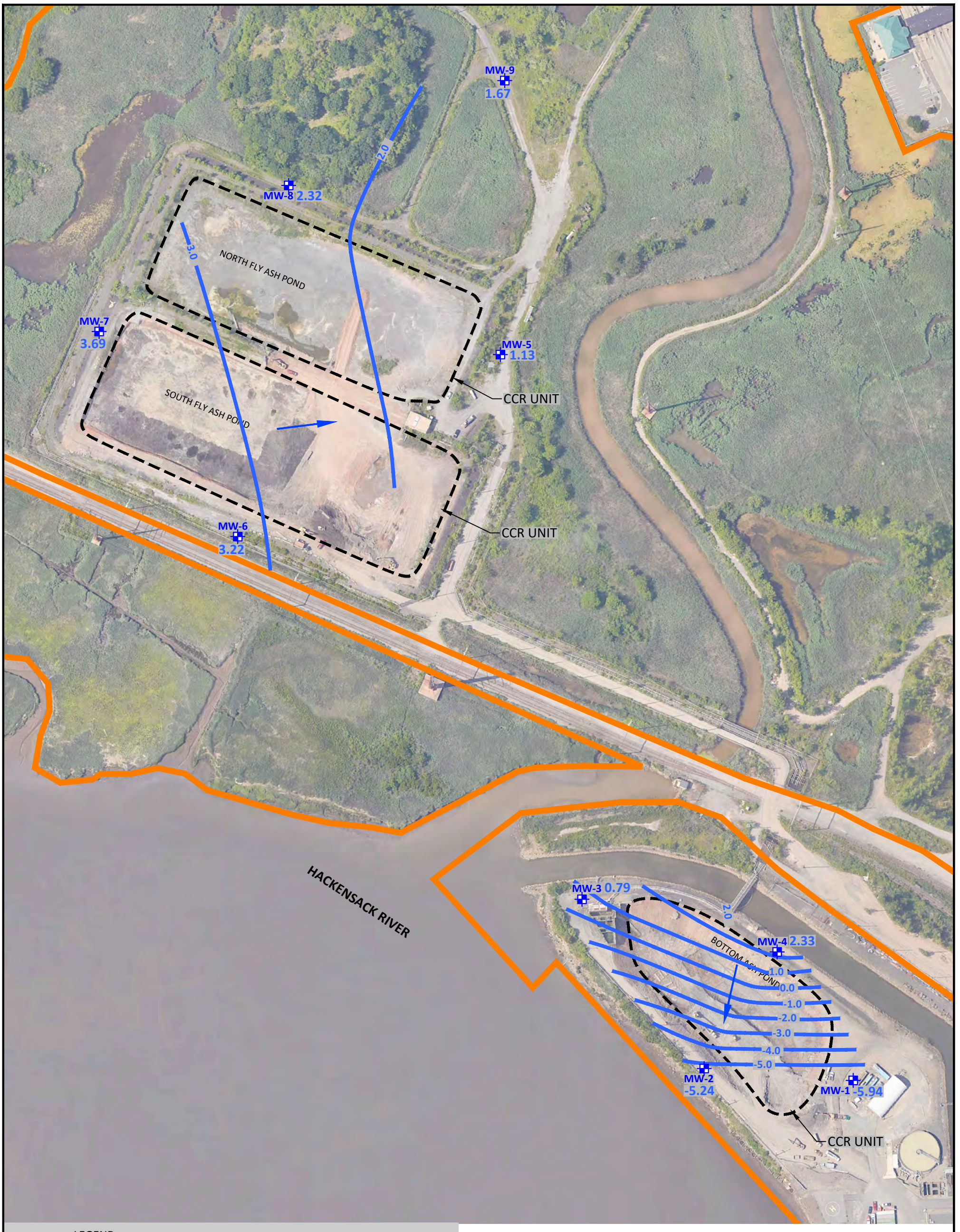
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FIGURE 2



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #1 MEASUREMENTS TAKEN JULY 30, 2018 TO AUGUST 1, 2018.

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

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GROUNDWATER ELEVATION CONTOUR MAP - EVENT #1

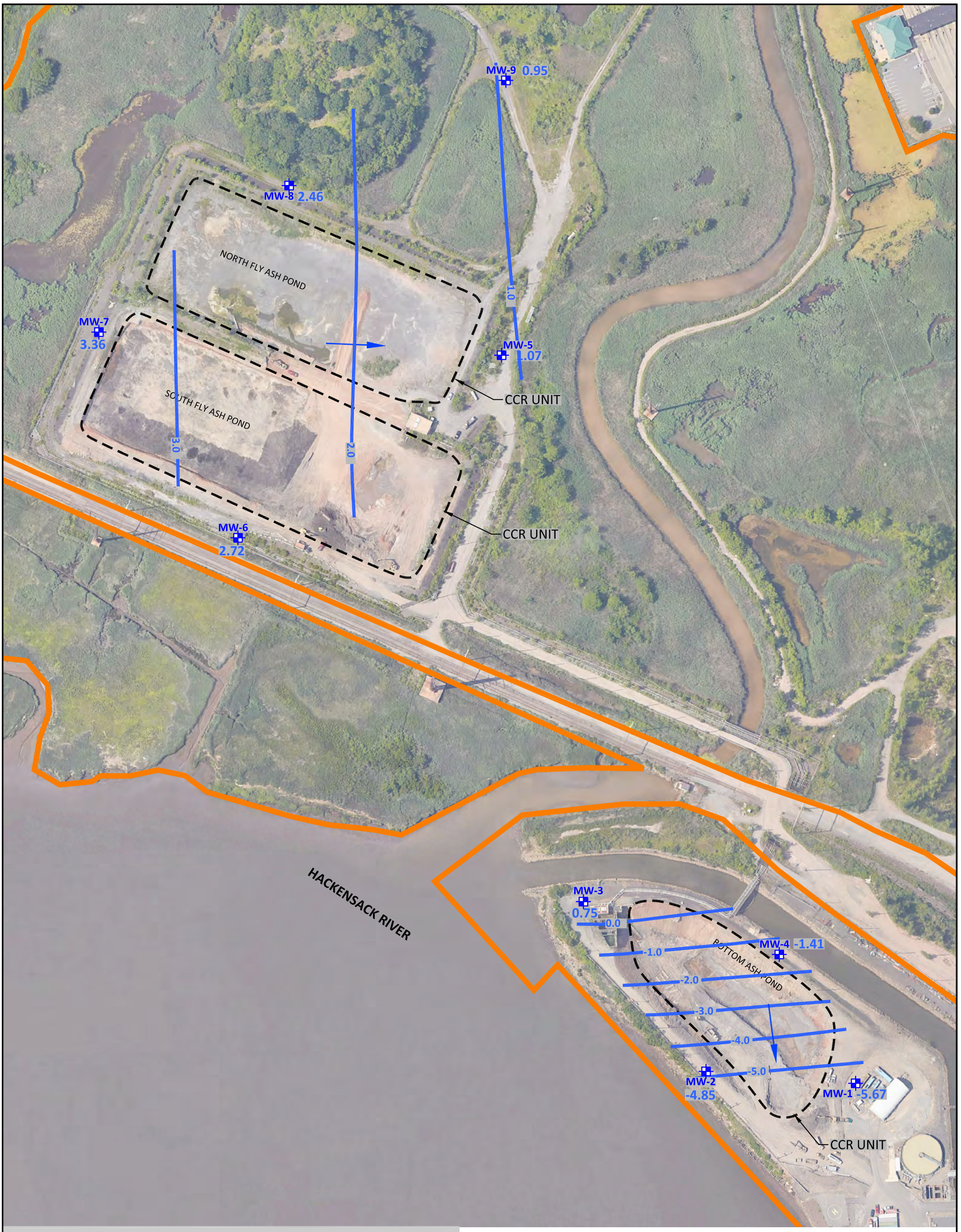
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FIGURE 3a



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #2 MEASUREMENTS TAKEN SEPTEMBER 5, 2018 TO SEPTEMBER 6,2018.

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

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GROUNDWATER ELEVATION CONTOUR MAP - EVENT #2

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FIGURE 3b



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #3 MEASUREMENTS TAKEN OCTOBER 1, 2018 TO OCTOBER 2, 2018.

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

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GROUNDWATER ELEVATION CONTOUR MAP - EVENT #3

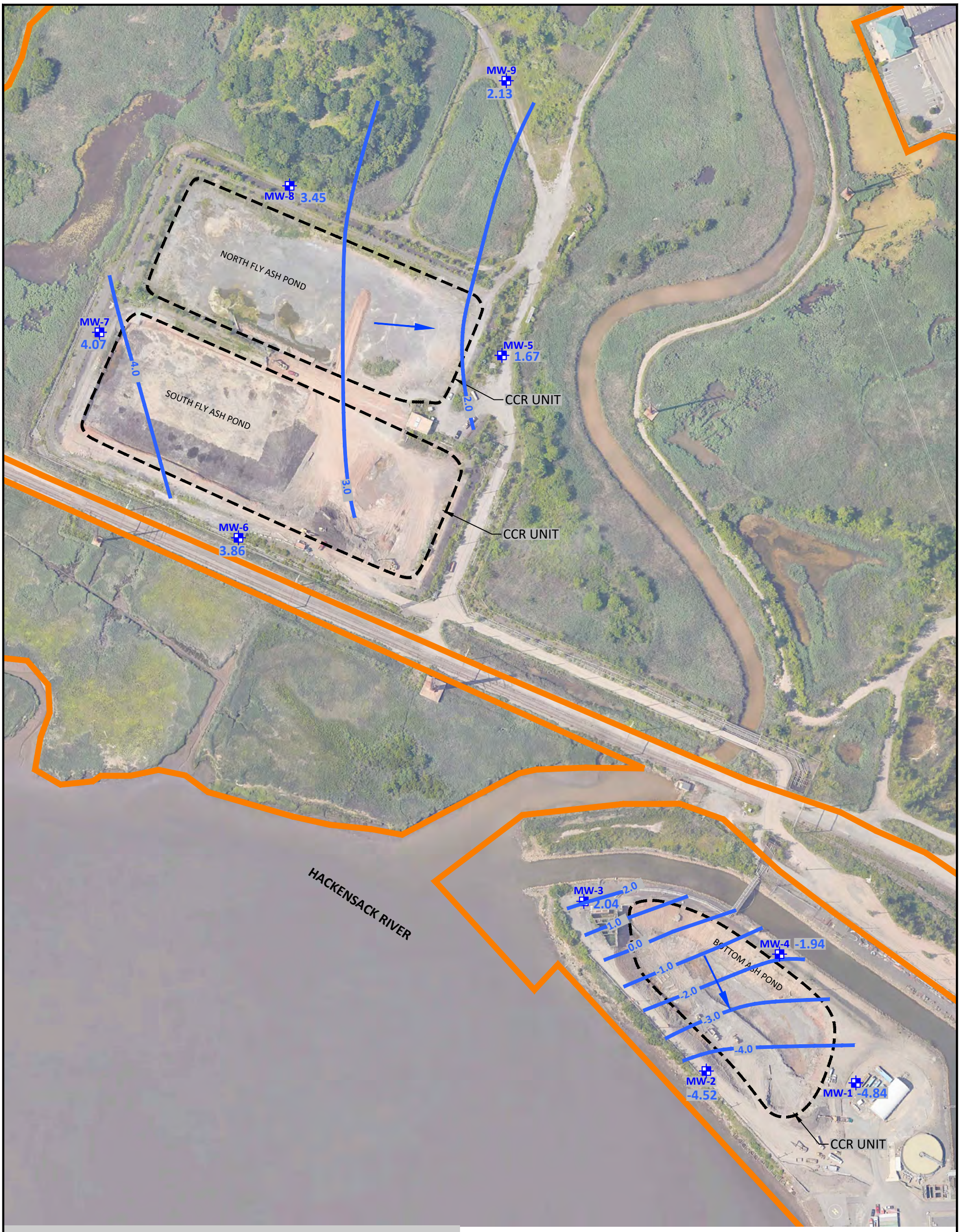
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FIGURE 3c



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #4 MEASUREMENTS TAKEN OCTOBER 31, 2018 TO NOVEMBER 1, 2018.

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

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GROUNDWATER ELEVATION CONTOUR MAP - EVENT #4

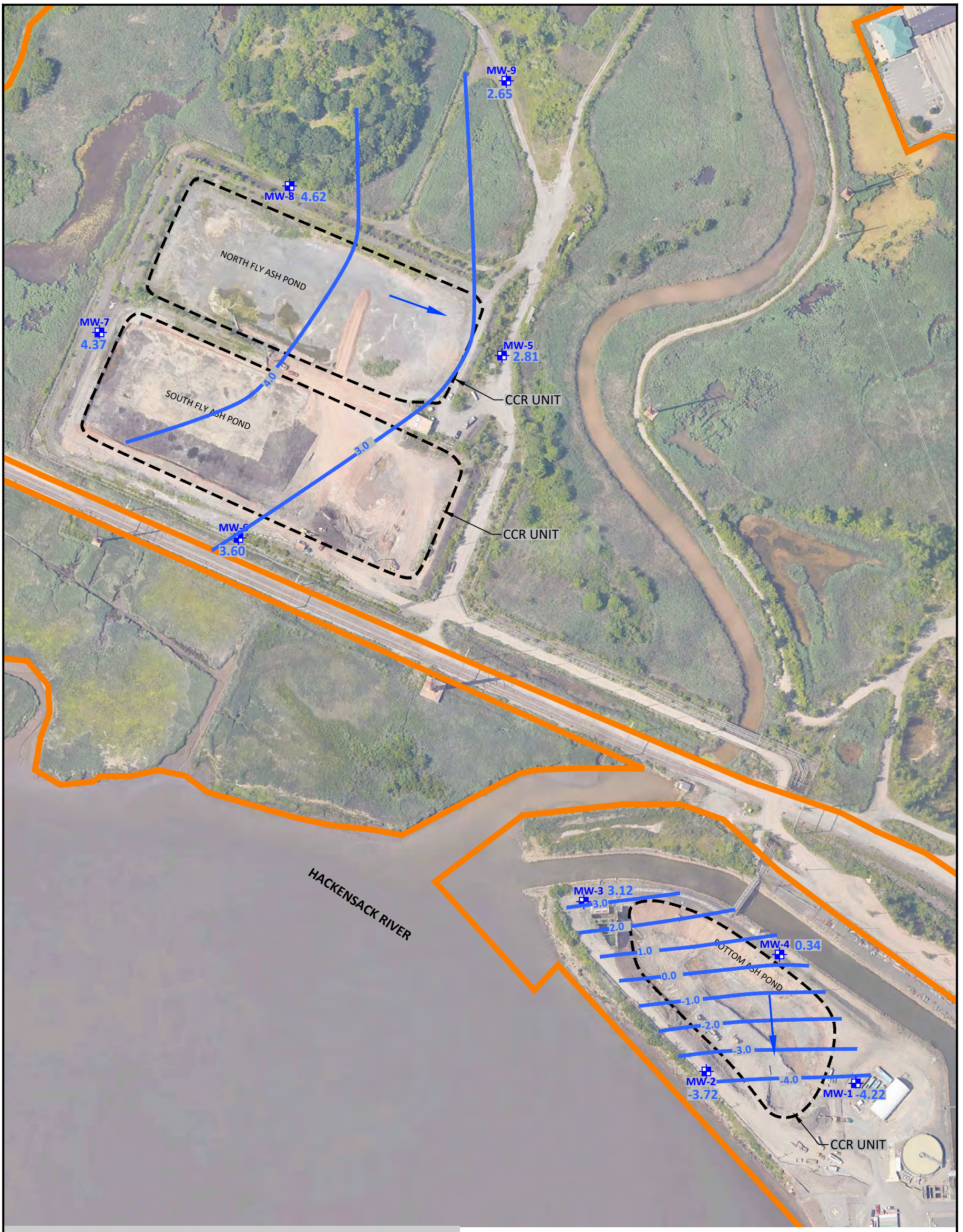
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FIGURE 3d



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #5 MEASUREMENTS TAKEN DECEMBER 3, 2018 TO DECEMBER 9, 2018.

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

N

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GROUNDWATER ELEVATION CONTOUR MAP - EVENT #5

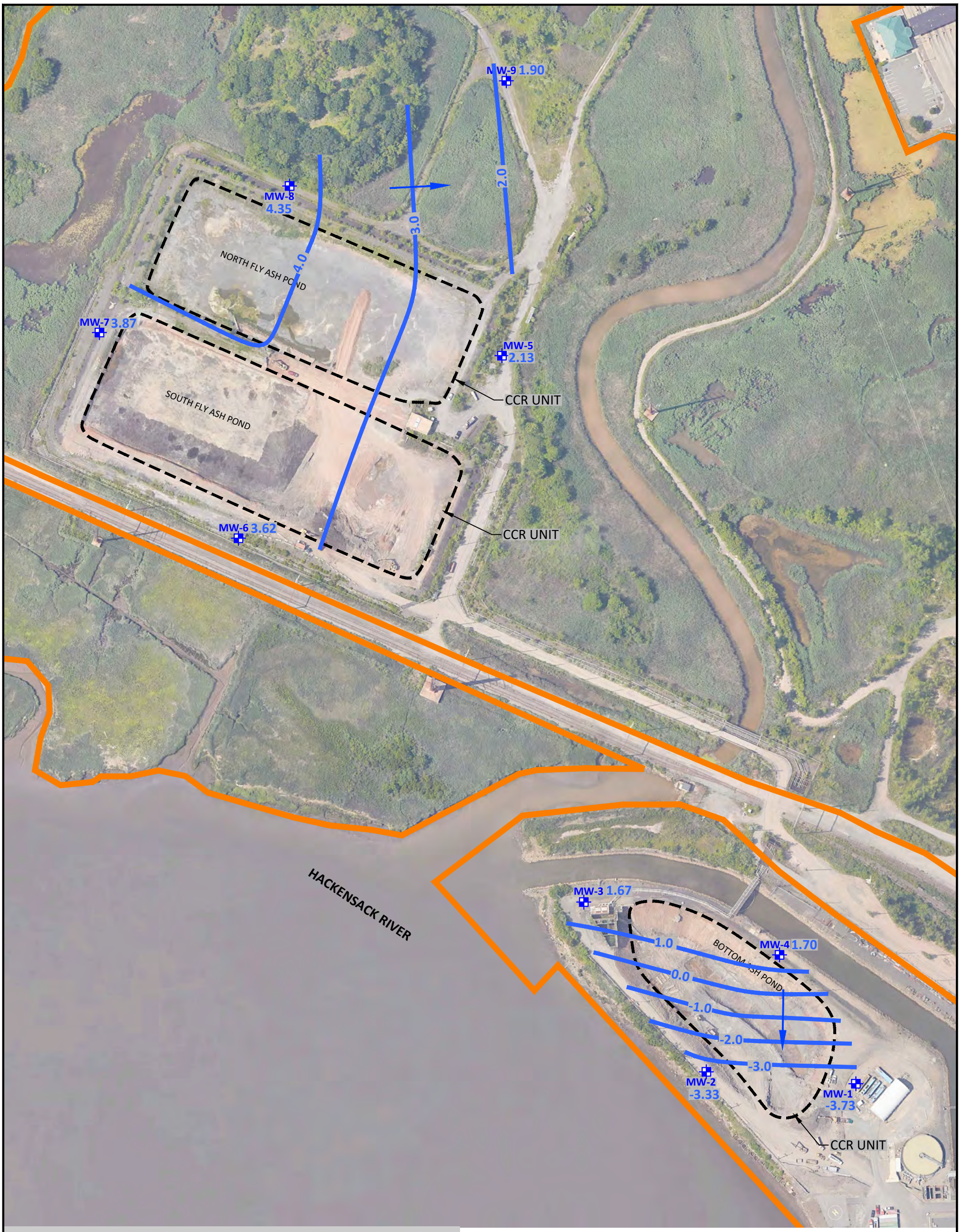
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FIGURE 3e



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #5 MEASUREMENTS TAKEN JANUARY 29-30, 2019.

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

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GROUNDWATER ELEVATION CONTOUR MAP - EVENT #6

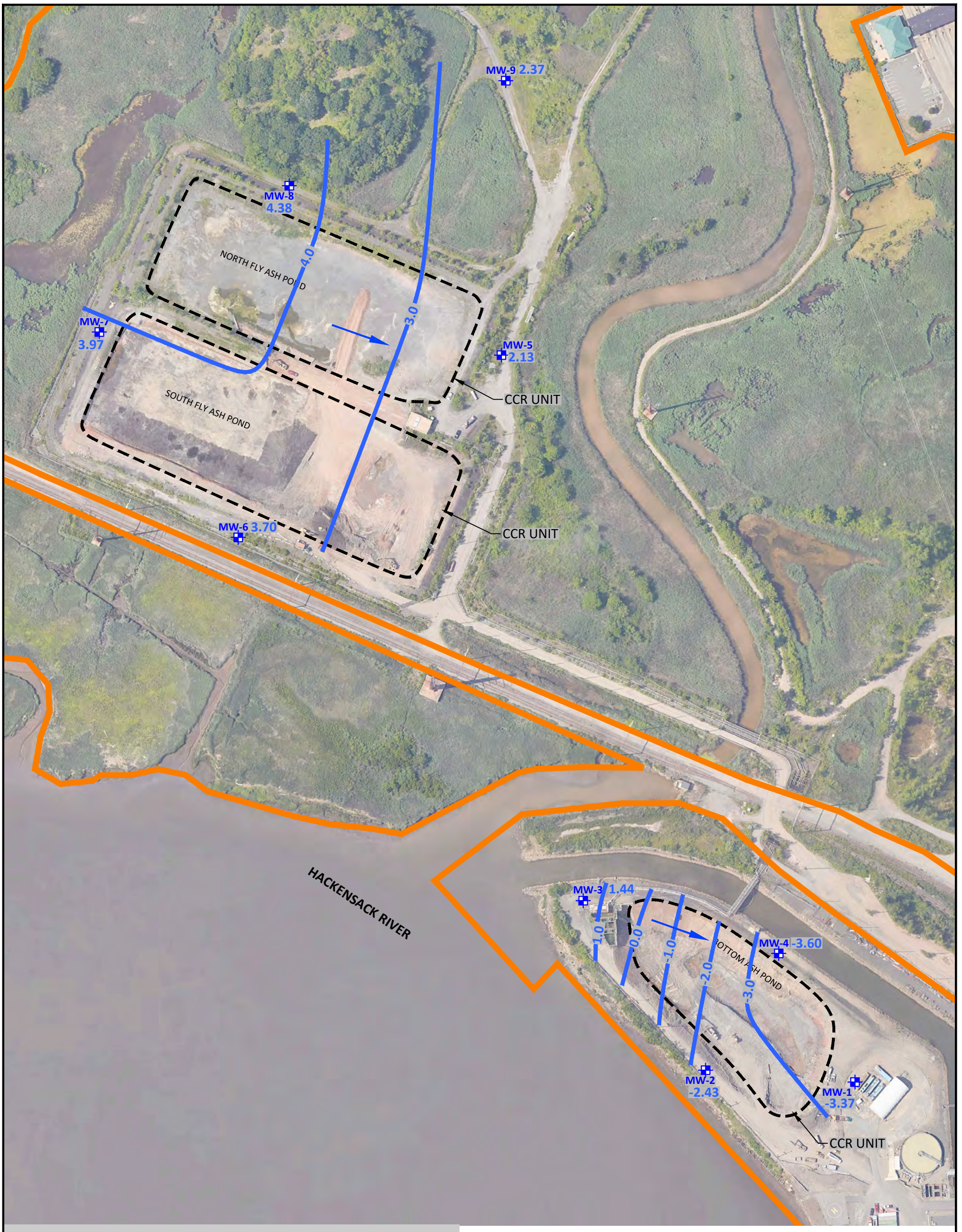
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FIGURE 3f



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #5 MEASUREMENTS TAKEN MARCH 18-19, 2019.

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

SOURCE: IMAGE ADAPTED FROM GOOGLE EARTH IMAGERY DATED NOVEMBER 2017.

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PREPARED FOR:

HRP HUDSON OWNER, LLC

GROUNDWATER ELEVATION CONTOUR MAP - EVENT #7

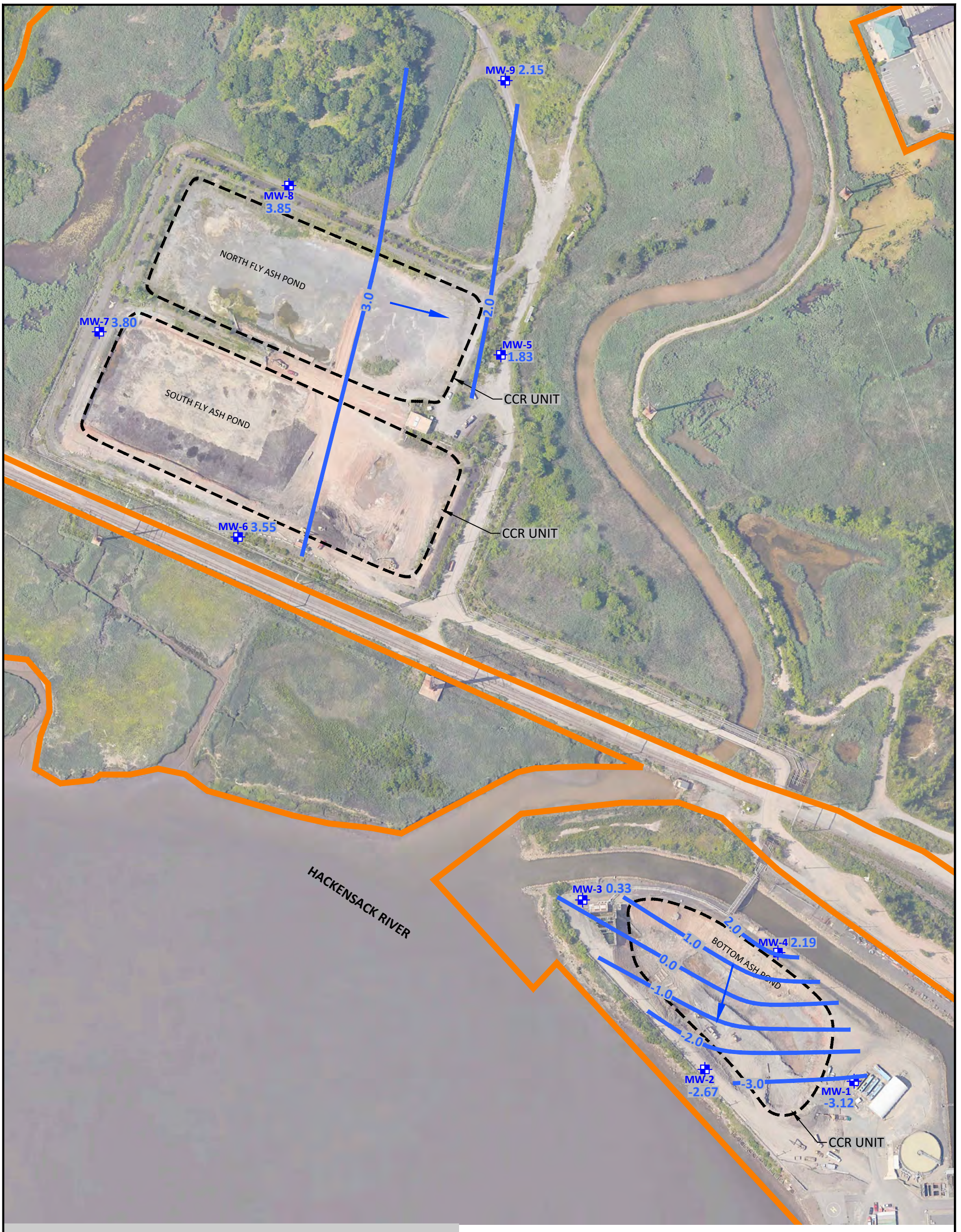
FORMER HUDSON GENERATING STATION
JERSEY CITY, NJ

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Weaver Consultants Group
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DRAWN BY:	RMD
REVIEWED BY:	AF
DATE:	5/22/2019
FILE:	3497-354-02-01
CAD:	SITELOC.dwg

FIGURE 3g



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE CCR UNIT LIMIT
- MW-1 APPROXIMATE MONITORING WELL LOCATION (BY GEI CONSULTANTS, INC.)
- GROUNDWATER CONTOUR
- 1.98 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER EVENT #5 MEASUREMENTS TAKEN APRIL 1-2, 2019.

N

APPROXIMATE GRAPHIC SCALE

200 0 100 200 400

1 inch = 200 ft.

SOURCE: IMAGE ADAPTED FROM GOOGLE EARTH IMAGERY DATED NOVEMBER 2017.

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PREPARED FOR:
HRP HUDSON OWNER, LLC

GROUNDWATER ELEVATION CONTOUR MAP - EVENT #8

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FILE:	3497-354-02-01
CAD:	SITELOC.dwg

FIGURE 3h

APPENDIX A

Groundwater Sampling Field Forms

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-1

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 73ºF, Mostly Sunny **Sampling Date:** 7/30/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 15.79 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 33.00 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 23.00 - 33.00 (ft) h. **Depth of Pump:** 28.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1008 **End Purge Time:** 1125

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	1015	200	18.93	6.72	17.56	141.6	4.61	33.5	--	--	15.79
2	1020	200	18.89	6.72	17.46	123.0	4.3	31.9	--	--	16.45
3	1025	200	19.58	6.73	17.68	120.1	4.26	30.6	--	--	16.73
4	1030	200	19.42	6.74	17.65	119.5	4.14	32.9	--	--	16.95
5	1035	200	17.67	6.72	16.93	121.3	3.82	32.8	--	--	17.50
6	1040	200	17.37	6.71	16.80	122.9	3.68	29.7	--	--	18.00
7	1045	200	18.27	6.72	17.10	122.7	3.79	25.1	--	--	18.15
8	1050	200	18.98	6.74	17.38	122.2	3.91	14.9	--	--	18.32
9	1055	200	19.56	6.75	17.59	119.1	4.08	18.0	--	--	18.40
10	1100	200	19.96	6.75	17.74	117.4	4.21	14.1	--	--	18.69
11	1105	200	20.26	6.76	17.84	113.9	4.38	10.8	--	--	18.80
12	1110	200	20.36	6.76	17.89	110.8	4.51	9.5	--	--	18.96
13	1115	200	20.35	6.76	17.88	108.0	4.62	9.1	--	--	19.10
14	1120	200	20.29	6.77	17.86	106.0	4.81	7.3	--	--	19.27
15	1125	200	20.33	6.77	17.86	105.1	4.94	6.8	--	--	19.45
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									--	--	
									--	--	

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-1, 7-30-2018, 1130

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1130 **End SampleTime:** 1200

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS: Turbidity out of range (cloud cover). Water level out of range (minimal effect).

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-2

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 79ºF, Cloudy **Sampling Date:** 7/30/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 12.81 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 34.99 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 25.00 - 35.00 (ft) h. **Depth of Pump:** 30.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1241 **End Purge Time:** 1335

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	1245	200	19.23	6.72	18.37	135.0	8.10	55.9	--	--	13.25
2	1250	200	19.25	6.71	18.26	119.5	7.77	48.2	--	--	13.50
3	1255	200	19.51	6.70	18.24	111.2	7.74	39.1	--	--	14.00
4	1300	200	19.46	6.70	18.18	113.3	7.78	36.2	--	--	14.41
5	1305	200	19.24	6.69	18.01	123.8	7.84	20.0	--	--	14.80
6	1310	200	19.06	6.68	17.92	132.9	7.86	14.6	--	--	15.30
7	1315	200	18.82	6.67	17.79	144.4	7.87	9.2	--	--	15.74
8	1320	200	18.67	6.68	17.77	152.2	7.91	7.8	--	--	16.00
9	1325	200	18.63	6.68	17.74	157.1	7.89	7.4	--	--	16.32
10	1330	200	18.5	6.68	17.69	160.6	7.87	6.6	--	--	16.75
11	1335	200	18.42	6.67	17.67	162.8	7.76	6.7	--	--	16.80
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3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-2, 7-30-2018, 1340

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1340 **End SampleTime:** 1410

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS: Water level out of range (minimal effect).

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-3

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 81ºF, Mostly Cloudy **Sampling Date:** 7/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 10.10 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 23.00 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 8.00 - 23.00 (ft) h. **Depth of Pump:** 15.5 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 0856 **End Purge Time:** 1005

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	0900	200	20.64	6.69	2.741	81.9	7.36	160.8	--	--	10.30
2	0905	200	19.56	6.73	1.767	80.4	6.91	101.2	--	--	10.70
3	0910	200	19.14	6.73	1.414	95.7	6.66	56.5	--	--	11.00
4	0915	200							--	--	
5	0920	200							--	--	
6	0925	200	0915 thru 0935 readings not taken, surveyors onsite.						--	--	
7	0930	200							--	--	
8	0935	200							--	--	
9	0940	200	19.85	6.75	1.385	162.9	5.67	-1.4	--	--	11.56
10	0945	200	19.98	6.76	1.432	168.5	5.61	8.4	--	--	11.69
11	0950	200	20.00	6.75	1.467	175.0	5.45	-4.3	--	--	11.89
12	0955	200	20.10	6.75	1.513	182.3	5.34	-6.4	--	--	12.00
13	1000	200	21.64	6.76	1.578	190.0	5.37	-6.5	--	--	12.11
14	1005	200	22.53	6.76	1.619	195.4	5.36	-6.1	--	--	12.20
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3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-3, 7-31-2018, 1010

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1010 **End SampleTime:** 1035

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS: Temp, Cond, & ORP 3rd reading out of range (difference minimal).

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-4

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 81ºF, Mostly Cloudy **Sampling Date:** 7/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 6.05 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 23.03 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 13.00 - 23.00 (ft) h. **Depth of Pump:** 18.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1110 **End Purge Time:** 1210

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	1115	200	23.68	6.59	17.71	95.4	3.06	327.0	--	--	6.00
2	1120	200	23.37	6.57	18.18	97.8	2.69	422.2	--	--	6.00
3	1125	200	23.43	6.58	18.19	99.1	2.59	251.5	--	--	6.00
4	1130	200	23.51	6.60	18.18	102.7	2.52	118.1	--	--	6.00
5	1135	200	23.58	6.60	18.18	100.0	2.46	71.1	--	--	6.00
6	1140	200	23.68	6.60	18.20	94.7	2.41	45.0	--	--	6.00
7	1145	200	23.76	6.58	18.24	88.8	2.38	24.8	--	--	6.00
8	1150	200	23.84	6.59	18.23	84.3	2.36	13.2	--	--	6.00
9	1155	200	23.87	6.58	18.22	79.1	2.33	13.3	--	--	6.00
10	1200	200	23.97	6.57	18.23	77.4	2.26	2.6	--	--	6.00
11	1205	200	23.74	6.56	18.16	74.8	2.23	-1.0	--	--	6.00
12	1210	200	23.78	6.56	18.15	73.1	2.28	-1.5	--	--	6.00
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3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-4, 7-31-2018, 1215

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1215 **End SampleTime:** 1225

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-5

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 81ºF, Mostly Cloudy **Sampling Date:** 7/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 5.82 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 16.98 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 6.98 - 16.98 (ft) h. **Depth of Pump:** 12.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1442 **End Purge Time:** 1540

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	1450	200	23.38	6.35	10.12	-77.6	4.25	40.7	--	--	5.98
2	1455	200	23.34	6.34	10.11	-86.1	4.33	20.1	--	--	6.00
3	1500	200	24.11	6.35	10.24	-90.7	4.35	11.7	--	--	6.00
4	1505	200	24.36	6.34	10.23	-94.8	4.35	7.3	--	--	6.00
5	1510	200	24.49	6.34	10.11	-98.2	4.34	14.1	--	--	6.00
6	1515	200	23.35	6.63	9.760	-99.3	4.37	7.8	--	--	6.00
7	1520	200	22.33	6.31	9.333	-99.9	4.22	9.5	--	--	6.00
8	1525	200	21.79	6.30	9.100	-100.3	4.16	22.6	--	--	6.00
9	1530	200	21.84	6.31	8.990	-101.2	4.14	0.5	--	--	6.00
10	1535	200	21.89	6.31	8.930	-102.2	4.12	2.4	--	--	6.00
11	1540	200	21.83	6.31	8.887	-102.7	4.12	2.4	--	--	6.00
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3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-5, 7-31-2018, 1545

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1545 **End SampleTime:** 1600

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Slightly green color.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-6

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 81ºF, Mostly Cloudy **Sampling Date:** 7/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 3.45 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 17.05 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 7.05 - 17.05 (ft) h. **Depth of Pump:** 12.1 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1301 **End Purge Time:** 1405

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	1310	200	23.36	6.45	13.55	-99.1	4.70	91.2	--	--	3.40
2	1315	200	22.66	6.46	13.88	-101.8	4.58	107.6	--	--	3.42
3	1320	200	21.53	6.48	12.49	-105.8	4.50	129.2	--	--	3.45
4	1325	200	21.81	6.43	10.60	-105.7	4.59	125.2	--	--	3.42
5	1330	200	22.45	6.40	10.05	-106.1	4.63	101.5	--	--	3.40
6	1335	200	22.95	6.42	9.988	-107.0	4.67	107.4	--	--	3.40
7	1340	200	23.36	6.38	9.968	-106.9	4.65	128.2	--	--	3.40
8	1345	200	23.58	6.37	9.924	-105.7	4.61	77.9	--	--	3.40
9	1350	200	23.36	6.36	9.730	-105.1	4.60	86.1	--	--	3.40
10	1355	200	23.20	6.35	9.424	-104.1	4.58	154.7	--	--	3.40
11	1400	200	22.25	6.29	8.864	-101.4	4.50	127.1	--	--	3.40
12	1405	200	22.05	6.29	8.568	-99.5	4.51	122.1	--	--	3.40
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3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-6, 7-31-2018, 1410

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1410 **End SampleTime:** 1440

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Slightly turbid with slight, sickly green color.

COMMENTS: Temp, Cond, Turbidity third reading slightly out of range (effect minimal).

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-7

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 81ºF, Overcast **Sampling Date:** 8/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 4.03 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 11.99 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 2.99 - 11.99 (ft) h. **Depth of Pump:** 8.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1137 **End Purge Time:** 1240

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	1140	200	25.77	7.02	3.206	-61.2	2.19	290.9	--	--	4.03
2	1145	200	24.98	6.93	3.135	-99.9	0.72	274.3	--	--	4.08
3	1150	200	24.86	6.90	2.661	-106.7	0.46	248.3	--	--	4.10
4	1155	200	25.27	6.84	1.936	-96.5	0.37	157.3	--	--	4.10
5	1200	200	25.51	6.82	1.695	-92.5	0.36	23..8	--	--	4.10
6	1205	200	25.55	6.81	1.455	-92.0	0.34	14.9	--	--	4.10
7	1210	200	26.00	6.82	1.213	-93.1	0.35	25.0	--	--	4.10
8	1215	200	26.38	6.82	1.012	-95.2	0.35	4.4	--	--	4.10
9	1220	200	26.54	6.84	0.851	-97.4	0.34	0.7	--	--	4.10
10	1225	200	27.03	6.85	0.769	-97.0	0.34	-0.9	--	--	4.10
11	1230	200	27.6	6.87	0.720	-99.8	0.36	-3.6	--	--	4.10
12	1235	200	27.99	6.87	0.690	-101.8	0.35	-3.9	--	--	4.10
13	1240	200	28.01	6.87	0.660	-102.5	0.35	-4.9	--	--	4.10
									--	--	
									--	--	
									--	--	
									--	--	
									--	--	

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-7, 8-1-2018, 1245

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1245 **End SampleTime:** 1300

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS: Conductivity out of range at time of sample.

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-8

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 81ºF, Mostly Cloudy **Sampling Date:** 8/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 5.26 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 13.60 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 3.60 - 13.60 (ft) h. **Depth of Pump:** 8.6 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1309 **End Purge Time:** 1435

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	1315	200	23.72	6.53	0.919	76.3	1.04	1438.0	--	--	5.30
2	1320	200	23.21	6.49	0.925	79.8	0.77	1104.0	--	--	5.30
3	1325	200	23.67	6.51	0.936	81.7	0.69	896.9	--	--	5.30
4	1330	200	23.83	6.51	0.942	83.7	0.66	722.9	--	--	5.30
5	1335	200	23.77	6.50	0.980	87.8	0.59	460.8	--	--	5.30
6	1340	200	23.70	6.50	0.995	89.7	0.58	338.2	--	--	5.30
7	1345	200	23.74	6.49	1.033	92.3	0.54	262.3	--	--	5.30
8	1350	200	23.60	6.49	1.045	93.9	0.53	191.6	--	--	5.30
9	1355	200	23.88	6.49	1.080	95.8	0.51	143.1	--	--	5.30
10	1400	200	24.06	6.48	1.102	97.2	0.50	128.7	--	--	5.30
11	1405	200	24.08	6.49	1.114	98.4	0.51	109.7	--	--	5.30
12	1410	200	23.91	6.48	1.137	99.5	0.48	87.5	--	--	5.30
13	1415	200	23.76	6.49	1.160	100.0	0.45	79.3	--	--	5.30
14	1420	200	23.75	6.49	1.176	100.1	0.44	68.8	--	--	5.30
15	1425	200	23.78	6.49	1.191	100.0	0.42	56.9	--	--	5.30
16	1430	200	24.43	6.49	1.219	100.3	0.43	18.1	--	--	5.30
17	1435	200	25.43	6.50	1.242	99.6	0.48	18.0	--	--	5.30
									--	--	

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-8, 8-1-2018, 1440

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1440 **End SampleTime:** 1455

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS: Third reading not stabilized for Temp, Cond, and Turbidity (sampled due to time).

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-9

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 75ºF, Overcast **Sampling Date:** 8/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 5.08 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 16.94 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 6.94 - 16.94 (ft) h. **Depth of Pump:** 11.9 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 0947 **End Purge Time:** 1100

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	0950	200	23.66	6.30	5.73	-36.1	1.84	55.3	--	--	5.15
2	0955	200	23.03	6.30	8.40	-76.3	0.76	82.0	--	--	5.18
3	1000	200	23.62	6.31	8.61	-87.3	0.67	508.9	--	--	5.20
4	1005	200	23.95	6.33	8.31	-93.7	0.58	717.3	--	--	5.20
5	1010	200	23.94	6.35	7.70	-98.5	0.50	131.3	--	--	6.00
6	1015	200	23.84	6.37	6.895	-100.4	0.41	202.5	--	--	6.00
7	1020	200	23.81	6.39	5.917	-100.4	0.35	183.9	--	--	6.00
8	1025	200	24.49	6.41	5.171	-99.2	0.30	76.2	--	--	6.00
9	1030	200	24.59	6.43	4.841	-99.5	0.28	62.1	--	--	6.00
10	1035	200	25.03	6.44	4.443	-97.4	0.27	41.8	--	--	6.00
11	1040	200	24.72	6.45	4.125	-100.0	0.24	29.1	--	--	6.00
12	1045	200	25.04	6.46	3.974	-98.4	0.23	23.2	--	--	6.00
13	1050	200	25.46	6.47	3.891	-99.3	0.23	0.6	--	--	6.00
14	1055	200	25.55	6.47	3.793	-101.0	0.23	-0.9	--	--	6.00
15	1100	200	25.9	6.48	3.719	-99.0	0.24	4.0	--	--	6.00
									--	--	
									--	--	
									--	--	

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony J. Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-9, 8-1-2018, 1105

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1105 **End SampleTime:** 1122

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Slightly green color.

COMMENTS: Conductivity third measurement slightly out of range (difference minimal).

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-1

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/6/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 14.90 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 33.00 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 23.00 - 33.00 (ft) h. **Depth of Pump:** 28.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 905 **End Purge Time:** 950

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	0	200	18.9	7.09	15.97	81.8	3.03	31.3	--	--	14.90
2	5	200	16.23	6.83	14.95	68.9	0.59	9.5	--	--	15.85
3	10	200	16.05	6.84	14.89	67.3	0.31	5.1	--	--	16.62
4	15	200	15.92	6.85	14.85	66.5	0.38	2.2	--	--	18.10
5	20	200	15.82	6.87	14.81	64.9	0.41	1.5	--	--	20.22
6	25	200	15.84	6.87	14.82	64.5	0.18	1.1	--	--	21.78
7	30	200	15.88	6.83	14.82	62.9	0.33	1.2	--	--	23.20
8	35	200	15.99	6.88	14.88	62.9	0.38	1.5	--	--	23.55
9	40	200	15.84	6.86	14.90	60.0	0.39	0.7	--	--	23.61
10	45	200	15.82	6.85	14.92	60.1	0.39	0.6	--	--	23.86

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-1, 9-6-2018, 0955

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 955 **End SampleTime:** 1040

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-2

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/6/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 12.80 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 34.99 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 25.00 - 35.00 (ft) h. **Depth of Pump:** 30.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 910 **End Purge Time:** 955

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	17.72	6.70	16.38	3.4	1.90	9.4	--	--	12.80
2	10	200	17.14	6.75	16.18	19.9	0.39	13.7	--	--	12.80
3	15	200	17.34	6.76	16.16	30.0	0.29	10.6	--	--	12.80
4	20	200	17.29	6.76	16.04	32.6	0.34	8.1	--	--	12.80
5	25	200	17.32	6.77	16.03	34.1	0.31	6.7	--	--	12.80
6	30	200	17.24	6.77	15.96	35.7	0.27	5.9	--	--	12.80
7	35	200	17.24	6.76	15.94	37.0	0.29	4.6	--	--	12.80
8	40	200	17.34	6.76	15.91	38.0	0.26	3.7	--	--	12.80
9	45	200	17.4	6.76	15.93	38.8	0.26	3.0	--	--	12.80

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Shane Wagner

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-2, 7-30-2018, 1340

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1340 **End SampleTime:** 1410

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS: Water level out of range (minimal effect).

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-3

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/6/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 10.14 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 23.00 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 8.00 - 23.00 (ft) h. **Depth of Pump:** 15.5 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1105 **End Purge Time:** 1150

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	150	24.07	6.76	5.644	100.5	0.92	0.3	--	--	10.14
2	10	150	23.4	6.70	5.641	68.3	0.78	0.2	--	--	10.14
3	15	150	23.35	6.71	5.755	60.1	0.53	0.3	--	--	10.14
4	20	150	23.36	6.72	5.746	53.1	0.44	0.3	--	--	10.14
5	25	150	23.12	6.73	5.730	49.2	0.35	0.3	--	--	10.14
6	30	150	23.74	6.74	5.776	40.2	0.49	0.6	--	--	10.14
7	35	150	24.4	6.74	5.898	57.3	0.51	1.7	--	--	10.14
8	40	150	24.46	6.74	5.884	55.9	0.50	1.0	--	--	10.14
9	45	150	24.49	6.74	5.895	54.2	0.49	0.7	--	--	10.14
									--	--	
									--	--	
									--	--	
									--	--	

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Shane Wagner

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-3, 9-6-2018, 1155

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1155 **End SampleTime:** 1240

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-4

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/6/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 10.15 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 23.03 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 13.00 - 23.00 (ft) h. **Depth of Pump:** 18.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1110 **End Purge Time:** 1155

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	0	100	30.70	7.13	7.24	16.7	4.00	30.4	--	--	10.15
2	5	100	25.61	6.83	12.14	45.4	0.97	1.8	--	--	10.15
3	10	100	25.19	6.86	11.90	61.4	1.37	1.2	--	--	10.15
4	15	100	24.84	6.87	11.81	71.9	0.64	3.4	--	--	10.15
5	20	100	24.82	6.88	11.75	15.5	0.61	3.2	--	--	10.16
6	25	100	24.92	6.88	11.72	81.3	1.55	3.3	--	--	10.16
7	30	100	24.96	6.89	11.72	84.9	1.15	2.6	--	--	10.16
8	35	100	25.05	6.89	11.73	86.4	1.13	2.3	--	--	10.17
9	40	100	24.92	6.88	11.67	85.8	1.14	1.5	--	--	10.17
10	45	100	25.21	6.88	11.70	86.7	1.15	1.0	--	--	10.17

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-4, 9-6-2018, 1200

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1200 **End SampleTime:** 1210

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-5

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/5/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a.	Depth to LNAPL:	--	(ft)	b.	Depth to Water:	6.23	(ft)
c.	Depth to DNAPL:	--	(ft)	d.	Total Well Depth:	16.98	(ft)
e.	LNAPL Thickness: (a-b)	--	(ft)	f.	DNAPL Thickness: (c-d)	--	(ft)
g.	Screen Interval:	6.98 - 16.98	(ft)	h.	Depth of Pump:	12.0	(ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1220 **End Purge Time:** 1300

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	150	26.13	6.35	3.158	-86.1	1.32	16.2	--	--	6.23
2	10	150	26.08	6.35	3.128	-84.4	0.90	13.4	--	--	6.23
3	15	150	25.55	6.35	2.969	-90.4	0.85	8.9	--	--	6.23
4	20	150	25.06	6.35	2.856	-101.2	0.83	6.8	--	--	6.23
5	25	150	24.78	6.36	2.819	-105.2	0.87	6.6	--	--	6.23
6	30	150	24.81	6.39	2.808	-112.5	0.86	4.6	--	--	6.23
7	35	150	24.63	6.39	2.814	-117.2	0.87	4.6	--	--	6.23
8	40	150	24.57	6.37	2.827	-121.0	0.88	4.8	--	--	6.23

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Shane Wagner

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-5, 9-5-2018, 1300

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1300 **End SampleTime:** 1310

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Slightly green color.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-6

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/5/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 4.00 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 17.05 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 7.05 - 17.05 (ft) h. **Depth of Pump:** 12.1 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1355 **End Purge Time:** 1435

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	150	23.85	6.47	4.220	-57.9	1.13	34.2	--	--	4.00
2	10	150	23.81	6.41	4.212	-58.0	0.87	26.9	--	--	4.00
3	15	150	23.87	6.46	4.199	-57.9	0.79	16.4	--	--	4.00
4	20	150	23.78	6.48	4.179	-57.9	0.60	9.2	--	--	4.00
5	25	150	23.75	6.47	4.172	-57.7	0.56	7.7	--	--	4.00
6	30	150	23.71	6.48	4.161	-57.4	0.59	5.6	--	--	4.00
7	35	150	23.85	6.48	4.165	-57.3	0.57	5.2	--	--	4.00
8	40	150	23.98	6.48	4.174	-56.3	0.56	5.3	--	--	4.00

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Shane Wagner

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-6, 9-5-2018, 1440

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1440 **End SampleTime:** 1450

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-7

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/5/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 4.50 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 11.99 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 2.99 - 11.99 (ft) h. **Depth of Pump:** 8.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1240 **End Purge Time:** 1325

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	0	100	28.02	6.77	5.279	-95.4	2.08	159.8	--	--	4.50
2	5	100	24.97	6.81	4.911	-97.3	0.73	119.1	--	--	4.50
3	10	100	25.84	6.70	2.943	-50.6	0.37	76.5	--	--	4.50
4	15	100	26.10	6.66	2.346	-45.8	0.50	47.4	--	--	4.51
5	20	100	26.40	6.68	1.614	-39.7	0.38	17.9	--	--	4.51
6	25	100	26.51	6.72	1.286	-41.2	0.33	10.4	--	--	4.52
7	30	100	26.60	6.78	1.011	-13.7	0.31	5.8	--	--	4.53
8	35	100	26.63	6.85	0.850	-48.7	0.31	4.2	--	--	4.53
9	40	100	26.67	6.87	0.837	-51.1	0.31	2.6	--	--	4.54
10	45	100	26.69	6.90	0.829	-50.3	0.31	1.6	--	--	4.54

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-7, 9-5-2018, 1330

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1330 **End SampleTime:** 1340

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-8

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 81ºF, Mostly Cloudy **Sampling Date:** 8/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 5.76 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 13.60 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 3.60 - 13.60 (ft) h. **Depth of Pump:** 8.6 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1045 **End Purge Time:** 1125

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	150	23.76	6.50	1.012	36.2	2.71	2.4	--	--	5.46
2	10	150	23.52	6.37	1.036	36.7	1.34	52.7	--	--	5.46
3	15	150	23.52	6.40	1.275	37.0	1.01	27.0	--	--	5.46
4	20	150	24.38	6.38	1.333	33.8	0.73	24.1	--	--	5.46
5	25	150	24.31	6.36	1.351	34.0	0.81	23.3	--	--	5.46
6	30	150	22.72	6.41	1.452	38.5	0.77	16.8	--	--	5.46
7	35	150	22.42	6.40	1.509	42.1	0.75	16.9	--	--	5.46
8	40	150	22.41	6.40	1.512	43.4	0.76	16.2	--	--	5.46

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Shane Wagner

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-8, 9-5-2018, 1130

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1135 **End SampleTime:** 1145

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-9

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: **Sampling Date:** 9/5/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 5.58 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 16.94 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 6.94 - 16.94 (ft) h. **Depth of Pump:** 11.9 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1035 **End Purge Time:** 1135

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	150	28.63	6.49	9.056	-84.7	1.77	47.9	--	--	5.58
2	10	150	26.21	6.38	8.547	-96.8	0.36	59.8	--	--	5.59
3	15	150	25.91	6.38	8.140	-98.2	0.51	46.5	--	--	5.59
4	20	150	25.87	6.38	7.792	-86.9	0.14	34.8	--	--	5.59
5	25	150	25.93	6.38	7.353	-92.4	0.19	27.1	--	--	5.59
6	30	150	25.90	6.38	7.001	-87.7	0.18	19.8	--	--	5.60
7	35	150	25.91	6.38	6.426	-94.0	0.16	15.2	--	--	5.60
8	40	150	26.00	6.38	6.177	-95.2	0.16	12.7	--	--	5.60
9	45	150	26.05	6.38	5.793	-96.9	0.15	10.9	--	--	5.60
10	50	150	26.11	6.38	5.439	-91.9	0.18	9.7	--	--	5.60
11	55	150	26.14	6.37	5.386	-86.9	0.16	8.5	--	--	5.61
12	60	150	26.18	6.37	5.374	-85.4	0.16	7.1	--	--	5.61

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-9, 9-5-2018, 1140

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1140 **End SampleTime:** 1150

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: Little sheen. Pale yellow color

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-1

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 69ºF, Partly Sunny **Sampling Date:** 10/2/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 14.90 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 33.00 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 23.00 - 33.00 (ft) h. **Depth of Pump:** 28.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 900 **End Purge Time:** 950

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	16.70	6.80	15.64	46.3	0.00	64.9	--	--	14.90
2	10	200	16.31	6.80	15.52	39.7	0.65	51.7	--	--	14.90
3	15	200	16.19	6.81	15.43	34.2	0.65	49.6	--	--	14.90
4	20	200	16.41	6.82	15.46	31.7	0.54	46.4	--	--	14.90
5	25	200	16.62	6.82	15.52	28.2	0.43	31.4	--	--	14.90
6	30	200	16.77	6.83	15.55	26.3	0.59	19.3	--	--	14.90
7	35	200	16.77	6.83	15.54	22.1	0.51	9.1	--	--	14.90
8	40	200	16.85	6.83	15.56	19.0	0.48	5.0	--	--	14.90
9	45	200	16.78	6.83	15.52	16.8	0.67	2.8	--	--	14.90
10	50	200	16.79	6.83	15.48	14.4	0.53	8.1	--	--	14.90

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-1, 10-2-2018, 1005

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1005 **End SampleTime:** 1010

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-2

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 74ºF, Partly Cloudy **Sampling Date:** 10/2/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 11.78 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 34.99 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 25.00 - 35.00 (ft) h. **Depth of Pump:** 30.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 900 **End Purge Time:** 950

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	100	17.22	6.71	15.40	57.0	2.80	42.3	--	--	11.80
2	10	100	15.80	6.73	14.98	40.6	0.94	59.7	--	--	13.00
3	15	100	15.38	6.74	14.84	36.8	0.69	60.6	--	--	14.87
4	20	100	15.26	6.74	14.79	32.8	0.65	54.5	--	--	16.10
5	25	100	15.23	6.74	14.76	31.2	0.63	45.6	--	--	16.80
6	30	100	15.25	6.74	14.75	29.2	0.62	20.9	--	--	18.11
7	35	100	15.26	6.74	14.77	28.2	0.62	15.9	--	--	19.86
8	40	100	15.18	6.75	14.71	26.0	0.62	9.9	--	--	20.03
9	45	100	15.18	6.75	14.72	24.5	0.61	9.6	--	--	20.21
10	50	100	15.16	6.75	14.72	23.4	0.60	7.8	--	--	20.22

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-2, 10-2-2018, 955

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 955 **End SampleTime:** 1000

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-3

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 78ºF, Sunny **Sampling Date:** 10/2/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 9.22 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 23.00 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 8.00 - 23.00 (ft) h. **Depth of Pump:** 15.5 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1050 **End Purge Time:** 1200

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	100	22.41	6.80	2.102	132.7	2.47	66.8	--	--	9.36
2	10	100	21.16	6.80	1.832	129.6	1.81	69.6	--	--	9.63
3	15	100	20.93	6.80	1.805	129.7	1.85	65.9	--	--	9.82
4	20	100	20.65	6.80	1.798	130.2	2.04	41.1	--	--	10.02
5	25	100	20.94	6.80	1.827	130.4	2.16	16.4	--	--	10.19
6	30	100	21.11	6.80	1.851	130.9	2.33	49.4	--	--	10.32
7	35	100	21.15	6.81	1.874	131.7	2.50	38.3	--	--	10.48
8	40	100	21.22	6.81	1.896	132.3	2.61	29.5	--	--	10.57
9	45	100	21.32	6.81	1.916	132.7	2.75	20.8	--	--	10.74
10	50	100	21.40	6.82	1.930	132.7	2.84	16.4	--	--	10.83
11	55	100	21.25	6.83	1.930	132.8	2.87	13.2	--	--	10.90
12	60	100	21.35	6.84	1.936	1329.0	2.89	9.8	--	--	10.98
13	65	100	21.35	6.85	1.930	132.8	2.88	7.9	--	--	11.13
14	70	100	21.25	6.86	1.923	132.2	2.82	5.3	--	--	11.20

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-3, 10-2-2018, 1205

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1205 **End SampleTime:** 1210

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-4

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 78ºF, Sunny **Sampling Date:** 10/2/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 9.05 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 23.03 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 13.00 - 23.00 (ft) h. **Depth of Pump:** 18.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1042 **End Purge Time:** 1137

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	21.28	6.66	15.80	-40.7	0.18	382.9	--	--	9.05
2	10	200	21.47	6.67	15.44	-58.4	0.37	307.0	--	--	9.05
3	15	200	21.84	6.72	13.79	-49.1	0.40	190.3	--	--	9.05
4	20	200	22.01	6.75	13.00	-15.9	0.31	84.5	--	--	9.05
5	25	200	21.81	6.74	12.80	3.7	0.46	47.1	--	--	9.05
6	30	200	21.89	6.74	12.83	15.8	0.47	27.1	--	--	9.05
7	35	200	22.20	6.73	12.97	26.9	0.46	12.7	--	--	9.05
8	40	200	22.36	6.72	13.04	34.5	0.39	10.0	--	--	9.05
9	45	200	22.42	6.70	13.03	41.2	0.37	5.0	--	--	9.05
10	50	200	22.50	6.69	13.02	45.5	0.37	3.9	--	--	9.05
11	55	200	22.57	6.67	13.03	50.4	0.28	4.2	--	--	9.05

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-4, 10-2-2018, 1140

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1140 **End SampleTime:** 1145

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-5

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 69ºF, Cloudy **Sampling Date:** 10/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 4.79 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 16.98 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 6.98 - 16.98 (ft) h. **Depth of Pump:** 12.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1015 **End Purge Time:** 1100

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	120	20.59	6.35	5.255	-53.0	1.66	22.0	--	--	4.88
2	10	120	20.60	6.38	5.398	-83.6	0.67	24.5	--	--	4.90
3	15	120	20.81	6.40	5.133	-91.8	0.59	21.0	--	--	4.93
4	20	120	21.01	6.41	4.947	-89.7	0.58	15.6	--	--	4.94
5	25	120	20.99	6.42	4.844	-88.4	0.57	13.4	--	--	4.94
6	30	120	21.16	6.42	4.630	-88.6	0.59	10.5	--	--	4.95
7	35	120	21.18	6.42	4.526	-88.3	0.61	9.0	--	--	4.95
8	40	120	21.38	6.42	4.491	-85.3	0.61	7.8	--	--	4.95
9	45	120	21.65	6.42	4.516	-84.3	0.63	7.4	--	--	4.95

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-5, 10-1-2018, 1110

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1110 **End SampleTime:** 1115

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: Possible organic sheen, pale brown color.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-6

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 68ºF, Cloudy **Sampling Date:** 10/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) **b.** **Depth to Water:** 2.72 (ft)

c. **Depth to DNAPL:** -- (ft) **d.** **Total Well Depth:** 17.05 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) **f.** **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 7.05 - 17.05 (ft) **h.** **Depth of Pump:** 12.1 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1023 **End Purge Time:** 1128

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	19.83	6.52	4.815	-26.5	2.72	108.9	--	--	2.72
2	10	200	19.09	6.52	4.732	-49.2	1.84	127.9	--	--	2.85
3	15	200	19.06	6.55	3.953	-55.6	2.03	165.2	--	--	2.85
4	20	200	19.20	6.56	3.337	-58.2	2.44	160.7	--	--	2.85
5	25	200	19.65	6.56	2.941	-54.9	2.74	214.7	--	--	2.85
6	30	200	19.85	6.55	2.841	-56.1	2.85	228.9	--	--	2.85
7	35	200	20.31	6.55	2.772	-58.4	3.14	47.1	--	--	2.85
8	40	200	20.85	6.55	2.800	-60.8	3.23	36.7	--	--	2.85
9	45	200	21.10	6.56	2.837	-63.1	3.37	23.2	--	--	2.85
10	50	200	20.91	6.55	2.766	-64.0	3.30	37.3	--	--	2.85
11	55	200	21.22	6.55	2.774	-64.7	3.35	9.7	--	--	2.85
12	60	200	21.60	6.55	2.881	-65.8	3.42	8.8	--	--	2.85
13	65	200	21.75	6.54	2.894	-67.0	3.42	8.7	--	--	2.85

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-6, 10-1-2018, 1130

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1130 **End SampleTime:** 1135

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-7

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 75ºF, Cloudy **Sampling Date:** 10/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 3.60 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 11.99 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 2.99 - 11.99 (ft) h. **Depth of Pump:** 8.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1346 **End Purge Time:** 1440

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	21.71	6.81	3.871	-72.1	1.95	133.2	--	--	3.60
2	10	200	21.45	6.88	3.129	-82.4	2.46	120.3	--	--	3.60
3	15	200	21.19	6.95	1.366	-75.6	3.40	95.7	--	--	3.60
4	20	200	20.97	7.01	0.656	-73.5	2.03	35.5	--	--	3.60
5	25	200	20.99	7.05	0.398	-81.6	1.30	16.1	--	--	3.60
6	30	200	21.03	7.06	0.352	-83.1	1.01	11.5	--	--	3.60
7	35	200	21.16	7.06	0.341	-84.9	0.85	8.7	--	--	3.60
8	40	200	21.49	7.06	0.342	-86.9	0.75	7.1	--	--	3.60
9	45	200	21.71	7.06	0.337	-76.8	0.72	5.0	--	--	3.60
10	50	200	22.01	7.06	0.338	-75.9	0.67	4.8	--	--	3.60
11	55	200	22.04	7.08	0.337	-76.6	0.65	4.7	--	--	3.60

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-7, 10-1-2018, 1440

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1440 **End SampleTime:** 1445

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-8

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 75ºF, Cloudy **Sampling Date:** 10/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 3.50 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 13.60 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 3.60 - 13.60 (ft) h. **Depth of Pump:** 8.6 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1345 **End Purge Time:** 1445

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	20.70	6.50	0.759	-1.7	1.88	414.7	--	--	3.51
2	10	200	20.09	6.38	0.818	16.5	0.49	242.1	--	--	3.52
3	15	200	20.01	6.38	0.891	22.2	0.45	164.1	--	--	3.54
4	20	200	19.87	6.37	0.961	26.6	0.42	80.8	--	--	3.56
5	25	200	19.86	6.38	1.023	30.8	0.41	52.8	--	--	3.56
6	30	200	19.87	6.38	1.090	34.4	0.40	30.4	--	--	3.56
7	35	200	19.97	6.38	1.146	37.1	0.39	21.0	--	--	3.56
8	40	200	20.04	6.38	1.206	40.8	0.39	15.2	--	--	3.56
9	45	200	20.07	6.38	1.233	42.8	0.39	13.7	--	--	3.56
10	50	200	20.16	6.38	1.267	45.7	0.39	9.9	--	--	3.56
11	55	200	20.14	6.38	1.296	48.6	0.39	9.2	--	--	3.56
12	60	200	20.10	6.38	1.297	50.1	0.39	7.6	--	--	3.56

3. SAMPLE COLLECTION DATA **Sampling Personnel:**

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-8, 10-1-2018, 1450

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1450 **End SampleTime:** 1455

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-9

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City

Weather Conditions: 71ºF, Cloudy **Sampling Date:** 10/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 4.26 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 16.94 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 6.94 - 16.94 (ft) h. **Depth of Pump:** 11.9 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1200 **End Purge Time:** 1305

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	25.22	6.29	5.418	-83.0	2.55	16.9	--	--	4.26
2	10	200	22.73	6.14	8.182	-149.1	0.81	18.1	--	--	4.37
3	15	200	22.04	6.19	7.805	-216.1	0.80	15.2	--	--	4.46
4	20	200	22.03	6.22	6.645	-217.9	0.61	21.5	--	--	4.46
5	25	200	22.26	6.24	5.577	-212.6	0.64	35.3	--	--	4.46
6	30	200	22.45	6.26	5.183	-210.4	0.70	41.3	--	--	4.46
7	35	200	22.93	6.27	5.030	-206.8	0.72	40.2	--	--	4.46
8	40	200	23.34	6.31	4.881	-215.0	0.77	38.1	--	--	4.46
9	45	200	23.50	6.31	4.800	-214.9	0.77	40.2	--	--	4.46
10	50	200	23.55	6.33	4.353	-217.5	0.72	37.3	--	--	4.52
11	55	200	21.87	6.36	3.510	-214.1	0.67	25.2	--	--	4.57
12	60	200	21.75	6.38	3.508	-211.8	0.67	22.8	--	--	4.60
13	65	200	21.57	6.40	3.452	-208.1	0.65	22.7	--	--	4.62

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-9, 10-1-2018, 1310

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1310 **End SampleTime:** 1315

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: Possible organic sheen, pale brown color.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-1

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 58ºF, Partly Sunny **Sampling Date:** 11/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 15.15 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 33.00 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 23.00 - 33.00 (ft) h. **Depth of Pump:** 28.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 857 **End Purge Time:** 945

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	14.64	7.32	0.022	241.3	10.09	23.3	--	--	15.15
2	10	200	14.50	7.16	13.430	73.7	1.77	61.5	--	--	16.00
3	15	200	14.48	7.16	13.490	69.4	1.32	31.6	--	--	17.50
4	20	200	14.48	7.16	13.560	65.2	1.25	17.9	--	--	18.25
5	25	200	14.55	7.16	13.620	61.8	1.19	13.4	--	--	18.70
6	30	200	14.69	7.15	13.680	58.8	1.15	11.1	--	--	18.70
7	35	200	14.76	7.15	13.670	55.7	1.13	9.9	--	--	18.70
8	40	200	14.75	7.15	13.670	51.5	1.11	9.2	--	--	18.70
9	45	200	14.69	7.14	13.630	48.6	1.10	8.4	--	--	18.70

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-1, 11-1-2018, 945

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 945 **End SampleTime:** 955

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-2

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 58ºF, Partly Cloudy **Sampling Date:** 11/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: -- (ft) **b.** Depth to Water: 11.70 (ft)

c. Depth to DNAPL: -- (ft) **d.** Total Well Depth: 34.99 (ft)

e. LNAPL Thickness: (a-b) -- (ft) **f.** DNAPL Thickness: (c-d) -- (ft)

g. Screen Interval: 25.00 - 35.00 (ft) **h.** Depth of Pump: 30.0 (ft)

2. WELL PURGE DATA

a. Purge Method: QED Bladder Pump / MP50 Controller

b. Field Testing Equipment: YSI 650 w/ turbidity meter

e. Begin Purge Time: 930 End Purge Time: 1030

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	100	15.58	6.93	14.060	-3.3	1.80	233.4	--	--	12.26
2	10	100	15.45	6.93	14.000	-10.6	1.21	234.6	--	--	13.02
3	15	100	15.34	6.94	13.950	-19.7	0.88	188.7	--	--	13.63
4	20	100	15.08	6.97	13.870	-28.3	0.70	137.6	--	--	14.01
5	25	100	15.04	6.98	13.890	-32.9	0.66	102.7	--	--	14.32
6	30	100	15.03	7.00	13.850	-36.0	0.63	93.4	--	--	14.61
7	35	100	15.06	7.01	13.900	-39.1	0.63	80.7	--	--	14.94
8	40	100	15.15	7.02	13.880	-40.8	0.65	65.5	--	--	15.23
9	45	100	15.47	7.03	14.070	-45.4	0.62	23.7	--	--	15.72
10	50	100	15.52	7.04	14.060	-47.6	0.60	16.2	--	--	16.39
11	55	100	51.53	7.04	14.050	-48.4	0.61	15.2	--	--	16.52
12	60	100	15.54	7.03	14.050	-48.4	0.61	14.8	--	--	16.63

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-2, 11-1-2018, 1035

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1035 **End SampleTime:** 1045

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-3

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 65ºF, Partly Cloudy **Sampling Date:** 11/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: -- (ft) **b.** Depth to Water: 9.25 (ft)

c. Depth to DNAPL: -- (ft) **d.** Total Well Depth: 23.00 (ft)

e. LNAPL Thickness: (a-b) -- (ft) **f.** DNAPL Thickness: (c-d) -- (ft)

g. Screen Interval: 8.00 - 23.00 (ft) **h.** Depth of Pump: 15.5 (ft)

2. WELL PURGE DATA

a. Purge Method: QED Bladder Pump / MP50 Controller

b. Field Testing Equipment: YSI 650 w/ turbidity meter

e. Begin Purge Time: 1110 End Purge Time: 1200

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	150	19.09	7.02	2.632	117.3	3.07	668.4	--	--	9.37
2	10	150	18.58	6.84	2.187	92.5	1.42	98.2	--	--	9.78
3	15	150	18.68	6.87	2.127	79.1	1.04	74.2	--	--	10.03
4	20	150	18.75	6.87	2.116	78.1	0.93	48.7	--	--	10.34
5	25	150	18.96	6.88	2.100	76.4	0.80	15.1	--	--	10.55
6	30	150	19.01	6.88	2.082	75.2	0.80	14.9	--	--	10.62
7	35	150	19.00	6.90	2.056	67.0	0.69	14.7	--	--	10.81
8	40	150	18.92	6.93	2.048	64.2	0.63	14.3	--	--	10.92
9	45	150	19.03	6.96	2.047	64.0	0.60	13.9	--	--	10.95

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-3, 11-1-2018, 1200

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1200 **End SampleTime:** 1210

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-4

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 62ºF, Partly Cloudy **Sampling Date:** 11/1/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 10.16 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 23.03 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 13.00 - 23.00 (ft) h. **Depth of Pump:** 18.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1027 **End Purge Time:** 1137

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	14.72	7.15	0.108	47.1	2.42	8.4	--	--	10.16
2	10	200	20.17	7.08	11.760	4.4	2.20	59.8	--	--	10.16
3	15	200	20.66	7.02	11.970	-4.5	1.74	29.0	--	--	10.16
4	20	200	20.46	6.87	11.870	-10.6	1.86	74.3	--	--	10.16
5	25	200	19.81	6.88	11.200	1.2	1.34	54.7	--	--	10.16
6	30	200	19.48	6.94	10.900	20.2	1.26	58.5	--	--	10.16
7	35	200	19.24	6.96	9.684	35.8	1.23	32.8	--	--	10.16
8	40	200	19.22	6.95	9.632	49.0	1.14	21.0	--	--	10.16
9	45	200	19.27	6.88	9.770	60.3	1.05	16.2	--	--	10.16
10	50	200	19.26	6.85	9.978	69.4	1.01	13.8	--	--	10.16
11	55	200	19.47	6.82	10.170	77.8	0.98	11.2	--	--	10.16
12	60	200	19.61	6.79	10.460	86.9	0.95	8.3	--	--	10.16
13	65	200	20.01	6.76	10.730	92.4	0.93	8.5	--	--	10.16
14	70	200	20.05	6.72	10.890	96.9	0.95	6.5	--	--	10.16

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-4, 11-1-2018, 1140

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1140 **End SampleTime:** 1150

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: None, sample water clear.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-5

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 52ºF, Partly Sunny **Sampling Date:** 10/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 5.21 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 16.98 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 6.98 - 16.98 (ft) h. **Depth of Pump:** 12.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1005 **End Purge Time:** 1100

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	150	16.54	6.39	2.246	-49.5	2.05	31.0	--	--	5.32
2	10	150	17.53	6.39	2.527	-94.7	0.53	28.7	--	--	5.41
3	15	150	17.44	6.38	2.429	-106.3	0.41	23.8	--	--	5.41
4	20	150	17.44	6.38	2.360	-109.6	0.40	25.2	--	--	5.42
5	25	150	17.51	6.37	2.310	-114.7	0.34	26.7	--	--	5.42
6	30	150	17.60	6.36	2.288	-118.0	0.32	27.1	--	--	5.43
7	35	150	17.64	6.35	2.285	-123.4	0.29	27.2	--	--	5.46
8	40	150	17.67	6.33	2.278	-126.0	0.28	27.1	--	--	5.46
9	45	150	17.64	6.33	2.279	-127.1	0.28	27.0	--	--	5.46

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Casey Kincaid

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-5, 10-31-2018, 1050

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1050 **End SampleTime:** 1100

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: Pale brown to greenish color.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-6

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 64ºF, Partly Cloudy **Sampling Date:** 10/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 2.65 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 17.05 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 7.05 - 17.05 (ft) h. **Depth of Pump:** 12.1 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1320 **End Purge Time:** 1415

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	17.06	4.67	1.735	-36.6	3.30	131.9	--	--	2.65
2	10	200	16.89	4.62	1.582	-36.3	2.49	128.9	--	--	2.71
3	15	200	16.89	5.03	1.404	-42.4	1.80	96.9	--	--	2.84
4	20	200	16.57	4.89	1.354	-41.6	1.65	83.7	--	--	2.98
5	25	200	16.47	4.88	1.304	-40.6	1.52	75.8	--	--	3.03
6	30	200	16.45	4.88	1.298	-39.8	1.44	70.0	--	--	3.03
7	35	200	16.43	4.82	1.309	-39.6	1.31	57.8	--	--	3.03
8	40	200	16.41	4.77	1.327	-39.8	1.24	48.5	--	--	3.03
9	45	200	16.41	5.25	1.349	-43.1	1.14	41.2	--	--	3.03
10	50	200	16.39	5.58	1.355	-42.6	1.18	37.2	--	--	3.03
11	55	200	16.33	5.58	1.370	-43.2	1.16	35.5	--	--	3.03
12	60	200	16.28	5.64	1.381	-44.3	1.15	34.8	--	--	3.03

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-6, 10-31-2018, 1420

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1420 **End SampleTime:** 1430

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-7

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 62ºF, Partly Cloudy **Sampling Date:** 10/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 3.65 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 11.99 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 2.99 - 11.99 (ft) h. **Depth of Pump:** 8.0 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1142 **End Purge Time:** 1250

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	18.63	4.69	1.256	27.0	3.68	29.9	--	--	3.65
2	10	200	17.71	5.23	0.954	-17.7	1.87	324.2	--	--	3.65
3	15	200	19.25	5.06	0.980	-15.9	1.26	269.0	--	--	3.65
4	20	200	18.22	5.01	0.934	-12.9	1.39	286.0	--	--	3.65
5	25	200	17.02	4.95	0.762	-7.1	1.02	177.8	--	--	3.65
6	30	200	16.93	4.93	0.693	-3.7	0.93	132.5	--	--	3.65
7	35	200	17.03	4.93	0.666	-3.7	0.89	117.8	--	--	3.65
8	40	200	17.20	4.91	0.646	-1.9	0.85	103.7	--	--	3.65
9	45	200	17.09	4.96	0.525	-6.4	0.76	52.4	--	--	3.65
10	50	200	16.94	4.95	0.394	-8.4	0.68	34.8	--	--	3.65
11	55	200	16.96	4.94	0.347	-7.8	0.65	30.1	--	--	3.65
12	60	200	17.05	4.92	0.340	-8.2	0.65	30.7	--	--	3.65
13	65	200	16.97	4.92	0.334	-8.2	0.65	29.3	--	--	3.65
14	70	200	16.95	4.92	0.332	-7.5	0.64	27.8	--	--	3.65

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-7, 10-31-2018, 1255

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1255 **End SampleTime:** 1305

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-8

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 61ºF, Partly Cloudy **Sampling Date:** 10/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 4.13 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 13.60 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 3.60 - 13.60 (ft) h. **Depth of Pump:** 8.6 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1140 **End Purge Time:** 1230

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	100	18.12	6.72	0.872	41.7	5.12	287.1	--	--	4.11
2	10	101	17.58	6.54	0.381	93.2	4.93	153.1	--	--	4.12
3	15	102	17.49	6.52	0.474	115.4	4.88	145.6	--	--	4.14
4	20	103	17.47	6.52	0.532	123.0	4.82	110.9	--	--	4.16
5	25	104	17.48	6.51	0.603	127.1	4.78	72.1	--	--	4.17
6	30	105	17.54	6.51	0.673	128.7	4.63	56.1	--	--	4.17
7	35	106	17.77	6.51	0.713	130.5	4.73	32.6	--	--	4.19
8	40	107	17.86	6.51	0.760	130.8	4.61	8.6	--	--	4.19
9	45	108	17.88	6.51	0.761	130.4	4.65	7.9	--	--	4.19
10	50	109	17.80	6.50	0.762	130.0	4.52	7.2	--	--	4.19

3. SAMPLE COLLECTION DATA **Sampling Personnel:**

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-8, 10-31-2018, 1235

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1235 **End SampleTime:** 1245

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: No odor/sheen. Clear water.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-9

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG - Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 51ºF, Cloudy **Sampling Date:** 10/31/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** -- (ft) b. **Depth to Water:** 4.62 (ft)

c. **Depth to DNAPL:** -- (ft) d. **Total Well Depth:** 16.94 (ft)

e. **LNAPL Thickness:** (a-b) -- (ft) f. **DNAPL Thickness:** (c-d) -- (ft)

g. **Screen Interval:** 6.94 - 16.94 (ft) h. **Depth of Pump:** 11.9 (ft)

2. WELL PURGE DATA

a. **Purge Method:** QED Bladder Pump / MP50 Controller

b. **Field Testing Equipment:** YSI 650 w/ turbidity meter

e. **Begin Purge Time:** 1012 **End Purge Time:** 1100

Read No.	Lapse Time (min.)	Purge Rate mL/min	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
0	--	--	--	--	--	--	--	--	--	--	--
PURGING VALUES											
1	5	200	17.28	6.16	1.780	1.9	2.54	21.7	--	--	4.62
2	10	200	17.52	5.97	1.799	-8.0	2.54	25.9	--	--	4.68
3	15	200	17.55	5.83	1.704	-7.3	2.89	30.0	--	--	4.75
4	20	200	17.75	5.73	1.607	-5.2	3.05	31.2	--	--	4.80
5	25	200	17.70	5.61	1.496	0.4	3.27	31.5	--	--	4.80
6	30	200	17.65	5.47	1.381	8.9	3.39	31.2	--	--	4.80
7	35	200	18.24	5.38	1.347	13.0	3.41	31.8	--	--	4.80
8	40	200	18.53	5.27	1.320	18.8	3.46	31.1	--	--	4.80
9	45	200	18.58	5.18	1.281	23.6	3.58	30.0	--	--	4.80
10	50	200	18.67	5.17	1.280	25.1	3.62	29.7	--	--	4.80

3. SAMPLE COLLECTION DATA **Sampling Personnel:** Anthony Shields

Sampling Method(s) & Equip: Poly bladder and QED pump

Sample I.D. (Name, Date, Time): MW-9, 10-31-2018, 1105

Sample Analytical Parameters/Method: TDS, Ra 226 & Ra 228, Site-Spec Metals List, Chloride, Fluoride, Sulfate, and pH

Sample Start Time: 1105 **End SampleTime:** 1115

PID/FID READING(s) : Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN: Possible organic sheen, pale brown color.

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-1

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 54F, sunny **Sampling Date:** 12/3/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 14.10 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 33.00 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 18.90 (ft) (a-d)

h. **Well Volume:** 3.08 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** 10:14 **End Purge Time:**

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	1020	200	13.86	6.78	16.30	-35.6	0.54	67.3	---	---	14.10
2	1025	200	13.77	6.79	16.27	-29.4	1.09	67.5	---	---	14.10
3	1030	200	13.76	6.80	16.25	-28.2	0.72	47.5	---	---	14.10
4	1035	200	13.72	6.82	16.23	-31.9	1.31	27.8	---	---	14.10
5	1040	200	13.78	6.83	16.26	-34.3	0.41	27.8	---	---	14.10
6	1045	200	13.69	6.83	16.23	-35.5	0.45	16.1	---	---	14.10
7	1050	200	13.72	6.84	16.24	-36.1	0.38	13.7	---	---	14.10
8	1055	200	13.74	6.84	16.26	-36.5	0.47	12.0	---	---	14.10
9	1100	200	13.80	6.84	16.28	-36.6	0.46	11.0	---	---	14.10
10	1105	200	13.76	6.84	16.28	-36.7	0.45	10.6	---	---	14.10
11	1110	200	13.85	6.84	16.31	-36.7	0.40	10.0	---	---	14.10

3. SAMPLE COLLECTION DATA **Sampling Personnel:** AS

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-1; 2018-12-03; 11:15

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 11:15 **End SampleTime:**

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-2

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 53F, partly cloudy **Sampling Date:** 12/3/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 11.69 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 34.99 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 23.30 (ft) (a-d)

h. **Well Volume:** 3.80 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** 12:05 **End Purge Time:** 13:05

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	5	150	14.78	6.87	16.07	93.4	0.72	16.0	---	---	13.58
2	10	150	14.8	6.93	16.15	67.6	0.56	14.1	---	---	14.68
3	15	150	14.87	6.97	16.19	57.6	0.56	12.7	---	---	15.45
4	20	150	14.76	6.97	16.16	56.7	0.64	8.8	---	---	15.91
5	25	150	14.69	6.96	16.13	59.3	0.60	6.9	---	---	16.03
6	30	150	14.62	6.96	16.11	61.4	0.61	6.2	---	---	16.21

3. SAMPLE COLLECTION DATA **Sampling Personnel:** RT

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-2; 2018-12-03; 12:40

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 12:40 **End SampleTime:** 13:05

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-3

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 55F, clear **Sampling Date:** 12/3/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 8.17 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 23.00 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 14.83 (ft) (a-d)

h. **Well Volume:** 2.42 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** 10:20 **End Purge Time:** 11:32

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	5	150	21.63	7.06	0.372	161.1	8.51	91.9	---	---	8.60
2	10	150	14.97	7.24	0.490	184.9	8.49	101.4	---	---	8.90
3	15	150	14.83	7.20	0.472	178.3	8.43	123.1	---	---	8.96
4	20	150	14.49	7.12	0.490	173.6	8.16	122.8	---	---	9.18
5	25	150	14.39	7.08	0.515	171.6	7.96	87.4	---	---	9.32
6	30	150	14.32	7.04	0.562	169.4	7.36	51.5	---	---	9.50
7	35	150	14.32	7.03	0.593	167.7	6.88	33.7	---	---	9.70
8	40	150	14.43	7.03	0.608	167.2	6.58	26.3	---	---	9.71
9	45	150	14.50	7.03	0.619	166.2	6.26	18.4	---	---	9.82
10	50	150	14.61	7.03	0.628	166.0	6.01	12.6	---	---	9.85
11	55	150	14.73	7.02	0.638	166.2	5.91	9.3	---	---	9.91

3. SAMPLE COLLECTION DATA **Sampling Personnel:** RT

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-3; 2018-12-03; 11:20

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 11:20 **End SampleTime:** 11:32

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-4

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 54F, mostly sunny **Sampling Date:** 12/3/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 8.06 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 23.03 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 14.97 (ft) (a-d)

h. **Well Volume:** 2.44 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** **11:48** **End Purge Time:**

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	1155	200	14.18	6.77	14.27	-76.1	0.94	260.0	---	---	8.06
2	1200	200	14.14	6.79	13.52	-75.9	0.95	223.4	---	---	8.06
3	1205	200	14.05	6.83	11.69	-65.5	1.59	178.0	---	---	8.06
4	1210	200	13.88	6.89	9.172	-51.8	2.25	130.8	---	---	8.06
5	1215	200	13.69	6.92	8.069	-44.3	3.39	69.1	---	---	8.06
6	1220	200	13.54	6.92	7.765	-40.3	4.46	36.6	---	---	8.06
7	1225	200	13.03	6.92	7.651	-37.3	4.54	25.8	---	---	8.06
8	1230	200	12.87	6.88	7.123	-39.5	4.51	22.1	---	---	8.06
9	1235	200	12.80	6.85	8.673	-43.6	4.58	19.9	---	---	8.06
10	1240	200	12.81	6.85	8.972	-46.0	4.53	19.0	---	---	8.06
11	1245	200	12.87	6.85	9.070	-46.8	4.55	16.7	---	---	8.06
12	1250	200	12.86	6.85	9.025	-46.1	4.55	14.4	---	---	8.06
13	1255	200	12.87	6.85	8.951	-45.0	4.53	13.2	---	---	8.06
14	1300	200	12.77	6.85	8.834	-43.4	4.61	13.1	---	---	8.06

3. SAMPLE COLLECTION DATA **Sampling Personnel:** AS

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-4; 2018-12-03; 13:05

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 13:05 **End SampleTime:**

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-5

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 38F, partly cloudy **Sampling Date:** 12/4/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a.	Depth to LNAPL:	---	(ft)	b.	Depth to Water:	4.40	(ft)
c.	Depth to DNAPL:	----	(ft)	d.	Total Well Depth:	15.00	(ft)
e.	LNAPL Thickness: (a-b)	---	(ft)	f.	DNAPL Thickness: (c-d)	---	(ft)
g.	Length of Water Column:	10.60	(ft) (a-d)				
h.	Well Volume:	1.73	(gal)				

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** 9:05 **End Purge Time:** 10:20

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	5	250	11.48	7.07	0.014	127.9	10.33	6.5	---	---	4.50
2	10	250	11.68	6.48	2.022	-98.7	0.70	7.5	---	---	4.60
3	15	250	11.71	6.49	1.972	-99.0	0.81	7.6	---	---	4.55
4	20	250	11.77	6.49	1.930	-99.0	0.66	6.7	---	---	4.61
5	25	250	11.72	6.49	1.879	-98.8	0.65	5.4	---	---	4.59
6	30	250	12.08	6.50	1.854	-98.8	0.60	5.4	---	---	4.63
7	35	250	12.19	6.50	1.838	-98.9	0.60	5.1	---	---	4.60
8	40	250	12.02	6.50	1.804	-99.6	0.66	7.5	---	---	4.55

3. SAMPLE COLLECTION DATA **Sampling Personnel:** RT

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-5; 2018-12-04; 9:55

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 9:55 **End SampleTime:** 10:20

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-6

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 40F, partly cloudy **Sampling Date:** 12/4/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 2.88 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 15 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 12.12 (ft) (a-d)

h. **Well Volume:** 1.98 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** 9:10 **End Purge Time:**

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	915	200	8.86	7.03	1.221	16.9	3.73	211.8	---	---	2.88
2	920	200	9.16	6.94	1.225	16.0	3.04	216.3	---	---	2.88
3	925	200	9.04	6.86	1.242	13.6	3.29	193.2	---	---	2.88
4	930	200	9.18	6.83	1.268	11.8	3.77	164.1	---	---	2.88
5	935	200	9.53	6.91	1.298	10.2	4.01	145.1	---	---	2.88
6	940	200	9.70	6.96	1.315	83.0	4.65	105.7	---	---	2.88
7	945	200	9.15	6.87	1.301	7.7	5.30	89.5	---	---	2.88
8	950	200	9.09	6.92	1.294	7.0	5.97	73.6	---	---	2.88
9	955	200	9.63	6.89	1.314	6.4	6.41	61.8	---	---	2.88
10	1000	200	10.14	6.88	1.328	5.5	7.07	57.4	---	---	2.88
11	1005	200	10.15	6.95	1.331	4.4	7.60	49.5	---	---	2.88
12	1010	200	9.52	6.86	1.308	4.3	7.78	47.7	---	---	2.88
13	1015	200	9.41	6.85	1.298	3.9	8.04	47.3	---	---	2.88
14	1020	200	9.68	6.81	1.269	3.5	8.25	40.8	---	---	2.88
15	1025	200	9.79	6.83	1.271	2.9	8.26	38.3	---	---	2.88
16	1030	200	9.96	6.84	1.274	2.0	8.23	37.1	---	---	2.88

3. SAMPLE COLLECTION DATA **Sampling Personnel:** AS

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-6; 2018-12-04; 10:35

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 10:35 **End SampleTime:**

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-7

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 40F, clear **Sampling Date:** 12/4/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 3.40 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 10.00 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 6.60 (ft) (a-d)

h. **Well Volume:** 1.08 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** 12:49 **End Purge Time:**

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	1255	200	10.18	6.74	0.687	54.1	1.18	180.9	---	---	3.40
2	1300	200	10.16	6.75	0.657	25.1	0.69	93.9	---	---	3.40
3	1305	200	10.15	6.79	0.569	-9.1	0.58	68.8	---	---	3.40
4	1310	200	10.09	6.86	0.447	-26.9	0.56	72.4	---	---	3.40
5	1315	200	10.17	6.92	0.358	-39.2	0.45	61.7	---	---	3.40
6	1320	200	10.12	6.96	0.286	-47.5	0.42	43.5	---	---	3.40
7	1325	200	10.21	7.01	0.245	-52.8	0.39	31.8	---	---	3.40
8	1330	200	10.08	7.03	0.215	-52.2	0.35	21.5	---	---	3.40
9	1335	200	10.04	7.06	0.194	-54.0	0.29	16.6	---	---	3.40
10	1340	200	10.03	7.09	0.174	-56.9	0.26	10.0	---	---	3.40
11	1345	200	10.05	7.12	0.171	-59.3	0.30	8.8	---	---	3.40
12	1350	200	9.95	7.12	0.169	-60.3	0.28	8.4	---	---	3.40

3. SAMPLE COLLECTION DATA **Sampling Personnel:** AS

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-7; 2018-12-04; 13:55

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 13:55 **End SampleTime:**

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-8

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 40F, partly cloudy **Sampling Date:** 12/4/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 3.05 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 11.00 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 7.95 (ft) (a-d)

h. **Well Volume:** 1.30 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** 11:25 **End Purge Time:** 12:50

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	5	250	14.14	6.56	2.191	71.8	7.72	1726	---	---	3.10
2	10	250	14.45	6.60	1.787	70.3	5.73	369	---	---	3.10
3	15	250	14.4	6.60	1.705	70.2	5.70	369	---	---	3.10
4	20	250	14.68	6.62	1.174	69.4	5.79	130.9	---	---	3.10
5	25	250	14.69	6.58	1.130	71.4	5.72	70.1	---	---	3.10
6	30	250	14.52	6.54	1.117	73.0	5.70	47.4	---	---	3.10
7	35	250	14.40	6.51	1.106	74.8	5.62	37.1	---	---	3.10
8	40	250	14.26	6.49	1.089	76.3	5.61	30.5	---	---	3.10
9	45	250	14.71	6.50	1.095	77.4	5.44	20.6	---	---	3.10
10	50	250	14.67	6.49	1.088	78.3	5.35	16.0	---	---	3.10
11	55	250	14.60	6.48	1.084	79.1	5.27	15.9	---	---	3.10
12	60	250	14.71	6.46	1.076	80.2	5.13	14.5	---	---	3.10

3. SAMPLE COLLECTION DATA **Sampling Personnel:** RT

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-8; 2018-12-04; 12:30

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 12:30 **End SampleTime:** 12:50

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

GEI Consultants

LOW-FLOW GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-9

PERMIT NO.:

Project No.: 1504710 **Client:** PSEG

Project Name: PSEG Hudson **Project Location:** Jersey City, NJ

Weather Conditions: 40F, clear **Sampling Date:** 12/4/2018

1. WATER LEVEL DATA (measured from top of inner well casing)

a. **Depth to LNAPL:** --- (ft) b. **Depth to Water:** 3.95 (ft)

c. **Depth to DNAPL:** ---- (ft) d. **Total Well Depth:** 15.00 (ft)

e. **LNAPL Thickness:** (a-b) --- (ft) f. **DNAPL Thickness:** (c-d) --- (ft)

g. **Length of Water Column:** 11.05 (ft) (a-d)

h. **Well Volume:** 1.80 (gal)

2. WELL PURGE DATA

a. **Purge Method:** Low Flow

b. **Field Testing Equipment:** YSI 6920, peri pump

e. **Begin Purge Time:** **11:29** **End Purge Time:**

Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±3%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (<0.3 ft)
CORRECTION FACTORS											
---	---	---	---	---	---	---	---	---	---	---	---
PURGING VALUES											
1	1135	200	10.73	6.66	0.642	-40.9	1.48	23.0	---	---	3.95
2	1140	200	10.87	6.66	0.589	-46.5	0.93	16.0	---	---	3.95
3	1145	200	11.01	6.66	0.541	-50.9	0.77	11.1	---	---	3.95
4	1150	200	10.96	6.70	0.513	-54.5	0.66	7.1	---	---	3.95
5	1155	200	10.81	6.72	0.491	-56.4	0.71	5.5	---	---	3.95
6	1200	200	10.81	6.73	0.478	-57.8	0.73	4.1	---	---	3.95
7	1205	200	10.62	6.74	0.471	-59.7	0.70	4.0	---	---	3.95
8	1210	200	10.58	6.72	0.469	-61.1	0.73	2.7	---	---	3.95

3. SAMPLE COLLECTION DATA **Sampling Personnel:** AS

Sampling Method(s) & Equip: Low flow- QED bladder pump, poly bladder, MP50

Sample I.D. (Name, Date, Time): MW-9; 2018-12-04; 12:15

Sample Analytical Parameters/Method: TDS, Ra 226, Ra 228, Site Spec Metals List, Chloride, Fluoride, Sulfate, pH

Sample Start Time: 12:15 **End SampleTime:**

PID/FID READING(s): Not Measured **PID/FID Model & Ionization Potential** Not Measured

ODOR/SHEEN:

COMMENTS:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	Former PSEG Hudson	Monitoring Well:	MW-8	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/29/19	Equipment Make/Model:	YSI 6820	Total Depth of Well:	13.55 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	3.23 feet (from top of casing)
Weather:	Light Snow, 23F	Equipment Serial #:	02A0931AA	Pump Intake:	6 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	900	7.90	X	5.94	X	124.50	X	0.517	X	118.5	X	3.40	X	Yellow	S.Turb.	3.25	225
1	905	8.26	4.56%	6.12	0.18	109.50	15	0.521	0.77%	92.2	22.19%	2.69	20.88%	Yellow	S.Turb.	3.27	225
2	910	8.28	4.81%	6.23	0.29	99.50	25	0.517	0.77%	68.2	73.75%	2.40	41.67%	Yellow	S.Turb.	3.29	225
3	915	8.15	1.60%	6.24	0.12	96.00	13.5	0.514	1.36%	48.5	90.10%	2.23	20.63%	Yellow	Clear	3.30	225
4	920	8.08	2.48%	6.25	0.02	95.30	4.2	0.514	0.58%	48.5	40.62%	2.20	9.09%	Yellow	Clear	3.30	225
5	925	7.97	2.26%	6.26	0.02	93.50	2.5	0.520	1.17%	50.9	4.95%	2.23	1.36%	Yellow	Clear	3.30	225
6	930	8.42	5.65%	6.27	0.02	90.80	4.5	0.517	1.17%	40.3	26.30%	2.19	1.83%	Yellow	Clear	3.30	225
7	935	8.56	7.40%	6.29	0.03	88.70	4.8	0.521	0.77%	42.0	26.30%	2.22	1.83%	Yellow	Clear	3.30	225
8	940	8.53	1.66%	6.30	0.03	87.20	3.6	0.522	0.97%	30.2	39.07%	2.20	1.37%	Yellow	Clear	3.30	225
9	945	8.65	1.41%	6.30	0.01	85.60	3.1	0.524	0.58%	28.4	47.89%	2.18	1.83%	Yellow	Clear	3.31	225
10	950	8.60	1.41%	6.30	0	84.80	2.4	0.523	0.38%	28.7	6.34%	2.23	2.29%	Yellow	Clear	3.31	225
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	900	Purge End Time:	950
Total Purge Volume (L):	11.25	Total Purge Time:	50 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	225

Sample Start Time:	950	Sample End Time:	1010
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-5	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/29/2019	Equipment Make/Model:	YSI - 6820	Total Depth of Well:	15.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	4.75 feet (from top of casing)
Weather:	Cloudy, 26F	Equipment Serial #:	11G101136	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	9:45	5.96	X	6.17	X	-18.80	X	3.400	X	6.8	X	13.98	X	Yellow	Clear	4.75	100
1	9:50	6.55	9.90%	6.32	0.15	-49.00	30.2	2.860	15.88%	9.4	38.24%	14.36	2.72%	Yellow	Clear	5.10	175
2	9:55	6.65	11.58%	6.38	0.21	-65.70	46.9	2.820	20.57%	10.4	52.94%	13.91	3.24%	Yellow	Clear	5.10	150
3	10:00	6.71	2.44%	6.39	0.07	-73.30	24.3	3.720	31.91%	8.4	23.81%	13.41	7.08%	Yellow	Clear	5.10	150
4	10:05	6.83	2.71%	6.39	0.01	-79.00	13.3	4.100	45.39%	7.1	46.48%	13.20	5.38%	Yellow	Clear	4.90	150
5	10:10	7.06	5.22%	6.39	0	-83.30	10	3.980	10.22%	5.6	50.00%	12.97	3.39%	Yellow	Clear	4.90	150
6	10:15	7.06	3.37%	6.39	0	-84.20	5.2	4.000	3.02%	5.7	26.79%	12.98	1.77%	Yellow	Clear	4.90	150
7	10:20	7.07	0.14%	6.39	0	-85.20	1.9	4.080	2.51%	5.2	9.62%	12.96	0.15%	Yellow	Clear	4.90	150
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	9:45	Purge End Time:	10:20
Total Purge Volume (L):	5.25	Total Purge Time:	35 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	10:20	Sample End Time:	10:35
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	Former PSEG Hudson	Monitoring Well:	MW-6	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/29/19	Equipment Make/Model:	YSI 6820	Total Depth of Well:	17.10 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	2.89 feet (from top of casing)
Weather:	Cloudy, 25F	Equipment Serial #:	02A0931AA	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	1110	5.95	X	6.49	X	76.60	X	0.971	X	82.6	X	4.57	X	Yellow	S.Turb.	2.89	200
1	1115	5.84	1.85%	6.52	0.03	69.90	6.7	0.929	4.33%	72.9	11.74%	3.98	12.91%	Yellow	S.Turb.	2.91	200
2	1120	4.86	22.43%	6.63	0.14	44.50	32.1	0.708	37.15%	62.3	32.58%	3.04	50.33%	Yellow	S.Turb.	2.93	200
3	1125	4.73	23.47%	6.71	0.19	36.80	33.1	0.706	31.59%	54.7	33.27%	3.24	30.92%	Yellow	S.Turb.	2.97	200
4	1130	4.89	3.38%	6.69	0.08	33.20	11.3	0.744	5.38%	47.3	31.71%	3.18	6.58%	Yellow	Clear	3.00	200
5	1135	5.04	6.55%	6.67	0.04	30.10	6.7	0.802	13.60%	45.2	21.02%	3.03	6.93%	Yellow	Clear	3.03	200
6	1140	5.19	6.13%	6.63	0.06	28.40	4.8	0.858	15.32%	40.3	17.37%	2.77	14.80%	Yellow	Clear	3.05	200
7	1145	5.36	6.35%	6.77	0.14	23.90	6.2	0.874	8.98%	35.4	27.68%	2.62	15.65%	Yellow	Clear	3.08	200
8	1150	5.40	4.05%	6.77	0.14	20.20	8.2	0.879	2.45%	28.8	39.93%	2.51	10.36%	Yellow	Clear	3.10	200
9	1155	5.23	3.25%	6.83	0.06	14.40	9.5	0.858	2.45%	17.4	103.45%	2.39	9.62%	Yellow	Clear	3.12	200
10	1200	5.17	4.45%	6.77	0.06	10.40	9.8	0.862	2.45%	16.4	75.61%	2.31	8.66%	Yellow	Clear	3.15	200
11	1205	5.22	1.16%	6.73	0.1	4.60	9.8	0.862	0.47%	15.9	9.43%	2.22	7.66%	Yellow	Clear	3.18	200
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	1110	Purge End Time:	1205
Total Purge Volume (L):	8.25	Total Purge Time:	55 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	1205	Sample End Time:	1235
Sampling Method:	Bladder Pump	Total Sampling Time:	30 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-7	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/29/2019	Equipment Make/Model:	YSI - 6820	Total Depth of Well:	10.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	3.85 feet (from top of casing)
Weather:	Cloudy, 26F	Equipment Serial #:	11G101136	Pump Intake:	5 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	11:35	2.84	X	7.08	X	-23.10	X	0.771	X	51.7	X	13.00	X	Grey	Clear	3.95	150
1	11:40	2.84	0.00%	7.06	0.02	-26.30	3.2	0.880	14.14%	43.5	15.86%	12.89	0.85%	Grey	Semi Turbid	3.95	150
2	11:45	2.77	2.53%	7.07	0.02	-36.20	13.1	0.735	19.73%	28.1	83.99%	12.46	4.33%	Grey	Turbid	3.95	150
3	11:50	2.69	5.58%	7.11	0.05	-46.20	19.9	0.647	36.01%	15.4	182.47%	12.41	3.87%	Grey	Semi Turbid	3.95	150
4	11:55	2.66	4.14%	7.13	0.06	-50.20	14	0.577	27.38%	12.3	128.46%	12.50	0.73%	Clear	Clear	3.95	150
5	12:00	2.70	1.50%	7.14	0.03	-52.70	6.5	0.415	55.90%	10.6	45.28%	12.40	0.81%	Clear	Clear	3.95	150
6	12:05	2.65	1.89%	7.17	0.04	-58.10	7.9	0.494	39.04%	7.4	66.22%	12.38	0.97%	Clear	Clear	3.95	150
7	12:10	2.59	4.25%	7.20	0.06	-63.30	10.6	0.480	19.04%	6.0	76.67%	12.32	0.65%	Clear	Clear	3.95	150
8	12:15	2.58	2.71%	7.21	0.04	-66.30	8.2	0.491	2.92%	5.9	25.42%	12.11	2.23%	Clear	Clear	3.95	150
9	12:20	2.52	2.78%	7.22	0.02	-68.00	4.7	0.490	2.29%	5.6	7.14%	12.07	2.07%	Clear	Clear	3.95	150
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	11:35	Purge End Time:	12:20
Total Purge Volume (L):	6.75	Total Purge Time:	45 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	12:20	Sample End Time:	12:35
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	Former PSEG Hudson	Monitoring Well:	MW-1	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/29/19	Equipment Make/Model:	YSI 6820	Total Depth of Well:	33.10 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	13.61 feet (from top of casing)
Weather:	Cloudy, 26F	Equipment Serial #:	02A0931AA	Pump Intake:	25 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	1350	6.96	X	7.13	X	51.80	X	19.860	X	10.2	X	11.38	X	Clear	Clear	13.89	200
1	1355	12.78	83.62%	6.71	0.42	15.00	36.8	19.860	0.00%	9.7	4.90%	3.83	66.34%	Clear	Clear	14.12	200
2	1400	12.83	84.34%	6.78	0.42	7.40	44.4	19.860	0.00%	7.7	32.47%	4.48	197.13%	Clear	Clear	14.43	200
3	1405	10.45	22.78%	6.80	0.09	6.50	8.5	18.210	9.06%	7.1	36.62%	5.45	42.30%	Clear	Clear	14.51	150
4	1410	9.59	33.79%	6.82	0.04	4.80	2.6	16.840	17.93%	5.9	30.51%	5.52	23.21%	Clear	Clear	14.60	150
5	1415	9.08	15.09%	6.84	0.04	3.90	2.6	16.440	10.77%	4.8	47.92%	5.22	5.75%	Clear	Clear	14.67	150
6	1420	9.11	5.62%	6.79	0.05	4.40	0.9	16.490	2.43%	4.1	43.90%	3.37	63.80%	Clear	Clear	14.70	150
7	1425	8.91	2.24%	6.78	0.06	4.80	0.9	16.530	0.55%	4.0	20.00%	3.31	57.70%	Clear	Clear	14.79	150
8	1430	8.78	3.76%	6.78	0.01	5.20	0.8	16.510	0.24%	3.8	7.89%	3.26	3.37%	Clear	Clear	14.89	150
9	1435	8.67	2.77%	6.79	0.01	6.30	1.5	16.510	0.12%	3.7	8.11%	3.29	1.53%	Clear	Clear	14.93	150
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	1350	Purge End Time:	1435
Total Purge Volume (L):	6.75	Total Purge Time:	45 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	1435	Sample End Time:	1515
Sampling Method:	Bladder Pump	Total Sampling Time:	45 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-4	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/29/2019	Equipment Make/Model:	YSI - 6820	Total Depth of Well:	23.25 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	6.7 feet (from top of casing)
Weather:	Cloudy, 26F	Equipment Serial #:	11G101136	Pump Intake:	17 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	14:10	8.69	X	6.60	X	-16.60	X	18.500	X	36.4	X	9.15	X	Yellow	Clear	6.30	150
1	14:15	8.82	1.50%	6.68	0.08	-32.20	15.6	16.500	10.81%	29.6	18.68%	8.85	3.28%	Yellow	Clear	6.30	150
2	14:20	8.78	1.50%	6.70	0.1	-33.30	16.7	15.350	20.52%	26.4	37.88%	8.72	4.93%	Yellow	Clear	6.30	150
3	14:25	8.75	0.80%	6.74	0.06	-32.80	1.1	14.200	16.20%	19.9	48.74%	10.20	16.97%	Yellow	Clear	6.30	150
4	14:30	8.69	1.04%	6.77	0.07	-32.00	1.3	12.700	20.87%	12.2	116.39%	8.71	17.11%	Yellow	Clear	6.30	150
5	14:35	8.69	0.69%	6.78	0.04	-31.80	1	12.130	17.07%	7.7	158.44%	8.66	17.78%	Yellow	Clear	6.30	150
6	14:40	8.58	1.28%	6.80	0.03	-29.70	2.3	11.490	10.53%	4.1	197.56%	10.31	19.05%	Yellow	Clear	6.30	150
7	14:45	8.61	1.28%	6.80	0.02	-29.60	2.2	11.430	6.12%	4.1	87.80%	10.34	19.40%	Yellow	Clear	6.30	150
8	14:50	8.60	0.35%	6.81	0.01	-29.20	0.5	11.6	1.49%	1.2	241.67%	10.38	0.68%	Yellow	Clear	6.30	150
9																	
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	14:10	Purge End Time:	14:50
Total Purge Volume (L):	6	Total Purge Time:	40 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	14:50	Sample End Time:	15:5
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations: Turbidity; if 3 values are <10NTU, consider the values as stabalized.

Sampling Technician: Fabio Iannacco Signature: 

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ 07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-9	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/30/2019	Equipment Make/Model:	YSI - 6820	Total Depth of Well:	16.30 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	4.85 feet (from top of casing)
Weather:	Sunny, 16F	Equipment Serial #:	11G101136	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	10:40	8.18	X	6.84	X	-53.90	X	1.690	X	55.4	X	15.42	X	Grey	S.Turb.	4.55	260
1	10:45	7.91	3.30%	6.82	0.02	-57.60	3.7	1.671	1.12%	52.6	5.05%	15.65	1.49%	Grey	S.Turb.	4.45	175
2	10:50	7.60	7.63%	6.78	0.06	-77.70	23.8	1.439	17.44%	37.5	47.73%	15.81	2.53%	Grey	S.Turb.	4.50	175
3	10:55	7.73	4.08%	6.80	0.04	-81.30	23.7	1.227	36.19%	26.4	99.24%	15.67	1.02%	Grey	S.Turb.	4.50	175
4	11:00	7.80	2.63%	6.81	0.03	-83.40	5.7	1.362	17.28%	21.3	76.06%	15.56	1.61%	Grey	S.Turb.	4.50	175
5	11:05	7.82	1.16%	6.82	0.02	-81.90	2.1	1.298	11.00%	9.8	169.39%	15.08	3.91%	Grey	S.Turb.	4.50	175
6	11:10	7.92	1.54%	6.83	0.02	-80.60	2.8	1.272	7.08%	9.6	121.88%	15.08	3.18%	Grey	S.Turb.	4.50	175
7	11:15	7.87	1.28%	6.83	0.01	-80.90	1.3	1.291	2.04%	9.0	8.89%	14.99	0.60%	Grey	S.Turb.	4.50	175
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	10:40	Purge End Time:	11:15
Total Purge Volume (L):	6.125	Total Purge Time:	35 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	175

Sample Start Time:	11:15	Sample End Time:	11:30
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature: Fabio Iannacco

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-2	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/30/2019	Equipment Make/Model:	YSI - 6820	Total Depth of Well:	3.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	11.3 feet (from top of casing)
Weather:	Sunny, 16F	Equipment Serial #:	11G101136	Pump Intake:	30 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	12:50	12.68	X	6.64	X	-24.00	X	22.360	X	11.7	X	13.23	X	Clear	Clear	13.10	220
1	12:55	13.25	4.50%	6.63	0.01	-27.50	3.5	22.470	0.49%	8.1	30.77%	14.12	6.73%	Clear	Clear	13.60	175
2	13:00	13.07	4.50%	6.63	0.01	-28.80	4.8	22.430	0.49%	7.1	64.79%	12.93	9.20%	Clear	Clear	14.70	75
3	13:05	12.70	4.33%	6.63	0	-29.80	2.3	22.490	0.27%	8.4	18.31%	13.00	9.20%	Clear	Clear	15.05	100
4	13:10	12.75	2.91%	6.63	0	-30.00	1.2	22.450	0.27%	7.7	18.31%	12.99	0.54%	Clear	Clear	15.20	100
5	13:15	12.49	2.08%	6.63	0	-30.60	0.8	22.690	1.07%	7.9	9.09%	13.24	1.92%	Clear	Clear	15.40	100
6	13:20	12.54	2.08%	6.63	0	-30.70	0.7	22.440	1.11%	7.4	6.76%	13.19	1.92%	Clear	Clear	15.45	100
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	12:50	Purge End Time:	13:20
Total Purge Volume (L):	3	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	100

Sample Start Time:	13:20	Sample End Time:	13:35
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-3	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	1/30/2019	Equipment Make/Model:	YSI - 6820	Total Depth of Well:	23.20 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	9.62 feet (from top of casing)
Weather:	Sunny, 16F	Equipment Serial #:	11G101136	Pump Intake:	16 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	14:45	9.51	X	7.76	X	-7.10	X	2.260	X	17.5	X	19.60	X	Clear	Clear	10.00	260
1	14:50	9.46	0.53%	7.41	0.35	8.70	15.8	1.895	16.15%	16.9	3.43%	19.25	1.79%	Clear	Clear	10.40	150
2	14:55	8.22	15.69%	7.23	0.53	21.10	28.2	2.700	42.48%	11.7	49.57%	18.76	4.48%	Clear	Clear	10.50	150
3	15:00	7.63	23.98%	7.18	0.23	25.20	16.5	2.657	42.48%	10.7	57.94%	18.53	3.89%	Clear	Clear	10.50	150
4	15:05	7.08	16.10%	7.16	0.07	28.90	7.8	2.777	4.52%	9.9	18.18%	18.31	2.46%	Clear	Clear	10.50	150
5	15:10	7.15	7.77%	7.12	0.06	32.10	6.9	2.795	5.19%	9.0	18.89%	17.98	3.06%	Clear	Clear	10.50	150
6	15:15	7.10	0.99%	7.14	0.04	33.40	4.5	2.860	2.99%	8.5	16.47%	17.95	2.01%	Clear	Clear	10.50	150
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	14:45	Purge End Time:	15:15
Total Purge Volume (L):	4.5	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	15:15	Sample End Time:	15:30
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations: Turbidity; if 3 values are <10NTU, consider the values as stabalized.

Sampling Technician: Fabio Iannacco Signature: 

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-5	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/18/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	15.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	4.75 feet (from top of casing)
Weather:	Sunny, 35F	Equipment Serial #:	YD008XGK	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	9:20	8.42	X	6.44	X	-89.00	X	5.250	X	0.0	X	1.35	X	Yellow	Clear	4.70	150
1	9:25	8.61	2.26%	6.51	0.07	-89.00	0	4.970	5.33%	0.0	0.00%	3.26	141.48%	Clear	Clear	4.80	225
2	9:30	8.48	2.26%	6.63	0.19	-84.00	5	4.490	16.93%	3.5	0.00%	4.95	266.67%	Yellow	Clear	4.80	225
3	9:35	8.14	5.77%	6.70	0.19	-73.00	16	3.810	30.45%	8.5	0.00%	5.52	69.33%	Yellow	Clear	4.80	225
4	9:40	8.09	4.82%	6.70	0.07	-69.00	15	3.680	22.01%	9.0	157.14%	5.52	11.52%	Yellow	Clear	4.80	225
5	9:45	7.96	2.26%	6.71	0.01	-65.00	8	3.440	10.76%	11.1	30.59%	5.59	1.27%	Yellow	Clear	4.80	225
6	9:50	7.92	2.15%	6.72	0.02	-63.00	6	3.460	6.98%	10.7	23.33%	5.65	2.36%	Yellow	Clear	4.80	225
7	9:55	7.86	1.27%	6.71	0.01	-61.00	4	3.370	2.67%	10.2	8.82%	5.70	1.97%	Yellow	Clear	4.80	225
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	9:20	Purge End Time:	9:55
Total Purge Volume (L):	7.875	Total Purge Time:	35 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	225

Sample Start Time:	9:55	Sample End Time:	10:15
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-7	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/18/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	10.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	3.75 feet (from top of casing)
Weather:	Sunny, 37F	Equipment Serial #:	YD008XGK	Pump Intake:	5 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	10:40	6.72	X	7.21	X	-65.00	X	0.240	X	44.8	X	0.32	X	Yellow	Clear	3.90	225
1	10:45	6.67	0.74%	7.21	0	-62.00	3	0.216	10.00%	39.7	11.38%	0.00	100.00%	Yellow	Clear	4.00	175
2	10:50	6.58	2.13%	7.26	0.05	-66.00	4	0.153	56.86%	21.2	111.32%	0.00	0.00%	Yellow	Clear	4.00	200
3	10:55	6.63	1.37%	7.28	0.07	-77.00	15	0.114	89.47%	10.9	264.22%	0.00	0.00%	Yellow	Clear	4.00	200
4	11:00	6.70	1.82%	7.27	0.02	-79.00	13	0.098	56.12%	6.9	207.25%	0.00	0.00%	Yellow	Clear	4.00	200
5	11:05	6.54	2.45%	7.26	0.02	-79.00	2	0.095	20.00%	4.4	147.73%	0.00	0.00%	Yellow	Clear	4.00	200
6	11:10	6.67	2.45%	7.26	0.01	-78.00	1	0.094	4.26%	4.0	72.50%	0.00	0.00%	Yellow	Clear	4.00	200
7	11:15	6.71	2.60%	7.25	0.01	-78.00	1	0.094	1.06%	3.7	18.92%	0.00	0.00%	Yellow	Clear	4.00	200
8	11:20	6.78	1.65%	7.25	0.01	-79.00	1	0.096	2.13%	3.9	8.11%	0.00	0.00%	Yellow	Clear	4.00	200
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	10:40	Purge End Time:	11:20
Total Purge Volume (L):	8	Total Purge Time:	40 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	200

Sample Start Time:	11:20	Sample End Time:	11:40
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature: 

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-4	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/18/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	23.25 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	12 feet (from top of casing)
Weather:	Sunny, 42F	Equipment Serial #:	YD008XGK	Pump Intake:	17 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	14:20	10.44	X	6.80	X	-40.00	X	11.500	X	0.2	X	1.83	X	Clear	Clear	12.10	200
1	14:25	10.20	2.30%	6.85	0.05	-37.00	3	9.400	18.26%	1.6	700.00%	2.90	58.47%	Clear	Clear	12.10	200
2	14:30	9.04	15.49%	6.95	0.15	-27.00	13	6.430	78.85%	2.1	950.00%	6.32	245.36%	Clear	Clear	12.10	200
3	14:35	8.38	21.72%	6.96	0.11	-15.00	22	6.020	56.15%	0.0	0.00%	6.33	118.28%	Clear	Clear	11.95	200
4	14:40	8.23	9.84%	6.98	0.03	-13.00	14	5.930	8.43%	0.0	0.00%	6.39	1.11%	Clear	Clear	11.95	200
5	14:45	8.08	3.71%	6.97	0.02	-12.00	3	5.990	1.52%	0.0	0.00%	6.30	1.43%	Clear	Clear	11.95	200
6	14:50	8.15	1.86%	6.99	0.02	-10.00	3	6.080	2.53%	0.0	0.00%	6.08	5.10%	Clear	Clear	11.95	200
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	14:20	Purge End Time:	14:50
Total Purge Volume (L):	6	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	200

Sample Start Time:	14:50	Sample End Time:	15:10
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-9	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/18/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	16.30 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	4.38 feet (from top of casing)
Weather:	Sunny, 42F	Equipment Serial #:	YD008XGK	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	12:35	9.25	X	6.95	X	-39.00	X	0.330	X	19.6	X	0.30	X	Clear	Clear	4.50	250
1	12:40	8.77	5.19%	6.97	0.02	-64.00	25	0.272	17.58%	9.1	53.57%	0.00	100.00%	Clear	Clear	4.50	225
2	12:45	8.68	6.57%	6.98	0.03	-70.00	31	0.264	25.00%	8.3	136.14%	0.00	0.00%	Clear	Clear	4.50	225
3	12:50	8.52	2.93%	7.00	0.03	-74.00	10	0.256	6.25%	8.2	10.98%	0.00	0.00%	Clear	Clear	4.50	225
4	12:55	8.60	1.88%	7.00	0.02	-77.00	7	0.251	5.18%	8.5	3.66%	0.00	0.00%	Clear	Clear	4.50	225
5	13:00	8.52	0.94%	7.01	0.01	-79.00	5	0.248	3.23%	7.8	8.97%	0.00	0.00%	Clear	Clear	4.50	225
6	13:05	8.36	2.87%	7.00	0.01	-80.00	3	0.246	2.03%	7.4	14.86%	0.00	0.00%	Clear	Clear	4.50	225
7	13:10	8.28	2.90%	7.02	0.02	-82.00	3	0.242	2.48%	7.1	9.86%	0.00	0.00%	Clear	Clear	4.50	225
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	12:35	Purge End Time:	13:10
Total Purge Volume (L):	7.875	Total Purge Time:	35 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	225

Sample Start Time:	13:10	Sample End Time:	13:30
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-2	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/19/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	3.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	10.4 feet (from top of casing)
Weather:	Sunny, 40F	Equipment Serial #:	YD008XGK	Pump Intake:	30 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	9:40	12.70	X	6.91	X	-23.00	X	9.570	X	39.2	X	7.03	X	Clear	S.Turb.	11.80	225
1	9:45	13.15	3.54%	7.04	0.13	-34.00	11	9.540	0.31%	20.1	48.72%	8.63	22.76%	Clear	Semi Turbid	12.50	200
2	9:50	13.33	4.96%	7.08	0.17	-29.00	11	9.450	1.27%	16.4	139.02%	8.70	23.76%	Clear	Clear	12.95	200
3	9:55	13.30	1.37%	7.10	0.06	-27.00	7	9.400	1.49%	15.8	27.22%	8.84	2.43%	Clear	Clear	13.20	175
4	10:00	13.24	0.68%	7.11	0.03	-23.00	6	9.320	1.39%	15.0	9.33%	8.96	2.99%	Clear	Clear	13.65	175
5	10:05	13.35	0.83%	7.12	0.02	-18.00	9	9.290	1.18%	14.9	6.04%	8.70	2.99%	Clear	Clear	14.25	175
6	10:10	13.36	0.91%	7.12	0.01	-17.00	6	9.110	2.31%	15.0	0.67%	8.82	2.99%	Clear	Clear	14.60	175
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	9:40	Purge End Time:	10:10
Total Purge Volume (L):	5.25	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	175

Sample Start Time:	10:10	Sample End Time:	10:30
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-3	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/19/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	23.20 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	9.85 feet (from top of casing)
Weather:	Sunny, 51F	Equipment Serial #:	YD008XGK	Pump Intake:	16 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	11:20	11.86	X	7.76	X	71.00	X	0.251	X	9.6	X	6.91	X	Clear	Clear	10.15	150
1	11:25	11.01	7.17%	7.33	0.43	115.00	44	0.198	21.12%	5.2	45.83%	5.48	20.69%	Clear	Clear	10.30	150
2	11:30	10.74	10.43%	7.27	0.49	129.00	58	0.193	30.05%	2.5	284.00%	5.40	27.96%	Clear	Clear	10.75	150
3	11:35	10.66	3.28%	7.26	0.07	134.00	19	0.196	2.59%	2.7	108.00%	5.56	2.96%	Clear	Clear	10.93	150
4	11:40	10.55	1.80%	7.25	0.02	138.00	9	0.199	3.11%	1.7	58.82%	5.52	2.96%	Clear	Clear	11.05	150
5	11:45	10.51	1.43%	7.25	0.01	141.00	7	0.201	2.55%	0.5	440.00%	5.42	2.58%	Clear	Clear	11.35	150
6	11:50	10.48	0.67%	7.24	0.01	142.00	4	0.201	1.01%	0.0	0.00%	5.30	4.15%	Clear	Clear	11.40	150
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	11:20	Purge End Time:	11:50
Total Purge Volume (L):	4.5	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	11:50	Sample End Time:	12:10
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-8	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/18/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	13.55 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	3.2 feet (from top of casing)
Weather:	Sunny, 37F	Equipment Serial #:	KTG20SUE	Pump Intake:	6 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	9:20	11.01	X	6.66	X	34.00	X	0.727	X	115.0	X	0.20	X	Clear	S.Turb.	3.25	250
1	9:25	10.59	3.81%	6.49	0.17	40.00	6	0.664	8.67%	108.0	6.09%	0.00	100.00%	Clear	emi Turbi	3.30	250
2	9:30	9.24	19.16%	5.89	0.77	126.00	92	0.482	50.83%	41.3	178.45%	0.00	0.00%	Clear	Clear	3.30	250
3	9:35	9.11	16.25%	5.79	0.7	155.00	115	0.465	42.80%	35.2	206.82%	0.00	0.00%	Clear	Clear	3.30	250
4	9:40	9.14	1.43%	5.74	0.15	137.00	29	0.464	3.88%	28.2	46.45%	0.00	0.00%	Clear	Clear	3.30	250
5	9:45	9.13	0.33%	5.72	0.07	117.00	38	0.465	0.22%	20.1	75.12%	0.00	0.00%	Clear	Clear	3.30	250
6	9:50	9.07	0.77%	5.72	0.02	114.00	23	0.465	0.22%	19.3	46.11%	0.00	0.00%	Clear	Clear	3.30	250
7	9:55	9.09	0.66%	5.72	0	110.00	7	0.467	0.43%	18.5	8.65%	0.00	0.00%	Clear	Clear	3.30	250
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10																	
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12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	9:20	Purge End Time:	9:55
Total Purge Volume (L):	8.75	Total Purge Time:	35 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	250

Sample Start Time:	9:55	Sample End Time:	10:10
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-6	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/18/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	17.05 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	2.81 feet (from top of casing)
Weather:	Sunny, 40F	Equipment Serial #:	KTG20SUE	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	10:35	10.75	X	6.23	X	-47.00	X	0.486	X	7.2	X	11.50	X	Clear	Clear	3.00	300
1	10:40	9.39	12.65%	6.50	0.27	-61.00	14	0.481	1.03%	7.1	1.39%	9.91	13.83%	Clear	Clear	3.01	275
2	10:45	9.20	16.85%	6.52	0.29	-63.00	16	0.504	4.78%	4.4	63.64%	9.14	25.82%	Clear	Clear	3.05	275
3	10:50	8.95	4.92%	6.54	0.04	-66.00	5	0.519	7.90%	5.8	61.36%	8.49	16.73%	Clear	Clear	3.05	275
4	10:55	9.27	3.58%	6.58	0.06	-70.00	7	0.522	3.57%	6.2	40.91%	7.42	23.18%	Clear	Clear	3.05	275
5	11:00	9.45	5.59%	6.60	0.06	-72.00	6	0.531	2.31%	6.1	6.90%	6.80	24.85%	Clear	Clear	3.05	275
6	11:05	9.61	3.67%	6.63	0.05	-75.00	5	0.539	3.26%	5.9	5.08%	6.31	17.59%	Clear	Clear	3.05	275
7	11:10	9.59	1.69%	6.66	0.06	-79.00	7	0.545	2.64%	5.7	7.02%	6.14	10.75%	Clear	Clear	3.05	275
8	11:15	9.72	1.36%	6.68	0.05	-80.00	5	0.546	1.30%	5.5	7.27%	5.95	6.05%	Clear	Clear	3.05	275
9																	
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:
Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10
Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	10:35	Purge End Time:	11:15
Total Purge Volume (L):	11	Total Purge Time:	40 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	275

Sample Start Time:	11:15	Sample End Time:	11:30
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-1	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	3/18/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	32.98 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	13.25 feet (from top of casing)
Weather:	Sunny, 43F	Equipment Serial #:	YD008XGK	Pump Intake:	25 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	12:35	13.70	X	6.64	X	-6.00	X	27.900	X	3.4	X	2.72	X	Clear	Clear	13.35	150
1	12:40	13.69	0.07%	6.64	0	-6.00	0	28.100	0.72%	3.3	2.94%	1.31	51.84%	Clear	Clear	13.44	150
2	12:45	13.64	0.44%	6.70	0.06	-12.00	6	29.300	5.02%	1.5	126.67%	0.00	0.00%	Clear	Clear	13.53	150
3	12:50	13.39	2.24%	6.75	0.11	-12.00	6	29.100	4.27%	1.2	175.00%	0.00	0.00%	Clear	Clear	13.62	150
4	12:55	13.17	3.57%	6.80	0.1	-9.00	3	29.000	1.03%	1.2	25.00%	0.00	0.00%	Clear	Clear	13.72	150
5	13:00	12.87	4.04%	6.82	0.07	-4.00	8	29.000	0.34%	1.1	9.09%	0.00	0.00%	Clear	Clear	13.97	150
6	13:05	12.89	2.33%	6.82	0.02	-3.00	6	29.000	0.00%	1.1	9.09%	0.00	0.00%	Clear	Clear	14.10	150
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*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	12:35	Purge End Time:	13:05
Total Purge Volume (L):	4.5	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	13:05	Sample End Time:	13:25
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD- PSEG Hudson	Monitoring Well:	MW-5	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/1/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	15.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	5.05 feet (from top of casing)
Weather:	Partly Cloudy, 34F	Equipment Serial #:	GWUWF40R	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	8:50	8.12	X	6.71	X	-66.00	X	7.970	X	59.2	X	0.00	X	Yellow	Clear	5.13	250
1	8:55	7.41	8.74%	6.71	0	-67.00	1	2.970	62.74%	17.1	0.00%	0.00	0.00%	Yellow	Clear	5.20	225
2	9:00	7.09	14.53%	6.71	0	-54.00	13	2.040	290.69%	9.9	0.00%	0.00	0.00%	Yellow	Clear	5.20	225
3	9:05	6.98	6.16%	6.55	0.16	-43.00	24	2.330	45.59%	8.5	0.00%	0.00	0.00%	Yellow	Clear	5.20	225
4	9:10	6.98	1.58%	6.62	0.16	-38.00	16	2.840	39.22%	7.0	41.43%	0.00	0.00%	Yellow	Clear	5.20	225
5	9:15	6.99	0.14%	6.63	0.08	-38.00	5	3.270	40.34%	6.6	28.79%	0.00	0.00%	Yellow	Clear	5.20	225
6	9:20	7.00	0.29%	6.64	0.02	-38.00	0	3.660	28.87%	5.8	20.69%	0.00	0.00%	Yellow	Clear	5.20	225
7	9:25	6.93	1.01%	6.68	0.05	-39.00	1	3.970	21.41%	5.7	15.79%	0.00	0.00%	Yellow	Clear	5.20	225
8	9:30	6.94	1.01%	6.70	0.06	-40.00	2	4.080	11.48%	5.6	3.57%	0.00	0.00%	Yellow	Clear	5.20	225
9																	
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14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	8:50	Purge End Time:	9:30
Total Purge Volume (L):	9	Total Purge Time:	40 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	225

Sample Start Time:	9:30	Sample End Time:	9:50
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-8	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/1/19	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	13.55 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	3.73 feet (from top of casing)
Weather:	Sunny, 34F	Equipment Serial #:	PGJA20YP	Pump Intake:	6 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	8:55	7.86	X	6.02	X	122.00	X	0.398	X	31.5	X	0.00	X	Clear	Clear	3.79	250
1	9:00	7.84	0.25%	6.10	0.08	108.00	14	0.417	4.77%	19.9	36.83%	0.00	0.00%	Clear	Clear	3.81	250
2	9:05	7.69	2.21%	6.09	0.08	110.00	14	0.456	14.57%	11.7	169.23%	0.00	0.00%	Clear	Clear	3.85	250
3	9:10	7.70	1.95%	6.10	0.01	110.00	2	0.475	13.91%	7.5	165.33%	0.00	0.00%	Clear	Clear	3.89	250
4	9:15	7.93	3.12%	6.11	0.02	111.00	1	0.490	7.46%	5.3	120.75%	0.00	0.00%	Clear	Clear	3.89	250
5	9:20	7.99	3.77%	6.10	0.01	113.00	3	0.497	4.63%	2.6	188.46%	0.00	0.00%	Clear	Clear	3.89	250
6	9:25	7.97	0.76%	6.13	0.03	114.00	3	0.503	2.65%	2.6	103.85%	0.00	0.00%	Clear	Clear	3.89	250
7	9:30	7.87	1.52%	6.14	0.04	115.00	2	0.506	1.81%	2.4	8.33%	0.00	0.00%	Clear	Clear	3.89	250
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13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	8:55	Purge End Time:	9:30
Total Purge Volume (L):	8.75	Total Purge Time:	35 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	250

Sample Start Time:	9:30	Sample End Time:	9:45
Sampling Method:	Bladder Pump	Total Sampling Time:	15 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-7	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/1/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	10.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	3.92 feet (from top of casing)
Weather:	Sunny, 37F	Equipment Serial #:	GWUWF40R	Pump Intake:	5 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	10:15	7.63	X	7.11	X	-33.00	X	1.600	X	82.3	X	1.79	X	Yellow	Clear	4.15	275
1	10:20	7.88	3.28%	7.16	0.05	-31.00	2	0.909	43.19%	44.6	45.81%	0.00	100.00%	Yellow	Clear	4.15	250
2	10:25	8.14	6.68%	7.22	0.11	-36.00	5	0.727	120.08%	30.7	168.08%	0.00	0.00%	Yellow	Clear	4.15	225
3	10:30	8.57	8.76%	7.28	0.12	-37.00	6	0.583	55.92%	18.4	142.39%	0.00	0.00%	Yellow	Clear	4.15	200
4	10:35	8.80	8.11%	7.33	0.11	-40.00	4	0.557	30.52%	14.7	108.84%	0.00	0.00%	Yellow	Clear	4.00	200
5	10:40	8.42	4.51%	7.34	0.06	-42.00	5	0.468	24.57%	12.4	48.39%	0.00	0.00%	Yellow	Clear	4.00	200
6	10:45	8.48	4.51%	7.37	0.04	-45.00	5	0.416	33.89%	11.2	31.25%	0.00	0.00%	Yellow	Clear	4.00	200
7	10:50	8.33	1.80%	7.40	0.06	-48.00	6	0.412	13.59%	9.3	33.33%	0.00	0.00%	Yellow	Clear	4.00	200
8	10:55	8.37	1.80%	7.43	0.06	-49.00	4	0.407	2.21%	8.1	38.27%	0.00	0.00%	Yellow	Clear	4.30	200
9																	
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

/horiba fell 10:37

Purge Start Time:	10:15	Purge End Time:	10:55
Total Purge Volume (L):	8	Total Purge Time:	40 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	200

Sample Start Time:	10:55	Sample End Time:	11:15
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-6	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/1/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	17.05 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	2.96 feet (from top of casing)
Weather:	Sunny, 40F	Equipment Serial #:	PGJA20YP	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	10:10	6.88	X	6.75	X	-60.00	X	0.585	X	111.0	X	3.15	X	Clear	S.Turb.	3.01	200
1	10:15	6.45	6.25%	6.85	0.1	-51.00	9	0.580	0.85%	284.0	155.86%	0.00	100.00%	Clear	Turbid	3.01	200
2	10:20	6.20	10.97%	6.84	0.1	-30.00	30	0.542	7.93%	373.0	236.04%	0.00	0.00%	Clear	Turbid	3.01	200
3	10:25	6.08	6.09%	6.81	0.04	-19.00	32	0.521	11.32%	294.0	31.34%	0.00	0.00%	Clear	Turbid	3.01	200
4	10:30	6.02	2.99%	6.78	0.06	-15.00	15	0.537	4.03%	257.0	45.14%	0.00	0.00%	Clear	Turbid	3.01	200
5	10:35	5.99	1.50%	6.76	0.05	-14.00	5	0.560	7.49%	204.0	44.12%	0.00	0.00%	Clear	Turbid	3.01	200
6	10:40	5.92	1.69%	6.75	0.03	-14.00	1	0.579	7.82%	174.0	47.70%	0.00	0.00%	Clear	Turbid	3.01	200
7	10:45	5.98	1.18%	6.72	0.04	-14.00	0	0.613	9.46%	142.0	43.66%	0.00	0.00%	Clear	emi Turbi	3.01	200
8	10:50	5.90	1.36%	6.77	0.05	-16.00	2	0.633	9.33%	130.0	33.85%	0.00	0.00%	Clear	emi Turbi	3.01	200
9	10:55	5.92	1.36%	6.77	0.05	-16.00	2	0.656	7.01%	102.0	39.22%	0.00	0.00%	Clear	emi Turbi	3.01	200
10	11:00	5.93	0.51%	6.77	0	-16.00	0	0.670	5.85%	96.7	34.44%	0.00	0.00%	Clear	emi Turbi	3.01	200
11	11:05	6.00	1.35%	6.79	0.02	-17.00	1	0.681	3.81%	85.2	19.72%	0.00	0.00%	Clear	emi Turbi	3.01	200
12	11:10	5.94	1.18%	6.82	0.05	-18.00	2	0.696	3.88%	82.1	17.78%	0.00	0.00%	Clear	emi Turbi	3.01	200
13	11:15	5.96	1.01%	6.83	0.04	-18.00	1	0.700	2.79%	77.4	10.08%	0.00	0.00%	Clear	emi Turbi	3.01	200
14	11:20	6.02	1.35%	6.83	0.01	-18.00	0	0.714	2.59%	75.5	8.74%	0.00	0.00%	Clear	emi Turbi	3.01	200
15																	

0

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	10:10	Purge End Time:	11:20
Total Purge Volume (L):	19.25	Total Purge Time:	70 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	275

Sample Start Time:	11:20	Sample End Time:	11:40
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-9	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/1/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	16.30 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	4.6 feet (from top of casing)
Weather:	Sunny, 42F	Equipment Serial #:	GWUWF40R	Pump Intake:	10 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	11:50	8.51	X	7.29	X	-25.00	X	0.435	X	24.6	X	0.65	X	Clear	Clear	4.63	250
1	11:55	7.82	8.11%	7.21	0.08	-34.00	9	0.399	8.28%	14.9	39.43%	0.00	100.00%	Clear	Clear	4.50	250
2	12:00	7.63	11.53%	7.22	0.08	-40.00	15	0.384	13.28%	12.5	96.80%	0.00	0.00%	Clear	Clear	4.50	225
3	12:05	7.58	3.17%	7.22	0.01	-42.00	8	0.378	5.56%	11.4	30.70%	0.00	0.00%	Clear	Clear	4.50	225
4	12:10	7.45	2.42%	7.23	0.01	-44.00	4	0.375	2.40%	9.8	27.55%	0.00	0.00%	Clear	Clear	4.50	225
5	12:15	7.51	1.74%	7.23	0.01	-45.00	3	0.375	0.80%	9.4	21.28%	0.00	0.00%	Clear	Clear	4.50	225
6	12:20	7.50	0.81%	7.24	0.01	-46.00	2	0.375	0.00%	9.1	7.69%	0.00	0.00%	Clear	Clear	4.50	225
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	11:50	Purge End Time:	12:20
Total Purge Volume (L):	6.75	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	225

Sample Start Time:	12:20	Sample End Time:	12:50
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-1	PID Reading:	0.00 ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/1/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	32.98 feet (from top of casing)
Field Personnel:	Tristan Morgan			Depth to Water:	13 feet (from top of casing)
Weather:	Sunny, 43F	Equipment Serial #:	PGJA20YP	Pump Intake:	25 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	12:25	8.60	X	6.72	X	46.00	X	30.700	X	11.7	X	0.00	X	Clear	Clear	13.00	175
1	12:30	10.36	20.47%	6.72	0	46.00	0	31.000	0.98%	23.9	104.27%	0.00	#DIV/0!	Clear	Clear	13.13	175
2	12:35	10.62	23.49%	6.90	0.18	59.00	13	30.800	0.98%	24.2	106.84%	0.00	0.00%	Clear	Clear	13.15	175
3	12:40	10.75	3.76%	6.97	0.25	58.00	13	30.800	0.65%	21.9	10.50%	0.00	0.00%	Clear	Clear	13.19	175
4	12:45	10.84	2.07%	7.03	0.13	54.00	5	30.800	0.00%	19.1	26.70%	0.00	0.00%	Clear	Clear	13.20	175
5	12:50	10.90	1.40%	7.07	0.1	46.00	12	30.800	0.00%	17.7	23.73%	0.00	0.00%	Clear	Clear	13.23	175
6	12:55	11.02	1.66%	7.13	0.1	44.00	10	30.700	0.33%	17.3	10.40%	0.00	0.00%	Clear	Clear	13.26	175
7	13:00	10.98	1.10%	7.17	0.1	37.00	9	30,8	0.33%	17.0	4.12%	0.00	0.00%	Clear	Clear	13.30	175
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	12:25	Purge End Time:	13:00
Total Purge Volume (L):	6.125	Total Purge Time:	35 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	175

Sample Start Time:	13:00	Sample End Time:	13:30
Sampling Method:	Bladder Pump	Total Sampling Time:	30 Minutes

Observations:

Sampling Technician: Tristan Morgan Signature: 

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-4	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/2/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	23.25 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	6.21 feet (from top of casing)
Weather:	Sunny, 42F	Equipment Serial #:	GWUWF40R	Pump Intake:	17 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	8:20	7.94	X	6.94	X	55.00	X	14.400	X	3.9	X	0.00	X	Clear	Clear	6.35	225
1	8:25	7.94	0.00%	6.95	0.01	77.00	22	11.900	17.36%	2.6	33.33%	0.00	0.00%	Clear	Clear	6.35	200
2	8:30	7.79	1.93%	6.96	0.02	90.00	35	11.000	30.91%	1.5	160.00%	0.00	0.00%	Clear	Clear	6.38	200
3	8:35	7.77	2.19%	6.97	0.02	80.00	13	10.800	10.19%	1.3	0.00%	0.00	0.00%	Clear	Clear	7.05	200
4	8:40	7.76	0.39%	6.99	0.03	61.00	29	10.700	2.80%	0.9	0.00%	0.00	0.00%	Clear	Clear	7.05	200
5	8:45	7.84	1.03%	6.99	0.02	45.00	35	10.700	0.93%	0.5	0.00%	0.00	0.00%	Clear	Clear	7.10	200
6	8:50	7.93	2.19%	6.99	0	36.00	25	10.700	0.00%	0.4	0.00%	0.00	0.00%	Clear	Clear	7.10	200
7	8:55	7.94	1.28%	6.98	0.01	32.00	13	10.700	0.00%	0.3	0.00%	0.00	0.00%	Clear	Clear	7.10	200
8	9:00	7.99	0.76%	6.98	0.01	28.00	8	10.700	0.00%	0.2	0.00%	0.00	0.00%	Clear	Clear	7.10	200
9																	
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	8:20	Purge End Time:	9:00
Total Purge Volume (L):	6	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	200

Sample Start Time:	9:00	Sample End Time:	9:20
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-2	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/2/2019	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	3.00 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	10.64 feet (from top of casing)
Weather:	Sunny, 47F	Equipment Serial #:	GWUWF40R	Pump Intake:	30 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	10:50	14.31	X	6.92	X	23.00	X	33.900	X	5.7	X	0.00	X	Clear	Clear	10.33	150
1	10:55	14.34	0.21%	6.90	0.02	19.00	4	34.300	1.18%	6.2	8.77%	0.00	0.00%	Clear	Clear	10.88	175
2	11:00	14.37	0.42%	6.89	0.03	17.00	6	34.400	1.47%	7.4	29.82%	0.00	0.00%	Clear	Clear	11.45	200
3	11:05	14.53	1.32%	6.89	0.01	17.00	2	34.300	0.29%	10.7	72.58%	0.00	0.00%	Clear	Clear	12.00	175
4	11:10	14.75	2.64%	6.89	0	20.00	3	34.200	0.58%	10.3	44.59%	0.00	0.00%	Clear	Clear	12.95	175
5	11:15	15.01	3.30%	6.89	0	28.00	11	33.700	1.78%	6.5	64.62%	0.00	0.00%	Clear	Clear	13.80	175
6	11:20	15.08	2.24%	6.89	0	32.00	12	33.400	2.40%	5.5	87.27%	0.00	0.00%	Clear	Clear	14.45	175
7	11:25	15.23	1.47%	6.92	0.03	39.00	11	32.900	2.43%	4.3	51.16%	0.00	0.00%	Clear	Clear	15.85	175
8	11:30	15.34	1.72%	6.93	0.04	42.00	10	32.700	2.14%	3.1	77.42%	0.00	0.00%	Clear	Clear	16.34	175
9																	
10																	
11																	
12																	
13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	10:50	Purge End Time:	11:30
Total Purge Volume (L):	7	Total Purge Time:	40 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	175

Sample Start Time:	11:30	Sample End Time:	11:50
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

Groundwater Purge Data Sheet

Sheet 1 of 1

Hampton-Clarke

Hampton-Clarke, Inc.
175 Route 46 W, Fairfield, NJ
07004

Project Name:	WCD-Hudson	Monitoring Well:	MW-3	PID Reading:	- ppm
Project Number:	1901252			Well Diameter:	2 inches
Date:	4/2/19	Equipment Make/Model:	Horiba U-52	Total Depth of Well:	23.20 feet (from top of casing)
Field Personnel:	Fabio Iannacco			Depth to Water:	10.96 feet (from top of casing)
Weather:	Sunny, 51F	Equipment Serial #:	GWUWF40R	Pump Intake:	16 feet (from top of casing)

	Time	Temperature (°C)		pH		ORP (mV)		Specific Conductivity (ms/cm)		Turbidity (NTU)		Dissolved Oxygen (mg/L)		Color / Clarity		Depth to Water	Purge Rate (mL/m)
		Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ	Reading	Δ				
0	12:40	14.84	X	7.62	X	136.00	X	1.410	X	11.0	X	2.03	X	Clear	Clear	11.00	150
1	12:45	14.35	3.30%	7.36	0.26	147.00	11	1.060	24.82%	8.8	20.00%	0.23	88.67%	Clear	Clear	11.30	150
2	12:50	13.71	8.24%	7.30	0.32	151.00	15	1.040	35.58%	7.7	42.86%	0.00	0.00%	Clear	Clear	11.75	150
3	12:55	13.37	7.33%	7.27	0.09	152.00	5	1.040	1.92%	5.4	62.96%	0.00	0.00%	Clear	Clear	11.93	150
4	13:00	12.91	6.20%	7.26	0.04	153.00	2	1.040	0.00%	5.7	42.59%	0.00	0.00%	Clear	Clear	12.08	150
5	13:05	12.77	4.70%	7.26	0.01	154.00	2	1.040	0.00%	5.2	9.62%	0.00	0.00%	Clear	Clear	12.35	150
6	13:10	12.67	1.89%	7.26	0	154.00	1	1.040	0.00%	5.8	0.00%	0.00	0.00%	Clear	Clear	12.40	150
7																	
8																	
9																	
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13																	
14																	
15																	

*Indicator Parameters Stabilized When 3 Consecutive Readings are Within:

Temp:+/- 3%, pH: +/- 0.1, Spec. Cond. +/- 3%, Turb: +/- 10% (for values >1), DO: +/- 10%, ORP: +/- 10

Temp: +/- 3% pH: +/- 0.1 ORP: +/- 10 Spec. Cond. +/- 3% Turb: +/- 10% DO: +/- 10%

Percent (%) Change = [(old value - new value)/ old value] * 100 = Δ

Purge Start Time:	12:40	Purge End Time:	13:10
Total Purge Volume (L):	4.5	Total Purge Time:	30 Minutes
Purge Method:	Bladder Pump	Purge Rate (mL/min):	150

Sample Start Time:	13:10	Sample End Time:	13:30
Sampling Method:	Bladder Pump	Total Sampling Time:	20 Minutes

Observations:

Sampling Technician: Fabio Iannacco Signature:

APPENDIX B

Laboratory Analytical Reports

eurofins | Lancaster Laboratories Environmental

2425 New Holland Pike, Lancaster, PA 17601 | 717-656-2300 | Fax: 717-656-2681 | www.LancasterLabs.com

Type III Data Package

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Project: PSEG Hudson & Mercer Stations
Groundwater and Water Samples
Collected on 07/30/18-08/01/18

SDG# GEJ45

GROUP	SAMPLE NUMBERS
1972515	9735148-9735157

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-13-10
AZ Cert. # AZ0780

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by: Dana M Kauffman **Date:** **09/04/2018**

Dana M. Kauffman
Manager

Any questions or concerns you might have regarding this data package should be directed to your client representative, Kerri Sachtleben at (717)-556-7376.

2425 New Holland Pike, Lancaster, PA 17601 | 717-656-2300 | Fax: 717-656-2681 | www.LancasterLabs.com

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Sample Reference List for SDG Number GEJ45 with a Data Package Type of III

07701 - GEI Consultants, Inc.

Project: PSEG Hudson & Mercer Stations

Lab Sample Number	Client Sample ID	Collection Date	Date Received
9735148	MW-1	07/30/2018 11:30	08/02/2018 16:20
9735149	MW-2	07/30/2018 13:40	08/02/2018 16:20
9735150	MW-3	07/31/2018 10:10	08/02/2018 16:20
9735151	MW-4	07/31/2018 12:15	08/02/2018 16:20
9735152	MW-5	07/31/2018 15:45	08/02/2018 16:20
9735153	MW-6	07/31/2018 14:10	08/02/2018 16:20
9735154	MW-7	08/01/2018 12:45	08/02/2018 16:20
9735155	MW-8	08/01/2018 14:40	08/02/2018 16:20
9735156	MW-9	08/01/2018 11:05	08/02/2018 16:20
9735157	FB-20180731	07/31/2018 12:00	08/02/2018 16:20

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Sample pH Log

SDG: GEJ45

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9735148	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:31:39PM	1532
9735148	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:09:59PM	24788
9735148	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:04:13PM	1532
9735148	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:02:06PM	1532
9735148	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:30:43PM	1532
9735148	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/5/2018 11:24:37PM	24788
9735148	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:31:39PM	1532
9735148	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:30:43PM	1532
9735149	004A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:32:53PM	1532
9735149	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:10:26PM	24788
9735149	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:02:20PM	1532
9735149	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:06:34PM	1532
9735149	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:31:12PM	1532
9735149	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/4/2018 11:33:07PM	1201
9735149	330A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:32:53PM	1532
9735149	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:31:12PM	1532
9735150	004A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:33:21PM	1532
9735150	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:10:54PM	24788
9735150	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:04:50PM	1532
9735150	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:04:25PM	1532
9735150	070A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:34:01PM	1532
9735150	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/4/2018 11:41:33PM	1201
9735150	330A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:33:21PM	1532
9735150	332A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:33:21PM	1532
9735151	004A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:34:14PM	1532
9735151	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:08:48PM	24788
9735151	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:05:14PM	1532
9735151	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:04:38PM	1532
9735151	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:35:43PM	1532
9735151	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/5/2018 11:22:50PM	24788
9735151	089B	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/5/2018 11:11:59PM	24788
9735151	148A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:08:25PM	24788
9735151	330A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:34:14PM	1532
9735151	332A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:34:14PM	1532
9735152	004A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:34:55PM	1532
9735152	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:11:24PM	24788
9735152	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:05:02PM	1532
9735152	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:06:11PM	1532

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9735152	070A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:35:55PM	1532
9735152	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/4/2018 11:30:52PM	1201
9735152	330A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:34:55PM	1532
9735152	332A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:34:55PM	1532
9735153	004A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:38:14PM	1532
9735153	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:11:48PM	24788
9735153	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:05:25PM	1532
9735153	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:07:40PM	1532
9735153	070A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:36:56PM	1532
9735153	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/4/2018 11:27:35PM	1201
9735153	330A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:38:14PM	1532
9735153	332A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:36:56PM	1532
9735154	004A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:55:51PM	1532
9735154	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:07:50PM	24788
9735154	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:05:59PM	1532
9735154	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:07:24PM	1532
9735154	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:38:44PM	1532
9735154	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/5/2018 11:27:30PM	24788
9735154	330A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:55:51PM	1532
9735154	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:38:44PM	1532
9735155	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:51:54PM	1532
9735155	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:12:24PM	24788
9735155	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:07:54PM	1532
9735155	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:05:48PM	1532
9735155	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:36:07PM	1532
9735155	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/4/2018 11:43:33PM	1201
9735155	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:51:54PM	1532
9735155	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:36:07PM	1532
9735156	004A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:53:05PM	1532
9735156	015A	6	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:09:22PM	24788
9735156	055A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:05:36PM	1532
9735156	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:07:00PM	1532
9735156	070A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:37:47PM	1532
9735156	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/4/2018 11:35:38PM	1201
9735156	330A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:53:05PM	1532
9735156	332A	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:37:47PM	1532
9735157	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:52:24PM	1532
9735157	015A		5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 10:12:49PM	24788
9735157	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:06:48PM	1532
9735157	055B	8	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 7:06:23PM	1532
9735157	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:54:42PM	1532
9735157	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/4/2018 11:46:03PM	1201
9735157	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:52:24PM	1532
9735157	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	8/2/2018 6:52:24PM	1532

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee

*pH Check Code Key
PK = Original container checked - pH is within the correct range. (No preservative was added)
PA = Original container checked - pH adjusted to correct range. (Preservative was added)
PV = Volatile container checked
PC = pH checked (unpreserved container)
SPK = Subsampled from an original container. Original container checked - pH is within correct range
SPA = Subsampled from an original container. Subsample container checked - pH adjusted to correct range.
SPC = Subsampled from an original container. pH checked (unpreserved container).
SUP = Subsampled from original container. Unable to be preserved due to the matrix of the sample.
UP = Unable to preserve due to matrix of the sample.
NA = Not applicable

**Chlorine Present Code Key
NA = Chlorine Not Checked
Y = Chlorine Present
N = Chlorine Not Present

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00259 Mercury

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

14044 ICP-WW, 3005A (tot rec) - U5

The sample is digested with nitric acid and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3005A, July 1992

14047 ICPMS - Water, 3020A - U5

The sample is digested with nitric and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3020A, July 1992

05713 WW SW846 Hg Digest

The sample is heated at 95 c with nitric acid, sulfuric acid, potassium persulfate, and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

07046 Barium
08014 Boron
01750 Calcium
07051 Chromium
07052 Cobalt
01756 Lithium
07036 Selenium
07022 Thallium

The solution resulting from the metals digestion is analyzed by Trace ICP.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6010D, Rev. 4, July 2014.

06024 Antimony
06025 Arsenic
06027 Beryllium
06028 Cadmium
06035 Lead
06038 Molybdenum

The solution resulting from the metals digestion is analyzed by ICP/MS.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6020B, Rev.2, July 2014.

00224 Chloride
01504 Fluoride
00228 Sulfate

A small volume of sample is introduced into an ion chromatograph. The anions are then separated and measured by a system consisting of a guard column, separator column, suppressor, and conductivity detector.

Reference: Method 300.0, Revision 2.1 (1993), Methods for Chemical Analysis of Water and Wastes USEPA 600.

12152 pH

The activity of hydrogen ions in the sample is measured using a glass electrode and a reference electrode.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 4500-H+ B-2011

00212 Total Dissolved Solids

A well-mixed sample is filtered through a glass fiber filter. The filtrate is collected in a tared beaker, evaporated in a steam bath and dried in an oven at 180C +/- 2C to a constant weight. The increase in weight is the total dissolved solids.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2540 C-2011

12151 Temperature of pH

The temperature of the sample measured during the pH analysis.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2550 B-2010

Analysis Reports / Field Chain of Custody

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Report Date: September 04, 2018 14:18

Project: PSEG Hudson & Mercer Stations

Account #: 07701
Group Number: 1972515
SDG: GEJ45
PO Number: 1504710
State of Sample Origin: NJ

Electronic Copy To	GEI Consultants, Inc.	Attn: Jason Kohl
Electronic Copy To	GEI Consultants, Inc.	Attn: Data Group

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-1 Grab Groundwater	07/30/2018 11:30	9735148
MW-2 Grab Groundwater	07/30/2018 13:40	9735149
MW-3 Grab Groundwater	07/31/2018 10:10	9735150
MW-4 Grab Groundwater	07/31/2018 12:15	9735151
MW-5 Grab Groundwater	07/31/2018 15:45	9735152
MW-6 Grab Groundwater	07/31/2018 14:10	9735153
MW-7 Grab Groundwater	08/01/2018 12:45	9735154
MW-8 Grab Groundwater	08/01/2018 14:40	9735155
MW-9 Grab Groundwater	08/01/2018 11:05	9735156
FB-20180731 Grab Water	07/31/2018 12:00	9735157

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: GEI Consultants, Inc.
Project: PSEG Hudson & Mercer Stations
Sampling Date(s): 07/30/18 - 08/01/18
Laboratory Sample ID(s): 9735148-9735157
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	Yes
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Dorothy M Love

Dorothy M. Love
Director

09/04/2018



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Project Name: PSEG Hudson & Mercer Stations
ELLE Group #: 1972515

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.
Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 9735148, 9735149, 9735155

An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly.

Sample #s: 9735148, 9735149, 9735150, 9735151, 9735152, 9735153, 9735154, 9735155, 9735156, 9735157

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.

SW-846 6020B Rev.2, July 2014, Metals Dissolved

Sample #s: 9735148, 9735149, 9735150, 9735151, 9735152, 9735153, 9735154, 9735155, 9735156, 9735157

The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.

Batch #: 182191404702A (Sample number(s): 9735148-9735157 UNSPK: 9735152 BKG: 9735152)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Arsenic, Cadmium

SM 2540 C-2011, Wet Chemistry

Batch #: 18220921201B (Sample number(s): 9735156 UNSPK: 9735156 BKG: 9735156)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/30/2018 11:30
SDG#: GEJ45-01

GEI Consultants, Inc.
ELLE Sample #: GW 9735148
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.693	0.0010	0.0100	1
08014	Boron	7440-42-8	1.08	0.0120	0.100	1
01750	Calcium	7440-70-2	396	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	0.0041 J	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.103	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0700	0.300	5
	An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0049	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.00045 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0037 J	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	6,750	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	15.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/30/2018 11:30
SDG#: GEJ45-01

GEI Consultants, Inc.
ELLE Sample #: GW 9735148
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	10,200	1,600	4,800	10
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.5	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 14:58	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 14:58	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 14:58	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 14:58	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 14:58	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 14:58	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 14:58	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/20/2018 23:33	Xavier Arroyo	5
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:08	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:25	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:25	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:25	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:25	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/30/2018 11:30
SDG#: GEJ45-01

GEI Consultants, Inc.
ELLE Sample #: GW 9735148
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:25	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 12:54	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/13/2018 14:27	Ashlynn M Cornelius	2000
01504	Fluoride	EPA 300.0	1	18215120117A	08/06/2018 17:14	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18215120117A	08/06/2018 17:14	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18215921201A	08/03/2018 15:47	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 13:22	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 13:22	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/30/2018 13:40
SDG#: GEJ45-02

GEI Consultants, Inc.
ELLE Sample #: GW 9735149
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	2.27	0.0010	0.0100	1
08014	Boron	7440-42-8	0.827	0.0120	0.100	1
01750	Calcium	7440-70-2	442	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	0.0031 J	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0891 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0700	0.300	5
	An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00052 J	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0059	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.00054 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0041	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,230	1,000	2,000	5000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	19.0	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/30/2018 13:40
SDG#: GEJ45-02

GEI Consultants, Inc.
ELLE Sample #: GW 9735149
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	10,400	1,600	4,800	10
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.6	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:01	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:01	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:01	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:01	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:01	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:01	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:01	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/20/2018 23:41	Xavier Arroyo	5
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:16	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:32	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:32	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:32	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:32	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/30/2018 13:40
SDG#: GEJ45-02

GEI Consultants, Inc.
ELLE Sample #: GW 9735149
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:32	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 12:56	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18215120112A	08/03/2018 18:57	Hallie A Burnett	5000
01504	Fluoride	EPA 300.0	1	18215120112A	08/03/2018 18:22	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18215120112A	08/03/2018 18:22	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18215921201A	08/03/2018 15:47	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 12:44	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 12:44	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 10:10
SDG#: GEJ45-03

GEI Consultants, Inc.
ELLE Sample #: GW 9735150
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0638	0.0010	0.0100	1
08014	Boron	7440-42-8	0.518	0.0120	0.100	1
01750	Calcium	7440-70-2	41.6	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0017 J	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0040	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0164	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	349	100	200	500
01504	Fluoride	16984-48-8	0.33 J	0.25	0.50	5
00228	Sulfate	14808-79-8	90.5	3.0	10.0	10
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	958	80.0	240	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 10:10
SDG#: GEJ45-03

GEI Consultants, Inc.
ELLE Sample #: GW 9735150
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.6	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.0	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:09	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:19	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:34	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:34	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:34	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:34	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:34	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 12:58	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 10:10
SDG#: GEJ45-03

GEI Consultants, Inc.
ELLE Sample #: GW 9735150
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/06/2018 20:22	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18218120117A	08/06/2018 20:05	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18218120117A	08/09/2018 18:36	Ashlynn M Cornelius	10
00212	Total Dissolved Solids	SM 2540 C-2011	1	18215921201A	08/03/2018 15:47	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	18215002207B	08/04/2018 12:56	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207B	08/04/2018 12:56	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 12:15
SDG#: GEJ45-04

GEI Consultants, Inc.
ELLE Sample #: GW 9735151
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.119	0.0010	0.0100	1
08014	Boron	7440-42-8	1.53	0.0120	0.100	1
01750	Calcium	7440-70-2	164	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0994 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00090 J	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0018 J	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.00050 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0076	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	6,610	1,000	2,000	5000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	864	150	500	500
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	10,400	1,600	4,800	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 12:15
SDG#: GEJ45-04

GEI Consultants, Inc.
ELLE Sample #: GW 9735151
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.5	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:12	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:22	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:36	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:36	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:36	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:36	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:36	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 12:46	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 12:15
SDG#: GEJ45-04

GEI Consultants, Inc.
ELLE Sample #: GW 9735151
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/06/2018 21:30	Ashlynn M Cornelius	5000
01504	Fluoride	EPA 300.0	1	18218120117A	08/06/2018 20:56	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18218120117A	08/06/2018 21:13	Ashlynn M Cornelius	500
00212	Total Dissolved Solids	SM 2540 C-2011	1	18215921202A	08/03/2018 17:02	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 13:16	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 13:16	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 15:45
SDG#: GEJ45-05

GEI Consultants, Inc.
ELLE Sample #: GW 9735152
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.184	0.0010	0.0100	1
08014	Boron	7440-42-8	0.802	0.0120	0.100	1
01750	Calcium	7440-70-2	185	0.0330	1.00	1
07051	Chromium	7440-47-3	0.0066 J	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0443 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0012 J	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.00038 J	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	2,910	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	2.0 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	5,120	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 15:45
SDG#: GEJ45-05

GEI Consultants, Inc.
ELLE Sample #: GW 9735152
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.9	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.1	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:15	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 21:51	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:11	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:11	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:11	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:11	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:11	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 13:01	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 15:45
SDG#: GEJ45-05

GEI Consultants, Inc.
ELLE Sample #: GW 9735152
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/06/2018 22:38	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18218120117A	08/06/2018 21:47	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18218120117A	08/06/2018 21:47	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18215921202A	08/03/2018 17:02	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 13:47	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 13:47	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 14:10
SDG#: GEJ45-06

GEI Consultants, Inc.
ELLE Sample #: GW 9735153
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.155	0.0010	0.0100	1
08014	Boron	7440-42-8	1.04	0.0120	0.100	1
01750	Calcium	7440-70-2	160	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0371 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0034 J	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.00054 J	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	2,740	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	3.6 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	4,290	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 14:10
SDG#: GEJ45-06

GEI Consultants, Inc.
ELLE Sample #: GW 9735153
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.7	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:17	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:25	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:39	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:39	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:39	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:39	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:39	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 13:03	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 14:10
SDG#: GEJ45-06

GEI Consultants, Inc.
ELLE Sample #: GW 9735153
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/06/2018 23:30	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18218120117A	08/06/2018 23:12	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18218120117A	08/06/2018 23:12	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18215921202A	08/03/2018 17:02	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 13:41	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 13:41	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 12:45
SDG#: GEJ45-07

GEI Consultants, Inc.
ELLE Sample #: GW 9735154
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0586	0.0010	0.0100	1
08014	Boron	7440-42-8	0.282	0.0120	0.100	1
01750	Calcium	7440-70-2	37.2	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0036 J	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.00020 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0077	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	87.1	10.0	20.0	50
01504	Fluoride	16984-48-8	0.36 J	0.25	0.50	5
00228	Sulfate	14808-79-8	20.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	361	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 12:45
SDG#: GEJ45-07

GEI Consultants, Inc.
ELLE Sample #: GW 9735154
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.5	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.1	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:20	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:28	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:41	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:41	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:41	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:41	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:41	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 13:05	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 12:45
SDG#: GEJ45-07

GEI Consultants, Inc.
ELLE Sample #: GW 9735154
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/07/2018 00:21	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	18218120117A	08/07/2018 00:04	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18218120117A	08/07/2018 00:04	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18220921201A	08/08/2018 15:05	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 13:08	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 13:08	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 14:40
SDG#: GEJ45-08

GEI Consultants, Inc.
ELLE Sample #: GW 9735155
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0954	0.0010	0.0100	1
08014	Boron	7440-42-8	0.281	0.0120	0.100	1
01750	Calcium	7440-70-2	34.0	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	0.0045 J	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0700	0.300	5
	An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0032 J	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.0018 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0061	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	475	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	21.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 14:40
SDG#: GEJ45-08

GEI Consultants, Inc.
ELLE Sample #: GW 9735155
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	916	160	480	1
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.7	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:23	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:23	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:23	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:23	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:23	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:23	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:23	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/20/2018 23:44	Xavier Arroyo	5
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:31	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:43	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:43	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:43	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:43	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 14:40
SDG#: GEJ45-08

GEI Consultants, Inc.
ELLE Sample #: GW 9735155
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:43	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 13:12	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/07/2018 00:55	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18218120117A	08/07/2018 00:38	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18218120117A	08/07/2018 00:38	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18220921201A	08/08/2018 15:05	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 13:28	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 13:28	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 11:05
SDG#: GEJ45-09

GEI Consultants, Inc.
ELLE Sample #: GW 9735156
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0731	0.0010	0.0100	1
08014	Boron	7440-42-8	0.382	0.0120	0.100	1
01750	Calcium	7440-70-2	93.9	0.0330	1.00	1
07051	Chromium	7440-47-3	0.0055 J	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0037 J	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0071	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	676	100	200	500
01504	Fluoride	16984-48-8	0.26 J	0.25	0.50	5
00228	Sulfate	14808-79-8	27.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,340	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 11:05
SDG#: GEJ45-09

GEI Consultants, Inc.
ELLE Sample #: GW 9735156
ELLE Group #: 1972515
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	24.4	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:25	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:33	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:46	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:46	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:46	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:46	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:46	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 13:14	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 08/01/2018 11:05
SDG#: GEJ45-09

GEI Consultants, Inc.
ELLE Sample #: GW 9735156
ELLE Group #: 1972515
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/07/2018 02:20	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18218120117A	08/07/2018 02:03	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18218120117A	08/07/2018 02:03	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18220921201B	08/08/2018 15:06	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18218004207A	08/07/2018 13:57	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18218004207A	08/07/2018 13:57	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20180731 Grab Water**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 12:00
SDG#: GEJ45-10FB

GEI Consultants, Inc.
ELLE Sample #: **GW 9735157**
ELLE Group #: **1972515**
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0100	1
08014	Boron	7440-42-8	N.D.	0.0120	0.100	1
01750	Calcium	7440-70-2	0.151 J	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.00080 J	0.00068	0.0040	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.					
06027	Beryllium	7440-41-7	N.D. K4	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.00020 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20180731 Grab Water**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 12:00
SDG#: GEJ45-10FB

GEI Consultants, Inc.
ELLE Sample #: GW 9735157
ELLE Group #: 1972515
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.5	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182181404401	08/08/2018 15:28	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/30/2018 22:36	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:48	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:48	Bradley M Berlot	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:48	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182191404702A	08/28/2018 01:48	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182191404702C	08/28/2018 01:48	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	182180571307	08/09/2018 13:16	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182181404401	08/08/2018 05:34	James L Mertz	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182191404702	08/08/2018 05:49	James L Mertz	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20180731 Grab Water**
PSEG - Hudson / 1504710

Project Name: **PSEG Hudson & Mercer Stations**

Submittal Date/Time: 08/02/2018 16:20
Collection Date/Time: 07/31/2018 12:00
SDG#: GEJ45-10FB

GEI Consultants, Inc.
ELLE Sample #: GW 9735157
ELLE Group #: 1972515
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
05713	WW SW846 Hg Digest	SW-846 7470A	1	182180571307	08/09/2018 07:05	James L Mertz	1
00224	Chloride	EPA 300.0	1	18218120117A	08/07/2018 02:55	Ashlynn M Cornelius	1
01504	Fluoride	EPA 300.0	1	18218120117A	08/07/2018 02:55	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	18218120117A	08/07/2018 02:55	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18215921202A	08/03/2018 17:02	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	18215002207A	08/04/2018 13:12	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18215002207A	08/04/2018 13:12	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1972515
Reported: 09/04/2018 14:18

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 182180571307	Sample number(s): 9735148-9735157		
Mercury	N.D.	0.000050	0.00020
Batch number: 182181404401	Sample number(s): 9735148-9735157		
Barium	N.D.	0.0010	0.0100
Boron	N.D.	0.0120	0.100
Calcium	N.D.	0.0330	1.00
Chromium	N.D.	0.0053	0.0300
Cobalt	N.D.	0.0015	0.0100
Lithium	N.D.	0.0110	0.100
Selenium	N.D.	0.0210	0.100
Thallium	N.D.	0.0140	0.0600
Batch number: 182191404702A	Sample number(s): 9735148-9735157		
Antimony	N.D.	0.00041	0.0040
Arsenic	N.D.	0.00068	0.0040
Beryllium	0.00010 J	0.000091	0.0010
Cadmium	N.D.	0.00015	0.0020
Lead	N.D.	0.0011	0.0060
Batch number: 182191404702C	Sample number(s): 9735148-9735157		
Molybdenum	N.D.	0.00031	0.0040
Batch number: 18215120112A	Sample number(s): 9735149		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18215120117A	Sample number(s): 9735148		
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18218120117A	Sample number(s): 9735148,9735150-9735157		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18215921201A	Sample number(s): 9735148-9735150		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18215921202A	Sample number(s): 9735151-9735153,9735157		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18220921201A	Sample number(s): 9735154-9735155		

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1972515
Reported: 09/04/2018 14:18

Method Blank (continued)

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18220921201B	Sample number(s): 9735156		
Total Dissolved Solids	N.D.	20.0	60.0

LCS/LCSD

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 182180571307	Sample number(s): 9735148-9735157								
Mercury	0.00100	0.000938			94		80-120		
Batch number: 182181404401	Sample number(s): 9735148-9735157								
Barium	2.00	2.09			104		80-120		
Boron	2.00	1.88			94		80-120		
Calcium	4.00	4.19			105		80-120		
Chromium	0.200	0.208			104		80-120		
Cobalt	0.500	0.548			110		80-120		
Lithium	1.00	1.08			108		80-120		
Selenium	0.150	0.156			104		80-120		
Thallium	0.150	0.161			108		80-120		
Batch number: 182191404702A	Sample number(s): 9735148-9735157								
Antimony	0.00600	0.00694			116		80-120		
Arsenic	0.0100	0.0101			101		80-120		
Beryllium	0.00400	0.00428			107		80-120		
Cadmium	0.00500	0.00497			99		84-120		
Lead	0.0150	0.0150			100		90-110		
Batch number: 182191404702C	Sample number(s): 9735148-9735157								
Molybdenum	0.0500	0.0510			102		80-120		
	mg/l	mg/l	mg/l	mg/l					
Batch number: 18215120112A	Sample number(s): 9735149								
Chloride	3.00	2.93			98		90-110		
Fluoride	0.750	0.680			91		90-110		
Sulfate	7.50	7.55			101		90-110		
Batch number: 18215120117A	Sample number(s): 9735148								
Fluoride	0.750	0.787			105		90-110		
Sulfate	7.50	7.68			102		90-110		
Batch number: 18218120117A	Sample number(s): 9735148,9735150-9735157								

*- Outside of specification
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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1972515
Reported: 09/04/2018 14:18

LCS/LCSD (continued)

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Chloride	3.00	2.92			97		90-110		
Fluoride	0.750	0.673			90		90-110		
Sulfate	7.50	7.55			101		90-110		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18215921201A	Sample number(s): 9735148-9735150								
Total Dissolved Solids	200	197			99		62-127		
Batch number: 18215921202A	Sample number(s): 9735151-9735153,9735157								
Total Dissolved Solids	200	199			100		62-127		
Batch number: 18220921201A	Sample number(s): 9735154-9735155								
Total Dissolved Solids	200	204			102		62-127		
Batch number: 18220921201B	Sample number(s): 9735156								
Total Dissolved Solids	200	204			102		62-127		
	Std. Units	**Std. Units**	**Std. Units**	**Std. Units**					
Batch number: 18215002207A	Sample number(s): 9735148-9735149,9735151-9735155,9735157								
pH	7.00	6.99			100		95-105		
Batch number: 18215002207B	Sample number(s): 9735150								
pH	7.00	6.99			100		95-105		
Batch number: 18218004207A	Sample number(s): 9735156								
pH	7.00	7.01			100		95-105		

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 182180571307	Sample number(s): 9735148-9735157 UNSPK: 9735151									
Mercury	N.D.	0.00100	0.000934	0.00100	0.000950	93	95	75-125	2	20
Batch number: 182191404702A	Sample number(s): 9735148-9735157 UNSPK: 9735152									
Antimony	N.D.	0.00600	0.00619	0.00600	0.00721	103	120	75-125	15	20
Arsenic	0.00124	0.0100	0.0126	0.0100	0.0122	114	110	75-125	3	20
Beryllium	N.D.	0.00400	0.00441	0.00400	0.00451	110	113	75-125	2	20
Cadmium	N.D.	0.00500	0.00477	0.00500	0.00446	95	89	75-125	7	20
Lead	N.D.	0.0150	0.0154	0.0150	0.0155	102	103	75-125	1	20

*- Outside of specification
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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1972515
Reported: 09/04/2018 14:18

MS/MSD (continued)

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 182191404702C	Sample number(s): 9735148-9735157 UNSPK: 9735152									
Molybdenum	0.000379	0.0500	0.0536	0.0500	0.0517	106	103	75-125	4	20
	mg/l	**mg/l**	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18220921201A	Sample number(s): 9735154-9735155 UNSPK: 9735156									
Total Dissolved Solids	1340	1600	2764			89		62-127		
Batch number: 18220921201B	Sample number(s): 9735156 UNSPK: 9735156									
Total Dissolved Solids	1340	1600	2764			89		62-127		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	mg/l	**mg/l**		
Batch number: 182180571307	Sample number(s): 9735148-9735157 BKG: 9735151			
Mercury	N.D.	N.D.	0 (1)	20
Batch number: 182191404702A	Sample number(s): 9735148-9735157 BKG: 9735152			
Antimony	N.D.	N.D.	0 (1)	20
Arsenic	0.00124	0.00265	73* (1)	20
Beryllium	N.D.	N.D.	0 (1)	20
Cadmium	N.D.	0.000210	200* (1)	20
Lead	N.D.	N.D.	0 (1)	20
Batch number: 182191404702C	Sample number(s): 9735148-9735157 BKG: 9735152			
Molybdenum	0.000379	0.000385	1 (1)	20
	Degrees C	**Degrees C**		
Batch number: 18215002207A	Sample number(s): 9735148-9735149,9735151-9735155,9735157 BKG: 9735149			
Temperature of pH	23.64	23.62	0	5
Batch number: 18215002207B	Sample number(s): 9735150 BKG: 9735150			
Temperature of pH	23.57	23.54	0	5
	mg/l	**mg/l**		
Batch number: 18220921201B	Sample number(s): 9735156 BKG: 9735156			
Total Dissolved Solids	1340	1268	6* (1)	5
	Std. Units	**Std. Units**		

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1972515
Reported: 09/04/2018 14:18

Laboratory Duplicate (continued)

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc Std. Units	DUP Conc Std. Units	DUP RPD	DUP RPD Max
Batch number: 18215002207A	Sample number(s): 9735148-9735149,9735151-9735155,9735157 BKG: 9735149			
pH	7.69	7.70	0	4
Batch number: 18215002207B	Sample number(s): 9735150 BKG: 9735150			
pH	7.95	7.93	0	4

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

For Eurofins Lancaster Laboratories Environmental use only
Acct. # 7701 Group # 172515 Sample # 9735146-57

COC # 573002

Client Information

Client: GEI Consultants, Inc.	Acct. #:
Project Name/#: PSEG - Hudson / 1504710	PWSID #:
Project Manager: Jason Kohl	P.O. #:
Sampler: Anthony J. Shields	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☒ No ☐

Matrix: Soil ☐ Sediment ☐ Tissue ☐ | Water ☒ Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: ____

Analysis Requested — Preservation and Filtration Codes

For Lab Use Only
FSC:
SCR#: 229867

Preservation Codes
H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks
3 coolers

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	TDS	Ra 226 + 228 Comb	Metals	Methyl GC	Chloride, Fluoride, Sulfate	pH
MW-1	7-30-18	1130	✓		7	✓	✓	✓		✓	✓
MW-2	7-30-18	1340	✓		7	✓	✓	✓		✓	✓
MW-3	7-31-18	1100	✓		7	✓	✓	✓		✓	✓
MW-4	7-31-18	1215	✓		8	✓	✓	✓	✓	✓	✓
MW-5	7-31-18	1545	✓		7	✓	✓	✓		✓	✓
MW-6	7-31-18	1410	✓		7	✓	✓	✓		✓	✓
MW-7	8-1-18	1245	✓		7	✓	✓	✓		✓	✓
MW-8	8-1-18	1440	✓		7	✓	✓	✓		✓	✓
MW-9	8-1-18	1105	✓		7	✓	✓	✓		✓	✓
FB:20180731	7-31-18	1200	✓		7	✓	✓	✓		✓	✓

Turnaround Time (TAT) Requested (please circle)
Standard Rush
(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days: ____

E-mail address: JKohl@GEIConsultants.com

Data Package Options (circle if required)
Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)
Type III (Reduced non-CLP) NJ DKQP TX TRRP-13
NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Bottle Storage	7-27-18	1600		7-27-18	1600
	8-2-18	1330		8/2/18	1330
	8/2/18	1620			
				8-2-18	1556 1620

EDD Required? Yes No
If yes, format: ____

Site-Specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Temperature upon receipt 0.9 - 1.8

3pm 8/1/18

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Sample Administration Receipt Documentation Log

Doc Log ID: 223144

Group Number(s): 1972515

Client: GEI Consultants

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	08/02/2018 16:20
Number of Packages:	3	Number of Projects:	1
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Wanita Curry (14057) at 17:10 on 08/02/2018

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT146	1.5	DT	Wet	Y	Bagged	N
2	DT146	1.8	DT	Wet	Y	Bagged	N
3	DT146	0.9	DT	Wet	Y	Bagged	N

2425 New Holland Pike
Lancaster, PA 17601-2425

T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

Metals in Liquid Data

Case Narrative/Conformance Summary

Metals in Liquid

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

ICP Metals

Fraction: Metals in Liquid

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9735148	MW-1	X		
9735149	MW-2	X		
9735150	MW-3	X		
9735151	MW-4	X		
9735152	MW-5	X		
9735153	MW-6	X		
9735154	MW-7	X		
9735155	MW-8	X		
9735156	MW-9	X		
9735157	FB-20180731	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

Method Blank

For noncompliant preparation/method blanks, corrective action is not required if the sample is ND or > 10 times the blank concentration, unless otherwise specified in the method or by the client.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

ICP Metals

Fraction: Metals in Liquid

Sample Duplicate

Batch#: 182191404702A (Sample number(s): 9735148-9735157, UNSPK: 9735152, BKG: 9735152)
The duplicate RPD for the following analyte(s) is outside the acceptance window:
Arsenic, Cadmium

SAMPLE ANALYSIS:

Refer to analysis run log for samples requiring dilutions.

The instrument detection limits (IDLs) are used for determining the U flags on the initial and continuing calibration blanks. The highest IDL is selected when multiple instruments are used for an analysis. The method detection limits (MDLs) are used for determining all other U flags.

(Sample number(s): 9735148-9735157: Analysis: 06025)
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: arsenic, lead.

(Sample number(s): 9735148-9735157: Analysis: 07036)
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium,Thallium.

(Sample number(s): 9735148-9735149, 9735155: Analysis: 07022)
An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly.

No other problems were encountered with the analysis of the samples.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

ICP Metals

Fraction: Metals in Liquid

Abbreviation Key

BKG – Background	AF - Cold Vapor Atomic Fluorescence
DUP – Duplicate	U - Below MDL
MS - Matrix Spike	B - Below LOQ
MSD - Matrix Spike Dup	N - Matrix Spike out of specifications
B – Blank	* - Duplicate out of specifications
Q - Laboratory Control Sample	E - Matrix Effects exist as proven by Serial Dilution or Spiked Dilution
Y - Laboratory Control Sample Duplicate	A - Post Digestion Spike
P - ICP Atomic Emission Spectrometer	L - Serial Dilution
MS - ICP Mass Spectrometry	R - Internal Standard Relative Intensity OOS
CV - Cold Vapor	NR - Not Required

Sample Data

Metals in Liquid

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735148 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	4.9			MS
7440-39-3	Barium	693			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1080			P
7440-43-9	Cadmium	0.45	B		MS
7440-70-2	Calcium	396000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	4.1	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	103			P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.7	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	70.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735149 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.52	B		MS
7440-38-2	Arsenic	5.9			MS
7440-39-3	Barium	2270			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	827			P
7440-43-9	Cadmium	0.54	B		MS
7440-70-2	Calcium	442000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	3.1	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	89.1	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	4.1			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	70.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735150 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.7	B		MS
7440-38-2	Arsenic	4.0			MS
7440-39-3	Barium	63.8			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	518			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	41600			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	16.4			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735151, 9735151BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.90	B		MS
7440-38-2	Arsenic	1.8	B		MS
7440-39-3	Barium	119			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1530			P
7440-43-9	Cadmium	0.50	B		MS
7440-70-2	Calcium	164000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	99.4	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	7.6			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence
NR = Not Required

CONCENTRATION QUALIFIERS:
U = Below MDL,
B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735152, 9735152BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	1.2	B		MS
7440-39-3	Barium	184			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	802			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	185000			P
7440-47-3	Chromium	6.6	B		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	44.3	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.38	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735153 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	3.4	B		MS
7440-39-3	Barium	155			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1040			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	160000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	37.1	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.54	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735154 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	3.6	B		MS
7440-39-3	Barium	58.6			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	282			P
7440-43-9	Cadmium	0.20	B		MS
7440-70-2	Calcium	37200			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	7.7			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence
NR = Not Required

CONCENTRATION QUALIFIERS:
U = Below MDL,
B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735155 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	3.2	B		MS
7440-39-3	Barium	95.4			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	281			P
7440-43-9	Cadmium	1.8	B		MS
7440-70-2	Calcium	34000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	4.5	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	6.1			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	70.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735156 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	3.7	B		MS
7440-39-3	Barium	73.1			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	382			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	93900			P
7440-47-3	Chromium	5.5	B		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	7.1			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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_____
_____
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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9735157 % Solids: 0.0
Concentration Units: UG/L Date Received: 08/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.80	B		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.20	B		MS
7440-70-2	Calcium	151	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
_____

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

Quality Control and Calibration Summary Forms

Metals in Liquid

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ45
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Barium	182181404401	9735148
Boron		9735149
Calcium		9735150
Chromium		9735151
Cobalt		9735152
Lithium		9735153
Selenium		9735154
Thallium		9735155
		9735156
		9735157
		*35952BKG
		P21804AB
		P21804AQ

LEGEND:

BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ45
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Antimony	182191404702	9735148
Arsenic		9735149
Beryllium		9735150
Cadmium		9735151
Lead		9735152BKG
Molybdenum		9735152MS
		9735152MSD
		9735152DUP
		9735153
		9735154
		9735155
		9735156
		9735157
		P21904BB
		P21904BQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ45
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Mercury	182180571307	9735148
		9735149
		9735150
		9735151BKG
		9735151MS
		9735151MSD
		9735151DUP
		9735152
		9735153
		9735154
		9735155
		9735156
		9735157
		P21871GB
		P21871GQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

Method: P
Run Name: 1822006T70
Calibration Date(s): 08/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Barium		600.0	604.69	100.8	500.0	513.13	102.6	500.0	502.55	100.5
Boron		600.0	567.35	94.6	500.0	484.56	96.9	500.0	477.49	95.5
Calcium		30000.0	29941.35	99.8	25000.0	24976.82	99.9	25000.0	24373.93	97.5
Chromium		600.0	586.41	97.7	500.0	493.11	98.6	500.0	484.72	96.9
Cobalt		600.0	603.41	100.6	500.0	511.72	102.3	500.0	503.42	100.7
Lithium		600.0	604.33	100.7	500.0	507.53	101.5	500.0	514.32	102.9
Selenium		600.0	599.90	100.0	500.0	509.83	102.0	500.0	500.74	100.1
Thallium		600.0	601.83	100.3	500.0	506.27	101.3	500.0	495.58	99.1

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: P
Run Name: 1822006T70
Calibration Date(s): 08/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium					500.0	503.12	100.6	500.0	477.27	95.5
Boron					500.0	484.60	96.9	500.0	456.05	91.2
Calcium					25000.0	24365.43	97.5	25000.0	23113.24	92.5
Chromium					500.0	487.27	97.5	500.0	464.10	92.8
Cobalt					500.0	506.07	101.2	500.0	484.64	96.9
Lithium					500.0	508.53	101.7	500.0	495.60	99.1
Selenium					500.0	502.12	100.4	500.0	493.21	98.6
Thallium					500.0	500.32	100.1	500.0	476.18	95.2

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: P
Run Name: 1823208T70
Calibration Date(s): 08/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium										
Thallium		600.0	620.60	103.4	500.0	502.52	100.5	500.0	502.97	100.6

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: P
Run Name: 1823208T70
Calibration Date(s): 08/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium										
Thallium					500.0	493.46	98.7	500.0	506.40	101.3

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: MS
Run Name: 1824001E03
Calibration Date(s): 08/28/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony										
Arsenic	75	500.0	522.10	104.4	250.0	250.90	100.4	250.0	264.90	106.0
Beryllium	9	50.0	53.38	106.8	25.0	25.53	102.1	25.0	30.56	122.2*
Cadmium	111	50.0	51.29	102.6	25.0	26.23	104.9	25.0	25.53	102.1
Lead	208	50.0	50.90	101.8	25.0	25.35	101.4	25.0	25.61	102.4
Molybdenum	98	50.0	51.54	103.1	25.0	26.07	104.3	25.0	24.92	99.7

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: MS
Run Name: 1824001E03
Calibration Date(s): 08/28/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony										
Arsenic	75				250.0	256.40	102.6			
Beryllium	9				25.0	29.03	116.1*			
Cadmium	111				25.0	24.98	99.9			
Lead	208				25.0	25.66	102.6			
Molybdenum	98				25.0	25.33	101.3			

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: MS
Run Name: 1824211E05
Calibration Date(s): 08/30/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121	50.0	52.03	104.1	25.0	26.22	104.9	25.0	26.97	107.9
Arsenic										
Beryllium	9	50.0	52.92	105.8	25.0	25.92	103.7	25.0	26.72	106.9
Cadmium										
Lead										
Molybdenum										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: MS
Run Name: 1824211E05
Calibration Date(s): 08/30/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121				25.0	25.40	101.6			
Arsenic										
Beryllium										
Cadmium										
Lead										
Molybdenum										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018
Concentration Units: UG/L

		Initial Calibration			Continuing Calibration					
Analyte	Mass	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury		2.5	2.46	98.4	1.0	0.96	96.0	1.0	0.91	91.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.94	94.0	1.0	0.94	94.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.94	94.0	1.0	0.94	94.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ45

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.90	90.0	1.0	0.94	94.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.93	93.0			

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1822006T70
Calibration Date(s): 08/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium		10.0	10.04	100.4		
Boron		100.0	92.94	92.9		
Calcium		1000.0	1021.63	102.2		
Chromium		30.0	31.23	104.1		
Cobalt		10.0	9.73	97.3		
Lithium		100.0	102.41	102.4		
Selenium		100.0	100.01	100.0		
Thallium		60.0	68.83	114.7		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1823208T70
Calibration Date(s): 08/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium						
Boron						
Calcium						
Chromium						
Cobalt						
Lithium						
Selenium						
Thallium		60.0	66.37	110.6		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Run Name: 1824001E03
Calibration Date(s): 08/28/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony						
Arsenic	75	4.0	4.10	102.5		
Beryllium	9	1.0	1.10	110.0		
Cadmium	111	2.0	1.96	98.0		
Lead	208	6.0	5.93	98.8		
Molybdenum	98	4.0	3.68	92.0		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Run Name: 1824211E05
Calibration Date(s): 08/30/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony	121	4.0	3.77	94.3		
Arsenic						
Beryllium	9	1.0	0.93	93.0		
Cadmium						
Lead						
Molybdenum						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ45

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018
Concentration Units: UG/L

			Initial		Final	
Analyte	Mass	True	Found	%R	Found	%R
Mercury		0.2	0.20	100.0		

Control limits: 50% - 150%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: P
Run Name: 1822006T70
Calibration Date(s): 08/08/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)							Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium		0.33	U	0.33	U	0.33	U	0.33	U		1.000	U	182181404401
Boron		8.4	U	8.4	U	8.4	U	8.4	U		12.000	U	182181404401
Calcium		33.4	U	33.4	U	33.4	U	33.4	U		33.000	U	182181404401
Chromium		0.96	U	0.96	U	1.3	B	0.96	U		5.300	U	182181404401
Cobalt		-0.78	B	0.53	U	-0.69	B	0.53	U		1.500	U	182181404401
Lithium		9.6	U	9.6	U	9.6	U	9.6	U		11.000	U	182181404401
Selenium		8.4	U	8.4	U	8.4	U	8.4	U		21.000	U	182181404401
Thallium		6.7	U	6.7	U	6.7	U	6.7	U		14.000	U	182181404401

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: P
Run Name: 1822006T70
Calibration Date(s): 08/08/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium				0.33	U								
Boron				8.4	U								
Calcium				33.4	U								
Chromium				0.96	U								
Cobalt				-0.74	B								
Lithium				9.6	U								
Selenium				8.4	U								
Thallium				6.7	U								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: P
Run Name: 1823208T70
Calibration Date(s): 08/20/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron													
Calcium													
Chromium													
Cobalt													
Lithium													
Selenium													
Thallium		6.7	U	-10.8	B	9.7	B	6.7	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: P
Run Name: 1823208T70
Calibration Date(s): 08/20/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron													
Calcium													
Chromium													
Cobalt													
Lithium													
Selenium													
Thallium				6.7	U								

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: MS
Run Name: 1824001E03
Calibration Date(s): 08/28/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony													
Arsenic	75	0.40	U	0.54	B	0.58	B	0.67	B	75	0.680	U	182191404702A
Beryllium	9	0.067	U	0.067	U	0.067	U	0.067	B				
Cadmium	111	0.14	B	0.22	B	0.22	B	0.14	U	111	0.150	U	182191404702A
Lead	208	0.20	U	0.24	B	0.20	U	0.20	U	208	1.100	U	182191404702A
Molybdenum	98	0.25	U	0.75	B	0.25	U	0.25	U	98	0.310	U	182191404702A

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: MS
Run Name: 1824211E05
Calibration Date(s): 08/30/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121	0.52	U	0.52	U	0.52	U	0.52	U	121	0.410	U	182191404702A
Arsenic													
Beryllium	9	0.067	U	0.096	B	0.067	U			9	0.100	B	182191404702A
Cadmium													
Lead													
Molybdenum													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury		0.050	U	0.050	U	0.050	U	0.050	U		0.050	U	182180571307

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U	0.050	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ45

Method: CV
Run Name: 1822102M07
Calibration Date(s): 08/09/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U	0.050	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ45

Instrument ID: 11016
Run Name: 1822006T70
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		485069	97.0						
Barium	0		1							
Boron	0		-21							
Calcium	500000		504236	100.8						
Chromium	0		0							
Cobalt	0		-1							
Iron	200000		200946	100.5						
Lithium	0		-1							
Magnesium	500000		536335	107.3						
Selenium	0		-5							
Thallium	0		19							

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ45

Instrument ID: 11016
Run Name: 1823208T70
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		475510	95.1						
Barium										
Boron										
Calcium	500000		508165	101.6						
Chromium										
Cobalt										
Iron	200000		200298	100.1						
Lithium										
Magnesium	500000		512773	102.6						
Selenium										
Thallium	0		3							

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ45

Instrument ID: 11332
Run Name: 1824001E03
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		107700	107.7		
Antimony							
Arsenic	75	0		1			
Beryllium	9	0		0			
Cadmium	111	0		0			
Calcium	44	300000		315000	105.0		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		282300	112.9		
Lead	208	0		1			
Magnesium	24	100000		103600	103.6		
Molybdenum	98	2000		2367	118.4		
Phosphorus	31	10000		NA			
Potassium	39	100000		114400	114.4		
Sodium	23	250000		252400	101.0		
Sulfur	34	10000		NA			
Titanium	47	2000		2275	113.8		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ45

Instrument ID: 19204
Run Name: 1824211E05
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		96328	96.3		
Antimony	121	0		1			
Arsenic							
Beryllium	9	0		0			
Cadmium							
Calcium	44	300000		281767	93.9		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		251290	100.5		
Lead							
Magnesium	24	100000		99733	99.7		
Molybdenum	98	2000		2063	103.2		
Phosphorus	31	10000		NA			
Potassium	39	100000		96303	96.3		
Sodium	23	250000		238391	95.4		
Sulfur	34	10000		NA			
Titanium	47	2000		2163	108.2		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9735151BKG Matrix Spike Lab Sample ID: 9735151MS Matrix Spike Duplicate Lab Sample ID: 9735151MSD
Batch Number(s): 182180571307

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Mercury		0.0500	U	0.9344		0.9503		1.0000	1.0000	UG/L	93		95		2		75 - 125	20	CV

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9735152BKG Matrix Spike Lab Sample ID: 9735152MS Matrix Spike Duplicate Lab Sample ID: 9735152MSD
Batch Number(s): 182191404702

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Antimony	121	0.4060	U	6.1870		7.2050		6.0000	6.0000	UG/L	103		120		15		75 - 125	20	MS
Arsenic	75	1.2380	B	12.6100		12.2000		10.0000	10.0000	UG/L	114		110		3		75 - 125	20	MS
Beryllium	9	0.0910	U	4.4080		4.5120		4.0000	4.0000	UG/L	110		113		2		75 - 125	20	MS
Cadmium	111	0.1510	U	4.7680		4.4550		5.0000	5.0000	UG/L	95		89		7		75 - 125	20	MS
Lead	208	1.0700	U	15.3500		15.4500		15.0000	15.0000	UG/L	102		103		1		75 - 125	20	MS
Molybdenum	98	0.3793	B	53.5800		51.6500		50.0000	50.0000	UG/L	106		103		4		75 - 125	20	MS

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9735151BKG Duplicate Lab Sample ID: 9735151DUP
Batch Number(s): 182180571307
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury			0.0500	U	0.0500	U			CV

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	FLAGS:
AF = Cold Vapor Atomic Fluorescence	* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9735152BKG Duplicate Lab Sample ID: 9735152DUP
Batch Number(s): 182191404702
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony	121		0.4060	U	0.4060	U			MS
Arsenic	75		1.2380	B	2.6480	B	73		MS
Beryllium	9		0.0910	U	0.0910	U			MS
Cadmium	111		0.1510	U	0.2098	B	200		MS
Lead	208		1.0700	U	1.0700	U			MS
Molybdenum	98		0.3793	B	0.3850	B	1		MS

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 7
LABORATORY CONTROL SAMPLE
SDG No.: GEJ45
Matrix: WATER

Analyte	Mass	Batch Number	Units	True	Found	C	Control Limits (%)	%R	M	In Spec
Antimony	121	182191404702	UG/L	6.000	6.941		80 - 120	116	MS	Yes
Arsenic	75	182191404702	UG/L	10.000	10.080		80 - 120	101	MS	Yes
Barium		182181404401	UG/L	2000.000	2089.950		80 - 120	104	P	Yes
Beryllium	9	182191404702	UG/L	4.000	4.282		80 - 120	107	MS	Yes
Boron		182181404401	UG/L	2000.000	1877.790		80 - 120	94	P	Yes
Cadmium	111	182191404702	UG/L	5.000	4.970		84 - 120	99	MS	Yes
Calcium		182181404401	UG/L	4000.000	4185.040		80 - 120	105	P	Yes
Chromium		182181404401	UG/L	200.000	207.890		80 - 120	104	P	Yes
Cobalt		182181404401	UG/L	500.000	547.870		80 - 120	110	P	Yes
Lead	208	182191404702	UG/L	15.000	15.010		90 - 110	100	MS	Yes
Lithium		182181404401	UG/L	1000.000	1077.490		80 - 120	108	P	Yes
Mercury		182180571307	UG/L	1.000	0.938		80 - 120	94	CV	Yes
Molybdenum	98	182191404702	UG/L	50.000	50.960		80 - 120	102	MS	Yes
Selenium		182181404401	UG/L	150.000	156.320		80 - 120	104	P	Yes
Thallium		182181404401	UG/L	150.000	161.250		80 - 120	108	P	Yes

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: *35952BKG Serial Dilution Lab Sample ID: *35952L
Batch Number(s): 182181404401
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Barium		150.4300		147.5000		2		P
Boron		466.8200		501.4500		7		P
Calcium		129876.9800		125083.2000		4		P
Chromium		5.3000	U	26.5000	U			P
Cobalt		1.5000	U	7.5000	U			P
Lithium		46.6600	B	55.0000	U	100		P
Selenium		21.0000	U	105.0000	U			P
Thallium		14.0000	U	70.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ45
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9735152BKG Serial Dilution Lab Sample ID: 9735152L
Batch Number(s): 182191404702
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Antimony	121	0.4060	U	2.0300	U			MS
Arsenic	75	1.2380	B	4.3655	B	253		MS
Beryllium	9	0.0910	U	0.4550	U			MS
Cadmium	111	0.1510	U	0.7550	U			MS
Lead	208	1.0700	U	5.3500	U			MS
Molybdenum	98	0.3793	B	1.5450	U	100		MS

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

Method: P
Instrument ID: 11016
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium	455.40		0.33
Boron	249.67		8.4
Calcium	317.93		33.4
Chromium	267.72		0.96
Cobalt	228.62		0.53
Lithium	670.78		9.6
Selenium	196.09		8.4
Thallium	190.86		6.7

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Instrument ID: 11332
Date: 07/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony			
Arsenic	75		0.40
Beryllium	9		0.018
Cadmium	111		0.14
Lead	208		0.20
Molybdenum	98		0.25

Comments:

_____
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_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Instrument ID: 19204
Date: 07/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony	121		0.52
Arsenic			
Beryllium	9		0.067
Cadmium			
Lead			
Molybdenum			

Comments:

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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Instrument ID: 17384
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Mercury	254.00		0.050

Comments:

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_____
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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ45
Matrix: WATER

Method: P
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium	455.40		10.0	1.0
Boron	249.67		100	12.0
Calcium	317.93		1000	33.0
Chromium	267.72		30.0	5.3
Cobalt	228.62		10.0	1.5
Lithium	670.78		100	11.0
Selenium	196.09		100	21.0
Thallium	190.86		60.0	14.0

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ45
Matrix: WATER

Method: MS
Date: 07/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony	121		4.0	0.41
Arsenic	75		4.0	0.68
Beryllium	9		1.0	0.091
Cadmium	111		2.0	0.15
Lead	208		6.0	1.1
Molybdenum	98		4.0	0.31

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ45
Matrix: WATER

Method: CV
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Mercury	254.00		0.20	0.050

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 15
ICP-MS TUNE
SDG No.: GEJ45
Matrix: WATER

Instrument ID: 11332
Date: 08/27/2018

Analyte	Mass	Avg. Measured Mass (amu)	Avg. Peak Width at 5% Peak Height (amu)	%RSD
Lithium	6.000	6.10	0.65	2.7
Magnesium	24.000	24.00	0.65	2.7
Rhodium	103.000	103.00	0.60	2.2
Indium	115.000	115.00	0.60	1.5
Cerium	140.000	140.00	0.60	2.8
Lead	208.000	208.05	0.65	2.8
Uranium	238.000	238.10	0.70	2.0

Comments:

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_____
_____
_____

Tune Report

Batch Folder D:\Agilent\ICPMH\1\DATA\~EPATUNEaa.b
Report Comment ICP-MS #19204 (E05) Daily Tune Check
Instrument Name G3281A JP12071581

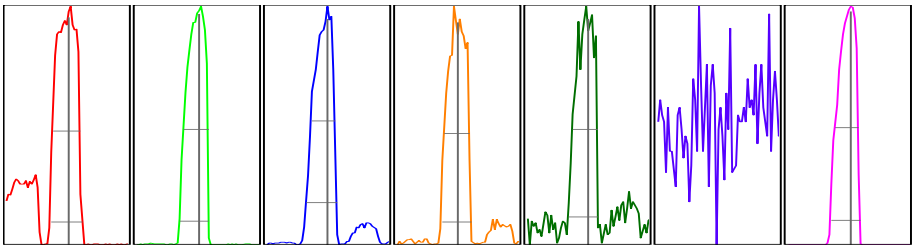
[No Gas]

Mass	Range	Count (Actual)	Response (Actual) [cps/ug/l]	Response (Required) [cps/ug/l]	Response (Flag)	Resp Ratio (Actual)	Resp Ratio (Required)	Resp Ratio (Flag)
7		2123	21234.43	2000.00		0.04	-	
89		6062	60623.02	6000.00		0.13	-	
205		2404	24041.52	3000.00		0.05	-	
70		596	5960.56	0.00		0.01	0 - 0.015	
156		169	1692.12	0.00		0.00	0 - 0.03	
220		45	451.03	0.00		0.00	-	
140		47827	478268.34	0.00		1.00	1 - 1	

Mass	RSD% (Actual)	RSD% (Required)	RSD% (Flag)	Background (Actual)	Background (Required)	Background (Flag)
7	2.15	5.00				
89	2.10	5.00				
205	3.14	5.00				
70	6.21					
156	5.45					
220	31.95					
140	2.53					

Mass	Replicate 1 Count	Replicate 2 Count	Replicate 3 Count	Replicate 4 Count	Replicate 5 Count
7	2086	2091	2145	2194	2101
89	5840	6159	6110	6076	6126
205	2339	2393	2366	2389	2534
70	546	572	614	610	639
156	162	182	160	174	169
220	36	37	55	33	66
140	46011	47512	47860	48501	49250

Integration Time [sec] 0.1



Mass	Peak Height	Axis (Actual)	Axis (Required)	Axis (Flag)	W-50%	W-X% (Actual)	W-X% (Required)	W-X% (Flag)
7	325.22	7.05	6.9 - 7.1		0.67	0.773	0.800	
89	1064.93	89.05	88.9 - 89.1		0.60	0.700	0.800	
205	425.90	205.00	204.9 - 205.1		0.56	0.733	0.800	
70	101.33	70.00	-		0.62	0.733		
156	28.28	156.00	-		0.59	0.719		
220	NaN	NaN	-		NaN	NaN		
140	8744.86	140.05	-		0.56	0.720		

X = 10 **Integration Time [sec]** 0.1 **Acquisition Time [sec]** 260.3 **Y Axis** Linear

Tune Parameters
Plasma Paramters

RF Power	1600 W	Carrier Gas	0.25 L/min	S/C Temp	20 ℃
RF Matching	1.60 V	Option Gas	0.0 %	Makeup/Dilution Gas	0.70 L/min
Smpl Depth	10.0 mm	Nebulizer Pump	0.10 rps	Gas Switch	Dilution Gas

Lenses Parameters

Tune Report

Extract 1	0.0 V	Omega Lens	8.0 V	Deflect	13.2 V				
Extract 2	-170.0 V	Cell Entrance	-30 V	Plate Bias	-40 V				
Mass	**Peak Height**	**Axis (Actual)**	**Axis (Required)**	**Axis (Flag)**	**W-50%**	**W-X% (Actual)**	**W-X% (Required)**	**W-X% (Flag)**	
Omega Bias	-90 V	Cell Exit	-50 V						

Cell Parameters

OctP Bias	-8.0 V	He Flow	0.0 mL/min	Energy Discrimination	5.0 V
OctP RF	190 V	H2 Flow	0.0 mL/min		
Use Gas	false	3rd Gas Flow	0 %		

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ45

Instrument ID: 11332
Run Name: 1824001E03

Start Date: 08/28/2018
End Date: 08/28/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-2-209	PB	IN-2-115	AS,CD,MO
SC-1-45	BE		

Lab Sample ID	Time	Internal Standards %RI For:													
		Element SC-1-45	Q	Element IN-2-115	Q	Element BI-2-209	Q	Element	Q	Element	Q	Element	Q	Element	Q
S0	00:38	100		100		100									
S	00:40	102		99		103									
ICV	00:43	99		106		111									
ICB	00:45	98		109		114									
LLC	00:47	98		110		117									
ICSA	00:50	92		103		104									
LRS2	00:52	95		99		105									
LRS3	00:54	98		102		109									
CCS	00:56	94		106		109									
CCS	00:59	94		108		113									
CCV	01:01	96		108		114									
CCB	01:04	98		108		112									
P21904BB	01:06	95		107		115									
P21904BQ	01:09	96		104		111									
9735152BKG	01:11	95		98		95									
9735152A	01:13			102		99									
9735152DUP	01:15	106		98		94									
9735152MS	01:18			97		92									
9735152MSD	01:20			100		92									
9735152L	01:23	115		111		106									
9735148	01:25	98		89		80									
CCV	01:27	115		116		117									
CCB	01:30	114		113		113									
9735149	01:32	97		86		79									
9735150	01:34	113		108		104									
9735151	01:36	100		90		81									
9735153	01:39	109		103		95									
9735154	01:41	115		110		110									
9735155	01:43	111		111		107									
9735156	01:46	117		110		106									
9735157	01:48	117		110		114									
ZZZZZZ	01:50														

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ45

Instrument ID: 11332
Run Name: 1824001E03

Start Date: 08/28/2018
End Date: 08/28/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-2-209	PB	IN-2-115	AS,CD,MO
SC-1-45	BE		

Lab Sample ID	Time	Internal Standards %RI For:													
		Element SC-1-45	Q	Element IN-2-115	Q	Element BI-2-209	Q	Element	Q	Element	Q	Element	Q	Element	Q
CCV	01:53	116		112		113									
CCB	01:55	102		111		110									

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ45

Instrument ID: 19204
Run Name: 1824211E05

Start Date: 08/30/2018
End Date: 08/30/2018

Standard	Elements Applies to	Standard	Elements Applies to
IN-1-115	SB	SC-2-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-2-45	Q	Element IN-1-115	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
S0	21:11	100		100											
S	21:14	102		101											
ICV	21:17	100		107											
ICB	21:20	103		102											
LLC	21:23	103		103											
ICSA	21:25	96		93											
LRS2	21:28	99		95											
LRS3	21:31	98		99											
CCS	21:34	97		100											
CCS	21:37	97		99											
CCV	21:40	98		95											
CCB	21:43	99		97											
P21904BB	21:45	99		96											
P21904BQ	21:48	102		107											
9735152BKG	21:51			96											
9735152A	21:54	98		95											
9735152DUP	21:57			96											
9735152MS	21:59	100		94											
9735152MSD	22:02	95		89											
9735152L	22:05			97											
9735148	22:08			93											
CCV	22:11	101		102											
CCB	22:14	103		102											
9735149	22:16			92											
9735150	22:19			104											
9735151	22:22			93											
9735153	22:25			96											
9735154	22:28			104											
9735155	22:31			100											
9735156	22:33			102											
9735157	22:36			105											
ZZZZZZ	22:39														

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ45

Instrument ID: 19204
Run Name: 1824211E05

Start Date: 08/30/2018
End Date: 08/30/2018

Standard	Elements Applies to	Standard	Elements Applies to
IN-1-115	SB	SC-2-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-2-45	Q	Element IN-1-115	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
CCV	22:42	107		100											
CCB	22:45	105		115											

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

Preparation and Run Logs

Metals in Liquid

Method: P
Batch Number: 182181404401

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9735148	08/08/2018	50.00	50
9735149	08/08/2018	50.00	50
9735150	08/08/2018	50.00	50
9735151	08/08/2018	50.00	50
9735152	08/08/2018	50.00	50
9735153	08/08/2018	50.00	50
9735154	08/08/2018	50.00	50
9735155	08/08/2018	50.00	50
9735156	08/08/2018	50.00	50
9735157	08/08/2018	50.00	50
*35952BKG	08/08/2018	50.00	50
P21804AB	08/08/2018	50.00	50
P21804AQ	08/08/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: MS
Batch Number: 182191404702

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9735148	08/08/2018	50.00	50
9735149	08/08/2018	50.00	50
9735150	08/08/2018	50.00	50
9735151	08/08/2018	25.00	25
9735153	08/08/2018	50.00	50
9735154	08/08/2018	50.00	50
9735155	08/08/2018	50.00	50
9735156	08/08/2018	50.00	50
9735157	08/08/2018	50.00	50
9735152BKG	08/08/2018	25.00	25
9735152DUP	08/08/2018	25.00	25
9735152MSD	08/08/2018	25.00	25
9735152MS	08/08/2018	25.00	25
P21904BB	08/08/2018	50.00	50
P21904BQ	08/08/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: CV
Batch Number: 182180571307

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9735148	08/09/2018	40.00	40
9735149	08/09/2018	40.00	40
9735150	08/09/2018	40.00	40
9735152	08/09/2018	40.00	40
9735153	08/09/2018	40.00	40
9735154	08/09/2018	40.00	40
9735155	08/09/2018	40.00	40
9735156	08/09/2018	40.00	40
9735157	08/09/2018	40.00	40
9735151BKG	08/09/2018	40.00	40
9735151DUP	08/09/2018	40.00	40
9735151MSD	08/09/2018	40.00	40
9735151MS	08/09/2018	40.00	40
P21871GB	08/09/2018	40.00	40
P21871GQ	08/09/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: P
Instrument ID: 11016
Run Name: 1822006T70

Run Start Date: 08/08/2018
Run End Date: 08/08/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: P
Instrument ID: 11016
Run Name: 1822006T70

Run Start Date: 08/08/2018
Run End Date: 08/08/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
CCV	1.00	15:35			X		X		X	X	X		X			X	X																								
CCB	1.00	15:38			X		X		X	X	X		X			X	X																								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: P
Instrument ID: 11016
Run Name: 1823208T70

Run Start Date: 08/20/2018
Run End Date: 08/20/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: MS
Instrument ID: 11332
Run Name: 1824001E03

Run Start Date: 08/28/2018
Run End Date: 08/28/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: MS
Instrument ID: 19204
Run Name: 1824211E05

Run Start Date: 08/30/2018
Run End Date: 08/30/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: CV
Instrument ID: 17384
Run Name: 1822102M07

Run Start Date: 08/09/2018
Run End Date: 08/09/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: CV
Instrument ID: 17384
Run Name: 1822102M07

Run Start Date: 08/09/2018
Run End Date: 08/09/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ45

Method: CV
Instrument ID: 17384
Run Name: 1822102M07

Run Start Date: 08/09/2018
Run End Date: 08/09/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
9735151MSD	1.00	12:52												X																											
9735148	1.00	12:54												X																											
9735149	1.00	12:56												X																											
9735150	1.00	12:58												X																											
9735152	1.00	13:01												X																											
9735153	1.00	13:03												X																											
9735154	1.00	13:05												X																											
CCV	1.00	13:07												X																											
CCB	1.00	13:09												X																											
9735155	1.00	13:12												X																											
9735156	1.00	13:14												X																											
9735157	1.00	13:16												X																											
ZZZZZZ	1.00	13:18																																							
ZZZZZZ	1.00	13:20																																							
ZZZZZZ	1.00	13:22																																							
ZZZZZZ	1.00	13:24																																							
ZZZZZZ	1.00	13:26																																							
ZZZZZZ	1.00	13:28																																							
ZZZZZZ	1.00	13:30																																							
CCV	1.00	13:33												X																											
CCB	1.00	13:35												X																											

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- A = Post Digest Spike
- L = Serial Dilution
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

Instrumental Wet Chemistry Data

Case Narrative/Conformance Summary

Instrumental Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

Sample #	Client ID	Matrix Liquid	Solid	Comments
9735148	MW-1	X		
9735149	MW-2	X		
9735150	MW-3	X		
9735151	MW-4	X		
9735152	MW-5	X		
9735153	MW-6	X		
9735154	MW-7	X		
9735155	MW-8	X		
9735156	MW-9	X		
9735157	FB-20180731	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Matrix QC may not be included if site-specific QC were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, laboratory spike data (LCS) are provided.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

SAMPLE ANALYSIS:

Samples	Chloride	Fluoride	Sulfate
9735148	DF2000	DF5	DF5
9735149	DF5000	DF5	DF5
9735150	DF500	DF5	DF10
9735151	DF5000	DF5	DF500
9735152	DF500	DF5	DF5
9735153	DF500	DF5	DF5
9735154	DF50	DF5	DF5
9735155	DF500	DF5	DF5
9735156	DF500	DF5	DF5
9735157	DF1	DF1	DF1

No problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

Quality Control and Calibration Summary Forms

Instrumental Wet Chemistry

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Quality Control Reference List
Instrumental Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

Fraction: Instrumental Wet Chemistry

Batch Number	Sample Number	Analysis Date	Chloride	Fluoride	Sulfate
18215120112A	9735149	08/03/2018 18:22:00		X	X
	9735149	08/03/2018 18:57:00	X		
	P21520LB	08/03/2018 13:44:00	X	X	X
	P21520LQ	08/06/2018 14:57:00	X	X	X
18215120117A	9735148	08/06/2018 17:14:00		X	X
	P21520QB	08/03/2018 09:59:00		X	X
	P21520QQ	08/03/2018 09:42:00		X	X
18218120117A	9735148	08/13/2018 14:27:00	X		
	9735150	08/06/2018 20:05:00		X	
	9735150	08/06/2018 20:22:00	X		
	9735150	08/09/2018 18:36:00			X
	9735151	08/06/2018 20:56:00		X	
	9735151	08/06/2018 21:13:00			X
	9735151	08/06/2018 21:30:00	X		
	9735152	08/06/2018 21:47:00		X	X
	9735152	08/06/2018 22:38:00	X		
	9735153	08/06/2018 23:12:00		X	X
	9735153	08/06/2018 23:30:00	X		
	9735154	08/07/2018 00:04:00		X	X
	9735154	08/07/2018 00:21:00	X		
	9735155	08/07/2018 00:38:00		X	X
	9735155	08/07/2018 00:55:00	X		
	9735156	08/07/2018 02:03:00		X	X
	9735156	08/07/2018 02:20:00	X		
	9735157	08/07/2018 02:55:00	X	X	X
	P21820QB	08/06/2018 14:40:00	X	X	X
	P21820QQ	08/06/2018 14:23:00	X	X	X

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Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: GEJ45
Matrix: LIQUID

Fraction: Instrumental Wet Chemistry

18215120112A / P21520LB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	08/03/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	08/03/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	08/03/18	N.D.	mg/l	0.30	1.0

18215120117A / P21520QB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Fluoride	IC	08/03/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	08/03/18	N.D.	mg/l	0.30	1.0

18218120117A / P21820QB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	08/06/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	08/06/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	08/06/18	N.D.	mg/l	0.30	1.0

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

LCS: P21520LQ	Batch: **18215120112A** (Sample number(s): 9735149)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.93	NA	98	NA	90-110	NA	NA
Fluoride	IC	0.750	0.680	NA	91	NA	90-110	NA	NA
Sulfate	IC	7.50	7.55	NA	101	NA	90-110	NA	NA

LCS: P21520QQ	Batch: **18215120117A** (Sample number(s): 9735148)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Fluoride	IC	0.750	0.787	NA	105	NA	90-110	NA	NA
Sulfate	IC	7.50	7.68	NA	102	NA	90-110	NA	NA

LCS: P21820QQ	Batch: **18218120117A** (Sample number(s): 9735148, 9735150-9735157)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.92	NA	97	NA	90-110	NA	NA
Fluoride	IC	0.750	0.673	NA	90	NA	90-110	NA	NA
Sulfate	IC	7.50	7.55	NA	101	NA	90-110	NA	NA

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LOQ/MDL Summary
Instrumental Water Quality

SDG: GEJ45

Fraction: Instrumental Wet Chemistry

00224: Chloride Analyte Name	Default MDL	Default LOQ	Units
Chloride	0.20	0.40	mg/l

01504: Fluoride Analyte Name	Default MDL	Default LOQ	Units
Fluoride	0.050	0.10	mg/l

00228: Sulfate Analyte Name	Default MDL	Default LOQ	Units
Sulfate	0.30	1.0	mg/l

Wet Chemistry Data

Case Narrative/Conformance Summary

Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

Water Quality

Fraction: Wet Chemistry

Sample #	Client ID	Matrix Liquid	Solid	Comments
9735148	MW-1	X		
9735149	MW-2	X		
9735150	MW-3	X		
9735151	MW-4	X		
9735152	MW-5	X		
9735153	MW-6	X		
9735154	MW-7	X		
9735155	MW-8	X		
9735156	MW-9	X		
9735157	FB-20180731	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

Sample Duplicate

Method defined actions are taken for any failed matrix QC.

Batch#: 18220921201B (Sample number(s): 9735156, UNSPK: 9735156, BKG: 9735156)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Total Dissolved Solids

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

Water Quality

Fraction: Wet Chemistry

SAMPLE ANALYSIS:

Samples	pH	Temperature of pH	Total Dissolved Solids
9735148	DF1	DF1	DF10
9735149	UNSPK,D/ DF1	UNSPK,D/ DF1	DF10
9735150	UNSPK,D/ DF1	UNSPK,D/ DF1	DF1
9735151	DF1	DF1	DF10
9735152	DF1	DF1	DF1
9735153	DF1	DF1	DF1
9735154	DF1	DF1	DF1
9735155	DF1	DF1	DF1
9735156	DF1	DF1	UNSPK,MS,D/ DF1
9735157	DF1	DF1	DF1

No problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

QC Summary

Wet Chemistry

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

Fraction: Wet Chemistry

Analysis	Batch Number	Sample Number	Analysis Date
Total Dissolved Solids	18215921201A	B215871B	08/03/2018 15:47
		L215871Q	08/03/2018 15:47
		9735148	08/03/2018 15:47
		9735149	08/03/2018 15:47
		9735150	08/03/2018 15:47
Total Dissolved Solids	18215921202A	B215872B	08/03/2018 17:02
		L215872Q	08/03/2018 17:02
		9735151	08/03/2018 17:02
		9735152	08/03/2018 17:02
		9735153	08/03/2018 17:02
		9735157	08/03/2018 17:02
Total Dissolved Solids	18220921201A	B220871B	08/08/2018 15:07
		L220871Q	08/08/2018 15:07
		9735154	08/08/2018 15:05
		9735155	08/08/2018 15:05
Total Dissolved Solids	18220921201B	9735156 UNSPK/BKG	08/08/2018 15:06
		9735156 MS,DUP	08/08/2018 15:07

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ45

Fraction: Wet Chemistry

Batch Number	Sample Number	Analysis Date	pH	Temperature of pH
18215002207A	9735148	08/04/2018 13:22:00	X	X
	9735149 BKG	08/04/2018 12:44:00	X	X
	9735149 DUP	08/04/2018 12:50:00	X	X
	9735151	08/04/2018 13:16:00	X	X
	9735152	08/04/2018 13:47:00	X	X
	9735153	08/04/2018 13:41:00	X	X
	9735154	08/04/2018 13:08:00	X	X
	9735155	08/04/2018 13:28:00	X	X
	9735157	08/04/2018 13:12:00	X	X
	P002207Q	08/04/2018 12:38:00	X	
18215002207B	9735150 BKG	08/04/2018 12:56:00	X	X
	9735150 DUP	08/04/2018 13:02:00	X	X
18218004207A	9735156	08/07/2018 13:57:00	X	X
	P004207Q	08/07/2018 13:08:00	X	

Quality Control Summary
Method Blank
Water Quality
SDG: GEJ45
Matrix: LIQUID

Fraction: Wet Chemistry

18215921201A / B215871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	08/03/18	N.D.	mg/l	20.0	60.0

18215921202A / B215872B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	08/03/18	N.D.	mg/l	20.0	60.0

18220921201A / B220871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	08/08/18	N.D.	mg/l	20.0	60.0

Water Quality
Fraction: Wet Chemistry

UNSPK: 9735156 MS: 9735156	Batch: **18220921201A** (Sample number(s): 9735154-9735155) Batch: **18220921201B** (Sample number(s): 9735156)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1600	1340.	2764.	NA	89	NA	62-127	NA	NA

Comments:
(2) The unspiked sample result is greater than four times the spike added.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

BKG: 9735149 DUP: 9735149	Batch: **18215002207A** (Sample number(s): 9735148-9735149, 9735151-9735155, 9735157)				
Parameter	**ME**	**Unspiked Conc Std. Units**	**DUP Conc Std. Units**	**%RPD**	**%RPD Limits**
pH	MTR	7.69	7.7	0	4

BKG: 9735149 DUP: 9735149	Batch: **18215002207A** (Sample number(s): 9735148-9735149, 9735151-9735155, 9735157)				
Parameter	**ME**	**Unspiked Conc Degrees C**	**DUP Conc Degrees C**	**%RPD**	**%RPD Limits**
Temperature of pH	MTR	23.64	23.62	0	5

BKG: 9735150 DUP: 9735150	Batch: **18215002207B** (Sample number(s): 9735150)				
Parameter	**ME**	**Unspiked Conc Std. Units**	**DUP Conc Std. Units**	**%RPD**	**%RPD Limits**
pH	MTR	7.95	7.93	0	4

BKG: 9735150 DUP: 9735150	Batch: **18215002207B** (Sample number(s): 9735150)				
Parameter	**ME**	**Unspiked Conc Degrees C**	**DUP Conc Degrees C**	**%RPD**	**%RPD Limits**
Temperature of pH	MTR	23.57	23.54	0	5

BKG: 9735156 DUP: 9735156	Batch: **18220921201B** (Sample number(s): 9735156)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1340.	1268.	6* (1)	5

Comments:
(1) The sample and/or duplicate result is less than five times the LOQ.
* = Out of Specification

Results are being reported on an as received basis.

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Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ45
Matrix: LIQUID

Water Quality
Fraction: Wet Chemistry

LCS: P002207Q	Batch: **18215002207A** (Sample number(s): 9735148-9735149, 9735151-9735155, 9735157) Batch: **18215002207B** (Sample number(s): 9735150)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	6.99	NA	100	NA	95-105	NA	NA

LCS: L215871Q	Batch: **18215921201A** (Sample number(s): 9735148-9735150)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	197	NA	99	NA	62-127	NA	NA

LCS: L215872Q	Batch: **18215921202A** (Sample number(s): 9735151-9735153, 9735157)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	199	NA	100	NA	62-127	NA	NA

LCS: P004207Q	Batch: **18218004207A** (Sample number(s): 9735156)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.01	NA	100	NA	95-105	NA	NA

LCS: L220871Q	Batch: **18220921201A** (Sample number(s): 9735154-9735155) Batch: **18220921201B** (Sample number(s): 9735156)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	204	NA	102	NA	62-127	NA	NA

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LOQ/MDL Summary
Water Quality

SDG: GEJ45

Fraction: Wet Chemistry

12152: pH Analyte Name	Default MDL	Default LOQ	Units
pH	0.010	0.010	Std. Units

12151: Temperature of pH Analyte Name	Default MDL	Default LOQ	Units
Temperature of pH	0.010	0.010	Degrees C

00212: Total Dissolved Solids Analyte Name	Default MDL	Default LOQ	Units
Total Dissolved Solids	20.0	60.0	mg/l

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
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F 843.766.1178

gel.com

September 05, 2018

Ms. Madeline Ratcliff
Eurofins Lancaster Laboratories Environmental, LLC
2425 New Holland Pike
Lancaster, Pennsylvania 17601

Re: NJ Radiochemistry Analyses
Work Order: 456680

Dear Ms. Ratcliff:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 08, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4289.

Sincerely,

Julie Robinson

Julie Robinson
Project Manager

Purchase Order: GELP15-0603
Chain of Custody: 1972517
Enclosures

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Case Narrative

Receipt Narrative
for
Eurofins Lancaster Laboratories
SDG: 456680

September 05, 2018

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 08, 2018 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

Laboratory ID	Client ID
456680001	MW-1
456680002	MW-2
456680003	MW-3
456680004	MW-4
456680005	MW-5
456680006	MW-6
456680007	MW-7
456680008	MW-8
456680009	MW-9
456680010	FB-20180731

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Julie Robinson
Project Manager

Chain of Custody and Supporting Documentation

eurofins | Lancaster Laboratories Environmental

H56680

Environmental Analysis Request/Chain of Custody

Acct. # _____ Group # 1972517 Sample # 9735159-68

Subcontractor: GEL	
Project Name/#:	Site ID #:
Requestor Madeline Ratcliff	P.O. #: NA
Sampler: AJS	PWSID #:
Phone #: 717-656-2300 Ext 1189	Quote #:
State where samples were collected: ___ NJ	For Compliance: Yes ☐ No ☑

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil ☐ Sediment ☐ Tissue ☐	Water ☑ Potable ☐ Ground ☐ NPDES ☐ Surface ☐	Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1 Mod)	Analyses Requested: Radium-228 (EPA 904.0 mod)
MW-1	7/30/2018	11:30	X			X		2	X	X
MW-2	7/30/2018	13:40	X			X		2	X	X
MW-3	7/31/2018	10:10	X			X		2	X	X
MW-4	7/31/2018	12:15	X			X		2	X	X
MW-5	7/31/2018	15:45	X			X		2	X	X
MW-6	7/31/2018	14:10	X			X		2	X	X
MW-7	8/1/2018	12:45	X			X		2	X	X
MW-8	8/1/2018	14:40	X			X		2	X	X
MW-9	8/1/2018	11:05	X			X		2	X	X
FB-20180731	7/31/2018	12:00	X			X		2	X	X

Preservation and Filtration Codes: None | None

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 P = H_3PO_4
F = Field Filtered O = Other

Remarks
9735159
9735160
9735161
9735162
9735163
9735164
9735165
9735166
9735167
9735168

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: **Preservation Needed – DKQP***

Rush results requested by(please check): E-Mail ☑ Phone ☐

E-mail Address: ENVsubcontracting@EurofinsUS.com

Phone: 717-656-2300 Ext 1189

Data Package Options (please check if required)

Type I (Validation/non-CLP)	☐	MA MCP	☐
Type III (Reduced non-CLP)	☐	CT RCP	☐
Type VI (Raw Data Only)	☐	TX TRRP-13	☐
NJ Reduced	☑	NYSDEC Category	☐ A or ☐ B
Level IV DOD	☐		

EDD Required? Yes ☑ No ☐ If yes, format: _ HazSite

Relinquished by:	Date	Time	Received by:	Date	Time
Cam C Sim	8/1/18	15:24	[illegible]	8/8/18	9:20
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: LANC	SDG/AR/COC/Work Order: 456680
Received By: SLB	Date Received: 8/8/18 JR
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 5035 4244 9038 5035 4244 9016 - 15°c 5035 4244 9027 - 12°c

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*			✓	Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: See above
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR3-17 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: SEE BELOW If Preservation added, Lot#: 180730BP
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

B12
B11
B13
B18

PM (or PMA) review: Initials JMC Date 8/9/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

Laboratory Certifications

List of current GEL Certifications as of 05 September 2018

State	Certification
Alaska	17−018
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122018−1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	9904
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−18−13
Utah NELAP	SC000122018−26
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Eurofins Lancaster Laboratories (LANC)
SDG #: 456680

Product: **GFPC, Ra228, Liquid**
Analytical Method: EPA 904.0/SW846 9320 Modified
Analytical Procedure: GL-RAD-A-063 REV# 2
Analytical Batch: 1791273

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
456680001	MW-1
456680002	MW-2
456680003	MW-3
456680004	MW-4
456680005	MW-5
456680006	MW-6
456680007	MW-7
456680008	MW-8
456680009	MW-9
456680010	FB-20180731
1204089245	Method Blank (MB)
1204089246	456680008(MW-8) Sample Duplicate (DUP)
1204089247	456680008(MW-8) Matrix Spike (MS)
1204089248	456680008(MW-8) Matrix Spike Duplicate (MSD)
1204089249	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Samples were re-eluted and recounted to verify sample results. The recounts are reported.

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204089247 (MW-8MS) and 1204089248 (MW-8MSD), aliquots were reduced to conserve sample volume.

Product: **Lucas Cell, Ra226, liquid**

Analytical Method: EPA 903.1 Modified
Analytical Procedure: GL-RAD-A-008 REV# 15
Analytical Batch: 1790749

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
456680001	MW-1
456680002	MW-2
456680003	MW-3
456680004	MW-4
456680005	MW-5
1204088003	Method Blank (MB)
1204088004	456752001(NonSDG) Sample Duplicate (DUP)
1204088005	456752001(NonSDG) Matrix Spike (MS)
1204088006	456752001(NonSDG) Matrix Spike Duplicate (MSD)
1204088007	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between MS and MSD
The Matrix Spike and Matrix Spike Duplicate (See Below) do not meet the duplication requirement; however, they both meet the spiked recovery requirement.

Sample	Analyte	Value
1204088005MS and 1204088006MSD (Non SDG 456752001)	Radium-226	RPD 26.1* (0%-20%)

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204088005 (Non SDG 456752001MS) and 1204088006 (Non SDG 456752001MSD), aliquots were reduced to conserve sample volume.

Product: **Lucas Cell, Ra226, liquid**
Analytical Method: EPA 903.1 Modified
Analytical Procedure: GL-RAD-A-008 REV# 15
Analytical Batch: 1790829

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
456680006	MW-6

456680007	MW-7
456680008	MW-8
456680009	MW-9
456680010	FB-20180731
1204088201	Method Blank (MB)
1204088202	456680006(MW-6) Sample Duplicate (DUP)
1204088203	456680006(MW-6) Matrix Spike (MS)
1204088204	456680006(MW-6) Matrix Spike Duplicate (MSD)
1204088205	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Samples were degassed and recounted due to low recovery. The recounts are reported.

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204088203 (MW-6MS) and 1204088204 (MW-6MSD), aliquots were reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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Qualifier Definition Report
for

LANC006 Eurofins Lancaster Laboratories

Client SDG: 456680 GEL Work Order: 456680

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria
** Analyte is a Tracer compound
U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:  **Name: Kate Gellatly**

Date: 05 SEP 2018 **Title: Analyst I**

Sample Data Summary

GEL LABORATORIES LLC
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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-1	Project:	LANC00115
Sample ID:	456680001	Client ID:	LANC006
Matrix:	Water		
Collect Date:	30-JUL-18 11:30		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228		2.40	+/-1.13	1.56	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		1.42	+/-0.414	0.278	1.00	pCi/L			PCW	08/14/18	0930	1790749	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			75.8	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-2	Project:	LANC00115
Sample ID:	456680002	Client ID:	LANC006
Matrix:	Water		
Collect Date:	30-JUL-18 13:40		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228		4.87	+/-1.53	1.91	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		2.71	+/-0.592	0.348	1.00	pCi/L			PCW	08/14/18	0930	1790749	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			75.6	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-3	Project:	LANC00115
Sample ID:	456680003	Client ID:	LANC006
Matrix:	Water		
Collect Date:	31-JUL-18 10:10		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228	U	1.62	+/-1.21	1.90	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226	U	0.384	+/-0.281	0.394	1.00	pCi/L			PCW	08/14/18	0930	1790749	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			69.3	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-4	Project:	LANC00115
Sample ID:	456680004	Client ID:	LANC006
Matrix:	Water		
Collect Date:	31-JUL-18 12:15		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228	U	0.724	+/-1.29	2.25	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		0.813	+/-0.397	0.505	1.00	pCi/L			PCW	08/14/18	0930	1790749	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			67.1	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-5	Project:	LANC00115
Sample ID:	456680005	Client ID:	LANC006
Matrix:	Water		
Collect Date:	31-JUL-18 15:45		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228	U	1.45	+/-0.972	1.48	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		1.06	+/-0.429	0.377	1.00	pCi/L			PCW	08/14/18	1000	1790749	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			83.8	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-6	Project:	LANC00115
Sample ID:	456680006	Client ID:	LANC006
Matrix:	Water		
Collect Date:	31-JUL-18 14:10		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228		2.54	+/-1.11	1.51	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		1.76	+/-0.523	0.508	1.00	pCi/L			PCW	08/21/18	0835	1790829	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			84.4	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-7	Project:	LANC00115
Sample ID:	456680007	Client ID:	LANC006
Matrix:	Water		
Collect Date:	01-AUG-18 12:45		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228	U	0.237	+/-0.742	1.36	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		0.586	+/-0.328	0.320	1.00	pCi/L			PCW	08/21/18	0835	1790829	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			86.5	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	MW-8	Project:	LANC00115
Sample ID:	456680008	Client ID:	LANC006
Matrix:	Water		
Collect Date:	01-AUG-18 14:40		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228	U	0.484	+/-0.782	1.37	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		0.756	+/-0.420	0.534	1.00	pCi/L			PCW	08/21/18	0910	1790829	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			80.3	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company : Eurofins Lancaster Laboratories Environmental, LLC
Address : 2425 New Holland Pike

Lancaster, Pennsylvania 17601
Contact: Ms. Madeline Ratcliff
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-9
Sample ID: 456680009
Matrix: Water
Collect Date: 01-AUG-18 11:05
Receive Date: 08-AUG-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228	U	0.296	+/-0.849	1.54	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226		0.396	+/-0.231	0.233	1.00	pCi/L			PCW	08/21/18	0910	1790829	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			82	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2018

Company :	Eurofins Lancaster Laboratories Environmental, LLC
Address :	2425 New Holland Pike
	Lancaster, Pennsylvania 17601
Contact:	Ms. Madeline Ratcliff
Project:	NJ Radiochemistry Analyses

Client Sample ID:	FB-20180731	Project:	LANC00115
Sample ID:	456680010	Client ID:	LANC006
Matrix:	Water		
Collect Date:	31-JUL-18 12:00		
Receive Date:	08-AUG-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Ra228, Liquid "As Received"													
Radium-228	U	0.0311	+/-0.690	1.33	3.00	pCi/L			JXC9	08/22/18	1447	1791273	1
Rad Radium-226													
Lucas Cell, Ra226, liquid "As Received"													
Radium-226	U	0.0808	+/-0.274	0.541	1.00	pCi/L			PCW	08/21/18	0910	1790829	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			82.2	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

QC Summary

Report Date: September 5, 2018

Eurofins Lancaster Laboratories Environmental, LLC
2425 New Holland Pike
Lancaster, Pennsylvania

Contact: **Ms. Madeline Ratcliff**

Workorder: **456680**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch 1791273											
QC1204089246 456680008 DUP											
Radium-228	U	0.484	U	0.751	pCi/L	N/A		N/A	JXC9	08/22/18	14:52
Uncertainty		+/-0.782		+/-0.870							
QC1204089249 LCS											
Radium-228	17.6			18.2	pCi/L		104	(75%-125%)		08/22/18	14:52
Uncertainty				+/-2.30							
QC1204089245 MB											
Radium-228			U	0.189	pCi/L					08/22/18	14:52
Uncertainty				+/-0.914							
QC1204089247 456680008 MS											
Radium-228	52.9 U	0.484		52.6	pCi/L		99.5	(75%-125%)		08/22/18	14:52
Uncertainty		+/-0.782		+/-6.51							
QC1204089248 456680008 MSD											
Radium-228	52.9 U	0.484		47.1	pCi/L	0	88.9	(0%-20%)		08/22/18	14:52
Uncertainty		+/-0.782		+/-5.56							
Rad Ra-226											
Batch 1790749											
QC1204088004 456752001 DUP											
Radium-226	U	0.250	U	0.287	pCi/L	N/A		N/A	PCW	08/14/18	10:35
Uncertainty		+/-0.212		+/-0.272							
QC1204088007 LCS											
Radium-226	26.0			21.8	pCi/L		84	(75%-125%)		08/14/18	11:05
Uncertainty				+/-1.58							
QC1204088003 MB											
Radium-226			U	0.0664	pCi/L					08/14/18	10:35
Uncertainty				+/-0.260							
QC1204088005 456752001 MS											
Radium-226	130 U	0.250		114	pCi/L		87.6	(75%-125%)		08/14/18	10:35
Uncertainty		+/-0.212		+/-8.03							
QC1204088006 456752001 MSD											
Radium-226	130 U	0.250		148	pCi/L	26.1*	114	(0%-20%)		08/14/18	10:35
Uncertainty		+/-0.212		+/-10.9							

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QC Summary

Workorder: **456680**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Ra-226										
Batch 1790829										
QC1204088202 456680006 DUP										
Radium-226		1.76		2.04	pCi/L	14.5		(0% - 100%)	PCW	08/21/18 09:10
	Uncertainty	+/-0.523		+/-0.608						
QC1204088205 LCS										
Radium-226	26.0			21.6	pCi/L		83.3	(75%-125%)		08/21/18 09:40
	Uncertainty			+/-1.68						
QC1204088201 MB										
Radium-226			U	0.173	pCi/L					08/21/18 09:10
	Uncertainty			+/-0.265						
QC1204088203 456680006 MS										
Radium-226	130	1.76		100	pCi/L		75.7	(75%-125%)		08/21/18 09:40
	Uncertainty	+/-0.523		+/-7.55						
QC1204088204 456680006 MSD										
Radium-226	130	1.76		99.4	pCi/L	0.774	75.1	(0%-20%)		08/21/18 09:40
	Uncertainty	+/-0.523		+/-7.77						

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

**	Analyte is a Tracer compound
<	Result is less than value reported
>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected

QC Summary

Workorder: **456680**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

UI Gamma Spectroscopy--Uncertain identification

UJ Gamma Spectroscopy--Uncertain identification

UL Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.

X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

Y Other specific qualifiers were required to properly define the results. Consult case narrative.

^ RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.

h Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 1791273 Check-list

This check-list was completed on 22-AUG-18 by Nat Long

This batch was reviewed by Nat Long on 22-AUG-18 and Kenshalla Oston on 24-AUG-18.

Batch ID: 1791273

Product: GFC28RAL

Description: Gas Flow Radium 228 GL-RAD-A-009

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium−228 in Liquid

Batch ID: **1791273**
Analyst: Jasmine Conley (JXC9)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL−RAD−A−063 REV# 2
Instrument: GFC−51204863

Due Dates for Lab: 02−SEP−2018 **Package: 04−SEP−2018** **SDG: 06−SEP−2018**

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1204089249	Radium−228 SPIKE	1809−A	.1	mL
MS	1204089247	Radium−228 SPIKE	1809−A	.1	mL
MSD	1204089248	Radium−228 SPIKE	1809−A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Aliquot (mL)	Ac−228 Ingrow (date)	Ac−228 Separation (date)
1	456675001	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
2	456677001	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
3	456677002	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
4	456677003	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
5	456677004	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
6	456680001	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
7	456680002	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
8	456680003	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
9	456680004	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
10	456680005	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
11	456680006	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
12	456680007	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
13	456680008	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
14	456680009	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
15	456680010	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
16	456683001	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
17	456683002	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
18	456683003	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
19	1204089245 MB	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
20	1204089246 DUP (456680008)	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50
21	1204089247 MS (456680008)	13−AUG−2018	3	100	08/16/18 07:52	08/22/18 12:50
22	1204089248 MSD (456680008)	13−AUG−2018	3	100	08/16/18 07:52	08/22/18 12:50
23	1204089249 LCS	13−AUG−2018	3	300	08/16/18 07:52	08/22/18 12:50

Reagent/Solvent Lot ID	Description	Amount
REGNT 2571685.11	2mL Cartridges	2 mL
REGNT 2662331.3	cerium 500 mg/L in 2%HCI	.2 mL
REGNT 2665682	Barium Carrier 228 REG	1 mL
REGNT 2672182	RGF−1.5 Ammonium Sulfate	10 mL
REGNT 2672200.7	Hydrofluoric Acid Poly Bottle	3 mL
REGNT 2769304.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 2805576.10	16M Nitric Acid Poly Coated Bottle	5 mL
REGNT 2817429	2M HCl	20 mL
REGNT 2819500	RGF−50% Potassium Carbonate	2 mL
REGNT 2819965	7M HNO3	25 mL
REGNT 2822290	RGF−1M Citric Acid	5 mL

Comments:

Pipet Id: RAD−GFC−1795419
Data Entry Date2: 13−AUG−2018 00:00

Prep Logbook

#	Sample ID	Prep Date	Min RDL (pCi/L)	Aliquot (mL)	Ac−228 Ingrow (date)	Ac−228 Separation (date)

Reagent/Solvent Lot ID	Description	Amount
WORK 0487−D	Barium−133 TRACER	.1 mL

Comments:

Radium-228 Liquid

Filename : RA228.XLS
File type : Excel
Version # : 1.4.2

Tracer S/N : 0487-D
Tracer Exp Date : 11/8/2018
Tracer Volume Added: 0.10

Batch : 1791273
Analyst : JAS02031
Prep Date : 8/13/2018
Ra-228 Method Uncertainty : 0.1268

Geometry: CeF on 25mm Filter

Procedure Code : GFC28RAL
Parmname : Radium-228
Required MDA : 3 pCi/L
Ra-228 Abundance : 1.00
Halflife of Ra-228 : 5.75 years
Halflife of Ac-228 : 6.15 hours

Sample Characteristics					**Tracer Calculations**					
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	456675001.1	0.3000	1.8459E-05	8/6/2018 8:50	216.3	4.34%	160.6	5.19%	0.1	0.000200
2	456677001.1	0.3000	1.8459E-05	8/3/2018 11:45	216.3	4.34%	169.2	5.02%	0.1	0.000200
3	456677002.1	0.3000	1.8459E-05	8/3/2018 12:35	216.3	4.34%	167.7	5.05%	0.1	0.000200
4	456677003.1	0.3000	1.8459E-05	8/3/2018 11:05	216.3	4.34%	169.9	5.01%	0.1	0.000200
5	456677004.1	0.3000	1.8459E-05	8/3/2018 14:35	216.3	4.34%	159.0	5.22%	0.1	0.000200
6	456680001.1	0.3000	1.8459E-05	7/30/2018 11:30	216.3	4.34%	163.9	5.12%	0.1	0.000200
7	456680002.1	0.3000	1.8459E-05	7/30/2018 13:40	216.3	4.34%	163.6	5.13%	0.1	0.000200
8	456680003.1	0.3000	1.8459E-05	7/31/2018 10:10	216.3	4.34%	150.0	5.41%	0.1	0.000200
9	456680004.1	0.3000	1.8459E-05	7/31/2018 12:15	216.3	4.34%	145.2	5.52%	0.1	0.000200
10	456680005.1	0.3000	1.8459E-05	7/31/2018 15:45	216.3	4.34%	181.3	4.82%	0.1	0.000200
11	456680006.1	0.3000	1.8459E-05	7/31/2018 14:10	216.3	4.34%	182.6	4.80%	0.1	0.000200
12	456680007.1	0.3000	1.8459E-05	8/1/2018 12:45	216.3	4.34%	187.1	4.73%	0.1	0.000200
13	456680008.1	0.3000	1.8459E-05	8/1/2018 14:40	216.3	4.34%	173.6	4.95%	0.1	0.000200
14	456680009.1	0.3000	1.8459E-05	8/1/2018 11:05	216.3	4.34%	177.3	4.88%	0.1	0.000200
15	456680010.1	0.3000	1.8459E-05	7/31/2018 12:00	216.3	4.34%	177.8	4.88%	0.1	0.000200
16	456683001.1	0.3000	1.8459E-05	8/2/2018 11:55	216.3	4.34%	162.0	5.16%	0.1	0.000200
17	456683002.1	0.3000	1.8459E-05	8/2/2018 13:20	216.3	4.34%	173.9	4.94%	0.1	0.000200
18	456683003.1	0.3000	1.8459E-05	8/2/2018 13:40	216.3	4.34%	186.7	4.73%	0.1	0.000200
19	1204089245.1	0.3000	1.8459E-05	8/13/2018 0:00	216.3	4.34%	185.6	4.75%	0.1	0.000200
20	1204089246.1	0.3000	1.8459E-05	8/1/2018 14:40	216.3	4.34%	179.9	4.84%	0.1	0.000200
21	1204089247.1	0.1000	1.1370E-05	8/1/2018 14:40	216.3	4.34%	175.6	4.91%	0.1	0.000200
22	1204089248.1	0.1000	1.1370E-05	8/1/2018 14:40	216.3	4.34%	210.3	4.41%	0.1	0.000200
23	1204089249.1	0.3000	1.8459E-05	8/13/2018 0:00	216.3	4.34%	165.6	5.09%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-063
Instrument SOP: GL-RAD-I-016

Count raw Data

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
1	1A	60	14	47	0.783	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.995	0.802	1.000	1.057	74.2%	3.39%
2	1B	60	5	56	0.933	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.994	0.802	1.000	1.057	78.2%	3.33%
3	1C	60	6	41	0.683	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.994	0.802	1.000	1.057	77.5%	3.34%
4	1D	60	13	85	1.417	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.994	0.802	1.000	1.057	78.5%	3.33%
5	2A	60	6	39	0.650	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.994	0.802	1.000	1.057	73.5%	3.41%
6	2B	60	5	68	1.133	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.992	0.802	1.000	1.057	75.8%	3.37%
7	2D	60	6	118	1.967	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.992	0.802	1.000	1.057	75.6%	3.37%
8	3B	60	8	61	1.017	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.802	1.000	1.057	69.3%	3.48%
9	3C	60	17	65	1.083	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.802	1.000	1.057	67.1%	3.52%
10	3D	60	12	57	0.950	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.802	1.000	1.057	83.8%	3.26%
11	4A	60	7	80	1.333	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.801	1.000	1.057	84.4%	3.25%
12	4B	60	5	36	0.600	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.801	1.000	1.057	86.5%	3.22%
13	4C	60	11	37	0.617	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.801	1.000	1.057	80.3%	3.30%
14	4D	60	11	43	0.717	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.801	1.000	1.057	82.0%	3.28%
15	5A	60	14	31	0.517	8/22/2018 14:47	8/16/2018 7:52	8/22/2018 12:50	0.993	0.801	1.000	1.057	82.2%	3.28%
16	5D	60	11	103	1.717	8/22/2018 14:48	8/16/2018 7:52	8/22/2018 12:50	0.993	0.801	1.000	1.057	74.9%	3.38%
17	6A	60	14	87	1.450	8/22/2018 14:52	8/16/2018 7:52	8/22/2018 12:50	0.993	0.794	1.000	1.057	80.4%	3.30%
18	6B	60	1	77	1.283	8/22/2018 14:52	8/16/2018 7:52	8/22/2018 12:50	0.993	0.794	1.000	1.057	86.3%	3.22%
19	6C	60	8	56	0.933	8/22/2018 14:52	8/16/2018 7:52	8/22/2018 12:50	0.997	0.794	1.000	1.057	85.8%	3.23%
20	7A	60	4	48	0.800	8/22/2018 14:52	8/16/2018 7:52	8/22/2018 12:50	0.993	0.794	1.000	1.057	83.2%	3.26%
21	7B	60	13	317	5.283	8/22/2018 14:52	8/16/2018 7:52	8/22/2018 12:50	0.993	0.794	1.000	1.057	81.2%	3.29%
22	7C	60	3	324	5.400	8/22/2018 14:52	8/16/2018 7:52	8/22/2018 12:50	0.993	0.794	1.000	1.057	97.2%	3.11%
23	7D	60	11	288	4.800	8/22/2018 14:52	8/16/2018 7:52	8/22/2018 12:50	0.997	0.794	1.000	1.057	76.6%	3.36%

Pos.	Calibration Data: Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2017	5/31/2019	0.6430	0.00738	0.514	8/17/2018 17:13	500
2	PIC	6/1/2017	5/31/2019	0.6519	0.00711	0.824	8/17/2018 17:13	500
3	PIC	6/1/2017	5/31/2019	0.6443	0.00847	0.624	8/17/2018 17:14	500
4	PIC	6/1/2017	5/31/2019	0.6504	0.00692	1.138	8/17/2018 17:14	500
5	PIC	6/1/2017	5/31/2019	0.6444	0.01914	0.414	8/17/2018 17:14	500
6	PIC	6/1/2017	5/31/2019	0.6448	0.02111	0.546	8/17/2018 17:14	500
7	PIC	6/1/2017	5/31/2019	0.6283	0.00745	0.808	8/17/2018 17:14	500
8	PIC	6/1/2017	5/31/2019	0.6291	0.01614	0.662	8/17/2018 17:33	500
9	PIC	6/1/2017	5/31/2019	0.6374	0.00988	0.928	8/17/2018 17:14	500
10	PIC	6/1/2017	5/31/2019	0.6255	0.02297	0.570	8/17/2018 17:14	500
11	PIC	6/1/2017	5/31/2019	0.6420	0.01123	0.644	8/17/2018 17:14	500
12	PIC	6/1/2017	5/31/2019	0.6410	0.01519	0.534	8/17/2018 17:14	500
13	PIC	6/1/2017	5/31/2019	0.6608	0.00889	0.488	8/17/2018 17:14	500
14	PIC	6/1/2017	5/31/2019	0.6462	0.00773	0.638	8/17/2018 17:35	500
15	PIC	6/1/2017	5/31/2019	0.6766	0.00851	0.508	8/17/2018 17:15	500
16	PIC	6/1/2017	5/31/2019	0.6669	0.00925	1.446	8/17/2018 17:35	500
17	PIC	6/1/2017	5/31/2019	0.6547	0.02228	0.754	8/17/2018 17:16	500
18	PIC	6/1/2017	5/31/2019	0.6465	0.00851	0.976	8/17/2018 17:16	500
19	PIC	6/1/2017	5/31/2019	0.6594	0.01970	0.880	8/17/2018 17:16	500
20	PIC	6/1/2017	5/31/2019	0.6570	0.00594	0.596	8/17/2018 17:16	500
21	PIC	6/1/2017	5/31/2019	0.6688	0.00627	0.550	8/17/2018 17:16	500
22	PIC	6/1/2017	5/31/2019	0.6600	0.00790	0.400	8/17/2018 17:16	500
23	PIC	6/1/2017	5/31/2019	0.6352	0.01113	0.384	8/17/2018 17:17	500

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

* - RPD changed to 0% due to sample & dup activity below MDA

Spike S/N : 1809-A
Spike Exp Date : 9/15/2018
Spike Activity (dpm/ml): 117.05
Spike Volume Added: 0.10

LCS S/N : 1809-A
LCS Exp Date : 9/15/2018
LCS Activity (dpm/ml): 117.05
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type		RPD	RER	Nominal pCi/L	Recovery
1	0.9514	0.6717	3	1.5518	**1.1227**	44.20%	0.2693	0.1187	0.9696	1.0118		SAMPLE					
2	1.1289	0.7970	3	1.7894	**0.4271**	120.01%	0.1093	0.1312	1.0043	1.0103		SAMPLE					
3	1.0030	0.7081	3	1.6157	**0.2367**	189.49%	0.0593	0.1124	0.8788	0.8809		SAMPLE					
4	1.3245	0.9351	3	2.0652	**1.0869**	57.84%	0.2787	0.1609	1.2300	1.2613		SAMPLE					
5	0.8617	0.6083	3	1.4270	**0.9928**	45.92%	0.2360	0.1080	0.8904	0.9271		SAMPLE					
6	0.9607	0.6783	3	1.5607	**2.3987**	24.39%	0.5873	0.1414	1.1315	1.2925		SAMPLE					
7	1.2017	0.8484	3	1.9069	**4.8660**	16.37%	1.1587	0.1855	1.5265	1.9752		SAMPLE					
8	1.1845	0.8362	3	1.9011	**1.6219**	38.30%	0.3547	0.1352	1.2115	1.2826		SAMPLE					
9	1.4299	1.0095	3	2.2521	**0.7243**	90.92%	0.1553	0.1411	1.2896	1.3031		SAMPLE					
10	0.9147	0.6458	3	1.4819	**1.4462**	34.52%	0.3800	0.1303	0.9718	1.0423		SAMPLE					
11	0.9405	0.6640	3	1.5121	**2.5378**	22.51%	0.6893	0.1533	1.1064	1.2850		SAMPLE					
12	0.8369	0.5909	3	1.3616	**0.2374**	159.44%	0.0660	0.1052	0.7418	0.7444		SAMPLE					
13	0.8366	0.5906	3	1.3694	**0.4840**	82.52%	0.1287	0.1061	0.7822	0.7921		SAMPLE					
14	0.9578	0.6762	3	1.5408	**0.2963**	146.20%	0.0787	0.1150	0.8489	0.8523		SAMPLE					
15	0.8143	0.5749	3	1.3293	**0.0311**	1132.13%	0.0087	0.0981	0.6902	0.6904		SAMPLE					
16	1.5291	1.0796	3	2.3588	**1.0812**	65.67%	0.2707	0.1775	1.3896	1.4173		SAMPLE					
17	1.0570	0.7463	3	1.6837	**2.6614**	23.36%	0.6960	0.1602	1.2009	1.3867		SAMPLE					
18	1.1344	0.8009	3	1.7821	**1.1086**	49.82%	0.3073	0.1528	1.0801	1.1170		SAMPLE					
19	1.0582	0.7471	3	1.6713	**0.1890**	246.76%	0.0533	0.1316	0.9139	0.9152		MB					
20	0.9052	0.6391	3	1.4624	**0.7514**	59.17%	0.2040	0.1205	0.8701	0.8913	456680008.1	DUP		43.3%			
21	2.6258	1.8539	3	4.2638	**52.6458**	7.14%	4.7333	0.2986	6.5092	15.0165	456680008.1	MS				52.9244	99.5%
22	1.8947	1.3377	3	3.1459	**47.0531**	6.83%	5.0000	0.3013	5.5580	13.2808	456680008.1	MSD	*	0.0%		52.9244	88.9%
23	0.8136	0.5744	3	1.3550	**18.2128**	7.34%	4.4160	0.2842	2.2973	5.2306		LCS				17.5753	103.6%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
456675001	1A	60	14	47	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456677001	1B	60	5	56	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456677002	1C	60	6	41	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456677003	1D	60	13	85	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456677004	2A	60	6	39	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680001	2B	60	5	68	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680002	2D	60	6	118	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680003	3B	60	8	61	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680004	3C	60	17	65	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680005	3D	60	12	57	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680006	4A	60	7	80	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680007	4B	60	5	36	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680008	4C	60	11	37	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680009	4D	60	11	43	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456680010	5A	60	14	31	8/22/2018 14:47	8/22/2018 15:47	PIC	1791273
456683001	5D	60	11	103	8/22/2018 14:48	8/22/2018 15:48	PIC	1791273
456683002	6A	60	14	87	8/22/2018 14:52	8/22/2018 15:52	PIC	1791273
456683003	6B	60	1	77	8/22/2018 14:52	8/22/2018 15:52	PIC	1791273
1204089245	6C	60	8	56	8/22/2018 14:52	8/22/2018 15:52	PIC	1791273
1204089246	7A	60	4	48	8/22/2018 14:52	8/22/2018 15:52	PIC	1791273
1204089247	7B	60	13	317	8/22/2018 14:52	8/22/2018 15:52	PIC	1791273
1204089248	7C	60	3	324	8/22/2018 14:52	8/22/2018 15:52	PIC	1791273
1204089249	7D	60	11	288	8/22/2018 14:52	8/22/2018 15:52	PIC	1791273

ASSAY 17-Aug-18 11:44:05

Protocol	id	8	228_REC
Time	limit	180	
Count	limit	50000	
Isotope	Ba-133		
Protocol	date	23-Sep-13	14:18:56
Run	id.	88	

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
1	98	1	180	759	216.3	4.34		11:44:13
2	98	2	180	592	160.6	5.19	74.25	11:47:24
3	98	3	180	618	169.2	5.02	78.22	11:50:36
4	98	4	180	613	167.7	5.05	77.53	11:53:47
5	98	5	180	620	169.9	5.01	78.55	11:56:58
6	51	6	180	587	159	5.22	73.51	12:00:26
7	51	7	180	602	163.9	5.12	75.77	12:03:37
8	51	8	180	601	163.6	5.13	75.64	12:06:49
9	51	9	180	560	150	5.41	69.35	12:10:00
10	51	10	180	546	145.2	5.52	67.13	12:13:11
11	78	11	180	654	181.3	4.82	83.82	12:16:36
12	78	12	180	658	182.6	4.8	84.42	12:19:47
13	78	13	180	671	187.1	4.73	86.50	12:22:59
14	78	14	180	631	173.6	4.95	80.26	12:26:10
15	78	15	180	642	177.3	4.88	81.97	12:29:21
16	81	16	180	644	177.8	4.88	82.20	12:32:45
17	81	17	180	596	162	5.16	74.90	12:35:57
18	81	18	180	632	173.9	4.94	80.40	12:39:08
19	81	19	180	670	186.7	4.73	86.32	12:42:20
20	81	20	180	667	185.6	4.75	85.81	12:45:31
21	88	21	180	650	179.9	4.84	83.17	12:48:56
22	88	22	180	637	175.6	4.91	81.18	12:52:07
23	88	23	180	741	210.3	4.41	97.23	12:55:18
24	88	24	180	607	165.6	5.09	76.56	12:58:30

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 22-Aug-2018

Detectors LB4100 A1 through J4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100B4	Above	Beta bkg	22-Aug 04:54	60	6.767	0.607	2.163	+20.75
LB4100C4	Below	Alpha bkg	22-Aug 04:56	60	0.00E+0	4.08E-6	0.304	-3.00
LB4100C4	Above	Beta bkg	22-Aug 04:56	60	3.867	0.686	2.113	+10.37
LB4100E2	Above	Beta bkg	22-Aug 04:54	60	5.283	0.937	2.376	+15.12
LB4100E2	Below	Beta eff	22-Aug 06:19	5	16241	16310	19260	-3.14
LB4100E2	Above	Beta XTalk	22-Aug 06:19	5	4.93E-4	1.04E-4	4.54E-4	+3.67
LB4100F3	Below	Alpha XTalk	22-Aug 06:54	5	0.273	0.277	0.357	-3.25
LB4100F4	Above	Beta bkg	22-Aug 04:54	60	2.883	-5.38E+0	30.300	-1.61
LB4100F4	Below	Beta eff	22-Aug 06:19	5	33167	33210	34710	-3.17
LB4100G2	Above	Alpha XTalk	22-Aug 06:19	5	0.466	0.256	0.413	+5.05
LB4100G2	Above	Beta bkg	22-Aug 04:54	60	3282	0.414	2.180	+11,147.44
LB4100G2	Above	Beta eff	22-Aug 06:25	5	20153	15140	19980	+3.21
LB4100H2	Above	Beta bkg	22-Aug 06:56	60	2.600	-1.72E+0	4.379	+1.25
LB4100I1	Below	Alpha eff	22-Aug 06:03	5	9615	9671	11370	-3.20
LB4100I1	Below	Beta eff	22-Aug 06:11	5	13908	14210	16190	-3.92
LB4100I2	Below	Alpha eff	22-Aug 06:03	5	12280	12630	14630	-4.05
LB4100I2	Above	Beta bkg	22-Aug 04:54	60	9.517	0.458	2.118	+29.75
LB4100I2	Below	Beta eff	22-Aug 06:11	5	15426	16230	18330	-5.30
LB4100I3	Above	Beta bkg	22-Aug 04:54	60	2.267	-5.60E-1	3.474	+1.20
PIC2C	Above	Beta bkg	22-Aug 05:53	60	0.833	0.109	0.711	+4.21
PIC12A	Above	Alpha bkg	22-Aug 06:52	60	0.333	-1.44E-2	0.356	+2.63

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100B3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC3A	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC6D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

PIC13C Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by K. Buck - Harman

Date 8-22-18

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC **Batch ID: 1791273**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
456675001	SAMPLE	JXC9	PIC1A	AUG-22-18 14:47:26	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456677001	SAMPLE	JXC9	PIC1B	AUG-22-18 14:47:28	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456677002	SAMPLE	JXC9	PIC1C	AUG-22-18 14:47:30	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456677003	SAMPLE	JXC9	PIC1D	AUG-22-18 14:47:32	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456677004	SAMPLE	JXC9	PIC2A	AUG-22-18 14:47:34	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680001	SAMPLE	JXC9	PIC2B	AUG-22-18 14:47:37	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680002	SAMPLE	JXC9	PIC2D	AUG-22-18 14:47:41	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680003	SAMPLE	JXC9	PIC3B	AUG-22-18 14:47:43	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680004	SAMPLE	JXC9	PIC3C	AUG-22-18 14:47:44	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680005	SAMPLE	JXC9	PIC3D	AUG-22-18 14:47:46	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680006	SAMPLE	JXC9	PIC4A	AUG-22-18 14:47:48	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680007	SAMPLE	JXC9	PIC4B	AUG-22-18 14:47:50	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680008	SAMPLE	JXC9	PIC4C	AUG-22-18 14:47:53	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680009	SAMPLE	JXC9	PIC4D	AUG-22-18 14:47:55	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456680010	SAMPLE	JXC9	PIC5A	AUG-22-18 14:47:59	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456683001	SAMPLE	JXC9	PIC5D	AUG-22-18 14:48:02	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204089245	MB	JXC9	PIC6C	AUG-22-18 14:52:31	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204089246	DUP	JXC9	PIC7A	AUG-22-18 14:52:34	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204089247	MS	JXC9	PIC7B	AUG-22-18 14:52:37	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204089248	MSD	JXC9	PIC7C	AUG-22-18 14:52:39	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204089249	LCS	JXC9	PIC7D	AUG-22-18 14:52:41	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456683002	SAMPLE	JXC9	PIC6A	AUG-22-18 14:52:44	DONE	CeF on 25mm Filter	01-JUN-17 00:00
456683003	SAMPLE	JXC9	PIC6B	AUG-22-18 14:52:46	DONE	CeF on 25mm Filter	01-JUN-17 00:00

Lucas Cell Raw Data

Batch 1790749 Check-list

This check-list was completed on 14-AUG-18 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 14-AUG-18 and Elizabeth Krouse on 15-AUG-18.

Batch ID: 1790749

Product: LUC26RAL

Description: Lucas Cell Radium 226 GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?		No	
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Radium-226 Queue Sheet

09-AUG-18

GEL Laboratories, Radiochemistry Division

Batch #: 1790749 Analyst: PCW First Client Due Date: 08/29/2018 Internal Due Date: 08/27/2018

Spike Isotope: Radium-226 Spike Code: 1715D Expiration Date: 12/19/18 Vol: 0.1 End Initial/Degas Date/Time: 8/16/18 1600

LCS Isotope: Radium-226 LCS Code: 1715D Expiration Date: 12/19/18 Vol: 0.1 End LN De-em Date: 8/14/18

Bkg Count Time: 30 (Min) Sample Count Time: 30 (Min) Start Count Date: 8/14/18

Prep Date: 8/16/18 Pipet ID: 27666953 Balance ID: 18150253 Initials: PW Witness: N/A

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Position (Label)	Aliquot (mL or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
456677001-1	FB-20180803	SAMPLE		WATER	1 pCi/L	LANC006	1	500	0629	0930	105	1	4	6
456677002-1	MW-1	SAMPLE		WATER	1 pCi/L	LANC006	2	500	0629	0930	204	2	6	17
456677003-1	MW-2	SAMPLE		WATER	1 pCi/L	LANC006	3	500	0629	0930	308	3	4	49
456677004-1	MW-6	SAMPLE		WATER	1 pCi/L	LANC006	4	500	0629	0930	402	4	5	11
456680001-1	MW-1	SAMPLE		WATER	1 pCi/L	LANC006	5	500	0629	0930	508	5	2	51
456680002-1	MW-2	SAMPLE		WATER	1 pCi/L	LANC006	6	500	0629	0930	606	6	3	89
456680003-1	MW-3	SAMPLE		WATER	1 pCi/L	LANC006	7	500	0629	0930	706	7	4	16
456680004-1	MW-4	SAMPLE		WATER	1 pCi/L	LANC006	8	500	0629	0930	807	8	8	34
456680005-1	MW-5	SAMPLE		WATER	1 pCi/L	LANC006	9	500	0658	1000	107	1	2	29
456732001-1	2018024736 MW-5	SAMPLE		WATER	1 pCi/L	DUPO007	10	500	0658	1000	208	2	6	73
456732002-1	2018024737 MW-4	SAMPLE		WATER	1 pCi/L	DUPO007	11	500	0658	1000	302	3	5	52
456732003-1	2018024738 MW-52	SAMPLE		WATER	1 pCi/L	DUPO007	12	500	0658	1000	408	4	8	61
456732004-1	2018024739 MW-55D	SAMPLE		WATER	1 pCi/L	DUPO007	13	500	0658	1000	506	5	1	5
456732005-1	2018024740 MW-5SI	SAMPLE		WATER	1 pCi/L	DUPO007	14	500	0658	1000	607	6	2	40
456752001-1	2018023353	SAMPLE		SURFACE WA	1 pCi/L	DUPO006	15	500	0658	1000	701	7	2	10
456752002-1	2018023355	SAMPLE		SURFACE WA	1 pCi/L	DUPO006	16	500	0658	1000	802	8	1	21
456755001-1	2018023215	SAMPLE		SURFACE WA	1 pCi/L	DUPO006	17	500	0730	1035	110	1	5	11
456755002-1	2018023221	SAMPLE		SURFACE WA	1 pCi/L	DUPO006	18	500	0730	1035	201	2	4	11
456755003-1	2018023225	SAMPLE		SURFACE WA	1 pCi/L	DUPO006	19	500	0730	1035	305	3	2	8
456755004-1	2018023235	SAMPLE		SURFACE WA	1 pCi/L	DUPO006	20	500	0730	1035	407	4	2	13
1204088003-1	MB for batch 1790749	MB		SURFACE WA	1 pCi/L	QC ACCOUNT	21	500	0730	1035	504	5	7	9
1204088004-1	2018023353(456752001DUP)	DUP		SURFACE WA	1 pCi/L	QC ACCOUNT	22	500	0730	1035	601	6	5	14
1204088005-1	2018023353(456752001MS)	MS		SURFACE WA	1 pCi/L	QC ACCOUNT	23	100	0730	1035	703	7	1	775
1204088006-1	2018023353(456752001MSD)	MSD		SURFACE WA	1 pCi/L	QC ACCOUNT	24	100	0730	1035	803	8	3	721
1204088007-1	LCS for batch 1790749	LCS		SURFACE WA	1 pCi/L	QC ACCOUNT	25	500	0749	1105	104	1	1	738

Comments:_____

Data Reviewed By: 8/14/18

Radium-226 Liquid

Filename : RA226.XLS
File type : Excel
Version # : 1.3.2

Batch : 1790749
Analyst : PCW
Prep Date : 8/10/2018
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 1 pCi/L
Halflife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halflife of Rn-222: 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					**Count Raw Data**							
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
1	456677001.1	0.5000	2.0256E-05	8/3/2018 11:45	105	30	6	0.200	4	0.133	30	2.0440
2	456677002.1	0.5000	2.0256E-05	8/3/2018 12:35	204	30	17	0.567	6	0.200	30	2.0820
3	456677003.1	0.5000	2.0256E-05	8/3/2018 11:05	308	30	49	1.633	4	0.133	30	1.4570
4	456677004.1	0.5000	2.0256E-05	8/3/2018 14:35	402	30	11	0.367	5	0.167	30	2.0200
5	456680001.1	0.5000	2.0256E-05	7/30/2018 11:30	508	30	51	1.700	2	0.067	30	2.1080
6	456680002.1	0.5000	2.0256E-05	7/30/2018 13:40	606	30	89	2.967	3	0.100	30	1.9430
7	456680003.1	0.5000	2.0256E-05	7/31/2018 10:10	706	30	16	0.533	4	0.133	30	1.9130
8	456680004.1	0.5000	2.0256E-05	7/31/2018 12:15	807	30	34	1.133	8	0.267	30	1.9580
9	456680005.1	0.5000	2.0256E-05	7/31/2018 15:45	107	30	29	0.967	2	0.067	30	1.5510
10	456732001.1	0.5000	2.0256E-05	8/6/2018 12:10	208	30	73	2.433	6	0.200	30	1.8820
11	456732002.1	0.5000	2.0256E-05	8/6/2018 12:34	302	30	52	1.733	5	0.167	30	1.6870
12	456732003.1	0.5000	2.0256E-05	8/6/2018 14:36	408	30	61	2.033	8	0.267	30	1.8510
13	456732004.1	0.5000	2.0256E-05	8/6/2018 15:52	506	30	5	0.167	1	0.033	30	2.0990
14	456732005.1	0.5000	2.0256E-05	8/6/2018 15:59	607	30	40	1.333	2	0.067	30	2.1300
15	456752001.1	0.5000	2.0256E-05	8/7/2018 8:30	701	30	10	0.333	2	0.067	30	1.9520
16	456752002.1	0.5000	2.0256E-05	8/7/2018 9:00	802	30	21	0.700	1	0.033	30	1.6450
17	456755001.1	0.5000	2.0256E-05	8/6/2018 9:05	110	30	11	0.367	5	0.167	30	2.0570
18	456755002.1	0.5000	2.0256E-05	8/6/2018 10:20	201	30	11	0.367	4	0.133	30	2.0070
19	456755003.1	0.5000	2.0256E-05	8/6/2018 11:10	305	30	8	0.267	2	0.067	30	1.4880
20	456755004.1	0.5000	2.0256E-05	8/6/2018 14:45	407	30	13	0.433	2	0.067	30	1.7420
21	1204088003.1	0.5000	2.0256E-05	8/10/2018 0:00	504	30	9	0.300	7	0.233	30	1.8310
22	1204088004.1	0.5000	2.0256E-05	8/7/2018 8:30	601	30	14	0.467	5	0.167	30	1.9080
23	1204088005.1	0.1000	1.1370E-05	8/7/2018 8:30	703	30	775	25.833	1	0.033	30	2.0680
24	1204088006.1	0.1000	1.1370E-05	8/7/2018 8:30	803	30	721	24.033	3	0.100	30	1.4750
25	1204088007.1	0.5000	2.0256E-05	8/10/2018 0:00	104	30	738	24.600	1	0.033	30	2.0520

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
9.300%	5/1/2018	4/30/2019	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
1.700%	8/1/2018	7/31/2019	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
9.500%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
1.600%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
5.200%	6/1/2018	5/31/2019	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
2.400%	7/1/2018	6/30/2019	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
3.000%	11/1/2017	10/31/2018	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
9.200%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 6:29	8/14/2018 9:30	0.503	0.977	1.002	1.000
9.300%	5/1/2018	4/30/2019	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
5.200%	8/1/2018	7/31/2019	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
9.700%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
7.000%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
2.500%	6/1/2018	5/31/2019	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
2.900%	7/1/2018	6/30/2019	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
1.900%	11/1/2017	10/31/2018	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
5.600%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 6:58	8/14/2018 10:00	0.505	0.977	1.002	1.000
5.000%	5/1/2018	4/30/2019	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
8.300%	8/1/2018	7/31/2019	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
2.900%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
6.600%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
9.700%	6/1/2018	5/31/2019	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
8.500%	7/1/2018	6/30/2019	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
2.400%	11/1/2017	10/31/2018	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
2.200%	3/1/2018	2/28/2019	8/10/2018 10:00	8/14/2018 7:30	8/14/2018 10:35	0.507	0.977	1.002	1.000
7.800%	5/1/2018	4/30/2019	8/10/2018 10:00	8/14/2018 7:49	8/14/2018 11:05	0.508	0.976	1.002	1.000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-D
Spike Exp Date : 12/19/2018
Spike Activity (dpm/ml): 288.45
Spike Volume Added: 0.10

LCS S/N : 1715-D
LCS Exp Date : 12/19/2018
LCS Activity (dpm/ml): 288.45
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	**2 SIGMA** Counting Uncertainty pCi/L	**2 SIGMA** Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1974	0.1394	1	0.3686	**0.0599**	158.39%	0.0667	0.1054	0.1857	0.1862		SAMPLE				
2	0.2374	0.1676	1	0.4234	**0.3235**	43.63%	0.3667	0.1599	0.2764	0.2806		SAMPLE				
3	0.2769	0.1955	1	0.5171	**1.8911**	18.76%	1.5000	0.2427	0.5996	0.7470		SAMPLE				
4	0.2233	0.1577	1	0.4063	**0.1819**	66.69%	0.2000	0.1333	0.2376	0.2392		SAMPLE				
5	0.1354	0.0956	1	0.2783	**1.4233**	15.74%	1.6333	0.2427	0.4145	0.4848		SAMPLE				
6	0.1799	0.1270	1	0.3485	**2.7101**	11.41%	2.8667	0.3197	0.5924	0.7213		SAMPLE				
7	0.2109	0.1489	1	0.3939	**0.3841**	37.39%	0.4000	0.1491	0.2806	0.2869		SAMPLE				
8	0.2914	0.2058	1	0.5053	**0.8131**	26.57%	0.8667	0.2160	0.3972	0.4394		SAMPLE				
9	0.1833	0.1294	1	0.3769	**1.0622**	22.62%	0.9000	0.1856	0.4293	0.4953		SAMPLE				
10	0.2617	0.1848	1	0.4668	**2.1722**	14.25%	2.2333	0.2963	0.5648	0.6829		SAMPLE				
11	0.2665	0.1881	1	0.4848	**1.6999**	18.77%	1.5667	0.2517	0.5352	0.6717		SAMPLE				
12	0.3072	0.2169	1	0.5327	**1.7471**	17.17%	1.7667	0.2769	0.5367	0.6396		SAMPLE				
13	0.0958	0.0676	1	0.2225	**0.1163**	61.29%	0.1333	0.0816	0.1396	0.1407		SAMPLE				
14	0.1335	0.0942	1	0.2744	**1.0886**	17.30%	1.2667	0.2160	0.3639	0.4012		SAMPLE				
15	0.1457	0.1028	1	0.2995	**0.2501**	43.34%	0.2667	0.1155	0.2122	0.2155		SAMPLE				
16	0.1222	0.0863	1	0.2839	**0.7418**	24.11%	0.6667	0.1563	0.3410	0.3666		SAMPLE				
17	0.2178	0.1538	1	0.3962	**0.1773**	66.85%	0.2000	0.1333	0.2317	0.2338		SAMPLE				
18	0.1996	0.1409	1	0.3728	**0.2121**	55.95%	0.2333	0.1291	0.2300	0.2345		SAMPLE				
19	0.1904	0.1344	1	0.3914	**0.2452**	52.78%	0.2000	0.1054	0.2533	0.2561		SAMPLE				
20	0.1626	0.1148	1	0.3344	**0.3839**	35.82%	0.3667	0.1291	0.2649	0.2752		SAMPLE				
21	0.2895	0.2044	1	0.5084	**0.0664**	200.24%	0.0667	0.1333	0.2603	0.2608		MB				
22	0.2348	0.1658	1	0.4271	**0.2868**	49.17%	0.3000	0.1453	0.2722	0.2795	456752001.1	DUP	13.7%			
23	0.4844	0.3420	1	1.1250	**113.7788**	4.33%	25.8000	0.9286	8.0261	19.0476	456752001.1	MS			129.9319	87.6%
24	1.1763	0.8305	1	2.2792	**147.9801**	4.35%	23.9333	0.8969	10.8694	24.8022	456752001.1	MSD	26.1%		129.9319	113.9%
25	0.0975	0.0689	1	0.2265	**21.8163**	8.63%	24.5667	0.9062	1.5772	4.8507		LCS			25.9863	84.0%

Batch 1790829 Check-list

This check-list was completed on 21-AUG-18 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 21-AUG-18 and Elizabeth Krouse on 22-AUG-18.

Batch ID:	**Product:**	**Description:** Lucas Cell Radium 226
1790829	LUC26RAL	GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Radium-226 Queue Sheet

21-AUG-18

GEL Laboratories, Radiochemistry Division

Batch #: 1790829 Analyst: PCW First Client Due Date: 09/05/2018 Internal Due Date: 09/02/2018

Spike Isotope: Radium-226 Spike Code: 171501 Expiration Date: 12/19/18 Vol: 0.1 End Initial/Degas Date/Time: 8/17/18 0541

LCS Isotope: Radium-226 LCS Code: 171501 Expiration Date: 12/19/18 Vol: 0.1 End LN De-em Date: 8/21/18

Bkg Count Time: 30 (Min) Sample Count Time: 30 (Min) Start Count Date: 8/21/18

Prep Date: 8/17/18 Pipet ID: 27616953 Balance ID: 10150253 Initials: TT Witness: NA

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Position (Label)	Aliquot (mL or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
456554001-1	594719-001	SAMPLE		WATER	1 pCi/L	XENC002	1	500	0504	0835	401	4	3	9
456555001-1	594825-001	SAMPLE		WATER	1 pCi/L	XENC002	2	500	0504	0835	504	5	1	16
456675001-1	B10	SAMPLE		WATER	1 pCi/L	LANC001	3	500	0504	0835	604	6	8	76
456680006-1	MW-6	SAMPLE		WATER	1 pCi/L	LANC006	4	500	0504	0835	706	7	8	64
456680007-1	MW-7	SAMPLE		WATER	1 pCi/L	LANC006	5	500	0504	0835	808	8	1	15
456680008-1	MW-8	SAMPLE		WATER	1 pCi/L	LANC006	6	500	0526	0910	101	1	5	24
456680009-1	MW-9	SAMPLE		WATER	1 pCi/L	LANC006	7	500	0526	0910	207	2	1	14
456680010-1	FB-20180731	SAMPLE		WATER	1 pCi/L	LANC006	8	500	0526	0910	305	3	5	7
456683001-1	B12	SAMPLE		WATER	1 pCi/L	LANC001	9	500	0526	0910	402	4	4	20
456683002-1	B11	SAMPLE		WATER	1 pCi/L	LANC001	10	500	0526	0910	505	5	4	40
456683003-1	B13	SAMPLE		WATER	1 pCi/L	LANC001	11	500	0526	0910	602	6	5	76
1204088201-1	MB for batch 1790829	MB		WATER	1 pCi/L	QC ACCOUNT	12	500	0526	0910	704	7	8	14
1204088202-1	MW-6(456680006DUP)	DUP		WATER	1 pCi/L	QC ACCOUNT	13	500	0526	0910	803	8	4	54
1204088203-1	MW-6(456680006MS)	MS		WATER	1 pCi/L	QC ACCOUNT	14	100	0548	0940	104	1	4	689
1204088204-1	MW-6(456680006MSD)	MSD		WATER	1 pCi/L	QC ACCOUNT	15	100	0548	0940	206	2	3	638
1204088205-1	LCS for batch 1790829	LCS		WATER	1 pCi/L	QC ACCOUNT	16	500	0548	0940	307	3	7	658

Comments:_____

Data Reviewed By: 8/21/18

Radium-226 Liquid

Filename : RA226.XLS
File type : Excel
Version # : 1.3.2

Batch : 1790829
Analyst : PCW
Prep Date : 8/17/2018
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 1 pCi/L
Halflife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halflife of Rn-222: 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					**Count Raw Data**							
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
1	456554001.1	0.5000	2.0256E-05	8/3/2018 10:00	401	30	9	0.300	3	0.100	30	1.9020
2	456555001.1	0.5000	2.0256E-05	8/6/2018 13:00	504	30	16	0.533	1	0.033	30	1.8310
3	456675001.1	0.5000	2.0256E-05	8/6/2018 8:50	604	30	76	2.533	8	0.267	30	2.0460
4	456680006.1	0.5000	2.0256E-05	7/31/2018 14:10	706	30	64	2.133	8	0.267	30	1.9130
5	456680007.1	0.5000	2.0256E-05	8/1/2018 12:45	808	30	15	0.500	1	0.033	30	1.4380
6	456680008.1	0.5000	2.0256E-05	8/1/2018 14:40	101	30	24	0.800	5	0.167	30	1.5100
7	456680009.1	0.5000	2.0256E-05	8/1/2018 11:05	207	30	14	0.467	1	0.033	30	1.9750
8	456680010.1	0.5000	2.0256E-05	7/31/2018 12:00	305	30	7	0.233	5	0.167	30	1.4880
9	456683001.1	0.5000	2.0256E-05	8/2/2018 11:55	402	30	20	0.667	4	0.133	30	2.0200
10	456683002.1	0.5000	2.0256E-05	8/2/2018 13:20	505	30	40	1.333	4	0.133	30	1.5140
11	456683003.1	0.5000	2.0256E-05	8/2/2018 13:40	602	30	76	2.533	5	0.167	30	2.1000
12	1204088201.1	0.5000	2.0256E-05	8/17/2018 0:00	704	30	14	0.467	8	0.267	30	2.0850
13	1204088202.1	0.5000	2.0256E-05	7/31/2018 14:10	803	30	54	1.800	4	0.133	30	1.4750
14	1204088203.1	0.1000	1.1370E-05	7/31/2018 14:10	104	30	689	22.967	4	0.133	30	2.0520
15	1204088204.1	0.1000	1.1370E-05	7/31/2018 14:10	206	30	638	21.267	3	0.100	30	1.9170
16	1204088205.1	0.5000	2.0256E-05	8/17/2018 0:00	307	30	658	21.933	7	0.233	30	1.8050

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
0.500%	3/1/2018	2/28/2019	8/17/2018 5:41	8/21/2018 5:04	8/21/2018 8:35	0.513	0.974	1.002	1.000
9.700%	6/1/2018	5/31/2019	8/17/2018 5:41	8/21/2018 5:04	8/21/2018 8:35	0.513	0.974	1.002	1.000
1.700%	7/1/2018	6/30/2019	8/17/2018 5:41	8/21/2018 5:04	8/21/2018 8:35	0.513	0.974	1.002	1.000
3.000%	11/1/2017	10/31/2018	8/17/2018 5:41	8/21/2018 5:04	8/21/2018 8:35	0.513	0.974	1.002	1.000
8.700%	3/1/2018	2/28/2019	8/17/2018 5:41	8/21/2018 5:04	8/21/2018 8:35	0.513	0.974	1.002	1.000
5.300%	5/1/2018	4/30/2019	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
2.100%	8/1/2018	7/31/2019	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
2.900%	3/1/2018	2/28/2019	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
1.600%	3/1/2018	2/28/2019	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
4.000%	6/1/2018	5/31/2019	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
2.100%	7/1/2018	6/30/2019	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
2.200%	11/1/2017	10/31/2018	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
2.200%	3/1/2018	2/28/2019	8/17/2018 5:41	8/21/2018 5:26	8/21/2018 9:10	0.515	0.972	1.002	1.000
7.800%	5/1/2018	4/30/2019	8/17/2018 5:41	8/21/2018 5:48	8/21/2018 9:40	0.516	0.971	1.002	1.000
6.600%	8/1/2018	7/31/2019	8/17/2018 5:41	8/21/2018 5:48	8/21/2018 9:40	0.516	0.971	1.002	1.000
6.300%	3/1/2018	2/28/2019	8/17/2018 5:41	8/21/2018 5:48	8/21/2018 9:40	0.516	0.971	1.002	1.000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-D
Spike Exp Date : 12/19/2018
Spike Activity (dpm/ml): 288.45
Spike Volume Added: 0.10

LCS S/N : 1715-D
LCS Exp Date : 12/19/2018
LCS Activity (dpm/ml): 288.45
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	**2 SIGMA** Counting Uncertainty pCi/L	**2 SIGMA** Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1806	0.1275	1	0.3499	**0.1898**	57.74%	0.2000	0.1155	0.2148	0.2165		SAMPLE				
2	0.1083	0.0765	1	0.2515	**0.4929**	29.15%	0.5000	0.1374	0.2656	0.2905		SAMPLE				
3	0.2741	0.1935	1	0.4753	**1.9998**	13.58%	2.2667	0.3055	0.5283	0.6057		SAMPLE				
4	0.2932	0.2070	1	0.5083	**1.7614**	15.45%	1.8667	0.2828	0.5231	0.5908		SAMPLE				
5	0.1379	0.0973	1	0.3202	**0.5858**	29.87%	0.4667	0.1333	0.3281	0.3532		SAMPLE				
6	0.2933	0.2071	1	0.5336	**0.7564**	28.83%	0.6333	0.1795	0.4202	0.4412		SAMPLE				
7	0.1003	0.0708	1	0.2329	**0.3957**	29.87%	0.4333	0.1291	0.2310	0.2386		SAMPLE				
8	0.2977	0.2102	1	0.5415	**0.0808**	173.23%	0.0667	0.1155	0.2743	0.2746		SAMPLE				
9	0.1961	0.1385	1	0.3662	**0.4761**	30.66%	0.5333	0.1633	0.2857	0.2943		SAMPLE				
10	0.2617	0.1847	1	0.4886	**1.4294**	18.85%	1.2000	0.2211	0.5162	0.5671		SAMPLE				
11	0.2109	0.1489	1	0.3837	**2.0324**	12.85%	2.3667	0.3000	0.5049	0.5899		SAMPLE				
12	0.2687	0.1897	1	0.4659	**0.1730**	78.20%	0.2000	0.1563	0.2650	0.2663		MB				
13	0.2686	0.1896	1	0.5015	**2.0377**	15.39%	1.6667	0.2539	0.6083	0.6814	456680006.1	DUP	14.5%			
14	0.9638	0.6804	1	1.7996	**100.1746**	8.70%	22.8333	0.8775	7.5455	22.3735	456680006.1	MS			129.9330	75.7%
15	0.8934	0.6308	1	1.7311	**99.4022**	7.71%	21.1667	0.8439	7.7680	20.7743	456680006.1	MSD	0.8%		129.9330	75.1%
16	0.2899	0.2047	1	0.5091	**21.6456**	7.44%	21.7000	0.8596	1.6806	4.4420		LCS			25.9861	83.3%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 14-AUG-2018

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:35	1	1.27E+05	127047	-1.95		
LUCAS2	EFF	07:35	1	1.31E+05	130758	0.9		
LUCAS3	EFF	07:35	1	1.36E+05	135798	-2.48		
LUCAS4	EFF	07:35	1	1.35E+05	134706	2.92		
LUCAS5	EFF	07:35	1	1.34E+05	133556	-0.09		
LUCAS6	EFF	07:35	1	1.35E+05	135204	0.53		
LUCAS7	EFF	07:35	1	1.43E+05	142901	2.1		
LUCAS8	EFF	07:35	1	1.38E+05	138078	-0.34		

Reviewed by: Lyndsey Pace **Date:** 14-AUG-18

GEL Laboratories LLC

Ludlum Alpha Scintillation Counter Checks for 21-AUG-2018

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:15	1	1.26E+05	126109	-2.68		
LUCAS2	EFF	07:15	1	1.33E+05	133370	2.13		
LUCAS3	EFF	07:15	1	1.37E+05	137314	-1.75		
LUCAS4	EFF	07:15	1	1.33E+05	133224	1.49		
LUCAS5	EFF	07:15	1	1.33E+05	133393	-0.2		
LUCAS6	EFF	07:15	1	1.34E+05	134013	-0.71		
LUCAS7	EFF	07:15	1	1.43E+05	142992	2.19		
LUCAS8	EFF	07:15	1	1.39E+05	138860	-0.07		

Reviewed by: Lyndsey Pace **Date:** 21-AUG-18

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Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR **Batch ID: 1790749**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
456677001	SAMPLE	PCW	LUCAS1	AUG-14-18 09:30:00	DONE	Lucas Cell	01-MAY-18 00:00
456677002	SAMPLE	PCW	LUCAS2	AUG-14-18 09:30:00	DONE	Lucas Cell	01-AUG-18 00:00
456677003	SAMPLE	PCW	LUCAS3	AUG-14-18 09:30:00	DONE	Lucas Cell	01-MAR-18 00:00
456677004	SAMPLE	PCW	LUCAS4	AUG-14-18 09:30:00	DONE	Lucas Cell	01-MAR-18 00:00
456680001	SAMPLE	PCW	LUCAS5	AUG-14-18 09:30:00	DONE	Lucas Cell	01-JUN-18 00:00
456680002	SAMPLE	PCW	LUCAS6	AUG-14-18 09:30:00	DONE	Lucas Cell	01-JUL-18 00:00
456680003	SAMPLE	PCW	LUCAS7	AUG-14-18 09:30:00	DONE	Lucas Cell	01-NOV-17 00:00
456680004	SAMPLE	PCW	LUCAS8	AUG-14-18 09:30:00	DONE	Lucas Cell	01-MAR-18 00:00
456680005	SAMPLE	PCW	LUCAS1	AUG-14-18 10:00:00	DONE	Lucas Cell	01-MAY-18 00:00
456732001	SAMPLE	PCW	LUCAS2	AUG-14-18 10:00:00	DONE	Lucas Cell	01-AUG-18 00:00
456732002	SAMPLE	PCW	LUCAS3	AUG-14-18 10:00:00	DONE	Lucas Cell	01-MAR-18 00:00
456732003	SAMPLE	PCW	LUCAS4	AUG-14-18 10:00:00	DONE	Lucas Cell	01-MAR-18 00:00
456732004	SAMPLE	PCW	LUCAS5	AUG-14-18 10:00:00	DONE	Lucas Cell	01-JUN-18 00:00
456732005	SAMPLE	PCW	LUCAS6	AUG-14-18 10:00:00	DONE	Lucas Cell	01-JUL-18 00:00
456752001	SAMPLE	PCW	LUCAS7	AUG-14-18 10:00:00	DONE	Lucas Cell	01-NOV-17 00:00
456752002	SAMPLE	PCW	LUCAS8	AUG-14-18 10:00:00	DONE	Lucas Cell	01-MAR-18 00:00
456755001	SAMPLE	PCW	LUCAS1	AUG-14-18 10:35:00	DONE	Lucas Cell	01-MAY-18 00:00
456755002	SAMPLE	PCW	LUCAS2	AUG-14-18 10:35:00	DONE	Lucas Cell	01-AUG-18 00:00
456755003	SAMPLE	PCW	LUCAS3	AUG-14-18 10:35:00	DONE	Lucas Cell	01-MAR-18 00:00
456755004	SAMPLE	PCW	LUCAS4	AUG-14-18 10:35:00	DONE	Lucas Cell	01-MAR-18 00:00
1204088003	MB	PCW	LUCAS5	AUG-14-18 10:35:00	DONE	Lucas Cell	01-JUN-18 00:00
1204088004	DUP	PCW	LUCAS6	AUG-14-18 10:35:00	DONE	Lucas Cell	01-JUL-18 00:00
1204088005	MS	PCW	LUCAS7	AUG-14-18 10:35:00	DONE	Lucas Cell	01-NOV-17 00:00
1204088006	MSD	PCW	LUCAS8	AUG-14-18 10:35:00	DONE	Lucas Cell	01-MAR-18 00:00
1204088007	LCS	PCW	LUCAS1	AUG-14-18 11:05:00	DONE	Lucas Cell	01-MAY-18 00:00

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR **Batch ID: 1790829**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
456554001	SAMPLE	PCW	LUCAS4	AUG-21-18 08:35:00	DONE	Lucas Cell	01-MAR-18 00:00
456555001	SAMPLE	PCW	LUCAS5	AUG-21-18 08:35:00	DONE	Lucas Cell	01-JUN-18 00:00
456675001	SAMPLE	PCW	LUCAS6	AUG-21-18 08:35:00	DONE	Lucas Cell	01-JUL-18 00:00
456680006	SAMPLE	PCW	LUCAS7	AUG-21-18 08:35:00	DONE	Lucas Cell	01-NOV-17 00:00
456680007	SAMPLE	PCW	LUCAS8	AUG-21-18 08:35:00	DONE	Lucas Cell	01-MAR-18 00:00
456680008	SAMPLE	PCW	LUCAS1	AUG-21-18 09:10:00	DONE	Lucas Cell	01-MAY-18 00:00
456680009	SAMPLE	PCW	LUCAS2	AUG-21-18 09:10:00	DONE	Lucas Cell	01-AUG-18 00:00
456680010	SAMPLE	PCW	LUCAS3	AUG-21-18 09:10:00	DONE	Lucas Cell	01-MAR-18 00:00
456683001	SAMPLE	PCW	LUCAS4	AUG-21-18 09:10:00	DONE	Lucas Cell	01-MAR-18 00:00
456683002	SAMPLE	PCW	LUCAS5	AUG-21-18 09:10:00	DONE	Lucas Cell	01-JUN-18 00:00
456683003	SAMPLE	PCW	LUCAS6	AUG-21-18 09:10:00	DONE	Lucas Cell	01-JUL-18 00:00
1204088201	MB	PCW	LUCAS7	AUG-21-18 09:10:00	DONE	Lucas Cell	01-NOV-17 00:00
1204088202	DUP	PCW	LUCAS8	AUG-21-18 09:10:00	DONE	Lucas Cell	01-MAR-18 00:00
1204088203	MS	PCW	LUCAS1	AUG-21-18 09:40:00	DONE	Lucas Cell	01-MAY-18 00:00
1204088204	MSD	PCW	LUCAS2	AUG-21-18 09:40:00	DONE	Lucas Cell	01-AUG-18 00:00
1204088205	LCS	PCW	LUCAS3	AUG-21-18 09:40:00	DONE	Lucas Cell	01-MAR-18 00:00

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Type III Data Package

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

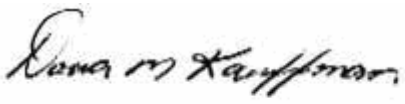
Project: PSEG Hudson
Groundwater and Water Samples
Collected on 09/05/18-09/06/18

SDG# GEJ51-V.2

GROUP	SAMPLE NUMBERS
1984787	9792190-9792200

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-18-27
AZ Cert. # AZ0780

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by:  **Date: 10/03/2018**

Dana M. Kauffman
Manager

Any questions or concerns you might have regarding this data package should be directed to your client representative, Kerri Sachtleben at (717)-556-7376.

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Sample Reference List for SDG Number GEJ51 with a Data Package Type of III

07701 - GEI Consultants, Inc.
Project: PSEG Hudson

Lab Sample Number	Client Sample ID	Collection Date	Date Received
9792190	MW-8	09/05/2018 11:30	09/07/2018 17:00
9792191	MW-9	09/05/2018 11:40	09/07/2018 17:00
9792192	MW-5	09/05/2018 13:00	09/07/2018 17:00
9792193	MW-7	09/05/2018 13:30	09/07/2018 17:00
9792194	MW-6	09/05/2018 14:40	09/07/2018 17:00
9792195	MW-1	09/06/2018 09:55	09/07/2018 17:00
9792196	MW-2	09/06/2018 10:00	09/07/2018 17:00
9792197	MW-3	09/06/2018 11:55	09/07/2018 17:00
9792198	MW-4	09/06/2018 12:00	09/07/2018 17:00
9792199	FB-09052018	09/05/2018 14:00	09/07/2018 17:00
9792200	FB-09062018	09/06/2018 12:30	09/07/2018 17:00

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Sample pH Log

SDG: GEJ51

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9792190	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 1:51:33PM	12190
9792190	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:11:57PM	25804
9792190	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:39:33PM	12665
9792190	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:40:19PM	12665
9792190	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:54:41PM	12190
9792190	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 12:49:49PM	12644
9792190	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 1:51:33PM	12190
9792190	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 1:51:33PM	12190
9792191	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:17:38PM	12190
9792191	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:11:07PM	25804
9792191	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:41:12PM	12665
9792191	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:40:44PM	12665
9792191	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:07:42PM	12190
9792191	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 12:18:27PM	12644
9792191	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:17:38PM	12190
9792191	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:17:38PM	12190
9792192	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:25:55PM	12190
9792192	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:09:29PM	25804
9792192	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:41:56PM	12665
9792192	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:41:36PM	12665
9792192	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:08:19PM	12190
9792192	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 12:55:10PM	12644
9792192	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:25:55PM	12190
9792192	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:25:55PM	12190
9792193	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:37:43PM	12190
9792193	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:15:23PM	25804
9792193	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:43:18PM	12665
9792193	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:42:17PM	12665
9792193	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:09:21PM	12190
9792193	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 12:42:54PM	12644
9792193	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:37:43PM	12190
9792193	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:37:43PM	12190
9792194	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:24:00PM	12190
9792194	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:16:29PM	25804
9792194	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:43:52PM	12665
9792194	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:43:35PM	12665
9792194	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:30:15PM	12190
9792194	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 2:01:39PM	12644

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9792194	148A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:22:08PM	25804
9792194	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:24:00PM	12190
9792194	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:24:00PM	12190
9792195	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:19:57PM	12190
9792195	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:17:31PM	25804
9792195	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:44:11PM	12665
9792195	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:44:28PM	12665
9792195	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:53:16PM	12190
9792195	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 12:37:52PM	12644
9792195	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:19:57PM	12190
9792195	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:19:57PM	12190
9792196	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:28:14PM	12190
9792196	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:18:45PM	25804
9792196	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:47:59PM	12665
9792196	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:48:17PM	12665
9792196	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:59:05PM	12190
9792196	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 12:09:06PM	12644
9792196	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:28:14PM	12190
9792196	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:28:14PM	12190
9792197	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:40:59PM	12190
9792197	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:19:52PM	25804
9792197	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:50:38PM	12665
9792197	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:50:21PM	12665
9792197	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:04:52PM	12190
9792197	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 5:53:47PM	1532
9792197	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:40:59PM	12190
9792197	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:40:59PM	12190
9792198	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:22:05PM	12190
9792198	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:20:26PM	25804
9792198	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:51:13PM	12665
9792198	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:50:55PM	12665
9792198	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:53:53PM	12190
9792198	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 12:15:41PM	12644
9792198	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:22:05PM	12190
9792198	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:22:05PM	12190
9792199	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:03:22PM	12190
9792199	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:18:20PM	25804
9792199	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:51:47PM	12665
9792199	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:51:31PM	12665
9792199	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:03:51PM	12190
9792199	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 5:57:36PM	1532
9792199	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:03:22PM	12190
9792199	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:03:22PM	12190
9792200	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 1:55:54PM	12190

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9792200	015A	9	5-7	PC	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 3:21:13PM	25804
9792200	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:58:05PM	12665
9792200	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 12:58:22PM	12665
9792200	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 2:59:44PM	12190
9792200	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/10/2018 5:56:02PM	1532
9792200	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 1:55:54PM	12190
9792200	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	9/8/2018 1:55:54PM	12190

***pH Check Code Key**
PK = Original container checked - pH is within the correct range. (No preservative was added)
PA = Original container checked - pH adjusted to correct range. (Preservative was added)
PV = Volatile container checked
PC = pH checked (unpreserved container)
SPK = Subsampled from an original container. Original container checked - pH is within correct range
SPA = Subsampled from an original container. Subsample container checked - pH adjusted to correct range.
SPC = Subsampled from an original container. pH checked (unpreserved container).
SUP = Subsampled from original container. Unable to be preserved due to the matrix of the sample.
UP = Unable to preserve due to matrix of the sample.
NA = Not applicable

****Chlorine Present Code Key**
NA = Chlorine Not Checked
Y = Chlorine Present
N = Chlorine Not Present

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00259 Mercury

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

14044 ICP-WW, 3005A (tot rec) - U5

The sample is digested with nitric acid and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3005A, July 1992

14047 ICPMS - Water, 3020A - U5

The sample is digested with nitric and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3020A, July 1992

05713 WW SW846 Hg Digest

The sample is heated at 95 c with nitric acid, sulfuric acid, potassium persulfate, and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

07046 Barium
08014 Boron
01750 Calcium
07051 Chromium
07052 Cobalt
01756 Lithium
07036 Selenium
07022 Thallium

The solution resulting from the metals digestion is analyzed by Trace ICP.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6010D, Rev. 4, July 2014.

06024 Antimony
06025 Arsenic
06027 Beryllium
06028 Cadmium
06035 Lead
06038 Molybdenum

The solution resulting from the metals digestion is analyzed by ICP/MS.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6020B, Rev.2, July 2014.

00224 Chloride
01504 Fluoride
00228 Sulfate

A small volume of sample is introduced into an ion chromatograph. The anions are then separated and measured by a system consisting of a guard column, separator column, suppressor, and conductivity detector.

Reference: Method 300.0, Revision 2.1 (1993), Methods for Chemical Analysis of Water and Wastes USEPA 600.

12152 pH

The activity of hydrogen ions in the sample is measured using a glass electrode and a reference electrode.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 4500-H+ B-2011

00212 Total Dissolved Solids

A well-mixed sample is filtered through a glass fiber filter. The filtrate is collected in a tared beaker, evaporated in a steam bath and dried in an oven at 180C +/- 2C to a constant weight. The increase in weight is the total dissolved solids.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2540 C-2011

12151 Temperature of pH

The temperature of the sample measured during the pH analysis.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2550 B-2010

Analysis Reports / Field Chain of Custody

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Report Date: September 21, 2018 16:39

Project: PSEG Hudson

Account #: 07701
Group Number: 1984787
SDG: GEJ51
PO Number: 1504710
State of Sample Origin: NJ

Electronic Copy To	GEI Consultants, Inc.	Attn: Jason Kohl
Electronic Copy To	GEI Consultants, Inc.	Attn: Data Group

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-8 Grab Groundwater	09/05/2018 11:30	9792190
MW-9 Grab Groundwater	09/05/2018 11:40	9792191
MW-5 Grab Groundwater	09/05/2018 13:00	9792192
MW-7 Grab Groundwater	09/05/2018 13:30	9792193
MW-6 Grab Groundwater	09/05/2018 14:40	9792194
MW-1 Grab Groundwater	09/06/2018 09:55	9792195
MW-2 Grab Groundwater	09/06/2018 10:00	9792196
MW-3 Grab Groundwater	09/06/2018 11:55	9792197
MW-4 Grab Groundwater	09/06/2018 12:00	9792198
FB-09052018 Grab Water	09/05/2018 14:00	9792199
FB-09062018 Grab Water	09/06/2018 12:30	9792200

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: GEI Consultants, Inc.
Project: PSEG Hudson
Sampling Date(s): 09/05/18 - 09/06/18
Laboratory Sample ID(s): 9792190-9792200
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Christiane S. Swelgart
Senior Specialist

09/21/2018



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Project Name: PSEG Hudson
ELLE Group #: 1984787

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.

Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Sample #s: 9792190-9792198

The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 9792196

An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly.
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.

Sample #s: 9792190, 9792191, 9792192, 9792193, 9792194, 9792195, 9792197, 9792198, 9792199, 9792200

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.

Batch #: 182541404402 (Sample number(s): 9792190-9792200 UNSPK: 9792194 BKG: 9792194)

The recovery(ies) for the following analyte(s) in the MS and/or MSD were below the acceptance window: Selenium, Calcium

SW-846 6020B Rev.2, July 2014, Metals Dissolved

Batch #: 182541404701A (Sample number(s): 9792190-9792200 UNSPK: 9792194 BKG: 9792194)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Arsenic

EPA 300.0, Wet Chemistry

Batch #: 18253520206A (Sample number(s): 9792191-9792200 UNSPK: 9792196 BKG: 9792196)

The recovery(ies) for the following analyte(s) in the MS were below the acceptance window: Fluoride

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 11:30
SDG#: GEJ51-01

GEI Consultants, Inc.
ELLE Sample #: GW 9792190
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.101	0.0010	0.0100	1
08014	Boron	7440-42-8	0.337	0.0120	0.100	1
01750	Calcium	7440-70-2	37.5	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	0.0068 J	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0015 J	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.00036 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0039 J	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals** The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	598	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	28.7	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	908	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 11:30
SDG#: GEJ51-01

GEI Consultants, Inc.
ELLE Sample #: GW 9792190
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.8	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:37	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:55	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:55	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:55	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:55	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 11:30
SDG#: GEJ51-01

GEI Consultants, Inc.
ELLE Sample #: GW 9792190
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:55	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 13:55	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:44	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520106A	09/10/2018 18:36	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18253520106A	09/10/2018 18:18	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520106A	09/10/2018 18:18	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921202A	09/10/2018 15:53	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006204A	09/12/2018 01:18	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006204A	09/12/2018 01:18	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 11:40
SDG#: GEJ51-02

GEI Consultants, Inc.
ELLE Sample #: GW 9792191
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.123	0.0010	0.0100	1
08014	Boron	7440-42-8	0.620	0.0120	0.100	1
01750	Calcium	7440-70-2	116	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	0.0021 J	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00053 J	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0022 J	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0018 J	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	947	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	22.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,200	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 11:40
SDG#: GEJ51-02

GEI Consultants, Inc.
ELLE Sample #: GW 9792191
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.9	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:40	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:03	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:03	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:03	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:03	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 11:40
SDG#: GEJ51-02

GEI Consultants, Inc.
ELLE Sample #: GW 9792191
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:03	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:03	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:46	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/13/2018 02:47	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 02:13	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 02:13	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006204A	09/12/2018 02:15	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006204A	09/12/2018 02:15	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 13:00
SDG#: GEJ51-03

GEI Consultants, Inc.
ELLE Sample #: GW 9792192
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0821	0.0010	0.0100	1
08014	Boron	7440-42-8	0.471	0.0120	0.100	1
01750	Calcium	7440-70-2	91.8	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.00086 J	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	739	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	3.4 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,670	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 13:00
SDG#: GEJ51-03

GEI Consultants, Inc.
ELLE Sample #: GW 9792192
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.9	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:48	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:06	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:06	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:06	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:06	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 13:00
SDG#: GEJ51-03

GEI Consultants, Inc.
ELLE Sample #: GW 9792192
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:06	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:06	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:48	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/13/2018 03:04	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 02:49	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 02:49	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006204A	09/12/2018 02:07	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006204A	09/12/2018 02:07	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 13:30
SDG#: GEJ51-04

GEI Consultants, Inc.
ELLE Sample #: GW 9792193
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0681	0.0010	0.0100	1
08014	Boron	7440-42-8	0.268	0.0120	0.100	1
01750	Calcium	7440-70-2	39.9	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0010 J	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0043	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	61.5	10.0	20.0	50
01504	Fluoride	16984-48-8	0.37 J	0.25	0.50	5
00228	Sulfate	14808-79-8	N.D.	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	350	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 13:30
SDG#: GEJ51-04

GEI Consultants, Inc.
ELLE Sample #: GW 9792193
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.8	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:51	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:09	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:09	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:09	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:09	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 13:30
SDG#: GEJ51-04

GEI Consultants, Inc.
ELLE Sample #: GW 9792193
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:09	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:09	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:50	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/11/2018 03:44	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 03:26	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 03:26	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006204A	09/12/2018 01:40	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006204A	09/12/2018 01:40	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 14:40
SDG#: GEJ51-05

GEI Consultants, Inc.
ELLE Sample #: GW 9792194
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.108	0.0010	0.0100	1
08014	Boron	7440-42-8	0.969	0.0120	0.100	1
01750	Calcium	7440-70-2	136	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0186 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0030 J	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	929	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	3.3 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,450	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 14:40
SDG#: GEJ51-05

GEI Consultants, Inc.
ELLE Sample #: GW 9792194
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.9	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:20	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:38	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:38	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:38	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:38	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 14:40
SDG#: GEJ51-05

GEI Consultants, Inc.
ELLE Sample #: GW 9792194
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 13:38	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 13:38	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:32	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18253520206A	09/13/2018 03:21	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 04:02	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 04:02	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006204A	09/12/2018 01:52	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006204A	09/12/2018 01:52	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 09:55
SDG#: GEJ51-06

GEI Consultants, Inc.
ELLE Sample #: GW 9792195
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.808	0.0010	0.0100	1
08014	Boron	7440-42-8	1.11	0.0120	0.100	1
01750	Calcium	7440-70-2	380	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	0.0048 J	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0431 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0023 J	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0029 J	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	6,760	500	1,000	2500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	123	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	11,800	1,600	4,800	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 09:55
SDG#: GEJ51-06

GEI Consultants, Inc.
ELLE Sample #: GW 9792195
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.7	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:53	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:11	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:11	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:11	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:11	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 09:55
SDG#: GEJ51-06

GEI Consultants, Inc.
ELLE Sample #: GW 9792195
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:11	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:11	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:52	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/13/2018 03:38	Ashlynn M Cornelius	2500
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 05:15	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 05:34	Ashlynn M Cornelius	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	10
12151	Temperature of pH	SM 2550 B-2010	1	18254006203A	09/12/2018 00:59	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006203A	09/12/2018 00:59	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 10:00
SDG#: GEJ51-07

GEI Consultants, Inc.
ELLE Sample #: GW 9792196
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	2.24	0.0010	0.0100	1
08014	Boron	7440-42-8	0.912	0.0120	0.100	1
01750	Calcium	7440-70-2	459	0.165	5.00	5
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	0.0035 J	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0630 J	0.0550	0.500	5
07036	Selenium	7782-49-2	N.D.	0.105	0.500	5
	An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly. The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.0047	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0026 J	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	6,970	500	1,000	2500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	15.8	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	11,600	1,600	4,800	10

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 10:00
SDG#: GEJ51-07

GEI Consultants, Inc.
ELLE Sample #: GW 9792196
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.9	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:57	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:57	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/18/2018 22:19	Cindy M Gehman	5
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:57	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:57	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/18/2018 22:19	Cindy M Gehman	5
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/18/2018 22:19	Cindy M Gehman	5
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 12:57	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:14	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:14	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:14	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:14	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 10:00
SDG#: GEJ51-07

GEI Consultants, Inc.
ELLE Sample #: GW 9792196
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:14	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:14	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:54	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/13/2018 01:55	Ashlynn M Cornelius	2500
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 01:18	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 01:18	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	10
12151	Temperature of pH	SM 2550 B-2010	1	18254006203A	09/12/2018 00:37	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006203A	09/12/2018 00:37	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 11:55
SDG#: GEJ51-08

GEI Consultants, Inc.
ELLE Sample #: GW 9792197
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.233	0.0010	0.0100	1
08014	Boron	7440-42-8	0.740	0.0120	0.100	1
01750	Calcium	7440-70-2	175	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0148 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00048 J	0.00041	0.0040	1
06025	Arsenic	7440-38-2	0.00086 J	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	0.00016 J	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0073	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	1,720	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	274	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	3,180	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 11:55
SDG#: GEJ51-08

GEI Consultants, Inc.
ELLE Sample #: GW 9792197
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.8	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.0	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:00	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:17	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:17	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:17	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:17	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 11:55
SDG#: GEJ51-08

GEI Consultants, Inc.
ELLE Sample #: GW 9792197
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:17	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:17	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:56	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/13/2018 04:29	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 05:52	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 06:10	Ashlynn M Cornelius	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006204A	09/12/2018 01:36	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006204A	09/12/2018 01:36	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 12:00
SDG#: GEJ51-09

GEI Consultants, Inc.
ELLE Sample #: GW 9792198
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0815	0.0010	0.0100	1
08014	Boron	7440-42-8	1.14	0.0120	0.100	1
01750	Calcium	7440-70-2	97.9	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	0.0551 J	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00046 J	0.00041	0.0040	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	0.0089	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals** The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	3,720	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	558	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	7,560	800	2,400	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 12:00
SDG#: GEJ51-09

GEI Consultants, Inc.
ELLE Sample #: GW 9792198
ELLE Group #: 1984787
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.8	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:03	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:20	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:20	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:20	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:20	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 12:00
SDG#: GEJ51-09

GEI Consultants, Inc.
ELLE Sample #: GW 9792198
ELLE Group #: 1984787
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:20	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:20	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 07:59	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/16/2018 06:26	Clinton M Wilson	2000
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 06:28	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 06:47	Ashlynn M Cornelius	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921201A	09/10/2018 15:31	Amy L Hankins	10
12151	Temperature of pH	SM 2550 B-2010	1	18254006203A	09/12/2018 00:34	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006203A	09/12/2018 00:34	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-09052018 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 14:00
SDG#: GEJ51-10FB

GEI Consultants, Inc.
ELLE Sample #: GW 9792199
ELLE Group #: 1984787
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0100	1
08014	Boron	7440-42-8	N.D.	0.0120	0.100	1
01750	Calcium	7440-70-2	0.0637 J	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **FB-09052018 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 14:00
SDG#: GEJ51-10FB

GEI Consultants, Inc.
ELLE Sample #: GW 9792199
ELLE Group #: 1984787
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.8	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	5.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:05	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:23	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:23	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:23	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:23	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:23	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:23	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 08:05	Damary Valentin	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-09052018 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/05/2018 14:00
SDG#: GEJ51-10FB

GEI Consultants, Inc.
ELLE Sample #: GW 9792199
ELLE Group #: 1984787
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/11/2018 07:05	Ashlynn M Cornelius	1
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 07:05	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 07:05	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921202A	09/10/2018 15:53	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006203A	09/12/2018 00:45	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006203A	09/12/2018 00:45	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-09062018 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 12:30
SDG#: GEJ51-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9792200
ELLE Group #: 1984787
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0100	1
08014	Boron	7440-42-8	N.D.	0.0120	0.100	1
01750	Calcium	7440-70-2	0.0534 J	0.0330	1.00	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0300	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0100	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.100	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.100	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0600	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0040	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0040	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.0010	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0020	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0060	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0040	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **FB-09062018 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 12:30
SDG#: GEJ51-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9792200
ELLE Group #: 1984787
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.9	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.1	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182541404402	09/17/2018 13:08	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:26	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:26	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:26	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:26	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182541404701A	09/20/2018 14:26	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182541404701C	09/20/2018 14:26	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182540571302	09/12/2018 08:07	Damary Valentin	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-09062018 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 09/07/2018 17:00
Collection Date/Time: 09/06/2018 12:30
SDG#: GEJ51-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9792200
ELLE Group #: 1984787
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182541404402	09/12/2018 06:23	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182541404701	09/12/2018 06:17	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182540571302	09/11/2018 16:10	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18253520206A	09/11/2018 07:23	Ashlynn M Cornelius	1
01504	Fluoride	EPA 300.0	1	18253520206A	09/11/2018 07:23	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	18253520206A	09/11/2018 07:23	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18253921202A	09/10/2018 15:53	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18254006203A	09/12/2018 00:41	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18254006203A	09/12/2018 00:41	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1984787
Reported: 09/21/2018 16:39

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 182540571302	Sample number(s): 9792190-9792200		
Mercury	N.D.	0.000050	0.00020
Batch number: 182541404402	Sample number(s): 9792190-9792200		
Barium	N.D.	0.0010	0.0100
Boron	N.D.	0.0120	0.100
Calcium	N.D.	0.0330	1.00
Chromium	N.D.	0.0053	0.0300
Cobalt	N.D.	0.0015	0.0100
Lithium	N.D.	0.0110	0.100
Selenium	N.D.	0.0210	0.100
Thallium	N.D.	0.0140	0.0600
Batch number: 182541404701A	Sample number(s): 9792190-9792200		
Antimony	N.D.	0.00041	0.0040
Arsenic	N.D.	0.00068	0.0040
Beryllium	N.D.	0.000091	0.0010
Cadmium	N.D.	0.00015	0.0020
Lead	N.D.	0.0011	0.0060
Batch number: 182541404701C	Sample number(s): 9792190-9792200		
Molybdenum	N.D.	0.00031	0.0040
Batch number: 18253520106A	Sample number(s): 9792190		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18253520206A	Sample number(s): 9792191-9792200		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18253921201A	Sample number(s): 9792191-9792198		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18253921202A	Sample number(s): 9792190,9792199-9792200		
Total Dissolved Solids	N.D.	20.0	60.0

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1984787
Reported: 09/21/2018 16:39

LCS/LCSD

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 182540571302	Sample number(s): 9792190-9792200								
Mercury	0.00100	0.000976			98		80-120		
Batch number: 182541404402	Sample number(s): 9792190-9792200								
Barium	2.00	2.02			101		80-120		
Boron	2.00	1.90			95		80-120		
Calcium	4.00	3.97			99		80-120		
Chromium	0.200	0.200			100		80-120		
Cobalt	0.500	0.513			103		80-120		
Lithium	1.00	1.01			101		80-120		
Selenium	0.150	0.136			91		80-120		
Thallium	0.150	0.160			106		80-120		
Batch number: 182541404701A	Sample number(s): 9792190-9792200								
Antimony	0.00600	0.00674			112		80-120		
Arsenic	0.0100	0.00924			92		80-120		
Beryllium	0.00400	0.00391			98		80-120		
Cadmium	0.00500	0.00474			95		80-120		
Lead	0.0150	0.0151			101		80-120		
Batch number: 182541404701C	Sample number(s): 9792190-9792200								
Molybdenum	0.0500	0.0456			91		80-120		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18253520106A	Sample number(s): 9792190								
Chloride	3.00	2.99			100		90-110		
Fluoride	0.750	0.725			97		90-110		
Sulfate	7.50	7.50			100		90-110		
Batch number: 18253520206A	Sample number(s): 9792191-9792200								
Chloride	3.00	2.98			99		90-110		
Fluoride	0.750	0.717			96		90-110		
Sulfate	7.50	7.46			99		90-110		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18253921201A	Sample number(s): 9792191-9792198								
Total Dissolved Solids	200	208			104		62-127		
Batch number: 18253921202A	Sample number(s): 9792190,9792199-9792200								
Total Dissolved Solids	200	204			102		62-127		
	Std. Units	**Std. Units**	**Std. Units**	**Std. Units**					
Batch number: 18254006203A	Sample number(s): 9792195-9792196,9792198-9792200								
pH	7.00	7.01			100		95-105		
Batch number: 18254006204A	Sample number(s): 9792190-9792194,9792197								

*- Outside of specification
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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1984787
Reported: 09/21/2018 16:39

LCS/LCSD (continued)

Analysis Name	LCS Spike Added Std. Units	LCS Conc Std. Units	LCSD Spike Added Std. Units	LCSD Conc Std. Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
pH	7.00	7.01			100		95-105		

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 182540571302	Sample number(s): 9792190-9792200 UNSPK: 9792194									
Mercury	N.D.	0.00100	0.000960	0.00100	0.000950	96	95	75-125	1	20
Batch number: 182541404402	Sample number(s): 9792190-9792200 UNSPK: 9792194									
Barium	0.108	2.00	1.97	2.00	2.01	93	95	75-125	2	20
Boron	0.969	2.00	2.89	2.00	2.92	96	98	75-125	1	20
Calcium	136.1	4.00	137.64	4.00	140.86	38 (2)	119 (2)	75-125	2	20
Chromium	N.D.	0.200	0.197	0.200	0.200	98	100	75-125	2	20
Cobalt	N.D.	0.500	0.469	0.500	0.472	94	94	75-125	1	20
Lithium	0.0186	1.00	1.03	1.00	1.05	101	103	75-125	2	20
Selenium	N.D.	0.150	0.111	0.150	0.109	74*	72*	75-125	2	20
Thallium	N.D.	0.150	0.132	0.150	0.131	88	88	75-125	0	20
Batch number: 182541404701A	Sample number(s): 9792190-9792200 UNSPK: 9792194									
Antimony	N.D.	0.00600	0.00571	0.00600	0.00575	95	96	75-125	1	20
Arsenic	0.00301	0.0100	0.0123	0.0100	0.0116	93	86	75-125	6	20
Beryllium	N.D.	0.00400	0.00408	0.00400	0.00402	102	101	75-125	1	20
Cadmium	N.D.	0.00500	0.00446	0.00500	0.00467	89	93	75-125	5	20
Lead	N.D.	0.0150	0.0151	0.0150	0.0151	101	101	75-125	0	20
Batch number: 182541404701C	Sample number(s): 9792190-9792200 UNSPK: 9792194									
Molybdenum	N.D.	0.0500	0.0470	0.0500	0.0481	94	96	75-125	2	20
	mg/l	mg/l	mg/l	mg/l	mg/l					
Batch number: 18253520206A	Sample number(s): 9792191-9792200 UNSPK: 9792196									
Chloride	6972.94	5000	12178.03			104		90-110		
Fluoride	N.D.	2.50	1.14			46*		90-110		
Sulfate	15.82	25	41.55			103		90-110		

*- Outside of specification
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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1984787
Reported: 09/21/2018 16:39

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	mg/l	mg/l		
Batch number: 182540571302	Sample number(s): 9792190-9792200 BKG: 9792194			
Mercury	N.D.	N.D.	0 (1)	20
Batch number: 182541404402	Sample number(s): 9792190-9792200 BKG: 9792194			
Barium	0.108	0.106	2	20
Boron	0.969	0.948	2	20
Calcium	136.1	134.63	1	20
Chromium	N.D.	N.D.	0 (1)	20
Cobalt	N.D.	N.D.	0 (1)	20
Lithium	0.0186	0.0218	16 (1)	20
Selenium	N.D.	N.D.	0 (1)	20
Thallium	N.D.	N.D.	0 (1)	20
Batch number: 182541404701A	Sample number(s): 9792190-9792200 BKG: 9792194			
Antimony	N.D.	N.D.	0 (1)	20
Arsenic	0.00301	0.00244	21* (1)	20
Beryllium	N.D.	N.D.	0 (1)	20
Cadmium	N.D.	N.D.	0 (1)	20
Lead	N.D.	N.D.	0 (1)	20
Batch number: 182541404701C	Sample number(s): 9792190-9792200 BKG: 9792194			
Molybdenum	N.D.	N.D.	0 (1)	20
	mg/l	mg/l		
Batch number: 18253520206A	Sample number(s): 9792191-9792200 BKG: 9792196			
Chloride	6972.94	6976.83	0	15
Fluoride	N.D.	N.D.	0 (1)	15
Sulfate	15.82	16.1	2 (1)	15
	Degrees C	Degrees C		
Batch number: 18254006204A	Sample number(s): 9792190-9792194,9792197 BKG: 9792190			
Temperature of pH	23.8	23.84	0	5
	Std. Units	Std. Units		
Batch number: 18254006204A	Sample number(s): 9792190-9792194,9792197 BKG: 9792190			
pH	7.19	7.20	0	4

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only

Acct. # 701 Group # 484787 Sample # 9792190-200

COC # 579870

Client Information

Client: GEI Consultants | Acct. #:

Project Name/#: PSEG - Hudson | PWSID #:

Project Manager: Jason Kohl | P.O. #:

Sampler: C Kincaid / S Wagner | Quote #:

State where samples were collected: NJ | For Compliance: Yes ☐ No ☐

Sample Identification	Collected Date	Collected Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water	Ground	Potable	Surface	NPDES	Other:	Total # of Containers	Metals	Mercury	Chloride	Fluoride	Sulfate	pH	Total Dissolved Solids	Ra 226	Ra 228
MW-8	9/5/18	1130	X					X						7	X	X	X	X	X	X	X	X	X
MW-9	↓	1140	X					X						7	X	X	X	X	X	X	X	X	X
MW-5		1300	X					X						7	X	X	X	X	X	X	X	X	X
MW-7		1330	X					X						7	X	X	X	X	X	X	X	X	X
MW-6	9/5/18	1440	X					X						7	X	X	X	X	X	X	X	X	X
MW-1	9/6/18	0955	X					X						7	X	X	X	X	X	X	X	X	X
MW-2	9/6/18	1000	X					X						7	X	X	X	X	X	X	X	X	X
MW-3	9/6/18	1155	X					X						7	X	X	X	X	X	X	X	X	X
MW-4	9/6/18	1200	X					X						7	X	X	X	X	X	X	X	X	X
FB-09052018	9/5/18	1400	X										X	7	X	X	X	X	X	X	X	X	X

Analysis Requested

Preservation and Filtration Codes

For Lab Use Only

FSC:

SCR#: 229173

Preservation Codes

H=HCl	T=Thiosulfate
N=HNO_3	B=NaOH
S=H_2SO_4	P=H_3PO_4
F=Field Filtered	O=Other

Remarks

Metals include: As, B, Ba, Be, Ca, Cd, Co, Cr, Li, Mb, Pb, Sb, Se, Th

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days: _____

E-mail address: jkohl@geiconsultants.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Bottle Storage GBH	8/31/18	1530		8/31/18	1600
				9/1/18	1135
	9/1/18	1700			
				9/7/18	1200

EDD Required? Yes No

If yes, format: _____

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.7 °C

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only

Acct. # 7701 Group # 198787 Sample # 9792190-200

COC # 579871

Client Information

Client: GEI Consultants	Acct. #:
Project Name/#: PSEG - Hudson	PWSID #:
Project Manager: Jason Kohl	P.O. #:
Sampler: C. Kincaid / S. Wagner	Quote #:
State where samples were collected: CK	For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water: Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: Aqueous

Analysis Requested

Preservation and Filtration Codes

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Metals	Mercury	Chloride	Fluoride	Sulfate	pH	Total Dissolved Solid	Ra 226	Ra 228
FB-09062018	9/6/18	1236	X		1	X	X	XX	X	X	X	X	XX	

For Lab Use Only

FSC:

SCR#:

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Metals include: As, B, Ba, Be, Ca, Cd, Co, Cr, Li, Mo, Pb, Sb, Se, Tl

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: jkohl@geiconsultants.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) NJ DKQP TX TRRP-13

NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	9/7/18	1035		9/7/18	1135
	9/7/18	1800			

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:

UPS FedEx Other

Temperature upon receipt 0.7 °C

eurofins | Lancaster Laboratories Environmental

Sample Administration Receipt Documentation Log

Doc Log ID: 226446

Group Number(s): 196478

Client: GEI Consultants

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	09/07/2018 17:00
Number of Packages:	4	Number of Projects:	2
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	Yes		

Unpacked by Melvin Sanchez (8943) at 19:30 on 09/07/2018

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT146	0.7	DT	Wet	Y	Bagged	N
2	DT146	0.7	DT	Wet	Y	Bagged	N
3	DT146	4.3	DT	Wet	Y	Bagged	N
4	DT146	5.1	DT	Wet	Y	Bagged	N

Container Quantity Discrepancy Details

Sample ID on COC	Container Qty. Received	Container Qty. on COC	Comments
MW-6	8	7	

General Comments: Receievd Metals Batch QC for sample MW-6

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

Metals in Liquid Data

Case Narrative/Conformance Summary

Metals in Liquid

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

ICP Metals

Fraction: Metals in Liquid

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9792190	MW-8	X		
9792191	MW-9	X		
9792192	MW-5	X		
9792193	MW-7	X		
9792194	MW-6	X		
9792195	MW-1	X		
9792196	MW-2	X		
9792197	MW-3	X		
9792198	MW-4	X		
9792199	FB-09052018	X		Field Blank
9792200	FB-09062018	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Method defined actions are taken for any failed matrix QC.

Batch#: 182541404402 (Sample number(s): 9792190-9792200, UNSPK: 9792194, BKG: 9792194)
The recovery(ies) for the following analyte(s) in the MS were below the acceptance window: Calcium

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

ICP Metals

Fraction: Metals in Liquid

The recovery(ies) for the following analyte(s) in the MS and MSD were below the acceptance window: Selenium

Sample Duplicate

Batch#: 182541404701A (Sample number(s): 9792190-9792200, UNSPK: 9792194, BKG: 9792194)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Arsenic

SAMPLE ANALYSIS:

Refer to analysis run log for samples requiring dilutions.

The instrument detection limits (IDLs) are used for determining the U flags on the initial and continuing calibration blanks. The highest IDL is selected when multiple instruments are used for an analysis. The method detection limits (MDLs) are used for determining all other U flags.

(Sample number(s): 9792190-9792195, 9792197-9792200: Analysis: 07036)
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.

(Sample number(s): 9792196: Analysis: 07036)
An interfering analyte exceeded the linear range of the instrument, and all affected analytes were analyzed at a higher dilution. The reporting limits were raised accordingly.
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Arsenic, Lead, Selenium, Thallium.

No other problems were encountered with the analysis of the samples.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

ICP Metals

Fraction: Metals in Liquid

Abbreviation Key

BKG – Background	AF - Cold Vapor Atomic Fluorescence
DUP – Duplicate	U - Below MDL
MS - Matrix Spike	B - Below LOQ
MSD - Matrix Spike Dup	N - Matrix Spike out of specifications
B – Blank	* - Duplicate out of specifications
Q - Laboratory Control Sample	E - Matrix Effects exist as proven by Serial Dilution or Spiked Dilution
Y - Laboratory Control Sample Duplicate	A - Post Digestion Spike
P - ICP Atomic Emission Spectrometer	L - Serial Dilution
MS - ICP Mass Spectrometry	R - Internal Standard Relative Intensity OOS
CV - Cold Vapor	NR - Not Required

Sample Data

Metals in Liquid

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792190 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	1.5	B		MS
7440-39-3	Barium	101			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	337			P
7440-43-9	Cadmium	0.36	B		MS
7440-70-2	Calcium	37500			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	6.8	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.9	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792191 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.53	B		MS
7440-38-2	Arsenic	2.2	B		MS
7440-39-3	Barium	123			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	620			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	116000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	2.1	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	1.8	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792192 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.86	B		MS
7440-39-3	Barium	82.1			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	471			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	91800			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792193 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	1.0	B		MS
7440-39-3	Barium	68.1			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	268			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	39900			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	4.3			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792194BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	3.0	B		MS
7440-39-3	Barium	108			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	969			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	136000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	18.6	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence
NR = Not Required

CONCENTRATION QUALIFIERS:
U = Below MDL,
B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792195 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	2.3	B		MS
7440-39-3	Barium	808			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1110			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	380000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	4.8	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	43.1	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	2.9	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792196 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	4.7			MS
7440-39-3	Barium	2240			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	912			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	459000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	3.5	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	63.0	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	2.6	B		MS
7782-49-2	Selenium	105	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792197 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.48	B		MS
7440-38-2	Arsenic	0.86	B		MS
7440-39-3	Barium	233			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	740			P
7440-43-9	Cadmium	0.16	B		MS
7440-70-2	Calcium	175000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	14.8	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	7.3			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792198 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.46	B		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	81.5			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1140			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	97900			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	55.1	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	8.9			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792199 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	63.7	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9792200 % Solids: 0.0
Concentration Units: UG/L Date Received: 09/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	53.4	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
_____

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

Quality Control and Calibration Summary Forms

Metals in Liquid

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ51
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Barium	182541404402	9792190
Boron		9792191
Calcium		9792192
Chromium		9792193
Cobalt		9792194BKG
Lithium		9792194MS
Selenium		9792194MSD
Thallium		9792194DUP
		9792195
		9792196
		9792197
		9792198
		9792199
		9792200
		P25404BB
		P25404BQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ51
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Antimony	182541404701	9792190
Arsenic		9792191
Beryllium		9792192
Cadmium		9792193
Lead		9792194BKG
Molybdenum		9792194MS
		9792194MSD
		9792194DUP
		9792195
		9792196
		9792197
		9792198
		9792199
		9792200
		P25404AB
		P25404AQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ51
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Mercury	182540571302	9792190
		9792191
		9792192
		9792193
		9792194BKG
		9792194MS
		9792194MSD
		9792194DUP
		9792195
		9792196
		9792197
		9792198
		9792199
		9792200
		P25471BB
		P25471BQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: P
Run Name: 1826003T73
Calibration Date(s): 09/17/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Barium		600.0	596.34	99.4	500.0	493.74	98.7	500.0	499.33	99.9
Boron		600.0	598.41	99.7	500.0	491.86	98.4	500.0	496.75	99.4
Calcium		30000.0	29324.00	97.7	25000.0	24528.12	98.1	25000.0	24483.96	97.9
Chromium		600.0	588.92	98.2	500.0	483.80	96.8	500.0	483.45	96.7
Cobalt		600.0	588.46	98.1	500.0	485.68	97.1	500.0	483.09	96.6
Lithium		600.0	597.03	99.5	500.0	497.15	99.4	500.0	496.47	99.3
Selenium		600.0	576.47	96.1	500.0	460.48	92.1	500.0	479.62	95.9
Thallium		600.0	598.64	99.8	500.0	492.37	98.5	500.0	492.82	98.6

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: P
Run Name: 1826003T73
Calibration Date(s): 09/17/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium					500.0	492.70	98.5	500.0	497.80	99.6
Boron					500.0	495.94	99.2	500.0	490.08	98.0
Calcium					25000.0	24224.07	96.9	25000.0	24172.54	96.7
Chromium					500.0	478.47	95.7	500.0	480.62	96.1
Cobalt					500.0	483.26	96.7	500.0	484.61	96.9
Lithium					500.0	499.79	100.0	500.0	499.99	100.0
Selenium					500.0	483.97	96.8	500.0	478.31	95.7
Thallium					500.0	496.79	99.4	500.0	495.75	99.2

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: P
Run Name: 1826106T74
Calibration Date(s): 09/18/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium		30000.0	29502.51	98.3	25000.0	25095.58	100.4	25000.0	25288.37	101.2
Chromium										
Cobalt										
Lithium		600.0	589.04	98.2	500.0	498.32	99.7	500.0	507.57	101.5
Selenium		600.0	582.68	97.1	500.0	499.34	99.9	500.0	505.67	101.1
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: P
Run Name: 1826106T74
Calibration Date(s): 09/18/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium					25000.0	25548.87	102.2			
Chromium										
Cobalt										
Lithium					500.0	506.17	101.2			
Selenium					500.0	490.78	98.2			
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: MS
Run Name: 1826301E05
Calibration Date(s): 09/20/2018
Concentration Units: UG/L

		Initial Calibration			Continuing Calibration					
Analyte	Mass	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Antimony	121	50.0	51.13	102.3	25.0	23.30	93.2	25.0	22.59	90.4
Arsenic	75	500.0	494.29	98.9	250.0	244.67	97.9	250.0	237.87	95.1
Beryllium	9	50.0	51.48	103.0	25.0	24.53	98.1	25.0	26.43	105.7
Cadmium	111	50.0	49.46	98.9	25.0	24.04	96.2	25.0	23.02	92.1
Lead	208	50.0	50.80	101.6	25.0	24.89	99.6	25.0	25.61	102.4
Molybdenum	98	50.0	48.56	97.1	25.0	23.43	93.7	25.0	23.28	93.1

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: MS
Run Name: 1826301E05
Calibration Date(s): 09/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121				25.0	26.27	105.1			
Arsenic	75				250.0	254.45	101.8			
Beryllium	9				25.0	24.35	97.4			
Cadmium	111				25.0	24.74	99.0			
Lead	208				25.0	25.38	101.5			
Molybdenum	98				25.0	23.70	94.8			

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: CV
Run Name: 1825501M09
Calibration Date(s): 09/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury		2.5	2.56	102.4	1.0	1.00	100.0	1.0	0.98	98.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: CV
Run Name: 1825501M09
Calibration Date(s): 09/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.98	98.0	1.0	0.98	98.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ51

Method: CV
Run Name: 1825501M09
Calibration Date(s): 09/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.97	97.0	1.0	0.98	98.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1826003T73
Calibration Date(s): 09/17/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium		10.0	10.43	104.3		
Boron		100.0	95.68	95.7		
Calcium		1000.0	982.34	98.2		
Chromium		30.0	29.12	97.1		
Cobalt		10.0	10.10	101.0		
Lithium		100.0	96.61	96.6		
Selenium		100.0	88.20	88.2		
Thallium		60.0	63.74	106.2		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ51

Method: P
Run Name: 1826106T74
Calibration Date(s): 09/18/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium						
Boron						
Calcium		1000.0	1031.10	103.1		
Chromium						
Cobalt						
Lithium		100.0	105.10	105.1		
Selenium		100.0	103.27	103.3		
Thallium						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ51

Method: MS
Run Name: 1826301E05
Calibration Date(s): 09/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony	121	4.0	4.36	109.0		
Arsenic	75	4.0	3.74	93.5		
Beryllium	9	1.0	1.04	104.0		
Cadmium	111	2.0	1.84	92.0		
Lead	208	6.0	6.22	103.7		
Molybdenum	98	4.0	3.85	96.3		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ51

Method: CV
Run Name: 1825501M09
Calibration Date(s): 09/12/2018
Concentration Units: UG/L

			Initial		Final	
Analyte	Mass	True	Found	%R	Found	%R
Mercury		0.2	0.20	100.0		

Control limits: 50% - 150%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ51

Method: P
Run Name: 1826003T73
Calibration Date(s): 09/17/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium		0.33	U	0.33	U	0.33	U	0.33	U		1.000	U	182541404402
Boron		8.4	U	8.4	U	8.4	U	8.4	U		12.000	U	182541404402
Calcium		33.4	U	33.4	U	33.4	U	33.4	U		33.000	U	182541404402
Chromium		-0.76	B	0.55	U	-0.56	B	0.55	U		5.300	U	182541404402
Cobalt		0.40	U	0.40	U	0.40	U	0.40	U		1.500	U	182541404402
Lithium		7.5	U	7.5	U	7.5	U	7.5	U		11.000	U	182541404402
Selenium		9.2	U	-9.4	B	-15.6	B	-10.4	B		21.000	U	182541404402
Thallium		3.1	U	3.1	U	3.1	U	3.1	B		14.000	U	182541404402

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ51

Method: P
Run Name: 1826003T73
Calibration Date(s): 09/17/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium				0.33	U								
Boron				8.4	U								
Calcium				33.4	U								
Chromium				0.55	U								
Cobalt				0.40	U								
Lithium				7.5	U								
Selenium				-10.4	B								
Thallium				3.1	U								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ51

Method: P
Run Name: 1826106T74
Calibration Date(s): 09/18/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron													
Calcium		33.4	U	33.4	U	33.4	U	33.4	U				
Chromium													
Cobalt													
Lithium		7.5	U	7.5	U	7.5	U	7.5	U				
Selenium		9.2	U	9.2	U	9.2	U	9.2	U				
Thallium													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ51

Method: MS
Run Name: 1826301E05
Calibration Date(s): 09/20/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121	0.52	U	0.52	U	0.52	U	0.52	U	121	0.410	U	182541404701A
Arsenic	75	0.40	U	0.40	U	0.40	U	0.40	U	75	0.680	U	182541404701A
Beryllium	9	0.067	U	0.067	U	0.067	U	0.067	U	9	0.091	U	182541404701A
Cadmium	111	0.17	U	0.17	U	0.17	U	0.17	U	111	0.150	U	182541404701A
Lead	208	0.21	U	0.21	U	0.21	U	0.21	U	208	1.100	U	182541404701A
Molybdenum	98	0.36	U	0.36	U	0.36	U	0.36	U	98	0.310	U	182541404701A

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ51

Method: CV
Run Name: 1825501M09
Calibration Date(s): 09/12/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury		0.050	U	0.050	U	0.050	U	0.050	U		0.050	U	182540571302

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ51

Method: CV
Run Name: 1825501M09
Calibration Date(s): 09/12/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U	0.050	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ51

Instrument ID: 18255
Run Name: 1826003T73
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		488335	97.7						
Barium	0		0							
Boron	0		-17							
Calcium	500000		487678	97.5						
Chromium	0		-1							
Cobalt	0		0							
Iron	200000		196951	98.5						
Lithium	0		-11							
Magnesium	500000		492845	98.6						
Selenium	0		-27							
Thallium	0		8							

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ51

Instrument ID: 23745
Run Name: 1826106T74
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		478571	95.7						
Barium										
Boron										
Calcium	500000		473994	94.8						
Chromium										
Cobalt										
Iron	200000		191275	95.6						
Lithium	0		-4							
Magnesium	500000		455592	91.1						
Selenium	0		16							
Thallium										

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ51

Instrument ID: 19204
Run Name: 1826301E05
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		98651	98.7		
Antimony	121	0		1			
Arsenic	75	0		1			
Beryllium	9	0		0			
Cadmium	111	0		0			
Calcium	44	300000		283624	94.5		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		267801	107.1		
Lead	208	0		1			
Magnesium	24	100000		106542	106.5		
Molybdenum	98	2000		2065	103.3		
Phosphorus	31	10000		NA			
Potassium	39	100000		96860	96.9		
Sodium	23	250000		257408	103.0		
Sulfur	34	10000		NA			
Titanium	47	2000		2047	102.4		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9792194BKG Matrix Spike Lab Sample ID: 9792194MS Matrix Spike Duplicate Lab Sample ID: 9792194MSD
Batch Number(s): 182541404701, 182541404402, 182540571302

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Antimony	121	0.4060	U	5.7110		5.7500		6.0000	6.0000	UG/L	95		96		1		75 - 125	20	MS
Arsenic	75	3.0080	B	12.2920		11.5910		10.0000	10.0000	UG/L	93		86		6		75 - 125	20	MS
Barium		108.1000		1974.6400		2006.0300		2000.0000	2000.0000	UG/L	93		95		2		75 - 125	20	P
Beryllium	9	0.0910	U	4.0810		4.0220		4.0000	4.0000	UG/L	102		101		1		75 - 125	20	MS
Boron		968.6800		2887.9800		2921.6600		2000.0000	2000.0000	UG/L	96		98		1		75 - 125	20	P
Cadmium	111	0.1510	U	4.4600		4.6690		5.0000	5.0000	UG/L	89		93		5		75 - 125	20	MS
Calcium		136103.2800		137638.2500		140855.2100		4000.0000	4000.0000	UG/L	38		119		2			20	P
Chromium		5.3000	U	196.5000		199.8200		200.0000	200.0000	UG/L	98		100		2		75 - 125	20	P
Cobalt		1.5000	U	468.5000		471.9100		500.0000	500.0000	UG/L	94		94		1		75 - 125	20	P
Lead	208	1.0700	U	15.1300		15.1490		15.0000	15.0000	UG/L	101		101		0		75 - 125	20	MS
Lithium		18.5800	B	1026.8200		1046.4400		1000.0000	1000.0000	UG/L	101		103		2		75 - 125	20	P
Mercury		0.0500	U	0.9601		0.9496		1.0000	1.0000	UG/L	96		95		1		75 - 125	20	CV
Molybdenum	98	0.3090	U	47.0010		48.0850		50.0000	50.0000	UG/L	94		96		2		75 - 125	20	MS
Selenium		21.0000	U	111.2900		108.5500		150.0000	150.0000	UG/L	74	N	72	N	2		75 - 125	20	P
Thallium		14.0000	U	132.0300		131.4200		150.0000	150.0000	UG/L	88		88		0		75 - 125	20	P

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5B
POST DIGEST SPIKE SAMPLE RECOVERY
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9792194BKG

Analyte	Mass	Sample Result(SR)	C	Spike Added(SA)	Spiked Sample Result(SSR)	C	SRR %R	Spiked Sample Duplicate(SSD)	C	SSD %R	M
Selenium		21.0000	U	800.0000	740.8000		93	NA	U	NA	P

Comments:

Note: Results shown are reported on an as-received basis.

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9792194BKG Duplicate Lab Sample ID: 9792194DUP
Batch Number(s): 182541404701, 182541404402, 182540571302
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony	121		0.4060	U	0.4060	U			MS
Arsenic	75		3.0080	B	2.4380	B	21		MS
Barium			108.1000		105.9400		2		P
Beryllium	9		0.0910	U	0.0910	U			MS
Boron			968.6800		948.4300		2		P
Cadmium	111		0.1510	U	0.1510	U			MS
Calcium			136103.2800		134634.9000		1		P
Chromium			5.3000	U	5.3000	U			P
Cobalt			1.5000	U	1.5000	U			P
Lead	208		1.0700	U	1.0700	U			MS
Lithium			18.5800	B	21.8400	B	16		P
Mercury			0.0500	U	0.0500	U			CV
Molybdenum	98		0.3090	U	0.3090	U			MS
Selenium			-39.0500	B	-32.7600	B	-18		P
Thallium			14.0000	U	14.0000	U			P

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 7
LABORATORY CONTROL SAMPLE
SDG No.: GEJ51
Matrix: WATER

Analyte	Mass	Batch Number	Units	True	Found	C	Control Limits (%)	%R	M	In Spec
Antimony	121	182541404701	UG/L	6.000	6.735		80 - 120	112	MS	Yes
Arsenic	75	182541404701	UG/L	10.000	9.240		80 - 120	92	MS	Yes
Barium		182541404402	UG/L	2000.000	2015.390		80 - 120	101	P	Yes
Beryllium	9	182541404701	UG/L	4.000	3.905		80 - 120	98	MS	Yes
Boron		182541404402	UG/L	2000.000	1897.780		80 - 120	95	P	Yes
Cadmium	111	182541404701	UG/L	5.000	4.741		80 - 120	95	MS	Yes
Calcium		182541404402	UG/L	4000.000	3971.070		80 - 120	99	P	Yes
Chromium		182541404402	UG/L	200.000	200.040		80 - 120	100	P	Yes
Cobalt		182541404402	UG/L	500.000	513.210		80 - 120	103	P	Yes
Lead	208	182541404701	UG/L	15.000	15.133		80 - 120	101	MS	Yes
Lithium		182541404402	UG/L	1000.000	1007.790		80 - 120	101	P	Yes
Mercury		182540571302	UG/L	1.000	0.976		80 - 120	98	CV	Yes
Molybdenum	98	182541404701	UG/L	50.000	45.571		80 - 120	91	MS	Yes
Selenium		182541404402	UG/L	150.000	136.280		80 - 120	91	P	Yes
Thallium		182541404402	UG/L	150.000	159.690		80 - 120	106	P	Yes

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ51
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9792194BKG Serial Dilution Lab Sample ID: 9792194L
Batch Number(s): 182541404701, 182541404402
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Antimony	121	0.4060	U	2.0300	U			MS
Arsenic	75	3.0080	B	3.4000	U	100		MS
Barium		108.1000		110.0500		2		P
Beryllium	9	0.0910	U	0.4550	U			MS
Boron		968.6800		980.7500		1		P
Cadmium	111	0.1510	U	0.7550	U			MS
Calcium		136103.2800		136053.6500		0		P
Chromium		5.3000	U	26.5000	U			P
Cobalt		1.5000	U	7.5000	U			P
Lead	208	1.0700	U	5.3500	U			MS
Lithium		18.5800	B	55.0000	U	100		P
Molybdenum	98	0.3090	U	1.5450	U			MS
Selenium		21.0000	U	105.0000	U			P
Thallium		14.0000	U	70.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

QUALITY ASSURANCE SUMMARY
FORM 10
INSTRUMENT DETECTION LIMITS (QUARTERLY)
SDG No.: GEJ51

Method: P
Instrument ID: 18255
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium	455.40		0.33
Boron	249.67		8.4
Calcium	317.93		33.4
Chromium	267.72		0.55
Cobalt	228.62		0.40
Lithium	670.78		5.3
Selenium	196.09		9.2
Thallium	190.86		3.1

Comments:

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Instrument ID: 23745
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium			
Boron			
Calcium	317.93		33.4
Chromium			
Cobalt			
Lithium	670.78		7.5
Selenium	196.09		6.0
Thallium			

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 10
INSTRUMENT DETECTION LIMITS (QUARTERLY)
SDG No.: GEJ51

Method: MS
Instrument ID: 19204
Date: 07/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony	121		0.52
Arsenic	75		0.40
Beryllium	9		0.067
Cadmium	111		0.17
Lead	208		0.21
Molybdenum	98		0.36

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Instrument ID: 23283
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Mercury			0.050

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ51
Matrix: WATER

Method: P
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium	455.40		10.0	1.0
Boron	249.67		100	12.0
Calcium	317.93		1000	33.0
Chromium				
Cobalt	228.62		10.0	1.5
Lithium	670.78		100	11.0
Selenium				
Thallium				

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ51
Matrix: WATER

Method: P
Date: 09/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium				
Boron				
Calcium				
Chromium	267.72		30.0	5.3
Cobalt				
Lithium				
Selenium	196.09		100	21.0
Thallium	190.86		60.0	14.0

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ51
Matrix: WATER

Method: MS
Date: 07/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony	121		4.0	0.41
Arsenic				
Beryllium	9		1.0	0.091
Cadmium	111		2.0	0.15
Lead				
Molybdenum	98		4.0	0.31

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ51
Matrix: WATER

Method: MS
Date: 09/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony				
Arsenic	75		4.0	0.68
Beryllium				
Cadmium				
Lead	208		6.0	1.1
Molybdenum				

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ51
Matrix: WATER

Method: CV
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Mercury			0.20	0.050

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Tune Report

Batch Folder D:\Agilent\ICPMH\1\DATA\~EPATUNEaa.b
Report Comment ICP-MS #19204 (E05) Daily Tune Check
Instrument Name G3281A JP12071581

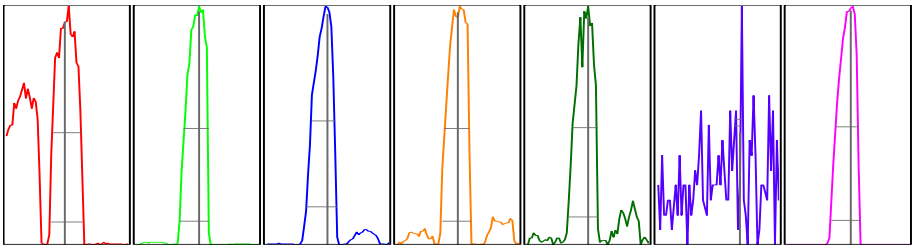
[No Gas]

Mass	Range	Count (Actual)	Response (Actual) [cps/ug/l]	Response (Required) [cps/ug/l]	Response (Flag)	Resp Ratio (Actual)	Resp Ratio (Required)	Resp Ratio (Flag)
7		1244	12443.47	2000.00		0.02	-	
89		8849	88489.03	6000.00		0.12	-	
205		3497	34965.06	3000.00		0.05	-	
70		1095	10950.34	0.00		0.01	0 - 0.015	
156		191	1912.14	0.00		0.00	0 - 0.03	
220		12	119.01	0.00		0.00	-	
140		75135	751345.15	0.00		1.00	1 - 1	

Mass	RSD% (Actual)	RSD% (Required)	RSD% (Flag)	Background (Actual)	Background (Required)	Background (Flag)
7	3.14	5.00				
89	1.51	5.00				
205	1.05	5.00				
70	1.67					
156	2.79					
220	33.67					
140	1.08					

Mass	Replicate 1 Count	Replicate 2 Count	Replicate 3 Count	Replicate 4 Count	Replicate 5 Count
7	1198	1215	1249	1264	1296
89	8669	8965	8901	8747	8962
205	3438	3518	3522	3522	3482
70	1070	1093	1107	1087	1118
156	188	188	190	201	191
220	7	18	10	14	11
140	73989	74934	74930	75798	76020

Integration Time [sec] 0.1



Mass	Peak Height	Axis (Actual)	Axis (Required)	Axis (Flag)	W-50%	W-X% (Actual)	W-X% (Required)	W-X% (Flag)
7	190.94	6.95	6.9 - 7.1		0.70	0.784	0.800	
89	1587.03	89.05	88.9 - 89.1		0.59	0.696	0.800	
205	637.12	205.00	204.9 - 205.1		0.55	0.725	0.800	
70	185.42	70.00	-		0.61	0.729		
156	34.56	156.00	-		0.57	0.720		
220	1.70	220.50	-		0.19	0.187		
140	14127.72	140.05	-		0.55	0.712		

X = 10 **Integration Time [sec]** 0.1 **Acquisition Time [sec]** 260.3 **Y Axis** Linear

Tune Parameters
Plasma Paramters

RF Power	1600 W	Carrier Gas	0.25 L/min	S/C Temp	20 ℃
RF Matching	1.60 V	Option Gas	0.0 %	Makeup/Dilution Gas	0.70 L/min
Smpl Depth	10.0 mm	Nebulizer Pump	0.10 rps	Gas Switch	Dilution Gas

Lenses Parameters

Tune Report

Extract 1		0.0 V	Omega Lens		8.1 V	Deflect		16.4 V	
Extract 2		-190.0 V	Cell Entrance		-32 V	Plate Bias		-40 V	
Mass	**Peak Height**	**Axis (Actual)**	**Axis (Required)**	**Axis (Flag)**	**W-50%**	**W-X% (Actual)**	**W-X% (Required)**	**W-X% (Flag)**	
Omega Bias		-90 V	Cell Exit			-58 V			

Cell Parameters

OctP Bias	-8.0 V	He Flow	0.0 mL/min	Energy Discrimination	5.0 V
OctP RF	200 V	H2 Flow	0.0 mL/min		
Use Gas	false	3rd Gas Flow	0 %		

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ51

Instrument ID: 19204
Run Name: 1826301E05

Start Date: 09/20/2018
End Date: 09/20/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-1-209	PB	IN-1-115	AS,CD,MO
SC-2-45	BE	TB-1-159	SB

Lab Sample ID	Time	Internal Standards %RI For: Element SC-2-45	Q	Element IN-1-115	Q	Element TB-1-159	Q	Element BI-1-209	Q	Element	Q	Element	Q	Element	Q
S0	12:58	100		100		100		100							
S	13:01	101		98		98		99							
ICV	13:04	99		98		95		97							
ICB	13:07	96		101		97		97							
LLC	13:10	101		105		97		99							
ICSA	13:12	89		86		91		83							
LRS2	13:15	99		97		99		99							
LRS3	13:18	103		104		99		99							
CCS	13:21	105		108		103		105							
CCS	13:24	104		104		103		105							
CCV	13:26	103		105		103		104							
CCB	13:29	104		104		101		103							
P25404AB	13:32	102		101		101		101							
P25404AQ	13:35	101		107		99		100							
9792194BKG	13:38	94		99		99		97							
9792194A	13:41	95		104		102		96							
9792194DUP	13:43	95		99		97		96							
9792194MS	13:46	94		102		98		95							
9792194MSD	13:49	94		98		98		95							
9792194L	13:52	103		107		102		105							
9792190	13:55	101		103		103		102							
CCV	13:57	104		111		103		108							
CCB	14:00	106		109		101		104							
9792191	14:03	98		103		101		101							
9792192	14:06	97		101		100		97							
9792193	14:09	105		107		106		106							
9792195	14:11	85		91		91		82							
9792196	14:14	82		89		87		76							
9792197	14:17	85		90		86		80							
9792198	14:20	76		80		79		73							
9792199	14:23	86		95		86		85							
9792200	14:26	87		97		89		86							

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ51

Instrument ID: 19204 Start Date: 09/20/2018
Run Name: 1826301E05 End Date: 09/20/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-1-209	PB	IN-1-115	AS,CD,MO
SC-2-45	BE	TB-1-159	SB

Lab Sample ID	Time	Internal Standards %RI For: Element SC-2-45	Q	Element IN-1-115	Q	Element TB-1-159	Q	Element BI-1-209	Q	Element	Q	Element	Q	Element	Q
CCV	14:28	96		100		93		91							
CCB	14:31	99		99		93		93							

LEGEND:
BKG = Background MS = Matrix Spike
DUP = Duplicate MSD = Matrix Spike Duplicate
L = Serial Dilution A = Post Digest Spike
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium LI = Lithium
BI = Bismuth SC = Scandium
GE = Germanium TB = Terbium
HO = Holmium Y = Yttrium
IN = Indium

Preparation and Run Logs

Metals in Liquid

Method: P
Batch Number: 182541404402

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9792190	09/12/2018	50.00	50
9792191	09/12/2018	50.00	50
9792192	09/12/2018	50.00	50
9792193	09/12/2018	50.00	50
9792195	09/12/2018	50.00	50
9792196	09/12/2018	50.00	50
9792197	09/12/2018	50.00	50
9792198	09/12/2018	50.00	50
9792199	09/12/2018	50.00	50
9792200	09/12/2018	50.00	50
9792194BKG	09/12/2018	50.00	50
9792194DUP	09/12/2018	50.00	50
9792194MSD	09/12/2018	50.00	50
9792194MS	09/12/2018	50.00	50
P25404BB	09/12/2018	50.00	50
P25404BQ	09/12/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: MS
Batch Number: 182541404701

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9792190	09/12/2018	50.00	50
9792191	09/12/2018	50.00	50
9792192	09/12/2018	50.00	50
9792193	09/12/2018	50.00	50
9792195	09/12/2018	50.00	50
9792196	09/12/2018	50.00	50
9792197	09/12/2018	50.00	50
9792198	09/12/2018	50.00	50
9792199	09/12/2018	50.00	50
9792200	09/12/2018	50.00	50
9792194BKG	09/12/2018	50.00	50
9792194DUP	09/12/2018	50.00	50
9792194MSD	09/12/2018	50.00	50
9792194MS	09/12/2018	50.00	50
P25404AB	09/12/2018	50.00	50
P25404AQ	09/12/2018	1.00	1

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

Method: CV
Batch Number: 182540571302

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9792190	09/11/2018	40.00	40
9792191	09/11/2018	40.00	40
9792192	09/11/2018	40.00	40
9792193	09/11/2018	40.00	40
9792195	09/11/2018	40.00	40
9792196	09/11/2018	40.00	40
9792197	09/11/2018	40.00	40
9792198	09/11/2018	40.00	40
9792199	09/11/2018	40.00	40
9792200	09/11/2018	40.00	40
9792194BKG	09/11/2018	40.00	40
9792194DUP	09/11/2018	40.00	40
9792194MSD	09/11/2018	40.00	40
9792194MS	09/11/2018	40.00	40
P25471BB	09/11/2018	40.00	40
P25471BQ	09/11/2018	1.00	1

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ51

Method: P
Instrument ID: 18255
Run Name: 1826003T73

Run Start Date: 09/17/2018
Run End Date: 09/17/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ51

Method: P
Instrument ID: 18255
Run Name: 1826003T73

Run Start Date: 09/17/2018
Run End Date: 09/17/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
CCV	1.00	13:16			X		X		X	X	X		X			X	X																								
CCB	1.00	13:19			X		X		X	X	X		X			X	X																								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ51

Method: P
Instrument ID: 23745
Run Name: 1826106T74

Run Start Date: 09/18/2018
Run End Date: 09/18/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ51

Method: MS
Instrument ID: 19204
Run Name: 1826301E05

Run Start Date: 09/20/2018
Run End Date: 09/20/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ51

Method: CV
Instrument ID: 23283
Run Name: 1825501M09

Run Start Date: 09/12/2018
Run End Date: 09/12/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ51

Method: CV
Instrument ID: 23283
Run Name: 1825501M09

Run Start Date: 09/12/2018
Run End Date: 09/12/2018

| Lab Sample ID | D/F | Time | Analytes | | |

Instrumental Wet Chemistry Data

Case Narrative/Conformance Summary

Instrumental Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9792190	MW-8	X		
9792191	MW-9	X		
9792192	MW-5	X		
9792193	MW-7	X		
9792194	MW-6	X		
9792195	MW-1	X		
9792196	MW-2	X		
9792197	MW-3	X		
9792198	MW-4	X		
9792199	FB-09052018	X		Field Blank
9792200	FB-09062018	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Method defined actions are taken for any failed matrix QC.

Batch#: 18253520206A (Sample number(s): 9792191-9792200, UNSPK: 9792196, BKG: 9792196)
The recovery(ies) for the following analyte(s) in the MS were below the acceptance window: Fluoride

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

SAMPLE ANALYSIS:

Samples	Chloride	Fluoride	Sulfate
9792190	DF500	DF5	DF5
9792191	DF500	DF5	DF5
9792192	DF500	DF5	DF5
9792193	DF50	DF5	DF5
9792194	DF500	DF5	DF5
9792195	DF2500	DF5	DF50
9792196	UNSPK,MS,D/ DF2500	UNSPK,MS,D/ DF5	UNSPK,MS,D/ DF5
9792197	DF500	DF5	DF50
9792198	DF2000	DF5	DF50
9792199	DF1	DF1	DF1
9792200	DF1	DF1	DF1

No problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

Quality Control and Calibration Summary Forms

Instrumental Wet Chemistry

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Quality Control Reference List
Instrumental Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

Fraction: Instrumental Wet Chemistry

Batch Number	Sample Number	Analysis Date	Chloride	Fluoride	Sulfate
18253520106A	9792190	09/10/2018 18:18:00		X	X
	9792190	09/10/2018 18:36:00	X		
	P25320FB	09/10/2018 13:26:00	X	X	X
	P25320FQ	09/10/2018 13:08:00	X	X	X
18253520206A	9792191	09/11/2018 02:13:00		X	X
	9792191	09/13/2018 02:47:00	X		
	9792192	09/11/2018 02:49:00		X	X
	9792192	09/13/2018 03:04:00	X		
	9792193	09/11/2018 03:26:00		X	X
	9792193	09/11/2018 03:44:00	X		
	9792194	09/11/2018 04:02:00		X	X
	9792194	09/13/2018 03:21:00	X		
	9792195	09/11/2018 05:15:00		X	
	9792195	09/11/2018 05:34:00			X
	9792195	09/13/2018 03:38:00	X		
	9792196 BKG	09/11/2018 01:18:00		X	X
	9792196 DUP	09/11/2018 01:36:00		X	X
	9792196 MS	09/11/2018 01:55:00		X	X
	9792196 BKG	09/13/2018 01:55:00	X		
	9792196 DUP	09/13/2018 02:12:00	X		
	9792196 MS	09/13/2018 02:29:00	X		
	9792197	09/11/2018 05:52:00		X	
	9792197	09/11/2018 06:10:00			X
	9792197	09/13/2018 04:29:00	X		
	9792198	09/11/2018 06:28:00		X	
	9792198	09/11/2018 06:47:00			X
	9792198	09/16/2018 06:26:00	X		
	9792199	09/11/2018 07:05:00	X	X	X
	9792200	09/11/2018 07:23:00	X	X	X
	P25320FB	09/10/2018 14:03:00	X	X	X
	P25320FQ	09/10/2018 13:44:00	X	X	X

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Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: GEJ51
Matrix: LIQUID

Fraction: Instrumental Wet Chemistry

18253520106A / P25320FB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	09/10/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	09/10/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	09/10/18	N.D.	mg/l	0.30	1.0

18253520206A / P25320FB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	09/10/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	09/10/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	09/10/18	N.D.	mg/l	0.30	1.0

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

UNSPK: 9792196 MS: 9792196	Batch: **18253520206A** (Sample number(s): 9792191-9792200)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	5000	6972.94	12178.03	NA	104	NA	90-110	NA	NA
Fluoride	IC	2.50	N.D.	1.14	NA	46 *	NA	90-110	NA	NA
Sulfate	IC	25	15.82	41.55	NA	103	NA	90-110	NA	NA

Comments:
(2) The unspiked sample result is greater than four times the spike added.
* = Out of Specification

Results are being reported on an as received basis.

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

BKG: 9792196 DUP: 9792196 **Parameter**	Batch: **18253520206A** (Sample number(s): 9792191-9792200) **ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Chloride	IC	6972.94	6976.83	0	15
Fluoride	IC	N.D.	N.D.	0 (1)	15
Sulfate	IC	15.82	16.1	2 (1)	15

Comments:
(1) The sample and/or duplicate result is less than five times the LOQ.
* = Out of Specification

Results are being reported on an as received basis.

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ51
Matrix: LIQUID

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

LCS: P25320FQ	Batch: **182535201 06A** (Sample number(s): 9792190)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.99	NA	100	NA	90-110	NA	NA
Fluoride	IC	0.750	0.725	NA	97	NA	90-110	NA	NA
Sulfate	IC	7.50	7.50	NA	100	NA	90-110	NA	NA

LCS: P25320FQ	Batch: **182535202 06A** (Sample number(s): 9792191-9792200)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.98	NA	99	NA	90-110	NA	NA
Fluoride	IC	0.750	0.717	NA	96	NA	90-110	NA	NA
Sulfate	IC	7.50	7.46	NA	99	NA	90-110	NA	NA

Instrument ID: 10913
Calibration Date: 08/20/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.475342	0.922655	2.377998	4.832213	7.523233	0.9985	0.9992
Fluoride	0.162212	0.502921	1.274630	2.670815	4.228668	0.9988	0.9994
Sulfate	0.338092	0.678324	1.782684	3.712438	5.884871	0.9992	0.9996

Concentration units: mg/L

Batch Numbers: 18253520106A, 18253520206A
Run Start Dates: 09/10/2018
Run Names: 1825301D06

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.9533	98	7.5	7.2183	96	0.75	0.7442	99
ICB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9551	99	7.5	7.3400	98	0.75	0.7111	95
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9953	100	7.5	7.4665	100	0.75	0.7360	98
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9655	99	7.5	7.4715	100	0.75	0.7169	96
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9999	100	7.5	7.4232	99	0.75	0.7282	97
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0029	100	7.5	7.4093	99	0.75	0.7374	98
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0406	101	7.5	7.2198	96	0.75	0.7332	98
CCB	0	ND	NA	0	ND	NA	0	ND	NA

* = Out of Specifications

Instrument ID: 24811
Calibration Date: 08/23/2018

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.722817	1.441954	3.472742	6.607293	9.556303	1.0000	1.0000

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Concentration units: mg/L

Batch Numbers: 18253520206A
Run Start Dates: 09/12/2018, 09/15/2018
Run Names: 1825501D17, 1825801D17

Sample	Chloride		
	True	Result	%Rec
ICV	3	2.9217	97
ICB	0	ND	NA
CCV2	3	2.7905	93
CCB	0	ND	NA
CCV2	3	2.7868	93
CCB	0	ND	NA
CCV2	3	2.7826	93
CCB	0	ND	NA
Low Chk	1.5	1.3790	92
High Chk	4.5	4.5017	100
CCV2	3	2.8528	95
CCB	0	ND	NA
CCV2	3	2.8548	95
CCB	0	ND	NA

* = Out of Specifications

Fraction: Instrumental Wet Chemistry

00224: Chloride Analyte Name	Default MDL	Default LOQ	Units
Chloride	0.20	0.40	mg/l

01504: Fluoride Analyte Name	Default MDL	Default LOQ	Units
Fluoride	0.050	0.10	mg/l

00228: Sulfate Analyte Name	Default MDL	Default LOQ	Units
Sulfate	0.30	1.0	mg/l

Wet Chemistry Data

Case Narrative/Conformance Summary

Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

Water Quality

Fraction: Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9792190	MW-8	X		
9792191	MW-9	X		
9792192	MW-5	X		
9792193	MW-7	X		
9792194	MW-6	X		
9792195	MW-1	X		
9792196	MW-2	X		
9792197	MW-3	X		
9792198	MW-4	X		
9792199	FB-09052018	X		Field Blank
9792200	FB-09062018	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Matrix QC may not be included if site-specific QC were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, laboratory spike data (LCS) are provided.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

Water Quality

Fraction: Wet Chemistry

SAMPLE ANALYSIS:

Samples	pH	Temperature of pH	Total Dissolved Solids
9792190	UNSPK,D/ DF1	UNSPK,D/ DF1	DF1
9792191	DF1	DF1	DF1
9792192	DF1	DF1	DF1
9792193	DF1	DF1	DF1
9792194	DF1	DF1	DF1
9792195	DF1	DF1	DF10
9792196	DF1	DF1	DF10
9792197	DF1	DF1	DF1
9792198	DF1	DF1	DF10
9792199	DF1	DF1	DF1
9792200	DF1	DF1	DF1

No problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

QC Summary

Wet Chemistry

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

Fraction: Wet Chemistry

Analysis	Batch Number	Sample Number	Analysis Date
Total Dissolved Solids	18253921201A	B253871B	09/10/2018 15:31
		L253871Q	09/10/2018 15:31
		9792191	09/10/2018 15:31
		9792192	09/10/2018 15:31
		9792193	09/10/2018 15:31
		9792194	09/10/2018 15:31
		9792195	09/10/2018 15:31
		9792196	09/10/2018 15:31
		9792197	09/10/2018 15:31
		9792198	09/10/2018 15:31
Total Dissolved Solids	18253921202A	B253872B	09/10/2018 15:53
		L253872Q	09/10/2018 15:53
		9792190	09/10/2018 15:53
		9792199	09/10/2018 15:53
		9792200	09/10/2018 15:53

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ51

Fraction: Wet Chemistry

Batch Number	Sample Number	Analysis Date	pH	Temperature of pH
18254006203A	9792195	09/12/2018 00:59:00	X	X
	9792196	09/12/2018 00:37:00	X	X
	9792198	09/12/2018 00:34:00	X	X
	9792199	09/12/2018 00:45:00	X	X
	9792200	09/12/2018 00:41:00	X	X
	P006203Q	09/11/2018 23:31:00	X	
18254006204A	9792190 BKG	09/12/2018 01:18:00	X	X
	9792190 DUP	09/12/2018 01:21:00	X	X
	9792191	09/12/2018 02:15:00	X	X
	9792192	09/12/2018 02:07:00	X	X
	9792193	09/12/2018 01:40:00	X	X
	9792194	09/12/2018 01:52:00	X	X
	9792197	09/12/2018 01:36:00	X	X
	P006204Q	09/12/2018 01:14:00	X	

Quality Control Summary
Method Blank
Water Quality
SDG: GEJ51
Matrix: LIQUID

Fraction: Wet Chemistry

18253921201A / B253871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	09/10/18	N.D.	mg/l	20.0	60.0

18253921202A / B253872B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	09/10/18	N.D.	mg/l	20.0	60.0

Water Quality
Fraction: Wet Chemistry

BKG: 9792190 DUP: 9792190 **Parameter**	Batch: **18254006204A** (Sample number(s): 9792190-9792194, 9792197) **ME**	**Unspiked Conc Std. Units**	**DUP Conc Std. Units**	**%RPD**	**%RPD Limits**
pH	MTR	7.19	7.2	0	4

BKG: 9792190 DUP: 9792190 **Parameter**	Batch: **18254006204A** (Sample number(s): 9792190-9792194, 9792197) **ME**	**Unspiked Conc Degrees C**	**DUP Conc Degrees C**	**%RPD**	**%RPD Limits**
Temperature of pH	MTR	23.8	23.84	0	5

Comments:
(1) The sample and/or duplicate result is less than five times the LOQ.
* = Out of Specification

Results are being reported on an as received basis.

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ51
Matrix: LIQUID

Water Quality
Fraction: Wet Chemistry

LCS: L253871Q	Batch: **18253921201A** (Sample number(s): 9792191-9792198)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	208	NA	104	NA	62-127	NA	NA

LCS: L253872Q	Batch: **18253921202A** (Sample number(s): 9792190, 9792199-9792200)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	204	NA	102	NA	62-127	NA	NA

LCS: P006203Q	Batch: **18254006203A** (Sample number(s): 9792195-9792196, 9792198-9792200)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.01	NA	100	NA	95-105	NA	NA

LCS: P006204Q	Batch: **18254006204A** (Sample number(s): 9792190-9792194, 9792197)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.01	NA	100	NA	95-105	NA	NA

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LOQ/MDL Summary
Water Quality

SDG: GEJ51

Fraction: Wet Chemistry

12152: pH Analyte Name	Default MDL	Default LOQ	Units
pH	0.010	0.010	Std. Units

12151: Temperature of pH Analyte Name	Default MDL	Default LOQ	Units
Temperature of pH	0.010	0.010	Degrees C

00212: Total Dissolved Solids Analyte Name	Default MDL	Default LOQ	Units
Total Dissolved Solids	20.0	60.0	mg/l

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

October 03, 2018

Ms. Hannah Cottman
Eurofins Lancaster Laboratories
2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994

Re: NJ Radiochemistry Analyses
Work Order: 459187

Dear Ms. Cottman:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 11, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4289.

Sincerely,

Taylor Cannon for
Julie Robinson
Project Manager

Purchase Order: 1984788
Chain of Custody: 1984788
Enclosures

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Case Narrative

Receipt Narrative
for
Eurofins Lancaster Laboratories
SDG: 459187

October 03, 2018

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on September 11, 2018 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

Laboratory ID	Client ID
459187001	MW-8
459187002	MW-9
459187003	MW-5
459187004	MW-7
459187005	MW-6
459187006	MW-1
459187007	MW-2
459187008	MW-3
459187009	MW-4
459187010	FB-09052018
459187011	FB-09062018

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

Taylor Cannon for
Julie Robinson
Project Manager

Chain of Custody and Supporting Documentation

459187

Environmental Analysis Request/Chain of Custody

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Page 1 of 2

Acct. # _____ Group # _____ Sample #

Subcontractor:	GEL		
Project Name/#:	1984788	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler:		PWSID #:	
Phone #:	717-556-7383	Quote #:	
State where samples were collected:	NJ	For Compliance: Yes ☑ No ☐	

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil ☐ Sediment ☐ Tissue ☐ / Water ☑ Potable ☐ Ground ☐ Surface ☐ NPDES ☐ / Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod/SW93920 mod)	Preservation and Filtration Codes: N	N
MW-8	9/5/2018	11:30	x		GW	2	x	x		
MW-9	9/5/2018	11:40	x		GW	2	x	x		
MW-5	9/5/2018	13:00	x		GW	2	x	x		
MW-7	9/5/2018	13:30	x		GW	2	x	x		
MW-6	9/5/2018	14:40	x		GW	2	x	x		
MW-1	9/6/2018	9:55	x		GW	2	x	x		
MW-2	9/6/2018	10:00	x		GW	2	x	x		
MW-3	9/6/2018	11:55	x		GW	2	x	x		
MW-4	9/6/2018	12:00	x		GW	2	x	x		
FB-09052018	9/5/2018	14:00	X		GW	2	x	x		

For Lab Use Only

SF #: _____

SCR #: _____

Preservation Codes

H = HCl | T = Thiosulfate
N = HNO_3 | B = NaOH
S = H_2SO_4 | P = H_3PO_4
F = Field Filtered | O = Other

Remarks

NJ DKQP Samples

Field Blank

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐

(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: ~~Preservation Needed~~ Nitric preserved

Rush results requested by (please check): E-Mail ☐ Phone ☐ NM 9/10/18

E-mail Address: ENVsubcontracting@EurofinsUS.com

Phone: ~~717-656-2300 Ext 1189~~ 717-556-7383 NM 9/11/18

Data Package Options (please check if required)

Type I (Validation/non-CLP)	☐	MA MCP	☐
Type III (Reduced non-CLP)	☑	CT RCP	☐
Type VI (Raw Data Only)	☐	TX TRRP-13	☐
NJ DKQP	☑	NYSDEC Category	☐ A or ☐ B

Level IV DOD ☐

EDD Required? Yes ☑ No ☐ If yes, format: HazSite

Relinquished by:	Date	Time	Received by:	Date	Time
	9/10/18	1657		9/11/18	9:50
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

Environmental Analysis Request/Chain of Custody

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Page 2 of 2

Acct. # _____ Group # _____ Sample # 1984788

Subcontractor: GEL			
Project Name/#: 1984788	Site ID #:		
Requestor: Hannah Cottman	P.O. #: NA		
Sampler:	PWSID #:		
Phone #: 717-556-7383	Quote #:		
State where samples were collected: NJ	For Compliance: Yes ☑ No ☐		

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil ☐ Sediment ☐ Tissue ☐	Water: Potable ☐ Ground ☑ Surface ☐ NPDES ☐	Other:	Total # of Containers	Analyses Requested / Preservation and Filtration Codes: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod/SW93920 mod)	Remarks
FB-09062018	9/6/2018	12:30	x			GW		2	X	X	Field Blank
											NJ DKQP Samples

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes
H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; F = Field Filtered; O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: ~~Preservation Needed~~ Nitric preserved.

Rush results requested by (please check): E-Mail ☐ Phone ☐ NW 9/10/18

E-mail Address: ENVsubcontracting@EurofinsUS.com

Phone: 717-656-2300 Ext 1189

Data Package Options (please check if required)

Type I (Validation/non-CLP)	☐	MA MCP	☐
Type III (Reduced non-CLP)	☑	CT RCP	☐
Type VI (Raw Data Only)	☐	TX TRRP-13	☐
NJ DKQP	☑	NYSDEC Category	☐ A or ☐ B
		Level IV DOD	☐

EDD Required? Yes ☑ No ☐ If yes, format: HazSite

Relinquished by:	Date	Time	Received by:	Date	Time
	9/10/18	16:57		9/11/18	9:50
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier: UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

GEL Laboratories LLC JA

SAMPLE RECEIPT & REVIEW FORM

Client: LANC	SDG/AR/COC/Work Order: 459183
Received By: AJA / Michelle Sterner	Date Received: 9/11/18 KG 9/11
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 5035 4245 0649 5035 4245 0650

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Ø CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	✓			Preservation Method: (Wet Ice) Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 1°
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR2-18 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials KG Date 9/11/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

Laboratory Certifications

There are no "Data Exception Reports" associated with this analytical report.

List of current GEL Certifications as of 03 October 2018

State	Certification
Alaska	17−018
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122018−1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	9904
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−18−13
Utah NELAP	SC000122018−27
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Eurofins Lancaster Laboratories (LANC)
SDG #: 459187

Product: **GFPC, Ra228, Liquid**
Analytical Method: EPA 904.0/SW846 9320 Modified
Analytical Procedure: GL-RAD-A-063 REV# 2
Analytical Batch: 1802264

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
459187001	MW-8
459187002	MW-9
459187003	MW-5
459187004	MW-7
459187005	MW-6
459187006	MW-1
459187007	MW-2
459187008	MW-3
459187009	MW-4
459187010	FB-09052018
459187011	FB-09062018
1204113223	Method Blank (MB)
1204113224	459187008(MW-3) Sample Duplicate (DUP)
1204113225	459187008(MW-3) Matrix Spike (MS)
1204113226	459187008(MW-3) Matrix Spike Duplicate (MSD)
1204113227	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204113225 (MW-3MS) and 1204113226 (MW-3MSD), aliquots were reduced to conserve sample volume.

Product: **Lucas Cell, Ra226, liquid**
Analytical Method: EPA 903.1 Modified
Analytical Procedure: GL-RAD-A-008 REV# 15
Analytical Batch: 1802180

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
459187001	MW-8
459187002	MW-9
459187003	MW-5
459187004	MW-7
459187005	MW-6
459187006	MW-1
459187007	MW-2
459187008	MW-3
459187009	MW-4
459187010	FB-09052018
459187011	FB-09062018
1204113013	Method Blank (MB)
1204113014	459187001(MW-8) Sample Duplicate (DUP)
1204113015	459187001(MW-8) Matrix Spike (MS)
1204113016	459187001(MW-8) Matrix Spike Duplicate (MSD)
1204113017	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample
The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204113014 (MW-8DUP)	Radium-226	RPD 139* (0.0%-100.0%) RER 2.06 (0-3)

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204113015 (MW-8MS) and 1204113016 (MW-8MSD), aliquots were reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report
for

LANC006 Eurofins Lancaster Laboratories

Client SDG: 459187 GEL Work Order: 459187

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria
** Analyte is a Tracer compound
U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: Theresa L Austin **Name: Theresa Austin**

Date: 28 SEP 2018 **Title: Group Leader**

Sample Data Summary

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-8
Sample ID: 459187001
Matrix: Ground Water
Collect Date: 05-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		2.50	+/-1.28	1.90	+/-1.45	3.00	pCi/L			JXC9	09/27/18	0925	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.112	+/-0.303	0.573	+/-0.304	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	88.7	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-9
Sample ID: 459187002
Matrix: Ground Water
Collect Date: 05-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	1.75	+/-1.22	1.91	+/-1.31	3.00	pCi/L			JXC9	09/27/18	0925	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.184	+/-0.297	0.529	+/-0.298	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	92.1	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-5
Sample ID: 459187003
Matrix: Ground Water
Collect Date: 05-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		2.59	+/-1.59	2.46	+/-1.74	3.00	pCi/L			JXC9	09/27/18	0925	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		0.466	+/-0.322	0.406	+/-0.334	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	79.4	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-7
Sample ID: 459187004
Matrix: Ground Water
Collect Date: 05-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	1.25	+/-0.912	1.40	+/-0.973	3.00	pCi/L			JXC9	09/27/18	0911	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.289	+/-0.269	0.396	+/-0.275	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	80.6	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike

Lancaster, Pennsylvania 17601-5994 Report Date: September 28, 2018

Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-6
Sample ID: 459187005
Matrix: Ground Water
Collect Date: 05-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		4.46	+/-1.34	1.62	+/-1.80	3.00	pCi/L			JXC9	09/27/18	0911	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		0.881	+/-0.431	0.514	+/-0.459	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	84	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-1
Sample ID: 459187006
Matrix: Ground Water
Collect Date: 06-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		2.27	+/-1.02	1.37	+/-1.19	3.00	pCi/L			JXC9	09/27/18	0911	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.11	+/-0.417	0.344	+/-0.451	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	85.4	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-2
Sample ID: 459187007
Matrix: Ground Water
Collect Date: 06-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		2.47	+/-0.936	1.14	+/-1.15	3.00	pCi/L			JXC9	09/27/18	0911	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.65	+/-0.521	0.376	+/-0.576	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	92.3	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-3
Sample ID: 459187008
Matrix: Ground Water
Collect Date: 06-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.205	+/-0.846	1.57	+/-0.848	3.00	pCi/L			JXC9	09/27/18	0911	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.224	+/-0.316	0.550	+/-0.318	1.00	pCi/L			PCW	09/27/18	0920	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	81	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-4
Sample ID: 459187009
Matrix: Ground Water
Collect Date: 06-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	1.77	+/-1.23	1.91	+/-1.32	3.00	pCi/L			JXC9	09/27/18	0912	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	-0.109	+/-0.256	0.586	+/-0.256	1.00	pCi/L			PCW	09/27/18	0955	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	75	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: FB-09052018
Sample ID: 459187010
Matrix: Ground Water
Collect Date: 05-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.697	+/-0.748	1.24	+/-0.771	3.00	pCi/L			JXC9	09/27/18	0912	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.0411	+/-0.267	0.551	+/-0.267	1.00	pCi/L			PCW	09/27/18	0955	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	93.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: September 28, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: FB-09062018
Sample ID: 459187011
Matrix: Ground Water
Collect Date: 06-SEP-18
Receive Date: 11-SEP-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	-0.378	+/-0.746	1.52	+/-0.747	3.00	pCi/L			JXC9	09/27/18	0913	1802264	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.0835	+/-0.231	0.462	+/-0.232	1.00	pCi/L			PCW	09/27/18	0955	1802180	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1802264	89.2	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

Quality Control Summary

QC Summary

Client : **Eurofins Lancaster Laboratories**
2425 New Holland Pike
Lancaster, Pennsylvania
Contact: **Ms. Hannah Cottman**
Workorder: **459187**

Report Date: September 28, 2018

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gas Flow										
Batch 1802264										
QC1204113224 459187008 DUP										
Radium-228	U	0.205	U	0.695	pCi/L	0		N/A	JXC9	09/27/1809:21
	Uncert:	+/-0.846		+/-1.04						
	TPU:	+/-0.848		+/-1.06						
QC1204113227 LCS										
Radium-228	17.3			20.7	pCi/L		120	(75%-125%)	JXC9	09/27/1809:20
	Uncert:			+/-2.44						
	TPU:			+/-6.12						
QC1204113223 MB										
Radium-228			U	-1.43	pCi/L				JXC9	09/27/1809:21
	Uncert:			+/-0.817						
	TPU:			+/-0.817						
QC1204113225 459187008 MS										
Radium-228	52.2 U	0.205		50.6	pCi/L		97	(75%-125%)	JXC9	09/27/1809:21
	Uncert:	+/-0.846		+/-6.59						
	TPU:	+/-0.848		+/-15.2						
QC1204113226 459187008 MSD										
Radium-228	52.2 U	0.205		48.7	pCi/L	3.96	93.2	(0%-20%)	JXC9	09/27/1809:21
	Uncert:	+/-0.846		+/-6.19						
	TPU:	+/-0.848		+/-14.7						
Rad Ra-226										
Batch 1802180										
QC1204113014 459187001 DUP										
Radium-226	U	0.112		0.628	pCi/L	139*		(0% - 100%)	PCW	09/27/1810:30
	Uncert:	+/-0.303		+/-0.361						
	TPU:	+/-0.304		+/-0.385						
QC1204113017 LCS										
Radium-226	26.0			22.5	pCi/L		86.8	(75%-125%)	PCW	09/27/1810:30
	Uncert:			+/-1.83						
	TPU:			+/-4.58						
QC1204113013 MB										
Radium-226			U	-0.0754	pCi/L				PCW	09/27/1810:30
	Uncert:			+/-0.276						
	TPU:			+/-0.277						
QC1204113015 459187001 MS										
Radium-226	130 U	0.112		138	pCi/L		106	(75%-125%)	PCW	09/27/1810:30
	Uncert:	+/-0.303		+/-10.4						
	TPU:	+/-0.304		+/-32.1						
QC1204113016 459187001 MSD										
Radium-226	130 U	0.112		132	pCi/L	4.1	102	(0%-20%)	PCW	09/27/1810:30
	Uncert:	+/-0.303		+/-10.2						

QC Summary

Workorder: **459187**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Ra-226										
Batch 1802180										
				TPU:	+/-0.304		+/-23.0			

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

**	Analyte is a Tracer compound
<	Result is less than value reported
>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
** Indicates analyte is a surrogate/tracer compound.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptence criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 1802264 Check-list

This check-list was completed on 27-SEP-18 by Nat Long

This batch was reviewed by Kenshalla Oston on 27-SEP-18 and Nat Long on 27-SEP-18.

Batch ID: 1802264

Product: GFC28RAL

Description: Gas Flow Radium 228 GL-RAD-A-009

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium−228 in Liquid

Batch ID: **1802264**
Analyst: Jasmine Conley (JXC9)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL−RAD−A−063 REV# 2
Instrument: GFC−51204863

Due Dates for Lab: 05−OCT−2018 **Package: 07−OCT−2018** **SDG: 09−OCT−2018**

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1204113227	Radium−228 SPIKE	1810−A	.1	mL
MS	1204113225	Radium−228 SPIKE	1810−A	.1	mL
MSD	1204113226	Radium−228 SPIKE	1810−A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Aliquot (mL)	Ac−228 Ingrow (date)	Ac−228 Separation (date)
1	459187001	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
2	459187002	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
3	459187003	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
4	459187004	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
5	459187005	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
6	459187006	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
7	459187007	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
8	459187008	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
9	459187009	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
10	459187010	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
11	459187011	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
12	459193001	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
13	459193002	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
14	459193003	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
15	459193004	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
16	459193005	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
17	459193006	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
18	459193007	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
19	1204113223 MB	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
20	1204113224 DUP (459187008)	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03
21	1204113225 MS (459187008)	21−SEP−2018	3	100	09/24/18 13:40	09/27/18 07:03
22	1204113226 MSD (459187008)	21−SEP−2018	3	100	09/24/18 13:40	09/27/18 07:03
23	1204113227 LCS	21−SEP−2018	3	300	09/24/18 13:40	09/27/18 07:03

Reagent/Solvent Lot ID	Description	Amount
REGNT 2571685.11	2mL Cartridges	2 mL
REGNT 2662331.3	cerium 500 mg/L in 2%HCI	.2 mL
REGNT 2672182	RGF−1.5 Ammonium Sulfate	10 mL
REGNT 2770329.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 2801523.7	Hydrofluoric Acid Poly Bottle	3 mL
REGNT 2822290	RGF−1M Citric Acid	5 mL
REGNT 2828165	RGF−16mg/mL Barium Chloride	1 mL
REGNT 2831338	RGF−50% Potassium Carbonate	2 mL
REGNT 2832275.4	HNO3	5 mL
REGNT 2832949	2M HCl	20 mL
REGNT 2833686	RGF−7M Nitric Acid	25 mL

Comments:

Pipet Id: RAD−GFC−1795419
Data Entry Date2: 21−SEP−2018 00:00

Prep Logbook

#	Sample ID	Prep Date	Min RDL (pCi/L)	Aliquot (mL)	Ac−228 Ingrow (date)	Ac−228 Separation (date)

Reagent/Solvent Lot ID	Description	Amount
WORK 0487−D	Barium−133 TRACER	.1 mL

Comments:

Radium-228 Liquid

Filename : RA228.XLS
File type : Excel
Version # : 1.4.2

Tracer S/N : 0487-D
Tracer Exp Date : 11/8/2018
Tracer Volume Added: 0.10

Batch : 1802264
Analyst : JAS02031
Prep Date : 9/21/2018
Ra-228 Method Uncertainty : 0.1268

Geometry: CeF on 25mm Filter

Procedure Code : GFC28RAL
Parmname : Radium-228
Required MDA : 3 pCi/L
Ra-228 Abundance : 1.00
Halflife of Ra-228 : 5.75 years
Halflife of Ac-228 : 6.15 hours

Sample Characteristics					**Tracer Calculations**					
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	459187001.1	0.3000	1.8459E-05	9/5/2018 11:30	186.5	7.32%	165.4	7.78%	0.1	0.000200
2	459187002.1	0.3000	1.8459E-05	9/5/2018 11:40	186.5	7.32%	171.7	7.63%	0.1	0.000200
3	459187003.1	0.3000	1.8459E-05	9/5/2018 13:00	186.5	7.32%	148.1	8.22%	0.1	0.000200
4	459187004.1	0.3000	1.8459E-05	9/5/2018 13:30	186.5	7.32%	150.3	8.16%	0.1	0.000200
5	459187005.1	0.3000	1.8459E-05	9/5/2018 14:40	186.5	7.32%	156.6	7.99%	0.1	0.000200
6	459187006.1	0.3000	1.8459E-05	9/6/2018 9:55	186.5	7.32%	159.3	7.92%	0.1	0.000200
7	459187007.1	0.3000	1.8459E-05	9/6/2018 10:00	186.5	7.32%	172.1	7.62%	0.1	0.000200
8	459187008.1	0.3000	1.8459E-05	9/6/2018 11:55	186.5	7.32%	151.1	8.13%	0.1	0.000200
9	459187009.1	0.3000	1.8459E-05	9/6/2018 12:00	186.5	7.32%	139.8	8.46%	0.1	0.000200
10	459187010.1	0.3000	1.8459E-05	9/5/2018 14:00	186.5	7.32%	175.0	7.56%	0.1	0.000200
11	459187011.1	0.3000	1.8459E-05	9/6/2018 12:30	186.5	7.32%	166.4	7.75%	0.1	0.000200
12	459193001.1	0.3000	1.8459E-05	9/4/2018 11:25	186.5	7.32%	171.6	7.63%	0.1	0.000200
13	459193002.1	0.3000	1.8459E-05	9/4/2018 11:30	186.5	7.32%	165.8	7.77%	0.1	0.000200
14	459193003.1	0.3000	1.8459E-05	9/4/2018 13:30	186.5	7.32%	163.6	7.82%	0.1	0.000200
15	459193004.1	0.3000	1.8459E-05	9/4/2018 13:50	186.5	7.32%	157.8	7.96%	0.1	0.000200
16	459193005.1	0.3000	1.8459E-05	9/4/2018 15:45	186.5	7.32%	163.6	7.82%	0.1	0.000200
17	459193006.1	0.3000	1.8459E-05	9/4/2018 15:50	186.5	7.32%	182.6	7.40%	0.1	0.000200
18	459193007.1	0.3000	1.8459E-05	9/4/2018 13:15	186.5	7.32%	157.8	7.96%	0.1	0.000200
19	1204113223.1	0.3000	1.8459E-05	9/21/2018 0:00	186.5	7.32%	164.4	7.80%	0.1	0.000200
20	1204113224.1	0.3000	1.8459E-05	9/6/2018 11:55	186.5	7.32%	163.2	7.83%	0.1	0.000200
21	1204113225.1	0.1000	1.1370E-05	9/6/2018 11:55	186.5	7.32%	153.9	8.06%	0.1	0.000200
22	1204113226.1	0.1000	1.1370E-05	9/6/2018 11:55	186.5	7.32%	164.3	7.80%	0.1	0.000200
23	1204113227.1	0.3000	1.8459E-05	9/21/2018 0:00	186.5	7.32%	152.9	8.09%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-063
Instrument SOP: GL-RAD-I-006, GL-RAD-I-016

Count raw Data

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
1	A1	60	1	104	1.733	9/27/2018 9:25	9/24/2018 13:40	9/27/2018 7:03	0.993	0.765	0.999	1.057	88.7%	5.35%
2	A2	60	5	89	1.483	9/27/2018 9:25	9/24/2018 13:40	9/27/2018 7:03	0.993	0.765	0.999	1.057	92.1%	5.29%
3	A3	60	7	103	1.717	9/27/2018 9:25	9/24/2018 13:40	9/27/2018 7:03	0.993	0.765	0.999	1.057	79.4%	5.51%
4	1A	60	15	47	0.783	9/27/2018 9:11	9/24/2018 13:40	9/27/2018 7:03	0.993	0.785	0.999	1.057	80.6%	5.49%
5	1B	60	12	116	1.933	9/27/2018 9:11	9/24/2018 13:40	9/27/2018 7:03	0.993	0.785	0.999	1.057	84.0%	5.43%
6	1C	60	8	67	1.117	9/27/2018 9:11	9/24/2018 13:40	9/27/2018 7:03	0.993	0.785	0.999	1.057	85.4%	5.40%
7	2A	60	12	67	1.117	9/27/2018 9:11	9/24/2018 13:40	9/27/2018 7:03	0.993	0.785	0.999	1.057	92.3%	5.29%
8	2C	60	7	39	0.650	9/27/2018 9:11	9/24/2018 13:40	9/27/2018 7:03	0.993	0.785	0.999	1.057	81.0%	5.48%
9	3C	60	16	72	1.200	9/27/2018 9:12	9/24/2018 13:40	9/27/2018 7:03	0.993	0.785	0.999	1.057	75.0%	5.60%
10	3D	60	2	40	0.667	9/27/2018 9:12	9/24/2018 13:40	9/27/2018 7:03	0.993	0.785	0.999	1.057	93.8%	5.27%
11	4A	60	5	36	0.600	9/27/2018 9:13	9/24/2018 13:40	9/27/2018 7:03	0.993	0.783	0.999	1.057	89.2%	5.34%
12	4B	60	4	34	0.567	9/27/2018 9:13	9/24/2018 13:40	9/27/2018 7:03	0.992	0.783	0.999	1.057	92.0%	5.29%
13	4C	60	12	40	0.667	9/27/2018 9:13	9/24/2018 13:40	9/27/2018 7:03	0.992	0.783	0.999	1.057	88.9%	5.34%
14	4D	60	13	51	0.850	9/27/2018 9:13	9/24/2018 13:40	9/27/2018 7:03	0.992	0.783	0.999	1.057	87.7%	5.36%
15	5A	60	13	42	0.700	9/27/2018 9:13	9/24/2018 13:40	9/27/2018 7:03	0.992	0.783	0.999	1.057	84.6%	5.41%
16	5B	60	7	32	0.533	9/27/2018 9:13	9/24/2018 13:40	9/27/2018 7:03	0.993	0.783	0.999	1.057	87.7%	5.36%
17	5D	60	4	130	2.167	9/27/2018 9:13	9/24/2018 13:40	9/27/2018 7:03	0.993	0.783	0.999	1.057	97.9%	5.21%
18	6A	60	8	39	0.650	9/27/2018 9:21	9/24/2018 13:40	9/27/2018 7:03	0.992	0.771	0.999	1.057	84.6%	5.41%
19	6B	60	6	40	0.667	9/27/2018 9:21	9/24/2018 13:40	9/27/2018 7:03	0.998	0.771	0.999	1.057	88.1%	5.36%
20	6C	60	8	71	1.183	9/27/2018 9:21	9/24/2018 13:40	9/27/2018 7:03	0.993	0.771	0.999	1.057	87.5%	5.37%
21	9B	60	4	317	5.283	9/27/2018 9:21	9/24/2018 13:40	9/27/2018 7:03	0.993	0.770	0.999	1.057	82.5%	5.45%
22	9D	60	7	299	4.983	9/27/2018 9:21	9/24/2018 13:40	9/27/2018 7:03	0.993	0.770	0.999	1.057	88.1%	5.36%
23	11B	60	10	379	6.317	9/27/2018 9:20	9/24/2018 13:40	9/27/2018 7:03	0.998	0.772	0.999	1.057	82.0%	5.46%

Pos.	Calibration Data: Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	LB4100	6/1/2017	5/31/2019	0.6357	0.02044	1.060	9/21/2018 17:20	500
2	LB4100	6/1/2017	5/31/2019	0.5994	0.02268	1.022	9/21/2018 17:20	500
3	LB4100	6/1/2017	5/31/2019	0.5708	0.01784	1.156	9/21/2018 17:20	500
4	PIC	6/1/2017	5/31/2019	0.6430	0.00738	0.466	9/21/2018 16:49	500
5	PIC	6/1/2017	5/31/2019	0.6519	0.00711	0.736	9/21/2018 16:49	500
6	PIC	6/1/2017	5/31/2019	0.6443	0.00847	0.504	9/21/2018 16:49	500
7	PIC	6/1/2017	5/31/2019	0.6444	0.01914	0.396	9/21/2018 16:49	500
8	PIC	6/1/2017	5/31/2019	0.6389	0.01274	0.598	9/21/2018 16:49	500
9	PIC	6/1/2017	5/31/2019	0.6374	0.00988	0.786	9/21/2018 16:50	500
10	PIC	6/1/2017	5/31/2019	0.6255	0.02297	0.466	9/21/2018 16:50	500
11	PIC	6/1/2017	5/31/2019	0.6420	0.01123	0.706	9/21/2018 16:50	500
12	PIC	6/1/2017	5/31/2019	0.6410	0.01519	0.502	9/21/2018 16:50	500
13	PIC	6/1/2017	5/31/2019	0.6608	0.00889	0.530	9/21/2018 16:50	500
14	PIC	6/1/2017	5/31/2019	0.6462	0.00773	0.538	9/21/2018 16:50	500
15	PIC	6/1/2017	5/31/2019	0.6766	0.00851	0.480	9/21/2018 16:50	500
16	PIC	6/1/2017	5/31/2019	0.6547	0.00426	0.384	9/21/2018 16:50	500
17	PIC	6/1/2017	5/31/2019	0.6669	0.00925	1.926	9/22/2018 14:12	500
18	PIC	6/1/2017	5/31/2019	0.6547	0.02228	0.730	9/21/2018 16:54	500
19	PIC	6/1/2017	5/31/2019	0.6465	0.00851	1.060	9/21/2018 16:55	500
20	PIC	6/1/2017	5/31/2019	0.6594	0.01970	0.990	9/21/2018 16:55	500
21	PIC	6/1/2017	5/31/2019	0.6716	0.00754	0.778	9/21/2018 16:56	500
22	PIC	6/1/2017	5/31/2019	0.6494	0.02610	0.516	9/21/2018 16:56	500
23	PIC	6/1/2017	5/31/2019	0.6620	0.00697	0.864	9/21/2018 16:52	500

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

* - RPD changed to 0% due to sample & dup activity below MDA

Spike S/N : 1810-A
Spike Exp Date : 5/23/2019
Spike Activity (dpm/ml): 115.34
Spike Volume Added: 0.10

LCS S/N : 1810-A
LCS Exp Date : 5/23/2019
LCS Activity (dpm/ml): 115.34
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	**2 SIGMA** Counting Uncertainty pCi/L	**2 SIGMA** Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.2167	0.8590	3	1.9036	**2.4996**	26.77%	0.6733	0.1761	1.2812	1.4513		SAMPLE				
2	1.2201	0.8614	3	1.9124	**1.7491**	35.93%	0.4613	0.1636	1.2158	1.3061		SAMPLE				
3	1.5803	1.1157	3	2.4622	**2.5886**	31.89%	0.5607	0.1758	1.5913	1.7414		SAMPLE				
4	0.8547	0.6034	3	1.4036	**1.2481**	37.68%	0.3173	0.1183	0.9117	0.9725		SAMPLE				
5	1.0168	0.7178	3	1.6218	**4.4577**	16.28%	1.1973	0.1836	1.3395	1.8028		SAMPLE				
6	0.8369	0.5909	3	1.3669	**2.2688**	23.51%	0.6127	0.1401	1.0167	1.1877		SAMPLE				
7	0.6865	0.4847	3	1.1406	**2.4696**	20.13%	0.7207	0.1393	0.9356	1.1516		SAMPLE				
8	0.9691	0.6842	3	1.5652	**0.2047**	210.99%	0.0520	0.1097	0.8463	0.8481		SAMPLE				
9	1.2036	0.8498	3	1.9128	**1.7656**	35.93%	0.4140	0.1469	1.2277	1.3185		SAMPLE				
10	0.7552	0.5332	3	1.2402	**0.6974**	54.99%	0.2007	0.1097	0.7475	0.7714		SAMPLE				
11	0.9536	0.6733	3	1.5248	**-0.3779**	100.93%	-0.1060	0.1068	0.7465	0.7466		SAMPLE				
12	0.7817	0.5519	3	1.2770	**0.2241**	158.16%	0.0647	0.1022	0.6943	0.6970		SAMPLE				
13	0.8065	0.5694	3	1.3128	**0.4756**	80.91%	0.1367	0.1103	0.7525	0.7634		SAMPLE				
14	0.8419	0.5944	3	1.3691	**1.1250**	39.94%	0.3120	0.1235	0.8725	0.9240		SAMPLE				
15	0.7878	0.5562	3	1.2910	**0.7858**	51.37%	0.2200	0.1124	0.7867	0.8150		SAMPLE				
16	0.7024	0.4959	3	1.1698	**0.5317**	66.03%	0.1493	0.0983	0.6858	0.7007		SAMPLE				
17	1.3833	0.9766	3	2.1099	**0.7536**	83.23%	0.2407	0.1999	1.2269	1.2435		SAMPLE				
18	1.0193	0.7197	3	1.6267	**-0.2998**	138.72%	-0.0800	0.1109	0.8144	0.8146		SAMPLE				
19	1.1881	0.8388	3	1.8589	**-1.4259**	29.74%	-0.3933	0.1150	0.8173	0.8174		MB				
20	1.1392	0.8043	3	1.7884	**0.6953**	76.41%	0.1933	0.1473	1.0385	1.0556	459187008.1	DUP	* 0.0%			
21	3.1552	2.2276	3	5.0170	**50.6262**	8.63%	4.5053	0.2994	6.5930	15.2182	459187008.1	MS			52.2049	97.0%
22	2.4909	1.7586	3	4.0618	**48.6622**	8.81%	4.4673	0.2900	6.1911	14.7269	459187008.1	MSD	4.0%		52.2049	93.2%
23	1.1238	0.7934	3	1.7767	**20.7090**	8.14%	5.4527	0.3271	2.4351	6.1167		LCS			17.3185	119.6%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
459187001	A1	60	1	104	9/27/2018 9:25	9/27/2018 10:25	LB4100	1802264
459187002	A2	60	5	89	9/27/2018 9:25	9/27/2018 10:25	LB4100	1802264
459187003	A3	60	7	103	9/27/2018 9:25	9/27/2018 10:25	LB4100	1802264
459187004	1A	60	15	47	9/27/2018 9:11	9/27/2018 10:11	PIC	1802264
459187005	1B	60	12	116	9/27/2018 9:11	9/27/2018 10:11	PIC	1802264
459187006	1C	60	8	67	9/27/2018 9:11	9/27/2018 10:11	PIC	1802264
459187007	2A	60	12	67	9/27/2018 9:11	9/27/2018 10:11	PIC	1802264
459187008	2C	60	7	39	9/27/2018 9:11	9/27/2018 10:11	PIC	1802264
459187009	3C	60	16	72	9/27/2018 9:12	9/27/2018 10:12	PIC	1802264
459187010	3D	60	2	40	9/27/2018 9:12	9/27/2018 10:12	PIC	1802264
459187011	4A	60	5	36	9/27/2018 9:13	9/27/2018 10:13	PIC	1802264
459193001	4B	60	4	34	9/27/2018 9:13	9/27/2018 10:13	PIC	1802264
459193002	4C	60	12	40	9/27/2018 9:13	9/27/2018 10:13	PIC	1802264
459193003	4D	60	13	51	9/27/2018 9:13	9/27/2018 10:13	PIC	1802264
459193004	5A	60	13	42	9/27/2018 9:13	9/27/2018 10:13	PIC	1802264
459193005	5B	60	7	32	9/27/2018 9:13	9/27/2018 10:13	PIC	1802264
459193006	5D	60	4	130	9/27/2018 9:13	9/27/2018 10:13	PIC	1802264
459193007	6A	60	8	39	9/27/2018 9:21	9/27/2018 10:21	PIC	1802264
1204113223	6B	60	6	40	9/27/2018 9:21	9/27/2018 10:21	PIC	1802264
1204113224	6C	60	8	71	9/27/2018 9:21	9/27/2018 10:21	PIC	1802264
1204113225	9B	60	4	317	9/27/2018 9:21	9/27/2018 10:21	PIC	1802264
1204113226	9D	60	7	299	9/27/2018 9:21	9/27/2018 10:21	PIC	1802264
1204113227	11B	60	10	379	9/27/2018 9:20	9/27/2018 10:20	PIC	1802264

ASSAY 24-Sep-18 14:31:14

Protocol	id	8	Ba-133
Time	limit		
Count	limit		
Isotope	Ba-133		
Protocol	date	9/24/2018	
Run	id.	1718	

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
1	97	1	180.03	644.85	186.49	7.32		02:31:14
2	97	2	180.04	581.48	165.36	7.78	88.67	02:34:27
3	97	3	180.05	600.6	171.72	7.63	92.08	02:37:41
4	97	4	180.04	529.6	148.07	8.22	79.40	02:40:55
5	97	5	180.03	536.14	150.26	8.16	80.57	02:44:09
1	76	1	180.04	555.17	156.59	7.99	83.97	02:48:08
2	76	2	180.06	563.31	159.28	7.92	85.41	02:51:22
3	76	3	180.03	601.73	172.13	7.62	92.30	02:54:36
4	76	4	180.04	538.77	151.12	8.13	81.03	02:57:50
5	76	5	180.04	504.9	139.84	8.46	74.99	03:01:04
1	86	1	180.03	610.34	174.99	7.56	93.83	03:04:40
2	86	2	180.04	584.62	166.4	7.75	89.23	03:07:53
3	86	3	180.06	600.17	171.57	7.63	92.00	03:11:07
4	86	4	180.04	582.71	165.77	7.77	88.89	03:14:21
5	86	5	180.04	576.22	163.61	7.82	87.73	03:17:35
1	53	1	180.04	558.68	157.76	7.96	84.59	03:21:18
2	53	2	180.04	576.17	163.59	7.82	87.72	03:24:32
3	53	3	180.04	633.31	182.63	7.4	97.93	03:27:46
4	53	4	180.04	558.82	157.81	7.96	84.62	03:31:00
5	53	5	180.03	578.48	164.37	7.8	88.14	03:34:14
1	70	1	180.06	575.19	163.24	7.83	87.53	03:38:10
2	70	2	180.04	547.22	153.94	8.06	82.55	03:41:24
3	70	3	180.05	578.19	164.25	7.8	88.07	03:44:38
4	70	4	180.04	544.11	152.9	8.09	81.99	03:47:52

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Sep-2018

Detectors LB4100 A1 through J4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100B1	Below	Alpha eff	27-Sep 08:04	5	9796	10030	12040	-3.70
LB4100B1	Below	Beta eff	27-Sep 08:20	5	48674	50540	59850	-4.20
LB4100B2	Below	Alpha eff	27-Sep 08:04	5	7816	8083	10940	-3.56
LB4100B2	Below	Beta eff	27-Sep 08:20	5	19832	21280	24110	-6.07
LB4100B3	Missing	Alpha eff	27-Sep 08:04	5	0.00E+0	8427	16450	-9.30
LB4100B3	Missing	Alpha XTalk	27-Sep 08:04	5	24702	0.270	0.653	+386,364.00
LB4100B4	Above	Beta bkg	27-Sep 06:07	60	84.350	0.607	2.163	+319.81
LB4100B4	Below	Beta eff	27-Sep 08:20	5	34510	36820	41450	-5.99
LB4100C1	Above	Beta bkg	27-Sep 06:27	60	1.983	1.035	1.925	+3.39
LB4100C2	Below	Beta eff	27-Sep 06:17	5	13735	15090	19370	-4.90
LB4100C2	need 2nd	Beta XTalk	27-Sep 06:17	5	4.37E-4	1.13E-4	4.85E-4	+2.22
LB4100C3	Above	Beta bkg	27-Sep 06:27	60	2.300	0.776	2.251	+3.20
LB4100C4	Above	Beta bkg	27-Sep 06:27	60	5.033	0.686	2.113	+15.27
LB4100C4	Below	Beta eff	27-Sep 06:17	5	16528	17060	23010	-3.54
LB4100E2	Above	Beta bkg	27-Sep 06:12	60	3.333	0.261	3.241	+3.19
LB4100E3	Above	Beta bkg	27-Sep 06:12	60	2.117	0.473	2.078	+3.14
LB4100E4	Above	Beta bkg	27-Sep 06:12	60	2.133	0.641	2.336	+2.28
LB4100G2	need 2nd	Alpha XTalk	27-Sep 05:48	5	0.410	0.256	0.413	+2.90
LB4100G2	Above	Beta bkg	27-Sep 06:17	60	2528	0.414	2.180	+8,587.40
LB4100H2	Above	Beta bkg	27-Sep 06:12	60	2.983	-1.72E+0	4.379	+1.63
LB4100I2	Above	Beta bkg	27-Sep 05:52	60	3.600	-1.65E+1	28.950	-0.35
LB4100I3	Above	Beta bkg	27-Sep 05:52	60	2.583	-5.60E-1	3.474	+1.68
LB4100J1	Above	Alpha bkg	27-Sep 08:30	60	0.367	0.053	0.379	+2.78
PIC7D	Below	Alpha eff	27-Sep 06:10	5	10260	10390	11090	-4.11
PIC7D	Above	Alpha XTalk	27-Sep 06:10	5	0.281	0.252	0.273	+5.21
PIC8A	Above	Beta XTalk	27-Sep 06:11	5	3.58E-4	5.74E-5	2.92E-4	+4.67
PIC12D	Above	Beta bkg	27-Sep 05:19	60	2.367	0.504	1.615	+7.06

PIC13D	Above	Beta bkg	27-Sep 06:28	60	1.850	-2.54E-1	1.788	+3.18

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

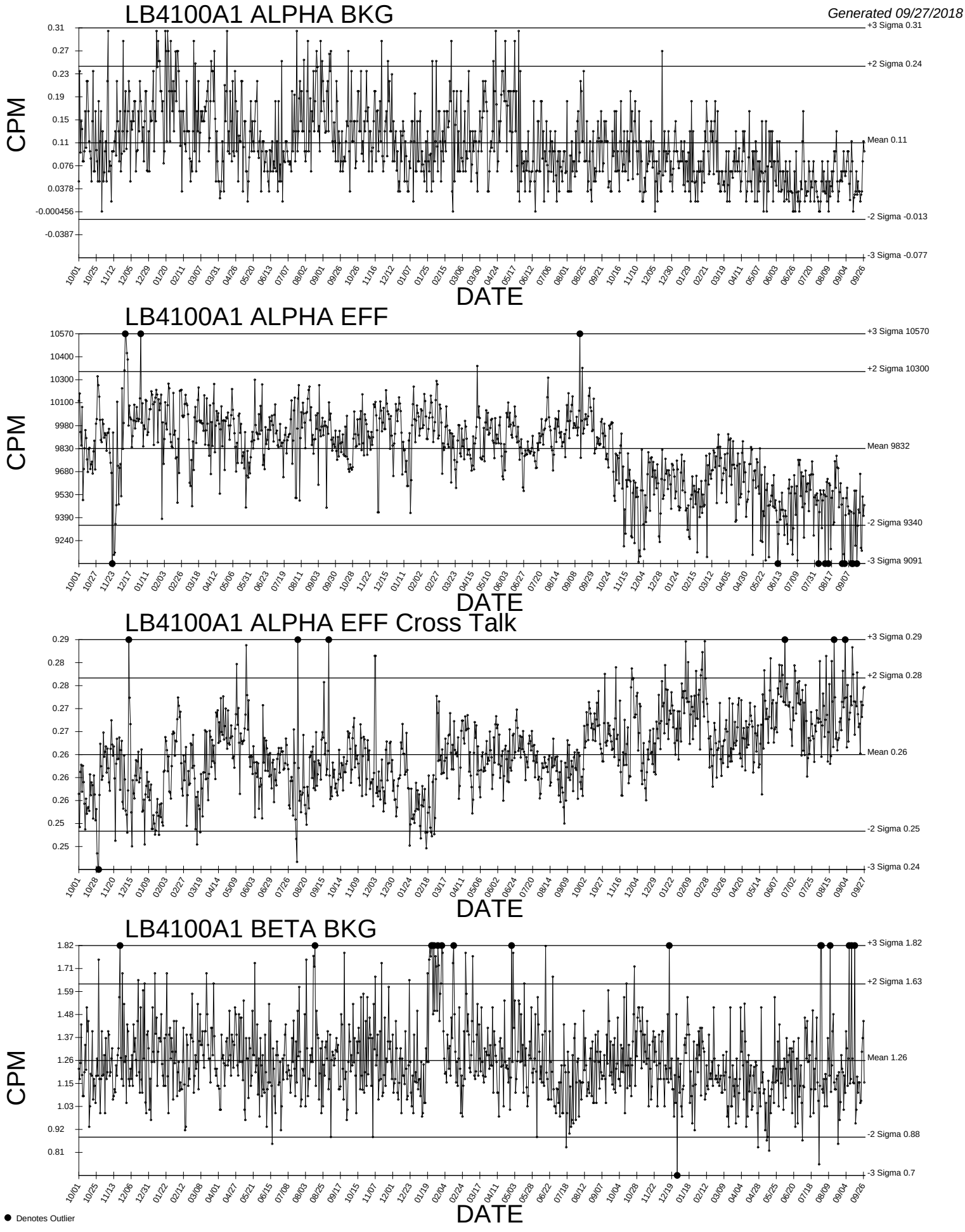
LB4100B3	Alpha bkg, Beta bkg, Beta eff, Beta XTalk
LB4100D1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC3A	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC6D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC13C	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

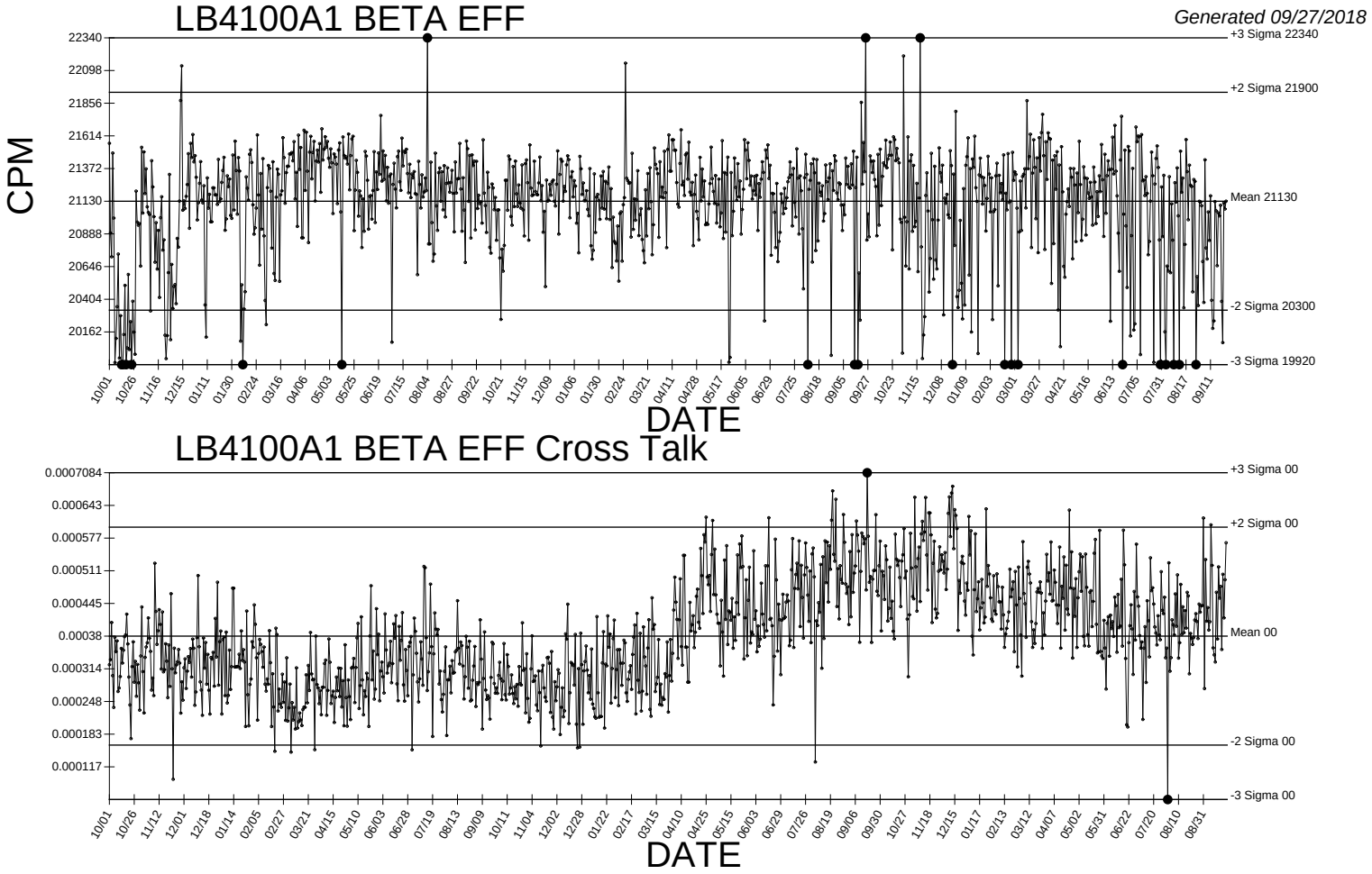
Reviewed by R. Gould - Harmon

Date 9-27-18

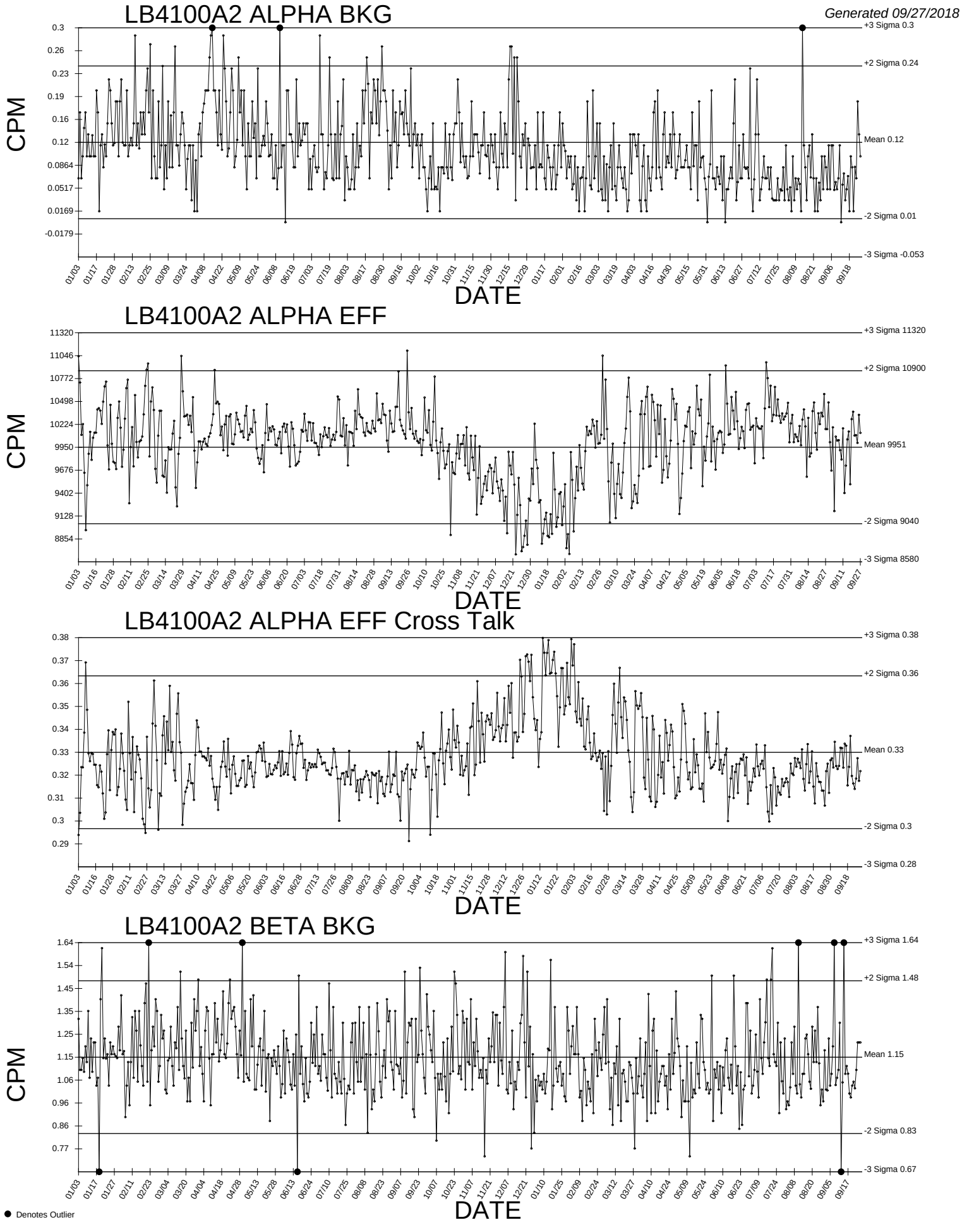
GEL Laboratories LLC

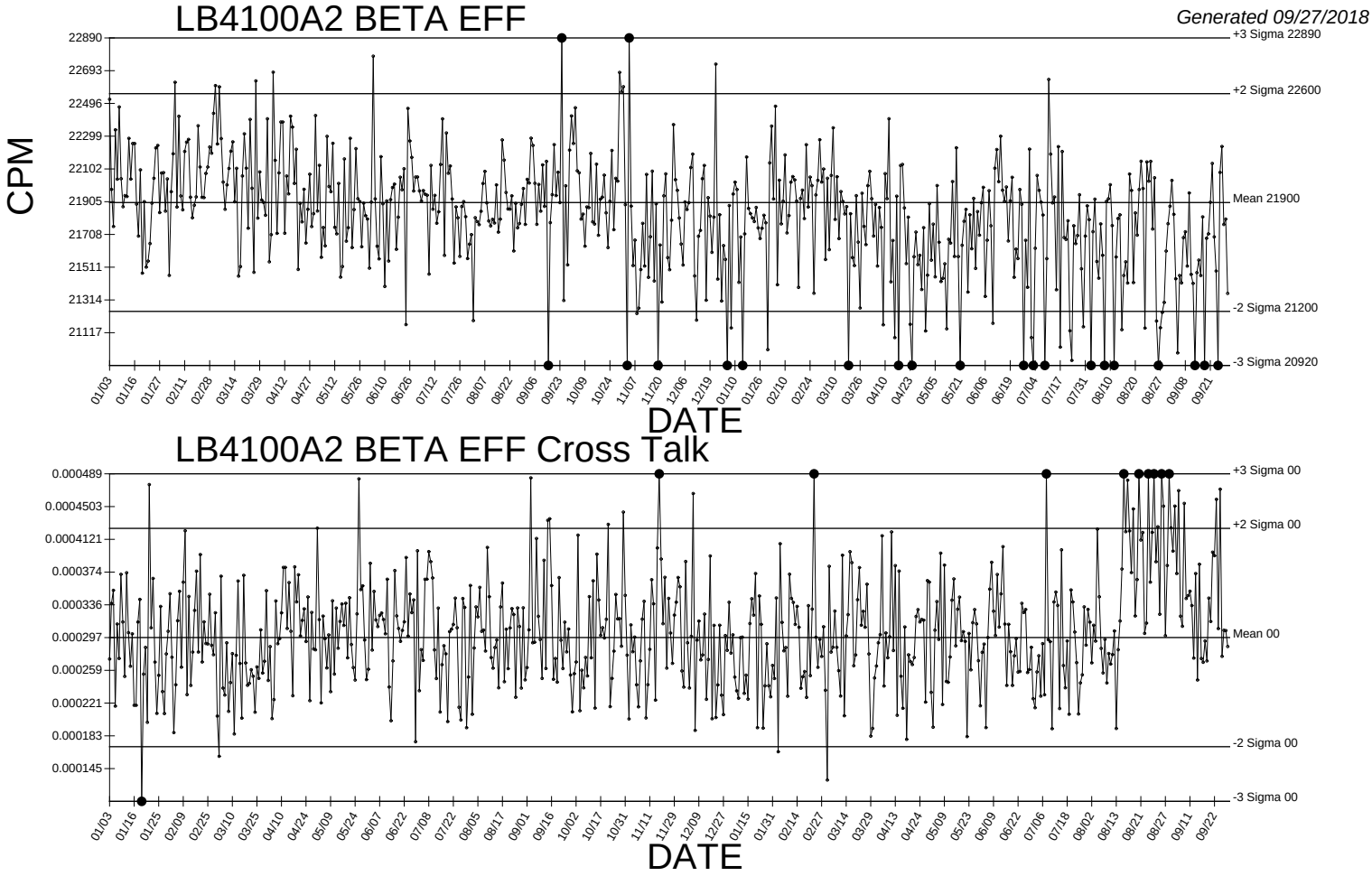
Background and Efficiency Data


LB4100A1 ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.31
+2 Sigma 0.24
Mean 0.11
-2 Sigma -0.013
-3 Sigma -0.077
LB4100A1 ALPHA EFF
+3 Sigma 10570
+2 Sigma 10300
Mean 9832
-2 Sigma 9340
-3 Sigma 9091
LB4100A1 ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.28
Mean 0.26
-2 Sigma 0.25
-3 Sigma 0.24
LB4100A1 BETA BKG
+3 Sigma 1.82
+2 Sigma 1.63
Mean 1.26
-2 Sigma 0.88
-3 Sigma 0.7
● Denotes Outlier

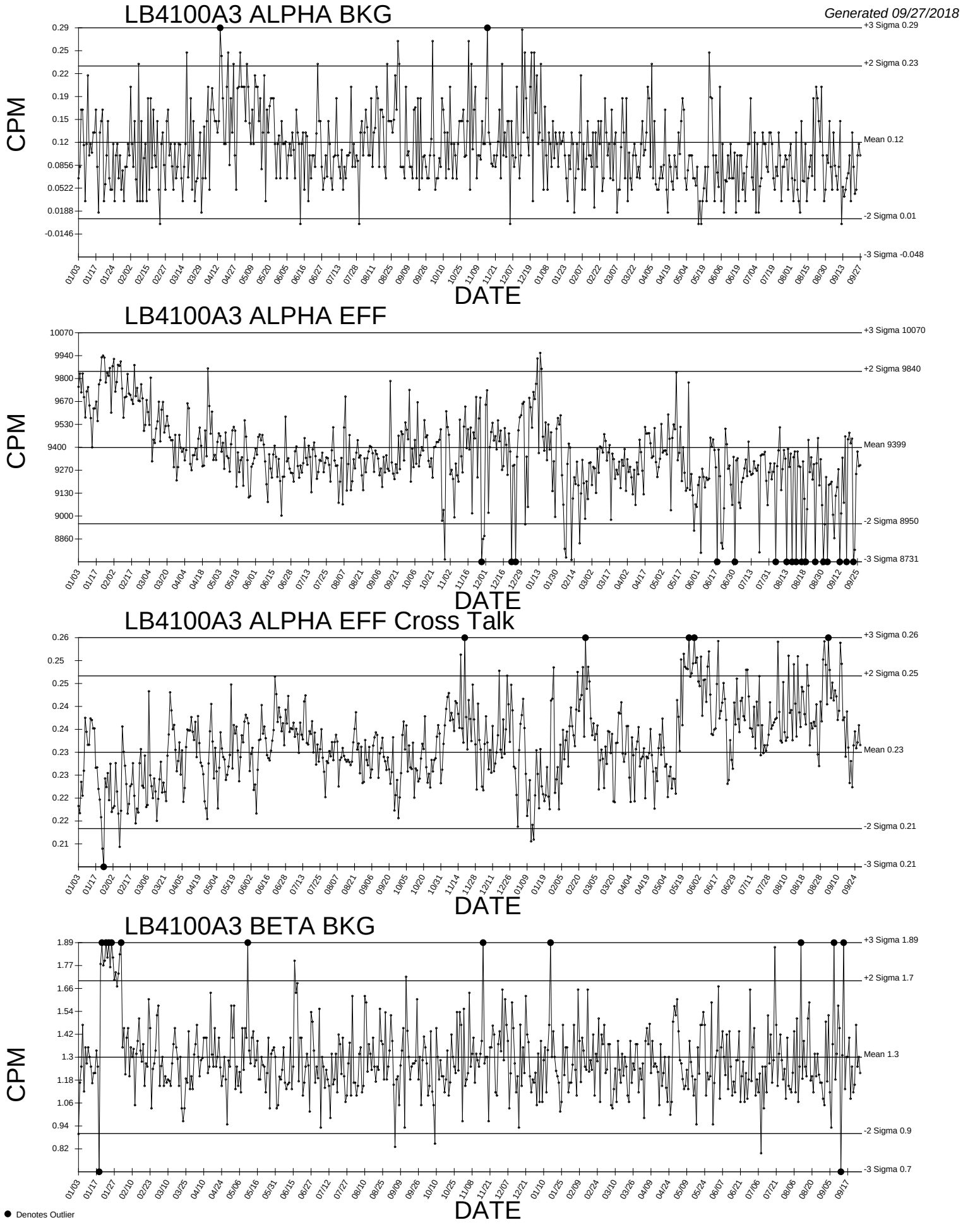


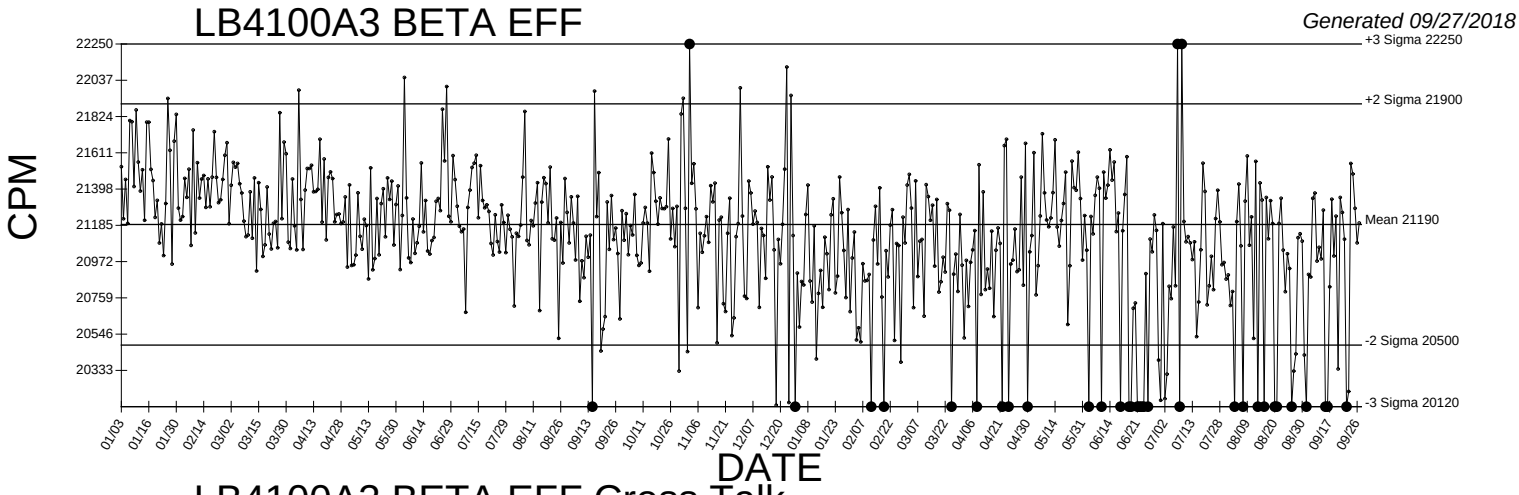
● Denotes Outlier

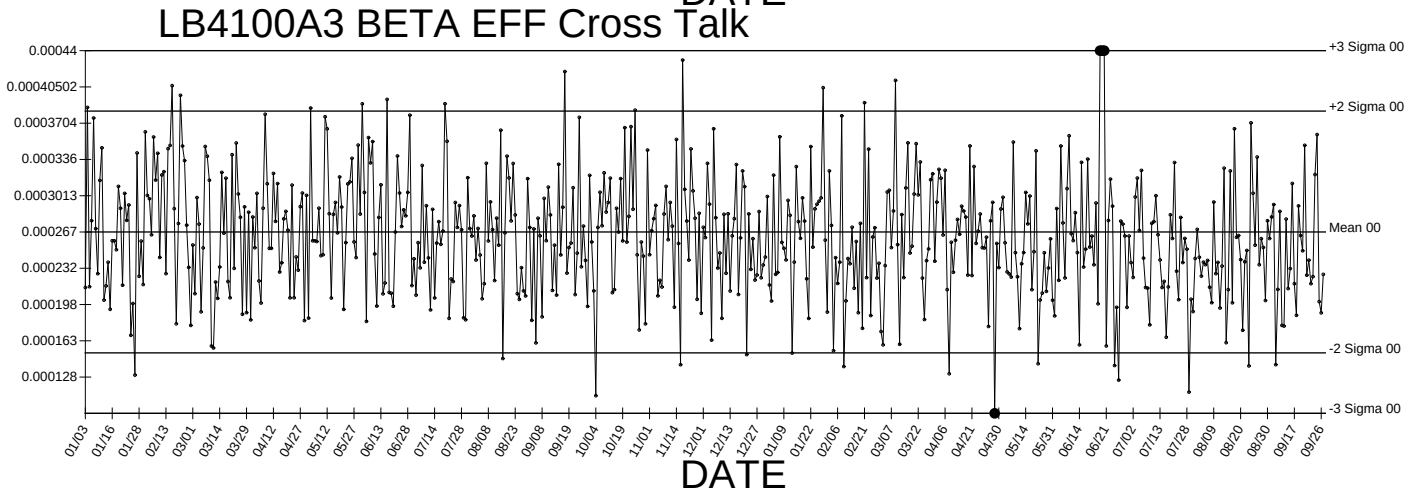

LB4100A2 ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.3
+2 Sigma 0.24
Mean 0.12
-2 Sigma 0.01
-3 Sigma -0.053
LB4100A2 ALPHA EFF
+3 Sigma 11320
+2 Sigma 10900
Mean 9951
-2 Sigma 9040
-3 Sigma 8580
LB4100A2 ALPHA EFF Cross Talk
+3 Sigma 0.38
+2 Sigma 0.36
Mean 0.33
-2 Sigma 0.3
-3 Sigma 0.28
LB4100A2 BETA BKG
+3 Sigma 1.64
+2 Sigma 1.48
Mean 1.15
-2 Sigma 0.83
-3 Sigma 0.67
Denotes Outlier



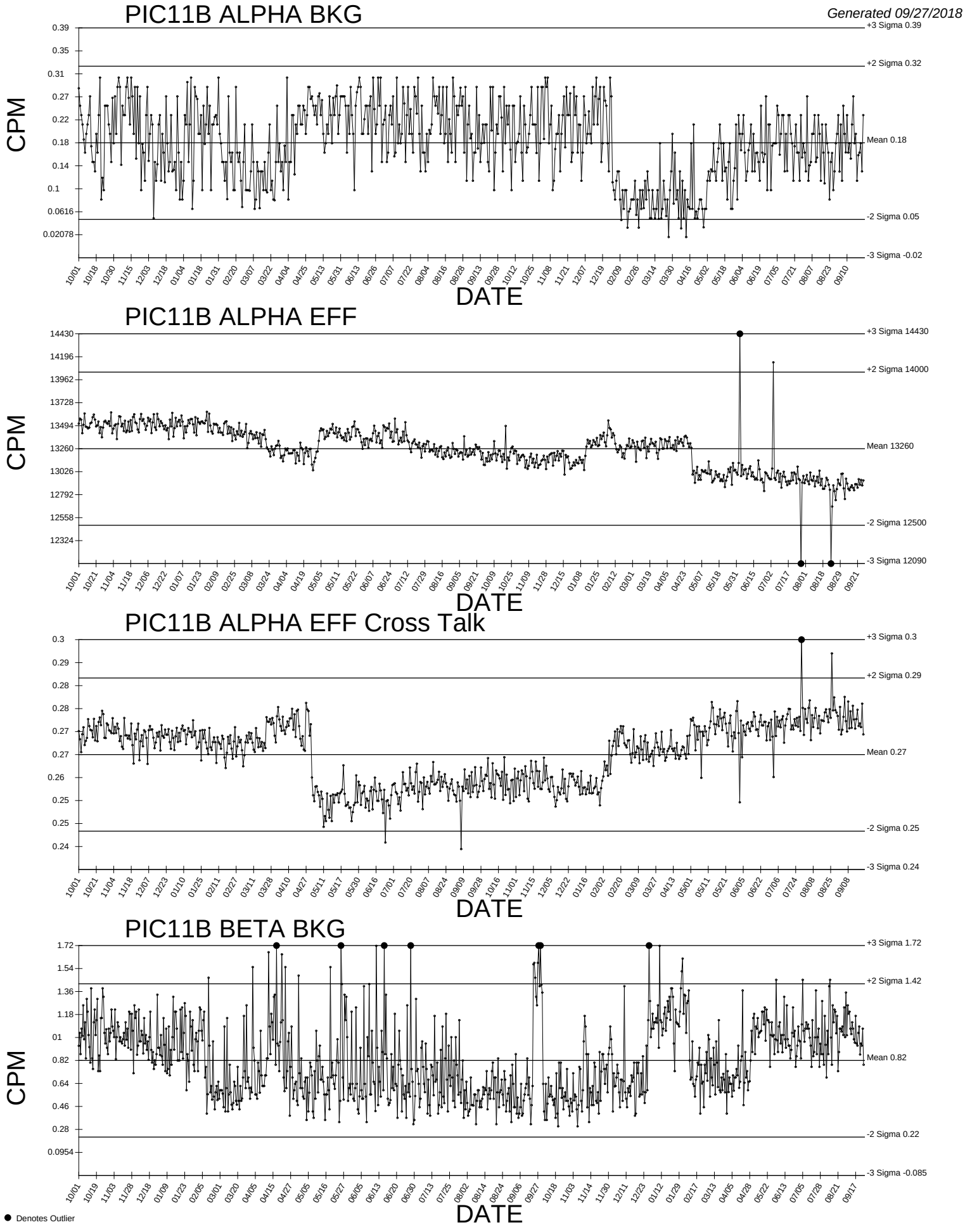
● Denotes Outlier

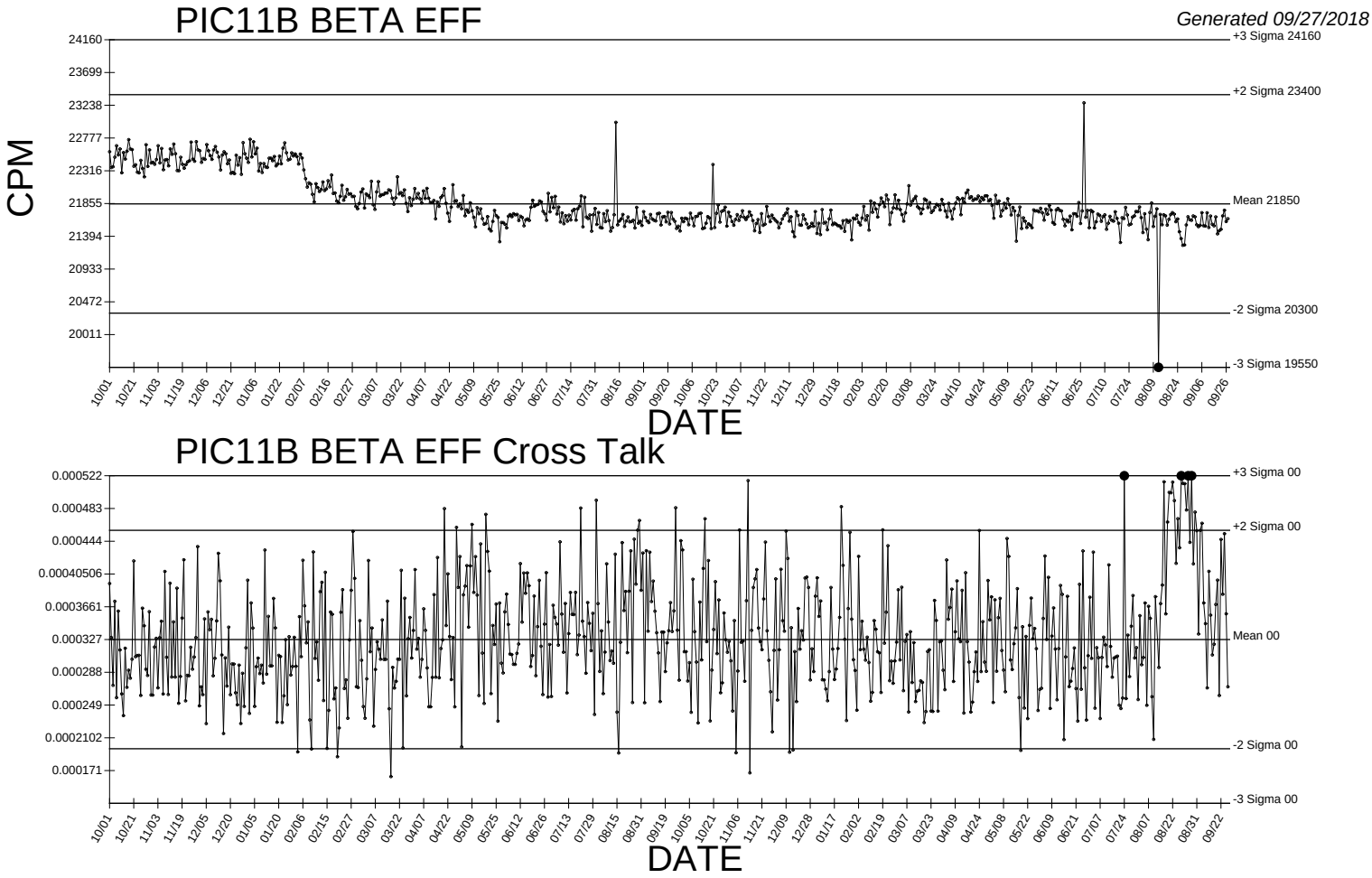

LB4100A3 ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.29
+2 Sigma 0.23
Mean 0.12
-2 Sigma 0.01
-3 Sigma -0.048
LB4100A3 ALPHA EFF
+3 Sigma 10070
+2 Sigma 9840
Mean 9399
-2 Sigma 8950
-3 Sigma 8731
LB4100A3 ALPHA EFF Cross Talk
+3 Sigma 0.26
+2 Sigma 0.25
Mean 0.23
-2 Sigma 0.21
-3 Sigma 0.21
LB4100A3 BETA BKG
+3 Sigma 1.89
+2 Sigma 1.7
Mean 1.3
-2 Sigma 0.9
-3 Sigma 0.7
Denotes Outlier



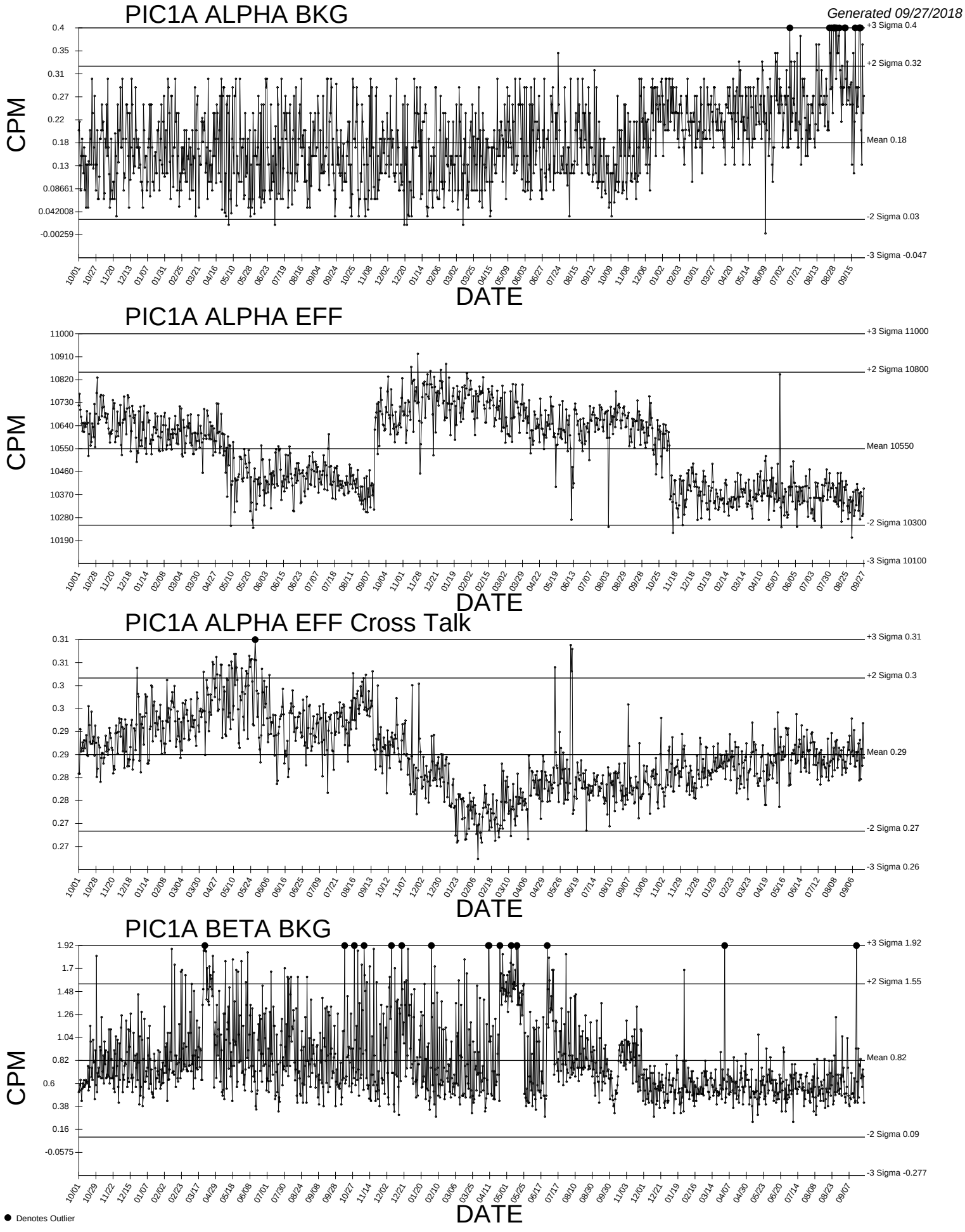


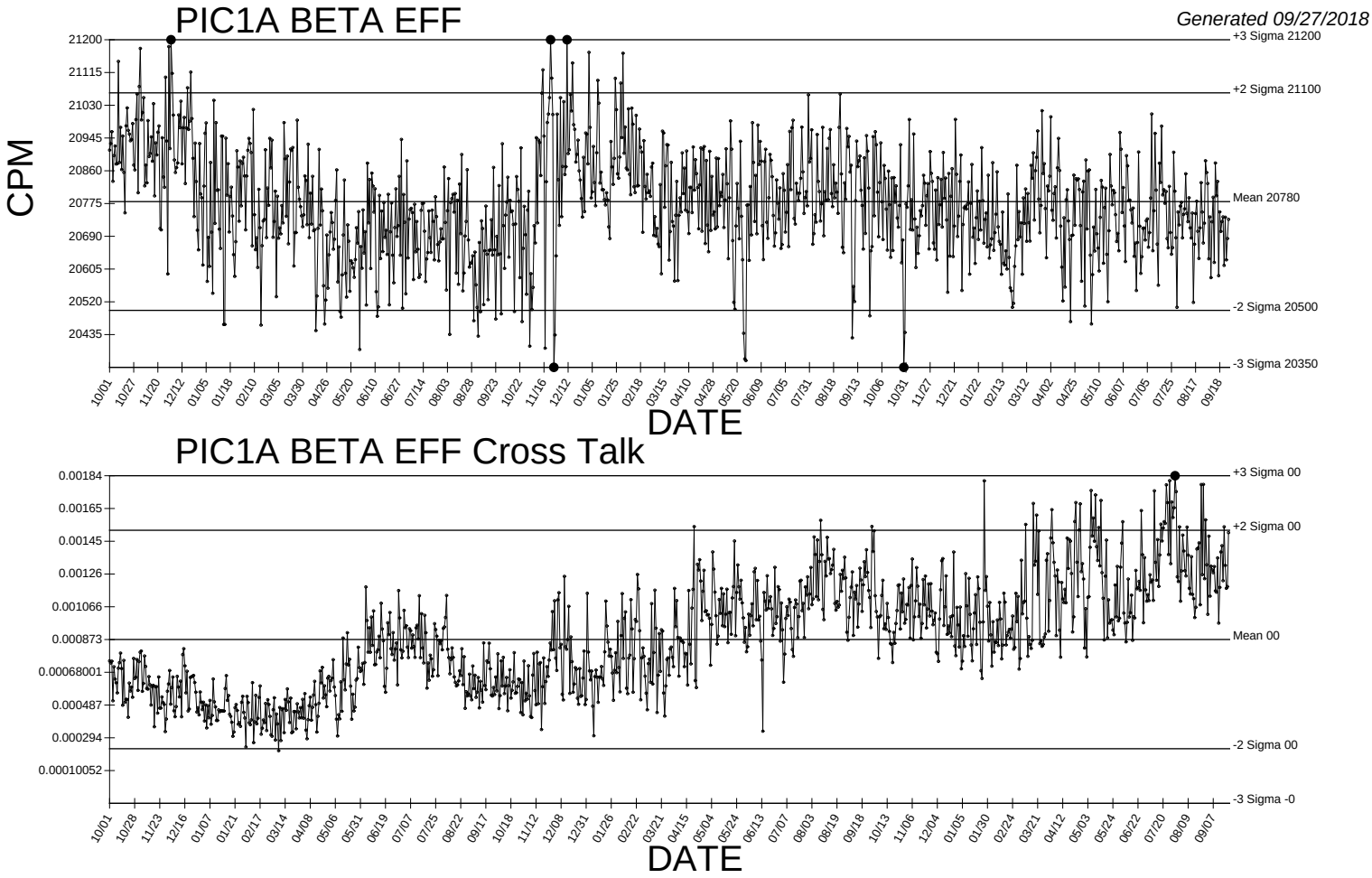
● Denotes Outlier


PIC11B ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.39
+2 Sigma 0.32
Mean 0.18
-2 Sigma 0.05
-3 Sigma -0.02
PIC11B ALPHA EFF
+3 Sigma 14430
+2 Sigma 14000
Mean 13260
-2 Sigma 12500
-3 Sigma 12090
PIC11B ALPHA EFF Cross Talk
+3 Sigma 0.3
+2 Sigma 0.29
Mean 0.27
-2 Sigma 0.25
-3 Sigma 0.24
PIC11B BETA BKG
+3 Sigma 1.72
+2 Sigma 1.42
Mean 0.82
-2 Sigma 0.22
-3 Sigma -0.085
● Denotes Outlier

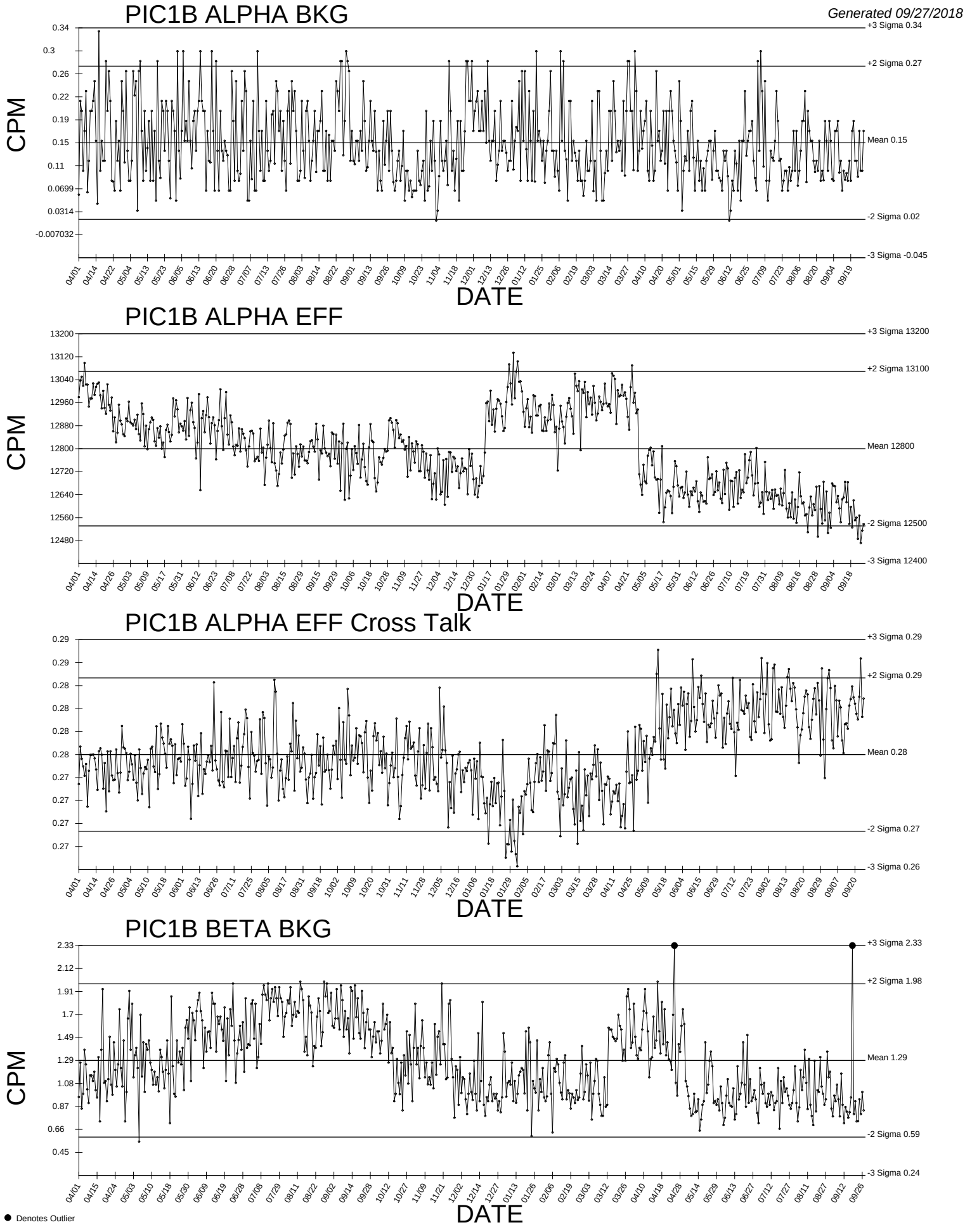


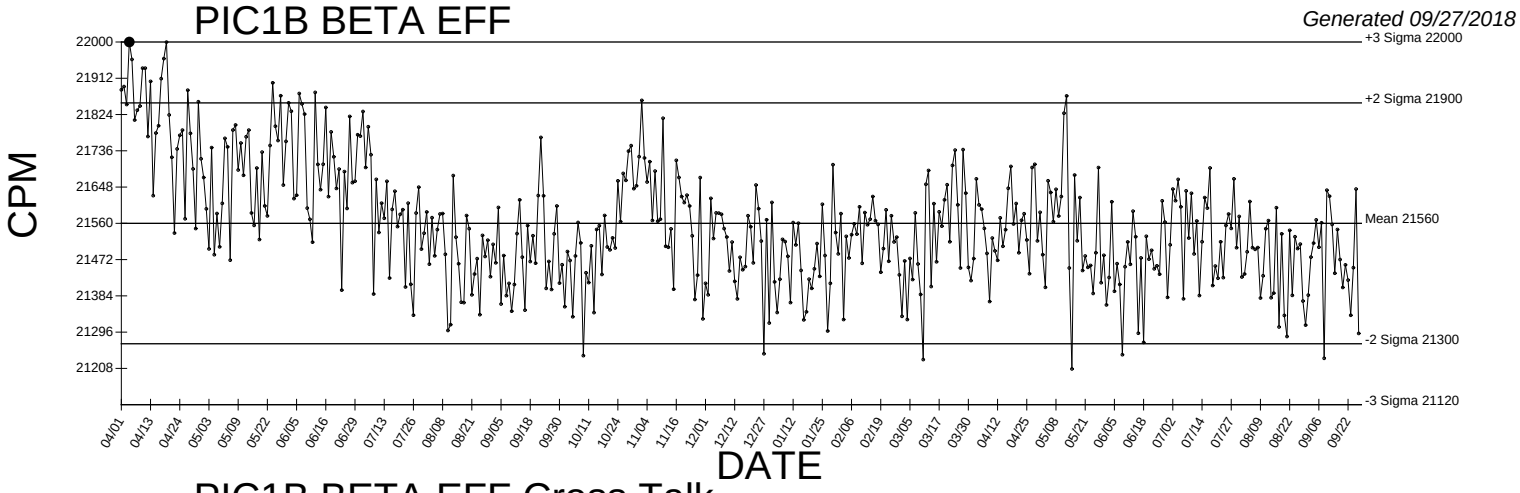
● Denotes Outlier

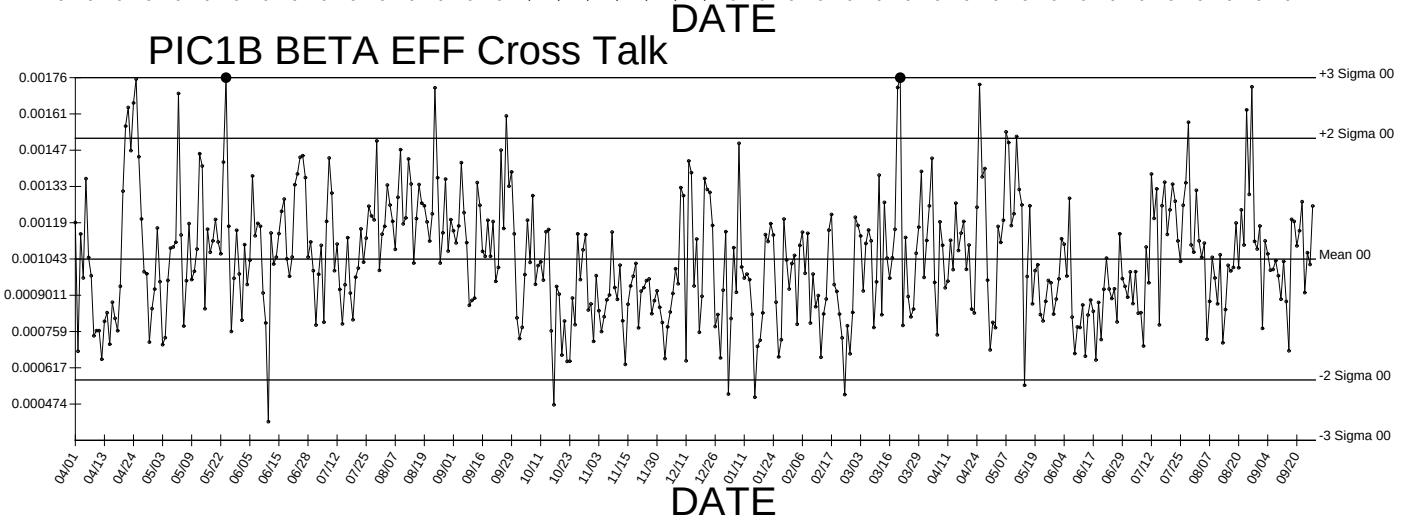

PIC1A ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.4
+2 Sigma 0.32
Mean 0.18
-2 Sigma 0.03
-3 Sigma -0.047
PIC1A ALPHA EFF
+3 Sigma 11000
+2 Sigma 10800
Mean 10550
-2 Sigma 10300
-3 Sigma 10100
PIC1A ALPHA EFF Cross Talk
+3 Sigma 0.31
+2 Sigma 0.3
Mean 0.29
-2 Sigma 0.27
-3 Sigma 0.26
PIC1A BETA BKG
+3 Sigma 1.92
+2 Sigma 1.55
Mean 0.82
-2 Sigma 0.09
-3 Sigma -0.277
Denotes Outlier



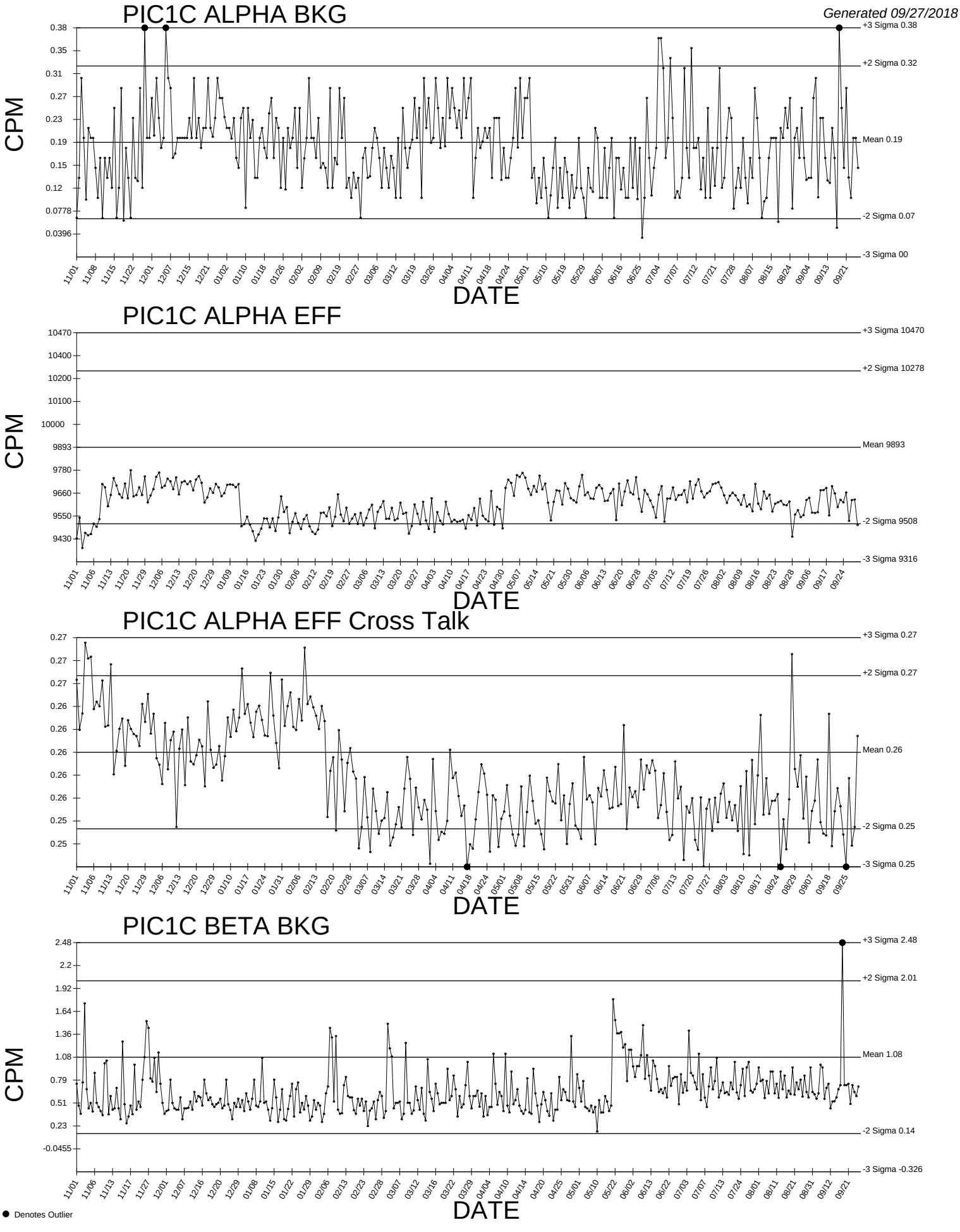
● Denotes Outlier

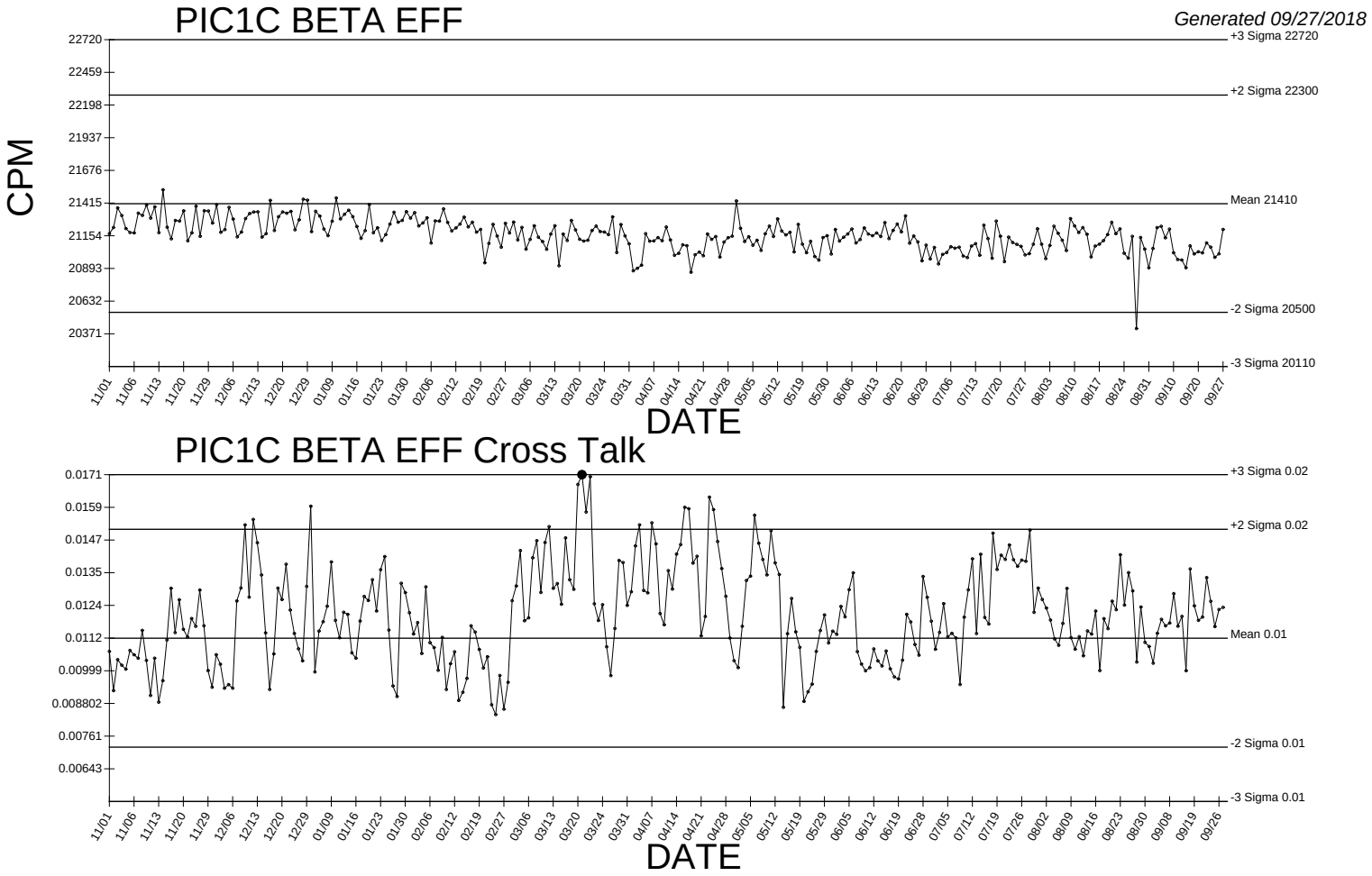

PIC1B ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.34
+2 Sigma 0.27
Mean 0.15
-2 Sigma 0.02
-3 Sigma -0.045
PIC1B ALPHA EFF
+3 Sigma 13200
+2 Sigma 13100
Mean 12800
-2 Sigma 12500
-3 Sigma 12400
PIC1B ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.29
Mean 0.28
-2 Sigma 0.27
-3 Sigma 0.26
PIC1B BETA BKG
+3 Sigma 2.33
+2 Sigma 1.98
Mean 1.29
-2 Sigma 0.59
-3 Sigma 0.24
Denotes Outlier



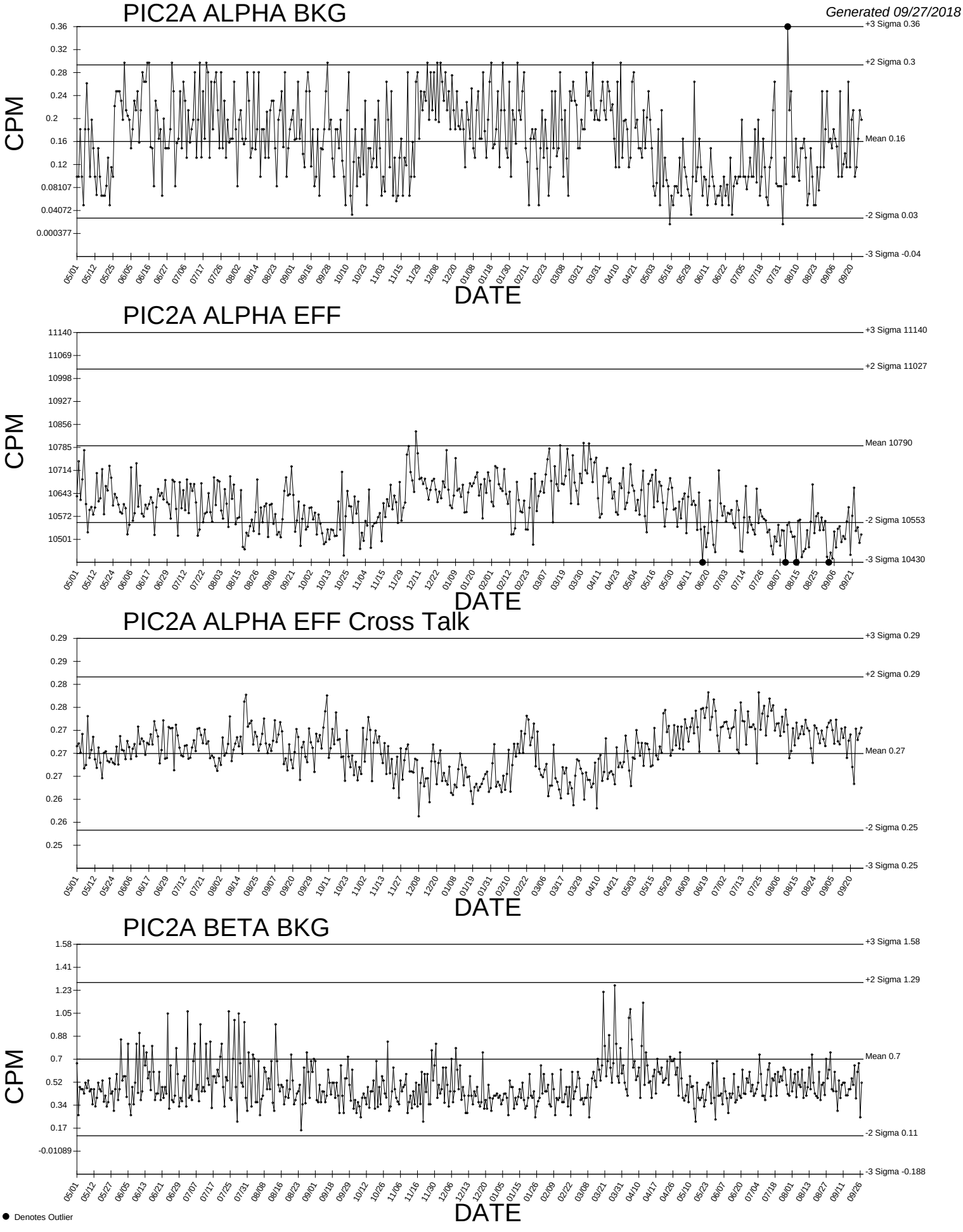


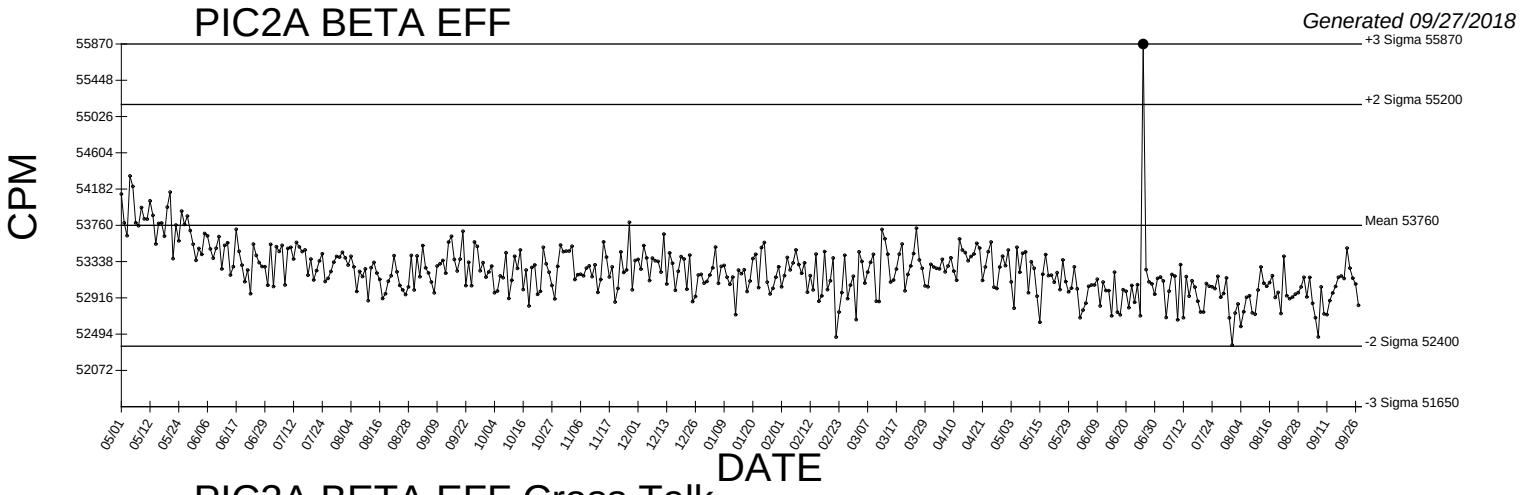
● Denotes Outlier

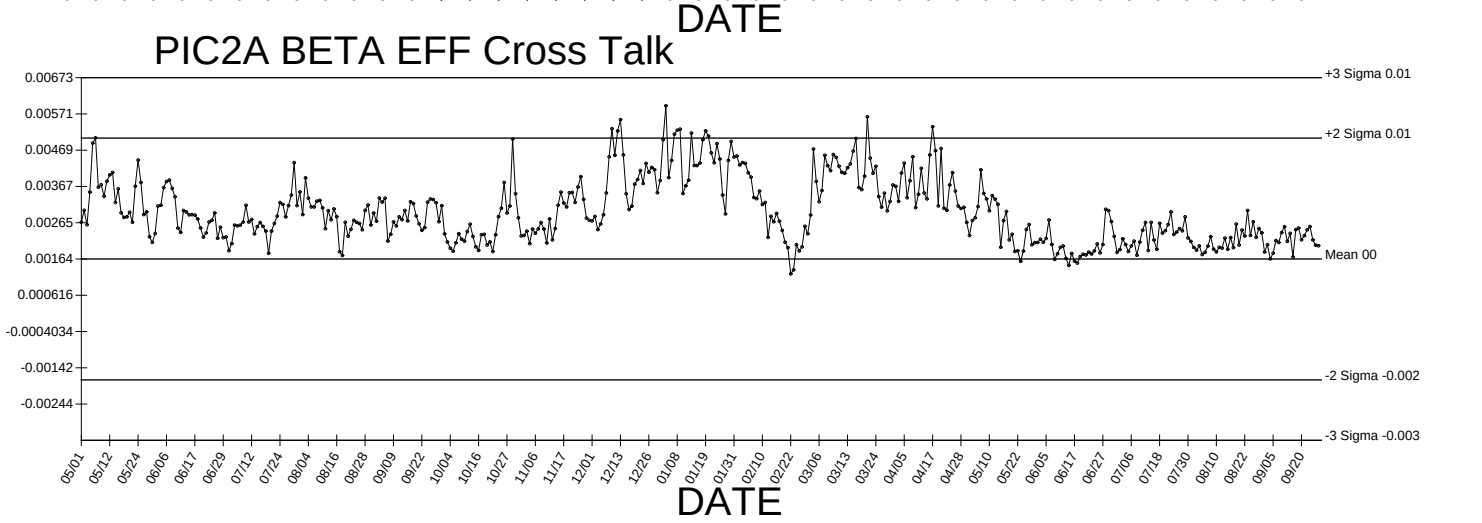

PIC1C ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.32
Mean 0.19
-2 Sigma 0.07
-3 Sigma 00
PIC1C ALPHA EFF
+3 Sigma 10470
+2 Sigma 10278
Mean 9893
-2 Sigma 9508
-3 Sigma 9316
PIC1C ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.25
-3 Sigma 0.25
PIC1C BETA BKG
+3 Sigma 2.48
+2 Sigma 2.01
Mean 1.08
-2 Sigma 0.14
-3 Sigma -0.326
Denotes Outlier



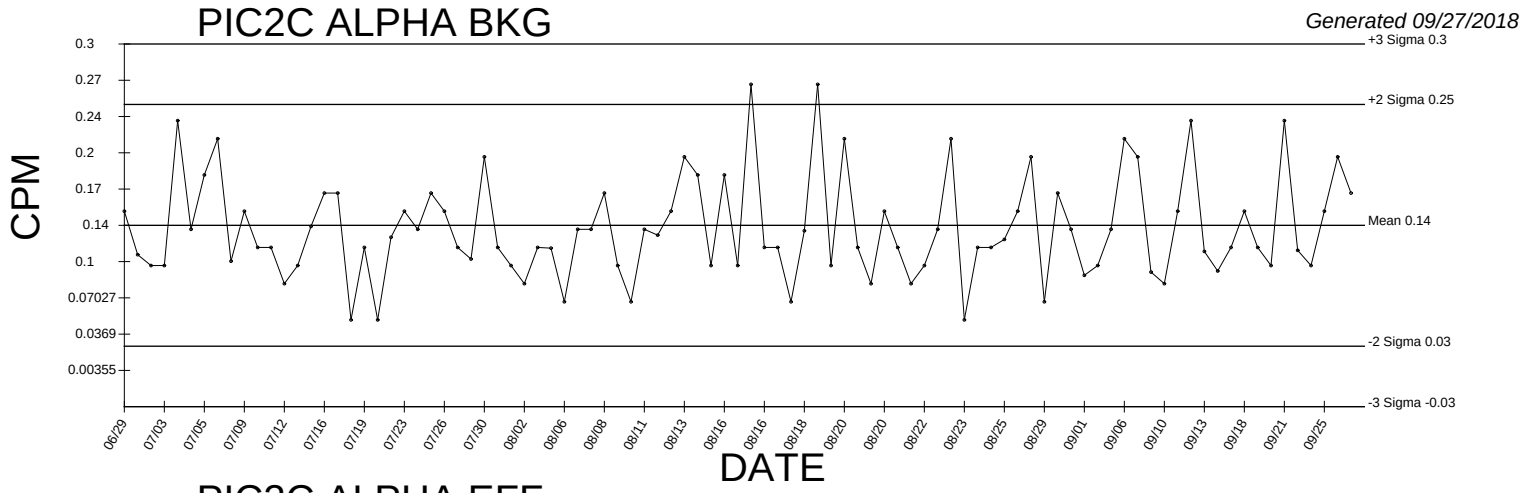
● Denotes Outlier

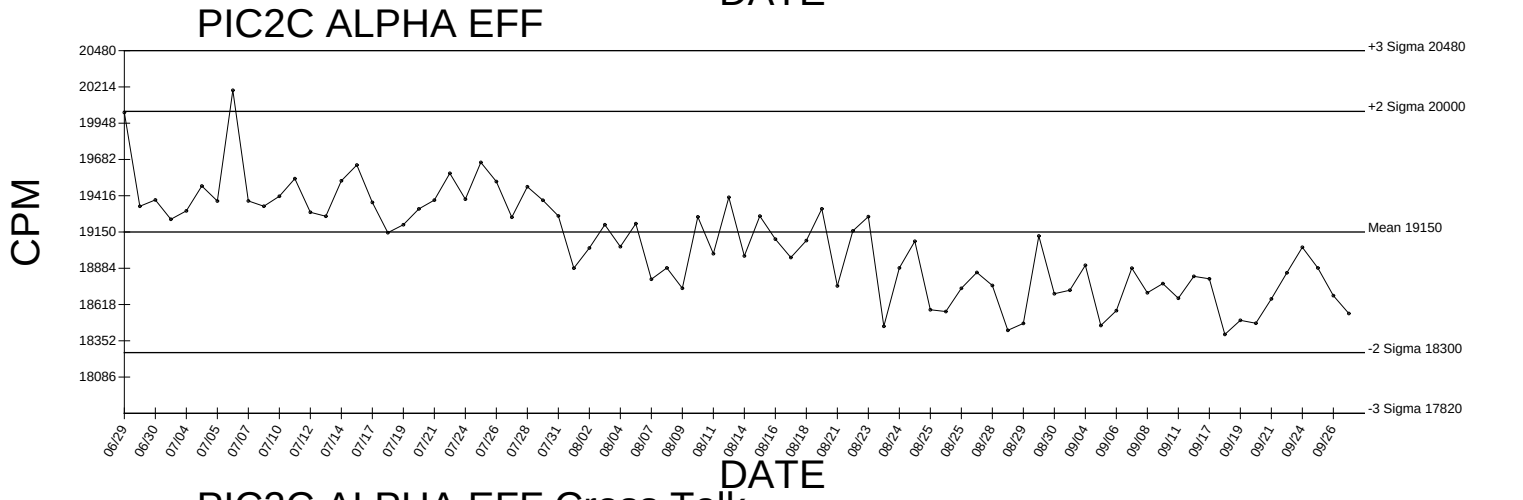

PIC2A ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.16
-2 Sigma 0.03
-3 Sigma -0.04
PIC2A ALPHA EFF
+3 Sigma 11140
+2 Sigma 11027
Mean 10790
-2 Sigma 10553
-3 Sigma 10430
PIC2A ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.29
Mean 0.27
-2 Sigma 0.25
-3 Sigma 0.25
PIC2A BETA BKG
+3 Sigma 1.58
+2 Sigma 1.29
Mean 0.7
-2 Sigma 0.11
-3 Sigma -0.188
Denotes Outlier

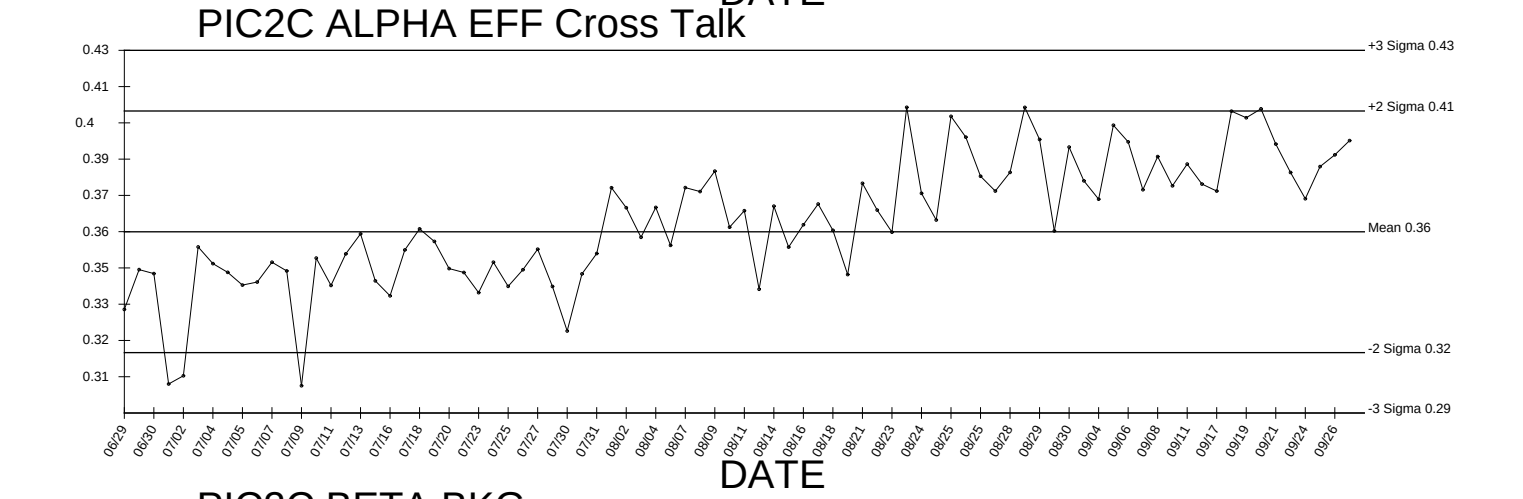


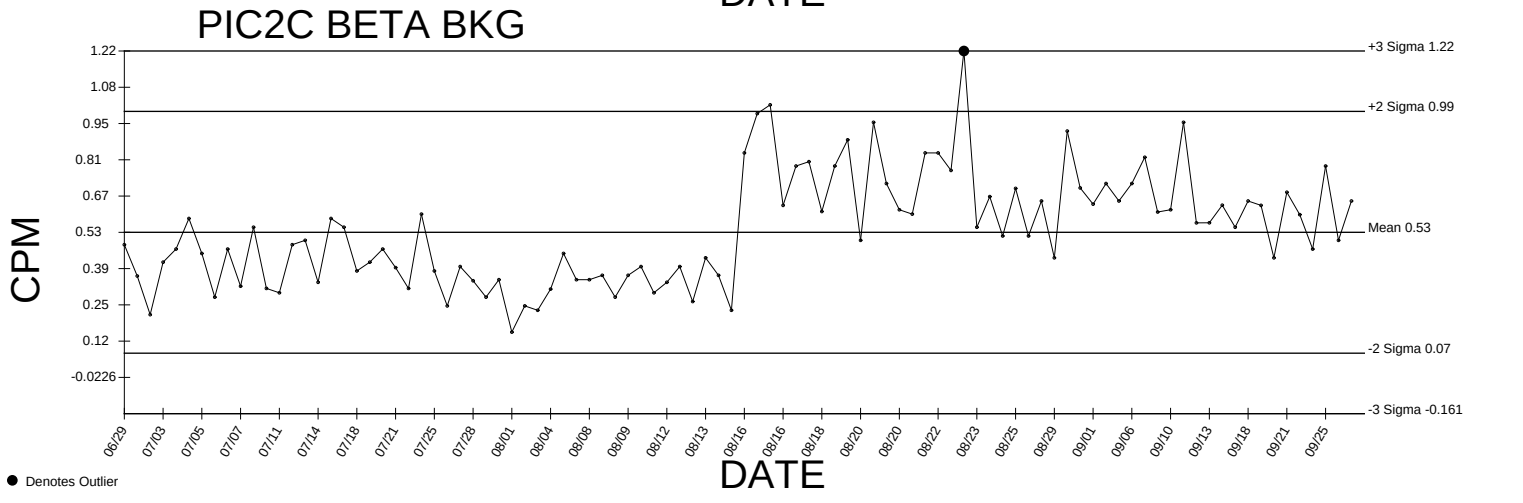


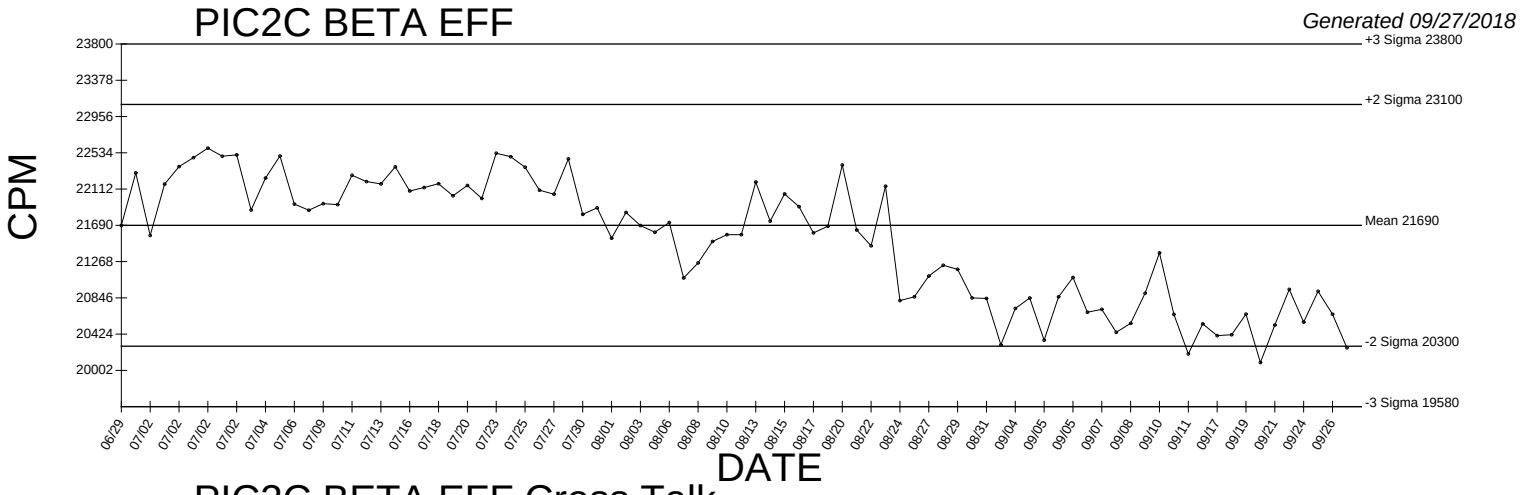
● Denotes Outlier

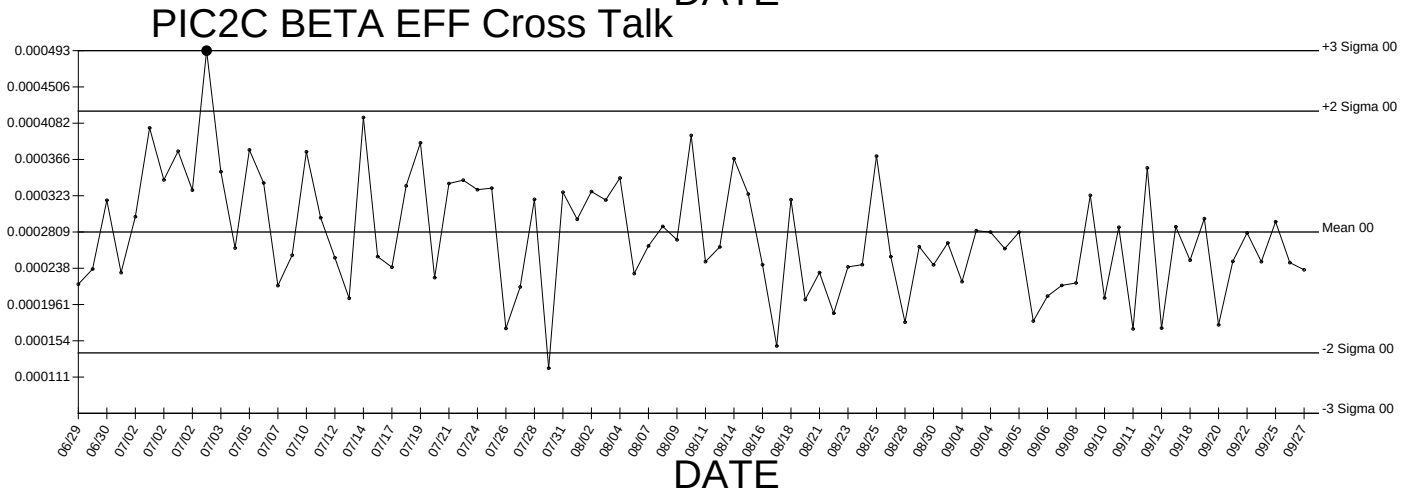

PIC2C ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.3
+2 Sigma 0.25
Mean 0.14
-2 Sigma 0.03
-3 Sigma -0.03


PIC2C ALPHA EFF
CPM
DATE
+3 Sigma 20480
+2 Sigma 20000
Mean 19150
-2 Sigma 18300
-3 Sigma 17820

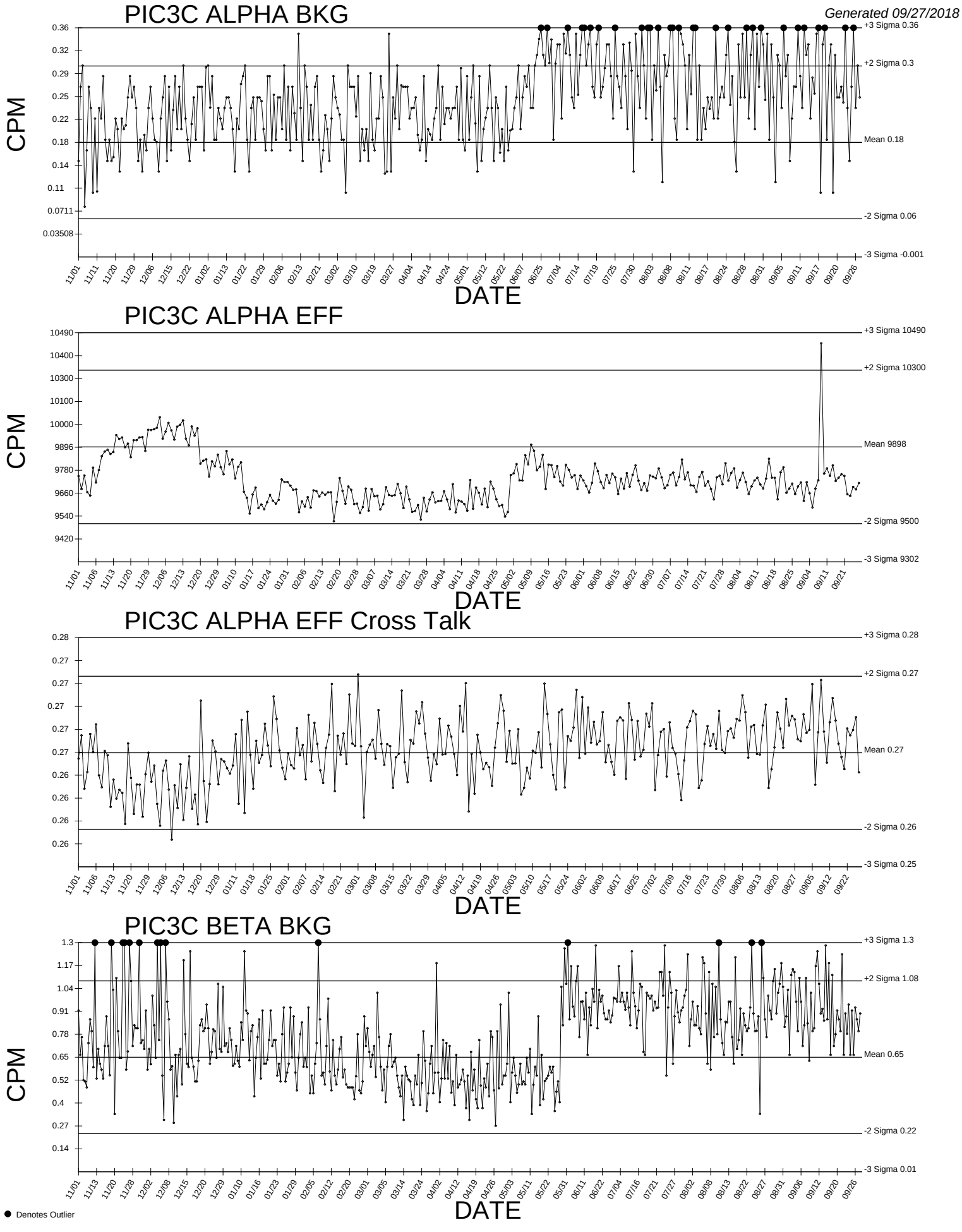

PIC2C ALPHA EFF Cross Talk
DATE
+3 Sigma 0.43
+2 Sigma 0.41
Mean 0.36
-2 Sigma 0.32
-3 Sigma 0.29

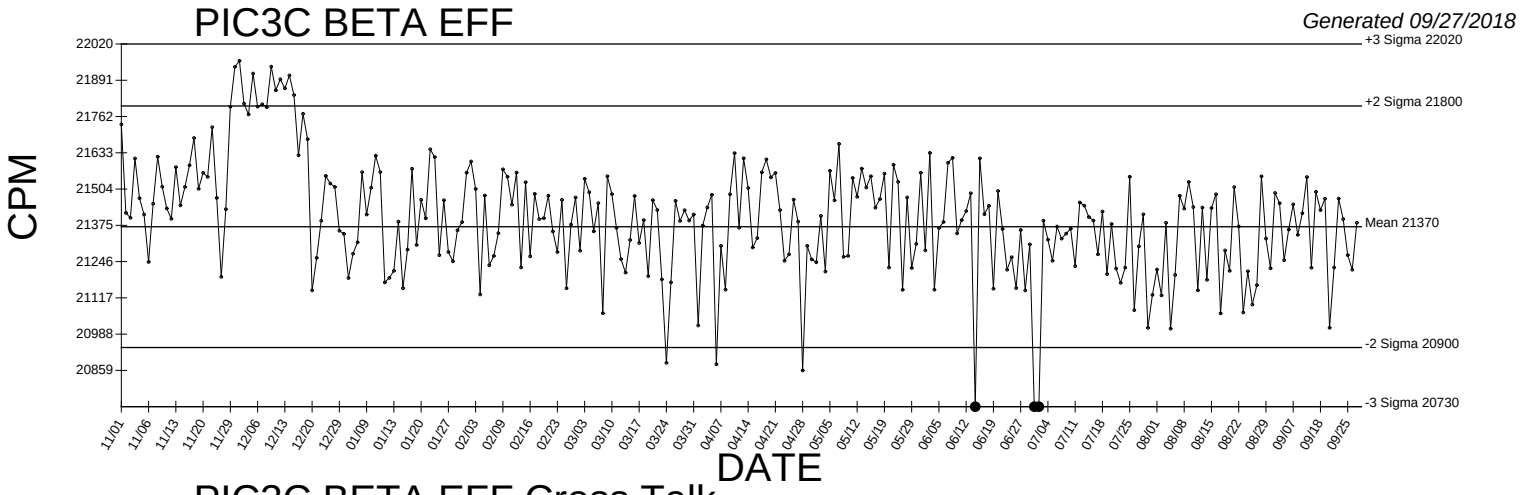

PIC2C BETA BKG
CPM
DATE
+3 Sigma 1.22
+2 Sigma 0.99
Mean 0.53
-2 Sigma 0.07
-3 Sigma -0.161
● Denotes Outlier

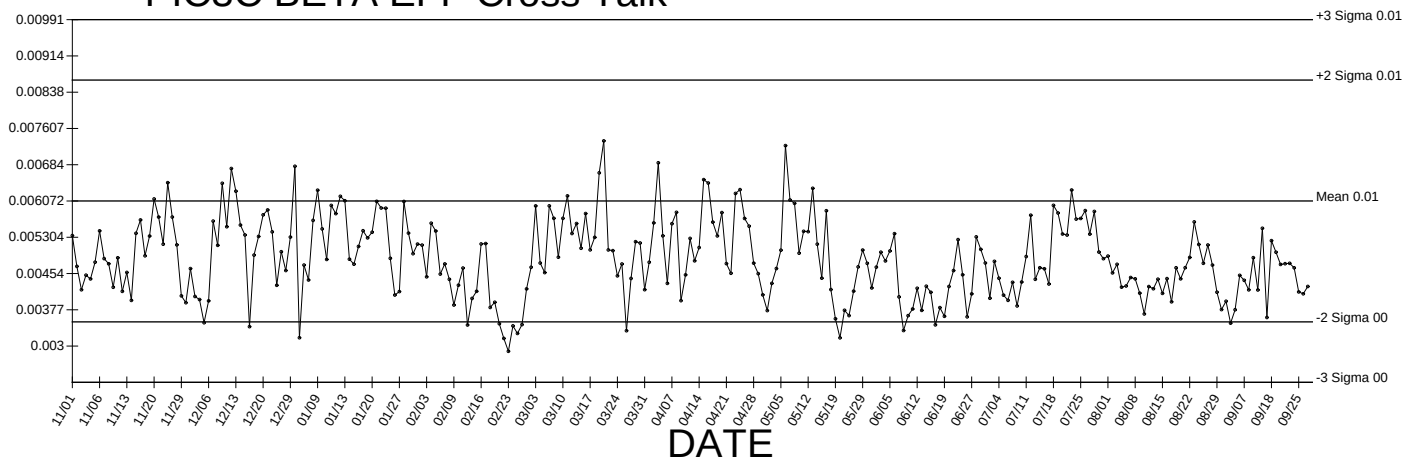




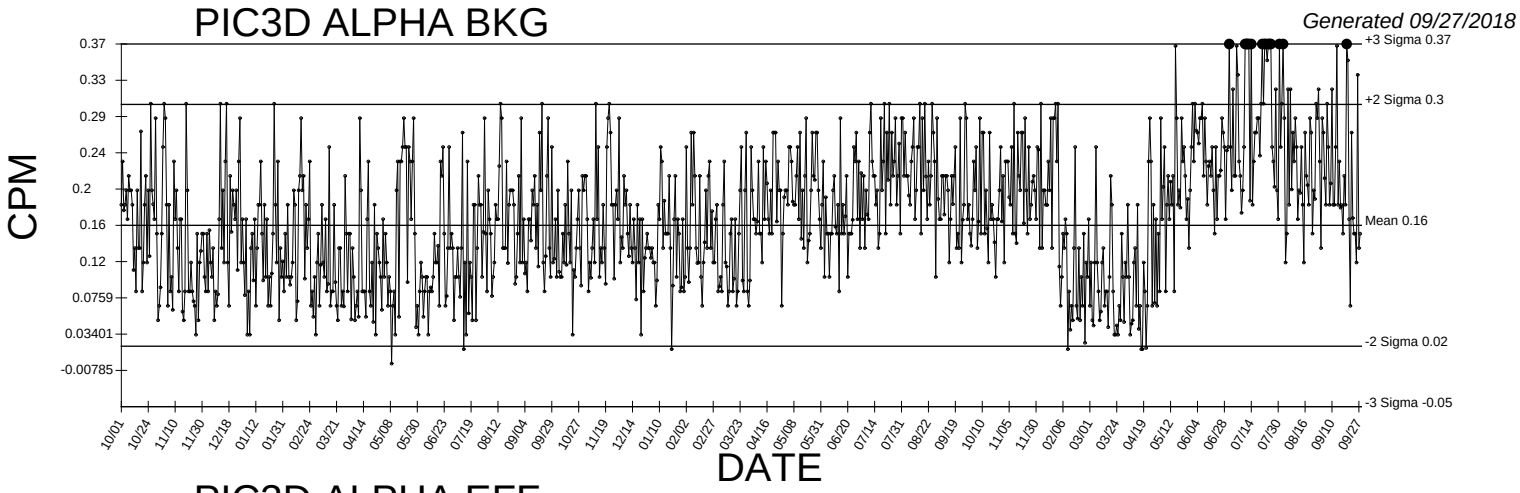
● Denotes Outlier

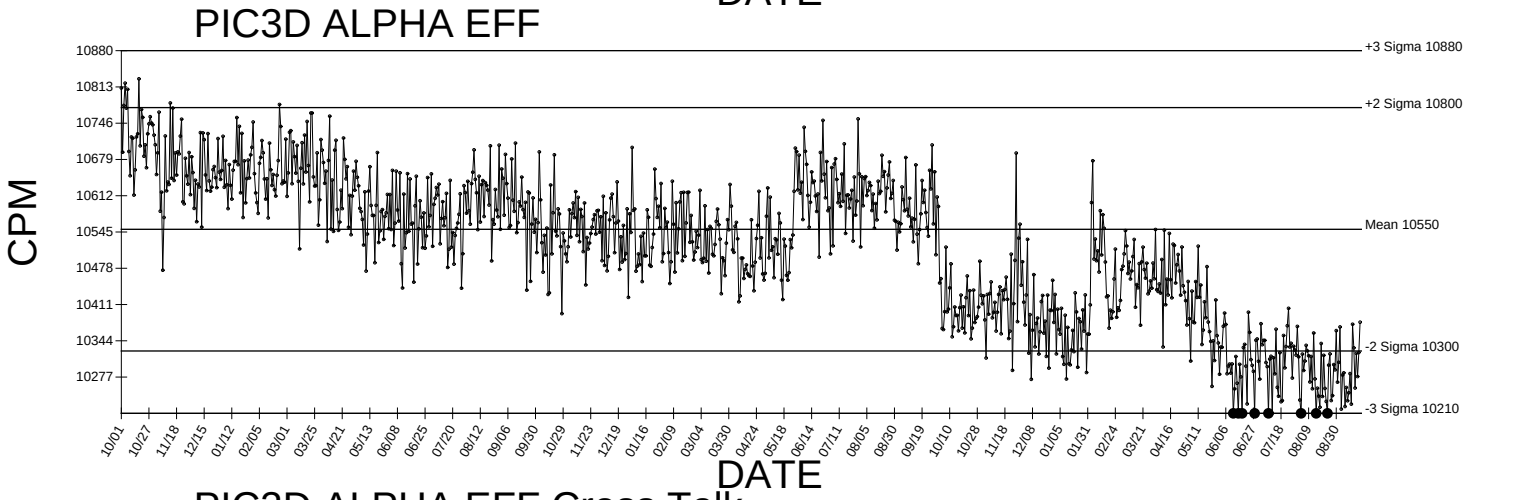

PIC3C ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.18
-2 Sigma 0.06
-3 Sigma -0.001
PIC3C ALPHA EFF
+3 Sigma 10490
+2 Sigma 10300
Mean 9898
-2 Sigma 9500
-3 Sigma 9302
PIC3C ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.27
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
PIC3C BETA BKG
+3 Sigma 1.3
+2 Sigma 1.08
Mean 0.65
-2 Sigma 0.22
-3 Sigma 0.01
Denotes Outlier

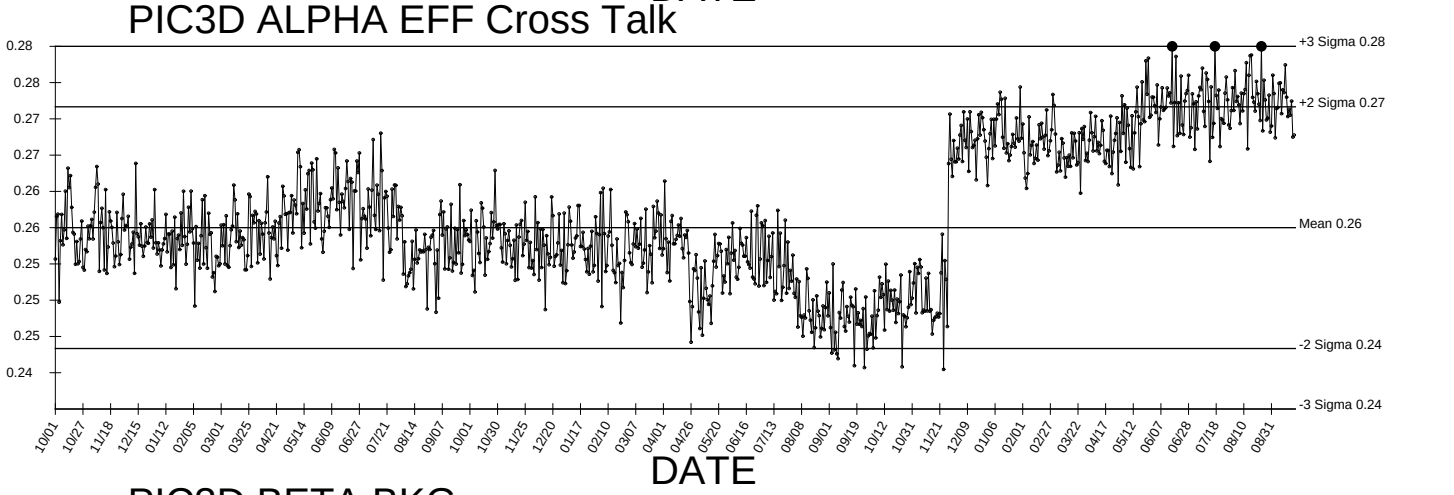


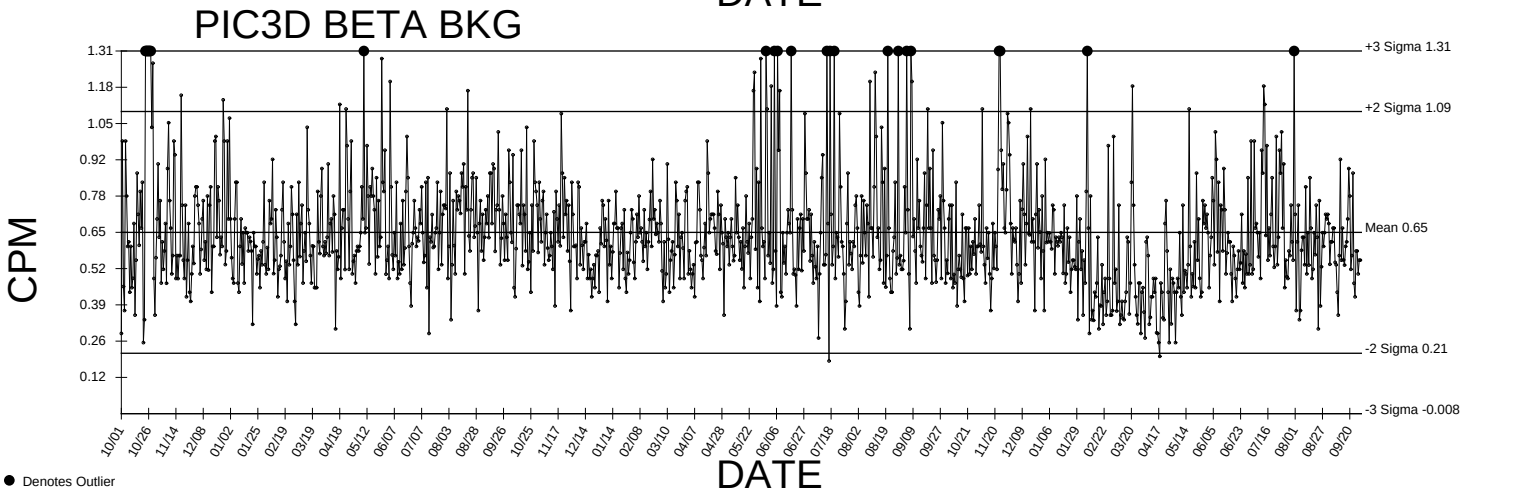


● Denotes Outlier

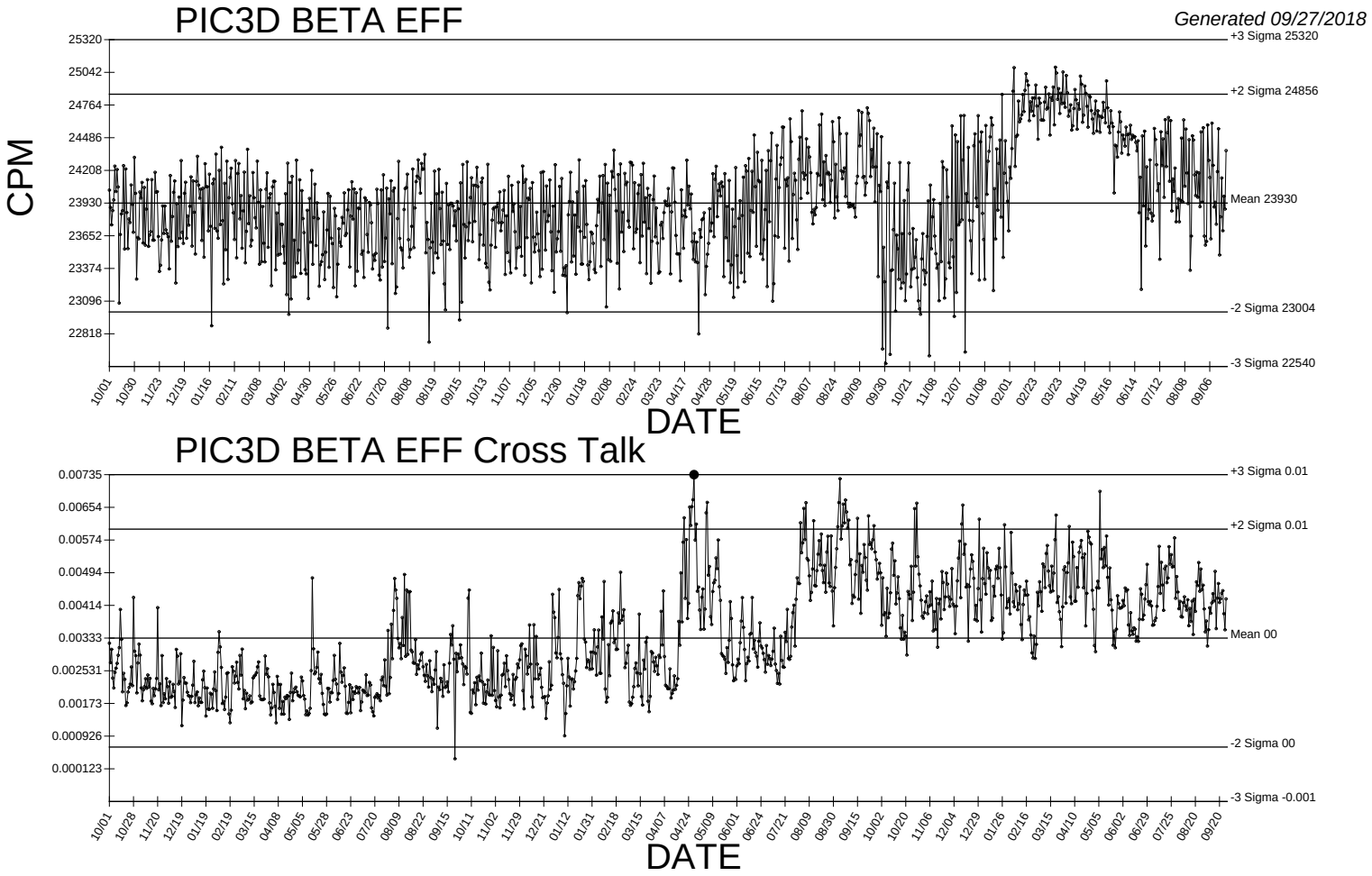




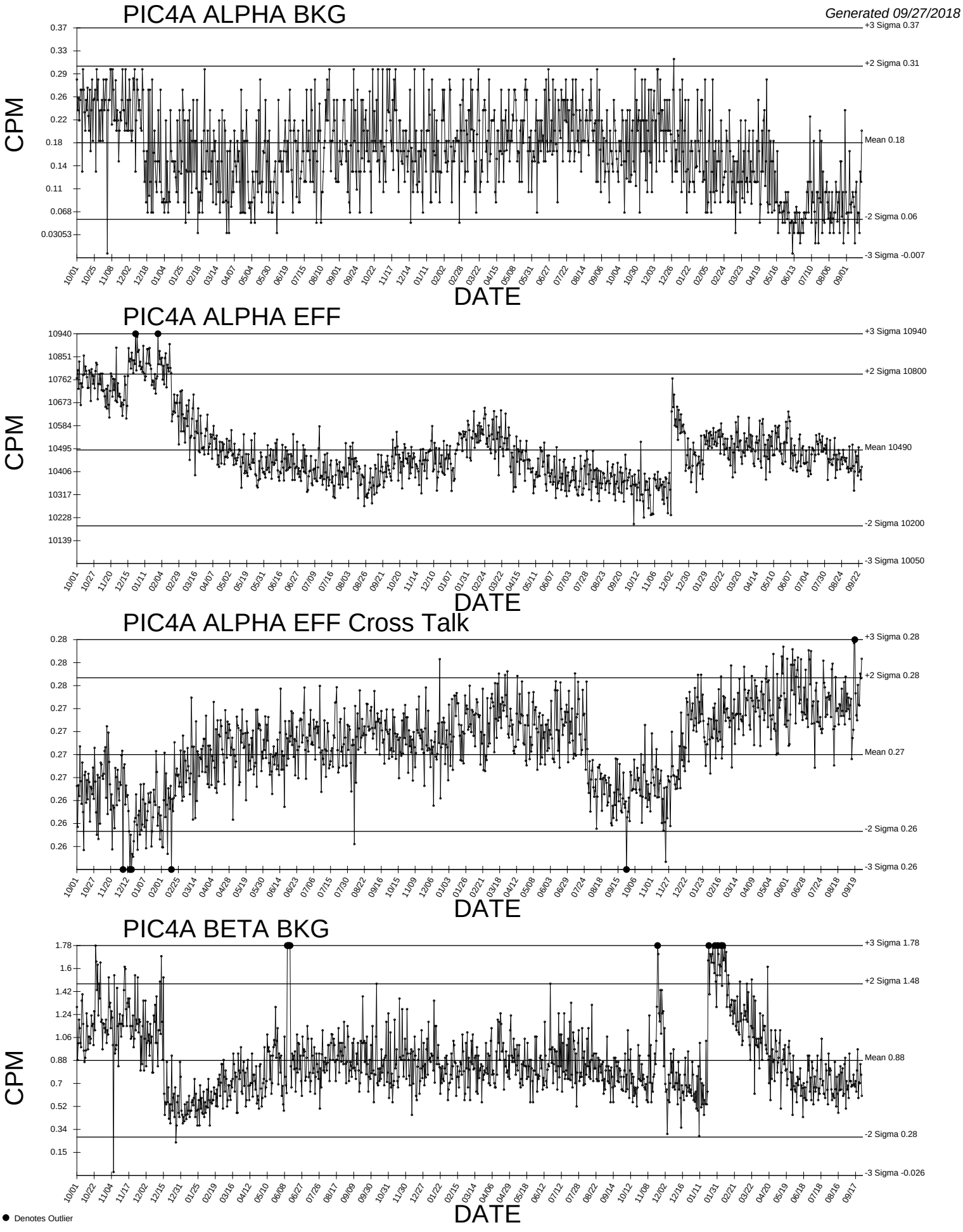


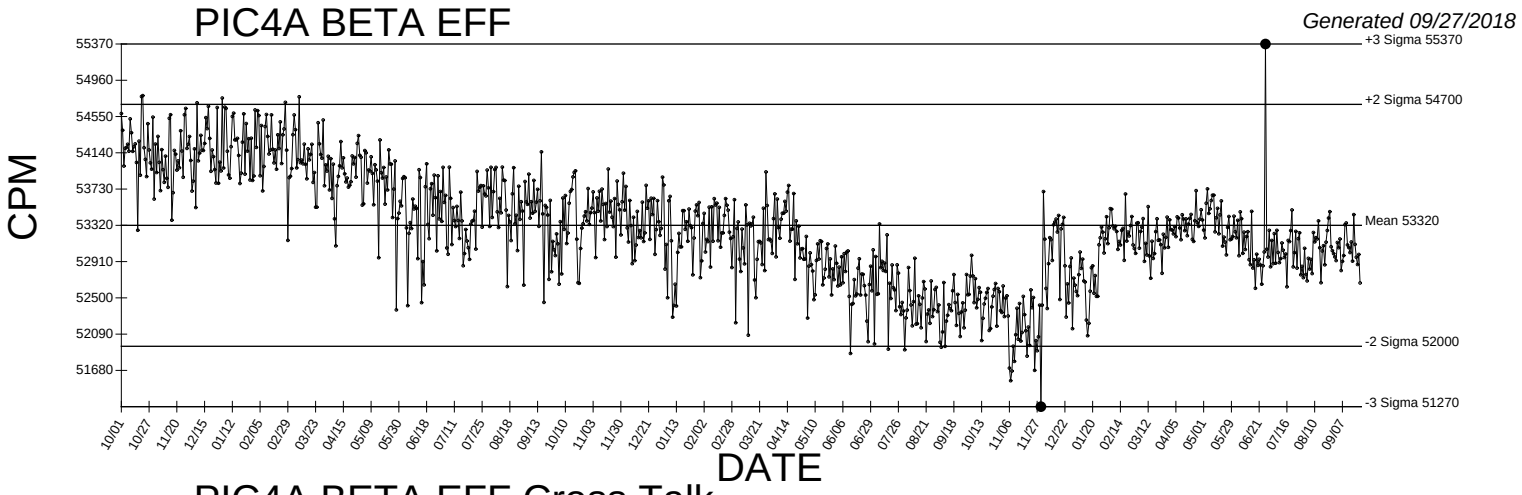


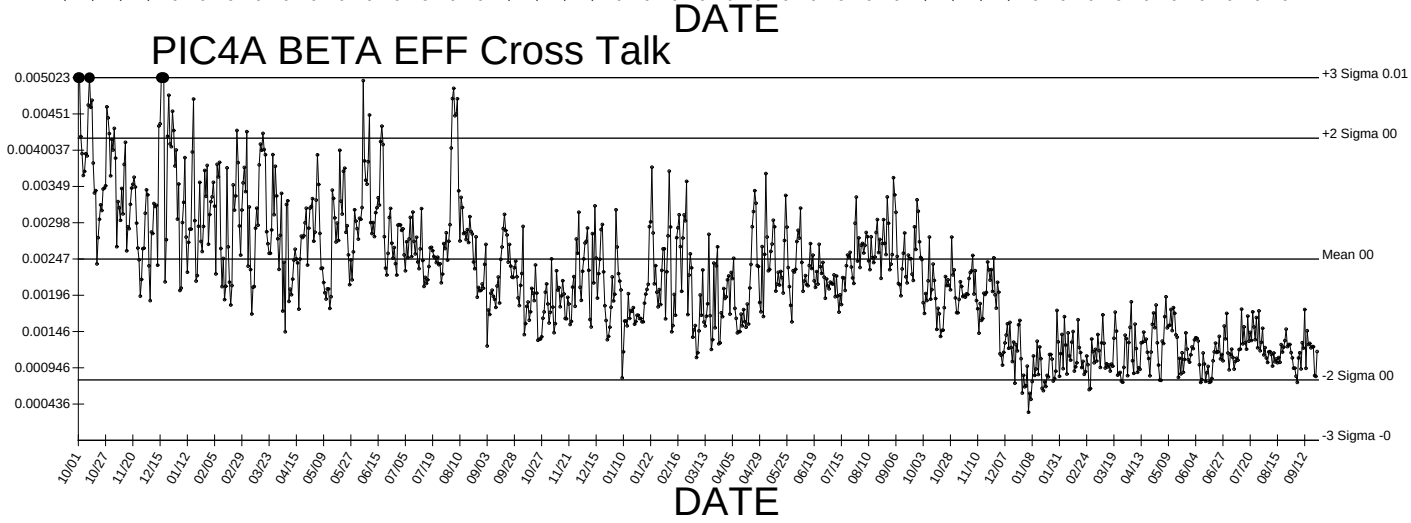
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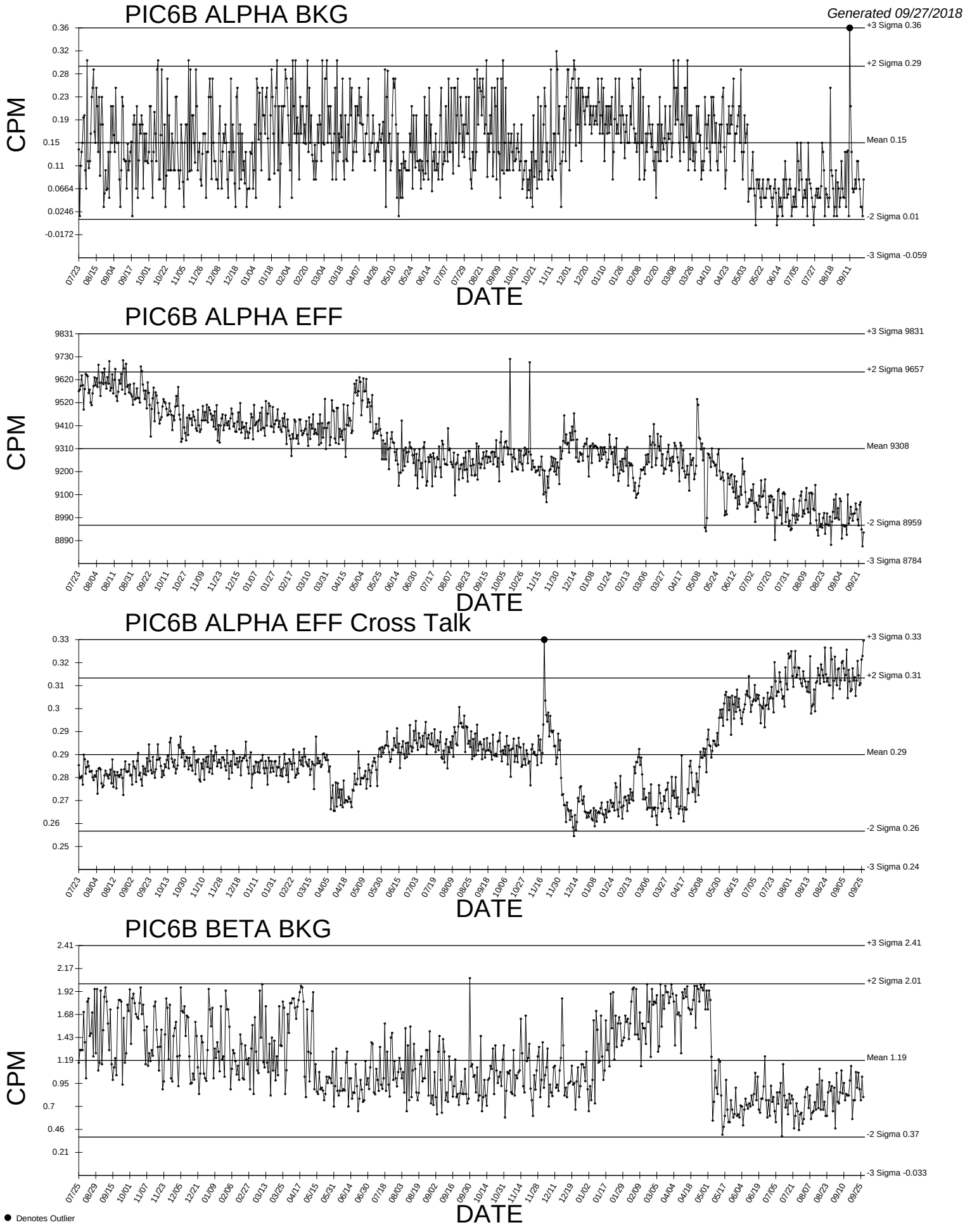
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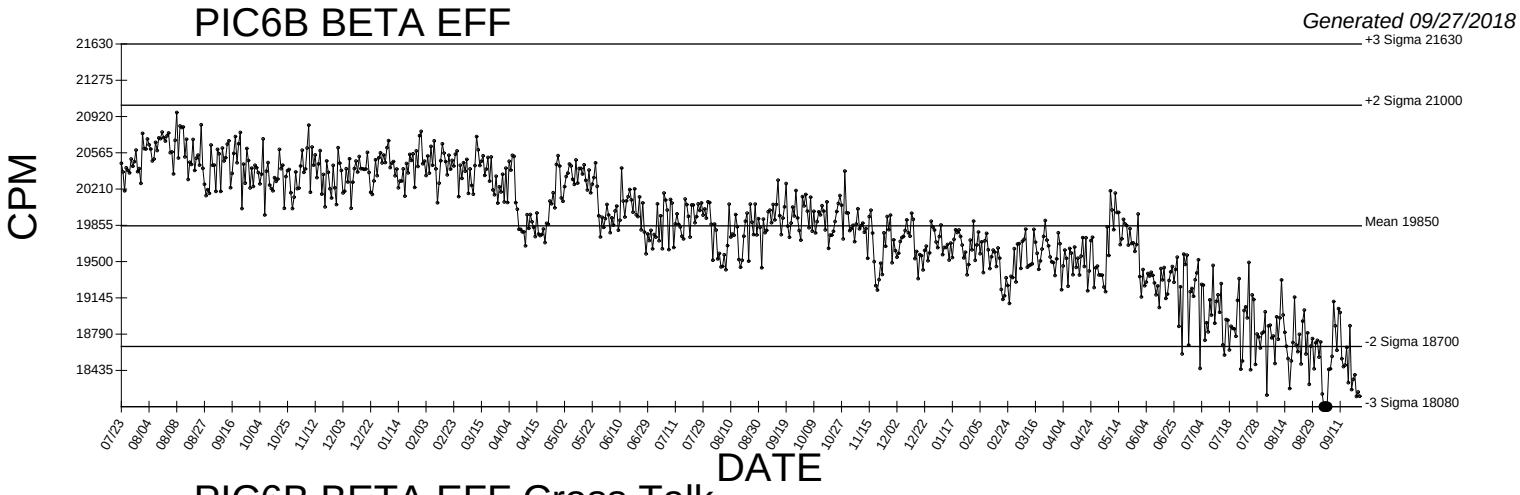

PIC4A ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.37
+2 Sigma 0.31
Mean 0.18
-2 Sigma 0.06
-3 Sigma -0.007
PIC4A ALPHA EFF
+3 Sigma 10940
+2 Sigma 10800
Mean 10490
-2 Sigma 10200
-3 Sigma 10050
PIC4A ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.26
PIC4A BETA BKG
+3 Sigma 1.78
+2 Sigma 1.48
Mean 0.88
-2 Sigma 0.28
-3 Sigma -0.026
Denotes Outlier

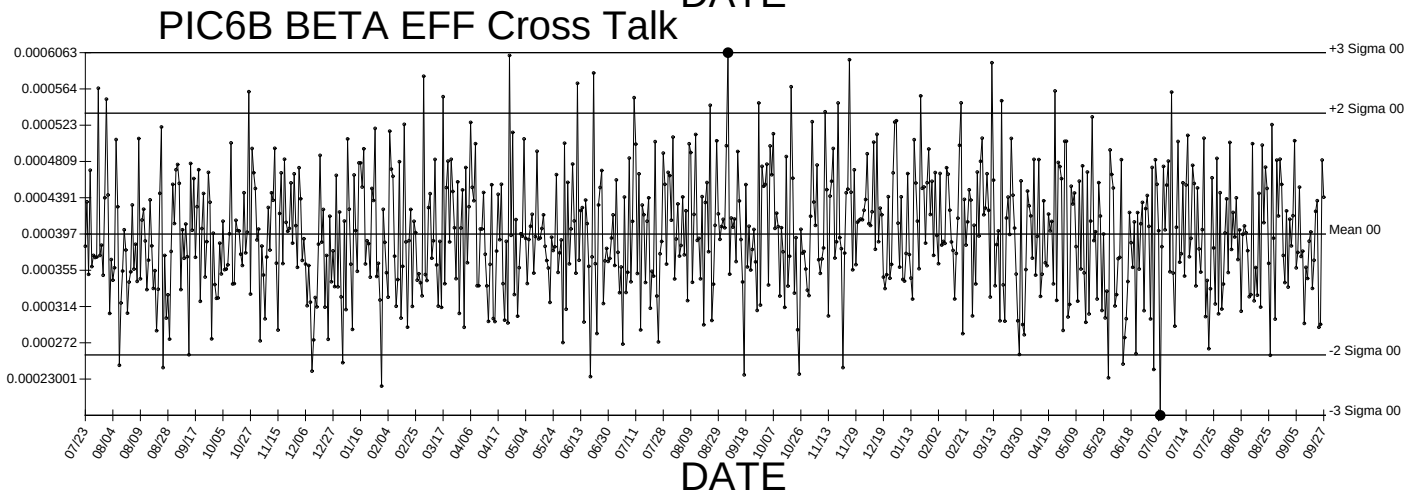




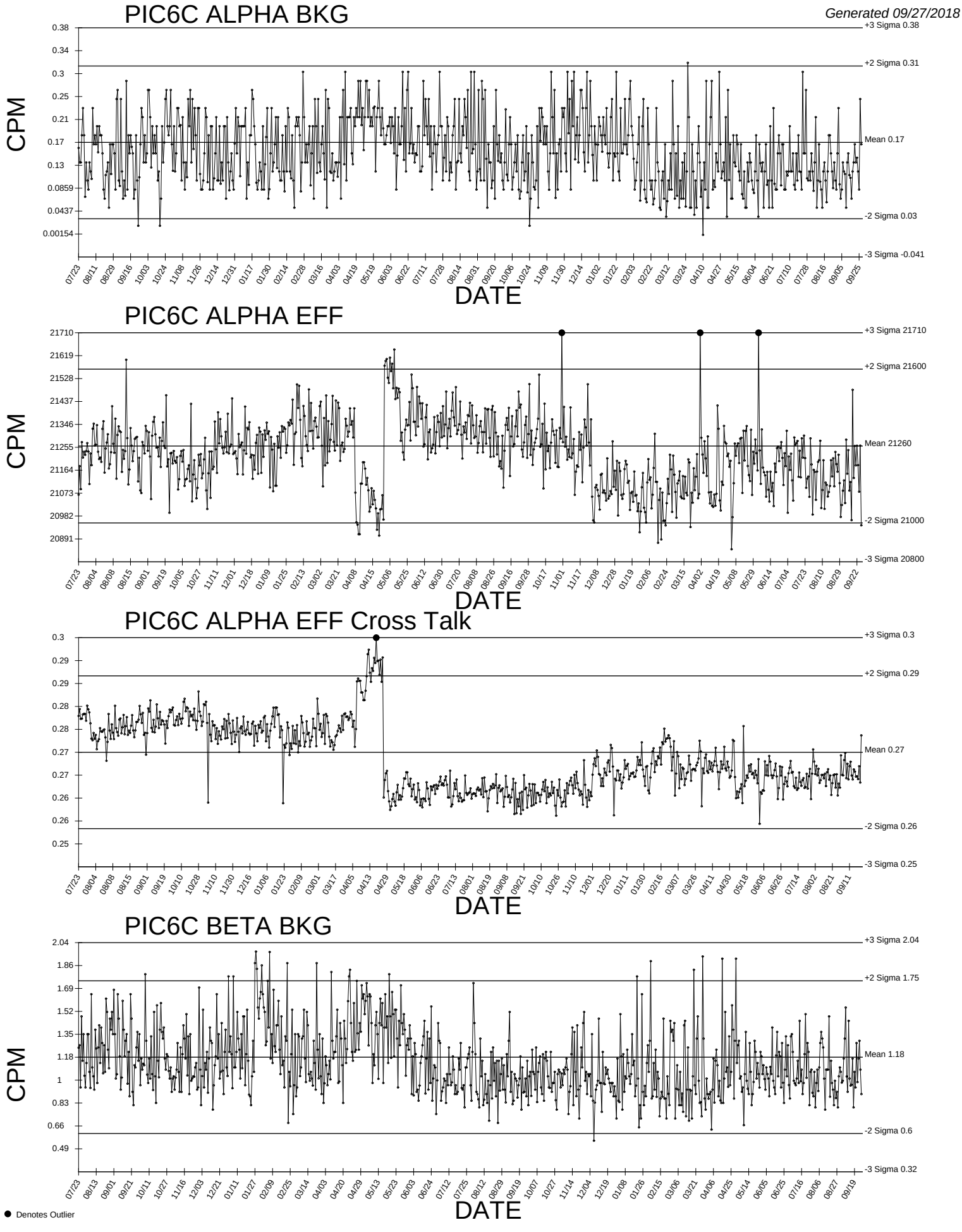
● Denotes Outlier

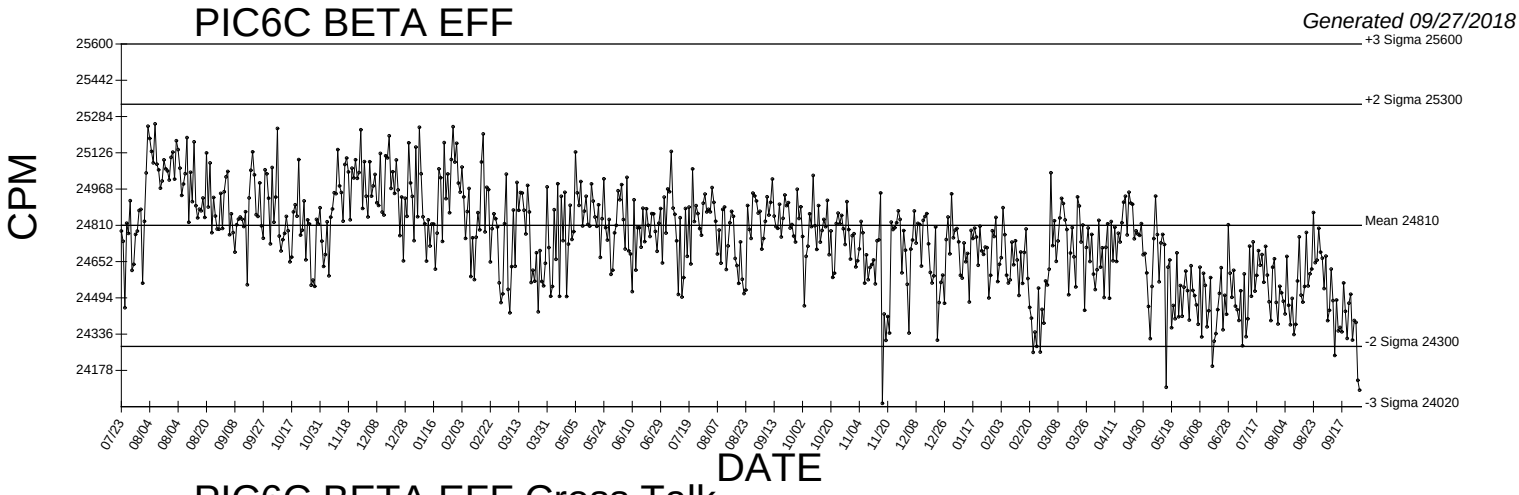

PIC6B ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.29
Mean 0.15
-2 Sigma 0.01
-3 Sigma -0.059
PIC6B ALPHA EFF
+3 Sigma 9831
+2 Sigma 9657
Mean 9308
-2 Sigma 8959
-3 Sigma 8784
PIC6B ALPHA EFF Cross Talk
+3 Sigma 0.33
+2 Sigma 0.31
Mean 0.29
-2 Sigma 0.26
-3 Sigma 0.24
PIC6B BETA BKG
+3 Sigma 2.41
+2 Sigma 2.01
Mean 1.19
-2 Sigma 0.37
-3 Sigma -0.033
Denotes Outlier

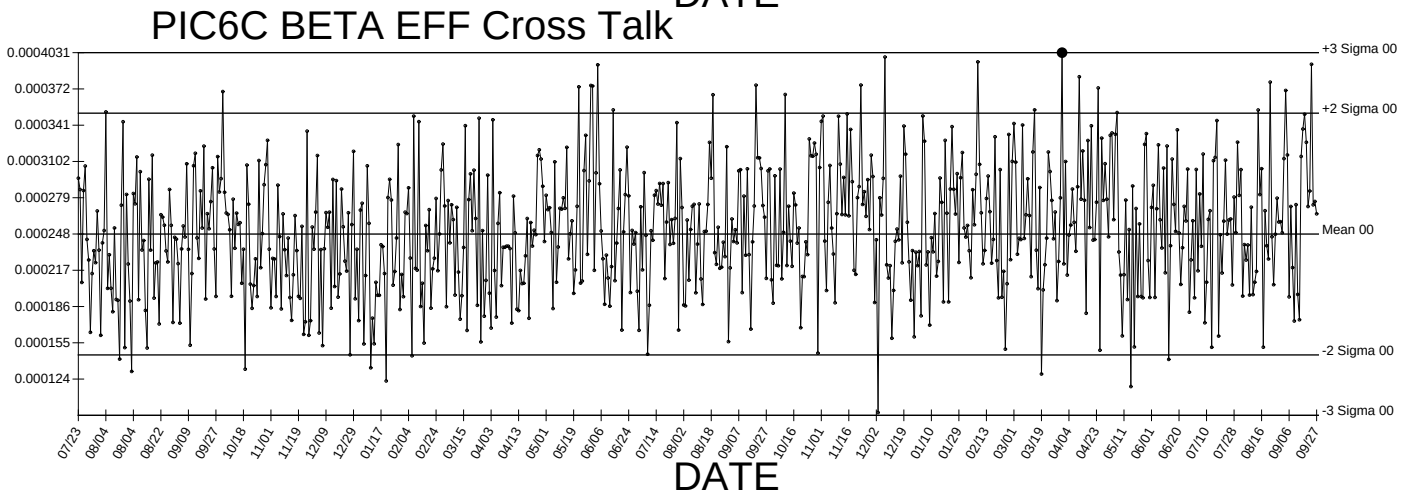




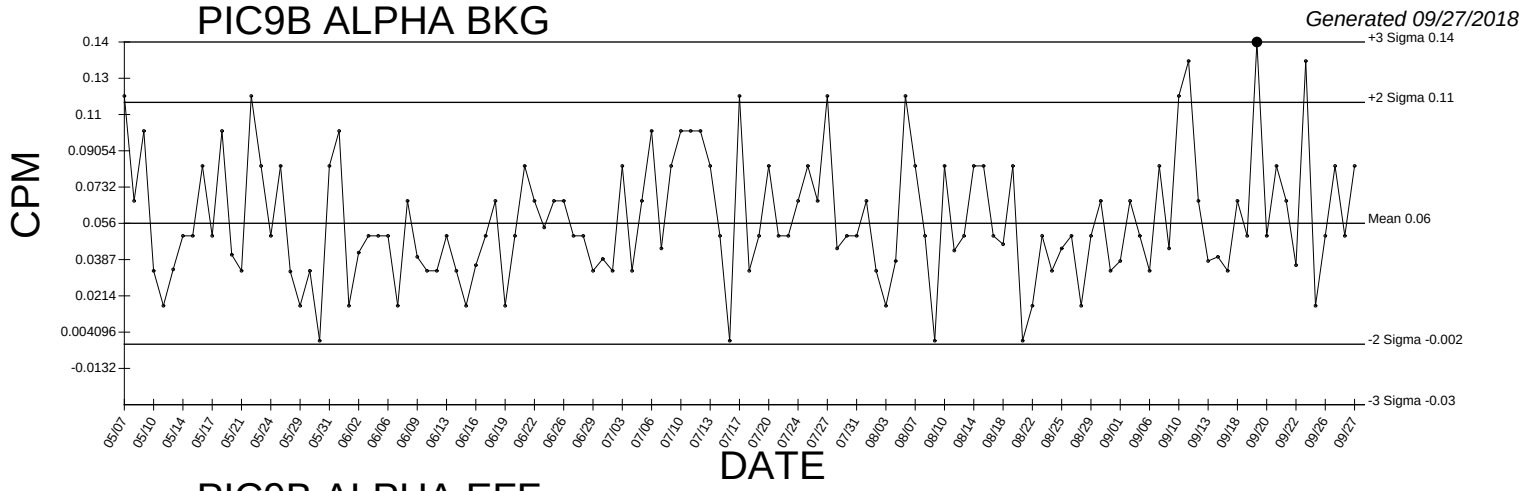
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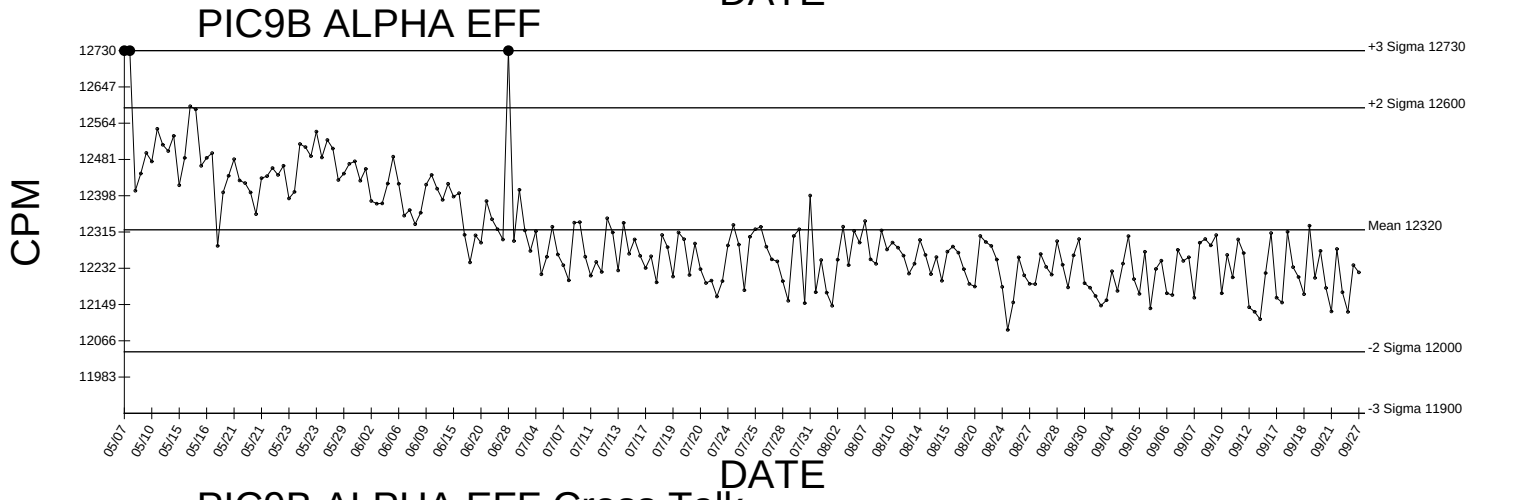

PIC6C ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.31
Mean 0.17
-2 Sigma 0.03
-3 Sigma -0.041
PIC6C ALPHA EFF
+3 Sigma 21710
+2 Sigma 21600
Mean 21260
-2 Sigma 21000
-3 Sigma 20800
PIC6C ALPHA EFF Cross Talk
+3 Sigma 0.3
+2 Sigma 0.29
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
PIC6C BETA BKG
+3 Sigma 2.04
+2 Sigma 1.75
Mean 1.18
-2 Sigma 0.6
-3 Sigma 0.32
Denotes Outlier

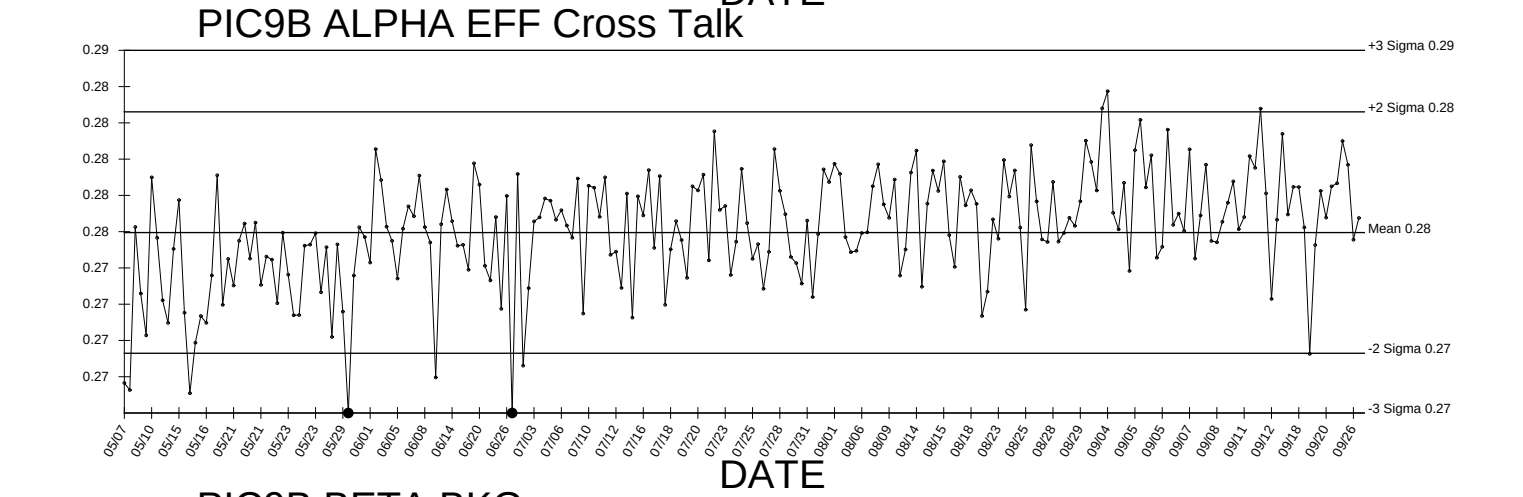


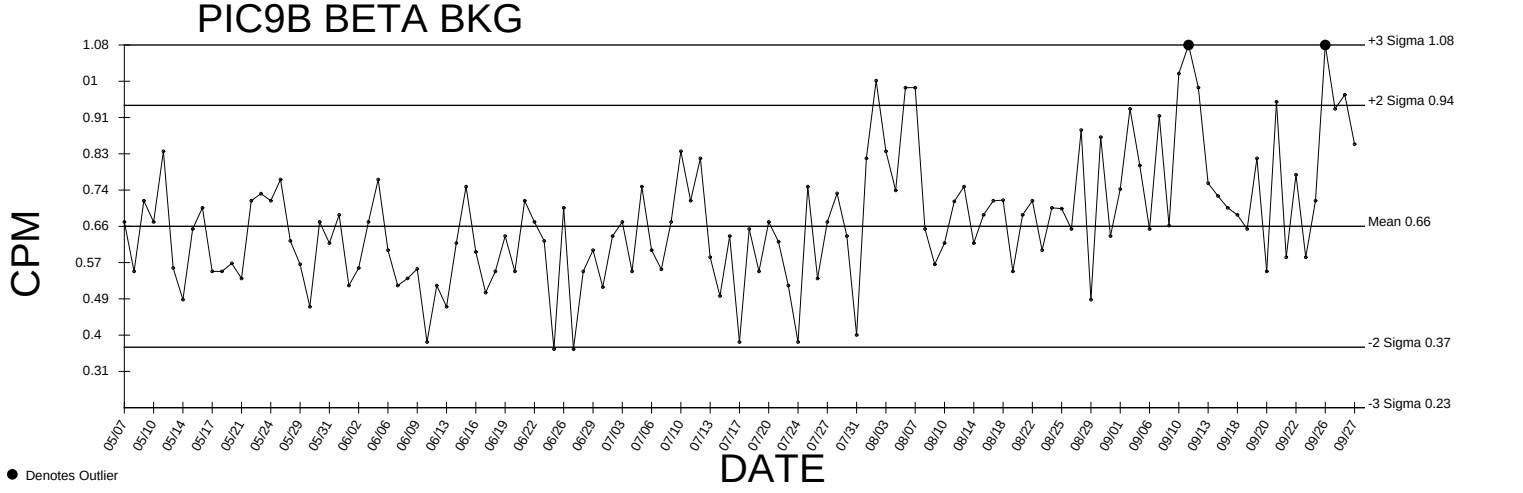


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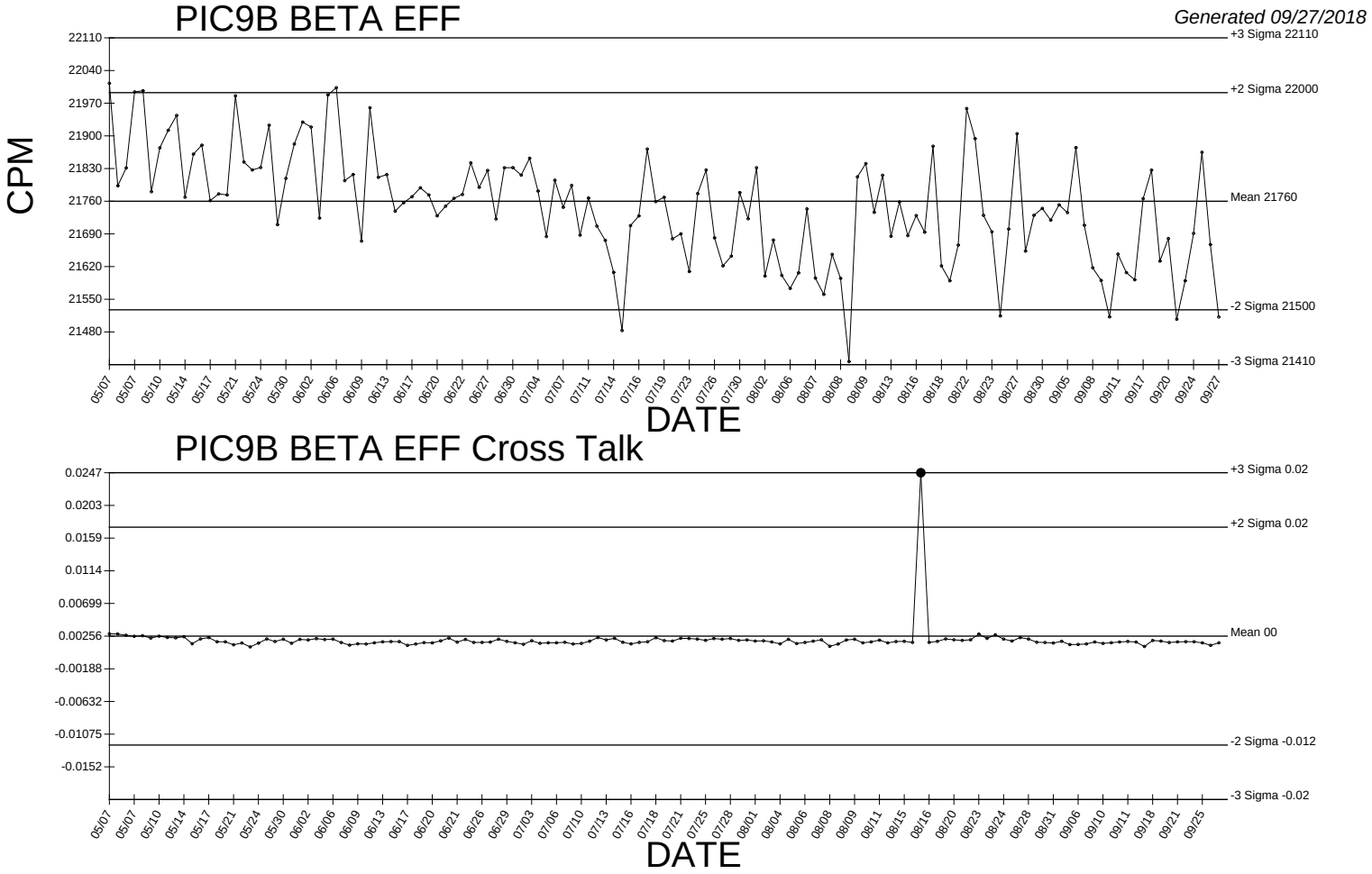




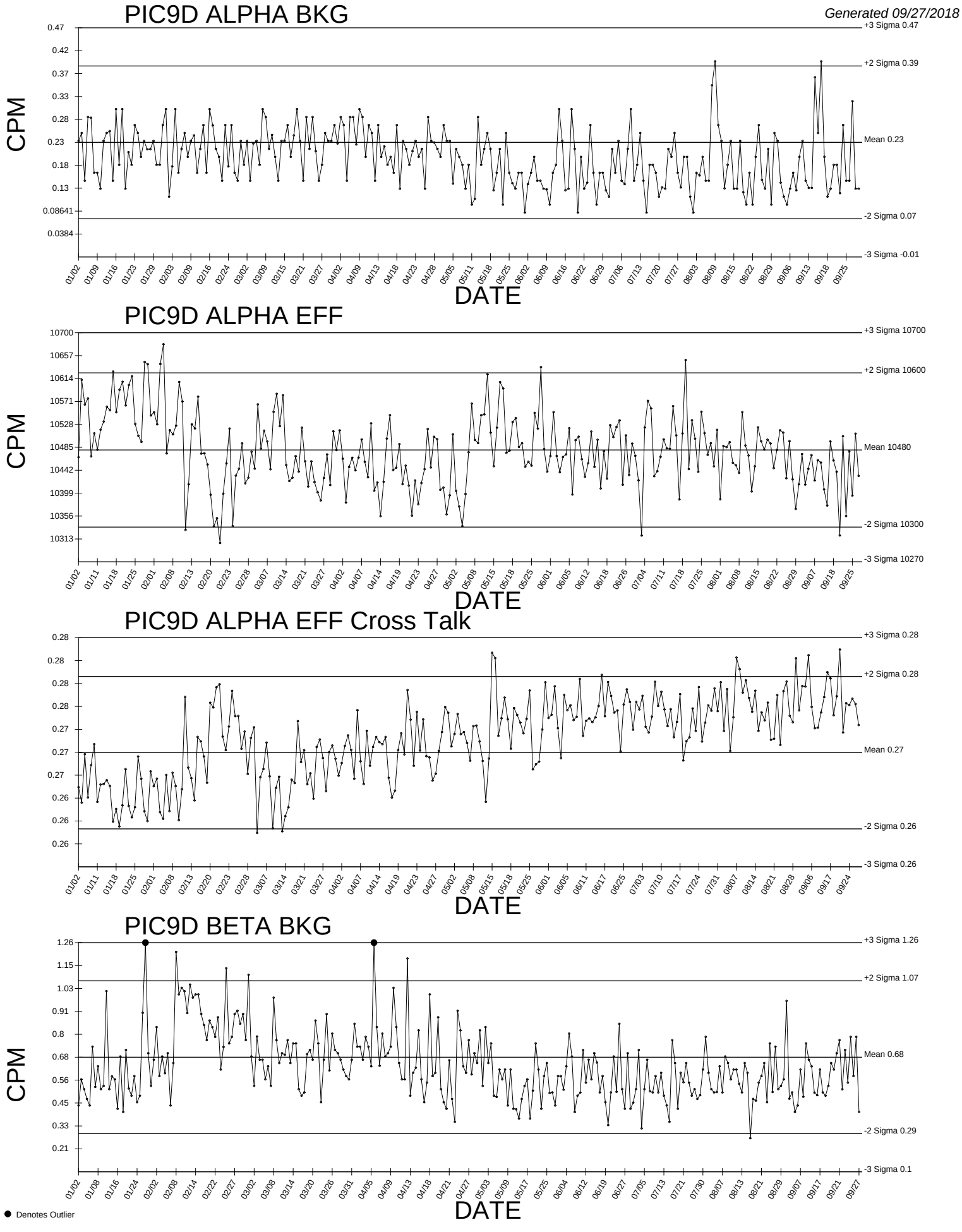


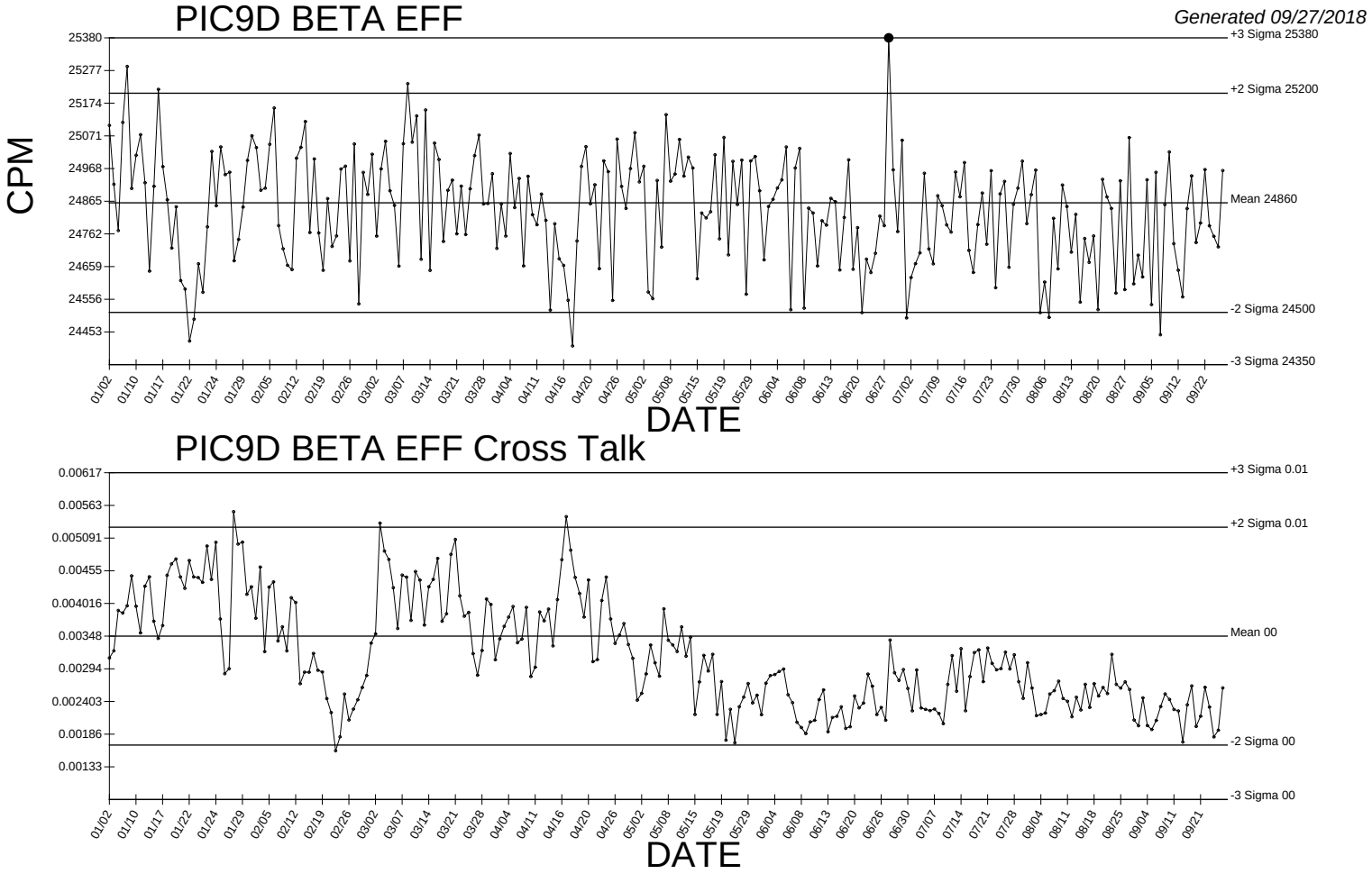


● Denotes Outlier



● Denotes Outlier


PIC9D ALPHA BKG
Generated 09/27/2018
CPM
DATE
+3 Sigma 0.47
+2 Sigma 0.39
Mean 0.23
-2 Sigma 0.07
-3 Sigma -0.01
PIC9D ALPHA EFF
+3 Sigma 10700
+2 Sigma 10600
Mean 10480
-2 Sigma 10300
-3 Sigma 10270
PIC9D ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.26
PIC9D BETA BKG
+3 Sigma 1.26
+2 Sigma 1.07
Mean 0.68
-2 Sigma 0.29
-3 Sigma 0.1
● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

0487

National Institute of Standards & Technology

0487

Certificate

Standard Reference Material 4251C
Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive barium-133 chloride, non-radioactive barium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains barium-133 with a total activity of approximately 2.5 MBq. Barium-133 decays by electron capture and during the decay process X-rays and gamma rays with energies from 4 to 400 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least June 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
October 1994

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

RC-S-035-002a

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have an acid concentration and a carrier concentration comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

RC-5-035-002b

PROPERTIES OF SRM 4251C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4251C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.015 ± 0.002) g•mL^{-1} at 22.1 °C** [b]*		
Solution mass	**(5.054 ± 0.001) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L^{-1})	Mass Fraction (g•g^{-1})
	H_2O HCl $BaCl_2$ $^{133}BaCl_2$	54 1.0 6×10^{-4} 4×10^{-7}	0.96 0.04 1.2×10^{-4} 8×10^{-8}
Radiological Properties:			
Radionuclide	**Barium-133**		
Reference time	**1200 EST, 1 September 1993**		
Massic activity of the solution [c] (Activity per unit mass of solution)	**4.876×10^5 Bq•g^{-1}**		
Relative expanded uncertainty (k=2)	**0.52%** [d]		
Photon-emitting impurities	None detected [e]		
Half lives used	Barium-133: (10.52 ± 0.13) a [f] Radium-226: (1600 ± 7) a [f]		
Measuring instrument	Pressurized "4π"γ ionization chamber A calibrated using a barium-133 solution whose activity was determined by 4π(e+X)-γ-anticoincidence counting		

*Notes and references are on pages 5 and 6.

RC-5-035-002

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [g]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [h]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
PIC A net response per gram of SRM 4251C, measured relative to RRS20 [j]	Standard deviation of the mean for 1000 repeated measurements (A)	0.008	1.0	0.01
PIC A background response, measured relative to RRS20	Standard deviation of the mean for >150 repeated measurements (A)	0.25	0.001 [k]	0.00
PIC A net response for RRS200, measured relative to RRS20	Standard deviation of the mean for >100 repeated measurements (A)	0.06	1.0	0.06
PIC A net response per Bq of barium-133 in solution, measured relative to RRS200.	Standard deviation of the mean for 240 repeated measurements (A)	0.02	1.0	0.02
Gravimetric measurements	Estimated (B)	0.01	1.0	0.01
Half life of barium-133 Half life of radium-226	Standard uncertainty of the half life (A)	1.24 [m] 0.44 [m]	0.004 [n] 0.004 [n]	0.00 0.00
Activity used to calibrate PIC A net response per Bq of barium-133 in solution	Standard uncertainty of the activity determined by $4\pi(e+X)$-γ-anticoincidence counting. (B)	0.22	1.0	0.22
Live-time [p]	Estimated (B)	0.10	1.0	0.10
PIC A charge collection	Estimated (B)	0.05	1.0	0.05
Source Positioning	Estimated (B)	0.05	1.0	0.05
Photon-emitting impurities	Limit of detection for Cs-134 (B) [q]	100.	0.00002	0.00
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.26
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.52

*Notes and references are on pages 5 and 6.

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NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	100	1.5	0.2

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for photon-emitting impurities are:
600 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 12 and 75 keV,
150 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 84 and 379 keV, and
3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 387 and 2700 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of barium-133.

[f] The stated uncertainty is the standard uncertainty. See reference [5].

[g] Relative standard uncertainty of the input quantity x_i.

[h] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[i] Relative component of combined standard uncertainty of output quantity y, rounded to two decimal places. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

RC-S-035-002e

[j] The response of pressurized ionization chamber A (PIC A) is determined from measurement of the time required to collect a given amount of charge on a stable fixed capacitor. All of the response measurements in the NIST pressurized ionization chambers are made relative to the response of one or more artifact standards. These artifact standards consist of microgram quantities of aged radium-226 in small welded stainless-steel capsules. These capsules are encapsulated in plastic rods whose dimensions are similar to those of the standard NIST ampoule. The artifact standards are called **Radium Reference Sources** and are designated as RRSx, where x is the nominal mass (in micrograms) of radium-226 in the capsule.

[k] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background response)/(average net sample response)

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated oscillator.

[q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i$ = 100%. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of Ba-133)}·{(Bq of impurity)/(Bq of Ba-133)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), April 1994.

RC-S-035-002f

Standard Traceability Log Rad

Source Material Info	
Parent Code:	0487
Prepared By:	Angela Johnson
Carrier Conc:	0.1 M HCL
Reference Date:	09/01/1993
Ampoule Mass (g):	5.054 g
Uncertainty:	+/- .26 %
LogBook No:	RC S 035 002

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Angela Johnson		
Prep Date:	10/31/2002		
Verification Date:	11/08/2017		
Expiration Date:	11/08/2018		
Primary Code:	0487-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.7696 g		
Density(g/mL):	0.9984	Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (100 mL) = 1395394.1760 dpm/mL
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (0.9984 g/mL) / (100 mL) = 1397609.3930 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/18/2015	Gregory Ramsay	15.0062	1000	0487-B	20972.806 dpm/mL	11/18/2016	11/18/2017
01/17/2017	Bethany Fiem	15.1795	1000	0487-C	21215.0117 dpm/mL	01/17/2017	01/17/2018
11/08/2017	Bethany Fiem	15.5573	1000	0487-D	21708.5658 dpm/mL	11/08/2017	11/08/2018

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 0487-D

v1.0.2

Instrument	BLUE
Analyst	BXF1
Verification Prep Date	11/8/2017

Standard Information	
Isotope	Ba-133
Serial Number	0487-D
Isotope Halflife	3.8410E+03 D
Reference Date	9/1/1993
Ref. Act. (DPM/mL)	21708.56581
Amount of Std. (mL)	1.0
Standard Prep Date	11/8/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	11/9/2017	90.10	3690.91	42.20
2	11/9/2017	91.20	3665.09	42.20
3	11/9/2017	91.10	3667.64	42.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3648.71	0.818070	4460.15	4460.15
2	3622.89	0.818070	4428.58	4428.58
3	3625.44	0.818070	4431.70	4431.70

	dpm/mL
Mean Value =	4440.14
Stdev =	17.39253395
Certificate Value* =	**4407.7**
Two sigma =	34.785
10 % of Mean =	444.014
Rule A (Pass/Fail)	**Pass**
% Recovery	100.74%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**11/8/2018**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ba-133 source 0487-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBLUE for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 11/8/2017 using Ba-133 source 1601-A.

Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001

11-13-17

11/14/17

National Institute of Standards & Technology

Certificate

Received 3-9-17

Standard Reference Material® 4339b

1810

Radium-228 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive radium-228 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4339b consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **radium-228** massic activity value, at a **Reference Time of 1200 EST, 07 October 2010**, is:

$$\mathbf{(195 \pm 14)\ Bq \cdot g^{-1}}$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, Becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analyses.

Expiration of Certification: The certification of **SRM 4339b** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Radiological and Chemical Hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the Physical Measurement Laboratory, Radiation and Biomolecular Physics Division, Radioactivity Group, M.P. Unterweger, Group Leader. The overall technical direction and physical measurement leading to certification and photon-emitting impurity analyses were provided by L. Pibida of the NIST Radioactivity Group, with production assistance by J. LaRosa, R. Collé, and L. Laureano-Pérez. Alpha-emitting impurity analyses were provided by J. LaRosa.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Lisa R. Karam, Chief
Radiation and Biomolecular Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 14 November 2012

Robert L. Watters, Jr., Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4339b

Radionuclide	**Radium-228[(a)]**
Reference time	**1200 EST, 07 October 2010**
Massic activity of the solution	**195 Bq g^{-1}**
Relative expanded uncertainty ($k = 2$)	**7.2 %[(b)]**

[(a)] The final ^{228}Ra purification from the ^{232}Th mother solution was performed on 02 September 2010 0920 EST.
[(b)] The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4,5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain what is assumed to be an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4339b

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	1.3 mol L^{-1} HNO_3 with 19.8 µg g^{-1} Ba^{+2}
Solution density	(1.034 ± 0.002) g mL^{-1} at 20.8 °C[(a)]
Solution mass	(5.180 ± 0.003) g[(a)]
Photon-emitting impurities	^{226}Ra: < 0.5 Bq g^{-1}[(b)]
Alpha-emitting impurities	^{232}Th: < 0.08 Bq g^{-1}[(c)]
Half-lives used	^{228}Ra: (5.75 ± 0.04) a[(d)] [6] ^{228}Ac: (6.15 ± 0.02) h [7] ^{226}Ra: (1600 ± 7) a [8] ^{232}Th: (14.02 ± 0.06) x 10^9 a [9]
Calibration methods (and instruments)	The certified massic activity for ^{228}Ra was obtained by high-resolution gamma-ray spectrometry of three master solution ampoules (eleven separate determinations), as measured on three to five different spectrometers and geometries on each ampoule, and used assumed nuclear data for probabilities per decay for 16 gamma-ray transitions. Confirmatory measurements were performed by 2πα spectrometry of ingrown ^{228}Th with a planar, ion-implanted Si detector.

[(a)] The stated uncertainty is two times the standard uncertainty. See reference 5.
[(b)] Based on gamma-ray spectrometry of forced-fitted peak at 186.2 keV and assuming a probability per decay of 0.0355 [6].
[(c)] The maximum ^{232}Th activity concentration in ^{228}Ra.
[(d)] The stated uncertainty is the standard uncertainty. See reference 5.

Table 3. Uncertainty Evaluation for the Massic Activity of SRM 4339b

	Uncertainty component	Assessment Type[a]	Relative standard uncertainty contribution on massic activity of ^{228}Ra (%)
1	Gamma-ray spectrometry precision; relative standard deviation of the grand mean on the average massic gamma-ray emission rates for 16 measured ^{228}Ac gamma-ray transitions. Each mean in the grand mean is based on 11 determinations with three sources in three to five different detectors. The uncertainty in the determination of the massic gamma-ray emission rate for any one transition in a given determination ranged from typically 0.5 % to 1.5 %. The relative standard deviation of the mean for the average of the 16 lines, for any one determination, was typically 1 %; whereas the relative standard deviation of the grand mean for the average of the 16 lines across all 11 determinations is 0.34 %[b]. Data passes normality test.	A	0.84
2	Uncertainty due to assumed gamma-ray probabilities per decay for the measured ^{228}Ac transitions [7]. The uncertainty on each transition has a shared (correlated) component of 2.5 % (see comments in [7]).	B	3.5
3	Detection efficiencies not embodied within component 1	B	0.4
4	Mass determinations for dilution factors and counting source preparations	B	0.1
5	Decay corrections for ^{228}Ra half-life uncertainty of 0.7 % [6]	B	0.003
6	Effect of ^{228}Ra and ^{228}Ac half-life uncertainties on secular equilibrium ratio	B	0.02
Relative combined standard uncertainty			**3.6**
Relative expanded uncertainty (k = 2)			**7.2**

[a] Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.
[b] Average massic gamma-ray emission rates of 11 geometries (R_γ) for 16 measured ^{228}Ac gamma-ray transitions with their respective energy (E_γ); assumed gamma-ray probabilities per decay (I_γ) and standard deviation of the mean (S_m).

E_γ (keV)	Assumed I_γ (%) [1]	Mean R_γ (s^{-1} g^{-1})(i)	S_m (%)(ii)
129.065	2.50	1347	0.38
153.967	0.754	421.6	0.40
209.249	3.97	2264	0.55
270.245	3.55	2014	0.33
328.004	3.04	1822	0.43
338.32	11.4	6712	0.43
409.46	2.02	1185	0.29
463.002	4.45	2645	0.33
755.313	1.03	593.3	0.46
772.291	1.52	899.2	0.53
794.942	4.31	2588	0.35
835.704	1.7	995.3	0.42
911.196	26.2	15609	0.29
964.786	4.99	3007	0.35
968.96	15.9	9582	0.30
1588.2	3.06	1889	0.28

(i) Grand mean for n = 11 determinations with three sources in three to five different detectors.
(ii) Relative standard deviation of the grand mean on R_γ for n = 11.

INSTRUCTIONS FOR HANDLING AND STORAGE

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

Storage: SRM 4339b should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

REFERENCES

[1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*, available at http://www.nist.gov/pml/div682/grp04/srm.cfm (accessed Nov 2012). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.

[2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 19 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 18 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement;* (ISO GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France (2008); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Nov 2012).

[5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://physics.nist.gov/Pubs/ (accessed Nov 2012).

[6] Luca, A.; June 2009, ^{228}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-228_tables.pdf (accessed Nov 2012).

[7] Pearce, A.; January 2010, ^{228}Ac. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ac-228_tables.pdf (accessed Nov 2012).

[8] Christé, V. and M.M. Bé; December 2006, ^{226}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-226_tables.pdf (accessed Nov 2012).

[9] Arinc, A.; September 2008, ^{232}Th. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Th-232_tables.pdf (accessed Nov 2012).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1810
Prepared By:	Tim Chandler
Carrier Conc:	1.3M HNO3
Reference Date:	10/07/2010
Ampoule Mass (g):	5.18 g
Uncertainty:	+/- 3.6 %
LogBook No:	GL-CED-297-103

A Solution Material Info			
Isotope:	Radium-228 SPIKE		
Prepared By:	Bethany Fiem		
Prep Date:	05/23/2018		
Verification Date:	05/23/2018		
Expiration Date:	05/23/2019		
Primary Code:	1810-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.1447 g		
Density(g/mL):	1.0178	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (200 mL) = 300.9650 dpm/mL
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (1.0178 g/mL) / (200 mL) = 295.7015 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1810-A Jar

v1.1.2
BMF
5/23/2018

Isotope	Result
Ra-228	pCi/L
Ra-228 N1	29340
Ra-228 N2	28510
Ra-228 N3	29320

Mean Value (Counting) =	29056.67	pCi/L	**107.165**	**Fail**	*Exception taken due to the high uncertainty of the certified value
Stdev =	473.533	pCi/L		**Rule B (Pass/Fail)**	
Certificate Value =	27114.0	pCi/L			
Two sigma =	947.0656436				
10 % of Mean =	2905.666667				
Rule A (Pass/Fail)	**Pass**				

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
Rule B = The determined mean value shall be within 5% of the certificate value.

5-23-18

5/25/18

Runlogs

Instrument Run Log

Instrument Type: GFPC **Batch ID: 1802264**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
459187004	SAMPLE	JXC9	PIC1A	SEP-27-18 09:11:42	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187005	SAMPLE	JXC9	PIC1B	SEP-27-18 09:11:45	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187006	SAMPLE	JXC9	PIC1C	SEP-27-18 09:11:49	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187007	SAMPLE	JXC9	PIC2A	SEP-27-18 09:11:54	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187008	SAMPLE	JXC9	PIC2C	SEP-27-18 09:11:58	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187009	SAMPLE	JXC9	PIC3C	SEP-27-18 09:12:02	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187010	SAMPLE	JXC9	PIC3D	SEP-27-18 09:12:10	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187011	SAMPLE	JXC9	PIC4A	SEP-27-18 09:13:03	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459193001	SAMPLE	JXC9	PIC4B	SEP-27-18 09:13:05	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459193002	SAMPLE	JXC9	PIC4C	SEP-27-18 09:13:07	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459193003	SAMPLE	JXC9	PIC4D	SEP-27-18 09:13:10	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459193004	SAMPLE	JXC9	PIC5A	SEP-27-18 09:13:16	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459193005	SAMPLE	JXC9	PIC5B	SEP-27-18 09:13:21	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459193006	SAMPLE	JXC9	PIC5D	SEP-27-18 09:13:22	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204113227	LCS	JXC9	PIC11B	SEP-27-18 09:20:33	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459193007	SAMPLE	JXC9	PIC6A	SEP-27-18 09:21:27	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204113223	MB	JXC9	PIC6B	SEP-27-18 09:21:37	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204113224	DUP	JXC9	PIC6C	SEP-27-18 09:21:44	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204113225	MS	JXC9	PIC9B	SEP-27-18 09:21:52	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204113226	MSD	JXC9	PIC9D	SEP-27-18 09:21:56	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187001	SAMPLE	JXC9	LB4100A1	SEP-27-18 09:25:47	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187002	SAMPLE	JXC9	LB4100A2	SEP-27-18 09:25:48	DONE	CeF on 25mm Filter	01-JUN-17 00:00
459187003	SAMPLE	JXC9	LB4100A3	SEP-27-18 09:25:48	DONE	CeF on 25mm Filter	01-JUN-17 00:00

Lucas Cell Raw Data

Batch 1802180 Check-list

This check-list was completed on 27-SEP-18 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 27-SEP-18 and Lyndsey Pace on 27-SEP-18.

Batch ID: 1802180

Product: LUC26RAL

Description: Lucas Cell Radium 226 GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Radium-226 Queue Sheet

17-SEP-18

GEL Laboratories, Radiochemistry Division

Batch #: 1802180 Analyst: PCW First Client Due Date: 10/09/2018 Internal Due Date: 10/05/2018

Spike Isotope: Radium-226 Spike Code: 17151 Expiration Date: 12/19/18 Vol: 0.1 End Initial/Degas Date/Time: 9/24/18 0900

LCS Isotope: Radium-226 LCS Code: 17151 Expiration Date: 12/19/18 Vol: 0.1 End LN De-em Date: 9/27/18

Bkg Count Time: 30 (Min) Sample Count Time: 30 (Min) Start Count Date: 9/27/18

Prep Date: 9/24/18 Pipet ID: 2766953 Balance ID: 18150253 Initials: PW Witness: N/A

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Position (Label)	Aliquot (ml or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
459187001-1	MW-8	SAMPLE		GROUND WATER	pCi/L	LANC006	1	500	0536	0920	105	1	7	10
459187002-1	MW-9	SAMPLE		GROUND WATER	pCi/L	LANC006	2	500	0536	0920	204	2	6	11
459187003-1	MW-5	SAMPLE		GROUND WATER	pCi/L	LANC006	3	500	0536	0920	307	3	2	13
459187004-1	MW-7	SAMPLE		GROUND WATER	pCi/L	LANC006	4	500	0536	0920	408	4	2	9
459187005-1	MW-6	SAMPLE		GROUND WATER	pCi/L	LANC006	5	500	0534	0920	507	5	5	28
459187006-1	MW-1	SAMPLE		GROUND WATER	pCi/L	LANC006	6	500	0536	0920	607	6	2	33
459187007-1	MW-2	SAMPLE		GROUND WATER	pCi/L	LANC006	7	500	0536	0920	701	7	2	44
459187008-1	MW-3	SAMPLE		GROUND WATER	pCi/L	LANC006	8	500	0534	0920	801	8	4	9
459187009-1	MW-4	SAMPLE		GROUND WATER	pCi/L	LANC006	9	500	0558	0955	106	1	8	5
459187010-1	FB-09052018	SAMPLE		GROUND WATER	pCi/L	LANC006	10	500	0558	0955	202	2	5	6
459187011-1	FB-09062018	SAMPLE		GROUND WATER	pCi/L	LANC006	11	500	0558	0955	301	3	3	5
459193001-1	MW-4	SAMPLE		GROUND WATER	pCi/L	LANC006	12	500	0556	0955	401	4	7	10
459193002-1	MW-6	SAMPLE		GROUND WATER	pCi/L	LANC006	13	500	0556	0955	505	5	3	11
459193003-1	MW-2	SAMPLE		GROUND WATER	pCi/L	LANC006	14	500	0558	0955	604	6	6	11
459193004-1	MW-5	SAMPLE		GROUND WATER	pCi/L	LANC006	15	500	0558	0955	705	7	8	16
459193005-1	MW-1	SAMPLE		GROUND WATER	pCi/L	LANC006	16	500	0558	0955	805	8	6	11
459193006-1	MW-3	SAMPLE		GROUND WATER	pCi/L	LANC006	17	500	0620	1030	203	2	1	23
459193007-1	FB-09042018	SAMPLE		GROUND WATER	pCi/L	LANC006	18	500	0620	1030	306	3	6	4
1204113013-1	MB for batch 1802180	MB		GROUND WATER	pCi/L	QC ACCOUNT	19	500	0620	1030	402	4	8	6
1204113014-1	MW-8(459187001DUP)	DUP		GROUND WATER	pCi/L	QC ACCOUNT	20	500	0620	1030	503	5	3	19
1204113015-1	MW-8(459187001MS)	MS		GROUND WATER	pCi/L	QC ACCOUNT	21	100	0620	1030	601	6	8	699
1204113016-1	MW-8(459187001MSD)	MSD		GROUND WATER	pCi/L	QC ACCOUNT	22	100	0620	1030	706	7	8	673
1204113017-1	LCS for batch 1802180	LCS		GROUND WATER	pCi/L	QC ACCOUNT	23	500	0620	1050	806	8	2	586

Comments:

Data Reviewed By: 9/27/18

Radium-226 Liquid

Filename : RA226.XLS
File type : Excel
Version # : 1.3.2

Batch : 1802180
Analyst : PCW
Prep Date : 9/24/2018
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 1 pCi/L
Halflife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halflife of Rn-222: 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					**Count Raw Data**							
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
1	459187001.1	0.5000	2.0256E-05	9/5/2018 11:30	105	30	10	0.333	7	0.233	30	2.0440
2	459187002.1	0.5000	2.0256E-05	9/5/2018 11:40	204	30	11	0.367	6	0.200	30	2.0820
3	459187003.1	0.5000	2.0256E-05	9/5/2018 13:00	307	30	13	0.433	2	0.067	30	1.8050
4	459187004.1	0.5000	2.0256E-05	9/5/2018 13:30	408	30	9	0.300	2	0.067	30	1.8510
5	459187005.1	0.5000	2.0256E-05	9/5/2018 14:40	507	30	28	0.933	5	0.167	30	1.9970
6	459187006.1	0.5000	2.0256E-05	9/6/2018 9:55	607	30	33	1.100	2	0.067	30	2.1300
7	459187007.1	0.5000	2.0256E-05	9/6/2018 10:00	701	30	44	1.467	2	0.067	30	1.9520
8	459187008.1	0.5000	2.0256E-05	9/6/2018 11:55	801	30	9	0.300	4	0.133	30	1.7120
9	459187009.1	0.5000	2.0256E-05	9/6/2018 12:00	106	30	5	0.167	8	0.267	30	2.1070
10	459187010.1	0.5000	2.0256E-05	9/5/2018 14:00	202	30	6	0.200	5	0.167	30	1.8580
11	459187011.1	0.5000	2.0256E-05	9/6/2018 12:30	301	30	5	0.167	3	0.100	30	1.8290
12	459193001.1	0.5000	2.0256E-05	9/4/2018 11:25	401	30	10	0.333	7	0.233	30	1.9020
13	459193002.1	0.5000	2.0256E-05	9/4/2018 11:30	505	30	11	0.367	3	0.100	30	1.5140
14	459193003.1	0.5000	2.0256E-05	9/4/2018 13:30	604	30	11	0.367	6	0.200	30	2.0460
15	459193004.1	0.5000	2.0256E-05	9/4/2018 13:50	705	30	10	0.333	8	0.267	30	1.9830
16	459193005.1	0.5000	2.0256E-05	9/4/2018 15:45	805	30	11	0.367	6	0.200	30	1.9810
17	459193006.1	0.5000	2.0256E-05	9/4/2018 15:50	203	30	23	0.767	1	0.033	30	1.8290
18	459193007.1	0.5000	2.0256E-05	9/4/2018 13:15	306	30	4	0.133	6	0.200	30	1.7820
19	1204113013.1	0.5000	2.0256E-05	9/24/2018 0:00	402	30	6	0.200	8	0.267	30	2.0200
20	1204113014.1	0.5000	2.0256E-05	9/5/2018 11:30	503	30	19	0.633	3	0.100	30	1.9410
21	1204113015.1	0.1000	1.1370E-05	9/5/2018 11:30	601	30	699	23.300	8	0.267	30	1.9080
22	1204113016.1	0.1000	1.1370E-05	9/5/2018 11:30	706	30	673	22.433	8	0.267	30	1.9130
23	1204113017.1	0.5000	2.0256E-05	9/24/2018 0:00	806	30	586	19.533	2	0.067	30	1.9730

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			
						De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
9.300%	5/1/2018	4/30/2019	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
1.700%	8/1/2018	7/31/2019	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
6.300%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
7.000%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
5.300%	6/1/2018	5/31/2019	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
2.900%	7/1/2018	6/30/2019	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
1.900%	11/1/2017	10/31/2018	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
3.700%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 5:36	9/27/2018 9:20	0.404	0.972	1.002	1.000
4.700%	5/1/2018	4/30/2019	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
9.300%	8/1/2018	7/31/2019	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
8.200%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
0.500%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
4.000%	6/1/2018	5/31/2019	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
1.700%	7/1/2018	6/30/2019	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
2.700%	11/1/2017	10/31/2018	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
3.100%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 5:58	9/27/2018 9:55	0.406	0.971	1.002	1.000
9.900%	8/1/2018	7/31/2019	9/24/2018 9:00	9/27/2018 6:20	9/27/2018 10:30	0.408	0.969	1.002	1.000
3.900%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 6:20	9/27/2018 10:30	0.408	0.969	1.002	1.000
1.600%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 6:20	9/27/2018 10:30	0.408	0.969	1.002	1.000
8.100%	6/1/2018	5/31/2019	9/24/2018 9:00	9/27/2018 6:20	9/27/2018 10:30	0.408	0.969	1.002	1.000
8.500%	7/1/2018	6/30/2019	9/24/2018 9:00	9/27/2018 6:20	9/27/2018 10:30	0.408	0.969	1.002	1.000
3.000%	11/1/2017	10/31/2018	9/24/2018 9:00	9/27/2018 6:20	9/27/2018 10:30	0.408	0.969	1.002	1.000
6.000%	3/1/2018	2/28/2019	9/24/2018 9:00	9/27/2018 6:20	9/27/2018 10:30	0.408	0.969	1.002	1.000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-D
Spike Exp Date : 12/19/2018
Spike Activity (dpm/ml): 288.43
Spike Volume Added: 0.10

LCS S/N : 1715-D
LCS Exp Date : 12/19/2018
LCS Activity (dpm/ml): 288.43
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	**2 SIGMA** Counting Uncertainty pCi/L	**2 SIGMA** Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3264	0.2305	1	0.5732	**0.1123**	137.75%	0.1000	0.1374	0.3026	0.3037		SAMPLE				
2	0.2967	0.2095	1	0.5292	**0.1838**	82.48%	0.1667	0.1374	0.2970	0.2983		SAMPLE				
3	0.1976	0.1395	1	0.4062	**0.4664**	35.77%	0.3667	0.1291	0.3218	0.3338		SAMPLE				
4	0.1927	0.1360	1	0.3961	**0.2894**	47.89%	0.2333	0.1106	0.2688	0.2749		SAMPLE				
5	0.2824	0.1993	1	0.5137	**0.8814**	25.53%	0.7667	0.1915	0.4315	0.4591		SAMPLE				
6	0.1674	0.1182	1	0.3442	**1.1138**	19.30%	1.0333	0.1972	0.4166	0.4510		SAMPLE				
7	0.1827	0.1290	1	0.3756	**1.6466**	16.26%	1.4000	0.2261	0.5212	0.5761		SAMPLE				
8	0.2946	0.2080	1	0.5501	**0.2235**	72.21%	0.1667	0.1202	0.3159	0.3180		SAMPLE				
9	0.3377	0.2384	1	0.5855	**-0.1087**	120.28%	-0.1000	0.1202	0.2561	0.2561		SAMPLE				
10	0.3027	0.2137	1	0.5508	**0.0411**	331.79%	0.0333	0.1106	0.2671	0.2673		SAMPLE				
11	0.2382	0.1682	1	0.4616	**0.0835**	141.66%	0.0667	0.0943	0.2314	0.2321		SAMPLE				
12	0.3499	0.2471	1	0.6145	**0.1204**	137.44%	0.1000	0.1374	0.3244	0.3248		SAMPLE				
13	0.2878	0.2032	1	0.5576	**0.4034**	46.94%	0.2667	0.1247	0.3698	0.3757		SAMPLE				
14	0.3012	0.2126	1	0.5372	**0.1866**	82.48%	0.1667	0.1374	0.3015	0.3028		SAMPLE				
15	0.3588	0.2533	1	0.6221	**0.0770**	212.15%	0.0667	0.1414	0.3201	0.3204		SAMPLE				
16	0.3111	0.2196	1	0.5548	**0.1927**	82.52%	0.1667	0.1374	0.3114	0.3129		SAMPLE				
17	0.1372	0.0969	1	0.3187	**0.9161**	24.37%	0.7333	0.1633	0.3998	0.4571		SAMPLE				
18	0.3450	0.2435	1	0.6153	**-0.0855**	158.16%	-0.0667	0.1054	0.2649	0.2650		SAMPLE				
19	0.3514	0.2481	1	0.6093	**-0.0754**	187.09%	-0.0667	0.1247	0.2765	0.2766		MB				
20	0.2239	0.1581	1	0.4339	**0.6278**	30.41%	0.5333	0.1563	0.3607	0.3851	459187001.1	DUP	139.3%	2.0602		
21	1.8601	1.3133	1	3.2252	**137.9113**	9.33%	23.0333	0.8863	10.4013	32.1309	459187001.1	MS			129.9275	106.1%
22	1.8552	1.3098	1	3.2168	**132.3753**	4.94%	22.1667	0.8699	10.1816	23.0083	459187001.1	MSD	4.1%	0.2746	129.9275	101.9%
23	0.1799	0.1270	1	0.3698	**22.5427**	7.30%	19.4667	0.8083	1.8346	4.5807		LCS			25.9849	86.8%

Continuing Calibration Data

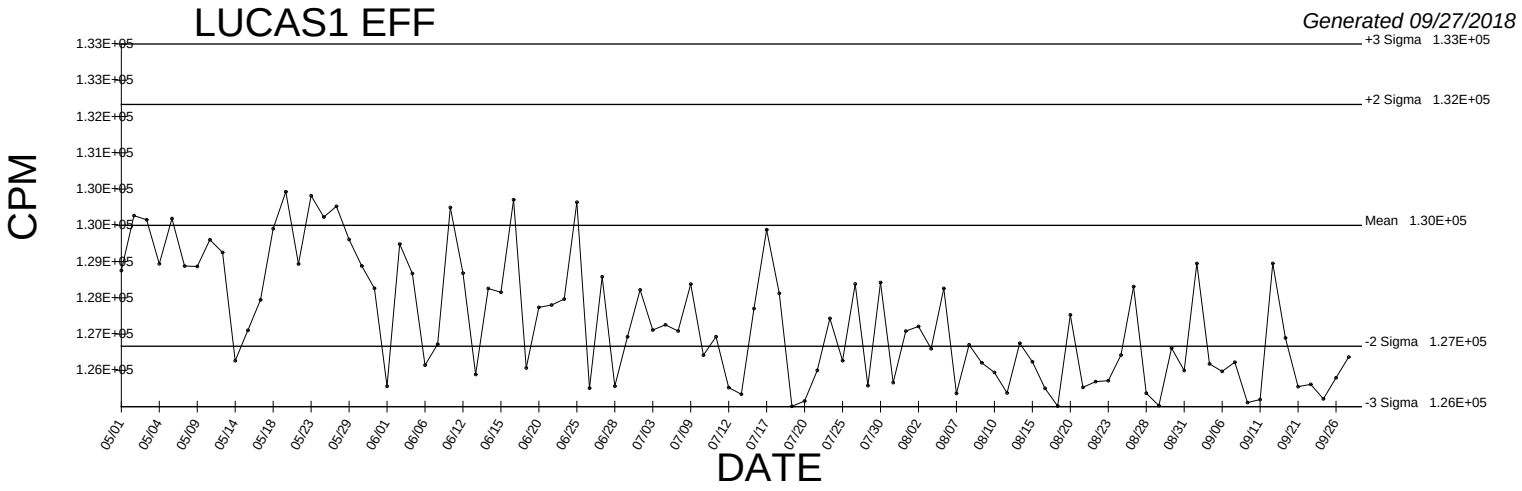
Ludlum Alpha Scintillation Counter Checks for 27-SEP-2018

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:20	1	1.27E+05	126753	-2.18		
LUCAS2	EFF	07:20	1	1.33E+05	133112	2.01		
LUCAS3	EFF	07:20	1	1.38E+05	138045	-1.4		
LUCAS4	EFF	07:20	1	1.32E+05	131528	-0.13		
LUCAS5	EFF	07:20	1	1.35E+05	134865	0.77		
LUCAS6	EFF	07:20	1	1.34E+05	133948	-0.78		
LUCAS7	EFF	07:20	1	1.42E+05	142440	1.63		
LUCAS8	EFF	07:20	1	1.37E+05	137481	-0.55		

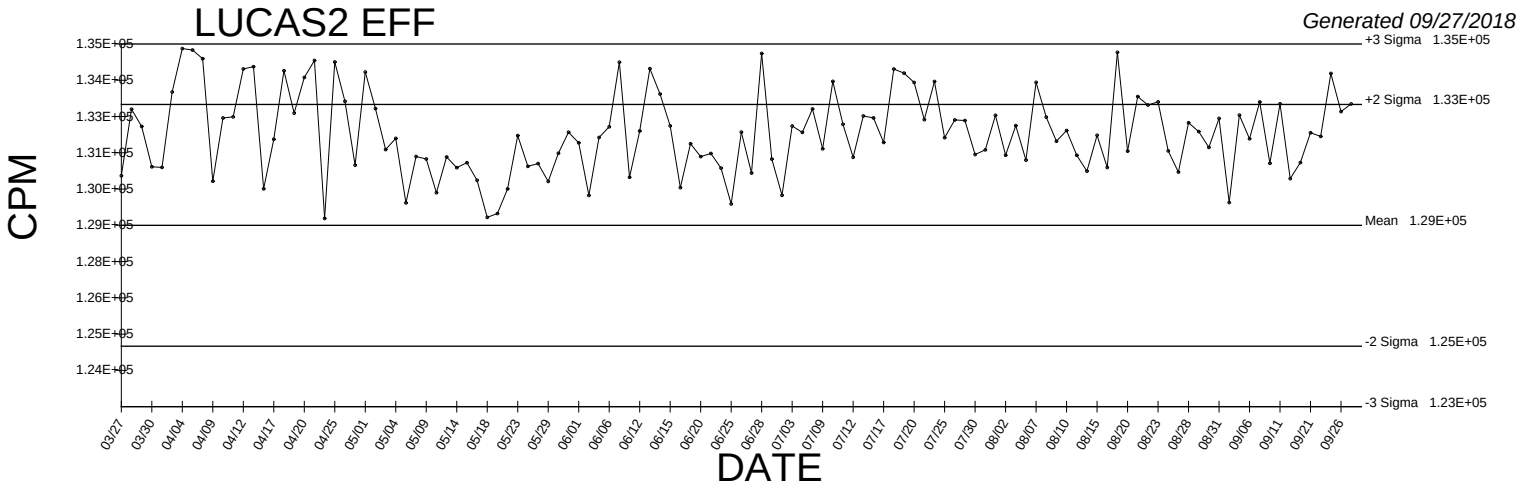
Reviewed by: Lyndsey Pace **Date:** 27-SEP-18

GEL Laboratories LLC

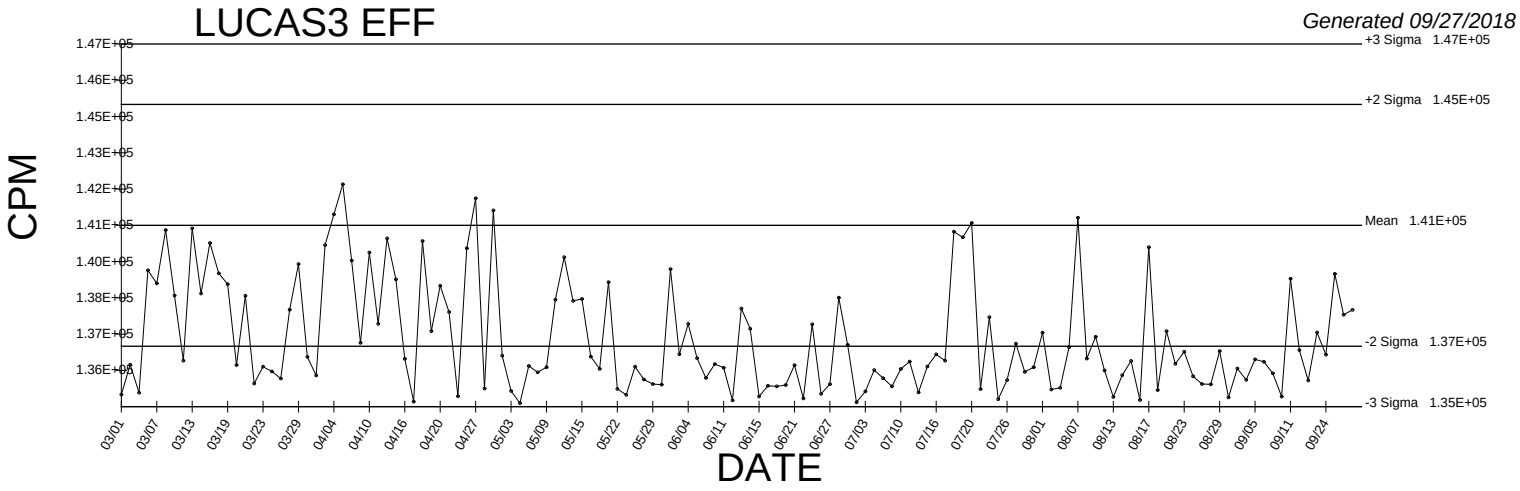
Efficiency Data



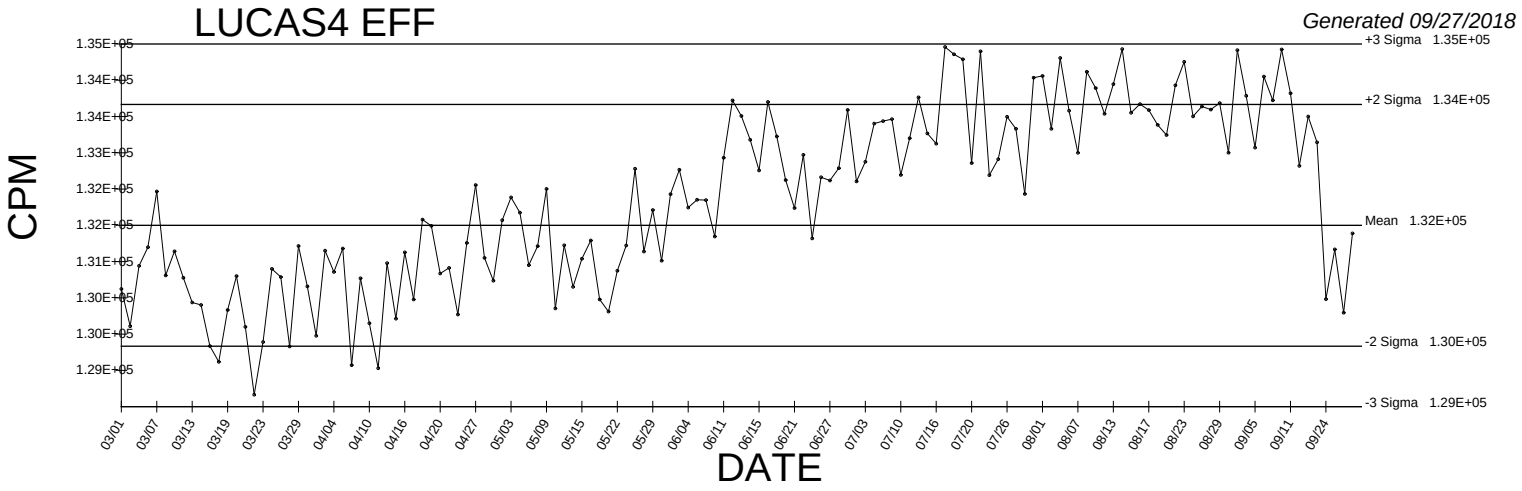
● Denotes Outlier



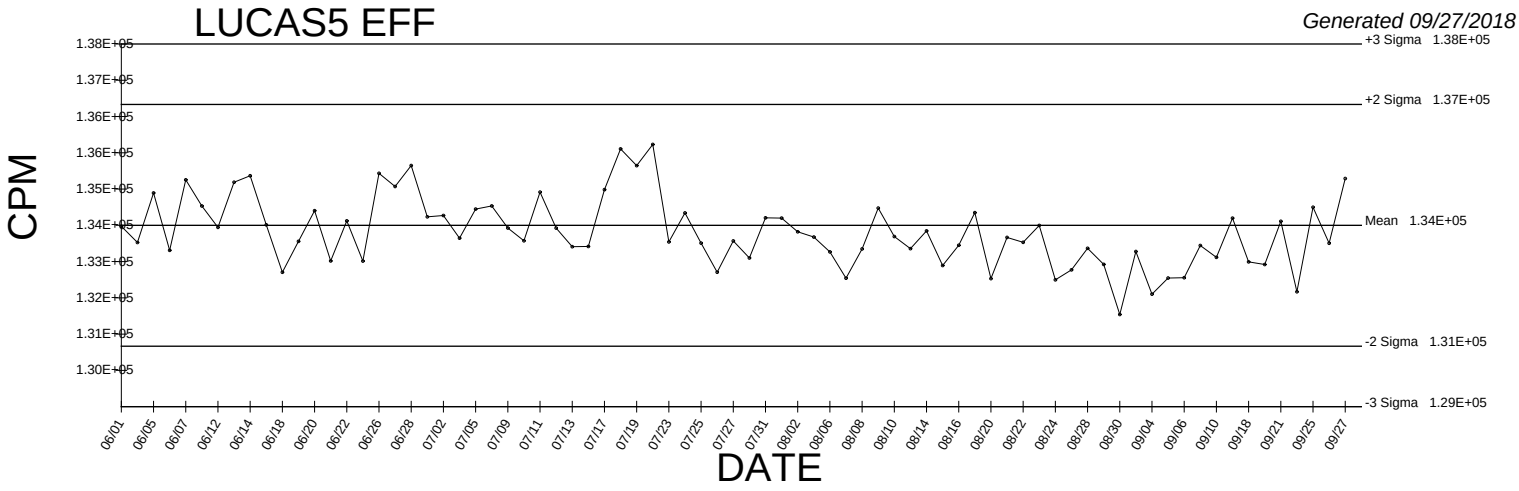
● Denotes Outlier



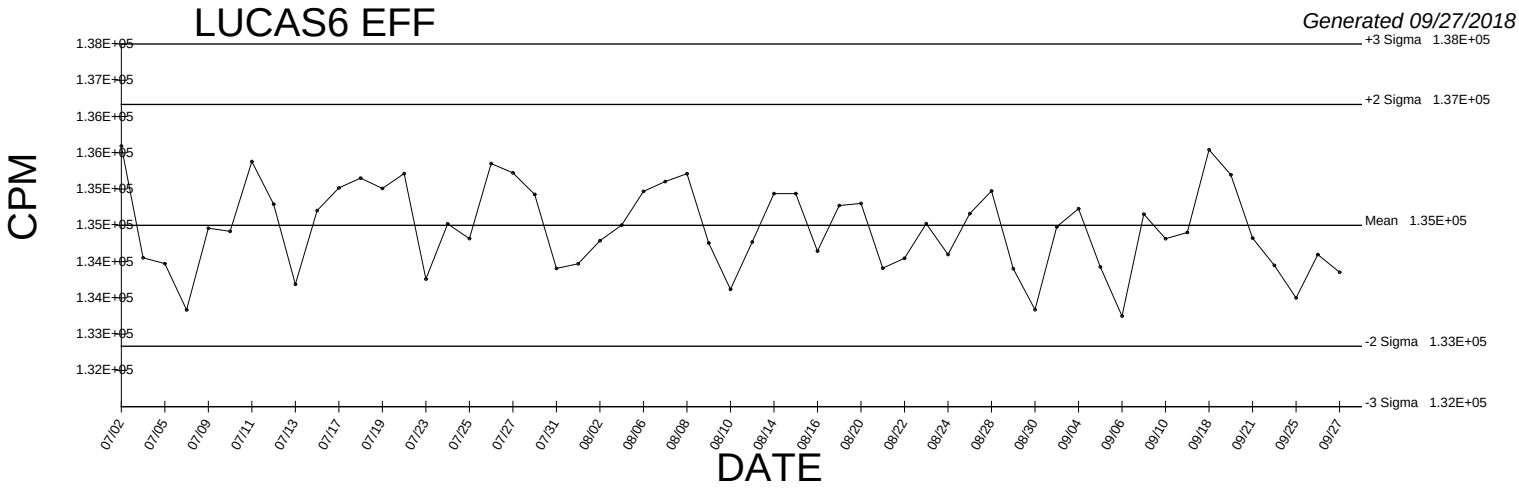
● Denotes Outlier



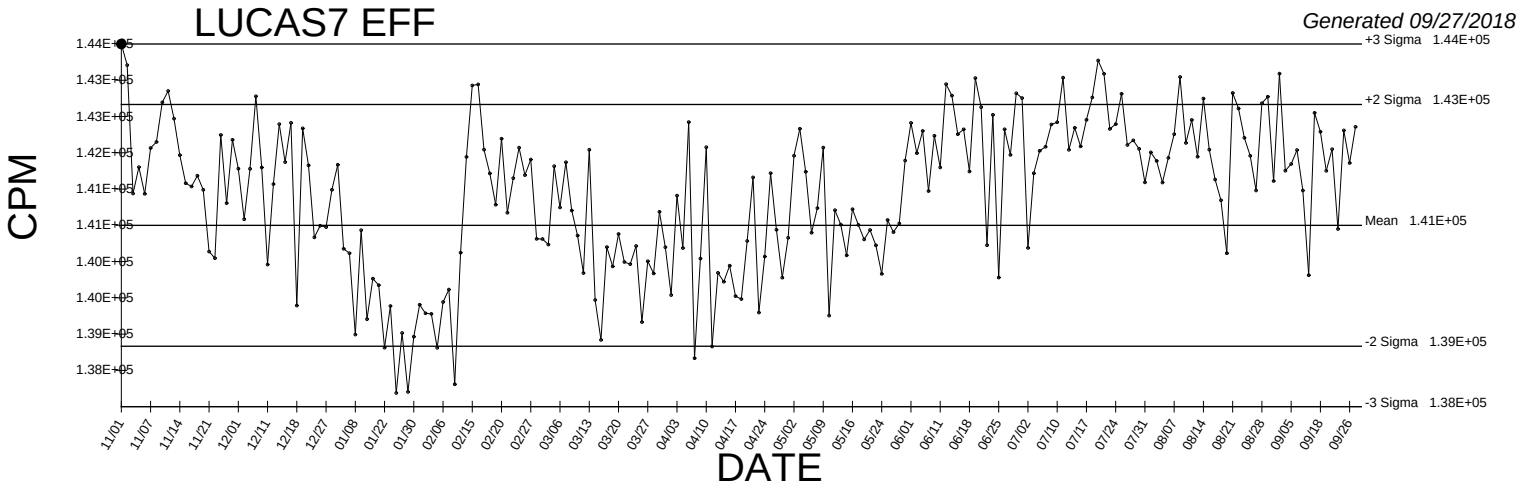
● Denotes Outlier



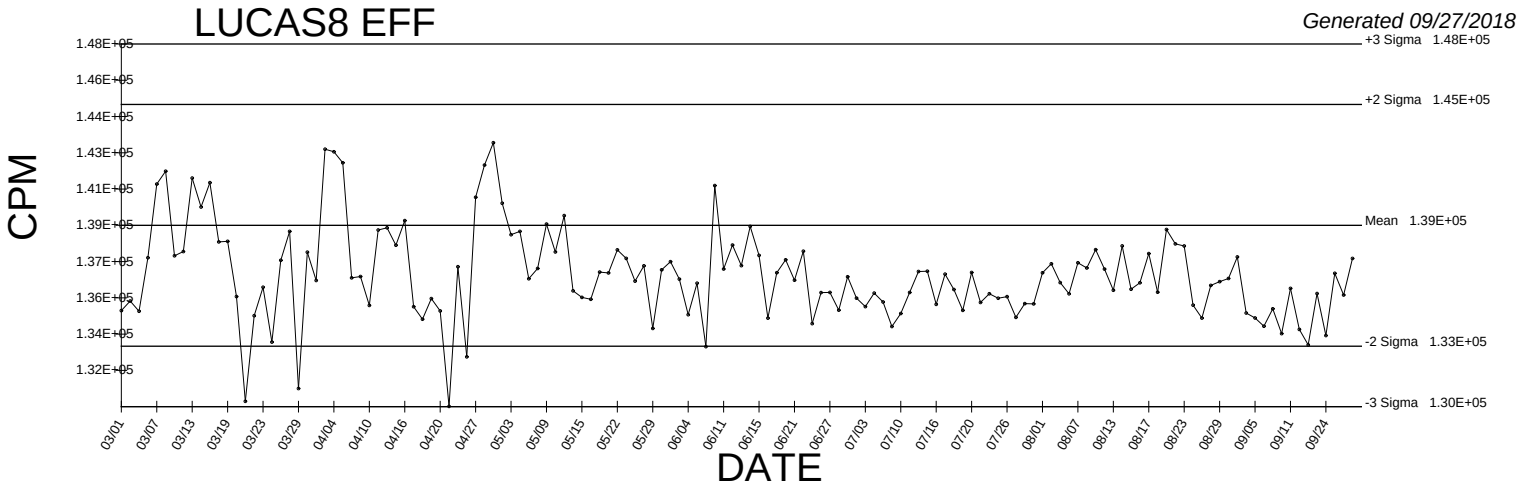
● Denotes Outlier



● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1715

98367

Ra-226 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 7 Product Code: 8226

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty* , % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Ra-226	5.844E+05	3.676E+04	1.0	2.1	4.7	09/09/2014

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities (other than decay products)<0.1%.
5.02193 g 0.1M HCl solution with approximately 30 µg/g Ba carrier.

Source Prepared by: R. Ormsby
R. Ormsby, Radiochemist

QC Approved: L. Tk
L. Tkavadze, Nuclear Metrologist

Date: 9 Sep 14

RECEIVED 9/10/14

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1715
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	09/09/2014
Ampoule Mass (g):	5.02193 g
Uncertainty:	+/- 2.35 %
LogBook No:	GL-CED-297-008

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Gregory Ramsay		
Prep Date:	07/06/2016		
Verification Date:	02/08/2017		
Expiration Date:	02/08/2018		
Primary Code:	1715-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9865 g		
Density(g/mL):	0.9967	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / (Ampoule Mass(g) *(Dilution Vol)) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / Density / (Ampoule Mass (g) * (Dilution Vol)) = Parent Activity (dpm/g)
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (5.02193 g * 100 mL) = 21900.3937 dpm/mL
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (0.9967 g/mL)/ (5.02193 g * 100 mL) = 21972.4854 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/06/2016	Gregory Ramsay	2.6261	200	1715-B	288.51 dpm/ml	01/25/2017	11/10/2018
02/08/2017	Gregory Ramsay	21.96	250	1715-C	1930.063 dpm/ml	02/08/2017	02/08/2018
12/19/2017	Gregory Ramsay	2.63	200	1715-D	288.938 dpm/ml	12/19/2017	12/19/2018

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1715-D

v1.0.2

Instrument	Yellow
Analyst	GXR1
Verification Prep Date	12/19/2017

Standard Information	
Isotope	Ra-226
Serial Number	1715-D
Isotope Halflife	1.6000E+03 Y
Reference Date	9/9/2014
Ref. Act. (DPM/mL)	288.938
Amount of Std. (mL)	0.5
Standard Prep Date	12/19/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	12/20/2017	773.48	70.40	11.00
2	12/20/2017	774.10	70.70	11.00
3	12/20/2017	772.98	73.30	11.00

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	59.40	0.422157	281.41	140.71
2	59.70	0.422157	282.83	141.42
3	62.30	0.422157	295.15	147.58

	dpm/mL
Mean Value =	286.47
Stdev =	7.555402963
Certificate Value* =	**288.5**
Two sigma =	15.111
10 % of Mean =	28.647
Rule A (Pass/Fail)	**Pass**
% Recovery	99.29%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**12/19/2018**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ra-226 source 1715-D by transferring 0.5 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCYellow for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 12/20/2017 using Ra-226 source 0299-H.

Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001

12/21/17

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR **Batch ID: 1802180**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
459187001	SAMPLE	PCW	LUCAS1	SEP-27-18 09:20:00	DONE	Lucas Cell	01-MAY-18 00:00
459187002	SAMPLE	PCW	LUCAS2	SEP-27-18 09:20:00	DONE	Lucas Cell	01-AUG-18 00:00
459187003	SAMPLE	PCW	LUCAS3	SEP-27-18 09:20:00	DONE	Lucas Cell	01-MAR-18 00:00
459187004	SAMPLE	PCW	LUCAS4	SEP-27-18 09:20:00	DONE	Lucas Cell	01-MAR-18 00:00
459187005	SAMPLE	PCW	LUCAS5	SEP-27-18 09:20:00	DONE	Lucas Cell	01-JUN-18 00:00
459187006	SAMPLE	PCW	LUCAS6	SEP-27-18 09:20:00	DONE	Lucas Cell	01-JUL-18 00:00
459187007	SAMPLE	PCW	LUCAS7	SEP-27-18 09:20:00	DONE	Lucas Cell	01-NOV-17 00:00
459187008	SAMPLE	PCW	LUCAS8	SEP-27-18 09:20:00	DONE	Lucas Cell	01-MAR-18 00:00
459187009	SAMPLE	PCW	LUCAS1	SEP-27-18 09:55:00	DONE	Lucas Cell	01-MAY-18 00:00
459187010	SAMPLE	PCW	LUCAS2	SEP-27-18 09:55:00	DONE	Lucas Cell	01-AUG-18 00:00
459187011	SAMPLE	PCW	LUCAS3	SEP-27-18 09:55:00	DONE	Lucas Cell	01-MAR-18 00:00
459193001	SAMPLE	PCW	LUCAS4	SEP-27-18 09:55:00	DONE	Lucas Cell	01-MAR-18 00:00
459193002	SAMPLE	PCW	LUCAS5	SEP-27-18 09:55:00	DONE	Lucas Cell	01-JUN-18 00:00
459193003	SAMPLE	PCW	LUCAS6	SEP-27-18 09:55:00	DONE	Lucas Cell	01-JUL-18 00:00
459193004	SAMPLE	PCW	LUCAS7	SEP-27-18 09:55:00	DONE	Lucas Cell	01-NOV-17 00:00
459193005	SAMPLE	PCW	LUCAS8	SEP-27-18 09:55:00	DONE	Lucas Cell	01-MAR-18 00:00
459193006	SAMPLE	PCW	LUCAS2	SEP-27-18 10:30:00	DONE	Lucas Cell	01-AUG-18 00:00
459193007	SAMPLE	PCW	LUCAS3	SEP-27-18 10:30:00	DONE	Lucas Cell	01-MAR-18 00:00
1204113013	MB	PCW	LUCAS4	SEP-27-18 10:30:00	DONE	Lucas Cell	01-MAR-18 00:00
1204113014	DUP	PCW	LUCAS5	SEP-27-18 10:30:00	DONE	Lucas Cell	01-JUN-18 00:00
1204113015	MS	PCW	LUCAS6	SEP-27-18 10:30:00	DONE	Lucas Cell	01-JUL-18 00:00
1204113016	MSD	PCW	LUCAS7	SEP-27-18 10:30:00	DONE	Lucas Cell	01-NOV-17 00:00
1204113017	LCS	PCW	LUCAS8	SEP-27-18 10:30:00	DONE	Lucas Cell	01-MAR-18 00:00

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Type III Data Package

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Project: PSEG Hudson
Groundwater and Water Samples
Collected on 10/01/18-10/02/18

SDG# GEJ55

GROUP	SAMPLE NUMBERS
1994403	9834961-9834971

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-18-27
AZ Cert. # AZ0780

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by: Dana M Kauffman **Date:** **10/26/2018**

Dana M. Kauffman
Manager

Any questions or concerns you might have regarding this data package should be directed to your client representative, Kerri Sachtleben at (717)-556-7376.

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Sample Reference List for SDG Number GEJ55 with a Data Package Type of III

07701 - GEI Consultants, Inc.

Project: PSEG Hudson

Lab Sample Number	Client Sample ID	Collection Date	Date Received
9834961	MW-6	10/01/2018 11:30	10/03/2018 18:10
9834962	MW-5	10/01/2018 11:10	10/03/2018 18:10
9834963	MW-9	10/01/2018 13:10	10/03/2018 18:10
9834964	MW-7	10/01/2018 14:40	10/03/2018 18:10
9834965	MW-8	10/01/2018 14:50	10/03/2018 18:10
9834966	FB-20181001	10/01/2018 12:00	10/03/2018 18:10
9834967	FB-20181002	10/02/2018 12:00	10/03/2018 18:10
9834968	MW-1	10/02/2018 10:05	10/03/2018 18:10
9834969	MW-2	10/02/2018 09:55	10/03/2018 18:10
9834970	MW-4	10/02/2018 11:40	10/03/2018 18:10
9834971	MW-3	10/02/2018 12:05	10/03/2018 18:10

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Sample pH Log

SDG: GEJ55

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9834961	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:51:57AM	1382
9834961	015A	7	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:01:54AM	12616
9834961	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:00:16AM	1382
9834961	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:02AM	1382
9834961	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:55:10AM	1382
9834961	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:14:17PM	12616
9834961	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:51:57AM	1382
9834961	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:51:57AM	1382
9834962	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:47:12AM	1382
9834962	015A	7	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:01:37AM	12616
9834962	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:53AM	1382
9834962	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:00:58AM	1382
9834962	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:56:02AM	1382
9834962	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:26:06PM	12616
9834962	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:47:12AM	1382
9834962	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:47:12AM	1382
9834963	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:47:54AM	1382
9834963	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:01:20AM	12616
9834963	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:57AM	1382
9834963	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:16AM	1382
9834963	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:53:54AM	1382
9834963	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 11:15:43AM	12616
9834963	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:47:54AM	1382
9834963	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:47:54AM	1382
9834964	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:51:08AM	1382
9834964	015A	7	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:02:10AM	12616
9834964	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:31AM	1382
9834964	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:33AM	1382
9834964	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:54:04AM	1382
9834964	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:21:28PM	12616
9834964	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:51:08AM	1382
9834964	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:51:08AM	1382
9834965	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:49:44AM	1382
9834965	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:01:01AM	12616
9834965	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:38AM	1382
9834965	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:11AM	1382
9834965	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:54:37AM	1382
9834965	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 11:11:53AM	12616

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9834965	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:49:44AM	1382
9834965	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:49:44AM	1382
9834966	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:46:26AM	1382
9834966	015A	5	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:00:42AM	12616
9834966	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:41AM	1382
9834966	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:27AM	1382
9834966	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:54:13AM	1382
9834966	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:22:58PM	12616
9834966	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:46:26AM	1382
9834966	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:46:26AM	1382
9834967	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:50:24AM	1382
9834967	015A	5	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:00:27AM	12616
9834967	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:23AM	1382
9834967	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:25AM	1382
9834967	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:54:59AM	1382
9834967	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:19:39PM	12616
9834967	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:50:24AM	1382
9834967	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:50:24AM	1382
9834968	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:52:40AM	1382
9834968	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:00:09AM	12616
9834968	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:34AM	1382
9834968	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:20AM	1382
9834968	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:53:43AM	1382
9834968	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:27:48PM	12616
9834968	089B	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:36:48PM	12616
9834968	148A	7	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 9:02:39AM	12616
9834968	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:52:40AM	1382
9834968	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:52:40AM	1382
9834969	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:45:44AM	1382
9834969	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 8:59:54AM	12616
9834969	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:59:27AM	1382
9834969	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:41AM	1382
9834969	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:54:47AM	1382
9834969	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 11:04:49AM	12616
9834969	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:45:44AM	1382
9834969	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:45:44AM	1382
9834970	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:44:01AM	1382
9834970	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 8:59:37AM	12616
9834970	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:00:01AM	1382
9834970	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:08AM	1382
9834970	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:53:31AM	1382
9834970	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 12:24:35PM	12616
9834970	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:44:01AM	1382
9834970	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:44:01AM	1382

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9834971	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:44:53AM	1382
9834971	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:00:04AM	1382
9834971	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 11:01:36AM	1382
9834971	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:55:20AM	1382
9834971	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/8/2018 11:17:29AM	12616
9834971	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:44:53AM	1382
9834971	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	10/4/2018 10:44:53AM	1382

***pH Check Code Key**
PK = Original container checked - pH is within the correct range. (No preservative was added)
PA = Original container checked - pH adjusted to correct range. (Preservative was added)
PV = Volatile container checked
PC = pH checked (unpreserved container)
SPK = Subsampled from an original container. Original container checked - pH is within correct range
SPA = Subsampled from an original container. Subsample container checked - pH adjusted to correct range.
SPC = Subsampled from an original container. pH checked (unpreserved container).
SUP = Subsampled from original container. Unable to be preserved due to the matrix of the sample.
UP = Unable to preserve due to matrix of the sample.
NA = Not applicable

****Chlorine Present Code Key**
NA = Chlorine Not Checked
Y = Chlorine Present
N = Chlorine Not Present

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00259 Mercury

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

14044 ICP-WW, 3005A (tot rec) - U5

The sample is digested with nitric acid and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3005A, July 1992

14047 ICPMS - Water, 3020A - U5

The sample is digested with nitric and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3020A, July 1992

05713 WW SW846 Hg Digest

The sample is heated at 95 c with nitric acid, sulfuric acid, potassium persulfate, and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

07046 Barium
08014 Boron
01750 Calcium
07051 Chromium
07052 Cobalt
01756 Lithium
07036 Selenium
07022 Thallium

The solution resulting from the metals digestion is analyzed by Trace ICP.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6010D, Rev. 4, July 2014.

06024 Antimony
06025 Arsenic
06027 Beryllium
06028 Cadmium
06035 Lead
06038 Molybdenum

The solution resulting from the metals digestion is analyzed by ICP/MS.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6020B, Rev.2, July 2014.

00224 Chloride
01504 Fluoride
00228 Sulfate

A small volume of sample is introduced into an ion chromatograph. The anions are then separated and measured by a system consisting of a guard column, separator column, suppressor, and conductivity detector.

Reference: Method 300.0, Revision 2.1 (1993), Methods for Chemical Analysis of Water and Wastes USEPA 600.

12152 pH

The activity of hydrogen ions in the sample is measured using a glass electrode and a reference electrode.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 4500-H+ B-2011

00212 Total Dissolved Solids

A well-mixed sample is filtered through a glass fiber filter. The filtrate is collected in a tared beaker, evaporated in a steam bath and dried in an oven at 180C +/- 2C to a constant weight. The increase in weight is the total dissolved solids.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2540 C-2011

12151 Temperature of pH

The temperature of the sample measured during the pH analysis.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2550 B-2010

Analysis Reports / Field Chain of Custody

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Report Date: October 15, 2018 13:24

Project: PSEG Hudson

Account #: 07701
Group Number: 1994403
SDG: GEJ55
PO Number: 1504710
State of Sample Origin: NJ

Electronic Copy To	GEI Consultants, Inc.	Attn: Jason Kohl
Electronic Copy To	GEI Consultants, Inc.	Attn: Data Group

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-6 Grab Groundwater	10/01/2018 11:30	9834961
MW-5 Grab Groundwater	10/01/2018 11:10	9834962
MW-9 Grab Groundwater	10/01/2018 13:10	9834963
MW-7 Grab Groundwater	10/01/2018 14:40	9834964
MW-8 Grab Groundwater	10/01/2018 14:50	9834965
FB-20181001 Grab Water	10/01/2018 12:00	9834966
FB-20181002 Grab Water	10/02/2018 12:00	9834967
MW-1 Grab Groundwater	10/02/2018 10:05	9834968
MW-2 Grab Groundwater	10/02/2018 09:55	9834969
MW-4 Grab Groundwater	10/02/2018 11:40	9834970
MW-3 Grab Groundwater	10/02/2018 12:05	9834971

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: GEI Consultants, Inc.
Project: PSEG Hudson
Sampling Date(s): 10/01/18 - 10/02/18
Laboratory Sample ID(s): 9834961-9834971
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Dorothy M Love

Dorothy M. Love
Director

10/15/2018



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Project Name: PSEG Hudson
ELLE Group #: 1994403

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.

Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 9834961, 9834962, 9834963, 9834964, 9834965, 9834966, 9834967, 9834968, 9834969, 9834970, 9834971

The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.

Batch #: 182831404402 (Sample number(s): 9834961-9834971 UNSPK: 9834961 BKG: 9834961)

The recovery(ies) for the following analyte(s) in the MS and/or MSD were below the acceptance window: Calcium, Selenium

The relative percent difference(s) for the following analyte(s) in the MS/MSD were outside acceptance windows: Selenium

SW-846 6020B Rev.2, July 2014, Metals Dissolved

Sample #s: 9834961, 9834962, 9834963, 9834964, 9834965, 9834966, 9834967, 9834968, 9834969, 9834970, 9834971

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.

SM 2540 C-2011, Wet Chemistry

Sample #s: 9834963

This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 1,410 mg/L result. We are reporting the result obtained within the holding time.

Sample #s: 9834961

This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18,

three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 1,510 mg/L result. We are reporting the result obtained within the holding time.

Sample #s: 9834962

This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 2,900 mg/L result. We are reporting the result obtained within the holding time.

Batch #: 18278921201A (Sample number(s): 9834968-9834970 UNSPK: 9834970 BKG: 9834970)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Sample Description: **MW-6 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 11:30
SDG#: GEJ55-01

GEI Consultants, Inc.
ELLE Sample #: GW 9834961
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0927	0.0010	0.0050	1
08014	Boron	7440-42-8	0.822	0.0120	0.0500	1
01750	Calcium	7440-70-2	110	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00075 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	692	100	200	500
01504	Fluoride	16984-48-8	0.42 J	0.25	0.50	5
00228	Sulfate	14808-79-8	9.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,500	20.0	60.0	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 11:30
SDG#: GEJ55-01

GEI Consultants, Inc.
ELLE Sample #: GW 9834961
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
	This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 1,510 mg/L result. We are reporting the result obtained within the holding time.					
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.9	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1
	The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.					

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 17:47	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:52	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:52	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:52	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 11:30
SDG#: GEJ55-01

GEI Consultants, Inc.
ELLE Sample #: GW 9834961
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:52	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:52	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 11:52	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:33	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115A	10/11/2018 22:23	Samuel J Weaver	500
01504	Fluoride	EPA 300.0	1	18284837115A	10/11/2018 22:06	Samuel J Weaver	5
00228	Sulfate	EPA 300.0	1	18284837115A	10/11/2018 22:06	Samuel J Weaver	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18277921203A	10/04/2018 23:15	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004208A	10/05/2018 10:41	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004208A	10/05/2018 10:41	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 11:10
SDG#: GEJ55-02

GEI Consultants, Inc.
ELLE Sample #: GW 9834962
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.116	0.0010	0.0050	1
08014	Boron	7440-42-8	0.679	0.0120	0.0500	1
01750	Calcium	7440-70-2	129	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0190 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0011 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.00037 J	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	1,100	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	4.0 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,940	20.0	60.0	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 11:10
SDG#: GEJ55-02

GEI Consultants, Inc.
ELLE Sample #: GW 9834962
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
	This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 2,900 mg/L result. We are reporting the result obtained within the holding time.					
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.0	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1
	The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.					

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:02	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:59	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:59	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:59	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 11:10
SDG#: GEJ55-02

GEI Consultants, Inc.
ELLE Sample #: GW 9834962
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:59	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 11:59	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 11:59	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:35	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115A	10/11/2018 22:56	Samuel J Weaver	500
01504	Fluoride	EPA 300.0	1	18284837115A	10/11/2018 22:40	Samuel J Weaver	5
00228	Sulfate	EPA 300.0	1	18284837115A	10/11/2018 22:40	Samuel J Weaver	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18277921203A	10/04/2018 23:15	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004208A	10/05/2018 10:44	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004208A	10/05/2018 10:44	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 13:10
SDG#: GEJ55-03

GEI Consultants, Inc.
ELLE Sample #: GW 9834963
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0892	0.0010	0.0050	1
08014	Boron	7440-42-8	0.473	0.0120	0.0500	1
01750	Calcium	7440-70-2	101	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00066 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0048	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.0058	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	631	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	51.9	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,270	20.0	60.0	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 13:10
SDG#: GEJ55-03

GEI Consultants, Inc.
ELLE Sample #: GW 9834963
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
	This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 1,410 mg/L result. We are reporting the result obtained within the holding time.					
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1
	The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.					

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:05	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:01	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:01	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:01	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 13:10
SDG#: GEJ55-03

GEI Consultants, Inc.
ELLE Sample #: GW 9834963
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:01	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:01	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:01	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:37	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115B	10/12/2018 00:53	Samuel J Weaver	500
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 00:36	Samuel J Weaver	5
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 00:36	Samuel J Weaver	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18277921203A	10/04/2018 23:15	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 10:14	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 10:14	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 14:40
SDG#: GEJ55-04

GEI Consultants, Inc.
ELLE Sample #: GW 9834964
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0318	0.0010	0.0050	1
08014	Boron	7440-42-8	0.197	0.0120	0.0500	1
01750	Calcium	7440-70-2	28.9	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00084 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.0061	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	29.2	1.0	2.0	5
01504	Fluoride	16984-48-8	0.48 J	0.25	0.50	5
00228	Sulfate	14808-79-8	9.9	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	223	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 14:40
SDG#: GEJ55-04

GEI Consultants, Inc.
ELLE Sample #: GW 9834964
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:13	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:03	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:03	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:03	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:03	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:03	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:03	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:39	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115B	10/12/2018 01:10	Samuel J Weaver	5
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 01:10	Samuel J Weaver	5

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 14:40
SDG#: GEJ55-04

GEI Consultants, Inc.
ELLE Sample #: GW 9834964
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 01:10	Samuel J Weaver	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18277921203A	10/04/2018 23:15	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 10:10	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 10:10	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 14:50
SDG#: GEJ55-05

GEI Consultants, Inc.
ELLE Sample #: GW 9834965
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0657	0.0010	0.0050	1
08014	Boron	7440-42-8	0.331	0.0120	0.0500	1
01750	Calcium	7440-70-2	24.9	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0090	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0016 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00069 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.0031	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	409	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	23.3	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	899	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 14:50
SDG#: GEJ55-05

GEI Consultants, Inc.
ELLE Sample #: GW 9834965
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:15	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:05	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:05	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:05	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:05	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:05	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:05	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:41	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115B	10/12/2018 02:00	Samuel J Weaver	500
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 01:43	Samuel J Weaver	5

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 14:50
SDG#: GEJ55-05

GEI Consultants, Inc.
ELLE Sample #: GW 9834965
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 01:43	Samuel J Weaver	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18277921203A	10/04/2018 23:15	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 09:39	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 09:39	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181001 Grab Water**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 12:00
SDG#: GEJ55-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9834966
ELLE Group #: 1994403
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.0735 J	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181001 Grab Water**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 12:00
SDG#: GEJ55-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9834966
ELLE Group #: 1994403
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:18	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:07	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:07	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:07	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:07	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:07	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:07	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:43	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115B	10/12/2018 02:17	Samuel J Weaver	1
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 02:17	Samuel J Weaver	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181001 Grab Water**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/01/2018 12:00
SDG#: GEJ55-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9834966
ELLE Group #: 1994403
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 02:17	Samuel J Weaver	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18277921203A	10/04/2018 23:15	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 10:03	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 10:03	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181002 Grab Water**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 12:00
SDG#: GEJ55-07FB

GEI Consultants, Inc.
ELLE Sample #: GW 9834967
ELLE Group #: 1994403
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.0902 J	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181002 Grab Water**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 12:00
SDG#: GEJ55-07FB

GEI Consultants, Inc.
ELLE Sample #: GW 9834967
ELLE Group #: 1994403
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:20	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:09	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:09	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:09	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:09	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:09	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:09	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:45	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115B	10/12/2018 02:33	Samuel J Weaver	1
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 02:33	Samuel J Weaver	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181002 Grab Water**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 12:00
SDG#: GEJ55-07FB

GEI Consultants, Inc.
ELLE Sample #: GW 9834967
ELLE Group #: 1994403
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 02:33	Samuel J Weaver	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18278921204A	10/05/2018 23:55	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 09:43	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 09:43	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 10:05
SDG#: GEJ55-08

GEI Consultants, Inc.
ELLE Sample #: GW 9834968
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.672	0.0010	0.0050	1
08014	Boron	7440-42-8	1.09	0.0120	0.0500	1
01750	Calcium	7440-70-2	393	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0044 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0372 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0013 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0017 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.0033	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	2,840	200	400	1000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	116	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	17,600	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 10:05
SDG#: GEJ55-08

GEI Consultants, Inc.
ELLE Sample #: GW 9834968
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.6	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:23	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:11	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:11	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:11	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:11	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:11	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:11	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:21	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	3	18284837115B	10/12/2018 14:09	Samuel J Weaver	1000
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 02:50	Samuel J Weaver	5

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 10:05
SDG#: GEJ55-08

GEI Consultants, Inc.
ELLE Sample #: GW 9834968
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 03:40	Samuel J Weaver	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	18278921201A	10/05/2018 16:26	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 10:07	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 10:07	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 09:55
SDG#: GEJ55-09

GEI Consultants, Inc.
ELLE Sample #: GW 9834969
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	2.15	0.0010	0.0050	1
08014	Boron	7440-42-8	0.912	0.0120	0.0500	1
01750	Calcium	7440-70-2	446	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0032 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0430 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.105	0.250	5
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00053 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0030	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.0027	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	3,770	200	400	1000
01504	Fluoride	16984-48-8	0.40 J	0.25	0.50	5
00228	Sulfate	14808-79-8	14.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	15,100	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.9	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 09:55
SDG#: GEJ55-09

GEI Consultants, Inc.
ELLE Sample #: GW 9834969
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.6	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:26	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:26	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:26	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:26	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:26	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:26	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/12/2018 15:05	Jonathan J Allen	5
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:26	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:14	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:14	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:14	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:14	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:14	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:14	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:47	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	3	18284837115B	10/12/2018 14:26	Samuel J Weaver	1000
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 04:14	Samuel J Weaver	5

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 09:55
SDG#: GEJ55-09

GEI Consultants, Inc.
ELLE Sample #: GW 9834969
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 04:14	Samuel J Weaver	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18278921201A	10/05/2018 16:26	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 09:47	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 09:47	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 11:40
SDG#: GEJ55-10

GEI Consultants, Inc.
ELLE Sample #: GW 9834970
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.149	0.0010	0.0050	1
08014	Boron	7440-42-8	1.38	0.0120	0.0500	1
01750	Calcium	7440-70-2	123	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0474 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00072 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.0069	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	1,150	200	400	1000
01504	Fluoride	16984-48-8	0.34 J	0.25	0.50	5
00228	Sulfate	14808-79-8	493	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	6,800	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.9	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 11:40
SDG#: GEJ55-10

GEI Consultants, Inc.
ELLE Sample #: GW 9834970
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:28	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:16	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:16	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:16	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:16	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:16	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:16	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:49	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	3	18284837115B	10/12/2018 14:43	Samuel J Weaver	1000
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 04:47	Samuel J Weaver	5

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 11:40
SDG#: GEJ55-10

GEI Consultants, Inc.
ELLE Sample #: GW 9834970
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	2	18284837115B	10/12/2018 05:04	Samuel J Weaver	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	18278921201A	10/05/2018 16:26	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 09:51	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 09:51	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 12:05
SDG#: GEJ55-11

GEI Consultants, Inc.
ELLE Sample #: GW 9834971
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0572	0.0010	0.0050	1
08014	Boron	7440-42-8	0.610	0.0120	0.0500	1
01750	Calcium	7440-70-2	53.4	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0013 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0045	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06038	Molybdenum	7439-98-7	0.0139	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	587	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	78.6	3.0	10.0	10
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,270	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 12:05
SDG#: GEJ55-11

GEI Consultants, Inc.
ELLE Sample #: GW 9834971
ELLE Group #: 1994403
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	182831404402	10/11/2018 18:31	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:22	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:22	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:22	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:22	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	182821404703A	10/11/2018 12:22	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	182821404703C	10/11/2018 12:22	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	182810571305	10/11/2018 08:51	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U5	SW-846 3005A	1	182831404402	10/11/2018 06:09	Annamaria Kuhns	1
14047	ICPMS - Water, 3020A - U5	SW-846 3020A	1	182821404703	10/10/2018 15:15	JoElla L Rice	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	182810571305	10/10/2018 16:20	JoElla L Rice	1
00224	Chloride	EPA 300.0	2	18284837115B	10/12/2018 05:54	Samuel J Weaver	500
01504	Fluoride	EPA 300.0	2	18284837115B	10/12/2018 05:37	Samuel J Weaver	5

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 10/03/2018 18:10
Collection Date/Time: 10/02/2018 12:05
SDG#: GEJ55-11

GEI Consultants, Inc.
ELLE Sample #: GW 9834971
ELLE Group #: 1994403
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00228	Sulfate	EPA 300.0	3	18284837115B	10/12/2018 15:00	Samuel J Weaver	10
00212	Total Dissolved Solids	SM 2540 C-2011	1	18278921204A	10/05/2018 23:55	Hannah M Royer	1
12151	Temperature of pH	SM 2550 B-2010	1	18277004207A	10/05/2018 09:59	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18277004207A	10/05/2018 09:59	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1994403
Reported: 10/15/2018 13:24

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 182810571305	Sample number(s): 9834961-9834971		
Mercury	N.D.	0.000050	0.00020
Batch number: 182821404703A	Sample number(s): 9834961-9834971		
Antimony	N.D.	0.00041	0.0020
Arsenic	N.D.	0.00068	0.0020
Beryllium	0.00011 J	0.000091	0.00050
Cadmium	N.D.	0.00015	0.0010
Lead	N.D.	0.0011	0.0030
Batch number: 182821404703C	Sample number(s): 9834961-9834971		
Molybdenum	N.D.	0.00031	0.0020
Batch number: 182831404402	Sample number(s): 9834961-9834971		
Barium	N.D.	0.0010	0.0050
Boron	N.D.	0.0120	0.0500
Calcium	N.D.	0.0330	0.500
Chromium	N.D.	0.0053	0.0150
Cobalt	N.D.	0.0015	0.0050
Lithium	N.D.	0.0110	0.0500
Selenium	N.D.	0.0210	0.0500
Thallium	N.D.	0.0140	0.0300
Batch number: 18284837115A	Sample number(s): 9834961-9834962		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18284837115B	Sample number(s): 9834963-9834971		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18277921203A	Sample number(s): 9834961-9834966		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18278921201A	Sample number(s): 9834968-9834970		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18278921204A	Sample number(s): 9834967,9834971		
Total Dissolved Solids	N.D.	20.0	60.0

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1994403
Reported: 10/15/2018 13:24

LCS/LCSD

Analysis Name	LCS Spike Added	LCS Conc	LCSD Spike Added	LCSD Conc	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
	mg/l	mg/l	mg/l	mg/l					
Batch number: 182810571305	Sample number(s): 9834961-9834971								
Mercury	0.00100	0.000905			91		80-120		
Batch number: 182821404703A	Sample number(s): 9834961-9834971								
Antimony	0.00600	0.00596			99		80-120		
Arsenic	0.0100	0.00953			95		80-120		
Beryllium	0.00400	0.00382			96		80-120		
Cadmium	0.00500	0.00454			91		80-120		
Lead	0.0150	0.0146			97		80-120		
Batch number: 182821404703C	Sample number(s): 9834961-9834971								
Molybdenum	0.0500	0.0476			95		80-120		
Batch number: 182831404402	Sample number(s): 9834961-9834971								
Barium	2.00	2.04			102		80-120		
Boron	2.00	1.96			98		80-120		
Calcium	4.00	3.98			100		80-120		
Chromium	0.200	0.197			99		80-120		
Cobalt	0.500	0.503			101		80-120		
Lithium	1.00	0.991			99		80-120		
Selenium	0.150	0.143			95		80-120		
Thallium	0.150	0.159			106		80-120		
	mg/l	mg/l	mg/l	mg/l					
Batch number: 18284837115A	Sample number(s): 9834961-9834962								
Chloride	3.00	2.84			95		90-110		
Fluoride	0.750	0.674			90		90-110		
Sulfate	7.50	6.80			91		90-110		
Batch number: 18284837115B	Sample number(s): 9834963-9834971								
Chloride	3.00	2.84			95		90-110		
Fluoride	0.750	0.674			90		90-110		
Sulfate	7.50	6.80			91		90-110		
	mg/l	mg/l	mg/l	mg/l					
Batch number: 18277921203A	Sample number(s): 9834961-9834966								
Total Dissolved Solids	200	196			98		62-127		
Batch number: 18278921201A	Sample number(s): 9834968-9834970								
Total Dissolved Solids	200	193			97		62-127		
Batch number: 18278921204A	Sample number(s): 9834967,9834971								
Total Dissolved Solids	200	203			102		62-127		
	Std. Units	Std. Units	Std. Units	Std. Units					

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1994403
Reported: 10/15/2018 13:24

LCS/LCSD (continued)

Analysis Name	LCS Spike Added Std. Units	LCS Conc Std. Units	LCSD Spike Added Std. Units	LCSD Conc Std. Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 18277004207A	Sample number(s): 9834963-9834971								
pH	7.00	7.04			101		95-105		
Batch number: 18277004208A	Sample number(s): 9834961-9834962								
pH	7.00	7.01			100		95-105		

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 182810571305	Sample number(s): 9834961-9834971 UNSPK: 9834968									
Mercury	N.D.	0.00100	0.000857	0.00100	0.000873	86	87	75-125	2	20
Batch number: 182831404402	Sample number(s): 9834961-9834971 UNSPK: 9834961									
Barium	0.0927	2.00	2.04	2.00	2.08	97	100	75-125	2	20
Boron	0.822	2.00	2.63	2.00	2.83	91	100	75-125	7	20
Calcium	110.26	4.00	107.68	4.00	112.59	-65 (2)	58 (2)	75-125	4	20
Chromium	N.D.	0.200	0.183	0.200	0.195	91	98	75-125	7	20
Cobalt	N.D.	0.500	0.501	0.500	0.500	100	100	75-125	0	20
Lithium	N.D.	1.00	1.03	1.00	1.02	103	102	75-125	1	20
Selenium	N.D.	0.150	0.0933	0.150	0.131	62*	87	75-125	33*	20
Thallium	N.D.	0.150	0.127	0.150	0.146	84	98	75-125	14	20
	mg/l	mg/l	mg/l	mg/l	mg/l					
Batch number: 18278921201A	Sample number(s): 9834968-9834970 UNSPK: 9834970									
Total Dissolved Solids	6800	4000	11810			125		62-127		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc mg/l	DUP Conc mg/l	DUP RPD	DUP RPD Max
Batch number: 182810571305	Sample number(s): 9834961-9834971 BKG: 9834968			
Mercury	N.D.	N.D.	0 (1)	20
Batch number: 182831404402	Sample number(s): 9834961-9834971 BKG: 9834961			

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 1994403
Reported: 10/15/2018 13:24

Laboratory Duplicate (continued)

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	mg/l	mg/l		
Barium	0.0927	0.0910	2	20
Boron	0.822	0.821	0	20
Calcium	110.26	110.05	0	20
Chromium	N.D.	N.D.	0 (1)	20
Cobalt	N.D.	N.D.	0 (1)	20
Lithium	N.D.	N.D.	0 (1)	20
Selenium	N.D.	N.D.	0 (1)	20
Thallium	N.D.	N.D.	0 (1)	20
	mg/l	mg/l		
Batch number: 18278921201A	Sample number(s): 9834968-9834970 BKG: 9834970			
Total Dissolved Solids	6800	8350	20*	5

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Acct. # 7701 Group # 1994403 Sample # 9834961-71

COC # 567050

Client Information

Client: GEI Consultants, Inc.	Acct. #:
Project Name/#: PSEG Hudson / 1504710	PWSID #:
Project Manager: Jason Kohl	P.O. #:
Sampler: Anthony J. Shields	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☑ No ☐

Matrix: Soil ☐ Sediment ☐ Tissue ☐ | Water ☑ Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: ____

Analysis Requested — Preservation and Filtration Codes

For Lab Use Only: FSC: ____ SCR#: 232049

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Site List of Metals	Mercury	Chloride	Fluoride	Sulfate	Alk	TDS	Ra 226	Ra 228	Metals EPC
MW-6	10-1-18	1130	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MW-5	10-1-18	1110	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MW-9	10-1-18	1310	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MW-7	10-1-18	1440	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MW-8	10-1-18	1450	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FB-20181001	10-1-18	1200	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FB-20181002	10-2-18	1200	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MW-1	10-2-18	1005	✓		8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW-2	10-2-18	0955	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MW-4	10-2-18	1140	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days: ____

E-mail address: JKohl@GEIConsultants.com

Relinquished by	Date	Time	Received by	Date	Time
Bottle Storage	9-28-18	1200		9-28-18	1200
	10-3-18	1315		10/3/18	1315
	10/3/18	1810		Date	Time
	Date	Time		Date	Time
	Date	Time		Date	Time

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) NJ DKQP TX TRRP-13

NYSDEC Category A or B MA MCP CT RCP

EDD Required? Yes No

If yes, format: ____

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Temperature upon receipt 2.5 °C

Environmental Analysis Request/Chain of Custody

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Acct. # 7701 Group # 1994403 Sample # 9834961-71

COC # 567051

Client Information

Client: GEI Consultants, Inc.	Acct. #:
Project Name/#: PSEG Hudson / 150471D	PWSID #:
Project Manager: Jason Kohl	P.O. #:
Sampler: Anthony J. Shields	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☑ No ☐

Matrix: Soil ☐ Sediment ☐ Tissue ☐ | Water ☑ Potable ☐ Ground ☑ NPDES ☐ Surface ☐ | Other: ☐

Analysis Requested — Preservation and Filtration Codes

For Lab Use Only
FSC:
SCR#:

Preservation Codes
H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Site List of Metals	Mercury	Chloride	Fluoride	Sulfate	pH	TDS	Ra-226	Ra-228
MW-3	10-2-18	1205	/		7	/	/	/	/	/	/	/	/	/

Remarks

Turnaround Time (TAT) Requested (please circle)
Standard Rush
(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: JKohl@GEIConsultants.com

Data Package Options (circle if required)
Type I (EPA Level 3 Equivalent/non-CLP)
Type III (Reduced non-CLP)
Type VI (Raw Data Only)
NJ DKQP TX TRRP-13
NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	10-3-18	1315		10/3/18	1315
	10/3/18	1810			
				10.3.18	1810

EDD Required? Yes No
If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes (No)
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:
UPS FedEx Other

Temperature upon receipt 2.0 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 228977

Group Number(s): 1994403

Client: GEI Consultants

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/03/2018 18:10
Number of Packages:	3	Number of Projects:	1
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	No	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Wanita Curry (14057) at 01:32 on 10/04/2018

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?	Samples Collected Same Day as Receipt?
1	DT42-01	2.5	DT	Wet	Y	Bagged	N	N
2	DT42-01	1.9	DT	Wet	Y	Bagged	N	N
3	DT42-01	9.8	DT	Wet	Y	Bagged	Y	N

Elevated Temperature Details

All Temperatures in °C

Cooler #	Thermometer ID	Top Left Temp	Top Right Temp	Bottom Left Temp	Bottom Right Temp	Center Temp	Factors Contributing to Elevated Temp	Comments
3	32170023	3.1	5.3	5.8	3.0	5.0	Temp bottle not near ice	

2425 New Holland Pike
Lancaster, PA 17601-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

Metals in Liquid Data

Case Narrative/Conformance Summary

Metals in Liquid

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

ICP Metals

Fraction: Metals in Liquid

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9834961	MW-6	X		
9834962	MW-5	X		
9834963	MW-9	X		
9834964	MW-7	X		
9834965	MW-8	X		
9834966	FB-20181001	X		Field Blank
9834967	FB-20181002	X		Field Blank
9834968	MW-1	X		
9834969	MW-2	X		
9834970	MW-4	X		
9834971	MW-3	X		

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

Method Blank

For noncompliant preparation/method blanks, corrective action is not required if the sample is ND or > 10 times the blank concentration, unless otherwise specified in the method or by the client.

MS/MSD

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

ICP Metals

Fraction: Metals in Liquid

Method defined actions are taken for any failed matrix QC.

Batch#: 182831404402 (Sample number(s): 9834961-9834971, UNSPK: 9834961, BKG: 9834961)
The relative percent difference(s) for the following analyte(s) in the MS/MSD is outside the acceptance window: Selenium
The recovery(ies) for the following analyte(s) in the MS were below the acceptance window: Selenium
The recovery(ies) for the following analyte(s) in the MS and MSD were below the acceptance window: Calcium

SAMPLE ANALYSIS:

Refer to analysis run log for samples requiring dilutions.

The instrument detection limits (IDLs) are used for determining the U flags on the initial and continuing calibration blanks. The highest IDL is selected when multiple instruments are used for an analysis. The method detection limits (MDLs) are used for determining all other U flags.

(Sample number(s): 9834961-9834971: Analysis: 07036)
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: Selenium, Thallium.

(Sample number(s): 9834961-9834971: Analysis: 06035)
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

BKG – Background	AF - Cold Vapor Atomic Fluorescence
DUP – Duplicate	U - Below MDL
MS - Matrix Spike	B - Below LOQ
MSD - Matrix Spike Dup	N - Matrix Spike out of specifications
B – Blank	* - Duplicate out of specifications
Q - Laboratory Control Sample	E - Matrix Effects exist as proven by Serial Dilution or Spiked Dilution
Y - Laboratory Control Sample Duplicate	A - Post Digestion Spike
P - ICP Atomic Emission Spectrometer	L - Serial Dilution
MS - ICP Mass Spectrometry	R - Internal Standard Relative Intensity OOS
CV - Cold Vapor	NR - Not Required

Sample Data

Metals in Liquid

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834961, 9834961BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.75	B		MS
7440-39-3	Barium	92.7			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	822			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	110000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
_____

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834962 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	1.1	B		MS
7440-39-3	Barium	116			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	679			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	129000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	19.0	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.37	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence
NR = Not Required

CONCENTRATION QUALIFIERS:
U = Below MDL,
B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834963 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.66	B		MS
7440-38-2	Arsenic	4.8			MS
7440-39-3	Barium	89.2			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	473			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	101000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	5.8			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834964 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.84	B		MS
7440-39-3	Barium	31.8			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	197			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	28900			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	6.1			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834965 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	1.6	B		MS
7440-39-3	Barium	65.7			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	331			P
7440-43-9	Cadmium	0.69	B		MS
7440-70-2	Calcium	24900			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	9.0			P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.1			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence
NR = Not Required

CONCENTRATION QUALIFIERS:
U = Below MDL,
B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834966 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	73.5	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834967 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	90.2	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834968, 9834968BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.3	B		MS
7440-38-2	Arsenic	1.7	B		MS
7440-39-3	Barium	672			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1090			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	393000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	4.4	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	37.2	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.3			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834969 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.53	B		MS
7440-38-2	Arsenic	3.0			MS
7440-39-3	Barium	2150			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	912			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	446000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	3.2	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	43.0	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	2.7			MS
7782-49-2	Selenium	105	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834970 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.72	B		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	149			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1380			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	123000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	47.4	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	6.9			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9834971 % Solids: 0.0
Concentration Units: UG/L Date Received: 10/03/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.3	B		MS
7440-38-2	Arsenic	4.5			MS
7440-39-3	Barium	57.2			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	610			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	53400			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	13.9			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

Quality Control and Calibration Summary Forms

Metals in Liquid

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ55
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Barium	182831404402	9834961BKG
Boron		9834961MS
Calcium		9834961MSD
Chromium		9834961DUP
Cobalt		9834962
Lithium		9834963
Selenium		9834964
Thallium		9834965
		9834966
		9834967
		9834968
		9834969
		9834970
		9834971
		P28304BB
		P28304BQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ55
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Antimony	182821404703	9834961
Arsenic		9834962
Beryllium		9834963
Cadmium		9834964
Lead		9834965
Molybdenum		9834966
		9834967
		9834968
		9834969
		9834970
		9834971
		*39159BKG
		P28204CB
		P28204CQ

LEGEND:

BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ55
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Mercury	182810571305	9834961
		9834962
		9834963
		9834964
		9834965
		9834966
		9834967
		9834968BKG
		9834968MS
		9834968MSD
		9834968DUP
		9834969
		9834970
		9834971
		P28171EB
		P28171EQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: P
Run Name: 1828407T73
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium		600.0	600.25	100.0	500.0	501.16	100.2	500.0	500.67	100.1
Boron		600.0	657.78	109.6	500.0	525.71	105.1	500.0	531.90	106.4
Calcium		30000.0	29150.67	97.2	25000.0	24480.91	97.9	25000.0	24657.11	98.6
Chromium		600.0	580.42	96.7	500.0	479.03	95.8	500.0	481.80	96.4
Cobalt		600.0	573.21	95.5	500.0	483.29	96.7	500.0	488.88	97.8
Lithium		600.0	593.33	98.9	500.0	490.33	98.1	500.0	501.97	100.4
Selenium		600.0	556.34	92.7	500.0	472.59	94.5	500.0	486.66	97.3
Thallium		600.0	586.23	97.7	500.0	488.57	97.7	500.0	497.66	99.5

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: P
Run Name: 1828407T73
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium					500.0	499.06	99.8	500.0	494.98	99.0
Boron					500.0	529.90	106.0	500.0	522.29	104.5
Calcium					25000.0	24575.69	98.3	25000.0	24028.34	96.1
Chromium					500.0	481.77	96.4	500.0	473.90	94.8
Cobalt					500.0	480.09	96.0	500.0	482.82	96.6
Lithium					500.0	497.10	99.4	500.0	477.37	95.5
Selenium					500.0	481.27	96.3	500.0	476.17	95.2
Thallium					500.0	491.70	98.3	500.0	496.60	99.3

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: P
Run Name: 1828407T73
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium					500.0	496.84	99.4			
Boron					500.0	525.52	105.1			
Calcium					25000.0	24258.97	97.0			
Chromium										
Cobalt					500.0	489.60	97.9			
Lithium					500.0	502.92	100.6			
Selenium					500.0	482.52	96.5			
Thallium					500.0	503.11	100.6			

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: P
Run Name: 1828504T72
Calibration Date(s): 10/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium		600.0	591.19	98.5	500.0	480.56	96.1	500.0	482.61	96.5
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: P
Run Name: 1828504T72
Calibration Date(s): 10/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium					500.0	487.70	97.5			
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: MS
Run Name: 1828404E07
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

		Initial Calibration			Continuing Calibration					
Analyte	Mass	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Antimony	121	50.0	50.50	101.0	25.0	25.83	103.3	25.0	25.83	103.3
Arsenic	75	500.0	503.35	100.7	250.0	257.38	103.0	250.0	253.74	101.5
Beryllium	9	50.0	50.04	100.1	25.0	24.07	96.3	25.0	23.32	93.3
Cadmium	111	50.0	49.67	99.3	25.0	25.61	102.4	25.0	26.45	105.8
Lead	208	50.0	50.17	100.3	25.0	25.58	102.3	25.0	25.64	102.6
Molybdenum	98	50.0	50.36	100.7	25.0	25.37	101.5	25.0	25.93	103.7

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: MS
Run Name: 1828404E07
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121				25.0	23.75	95.0	25.0	24.28	97.1
Arsenic	75				250.0	265.99	106.4	250.0	261.62	104.6
Beryllium	9				25.0	26.65	106.6	25.0	25.75	103.0
Cadmium	111				25.0	25.39	101.6	25.0	24.86	99.4
Lead	208				25.0	25.09	100.4	25.0	25.69	102.8
Molybdenum	98				25.0	24.99	100.0	25.0	24.66	98.6

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: CV
Run Name: 1828401M09
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

		Initial Calibration			Continuing Calibration					
Analyte	Mass	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury		2.5	2.49	99.6	1.0	1.01	101.0	1.0	1.00	100.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: CV
Run Name: 1828401M09
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.98	98.0	1.0	0.98	98.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ55

Method: CV
Run Name: 1828401M09
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.99	99.0	1.0	0.99	99.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1828407T73
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium		5.0	5.51	110.2		
Boron		50.0	51.12	102.2		
Calcium		500.0	538.89	107.8		
Chromium		15.0	14.64	97.6		
Cobalt		5.0	5.54	110.8		
Lithium		50.0	44.17	88.3		
Selenium		50.0	58.45	116.9		
Thallium		30.0	35.37	117.9		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1828504T72
Calibration Date(s): 10/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium						
Boron						
Calcium						
Chromium						
Cobalt						
Lithium						
Selenium		50.0	53.88	107.8		
Thallium						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ55

Method: MS
Run Name: 1828404E07
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony	121	2.0	1.95	97.5		
Arsenic	75	2.0	2.21	110.5		
Beryllium	9	0.5	0.55	110.0		
Cadmium	111	1.0	1.03	103.0		
Lead	208	3.0	3.03	101.0		
Molybdenum	98	2.0	1.86	93.0		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1828401M09
Calibration Date(s): 10/11/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Mercury		0.2	0.20	100.0		

Control limits: 50% - 150%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ55

Method: P
Run Name: 1828407T73
Calibration Date(s): 10/11/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)							Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium		0.33	U	0.33	U	0.33	U	0.33	U		1.000	U	182831404402
Boron		8.4	U	8.4	U	8.4	U	8.4	U		12.000	U	182831404402
Calcium		33.4	U	33.4	U	33.4	U	33.4	U		33.000	U	182831404402
Chromium		-0.79	B	0.55	U	-0.60	B	0.55	U		5.300	U	182831404402
Cobalt		0.40	U	0.40	U	0.40	U	0.40	U		1.500	U	182831404402
Lithium		5.3	U	5.3	U	5.3	U	-5.8	B		11.000	U	182831404402
Selenium		9.2	U	9.2	U	9.2	U	13.3	B		21.000	U	182831404402
Thallium		8.4	B	6.5	B	8.6	B	3.1	U		14.000	U	182831404402

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ55

Method: P
Run Name: 1828407T73
Calibration Date(s): 10/11/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium				0.33	U	0.33	U						
Boron				8.4	U	8.4	U						
Calcium				33.4	U	33.4	U						
Chromium				0.55	U								
Cobalt				0.40	U	0.40	U						
Lithium				5.3	U	5.3	U						
Selenium				9.2	U	9.2	U						
Thallium				3.1	U	10.4	B						

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ55

Method: P
Run Name: 1828504T72
Calibration Date(s): 10/12/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron													
Calcium													
Chromium													
Cobalt													
Lithium													
Selenium		9.2	U	9.2	U	9.2	U	9.2	U				
Thallium													

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ55

Method: MS
Run Name: 1828404E07
Calibration Date(s): 10/11/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121	0.29	U	0.32	B	0.29	U	0.29	U	121	0.410	U	182821404703A
Arsenic	75	0.50	U	0.50	U	0.50	U	0.50	U	75	0.680	U	182821404703A
Beryllium	9	0.073	U	0.073	U	0.073	U	0.073	U	9	0.106	B	182821404703A
Cadmium	111	0.18	U	0.18	U	0.18	U	0.18	U	111	0.150	U	182821404703A
Lead	208	0.14	U	0.14	U	0.14	U	0.14	U	208	1.100	U	182821404703A
Molybdenum	98	0.30	U	0.30	U	0.30	U	0.30	U	98	0.310	U	182821404703A

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ55

Method: MS
Run Name: 1828404E07
Calibration Date(s): 10/11/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121			0.29	U								
Arsenic	75			0.50	U								
Beryllium	9			0.073	U								
Cadmium	111			0.18	U								
Lead	208			0.14	U								
Molybdenum	98			0.30	U								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ55

Method: CV
Run Name: 1828401M09
Calibration Date(s): 10/11/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury		0.050	U	0.050	U	0.050	U	0.050	U		0.050	U	182810571305

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ55

Method: CV
Run Name: 1828401M09
Calibration Date(s): 10/11/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U	0.050	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ55

Instrument ID: 18255
Run Name: 1828407T73
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		477165	95.4						
Barium	0		0							
Boron	0		-9							
Calcium	500000		483383	96.7						
Chromium	0		0							
Cobalt	0		0							
Iron	200000		193773	96.9						
Lithium	0		-6							
Magnesium	500000		503996	100.8						
Selenium	0		4							
Thallium	0		12							

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ55

Instrument ID: 16417
Run Name: 1828504T72
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		495136	99.0						
Barium										
Boron										
Calcium	500000		495981	99.2						
Chromium										
Cobalt										
Iron	200000		192074	96.0						
Lithium										
Magnesium	500000		477936	95.6						
Selenium	0		36							
Thallium										

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ55

Instrument ID: 27813
Run Name: 1828404E07
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		104232	104.2		
Antimony	121	0		1			
Arsenic	75	0		1			
Beryllium	9	0		0			
Cadmium	111	0		0			
Calcium	44	300000		291435	97.1		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		244707	97.9		
Lead	208	0		1			
Magnesium	24	100000		98559	98.6		
Molybdenum	98	2000		2146	107.3		
Phosphorus	31	10000		NA			
Potassium	39	100000		103406	103.4		
Sodium	23	250000		241595	96.6		
Sulfur	34	10000		NA			
Titanium	47	2000		2068	103.4		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9834961BKG Matrix Spike Lab Sample ID: 9834961MS Matrix Spike Duplicate Lab Sample ID: 9834961MSD
Batch Number(s): 182831404402

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Barium		92.6600		2040.8900		2083.9000		2000.0000	2000.0000	UG/L	97		100		2		75 - 125	20	P
Boron		822.2800		2634.4500		2831.5500		2000.0000	2000.0000	UG/L	91		100		7		75 - 125	20	P
Calcium		110257.4400		107675.1900		112585.0000		4000.0000	4000.0000	UG/L	-65		58		4			20	P
Chromium		5.3000	U	182.8600		195.2600		200.0000	200.0000	UG/L	91		98		7		75 - 125	20	P
Cobalt		1.5000	U	500.5300		499.8600		500.0000	500.0000	UG/L	100		100		0		75 - 125	20	P
Lithium		11.0000	U	1028.7700		1021.4400		1000.0000	1000.0000	UG/L	103		102		1		75 - 125	20	P
Selenium		21.0000	U	93.3400		130.7600		150.0000	150.0000	UG/L	62	N	87		33	*	75 - 125	20	P
Thallium		14.0000	U	126.7000		146.2700		150.0000	150.0000	UG/L	84		98		14		75 - 125	20	P

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9834968BKG Matrix Spike Lab Sample ID: 9834968MS Matrix Spike Duplicate Lab Sample ID: 9834968MSD
Batch Number(s): 182810571305

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Mercury		0.0500	U	0.8574		0.8727		1.0000	1.0000	UG/L	86		87		2		75 - 125	20	CV

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5B
POST DIGEST SPIKE SAMPLE RECOVERY
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9834961BKG

Analyte	Mass	Sample Result(SR)	C	Spike Added(SA)	Spiked Sample Result(SSR)	C	SRR %R	Spiked Sample Duplicate(SSD)	C	SSD %R	M
Selenium		21.0000	U	800.0000	763.7600		95	NA	U	NA	P

Comments:

Note: Results shown are reported on an as-received basis.

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9834961BKG Duplicate Lab Sample ID: 9834961DUP
Batch Number(s): 182831404402
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Barium			92.6600		91.0400		2		P
Boron			822.2800		821.3400		0		P
Calcium			110257.4400		110048.5800		0		P
Chromium			5.3000	U	5.3000	U			P
Cobalt			1.5000	U	1.5000	U			P
Lithium			11.0000	U	11.0000	U			P
Selenium			-28.3300	B	21.0000	U	-200		P
Thallium			14.0000	U	14.0000	U			P

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9834968BKG Duplicate Lab Sample ID: 9834968DUP
Batch Number(s): 182810571305
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury			0.0500	U	0.0500	U			CV

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	FLAGS:
AF = Cold Vapor Atomic Fluorescence	* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 7
LABORATORY CONTROL SAMPLE
SDG No.: GEJ55
Matrix: WATER

Analyte	Mass	Batch Number	Units	True	Found	C	Control Limits (%)	%R	M	In Spec
Antimony	121	182821404703	UG/L	6.000	5.962		80 - 120	99	MS	Yes
Arsenic	75	182821404703	UG/L	10.000	9.533		80 - 120	95	MS	Yes
Barium		182831404402	UG/L	2000.000	2036.820		80 - 120	102	P	Yes
Beryllium	9	182821404703	UG/L	4.000	3.822		80 - 120	96	MS	Yes
Boron		182831404402	UG/L	2000.000	1959.590		80 - 120	98	P	Yes
Cadmium	111	182821404703	UG/L	5.000	4.541		80 - 120	91	MS	Yes
Calcium		182831404402	UG/L	4000.000	3982.040		80 - 120	100	P	Yes
Chromium		182831404402	UG/L	200.000	197.290		80 - 120	99	P	Yes
Cobalt		182831404402	UG/L	500.000	503.130		80 - 120	101	P	Yes
Lead	208	182821404703	UG/L	15.000	14.555		80 - 120	97	MS	Yes
Lithium		182831404402	UG/L	1000.000	991.120		80 - 120	99	P	Yes
Mercury		182810571305	UG/L	1.000	0.905		80 - 120	91	CV	Yes
Molybdenum	98	182821404703	UG/L	50.000	47.637		80 - 120	95	MS	Yes
Selenium		182831404402	UG/L	150.000	142.700		80 - 120	95	P	Yes
Thallium		182831404402	UG/L	150.000	159.260		80 - 120	106	P	Yes

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: *39159BKG Serial Dilution Lab Sample ID: *39159L
Batch Number(s): 182821404703
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Antimony	121	0.4060	U	2.0300	U			MS
Arsenic	75	1.6349	B	3.4000	U	100		MS
Beryllium	9	0.0910	U	0.4550	U			MS
Cadmium	111	0.1510	U	0.7550	U			MS
Lead	208	1.0700	U	5.3500	U			MS
Molybdenum	98	0.4753	B	1.5450	U	100		MS

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ55
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9834961BKG Serial Dilution Lab Sample ID: 9834961L
Batch Number(s): 182831404402
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Barium		92.6600		90.6500		2		P
Boron		822.2800		820.8000		0		P
Calcium		110257.4400		104894.3500		5		P
Chromium		5.3000	U	26.5000	U			P
Cobalt		1.5000	U	7.5000	U			P
Lithium		11.0000	U	55.0000	U			P
Selenium		21.0000	U	105.0000	U			P
Thallium		14.0000	U	70.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

Method: P
Instrument ID: 16417
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium			
Boron			
Calcium			
Chromium			
Cobalt			
Lithium			
Selenium	196.09		5.8
Thallium			

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Instrument ID: 18255
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium	455.40		0.33
Boron	249.67		8.4
Calcium	317.93		33.4
Chromium	267.72		0.55
Cobalt	228.62		0.40
Lithium	670.78		5.3
Selenium	196.09		9.2
Thallium	190.86		3.1

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Instrument ID: 27813
Date: 09/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony	121		0.29
Arsenic	75		0.50
Beryllium	9		0.073
Cadmium	111		0.18
Lead	208		0.14
Molybdenum	98		0.30

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Instrument ID: 23283
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Mercury			0.050

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ55
Matrix: WATER

Method: P
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium	455.40		5.0	1.0
Boron	249.67		50.0	12.0
Calcium	317.93		500	33.0
Chromium				
Cobalt	228.62		5.0	1.5
Lithium	670.78		50.0	11.0
Selenium				
Thallium				

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ55
Matrix: WATER

Method: P
Date: 09/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium				
Boron				
Calcium				
Chromium	267.72		15.0	5.3
Cobalt				
Lithium				
Selenium	196.09		50.0	21.0
Thallium	190.86		30.0	14.0

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ55
Matrix: WATER

Method: MS
Date: 09/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony	121		2.0	0.41
Arsenic	75		2.0	0.68
Beryllium	9		0.50	0.091
Cadmium	111		1.0	0.15
Lead	208		3.0	1.1
Molybdenum	98		2.0	0.31

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ55
Matrix: WATER

Method: CV
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Mercury			0.20	0.050

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

US EPA Tune Check Report

Operator Name	US19_USR_INS27814
Acq/Data Batch	D:\Agilent\ICPMH\1\DATA\EPA_Tune.b
Acq. Date-Time	2018-10-11 09:04:35
Report Comment	---
Instrument Name	G8403A SG18254097

[No Gas]

Sensitivity

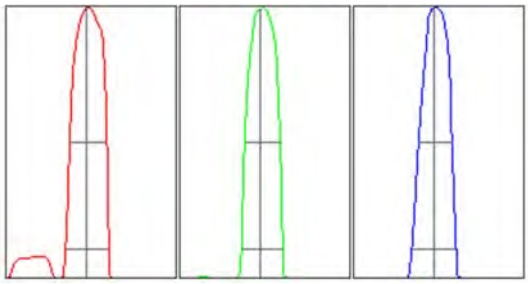
Mass	Conc. [ug/l]	Count	CPS	Resp (Required) [cps/ug/l]	Resp (Flag)	RSD%	RSD% (Required)
7	10.00	737	7367.31			0.501	5.000
89	10.00	4621	46211.75			0.434	5.000
205	10.00	2371	23710.24			0.506	5.000

Mass	RSD% (Flag)
7	
89	
205	

Mass	Rep#1 Count	Rep#2 Count	Rep#3 Count	Rep#4 Count	Rep#5 Count
7	735	742	740	734	733
89	4640	4622	4629	4587	4627
205	2373	2361	2359	2373	2389

Integration Time [sec] 0.1

Resolution/Axis



Mass	Peak Height	Axis	Axis (Required)	Axis (Flag)
7	1157.58	6.95	6.90 - 7.10	
89	7640.81	88.95	88.90 - 89.10	
205	4103.95	204.95	204.90 - 205.10	

Mass	W-50%	W-10%	W-10% (Required)	W-10% (Flag)
7	0.66	0.765	0.800	
89	0.64	0.731	0.800	
205	0.60	0.780	0.800	

Integration Time [sec] 0.1

Acquisition Time [sec] 113.7

Y Axis Linear

US EPA Tune Check Report

Tune Parameters

Plasma Parameters

Plasma Mode	---	Nebulizer Gas	0.65 L/min	Dilution Gas	0.45 L/min
RF Power	1550 W	Option Gas	---	Auxiliary Gas	0.90 L/min
RF Matching	1.10 V	Nebulizer Pump	0.10 rps	Plasma Gas	15.0 L/min
Sample Depth	10.0 mm	S/C Temp	2 °C		

Lens Parameters

Extract 1	0.0 V	Omega Lens	12.2 V	Deflect	15.8 V
Extract 2	-245.0 V	Cell Entrance	-38 V	Plate Bias	-50 V
Omega Bias	-85 V	Cell Exit	-60 V		

Cell Parameters

Use Gas	No	3rd Gas Flow	---	Energy Discrimination	5.0 V
He Flow	0.0 mL/min	OctP Bias	-8.0 V		
H2 Flow	0.0 mL/min	OctP RF	200 V		

QP Parameters

Mass Gain	124	Axis Gain	0.9993	QP Bias	-3.0 V
Mass Offset	124	Axis Offset	0.04		

Hardware Settings

Torch

Torch H	0.2 mm	Torch V	-0.2 mm		

EM

Discriminator	3.9 mV	Analog HV	2138 V	Pulse HV	1343 V

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ55

Instrument ID: 27813
Run Name: 1828404E07

Start Date: 10/11/2018
End Date: 10/11/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-3-209	PB	GE-1-72	BE
IN-3-115	AS,CD,MO,SB		

Lab Sample ID	Time	Internal Standards %RI For: Element GE-1-72	Q	Element IN-3-115	Q	Element BI-3-209	Q	Element	Q	Element	Q	Element	Q	Element	Q
S0	11:09	100		100		100									
S	11:11	107		101		103									
ICV	11:14	109		104		105									
ICB	11:16	104		101		102									
LLC	11:18	100		99		100									
ICSA	11:20	107		88		87									
LRS2	11:22	107		99		99									
LRS3	11:24	101		102		103									
CCS	11:26	110		102		105									
CCS	11:29	111		101		102									
CCV	11:31	110		101		101									
CCB	11:33	105		99		102									
P28204CB	11:35	105		102		101									
P28204CQ	11:37	112		89		90									
*39159BKG	11:39	113		101		103									
ZZZZZZ	11:41														
ZZZZZZ	11:44														
ZZZZZZ	11:46														
ZZZZZZ	11:48														
*39159L	11:50	113		104		106									
9834961	11:52	108		101		99									
CCV	11:54	94		98		100									
CCB	11:56	103		97		98									
9834962	11:59	105		101		97									
9834963	12:01	110		102		100									
9834964	12:03	95		101		102									
9834965	12:05	111		110		108									
9834966	12:07	108		114		116									
9834967	12:09	122	R	107		106									
9834968	12:11	114		102		87									
9834969	12:14	96		96		79									
9834970	12:16	91		104		86									

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ55

Instrument ID: 27813
Run Name: 1828404E07

Start Date: 10/11/2018
End Date: 10/11/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-3-209	PB	GE-1-72	BE
IN-3-115	AS,CD,MO,SB		

Lab Sample ID	Time	Internal Standards %RI For: Element GE-1-72	Q	Element IN-3-115	Q	Element BI-3-209	Q	Element	Q	Element	Q	Element	Q	Element	Q
CCV	12:18	120		116		104									
CCB	12:20	115		115		103									
9834971	12:22	105		110		97									
ZZZZZZ	12:24														
ZZZZZZ	12:27														
ZZZZZZ	12:29														
ZZZZZZ	12:31														
ZZZZZZ	12:33														
ZZZZZZ	12:35														
ZZZZZZ	12:37														
ZZZZZZ	12:39														
CCV	12:42	106		101		92									
CCB	12:44	97		96		90									

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

Preparation and Run Logs

Metals in Liquid

Method: P
Batch Number: 182831404402

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9834962	10/11/2018	50.00	50
9834963	10/11/2018	50.00	50
9834964	10/11/2018	50.00	50
9834965	10/11/2018	50.00	50
9834966	10/11/2018	50.00	50
9834967	10/11/2018	50.00	50
9834968	10/11/2018	50.00	50
9834969	10/11/2018	50.00	50
9834970	10/11/2018	50.00	50
9834971	10/11/2018	50.00	50
9834961BKG	10/11/2018	25.00	25
9834961DUP	10/11/2018	25.00	25
9834961MSD	10/11/2018	25.00	25
9834961MS	10/11/2018	25.00	25
P28304BB	10/11/2018	50.00	50
P28304BQ	10/11/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: MS
Batch Number: 182821404703

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9834961	10/10/2018	50.00	50
9834962	10/10/2018	50.00	50
9834963	10/10/2018	50.00	50
9834964	10/10/2018	50.00	50
9834965	10/10/2018	50.00	50
9834966	10/10/2018	50.00	50
9834967	10/10/2018	50.00	50
9834968	10/10/2018	50.00	50
9834969	10/10/2018	50.00	50
9834970	10/10/2018	50.00	50
9834971	10/10/2018	50.00	50
*39159BKG	10/10/2018	50.00	50
P28204CB	10/10/2018	50.00	50
P28204CQ	10/10/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: CV
Batch Number: 182810571305

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9834961	10/10/2018	40.00	40
9834962	10/10/2018	40.00	40
9834963	10/10/2018	40.00	40
9834964	10/10/2018	40.00	40
9834965	10/10/2018	20.00	20
9834966	10/10/2018	40.00	40
9834967	10/10/2018	40.00	40
9834969	10/10/2018	40.00	40
9834970	10/10/2018	40.00	40
9834971	10/10/2018	40.00	40
9834968BKG	10/10/2018	40.00	40
9834968DUP	10/10/2018	40.00	40
9834968MSD	10/10/2018	40.00	40
9834968MS	10/10/2018	40.00	40
P28171EB	10/10/2018	40.00	40
P28171EQ	10/10/2018	1.00	1

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ55

Method: P
Instrument ID: 18255
Run Name: 1828407T73

Run Start Date: 10/11/2018
Run End Date: 10/11/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ55

Method: P
Instrument ID: 18255
Run Name: 1828407T73

Run Start Date: 10/11/2018
Run End Date: 10/11/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
CCV	1.00	18:39			X		X		X	X	X		X			X	X																								
CCB	1.00	18:41			X		X		X	X	X		X			X	X																								
ZZZZZZ	1.00	18:44																																							
ZZZZZZ	1.00	18:46																																							
ZZZZZZ	1.00	18:49																																							
ZZZZZZ	1.00	18:52																																							
ZZZZZZ	1.00	18:54																																							
ZZZZZZ	1.00	18:57																																							
ZZZZZZ	1.00	18:59																																							
9834961DA	1.00	19:02														X																									
CCV	1.00	19:04			X		X		X		X		X			X	X																								
CCB	1.00	19:07			X		X		X		X		X			X	X																								

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- A = Post Digest Spike
- L = Serial Dilution
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ55

Method: P
Instrument ID: 16417
Run Name: 1828504T72

Run Start Date: 10/12/2018
Run End Date: 10/12/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ55

Method: MS
Instrument ID: 27813
Run Name: 1828404E07

Run Start Date: 10/11/2018
Run End Date: 10/11/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ55

Method: MS
Instrument ID: 27813
Run Name: 1828404E07

Run Start Date: 10/11/2018
Run End Date: 10/11/2018

Lab Sample ID	D/F	Time	Analytes																																			
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																						
ZZZZZZ	1.00	12:31																																					
ZZZZZZ	1.00	12:33																																					
ZZZZZZ	1.00	12:35																																					
ZZZZZZ	1.00	12:37																																					
ZZZZZZ	1.00	12:39																																					
CCV	1.00	12:42	X	X		X		X				X			X																								
CCB	1.00	12:44	X	X		X		X				X			X																								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ55

Method: CV
Instrument ID: 23283
Run Name: 1828401M09

Run Start Date: 10/11/2018
Run End Date: 10/11/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ55

Method: CV
Instrument ID: 23283
Run Name: 1828401M09

Run Start Date: 10/11/2018
Run End Date: 10/11/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
ZZZZZZ	1.00	07:50																																							
ZZZZZZ	1.00	07:52																																							
ZZZZZZ	1.00	07:54																																							
ZZZZZZ	1.00	07:56																																							
ZZZZZZ	1.00	07:58																																							
ZZZZZZ	1.00	08:00																																							
ZZZZZZ	1.00	08:02																																							
CCV	1.00	08:04												X																											
CCB	1.00	08:06												X																											
ZZZZZZ	1.00	08:08																																							
ZZZZZZ	1.00	08:10																																							
ZZZZZZ	1.00	08:12																																							
ZZZZZZ	1.00	08:15																																							
P28171EB	1.00	08:17												X																											
P28171EQ	1.00	08:19												X																											
9834968BKG	1.00	08:21												X																											
9834968DUP	1.00	08:23												X																											
9834968MS	1.00	08:25												X																											
9834968MSD	1.00	08:27												X																											
CCV	1.00	08:29												X																											
CCB	1.00	08:31												X																											
9834961	1.00	08:33												X																											
9834962	1.00	08:35												X																											
9834963	1.00	08:37												X																											
9834964	1.00	08:39												X																											
9834965	1.00	08:41												X																											
9834966	1.00	08:43												X																											
9834967	1.00	08:45												X																											
9834969	1.00	08:47												X																											
9834970	1.00	08:49												X																											
9834971	1.00	08:51												X																											
CCV	1.00	08:53												X																											
CCB	1.00	08:55												X																											

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Instrumental Wet Chemistry Data

Case Narrative/Conformance Summary

Instrumental Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

Sample #	Client ID	Matrix Liquid	Solid	Comments
9834961	MW-6	X		
9834962	MW-5	X		
9834963	MW-9	X		
9834964	MW-7	X		
9834965	MW-8	X		
9834966	FB-20181001	X		Field Blank
9834967	FB-20181002	X		Field Blank
9834968	MW-1	X		
9834969	MW-2	X		
9834970	MW-4	X		
9834971	MW-3	X		

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Matrix QC may not be included if site-specific QC were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, laboratory spike data (LCS) are provided.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

SAMPLE ANALYSIS:

Samples	Chloride	Fluoride	Sulfate
9834961	DF500	DF5	DF5
9834962	DF500	DF5	DF5
9834963	DF500	DF5	DF5
9834964	DF5	DF5	DF5
9834965	DF500	DF5	DF5
9834966	DF1	DF1	DF1
9834967	DF1	DF1	DF1
9834968	DF1000	DF5	DF50
9834969	DF1000	DF5	DF5
9834970	DF1000	DF5	DF50
9834971	DF500	DF5	DF10

No problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

Quality Control and Calibration Summary Forms

Instrumental Wet Chemistry

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Quality Control Reference List
Instrumental Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

Fraction: Instrumental Wet Chemistry

Batch Number	Sample Number	Analysis Date	Chloride	Fluoride	Sulfate
18284837115A	9834961	10/11/2018 22:06:00		X	X
	9834961	10/11/2018 22:23:00	X		
	9834962	10/11/2018 22:40:00		X	X
	9834962	10/11/2018 22:56:00	X		
	P28437OB	10/11/2018 18:29:00	X	X	X
	P28437OQ	10/11/2018 18:12:00	X	X	X
18284837115B	9834963	10/12/2018 00:36:00		X	X
	9834963	10/12/2018 00:53:00	X		
	9834964	10/12/2018 01:10:00	X	X	X
	9834965	10/12/2018 01:43:00		X	X
	9834965	10/12/2018 02:00:00	X		
	9834966	10/12/2018 02:17:00	X	X	X
	9834967	10/12/2018 02:33:00	X	X	X
	9834968	10/12/2018 02:50:00		X	
	9834968	10/12/2018 03:40:00			X
	9834968	10/12/2018 14:09:00	X		
	9834969	10/12/2018 04:14:00		X	X
	9834969	10/12/2018 14:26:00	X		
	9834970	10/12/2018 04:47:00		X	
	9834970	10/12/2018 05:04:00			X
	9834970	10/12/2018 14:43:00	X		
	9834971	10/12/2018 05:37:00		X	
	9834971	10/12/2018 05:54:00	X		
	9834971	10/12/2018 15:00:00			X

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Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: GEJ55
Matrix: LIQUID

Fraction: Instrumental Wet Chemistry

18284837115A / P28437OB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	10/11/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	10/11/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	10/11/18	N.D.	mg/l	0.30	1.0

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Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ55
Matrix: LIQUID

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

LCS: P28437OQ	Batch: **18284837115A** (Sample number(s): 9834961-9834962) Batch: **18284837115B** (Sample number(s): 9834963-9834971)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.84	NA	95	NA	90-110	NA	NA
Fluoride	IC	0.750	0.674	NA	90	NA	90-110	NA	NA
Sulfate	IC	7.50	6.80	NA	91	NA	90-110	NA	NA

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Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis/Anion Scan

SDG: GEJ55

Instrument ID: 12115
Calibration Date: 09/29/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	1.037403	2.041477	5.219284	10.851470	17.490093	0.9954	0.9977
Fluoride	0.236313	0.925457	2.418468	5.136735	8.442792	0.9965	0.9983
Sulfate	0.625176	1.274492	3.246368	6.855216	11.396219	0.9963	0.9981

Concentration units: mg/L

Batch Numbers: 18284837115A, 18284837115B
Run Start Dates: 10/11/2018
Run Names: 1828401D15

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.9780	99	7.5	7.4559	99	0.75	0.7456	99
ICB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9206	97	7.5	7.1218	95	0.75	0.7066	94
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9443	98	7.5	7.2257	96	0.75	0.7136	95
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9770	99	7.5	7.3930	99	0.75	0.7566	101
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0806	103	7.5	7.4216	99	0.75	0.7815	104
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0425	101	7.5	7.5011	100	0.75	0.7769	104
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9781	99	7.5	7.3087	97			
CCB	0	ND	NA	0	ND	NA			
CCV2	3	2.7871	93	7.5	7.1807	96			
CCB	0	ND	NA	0	ND	NA			

* = Out of Specifications

Fraction: Instrumental Wet Chemistry

00224: Chloride Analyte Name	Default MDL	Default LOQ	Units
Chloride	0.20	0.40	mg/l

01504: Fluoride Analyte Name	Default MDL	Default LOQ	Units
Fluoride	0.050	0.10	mg/l

00228: Sulfate Analyte Name	Default MDL	Default LOQ	Units
Sulfate	0.30	1.0	mg/l

Wet Chemistry Data

Case Narrative/Conformance Summary

Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

Water Quality

Fraction: Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	DF	Comments
9834961	MW-6	X		1	
9834962	MW-5	X		1	
9834963	MW-9	X		1	
9834964	MW-7	X		1	
9834965	MW-8	X		1	
9834966	FB-20181001	X		1	Field Blank
9834967	FB-20181002	X		1	Field Blank
9834968	MW-1	X		1	
9834969	MW-2	X		1	
9834970	MW-4	X		1	
9834971	MW-3	X		1	

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

Sample Duplicate

Method defined actions are taken for any failed matrix QC.

Batch#: 18278921201A (Sample number(s): 9834968-9834970, UNSPK: 9834970, BKG: 9834970)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Total Dissolved Solids

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

Water Quality

Fraction: Wet Chemistry

SAMPLE ANALYSIS:

(Sample number(s): 9834962: Analysis: 00212)
This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 2,900 mg/L result. We are reporting the result obtained within the holding time.

(Sample number(s): 9834961: Analysis: 00212)
This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 1,510 mg/L result. We are reporting the result obtained within the holding time.

(Sample number(s): 9834963: Analysis: 00212)
This sample's TDS prescreen led to aliquot selection that yielded a weight of dried residue over the method's 200 mg limit. We reanalyzed on 10/11/18, three days past the holding time, using a smaller sample aliquot that yielded dried residue under 200 mg and a 1,410 mg/L result. We are reporting the result obtained within the holding time.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

QC Summary

Wet Chemistry

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

Fraction: Wet Chemistry

Analysis	Batch Number	Sample Number	Analysis Date
Total Dissolved Solids	18277921203A	B277873B	10/04/2018 23:15
		L277873Q	10/04/2018 23:15
		9834961	10/04/2018 23:15
		9834962	10/04/2018 23:15
		9834963	10/04/2018 23:15
		9834964	10/04/2018 23:15
		9834965	10/04/2018 23:15
		9834966	10/04/2018 23:15
Total Dissolved Solids	18278921201A	B278871B	10/05/2018 16:27
		L278871Q	10/05/2018 16:27
		9834968	10/05/2018 16:26
		9834969	10/05/2018 16:26
		9834970 UNSPK/BKG	10/05/2018 16:26
		9834970 MS,DUP	10/05/2018 16:27
Total Dissolved Solids	18278921204A	B278874B	10/05/2018 23:55
		L278874Q	10/05/2018 23:55
		9834967	10/05/2018 23:55
		9834971	10/05/2018 23:55

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ55

Fraction: Wet Chemistry

Batch Number	Sample Number	Analysis Date	pH	Temperature of pH
18277004207A	9834963	10/05/2018 10:14:00	X	X
	9834964	10/05/2018 10:10:00	X	X
	9834965	10/05/2018 09:39:00	X	X
	9834966	10/05/2018 10:03:00	X	X
	9834967	10/05/2018 09:43:00	X	X
	9834968	10/05/2018 10:07:00	X	X
	9834969	10/05/2018 09:47:00	X	X
	9834970	10/05/2018 09:51:00	X	X
	9834971	10/05/2018 09:59:00	X	X
	P004207Q	10/05/2018 08:40:00	X	
18277004208A	9834961	10/05/2018 10:41:00	X	X
	9834962	10/05/2018 10:44:00	X	X
	P004208Q	10/05/2018 10:22:00	X	

Quality Control Summary
Method Blank
Water Quality
SDG: GEJ55
Matrix: LIQUID

Fraction: Wet Chemistry

18277921203A / B277873B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	10/04/18	N.D.	mg/l	20.0	60.0

18278921201A / B278871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	10/05/18	N.D.	mg/l	20.0	60.0

18278921204A / B278874B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	10/05/18	N.D.	mg/l	20.0	60.0

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Quality Control Summary
Matrix Spike/Matrix Spike Duplicate

SDG: GEJ55
Matrix: LIQUID

Water Quality
Fraction: Wet Chemistry

UNSPK: 9834970 MS: 9834970	Batch: **18278921201A** (Sample number(s): 9834968-9834970)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	4000	6800.	11810.	NA	125	NA	62-127	NA	NA

Comments:
(2) The unspiked sample result is greater than four times the spike added.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

BKG: 9834970 DUP: 9834970 **Parameter**	Batch: **18278921201A** (Sample number(s): 9834968-9834970) **ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	6800.	8350.	20*	5

Comments:
(1) The sample and/or duplicate result is less than five times the LOQ.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

LCS: P004207Q	Batch: **18277004207A** (Sample number(s): 9834963-9834971)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.04	NA	101	NA	95-105	NA	NA

LCS: P004208Q	Batch: **18277004208A** (Sample number(s): 9834961-9834962)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.01	NA	100	NA	95-105	NA	NA

LCS: L277873Q	Batch: **18277921203A** (Sample number(s): 9834961-9834966)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	196	NA	98	NA	62-127	NA	NA

LCS: L278871Q	Batch: **18278921201A** (Sample number(s): 9834968-9834970)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	193	NA	97	NA	62-127	NA	NA

LCS: L278874Q	Batch: **18278921204A** (Sample number(s): 9834967, 9834971)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	203	NA	102	NA	62-127	NA	NA

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LOQ/MDL Summary
Water Quality

SDG: GEJ55

Fraction: Wet Chemistry

12152: pH Analyte Name	Default MDL	Default LOQ	Units
pH	0.010	0.010	Std. Units

12151: Temperature of pH Analyte Name	Default MDL	Default LOQ	Units
Temperature of pH	0.010	0.010	Degrees C

00212: Total Dissolved Solids Analyte Name	Default MDL	Default LOQ	Units
Total Dissolved Solids	20.0	60.0	mg/l

GEL Laboratories LLC
a member of The GEL Group INC

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October 31, 2018

Ms. Hannah Cottman
Eurofins Lancaster Laboratories
2425 New Holland Pike
P.O. Box 12425
Lancaster, Pennsylvania 17601-5994

Re: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603
Work Order: 461032

Dear Ms. Cottman:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 05, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4289.

Sincerely,

Katelyn Gray for
Julie Robinson
Project Manager

Purchase Order: GELP15-0603
Chain of Custody: 1994404
Enclosures

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Case Narrative

Eurofins Lancaster Laboratories
Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603
SDG: 461032

Receipt Narrative
for
Eurofins Lancaster Laboratories
SDG: 461032

October 31, 2018

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 05, 2018 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

Laboratory ID	Client ID
461032001	MW-6
461032002	MW-5
461032003	MW-9
461032004	MW-7
461032005	MW-8
461032006	FB-20181001
461032007	FB-20181002
461032008	MW-1
461032009	MW-2
461032010	MW-4
461032011	MW-3

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Katelyn Gray for
Julie Robinson
Project Manager

Chain of Custody and Supporting Documentation

4601032

Environmental Analysis Request/Chain of Custody

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Acct. # _____ Group # 1994404 Sample # 9834972-82

Subcontractor: GEL			
Project Name/#: 1994404	Site ID #:		
Requestor Hannah Cottman	P.O. #: NA		
Sampler:	PWSID #:		
Phone #: 717-656-2300 Ext 1896	Quote #:		
State where samples were collected: NJ	For Compliance: Yes ☑ No ☐		

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water	Ground	Potable	Surface	NPDES	Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod)	Remarks
														Preservation: None	None		
MW-6	10/1/2018	1130	X					X						2	X	X	9834972
MW-5	10/1/2018	1110	X					X						2	X	X	9834973
MW-9	10/1/2018	1310	X					X						2	X	X	9834974
MW-7	10/1/2018	1440	X					X						2	X	X	9834975
MW-8	10/1/2018	1450	X					X						2	X	X	9834976
FB-20181001	10/1/2018	1200	X					X						2	X	X	9834977
FB-20181002	10/2/2018	1200	X					X						2	X	X	9834978
MW-1	10/2/2018	1005	X					X						2	X	X	9834979
MW-2	10/2/2018	0955	X					X						2	X	X	9834980
MW-4	10/2/2018	1140	X					X						2	X	X	9834981
MW-3	10/2/2018	1205	X					X						2	X	X	9834982

For Lab Use Only

SF #: _____

SCR #: _____

Preservation Codes

H = HCl T = Thiosulfate

N = HNO_3 B = NaOH

S = H_2SO_4 P = H_3PO_4

F = Field Filtered O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐

(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: **Presrvation Needed**

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: ENVsubcontracting@EurofinsUS.com

Phone: 717-656-2300 Ext 1896

Data Package Options (please check if required) ☐ Level IV DOD

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NJ DKQP ☑ NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: HazSite EDD

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	10-4-18	1645	[signature]	10.5.18	0850
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: LANC	**SDG/AR/COC/Work Order:** 461032
Received By: LM	**Date Received:** 10/5/18
Carrier and Tracking Number	Circle Applicable: ~~FedEx Express~~ FedEx Ground UPS Field Services Courier Other 5035 4245 1987 21°C 5035 4245 1998 21°C

Suspected Hazard Information	Yes	No	
		✓	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 (CPM) / mR/Hr **Classified as: Rad 1 Rad 2 Rad 3**
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice (None) Other: *all temperatures are recorded in Celsius TEMP: See above
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR3-18 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: If Preservation added, Lot#: All Samples need Preservative
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials KG Date 10/8/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

Laboratory Certifications

List of current GEL Certifications as of 31 October 2018

State	Certification
Alaska	17−018
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122018−1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	9904
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−18−13
Utah NELAP	SC000122018−27
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Eurofins Lancaster Laboratories (LEANC)
SDG #: 461032

Product: **GFPC, Ra228, Liquid**
Analytical Method: EPA 904.0/SW846 9320 Modified
Analytical Procedure: GL-RAD-A-063 REV# 2
Analytical Batch: 1810350

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
461032001	MW-6
461032002	MW-5
461032003	MW-9
461032004	MW-7
461032005	MW-8
461032006	FB-20181001
461032007	FB-20181002
461032008	MW-1
461032009	MW-2
461032010	MW-4
461032011	MW-3
1204131260	Method Blank (MB)
1204131261	461024001(NonSDG) Sample Duplicate (DUP)
1204131262	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Lucas Cell, Ra226, liquid**
Analytical Method: EPA 903.1 Modified
Analytical Procedure: GL-RAD-A-008 REV# 15
Analytical Batch: 1810045

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
461032001	MW-6
461032002	MW-5
461032003	MW-9
461032004	MW-7
461032005	MW-8

461032006	FB-20181001
461032007	FB-20181002
461032008	MW-1
461032009	MW-2
461032010	MW-4
461032011	MW-3
1204130612	Method Blank (MB)
1204130613	461032001(MW-6) Sample Duplicate (DUP)
1204130614	461032001(MW-6) Matrix Spike (MS)
1204130615	461032001(MW-6) Matrix Spike Duplicate (MSD)
1204130616	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204130614 (MW-6MS) and 1204130615 (MW-6MSD), aliquots were reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report
for

LANC001 Eurofins Lancaster Laboratories

Client SDG: 461032 GEL Work Order: 461032

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria
** Analyte is a Tracer compound
U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: Theresa L Austin **Name: Theresa Austin**

Date: 31 OCT 2018 **Title: Group Leader**

Sample Data Summary

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
P.O. Box 12425
Lancaster, Pennsylvania 17601-5994

Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-6
Sample ID: 461032001
Matrix: Water
Collect Date: 01-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	-0.339	+/-0.900	1.75	+/-0.900	3.00	pCi/L			JXC9	10/17/18	0937	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		7.72	+/-1.10	0.381	+/-1.86	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	93.6	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Company : Eurofins Lancaster Laboratories
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Lancaster, Pennsylvania 17601-5994

Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-5
Sample ID: 461032002
Matrix: Water
Collect Date: 01-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	-0.0263	+/-0.841	1.59	+/-0.841	3.00	pCi/L			JXC9	10/17/18	0937	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		5.02	+/-0.955	0.617	+/-1.30	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	91.3	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-9
Sample ID: 461032003
Matrix: Water
Collect Date: 01-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.239	+/-0.788	1.44	+/-0.791	3.00	pCi/L			JXC9	10/17/18	0937	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.87	+/-0.600	0.366	+/-0.747	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	88.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-7
Sample ID: 461032004
Matrix: Water
Collect Date: 01-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.455	+/-0.594	1.02	+/-0.607	3.00	pCi/L			JXC9	10/17/18	0937	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		9.21	+/-1.24	0.406	+/-1.82	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	99.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Lancaster, Pennsylvania 17601-5994

Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-8
Sample ID: 461032005
Matrix: Water
Collect Date: 01-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.355	+/-0.591	1.04	+/-0.599	3.00	pCi/L			JXC9	10/17/18	0938	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		72.8	+/-3.52	0.591	+/-17.7	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	98.6	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: FB-20181001
Sample ID: 461032006
Matrix: Water
Collect Date: 01-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.217	+/-0.658	1.21	+/-0.660	3.00	pCi/L			JXC9	10/17/18	0938	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.169	+/-0.234	0.405	+/-0.237	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	98.3	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: FB-20181002
Sample ID: 461032007
Matrix: Water
Collect Date: 02-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	1.30	+/-0.869	1.31	+/-0.939	3.00	pCi/L			JXC9	10/17/18	0938	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.00	+/-0.246	0.531	+/-0.246	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	85.1	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

GEL LABORATORIES LLC

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
P.O. Box 12425
Lancaster, Pennsylvania 17601-5994

Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-1
Sample ID: 461032008
Matrix: Water
Collect Date: 02-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.928	+/-0.659	0.977	+/-0.706	3.00	pCi/L			JXC9	10/17/18	0938	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		9.90	+/-1.47	0.673	+/-2.10	1.00	pCi/L			PCW	10/11/18	0635	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	91.1	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

GEL LABORATORIES LLC
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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
P.O. Box 12425
Lancaster, Pennsylvania 17601-5994

Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-2
Sample ID: 461032009
Matrix: Water
Collect Date: 02-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		3.81	+/-1.15	1.34	+/-1.55	3.00	pCi/L			JXC9	10/17/18	0938	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		4.70	+/-0.884	0.618	+/-1.20	1.00	pCi/L			PCW	10/11/18	0725	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	89.5	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
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Lancaster, Pennsylvania 17601-5994

Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-4
Sample ID: 461032010
Matrix: Water
Collect Date: 02-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	1.11	+/-1.17	1.95	+/-1.21	3.00	pCi/L			JXC9	10/17/18	0938	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.92	+/-0.614	0.587	+/-0.678	1.00	pCi/L			PCW	10/11/18	0725	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	70.1	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
P.O. Box 12425
Lancaster, Pennsylvania 17601-5994

Report Date: October 31, 2018

Contact: Ms. Hannah Cottman

Project: Radiochemistry Analyses Level V/4-file Equis EDD - GELP15-0603

Client Sample ID: MW-3
Sample ID: 461032011
Matrix: Water
Collect Date: 02-OCT-18
Receive Date: 05-OCT-18
Collector: Client

Project: LANC00216
Client ID: LANC001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	-0.28	+/-0.662	1.36	+/-0.662	3.00	pCi/L			JXC9	10/17/18	0938	1810350	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		2.68	+/-0.753	0.684	+/-0.909	1.00	pCi/L			PCW	10/11/18	0725	1810045	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1810350	95.2	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

Quality Control Summary

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Client : **Eurofins Lancaster Laboratories**
2425 New Holland Pike
P.O. Box 12425
Lancaster, Pennsylvania

Contact: **Ms. Hannah Cottman**

Workorder: **461032**

Parmname		NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gas Flow											
Batch	1810350										
QC1204131261	461024001 DUP										
Radium-228		U	0.266	U	-0.795	pCi/L	0		N/A	JXC9	10/17/1809:40
		Uncert:	+/-0.804		+/-0.780						
		TPU:	+/-0.807		+/-0.780						
QC1204131262	LCS										
Radium-228		17.2			15.4	pCi/L		89.8	(75%-125%)	JXC9	10/17/1809:40
		Uncert:			+/-1.98						
		TPU:			+/-4.64						
QC1204131260	MB										
Radium-228				U	0.716	pCi/L				JXC9	10/17/1809:40
		Uncert:			+/-0.831						
		TPU:			+/-0.854						
Rad Ra-226											
Batch	1810045										
QC1204130613	461032001 DUP										
Radium-226			7.72		8.13	pCi/L	5.25		(0%-20%)	PCW	10/11/1808:05
		Uncert:	+/-1.10		+/-1.14						
		TPU:	+/-1.86		+/-1.84						
QC1204130616	LCS										
Radium-226		26.0			25.7	pCi/L		98.9	(75%-125%)	PCW	10/11/1808:05
		Uncert:			+/-2.00						
		TPU:			+/-4.49						
QC1204130612	MB										
Radium-226				U	0.208	pCi/L				PCW	10/11/1808:05
		Uncert:			+/-0.250						
		TPU:			+/-0.252						
QC1204130614	461032001 MS										
Radium-226		130	7.72		120	pCi/L		86.1	(75%-125%)	PCW	10/11/1808:05
		Uncert:	+/-1.10		+/-9.47						
		TPU:	+/-1.86		+/-20.3						
QC1204130615	461032001 MSD										
Radium-226		130	7.72		116	pCi/L	3.2	83.2	(0%-20%)	PCW	10/11/1808:05
		Uncert:	+/-1.10		+/-9.39						
		TPU:	+/-1.86		+/-19.8						

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

** Analyte is a Tracer compound

< Result is less than value reported

QC Summary

Workorder: **461032**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time

>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
** Indicates analyte is a surrogate/tracer compound.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptence criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 1810350 Check-list

This check-list was completed on 17-OCT-18 by Kenshalla Oston

This batch was reviewed by Kenshalla Oston on 17-OCT-18 and Nat Long on 17-OCT-18.

Batch ID:	**Product:**	**Description:** Gas Flow Radium 228
1810350	GFC28RAL	GL-RAD-A-009

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium−228 in Liquid

Batch ID: **1810350**
Analyst: Jasmine Conley (JXC9)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL−RAD−A−063 REV# 2
Instrument: GFC−51204863

Due Dates for Lab: 29−OCT−2018 **Package: 31−OCT−2018** **SDG: 02−NOV−2018**

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1204131262	Radium−228 SPIKE	1810−A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Aliquot (mL)	Ac−228 Ingrow (date)	Ac−228 Separation (date)
1	461024001	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
2	461032001	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
3	461032002	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
4	461032003	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
5	461032004	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
6	461032005	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
7	461032006	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
8	461032007	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
9	461032008	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
10	461032009	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
11	461032010	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
12	461032011	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
13	461045001	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
14	1204131260 MB	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
15	1204131261 DUP (461024001)	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20
16	1204131262 LCS	11−OCT−2018	3	300	10/12/18 13:16	10/17/18 07:20

Reagent/Solvent Lot ID	Description	Amount
REGNT 2571685.11	2mL Cartridges	2 mL
REGNT 2662331.3	cerium 500 mg/L in 2%HCI	.2 mL
REGNT 2672182	RGF−1.5 Ammonium Sulfate	10 mL
REGNT 2801523.7	Hydrofluoric Acid Poly Bottle	3 mL
REGNT 2832203.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 2833686	RGF−7M Nitric Acid	25 mL
REGNT 2836171.10	HNO3	5 mL
REGNT 2838193	RGF−50% Potassium Carbonate	2 mL
REGNT 2840709	RGF−16mg/mL Barium Chloride	1 mL
REGNT 2841696	2M HCl	20 mL
REGNT 2843889	RGF−1M Citric Acid	5 mL
WORK 0487−D	Barium−133 TRACER	.1 mL

Comments:

Pipet Id: RAD−GFC−1795419
Data Entry Date2: 11−OCT−2018 00:00

Radium-228 Liquid

Filename : RA228.XLS
File type : Excel
Version # : 1.4.2

Tracer S/N : 0487-D
Tracer Exp Date : 11/8/2018
Tracer Volume Added: 0.10

Batch : 1810350
Analyst : JAS02031
Prep Date : 10/11/2018
Ra-228 Method Uncertainty : 0.1268

Geometry: CeF on 25mm Filter

Procedure Code : GFC28RAL
Parmname : Radium-228
Required MDA : 3 pCi/L
Ra-228 Abundance : 1.00
Halflife of Ra-228 : 5.75 years
Halflife of Ac-228 : 6.15 hours

Sample Characteristics					**Tracer Calculations**					
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	461024001.1	0.3000	1.8459E-05	10/4/2018 9:27	176.1	7.54%	160.5	7.89%	0.1	0.000200
2	461032001.1	0.3000	1.8459E-05	10/1/2018 11:30	176.1	7.54%	164.8	7.79%	0.1	0.000200
3	461032002.1	0.3000	1.8459E-05	10/1/2018 11:10	176.1	7.54%	160.7	7.89%	0.1	0.000200
4	461032003.1	0.3000	1.8459E-05	10/1/2018 13:10	176.1	7.54%	156.4	8.00%	0.1	0.000200
5	461032004.1	0.3000	1.8459E-05	10/1/2018 14:40	176.1	7.54%	175.8	7.54%	0.1	0.000200
6	461032005.1	0.3000	1.8459E-05	10/1/2018 14:50	176.1	7.54%	173.7	7.59%	0.1	0.000200
7	461032006.1	0.3000	1.8459E-05	10/1/2018 12:00	176.1	7.54%	173.0	7.60%	0.1	0.000200
8	461032007.1	0.3000	1.8459E-05	10/2/2018 12:00	176.1	7.54%	149.8	8.17%	0.1	0.000200
9	461032008.1	0.3000	1.8459E-05	10/2/2018 10:05	176.1	7.54%	160.5	7.89%	0.1	0.000200
10	461032009.1	0.3000	1.8459E-05	10/2/2018 9:55	176.1	7.54%	157.6	7.97%	0.1	0.000200
11	461032010.1	0.3000	1.8459E-05	10/2/2018 11:40	176.1	7.54%	123.5	9.00%	0.1	0.000200
12	461032011.1	0.3000	1.8459E-05	10/2/2018 12:05	176.1	7.54%	167.7	7.72%	0.1	0.000200
13	461045001.1	0.3000	1.8459E-05	10/4/2018 9:00	176.1	7.54%	79.6	11.21%	0.1	0.000200
14	1204131260.1	0.3000	1.8459E-05	10/11/2018 0:00	176.1	7.54%	153.4	8.07%	0.1	0.000200
15	1204131261.1	0.3000	1.8459E-05	10/4/2018 9:27	176.1	7.54%	159.6	7.92%	0.1	0.000200
16	1204131262.1	0.3000	1.8459E-05	10/11/2018 0:00	176.1	7.54%	154.2	8.05%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-063
Instrument SOP: GL-RAD-I-016

Count raw Data

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
1	6A	60	17	48	0.800	10/17/2018 9:37	10/12/2018 13:16	10/17/2018 7:20	0.996	0.772	1.000	1.057	91.2%	5.46%
2	6B	60	5	61	1.017	10/17/2018 9:37	10/12/2018 13:16	10/17/2018 7:20	0.995	0.772	1.000	1.057	93.6%	5.43%
3	6C	60	8	53	0.883	10/17/2018 9:37	10/12/2018 13:16	10/17/2018 7:20	0.995	0.772	1.000	1.057	91.3%	5.46%
4	7A	60	7	44	0.733	10/17/2018 9:37	10/12/2018 13:16	10/17/2018 7:20	0.995	0.772	1.000	1.057	88.8%	5.50%
5	7B	60	9	33	0.550	10/17/2018 9:37	10/12/2018 13:16	10/17/2018 7:20	0.995	0.772	1.000	1.057	99.8%	5.34%
6	7C	60	5	31	0.517	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.995	0.772	1.000	1.057	98.6%	5.36%
7	7D	60	12	35	0.583	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.995	0.771	1.000	1.057	98.3%	5.36%
8	8B	60	7	53	0.883	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.995	0.771	1.000	1.057	85.1%	5.57%
9	8C	60	9	33	0.550	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.995	0.771	1.000	1.057	91.1%	5.46%
10	9A	60	3	102	1.700	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.995	0.771	1.000	1.057	89.5%	5.49%
11	9B	60	3	64	1.067	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.995	0.771	1.000	1.057	70.1%	5.88%
12	9C	60	13	33	0.550	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.995	0.771	1.000	1.057	95.2%	5.40%
13	9D	60	14	39	0.650	10/17/2018 9:38	10/12/2018 13:16	10/17/2018 7:20	0.996	0.771	1.000	1.057	45.2%	6.76%
14	10A	60	5	47	0.783	10/17/2018 9:40	10/12/2018 13:16	10/17/2018 7:20	0.998	0.768	1.000	1.057	87.1%	5.53%
15	10B	60	4	42	0.700	10/17/2018 9:40	10/12/2018 13:16	10/17/2018 7:20	0.996	0.768	1.000	1.057	90.6%	5.47%
16	10C	60	3	283	4.717	10/17/2018 9:40	10/12/2018 13:16	10/17/2018 7:20	0.998	0.767	1.000	1.057	87.6%	5.52%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2017	5/31/2019	0.6547	0.02228	0.723	10/12/2018 15:04	1000
2	PIC	6/1/2017	5/31/2019	0.6465	0.00851	1.116	10/12/2018 15:04	1000
3	PIC	6/1/2017	5/31/2019	0.6594	0.01970	0.891	10/12/2018 15:04	1000
4	PIC	6/1/2017	5/31/2019	0.6570	0.00594	0.666	10/12/2018 15:05	1000
5	PIC	6/1/2017	5/31/2019	0.6688	0.00627	0.403	10/12/2018 15:05	1000
6	PIC	6/1/2017	5/31/2019	0.6600	0.00790	0.405	10/12/2018 15:05	1000
7	PIC	6/1/2017	5/31/2019	0.6352	0.01113	0.518	10/12/2018 15:05	1000
8	PIC	6/1/2017	5/31/2019	0.6773	0.02148	0.522	10/12/2018 15:05	1000
9	PIC	6/1/2017	5/31/2019	0.6559	0.01955	0.282	10/12/2018 15:05	1000
10	PIC	6/1/2017	5/31/2019	0.6688	0.00758	0.599	10/12/2018 15:05	1000
11	PIC	6/1/2017	5/31/2019	0.6716	0.00754	0.815	10/12/2018 15:06	1000
12	PIC	6/1/2017	5/31/2019	0.6373	0.00584	0.632	10/12/2018 15:06	1000
13	PIC	6/1/2017	5/31/2019	0.6494	0.02610	0.507	10/12/2018 15:06	1000
14	PIC	6/1/2017	5/31/2019	0.6554	0.00651	0.586	10/12/2018 15:06	1000
15	PIC	6/1/2017	5/31/2019	0.6461	0.00652	0.924	10/12/2018 15:06	1000
16	PIC	6/1/2017	5/31/2019	0.6584	0.00638	0.419	10/12/2018 15:06	1000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

* - RPD changed to 0% due to sample & dup activity below MDA

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1810-A
LCS Exp Date : 5/23/2019
LCS Activity (dpm/ml): 114.58
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.9110	0.6432	3	1.4594	**0.2664**	154.09%	0.0770	0.1186	0.8039	0.8073		SAMPLE				
2	1.1178	0.7892	3	1.7492	**-0.3394**	135.40%	-0.0993	0.1344	0.8999	0.9001		SAMPLE				
3	1.0041	0.7089	3	1.5895	**-0.0263**	1629.83%	-0.0077	0.1250	0.8412	0.8414		SAMPLE				
4	0.8956	0.6323	3	1.4417	**0.2386**	168.69%	0.0673	0.1135	0.7884	0.7911		SAMPLE				
5	0.6091	0.4301	3	1.0150	**0.4555**	66.76%	0.1470	0.0978	0.5941	0.6067		SAMPLE				
6	0.6262	0.4421	3	1.0431	**0.3548**	85.20%	0.1117	0.0950	0.5913	0.5990		SAMPLE				
7	0.7390	0.5217	3	1.2092	**0.2166**	154.99%	0.0653	0.1012	0.6576	0.6602		SAMPLE				
8	0.8035	0.5673	3	1.3141	**1.2976**	34.69%	0.3613	0.1235	0.8690	0.9393		SAMPLE				
9	0.5692	0.4019	3	0.9768	**0.9276**	36.73%	0.2680	0.0972	0.6594	0.7064		SAMPLE				
10	0.8286	0.5850	3	1.3428	**3.8061**	16.41%	1.1010	0.1701	1.1525	1.5473		SAMPLE				
11	1.2286	0.8674	3	1.9546	**1.1060**	54.50%	0.2517	0.1364	1.1745	1.2130		SAMPLE				
12	0.8399	0.5930	3	1.3565	**-0.2797**	120.84%	-0.0820	0.0990	0.6619	0.6620		SAMPLE				
13	1.5553	1.0980	3	2.5487	**1.0086**	74.82%	0.1430	0.1065	1.4721	1.5001		SAMPLE				
14	0.8607	0.6077	3	1.3969	**0.7165**	59.45%	0.1973	0.1168	0.8311	0.8536		MB				
15	1.0560	0.7456	3	1.6685	**-0.7946**	50.40%	-0.2240	0.1122	0.7802	0.7803	461024001.1	DUP	* 0.0%			
16	0.7206	0.5088	3	1.1973	**15.4494**	8.58%	4.2977	0.2811	1.9808	4.6367		LCS			17.2046	89.8%

ASSAY 12-Oct-18 16:05:37

Protocol	id	8	Ba-133
Time	limit		
Count	limit		
Isotope	Ba-133		
Protocol	date	10/12/2018	
Run	id.	1896	

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
1	97	1	180.03	613.6	176.08	7.54		04:05:37
2	97	2	180.04	566.9	160.5	7.89	91.15	04:08:51
3	97	3	180.06	579.77	164.77	7.79	93.58	04:12:05
4	97	4	180.06	567.6	160.71	7.89	91.27	04:15:19
5	97	5	180.04	554.65	156.41	8	88.83	04:19:01
1	87	1	180.03	612.6	175.75	7.54	99.81	04:22:45
2	87	2	180.03	606.39	173.68	7.59	98.64	04:25:59
3	87	3	180.06	604.48	173	7.6	98.25	04:29:12
4	87	4	180.04	534.68	149.76	8.17	85.05	04:32:26
5	87	5	180.04	566.88	160.49	7.89	91.15	04:35:41
1	92	1	180.03	558.19	157.61	7.97	89.51	04:39:25
2	92	2	180.06	455.9	123.49	9	70.13	04:42:38
3	92	3	180.06	588.48	167.67	7.72	95.22	04:45:52
4	92	4	180.04	324.05	79.56	11.21	45.18	04:49:06
5	92	5	180.06	545.53	153.36	8.07	87.10	04:52:21
1	70	1	180.06	564.22	159.59	7.92	90.63	04:56:04
2	70	2	180.04	548.14	154.24	8.05	87.60	04:59:18

END OF ASSAY

1810350.xls

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
461024001	6A	60	17	48	10/17/2018 9:37	10/17/2018 10:37	PIC	1810350
461032001	6B	60	5	61	10/17/2018 9:37	10/17/2018 10:37	PIC	1810350
461032002	6C	60	8	53	10/17/2018 9:37	10/17/2018 10:37	PIC	1810350
461032003	7A	60	7	44	10/17/2018 9:37	10/17/2018 10:37	PIC	1810350
461032004	7B	60	9	33	10/17/2018 9:37	10/17/2018 10:37	PIC	1810350
461032005	7C	60	5	31	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
461032006	7D	60	12	35	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
461032007	8B	60	7	53	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
461032008	8C	60	9	33	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
461032009	9A	60	3	102	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
461032010	9B	60	3	64	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
461032011	9C	60	13	33	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
461045001	9D	60	14	39	10/17/2018 9:38	10/17/2018 10:38	PIC	1810350
1204131260	10A	60	5	47	10/17/2018 9:40	10/17/2018 10:40	PIC	1810350
1204131261	10B	60	4	42	10/17/2018 9:40	10/17/2018 10:40	PIC	1810350
1204131262	10C	60	3	283	10/17/2018 9:40	10/17/2018 10:40	PIC	1810350

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 17-Oct-2018

Detectors LB4100 A1 through J4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100C1	need 2nd	Beta bkg	17-Oct 06:18	60	1.783	1.035	1.925	+2.04
LB4100C4	Above	Beta bkg	17-Oct 06:18	60	6.800	0.686	2.113	+22.70
LB4100E2	Above	Beta bkg	17-Oct 06:01	60	2.567	0.261	3.241	+1.64
LB4100E3	Above	Beta bkg	17-Oct 06:01	60	2.700	0.473	2.078	+5.33
LB4100G2	Above	Alpha XTalk	17-Oct 05:42	5	0.800	0.256	0.413	+17.79
LB4100G2	Above	Beta bkg	17-Oct 06:01	60	2940	0.414	2.180	+9,984.83
LB4100G2	Above	Beta eff	17-Oct 05:52	5	21800	15140	19980	+5.26
LB4100H2	Above	Beta bkg	17-Oct 07:16	60	3.000	-1.72E+0	4.379	+1.64
LB4100I2	Above	Beta bkg	17-Oct 05:43	60	3.250	-1.65E+1	28.950	-0.39
LB4100I3	Above	Beta bkg	17-Oct 05:43	60	2.617	-5.60E-1	3.474	+1.72
LB4100J3	Below	Alpha eff	17-Oct 07:03	5	19860	20390	22910	-4.26
PIC1A	Above	Alpha bkg	17-Oct 05:36	60	0.317	-4.72E-2	0.399	+1.90
PIC4D	Below	Alpha XTalk	17-Oct 05:44	5	0.249	0.256	0.273	-5.28
PIC5D	Above	Beta bkg	17-Oct 07:00	60	2.233	0.019	2.073	+3.47
PIC8A	Above	Beta XTalk	17-Oct 07:10	5	3.03E-4	5.74E-5	2.92E-4	+3.29
PIC12D	need 2nd	Beta bkg	17-Oct 05:17	60	1.483	0.504	1.615	+2.29

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100B1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100B2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100B3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100B4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC3A	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC6D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

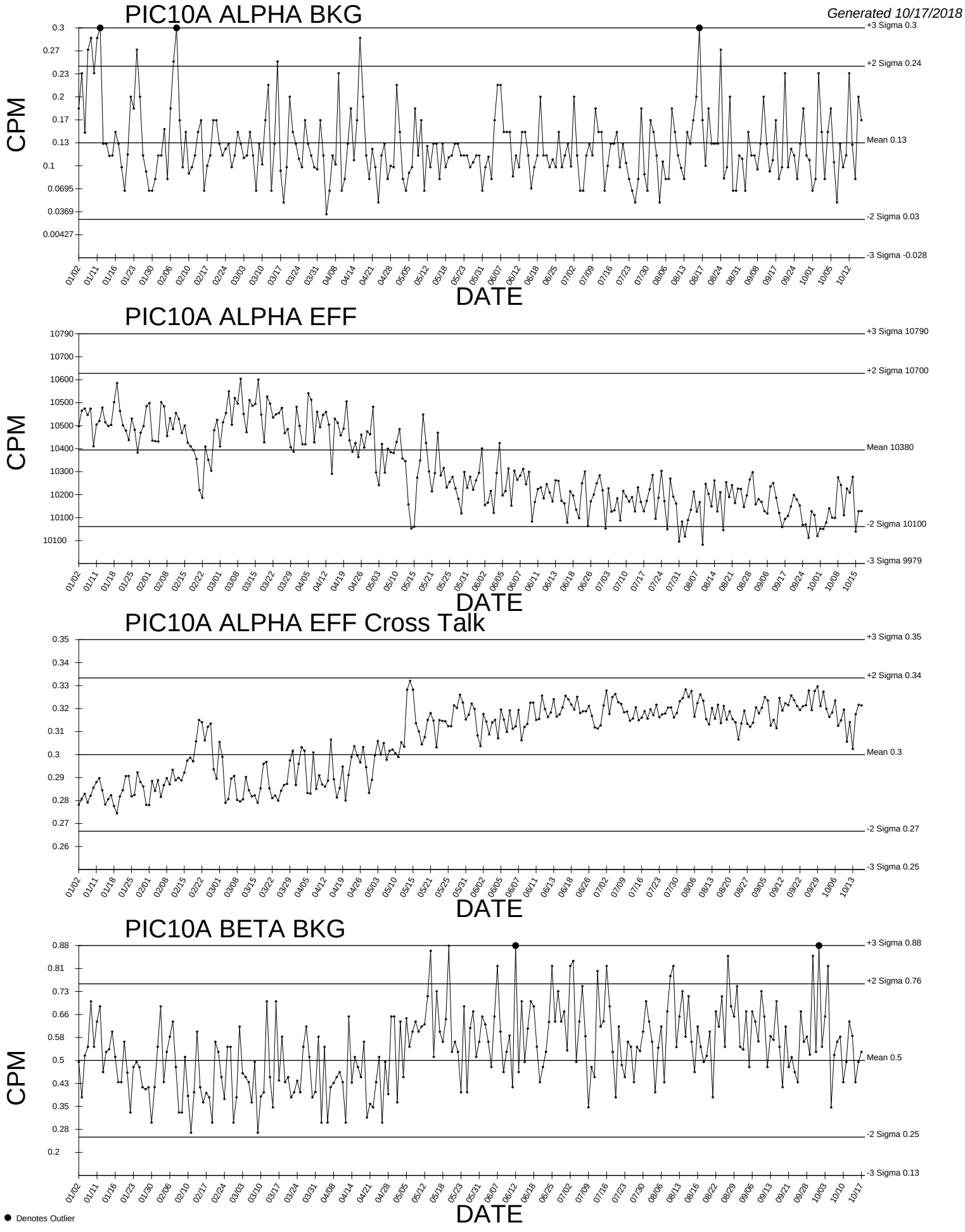
PIC13C Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

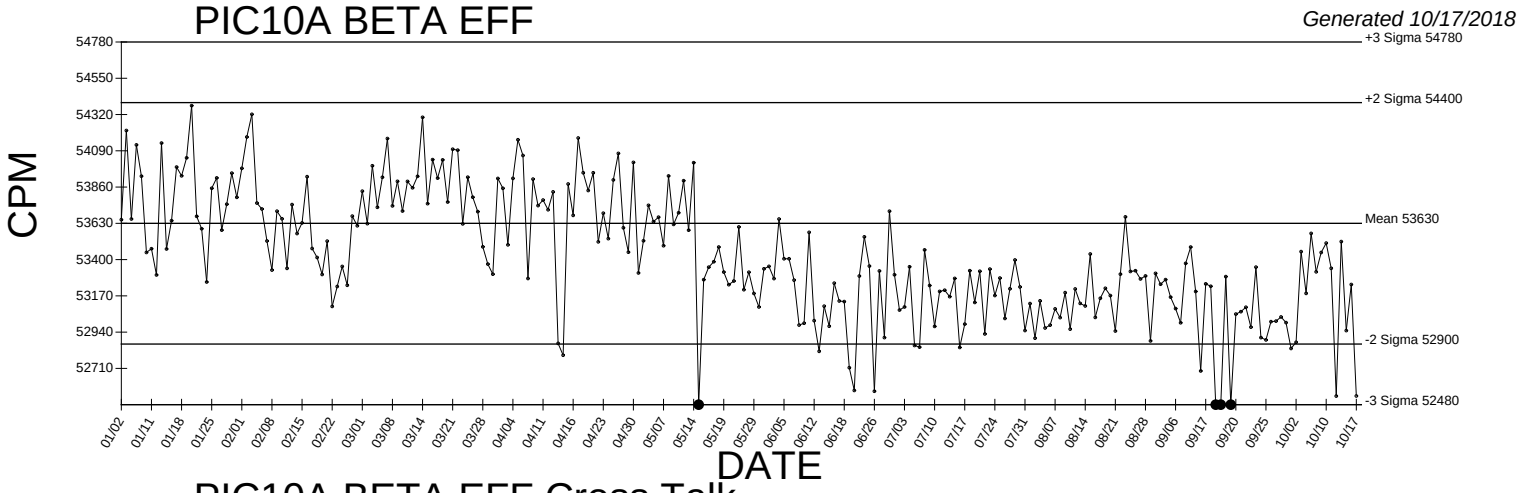
Reviewed by R. Brink-Hammen

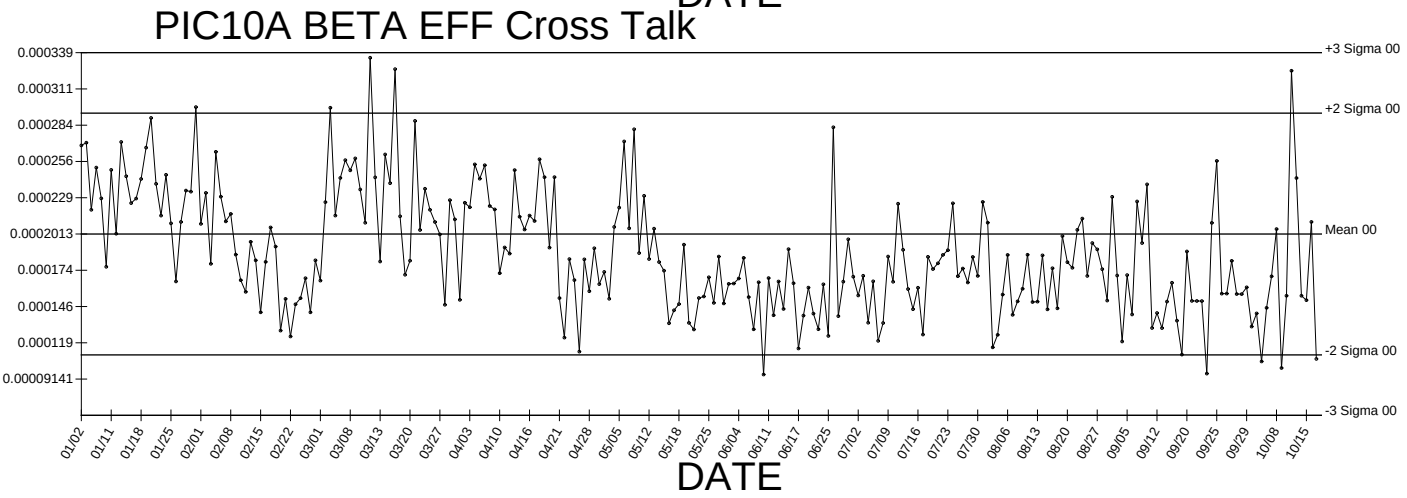
Date 10-17-18

GEL Laboratories LLC

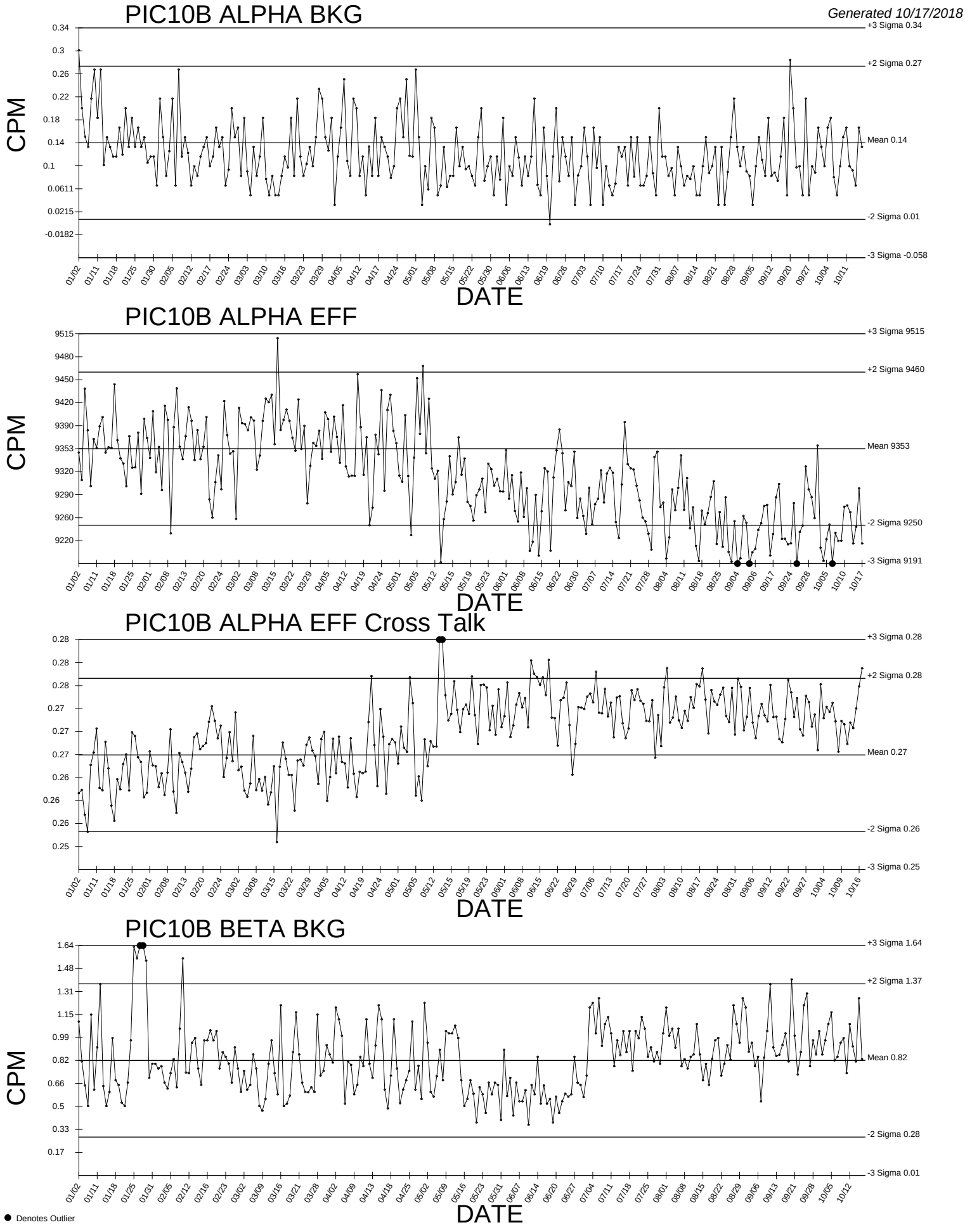
Background and Efficiency Data

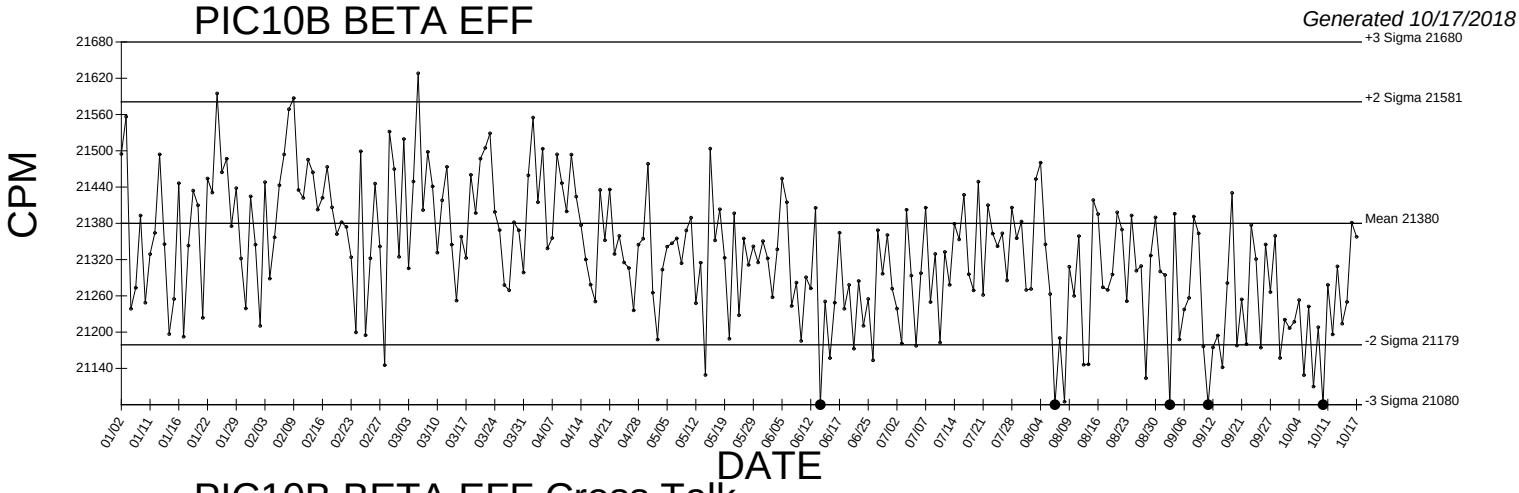

PIC10A ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.3
+2 Sigma 0.24
Mean 0.13
-2 Sigma 0.03
-3 Sigma -0.028
PIC10A ALPHA EFF
+3 Sigma 10790
+2 Sigma 10700
Mean 10380
-2 Sigma 10100
-3 Sigma 9979
PIC10A ALPHA EFF Cross Talk
+3 Sigma 0.35
+2 Sigma 0.34
Mean 0.3
-2 Sigma 0.27
-3 Sigma 0.25
PIC10A BETA BKG
+3 Sigma 0.88
+2 Sigma 0.76
Mean 0.5
-2 Sigma 0.25
-3 Sigma 0.13
Denotes Outlier

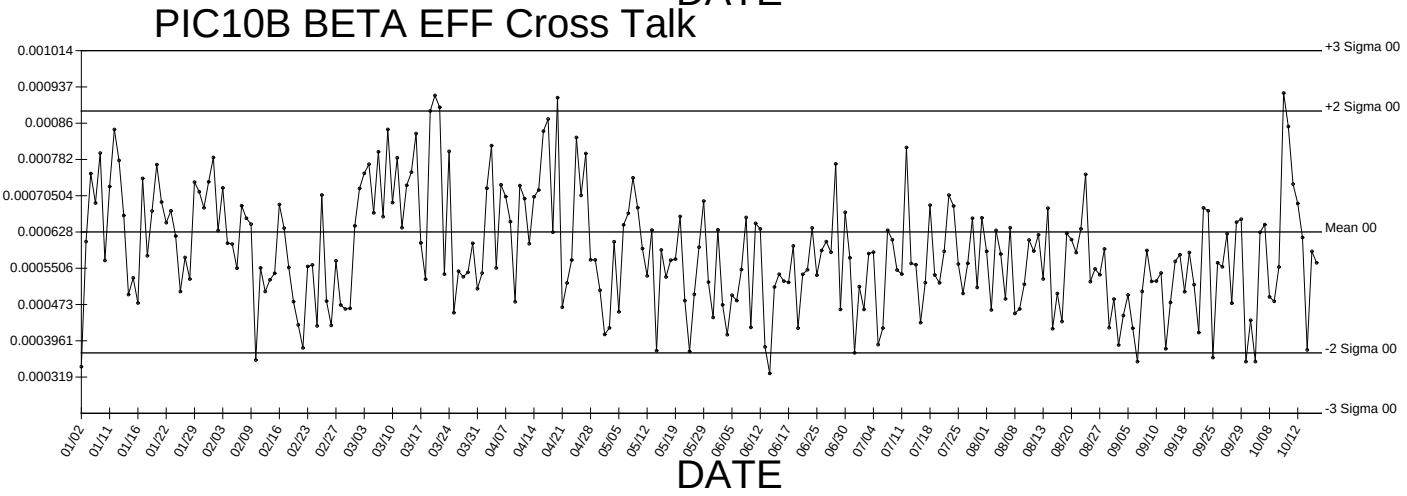




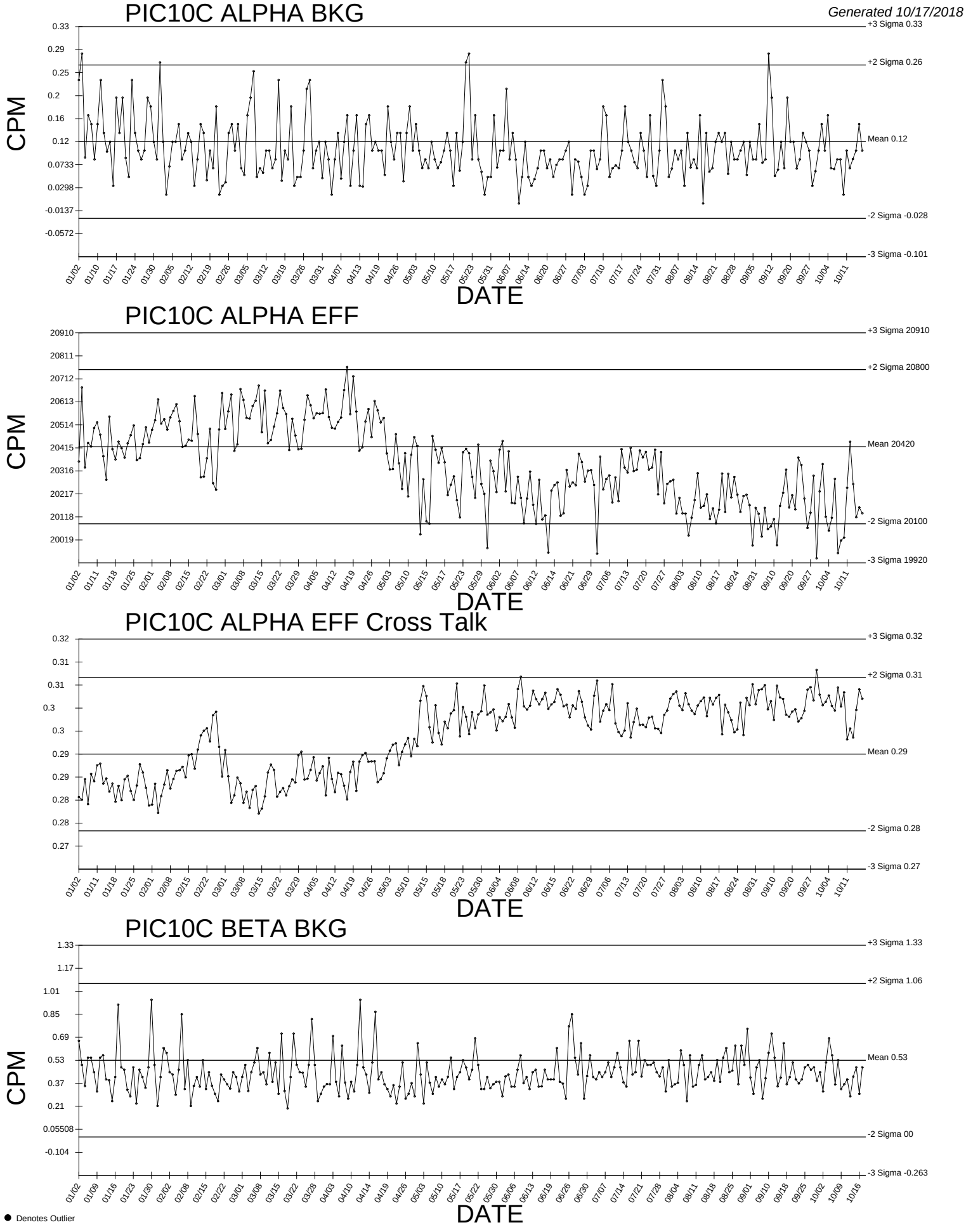
● Denotes Outlier

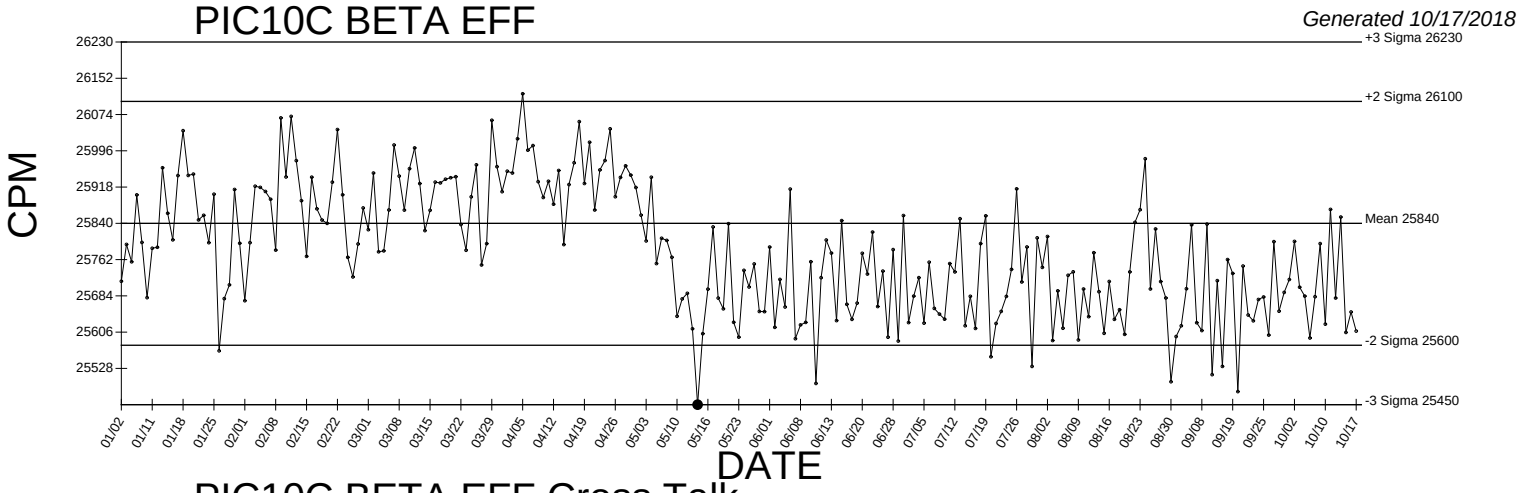

PIC10B ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.34
+2 Sigma 0.27
Mean 0.14
-2 Sigma 0.01
-3 Sigma -0.058
PIC10B ALPHA EFF
+3 Sigma 9515
+2 Sigma 9460
Mean 9353
-2 Sigma 9250
-3 Sigma 9191
PIC10B ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
PIC10B BETA BKG
+3 Sigma 1.64
+2 Sigma 1.37
Mean 0.82
-2 Sigma 0.28
-3 Sigma 0.01
● Denotes Outlier

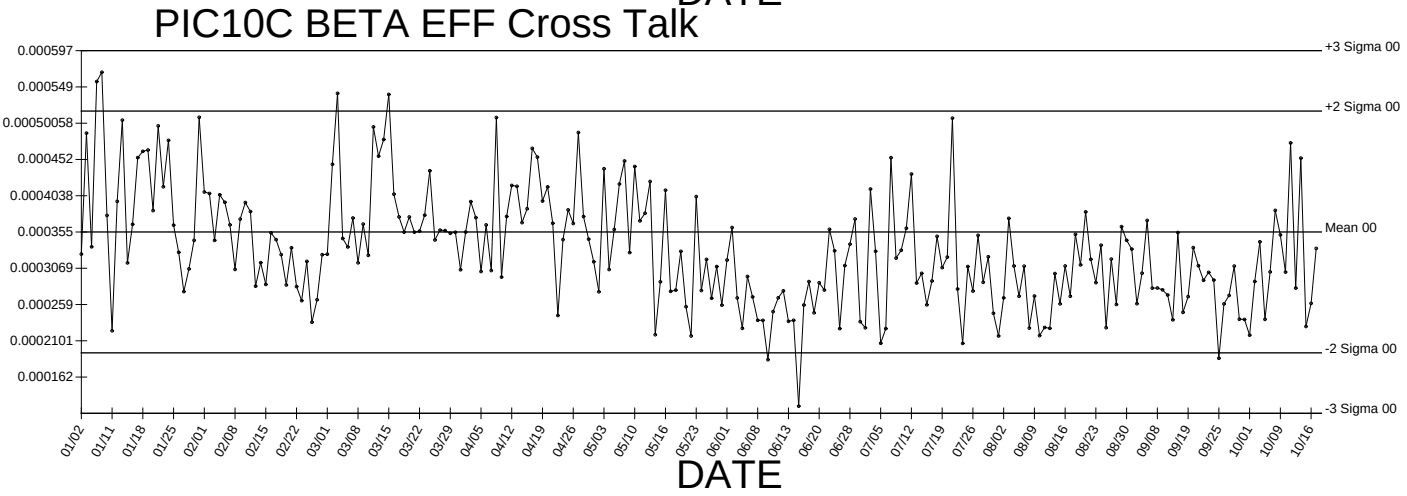




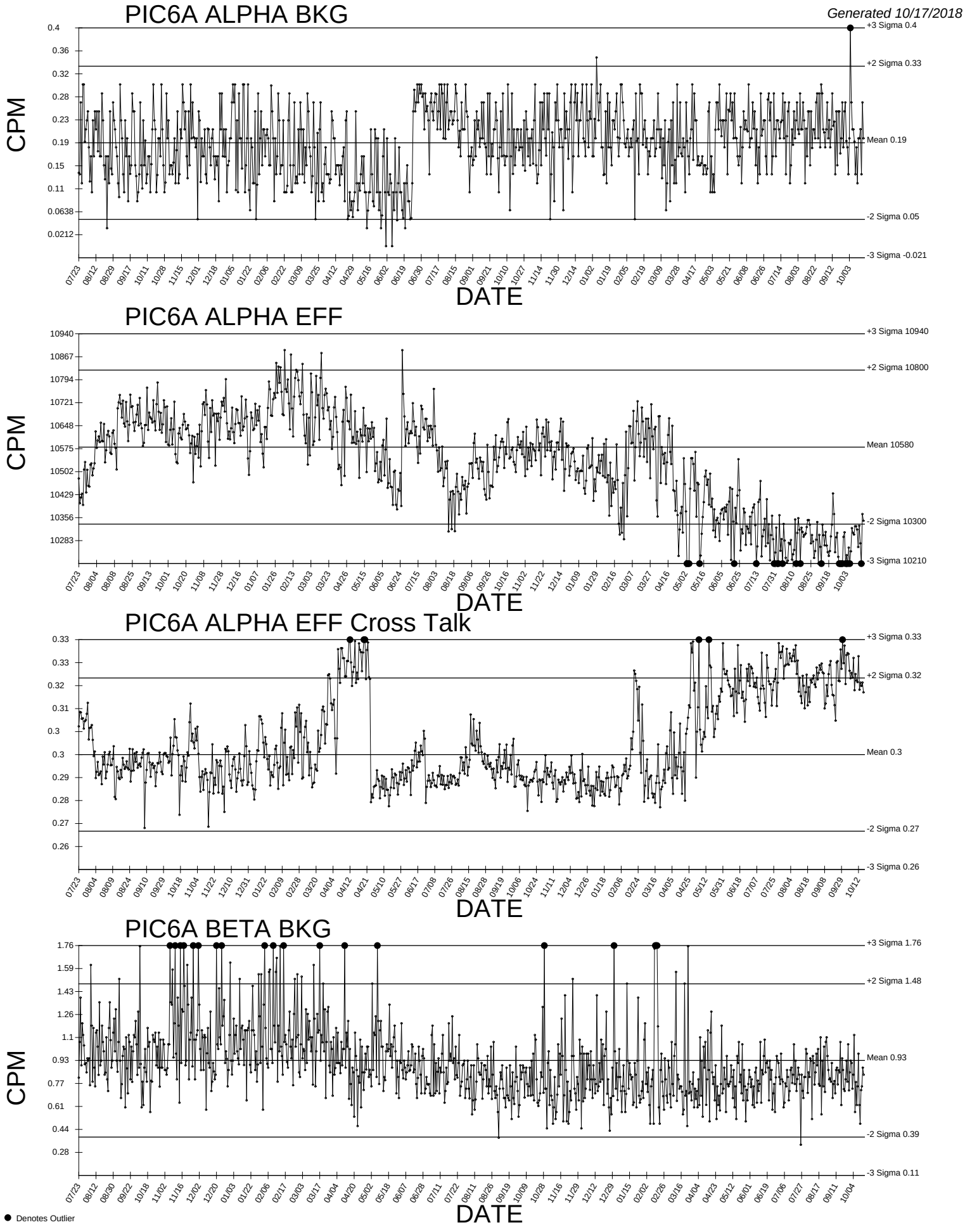
● Denotes Outlier

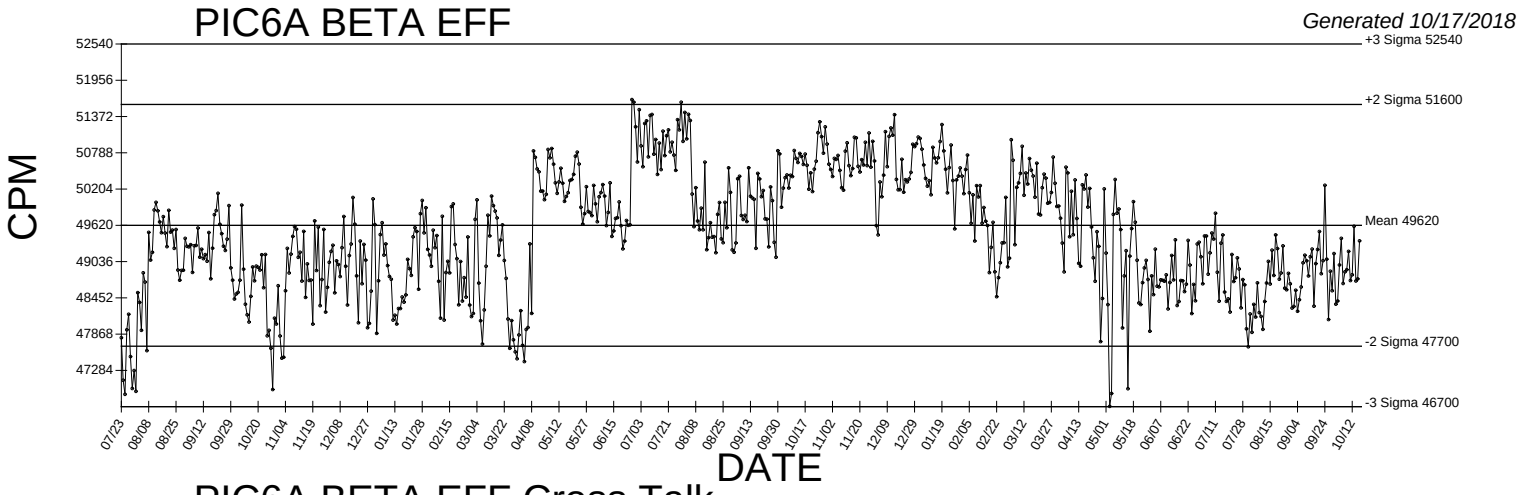

PIC10C ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.33
+2 Sigma 0.26
Mean 0.12
-2 Sigma -0.028
-3 Sigma -0.101
PIC10C ALPHA EFF
+3 Sigma 20910
+2 Sigma 20800
Mean 20420
-2 Sigma 20100
-3 Sigma 19920
PIC10C ALPHA EFF Cross Talk
+3 Sigma 0.32
+2 Sigma 0.31
Mean 0.29
-2 Sigma 0.28
-3 Sigma 0.27
PIC10C BETA BKG
+3 Sigma 1.33
+2 Sigma 1.06
Mean 0.53
-2 Sigma 00
-3 Sigma -0.263
Denotes Outlier

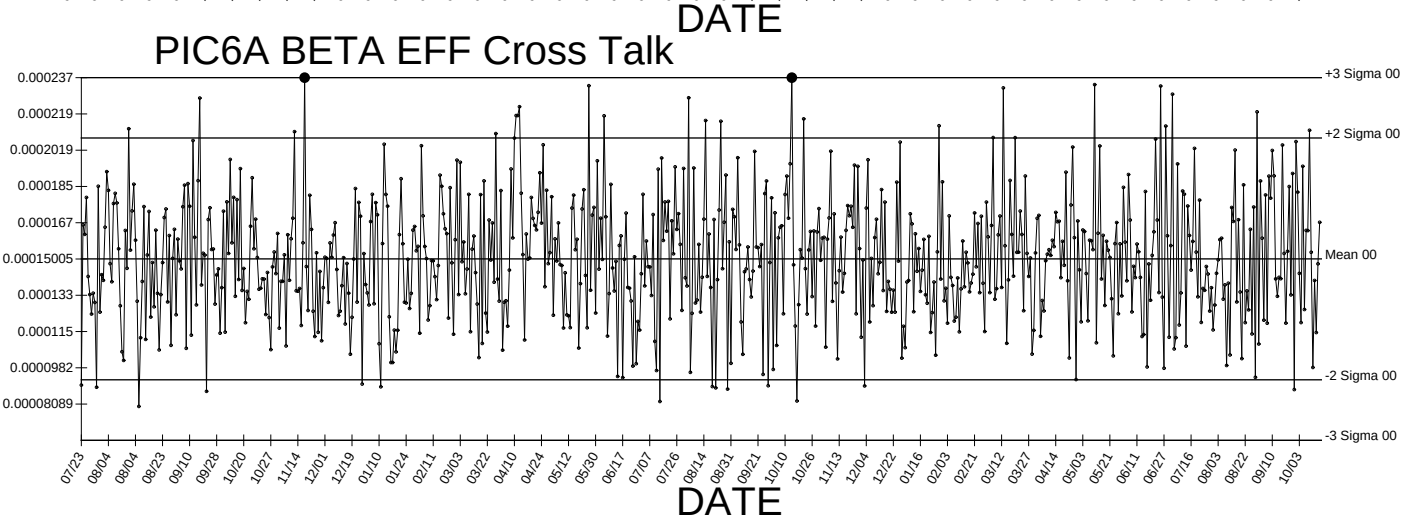




● Denotes Outlier

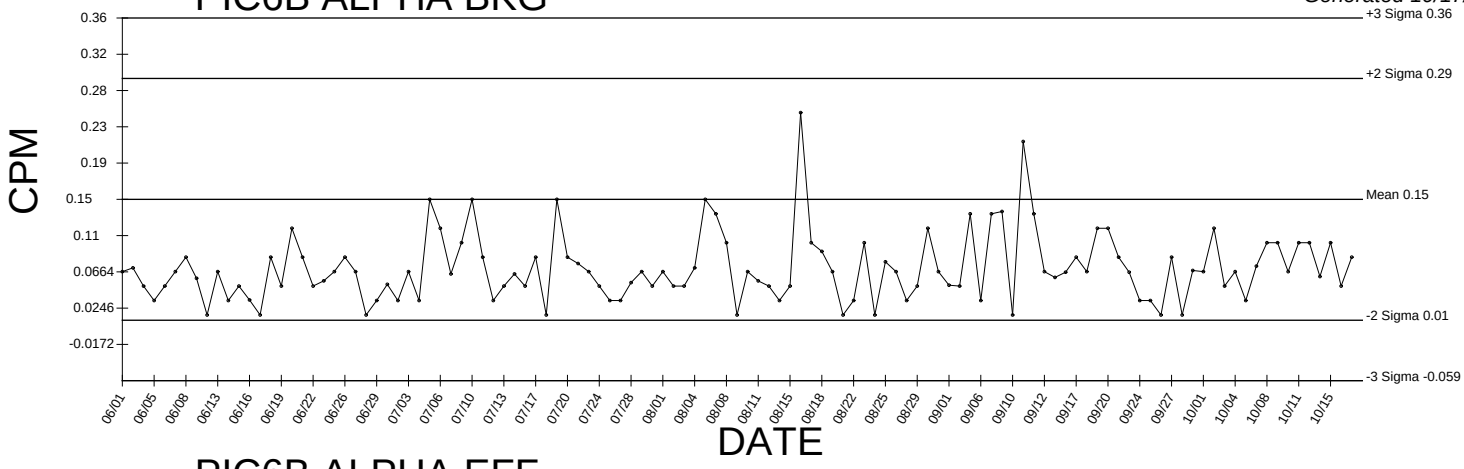

PIC6A ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.4
+2 Sigma 0.33
Mean 0.19
-2 Sigma 0.05
-3 Sigma -0.021
PIC6A ALPHA EFF
+3 Sigma 10940
+2 Sigma 10800
Mean 10580
-2 Sigma 10300
-3 Sigma 10210
PIC6A ALPHA EFF Cross Talk
+3 Sigma 0.33
+2 Sigma 0.32
Mean 0.3
-2 Sigma 0.27
-3 Sigma 0.26
PIC6A BETA BKG
+3 Sigma 1.76
+2 Sigma 1.48
Mean 0.93
-2 Sigma 0.39
-3 Sigma 0.11
Denotes Outlier



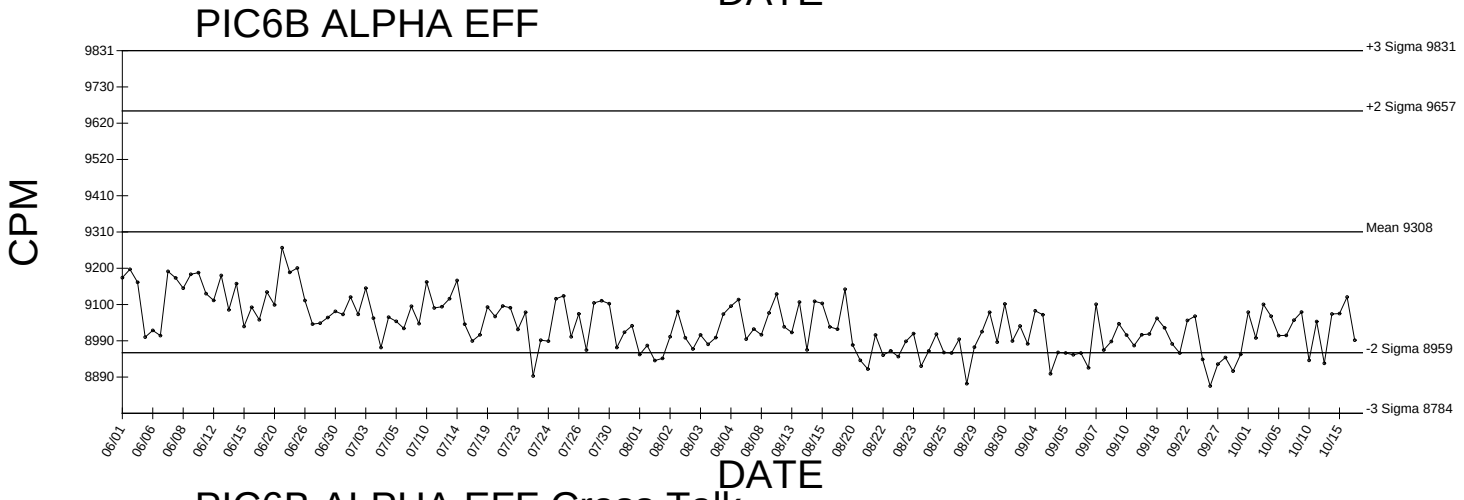


● Denotes Outlier

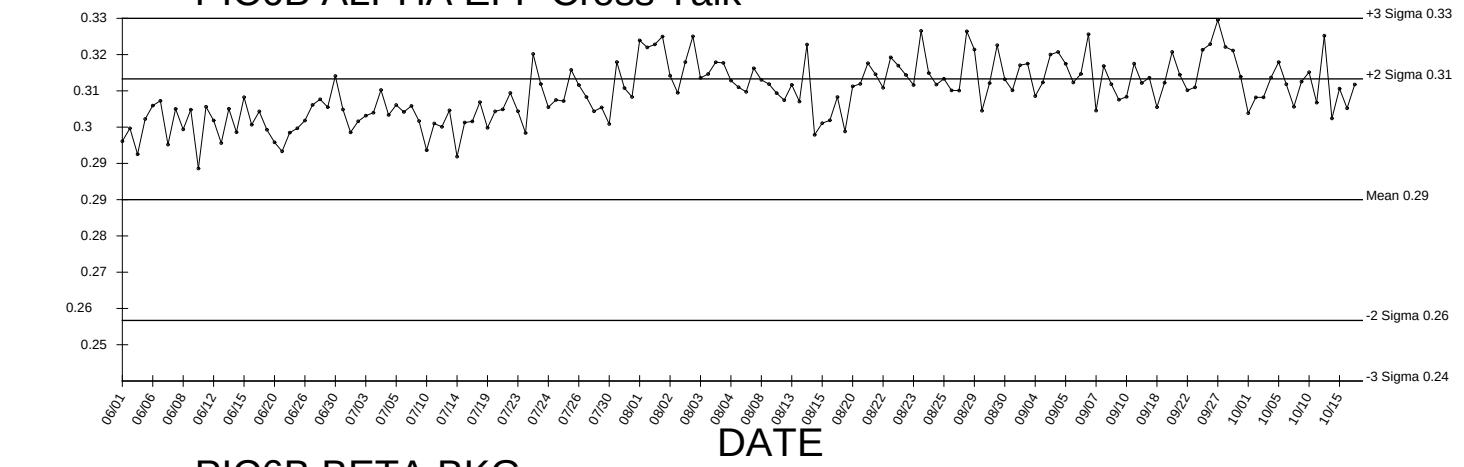
PIC6B ALPHA BKG



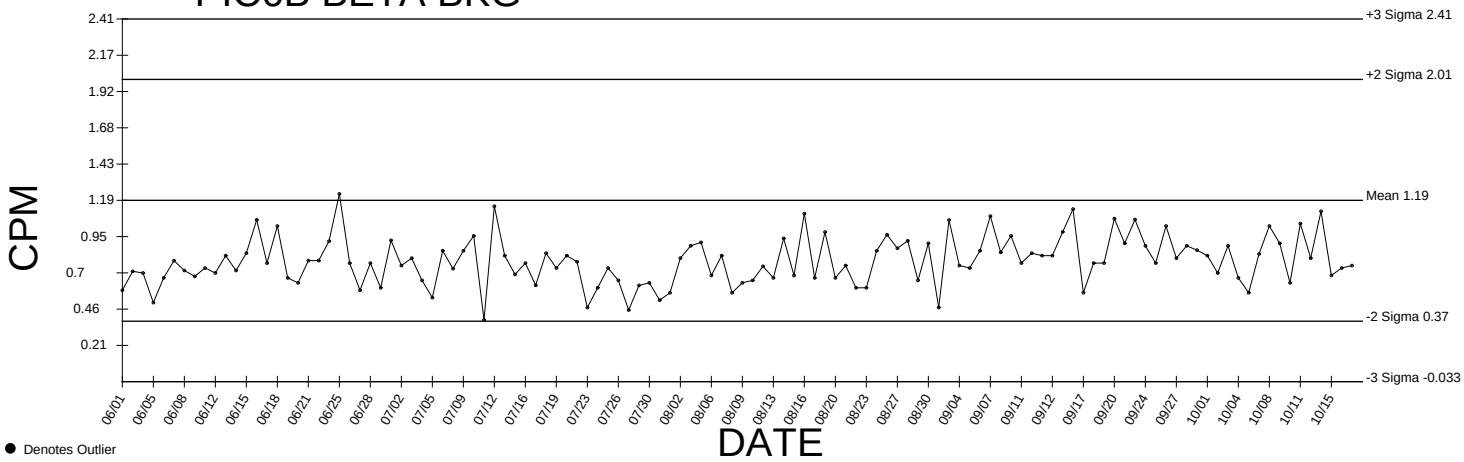
PIC6B ALPHA EFF



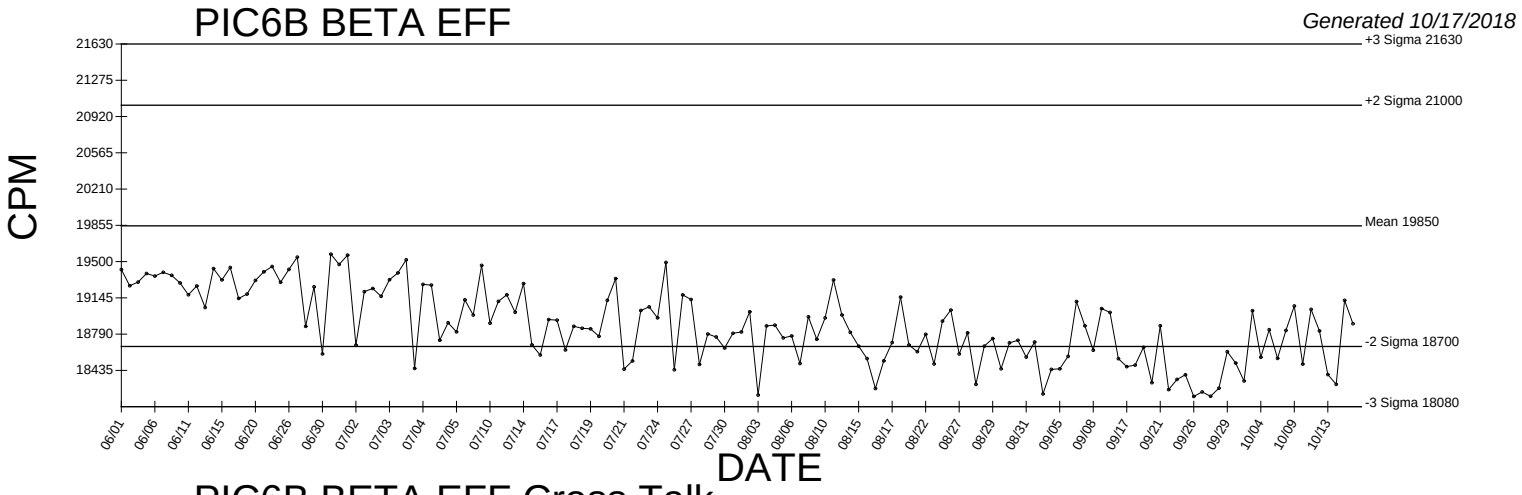
PIC6B ALPHA EFF Cross Talk

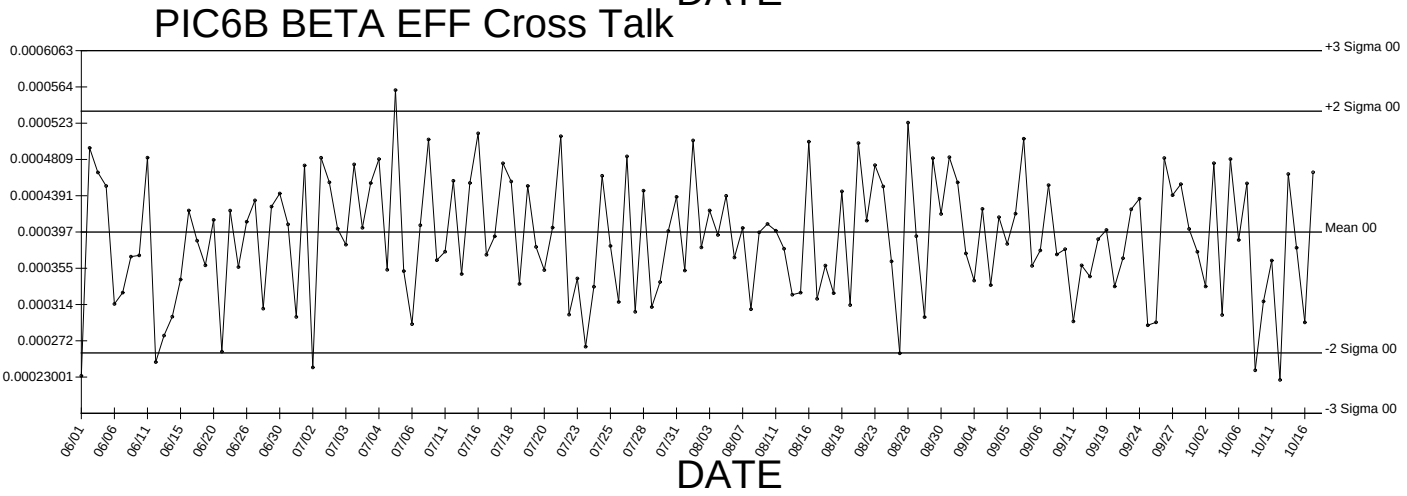


PIC6B BETA BKG

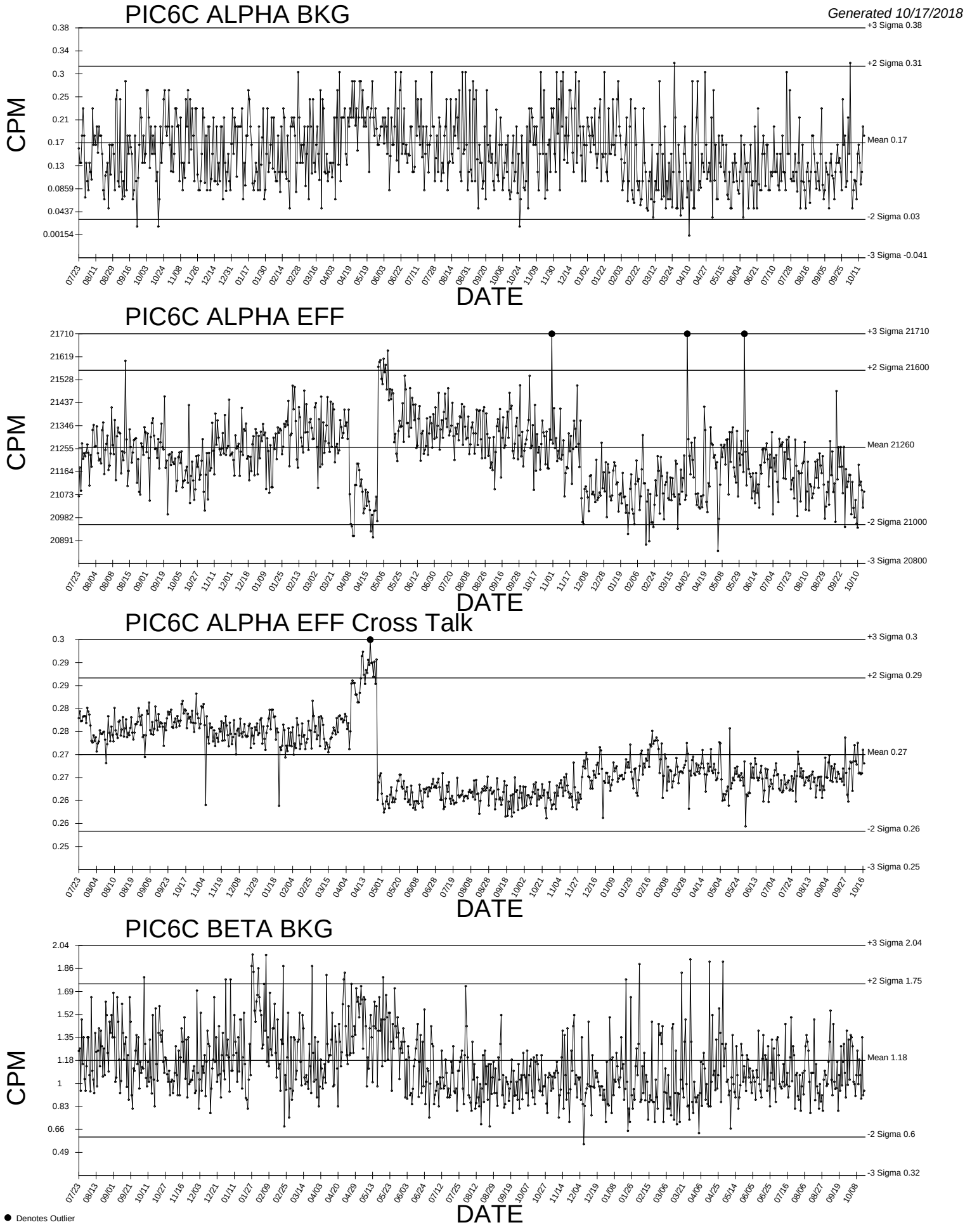


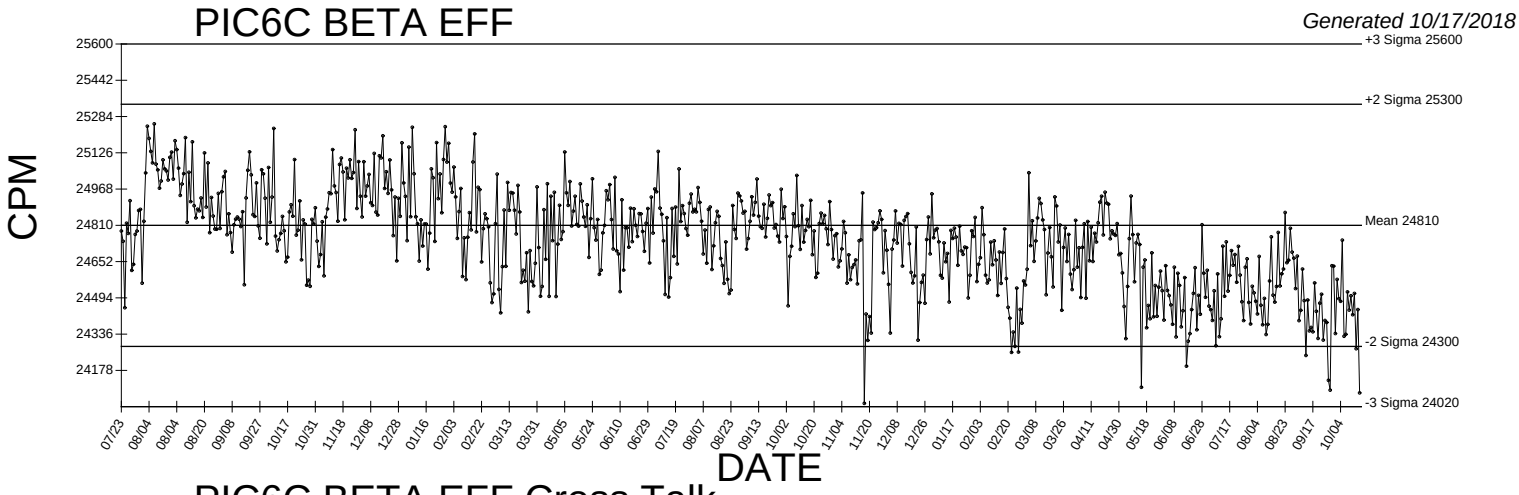
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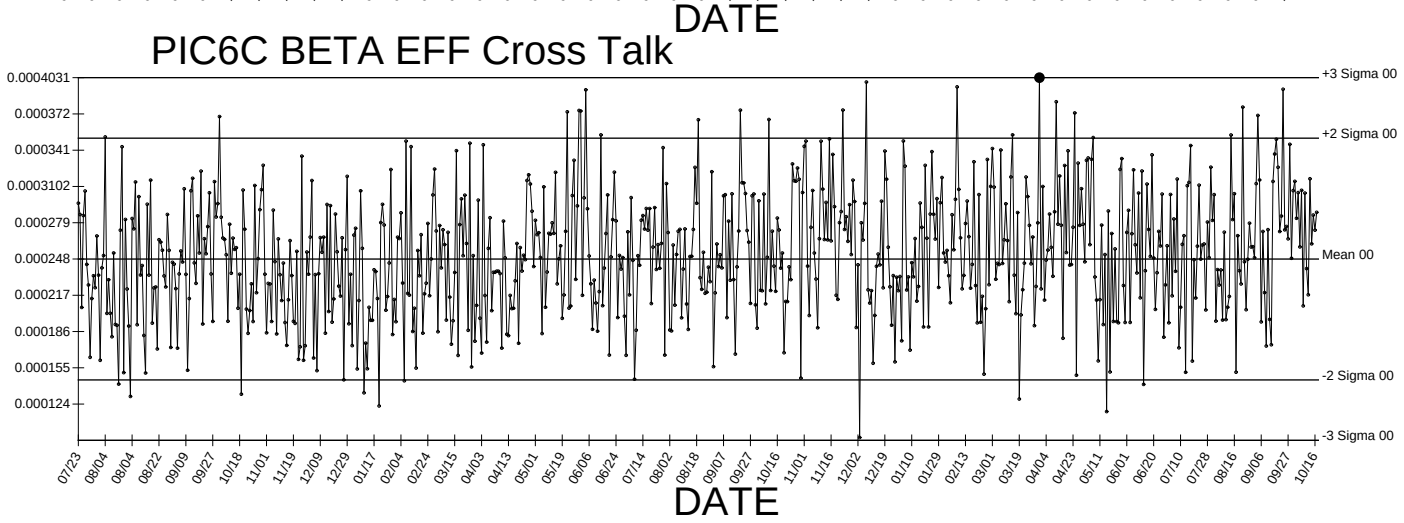




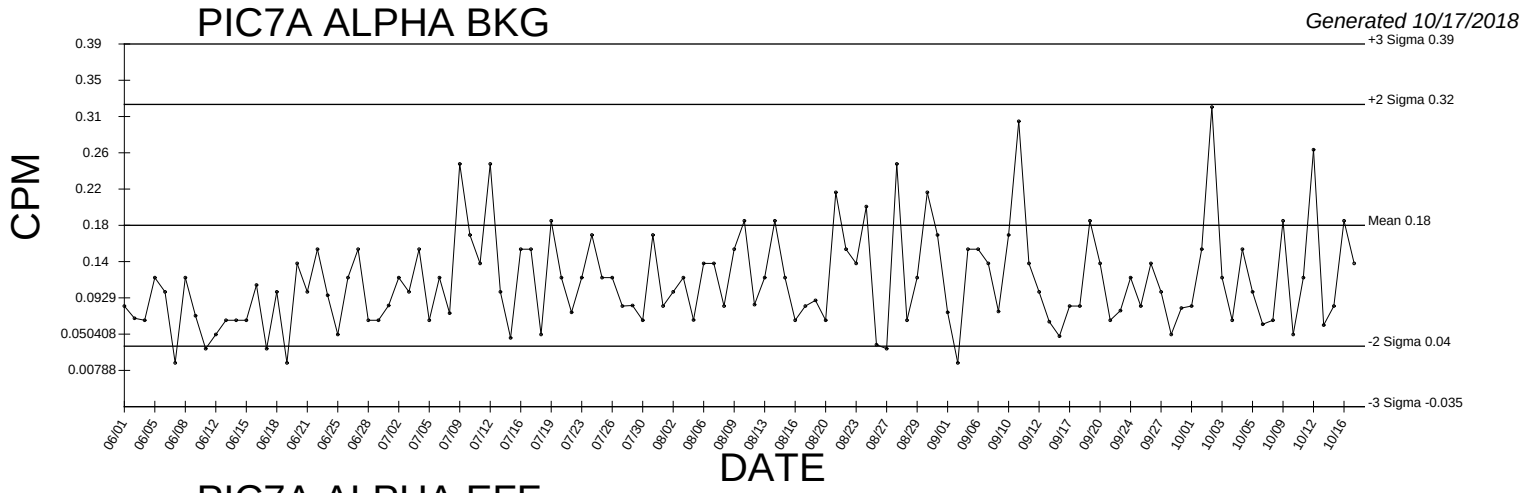
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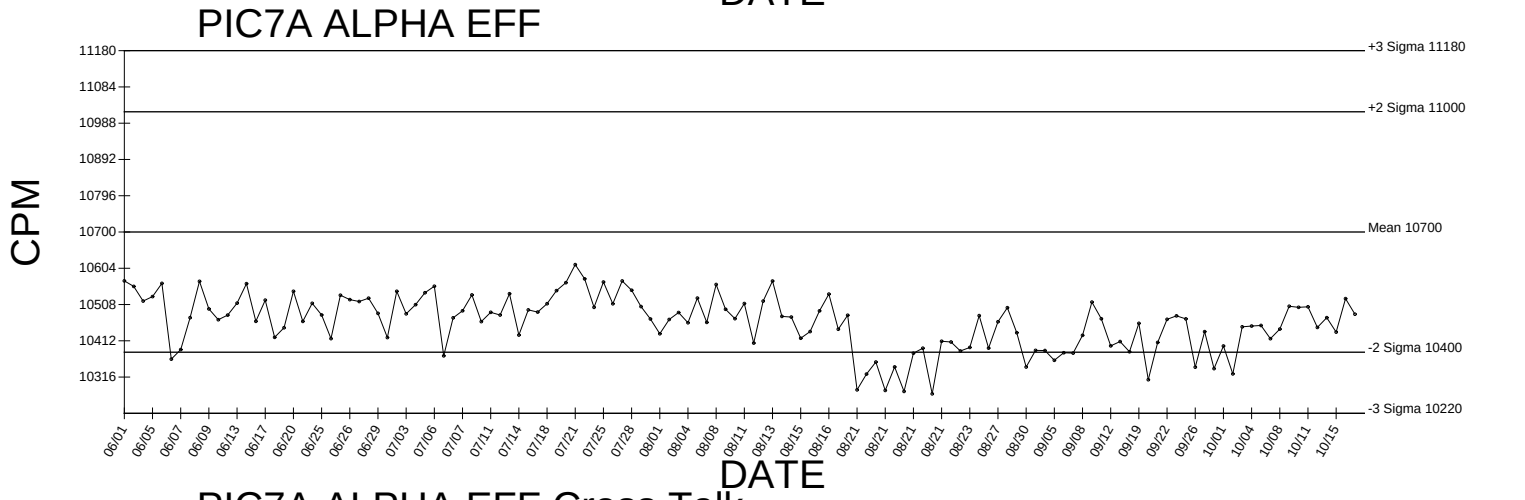

PIC6C ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.31
Mean 0.17
-2 Sigma 0.03
-3 Sigma -0.041
PIC6C ALPHA EFF
+3 Sigma 21710
+2 Sigma 21600
Mean 21260
-2 Sigma 21000
-3 Sigma 20800
PIC6C ALPHA EFF Cross Talk
+3 Sigma 0.3
+2 Sigma 0.29
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
PIC6C BETA BKG
+3 Sigma 2.04
+2 Sigma 1.75
Mean 1.18
-2 Sigma 0.6
-3 Sigma 0.32
Denotes Outlier

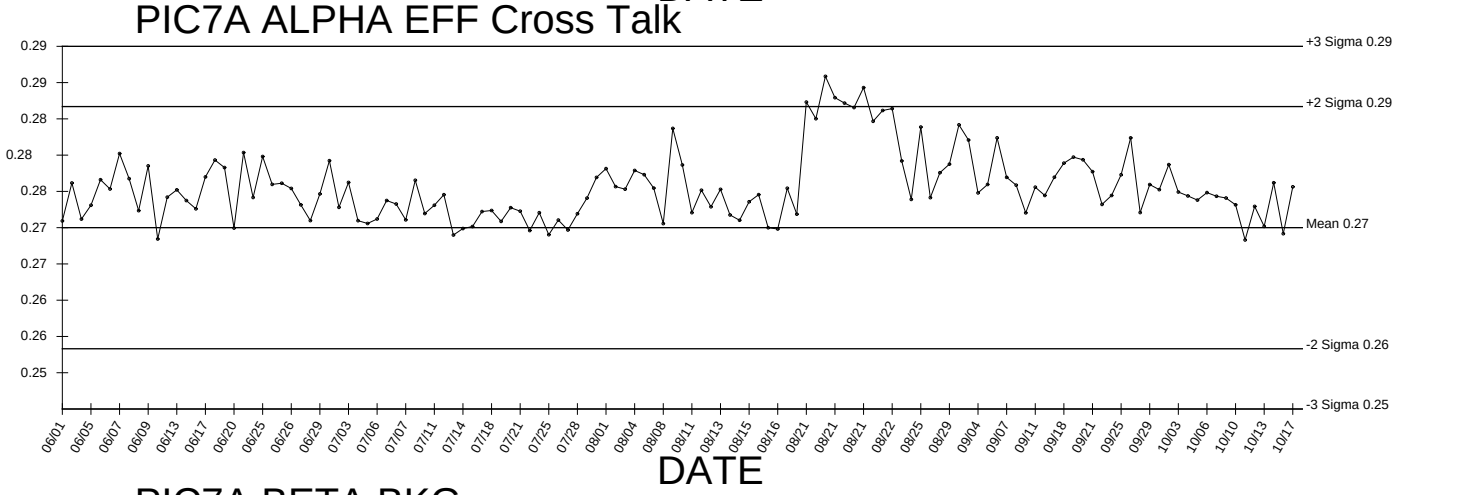


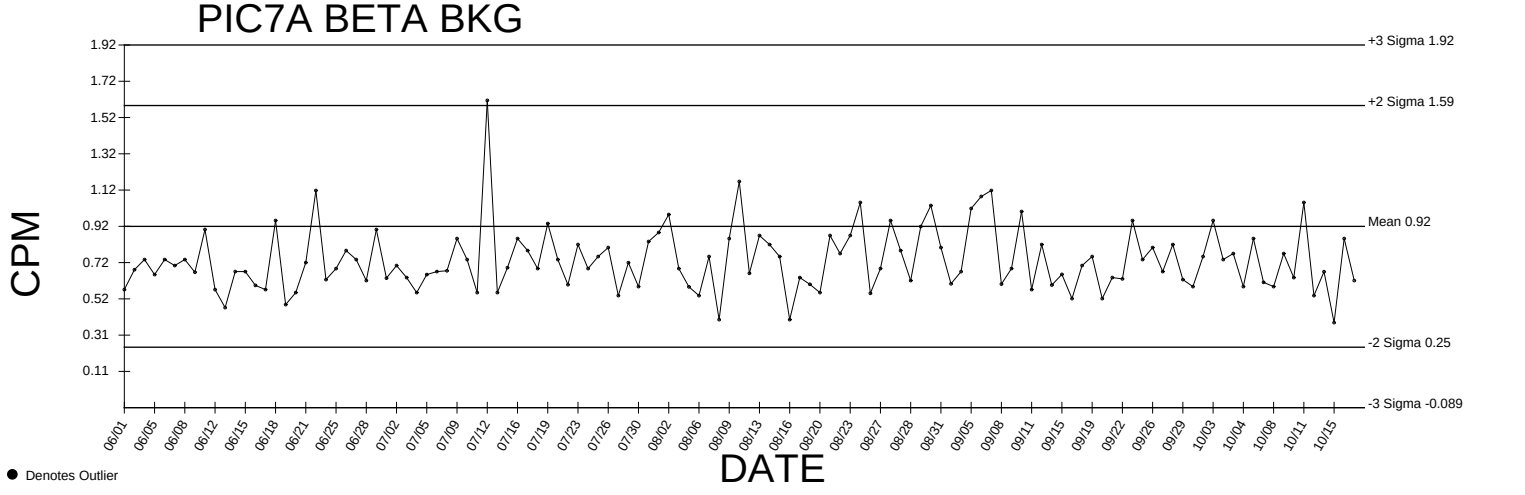


● Denotes Outlier

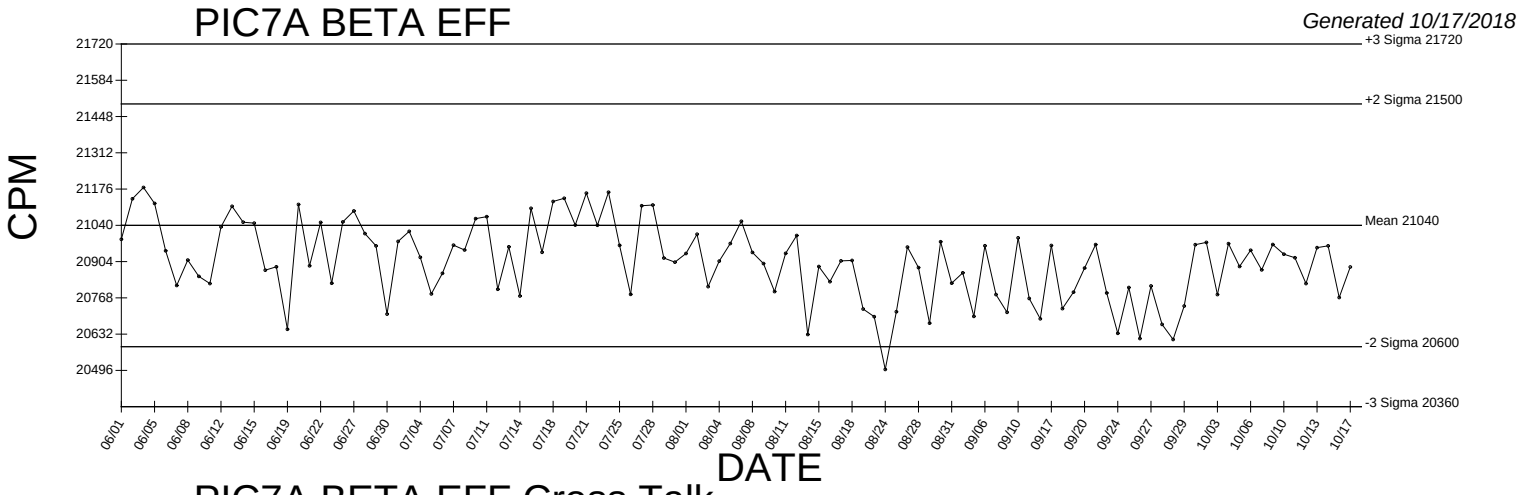


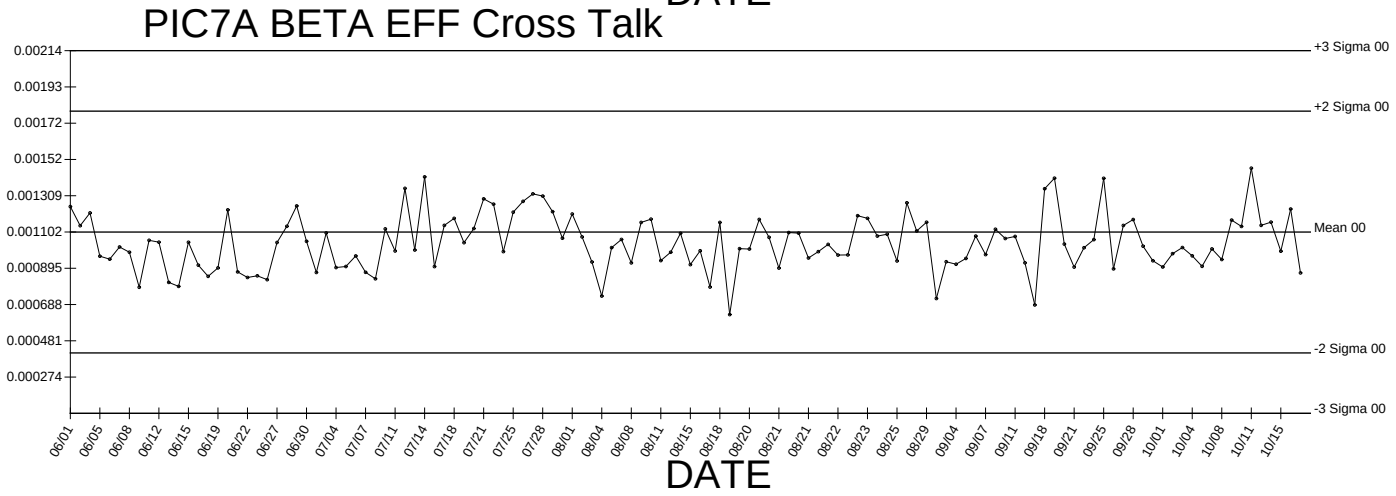




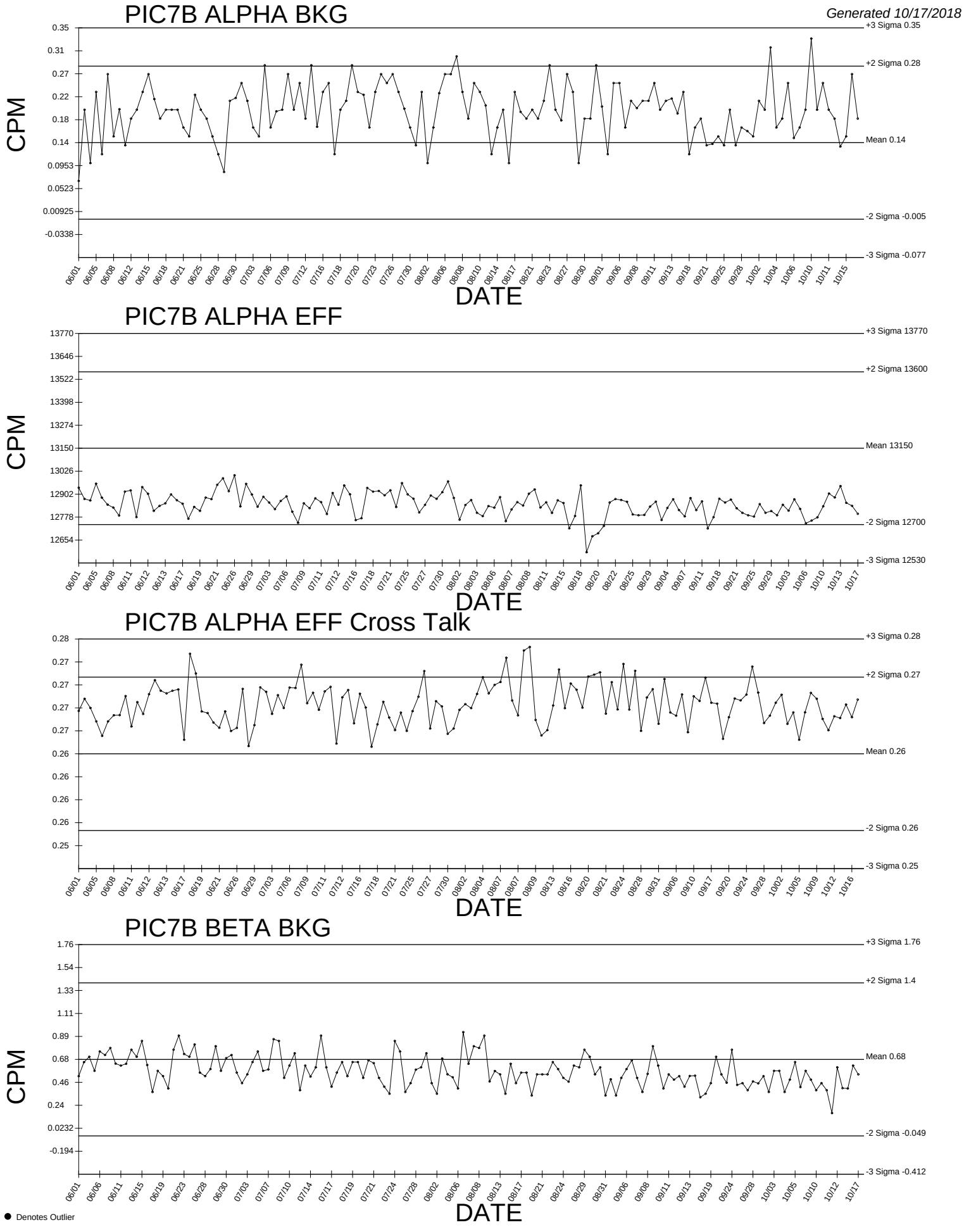


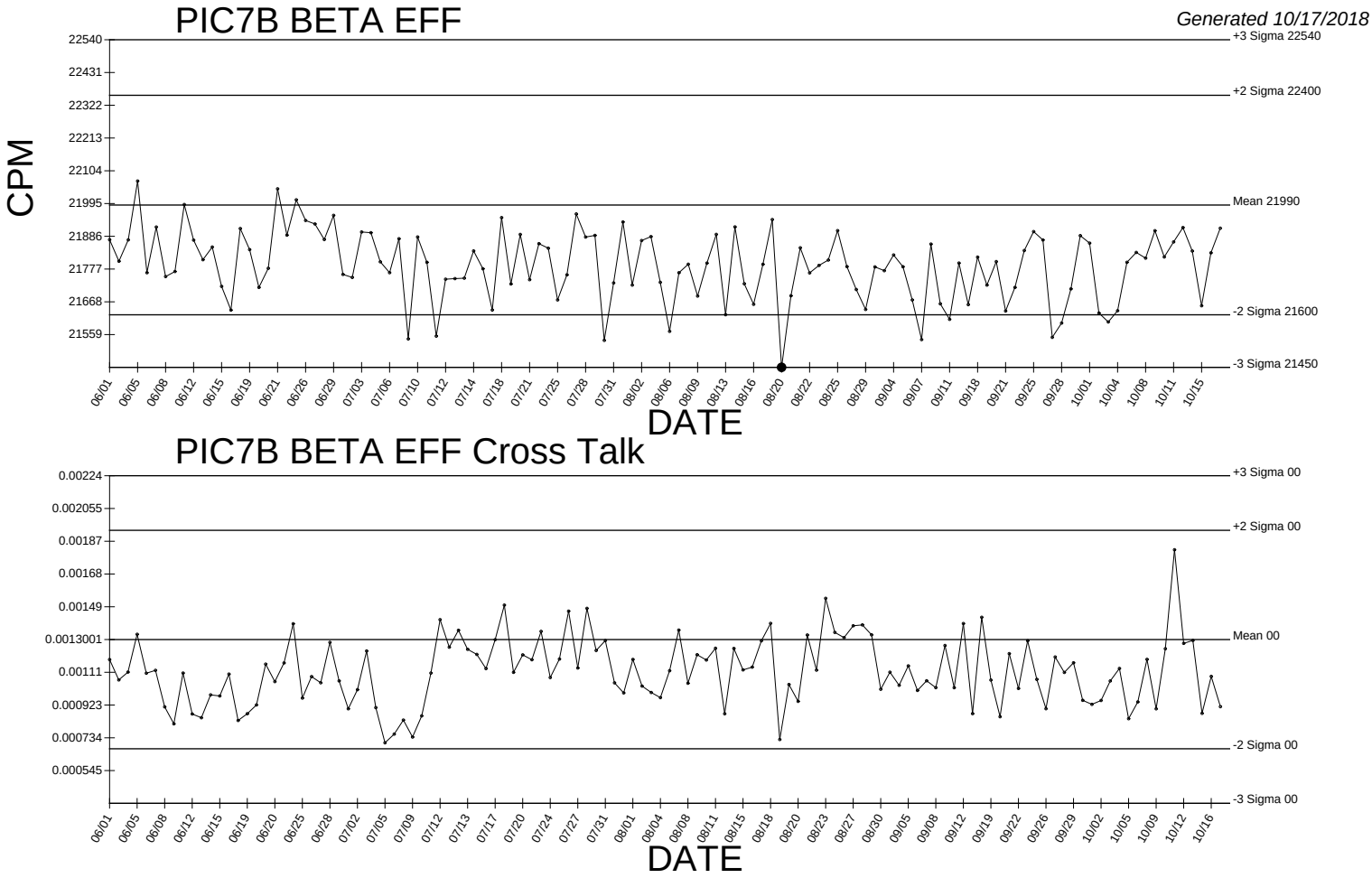
● Denotes Outlier



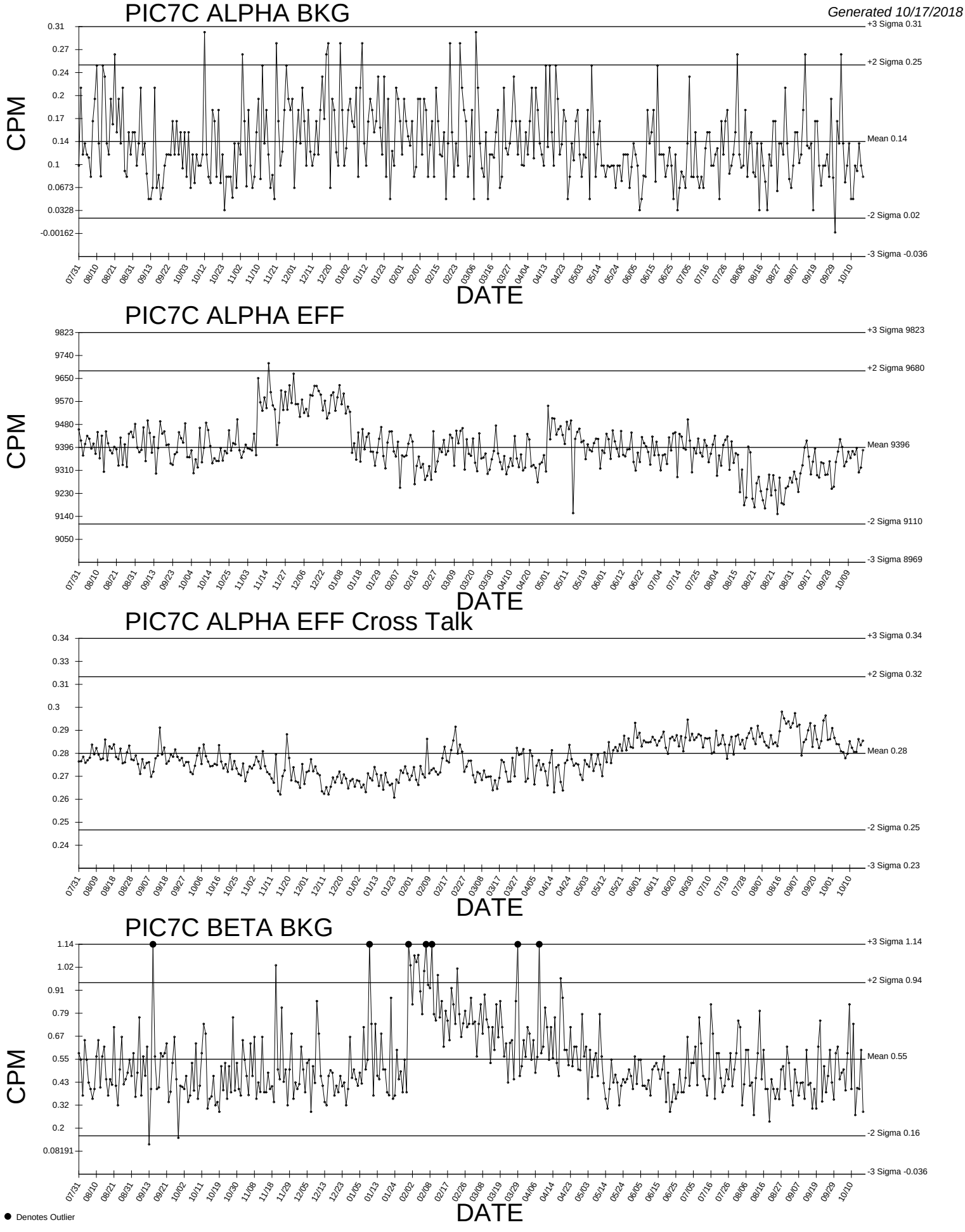


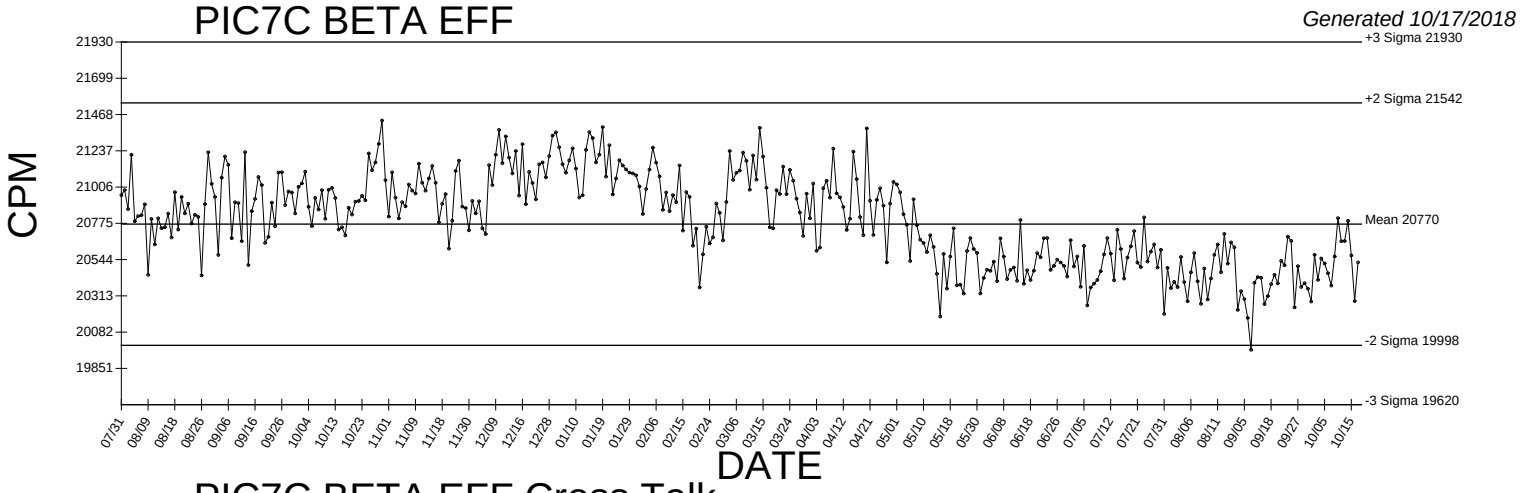
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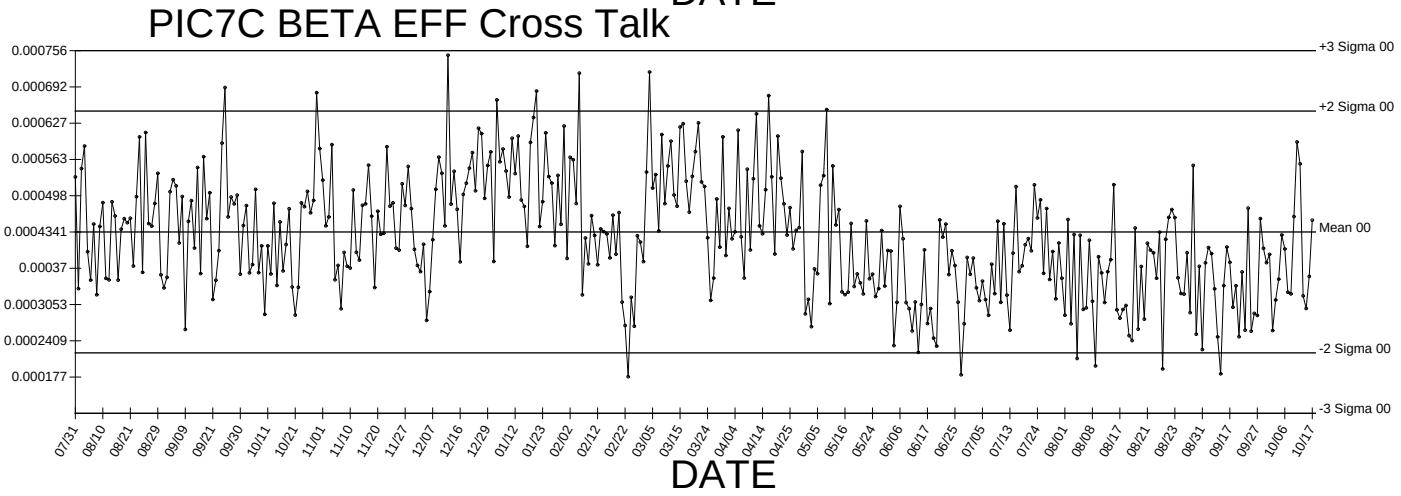

PIC7B ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.35
+2 Sigma 0.28
Mean 0.14
-2 Sigma -0.005
-3 Sigma -0.077
PIC7B ALPHA EFF
+3 Sigma 13770
+2 Sigma 13600
Mean 13150
-2 Sigma 12700
-3 Sigma 12530
PIC7B ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.26
-3 Sigma 0.25
PIC7B BETA BKG
+3 Sigma 1.76
+2 Sigma 1.4
Mean 0.68
-2 Sigma -0.049
-3 Sigma -0.412
● Denotes Outlier



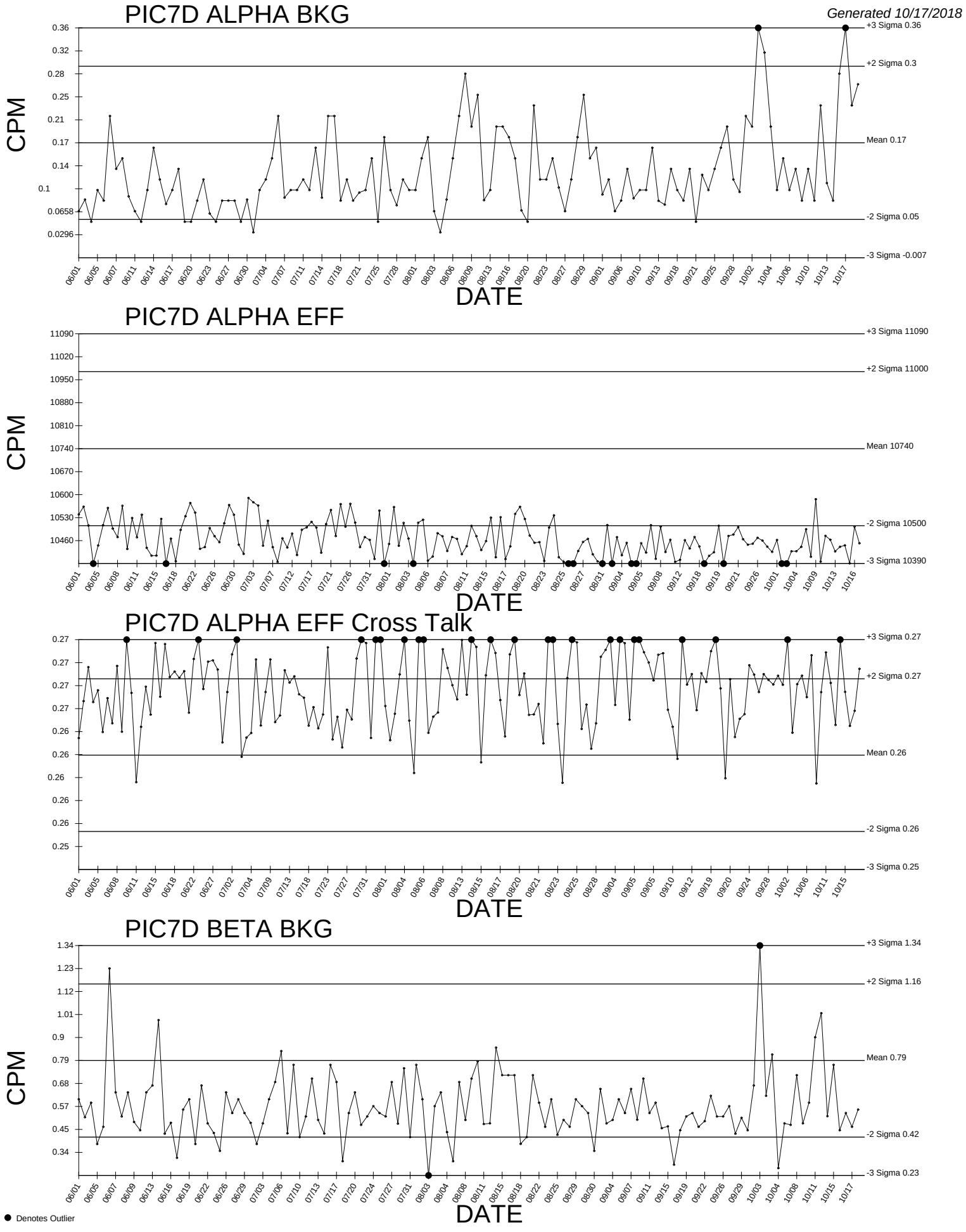
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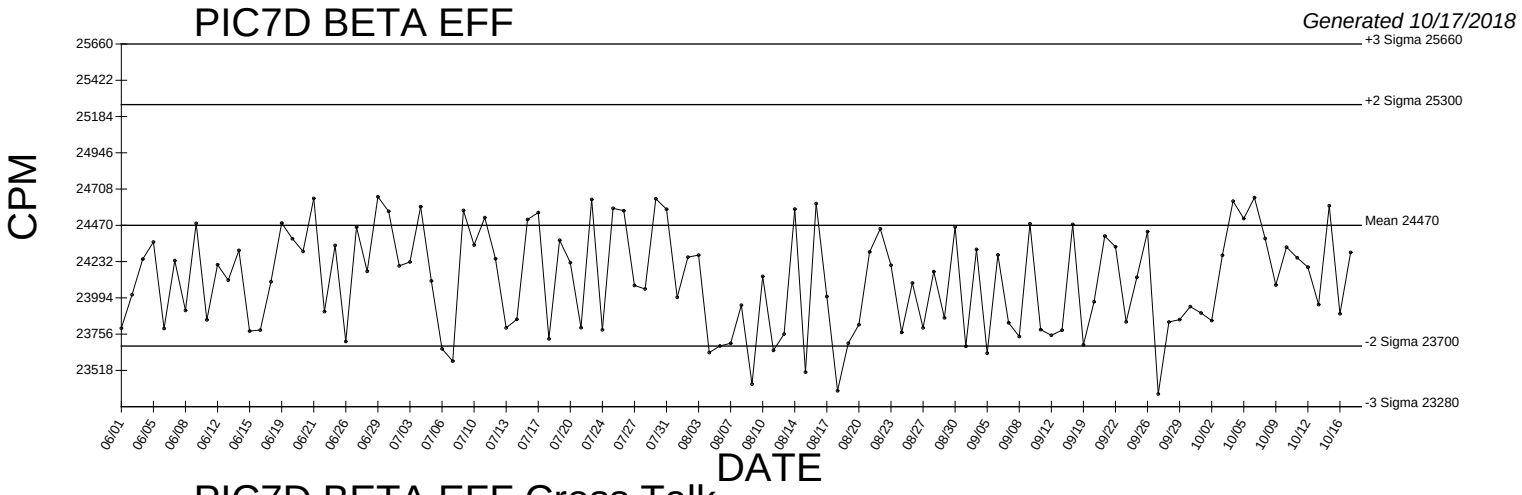

PIC7C ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.31
+2 Sigma 0.25
Mean 0.14
-2 Sigma 0.02
-3 Sigma -0.036
PIC7C ALPHA EFF
+3 Sigma 9823
+2 Sigma 9680
Mean 9396
-2 Sigma 9110
-3 Sigma 8969
PIC7C ALPHA EFF Cross Talk
+3 Sigma 0.34
+2 Sigma 0.32
Mean 0.28
-2 Sigma 0.25
-3 Sigma 0.23
PIC7C BETA BKG
+3 Sigma 1.14
+2 Sigma 0.94
Mean 0.55
-2 Sigma 0.16
-3 Sigma -0.036
● Denotes Outlier

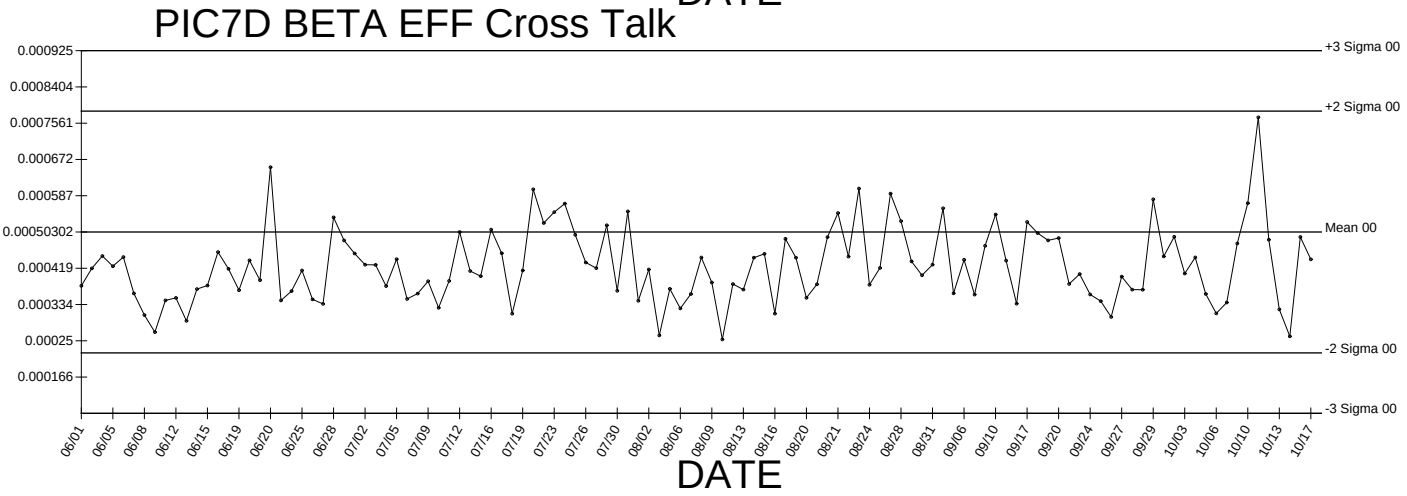




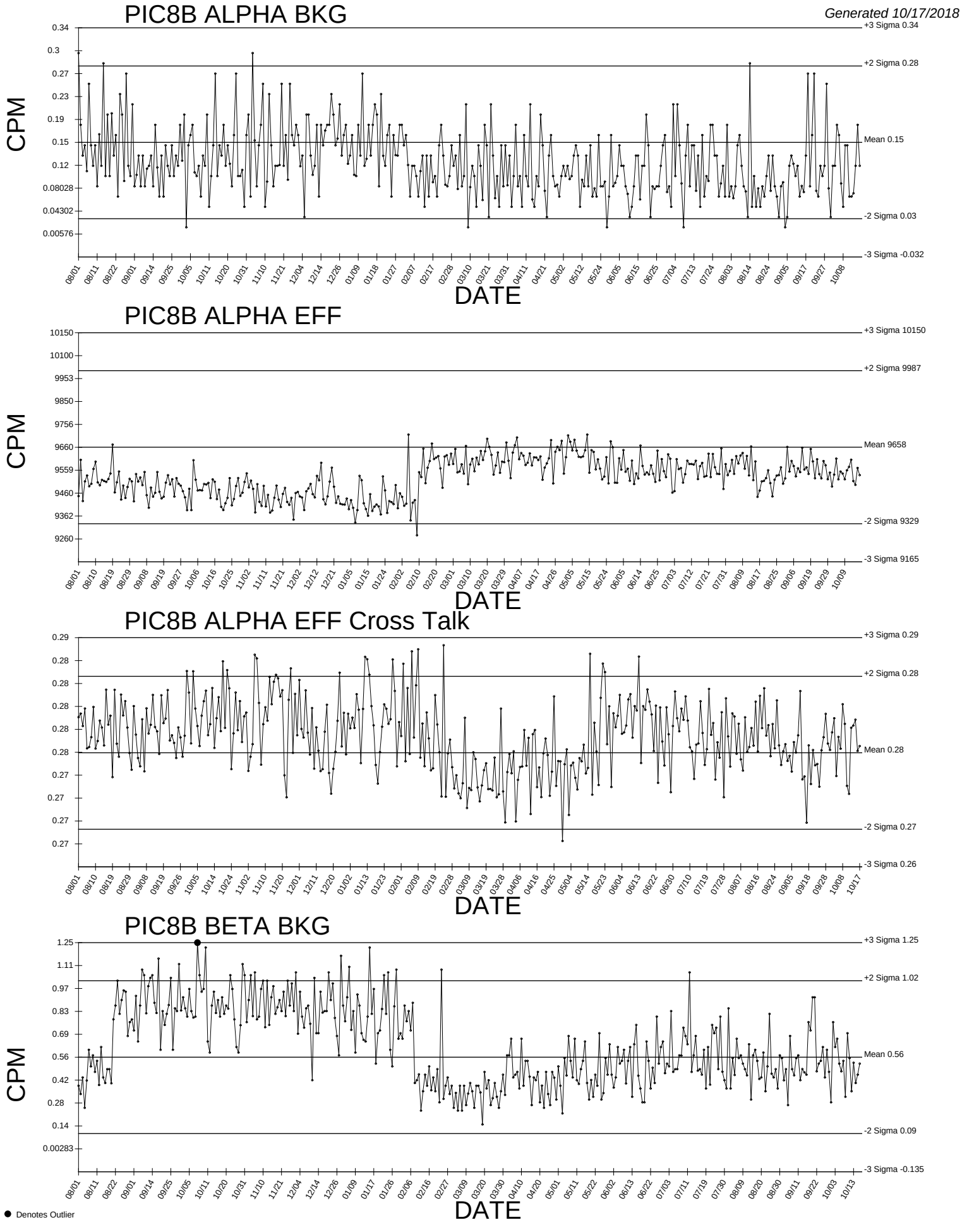
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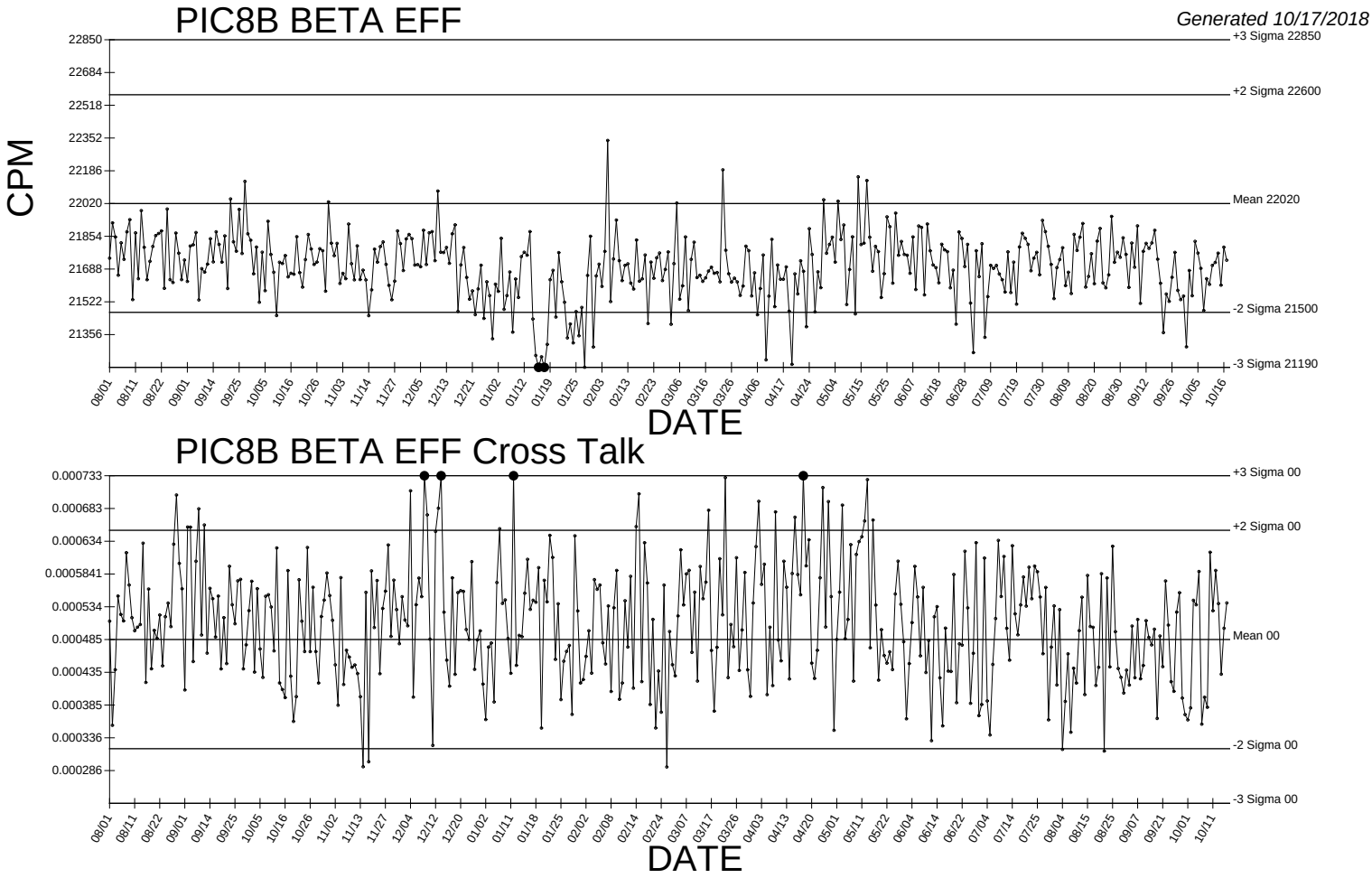

PIC7D ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.17
-2 Sigma 0.05
-3 Sigma -0.007
PIC7D ALPHA EFF
+3 Sigma 11090
+2 Sigma 11000
Mean 10740
-2 Sigma 10500
-3 Sigma 10390
PIC7D ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.26
-3 Sigma 0.25
PIC7D BETA BKG
+3 Sigma 1.34
+2 Sigma 1.16
Mean 0.79
-2 Sigma 0.42
-3 Sigma 0.23
Denotes Outlier



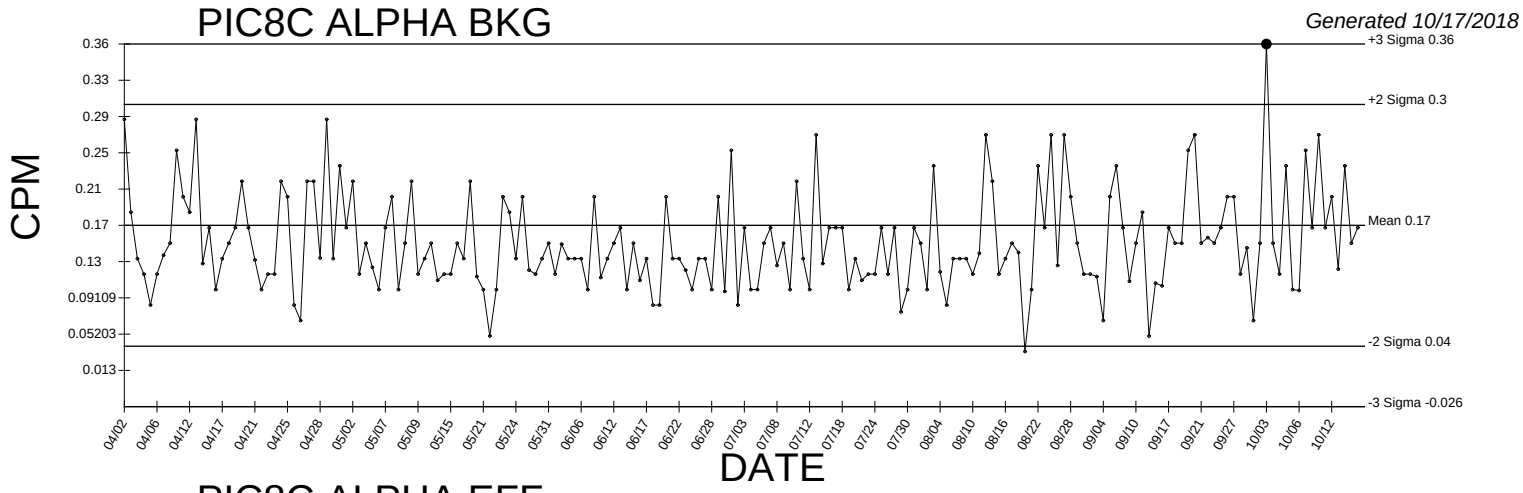


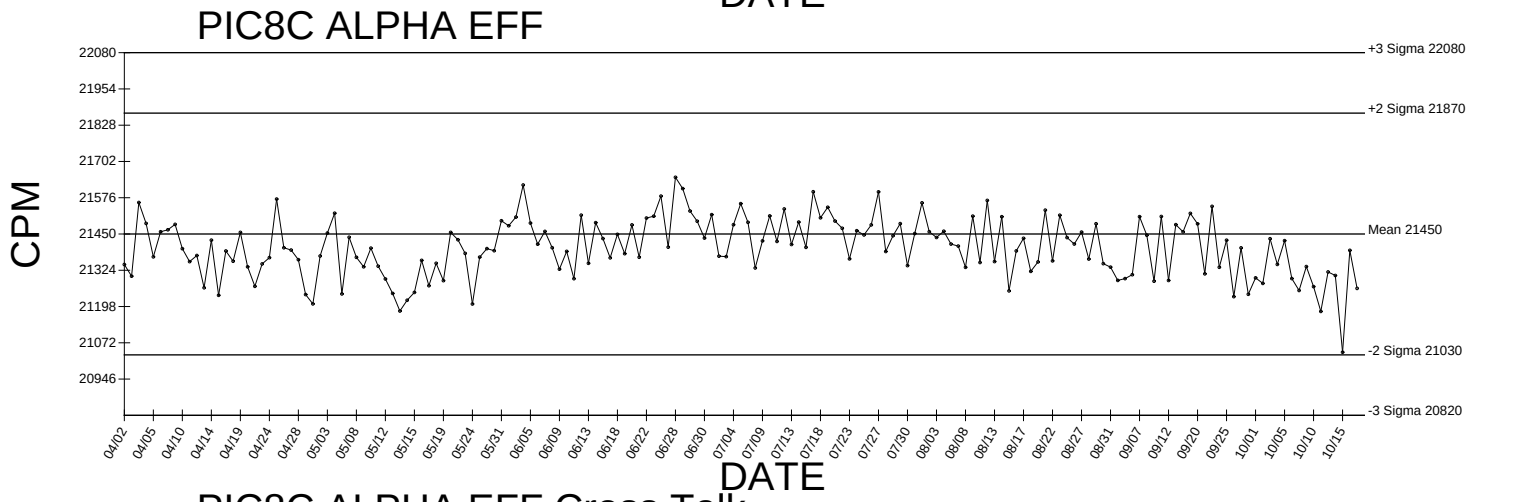
● Denotes Outlier

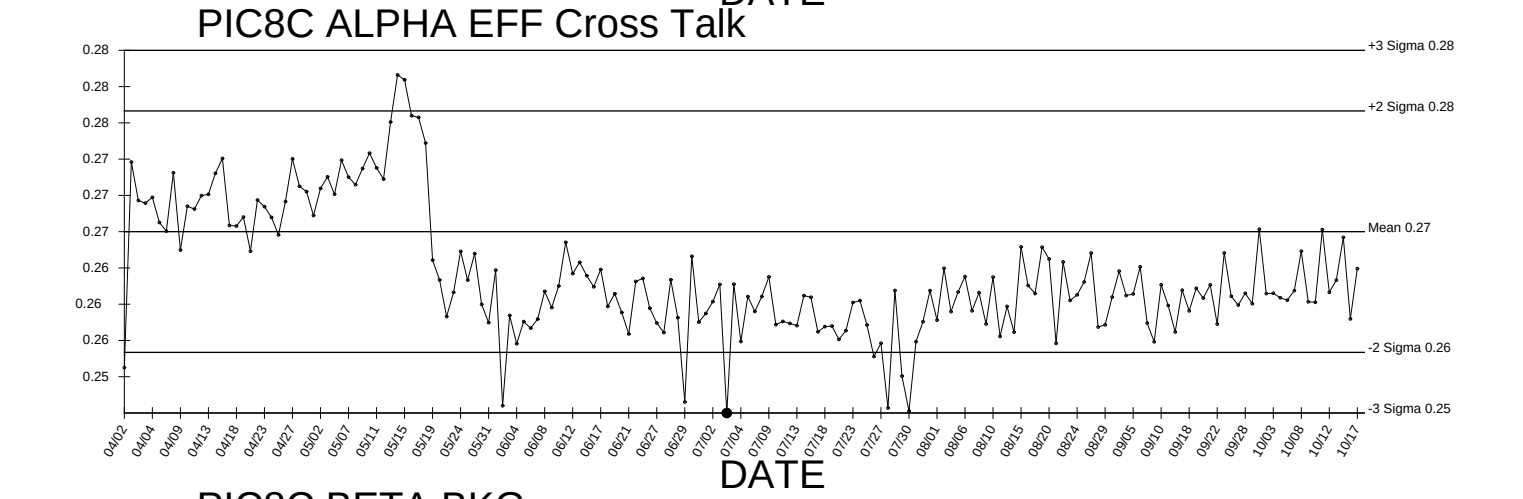

PIC8B ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.34
+2 Sigma 0.28
Mean 0.15
-2 Sigma 0.03
-3 Sigma -0.032
PIC8B ALPHA EFF
+3 Sigma 10150
+2 Sigma 9987
Mean 9658
-2 Sigma 9329
-3 Sigma 9165
PIC8B ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.28
Mean 0.28
-2 Sigma 0.27
-3 Sigma 0.26
PIC8B BETA BKG
+3 Sigma 1.25
+2 Sigma 1.02
Mean 0.56
-2 Sigma 0.09
-3 Sigma -0.135
● Denotes Outlier

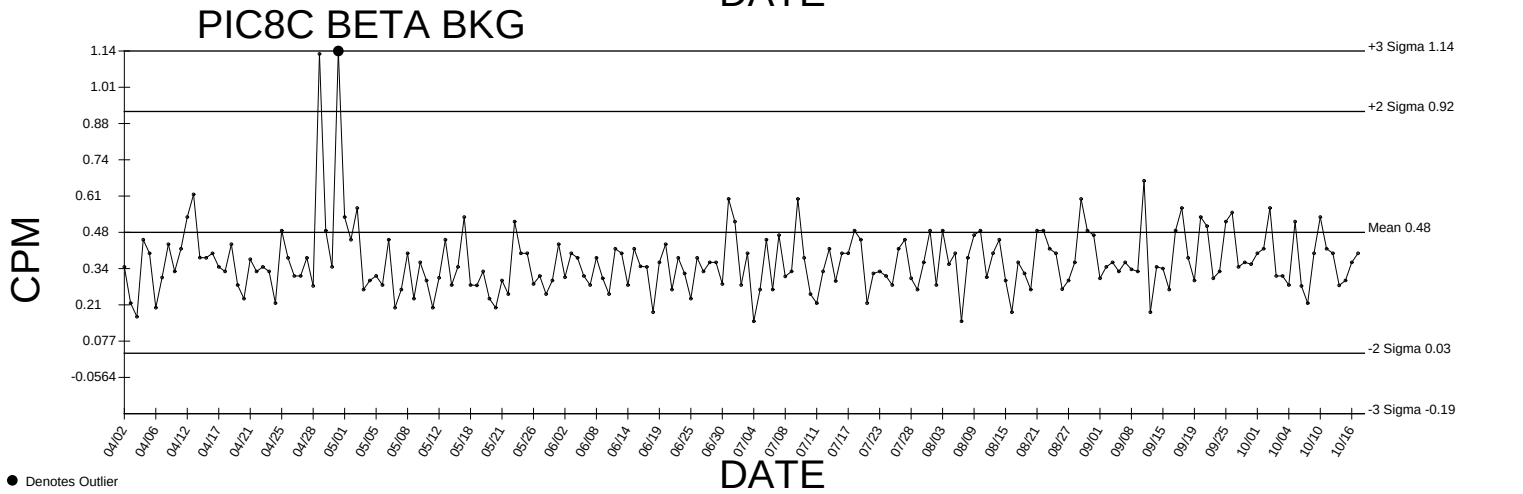


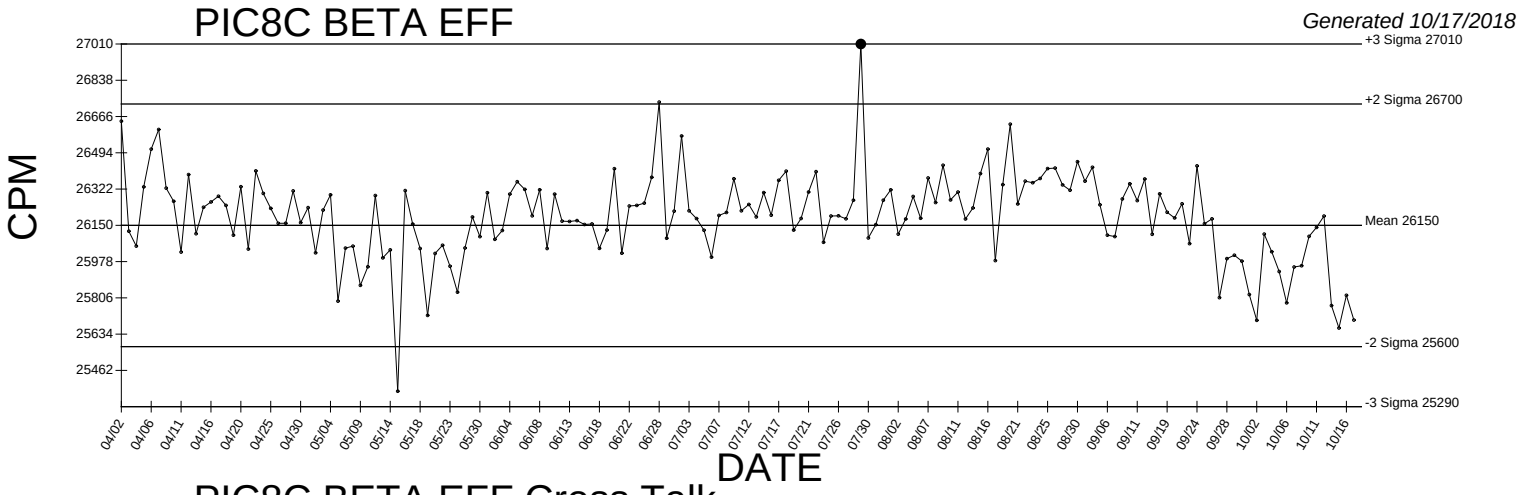
● Denotes Outlier

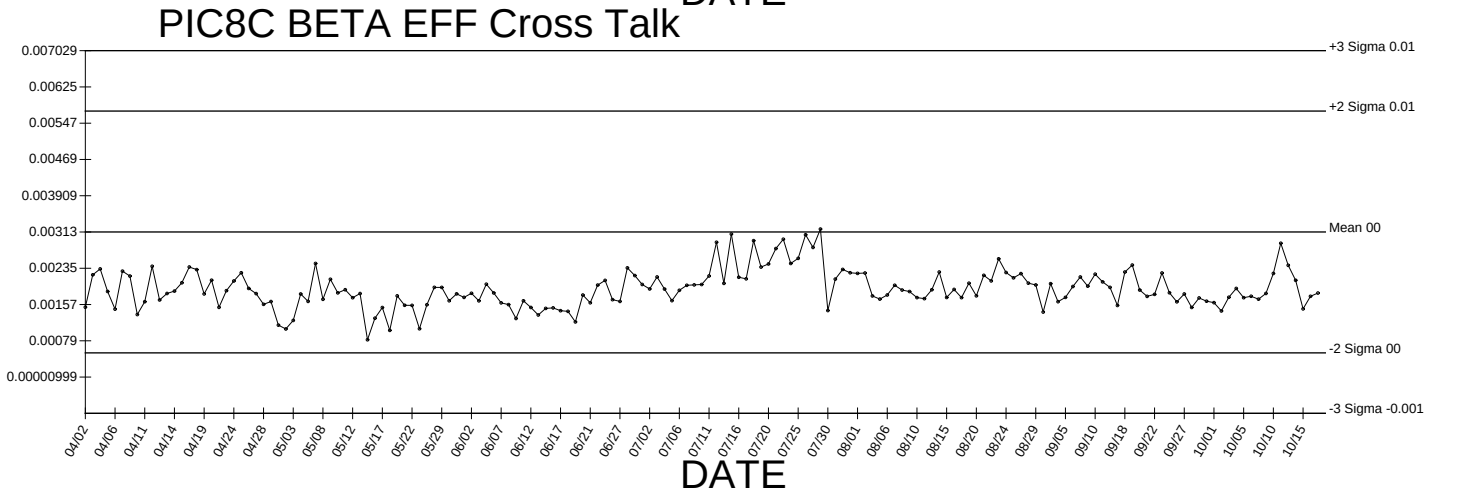

PIC8C ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.17
-2 Sigma 0.04
-3 Sigma -0.026


PIC8C ALPHA EFF
CPM
DATE
+3 Sigma 22080
+2 Sigma 21870
Mean 21450
-2 Sigma 21030
-3 Sigma 20820

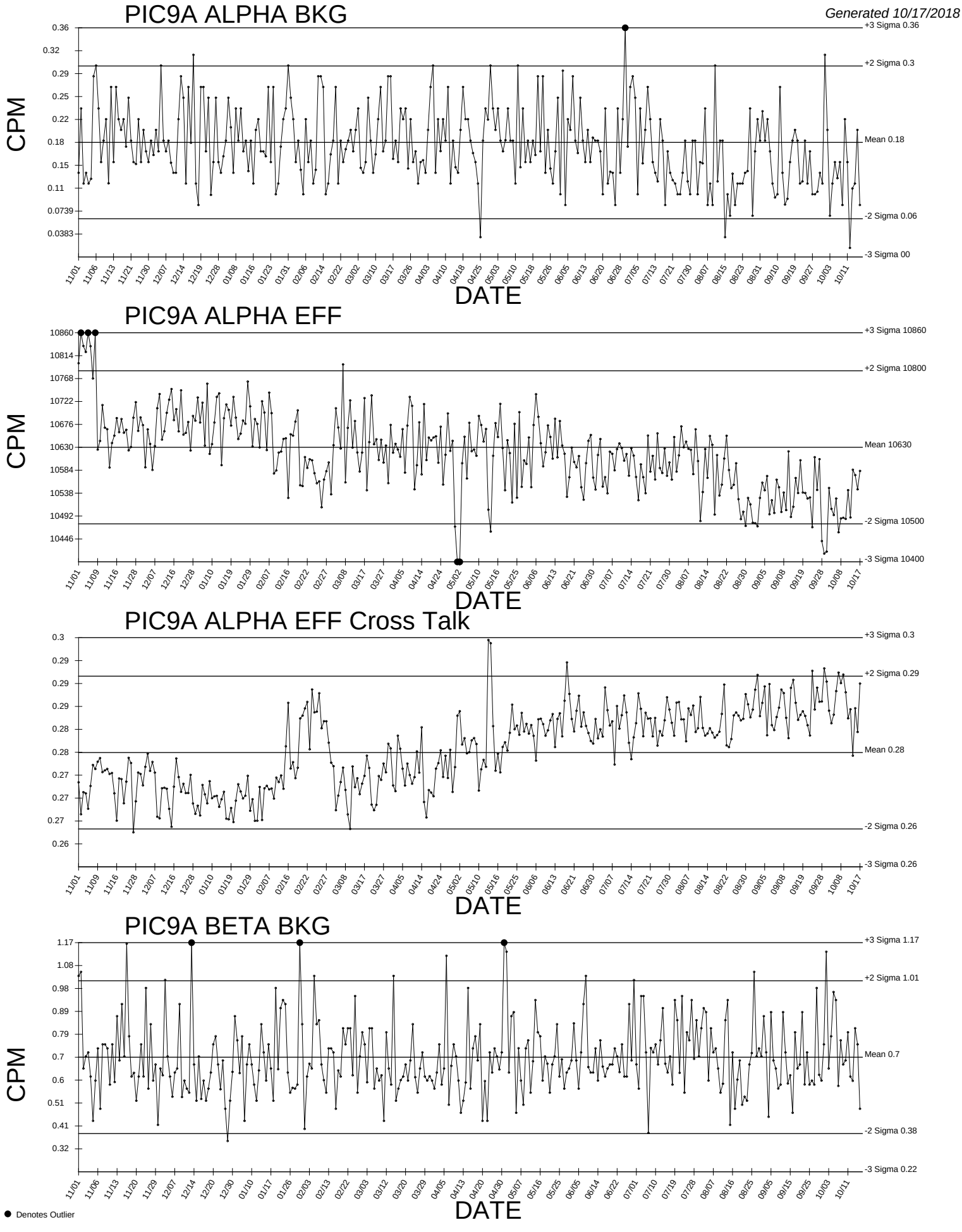

PIC8C ALPHA EFF Cross Talk
DATE
+3 Sigma 0.28
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25

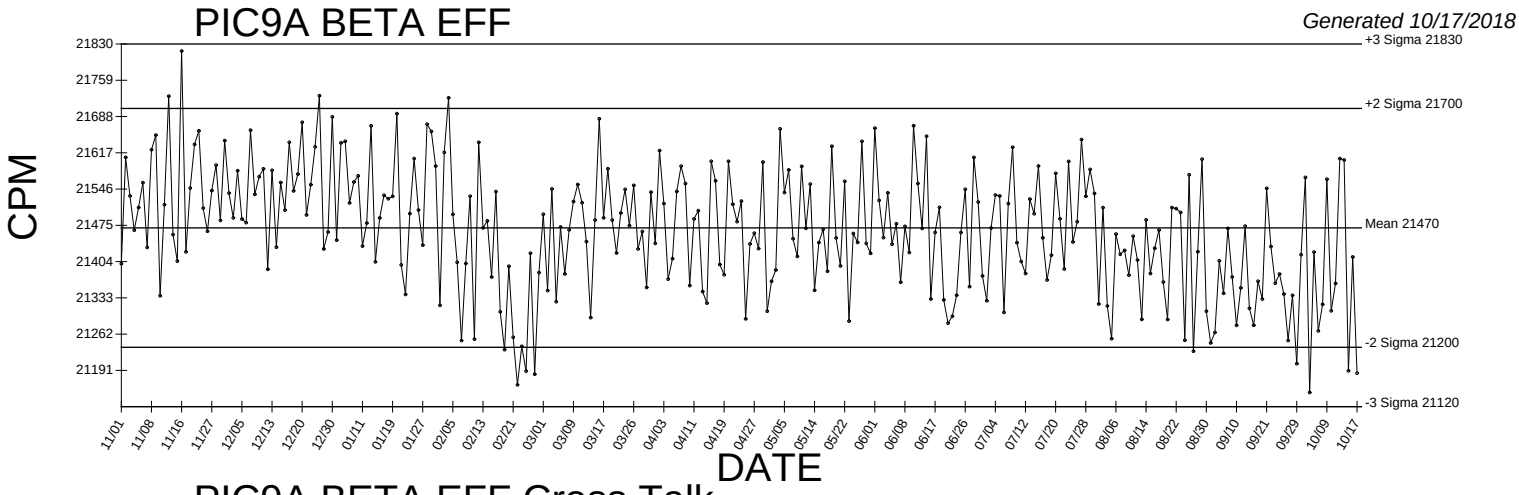

PIC8C BETA BKG
CPM
DATE
+3 Sigma 1.14
+2 Sigma 0.92
Mean 0.48
-2 Sigma 0.03
-3 Sigma -0.19
● Denotes Outlier

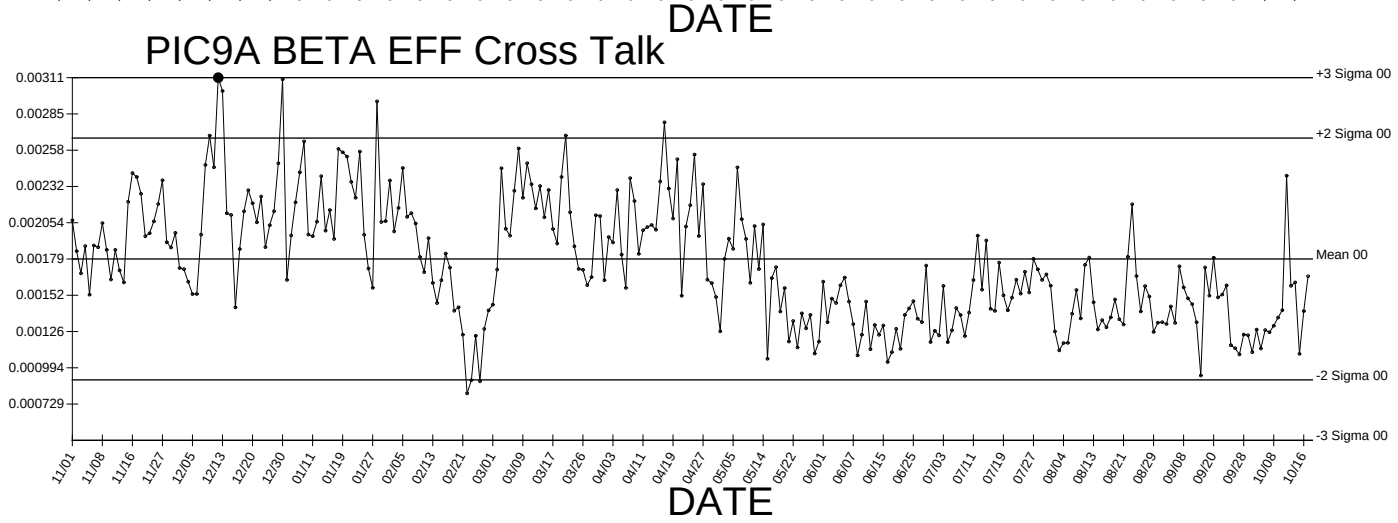




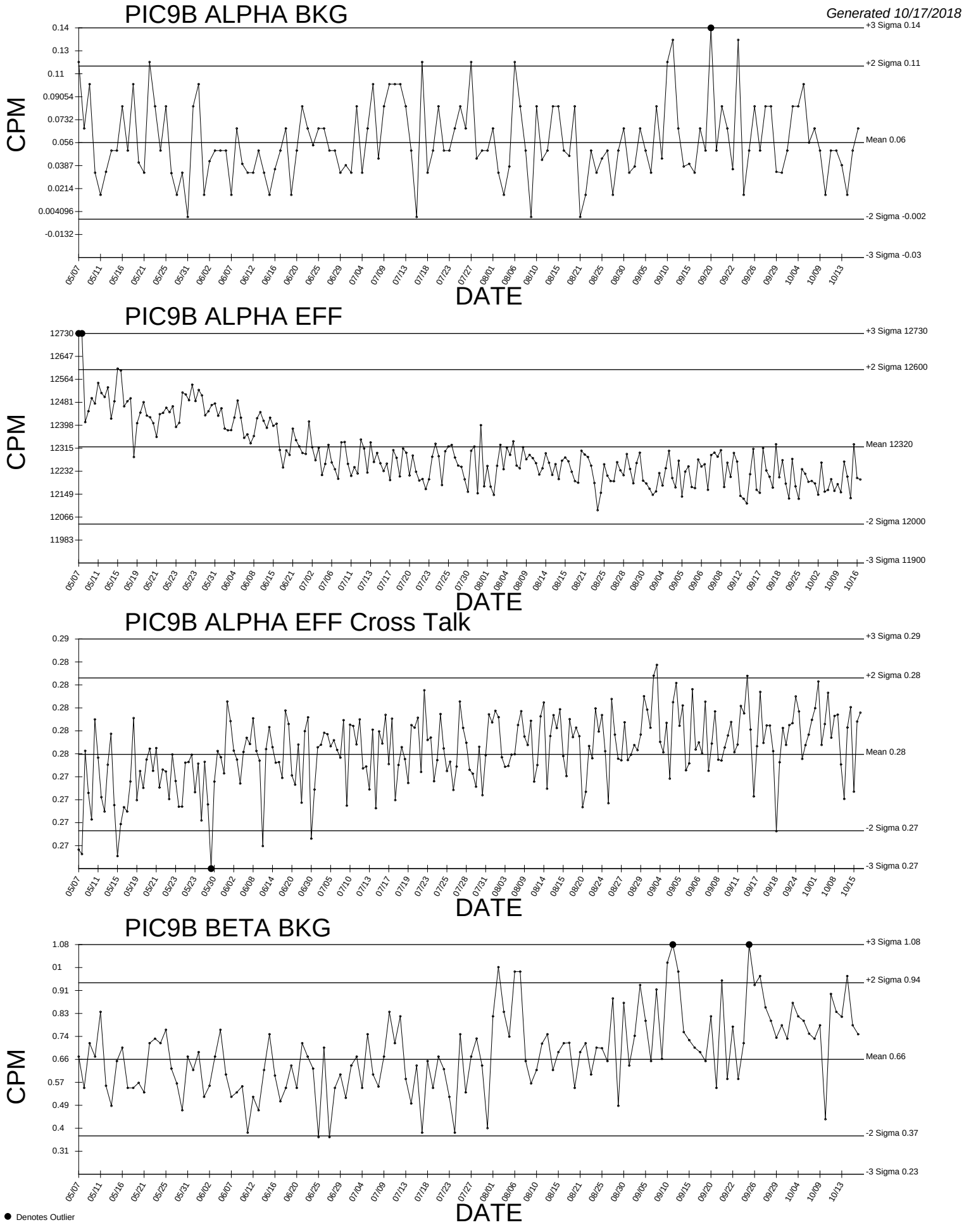
● Denotes Outlier

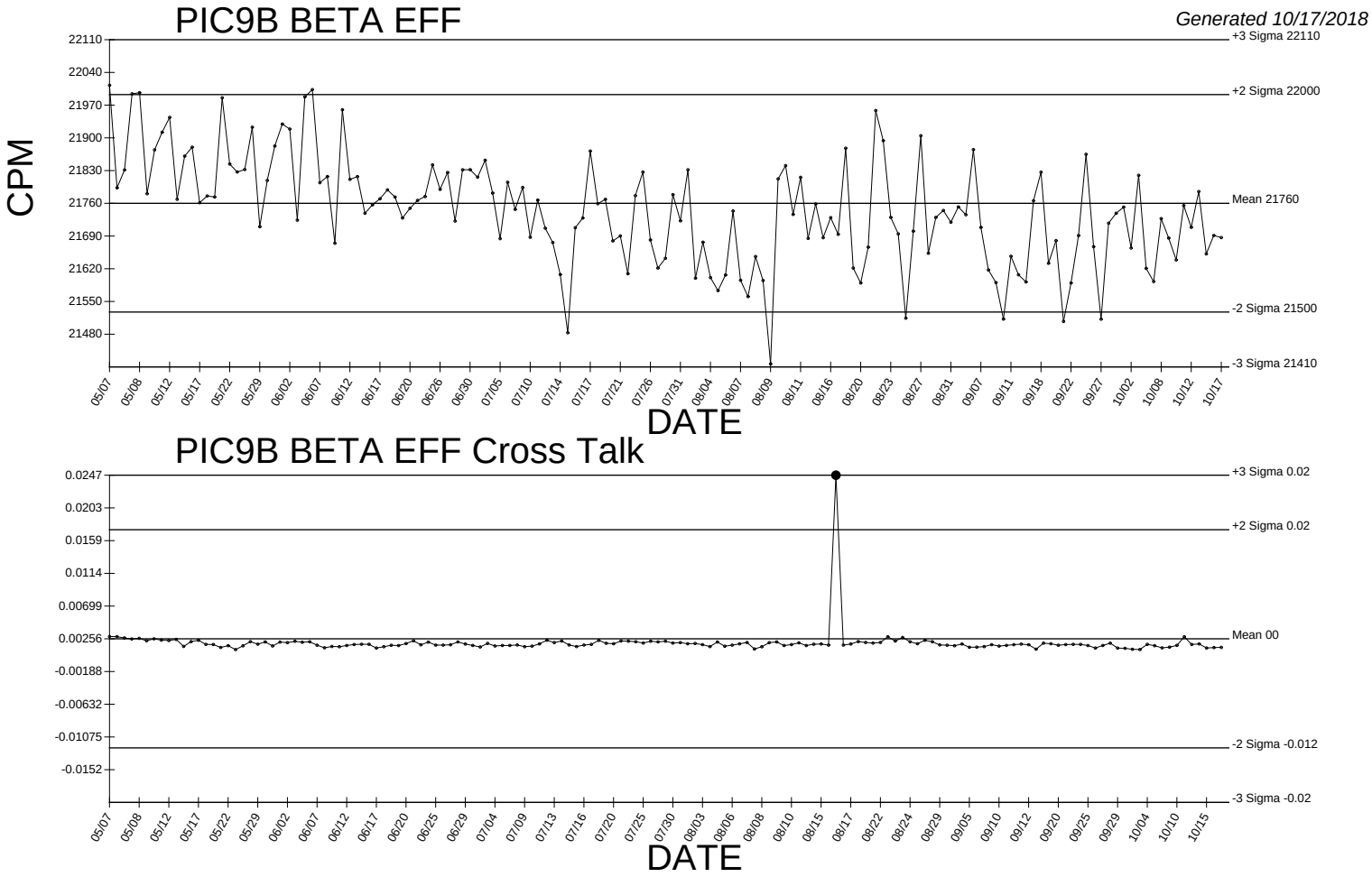

PIC9A ALPHA BKG
Generated 10/17/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.18
-2 Sigma 0.06
-3 Sigma 00
PIC9A ALPHA EFF
+3 Sigma 10860
+2 Sigma 10800
Mean 10630
-2 Sigma 10500
-3 Sigma 10400
PIC9A ALPHA EFF Cross Talk
+3 Sigma 0.3
+2 Sigma 0.29
Mean 0.28
-2 Sigma 0.26
-3 Sigma 0.26
PIC9A BETA BKG
+3 Sigma 1.17
+2 Sigma 1.01
Mean 0.7
-2 Sigma 0.38
-3 Sigma 0.22
Denotes Outlier



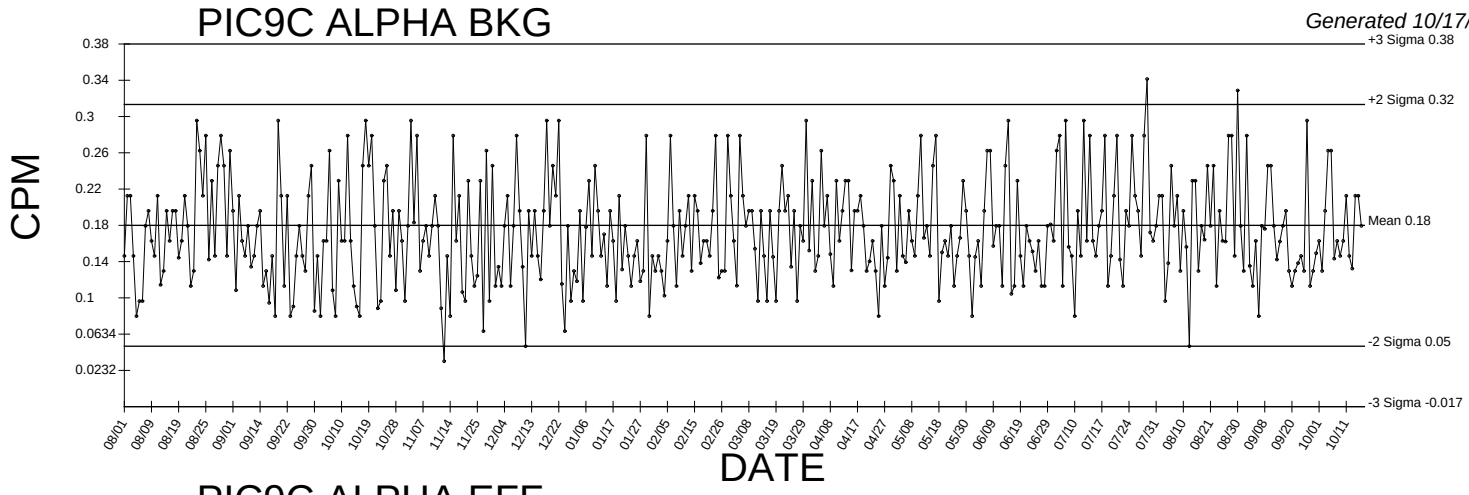


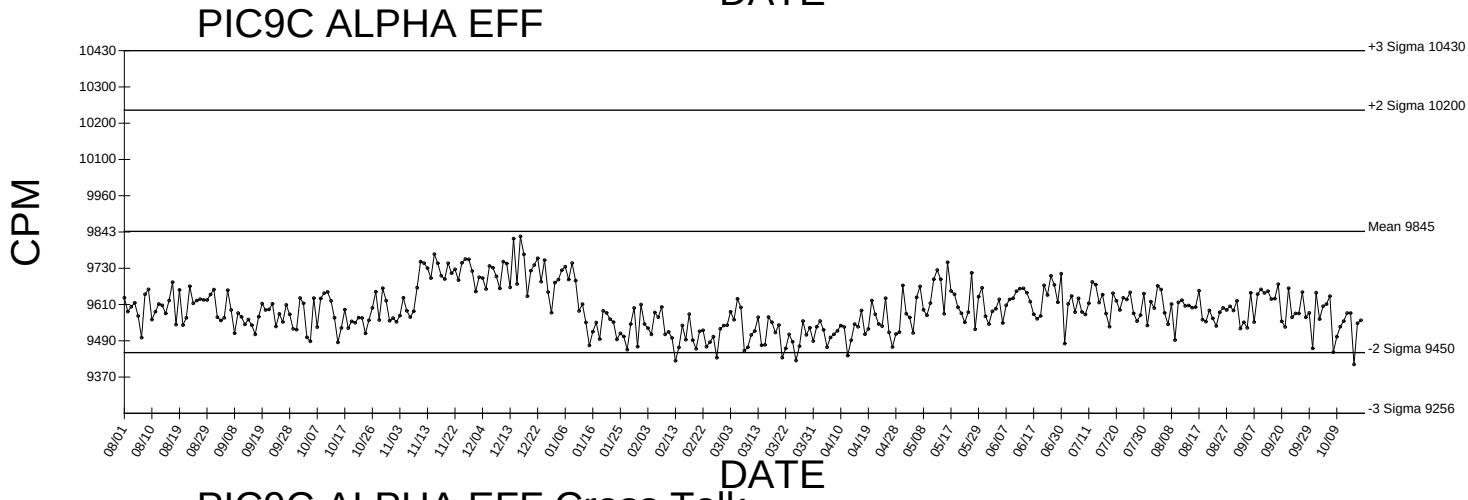
● Denotes Outlier

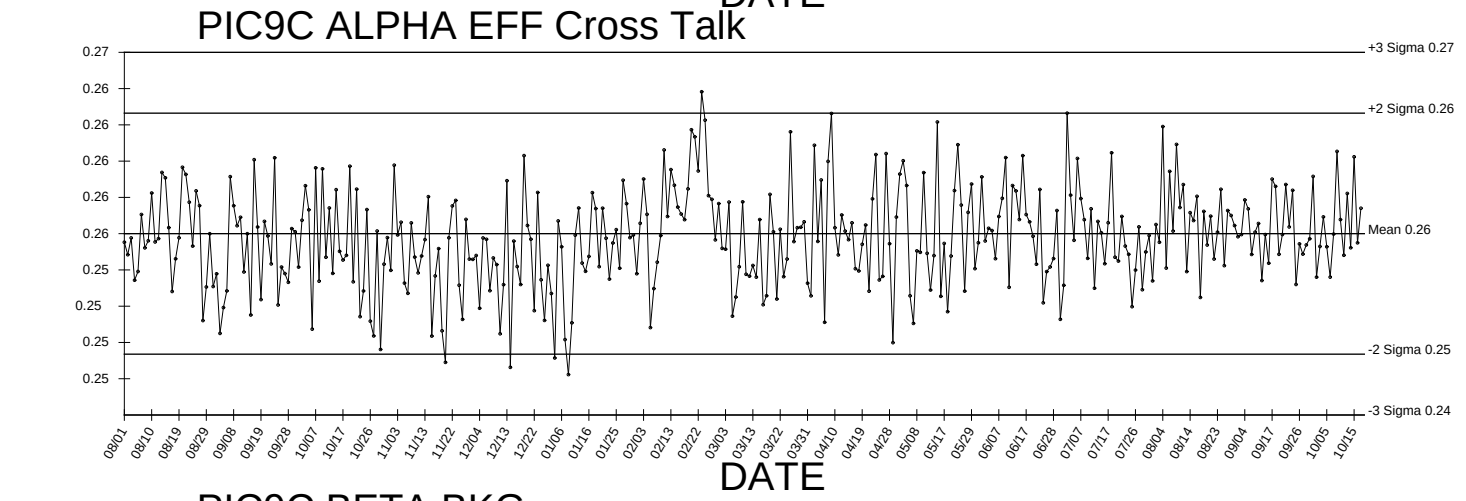

PIC9B ALPHA BKG
Generated 10/17/2018
CPM
0.14
0.13
0.11
0.09054
0.0732
0.056
0.0387
0.0214
0.004096
-0.0132
+3 Sigma 0.14
+2 Sigma 0.11
Mean 0.06
-2 Sigma -0.002
-3 Sigma -0.03
DATE
PIC9B ALPHA EFF
CPM
12730
12647
12564
12481
12398
12315
12232
12149
12066
11983
+3 Sigma 12730
+2 Sigma 12600
Mean 12320
-2 Sigma 12000
-3 Sigma 11900
DATE
PIC9B ALPHA EFF Cross Talk
0.29
0.28
0.28
0.28
0.28
0.28
0.27
0.27
0.27
0.27
+3 Sigma 0.29
+2 Sigma 0.28
Mean 0.28
-2 Sigma 0.27
-3 Sigma 0.27
DATE
PIC9B BETA BKG
CPM
1.08
01
0.91
0.83
0.74
0.66
0.57
0.49
0.4
0.31
+3 Sigma 1.08
+2 Sigma 0.94
Mean 0.66
-2 Sigma 0.37
-3 Sigma 0.23
DATE
Denotes Outlier

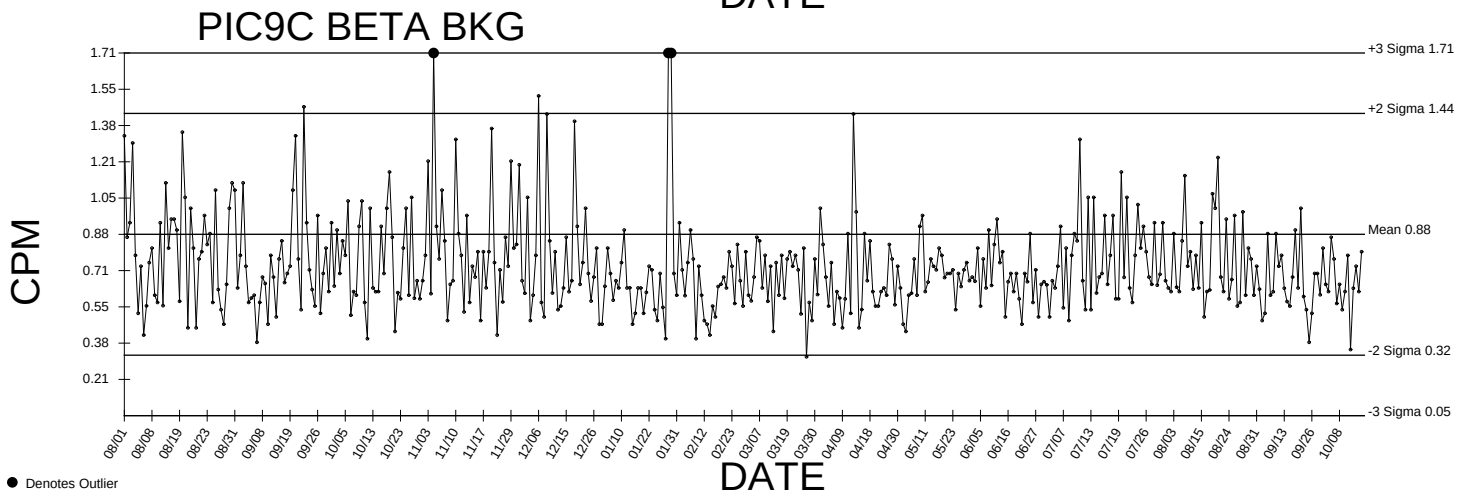


● Denotes Outlier

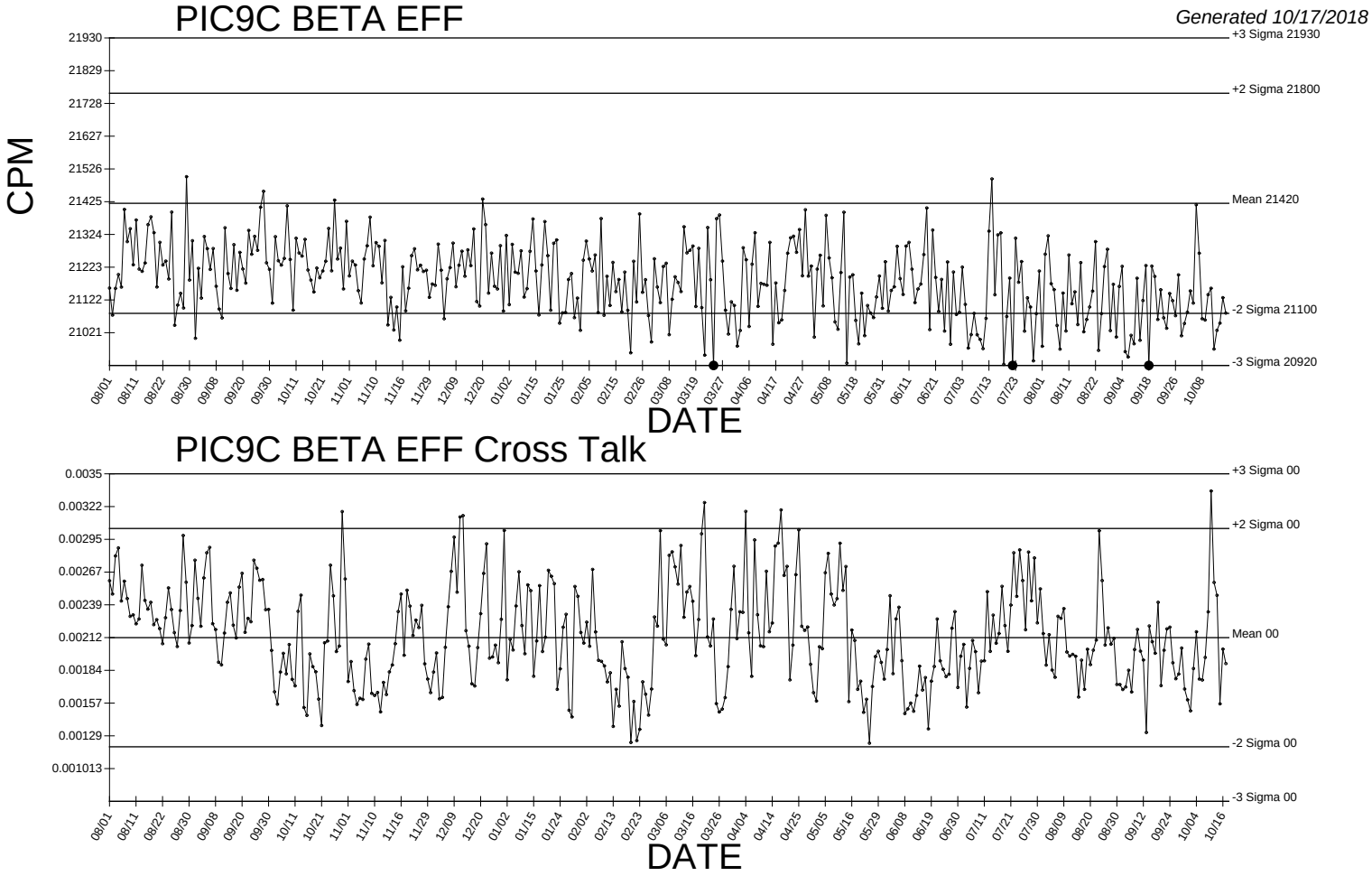








● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

0487

National Institute of Standards & Technology

0487

Certificate

Standard Reference Material 4251C
Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive barium-133 chloride, non-radioactive barium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains barium-133 with a total activity of approximately 2.5 MBq. Barium-133 decays by electron capture and during the decay process X-rays and gamma rays with energies from 4 to 400 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least June 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
October 1994

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

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Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have an acid concentration and a carrier concentration comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

RC-5-035-002b

PROPERTIES OF SRM 4251C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4251C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.015 ± 0.002) g•mL^{-1} at 22.1 °C** [b]*		
Solution mass	**(5.054 ± 0.001) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L^{-1})	Mass Fraction (g•g^{-1})
	H_2O HCl $BaCl_2$ $^{133}BaCl_2$	54 1.0 6×10^{-4} 4×10^{-7}	0.96 0.04 1.2×10^{-4} 8×10^{-8}
Radiological Properties:			
Radionuclide	**Barium-133**		
Reference time	**1200 EST, 1 September 1993**		
Massic activity of the solution [c] (Activity per unit mass of solution)	**4.876×10^5 Bq•g^{-1}**		
Relative expanded uncertainty (k=2)	**0.52%** [d]		
Photon-emitting impurities	None detected [e]		
Half lives used	Barium-133: (10.52 ± 0.13) a [f] Radium-226: (1600 ± 7) a [f]		
Measuring instrument	Pressurized "4π"γ ionization chamber A calibrated using a barium-133 solution whose activity was determined by 4π(e+X)-γ-anticoincidence counting		

*Notes and references are on pages 5 and 6.

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EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [g]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [h]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
PIC A net response per gram of SRM 4251C, measured relative to RRS20 [j]	Standard deviation of the mean for 1000 repeated measurements (A)	0.008	1.0	0.01
PIC A background response, measured relative to RRS20	Standard deviation of the mean for >150 repeated measurements (A)	0.25	0.001 [k]	0.00
PIC A net response for RRS200, measured relative to RRS20	Standard deviation of the mean for >100 repeated measurements (A)	0.06	1.0	0.06
PIC A net response per Bq of barium-133 in solution, measured relative to RRS200.	Standard deviation of the mean for 240 repeated measurements (A)	0.02	1.0	0.02
Gravimetric measurements	Estimated (B)	0.01	1.0	0.01
Half life of barium-133 Half life of radium-226	Standard uncertainty of the half life (A)	1.24 [m] 0.44 [m]	0.004 [n] 0.004 [n]	0.00 0.00
Activity used to calibrate PIC A net response per Bq of barium-133 in solution	Standard uncertainty of the activity determined by $4\pi(e+X)$-γ-anticoincidence counting. (B)	0.22	1.0	0.22
Live-time [p]	Estimated (B)	0.10	1.0	0.10
PIC A charge collection	Estimated (B)	0.05	1.0	0.05
Source Positioning	Estimated (B)	0.05	1.0	0.05
Photon-emitting impurities	Limit of detection for Cs-134 (B) [q]	100.	0.00002	0.00
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.26
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.52

*Notes and references are on pages 5 and 6.

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NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	100	1.5	0.2

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for photon-emitting impurities are:
600 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 12 and 75 keV,
150 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 84 and 379 keV, and
3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 387 and 2700 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of barium-133.

[f] The stated uncertainty is the standard uncertainty. See reference [5].

[g] Relative standard uncertainty of the input quantity x_i.

[h] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[i] Relative component of combined standard uncertainty of output quantity y, rounded to two decimal places. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

RC-S-035-002e

[j] The response of pressurized ionization chamber A (PIC A) is determined from measurement of the time required to collect a given amount of charge on a stable fixed capacitor. All of the response measurements in the NIST pressurized ionization chambers are made relative to the response of one or more artifact standards. These artifact standards consist of microgram quantities of aged radium-226 in small welded stainless-steel capsules. These capsules are encapsulated in plastic rods whose dimensions are similar to those of the standard NIST ampoule. The artifact standards are called **Radium Reference Sources** and are designated as RRSx, where x is the nominal mass (in micrograms) of radium-226 in the capsule.

[k] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background response)/(average net sample response)

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated oscillator.

[q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i$ = 100%. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of Ba-133)}·{(Bq of impurity)/(Bq of Ba-133)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), April 1994.

RC-S-035-002f

Standard Traceability Log Rad

Source Material Info	
Parent Code:	0487
Prepared By:	Angela Johnson
Carrier Conc:	0.1 M HCL
Reference Date:	09/01/1993
Ampoule Mass (g):	5.054 g
Uncertainty:	+/- .26 %
LogBook No:	RC S 035 002

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Angela Johnson		
Prep Date:	10/31/2002		
Verification Date:	10/10/2018		
Expiration Date:	10/10/2019		
Primary Code:	0487-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.7696 g		
Density(g/mL):	0.9984	Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (100 mL) = 1395394.1760 dpm/mL
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (0.9984 g/mL) / (100 mL) = 1397609.3930 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/18/2015	Gregory Ramsay	15.0062	1000	0487-B	20972.806 dpm/mL	11/18/2016	11/18/2017
01/17/2017	Bethany Fiem	15.1795	1000	0487-C	21215.0117 dpm/mL	01/17/2017	01/17/2018
11/08/2017	Bethany Fiem	15.5573	1000	0487-D	21708.5658 dpm/mL	11/08/2017	11/08/2018

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 0487-D

v1.0.2

Instrument	BLUE
Analyst	BXF1
Verification Prep Date	11/8/2017

Standard Information	
Isotope	Ba-133
Serial Number	0487-D
Isotope Halflife	3.8410E+03 D
Reference Date	9/1/1993
Ref. Act. (DPM/mL)	21708.56581
Amount of Std. (mL)	1.0
Standard Prep Date	11/8/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	11/9/2017	90.10	3690.91	42.20
2	11/9/2017	91.20	3665.09	42.30
3	11/9/2017	91.10	3667.64	42.20

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3648.71	0.818070	4460.15	4460.15
2	3622.89	0.818070	4428.58	4428.58
3	3625.44	0.818070	4431.70	4431.70

	dpm/mL
Mean Value =	4440.14
Stdev =	17.39253395
Certificate Value* =	**4407.7**
Two sigma =	34.785
10 % of Mean =	444.014
Rule A (Pass/Fail)	**Pass**
% Recovery	100.74%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**11/8/2018**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ba-133 source 0487-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCBLUE for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 11/8/2017 using Ba-133 source 1601-A.

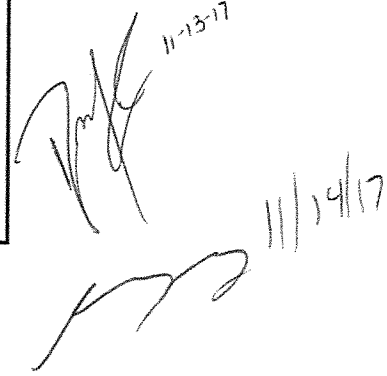
Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001



National Institute of Standards & Technology

Certificate

Received 3-9-17

Standard Reference Material® 4339b

1810

Radium-228 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive radium-228 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4339b consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **radium-228** massic activity value, at a **Reference Time of 1200 EST, 07 October 2010**, is:

$$\mathbf{(195 \pm 14)\ Bq \cdot g^{-1}}$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, Becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analyses.

Expiration of Certification: The certification of **SRM 4339b** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Radiological and Chemical Hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the Physical Measurement Laboratory, Radiation and Biomolecular Physics Division, Radioactivity Group, M.P. Unterweger, Group Leader. The overall technical direction and physical measurement leading to certification and photon-emitting impurity analyses were provided by L. Pibida of the NIST Radioactivity Group, with production assistance by J. LaRosa, R. Collé, and L. Laureano-Pérez. Alpha-emitting impurity analyses were provided by J. LaRosa.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Lisa R. Karam, Chief
Radiation and Biomolecular Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 14 November 2012

Robert L. Watters, Jr., Director
Office of Reference Materials

CLCEN-707-103

Table 1. Certified Massic Activity of SRM 4339b

Radionuclide	**Radium-228[a]**
Reference time	**1200 EST, 07 October 2010**
Massic activity of the solution	**195 Bq g^{-1}**
Relative expanded uncertainty ($k = 2$)	**7.2 %[b]**

[a] The final ^{228}Ra purification from the ^{232}Th mother solution was performed on 02 September 2010 0920 EST.
[b] The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4,5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain what is assumed to be an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4339b

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	1.3 mol L^{-1} HNO_3 with 19.8 µg g^{-1} Ba^{+2}
Solution density	(1.034 ± 0.002) g mL^{-1} at 20.8 °C[a]
Solution mass	(5.180 ± 0.003) g[a]
Photon-emitting impurities	^{226}Ra: < 0.5 Bq g^{-1}[b]
Alpha-emitting impurities	^{232}Th: < 0.08 Bq g^{-1}[c]
Half-lives used	^{228}Ra: (5.75 ± 0.04) a[d] [6] ^{228}Ac: (6.15 ± 0.02) h [7] ^{226}Ra: (1600 ± 7) a [8] ^{232}Th: (14.02 ± 0.06) x 10^9 a [9]
Calibration methods (and instruments)	The certified massic activity for ^{228}Ra was obtained by high-resolution gamma-ray spectrometry of three master solution ampoules (eleven separate determinations), as measured on three to five different spectrometers and geometries on each ampoule, and used assumed nuclear data for probabilities per decay for 16 gamma-ray transitions. Confirmatory measurements were performed by 2πα spectrometry of ingrown ^{228}Th with a planar, ion-implanted Si detector.

[a] The stated uncertainty is two times the standard uncertainty. See reference 5.
[b] Based on gamma-ray spectrometry of forced-fitted peak at 186.2 keV and assuming a probability per decay of 0.0355 [6].
[c] The maximum ^{232}Th activity concentration in ^{228}Ra.
[d] The stated uncertainty is the standard uncertainty. See reference 5.

Table 3. Uncertainty Evaluation for the Massic Activity of SRM 4339b

	Uncertainty component	Assessment Type[a]	Relative standard uncertainty contribution on massic activity of ^{228}Ra (%)
1	Gamma-ray spectrometry precision; relative standard deviation of the grand mean on the average massic gamma-ray emission rates for 16 measured ^{228}Ac gamma-ray transitions. Each mean in the grand mean is based on 11 determinations with three sources in three to five different detectors. The uncertainty in the determination of the massic gamma-ray emission rate for any one transition in a given determination ranged from typically 0.5 % to 1.5 %. The relative standard deviation of the mean for the average of the 16 lines, for any one determination, was typically 1 %; whereas the relative standard deviation of the grand mean for the average of the 16 lines across all 11 determinations is 0.34 %[b]. Data passes normality test.	A	0.84
2	Uncertainty due to assumed gamma-ray probabilities per decay for the measured ^{228}Ac transitions [7]. The uncertainty on each transition has a shared (correlated) component of 2.5 % (see comments in [7]).	B	3.5
3	Detection efficiencies not embodied within component 1	B	0.4
4	Mass determinations for dilution factors and counting source preparations	B	0.1
5	Decay corrections for ^{228}Ra half-life uncertainty of 0.7 % [6]	B	0.003
6	Effect of ^{228}Ra and ^{228}Ac half-life uncertainties on secular equilibrium ratio	B	0.02
Relative combined standard uncertainty			**3.6**
Relative expanded uncertainty (k = 2)			**7.2**

[a] Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.
[b] Average massic gamma-ray emission rates of 11 geometries (R_γ) for 16 measured ^{228}Ac gamma-ray transitions with their respective energy (E_γ); assumed gamma-ray probabilities per decay (I_γ) and standard deviation of the mean (S_m).

E_γ (keV)	Assumed I_γ (%) [1]	Mean R_γ (s^{-1} g^{-1})(i)	S_m (%)(ii)
129.065	2.50	1347	0.38
153.967	0.754	421.6	0.40
209.249	3.97	2264	0.55
270.245	3.55	2014	0.33
328.004	3.04	1822	0.43
338.32	11.4	6712	0.43
409.46	2.02	1185	0.29
463.002	4.45	2645	0.33
755.313	1.03	593.3	0.46
772.291	1.52	899.2	0.53
794.942	4.31	2588	0.35
835.704	1.7	995.3	0.42
911.196	26.2	15609	0.29
964.786	4.99	3007	0.35
968.96	15.9	9582	0.30
1588.2	3.06	1889	0.28

(i) Grand mean for n = 11 determinations with three sources in three to five different detectors.
(ii) Relative standard deviation of the grand mean on R_γ for n = 11.

INSTRUCTIONS FOR HANDLING AND STORAGE

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

Storage: SRM 4339b should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

REFERENCES

[1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*, available at http://www.nist.gov/pml/div682/grp04/srm.cfm (accessed Nov 2012). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.

[2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 19 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 18 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement;* (ISO GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France (2008); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Nov 2012).

[5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://physics.nist.gov/Pubs/ (accessed Nov 2012).

[6] Luca, A.; June 2009, ^{228}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-228_tables.pdf (accessed Nov 2012).

[7] Pearce, A.; January 2010, ^{228}Ac. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ac-228_tables.pdf (accessed Nov 2012).

[8] Christé, V. and M.M. Bé; December 2006, ^{226}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-226_tables.pdf (accessed Nov 2012).

[9] Arinc, A.; September 2008, ^{232}Th. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Th-232_tables.pdf (accessed Nov 2012).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1810
Prepared By:	Tim Chandler
Carrier Conc:	1.3M HNO3
Reference Date:	10/07/2010
Ampoule Mass (g):	5.18 g
Uncertainty:	+/- 3.6 %
LogBook No:	GL-CED-297-103

A Solution Material Info			
Isotope:	Radium-228 SPIKE		
Prepared By:	Bethany Fiem		
Prep Date:	05/23/2018		
Verification Date:	05/23/2018		
Expiration Date:	05/23/2019		
Primary Code:	1810-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.1447 g		
Density(g/mL):	1.0178	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (200 mL) = 300.9650 dpm/mL
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (1.0178 g/mL) / (200 mL) = 295.7015 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1810-A Jar

v1.1.2
BMF
5/23/2018

Isotope	Result
Ra-228	pCi/L
Ra-228 N1	29340
Ra-228 N2	28510
Ra-228 N3	29320

Mean Value (Counting) =	29056.67	pCi/L	**107.165**	**Fail**	*Exception taken due to the high uncertainty of the certified value
Stdev =	473.533	pCi/L		**Rule B (Pass/Fail)**	
Certificate Value =	27114.0	pCi/L			
Two sigma =	947.0656436				
10 % of Mean =	2905.666667				
Rule A (Pass/Fail)	**Pass**				

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
Rule B = The determined mean value shall be within 5% of the certificate value.

5-23-18

5/25/18

Runlogs

Instrument Run Log

Instrument Type: GFPC **Batch ID: 1810350**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
461024001	SAMPLE	JXC9	PIC6A	OCT-17-18 09:37:31	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032001	SAMPLE	JXC9	PIC6B	OCT-17-18 09:37:37	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032002	SAMPLE	JXC9	PIC6C	OCT-17-18 09:37:42	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032003	SAMPLE	JXC9	PIC7A	OCT-17-18 09:37:52	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032004	SAMPLE	JXC9	PIC7B	OCT-17-18 09:37:58	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032005	SAMPLE	JXC9	PIC7C	OCT-17-18 09:38:03	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032006	SAMPLE	JXC9	PIC7D	OCT-17-18 09:38:09	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032007	SAMPLE	JXC9	PIC8B	OCT-17-18 09:38:14	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032008	SAMPLE	JXC9	PIC8C	OCT-17-18 09:38:19	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032009	SAMPLE	JXC9	PIC9A	OCT-17-18 09:38:26	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032010	SAMPLE	JXC9	PIC9B	OCT-17-18 09:38:33	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461032011	SAMPLE	JXC9	PIC9C	OCT-17-18 09:38:39	DONE	CeF on 25mm Filter	01-JUN-17 00:00
461045001	SAMPLE	JXC9	PIC9D	OCT-17-18 09:38:47	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204131260	MB	JXC9	PIC10A	OCT-17-18 09:40:45	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204131261	DUP	JXC9	PIC10B	OCT-17-18 09:40:49	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204131262	LCS	JXC9	PIC10C	OCT-17-18 09:40:54	DONE	CeF on 25mm Filter	01-JUN-17 00:00

Lucas Cell Raw Data

Batch 1810045 Check-list

This check-list was completed on 11-OCT-18 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 11-OCT-18 and Lyndsey Pace on 11-OCT-18.

Batch ID: 1810045

Product: LUC26RAL

Description: Lucas Cell Radium 226 GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Radium-226 Queue Sheet

08-OCT-18

GEL Laboratories, Radiochemistry Division

Batch #: 1810045 **Analyst:** PCW **First Client Due Date:** 11/02/2018 **Internal Due Date:** 10/29/2018

Spike Isotope: Radium-226 **Spike Code:** 17150 **Expiration Date:** 12/19/18 **Vol:** 0.1 **End Initial/Degas Date/Time:** 10/8/18 1200

LCS Isotope: Radium-226 **LCS Code:** 17150 **Expiration Date:** 12/19/18 **Vol:** 0.1 **End LN De-em Date:** 10/11/18

Bkg Count Time: 30 (Min) **Sample Count Time:** 30 (Min) **Start Count Date:** 10/11/18

Prep Date: 10/5/18 **Pipet ID:** 2706953 **Balance ID:** 18150253 **Initials:** PW **Witness:** N/A

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Position (Label)	Aliquot (mL or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
461032001-1	MW-6	SAMPLE		WATER	1 pCi/L	LANC001	1	500	0335	0635	108	1	2	196
461032002-1	MW-5	SAMPLE		WATER	1 pCi/L	LANC001	2	500	0335	0635	208	2	6	123
461032003-1	MW-9	SAMPLE		WATER	1 pCi/L	LANC001	3	500	0335	0635	302	3	1	40
461032004-1	MW-7	SAMPLE		WATER	1 pCi/L	LANC001	4	500	0335	0635	401	4	2	219
461032005-1	MW-8	SAMPLE		WATER	1 pCi/L	LANC001	5	500	0335	0635	504	5	5	16516
461032006-1	FB-20181001	SAMPLE		WATER	1 pCi/L	LANC001	6	500	0335	0635	601	6	2	6
461032007-1	FB-20181002	SAMPLE		WATER	1 pCi/L	LANC001	7	500	0335	0635	707	7	5	5
461032008-1	MW-1	SAMPLE		WATER	1 pCi/L	LANC001	8	500	0335	0635	803	8	4	185
461032009-1	MW-2	SAMPLE		WATER	1 pCi/L	LANC001	9	500	0359	0725	106	1	8	131
461032010-1	MW-4	SAMPLE		WATER	1 pCi/L	LANC001	10	500	0358	0725	207	2	6	53
461032011-1	MW-3	SAMPLE		WATER	1 pCi/L	LANC001	11	500	0358	0725	307	3	7	67
461125001-1	AE23673	SAMPLE		GROUND WA	1 pCi/L	SOOP001	12	500	0358	0725	403	4	3	239
461125002-1	AE23674	SAMPLE		GROUND WA	1 pCi/L	SOOP001	13	500	0358	0725	506	5	3	58
461125003-1	AE23677	SAMPLE		GROUND WA	1 pCi/L	SOOP001	14	500	0358	0725	607	6	4	25
461125004-1	AE23678	SAMPLE		GROUND WA	1 pCi/L	SOOP001	15	500	0358	0725	701	7	7	212
461125005-1	AE23679	SAMPLE		GROUND WA	1 pCi/L	SOOP001	16	500	0358	0725	804	8	8	77
461125006-1	AE23680	SAMPLE		GROUND WA	1 pCi/L	SOOP001	17	500	0421	0805	101	1	3	84
461125007-1	AE23675	SAMPLE		GROUND WA	1 pCi/L	SOOP001	18	500	0421	0805	203	2	7	58
461125008-1	AE23676	SAMPLE		GROUND WA	1 pCi/L	SOOP001	19	500	0421	0805	306	3	8	80
1204130612-1	MB for batch 1810045	MB		WATER	1 pCi/L	QC ACCOUNT	20	500	0421	0805	405	4	1	5
1204130613-1	MW-6(461032001DUP)	DUP		WATER	1 pCi/L	QC ACCOUNT	21	500	0421	0805	501	5	3	205
1204130614-1	MW-6(461032001MS)	MS		WATER	1 pCi/L	QC ACCOUNT	22	100	0421	0805	602	6	6	431
1204130615-1	MW-6(461032001MSD)	MSD		WATER	1 pCi/L	QC ACCOUNT	23	100	0421	0805	704	7	8	609
1204130616-1	LCS for batch 1810045	LCS		WATER	1 pCi/L	QC ACCOUNT	24	500	0421	0805	805	8	1	634

Comments: _____

Data Reviewed By: _____ 10/11/18

Radium-226 Liquid

Filename : RA226.XLS
File type : Excel
Version # : 1.3.2

Batch : 1810045
Analyst : PCW
Prep Date : 10/8/2018
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 1 pCi/L
Halflife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halflife of Rn-222: 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					**Count Raw Data**							
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
1	461032001.1	0.5000	2.0256E-05	10/1/2018 11:30	108	30	196	6.533	2	0.067	30	2.0290
2	461032002.1	0.5000	2.0256E-05	10/1/2018 11:10	208	30	123	4.100	6	0.200	30	1.8820
3	461032003.1	0.5000	2.0256E-05	10/1/2018 13:10	302	30	40	1.333	1	0.033	30	1.6870
4	461032004.1	0.5000	2.0256E-05	10/1/2018 14:40	401	30	219	7.300	2	0.067	30	1.9020
5	461032005.1	0.5000	2.0256E-05	10/1/2018 14:50	504	30	1656	55.200	5	0.167	30	1.8310
6	461032006.1	0.5000	2.0256E-05	10/1/2018 12:00	601	30	6	0.200	2	0.067	30	1.9080
7	461032007.1	0.5000	2.0256E-05	10/2/2018 12:00	707	30	5	0.167	5	0.167	30	2.0370
8	461032008.1	0.5000	2.0256E-05	10/2/2018 10:05	803	30	185	6.167	4	0.133	30	1.4750
9	461032009.1	0.5000	2.0256E-05	10/2/2018 9:55	106	30	131	4.367	8	0.267	30	2.1070
10	461032010.1	0.5000	2.0256E-05	10/2/2018 11:40	207	30	53	1.767	6	0.200	30	1.9750
11	461032011.1	0.5000	2.0256E-05	10/2/2018 12:05	307	30	67	2.233	7	0.233	30	1.8050
12	461125001.1	0.5000	2.0256E-05	10/1/2018 10:43	403	30	239	7.967	3	0.100	30	1.4320
13	461125002.1	0.5000	2.0256E-05	10/1/2018 11:25	506	30	58	1.933	3	0.100	30	2.0990
14	461125003.1	0.5000	2.0256E-05	10/1/2018 12:46	607	30	25	0.833	4	0.133	30	2.1300
15	461125004.1	0.5000	2.0256E-05	10/1/2018 13:43	701	30	212	7.067	7	0.233	30	1.9520
16	461125005.1	0.5000	2.0256E-05	10/1/2018 14:43	804	30	77	2.567	8	0.267	30	1.8590
17	461125006.1	0.5000	2.0256E-05	10/1/2018 15:43	101	30	84	2.800	3	0.100	30	1.5100
18	461125007.1	0.5000	2.0256E-05	10/2/2018 10:23	203	30	58	1.933	7	0.233	30	1.8290
19	461125008.1	0.5000	2.0256E-05	10/2/2018 10:28	308	30	80	2.667	8	0.267	30	1.4570
20	1204130612.1	0.5000	2.0256E-05	10/8/2018 0:00	405	30	5	0.167	1	0.033	30	1.5460
21	1204130613.1	0.5000	2.0256E-05	10/1/2018 11:30	507	30	205	6.833	3	0.100	30	1.9970
22	1204130614.1	0.1000	1.1370E-05	10/1/2018 11:30	602	30	631	21.033	6	0.200	30	2.1000
23	1204130615.1	0.1000	1.1370E-05	10/1/2018 11:30	704	30	609	20.300	8	0.267	30	2.0850
24	1204130616.1	0.5000	2.0256E-05	10/8/2018 0:00	805	30	634	21.133	1	0.033	30	1.9810

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			
						De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
6.700%	5/1/2018	4/30/2019	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
5.200%	8/1/2018	7/31/2019	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
9.700%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
0.500%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
9.700%	6/1/2018	5/31/2019	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
8.500%	7/1/2018	6/30/2019	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
4.300%	11/1/2017	10/31/2018	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
2.200%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 3:35	10/11/2018 6:35	0.381	0.978	1.002	1.000
4.700%	5/1/2018	4/30/2019	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
2.100%	8/1/2018	7/31/2019	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
6.300%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
4.500%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
2.500%	6/1/2018	5/31/2019	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
2.900%	7/1/2018	6/30/2019	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
1.900%	11/1/2017	10/31/2018	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
4.200%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 3:58	10/11/2018 7:25	0.383	0.974	1.002	1.000
5.300%	5/1/2018	4/30/2019	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000
9.900%	8/1/2018	7/31/2019	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000
9.500%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000
2.500%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000
5.300%	6/1/2018	5/31/2019	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000
2.100%	7/1/2018	6/30/2019	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000
2.200%	11/1/2017	10/31/2018	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000
3.100%	3/1/2018	2/28/2019	10/8/2018 12:00	10/11/2018 4:21	10/11/2018 8:05	0.385	0.972	1.002	1.000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-D
Spike Exp Date : 12/19/2018
Spike Activity (dpm/ml): 288.43
Spike Volume Added: 0.10

LCS S/N : 1715-D
LCS Exp Date : 12/19/2018
LCS Activity (dpm/ml): 288.43
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1853	0.1308	1	0.3810	**7.7156**	9.87%	6.4667	0.4690	1.0969	1.8628		SAMPLE				
2	0.3461	0.2443	1	0.6173	**5.0167**	11.01%	3.9000	0.3786	0.9545	1.3027		SAMPLE				
3	0.1576	0.1113	1	0.3661	**1.8655**	19.07%	1.3000	0.2134	0.6003	0.7475		SAMPLE				
4	0.1977	0.1396	1	0.4064	**9.2066**	6.87%	7.2333	0.4955	1.2362	1.8173		SAMPLE				
5	0.3247	0.2293	1	0.5907	**72.7627**	10.01%	55.0333	1.3585	3.5205	17.7224		SAMPLE				
6	0.1971	0.1391	1	0.4052	**0.1692**	71.22%	0.1333	0.0943	0.2345	0.2374		SAMPLE				
7	0.2919	0.2061	1	0.5310	**0.000E+00**	0.00%	0.0000	0.1054	0.2455	0.2456		SAMPLE				
8	0.3605	0.2545	1	0.6732	**9.9023**	7.91%	6.0333	0.4583	1.4742	2.0973		SAMPLE				
9	0.3565	0.2517	1	0.6181	**4.7047**	10.68%	4.1000	0.3930	0.8839	1.1959		SAMPLE				
10	0.3294	0.2325	1	0.5875	**1.9179**	16.48%	1.5667	0.2560	0.6143	0.6784		SAMPLE				
11	0.3893	0.2748	1	0.6836	**2.6790**	15.66%	2.0000	0.2867	0.7528	0.9087		SAMPLE				
12	0.3212	0.2268	1	0.6224	**13.2820**	7.98%	7.8667	0.5185	1.7160	2.8272		SAMPLE				
13	0.2191	0.1547	1	0.4246	**2.1118**	14.42%	1.8333	0.2603	0.5878	0.6701		SAMPLE				
14	0.2494	0.1760	1	0.4656	**0.7946**	25.81%	0.7000	0.1795	0.3994	0.4180		SAMPLE				
15	0.3599	0.2541	1	0.6321	**8.4639**	7.46%	6.8333	0.4933	1.1975	1.7396		SAMPLE				
16	0.4040	0.2853	1	0.7006	**2.9913**	14.01%	2.3000	0.3073	0.7834	0.9278		SAMPLE				
17	0.3039	0.2145	1	0.5888	**4.3124**	12.68%	2.7000	0.3109	0.9733	1.2391		SAMPLE				
18	0.3832	0.2705	1	0.6729	**2.2416**	18.65%	1.7000	0.2687	0.6946	0.8811		SAMPLE				
19	0.5142	0.3631	1	0.8916	**3.9726**	16.12%	2.4000	0.3127	1.0145	1.3803		SAMPLE				
20	0.1713	0.1210	1	0.3979	**0.2080**	61.29%	0.1333	0.0816	0.2496	0.2517		MB				
21	0.2298	0.1622	1	0.4452	**8.1317**	8.89%	6.7333	0.4807	1.1379	1.8402	461032001.1	DUP	5.3%			
22	1.5449	1.0907	1	2.7557	**119.6294**	4.55%	20.8333	0.8413	9.4686	20.3003	461032001.1	MS			129.9234	86.1%
23	1.7967	1.2685	1	3.1154	**115.8632**	4.68%	20.0333	0.8280	9.3858	19.8185	461032001.1	MSD	3.2%		129.9234	83.2%
24	0.1337	0.0944	1	0.3106	**25.6876**	5.05%	21.1000	0.8400	2.0043	4.4947		LCS			25.9845	98.9%

Continuing Calibration Data

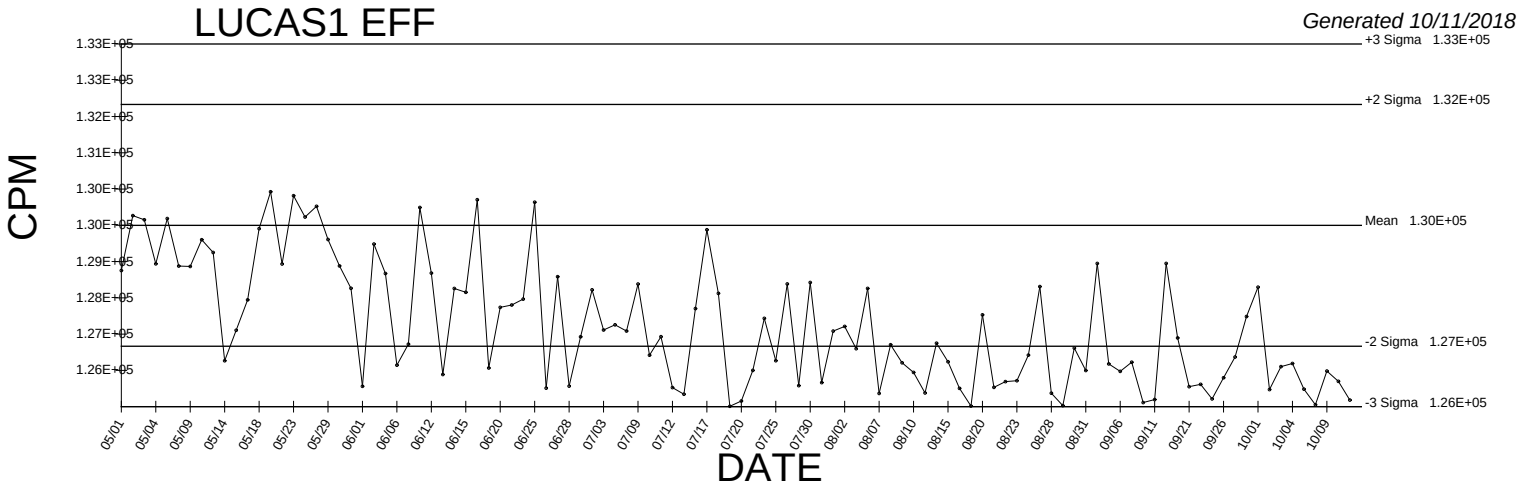
Ludlum Alpha Scintillation Counter Checks for 11-OCT-2018

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:15	1	1.26E+05	125839	-2.89		
LUCAS2	EFF	07:15	1	1.34E+05	134200	2.52		
LUCAS3	EFF	07:15	1	1.37E+05	137221	-1.8		
LUCAS4	EFF	07:15	1	1.31E+05	130618	-1.01		
LUCAS5	EFF	07:15	1	1.34E+05	133991	0.2		
LUCAS6	EFF	07:15	1	1.33E+05	133120	-1.63		
LUCAS7	EFF	07:15	1	1.43E+05	142589	1.78		
LUCAS8	EFF	07:15	1	1.38E+05	137710	-0.47		

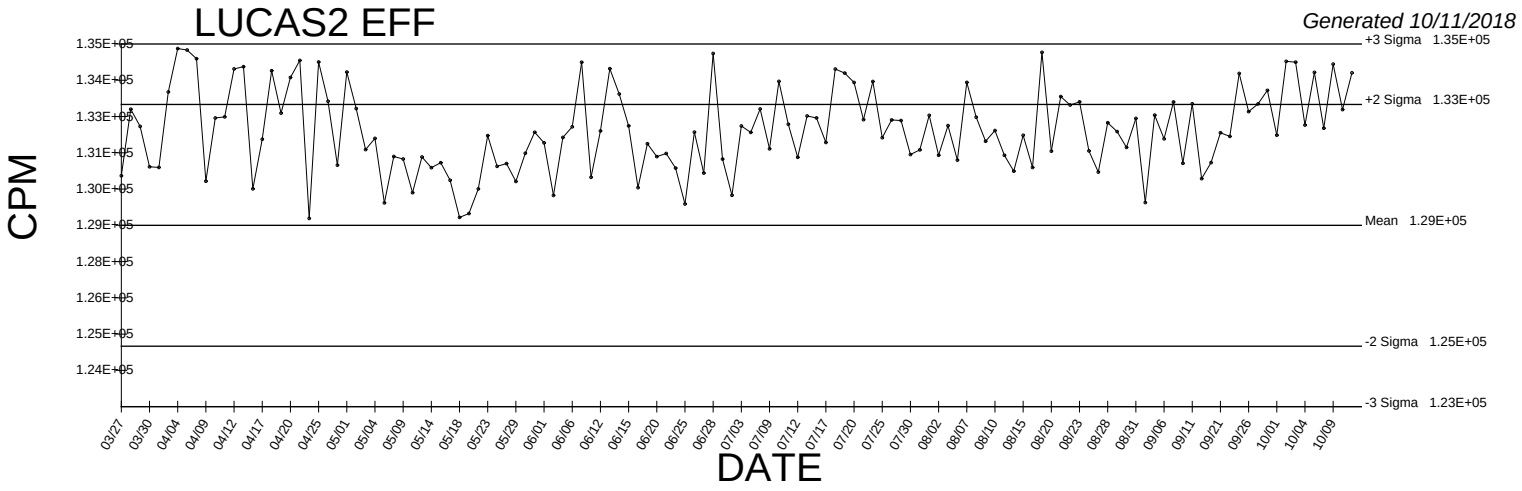
Reviewed by: Lyndsey Pace **Date:** 11-OCT-18

GEL Laboratories LLC

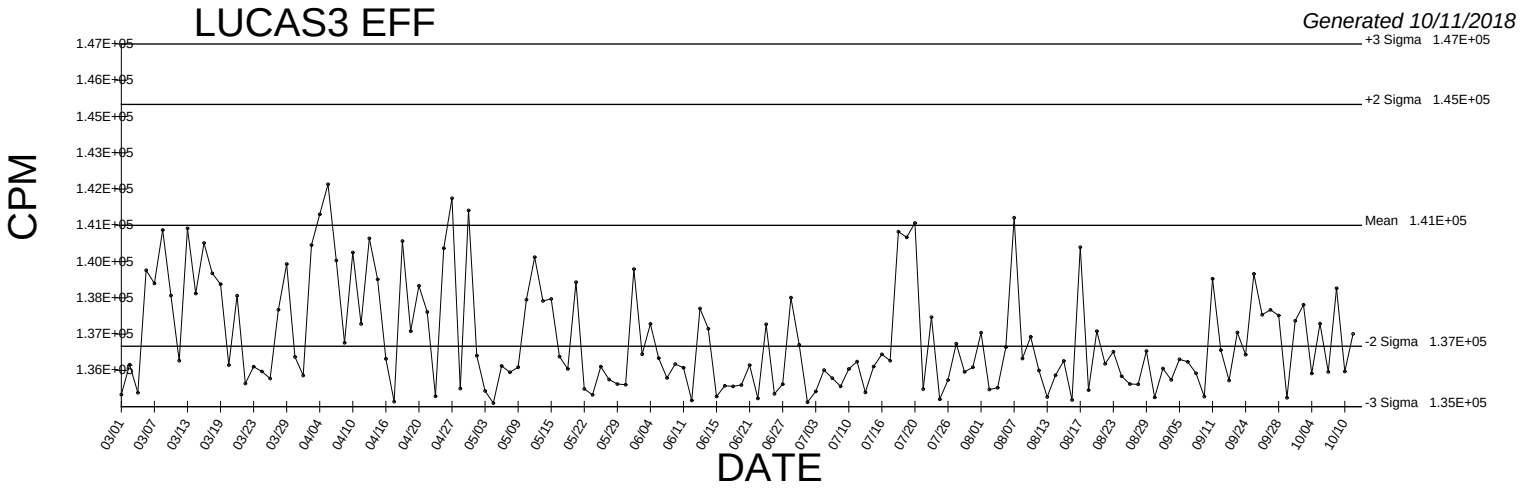
Efficiency Data



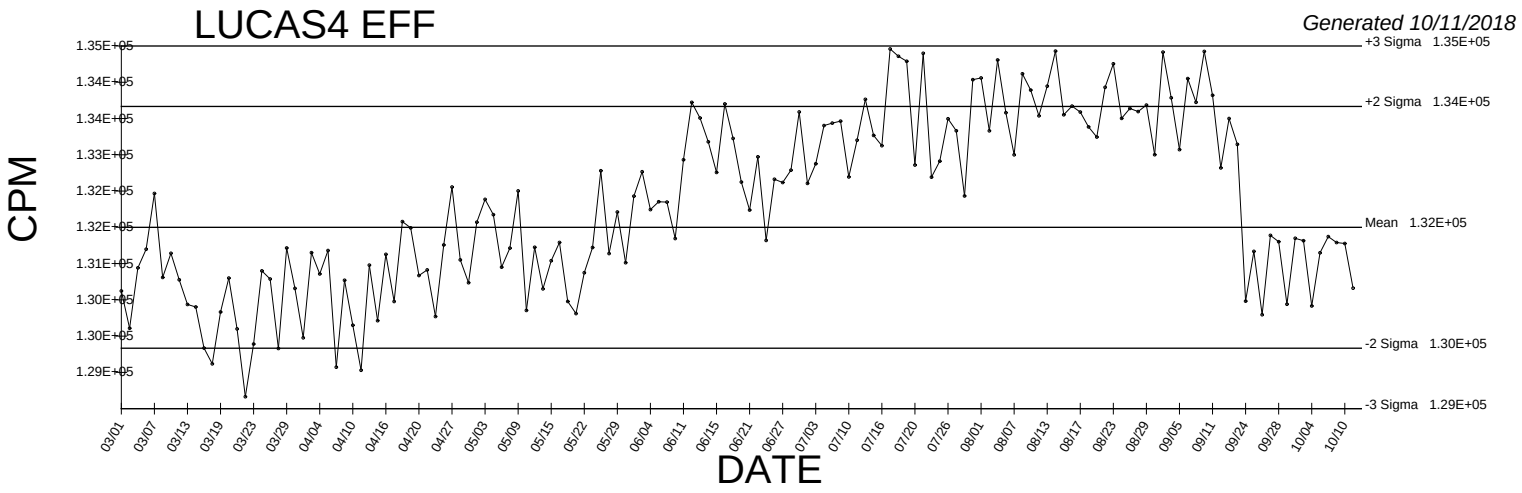
● Denotes Outlier



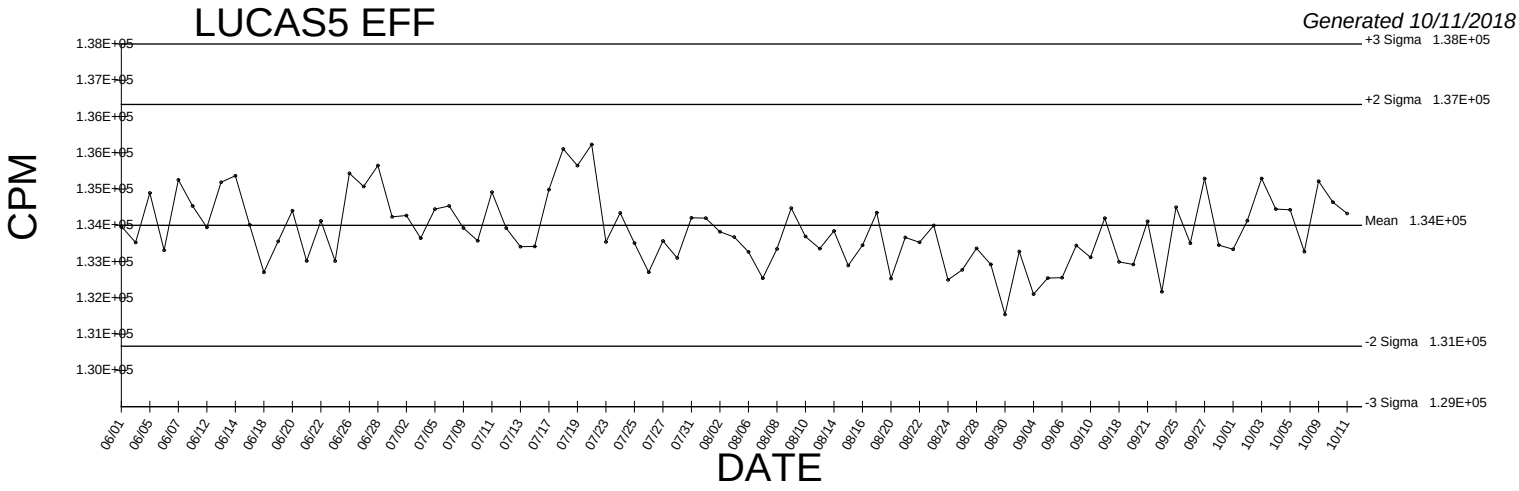
● Denotes Outlier



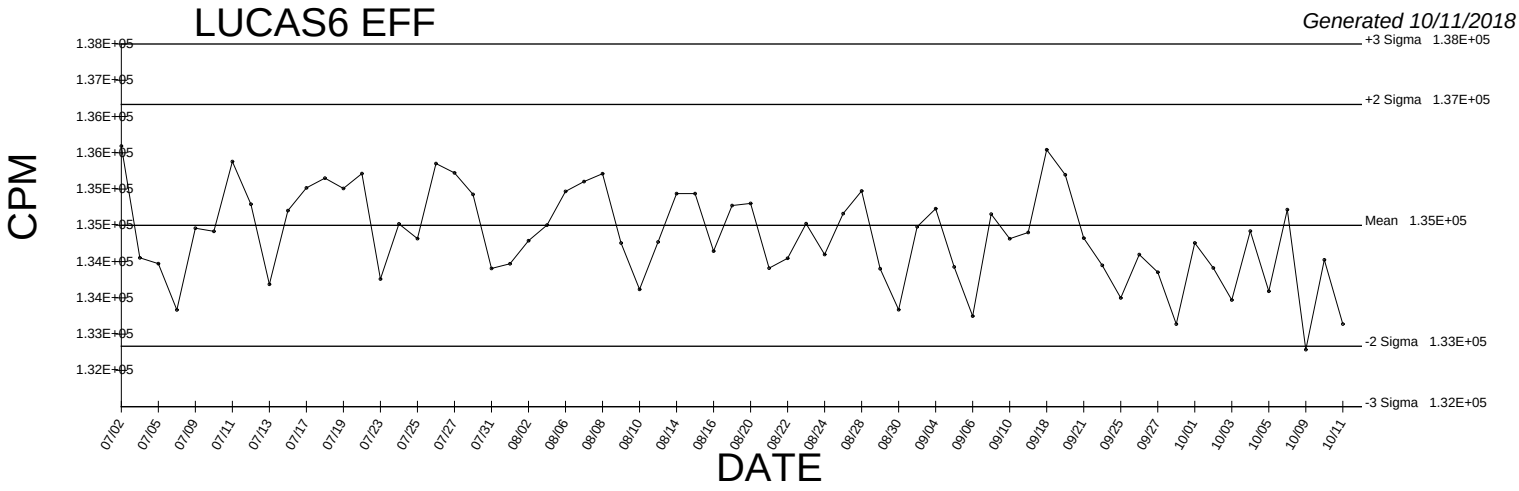
● Denotes Outlier



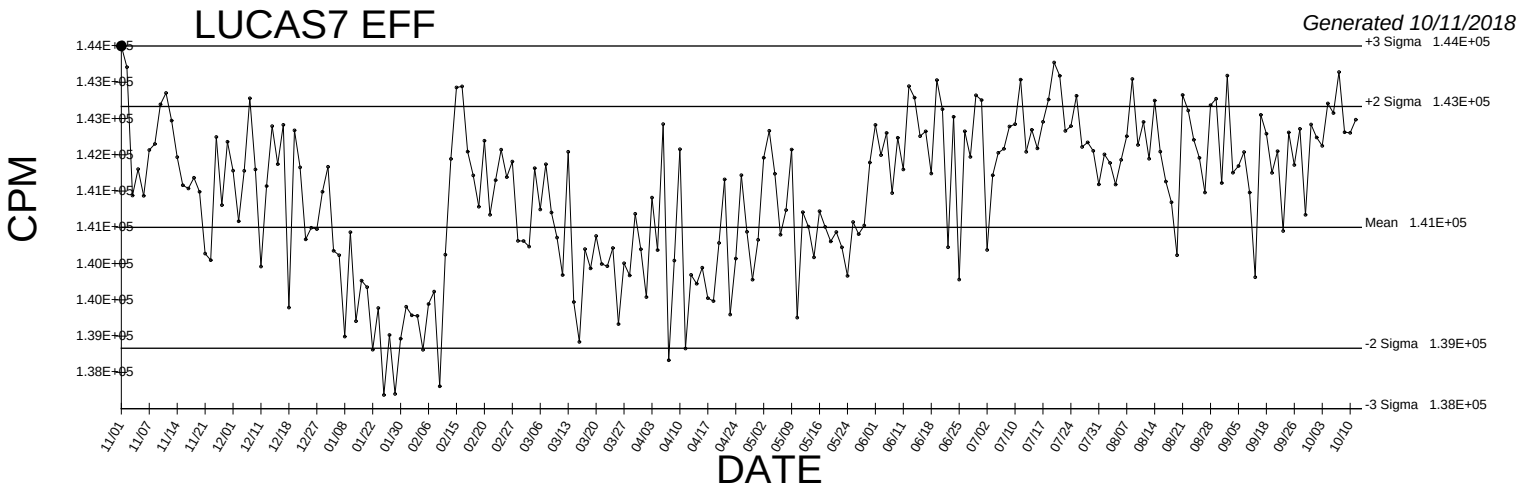
● Denotes Outlier



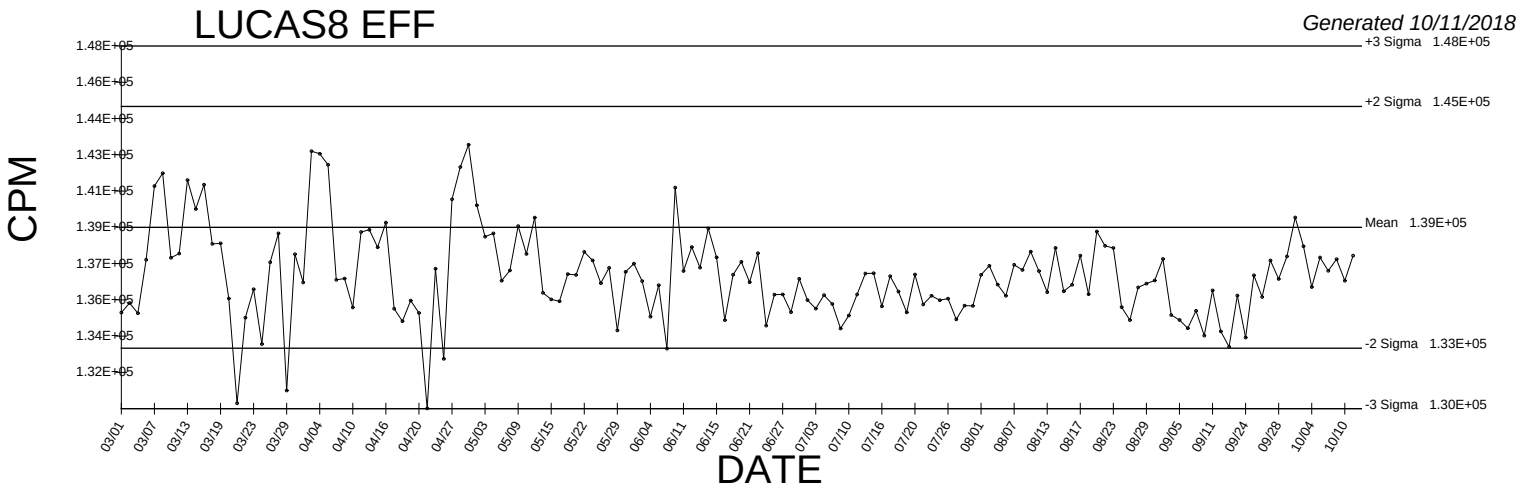
● Denotes Outlier



● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1715

98367

Ra-226 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 7 Product Code: 8226

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty* , % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Ra-226	5.844E+05	3.676E+04	1.0	2.1	4.7	09/09/2014

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities (other than decay products)<0.1%.
5.02193 g 0.1M HCl solution with approximately 30 µg/g Ba carrier.

Source Prepared by: R. Ormsby
R. Ormsby, Radiochemist

QC Approved: L. Tk
L. Tkavadze, Nuclear Metrologist

Date: 9 Sep 14

RECEIVED 9/10/14

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1715
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	09/09/2014
Ampoule Mass (g):	5.02193 g
Uncertainty:	+/- 2.35 %
LogBook No:	GL-CED-297-008

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Gregory Ramsay		
Prep Date:	07/06/2016		
Verification Date:	02/08/2017		
Expiration Date:	02/08/2018		
Primary Code:	1715-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9865 g		
Density(g/mL):	0.9967	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / (Ampoule Mass(g) *(Dilution Vol)) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / Density / (Ampoule Mass (g) * (Dilution Vol)) = Parent Activity (dpm/g)
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (5.02193 g * 100 mL) = 21900.3937 dpm/mL
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (0.9967 g/mL)/ (5.02193 g * 100 mL) = 21972.4854 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/06/2016	Gregory Ramsay	2.6261	200	1715-B	288.51 dpm/ml	01/25/2017	11/10/2018
02/08/2017	Gregory Ramsay	21.96	250	1715-C	1930.063 dpm/ml	02/08/2017	02/08/2018
12/19/2017	Gregory Ramsay	2.63	200	1715-D	288.938 dpm/ml	12/19/2017	12/19/2018

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1715-D

v1.0.2

Instrument	Yellow
Analyst	GXR1
Verification Prep Date	12/19/2017

Standard Information	
Isotope	Ra-226
Serial Number	1715-D
Isotope Halflife	1.6000E+03 Y
Reference Date	9/9/2014
Ref. Act. (DPM/mL)	288.938
Amount of Std. (mL)	0.5
Standard Prep Date	12/19/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	12/20/2017	773.48	70.40	11.00
2	12/20/2017	774.10	70.70	11.00
3	12/20/2017	772.98	73.30	11.00

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	59.40	0.422157	281.41	140.71
2	59.70	0.422157	282.83	141.42
3	62.30	0.422157	295.15	147.58

	dpm/mL
Mean Value =	286.47
Stdev =	7.555402963
Certificate Value* =	**288.5**
Two sigma =	15.111
10 % of Mean =	28.647
Rule A (Pass/Fail)	**Pass**
% Recovery	99.29%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**12/19/2018**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ra-226 source 1715-D by transferring 0.5 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCYellow for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 12/20/2017 using Ra-226 source 0299-H.

Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001

12/21/17

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR **Batch ID: 1810045**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
461032001	SAMPLE	PCW	LUCAS1	OCT-11-18 06:35:00	DONE	Lucas Cell	01-MAY-18 00:00
461032002	SAMPLE	PCW	LUCAS2	OCT-11-18 06:35:00	DONE	Lucas Cell	01-AUG-18 00:00
461032003	SAMPLE	PCW	LUCAS3	OCT-11-18 06:35:00	DONE	Lucas Cell	01-MAR-18 00:00
461032004	SAMPLE	PCW	LUCAS4	OCT-11-18 06:35:00	DONE	Lucas Cell	01-MAR-18 00:00
461032005	SAMPLE	PCW	LUCAS5	OCT-11-18 06:35:00	DONE	Lucas Cell	01-JUN-18 00:00
461032006	SAMPLE	PCW	LUCAS6	OCT-11-18 06:35:00	DONE	Lucas Cell	01-JUL-18 00:00
461032007	SAMPLE	PCW	LUCAS7	OCT-11-18 06:35:00	DONE	Lucas Cell	01-NOV-17 00:00
461032008	SAMPLE	PCW	LUCAS8	OCT-11-18 06:35:00	DONE	Lucas Cell	01-MAR-18 00:00
461032009	SAMPLE	PCW	LUCAS1	OCT-11-18 07:25:00	DONE	Lucas Cell	01-MAY-18 00:00
461032010	SAMPLE	PCW	LUCAS2	OCT-11-18 07:25:00	DONE	Lucas Cell	01-AUG-18 00:00
461032011	SAMPLE	PCW	LUCAS3	OCT-11-18 07:25:00	DONE	Lucas Cell	01-MAR-18 00:00
461125001	SAMPLE	PCW	LUCAS4	OCT-11-18 07:25:00	DONE	Lucas Cell	01-MAR-18 00:00
461125002	SAMPLE	PCW	LUCAS5	OCT-11-18 07:25:00	DONE	Lucas Cell	01-JUN-18 00:00
461125003	SAMPLE	PCW	LUCAS6	OCT-11-18 07:25:00	DONE	Lucas Cell	01-JUL-18 00:00
461125004	SAMPLE	PCW	LUCAS7	OCT-11-18 07:25:00	DONE	Lucas Cell	01-NOV-17 00:00
461125005	SAMPLE	PCW	LUCAS8	OCT-11-18 07:25:00	DONE	Lucas Cell	01-MAR-18 00:00
461125006	SAMPLE	PCW	LUCAS1	OCT-11-18 08:05:00	DONE	Lucas Cell	01-MAY-18 00:00
461125007	SAMPLE	PCW	LUCAS2	OCT-11-18 08:05:00	DONE	Lucas Cell	01-AUG-18 00:00
461125008	SAMPLE	PCW	LUCAS3	OCT-11-18 08:05:00	DONE	Lucas Cell	01-MAR-18 00:00
1204130612	MB	PCW	LUCAS4	OCT-11-18 08:05:00	DONE	Lucas Cell	01-MAR-18 00:00
1204130613	DUP	PCW	LUCAS5	OCT-11-18 08:05:00	DONE	Lucas Cell	01-JUN-18 00:00
1204130614	MS	PCW	LUCAS6	OCT-11-18 08:05:00	DONE	Lucas Cell	01-JUL-18 00:00
1204130615	MSD	PCW	LUCAS7	OCT-11-18 08:05:00	DONE	Lucas Cell	01-NOV-17 00:00
1204130616	LCS	PCW	LUCAS8	OCT-11-18 08:05:00	DONE	Lucas Cell	01-MAR-18 00:00

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2425 New Holland Pike, Lancaster, PA 17601 | 717-656-2300 | Fax: 717-656-2681 | www.LancasterLabs.com

Type III Data Package

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Project: PSEG Hudson
Groundwater and Water Samples
Collected on 10/31/18-11/01/18

SDG# GEJ60

GROUP	SAMPLE NUMBERS
2005364	9881981-9881991

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-18-27
AZ Cert. # AZ0780

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by: Dana M Kauffman **Date: 11/28/2018**

Dana M. Kauffman
Manager

Any questions or concerns you might have regarding this data package should be directed to your client representative, Kerri Sachtleben at (717)-556-7376.

2425 New Holland Pike, Lancaster, PA 17601 | 717-656-2300 | Fax: 717-656-2681 | www.LancasterLabs.com

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Sample Reference List for SDG Number GEJ60 with a Data Package Type of III

07701 - GEI Consultants, Inc.

Project: PSEG Hudson

Lab Sample Number	Client Sample ID	Collection Date	Date Received
9881981	MW-9	10/31/2018 11:05	11/02/2018 17:20
9881982	MW-7	10/31/2018 12:55	11/02/2018 17:20
9881983	MW-8	10/31/2018 12:35	11/02/2018 17:20
9881984	MW-5	10/31/2018 10:50	11/02/2018 17:20
9881985	MW-6	10/31/2018 14:20	11/02/2018 17:20
9881986	FB-20181031	10/31/2018 11:00	11/02/2018 17:20
9881987	MW-1	11/01/2018 09:45	11/02/2018 17:20
9881988	MW-4	11/01/2018 11:40	11/02/2018 17:20
9881989	MW-2	11/01/2018 10:35	11/02/2018 17:20
9881990	MW-3	11/01/2018 12:00	11/02/2018 17:20
9881991	FB-20181101	11/01/2018 11:00	11/02/2018 17:20

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Sample pH Log

SDG: GEJ60

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9881981	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:55:34PM	25804
9881981	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 6:55:22PM	12665
9881981	055A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:06:49AM	25684
9881981	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:49:52PM	25804
9881981	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:20:56AM	25684
9881981	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:55:24AM	12616
9881981	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:55:34PM	25804
9881981	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:20:56AM	25684
9881982	004A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:06AM	25684
9881982	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:01:23PM	12665
9881982	055A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:07:48AM	25684
9881982	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:50:18PM	25804
9881982	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:10:43AM	25684
9881982	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:47:03AM	12616
9881982	330A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:06AM	25684
9881982	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:10:43AM	25684
9881983	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:12:57AM	25684
9881983	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:01:47PM	12665
9881983	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:48:57PM	25804
9881983	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:47:00PM	25804
9881983	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:16:06AM	25684
9881983	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:44:58AM	12616
9881983	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:12:57AM	25684
9881983	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:12:57AM	25684
9881984	004A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:14:00AM	25684
9881984	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:02:46PM	12665
9881984	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:45:07PM	25804
9881984	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:51:53PM	25804
9881984	070A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:19:31AM	25684
9881984	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:42:45AM	12616
9881984	330A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:14:00AM	25684
9881984	332A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:14:00AM	25684
9881985	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:06:39PM	25804
9881985	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:03:20PM	12665
9881985	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:51:29PM	25804
9881985	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:45:26PM	25804
9881985	070A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:19:55AM	25684
9881985	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:41:06AM	12616

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9881985	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:06:39PM	25804
9881985	332A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:19:55AM	25684
9881986	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:15:02AM	25684
9881986	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:02:28PM	12665
9881986	055A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:46:28PM	25804
9881986	055B	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:49:27PM	25804
9881986	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:23:42AM	25684
9881986	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:49:21AM	12616
9881986	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:15:02AM	25684
9881986	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:15:02AM	25684
9881987	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:52AM	25684
9881987	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:02:07PM	12665
9881987	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:47:49PM	25804
9881987	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:48:35PM	25804
9881987	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:24:00AM	25684
9881987	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:39:11AM	12616
9881987	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:52AM	25684
9881987	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:52AM	25684
9881988	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:04:51PM	25804
9881988	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:03:03PM	12665
9881988	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:51:02PM	25804
9881988	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:50:40PM	25804
9881988	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:21:59AM	25684
9881988	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 11:00:43AM	12616
9881988	148A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:04:46PM	12665
9881988	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:04:51PM	25804
9881988	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:21:59AM	25684
9881989	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:09:45PM	25804
9881989	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:03:43PM	12665
9881989	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:47:19PM	25804
9881989	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:48:09PM	25804
9881989	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:23:00AM	25684
9881989	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:57:05AM	12616
9881989	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:09:45PM	25804
9881989	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:23:00AM	25684
9881990	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:05:52PM	25804
9881990	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:04:19PM	12665
9881990	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:06:26AM	25684
9881990	055B	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:07:22AM	25684
9881990	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:05:40AM	25684
9881990	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:51:07AM	12616
9881990	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:05:52PM	25804
9881990	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:05:40AM	25684
9881991	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:11:39AM	25684

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9881991	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:04:01PM	12665
9881991	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:45:55PM	25804
9881991	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:44:42PM	25804
9881991	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:09:15AM	25684
9881991	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:52:51AM	12616
9881991	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:11:39AM	25684
9881991	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:09:15AM	25684

*pH Check Code Key
PK = Original container checked - pH is within the correct range. (No preservative was added)
PA = Original container checked - pH adjusted to correct range. (Preservative was added)
PV = Volatile container checked
PC = pH checked (unpreserved container)
SPK = Subsampled from an original container. Original container checked - pH is within correct range
SPA = Subsampled from an original container. Subsample container checked - pH adjusted to correct range.
SPC = Subsampled from an original container. pH checked (unpreserved container).
SUP = Subsampled from original container. Unable to be preserved due to the matrix of the sample.
UP = Unable to preserve due to matrix of the sample.
NA = Not applicable

**Chlorine Present Code Key
NA = Chlorine Not Checked
Y = Chlorine Present
N = Chlorine Not Present

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00259 Mercury

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

14044 ICP-WW, 3005A (tot rec) - U345

The sample is digested with nitric acid and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3005A, July 1992

14047 ICPMS - Water, 3020A - U345

The sample is digested with nitric and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3020A, July 1992

05713 WW SW846 Hg Digest

The sample is heated at 95 c with nitric acid, sulfuric acid, potassium persulfate, and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

07046 Barium
08014 Boron
01750 Calcium
07051 Chromium
07052 Cobalt
01756 Lithium
07036 Selenium
07022 Thallium

The solution resulting from the metals digestion is analyzed by Trace ICP.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6010D, Rev. 4, July 2014.

06024 Antimony
06025 Arsenic
06027 Beryllium
06028 Cadmium
06035 Lead
06038 Molybdenum

The solution resulting from the metals digestion is analyzed by ICP/MS.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6020B, Rev.2, July 2014.

00224 Chloride
01504 Fluoride
00228 Sulfate

A small volume of sample is introduced into an ion chromatograph. The anions are then separated and measured by a system consisting of a guard column, separator column, suppressor, and conductivity detector.

Reference: Method 300.0, Revision 2.1 (1993), Methods for Chemical Analysis of Water and Wastes USEPA 600.

12152 pH

The activity of hydrogen ions in the sample is measured using a glass electrode and a reference electrode.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 4500-H+ B-2011

00212 Total Dissolved Solids

A well-mixed sample is filtered through a glass fiber filter. The filtrate is collected in a tared beaker, evaporated in a steam bath and dried in an oven at 180C +/- 2C to a constant weight. The increase in weight is the total dissolved solids.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2540 C-2011

12151 Temperature of pH

The temperature of the sample measured during the pH analysis.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2550 B-2010

Analysis Reports / Field Chain of Custody

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Report Date: November 16, 2018 12:45

Project: PSEG Hudson

Account #: 07701
Group Number: 2005364
SDG: GEJ60
PO Number: 1504710
State of Sample Origin: NJ

Electronic Copy To	GEI Consultants, Inc.	Attn: Jason Kohl
Electronic Copy To	GEI Consultants, Inc.	Attn: Data Group

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-9 Grab Groundwater	10/31/2018 11:05	9881981
MW-7 Grab Groundwater	10/31/2018 12:55	9881982
MW-8 Grab Groundwater	10/31/2018 12:35	9881983
MW-5 Grab Groundwater	10/31/2018 10:50	9881984
MW-6 Grab Groundwater	10/31/2018 14:20	9881985
FB-20181031 Grab Water	10/31/2018 11:00	9881986
MW-1 Grab Groundwater	11/01/2018 09:45	9881987
MW-4 Grab Groundwater	11/01/2018 11:40	9881988
MW-2 Grab Groundwater	11/01/2018 10:35	9881989
MW-3 Grab Groundwater	11/01/2018 12:00	9881990
FB-20181101 Grab Water	11/01/2018 11:00	9881991

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: GEI Consultants, Inc.
Project: PSEG Hudson
Sampling Date(s): 10/31/18 - 11/01/18
Laboratory Sample ID(s): 9881981-9881991
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Kenneth Boley
Senior Specialist, Quality Assurance

11/16/2018



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Project Name: PSEG Hudson
ELLE Group #: 2005364

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.
Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 9881981, 9881982, 9881983, 9881984, 9881985, 9881986, 9881987, 9881988, 9881989, 9881990, 9881991

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.

Batch #: 183111404401 (Sample number(s): 9881981-9881991 UNSPK: 9881989 BKG: 9881989)

The recovery(ies) for the following analyte(s) in the MS and/or MSD exceeded the acceptance window indicating a positive bias: Calcium

The recovery(ies) for the following analyte(s) in the MS and/or MSD were below the acceptance window: Calcium

SW-846 6020B Rev.2, July 2014, Metals Dissolved

Batch #: 183121404701A (Sample number(s): 9881981-9881991 UNSPK: 9881987 BKG: 9881987)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Antimony, Cadmium

SM 2540 C-2011, Wet Chemistry

Sample #s: 9881988

The sample was originally ran within holding time for Total Dissolved Solids at a reduced volume with a result that was less than the Limit of Quantitation, the sample was reanalyzed for Total Dissolved Solids outside of the 7 day holding time on 11/12/2018.
The sample is being reported per client request.

Batch #: 18309921202B (Sample number(s): 9881981 UNSPK: 9881984 BKG: 9881981, 9881984)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Batch #: 18316921201B (Sample number(s): 9881988 BKG: 9881988)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:05
SDG#: GEJ60-01

GEI Consultants, Inc.
ELLE Sample #: GW 9881981
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0549	0.0010	0.0050	1
08014	Boron	7440-42-8	0.274	0.0120	0.0500	1
01750	Calcium	7440-70-2	76.2	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0017 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0058	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0120	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	291	20.0	40.0	100
01504	Fluoride	16984-48-8	0.37 J	0.25	0.50	5
00228	Sulfate	14808-79-8	67.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	860	80.0	240	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:05
SDG#: GEJ60-01

GEI Consultants, Inc.
ELLE Sample #: GW 9881981
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:46	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:35	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/05/2018 20:08	Ashlynn M Cornelius	100

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:05
SDG#: GEJ60-01

GEI Consultants, Inc.
ELLE Sample #: GW 9881981
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 15:47	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/05/2018 19:51	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202B	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:54	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:54	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:55
SDG#: GEJ60-02

GEI Consultants, Inc.
ELLE Sample #: GW 9881982
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0381	0.0010	0.0050	1
08014	Boron	7440-42-8	0.151	0.0120	0.0500	1
01750	Calcium	7440-70-2	32.7	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00075 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0056	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	44.4	4.0	8.0	20
01504	Fluoride	16984-48-8	0.39 J	0.25	0.50	5
00228	Sulfate	14808-79-8	11.8	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	253	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.9	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:55
SDG#: GEJ60-02

GEI Consultants, Inc.
ELLE Sample #: GW 9881982
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:53	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:47	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/05/2018 20:42	Ashlynn M Cornelius	20

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:55
SDG#: GEJ60-02

GEI Consultants, Inc.
ELLE Sample #: GW 9881982
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 16:04	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/05/2018 20:25	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:45	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:45	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:35
SDG#: GEJ60-03

GEI Consultants, Inc.
ELLE Sample #: GW 9881983
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0618	0.0010	0.0050	1
08014	Boron	7440-42-8	0.191	0.0120	0.0500	1
01750	Calcium	7440-70-2	28.5	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0037 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00070 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00069 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0039	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	349	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	17.5	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	828	80.0	240	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:35
SDG#: GEJ60-03

GEI Consultants, Inc.
ELLE Sample #: GW 9881983
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:55	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:49	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 02:04	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:35
SDG#: GEJ60-03

GEI Consultants, Inc.
ELLE Sample #: GW 9881983
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 01:46	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 01:46	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:50	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:50	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 10:50
SDG#: GEJ60-04

GEI Consultants, Inc.
ELLE Sample #: GW 9881984
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0844	0.0010	0.0050	1
08014	Boron	7440-42-8	0.444	0.0120	0.0500	1
01750	Calcium	7440-70-2	101	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0150 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00087 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	849	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	8.0	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,760	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 10:50
SDG#: GEJ60-04

GEI Consultants, Inc.
ELLE Sample #: GW 9881984
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.1	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:57	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:51	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 02:41	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 10:50
SDG#: GEJ60-04

GEI Consultants, Inc.
ELLE Sample #: GW 9881984
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 02:22	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 02:22	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:49	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:49	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 14:20
SDG#: GEJ60-05

GEI Consultants, Inc.
ELLE Sample #: GW 9881985
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0707	0.0010	0.0050	1
08014	Boron	7440-42-8	0.595	0.0120	0.0500	1
01750	Calcium	7440-70-2	99.9	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0015 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.00032 J	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	434	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	32.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,130	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 14:20
SDG#: GEJ60-05

GEI Consultants, Inc.
ELLE Sample #: GW 9881985
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:59	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:53	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 03:54	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 14:20
SDG#: GEJ60-05

GEI Consultants, Inc.
ELLE Sample #: GW 9881985
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 02:59	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 02:59	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921201A	11/05/2018 13:05	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:44	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:44	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181031 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:00
SDG#: GEJ60-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881986
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.114 J	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181031 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:00
SDG#: GEJ60-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881986
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:01	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:55	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 04:12	Ashlynn M Cornelius	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181031 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:00
SDG#: GEJ60-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881986
ELLE Group #: 2005364
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 04:12	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 04:12	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:36	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:36	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 09:45
SDG#: GEJ60-07

GEI Consultants, Inc.
ELLE Sample #: GW 9881987
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.715	0.0010	0.0050	1
08014	Boron	7440-42-8	1.06	0.0120	0.0500	1
01750	Calcium	7440-70-2	382	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0069	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0478 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0016 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0020 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00016 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0033	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,540	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	122	6.0	20.0	20
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	7,140	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.0	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 09:45
SDG#: GEJ60-07

GEI Consultants, Inc.
ELLE Sample #: GW 9881987
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:33	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:57	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/08/2018 23:30	Ashlynn M Cornelius	2000

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 09:45
SDG#: GEJ60-07

GEI Consultants, Inc.
ELLE Sample #: GW 9881987
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 04:30	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/08/2018 22:35	Ashlynn M Cornelius	20
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:41	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:41	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:40
SDG#: GEJ60-08

GEI Consultants, Inc.
ELLE Sample #: GW 9881988
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0997	0.0010	0.0050	1
08014	Boron	7440-42-8	1.19	0.0120	0.0500	1
01750	Calcium	7440-70-2	128	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0030 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0497 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00082 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00069 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0065	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	5,370	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	551	30.0	100	100
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	9,560	80.0	240	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:40
SDG#: GEJ60-08

GEI Consultants, Inc.
ELLE Sample #: GW 9881988
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
	The sample was originally ran within holding time for Total Dissolved Solids at a reduced volume with a result that was less than the Limit of Quantitation, the sample was reanalyzed for Total Dissolved Solids outside of the 7 day holding time on 11/12/2018. The sample is being reported per client request.					
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1
	The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.					

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:40
SDG#: GEJ60-08

GEI Consultants, Inc.
ELLE Sample #: GW 9881988
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:04	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:59	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/08/2018 14:04	Ashlynn M Cornelius	2000
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 16:21	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/08/2018 13:46	Ashlynn M Cornelius	100
00212	Total Dissolved Solids	SM 2540 C-2011	2	18316921201B	11/12/2018 12:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:31	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:31	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 10:35
SDG#: GEJ60-09

GEI Consultants, Inc.
ELLE Sample #: GW 9881989
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	1.98	0.0010	0.0050	1
08014	Boron	7440-42-8	0.814	0.0120	0.0500	1
01750	Calcium	7440-70-2	419	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0047 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0505	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00066 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0033	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00024 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0036	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,650	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	15.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	17,300	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 10:35
SDG#: GEJ60-09

GEI Consultants, Inc.
ELLE Sample #: GW 9881989
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:06	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 07:05	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117B	11/09/2018 00:06	Ashlynn M Cornelius	2000

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 10:35
SDG#: GEJ60-09

GEI Consultants, Inc.
ELLE Sample #: GW 9881989
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117B	11/06/2018 09:41	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117B	11/06/2018 09:41	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:35	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:35	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 12:00
SDG#: GEJ60-10

GEI Consultants, Inc.
ELLE Sample #: GW 9881990
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0749	0.0010	0.0050	1
08014	Boron	7440-42-8	0.507	0.0120	0.0500	1
01750	Calcium	7440-70-2	78.6	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0138 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00096 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0026	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0115	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	703	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	129	6.0	20.0	20
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,720	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.0	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 12:00
SDG#: GEJ60-10

GEI Consultants, Inc.
ELLE Sample #: GW 9881990
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:08	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 07:07	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/05/2018 23:16	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 12:00
SDG#: GEJ60-10

GEI Consultants, Inc.
ELLE Sample #: GW 9881990
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 16:38	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/08/2018 14:22	Ashlynn M Cornelius	20
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:59	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:59	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181101 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:00
SDG#: GEJ60-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881991
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.0953 J	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	26.0 J	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181101 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:00
SDG#: GEJ60-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881991
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:10	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 07:09	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117B	11/06/2018 10:17	Ashlynn M Cornelius	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181101 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:00
SDG#: GEJ60-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881991
ELLE Group #: 2005364
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117B	11/06/2018 10:17	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	18309520117B	11/06/2018 10:17	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:55	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:55	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 183110571301	Sample number(s): 9881981-9881991		
Mercury	N.D.	0.000050	0.00020
Batch number: 183111404401	Sample number(s): 9881981-9881991		
Barium	N.D.	0.0010	0.0050
Boron	N.D.	0.0120	0.0500
Calcium	N.D.	0.0330	0.500
Chromium	N.D.	0.0053	0.0150
Cobalt	N.D.	0.0015	0.0050
Lithium	N.D.	0.0110	0.0500
Selenium	N.D.	0.0210	0.0500
Thallium	N.D.	0.0140	0.0300
Batch number: 183121404701A	Sample number(s): 9881981-9881991		
Antimony	N.D.	0.00041	0.0020
Arsenic	N.D.	0.00068	0.0020
Beryllium	N.D.	0.000091	0.00050
Cadmium	N.D.	0.00015	0.0010
Lead	N.D.	0.0011	0.0030
Batch number: 183121404701C	Sample number(s): 9881981-9881991		
Molybdenum	N.D.	0.00031	0.0020
Batch number: 18308520117B	Sample number(s): 9881981-9881982,9881988,9881990		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18309520117A	Sample number(s): 9881983-9881987		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18309520117B	Sample number(s): 9881989,9881991		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18309921201A	Sample number(s): 9881985		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991		
Total Dissolved Solids	N.D.	20.0	60.0

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

Method Blank (continued)

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 18309921202B	Sample number(s): 9881981		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18316921201B	Sample number(s): 9881988		
Total Dissolved Solids	N.D.	20.0	60.0

LCS/LCSD

Analysis Name	LCS Spike Added	LCS Conc	LCSD Spike Added	LCSD Conc	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
	mg/l	mg/l	mg/l	mg/l					
Batch number: 183110571301	Sample number(s): 9881981-9881991								
Mercury	0.00100	0.000862			86		80-120		
Batch number: 183111404401	Sample number(s): 9881981-9881991								
Barium	2.00	2.04			102		80-120		
Boron	2.00	1.84			92		80-120		
Calcium	4.00	4.07			102		80-120		
Chromium	0.200	0.202			101		80-120		
Cobalt	0.500	0.515			103		80-120		
Lithium	1.00	1.02			102		80-120		
Selenium	0.150	0.145			97		80-120		
Thallium	0.150	0.159			106		80-120		
Batch number: 183121404701A	Sample number(s): 9881981-9881991								
Antimony	0.00600	0.00606			101		80-120		
Arsenic	0.0100	0.0101			101		80-120		
Beryllium	0.00400	0.00409			102		80-120		
Cadmium	0.00500	0.00521			104		80-120		
Lead	0.0150	0.0153			102		80-120		
Batch number: 183121404701C	Sample number(s): 9881981-9881991								
Molybdenum	0.0500	0.0526			105		80-120		
	mg/l	mg/l	mg/l	mg/l					
Batch number: 18308520117B	Sample number(s): 9881981-9881982,9881988,9881990								
Chloride	3.00	2.98			99		90-110		
Fluoride	0.750	0.784			105		90-110		
Sulfate	7.50	7.59			101		90-110		
Batch number: 18309520117A	Sample number(s): 9881983-9881987								
Chloride	3.00	2.99			100		90-110		
Fluoride	0.750	0.750			100		90-110		
Sulfate	7.50	7.74			103		90-110		

*- Outside of specification
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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

LCS/LCSD (continued)

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 18309520117B	Sample number(s): 9881989,9881991								
Chloride	3.00	2.99			100		90-110		
Fluoride	0.750	0.750			100		90-110		
Sulfate	7.50	7.74			103		90-110		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18309921201A	Sample number(s): 9881985								
Total Dissolved Solids	200	195	200	200	98	100	62-127	3	14
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991								
Total Dissolved Solids	200	203			102		62-127		
Batch number: 18309921202B	Sample number(s): 9881981								
Total Dissolved Solids	200	203			102		62-127		
Batch number: 18316921201B	Sample number(s): 9881988								
Total Dissolved Solids	200	196			98		62-127		
	Std. Units	**Std. Units**	**Std. Units**	**Std. Units**					
Batch number: 18309005103A	Sample number(s): 9881982-9881983,9881986-9881988,9881990-9881991								
pH	7.00	7.00			100		95-105		
Batch number: 18309005104A	Sample number(s): 9881981,9881984-9881985,9881989								
pH	7.00	7.00			100		95-105		

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 183110571301	Sample number(s): 9881981-9881991 UNSPK: 9881981									
Mercury	N.D.	0.00100	0.000815	0.00100	0.000807	82	81	75-125	1	20
Batch number: 183111404401	Sample number(s): 9881981-9881991 UNSPK: 9881989									
Barium	1.98	2.00	3.81	2.00	3.72	92	87	75-125	3	20
Boron	0.814	2.00	3.10	2.00	3.08	115	113	75-125	1	20
Calcium	419.46	4.00	426.06	4.00	419.26	165 (2)	-5 (2)	75-125	2	20
Chromium	N.D.	0.200	0.221	0.200	0.200	111	100	75-125	10	20
Cobalt	0.00467	0.500	0.478	0.500	0.477	95	95	75-125	0	20
Lithium	0.0505	1.00	1.08	1.00	1.10	103	105	75-125	2	20
Selenium	N.D.	0.150	0.154	0.150	0.156	103	104	75-125	2	20

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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

MS/MSD (continued)

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Thallium	N.D.	0.150	0.131	0.150	0.131	87	87	75-125	0	20
Batch number: 183121404701A	Sample number(s): 9881981-9881991 UNSPK: 9881987									
Antimony	0.00164	0.00600	0.00689	0.00600	0.00730	88	94	75-125	6	20
Arsenic	0.00200	0.0100	0.0138	0.0100	0.0130	118	110	75-125	6	20
Beryllium	N.D.	0.00400	0.00389	0.00400	0.00412	97	103	75-125	6	20
Cadmium	0.000160	0.00500	0.00521	0.00500	0.00505	101	98	75-125	3	20
Lead	N.D.	0.0150	0.0162	0.0150	0.0164	108	109	75-125	1	20
Batch number: 183121404701C	Sample number(s): 9881981-9881991 UNSPK: 9881987									
Molybdenum	0.00329	0.0500	0.0556	0.0500	0.0567	105	107	75-125	2	20
	mg/l	mg/l	mg/l	mg/l	mg/l					
Batch number: 18309921201A	Sample number(s): 9881985 UNSPK: 9881985									
Total Dissolved Solids	1132	1600	2708			99		62-127		
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991 UNSPK: 9881984									
Total Dissolved Solids	1756	1600	3176			89		62-127		
Batch number: 18309921202B	Sample number(s): 9881981 UNSPK: 9881984									
Total Dissolved Solids	1756	1600	3176			89		62-127		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc mg/l	DUP Conc mg/l	DUP RPD	DUP RPD Max
Batch number: 183110571301	Sample number(s): 9881981-9881991 BKG: 9881981			
Mercury	N.D.	N.D.	0 (1)	20
Batch number: 183111404401	Sample number(s): 9881981-9881991 BKG: 9881989			
Barium	1.98	1.95	2	20
Boron	0.814	0.802	1	20
Calcium	419.46	408.84	3	20
Chromium	N.D.	N.D.	0 (1)	20
Cobalt	0.00467	0.00422	10 (1)	20
Lithium	0.0505	0.0513	2 (1)	20
Selenium	N.D.	N.D.	0 (1)	20
Thallium	N.D.	N.D.	0 (1)	20
Batch number: 183121404701A	Sample number(s): 9881981-9881991 BKG: 9881987			

*- Outside of specification
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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

Laboratory Duplicate (continued)

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	mg/l	mg/l		
Antimony	0.00164	0.000708	79* (1)	20
Arsenic	0.00200	0.00164	20 (1)	20
Beryllium	N.D.	N.D.	0 (1)	20
Cadmium	0.000160	N.D.	200* (1)	20
Lead	N.D.	N.D.	0 (1)	20
Batch number: 183121404701C	Sample number(s): 9881981-9881991 BKG: 9881987			
Molybdenum	0.00329	0.00300	9 (1)	20
	Degrees C	Degrees C		
Batch number: 18309005104A	Sample number(s): 9881981,9881984-9881985,9881989 BKG: 9881989			
Temperature of pH	22.72	22.99	1	5
	mg/l	mg/l		
Batch number: 18309921201A	Sample number(s): 9881985 BKG: 9881985			
Total Dissolved Solids	1132	1100	3 (1)	5
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991 BKG: 9881984			
Total Dissolved Solids	1756	1700	3 (1)	5
Batch number: 18309921202B	Sample number(s): 9881981 BKG: 9881981			
Total Dissolved Solids	860	926	7* (1)	5
Batch number: 18316921201B	Sample number(s): 9881988 BKG: 9881988			
Total Dissolved Solids	9556	9002	6*	5
	Std. Units	Std. Units		
Batch number: 18309005104A	Sample number(s): 9881981,9881984-9881985,9881989 BKG: 9881989			
pH	7.68	7.71	0	4

*- Outside of specification
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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only

Acct. # 7701 Group # 2005361 Sample # 9881981-91

COC # 569380

Client Information

Client: GEI Consultants	Acct. #:
Project Name/#: PSEG - Hudson	PWSID #:
Project Manager: Jason Kohl	P.O. #:
Sampler: Casey Kincaid / Anthony Shields	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

For Lab Use Only

FSC:

SCR#: 233149

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Metals include: As, B, Ba, Be, Ca, Cd, Co, Cr, Li, Mb, Pb, Sb, Se, Th

Sample Identification	Collected Date	Collected Time	Grab	Composite	Matrix: Soil ☐ Sediment ☐ Tissue ☐	Water: Potable ☐ Ground ☒ NPDES ☐ Surface ☐	Other: Aqueous	Total # of Containers	Metals	Mercury	Chloride	Fluoride	Sulfate	pH	Total Dissolved Solids	Ra 226	Ra 228	QA/QC
MW-9	10/31/18	1105	X			X		7	X	X	X	X	X	X	X	X	X	
MW-7	10/31/18	1255	X			X		7	X	X	X	X	X	X	X	X	X	
MW-8	10/31/18	1235	X			X		7	X	X	X	X	X	X	X	X	X	
MW-5	10/31/18	1050	X			X		7	X	X	X	X	X	X	X	X	X	
MW-6	10/31/18	1420	X			X		7	X	X	X	X	X	X	X	X	X	
FB-20181031	10/31/18	1100	X				X	7	X	X	X	X	X	X	X	X	X	
MW-1	11/1/18	0945	X			X		7	X	X	X	X	X	X	X	X	X	
MW-4	11/1/18	1140	X			X		8	X	X	X	X	X	X	X	X	X	X
MW-2	11/1/18	1035	X			X		7	X	X	X	X	X	X	X	X	X	
MW-3	11/1/18	1200	X			X		7	X	X	X	X	X	X	X	X	X	

Matrix

Soil ☐ Sediment ☐ Tissue ☐

Water: Potable ☐ Ground ☒ NPDES ☐ Surface ☐

Other: Aqueous

Analysis Requested

Preservation and Filtration Codes

Metals | Mercury | Chloride | Fluoride | Sulfate | pH | Total Dissolved Solids | Ra 226 | Ra 228 | QA/QC

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: jkohl@geiconsultants.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) NJ DKQP TX TRRP-13

NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Bottle Storage				10/31/18	0700
	11/2/18	1328		11/2/18	1328
	11/2/18	1720			
				11/2/18	1720

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS FedEx Other

Temperature upon receipt 1.6 °C

Environmental Analysis Request/Chain of Custody

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Acct. # 7701 Group # 2005364 Sample # 9881981-91

COC # 569379

Client Information

Client: GEI Consultants

Acct. #:

Project Name/#: PSEG - Hudson

PWSID #:

Project Manager: Jason Kohl

P.O. #:

Sampler: Casey Kincaid / Anthony Shields

Quote #:

State where samples were collected: NJ

For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: Aqueous

Analysis Requested

Preservation and Filtration Codes

Sample Identification	Collected Date	Collected Time	Grab	Composite	Soil	Sediment	Tissue	Potable	Ground	NPDES	Surface	Other: Aqueous	Total # of Containers	Metals	Mercury	Chloride	Fluoride	Sulfate	pH	Total Dissolved Solids	Ra 226	Ra 228
FB-20181101	11/1/18	1400	X									X	7	X	X	X	X	X	X	X	X	X

For Lab Use Only

FSC:

SCR#:

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Metals include: As, B, Ba, Be, Ca, Cd, Co, Cr, Li, Mb, Pb, Sb, Se, Th

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: jkohl@geiconsultants.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) NJ DKQP TX TRRP-13

NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	11/2/18	1328		11/2/18	1328
	11/2/18	1720			
				11/2/18	1720

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS FedEx Other

Temperature upon receipt 1.6 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 231997

Group Number(s): 2005364

Client: GEI

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	11/02/2018 17:20
Number of Packages:	3	Number of Projects:	1
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Wanita Curry (14057) at 22:13 on 11/02/2018

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	8013596-IR	2.7	IR	Wet	Y	Bagged	N
2	8013596-IR	1.6	IR	Wet	Y	Bagged	N
3	8013596-IR	2.2	IR	Wet	Y	Bagged	N

General Comments: QC Metals Batch for : MW-4 (1 Container)

2425 New Holland Pike
Lancaster, PA 17601-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

Metals in Liquid Data

Case Narrative/Conformance Summary

Metals in Liquid

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

ICP Metals

Fraction: Metals in Liquid

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9881981	MW-9	X		
9881982	MW-7	X		
9881983	MW-8	X		
9881984	MW-5	X		
9881985	MW-6	X		
9881986	FB-20181031	X		Field Blank
9881987	MW-1	X		
9881988	MW-4	X		
9881989	MW-2	X		
9881990	MW-3	X		
9881991	FB-20181101	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Method defined actions are taken for any failed matrix QC.

Batch#: 183111404401 (Sample number(s): 9881981-9881991, UNSPK: 9881989, BKG: 9881989)
The recovery(ies) for the following analyte(s) in the MS exceeded the acceptance window indicating a positive bias: Calcium

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

ICP Metals

Fraction: Metals in Liquid

The recovery(ies) for the following analyte(s) in the MSD were below the acceptance window: Calcium

Sample Duplicate

Batch#: 183121404701A (Sample number(s): 9881981-9881991, UNSPK: 9881987, BKG: 9881987)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Antimony, Cadmium

SAMPLE ANALYSIS:

Refer to analysis run log for samples requiring dilutions.

The instrument detection limits (IDLs) are used for determining the U flags on the initial and continuing calibration blanks. The highest IDL is selected when multiple instruments are used for an analysis. The method detection limits (MDLs) are used for determining all other U flags.

(Sample number(s): 9881981-9881991: Analysis: 01750)
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

BKG – Background	AF - Cold Vapor Atomic Fluorescence
DUP – Duplicate	U - Below MDL
MS - Matrix Spike	B - Below LOQ
MSD - Matrix Spike Dup	N - Matrix Spike out of specifications
B – Blank	* - Duplicate out of specifications
Q - Laboratory Control Sample	E - Matrix Effects exist as proven by Serial Dilution or Spiked Dilution
Y - Laboratory Control Sample Duplicate	A - Post Digestion Spike
P - ICP Atomic Emission Spectrometer	L - Serial Dilution
MS - ICP Mass Spectrometry	R - Internal Standard Relative Intensity OOS
CV - Cold Vapor	NR - Not Required

Sample Data

Metals in Liquid

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881981, 9881981BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.7	B		MS
7440-38-2	Arsenic	5.8			MS
7440-39-3	Barium	54.9			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	274			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	76200			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	12.0			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881982 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.75	B		MS
7440-39-3	Barium	38.1			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	151			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	32700			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	5.6			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881983 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.70	B		MS
7440-39-3	Barium	61.8			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	191			P
7440-43-9	Cadmium	0.69	B		MS
7440-70-2	Calcium	28500			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	3.7	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.9			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881984 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.87	B		MS
7440-39-3	Barium	84.4			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	444			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	101000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	15.0	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881985 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	1.5	B		MS
7440-39-3	Barium	70.7			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	595			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	99900			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.32	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881986 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	114	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881987, 9881987BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.6	B		MS
7440-38-2	Arsenic	2.0	B		MS
7440-39-3	Barium	715			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1060			P
7440-43-9	Cadmium	0.16	B		MS
7440-70-2	Calcium	382000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	6.9			P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	47.8	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.3			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881988 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.82	B		MS
7440-38-2	Arsenic	0.69	B		MS
7440-39-3	Barium	99.7			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1190			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	128000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	3.0	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	49.7	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	6.5			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881989, 9881989BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.66	B		MS
7440-38-2	Arsenic	3.3			MS
7440-39-3	Barium	1980			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	814			P
7440-43-9	Cadmium	0.24	B		MS
7440-70-2	Calcium	419000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	4.7	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	50.5			P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.6			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881990 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.96	B		MS
7440-38-2	Arsenic	2.6			MS
7440-39-3	Barium	74.9			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	507			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	78600			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	13.8	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	11.5			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881991 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	95.3	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

Quality Control and Calibration Summary Forms

Metals in Liquid

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ60
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Barium	183111404401	9881981
Boron		9881982
Calcium		9881983
Chromium		9881984
Cobalt		9881985
Lithium		9881986
Selenium		9881987
Thallium		9881988
		9881989BKG
		9881989MS
		9881989MSD
		9881989DUP
		9881990
		9881991
		P31104AB
		P31104AQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ60
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Antimony	183121404701	9881981
Arsenic		9881982
Beryllium		9881983
Cadmium		9881984
Lead		9881985
Molybdenum		9881986
		9881987BKG
		9881987MS
		9881987MSD
		9881987DUP
		9881988
		9881989
		9881990
		9881991
		P31204AB
		P31204AQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ60
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Mercury	183110571301	9881981BKG
		9881981MS
		9881981MSD
		9881981DUP
		9881982
		9881983
		9881984
		9881985
		9881986
		9881987
		9881988
		9881989
		9881990
		9881991
		P31171AB
		P31171AQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Barium		600.0	608.55	101.4	500.0	496.58	99.3	500.0	500.18	100.0
Boron		600.0	582.20	97.0	500.0	467.07	93.4	500.0	484.05	96.8
Calcium		30000.0	29931.86	99.8	25000.0	25075.02	100.3	25000.0	24798.40	99.2
Chromium		600.0	608.83	101.5	500.0	493.78	98.8	500.0	507.47	101.5
Cobalt		600.0	599.13	99.9	500.0	482.67	96.5	500.0	495.09	99.0
Lithium		600.0	603.31	100.6	500.0	510.87	102.2	500.0	506.76	101.4
Selenium		600.0	591.68	98.6	500.0	477.46	95.5	500.0	494.82	99.0
Thallium		600.0	603.99	100.7	500.0	482.86	96.6	500.0	497.29	99.5

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium					500.0	495.66	99.1	500.0	495.51	99.1
Boron					500.0	469.29	93.9	500.0	472.34	94.5
Calcium					25000.0	23986.70	95.9	25000.0	24018.88	96.1
Chromium					500.0	493.66	98.7	500.0	497.28	99.5
Cobalt					500.0	493.73	98.7	500.0	496.10	99.2
Lithium					500.0	497.26	99.5	500.0	505.58	101.1
Selenium					500.0	491.42	98.3	500.0	497.73	99.5
Thallium					500.0	496.79	99.4	500.0	497.19	99.4

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron		600.0	594.75	99.1	500.0	488.77	97.8	500.0	492.52	98.5
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium										
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron					500.0	501.40	100.3			
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium										
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Antimony	121	50.0	54.34	108.7	25.0	26.95	107.8	25.0	25.51	102.0
Arsenic	75	500.0	512.16	102.4	250.0	261.40	104.6	250.0	263.41	105.4
Beryllium	9	50.0	51.18	102.4	25.0	24.33	97.3	25.0	27.22	108.9
Cadmium	111	50.0	52.51	105.0	25.0	27.02	108.1	25.0	25.67	102.7
Lead	208	50.0	51.76	103.5	25.0	26.30	105.2	25.0	26.64	106.6
Molybdenum	98	50.0	52.43	104.9	25.0	26.72	106.9	25.0	26.72	106.9

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121				25.0	25.00	100.0			
Arsenic	75				250.0	258.73	103.5			
Beryllium	9				25.0	26.52	106.1			
Cadmium	111				25.0	25.16	100.6			
Lead	208				25.0	26.93	107.7			
Molybdenum	98				25.0	26.03	104.1			

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

		Initial Calibration			Continuing Calibration					
Analyte	Mass	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury		2.5	2.33	93.2	1.0	0.97	97.0	1.0	0.94	94.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.94	94.0	1.0	0.94	94.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.93	93.0	1.0	0.91	91.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.91	91.0			

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium		5.0	5.13	102.6		
Boron		50.0	45.64	91.3		
Calcium		500.0	523.94	104.8		
Chromium		15.0	14.00	93.3		
Cobalt		5.0	5.68	113.6		
Lithium		50.0	54.93	109.9		
Selenium		50.0	51.00	102.0		
Thallium		30.0	32.37	107.9		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium						
Boron		50.0	51.59	103.2		
Calcium						
Chromium						
Cobalt						
Lithium						
Selenium						
Thallium						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony	121	2.0	2.14	107.0		
Arsenic	75	2.0	2.04	102.0		
Beryllium	9	0.5	0.50	100.0		
Cadmium	111	1.0	1.11	111.0		
Lead	208	3.0	3.14	104.7		
Molybdenum	98	2.0	2.11	105.5		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Mercury		0.2	0.17	85.0	0.16	80.0

Control limits: 50% - 150%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium		0.33	U	0.33	U	0.33	U	0.33	U		1.000	U	183111404401
Boron		8.4	U	8.4	U	8.4	U	8.4	U		12.000	U	183111404401
Calcium		33.4	U	33.4	U	33.4	U	33.4	U		33.000	U	183111404401
Chromium		0.85	U	0.85	U	0.85	U	-1.1	B		5.300	U	183111404401
Cobalt		0.56	U	0.78	B	0.80	B	0.56	U		1.500	U	183111404401
Lithium		7.5	U	7.5	U	7.5	U	7.5	U		11.000	U	183111404401
Selenium		6.0	U	6.0	U	6.0	U	6.0	U		21.000	U	183111404401
Thallium		4.9	U	4.9	U	4.9	U	4.9	U		14.000	U	183111404401

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium				0.33	U								
Boron				8.4	U								
Calcium				33.4	U								
Chromium				0.85	U								
Cobalt				0.56	U								
Lithium				7.5	U								
Selenium				6.0	U								
Thallium				4.9	U								

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron		8.4	U	8.4	U	8.4	U	8.4	U				
Calcium													
Chromium													
Cobalt													
Lithium													
Selenium													
Thallium													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121	0.75	B	0.82	B	0.38	B	0.40	B	121	0.410	U	183121404701A
Arsenic	75	0.50	U	0.50	U	0.50	U	0.50	U	75	0.680	U	183121404701A
Beryllium	9	0.073	U	0.073	U	0.073	U	0.073	U	9	0.091	U	183121404701A
Cadmium	111	0.18	U	0.18	U	0.18	U	0.18	U	111	0.150	U	183121404701A
Lead	208	0.14	U	0.14	U	0.14	U	0.14	U	208	1.100	U	183121404701A
Molybdenum	98	0.30	U	0.30	U	0.30	U	0.30	U	98	0.310	U	183121404701A

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury		0.050	U	0.050	U	0.050	U	0.050	U		0.050	U	183110571301

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U	0.050	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U								

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ60

Instrument ID: 23745
Run Name: 1831201T74
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		486120	97.2						
Barium	0		1							
Boron	0		5							
Calcium	500000		489147	97.8						
Chromium	0		-8							
Cobalt	0		2							
Iron	200000		196140	98.1						
Lithium	0		1							
Magnesium	500000		453594	90.7						
Selenium	0		2							
Thallium	0		3							

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ60

Instrument ID: 23290
Run Name: 1831402T75
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		489241	97.8						
Barium										
Boron	0		-52							
Calcium	500000		495455	99.1						
Chromium										
Cobalt										
Iron	200000		195510	97.8						
Lithium										
Magnesium	500000		488461	97.7						
Selenium										
Thallium										

Control Limits: All Metals 80%-120%

QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ60

Instrument ID: 27813
Run Name: 1831606E07
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		103716	103.7		
Antimony	121	0		2			
Arsenic	75	0		1			
Beryllium	9	0		0			
Cadmium	111	0		0			
Calcium	44	300000		295516	98.5		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		245617	98.2		
Lead	208	0		1			
Magnesium	24	100000		99808	99.8		
Molybdenum	98	2000		2128	106.4		
Phosphorus	31	10000		NA			
Potassium	39	100000		103067	103.1		
Sodium	23	250000		241597	96.6		
Sulfur	34	10000		NA			
Titanium	47	2000		2057	102.9		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881981BKG Matrix Spike Lab Sample ID: 9881981MS Matrix Spike Duplicate Lab Sample ID: 9881981MSD
Batch Number(s): 183110571301

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Mercury		0.0500	U	0.8151		0.8069		1.0000	1.0000	UG/L	82		81		1		75 - 125	20	CV

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881987BKG Matrix Spike Lab Sample ID: 9881987MS Matrix Spike Duplicate Lab Sample ID: 9881987MSD
Batch Number(s): 183121404701

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Antimony	121	1.6358	B	6.8896		7.2995		6.0000	6.0000	UG/L	88		94		6		75 - 125	20	MS
Arsenic	75	1.9954	B	13.7849		12.9925		10.0000	10.0000	UG/L	118		110		6		75 - 125	20	MS
Beryllium	9	0.0910	U	3.8875		4.1192		4.0000	4.0000	UG/L	97		103		6		75 - 125	20	MS
Cadmium	111	0.1603	B	5.2103		5.0455		5.0000	5.0000	UG/L	101		98		3		75 - 125	20	MS
Lead	208	1.0700	U	16.2283		16.3524		15.0000	15.0000	UG/L	108		109		1		75 - 125	20	MS
Molybdenum	98	3.2928		55.6349		56.6726		50.0000	50.0000	UG/L	105		107		2		75 - 125	20	MS

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881989BKG Matrix Spike Lab Sample ID: 9881989MS Matrix Spike Duplicate Lab Sample ID: 9881989MSD
Batch Number(s): 183111404401

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Barium		1982.6600		3813.6100		3715.3400		2000.0000	2000.0000	UG/L	92		87		3		75 - 125	20	P
Boron		813.5100		3103.7500		3078.3000		2000.0000	2000.0000	UG/L	115		113		1		75 - 125	20	P
Calcium		419461.5700		426059.9800		419260.9100		4000.0000	4000.0000	UG/L	165		-5		2			20	P
Chromium		5.3000	U	221.4300		199.9100		200.0000	200.0000	UG/L	111		100		10		75 - 125	20	P
Cobalt		4.6700	B	478.0200		477.4600		500.0000	500.0000	UG/L	95		95		0		75 - 125	20	P
Lithium		50.5300		1078.5700		1098.1100		1000.0000	1000.0000	UG/L	103		105		2		75 - 125	20	P
Selenium		21.0000	U	153.7900		156.4200		150.0000	150.0000	UG/L	103		104		2		75 - 125	20	P
Thallium		14.0000	U	131.0500		130.8500		150.0000	150.0000	UG/L	87		87		0		75 - 125	20	P

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881981BKG Duplicate Lab Sample ID: 9881981DUP
Batch Number(s): 183110571301
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury			0.0500	U	0.0500	U			CV

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	FLAGS:
AF = Cold Vapor Atomic Fluorescence	* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881987BKG Duplicate Lab Sample ID: 9881987DUP
Batch Number(s): 183121404701
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony	121		1.6358	B	0.7080	B	79		MS
Arsenic	75		1.9954	B	1.6389	B	20		MS
Beryllium	9		0.0910	U	0.0910	U			MS
Cadmium	111		0.1603	B	0.1510	U	200		MS
Lead	208		1.0700	U	1.0700	U			MS
Molybdenum	98	2.0	3.2928		2.9966		9		MS

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881989BKG Duplicate Lab Sample ID: 9881989DUP
Batch Number(s): 183111404401
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Barium			1982.6600		1951.2000		2		P
Boron			813.5100		801.7100		1		P
Calcium			419461.5700		408836.9600		3		P
Chromium			5.3000	U	5.3000	U			P
Cobalt			4.6700	B	4.2200	B	10		P
Lithium		50.0	50.5300		51.3300		2		P
Selenium			21.0000	U	21.0000	U			P
Thallium			14.0000	U	14.0000	U			P

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 7
LABORATORY CONTROL SAMPLE
SDG No.: GEJ60
Matrix: WATER

Analyte	Mass	Batch Number	Units	True	Found	C	Control Limits (%)	%R	M	In Spec
Antimony	121	183121404701	UG/L	6.000	6.056		80 - 120	101	MS	Yes
Arsenic	75	183121404701	UG/L	10.000	10.139		80 - 120	101	MS	Yes
Barium		183111404401	UG/L	2000.000	2039.220		80 - 120	102	P	Yes
Beryllium	9	183121404701	UG/L	4.000	4.087		80 - 120	102	MS	Yes
Boron		183111404401	UG/L	2000.000	1835.700		80 - 120	92	P	Yes
Cadmium	111	183121404701	UG/L	5.000	5.210		80 - 120	104	MS	Yes
Calcium		183111404401	UG/L	4000.000	4074.890		80 - 120	102	P	Yes
Chromium		183111404401	UG/L	200.000	201.580		80 - 120	101	P	Yes
Cobalt		183111404401	UG/L	500.000	514.650		80 - 120	103	P	Yes
Lead	208	183121404701	UG/L	15.000	15.307		80 - 120	102	MS	Yes
Lithium		183111404401	UG/L	1000.000	1023.710		80 - 120	102	P	Yes
Mercury		183110571301	UG/L	1.000	0.862		80 - 120	86	CV	Yes
Molybdenum	98	183121404701	UG/L	50.000	52.569		80 - 120	105	MS	Yes
Selenium		183111404401	UG/L	150.000	145.300		80 - 120	97	P	Yes
Thallium		183111404401	UG/L	150.000	158.510		80 - 120	106	P	Yes

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881987BKG Serial Dilution Lab Sample ID: 9881987L
Batch Number(s): 183121404701
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Antimony	121	1.6358	B	2.0300	U	100		MS
Arsenic	75	1.9954	B	3.4000	U	100		MS
Beryllium	9	0.0910	U	1.3501	B	100		MS
Cadmium	111	0.1603	B	0.7550	U	100		MS
Lead	208	1.0700	U	5.3500	U			MS
Molybdenum	98	3.2928		3.0932	B	6		MS

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881989BKG Serial Dilution Lab Sample ID: 9881989L
Batch Number(s): 183111404401
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Barium		1982.6600		2030.6000		2		P
Boron		813.5100		836.4000		3		P
Calcium		419461.5700		422550.9000		1		P
Chromium		5.3000	U	26.5000	U			P
Cobalt		4.6700	B	7.8500	B	68		P
Lithium		50.5300		74.9000	B	48		P
Selenium		21.0000	U	105.0000	U			P
Thallium		14.0000	U	70.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

Method: P
Instrument ID: 23290
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium			
Boron	249.67		8.4
Calcium			
Chromium			
Cobalt			
Lithium			
Selenium			
Thallium			

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Instrument ID: 23745
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium	455.40		0.33
Boron	249.67		8.4
Calcium	317.93		33.4
Chromium	267.72		0.85
Cobalt	228.62		0.56
Lithium	670.78		7.5
Selenium	196.09		6.0
Thallium	190.86		4.9

Comments:

_____
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_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Instrument ID: 27813
Date: 09/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony	121		0.29
Arsenic	75		0.50
Beryllium	9		0.073
Cadmium	111		0.18
Lead	208		0.14
Molybdenum	98		0.30

Comments:

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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Instrument ID: 17384
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Mercury	254.00		0.050

Comments:

_____
_____
_____
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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: P
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium	455.40		5.0	1.0
Boron	249.67		50.0	12.0
Calcium	317.93		500	33.0
Chromium				
Cobalt	228.62		5.0	1.5
Lithium	670.78		50.0	11.0
Selenium				
Thallium				

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: P
Date: 09/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium				
Boron				
Calcium				
Chromium	267.72		15.0	5.3
Cobalt				
Lithium				
Selenium	196.09		50.0	21.0
Thallium	190.86		30.0	14.0

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
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_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: MS
Date: 09/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony	121		2.0	0.41
Arsenic	75		2.0	0.68
Beryllium	9		0.50	0.091
Cadmium	111		1.0	0.15
Lead	208		3.0	1.1
Molybdenum	98		2.0	0.31

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
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METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: CV
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Mercury	254.00		0.20	0.050

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

US EPA Tune Check Report

Operator Name	US19_USR_INS27814
Acq/Data Batch	D:\Agilent\ICPMH\1\DATA\EPA_Tune.b
Acq. Date-Time	2018-11-12 01:43:31
Report Comment	---
Instrument Name	G8403A SG18254097

[No Gas]

Sensitivity

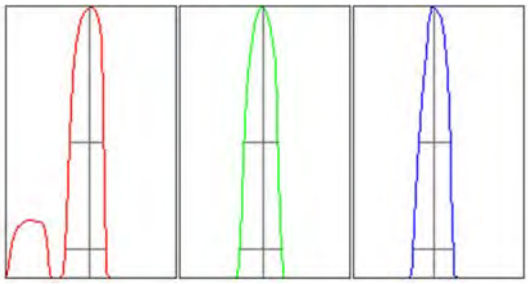
Mass	Conc. [ug/l]	Count	CPS	Resp (Required) [cps/ug/l]	Resp (Flag)	RSD%	RSD% (Required)
7	10.00	679	6792.65			2.195	5.000
89	10.00	2982	29818.34			1.937	5.000
205	10.00	1494	14935.78			2.609	5.000

Mass	RSD% (Flag)
7	
89	
205	

Mass	Rep#1 Count	Rep#2 Count	Rep#3 Count	Rep#4 Count	Rep#5 Count
7	686	690	691	655	674
89	2970	3029	3054	2928	2928
205	1498	1493	1519	1429	1529

Integration Time [sec] 0.1

Resolution/Axis



Mass	Peak Height	Axis	Axis (Required)	Axis (Flag)
7	1143.07	7.00	6.90 - 7.10	
89	5268.02	89.00	88.90 - 89.10	
205	2833.62	204.95	204.90 - 205.10	

Mass	W-50%	W-10%	W-10% (Required)	W-10% (Flag)
7	0.61	0.722	0.800	
89	0.60	0.744	0.800	
205	0.55	0.715	0.800	

Integration Time [sec] 0.1

Acquisition Time [sec] 113.7

Y Axis Linear

US EPA Tune Check Report

Tune Parameters

Plasma Parameters

Plasma Mode	---	Nebulizer Gas	0.65 L/min	Dilution Gas	0.45 L/min
RF Power	1550 W	Option Gas	---	Auxiliary Gas	0.90 L/min
RF Matching	1.10 V	Nebulizer Pump	0.10 rps	Plasma Gas	15.0 L/min
Sample Depth	10.0 mm	S/C Temp	2 °C		

Lens Parameters

Extract 1	0.0 V	Omega Lens	12.3 V	Deflect	17.0 V
Extract 2	-250.0 V	Cell Entrance	-40 V	Plate Bias	-50 V
Omega Bias	-95 V	Cell Exit	-60 V		

Cell Parameters

Use Gas	No	3rd Gas Flow	---	Energy Discrimination	5.0 V
He Flow	0.0 mL/min	OctP Bias	-8.0 V		
H2 Flow	0.0 mL/min	OctP RF	200 V		

QP Parameters

Mass Gain	125	Axis Gain	0.9994	QP Bias	-3.0 V
Mass Offset	125	Axis Offset	0.00		

Hardware Settings

Torch

Torch H	0.2 mm	Torch V	-0.1 mm		

EM

Discriminator	4.1 mV	Analog HV	2147 V	Pulse HV	1671 V

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ60

Instrument ID: 27813
Run Name: 1831606E07

Start Date: 11/12/2018
End Date: 11/12/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-3-209	PB	GE-3-72	AS
IN-3-115	CD,MO,SB	SC-1-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-1-45	Q	Element GE-3-72	Q	Element IN-3-115	Q	Element BI-3-209	Q	Element	Q	Element	Q	Element	Q
S0	11:03	100		100		100		100							
S	11:05	100		103		103		105							
ICV	11:08	99		102		99		101							
ICB	11:10	100		99		98		98							
LLC	11:12	100		98		96		98							
ICSA	11:14	94		95		93		94							
LRS2	11:16	99		99		94		96							
LRS3	11:18	102		101		100		99							
CCS	11:20	95		100		99		98							
CCS	11:23	98		98		99		97							
CCV	11:25	101		102		100		101							
CCB	11:27	97		101		101		99							
P31204AB	11:29	92		100		99		100							
P31204AQ	11:31	101		102		100		101							
9881987BKG	11:33	97		99		95		86							
9881987A	11:36	98		97		92		84							
9881987DUP	11:38	101		106		100		88							
9881987MS	11:40	100		100		95		83							
9881987MSD	11:42	100		99		95		83							
9881987L	11:44	84		119		113		99							
9881981	11:46	104		111		101		95							
CCV	11:49	100		108		102		96							
CCB	11:51	102		106		102		96							
9881982	11:53	103		107		99		94							
9881983	11:55	103		111		107		98							
9881984	11:57	106		107		103		94							
9881985	11:59	103		109		104		97							
9881986	12:01	95		102		100		95							
9881988	12:04	98		99		92		83							
9881989	12:06	91		100		93		81							
9881990	12:08	106		115		106		99							
9881991	12:10	104		108		104		99							

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ60

Instrument ID: 27813
Run Name: 1831606E07

Start Date: 11/12/2018
End Date: 11/12/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-3-209	PB	GE-3-72	AS
IN-3-115	CD,MO,SB	SC-1-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-1-45	Q	Element GE-3-72	Q	Element IN-3-115	Q	Element BI-3-209	Q	Element	Q	Element	Q	Element	Q
CCV	12:12	105		107		102		96							
CCB	12:14	98		104		99		94							

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

Preparation and Run Logs

Metals in Liquid

Method: P
Batch Number: 183111404401

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9881981	11/07/2018	50.00	50
9881982	11/07/2018	50.00	50
9881983	11/07/2018	50.00	50
9881984	11/07/2018	50.00	50
9881985	11/07/2018	50.00	50
9881986	11/07/2018	50.00	50
9881987	11/07/2018	50.00	50
9881988	11/07/2018	50.00	50
9881990	11/07/2018	50.00	50
9881991	11/07/2018	50.00	50
9881989BKG	11/07/2018	50.00	50
9881989DUP	11/07/2018	50.00	50
9881989MSD	11/07/2018	50.00	50
9881989MS	11/07/2018	50.00	50
P31104AB	11/07/2018	50.00	50
P31104AQ	11/07/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: MS
Batch Number: 183121404701

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9881981	11/09/2018	50.00	50
9881982	11/09/2018	50.00	50
9881983	11/09/2018	50.00	50
9881984	11/09/2018	50.00	50
9881985	11/09/2018	50.00	50
9881986	11/09/2018	50.00	50
9881988	11/09/2018	50.00	50
9881989	11/09/2018	50.00	50
9881990	11/09/2018	50.00	50
9881991	11/09/2018	50.00	50
9881987BKG	11/09/2018	50.00	50
9881987DUP	11/09/2018	50.00	50
9881987MSD	11/09/2018	50.00	50
9881987MS	11/09/2018	50.00	50
P31204AB	11/09/2018	50.00	50
P31204AQ	11/09/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: CV
Batch Number: 183110571301

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9881982	11/07/2018	40.00	40
9881983	11/07/2018	40.00	40
9881984	11/07/2018	40.00	40
9881985	11/07/2018	40.00	40
9881986	11/07/2018	40.00	40
9881987	11/07/2018	40.00	40
9881988	11/07/2018	40.00	40
9881989	11/07/2018	40.00	40
9881990	11/07/2018	40.00	40
9881991	11/07/2018	40.00	40
9881981BKG	11/07/2018	40.00	40
9881981DUP	11/07/2018	40.00	40
9881981MSD	11/07/2018	40.00	40
9881981MS	11/07/2018	40.00	40
P31171AB	11/07/2018	40.00	40
P31171AQ	11/07/2018	1.00	1

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: P
Instrument ID: 23745
Run Name: 1831201T74

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: P
Instrument ID: 23745
Run Name: 1831201T74

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
CCV	1.00	08:38			X		X		X	X	X		X			X	X																								
CCB	1.00	08:41			X		X		X	X	X		X			X	X																								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: P
Instrument ID: 23290
Run Name: 1831402T75

Run Start Date: 11/10/2018
Run End Date: 11/10/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
S0	1.00	09:15					X																																		
S	1.00	09:17																																						
S	1.00	09:20					X																																	
S	1.00	09:23																																						
ICV	1.00	09:26					X																																	
ICB	1.00	09:28					X																																	
LLC	1.00	09:31					X																																	
ICSA	1.00	09:34					X																																	
CCV	1.00	09:37					X																																	
CCB	1.00	09:39					X																																	
LRS2	1.00	09:42					X																																	
LRS4	1.00	09:45					X																																	
LRS3	1.00	09:48					X																																	
LRS5	1.00	09:51					X																																	
CCV	1.00	09:54					X																																	
CCB	1.00	09:56					X																																	
P31104AB	1.00	09:59																																						
P31104AB	1.00	10:02																																						
P31104AQ	1.00	10:05																																						
9881989MS	5.00	10:08					X																																	
9881989MSD	5.00	10:11					X																																	
ZZZZZZ	1.00	10:14																																						
ZZZZZZ	1.00	10:17																																						
ZZZZZZ	5.00	10:19																																						
CCV	1.00	10:22					X																																	
CCB	1.00	10:25					X																																	

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- A = Post Digest Spike
- L = Serial Dilution
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: MS
Instrument ID: 27813
Run Name: 1831606E07

Run Start Date: 11/12/2018
Run End Date: 11/12/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: CV
Instrument ID: 17384
Run Name: 1831201M07

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: CV
Instrument ID: 17384
Run Name: 1831201M07

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
ZZZZZZ	1.00	07:11																																							
ZZZZZZ	1.00	07:13																																							
ZZZZZZ	1.00	07:15																																							
ZZZZZZ	1.00	07:17																																							
ZZZZZZ	1.00	07:19																																							
ZZZZZZ	1.00	07:21																																							
ZZZZZZ	1.00	07:23																																							
CCV	1.00	07:25												X																											
CCB	1.00	07:27												X																											
ZZZZZZ	1.00	07:29																																							
ZZZZZZ	1.00	07:31																																							
ZZZZZZ	1.00	07:33																																							
ZZZZZZ	1.00	07:35																																							
ZZZZZZ	1.00	07:38																																							
ZZZZZZ	1.00	07:40																																							
ZZZZZZ	1.00	07:42																																							
ZZZZZZ	1.00	07:44																																							
ZZZZZZ	1.00	07:46																																							
ZZZZZZ	1.00	07:48																																							
CCV	1.00	07:50												X																											
CCB	1.00	07:52												X																											
ZZZZZZ	1.00	07:54																																							
ZZZZZZ	1.00	07:56																																							
ZZZZZZ	1.00	07:58																																							
ZZZZZZ	1.00	08:00																																							
ZZZZZZ	1.00	08:02																																							
ZZZZZZ	1.00	08:04																																							
ZZZZZZ	1.00	08:06																																							
ZZZZZZ	1.00	08:08																																							
ZZZZZZ	1.00	08:10																																							
ZZZZZZ	1.00	08:12																																							
CCV	1.00	08:14												X																											
CCB	1.00	08:16												X																											
ZZZZZZ	1.00	08:18																																							
ZZZZZZ	1.00	08:20																																							
CRA	1.00	08:22												X																											
CCV	1.00	08:24												X																											
CCB	1.00	08:26												X																											

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

METHODS:	LEGEND:
P = ICP Atomic Emission Spectrometer	BKG = Background
MS = ICP Mass Spectrometry	DUP = Duplicate
CV = Cold Vapor	MS = Matrix Spike
AF = Cold Vapor Atomic Fluorescence	MSD = Matrix Spike Duplicate
	A = Post Digest Spike
	L = Serial Dilution
	B = Blank
	Q = Laboratory Control Sample
	Y = Laboratory Control Sample Duplicate

Instrumental Wet Chemistry Data

Case Narrative/Conformance Summary

Instrumental Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9881981	MW-9	X		
9881982	MW-7	X		
9881983	MW-8	X		
9881984	MW-5	X		
9881985	MW-6	X		
9881986	FB-20181031	X		Field Blank
9881987	MW-1	X		
9881988	MW-4	X		
9881989	MW-2	X		
9881990	MW-3	X		
9881991	FB-20181101	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Matrix QC may not be included if site-specific QC were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, laboratory spike data (LCS) are provided.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

SAMPLE ANALYSIS:

Samples	Chloride	Fluoride	Sulfate
9881981	DF100	DF5	DF5
9881982	DF20	DF5	DF5
9881983	DF500	DF5	DF5
9881984	DF500	DF5	DF5
9881985	DF500	DF5	DF5
9881986	DF1	DF1	DF1
9881987	DF2000	DF5	DF20
9881988	DF2000	DF5	DF100
9881989	DF2000	DF5	DF5
9881990	DF500	DF5	DF20
9881991	DF1	DF1	DF1

No problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

Quality Control and Calibration Summary Forms

Instrumental Wet Chemistry

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Quality Control Reference List
Instrumental Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Fraction: Instrumental Wet Chemistry

Batch Number	Sample Number	Analysis Date	Chloride	Fluoride	Sulfate
18308520117A	P30820QB	11/05/2018 11:35:00	X	X	X
	P30820QQ	11/05/2018 11:18:00	X		X
	P30820QQ	11/06/2018 15:12:00		X	
18308520117B	9881981	11/05/2018 19:51:00			X
	9881981	11/05/2018 20:08:00	X		
	9881981	11/06/2018 15:47:00		X	
	9881982	11/05/2018 20:25:00			X
	9881982	11/05/2018 20:42:00	X		
	9881982	11/06/2018 16:04:00		X	
	9881988	11/06/2018 16:21:00		X	
	9881988	11/08/2018 13:46:00			X
	9881988	11/08/2018 14:04:00	X		
	9881990	11/05/2018 23:16:00	X		
	9881990	11/06/2018 16:38:00		X	
	9881990	11/08/2018 14:22:00			X
18309520117A	9881983	11/06/2018 01:46:00		X	X
	9881983	11/06/2018 02:04:00	X		
	9881984	11/06/2018 02:22:00		X	X
	9881984	11/06/2018 02:41:00	X		
	9881985	11/06/2018 02:59:00		X	X
	9881985	11/06/2018 03:54:00	X		
	9881986	11/06/2018 04:12:00	X	X	X
	9881987	11/06/2018 04:30:00		X	
	9881987	11/08/2018 22:35:00			X
	9881987	11/08/2018 23:30:00	X		
	P30920QB	11/05/2018 12:23:00	X	X	X
	P30920QQ	11/05/2018 12:04:00	X	X	X
18309520117B	9881989	11/06/2018 09:41:00		X	X
	9881989	11/09/2018 00:06:00	X		
	9881991	11/06/2018 10:17:00	X	X	X

Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: GEJ60
Matrix: LIQUID

Fraction: Instrumental Wet Chemistry

18308520117A / P30820QB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	11/05/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	11/05/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	11/05/18	N.D.	mg/l	0.30	1.0

18309520117A / P30920QB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	11/05/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	11/05/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	11/05/18	N.D.	mg/l	0.30	1.0

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Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ60
Matrix: LIQUID

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

LCS: P30820QQ	Batch: **18308520117B** (Sample number(s): 9881981-9881982, 9881988, 9881990)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.98	NA	99	NA	90-110	NA	NA
Fluoride	IC	0.750	0.784	NA	105	NA	90-110	NA	NA
Sulfate	IC	7.50	7.59	NA	101	NA	90-110	NA	NA

LCS: P30920QQ	Batch: **18309520117A** (Sample number(s): 9881983-9881987) Batch: **18309520117B** (Sample number(s): 9881989, 9881991)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.99	NA	100	NA	90-110	NA	NA
Fluoride	IC	0.750	0.750	NA	100	NA	90-110	NA	NA
Sulfate	IC	7.50	7.74	NA	103	NA	90-110	NA	NA

Instrument ID: 10913
Calibration Date: 10/19/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.497489	0.996617	2.345320	4.756166	7.018871	0.9997	0.9998
Fluoride	0.121234	0.385025	0.973416	2.065283	3.275179	0.9995	0.9997
Sulfate	0.322734	0.652928	1.727408	3.663232	5.670423	0.9993	0.9996

Concentration units: mg/L

Batch Numbers: 18308520117B, 18309520117A, 18309520117B
Run Start Dates: 11/08/2018, 11/05/2018
Run Names: 1831201D06, 1830901D06

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.9792	99	7.5	7.5877	101	0.75	0.8152	109
ICB	0	ND	NA	0	ND	NA	0	ND	NA
Low Chk	1.5	1.4653	98	3.75	3.9262	105	0.75	0.7558	101
High Chk	4.5	4.6036	102	11.25	11.8342	105	2.25	2.4841	110
CCV2	3	2.9990	100	7.5	7.7885	104	0.75	0.7580	101
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0023	100	7.5	7.7403	103	0.75	0.7563	101
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9777	99	7.5	7.7744	104	0.75	0.7547	101
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9798	99	7.5	7.7383	103	0.75	0.7631	102
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0053	100	7.5	7.9190	106	0.75	0.7833	104
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9973	100	7.5	7.7602	103	0.75	0.7662	102
CCB	0	ND	NA	0	ND	NA	0	ND	NA
Low Chk	1.5	1.4775	99	3.75	3.6969	99			
High Chk	4.5	4.5741	102	11.25	12.1558	108			
CCV2	3	2.9558	99	7.5	7.5607	101			
CCB	0	ND	NA	0	ND	NA			
CCV2	3	2.9533	98	7.5	7.5811	101			
CCB	0	ND	NA	0	ND	NA			
CCV2				7.5	7.2438	97			
CCB				0	ND	NA			
CCV2	3	2.9484	98	7.5	7.5369	100			

* = Out of Specifications

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
CCB	0	ND	NA	0	ND	NA			
CCV2	3	2.9609	99						
CCB	0	ND	NA						

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis/Anion Scan

SDG: GEJ60

Instrument ID: 24811
Calibration Date: 11/02/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.677137	1.372108	3.447310	7.094930	11.237807	0.9981	0.9990
Fluoride	0.189605	0.722716	1.892251	4.164881	6.641591	0.9984	0.9992
Sulfate	0.405978	0.865700	2.165607	4.516121	6.997385	0.9997	0.9999

Concentration units: mg/L

Batch Numbers: 18308520117B
Run Start Dates: 11/05/2018, 11/06/2018
Run Names: 1830901D17, 1831001D17

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.9428	98	7.5	7.5797	101	0.75	0.7691	103
ICB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9841	99	7.5	7.5599	101	0.75	0.7875	105
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0080	100	7.5	7.7488	103	0.75	0.8540	114
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9755	99	7.5	7.6480	102			
CCB	0	ND	NA	0	ND	NA			
CCV2	3	2.9827	99	7.5	7.7079	103			
CCB	0	ND	NA	0	ND	NA			
CCV2	3	3.0445	101						
CCB	0	ND	NA						
CCV2							0.75	0.7927	106
CCB							0	ND	NA
CCV2							0.75	0.7696	103
CCB							0	ND	NA

* = Out of Specifications

Fraction: Instrumental Wet Chemistry

00224: Chloride Analyte Name	Default MDL	Default LOQ	Units
Chloride	0.20	0.40	mg/l

01504: Fluoride Analyte Name	Default MDL	Default LOQ	Units
Fluoride	0.050	0.10	mg/l

00228: Sulfate Analyte Name	Default MDL	Default LOQ	Units
Sulfate	0.30	1.0	mg/l

Wet Chemistry Data

Case Narrative/Conformance Summary

Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Water Quality

Fraction: Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	DF	Comments
9881981	MW-9	X		1	
9881982	MW-7	X		1	
9881983	MW-8	X		1	
9881984	MW-5	X		1	
9881985	MW-6	X		1	
9881986	FB-20181031	X		1	Field Blank
9881987	MW-1	X		1	
9881988	MW-4	X		1	
9881989	MW-2	X		1	
9881990	MW-3	X		1	
9881991	FB-20181101	X		1	Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

Sample Duplicate

Method defined actions are taken for any failed matrix QC.

Batch#: 18316921201B (Sample number(s): 9881988, BKG: 9881988)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Total Dissolved Solids

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Water Quality

Fraction: Wet Chemistry

Batch#: 18309921202B (Sample number(s): 9881981, UNSPK: 9881984, BKG: 9881981-9881984)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Total Dissolved Solids

SAMPLE ANALYSIS:

(Sample number(s): 9881988: Analysis: 00212)
The sample was originally ran within holding time for Total Dissolved Solids at a reduced volume with a result that was less than the Limit of Quantitation, the sample was reanalyzed for Total Dissolved Solids outside of the 7 day holding time on 11/12/2018.
The sample is being reported per client request.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

QC Summary

Wet Chemistry

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Fraction: Wet Chemistry

Analysis	Batch Number	Sample Number	Analysis Date
Total Dissolved Solids	18309921201A	B309871B	11/05/2018 13:07
		L309871Q	11/05/2018 13:07
		L309871Y	11/05/2018 13:07
		9881985 UNSPK/BKG	11/05/2018 13:05
		9881985 MS,DUP	11/05/2018 13:07
Total Dissolved Solids	18309921202A	B309872B	11/05/2018 14:42
		L309872Q	11/05/2018 14:42
		9881982	11/05/2018 14:41
		9881983	11/05/2018 14:41
		9881984 UNSPK/BKG	11/05/2018 14:41
		9881984 MS,DUP	11/05/2018 14:42
		9881986	11/05/2018 14:41
		9881987	11/05/2018 14:41
		9881989	11/05/2018 14:41
		9881990	11/05/2018 14:41
		9881991	11/05/2018 14:41
Total Dissolved Solids	18309921202B	9881981 BKG	11/05/2018 14:41
		9881981 DUP	11/05/2018 14:42
Total Dissolved Solids	18316921201A	B316871B	11/12/2018 12:59
		L316871Q	11/12/2018 12:59
Total Dissolved Solids	18316921201B	9881988 BKG	11/12/2018 12:57
		9881988 DUP	11/12/2018 12:59

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Fraction: Wet Chemistry

Batch Number	Sample Number	Analysis Date	pH	Temperature of pH
18309005103A	9881982	11/06/2018 01:45:00	X	X
	9881983	11/06/2018 01:50:00	X	X
	9881986	11/06/2018 01:36:00	X	X
	9881987	11/06/2018 01:41:00	X	X
	9881988	11/06/2018 01:31:00	X	X
	9881990	11/06/2018 01:59:00	X	X
	9881991	11/06/2018 01:55:00	X	X
	P005103Q	11/06/2018 00:37:00	X	
18309005104A	9881981	11/06/2018 02:54:00	X	X
	9881984	11/06/2018 02:49:00	X	X
	9881985	11/06/2018 02:44:00	X	X
	9881989 BKG	11/06/2018 02:35:00	X	X
	9881989 DUP	11/06/2018 02:40:00	X	X
	P005104Q	11/06/2018 02:30:00	X	

Quality Control Summary
Method Blank
Water Quality
SDG: GEJ60
Matrix: LIQUID

Fraction: Wet Chemistry

18309921201A / B309871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	11/05/18	N.D.	mg/l	20.0	60.0

18309921202A / B309872B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	11/05/18	N.D.	mg/l	20.0	60.0

18316921201A / B316871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	11/12/18	N.D.	mg/l	20.0	60.0

Water Quality
Fraction: Wet Chemistry

UNSPK: 9881985 MS: 9881985	Batch: **18309921201A** (Sample number(s): 9881985)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1600	1132.	2708.	NA	99	NA	62-127	NA	NA

UNSPK: 9881984 MS: 9881984	Batch: **18309921202A** (Sample number(s): 9881982-9881984, 9881986-9881987, 9881989-9881991) Batch: **18309921202B** (Sample number(s): 9881981)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1600	1756.	3176.	NA	89	NA	62-127	NA	NA

Comments:
(2) The unspiked sample result is greater than four times the spike added.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

BKG: 9881989 DUP: 9881989	Batch: **18309005104A** (Sample number(s): 9881981, 9881984-9881985, 9881989)				
Parameter	**ME**	**Unspiked Conc Std. Units**	**DUP Conc Std. Units**	**%RPD**	**%RPD Limits**
pH	MTR	7.68	7.71	0	4

BKG: 9881989 DUP: 9881989	Batch: **18309005104A** (Sample number(s): 9881981, 9881984-9881985, 9881989)				
Parameter	**ME**	**Unspiked Conc Degrees C**	**DUP Conc Degrees C**	**%RPD**	**%RPD Limits**
Temperature of pH	MTR	22.72	22.99	1	5

BKG: 9881985 DUP: 9881985	Batch: **18309921201A** (Sample number(s): 9881985)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1132.	1100.	3 (1)	5

BKG: 9881984 DUP: 9881984	Batch: **18309921202A** (Sample number(s): 9881982-9881984, 9881986-9881987, 9881989-9881991)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1756.	1700.	3 (1)	5

BKG: 9881981 DUP: 9881981	Batch: **18309921202B** (Sample number(s): 9881981)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	860.	926.	7* (1)	5

BKG: 9881988 DUP: 9881988	Batch: **18316921201B** (Sample number(s): 9881988)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	9556.	9002.	6*	5

Comments:
(1) The sample and/or duplicate result is less than five times the LOQ.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

LCS: P005103Q	Batch: **18309005103A** (Sample number(s): 9881982-9881983, 9881986-9881988, 9881990-9881991)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.00	NA	100	NA	95-105	NA	NA

LCS: P005104Q	Batch: **18309005104A** (Sample number(s): 9881981, 9881984-9881985, 9881989)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.00	NA	100	NA	95-105	NA	NA

LCS: L309871Q LCSD: L309871Y	Batch: **18309921201A** (Sample number(s): 9881985)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	195	200	98	100	62-127	3	14

LCS: L309872Q	Batch: **18309921202A** (Sample number(s): 9881982-9881984, 9881986-9881987, 9881989-9881991) Batch: **18309921202B** (Sample number(s): 9881981)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	203	NA	102	NA	62-127	NA	NA

LCS: L316871Q	Batch: **18316921201B** (Sample number(s): 9881988)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	196	NA	98	NA	62-127	NA	NA

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LOQ/MDL Summary
Water Quality

SDG: GEJ60

Fraction: Wet Chemistry

12152: pH Analyte Name	Default MDL	Default LOQ	Units
pH	0.010	0.010	Std. Units

12151: Temperature of pH Analyte Name	Default MDL	Default LOQ	Units
Temperature of pH	0.010	0.010	Degrees C

00212: Total Dissolved Solids Analyte Name	Default MDL	Default LOQ	Units
Total Dissolved Solids	20.0	60.0	mg/l

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Type III Data Package

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Project: PSEG Hudson
Groundwater and Water Samples
Collected on 10/31/18-11/01/18

SDG# GEJ60

GROUP	SAMPLE NUMBERS
2005364	9881981-9881991

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-18-27
AZ Cert. # AZ0780

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by: Dana M Kauffman **Date: 11/28/2018**

Dana M. Kauffman
Manager

Any questions or concerns you might have regarding this data package should be directed to your client representative, Kerri Sachtleben at (717)-556-7376.

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Sample Reference List for SDG Number GEJ60 with a Data Package Type of III

07701 - GEI Consultants, Inc.

Project: PSEG Hudson

Lab Sample Number	Client Sample ID	Collection Date	Date Received
9881981	MW-9	10/31/2018 11:05	11/02/2018 17:20
9881982	MW-7	10/31/2018 12:55	11/02/2018 17:20
9881983	MW-8	10/31/2018 12:35	11/02/2018 17:20
9881984	MW-5	10/31/2018 10:50	11/02/2018 17:20
9881985	MW-6	10/31/2018 14:20	11/02/2018 17:20
9881986	FB-20181031	10/31/2018 11:00	11/02/2018 17:20
9881987	MW-1	11/01/2018 09:45	11/02/2018 17:20
9881988	MW-4	11/01/2018 11:40	11/02/2018 17:20
9881989	MW-2	11/01/2018 10:35	11/02/2018 17:20
9881990	MW-3	11/01/2018 12:00	11/02/2018 17:20
9881991	FB-20181101	11/01/2018 11:00	11/02/2018 17:20

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Sample pH Log

SDG: GEJ60

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9881981	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:55:34PM	25804
9881981	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 6:55:22PM	12665
9881981	055A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:06:49AM	25684
9881981	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:49:52PM	25804
9881981	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:20:56AM	25684
9881981	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:55:24AM	12616
9881981	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:55:34PM	25804
9881981	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:20:56AM	25684
9881982	004A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:06AM	25684
9881982	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:01:23PM	12665
9881982	055A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:07:48AM	25684
9881982	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:50:18PM	25804
9881982	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:10:43AM	25684
9881982	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:47:03AM	12616
9881982	330A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:06AM	25684
9881982	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:10:43AM	25684
9881983	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:12:57AM	25684
9881983	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:01:47PM	12665
9881983	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:48:57PM	25804
9881983	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:47:00PM	25804
9881983	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:16:06AM	25684
9881983	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:44:58AM	12616
9881983	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:12:57AM	25684
9881983	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:12:57AM	25684
9881984	004A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:14:00AM	25684
9881984	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:02:46PM	12665
9881984	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:45:07PM	25804
9881984	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:51:53PM	25804
9881984	070A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:19:31AM	25684
9881984	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:42:45AM	12616
9881984	330A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:14:00AM	25684
9881984	332A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:14:00AM	25684
9881985	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:06:39PM	25804
9881985	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:03:20PM	12665
9881985	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:51:29PM	25804
9881985	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:45:26PM	25804
9881985	070A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:19:55AM	25684
9881985	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:41:06AM	12616

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9881985	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:06:39PM	25804
9881985	332A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:19:55AM	25684
9881986	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:15:02AM	25684
9881986	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:02:28PM	12665
9881986	055A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:46:28PM	25804
9881986	055B	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:49:27PM	25804
9881986	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:23:42AM	25684
9881986	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:49:21AM	12616
9881986	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:15:02AM	25684
9881986	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:15:02AM	25684
9881987	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:52AM	25684
9881987	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:02:07PM	12665
9881987	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:47:49PM	25804
9881987	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:48:35PM	25804
9881987	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:24:00AM	25684
9881987	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:39:11AM	12616
9881987	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:52AM	25684
9881987	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:17:52AM	25684
9881988	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:04:51PM	25804
9881988	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:03:03PM	12665
9881988	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:51:02PM	25804
9881988	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:50:40PM	25804
9881988	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:21:59AM	25684
9881988	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 11:00:43AM	12616
9881988	148A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:04:46PM	12665
9881988	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:04:51PM	25804
9881988	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:21:59AM	25684
9881989	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:09:45PM	25804
9881989	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:03:43PM	12665
9881989	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:47:19PM	25804
9881989	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:48:09PM	25804
9881989	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:23:00AM	25684
9881989	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:57:05AM	12616
9881989	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:09:45PM	25804
9881989	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:23:00AM	25684
9881990	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:05:52PM	25804
9881990	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:04:19PM	12665
9881990	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:06:26AM	25684
9881990	055B	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:07:22AM	25684
9881990	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:05:40AM	25684
9881990	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:51:07AM	12616
9881990	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 1:05:52PM	25804
9881990	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:05:40AM	25684
9881991	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:11:39AM	25684

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9881991	015A	6	5-7	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 7:04:01PM	12665
9881991	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:45:55PM	25804
9881991	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 12:44:42PM	25804
9881991	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:09:15AM	25684
9881991	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/6/2018 10:52:51AM	12616
9881991	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:11:39AM	25684
9881991	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	11/3/2018 9:09:15AM	25684

*pH Check Code Key
PK = Original container checked - pH is within the correct range. (No preservative was added)
PA = Original container checked - pH adjusted to correct range. (Preservative was added)
PV = Volatile container checked
PC = pH checked (unpreserved container)
SPK = Subsampled from an original container. Original container checked - pH is within correct range
SPA = Subsampled from an original container. Subsample container checked - pH adjusted to correct range.
SPC = Subsampled from an original container. pH checked (unpreserved container).
SUP = Subsampled from original container. Unable to be preserved due to the matrix of the sample.
UP = Unable to preserve due to matrix of the sample.
NA = Not applicable

**Chlorine Present Code Key
NA = Chlorine Not Checked
Y = Chlorine Present
N = Chlorine Not Present

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00259 Mercury

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

14044 ICP-WW, 3005A (tot rec) - U345

The sample is digested with nitric acid and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3005A, July 1992

14047 ICPMS - Water, 3020A - U345

The sample is digested with nitric and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3020A, July 1992

05713 WW SW846 Hg Digest

The sample is heated at 95 c with nitric acid, sulfuric acid, potassium persulfate, and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

07046 Barium
08014 Boron
01750 Calcium
07051 Chromium
07052 Cobalt
01756 Lithium
07036 Selenium
07022 Thallium

The solution resulting from the metals digestion is analyzed by Trace ICP.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6010D, Rev. 4, July 2014.

06024 Antimony
06025 Arsenic
06027 Beryllium
06028 Cadmium
06035 Lead
06038 Molybdenum

The solution resulting from the metals digestion is analyzed by ICP/MS.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6020B, Rev.2, July 2014.

00224 Chloride
01504 Fluoride
00228 Sulfate

A small volume of sample is introduced into an ion chromatograph. The anions are then separated and measured by a system consisting of a guard column, separator column, suppressor, and conductivity detector.

Reference: Method 300.0, Revision 2.1 (1993), Methods for Chemical Analysis of Water and Wastes USEPA 600.

12152 pH

The activity of hydrogen ions in the sample is measured using a glass electrode and a reference electrode.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 4500-H+ B-2011

00212 Total Dissolved Solids

A well-mixed sample is filtered through a glass fiber filter. The filtrate is collected in a tared beaker, evaporated in a steam bath and dried in an oven at 180C +/- 2C to a constant weight. The increase in weight is the total dissolved solids.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2540 C-2011

12151 Temperature of pH

The temperature of the sample measured during the pH analysis.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2550 B-2010

Analysis Reports / Field Chain of Custody

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Report Date: November 16, 2018 12:45

Project: PSEG Hudson

Account #: 07701
Group Number: 2005364
SDG: GEJ60
PO Number: 1504710
State of Sample Origin: NJ

Electronic Copy To	GEI Consultants, Inc.	Attn: Jason Kohl
Electronic Copy To	GEI Consultants, Inc.	Attn: Data Group

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-9 Grab Groundwater	10/31/2018 11:05	9881981
MW-7 Grab Groundwater	10/31/2018 12:55	9881982
MW-8 Grab Groundwater	10/31/2018 12:35	9881983
MW-5 Grab Groundwater	10/31/2018 10:50	9881984
MW-6 Grab Groundwater	10/31/2018 14:20	9881985
FB-20181031 Grab Water	10/31/2018 11:00	9881986
MW-1 Grab Groundwater	11/01/2018 09:45	9881987
MW-4 Grab Groundwater	11/01/2018 11:40	9881988
MW-2 Grab Groundwater	11/01/2018 10:35	9881989
MW-3 Grab Groundwater	11/01/2018 12:00	9881990
FB-20181101 Grab Water	11/01/2018 11:00	9881991

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: GEI Consultants, Inc.
Project: PSEG Hudson
Sampling Date(s): 10/31/18 - 11/01/18
Laboratory Sample ID(s): 9881981-9881991
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Kenneth Boley
Senior Specialist, Quality Assurance

11/16/2018



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Project Name: PSEG Hudson
ELLE Group #: 2005364

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.
Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 9881981, 9881982, 9881983, 9881984, 9881985, 9881986, 9881987, 9881988, 9881989, 9881990, 9881991

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.

Batch #: 183111404401 (Sample number(s): 9881981-9881991 UNSPK: 9881989 BKG: 9881989)

The recovery(ies) for the following analyte(s) in the MS and/or MSD exceeded the acceptance window indicating a positive bias: Calcium

The recovery(ies) for the following analyte(s) in the MS and/or MSD were below the acceptance window: Calcium

SW-846 6020B Rev.2, July 2014, Metals Dissolved

Batch #: 183121404701A (Sample number(s): 9881981-9881991 UNSPK: 9881987 BKG: 9881987)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Antimony, Cadmium

SM 2540 C-2011, Wet Chemistry

Sample #s: 9881988

The sample was originally ran within holding time for Total Dissolved Solids at a reduced volume with a result that was less than the Limit of Quantitation, the sample was reanalyzed for Total Dissolved Solids outside of the 7 day holding time on 11/12/2018.
The sample is being reported per client request.

Batch #: 18309921202B (Sample number(s): 9881981 UNSPK: 9881984 BKG: 9881981, 9881984)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Batch #: 18316921201B (Sample number(s): 9881988 BKG: 9881988)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:05
SDG#: GEJ60-01

GEI Consultants, Inc.
ELLE Sample #: GW 9881981
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0549	0.0010	0.0050	1
08014	Boron	7440-42-8	0.274	0.0120	0.0500	1
01750	Calcium	7440-70-2	76.2	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0017 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0058	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0120	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	291	20.0	40.0	100
01504	Fluoride	16984-48-8	0.37 J	0.25	0.50	5
00228	Sulfate	14808-79-8	67.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	860	80.0	240	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:05
SDG#: GEJ60-01

GEI Consultants, Inc.
ELLE Sample #: GW 9881981
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:58	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:46	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:46	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:35	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/05/2018 20:08	Ashlynn M Cornelius	100

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:05
SDG#: GEJ60-01

GEI Consultants, Inc.
ELLE Sample #: GW 9881981
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 15:47	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/05/2018 19:51	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202B	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:54	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:54	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:55
SDG#: GEJ60-02

GEI Consultants, Inc.
ELLE Sample #: GW 9881982
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0381	0.0010	0.0050	1
08014	Boron	7440-42-8	0.151	0.0120	0.0500	1
01750	Calcium	7440-70-2	32.7	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00075 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0056	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	44.4	4.0	8.0	20
01504	Fluoride	16984-48-8	0.39 J	0.25	0.50	5
00228	Sulfate	14808-79-8	11.8	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	253	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.9	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:55
SDG#: GEJ60-02

GEI Consultants, Inc.
ELLE Sample #: GW 9881982
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:01	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:53	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:53	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:47	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/05/2018 20:42	Ashlynn M Cornelius	20

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:55
SDG#: GEJ60-02

GEI Consultants, Inc.
ELLE Sample #: GW 9881982
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 16:04	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/05/2018 20:25	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:45	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:45	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:35
SDG#: GEJ60-03

GEI Consultants, Inc.
ELLE Sample #: GW 9881983
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0618	0.0010	0.0050	1
08014	Boron	7440-42-8	0.191	0.0120	0.0500	1
01750	Calcium	7440-70-2	28.5	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0037 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00070 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00069 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0039	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	349	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	17.5	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	828	80.0	240	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:35
SDG#: GEJ60-03

GEI Consultants, Inc.
ELLE Sample #: GW 9881983
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:09	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:55	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:55	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:49	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 02:04	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 12:35
SDG#: GEJ60-03

GEI Consultants, Inc.
ELLE Sample #: GW 9881983
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 01:46	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 01:46	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:50	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:50	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 10:50
SDG#: GEJ60-04

GEI Consultants, Inc.
ELLE Sample #: GW 9881984
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0844	0.0010	0.0050	1
08014	Boron	7440-42-8	0.444	0.0120	0.0500	1
01750	Calcium	7440-70-2	101	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0150 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00087 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	849	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	8.0	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,760	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 10:50
SDG#: GEJ60-04

GEI Consultants, Inc.
ELLE Sample #: GW 9881984
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.1	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:12	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:57	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:57	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:51	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 02:41	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 10:50
SDG#: GEJ60-04

GEI Consultants, Inc.
ELLE Sample #: GW 9881984
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 02:22	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 02:22	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:49	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:49	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 14:20
SDG#: GEJ60-05

GEI Consultants, Inc.
ELLE Sample #: GW 9881985
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0707	0.0010	0.0050	1
08014	Boron	7440-42-8	0.595	0.0120	0.0500	1
01750	Calcium	7440-70-2	99.9	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0015 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.00032 J	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	434	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	32.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,130	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 14:20
SDG#: GEJ60-05

GEI Consultants, Inc.
ELLE Sample #: GW 9881985
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:15	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:59	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:59	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:53	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 03:54	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 14:20
SDG#: GEJ60-05

GEI Consultants, Inc.
ELLE Sample #: GW 9881985
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 02:59	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 02:59	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921201A	11/05/2018 13:05	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:44	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:44	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181031 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:00
SDG#: GEJ60-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881986
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.114 J	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181031 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:00
SDG#: GEJ60-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881986
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:18	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:01	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:01	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:55	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/06/2018 04:12	Ashlynn M Cornelius	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181031 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 10/31/2018 11:00
SDG#: GEJ60-06FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881986
ELLE Group #: 2005364
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 04:12	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	18309520117A	11/06/2018 04:12	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:36	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:36	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 09:45
SDG#: GEJ60-07

GEI Consultants, Inc.
ELLE Sample #: GW 9881987
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.715	0.0010	0.0050	1
08014	Boron	7440-42-8	1.06	0.0120	0.0500	1
01750	Calcium	7440-70-2	382	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0069	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0478 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0016 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0020 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00016 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0033	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,540	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	122	6.0	20.0	20
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	7,140	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.0	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 09:45
SDG#: GEJ60-07

GEI Consultants, Inc.
ELLE Sample #: GW 9881987
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:20	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 11:33	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 11:33	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:57	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117A	11/08/2018 23:30	Ashlynn M Cornelius	2000

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 09:45
SDG#: GEJ60-07

GEI Consultants, Inc.
ELLE Sample #: GW 9881987
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117A	11/06/2018 04:30	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117A	11/08/2018 22:35	Ashlynn M Cornelius	20
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:41	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:41	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:40
SDG#: GEJ60-08

GEI Consultants, Inc.
ELLE Sample #: GW 9881988
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0997	0.0010	0.0050	1
08014	Boron	7440-42-8	1.19	0.0120	0.0500	1
01750	Calcium	7440-70-2	128	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0030 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0497 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00082 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00069 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0065	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	5,370	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	551	30.0	100	100
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	9,560	80.0	240	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:40
SDG#: GEJ60-08

GEI Consultants, Inc.
ELLE Sample #: GW 9881988
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2540 C-2011**		**mg/l**	**mg/l**	**mg/l**	
	The sample was originally ran within holding time for Total Dissolved Solids at a reduced volume with a result that was less than the Limit of Quantitation, the sample was reanalyzed for Total Dissolved Solids outside of the 7 day holding time on 11/12/2018. The sample is being reported per client request.					
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1
	The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.					

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:24	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:40
SDG#: GEJ60-08

GEI Consultants, Inc.
ELLE Sample #: GW 9881988
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:04	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:04	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 06:59	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/08/2018 14:04	Ashlynn M Cornelius	2000
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 16:21	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/08/2018 13:46	Ashlynn M Cornelius	100
00212	Total Dissolved Solids	SM 2540 C-2011	2	18316921201B	11/12/2018 12:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:31	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:31	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 10:35
SDG#: GEJ60-09

GEI Consultants, Inc.
ELLE Sample #: GW 9881989
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	1.98	0.0010	0.0050	1
08014	Boron	7440-42-8	0.814	0.0120	0.0500	1
01750	Calcium	7440-70-2	419	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0047 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0505	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00066 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0033	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00024 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0036	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,650	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	15.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	17,300	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 10:35
SDG#: GEJ60-09

GEI Consultants, Inc.
ELLE Sample #: GW 9881989
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 07:39	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:06	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:06	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 07:05	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117B	11/09/2018 00:06	Ashlynn M Cornelius	2000

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 10:35
SDG#: GEJ60-09

GEI Consultants, Inc.
ELLE Sample #: GW 9881989
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117B	11/06/2018 09:41	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18309520117B	11/06/2018 09:41	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005104A	11/06/2018 02:35	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005104A	11/06/2018 02:35	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 12:00
SDG#: GEJ60-10

GEI Consultants, Inc.
ELLE Sample #: GW 9881990
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0749	0.0010	0.0050	1
08014	Boron	7440-42-8	0.507	0.0120	0.0500	1
01750	Calcium	7440-70-2	78.6	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0138 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00096 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0026	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0115	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	703	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	129	6.0	20.0	20
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,720	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.0	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 12:00
SDG#: GEJ60-10

GEI Consultants, Inc.
ELLE Sample #: GW 9881990
ELLE Group #: 2005364
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:27	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:08	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:08	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 07:07	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18308520117B	11/05/2018 23:16	Ashlynn M Cornelius	500

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 12:00
SDG#: GEJ60-10

GEI Consultants, Inc.
ELLE Sample #: GW 9881990
ELLE Group #: 2005364
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18308520117B	11/06/2018 16:38	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	18308520117B	11/08/2018 14:22	Ashlynn M Cornelius	20
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:59	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:59	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181101 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:00
SDG#: GEJ60-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881991
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.0953 J	0.0330	0.500	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported. The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.					
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	26.0 J	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181101 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:00
SDG#: GEJ60-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881991
ELLE Group #: 2005364
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was filtered in the lab for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183111404401	11/08/2018 08:30	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183121404701A	11/12/2018 12:10	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183121404701C	11/12/2018 12:10	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	183110571301	11/08/2018 07:09	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183111404401	11/07/2018 15:50	JoElla L Rice	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183121404701	11/09/2018 04:10	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183110571301	11/07/2018 16:15	JoElla L Rice	1
00224	Chloride	EPA 300.0	1	18309520117B	11/06/2018 10:17	Ashlynn M Cornelius	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181101 Grab Water**
PSEG - Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 11/02/2018 17:20
Collection Date/Time: 11/01/2018 11:00
SDG#: GEJ60-11FB

GEI Consultants, Inc.
ELLE Sample #: GW 9881991
ELLE Group #: 2005364
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01504	Fluoride	EPA 300.0	1	18309520117B	11/06/2018 10:17	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	18309520117B	11/06/2018 10:17	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18309921202A	11/05/2018 14:41	Alexa Sanchez	1
12151	Temperature of pH	SM 2550 B-2010	1	18309005103A	11/06/2018 01:55	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18309005103A	11/06/2018 01:55	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 183110571301	Sample number(s): 9881981-9881991		
Mercury	N.D.	0.000050	0.00020
Batch number: 183111404401	Sample number(s): 9881981-9881991		
Barium	N.D.	0.0010	0.0050
Boron	N.D.	0.0120	0.0500
Calcium	N.D.	0.0330	0.500
Chromium	N.D.	0.0053	0.0150
Cobalt	N.D.	0.0015	0.0050
Lithium	N.D.	0.0110	0.0500
Selenium	N.D.	0.0210	0.0500
Thallium	N.D.	0.0140	0.0300
Batch number: 183121404701A	Sample number(s): 9881981-9881991		
Antimony	N.D.	0.00041	0.0020
Arsenic	N.D.	0.00068	0.0020
Beryllium	N.D.	0.000091	0.00050
Cadmium	N.D.	0.00015	0.0010
Lead	N.D.	0.0011	0.0030
Batch number: 183121404701C	Sample number(s): 9881981-9881991		
Molybdenum	N.D.	0.00031	0.0020
Batch number: 18308520117B	Sample number(s): 9881981-9881982,9881988,9881990		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18309520117A	Sample number(s): 9881983-9881987		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18309520117B	Sample number(s): 9881989,9881991		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18309921201A	Sample number(s): 9881985		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991		
Total Dissolved Solids	N.D.	20.0	60.0

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

Method Blank (continued)

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 18309921202B	Sample number(s): 9881981		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18316921201B	Sample number(s): 9881988		
Total Dissolved Solids	N.D.	20.0	60.0

LCS/LCSD

Analysis Name	LCS Spike Added	LCS Conc	LCSD Spike Added	LCSD Conc	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
	mg/l	mg/l	mg/l	mg/l					
Batch number: 183110571301	Sample number(s): 9881981-9881991								
Mercury	0.00100	0.000862			86		80-120		
Batch number: 183111404401	Sample number(s): 9881981-9881991								
Barium	2.00	2.04			102		80-120		
Boron	2.00	1.84			92		80-120		
Calcium	4.00	4.07			102		80-120		
Chromium	0.200	0.202			101		80-120		
Cobalt	0.500	0.515			103		80-120		
Lithium	1.00	1.02			102		80-120		
Selenium	0.150	0.145			97		80-120		
Thallium	0.150	0.159			106		80-120		
Batch number: 183121404701A	Sample number(s): 9881981-9881991								
Antimony	0.00600	0.00606			101		80-120		
Arsenic	0.0100	0.0101			101		80-120		
Beryllium	0.00400	0.00409			102		80-120		
Cadmium	0.00500	0.00521			104		80-120		
Lead	0.0150	0.0153			102		80-120		
Batch number: 183121404701C	Sample number(s): 9881981-9881991								
Molybdenum	0.0500	0.0526			105		80-120		
	mg/l	mg/l	mg/l	mg/l					
Batch number: 18308520117B	Sample number(s): 9881981-9881982,9881988,9881990								
Chloride	3.00	2.98			99		90-110		
Fluoride	0.750	0.784			105		90-110		
Sulfate	7.50	7.59			101		90-110		
Batch number: 18309520117A	Sample number(s): 9881983-9881987								
Chloride	3.00	2.99			100		90-110		
Fluoride	0.750	0.750			100		90-110		
Sulfate	7.50	7.74			103		90-110		

*- Outside of specification
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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

LCS/LCSD (continued)

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 18309520117B	Sample number(s): 9881989,9881991								
Chloride	3.00	2.99			100		90-110		
Fluoride	0.750	0.750			100		90-110		
Sulfate	7.50	7.74			103		90-110		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18309921201A	Sample number(s): 9881985								
Total Dissolved Solids	200	195	200	200	98	100	62-127	3	14
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991								
Total Dissolved Solids	200	203			102		62-127		
Batch number: 18309921202B	Sample number(s): 9881981								
Total Dissolved Solids	200	203			102		62-127		
Batch number: 18316921201B	Sample number(s): 9881988								
Total Dissolved Solids	200	196			98		62-127		
	Std. Units	**Std. Units**	**Std. Units**	**Std. Units**					
Batch number: 18309005103A	Sample number(s): 9881982-9881983,9881986-9881988,9881990-9881991								
pH	7.00	7.00			100		95-105		
Batch number: 18309005104A	Sample number(s): 9881981,9881984-9881985,9881989								
pH	7.00	7.00			100		95-105		

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 183110571301	Sample number(s): 9881981-9881991 UNSPK: 9881981									
Mercury	N.D.	0.00100	0.000815	0.00100	0.000807	82	81	75-125	1	20
Batch number: 183111404401	Sample number(s): 9881981-9881991 UNSPK: 9881989									
Barium	1.98	2.00	3.81	2.00	3.72	92	87	75-125	3	20
Boron	0.814	2.00	3.10	2.00	3.08	115	113	75-125	1	20
Calcium	419.46	4.00	426.06	4.00	419.26	165 (2)	-5 (2)	75-125	2	20
Chromium	N.D.	0.200	0.221	0.200	0.200	111	100	75-125	10	20
Cobalt	0.00467	0.500	0.478	0.500	0.477	95	95	75-125	0	20
Lithium	0.0505	1.00	1.08	1.00	1.10	103	105	75-125	2	20
Selenium	N.D.	0.150	0.154	0.150	0.156	103	104	75-125	2	20

*- Outside of specification
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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

MS/MSD (continued)

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Thallium	N.D.	0.150	0.131	0.150	0.131	87	87	75-125	0	20
Batch number: 183121404701A	Sample number(s): 9881981-9881991 UNSPK: 9881987									
Antimony	0.00164	0.00600	0.00689	0.00600	0.00730	88	94	75-125	6	20
Arsenic	0.00200	0.0100	0.0138	0.0100	0.0130	118	110	75-125	6	20
Beryllium	N.D.	0.00400	0.00389	0.00400	0.00412	97	103	75-125	6	20
Cadmium	0.000160	0.00500	0.00521	0.00500	0.00505	101	98	75-125	3	20
Lead	N.D.	0.0150	0.0162	0.0150	0.0164	108	109	75-125	1	20
Batch number: 183121404701C	Sample number(s): 9881981-9881991 UNSPK: 9881987									
Molybdenum	0.00329	0.0500	0.0556	0.0500	0.0567	105	107	75-125	2	20
	mg/l	mg/l	mg/l	mg/l	mg/l					
Batch number: 18309921201A	Sample number(s): 9881985 UNSPK: 9881985									
Total Dissolved Solids	1132	1600	2708			99		62-127		
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991 UNSPK: 9881984									
Total Dissolved Solids	1756	1600	3176			89		62-127		
Batch number: 18309921202B	Sample number(s): 9881981 UNSPK: 9881984									
Total Dissolved Solids	1756	1600	3176			89		62-127		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc mg/l	DUP Conc mg/l	DUP RPD	DUP RPD Max
Batch number: 183110571301	Sample number(s): 9881981-9881991 BKG: 9881981			
Mercury	N.D.	N.D.	0 (1)	20
Batch number: 183111404401	Sample number(s): 9881981-9881991 BKG: 9881989			
Barium	1.98	1.95	2	20
Boron	0.814	0.802	1	20
Calcium	419.46	408.84	3	20
Chromium	N.D.	N.D.	0 (1)	20
Cobalt	0.00467	0.00422	10 (1)	20
Lithium	0.0505	0.0513	2 (1)	20
Selenium	N.D.	N.D.	0 (1)	20
Thallium	N.D.	N.D.	0 (1)	20
Batch number: 183121404701A	Sample number(s): 9881981-9881991 BKG: 9881987			

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2005364
Reported: 11/16/2018 12:45

Laboratory Duplicate (continued)

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	mg/l	mg/l		
Antimony	0.00164	0.000708	79* (1)	20
Arsenic	0.00200	0.00164	20 (1)	20
Beryllium	N.D.	N.D.	0 (1)	20
Cadmium	0.000160	N.D.	200* (1)	20
Lead	N.D.	N.D.	0 (1)	20
Batch number: 183121404701C	Sample number(s): 9881981-9881991 BKG: 9881987			
Molybdenum	0.00329	0.00300	9 (1)	20
	Degrees C	Degrees C		
Batch number: 18309005104A	Sample number(s): 9881981,9881984-9881985,9881989 BKG: 9881989			
Temperature of pH	22.72	22.99	1	5
	mg/l	mg/l		
Batch number: 18309921201A	Sample number(s): 9881985 BKG: 9881985			
Total Dissolved Solids	1132	1100	3 (1)	5
Batch number: 18309921202A	Sample number(s): 9881982-9881984,9881986-9881987,9881989-9881991 BKG: 9881984			
Total Dissolved Solids	1756	1700	3 (1)	5
Batch number: 18309921202B	Sample number(s): 9881981 BKG: 9881981			
Total Dissolved Solids	860	926	7* (1)	5
Batch number: 18316921201B	Sample number(s): 9881988 BKG: 9881988			
Total Dissolved Solids	9556	9002	6*	5
	Std. Units	Std. Units		
Batch number: 18309005104A	Sample number(s): 9881981,9881984-9881985,9881989 BKG: 9881989			
pH	7.68	7.71	0	4

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only

Acct. # 7701 Group # 2005361 Sample # 9881981-91

COC # 569380

Client Information

Client: GEI Consultants	Acct. #:
Project Name/#: PSEG - Hudson	PWSID #:
Project Manager: Jason Kohl	P.O. #:
Sampler: Casey Kincaid / Anthony Shields	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

For Lab Use Only

FSC:

SCR#: 233149

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Metals include: As, B, Ba, Be, Ca, Cd, Co, Cr, Li, Mb, Pb, Sb, Se, Th

Sample Identification	Collected Date	Collected Time	Grab	Composite	Matrix: Soil ☐ Sediment ☐ Tissue ☐	Water: Potable ☐ Ground ☒ NPDES ☐ Surface ☐	Other: Aqueous	Total # of Containers	Metals	Mercury	Chloride	Fluoride	Sulfate	pH	Total Dissolved Solids	Ra 226	Ra 228	QA/QC
MW-9	10/31/18	1105	X			X		7	X	X	X	X	X	X	X	X	X	
MW-7	10/31/18	1255	X			X		7	X	X	X	X	X	X	X	X	X	
MW-8	10/31/18	1235	X			X		7	X	X	X	X	X	X	X	X	X	
MW-5	10/31/18	1050	X			X		7	X	X	X	X	X	X	X	X	X	
MW-6	10/31/18	1420	X			X		7	X	X	X	X	X	X	X	X	X	
FB-20181031	10/31/18	1100	X				X	7	X	X	X	X	X	X	X	X	X	
MW-1	11/1/18	0945	X			X		7	X	X	X	X	X	X	X	X	X	
MW-4	11/1/18	1140	X			X		8	X	X	X	X	X	X	X	X	X	X
MW-2	11/1/18	1035	X			X		7	X	X	X	X	X	X	X	X	X	
MW-3	11/1/18	1200	X			X		7	X	X	X	X	X	X	X	X	X	

Matrix

Soil ☐ Sediment ☐ Tissue ☐

Water: Potable ☐ Ground ☒ NPDES ☐ Surface ☐

Other: Aqueous

Analysis Requested

Preservation and Filtration Codes

Metals | Mercury | Chloride | Fluoride | Sulfate | pH | Total Dissolved Solids | Ra 226 | Ra 228 | QA/QC

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: jkohl@geiconsultants.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) NJ DKQP TX TRRP-13

NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Bottle Storage				10/31/18	0700
	11/2/18	1328		11/2/18	1328
	11/2/18	1720			
				11/2/18	1720

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS FedEx Other

Temperature upon receipt 1.6 °C

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only

Acct. # 7701 Group # 2005364 Sample # 9881981-91

COC # 569379

Client Information

Client: GEI Consultants

Acct. #:

Project Name/#: PSEG - Hudson

PWSID #:

Project Manager: Jason Kohl

P.O. #:

Sampler: Casey Kincaid / Anthony Shields

Quote #:

State where samples were collected: NJ

For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: Aqueous

Analysis Requested

Preservation and Filtration Codes

Sample Identification	Collected Date	Collected Time	Grab	Composite	Soil	Sediment	Tissue	Potable	Ground	NPDES	Surface	Other: Aqueous	Total # of Containers	Metals	Mercury	Chloride	Fluoride	Sulfate	pH	Total Dissolved Solids	Ra 226	Ra 228
FB-20181101	11/1/18	1400	X									X	7	X	X	X	X	X	X	X	X	X

For Lab Use Only

FSC:

SCR#:

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Metals include: As, B, Ba, Be, Ca, Cd, Co, Cr, Li, Mb, Pb, Sb, Se, Th

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: jkohl@geiconsultants.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) NJ DKQP TX TRRP-13

NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	11/2/18	1328		11/2/18	1328
	11/2/18	1720			
				11/2/18	1720

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS FedEx Other

Temperature upon receipt 1.6 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 231997

Group Number(s): 2005364

Client: GEI

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	11/02/2018 17:20
Number of Packages:	3	Number of Projects:	1
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Wanita Curry (14057) at 22:13 on 11/02/2018

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	8013596-IR	2.7	IR	Wet	Y	Bagged	N
2	8013596-IR	1.6	IR	Wet	Y	Bagged	N
3	8013596-IR	2.2	IR	Wet	Y	Bagged	N

General Comments: QC Metals Batch for : MW-4 (1 Container)

2425 New Holland Pike
Lancaster, PA 17601-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

Metals in Liquid Data

Case Narrative/Conformance Summary

Metals in Liquid

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

ICP Metals

Fraction: Metals in Liquid

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9881981	MW-9	X		
9881982	MW-7	X		
9881983	MW-8	X		
9881984	MW-5	X		
9881985	MW-6	X		
9881986	FB-20181031	X		Field Blank
9881987	MW-1	X		
9881988	MW-4	X		
9881989	MW-2	X		
9881990	MW-3	X		
9881991	FB-20181101	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Method defined actions are taken for any failed matrix QC.

Batch#: 183111404401 (Sample number(s): 9881981-9881991, UNSPK: 9881989, BKG: 9881989)
The recovery(ies) for the following analyte(s) in the MS exceeded the acceptance window indicating a positive bias: Calcium

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

ICP Metals

Fraction: Metals in Liquid

The recovery(ies) for the following analyte(s) in the MSD were below the acceptance window: Calcium

Sample Duplicate

Batch#: 183121404701A (Sample number(s): 9881981-9881991, UNSPK: 9881987, BKG: 9881987)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Antimony, Cadmium

SAMPLE ANALYSIS:

Refer to analysis run log for samples requiring dilutions.

The instrument detection limits (IDLs) are used for determining the U flags on the initial and continuing calibration blanks. The highest IDL is selected when multiple instruments are used for an analysis. The method detection limits (MDLs) are used for determining all other U flags.

(Sample number(s): 9881981-9881991: Analysis: 01750)
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The following were evaluated using the MDL: selenium, thallium.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

BKG – Background	AF - Cold Vapor Atomic Fluorescence
DUP – Duplicate	U - Below MDL
MS - Matrix Spike	B - Below LOQ
MSD - Matrix Spike Dup	N - Matrix Spike out of specifications
B – Blank	* - Duplicate out of specifications
Q - Laboratory Control Sample	E - Matrix Effects exist as proven by Serial Dilution or Spiked Dilution
Y - Laboratory Control Sample Duplicate	A - Post Digestion Spike
P - ICP Atomic Emission Spectrometer	L - Serial Dilution
MS - ICP Mass Spectrometry	R - Internal Standard Relative Intensity OOS
CV - Cold Vapor	NR - Not Required

Sample Data

Metals in Liquid

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881981, 9881981BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.7	B		MS
7440-38-2	Arsenic	5.8			MS
7440-39-3	Barium	54.9			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	274			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	76200			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	12.0			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881982 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.75	B		MS
7440-39-3	Barium	38.1			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	151			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	32700			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	5.6			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881983 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.70	B		MS
7440-39-3	Barium	61.8			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	191			P
7440-43-9	Cadmium	0.69	B		MS
7440-70-2	Calcium	28500			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	3.7	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.9			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881984 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.87	B		MS
7440-39-3	Barium	84.4			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	444			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	101000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	15.0	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881985 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	1.5	B		MS
7440-39-3	Barium	70.7			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	595			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	99900			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.32	B		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881986 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	114	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881987, 9881987BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.6	B		MS
7440-38-2	Arsenic	2.0	B		MS
7440-39-3	Barium	715			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1060			P
7440-43-9	Cadmium	0.16	B		MS
7440-70-2	Calcium	382000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	6.9			P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	47.8	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.3			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881988 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.82	B		MS
7440-38-2	Arsenic	0.69	B		MS
7440-39-3	Barium	99.7			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1190			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	128000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	3.0	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	49.7	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	6.5			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881989, 9881989BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.66	B		MS
7440-38-2	Arsenic	3.3			MS
7440-39-3	Barium	1980			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	814			P
7440-43-9	Cadmium	0.24	B		MS
7440-70-2	Calcium	419000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	4.7	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	50.5			P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.6			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881990 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.96	B		MS
7440-38-2	Arsenic	2.6			MS
7440-39-3	Barium	74.9			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	507			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	78600			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	13.8	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	11.5			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9881991 % Solids: 0.0
Concentration Units: UG/L Date Received: 11/02/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	95.3	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

Quality Control and Calibration Summary Forms

Metals in Liquid

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ60
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Barium	183111404401	9881981
Boron		9881982
Calcium		9881983
Chromium		9881984
Cobalt		9881985
Lithium		9881986
Selenium		9881987
Thallium		9881988
		9881989BKG
		9881989MS
		9881989MSD
		9881989DUP
		9881990
		9881991
		P31104AB
		P31104AQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ60
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Antimony	183121404701	9881981
Arsenic		9881982
Beryllium		9881983
Cadmium		9881984
Lead		9881985
Molybdenum		9881986
		9881987BKG
		9881987MS
		9881987MSD
		9881987DUP
		9881988
		9881989
		9881990
		9881991
		P31204AB
		P31204AQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ60
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Mercury	183110571301	9881981BKG
		9881981MS
		9881981MSD
		9881981DUP
		9881982
		9881983
		9881984
		9881985
		9881986
		9881987
		9881988
		9881989
		9881990
		9881991
		P31171AB
		P31171AQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Barium		600.0	608.55	101.4	500.0	496.58	99.3	500.0	500.18	100.0
Boron		600.0	582.20	97.0	500.0	467.07	93.4	500.0	484.05	96.8
Calcium		30000.0	29931.86	99.8	25000.0	25075.02	100.3	25000.0	24798.40	99.2
Chromium		600.0	608.83	101.5	500.0	493.78	98.8	500.0	507.47	101.5
Cobalt		600.0	599.13	99.9	500.0	482.67	96.5	500.0	495.09	99.0
Lithium		600.0	603.31	100.6	500.0	510.87	102.2	500.0	506.76	101.4
Selenium		600.0	591.68	98.6	500.0	477.46	95.5	500.0	494.82	99.0
Thallium		600.0	603.99	100.7	500.0	482.86	96.6	500.0	497.29	99.5

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium					500.0	495.66	99.1	500.0	495.51	99.1
Boron					500.0	469.29	93.9	500.0	472.34	94.5
Calcium					25000.0	23986.70	95.9	25000.0	24018.88	96.1
Chromium					500.0	493.66	98.7	500.0	497.28	99.5
Cobalt					500.0	493.73	98.7	500.0	496.10	99.2
Lithium					500.0	497.26	99.5	500.0	505.58	101.1
Selenium					500.0	491.42	98.3	500.0	497.73	99.5
Thallium					500.0	496.79	99.4	500.0	497.19	99.4

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron		600.0	594.75	99.1	500.0	488.77	97.8	500.0	492.52	98.5
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium										
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron					500.0	501.40	100.3			
Calcium										
Chromium										
Cobalt										
Lithium										
Selenium										
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Antimony	121	50.0	54.34	108.7	25.0	26.95	107.8	25.0	25.51	102.0
Arsenic	75	500.0	512.16	102.4	250.0	261.40	104.6	250.0	263.41	105.4
Beryllium	9	50.0	51.18	102.4	25.0	24.33	97.3	25.0	27.22	108.9
Cadmium	111	50.0	52.51	105.0	25.0	27.02	108.1	25.0	25.67	102.7
Lead	208	50.0	51.76	103.5	25.0	26.30	105.2	25.0	26.64	106.6
Molybdenum	98	50.0	52.43	104.9	25.0	26.72	106.9	25.0	26.72	106.9

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121				25.0	25.00	100.0			
Arsenic	75				250.0	258.73	103.5			
Beryllium	9				25.0	26.52	106.1			
Cadmium	111				25.0	25.16	100.6			
Lead	208				25.0	26.93	107.7			
Molybdenum	98				25.0	26.03	104.1			

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

		Initial Calibration			Continuing Calibration					
Analyte	Mass	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury		2.5	2.33	93.2	1.0	0.97	97.0	1.0	0.94	94.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.94	94.0	1.0	0.94	94.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.93	93.0	1.0	0.91	91.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.91	91.0			

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium		5.0	5.13	102.6		
Boron		50.0	45.64	91.3		
Calcium		500.0	523.94	104.8		
Chromium		15.0	14.00	93.3		
Cobalt		5.0	5.68	113.6		
Lithium		50.0	54.93	109.9		
Selenium		50.0	51.00	102.0		
Thallium		30.0	32.37	107.9		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium						
Boron		50.0	51.59	103.2		
Calcium						
Chromium						
Cobalt						
Lithium						
Selenium						
Thallium						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony	121	2.0	2.14	107.0		
Arsenic	75	2.0	2.04	102.0		
Beryllium	9	0.5	0.50	100.0		
Cadmium	111	1.0	1.11	111.0		
Lead	208	3.0	3.14	104.7		
Molybdenum	98	2.0	2.11	105.5		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Mercury		0.2	0.17	85.0	0.16	80.0

Control limits: 50% - 150%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium		0.33	U	0.33	U	0.33	U	0.33	U		1.000	U	183111404401
Boron		8.4	U	8.4	U	8.4	U	8.4	U		12.000	U	183111404401
Calcium		33.4	U	33.4	U	33.4	U	33.4	U		33.000	U	183111404401
Chromium		0.85	U	0.85	U	0.85	U	-1.1	B		5.300	U	183111404401
Cobalt		0.56	U	0.78	B	0.80	B	0.56	U		1.500	U	183111404401
Lithium		7.5	U	7.5	U	7.5	U	7.5	U		11.000	U	183111404401
Selenium		6.0	U	6.0	U	6.0	U	6.0	U		21.000	U	183111404401
Thallium		4.9	U	4.9	U	4.9	U	4.9	U		14.000	U	183111404401

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: P
Run Name: 1831201T74
Calibration Date(s): 11/08/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium				0.33	U								
Boron				8.4	U								
Calcium				33.4	U								
Chromium				0.85	U								
Cobalt				0.56	U								
Lithium				7.5	U								
Selenium				6.0	U								
Thallium				4.9	U								

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: P
Run Name: 1831402T75
Calibration Date(s): 11/10/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron		8.4	U	8.4	U	8.4	U	8.4	U				
Calcium													
Chromium													
Cobalt													
Lithium													
Selenium													
Thallium													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: MS
Run Name: 1831606E07
Calibration Date(s): 11/12/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121	0.75	B	0.82	B	0.38	B	0.40	B	121	0.410	U	183121404701A
Arsenic	75	0.50	U	0.50	U	0.50	U	0.50	U	75	0.680	U	183121404701A
Beryllium	9	0.073	U	0.073	U	0.073	U	0.073	U	9	0.091	U	183121404701A
Cadmium	111	0.18	U	0.18	U	0.18	U	0.18	U	111	0.150	U	183121404701A
Lead	208	0.14	U	0.14	U	0.14	U	0.14	U	208	1.100	U	183121404701A
Molybdenum	98	0.30	U	0.30	U	0.30	U	0.30	U	98	0.310	U	183121404701A

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury		0.050	U	0.050	U	0.050	U	0.050	U		0.050	U	183110571301

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U	0.050	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ60

Method: CV
Run Name: 1831201M07
Calibration Date(s): 11/08/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U								

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ60

Instrument ID: 23745
Run Name: 1831201T74
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		486120	97.2						
Barium	0		1							
Boron	0		5							
Calcium	500000		489147	97.8						
Chromium	0		-8							
Cobalt	0		2							
Iron	200000		196140	98.1						
Lithium	0		1							
Magnesium	500000		453594	90.7						
Selenium	0		2							
Thallium	0		3							

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ60

Instrument ID: 23290
Run Name: 1831402T75
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		489241	97.8						
Barium										
Boron	0		-52							
Calcium	500000		495455	99.1						
Chromium										
Cobalt										
Iron	200000		195510	97.8						
Lithium										
Magnesium	500000		488461	97.7						
Selenium										
Thallium										

Control Limits: All Metals 80%-120%

QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ60

Instrument ID: 27813
Run Name: 1831606E07
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		103716	103.7		
Antimony	121	0		2			
Arsenic	75	0		1			
Beryllium	9	0		0			
Cadmium	111	0		0			
Calcium	44	300000		295516	98.5		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		245617	98.2		
Lead	208	0		1			
Magnesium	24	100000		99808	99.8		
Molybdenum	98	2000		2128	106.4		
Phosphorus	31	10000		NA			
Potassium	39	100000		103067	103.1		
Sodium	23	250000		241597	96.6		
Sulfur	34	10000		NA			
Titanium	47	2000		2057	102.9		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881981BKG Matrix Spike Lab Sample ID: 9881981MS Matrix Spike Duplicate Lab Sample ID: 9881981MSD
Batch Number(s): 183110571301

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Mercury		0.0500	U	0.8151		0.8069		1.0000	1.0000	UG/L	82		81		1		75 - 125	20	CV

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881987BKG Matrix Spike Lab Sample ID: 9881987MS Matrix Spike Duplicate Lab Sample ID: 9881987MSD
Batch Number(s): 183121404701

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Antimony	121	1.6358	B	6.8896		7.2995		6.0000	6.0000	UG/L	88		94		6		75 - 125	20	MS
Arsenic	75	1.9954	B	13.7849		12.9925		10.0000	10.0000	UG/L	118		110		6		75 - 125	20	MS
Beryllium	9	0.0910	U	3.8875		4.1192		4.0000	4.0000	UG/L	97		103		6		75 - 125	20	MS
Cadmium	111	0.1603	B	5.2103		5.0455		5.0000	5.0000	UG/L	101		98		3		75 - 125	20	MS
Lead	208	1.0700	U	16.2283		16.3524		15.0000	15.0000	UG/L	108		109		1		75 - 125	20	MS
Molybdenum	98	3.2928		55.6349		56.6726		50.0000	50.0000	UG/L	105		107		2		75 - 125	20	MS

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881989BKG Matrix Spike Lab Sample ID: 9881989MS Matrix Spike Duplicate Lab Sample ID: 9881989MSD
Batch Number(s): 183111404401

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Barium		1982.6600		3813.6100		3715.3400		2000.0000	2000.0000	UG/L	92		87		3		75 - 125	20	P
Boron		813.5100		3103.7500		3078.3000		2000.0000	2000.0000	UG/L	115		113		1		75 - 125	20	P
Calcium		419461.5700		426059.9800		419260.9100		4000.0000	4000.0000	UG/L	165		-5		2			20	P
Chromium		5.3000	U	221.4300		199.9100		200.0000	200.0000	UG/L	111		100		10		75 - 125	20	P
Cobalt		4.6700	B	478.0200		477.4600		500.0000	500.0000	UG/L	95		95		0		75 - 125	20	P
Lithium		50.5300		1078.5700		1098.1100		1000.0000	1000.0000	UG/L	103		105		2		75 - 125	20	P
Selenium		21.0000	U	153.7900		156.4200		150.0000	150.0000	UG/L	103		104		2		75 - 125	20	P
Thallium		14.0000	U	131.0500		130.8500		150.0000	150.0000	UG/L	87		87		0		75 - 125	20	P

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881981BKG Duplicate Lab Sample ID: 9881981DUP
Batch Number(s): 183110571301
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury			0.0500	U	0.0500	U			CV

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	FLAGS:
AF = Cold Vapor Atomic Fluorescence	* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881987BKG Duplicate Lab Sample ID: 9881987DUP
Batch Number(s): 183121404701
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Antimony	121		1.6358	B	0.7080	B	79		MS
Arsenic	75		1.9954	B	1.6389	B	20		MS
Beryllium	9		0.0910	U	0.0910	U			MS
Cadmium	111		0.1603	B	0.1510	U	200		MS
Lead	208		1.0700	U	1.0700	U			MS
Molybdenum	98	2.0	3.2928		2.9966		9		MS

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881989BKG Duplicate Lab Sample ID: 9881989DUP
Batch Number(s): 183111404401
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Barium			1982.6600		1951.2000		2		P
Boron			813.5100		801.7100		1		P
Calcium			419461.5700		408836.9600		3		P
Chromium			5.3000	U	5.3000	U			P
Cobalt			4.6700	B	4.2200	B	10		P
Lithium		50.0	50.5300		51.3300		2		P
Selenium			21.0000	U	21.0000	U			P
Thallium			14.0000	U	14.0000	U			P

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 7
LABORATORY CONTROL SAMPLE
SDG No.: GEJ60
Matrix: WATER

Analyte	Mass	Batch Number	Units	True	Found	C	Control Limits (%)	%R	M	In Spec
Antimony	121	183121404701	UG/L	6.000	6.056		80 - 120	101	MS	Yes
Arsenic	75	183121404701	UG/L	10.000	10.139		80 - 120	101	MS	Yes
Barium		183111404401	UG/L	2000.000	2039.220		80 - 120	102	P	Yes
Beryllium	9	183121404701	UG/L	4.000	4.087		80 - 120	102	MS	Yes
Boron		183111404401	UG/L	2000.000	1835.700		80 - 120	92	P	Yes
Cadmium	111	183121404701	UG/L	5.000	5.210		80 - 120	104	MS	Yes
Calcium		183111404401	UG/L	4000.000	4074.890		80 - 120	102	P	Yes
Chromium		183111404401	UG/L	200.000	201.580		80 - 120	101	P	Yes
Cobalt		183111404401	UG/L	500.000	514.650		80 - 120	103	P	Yes
Lead	208	183121404701	UG/L	15.000	15.307		80 - 120	102	MS	Yes
Lithium		183111404401	UG/L	1000.000	1023.710		80 - 120	102	P	Yes
Mercury		183110571301	UG/L	1.000	0.862		80 - 120	86	CV	Yes
Molybdenum	98	183121404701	UG/L	50.000	52.569		80 - 120	105	MS	Yes
Selenium		183111404401	UG/L	150.000	145.300		80 - 120	97	P	Yes
Thallium		183111404401	UG/L	150.000	158.510		80 - 120	106	P	Yes

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881987BKG Serial Dilution Lab Sample ID: 9881987L
Batch Number(s): 183121404701
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Antimony	121	1.6358	B	2.0300	U	100		MS
Arsenic	75	1.9954	B	3.4000	U	100		MS
Beryllium	9	0.0910	U	1.3501	B	100		MS
Cadmium	111	0.1603	B	0.7550	U	100		MS
Lead	208	1.0700	U	5.3500	U			MS
Molybdenum	98	3.2928		3.0932	B	6		MS

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ60
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9881989BKG Serial Dilution Lab Sample ID: 9881989L
Batch Number(s): 183111404401
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Barium		1982.6600		2030.6000		2		P
Boron		813.5100		836.4000		3		P
Calcium		419461.5700		422550.9000		1		P
Chromium		5.3000	U	26.5000	U			P
Cobalt		4.6700	B	7.8500	B	68		P
Lithium		50.5300		74.9000	B	48		P
Selenium		21.0000	U	105.0000	U			P
Thallium		14.0000	U	70.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

Method: P
Instrument ID: 23290
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium			
Boron	249.67		8.4
Calcium			
Chromium			
Cobalt			
Lithium			
Selenium			
Thallium			

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Instrument ID: 23745
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium	455.40		0.33
Boron	249.67		8.4
Calcium	317.93		33.4
Chromium	267.72		0.85
Cobalt	228.62		0.56
Lithium	670.78		7.5
Selenium	196.09		6.0
Thallium	190.86		4.9

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Instrument ID: 27813
Date: 09/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony	121		0.29
Arsenic	75		0.50
Beryllium	9		0.073
Cadmium	111		0.18
Lead	208		0.14
Molybdenum	98		0.30

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: CV
Instrument ID: 17384
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Mercury	254.00		0.050

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: P
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium	455.40		5.0	1.0
Boron	249.67		50.0	12.0
Calcium	317.93		500	33.0
Chromium				
Cobalt	228.62		5.0	1.5
Lithium	670.78		50.0	11.0
Selenium				
Thallium				

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: P
Date: 09/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium				
Boron				
Calcium				
Chromium	267.72		15.0	5.3
Cobalt				
Lithium				
Selenium	196.09		50.0	21.0
Thallium	190.86		30.0	14.0

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: MS
Date: 09/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony	121		2.0	0.41
Arsenic	75		2.0	0.68
Beryllium	9		0.50	0.091
Cadmium	111		1.0	0.15
Lead	208		3.0	1.1
Molybdenum	98		2.0	0.31

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ60
Matrix: WATER

Method: CV
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Mercury	254.00		0.20	0.050

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

US EPA Tune Check Report

Operator Name	US19_USR_INS27814
Acq/Data Batch	D:\Agilent\ICPMH\1\DATA\EPA_Tune.b
Acq. Date-Time	2018-11-12 01:43:31
Report Comment	---
Instrument Name	G8403A SG18254097

[No Gas]

Sensitivity

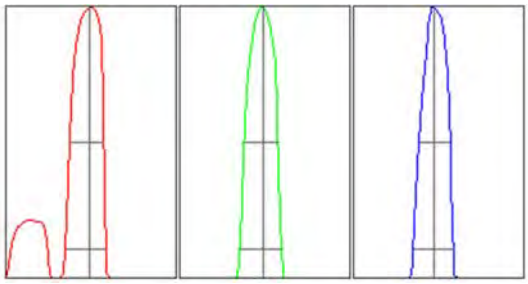
Mass	Conc. [ug/l]	Count	CPS	Resp (Required) [cps/ug/l]	Resp (Flag)	RSD%	RSD% (Required)
7	10.00	679	6792.65			2.195	5.000
89	10.00	2982	29818.34			1.937	5.000
205	10.00	1494	14935.78			2.609	5.000

Mass	RSD% (Flag)
7	
89	
205	

Mass	Rep#1 Count	Rep#2 Count	Rep#3 Count	Rep#4 Count	Rep#5 Count
7	686	690	691	655	674
89	2970	3029	3054	2928	2928
205	1498	1493	1519	1429	1529

Integration Time [sec] 0.1

Resolution/Axis



Mass	Peak Height	Axis	Axis (Required)	Axis (Flag)
7	1143.07	7.00	6.90 - 7.10	
89	5268.02	89.00	88.90 - 89.10	
205	2833.62	204.95	204.90 - 205.10	

Mass	W-50%	W-10%	W-10% (Required)	W-10% (Flag)
7	0.61	0.722	0.800	
89	0.60	0.744	0.800	
205	0.55	0.715	0.800	

Integration Time [sec] 0.1

Acquisition Time [sec] 113.7

Y Axis Linear

US EPA Tune Check Report

Tune Parameters

Plasma Parameters

Plasma Mode	---	Nebulizer Gas	0.65 L/min	Dilution Gas	0.45 L/min
RF Power	1550 W	Option Gas	---	Auxiliary Gas	0.90 L/min
RF Matching	1.10 V	Nebulizer Pump	0.10 rps	Plasma Gas	15.0 L/min
Sample Depth	10.0 mm	S/C Temp	2 °C		

Lens Parameters

Extract 1	0.0 V	Omega Lens	12.3 V	Deflect	17.0 V
Extract 2	-250.0 V	Cell Entrance	-40 V	Plate Bias	-50 V
Omega Bias	-95 V	Cell Exit	-60 V		

Cell Parameters

Use Gas	No	3rd Gas Flow	---	Energy Discrimination	5.0 V
He Flow	0.0 mL/min	OctP Bias	-8.0 V		
H2 Flow	0.0 mL/min	OctP RF	200 V		

QP Parameters

Mass Gain	125	Axis Gain	0.9994	QP Bias	-3.0 V
Mass Offset	125	Axis Offset	0.00		

Hardware Settings

Torch

Torch H	0.2 mm	Torch V	-0.1 mm		

EM

Discriminator	4.1 mV	Analog HV	2147 V	Pulse HV	1671 V

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ60

Instrument ID: 27813
Run Name: 1831606E07

Start Date: 11/12/2018
End Date: 11/12/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-3-209	PB	GE-3-72	AS
IN-3-115	CD,MO,SB	SC-1-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-1-45	Q	Element GE-3-72	Q	Element IN-3-115	Q	Element BI-3-209	Q	Element	Q	Element	Q	Element	Q
S0	11:03	100		100		100		100							
S	11:05	100		103		103		105							
ICV	11:08	99		102		99		101							
ICB	11:10	100		99		98		98							
LLC	11:12	100		98		96		98							
ICSA	11:14	94		95		93		94							
LRS2	11:16	99		99		94		96							
LRS3	11:18	102		101		100		99							
CCS	11:20	95		100		99		98							
CCS	11:23	98		98		99		97							
CCV	11:25	101		102		100		101							
CCB	11:27	97		101		101		99							
P31204AB	11:29	92		100		99		100							
P31204AQ	11:31	101		102		100		101							
9881987BKG	11:33	97		99		95		86							
9881987A	11:36	98		97		92		84							
9881987DUP	11:38	101		106		100		88							
9881987MS	11:40	100		100		95		83							
9881987MSD	11:42	100		99		95		83							
9881987L	11:44	84		119		113		99							
9881981	11:46	104		111		101		95							
CCV	11:49	100		108		102		96							
CCB	11:51	102		106		102		96							
9881982	11:53	103		107		99		94							
9881983	11:55	103		111		107		98							
9881984	11:57	106		107		103		94							
9881985	11:59	103		109		104		97							
9881986	12:01	95		102		100		95							
9881988	12:04	98		99		92		83							
9881989	12:06	91		100		93		81							
9881990	12:08	106		115		106		99							
9881991	12:10	104		108		104		99							

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ60

Instrument ID: 27813
Run Name: 1831606E07

Start Date: 11/12/2018
End Date: 11/12/2018

Standard	Elements Applies to	Standard	Elements Applies to
BI-3-209	PB	GE-3-72	AS
IN-3-115	CD,MO,SB	SC-1-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-1-45	Q	Element GE-3-72	Q	Element IN-3-115	Q	Element BI-3-209	Q	Element	Q	Element	Q	Element	Q
CCV	12:12	105		107		102		96							
CCB	12:14	98		104		99		94							

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

Preparation and Run Logs

Metals in Liquid

Method: P
Batch Number: 183111404401

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9881981	11/07/2018	50.00	50
9881982	11/07/2018	50.00	50
9881983	11/07/2018	50.00	50
9881984	11/07/2018	50.00	50
9881985	11/07/2018	50.00	50
9881986	11/07/2018	50.00	50
9881987	11/07/2018	50.00	50
9881988	11/07/2018	50.00	50
9881990	11/07/2018	50.00	50
9881991	11/07/2018	50.00	50
9881989BKG	11/07/2018	50.00	50
9881989DUP	11/07/2018	50.00	50
9881989MSD	11/07/2018	50.00	50
9881989MS	11/07/2018	50.00	50
P31104AB	11/07/2018	50.00	50
P31104AQ	11/07/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: MS
Batch Number: 183121404701

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9881981	11/09/2018	50.00	50
9881982	11/09/2018	50.00	50
9881983	11/09/2018	50.00	50
9881984	11/09/2018	50.00	50
9881985	11/09/2018	50.00	50
9881986	11/09/2018	50.00	50
9881988	11/09/2018	50.00	50
9881989	11/09/2018	50.00	50
9881990	11/09/2018	50.00	50
9881991	11/09/2018	50.00	50
9881987BKG	11/09/2018	50.00	50
9881987DUP	11/09/2018	50.00	50
9881987MSD	11/09/2018	50.00	50
9881987MS	11/09/2018	50.00	50
P31204AB	11/09/2018	50.00	50
P31204AQ	11/09/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: CV
Batch Number: 183110571301

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9881982	11/07/2018	40.00	40
9881983	11/07/2018	40.00	40
9881984	11/07/2018	40.00	40
9881985	11/07/2018	40.00	40
9881986	11/07/2018	40.00	40
9881987	11/07/2018	40.00	40
9881988	11/07/2018	40.00	40
9881989	11/07/2018	40.00	40
9881990	11/07/2018	40.00	40
9881991	11/07/2018	40.00	40
9881981BKG	11/07/2018	40.00	40
9881981DUP	11/07/2018	40.00	40
9881981MSD	11/07/2018	40.00	40
9881981MS	11/07/2018	40.00	40
P31171AB	11/07/2018	40.00	40
P31171AQ	11/07/2018	1.00	1

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: P
Instrument ID: 23745
Run Name: 1831201T74

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: P
Instrument ID: 23745
Run Name: 1831201T74

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
CCV	1.00	08:38			X		X		X	X	X		X			X	X																								
CCB	1.00	08:41			X		X		X	X	X		X			X	X																								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: P
Instrument ID: 23290
Run Name: 1831402T75

Run Start Date: 11/10/2018
Run End Date: 11/10/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
S0	1.00	09:15					X																																		
S	1.00	09:17																																						
S	1.00	09:20					X																																	
S	1.00	09:23																																						
ICV	1.00	09:26					X																																	
ICB	1.00	09:28					X																																	
LLC	1.00	09:31					X																																	
ICSA	1.00	09:34					X																																	
CCV	1.00	09:37					X																																	
CCB	1.00	09:39					X																																	
LRS2	1.00	09:42					X																																	
LRS4	1.00	09:45					X																																	
LRS3	1.00	09:48					X																																	
LRS5	1.00	09:51					X																																	
CCV	1.00	09:54					X																																	
CCB	1.00	09:56					X																																	
P31104AB	1.00	09:59																																						
P31104AB	1.00	10:02																																						
P31104AQ	1.00	10:05																																						
9881989MS	5.00	10:08					X																																	
9881989MSD	5.00	10:11					X																																	
ZZZZZZ	1.00	10:14																																						
ZZZZZZ	1.00	10:17																																						
ZZZZZZ	5.00	10:19																																						
CCV	1.00	10:22					X																																	
CCB	1.00	10:25					X																																	

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- A = Post Digest Spike
- L = Serial Dilution
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: MS
Instrument ID: 27813
Run Name: 1831606E07

Run Start Date: 11/12/2018
Run End Date: 11/12/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: CV
Instrument ID: 17384
Run Name: 1831201M07

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ60

Method: CV
Instrument ID: 17384
Run Name: 1831201M07

Run Start Date: 11/08/2018
Run End Date: 11/08/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
ZZZZZZ	1.00	07:11																																							
ZZZZZZ	1.00	07:13																																							
ZZZZZZ	1.00	07:15																																							
ZZZZZZ	1.00	07:17																																							
ZZZZZZ	1.00	07:19																																							
ZZZZZZ	1.00	07:21																																							
ZZZZZZ	1.00	07:23																																							
CCV	1.00	07:25												X																											
CCB	1.00	07:27												X																											
ZZZZZZ	1.00	07:29																																							
ZZZZZZ	1.00	07:31																																							
ZZZZZZ	1.00	07:33																																							
ZZZZZZ	1.00	07:35																																							
ZZZZZZ	1.00	07:38																																							
ZZZZZZ	1.00	07:40																																							
ZZZZZZ	1.00	07:42																																							
ZZZZZZ	1.00	07:44																																							
ZZZZZZ	1.00	07:46																																							
ZZZZZZ	1.00	07:48																																							
CCV	1.00	07:50												X																											
CCB	1.00	07:52												X																											
ZZZZZZ	1.00	07:54																																							
ZZZZZZ	1.00	07:56																																							
ZZZZZZ	1.00	07:58																																							
ZZZZZZ	1.00	08:00																																							
ZZZZZZ	1.00	08:02																																							
ZZZZZZ	1.00	08:04																																							
ZZZZZZ	1.00	08:06																																							
ZZZZZZ	1.00	08:08																																							
ZZZZZZ	1.00	08:10																																							
ZZZZZZ	1.00	08:12																																							
CCV	1.00	08:14												X																											
CCB	1.00	08:16												X																											
ZZZZZZ	1.00	08:18																																							
ZZZZZZ	1.00	08:20																																							
CRA	1.00	08:22												X																											
CCV	1.00	08:24												X																											
CCB	1.00	08:26												X																											

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

METHODS:	LEGEND:
P = ICP Atomic Emission Spectrometer	BKG = Background
MS = ICP Mass Spectrometry	DUP = Duplicate
CV = Cold Vapor	MS = Matrix Spike
AF = Cold Vapor Atomic Fluorescence	MSD = Matrix Spike Duplicate
	A = Post Digest Spike
	L = Serial Dilution
	B = Blank
	Q = Laboratory Control Sample
	Y = Laboratory Control Sample Duplicate

Instrumental Wet Chemistry Data

Case Narrative/Conformance Summary

Instrumental Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	Comments
9881981	MW-9	X		
9881982	MW-7	X		
9881983	MW-8	X		
9881984	MW-5	X		
9881985	MW-6	X		
9881986	FB-20181031	X		Field Blank
9881987	MW-1	X		
9881988	MW-4	X		
9881989	MW-2	X		
9881990	MW-3	X		
9881991	FB-20181101	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Matrix QC may not be included if site-specific QC were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, laboratory spike data (LCS) are provided.

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

SAMPLE ANALYSIS:

Samples	Chloride	Fluoride	Sulfate
9881981	DF100	DF5	DF5
9881982	DF20	DF5	DF5
9881983	DF500	DF5	DF5
9881984	DF500	DF5	DF5
9881985	DF500	DF5	DF5
9881986	DF1	DF1	DF1
9881987	DF2000	DF5	DF20
9881988	DF2000	DF5	DF100
9881989	DF2000	DF5	DF5
9881990	DF500	DF5	DF20
9881991	DF1	DF1	DF1

No problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

Quality Control and Calibration Summary Forms

Instrumental Wet Chemistry

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Quality Control Reference List
Instrumental Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Fraction: Instrumental Wet Chemistry

Batch Number	Sample Number	Analysis Date	Chloride	Fluoride	Sulfate
18308520117A	P30820QB	11/05/2018 11:35:00	X	X	X
	P30820QQ	11/05/2018 11:18:00	X		X
	P30820QQ	11/06/2018 15:12:00		X	
18308520117B	9881981	11/05/2018 19:51:00			X
	9881981	11/05/2018 20:08:00	X		
	9881981	11/06/2018 15:47:00		X	
	9881982	11/05/2018 20:25:00			X
	9881982	11/05/2018 20:42:00	X		
	9881982	11/06/2018 16:04:00		X	
	9881988	11/06/2018 16:21:00		X	
	9881988	11/08/2018 13:46:00			X
	9881988	11/08/2018 14:04:00	X		
	9881990	11/05/2018 23:16:00	X		
	9881990	11/06/2018 16:38:00		X	
	9881990	11/08/2018 14:22:00			X
18309520117A	9881983	11/06/2018 01:46:00		X	X
	9881983	11/06/2018 02:04:00	X		
	9881984	11/06/2018 02:22:00		X	X
	9881984	11/06/2018 02:41:00	X		
	9881985	11/06/2018 02:59:00		X	X
	9881985	11/06/2018 03:54:00	X		
	9881986	11/06/2018 04:12:00	X	X	X
	9881987	11/06/2018 04:30:00		X	
	9881987	11/08/2018 22:35:00			X
	9881987	11/08/2018 23:30:00	X		
	P30920QB	11/05/2018 12:23:00	X	X	X
	P30920QQ	11/05/2018 12:04:00	X	X	X
18309520117B	9881989	11/06/2018 09:41:00		X	X
	9881989	11/09/2018 00:06:00	X		
	9881991	11/06/2018 10:17:00	X	X	X

Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: GEJ60
Matrix: LIQUID

Fraction: Instrumental Wet Chemistry

18308520117A / P30820QB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	11/05/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	11/05/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	11/05/18	N.D.	mg/l	0.30	1.0

18309520117A / P30920QB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	11/05/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	11/05/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	11/05/18	N.D.	mg/l	0.30	1.0

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Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ60
Matrix: LIQUID

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

LCS: P30820QQ	Batch: **18308520117B** (Sample number(s): 9881981-9881982, 9881988, 9881990)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.98	NA	99	NA	90-110	NA	NA
Fluoride	IC	0.750	0.784	NA	105	NA	90-110	NA	NA
Sulfate	IC	7.50	7.59	NA	101	NA	90-110	NA	NA

LCS: P30920QQ	Batch: **18309520117A** (Sample number(s): 9881983-9881987) Batch: **18309520117B** (Sample number(s): 9881989, 9881991)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	2.99	NA	100	NA	90-110	NA	NA
Fluoride	IC	0.750	0.750	NA	100	NA	90-110	NA	NA
Sulfate	IC	7.50	7.74	NA	103	NA	90-110	NA	NA

Instrument ID: 10913
Calibration Date: 10/19/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.497489	0.996617	2.345320	4.756166	7.018871	0.9997	0.9998
Fluoride	0.121234	0.385025	0.973416	2.065283	3.275179	0.9995	0.9997
Sulfate	0.322734	0.652928	1.727408	3.663232	5.670423	0.9993	0.9996

Concentration units: mg/L

Batch Numbers: 18308520117B, 18309520117A, 18309520117B
Run Start Dates: 11/08/2018, 11/05/2018
Run Names: 1831201D06, 1830901D06

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.9792	99	7.5	7.5877	101	0.75	0.8152	109
ICB	0	ND	NA	0	ND	NA	0	ND	NA
Low Chk	1.5	1.4653	98	3.75	3.9262	105	0.75	0.7558	101
High Chk	4.5	4.6036	102	11.25	11.8342	105	2.25	2.4841	110
CCV2	3	2.9990	100	7.5	7.7885	104	0.75	0.7580	101
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0023	100	7.5	7.7403	103	0.75	0.7563	101
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9777	99	7.5	7.7744	104	0.75	0.7547	101
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9798	99	7.5	7.7383	103	0.75	0.7631	102
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0053	100	7.5	7.9190	106	0.75	0.7833	104
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9973	100	7.5	7.7602	103	0.75	0.7662	102
CCB	0	ND	NA	0	ND	NA	0	ND	NA
Low Chk	1.5	1.4775	99	3.75	3.6969	99			
High Chk	4.5	4.5741	102	11.25	12.1558	108			
CCV2	3	2.9558	99	7.5	7.5607	101			
CCB	0	ND	NA	0	ND	NA			
CCV2	3	2.9533	98	7.5	7.5811	101			
CCB	0	ND	NA	0	ND	NA			
CCV2				7.5	7.2438	97			
CCB				0	ND	NA			
CCV2	3	2.9484	98	7.5	7.5369	100			

* = Out of Specifications

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
CCB	0	ND	NA	0	ND	NA			
CCV2	3	2.9609	99						
CCB	0	ND	NA						

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis/Anion Scan

SDG: GEJ60

Instrument ID: 24811
Calibration Date: 11/02/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.677137	1.372108	3.447310	7.094930	11.237807	0.9981	0.9990
Fluoride	0.189605	0.722716	1.892251	4.164881	6.641591	0.9984	0.9992
Sulfate	0.405978	0.865700	2.165607	4.516121	6.997385	0.9997	0.9999

Concentration units: mg/L

Batch Numbers: 18308520117B
Run Start Dates: 11/05/2018, 11/06/2018
Run Names: 1830901D17, 1831001D17

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.9428	98	7.5	7.5797	101	0.75	0.7691	103
ICB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9841	99	7.5	7.5599	101	0.75	0.7875	105
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0080	100	7.5	7.7488	103	0.75	0.8540	114
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9755	99	7.5	7.6480	102			
CCB	0	ND	NA	0	ND	NA			
CCV2	3	2.9827	99	7.5	7.7079	103			
CCB	0	ND	NA	0	ND	NA			
CCV2	3	3.0445	101						
CCB	0	ND	NA						
CCV2							0.75	0.7927	106
CCB							0	ND	NA
CCV2							0.75	0.7696	103
CCB							0	ND	NA

* = Out of Specifications

Fraction: Instrumental Wet Chemistry

00224: Chloride Analyte Name	Default MDL	Default LOQ	Units
Chloride	0.20	0.40	mg/l

01504: Fluoride Analyte Name	Default MDL	Default LOQ	Units
Fluoride	0.050	0.10	mg/l

00228: Sulfate Analyte Name	Default MDL	Default LOQ	Units
Sulfate	0.30	1.0	mg/l

Wet Chemistry Data

Case Narrative/Conformance Summary

Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Water Quality

Fraction: Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	DF	Comments
9881981	MW-9	X		1	
9881982	MW-7	X		1	
9881983	MW-8	X		1	
9881984	MW-5	X		1	
9881985	MW-6	X		1	
9881986	FB-20181031	X		1	Field Blank
9881987	MW-1	X		1	
9881988	MW-4	X		1	
9881989	MW-2	X		1	
9881990	MW-3	X		1	
9881991	FB-20181101	X		1	Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

Sample Duplicate

Method defined actions are taken for any failed matrix QC.

Batch#: 18316921201B (Sample number(s): 9881988, BKG: 9881988)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Total Dissolved Solids

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Water Quality

Fraction: Wet Chemistry

Batch#: 18309921202B (Sample number(s): 9881981, UNSPK: 9881984, BKG: 9881981-9881984)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Total Dissolved Solids

SAMPLE ANALYSIS:

(Sample number(s): 9881988: Analysis: 00212)
The sample was originally ran within holding time for Total Dissolved Solids at a reduced volume with a result that was less than the Limit of Quantitation, the sample was reanalyzed for Total Dissolved Solids outside of the 7 day holding time on 11/12/2018.
The sample is being reported per client request.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

QC Summary

Wet Chemistry

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Fraction: Wet Chemistry

Analysis	Batch Number	Sample Number	Analysis Date
Total Dissolved Solids	18309921201A	B309871B	11/05/2018 13:07
		L309871Q	11/05/2018 13:07
		L309871Y	11/05/2018 13:07
		9881985 UNSPK/BKG	11/05/2018 13:05
		9881985 MS,DUP	11/05/2018 13:07
Total Dissolved Solids	18309921202A	B309872B	11/05/2018 14:42
		L309872Q	11/05/2018 14:42
		9881982	11/05/2018 14:41
		9881983	11/05/2018 14:41
		9881984 UNSPK/BKG	11/05/2018 14:41
		9881984 MS,DUP	11/05/2018 14:42
		9881986	11/05/2018 14:41
		9881987	11/05/2018 14:41
		9881989	11/05/2018 14:41
		9881990	11/05/2018 14:41
		9881991	11/05/2018 14:41
Total Dissolved Solids	18309921202B	9881981 BKG	11/05/2018 14:41
		9881981 DUP	11/05/2018 14:42
Total Dissolved Solids	18316921201A	B316871B	11/12/2018 12:59
		L316871Q	11/12/2018 12:59
Total Dissolved Solids	18316921201B	9881988 BKG	11/12/2018 12:57
		9881988 DUP	11/12/2018 12:59

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ60

Fraction: Wet Chemistry

Batch Number	Sample Number	Analysis Date	pH	Temperature of pH
18309005103A	9881982	11/06/2018 01:45:00	X	X
	9881983	11/06/2018 01:50:00	X	X
	9881986	11/06/2018 01:36:00	X	X
	9881987	11/06/2018 01:41:00	X	X
	9881988	11/06/2018 01:31:00	X	X
	9881990	11/06/2018 01:59:00	X	X
	9881991	11/06/2018 01:55:00	X	X
	P005103Q	11/06/2018 00:37:00	X	
18309005104A	9881981	11/06/2018 02:54:00	X	X
	9881984	11/06/2018 02:49:00	X	X
	9881985	11/06/2018 02:44:00	X	X
	9881989 BKG	11/06/2018 02:35:00	X	X
	9881989 DUP	11/06/2018 02:40:00	X	X
	P005104Q	11/06/2018 02:30:00	X	

Quality Control Summary
Method Blank
Water Quality
SDG: GEJ60
Matrix: LIQUID

Fraction: Wet Chemistry

18309921201A / B309871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	11/05/18	N.D.	mg/l	20.0	60.0

18309921202A / B309872B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	11/05/18	N.D.	mg/l	20.0	60.0

18316921201A / B316871B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	11/12/18	N.D.	mg/l	20.0	60.0

Water Quality
Fraction: Wet Chemistry

UNSPK: 9881985 MS: 9881985	Batch: **18309921201A** (Sample number(s): 9881985)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1600	1132.	2708.	NA	99	NA	62-127	NA	NA

UNSPK: 9881984 MS: 9881984	Batch: **18309921202A** (Sample number(s): 9881982-9881984, 9881986-9881987, 9881989-9881991) Batch: **18309921202B** (Sample number(s): 9881981)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1600	1756.	3176.	NA	89	NA	62-127	NA	NA

Comments:
(2) The unspiked sample result is greater than four times the spike added.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

BKG: 9881989 DUP: 9881989	Batch: **18309005104A** (Sample number(s): 9881981, 9881984-9881985, 9881989)				
Parameter	**ME**	**Unspiked Conc Std. Units**	**DUP Conc Std. Units**	**%RPD**	**%RPD Limits**
pH	MTR	7.68	7.71	0	4

BKG: 9881989 DUP: 9881989	Batch: **18309005104A** (Sample number(s): 9881981, 9881984-9881985, 9881989)				
Parameter	**ME**	**Unspiked Conc Degrees C**	**DUP Conc Degrees C**	**%RPD**	**%RPD Limits**
Temperature of pH	MTR	22.72	22.99	1	5

BKG: 9881985 DUP: 9881985	Batch: **18309921201A** (Sample number(s): 9881985)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1132.	1100.	3 (1)	5

BKG: 9881984 DUP: 9881984	Batch: **18309921202A** (Sample number(s): 9881982-9881984, 9881986-9881987, 9881989-9881991)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	1756.	1700.	3 (1)	5

BKG: 9881981 DUP: 9881981	Batch: **18309921202B** (Sample number(s): 9881981)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	860.	926.	7* (1)	5

BKG: 9881988 DUP: 9881988	Batch: **18316921201B** (Sample number(s): 9881988)				
Parameter	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	9556.	9002.	6*	5

Comments:
(1) The sample and/or duplicate result is less than five times the LOQ.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

LCS: P005103Q	Batch: **18309005103A** (Sample number(s): 9881982-9881983, 9881986-9881988, 9881990-9881991)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.00	NA	100	NA	95-105	NA	NA

LCS: P005104Q	Batch: **18309005104A** (Sample number(s): 9881981, 9881984-9881985, 9881989)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.00	NA	100	NA	95-105	NA	NA

LCS: L309871Q LCSD: L309871Y	Batch: **18309921201A** (Sample number(s): 9881985)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	195	200	98	100	62-127	3	14

LCS: L309872Q	Batch: **18309921202A** (Sample number(s): 9881982-9881984, 9881986-9881987, 9881989-9881991) Batch: **18309921202B** (Sample number(s): 9881981)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	203	NA	102	NA	62-127	NA	NA

LCS: L316871Q	Batch: **18316921201B** (Sample number(s): 9881988)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	196	NA	98	NA	62-127	NA	NA

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LOQ/MDL Summary
Water Quality

SDG: GEJ60

Fraction: Wet Chemistry

12152: pH Analyte Name	Default MDL	Default LOQ	Units
pH	0.010	0.010	Std. Units

12151: Temperature of pH Analyte Name	Default MDL	Default LOQ	Units
Temperature of pH	0.010	0.010	Degrees C

00212: Total Dissolved Solids Analyte Name	Default MDL	Default LOQ	Units
Total Dissolved Solids	20.0	60.0	mg/l

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

November 29, 2018

Ms. Hannah Cottman
Eurofins Lancaster Laboratories
2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994

Re: NJ Radiochemistry Analyses
Work Order: 463530

Dear Ms. Cottman:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 06, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4289.

Sincerely,

Taylor Cannon for
Julie Robinson
Project Manager

Purchase Order: 2005365
Chain of Custody: 2005365
Enclosures

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Case Narrative

Receipt Narrative
for
Eurofins Lancaster Laboratories
SDG: 463530

November 29, 2018

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on November 06, 2018 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

Laboratory ID	Client ID
463530001	MW-9
463530002	MW-7
463530003	MW-8
463530004	MW-5
463530005	MW-6
463530006	FB-20181031
463530007	MW-1
463530008	MW-4
463530009	MW-2
463530010	MW-3
463530011	FB-20181101

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

Taylor Cannon for
Julie Robinson
Project Manager

Chain of Custody and Supporting Documentation

Environmental Analysis Request/Chain of Custody

4103530

eurofins | Lancaster Laboratories Environmental

Acct. # _____ Group # 2005365 Sample # 9881992-2002

Subcontractor:	GEL		
Project Name/#:	2005365	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler:		PWSID #:	
Phone #:	717-656-2300 Ext 1896	Quote #:	
State where samples were collected:	NJ	For Compliance:	Yes ☑ No ☐

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water: Potable	Ground	Surface	NPDES	Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod)	Preservation and Filtration Codes: None	None	Remarks
MW-9	10/31/2018	1105	X						X				2	X	X			9881992
MW-7	10/31/2018	1255	X						X				2	X	X			9881993
MW-8	10/31/2018	1235	X						X				2	X	X			9881994
MW-5	10/31/2018	1050	X						X				2	X	X			9881995
MW-6	10/31/2018	1420	X						X				2	X	X			9881996
FB-20181031	10/31/2018	1100	X						X				2	X	X			9881997
MW-1	11/1/2018	0945	X						X				2	X	X			9881998
MW-4	11/1/2018	1140	X						X				2	X	X			9881999
MW-2	11/1/2018	1035	X						X				2	X	X			9882000
MW-3	11/1/2018	1200	X						X				2	X	X			9882001
FB-20181101	11/1/2018	1100	X						X				1	X	X			9882002

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 P = H_3PO_4
F = Field Filtered O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: **Presrvation Needed**

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: ENVsubcontracting@EurofinsUS.com

Phone: 717-656-2300 Ext 1896

Data Package Options (please check if required) ☐ Level IV DOD

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NJ DKQP ☑ NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: Hazsite

Relinquished by:	Date	Time	Received by:	Date	Time
Hannah Cottman	11-5-18	1620	[signature]	11/6/18	8:55
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

GEL Laboratories LLC JR

SAMPLE RECEIPT & REVIEW FORM

Client: LANC	**SDG/AR/COC/Work Order:** 403530
Received By: AJA	**Date Received:** 11/6/18
Carrier and Tracking Number	Circle Applicable: (FedEx Express) FedEx Ground UPS Field Services Courier Other 5035 4245 4162

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr **Classified as: Rad 1 Rad 2 Rad 3**
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	**Comments/Qualifiers (Required for Non-Conforming Items)**
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice (None) Other: *all temperatures are recorded in Celsius TEMP: 18°
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-18 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: Preserved all samples on arrival If Preservation added, Lot#: 181011
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials KG Date 11/7/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

Laboratory Certifications

There are no "Data Exception Reports" associated with this analytical report.

List of current GEL Certifications as of 29 November 2018

State	Certification
Alaska	17−018
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122019−1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	9904
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−18−13
Utah NELAP	SC000122018−27
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Eurofins Lancaster Laboratories (LANC)
SDG #: 463530

Product: **GFPC, Ra228, Liquid**
Analytical Method: EPA 904.0/SW846 9320 Modified
Analytical Procedure: GL-RAD-A-063 REV# 2
Analytical Batch: 1820404

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
463530001	MW-9
463530002	MW-7
463530003	MW-8
463530004	MW-5
463530005	MW-6
463530006	FB-20181031
463530007	MW-1
463530008	MW-4
463530009	MW-2
463530010	MW-3
463530011	FB-20181101
1204154520	Method Blank (MB)
1204154521	463530008(MW-4) Sample Duplicate (DUP)
1204154522	463530008(MW-4) Matrix Spike (MS)
1204154523	463530008(MW-4) Matrix Spike Duplicate (MSD)
1204154524	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample
The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204154521 (MW-4DUP)	Radium-228	RPD 134* (0.0%-100.0%) RER 2.33 (0-3)

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204154522 (MW-4MS) and 1204154523 (MW-4MSD), aliquots

were reduced to conserve sample volume.

Product: **Lucas Cell, Ra226, liquid**
Analytical Method: EPA 903.1 Modified
Analytical Procedure: GL-RAD-A-008 REV# 15
Analytical Batch: 1819735

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
463530001	MW-9
463530002	MW-7
463530003	MW-8
463530004	MW-5
463530005	MW-6
463530006	FB-20181031
463530007	MW-1
463530008	MW-4
463530009	MW-2
463530010	MW-3
463530011	FB-20181101
1204152948	Method Blank (MB)
1204152949	463511005(NonSDG) Sample Duplicate (DUP)
1204152950	463511005(NonSDG) Matrix Spike (MS)
1204152951	463511005(NonSDG) Matrix Spike Duplicate (MSD)
1204152952	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample
The Sample and the Duplicate, 1204152949 (Non SDG 463511005DUP), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value of 1.73.

Technical Information

Recounts
Samples 1204152948 (MB), 1204152952 (LCS), 463530003 (MW-8) and 463530009 (MW-2) were degassed and recounted to verify sample results. The second counts are reported. Sample 1204152949 (Non SDG 463511005DUP) was recounted due to high relative percent difference/relative error ratio. The recount is reported.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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Qualifier Definition Report
for

LANC006 Eurofins Lancaster Laboratories

Client SDG: 463530 GEL Work Order: 463530

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria
** Analyte is a Tracer compound
U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:  **Name: Theresa Austin**

Date: 29 NOV 2018 **Title: Group Leader**

Sample Data Summary

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-9
Sample ID: 463530001
Matrix: Ground Water
Collect Date: 31-OCT-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.979	+/-0.673	1.00	+/-0.723	3.00	pCi/L			JXC9	11/27/18	0911	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.405	+/-0.296	0.415	+/-0.306	1.00	pCi/L			PCW	11/13/18	0500	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	96.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-7
Sample ID: 463530002
Matrix: Ground Water
Collect Date: 31-OCT-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	1.07	+/-0.919	1.47	+/-0.965	3.00	pCi/L			JXC9	11/27/18	0911	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.28	+/-0.437	0.419	+/-0.493	1.00	pCi/L			PCW	11/13/18	0500	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	82.6	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

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Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-8
Sample ID: 463530003
Matrix: Ground Water
Collect Date: 31-OCT-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.734	+/-0.885	1.50	+/-0.907	3.00	pCi/L			JXC9	11/27/18	0911	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.56	+/-0.534	0.454	+/-0.611	1.00	pCi/L			PCW	11/16/18	0445	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	90	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
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Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-5
Sample ID: 463530004
Matrix: Ground Water
Collect Date: 31-OCT-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.789	+/-0.696	1.12	+/-0.728	3.00	pCi/L			JXC9	11/27/18	0911	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.66	+/-0.535	0.547	+/-0.648	1.00	pCi/L			PCW	11/13/18	0500	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	104	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Company : Eurofins Lancaster Laboratories
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Lancaster, Pennsylvania 17601-5994

Report Date: November 29, 2018

Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-6
Sample ID: 463530005
Matrix: Ground Water
Collect Date: 31-OCT-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	1.14	+/-0.784	1.19	+/-0.844	3.00	pCi/L			JXC9	11/27/18	0911	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.68	+/-0.476	0.350	+/-0.569	1.00	pCi/L			PCW	11/13/18	0500	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	95.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: FB-20181031
Sample ID: 463530006
Matrix: Ground Water
Collect Date: 31-OCT-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.812	+/-0.848	1.41	+/-0.877	3.00	pCi/L			JXC9	11/27/18	0911	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.00	+/-0.207	0.438	+/-0.207	1.00	pCi/L			PCW	11/13/18	0535	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	87.6	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

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Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-1
Sample ID: 463530007
Matrix: Ground Water
Collect Date: 01-NOV-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		3.49	+/-1.16	1.35	+/-1.50	3.00	pCi/L			JXC9	11/27/18	0912	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		2.65	+/-0.611	0.376	+/-0.886	1.00	pCi/L			PCW	11/13/18	0535	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	75.6	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
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Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-4
Sample ID: 463530008
Matrix: Ground Water
Collect Date: 01-NOV-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.457	+/-0.687	1.19	+/-0.698	3.00	pCi/L			JXC9	11/27/18	0912	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		1.19	+/-0.464	0.503	+/-0.503	1.00	pCi/L			PCW	11/13/18	0535	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	86.7	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-2
Sample ID: 463530009
Matrix: Ground Water
Collect Date: 01-NOV-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		4.40	+/-1.12	1.20	+/-1.64	3.00	pCi/L			JXC9	11/27/18	0911	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		2.28	+/-0.613	0.384	+/-0.764	1.00	pCi/L			PCW	11/16/18	0445	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	101	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
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Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-3
Sample ID: 463530010
Matrix: Ground Water
Collect Date: 01-NOV-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		2.31	+/-0.959	1.25	+/-1.15	3.00	pCi/L			JXC9	11/27/18	0912	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		0.601	+/-0.300	0.332	+/-0.319	1.00	pCi/L			PCW	11/13/18	0535	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	89.5	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: November 29, 2018
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: FB-20181101
Sample ID: 463530011
Matrix: Ground Water
Collect Date: 01-NOV-18
Receive Date: 06-NOV-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.543	+/-0.658	1.11	+/-0.675	3.00	pCi/L			JXC9	11/27/18	0912	1820404	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.0895	+/-0.175	0.330	+/-0.176	1.00	pCi/L			PCW	11/13/18	0535	1819735	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1820404	92.3	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

Quality Control Summary

QC Summary

Client : **Eurofins Lancaster Laboratories**
2425 New Holland Pike

Lancaster, Pennsylvania

Contact: **Ms. Hannah Cottman**

Workorder: **463530**

Report Date: November 29, 2018

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gas Flow										
Batch 1820404										
QC1204154521 463530008 DUP										
Radium-228	U	0.457		2.31	pCi/L	134*		(0% - 100%)	JXC9	11/27/1809:10
	Uncert:	+/-0.687		+/-1.24						
	TPU:	+/-0.698		+/-1.39						
QC1204154524 LCS										
Radium-228	5.67			5.32	pCi/L		93.8	(75%-125%)	JXC9	11/27/1809:10
	Uncert:			+/-0.625						
	TPU:			+/-1.57						
QC1204154520 MB										
Radium-228			U	-0.0158	pCi/L				JXC9	11/27/1809:10
	Uncert:			+/-0.306						
	TPU:			+/-0.307						
QC1204154522 463530008 MS										
Radium-228	51.2 U	0.457		42.8	pCi/L		83.6	(75%-125%)	JXC9	11/27/1809:10
	Uncert:	+/-0.687		+/-5.83						
	TPU:	+/-0.698		+/-13.0						
QC1204154523 463530008 MSD										
Radium-228	51.2 U	0.457		47.0	pCi/L	9.3	91.8	(0%-20%)	JXC9	11/27/1809:10
	Uncert:	+/-0.687		+/-5.83						
	TPU:	+/-0.698		+/-14.0						
Rad Ra-226										
Batch 1819735										
QC1204152949 463511005 DUP										
Radium-226		2.15		1.44	pCi/L	39.2*		(0%-20%)	PCW	11/13/1808:35
	Uncert:	+/-0.459		+/-0.341						
	TPU:	+/-0.652		+/-0.460						
QC1204152952 LCS										
Radium-226	16.2			15.4	pCi/L		94.7	(75%-125%)	PCW	11/16/1804:45
	Uncert:			+/-1.38						
	TPU:			+/-3.70						
QC1204152948 MB										
Radium-226			U	0.00	pCi/L				PCW	11/16/1804:45
	Uncert:			+/-0.153						
	TPU:			+/-0.153						
QC1204152950 463511005 MS										
Radium-226	26.0	2.15		23.5	pCi/L		82.3	(75%-125%)	PCW	11/13/1806:10
	Uncert:	+/-0.459		+/-1.71						
	TPU:	+/-0.652		+/-3.96						
QC1204152951 463511005 MSD										
Radium-226	26.0	2.15		25.2	pCi/L	6.86	88.7	(0%-20%)	PCW	11/13/1806:10
	Uncert:	+/-0.459		+/-1.87						

QC Summary

Workorder: **463530**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Ra-226										
Batch 1819735										
				TPU:	+/-0.652		+/-5.14			

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

**	Analyte is a Tracer compound
<	Result is less than value reported
>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
** Indicates analyte is a surrogate/tracer compound.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptence criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 1820404 Check-list

This check-list was completed on 27-NOV-18 by Kenshalla Oston

This batch was reviewed by Kenshalla Oston on 27-NOV-18 and Nat Long on 27-NOV-18.

Batch ID:	**Product:**	**Description:** Gas Flow Radium 228
1820404	GFC28RAL	GL-RAD-A-009

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium−228 in Liquid

Batch ID: **1820404**
Analyst: Jasmine Conley (JXC9)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL−RAD−A−063 REV# 2
Instrument: GFC−51204863

Due Dates for Lab: 01−DEC−2018 **Package: 03−DEC−2018** **SDG: 05−DEC−2018**

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1204154524	Radium−228 SPIKE	1810−A	.1	mL
MS	1204154522	Radium−228 SPIKE	1810−A	.1	mL
MSD	1204154523	Radium−228 SPIKE	1810−A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Aliquot (mL)	Ac−228 Ingrow (date)	Ac−228 Separation (date)
1	463530001	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
2	463530002	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
3	463530003	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
4	463530004	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
5	463530005	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
6	463530006	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
7	463530007	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
8	463530008	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
9	463530009	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
10	463530010	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
11	463530011	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
12	463541001	15−NOV−2018	1	900	11/16/18 13:30	11/27/18 07:14
13	463646001	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
14	463646002	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
15	463646003	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
16	1204154520 MB	15−NOV−2018	1	900	11/16/18 13:30	11/27/18 07:14
17	1204154521 DUP (463530008)	15−NOV−2018	3	300	11/16/18 13:30	11/27/18 07:14
18	1204154522 MS (463530008)	15−NOV−2018	3	100	11/16/18 13:30	11/27/18 07:14
19	1204154523 MSD (463530008)	15−NOV−2018	3	100	11/16/18 13:30	11/27/18 07:14
20	1204154524 LCS	15−NOV−2018	1	900	11/16/18 13:30	11/27/18 07:14

Reagent/Solvent Lot ID	Description	Amount
REGNT 2571685.11	2mL Cartridges	2 mL
REGNT 2662327.1	cerium 500 mg/L in 2%HCI	.2 mL
REGNT 2672182	RGF−1.5 Ammonium Sulfate	10 mL
REGNT 2766682.3	RGF−Nitric Acid	5 mL
REGNT 2832194.1	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 2832313.1	Hydrofluoric Acid Poly Bottle	3 mL
REGNT 2838193	RGF−50% Potassium Carbonate	2 mL
REGNT 2840709	RGF−16mg/mL Barium Chloride	1 mL
REGNT 2843889	RGF−1M Citric Acid	5 mL
REGNT 2849126	RGF−7M Nitric Acid	25 mL
REGNT 2851710	2M HCl	20 mL
WORK 0487−D	Barium−133 TRACER	.1 mL

Comments:

Pipet Id: RAD−GFC−1795419
Data Entry Date2: 15−NOV−2018 00:00

Radium-228 Liquid

Filename : RA228.XLS
File type : Excel
Version # : 1.4.2

Tracer S/N : 0487-D
Tracer Exp Date : 10/10/2019
Tracer Volume Added: 0.10

Batch : 1820404
Analyst : JAS02031
Prep Date : 11/15/2018
Ra-228 Method Uncertainty : 0.1268

Geometry: CeF on 25mm Filter

Procedure Code : GFC28RAL
Parmname : Radium-228
Required MDA : 1 pCi/L
Ra-228 Abundance : 1.00
Halflife of Ra-228 : 5.75 years
Halflife of Ac-228 : 6.15 hours

Sample Characteristics					**Tracer Calculations**					
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	463530001.1	0.3000	1.8459E-05	10/31/2018 11:05	178.0	7.49%	172.3	7.62%	0.1	0.000200
2	463530002.1	0.3000	1.8459E-05	10/31/2018 12:55	178.0	7.49%	147.0	8.25%	0.1	0.000200
3	463530003.1	0.3000	1.8459E-05	10/31/2018 12:35	178.0	7.49%	160.3	7.90%	0.1	0.000200
4	463530004.1	0.3000	1.8459E-05	10/31/2018 10:50	178.0	7.49%	184.5	7.36%	0.1	0.000200
5	463530005.1	0.3000	1.8459E-05	10/31/2018 14:20	178.0	7.49%	170.5	7.66%	0.1	0.000200
6	463530006.1	0.3000	1.8459E-05	10/31/2018 11:00	178.0	7.49%	156.0	8.01%	0.1	0.000200
7	463530007.1	0.3000	1.8459E-05	11/1/2018 9:45	178.0	7.49%	134.7	8.62%	0.1	0.000200
8	463530008.1	0.3000	1.8459E-05	11/1/2018 11:40	178.0	7.49%	154.3	8.05%	0.1	0.000200
9	463530009.1	0.3000	1.8459E-05	11/1/2018 10:35	178.0	7.49%	179.9	7.46%	0.1	0.000200
10	463530010.1	0.3000	1.8459E-05	11/1/2018 12:00	178.0	7.49%	159.3	7.92%	0.1	0.000200
11	463530011.1	0.3000	1.8459E-05	11/1/2018 11:00	178.0	7.49%	164.4	7.80%	0.1	0.000200
12	463541001.1	0.9000	2.0768E-05	11/1/2018 12:00	178.0	7.49%	105.5	9.74%	0.1	0.000200
13	463646001.1	0.3000	1.8459E-05	11/5/2018 10:45	178.0	7.49%	124.4	8.97%	0.1	0.000200
14	463646002.1	0.3000	1.8459E-05	11/5/2018 12:00	178.0	7.49%	158.2	7.95%	0.1	0.000200
15	463646003.1	0.3000	1.8459E-05	11/5/2018 14:15	178.0	7.49%	141.3	8.41%	0.1	0.000200
16	1204154520.1	0.9000	2.0768E-05	11/15/2018 0:00	178.0	7.49%	164.6	7.80%	0.1	0.000200
17	1204154521.1	0.3000	1.8459E-05	11/1/2018 11:40	178.0	7.49%	147.7	8.23%	0.1	0.000200
18	1204154522.1	0.1000	1.1370E-05	11/1/2018 11:40	178.0	7.49%	169.1	7.69%	0.1	0.000200
19	1204154523.1	0.1000	1.1370E-05	11/1/2018 11:40	178.0	7.49%	161.2	7.88%	0.1	0.000200
20	1204154524.1	0.9000	2.0768E-05	11/15/2018 0:00	178.0	7.49%	173.0	7.60%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-063
Instrument SOP: GL-RAD-I-016

Count raw Data

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
1	1C	60	8	40	0.667	11/27/2018 9:11	11/16/2018 13:30	11/27/2018 7:14	0.991	0.802	1.000	1.057	96.8%	5.35%
2	2B	60	13	54	0.900	11/27/2018 9:11	11/16/2018 13:30	11/27/2018 7:14	0.991	0.802	1.000	1.057	82.6%	5.58%
3	3B	60	24	54	0.900	11/27/2018 9:11	11/16/2018 13:30	11/27/2018 7:14	0.991	0.802	1.000	1.057	90.0%	5.45%
4	3C	60	26	46	0.767	11/27/2018 9:11	11/16/2018 13:30	11/27/2018 7:14	0.991	0.802	1.000	1.057	104%	5.26%
5	3D	60	9	50	0.833	11/27/2018 9:11	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	95.8%	5.36%
6	4B	60	8	51	0.850	11/27/2018 9:11	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	87.6%	5.49%
7	5A	60	25	81	1.350	11/27/2018 9:12	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	75.6%	5.72%
8	5B	60	12	34	0.567	11/27/2018 9:12	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	86.7%	5.51%
9	9C	60	10	121	2.017	11/27/2018 9:11	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	101%	5.29%
10	9D	60	9	71	1.183	11/27/2018 9:12	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	89.5%	5.46%
11	10C	60	14	36	0.600	11/27/2018 9:12	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	92.3%	5.41%
12	10D	60	17	35	0.583	11/27/2018 9:12	11/16/2018 13:30	11/27/2018 7:14	0.991	0.801	1.000	1.057	59.2%	6.15%
13	11A	60	28	82	1.367	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.993	0.804	1.000	1.057	69.9%	5.85%
14	11B	60	20	60	1.000	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.993	0.804	1.000	1.057	88.8%	5.47%
15	11C	60	15	53	0.883	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.993	0.804	1.000	1.057	79.4%	5.64%
16	11D	60	14	75	1.250	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.996	0.803	1.000	1.057	92.4%	5.41%
17	12A	60	19	108	1.800	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.991	0.803	1.000	1.057	83.0%	5.57%
18	12B	60	8	321	5.350	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.991	0.803	1.000	1.057	95.0%	5.37%
19	13A	60	6	309	5.150	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.991	0.803	1.000	1.057	90.6%	5.44%
20	13B	60	10	328	5.467	11/27/2018 9:10	11/16/2018 13:30	11/27/2018 7:14	0.996	0.803	1.000	1.057	97.2%	5.34%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2017	5/31/2019	0.6443	0.00847	0.361	11/23/2018 16:55	1000
2	PIC	6/1/2017	5/31/2019	0.6448	0.02111	0.615	11/23/2018 16:55	1000
3	PIC	6/1/2017	5/31/2019	0.6291	0.01614	0.692	11/26/2018 9:00	500
4	PIC	6/1/2017	5/31/2019	0.6374	0.00988	0.506	11/26/2018 9:00	500
5	PIC	6/1/2017	5/31/2019	0.6255	0.02297	0.491	11/23/2018 16:56	1000
6	PIC	6/1/2017	5/31/2019	0.6410	0.01519	0.622	11/23/2018 16:56	1000
7	PIC	6/1/2017	5/31/2019	0.6766	0.00851	0.456	11/23/2018 16:56	1000
8	PIC	6/1/2017	5/31/2019	0.6547	0.00426	0.437	11/23/2018 16:56	1000
9	PIC	6/1/2017	5/31/2019	0.6373	0.00584	0.598	11/23/2018 16:54	1000
10	PIC	6/1/2017	5/31/2019	0.6494	0.02610	0.513	11/23/2018 16:54	1000
11	PIC	6/1/2017	5/31/2019	0.6584	0.00638	0.435	11/23/2018 16:54	1000
12	PIC	6/1/2017	5/31/2019	0.6578	0.00557	0.463	11/23/2018 16:54	1000
13	PIC	6/1/2017	5/31/2019	0.6648	0.01317	0.536	11/23/2018 16:49	1000
14	PIC	6/1/2017	5/31/2019	0.6620	0.00697	0.950	11/23/2018 16:49	1000
15	PIC	6/1/2017	5/31/2019	0.6578	0.01278	0.456	11/23/2018 16:50	1000
16	PIC	6/1/2017	5/31/2019	0.6802	0.01068	1.265	11/23/2018 16:50	1000
17	PIC	6/1/2017	5/31/2019	0.6732	0.01964	1.154	11/23/2018 16:50	1000
18	PIC	6/1/2017	5/31/2019	0.6361	0.01114	1.023	11/23/2018 16:50	1000
19	PIC	6/1/2017	5/31/2019	0.6527	0.00714	0.504	11/23/2018 16:50	1000
20	PIC	6/1/2017	5/31/2019	0.6463	0.00967	0.424	11/23/2018 16:50	1000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1810-A
Spike Exp Date : 5/23/2019
Spike Activity (dpm/ml): 113.27
Spike Volume Added: 0.10

LCS S/N : 1810-A
LCS Exp Date : 5/23/2019
LCS Activity (dpm/ml): 113.27
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	**2 SIGMA** Counting Uncertainty pCi/L	**2 SIGMA** Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.5962	0.4209	3	1.0020	**0.9794**	35.46%	0.3057	0.1071	0.6726	0.7228		SAMPLE				
2	0.9116	0.6436	3	1.4748	**1.0697**	44.25%	0.2850	0.1250	0.9193	0.9651		SAMPLE				
3	0.9341	0.6595	3	1.4953	**0.7337**	61.80%	0.2080	0.1280	0.8849	0.9072		SAMPLE				
4	0.6852	0.4838	3	1.1189	**0.7888**	45.37%	0.2607	0.1174	0.6965	0.7283		SAMPLE				
5	0.7242	0.5113	3	1.1894	**1.1424**	35.51%	0.3423	0.1199	0.7844	0.8443		SAMPLE				
6	0.8694	0.6138	3	1.4055	**0.8115**	53.64%	0.2280	0.1216	0.8484	0.8767		SAMPLE				
7	0.8167	0.5766	3	1.3485	**3.4914**	17.91%	0.8940	0.1515	1.1597	1.5014		SAMPLE				
8	0.7215	0.5094	3	1.1949	**0.4569**	76.86%	0.1297	0.0994	0.6866	0.6977		SAMPLE				
9	0.7431	0.5246	3	1.2044	**4.4020**	14.08%	1.4187	0.1850	1.1249	1.6350		SAMPLE				
10	0.7630	0.5387	3	1.2493	**2.3057**	22.07%	0.6703	0.1423	0.9590	1.1501		SAMPLE				
11	0.6716	0.4742	3	1.1128	**0.5425**	62.15%	0.1650	0.1022	0.6584	0.6745		SAMPLE				
12	0.3604	0.2545	1	0.5944	**0.2058**	84.10%	0.1203	0.1009	0.3383	0.3431		SAMPLE				
13	0.9711	0.6856	3	1.5854	**3.5579**	19.33%	0.8307	0.1527	1.2818	1.6124		SAMPLE				
14	1.0212	0.7210	3	1.6111	**0.1692**	265.51%	0.0500	0.1327	0.8801	0.8813		SAMPLE				
15	0.7970	0.5627	3	1.3160	**1.6287**	29.40%	0.4273	0.1232	0.9203	1.0222		SAMPLE				
16	0.3664	0.2587	1	0.5699	**-0.0158**	991.05%	-0.0150	0.1487	0.3065	0.3065		MB				
17	1.1878	0.8386	3	1.8557	**2.3064**	27.95%	0.6460	0.1765	1.2351	1.3876	463530008.1	DUP	133.9%	2.3340		
18	3.1019	2.1900	3	4.8751	**42.8496**	8.85%	4.3270	0.3003	5.8290	12.9861	463530008.1	MS			51.2490	83.6%
19	2.2255	1.5712	3	3.6486	**47.0282**	8.37%	4.6460	0.2938	5.8295	14.0070	463530008.1	MSD	9.3%	0.4288	51.2490	91.8%
20	0.2126	0.1501	1	0.3528	**5.3153**	8.09%	5.0427	0.3025	0.6251	1.5671		LCS			5.6690	93.8%

1820404.xls

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
463530001	1C	60	8	40	11/27/2018 9:11	11/27/2018 10:11	PIC	1820404
463530002	2B	60	13	54	11/27/2018 9:11	11/27/2018 10:11	PIC	1820404
463530003	3B	60	24	54	11/27/2018 9:11	11/27/2018 10:11	PIC	1820404
463530004	3C	60	26	46	11/27/2018 9:11	11/27/2018 10:11	PIC	1820404
463530005	3D	60	9	50	11/27/2018 9:11	11/27/2018 10:11	PIC	1820404
463530006	4B	60	8	51	11/27/2018 9:11	11/27/2018 10:11	PIC	1820404
463530007	5A	60	25	81	11/27/2018 9:12	11/27/2018 10:12	PIC	1820404
463530008	5B	60	12	34	11/27/2018 9:12	11/27/2018 10:12	PIC	1820404
463530009	9C	60	10	121	11/27/2018 9:11	11/27/2018 10:11	PIC	1820404
463530010	9D	60	9	71	11/27/2018 9:12	11/27/2018 10:12	PIC	1820404
463530011	10C	60	14	36	11/27/2018 9:12	11/27/2018 10:12	PIC	1820404
463541001	10D	60	17	35	11/27/2018 9:12	11/27/2018 10:12	PIC	1820404
463646001	11A	60	28	82	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404
463646002	11B	60	20	60	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404
463646003	11C	60	15	53	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404
1204154520	11D	60	14	75	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404
1204154521	12A	60	19	108	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404
1204154522	12B	60	8	321	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404
1204154523	13A	60	6	309	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404
1204154524	13B	60	10	328	11/27/2018 9:10	11/27/2018 10:10	PIC	1820404

ASSAY 19-Nov-18 15:36:03

Protocol	id	8 Ba-133
Time	limit	
Count	limit	
Isotope	Ba-133	
Protocol	date	11/19/2018
Run	id.	2216

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
1	87	1	180.04	619.51	178.03	7.49		03:36:03
2	87	2	180.04	602.28	172.29	7.62	96.78	03:39:18
3	87	3	180.04	526.31	146.97	8.25	82.55	03:42:32
4	87	4	180.06	566.36	160.3	7.9	90.04	03:45:46
5	87	5	180.04	638.77	184.45	7.36	103.61	03:49:00
1	91	1	180.06	596.9	170.48	7.66	95.76	03:52:35
2	91	2	180.06	553.43	155.99	8.01	87.62	03:55:49
3	91	3	180.04	489.39	134.67	8.62	75.64	03:59:03
4	91	4	180.04	548.22	154.27	8.05	86.65	04:02:17
5	91	5	180.06	625.22	179.92	7.46	101.06	04:05:31
1	77	1	180.04	563.31	159.3	7.92	89.48	04:09:06
2	77	2	180.04	578.6	164.4	7.8	92.34	04:12:21
3	77	3	180.03	401.71	105.46	9.74	59.24	04:15:34
4	77	4	180.04	458.56	124.39	8.97	69.87	04:18:48
5	77	5	180.06	559.9	158.15	7.95	88.83	04:22:02
1	100	1	180.06	509.34	141.3	8.41	79.37	04:25:44
2	100	2	180.04	579.14	164.58	7.8	92.45	04:28:59
3	100	3	180.04	528.48	147.69	8.23	82.96	04:32:13
4	100	4	180.06	592.65	169.06	7.69	94.96	04:35:27
5	100	5	180.03	569.05	161.23	7.88	90.56	04:38:41
1	86	1	180.04	604.31	172.97	7.6	97.16	04:42:24

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Nov-2018

Detectors LB4100 A1 through J4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100B2	Above	Alpha bkg	27-Nov 05:51	60	0.483	-4.24E-2	0.351	+5.02
LB4100C1	Above	Beta bkg	27-Nov 05:53	60	2.017	1.035	1.925	+3.62
LB4100C4	Above	Beta bkg	27-Nov 05:54	60	2.133	0.686	2.113	+3.09
LB4100E2	need 2nd	Beta bkg	27-Nov 05:51	60	1.933	0.261	3.241	+0.37
LB4100E3	Above	Beta bkg	27-Nov 05:51	60	2.233	0.473	2.078	+3.58
LB4100E3	need 2nd	Beta eff	27-Nov 07:23	5	15783	15700	18690	-2.83
LB4100J1	need 2nd	Alpha eff	27-Nov 06:56	5	10330	10110	11600	-2.11
LB4100J1	Below	Beta eff	27-Nov 07:16	5	35176	36170	42660	-3.92
LB4100J2	Above	Alpha bkg	27-Nov 05:51	60	0.383	-6.70E-2	0.379	+3.06
LB4100J2	Below	Beta eff	27-Nov 07:16	5	12806	14050	17090	-5.46
LB4100J3	Below	Beta eff	27-Nov 07:16	5	16524	16680	20710	-3.23
LB4100J4	Above	Alpha bkg	27-Nov 05:51	60	0.333	-4.35E-2	0.401	+2.09
LB4100J4	need 2nd	Beta eff	27-Nov 07:16	5	27697	27360	34330	-2.71
PIC1A	Above	Alpha bkg	27-Nov 05:52	60	0.317	-4.72E-2	0.399	+1.90
PIC2C	Above	Alpha bkg	27-Nov 05:53	60	0.567	-2.98E-2	0.304	+7.73
PIC4A	Above	Alpha bkg	27-Nov 05:53	60	0.450	-4.12E-2	0.369	+4.18
PIC4C	Above	Alpha bkg	27-Nov 05:53	60	0.400	-7.27E-2	0.383	+3.22
PIC6A	Above	Alpha bkg	27-Nov 06:07	60	0.400	-2.15E-2	0.405	+2.93
PIC6B	Above	Alpha bkg	27-Nov 06:07	60	1.000	-5.91E-2	0.359	+12.20
PIC6B	Above	Beta bkg	27-Nov 06:07	60	2.250	-3.32E-2	2.413	+2.60
PIC8C	Above	Alpha bkg	27-Nov 06:07	60	0.583	-2.61E-2	0.365	+6.36
PIC13D	Below	Beta eff	27-Nov 06:23	5	24608	24810	26470	-3.73

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100B3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

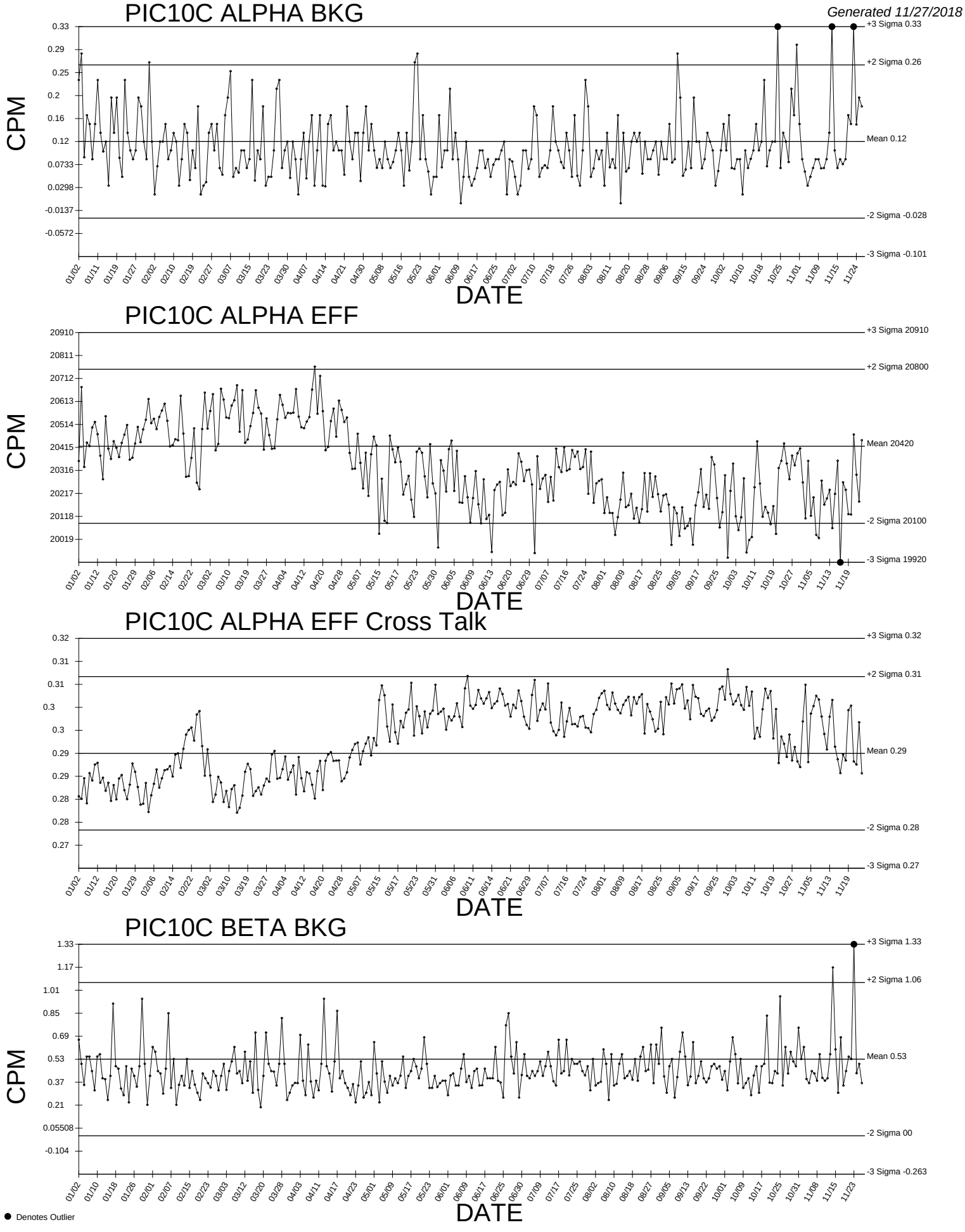
LB4100D1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC3A	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC6D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC13C	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

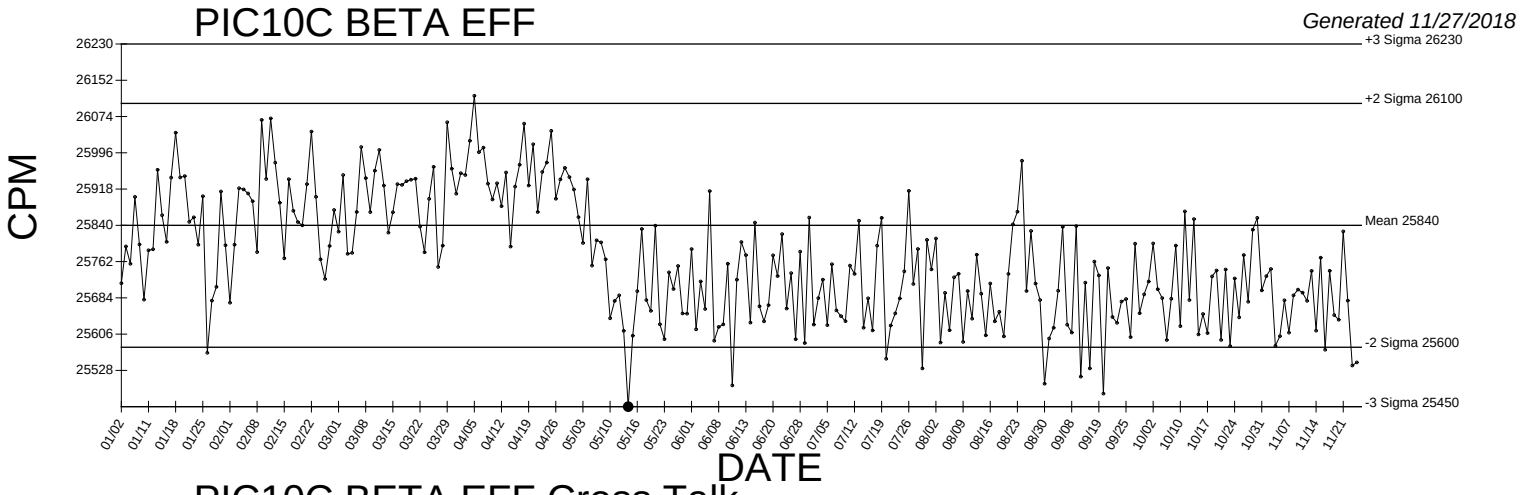
Reviewed by _____

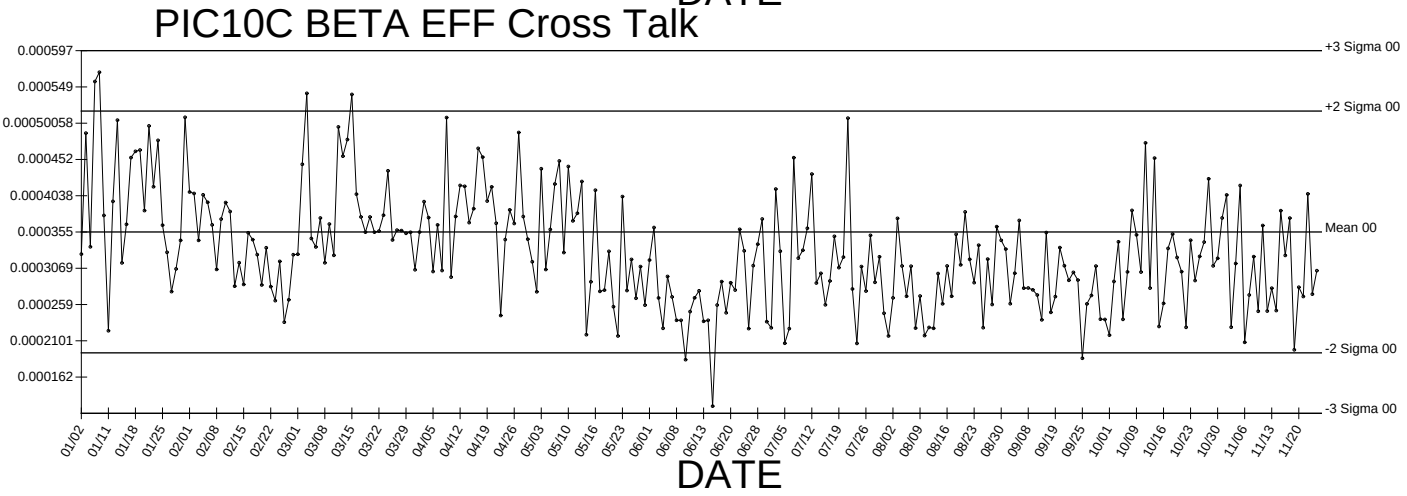
Date 11/27/18

GEL Laboratories LLC

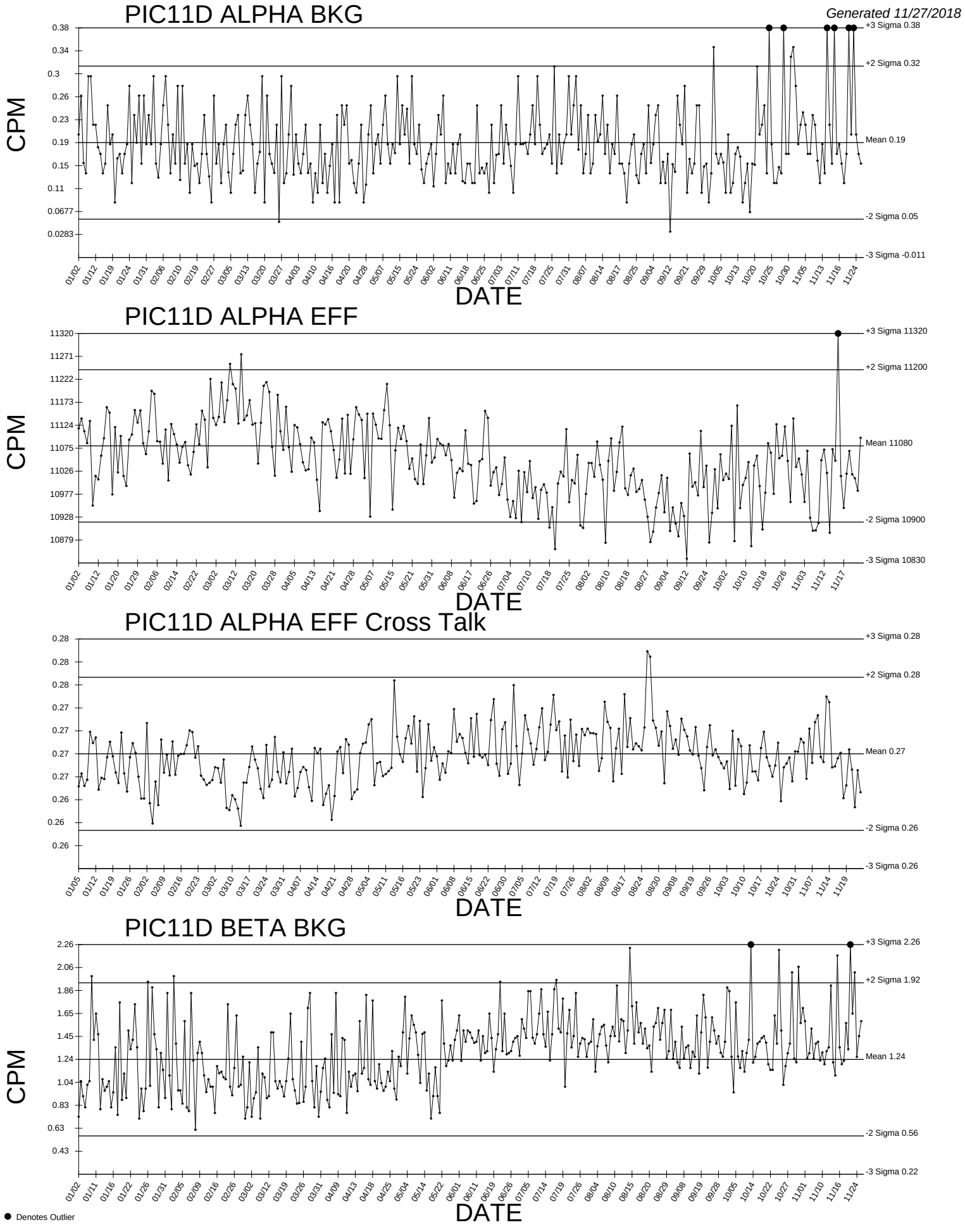
Background and Efficiency Data

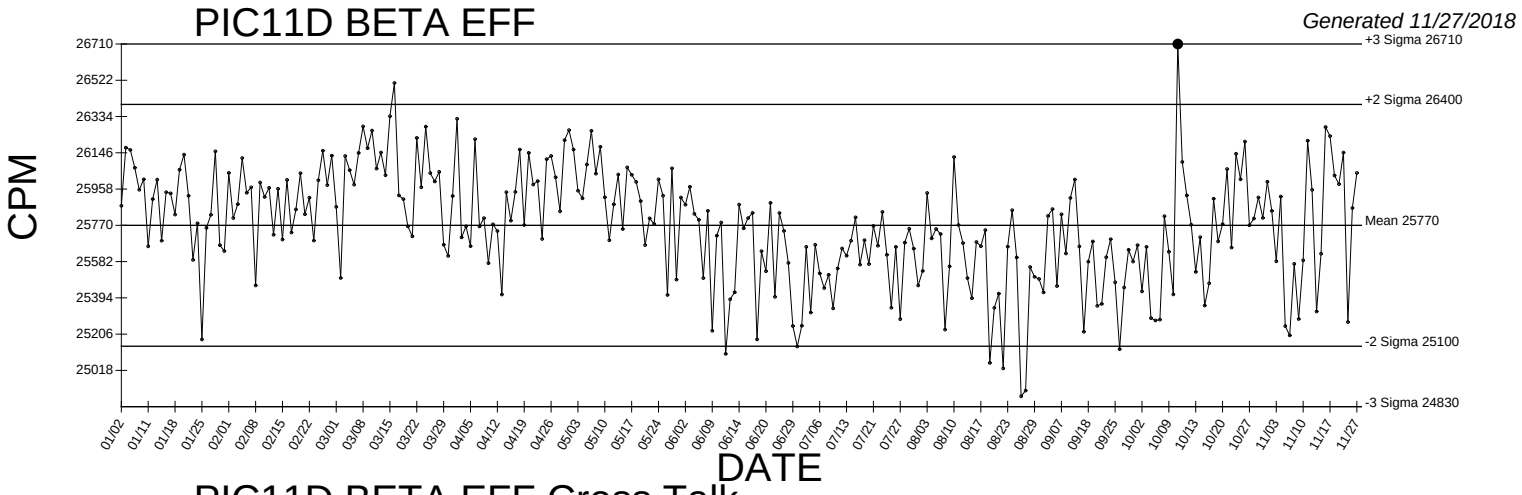

PIC10C ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.33
+2 Sigma 0.26
Mean 0.12
-2 Sigma -0.028
-3 Sigma -0.101
PIC10C ALPHA EFF
+3 Sigma 20910
+2 Sigma 20800
Mean 20420
-2 Sigma 20100
-3 Sigma 19920
PIC10C ALPHA EFF Cross Talk
+3 Sigma 0.32
+2 Sigma 0.31
Mean 0.29
-2 Sigma 0.28
-3 Sigma 0.27
PIC10C BETA BKG
+3 Sigma 1.33
+2 Sigma 1.06
Mean 0.53
-2 Sigma 00
-3 Sigma -0.263
Denotes Outlier

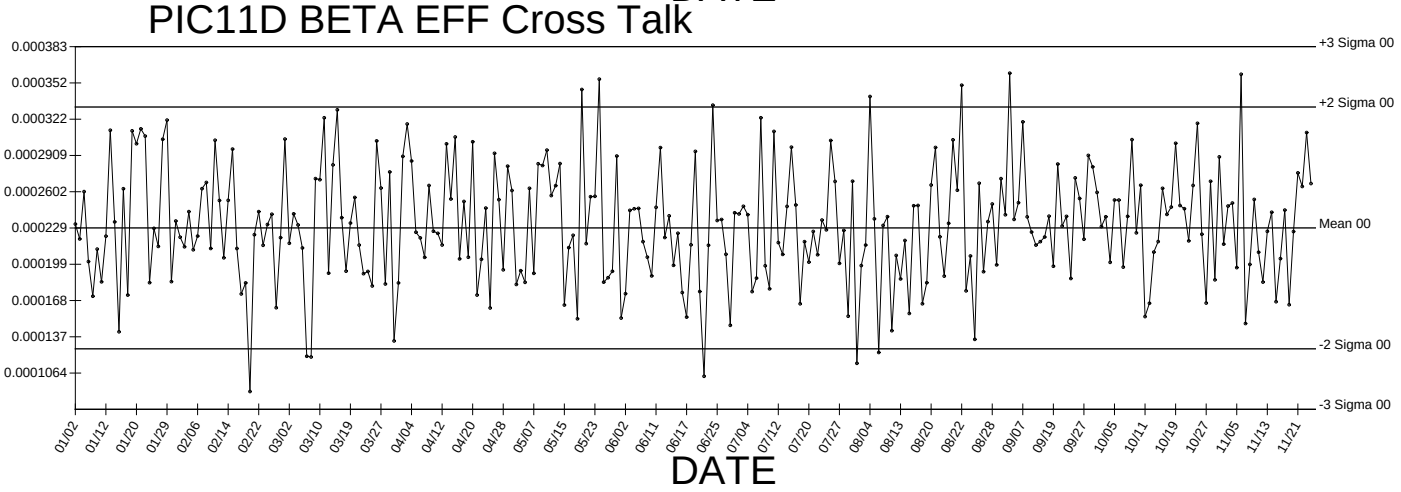




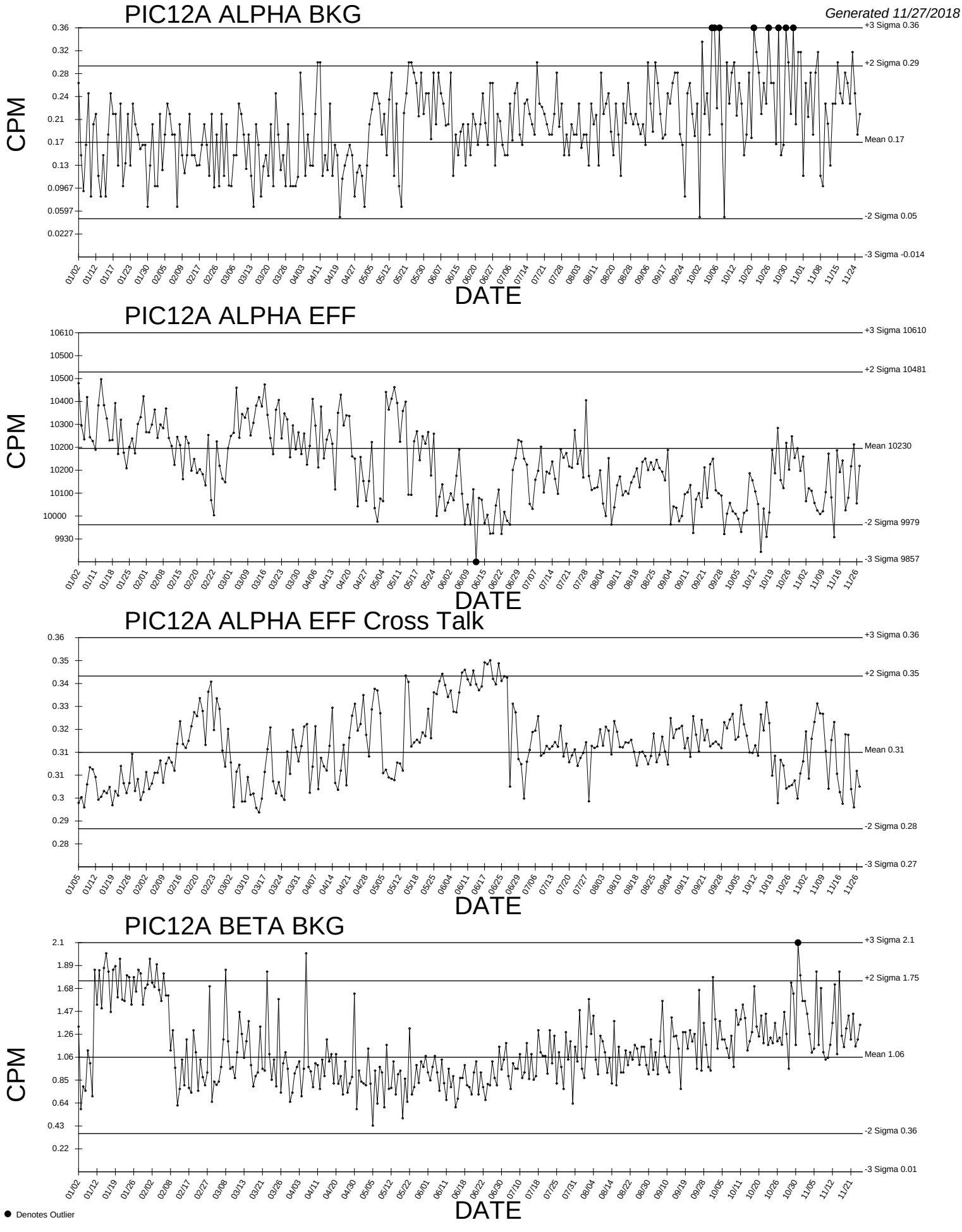
● Denotes Outlier

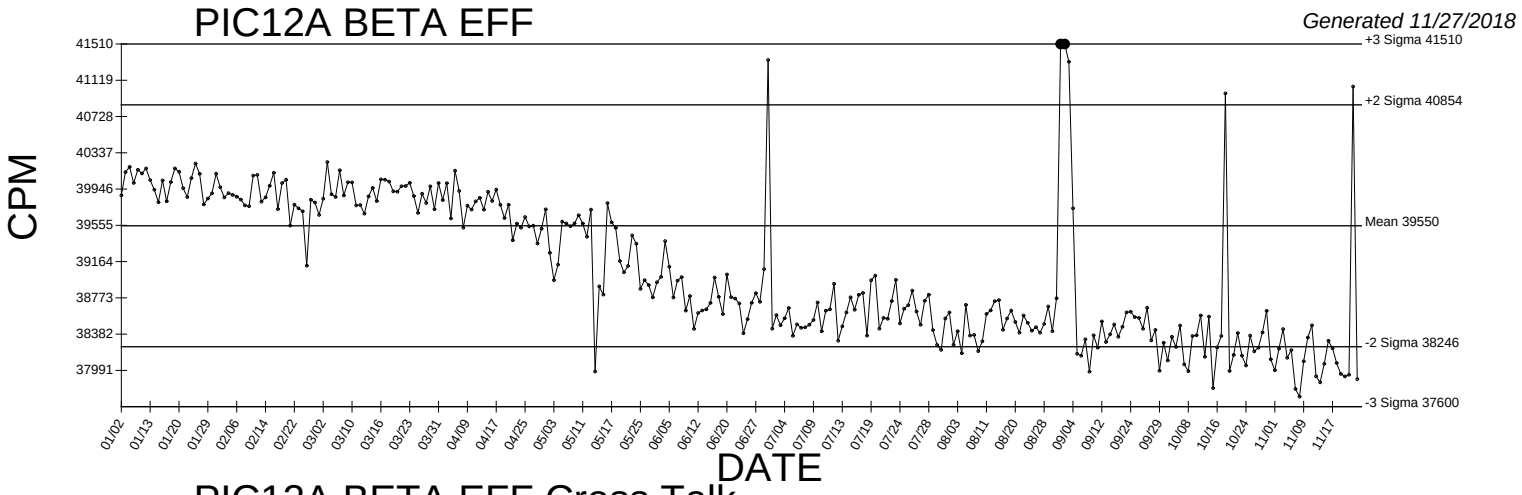

PIC11D ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.32
Mean 0.19
-2 Sigma 0.05
-3 Sigma -0.011
PIC11D ALPHA EFF
+3 Sigma 11320
+2 Sigma 11200
Mean 11080
-2 Sigma 10900
-3 Sigma 10830
PIC11D ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.26
PIC11D BETA BKG
+3 Sigma 2.26
+2 Sigma 1.92
Mean 1.24
-2 Sigma 0.56
-3 Sigma 0.22
Denotes Outlier

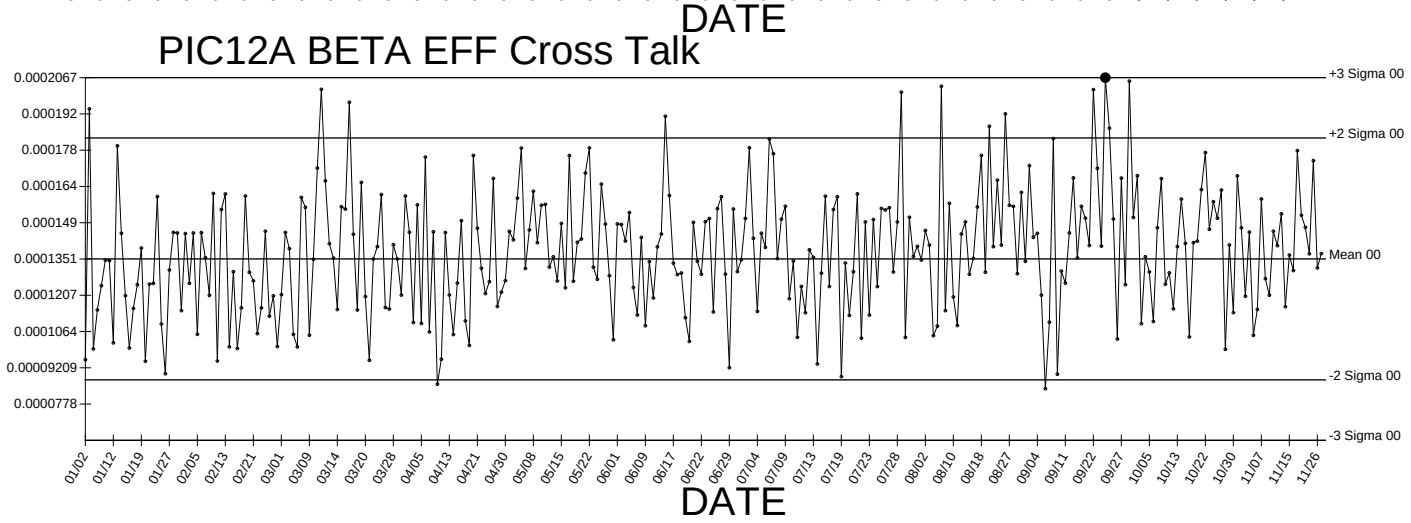




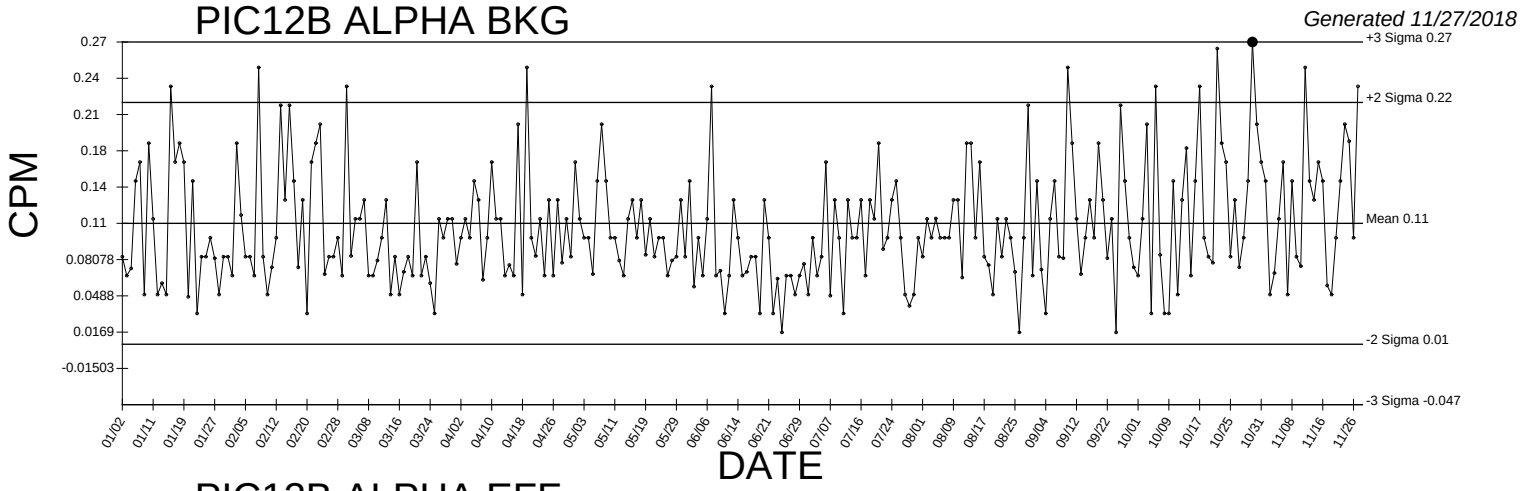
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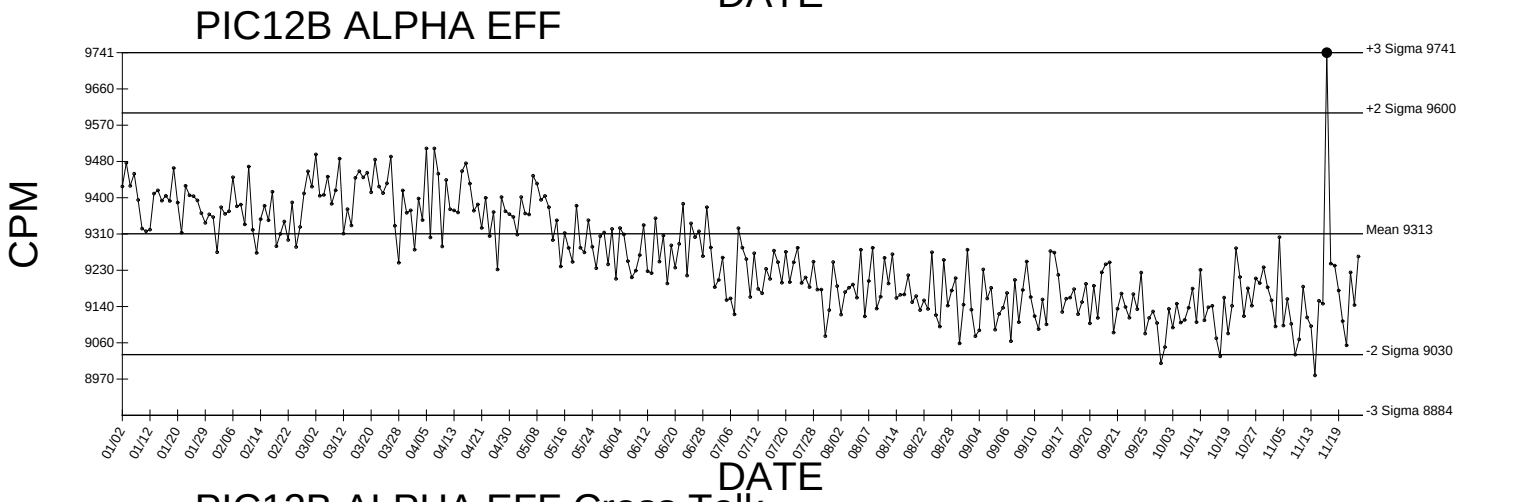

PIC12A ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.29
Mean 0.17
-2 Sigma 0.05
-3 Sigma -0.014
PIC12A ALPHA EFF
+3 Sigma 10610
+2 Sigma 10481
Mean 10230
-2 Sigma 9979
-3 Sigma 9857
PIC12A ALPHA EFF Cross Talk
+3 Sigma 0.36
+2 Sigma 0.35
Mean 0.31
-2 Sigma 0.28
-3 Sigma 0.27
PIC12A BETA BKG
+3 Sigma 2.1
+2 Sigma 1.75
Mean 1.06
-2 Sigma 0.36
-3 Sigma 0.01
Denotes Outlier

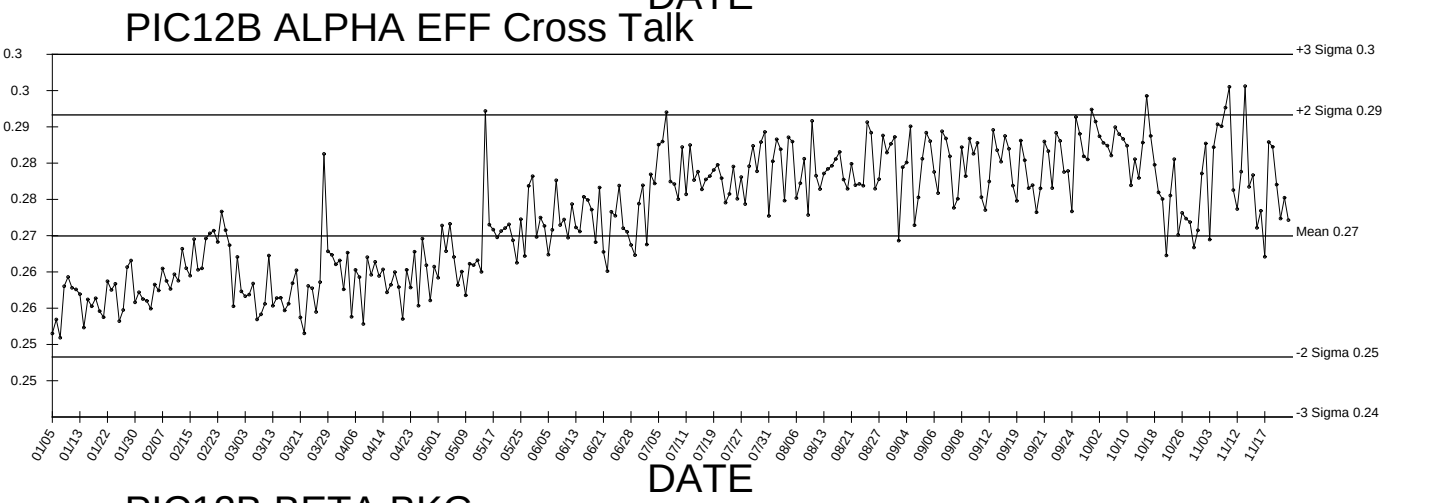


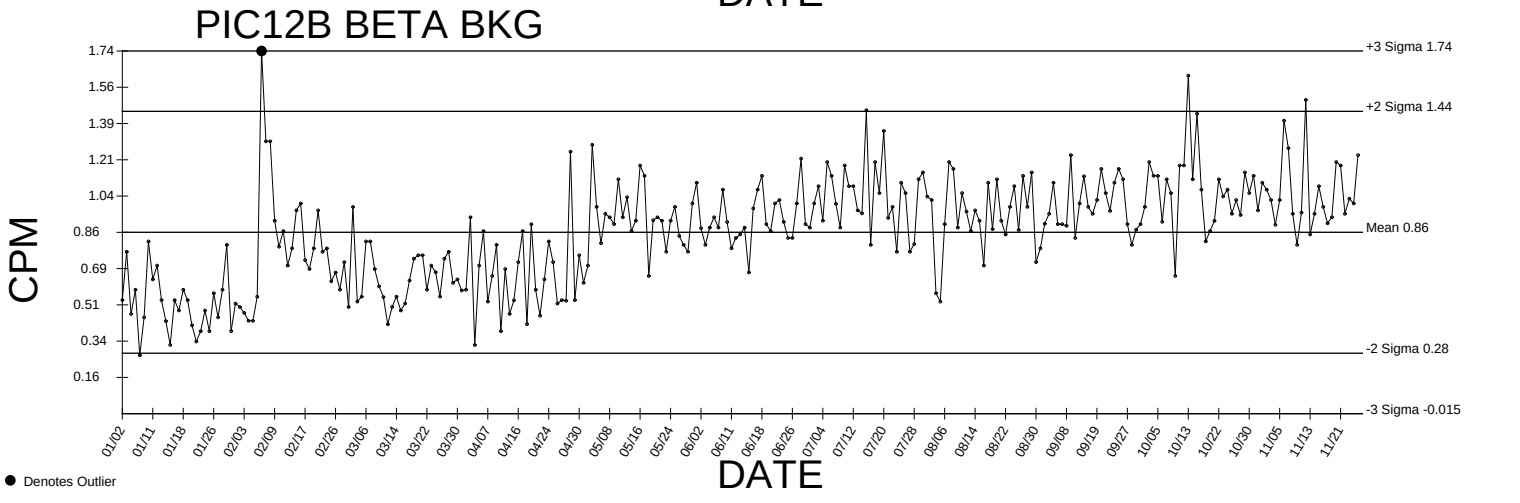


● Denotes Outlier

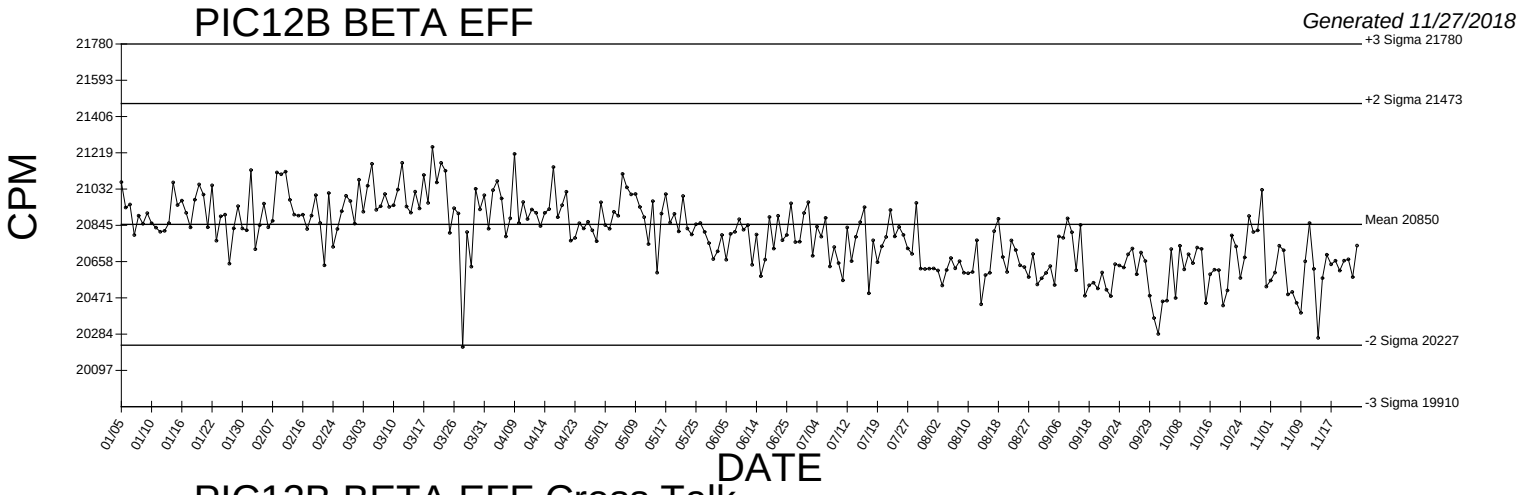


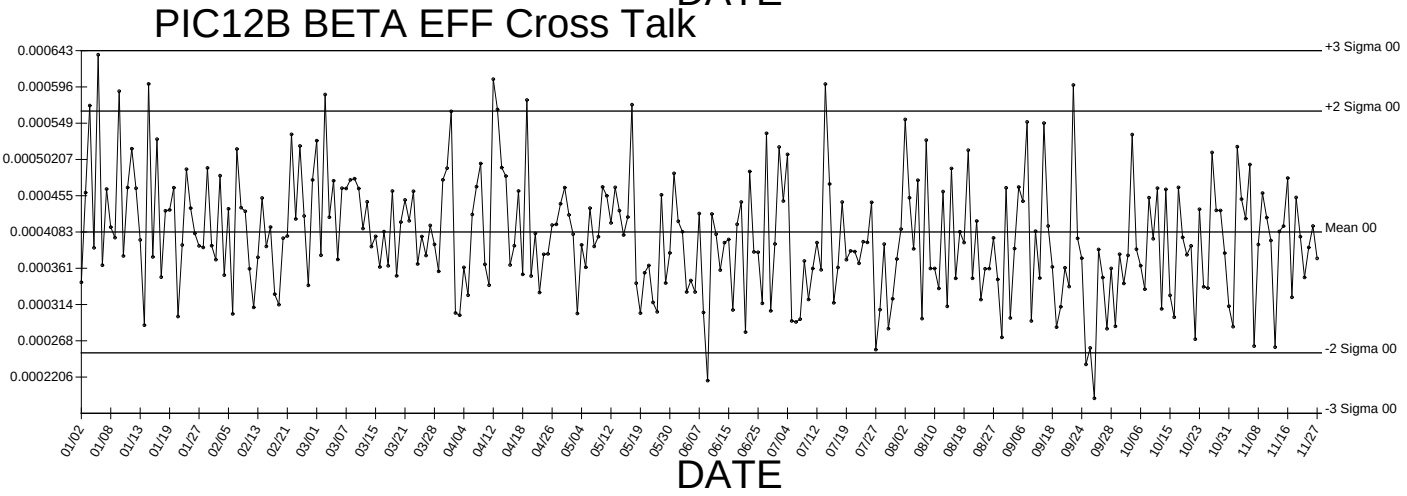




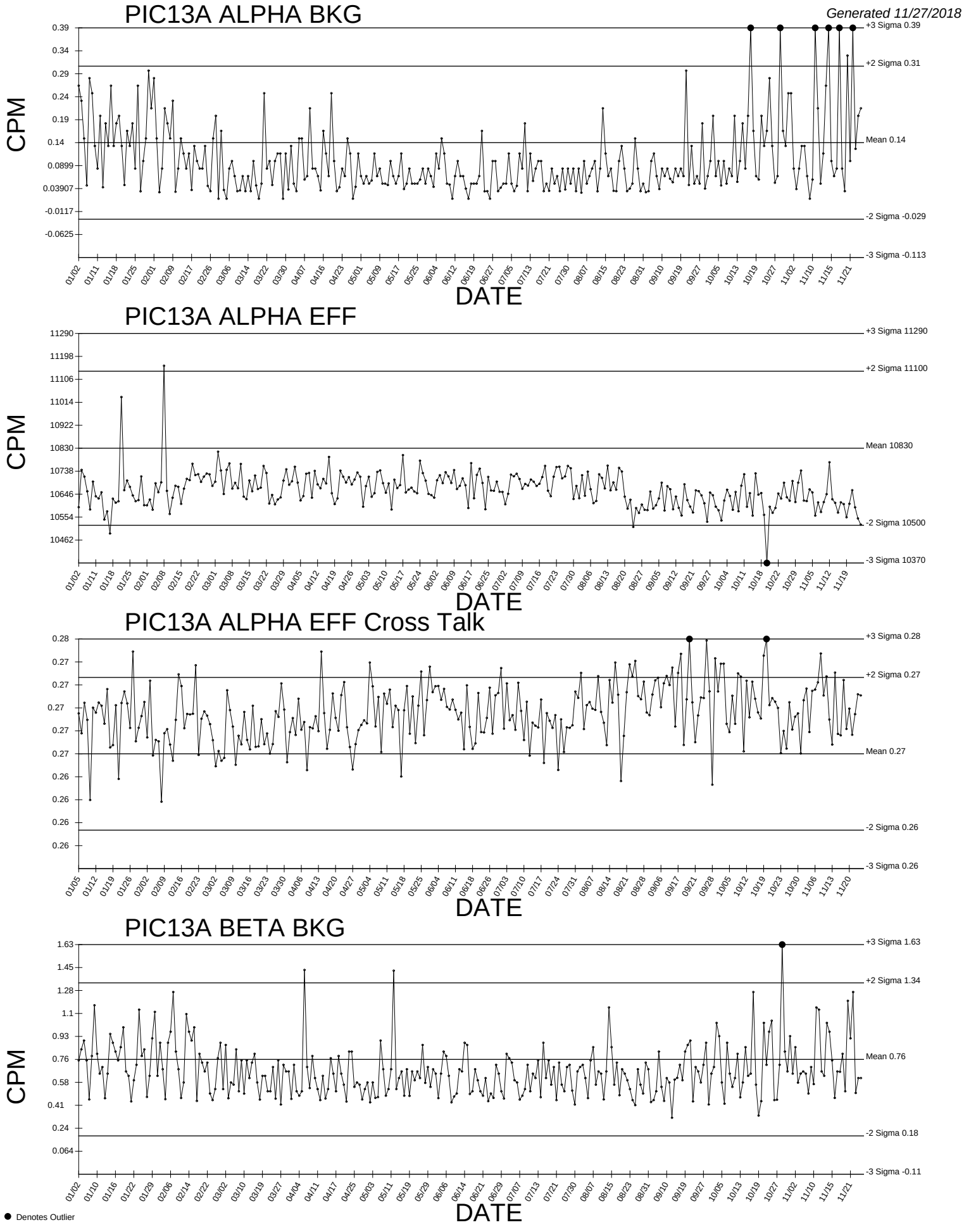


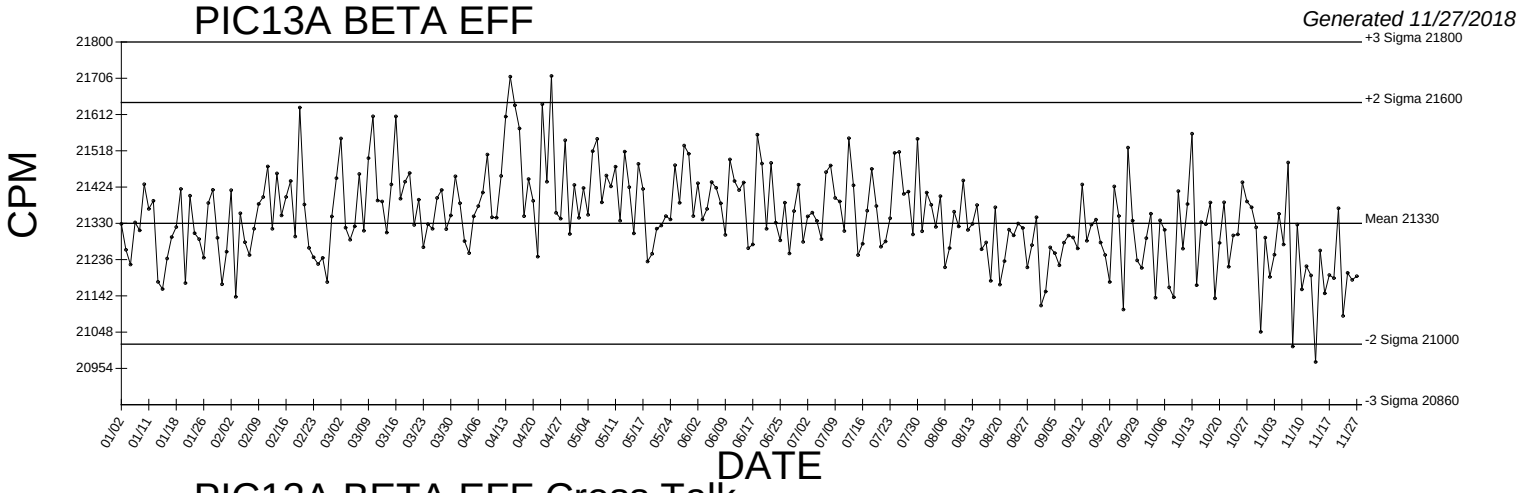
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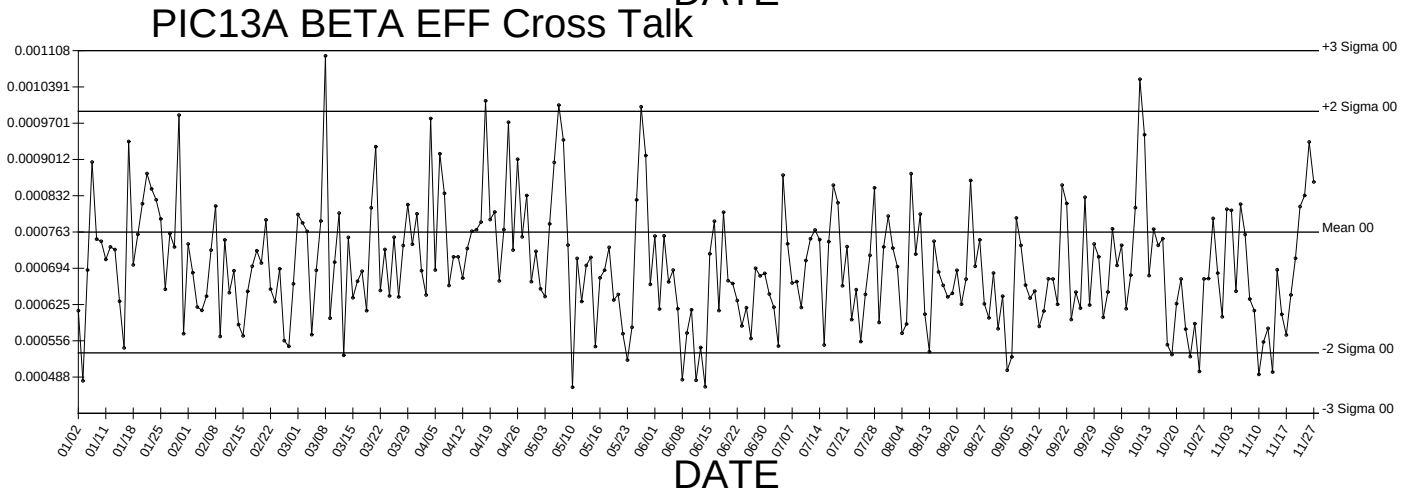




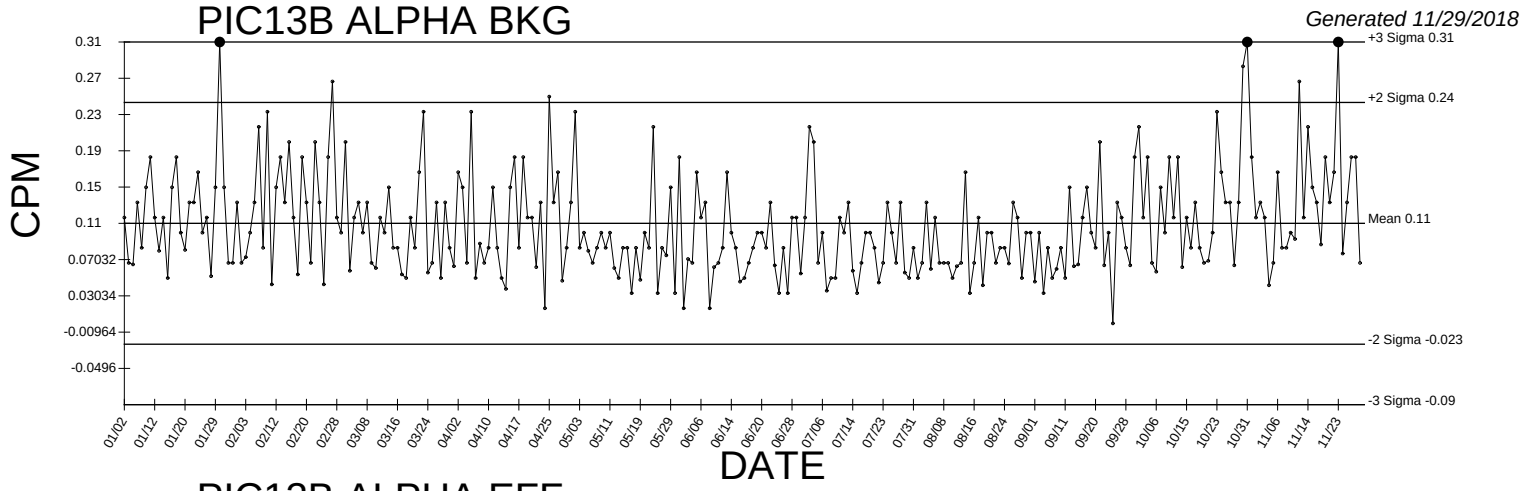
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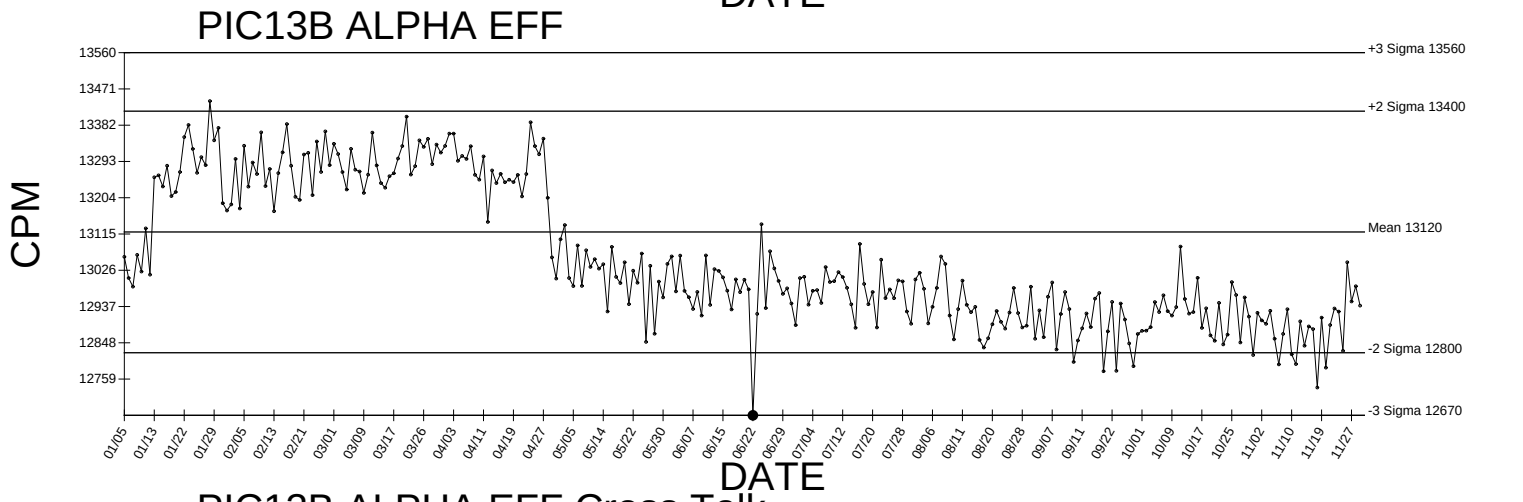

PIC13A ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.39
+2 Sigma 0.31
Mean 0.14
-2 Sigma -0.029
-3 Sigma -0.113
PIC13A ALPHA EFF
+3 Sigma 11290
+2 Sigma 11100
Mean 10830
-2 Sigma 10500
-3 Sigma 10370
PIC13A ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.27
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.26
PIC13A BETA BKG
+3 Sigma 1.63
+2 Sigma 1.34
Mean 0.76
-2 Sigma 0.18
-3 Sigma -0.11
Denotes Outlier

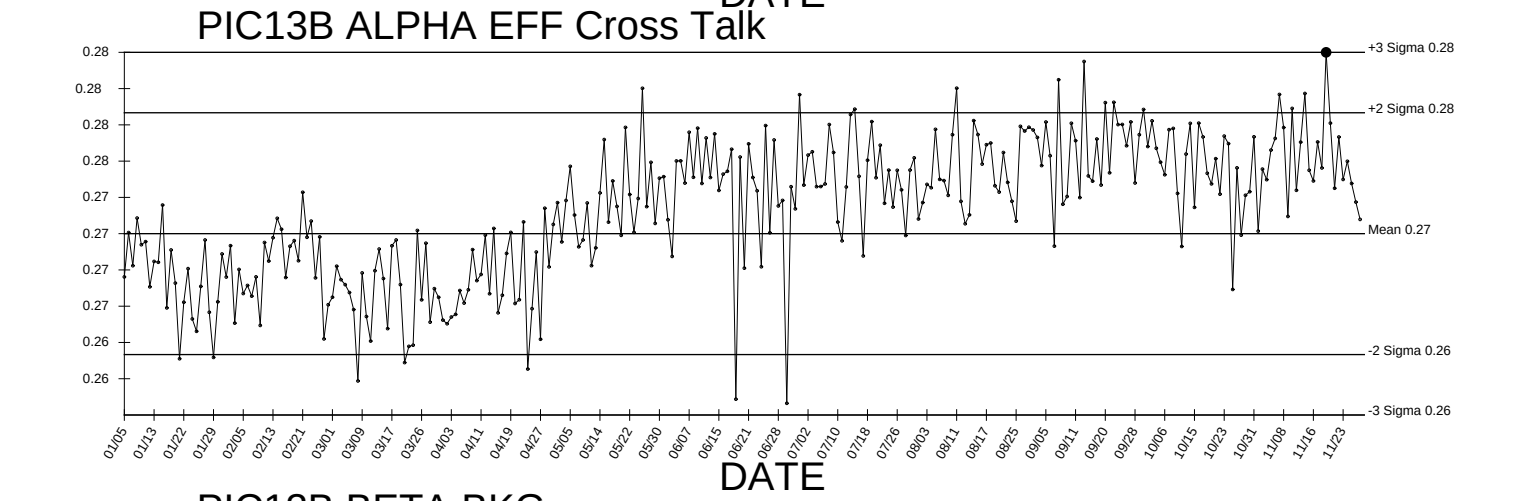


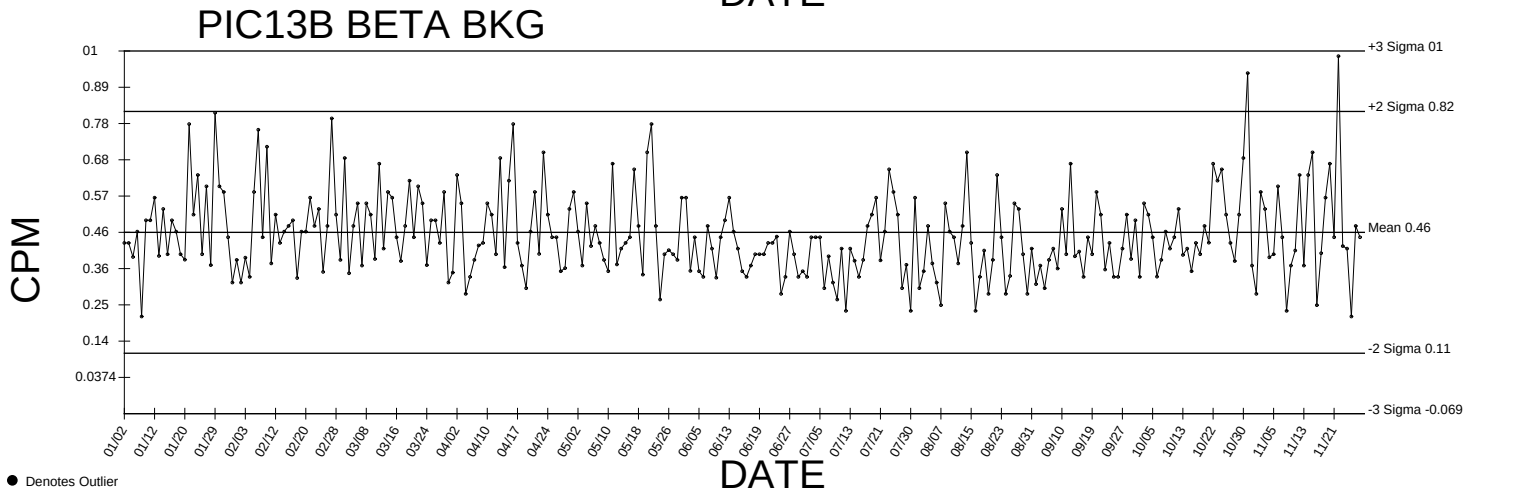


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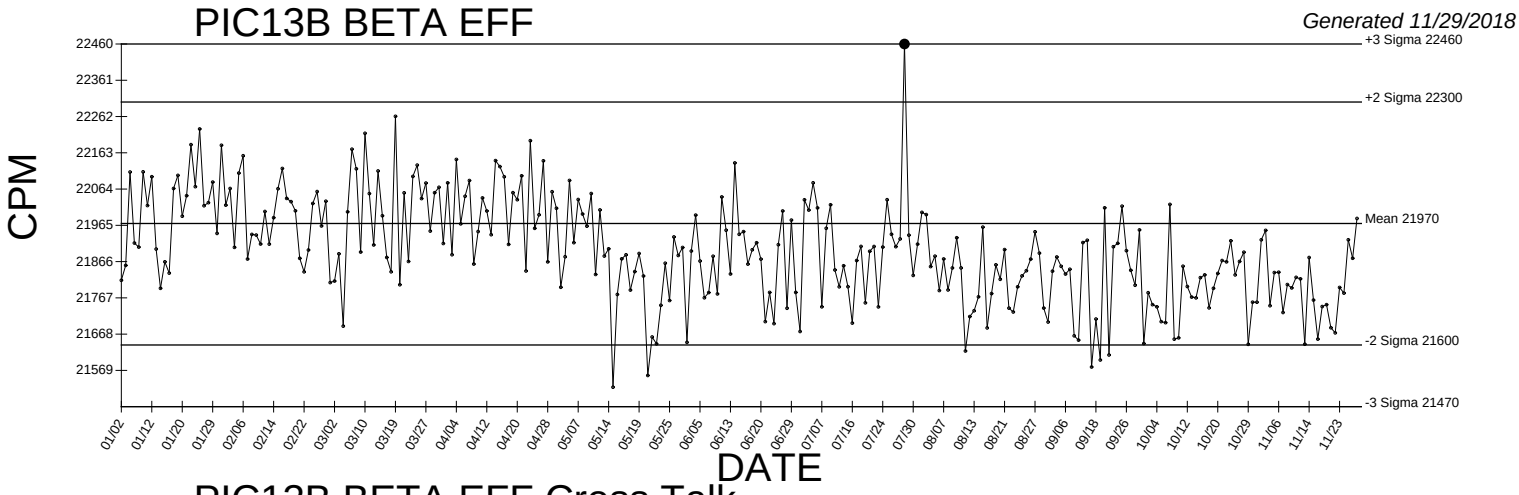


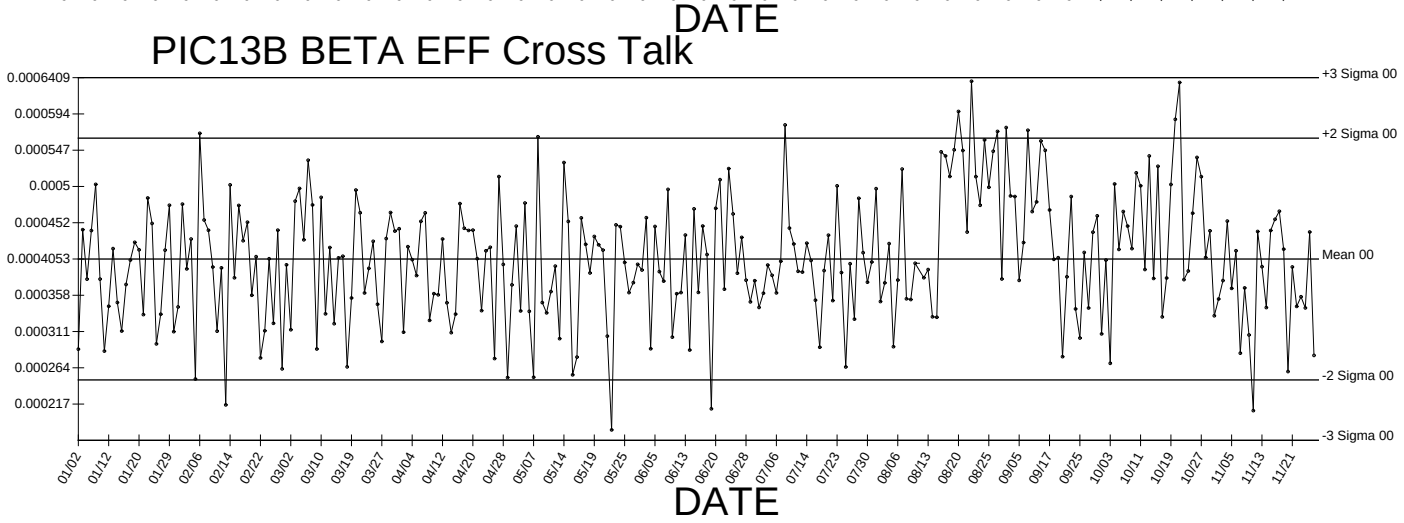




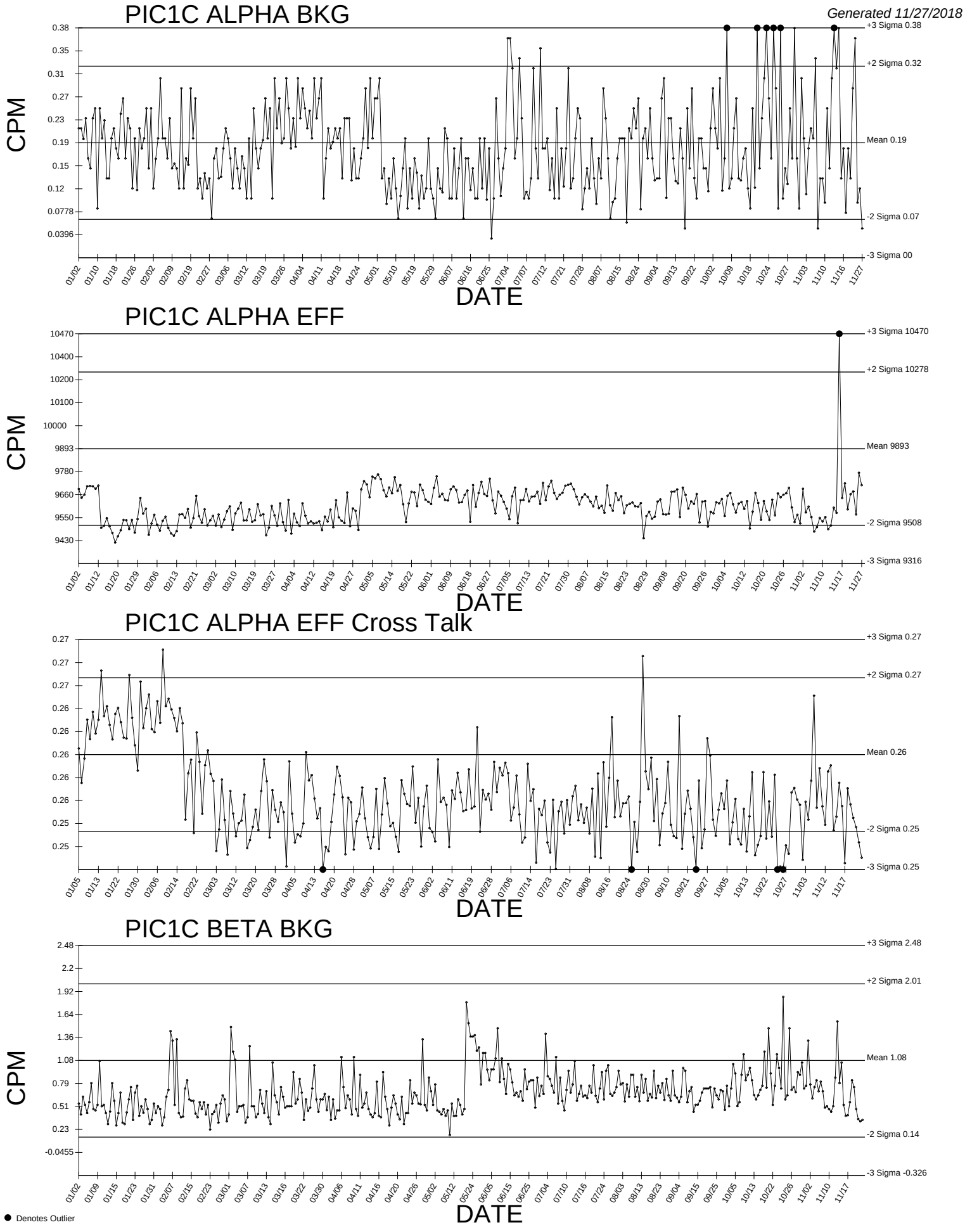


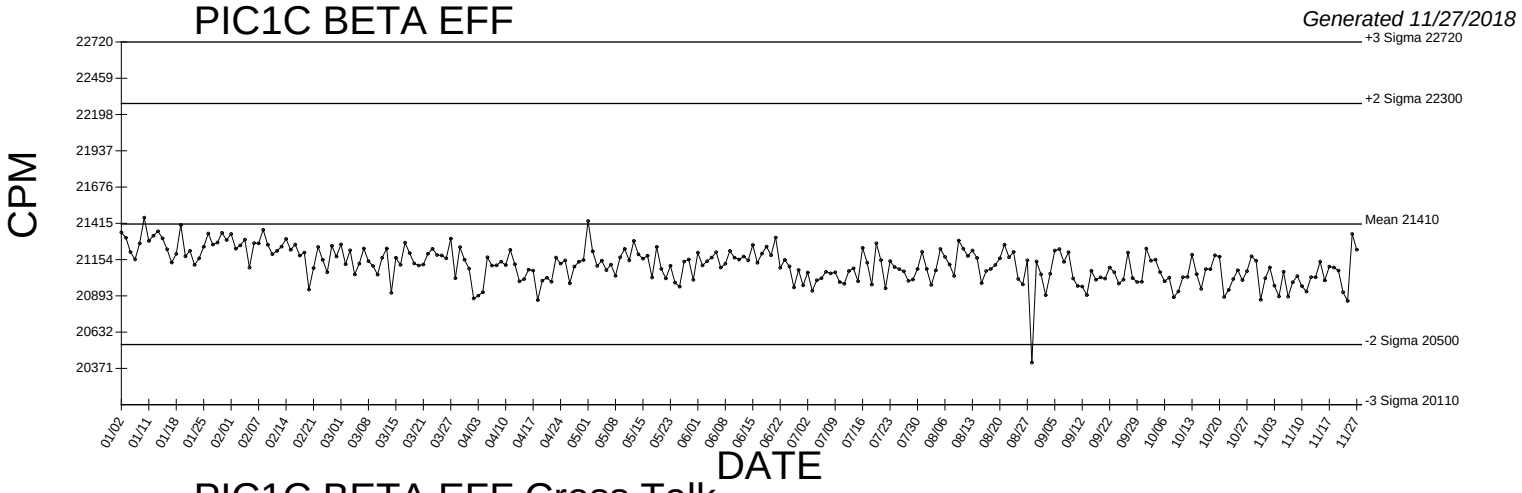
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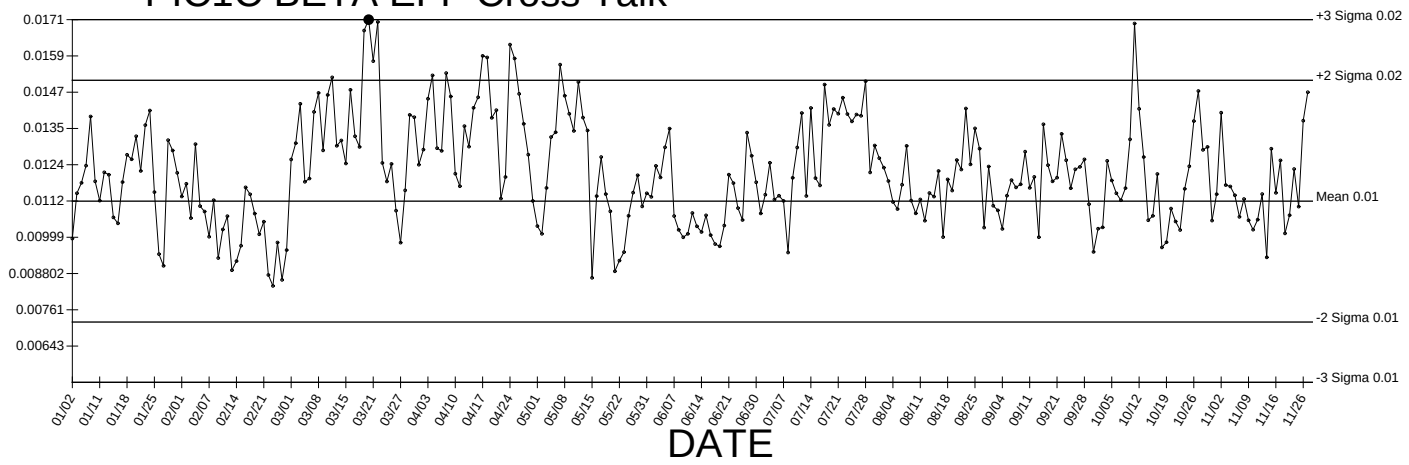




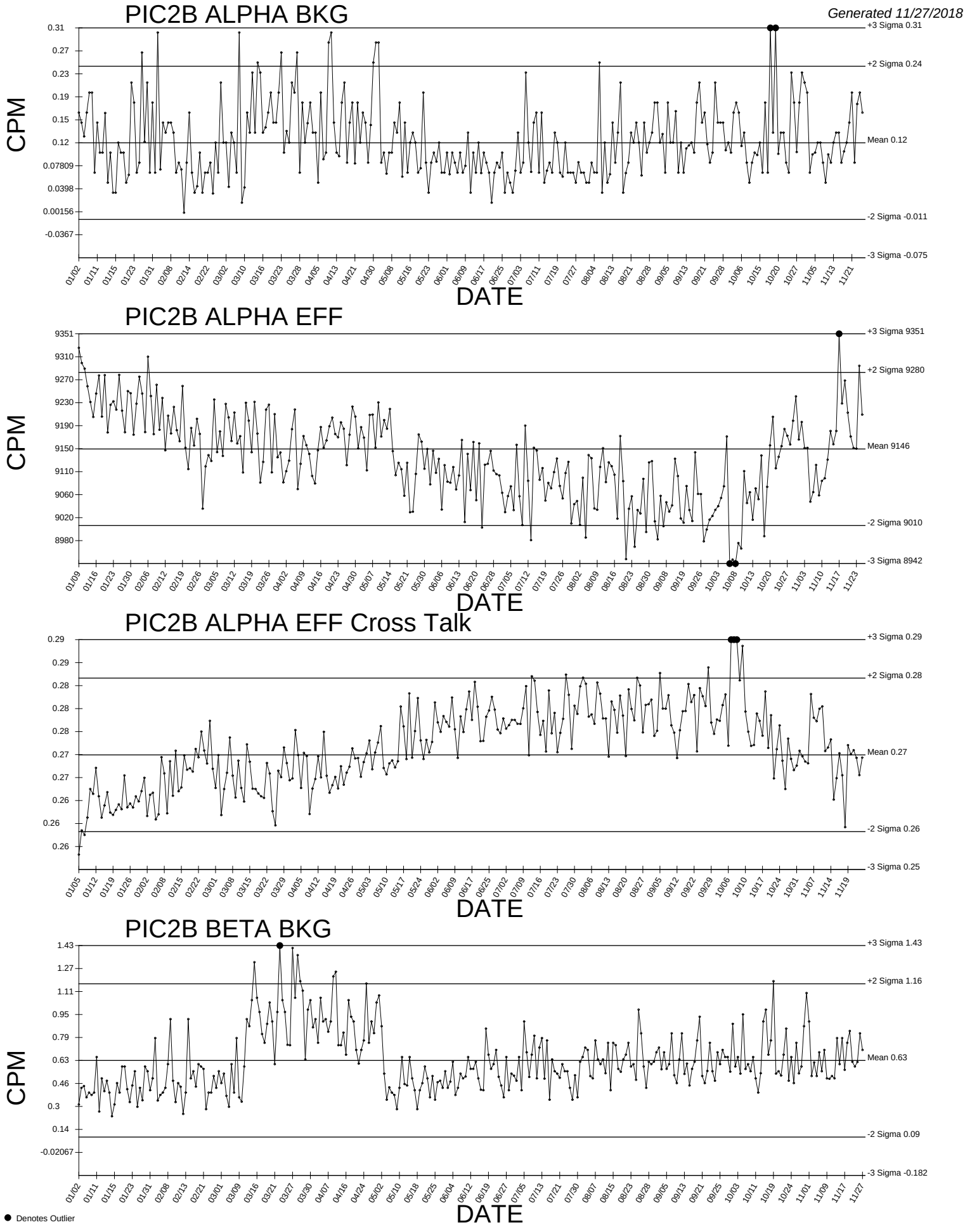
● Denotes Outlier

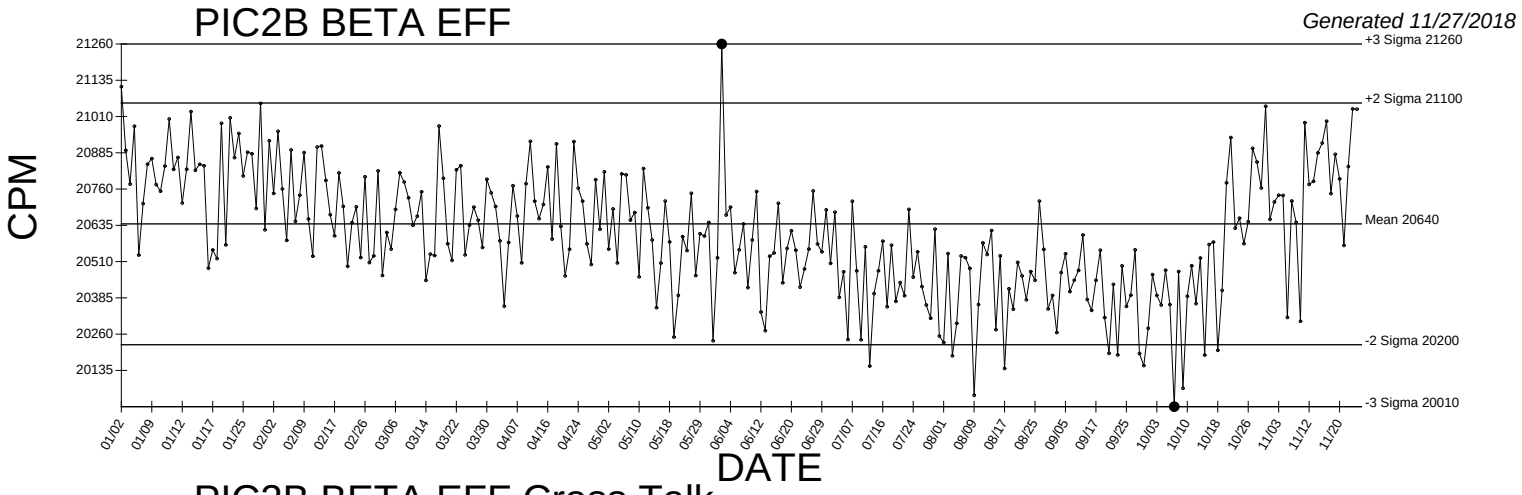

PIC1C ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.32
Mean 0.19
-2 Sigma 0.07
-3 Sigma 00
PIC1C ALPHA EFF
+3 Sigma 10470
+2 Sigma 10278
Mean 9893
-2 Sigma 9508
-3 Sigma 9316
PIC1C ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.25
-3 Sigma 0.25
PIC1C BETA BKG
+3 Sigma 2.48
+2 Sigma 2.01
Mean 1.08
-2 Sigma 0.14
-3 Sigma -0.326
Denotes Outlier

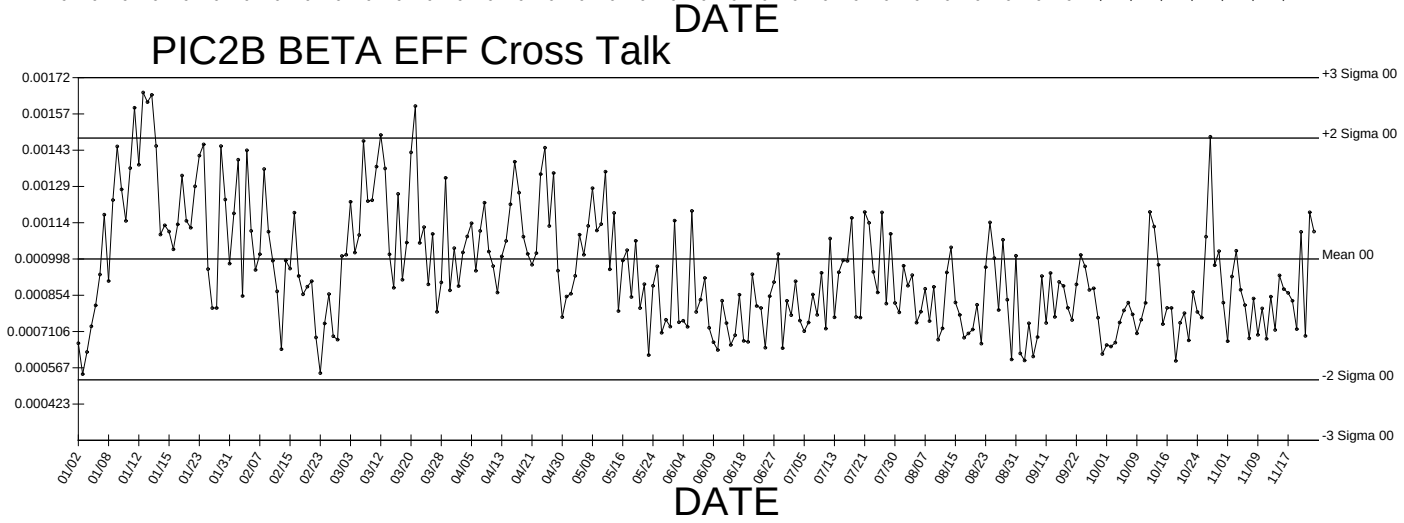




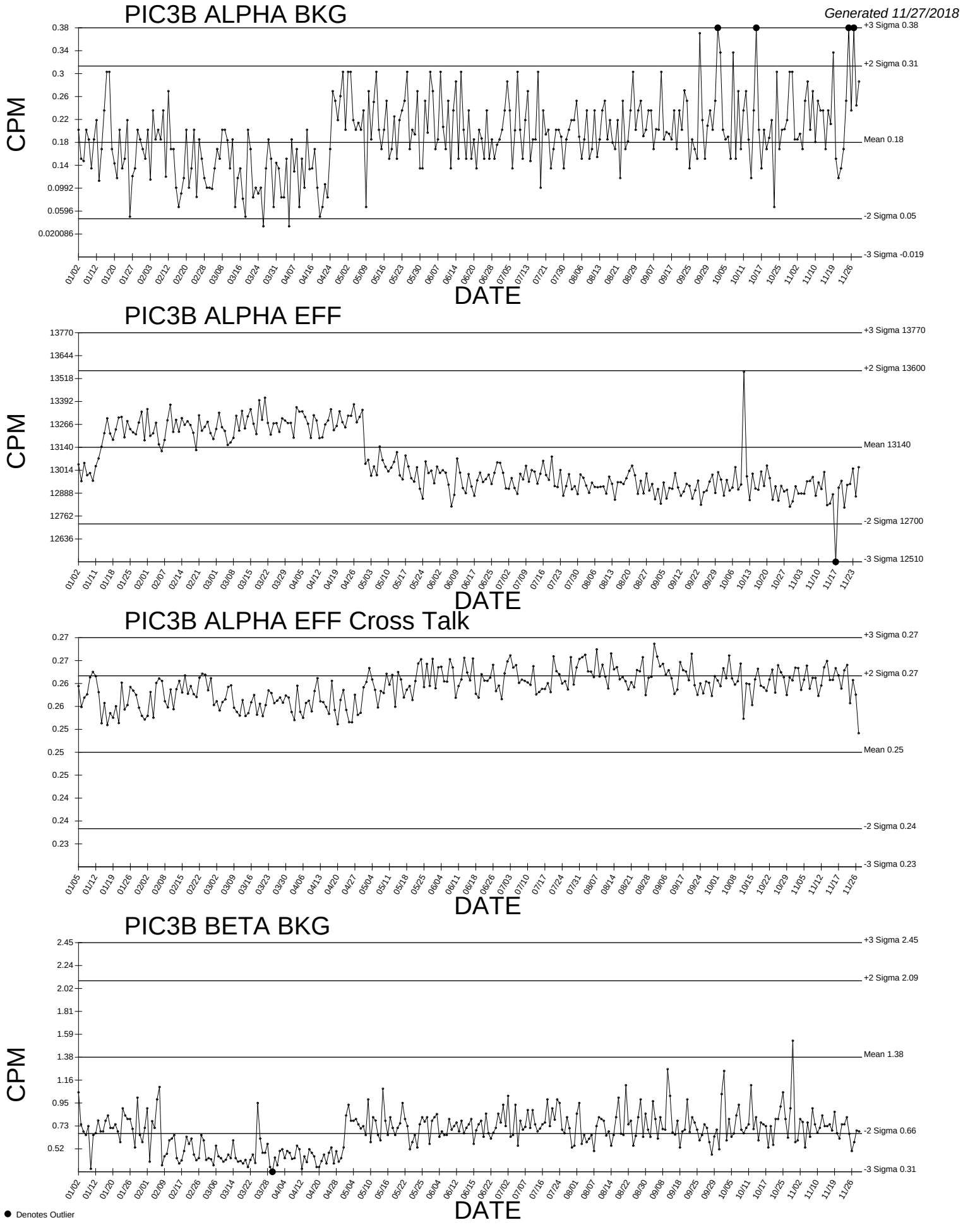
● Denotes Outlier

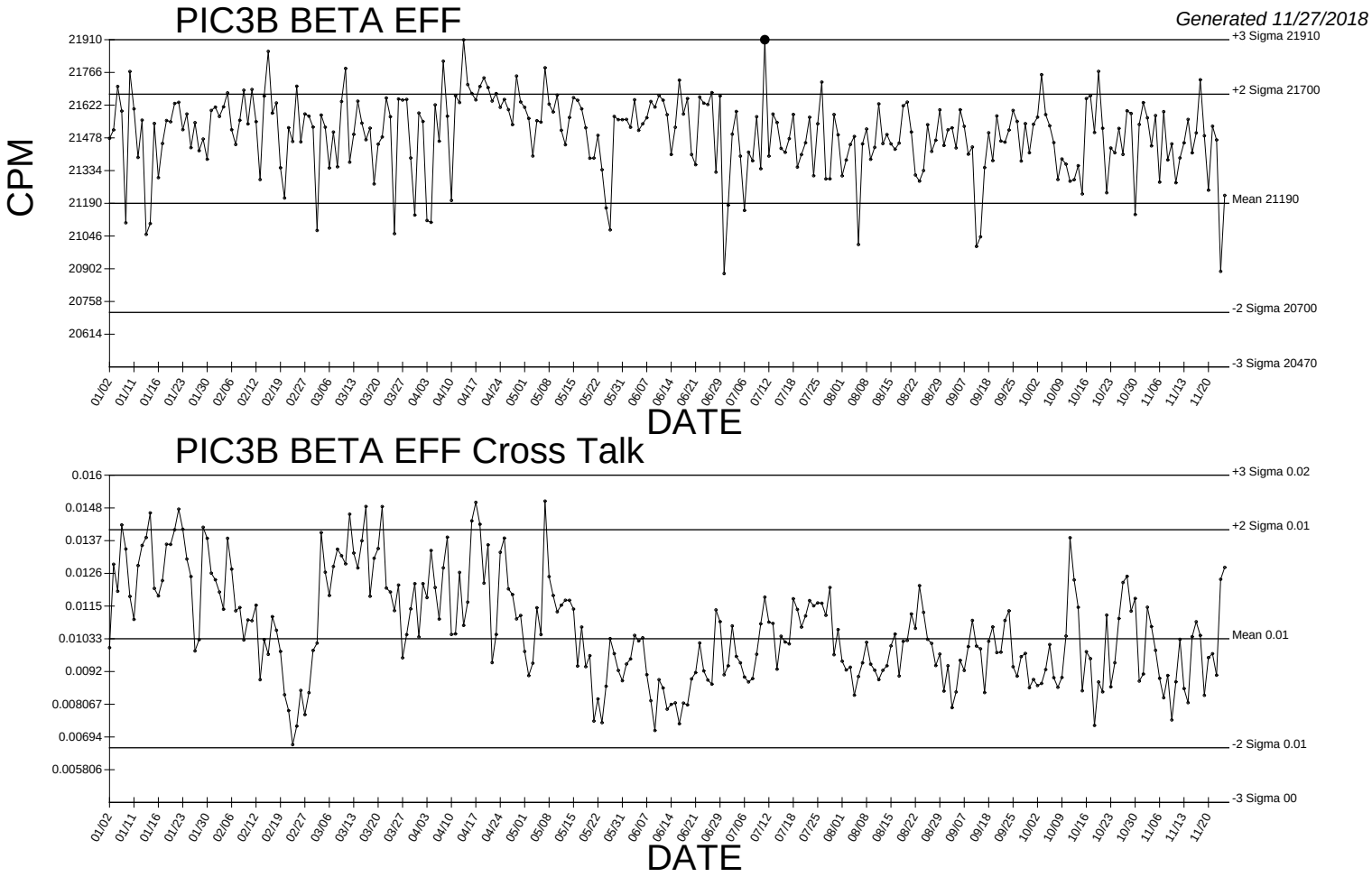

PIC2B ALPHA BKG
Generated 11/27/2018
CPM
0.31
0.27
0.23
0.19
0.15
0.12
0.07809
0.0398
0.00156
-0.0367
+3 Sigma 0.31
+2 Sigma 0.24
Mean 0.12
-2 Sigma -0.011
-3 Sigma -0.075
01/02 01/11 01/15 01/23 01/31 02/08 02/14 02/22 03/02 03/10 03/16 03/23 03/28 04/05 04/13 04/21 04/30 05/08 05/16 05/23 06/01 06/09 06/17 06/25 07/03 07/11 07/19 07/27 08/04 08/13 08/21 08/28 09/05 09/13 09/21 09/28 10/06 10/15 10/20 10/27 11/05 11/13 11/21
DATE
PIC2B ALPHA EFF
CPM
9351
9310
9270
9230
9190
9150
9110
9060
9020
8980
+3 Sigma 9351
+2 Sigma 9280
Mean 9146
-2 Sigma 9010
-3 Sigma 8942
01/09 01/16 01/23 01/30 02/06 02/12 02/19 02/26 03/05 03/12 03/19 03/26 04/02 04/09 04/16 04/23 04/30 05/07 05/14 05/21 05/30 06/06 06/13 06/20 06/28 07/05 07/12 07/19 07/26 08/02 08/09 08/16 08/23 08/30 09/08 09/19 09/26 10/03 10/08 10/13 10/20 10/27 11/03 11/10 11/17 11/23
DATE
PIC2B ALPHA EFF Cross Talk
0.29
0.29
0.28
0.28
0.28
0.27
0.27
0.26
0.26
+3 Sigma 0.29
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
01/05 01/12 01/19 01/26 02/02 02/08 02/15 02/22 03/01 03/08 03/15 03/22 03/29 04/05 04/12 04/19 04/26 05/03 05/10 05/17 05/24 06/02 06/09 06/17 06/25 07/02 07/09 07/16 07/23 07/30 08/06 08/13 08/20 08/27 09/05 09/12 09/22 09/29 10/06 10/10 10/17 10/24 10/31 11/07 11/14 11/19
DATE
PIC2B BETA BKG
CPM
1.43
1.27
1.11
0.95
0.79
0.63
0.46
0.3
0.14
-0.02067
+3 Sigma 1.43
+2 Sigma 1.16
Mean 0.63
-2 Sigma 0.09
-3 Sigma -0.182
01/02 01/11 01/15 01/23 01/31 02/08 02/13 02/21 03/01 03/09 03/16 03/21 03/27 03/30 04/07 04/16 04/24 05/02 05/10 05/18 05/25 06/04 06/12 06/19 06/27 07/05 07/13 07/21 07/30 08/07 08/15 08/23 08/28 09/05 09/13 09/21 09/25 10/03 10/11 10/19 10/24 11/01 11/09 11/17 11/27
DATE
Denotes Outlier



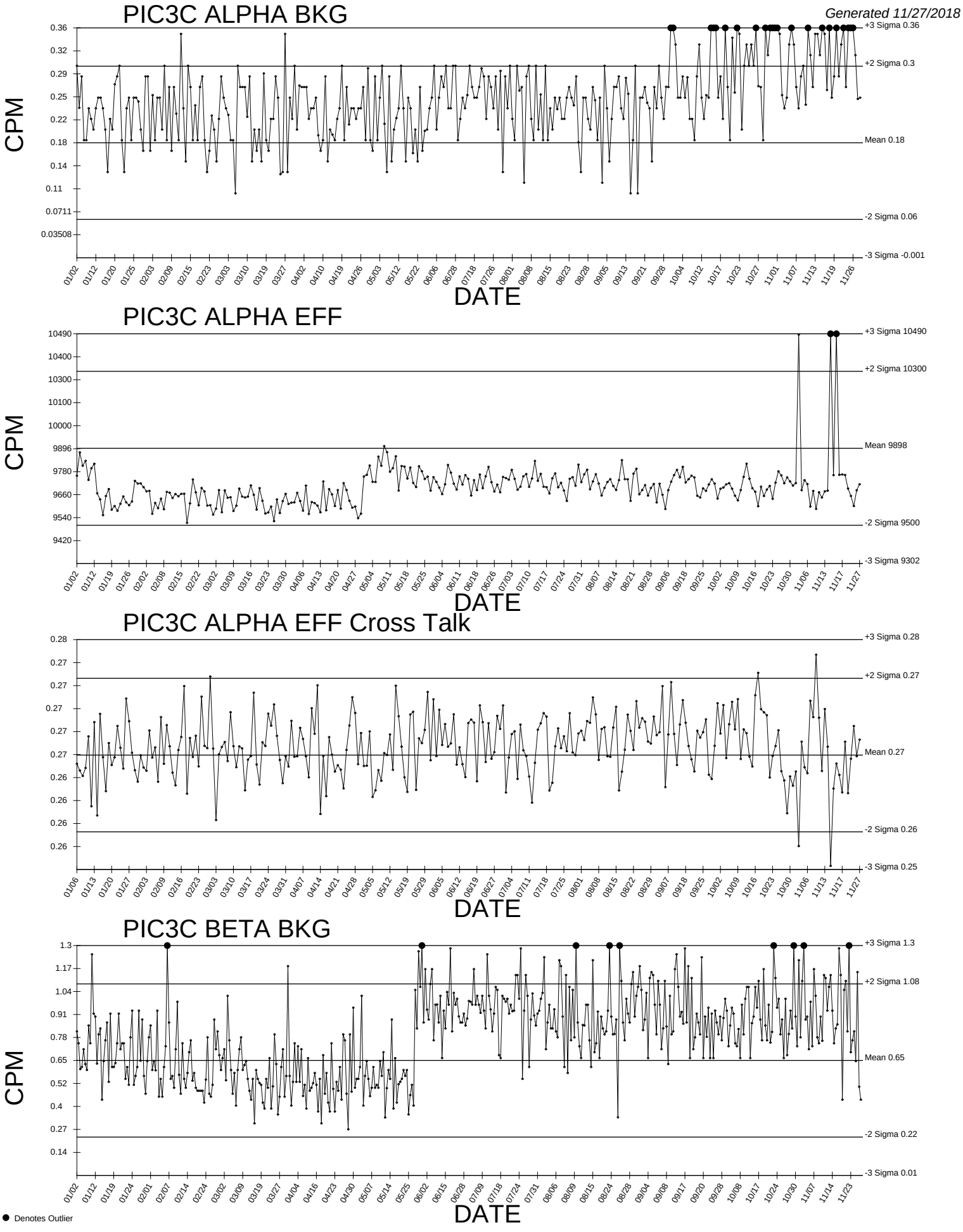


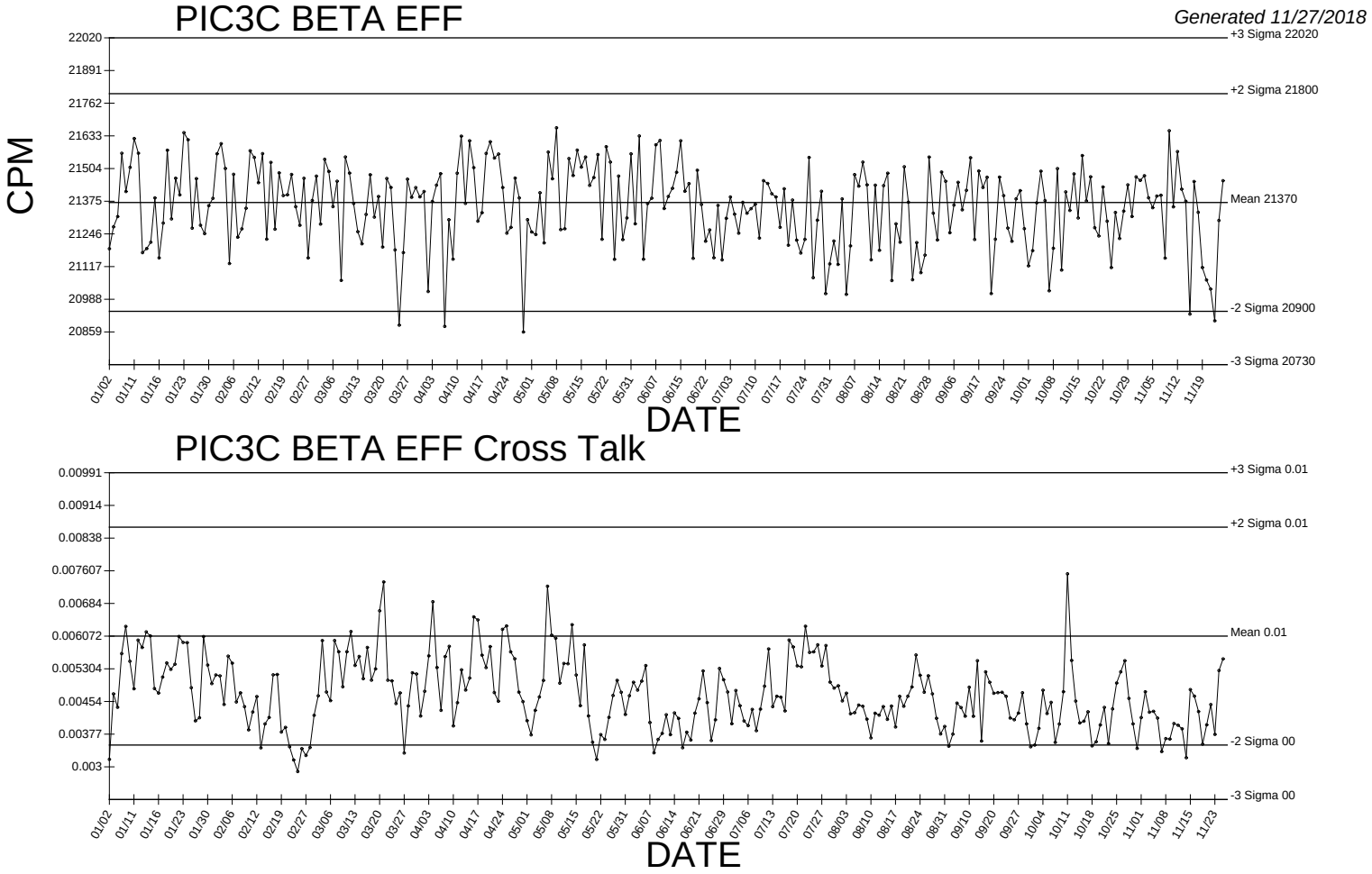
● Denotes Outlier


PIC3B ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.31
Mean 0.18
-2 Sigma 0.05
-3 Sigma -0.019
PIC3B ALPHA EFF
+3 Sigma 13770
+2 Sigma 13600
Mean 13140
-2 Sigma 12700
-3 Sigma 12510
PIC3B ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.25
-2 Sigma 0.24
-3 Sigma 0.23
PIC3B BETA BKG
+3 Sigma 2.45
+2 Sigma 2.09
Mean 1.38
-2 Sigma 0.66
-3 Sigma 0.31
Denotes Outlier

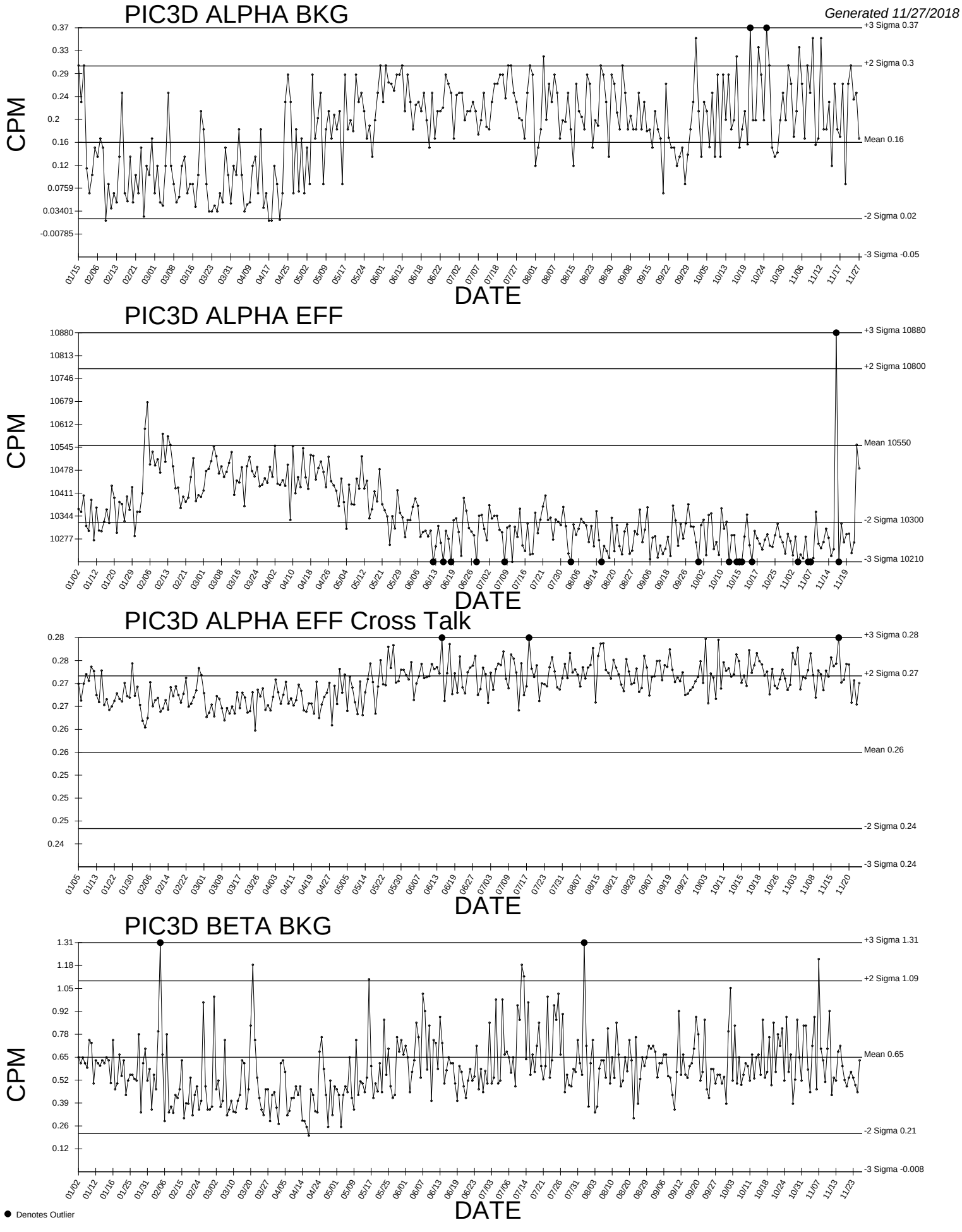


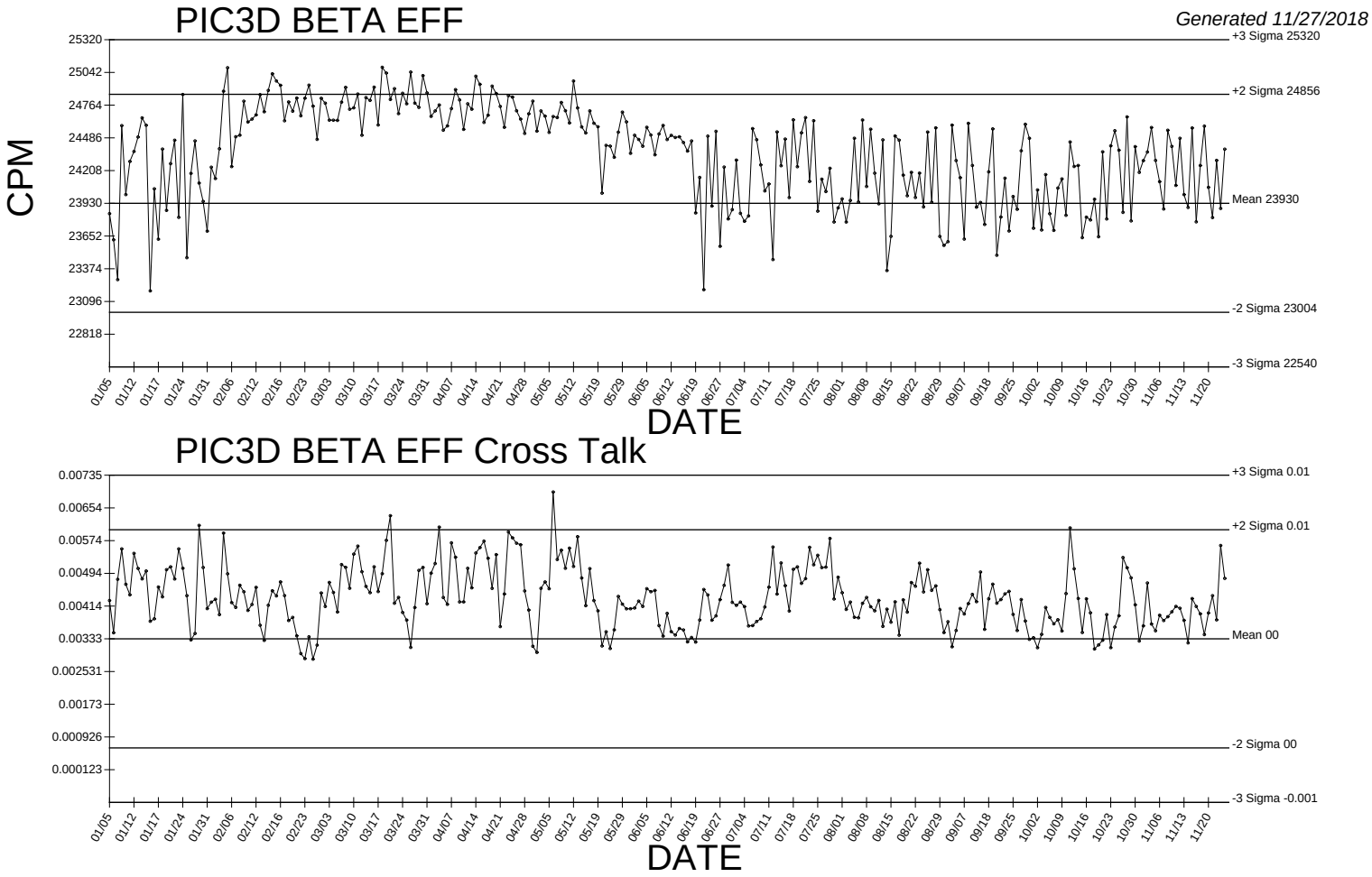
● Denotes Outlier


PIC3C ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.18
-2 Sigma 0.06
-3 Sigma -0.001
PIC3C ALPHA EFF
+3 Sigma 10490
+2 Sigma 10300
Mean 9898
-2 Sigma 9500
-3 Sigma 9302
PIC3C ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.27
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
PIC3C BETA BKG
+3 Sigma 1.3
+2 Sigma 1.08
Mean 0.65
-2 Sigma 0.22
-3 Sigma 0.01
Denotes Outlier

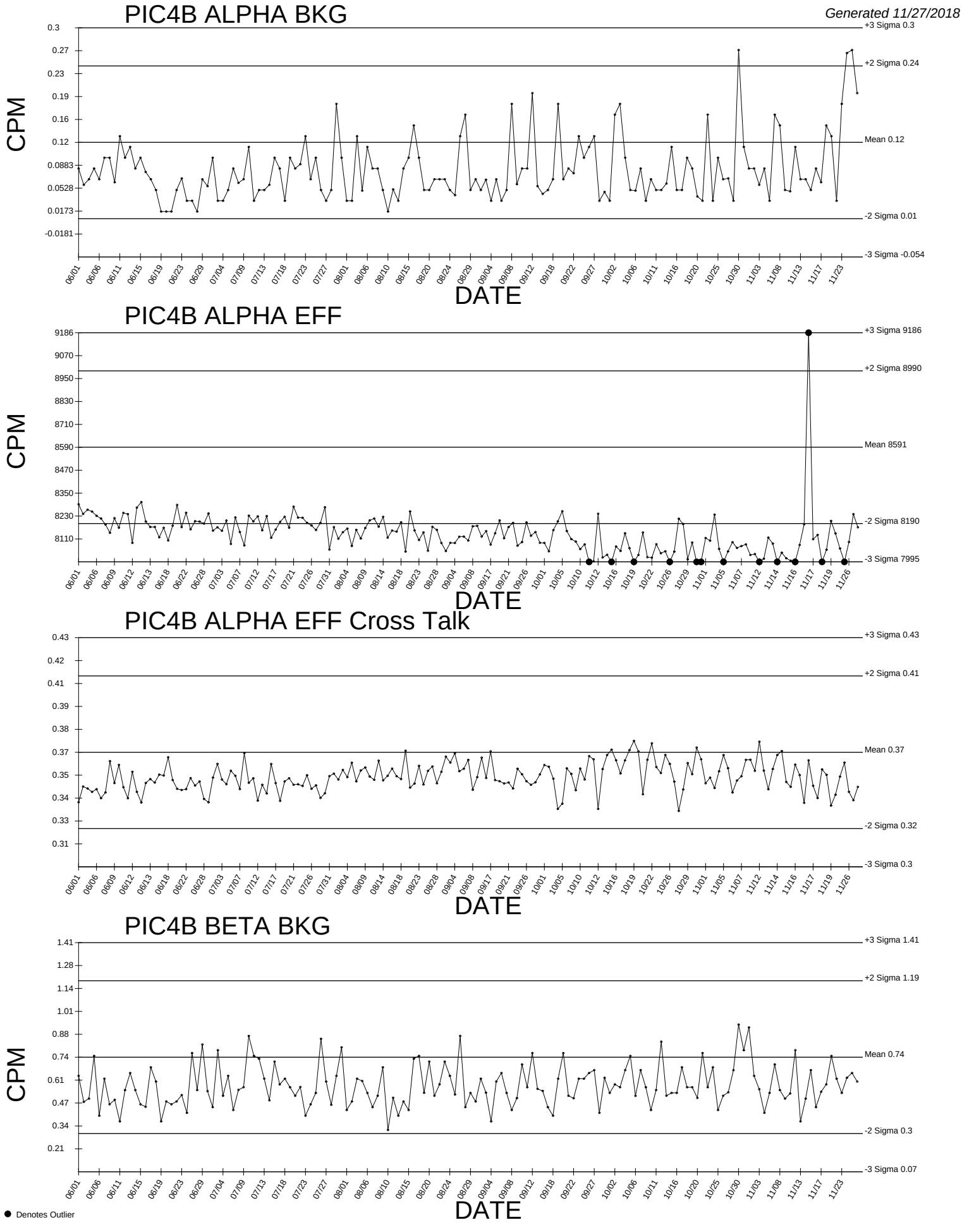


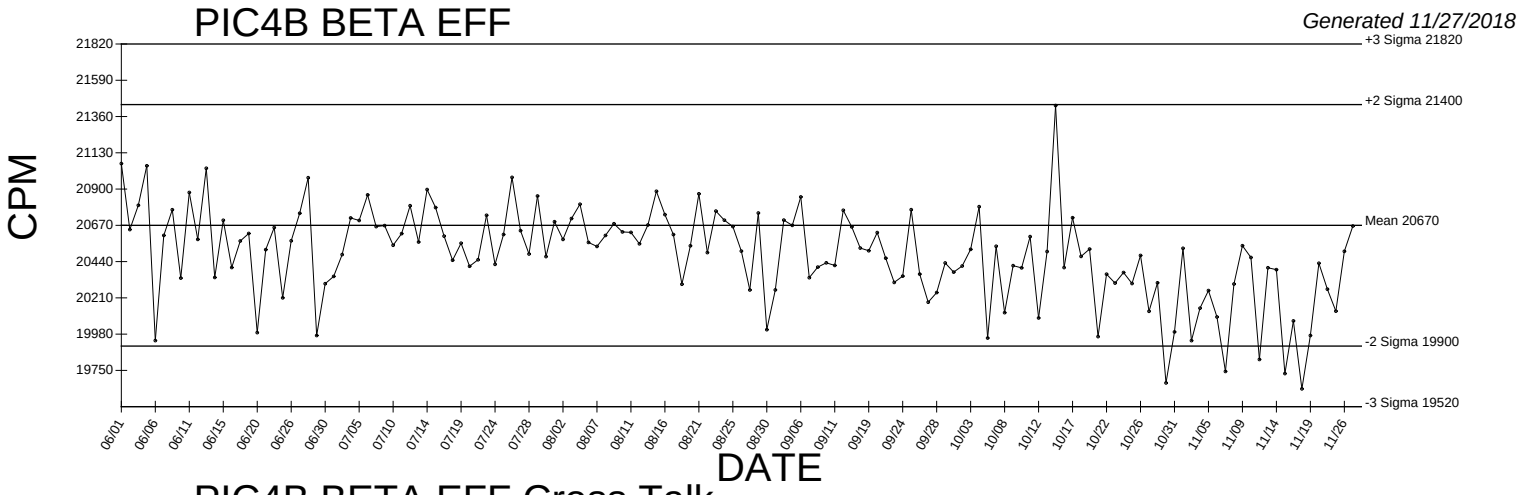
● Denotes Outlier

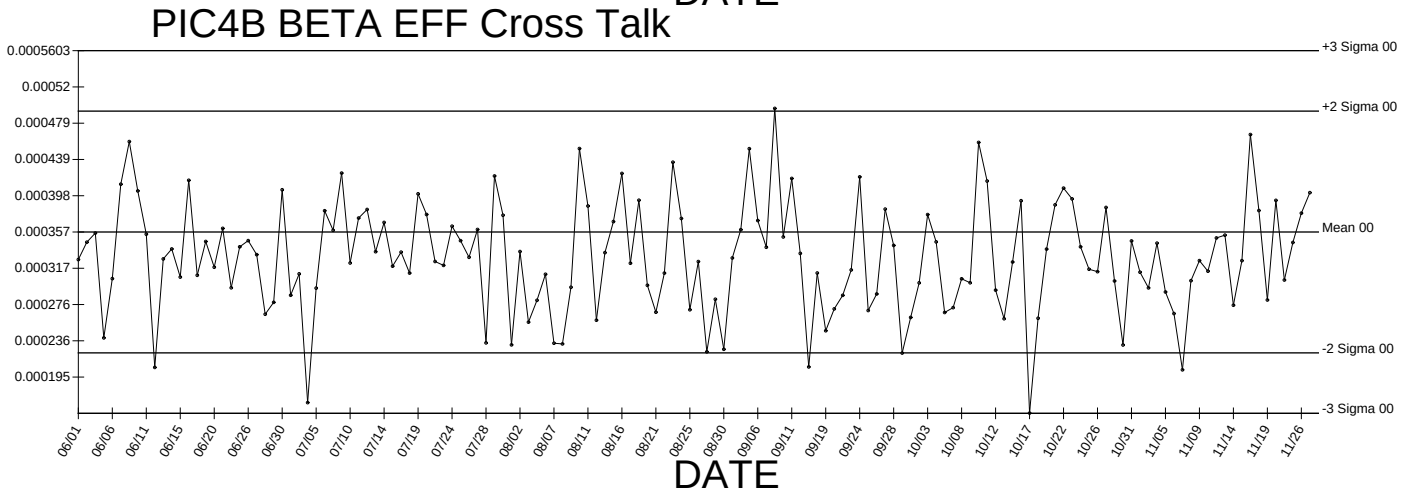

PIC3D ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.37
+2 Sigma 0.3
Mean 0.16
-2 Sigma 0.02
-3 Sigma -0.05
PIC3D ALPHA EFF
+3 Sigma 10880
+2 Sigma 10800
Mean 10550
-2 Sigma 10300
-3 Sigma 10210
PIC3D ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.24
-3 Sigma 0.24
PIC3D BETA BKG
+3 Sigma 1.31
+2 Sigma 1.09
Mean 0.65
-2 Sigma 0.21
-3 Sigma -0.008
Denotes Outlier



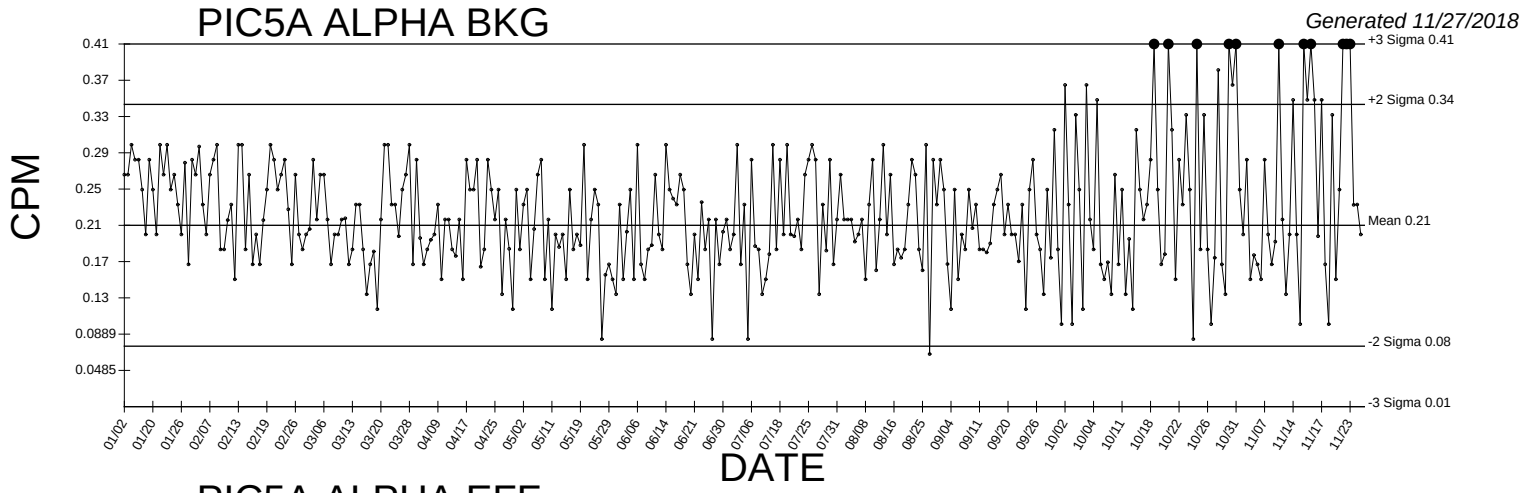
● Denotes Outlier

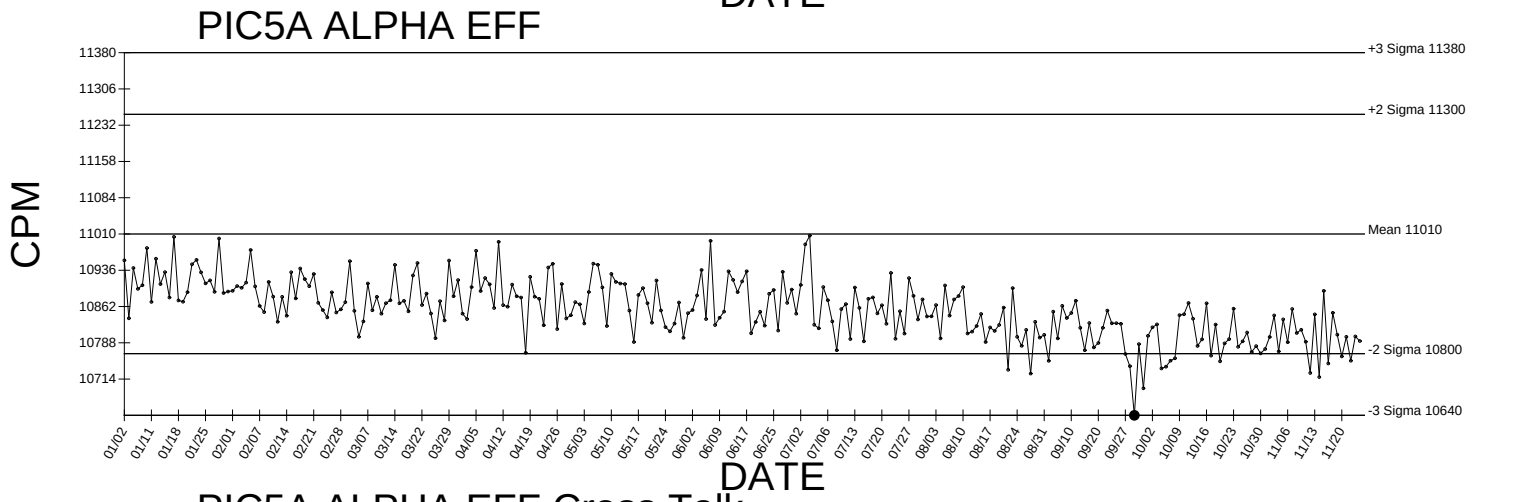

PIC4B ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.3
+2 Sigma 0.24
Mean 0.12
-2 Sigma 0.01
-3 Sigma -0.054
PIC4B ALPHA EFF
+3 Sigma 9186
+2 Sigma 8990
Mean 8591
-2 Sigma 8190
-3 Sigma 7995
PIC4B ALPHA EFF Cross Talk
+3 Sigma 0.43
+2 Sigma 0.41
Mean 0.37
-2 Sigma 0.32
-3 Sigma 0.3
PIC4B BETA BKG
+3 Sigma 1.41
+2 Sigma 1.19
Mean 0.74
-2 Sigma 0.3
-3 Sigma 0.07
Denotes Outlier

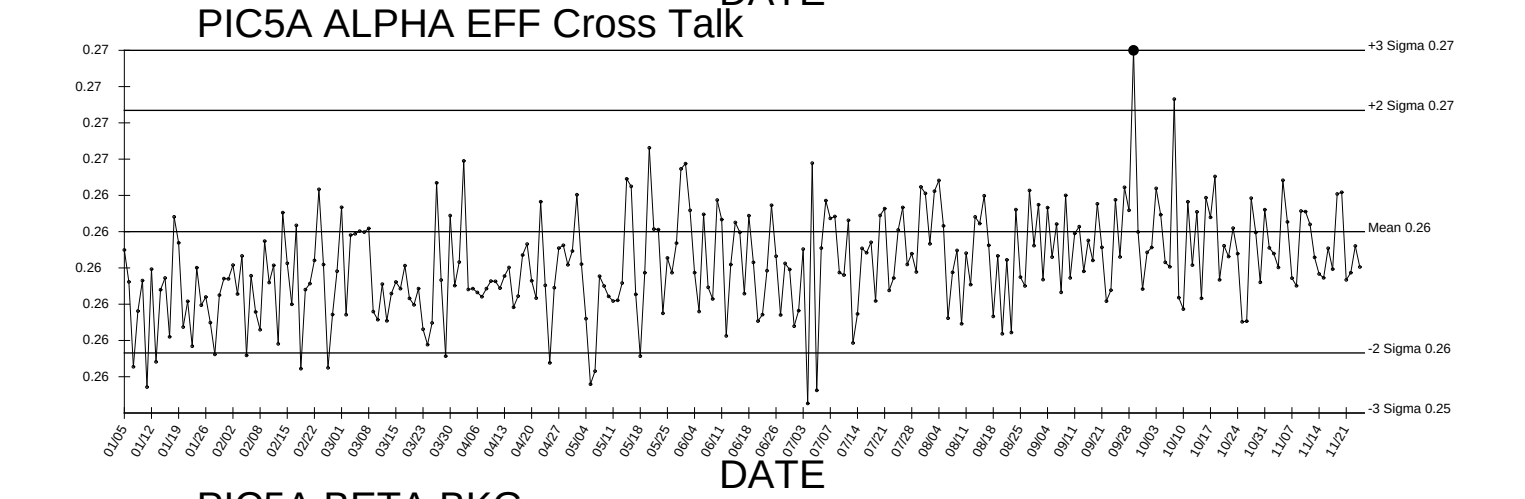


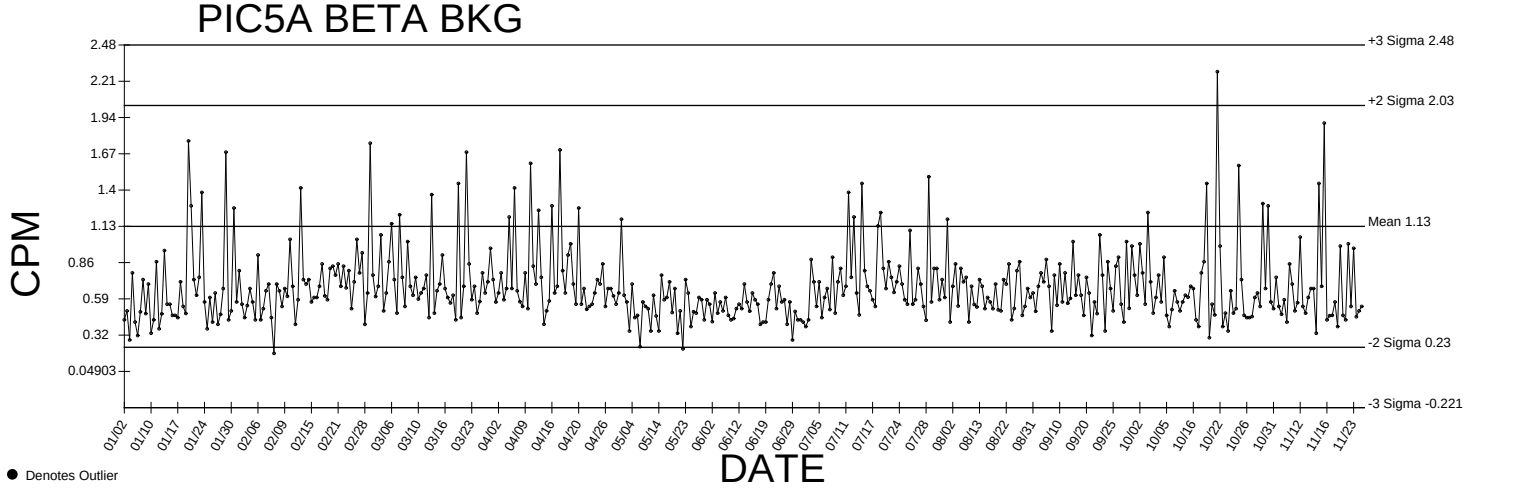


● Denotes Outlier

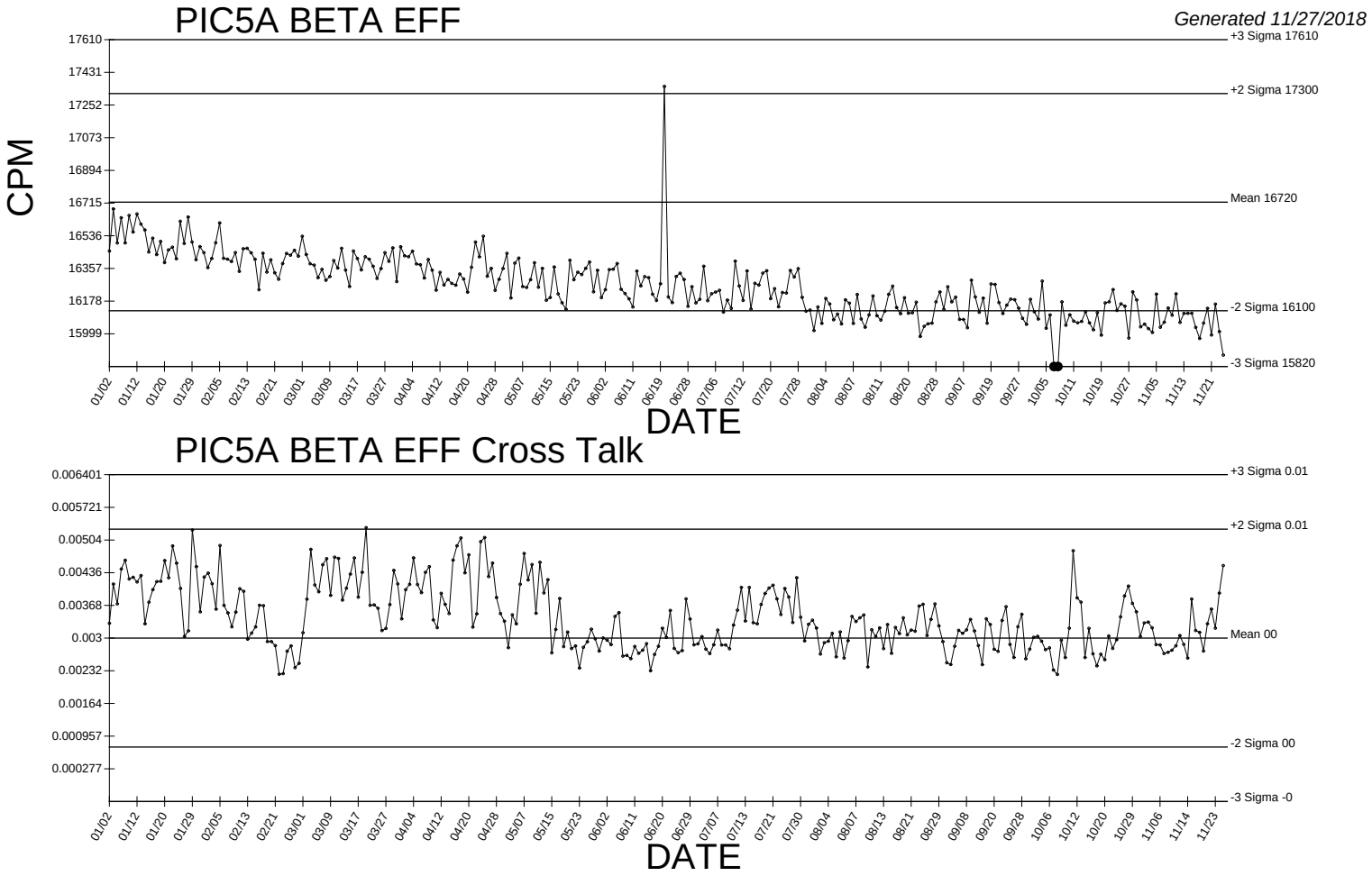




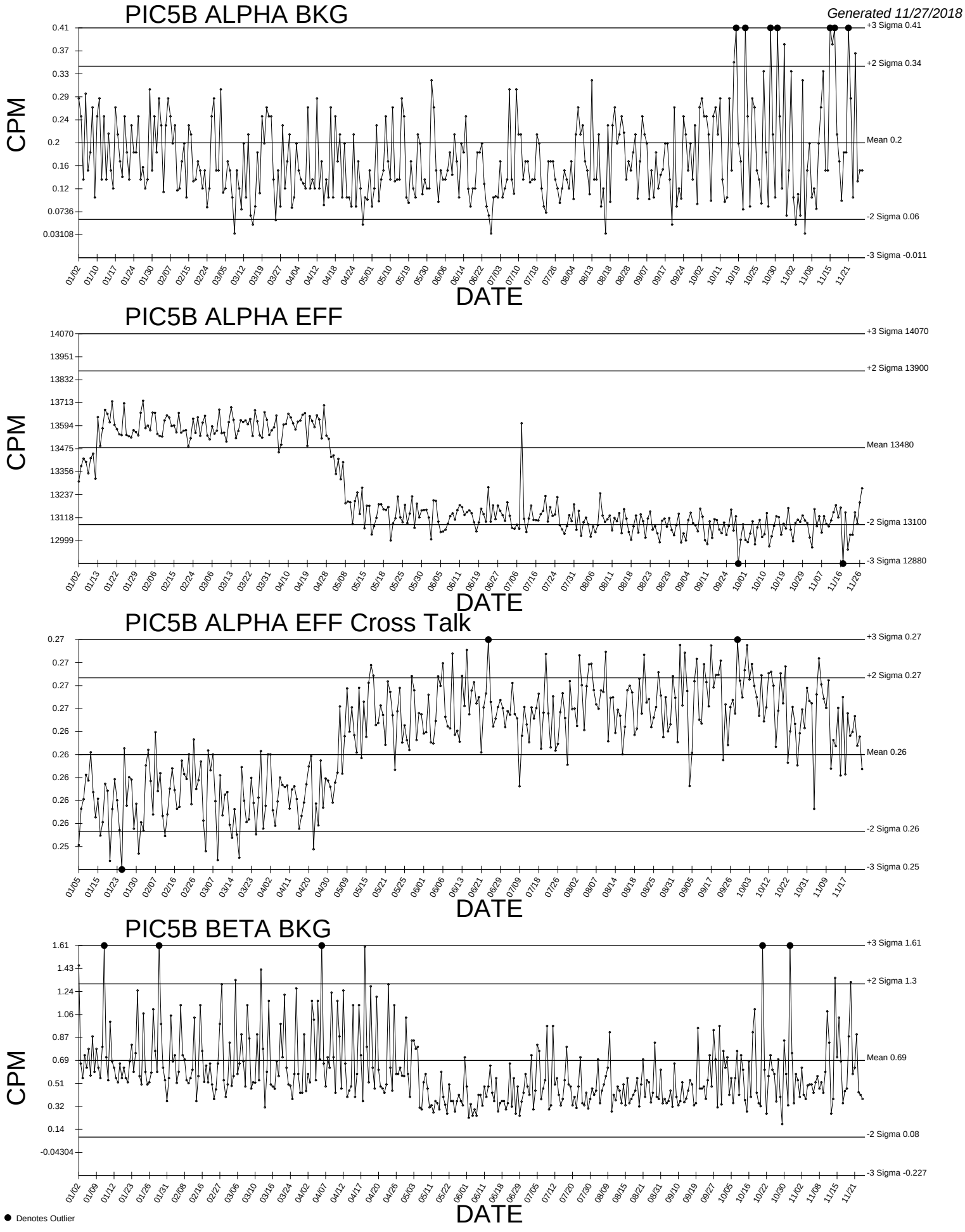


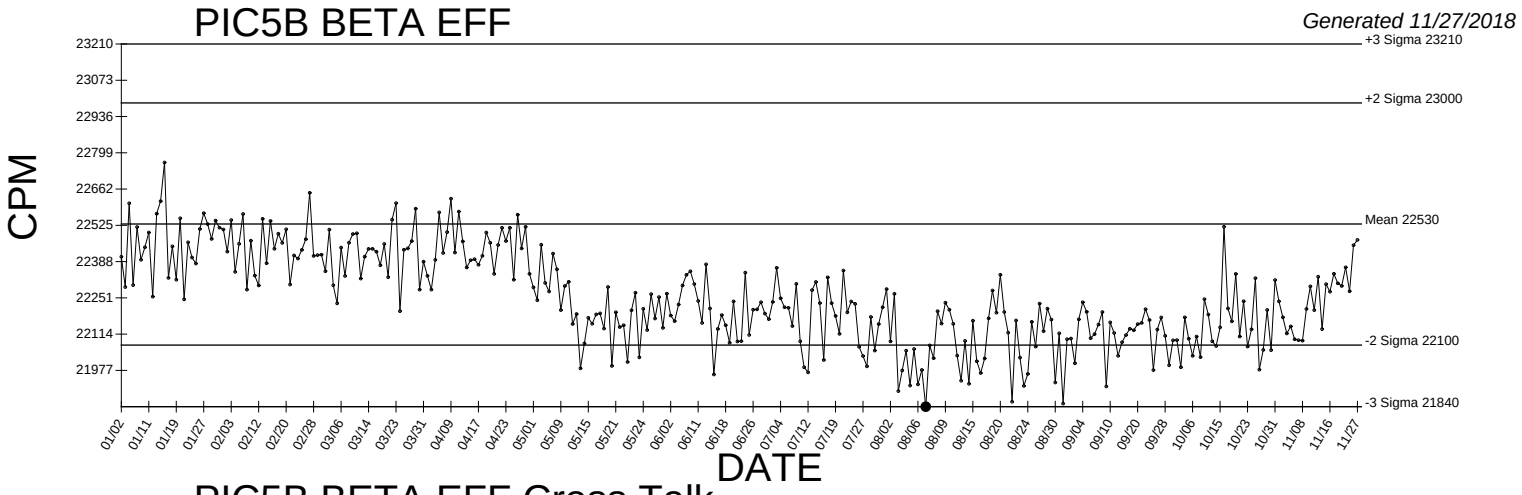


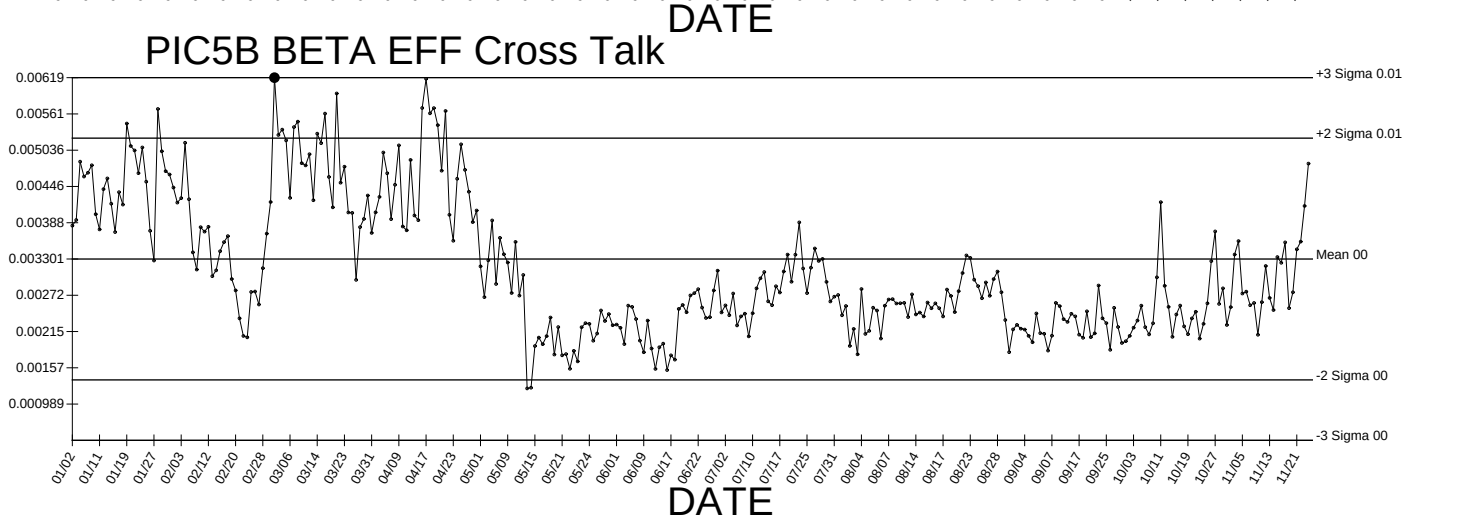
● Denotes Outlier



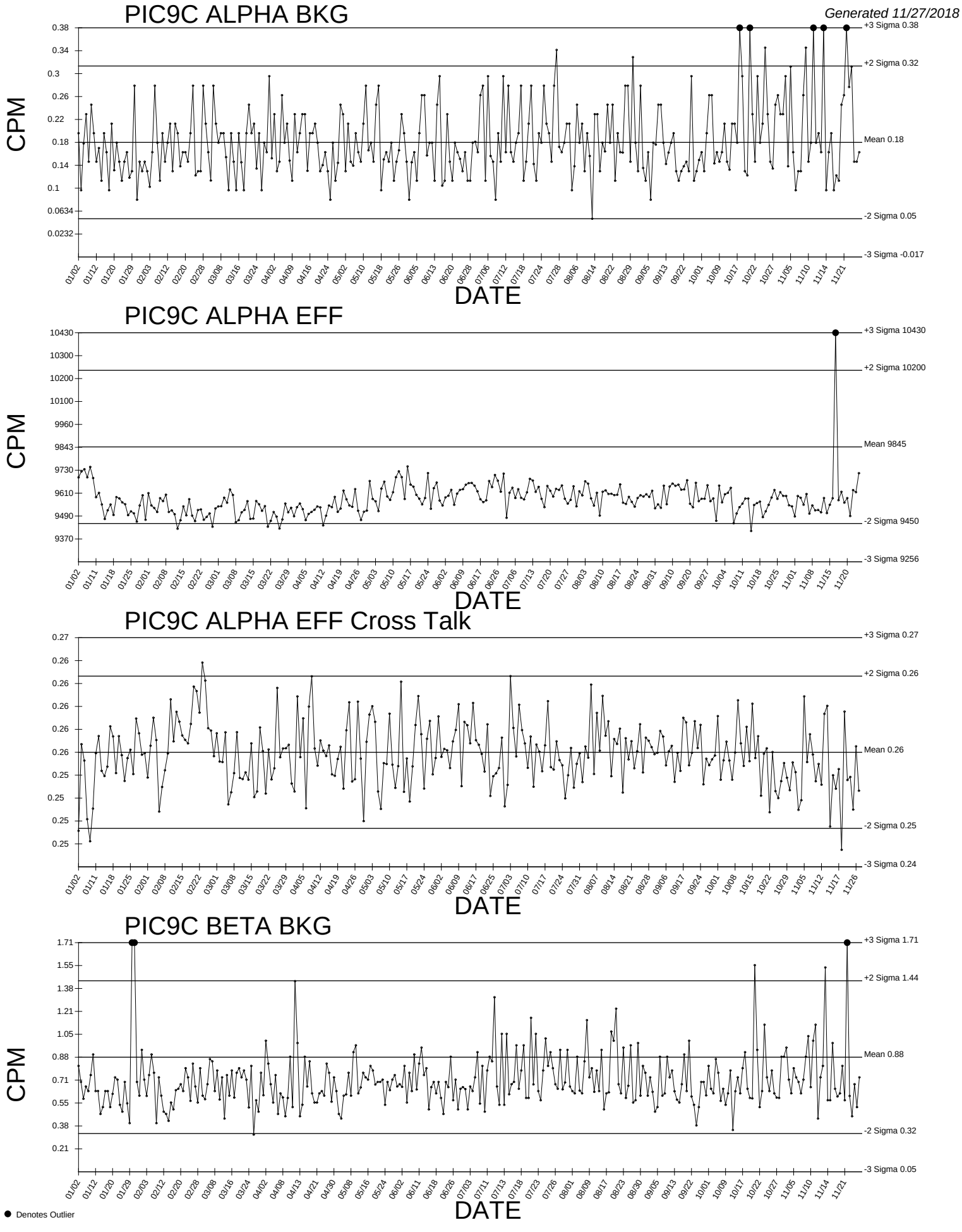
● Denotes Outlier

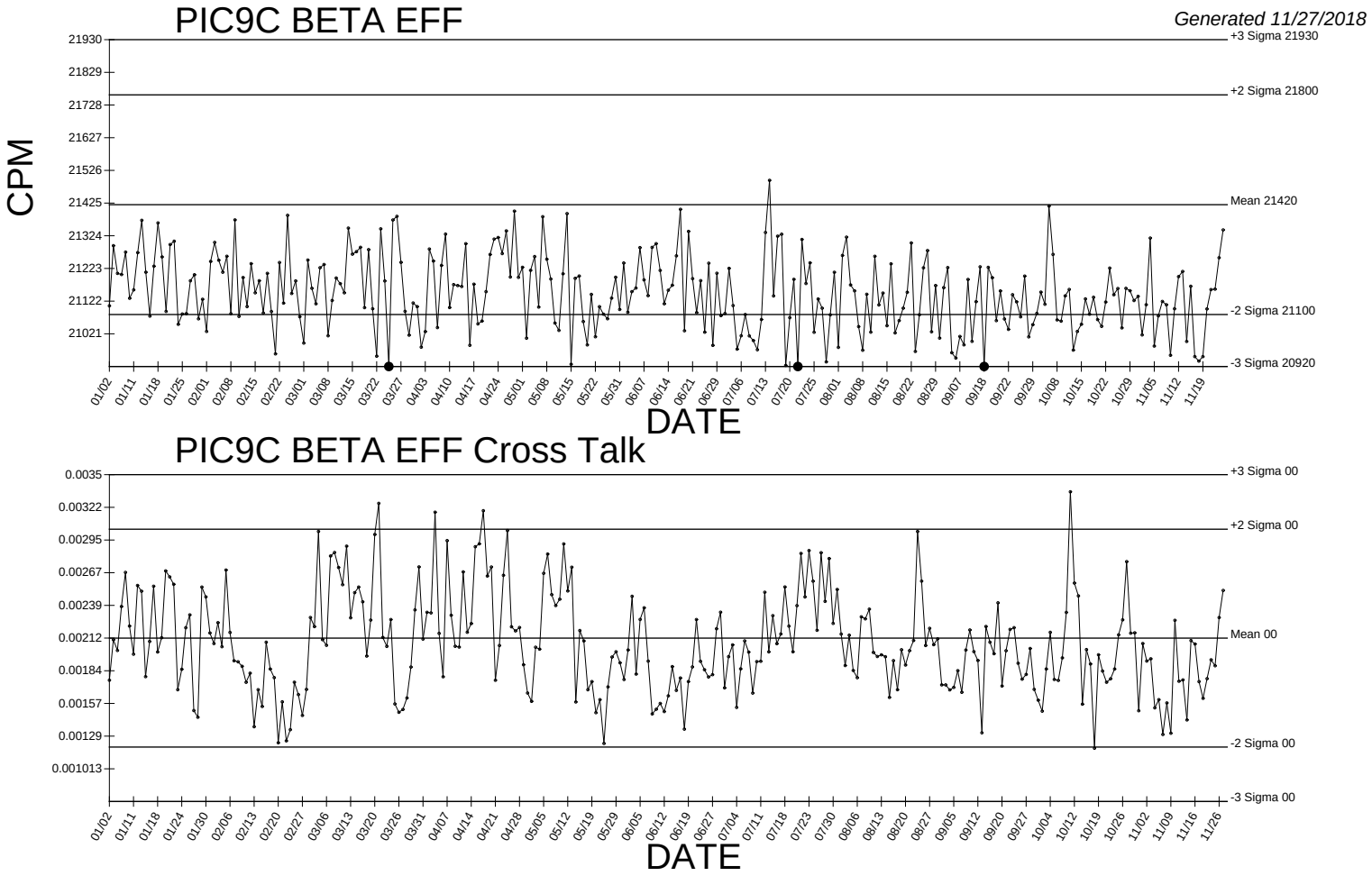

PIC5B ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.41
+2 Sigma 0.34
Mean 0.2
-2 Sigma 0.06
-3 Sigma -0.011
PIC5B ALPHA EFF
+3 Sigma 14070
+2 Sigma 13900
Mean 13480
-2 Sigma 13100
-3 Sigma 12880
PIC5B ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.26
-3 Sigma 0.25
PIC5B BETA BKG
+3 Sigma 1.61
+2 Sigma 1.3
Mean 0.69
-2 Sigma 0.08
-3 Sigma -0.227
Denotes Outlier



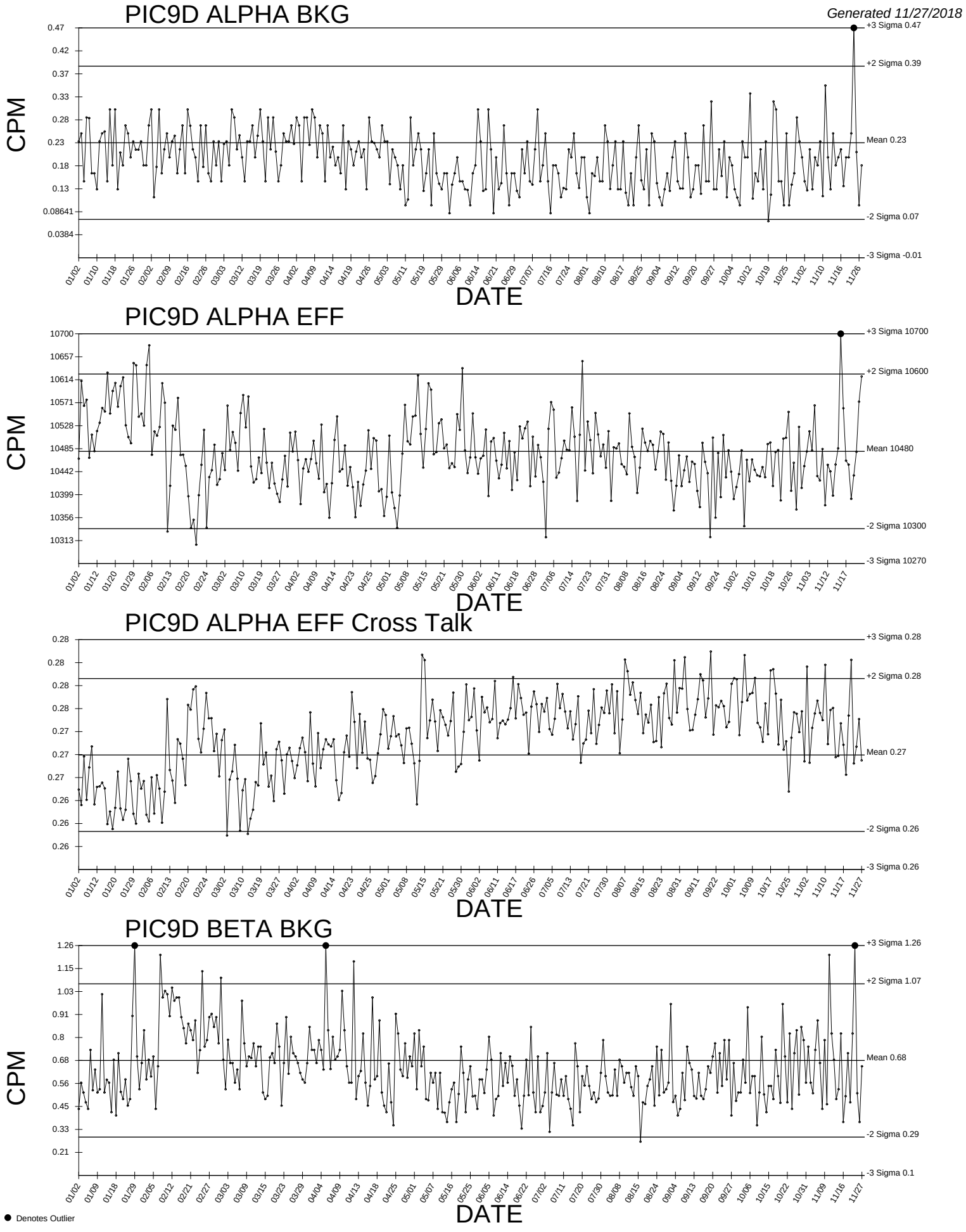


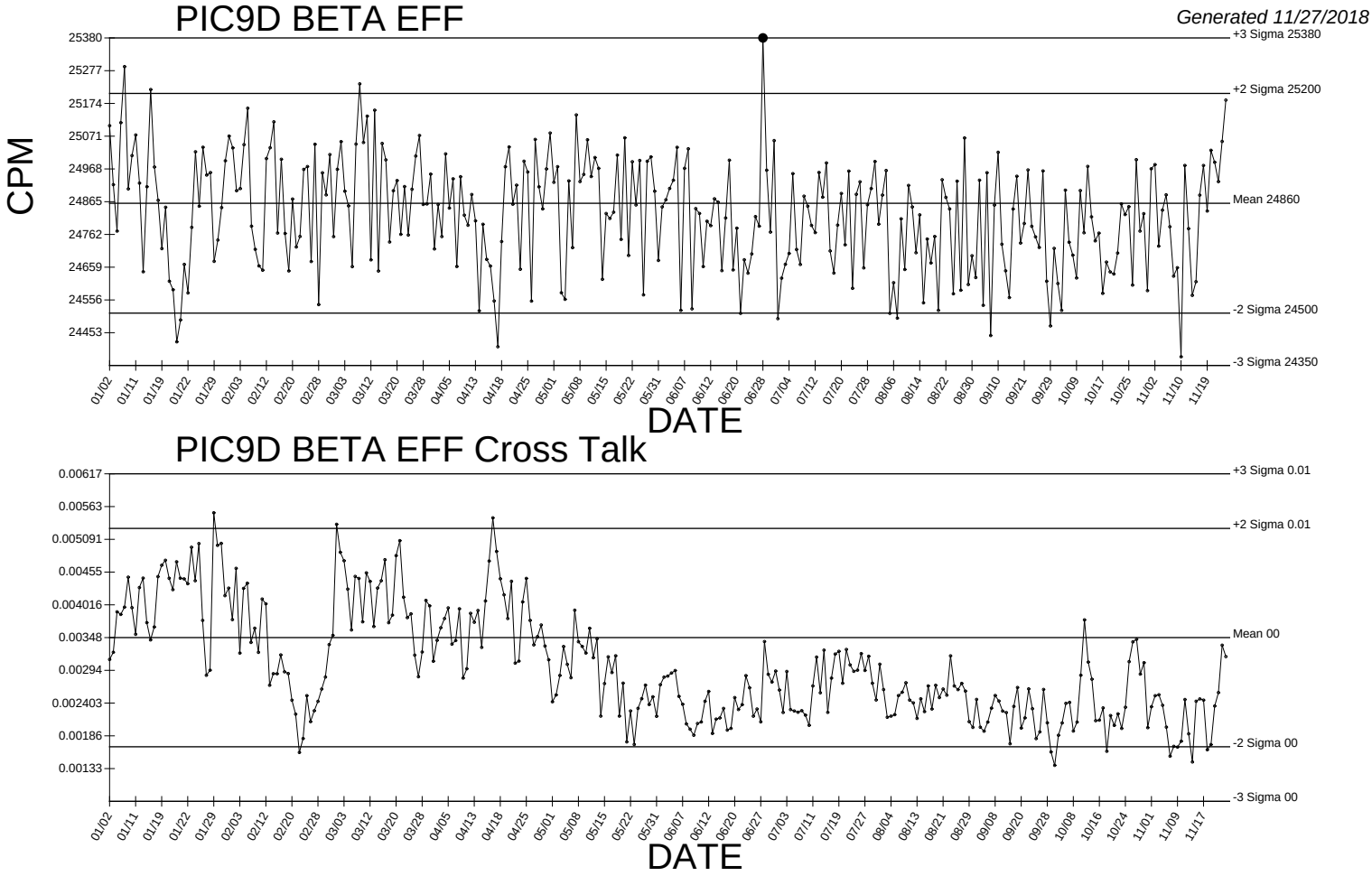
● Denotes Outlier


PIC9C ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.32
Mean 0.18
-2 Sigma 0.05
-3 Sigma -0.017
PIC9C ALPHA EFF
+3 Sigma 10430
+2 Sigma 10200
Mean 9845
-2 Sigma 9450
-3 Sigma 9256
PIC9C ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.26
Mean 0.26
-2 Sigma 0.25
-3 Sigma 0.24
PIC9C BETA BKG
+3 Sigma 1.71
+2 Sigma 1.44
Mean 0.88
-2 Sigma 0.32
-3 Sigma 0.05
Denotes Outlier



● Denotes Outlier


PIC9D ALPHA BKG
Generated 11/27/2018
CPM
DATE
+3 Sigma 0.47
+2 Sigma 0.39
Mean 0.23
-2 Sigma 0.07
-3 Sigma -0.01
PIC9D ALPHA EFF
+3 Sigma 10700
+2 Sigma 10600
Mean 10480
-2 Sigma 10300
-3 Sigma 10270
PIC9D ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.26
PIC9D BETA BKG
+3 Sigma 1.26
+2 Sigma 1.07
Mean 0.68
-2 Sigma 0.29
-3 Sigma 0.1
Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

0487

National Institute of Standards & Technology

0487

Certificate

Standard Reference Material 4251C
Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive barium-133 chloride, non-radioactive barium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains barium-133 with a total activity of approximately 2.5 MBq. Barium-133 decays by electron capture and during the decay process X-rays and gamma rays with energies from 4 to 400 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least June 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
October 1994

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

RC-S-035-002a

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have an acid concentration and a carrier concentration comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

RC-5-035-002b

PROPERTIES OF SRM 4251C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4251C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.015 ± 0.002) g•mL^{-1} at 22.1 °C** [b]*		
Solution mass	**(5.054 ± 0.001) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L^{-1})	Mass Fraction (g•g^{-1})
	H_2O HCl $BaCl_2$ $^{133}BaCl_2$	54 1.0 6×10^{-4} 4×10^{-7}	0.96 0.04 1.2×10^{-4} 8×10^{-8}
Radiological Properties:			
Radionuclide	**Barium-133**		
Reference time	**1200 EST, 1 September 1993**		
Massic activity of the solution [c] (Activity per unit mass of solution)	**4.876×10^5 Bq•g^{-1}**		
Relative expanded uncertainty (k=2)	**0.52%** [d]		
Photon-emitting impurities	None detected [e]		
Half lives used	Barium-133: (10.52 ± 0.13) a [f] Radium-226: (1600 ± 7) a [f]		
Measuring instrument	Pressurized "4π"γ ionization chamber A calibrated using a barium-133 solution whose activity was determined by 4π(e+X)-γ-anticoincidence counting		

*Notes and references are on pages 5 and 6.

RC-5-035-002

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [g]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [h]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
PIC A net response per gram of SRM 4251C, measured relative to RRS20 [j]	Standard deviation of the mean for 1000 repeated measurements (A)	0.008	1.0	0.01
PIC A background response, measured relative to RRS20	Standard deviation of the mean for >150 repeated measurements (A)	0.25	0.001 [k]	0.00
PIC A net response for RRS200, measured relative to RRS20	Standard deviation of the mean for >100 repeated measurements (A)	0.06	1.0	0.06
PIC A net response per Bq of barium-133 in solution, measured relative to RRS200.	Standard deviation of the mean for 240 repeated measurements (A)	0.02	1.0	0.02
Gravimetric measurements	Estimated (B)	0.01	1.0	0.01
Half life of barium-133 Half life of radium-226	Standard uncertainty of the half life (A)	1.24 [m] 0.44 [m]	0.004 [n] 0.004 [n]	0.00 0.00
Activity used to calibrate PIC A net response per Bq of barium-133 in solution	Standard uncertainty of the activity determined by $4\pi(e+X)$-γ-anticoincidence counting. (B)	0.22	1.0	0.22
Live-time [p]	Estimated (B)	0.10	1.0	0.10
PIC A charge collection	Estimated (B)	0.05	1.0	0.05
Source Positioning	Estimated (B)	0.05	1.0	0.05
Photon-emitting impurities	Limit of detection for Cs-134 (B) [q]	100.	0.00002	0.00
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.26
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.52

*Notes and references are on pages 5 and 6.

RC-S-035-002

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	100	1.5	0.2

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for photon-emitting impurities are:
600 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 12 and 75 keV,
150 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 84 and 379 keV, and
3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 387 and 2700 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of barium-133.

[f] The stated uncertainty is the standard uncertainty. See reference [5].

[g] Relative standard uncertainty of the input quantity x_i.

[h] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[i] Relative component of combined standard uncertainty of output quantity y, rounded to two decimal places. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

RC-S-035-002e

[j] The response of pressurized ionization chamber A (PIC A) is determined from measurement of the time required to collect a given amount of charge on a stable fixed capacitor. All of the response measurements in the NIST pressurized ionization chambers are made relative to the response of one or more artifact standards. These artifact standards consist of microgram quantities of aged radium-226 in small welded stainless-steel capsules. These capsules are encapsulated in plastic rods whose dimensions are similar to those of the standard NIST ampoule. The artifact standards are called **Radium Reference Sources** and are designated as RRSx, where x is the nominal mass (in micrograms) of radium-226 in the capsule.

[k] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background response)/(average net sample response)

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated oscillator.

[q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i$ = 100%. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of Ba-133)}·{(Bq of impurity)/(Bq of Ba-133)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), April 1994.

RC-S-035-002f

Standard Traceability Log Rad

Source Material Info	
Parent Code:	0487
Prepared By:	Angela Johnson
Carrier Conc:	0.1 M HCL
Reference Date:	09/01/1993
Ampoule Mass (g):	5.054 g
Uncertainty:	+/- .26 %
LogBook No:	RC S 035 002

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Angela Johnson		
Prep Date:	10/31/2002		
Verification Date:	10/10/2018		
Expiration Date:	10/10/2019		
Primary Code:	0487-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.7696 g		
Density(g/mL):	0.9984	Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (100 mL) = 1395394.1760 dpm/mL
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (0.9984 g/mL) / (100 mL) = 1397609.3930 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/18/2015	Gregory Ramsay	15.0062	1000	0487-B	20972.806 dpm/mL	11/18/2016	11/18/2017
01/17/2017	Bethany Fiem	15.1795	1000	0487-C	21215.0117 dpm/mL	01/17/2017	01/17/2018
11/08/2017	Bethany Fiem	15.5573	1000	0487-D	21708.5658 dpm/mL	10/10/2018	10/10/2019

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 0487-D

v1.0.2

Instrument	YELLOW
Analyst	BXF1
Verification Prep Date	10/10/2018

Standard Information	
Isotope	Ba-133
Serial Number	0487-D
Isotope Halflife	3.8410E+03 D
Reference Date	9/1/1993
Ref. Act. (DPM/mL)	21708.5658
Amount of Std. (mL)	1.0
Standard Prep Date	11/8/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	10/11/2018	761.95	3290.62	19.66
2	10/11/2018	761.95	3210.30	19.66
3	10/11/2018	760.37	3256.97	19.66

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3270.96	0.763851	4282.20	4282.20
2	3190.64	0.763851	4177.04	4177.04
3	3237.31	0.763851	4238.14	4238.14

	dpm/mL
Mean Value =	4232.46
Stdev =	52.80544344
Certificate Value* =	**4148.3**
Two sigma =	105.611
10 % of Mean =	423.246
Rule A (Pass/Fail)	**Pass**
% Recovery	102.03%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**10/10/2019**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ba-133 source 0487-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCYELLOW for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 10/10/2018 using Ba-133 source 1601-A.

Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001

10-11-18

11/14/18

National Institute of Standards & Technology

Certificate

Received 3-9-17

Standard Reference Material® 4339b

1810

Radium-228 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive radium-228 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4339b consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **radium-228** massic activity value, at a **Reference Time of 1200 EST, 07 October 2010**, is:

$$\mathbf{(195 \pm 14)\ Bq \cdot g^{-1}}$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, Becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analyses.

Expiration of Certification: The certification of **SRM 4339b** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Radiological and Chemical Hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the Physical Measurement Laboratory, Radiation and Biomolecular Physics Division, Radioactivity Group, M.P. Unterweger, Group Leader. The overall technical direction and physical measurement leading to certification and photon-emitting impurity analyses were provided by L. Pibida of the NIST Radioactivity Group, with production assistance by J. LaRosa, R. Collé, and L. Laureano-Pérez. Alpha-emitting impurity analyses were provided by J. LaRosa.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Lisa R. Karam, Chief
Radiation and Biomolecular Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 14 November 2012

Robert L. Watters, Jr., Director
Office of Reference Materials

Table 1. Certified Massic Activity of SRM 4339b

Radionuclide	**Radium-228[a]**
Reference time	**1200 EST, 07 October 2010**
Massic activity of the solution	**195 Bq g^{-1}**
Relative expanded uncertainty ($k = 2$)	**7.2 %[b]**

[a] The final ^{228}Ra purification from the ^{232}Th mother solution was performed on 02 September 2010 0920 EST.
[b] The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4,5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain what is assumed to be an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4339b

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	1.3 mol L^{-1} HNO_3 with 19.8 µg g^{-1} Ba^{+2}
Solution density	(1.034 ± 0.002) g mL^{-1} at 20.8 °C[a]
Solution mass	(5.180 ± 0.003) g[a]
Photon-emitting impurities	^{226}Ra: < 0.5 Bq g^{-1}[b]
Alpha-emitting impurities	^{232}Th: < 0.08 Bq g^{-1}[c]
Half-lives used	^{228}Ra: (5.75 ± 0.04) a[d] [6] ^{228}Ac: (6.15 ± 0.02) h [7] ^{226}Ra: (1600 ± 7) a [8] ^{232}Th: (14.02 ± 0.06) x 10^9 a [9]
Calibration methods (and instruments)	The certified massic activity for ^{228}Ra was obtained by high-resolution gamma-ray spectrometry of three master solution ampoules (eleven separate determinations), as measured on three to five different spectrometers and geometries on each ampoule, and used assumed nuclear data for probabilities per decay for 16 gamma-ray transitions. Confirmatory measurements were performed by 2πα spectrometry of ingrown ^{228}Th with a planar, ion-implanted Si detector.

[a] The stated uncertainty is two times the standard uncertainty. See reference 5.
[b] Based on gamma-ray spectrometry of forced-fitted peak at 186.2 keV and assuming a probability per decay of 0.0355 [6].
[c] The maximum ^{232}Th activity concentration in ^{228}Ra.
[d] The stated uncertainty is the standard uncertainty. See reference 5.

Table 3. Uncertainty Evaluation for the Massic Activity of SRM 4339b

	Uncertainty component	Assessment Type[a]	Relative standard uncertainty contribution on massic activity of ^{228}Ra (%)
1	Gamma-ray spectrometry precision; relative standard deviation of the grand mean on the average massic gamma-ray emission rates for 16 measured ^{228}Ac gamma-ray transitions. Each mean in the grand mean is based on 11 determinations with three sources in three to five different detectors. The uncertainty in the determination of the massic gamma-ray emission rate for any one transition in a given determination ranged from typically 0.5 % to 1.5 %. The relative standard deviation of the mean for the average of the 16 lines, for any one determination, was typically 1 %; whereas the relative standard deviation of the grand mean for the average of the 16 lines across all 11 determinations is 0.34 %[b]. Data passes normality test.	A	0.84
2	Uncertainty due to assumed gamma-ray probabilities per decay for the measured ^{228}Ac transitions [7]. The uncertainty on each transition has a shared (correlated) component of 2.5 % (see comments in [7]).	B	3.5
3	Detection efficiencies not embodied within component 1	B	0.4
4	Mass determinations for dilution factors and counting source preparations	B	0.1
5	Decay corrections for ^{228}Ra half-life uncertainty of 0.7 % [6]	B	0.003
6	Effect of ^{228}Ra and ^{228}Ac half-life uncertainties on secular equilibrium ratio	B	0.02
Relative combined standard uncertainty			**3.6**
Relative expanded uncertainty (k = 2)			**7.2**

[a] Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.
[b] Average massic gamma-ray emission rates of 11 geometries (R_γ) for 16 measured ^{228}Ac gamma-ray transitions with their respective energy (E_γ); assumed gamma-ray probabilities per decay (I_γ) and standard deviation of the mean (S_m).

E_γ (keV)	Assumed I_γ (%) [1]	Mean R_γ (s^{-1} g^{-1})(i)	S_m (%)(ii)
129.065	2.50	1347	0.38
153.967	0.754	421.6	0.40
209.249	3.97	2264	0.55
270.245	3.55	2014	0.33
328.004	3.04	1822	0.43
338.32	11.4	6712	0.43
409.46	2.02	1185	0.29
463.002	4.45	2645	0.33
755.313	1.03	593.3	0.46
772.291	1.52	899.2	0.53
794.942	4.31	2588	0.35
835.704	1.7	995.3	0.42
911.196	26.2	15609	0.29
964.786	4.99	3007	0.35
968.96	15.9	9582	0.30
1588.2	3.06	1889	0.28

(i) Grand mean for n = 11 determinations with three sources in three to five different detectors.
(ii) Relative standard deviation of the grand mean on R_γ for n = 11.

INSTRUCTIONS FOR HANDLING AND STORAGE

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

Storage: SRM 4339b should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

REFERENCES

[1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*, available at http://www.nist.gov/pml/div682/grp04/srm.cfm (accessed Nov 2012). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.

[2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 19 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 18 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement;* (ISO GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France (2008); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Nov 2012).

[5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://physics.nist.gov/Pubs/ (accessed Nov 2012).

[6] Luca, A.; June 2009, ^{228}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-228_tables.pdf (accessed Nov 2012).

[7] Pearce, A.; January 2010, ^{228}Ac. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ac-228_tables.pdf (accessed Nov 2012).

[8] Christé, V. and M.M. Bé; December 2006, ^{226}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-226_tables.pdf (accessed Nov 2012).

[9] Arinc, A.; September 2008, ^{232}Th. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Th-232_tables.pdf (accessed Nov 2012).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1810
Prepared By:	Tim Chandler
Carrier Conc:	1.3M HNO3
Reference Date:	10/07/2010
Ampoule Mass (g):	5.18 g
Uncertainty:	+/- 3.6 %
LogBook No:	GL-CED-297-103

A Solution Material Info			
Isotope:	Radium-228 SPIKE		
Prepared By:	Bethany Fiem		
Prep Date:	05/23/2018		
Verification Date:	05/23/2018		
Expiration Date:	05/23/2019		
Primary Code:	1810-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.1447 g		
Density(g/mL):	1.0178	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (200 mL) = 300.9650 dpm/mL
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (1.0178 g/mL) / (200 mL) = 295.7015 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1810-A Jar

v1.1.2
BMF
5/23/2018

Isotope	Result
Ra-228	pCi/L
Ra-228 N1	29340
Ra-228 N2	28510
Ra-228 N3	29320

Mean Value (Counting) =	29056.67	pCi/L	**107.165**	**Fail**	*Exception taken due to the high uncertainty of the certified value
Stdev =	473.533	pCi/L		**Rule B (Pass/Fail)**	
Certificate Value =	27114.0	pCi/L			
Two sigma =	947.0656436				
10 % of Mean =	2905.666667				
Rule A (Pass/Fail)	**Pass**				

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
Rule B = The determined mean value shall be within 5% of the certificate value.

5-23-18

5/25/18

Runlogs

Instrument Run Log

Instrument Type: GFPC **Batch ID: 1820404**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
463646001	SAMPLE	JXC9	PIC11A	NOV-27-18 09:10:13	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463646002	SAMPLE	JXC9	PIC11B	NOV-27-18 09:10:17	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463646003	SAMPLE	JXC9	PIC11C	NOV-27-18 09:10:22	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204154520	MB	JXC9	PIC11D	NOV-27-18 09:10:32	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204154521	DUP	JXC9	PIC12A	NOV-27-18 09:10:41	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204154522	MS	JXC9	PIC12B	NOV-27-18 09:10:45	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204154523	MSD	JXC9	PIC13A	NOV-27-18 09:10:51	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204154524	LCS	JXC9	PIC13B	NOV-27-18 09:10:54	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530001	SAMPLE	JXC9	PIC1C	NOV-27-18 09:11:33	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530002	SAMPLE	JXC9	PIC2B	NOV-27-18 09:11:37	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530003	SAMPLE	JXC9	PIC3B	NOV-27-18 09:11:41	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530004	SAMPLE	JXC9	PIC3C	NOV-27-18 09:11:46	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530005	SAMPLE	JXC9	PIC3D	NOV-27-18 09:11:51	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530009	SAMPLE	JXC9	PIC9C	NOV-27-18 09:11:56	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530006	SAMPLE	JXC9	PIC4B	NOV-27-18 09:11:57	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530010	SAMPLE	JXC9	PIC9D	NOV-27-18 09:12:00	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530007	SAMPLE	JXC9	PIC5A	NOV-27-18 09:12:01	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530011	SAMPLE	JXC9	PIC10C	NOV-27-18 09:12:06	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463530008	SAMPLE	JXC9	PIC5B	NOV-27-18 09:12:07	DONE	CeF on 25mm Filter	01-JUN-17 00:00
463541001	SAMPLE	JXC9	PIC10D	NOV-27-18 09:12:13	DONE	CeF on 25mm Filter	01-JUN-17 00:00

Lucas Cell Raw Data

Batch 1819735 Check-list

This check-list was completed on 16-NOV-18 by Heather McCarty

This batch was reviewed by Elizabeth Krouse on 16-NOV-18 and Gregory Ramsay on 16-NOV-18.

Batch ID: 1819735

Product: LUC26RAL

Description: Lucas Cell Radium 226 GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
13	Has the method required detection limit been met?	Yes		
14	Is the Relative Error Ratio (RER) less than 2?	Yes		
Miscellaneous Information				
15	Are sample-specific MDA/MDC calculated and reported?	Yes		

Logbook

Radium-226 in Liquid

Batch ID: 1819735 **Due Dates for Lab: 18-NOV-2018 Package: 20-NOV-2018 SDG: 21-NOV-2018**

Analyst: Peter Wilber (PCW) **Lab SOP: GL-RAD-A-008 REV# 15**

Instrument: GFC-18150253 **Method: EPA 903.1 Modified**

#	Sample ID	Run Date	Min RDL (pCi/L)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	~~Total Counts~~ SKL Counts	~~Background Counts~~ Total Counts	
1	463427001 Leachate	11/08/18	1	400	11/09/18 06:48	206	11/13/18 01:22	0500	3	9	
2	463511005 CSMP0065-05	11/08/18	.5	800	11/09/18 06:48	301	11/13/18 01:22	~~0500~~ 0535	6	~~141~~ 106	
3	463530001 MW-9	11/08/18	1	500	11/09/18 06:48	408	11/13/18 01:22	0500	4	16	
4	463530002 MW-7	11/08/18	1	500	11/09/18 06:48	507	11/13/18 01:22	0500	5	46	
~~5~~	~~463530003 MW-8~~	~~11/08/18~~	~~1~~	~~500~~	~~11/09/18 06:48~~	~~604~~	~~11/13/18 01:22~~	~~0500~~	~~2~~	~~302~~	
6	463530004 MW-5	11/08/18	1	500	11/09/18 06:48	704	11/13/18 01:22	0500	8	57	
7	463530005 MW-6	11/08/18	1	500	11/09/18 06:48	806	11/13/18 01:22	0500	3	56	
8	463530006 FB-20181031	11/08/18	1	500	11/09/18 06:48	105	11/13/18 01:52	0535	6	6	
9	463530007 MW-1	11/08/18	1	500	11/09/18 06:48	203	11/13/18 01:52	0535	3	81	
10	463530008 MW-4	11/08/18	1	500	11/09/18 06:48	306	11/13/18 01:52	0535	6	40	
~~11~~	~~463530009 MW-2~~	~~11/08/18~~	~~1~~	~~500~~	~~11/09/18 06:48~~	~~406~~	~~11/13/18 01:52~~	~~0535~~	~~4~~	~~200~~	
12	463530010 MW-3	11/08/18	1	500	11/09/18 06:48	501	11/13/18 01:52	0535	3	23	
13	463530011 FB-20181101	11/08/18	1	500	11/09/18 06:48	603	11/13/18 01:52	0535	3	6	
14	463541001 L8K0089-01	11/08/18	1	500	11/09/18 06:48	705	11/13/18 01:52	0535	5	14	
15	463646001 FN-2-110518	11/08/18	1	500	11/09/18 06:48	802	11/13/18 01:52	0535	8	21	
16	463646002 FN-1-110518	11/08/18	1	500	11/09/18 06:48	101	11/13/18 02:22	0610	3	43	
~~17~~	~~463646003 FN-6-110518~~	~~11/08/18~~	~~1~~	~~500~~	~~11/09/18 06:48~~	~~207~~	~~11/13/18 02:22~~	~~0610~~	~~5~~	~~410~~	
18	463661005 BVR0009-05	11/08/18	.5	800	11/09/18 06:48	305	11/13/18 02:22	0610	1	489	
~~19~~	~~1204152948 MB~~	~~11/08/18~~	~~.5~~	~~800~~	~~11/09/18 06:48~~	~~405~~	~~11/13/18 02:22~~	~~0610~~	~~1~~	~~1~~	
20	1204152949 DUP (463511005)	11/08/18	.5	800	11/09/18 06:48	503	11/13/18 02:22	~~0610~~ 0555	1	~~69~~ 72	
21	1204152950 MS (463511005)	11/08/18	.5	500	11/09/18 06:48	606	11/13/18 02:22	0610	5	742	
22	1204152951 MSD (463511005)	11/08/18	.5	500	11/09/18 06:48	701	11/13/18 01:22	0610	7	718	
~~23~~	~~1204152952 LCS~~	~~11/08/18~~	~~.5~~	~~500~~	~~11/09/18 06:48~~	~~804~~	~~11/13/18 02:22~~	~~0610~~	~~5~~	~~776~~	

Type	Name	Serial Number	Spike Amount	Spike Units
SPIKE	Radium-226 SPIKE	1715-~~B~~ D	.1	mL
SPIKE	Radium-226 SPIKE	1715-D	.1	mL

Spike Pipet ID: RAD-RA226-2766953

Radium-226 Queue Sheet

16-NOV-18

GEL Laboratories, Radiochemistry Division

Batch #: 1819735 Analyst: PCW First Client Due Date: 11/21/2018 Internal Due Date: 11/18/2018

Spike Isotope: Radium-226 Spike Code: — Expiration Date: — Vol: — End Initial/Degas Date/Time: 11/13/18

LCS Isotope: Radium-226 LCS Code: 1715 D Expiration Date: 12/31/18 Vol: 0.1 End LN De-em Date: 11/14/18

Bkg Count Time: 30 (Min) Sample Count Time: 30 (Min) Start Count Date: 11/16/18

Prep Date: 11/8/18 Pipet ID: 2766553 Balance ID: _____ Initials: PCW Witness: N/A

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Position (Label)	Aliquot (mL or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
463427001-1	Leachate	SAMPLE		WATER	1 pCi/L	LANC001	1							
463511005-1	CSMP0065-05	SAMPLE		WATER	.5 pCi/L	UCOR011	2			SK 11/16/18				
463530001-1	MW-9	SAMPLE		WATER	1 pCi/L	LANC006	3							
463530002-1	MW-7	SAMPLE		WATER	1 pCi/L	LANC006	4							
463530003-1	MW-8	SAMPLE		WATER	1 pCi/L	LANC006	5	500	0131	0445	307	3	3	41
463530004-1	MW-5	SAMPLE		WATER	1 pCi/L	LANC006	6							
463530005-1	MW-6	SAMPLE		WATER	1 pCi/L	LANC006	7							
463530006-1	FB-20181031	SAMPLE		WATER	1 pCi/L	LANC006	8			SK 11/16/18				
463530007-1	MW-1	SAMPLE		WATER	1 pCi/L	LANC006	9							
463530008-1	MW-4	SAMPLE		WATER	1 pCi/L	LANC006	10							
463530009-1	MW-2	SAMPLE		WATER	1 pCi/L	LANC006	11	500	0131	0445	408	4	2	59
463530010-1	MW-3	SAMPLE		WATER	1 pCi/L	LANC006	12							
463530011-1	FB-20181101	SAMPLE		WATER	1 pCi/L	LANC006	13			SK 11/16/18				
463541001-1	L8K0089-01	SAMPLE		WATER	1 pCi/L	MBAC001	14							
463646001-1	FN-2-110518	SAMPLE		WATER	1 pCi/L	LANC001	15							
463646002-1	FN-1-110518	SAMPLE		WATER	1 pCi/L	LANC001	16							
463646003-1	FN-6-110518	SAMPLE		WATER	1 pCi/L	LANC001	17	500	0131	0445	503	5	1	29
463661005-1	BVR0009-05	SAMPLE		WATER	.5 pCi/L	UCOR011	18	500	0131	0445	604	6	1	60
1204152948-1	MB for batch 1819735	MB		WATER	.5 pCi/L	QC ACCOUNT	19	800	0131	0445	706	7	5	5
1204152949-1	CSMP0065-05(463511005DUP)	DUP		WATER	.5 pCi/L	QC ACCOUNT	20							
1204152950-1	CSMP0065-05(463511005MS)	MS		WATER	.5 pCi/L	QC ACCOUNT	21			SK 11/16/18				
1204152951-1	CSMP0065-05(463511005MSD)	MSD		WATER	.5 pCi/L	QC ACCOUNT	22							
1204152952-1	LCS for batch 1819735	LCS		WATER	.5 pCi/L	QC ACCOUNT	23	800	0131	0445	902	8	1	478

Comments: Verification

Data Reviewed By: _____ 11/16/18

Radium-226 Liquid

Filename : RA226.XLS
File type : Excel
Version # : 1.3.2

Batch : 1819735
Analyst : PETE049
Prep Date : 11/8/2018
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 0.5 pCi/L
Halflife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halflife of Rn-222: 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					**Count Raw Data**							
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
1	463427001.1	0.4000	1.9669E-05	10/30/2018 11:00	206	30	9	0.300	3	0.100	30	1.9170
2	463511005.1	0.8000	2.0861E-05	11/5/2018 9:49	301	30	106	3.533	8	0.267	30	1.8290
3	463530001.1	0.5000	2.0256E-05	10/31/2018 11:05	408	30	16	0.533	4	0.133	30	1.8510
4	463530002.1	0.5000	2.0256E-05	10/31/2018 12:55	507	30	46	1.533	5	0.167	30	1.9970
5	463530003.1	0.5000	2.0256E-05	10/31/2018 12:35	307	30	41	1.367	3	0.100	30	1.8050
6	463530004.1	0.5000	2.0256E-05	10/31/2018 10:50	704	30	57	1.900	8	0.267	30	1.8450
7	463530005.1	0.5000	2.0256E-05	10/31/2018 14:20	806	30	56	1.867	3	0.100	30	1.9730
8	463530006.1	0.5000	2.0256E-05	10/31/2018 11:00	105	30	6	0.200	6	0.200	30	2.0440
9	463530007.1	0.5000	2.0256E-05	11/1/2018 9:45	203	30	81	2.700	3	0.100	30	1.8290
10	463530008.1	0.5000	2.0256E-05	11/1/2018 11:40	306	30	40	1.333	6	0.200	30	1.7820
11	463530009.1	0.5000	2.0256E-05	11/1/2018 10:35	408	30	59	1.967	2	0.067	30	1.8510
12	463530010.1	0.5000	2.0256E-05	11/1/2018 12:00	501	30	23	0.767	3	0.100	30	2.0710
13	463530011.1	0.5000	2.0256E-05	11/1/2018 11:00	603	30	6	0.200	3	0.100	30	2.0850
14	463541001.1	0.5000	2.0256E-05	11/1/2018 12:00	705	30	14	0.467	5	0.167	30	1.8350
15	463646001.1	0.5000	2.0256E-05	11/5/2018 10:45	802	30	21	0.700	8	0.267	30	1.6450
16	463646002.1	0.5000	2.0256E-05	11/5/2018 12:00	101	30	43	1.433	3	0.100	30	1.5100
17	463646003.1	0.5000	2.0256E-05	11/5/2018 14:15	503	30	29	0.967	1	0.033	30	1.9410
18	463661005.1	0.8000	2.0861E-05	11/5/2018 13:30	604	30	60	2.000	1	0.033	30	2.0460
19	1204152948.1	0.8000	2.0861E-05	11/8/2018 0:00	706	30	5	0.167	5	0.167	30	1.8720
20	1204152949.1	0.8000	2.0861E-05	11/5/2018 9:49	503	30	72	2.400	1	0.033	30	1.9410
21	1204152950.1	0.5000	2.0256E-05	11/5/2018 9:49	606	30	742	24.733	5	0.167	30	1.9430
22	1204152951.1	0.5000	2.0256E-05	11/5/2018 9:49	701	30	718	23.933	7	0.233	30	1.7770
23	1204152952.1	0.8000	2.0861E-05	11/8/2018 0:00	808	30	478	15.933	1	0.033	30	1.4380

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			
						De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
6.600%	8/1/2018	7/31/2019	11/9/2018 6:48	11/13/2018 1:22	11/13/2018 5:00	0.495	0.973	1.002	1.000
8.200%	3/1/2018	2/28/2019	11/9/2018 6:48	11/13/2018 1:22	11/13/2018 8:35	0.495	0.947	1.002	1.000
7.000%	3/1/2018	2/28/2019	11/9/2018 6:48	11/13/2018 1:22	11/13/2018 5:00	0.495	0.973	1.002	1.000
5.300%	6/1/2018	5/31/2019	11/9/2018 6:48	11/13/2018 1:22	11/13/2018 5:00	0.495	0.973	1.002	1.000
6.300%	3/1/2018	2/28/2019	11/13/2018 2:22	11/16/2018 1:31	11/16/2018 4:45	0.416	0.976	1.002	1.000
8.500%	11/1/2018	10/31/2019	11/9/2018 6:48	11/13/2018 1:22	11/13/2018 5:00	0.495	0.973	1.002	1.000
6.000%	3/1/2018	2/28/2019	11/9/2018 6:48	11/13/2018 1:22	11/13/2018 5:00	0.495	0.973	1.002	1.000
9.300%	5/1/2018	4/30/2019	11/9/2018 6:48	11/13/2018 1:52	11/13/2018 5:35	0.497	0.972	1.002	1.000
9.900%	8/1/2018	7/31/2019	11/9/2018 6:48	11/13/2018 1:52	11/13/2018 5:35	0.497	0.972	1.002	1.000
3.900%	3/1/2018	2/28/2019	11/9/2018 6:48	11/13/2018 1:52	11/13/2018 5:35	0.497	0.972	1.002	1.000
7.000%	3/1/2018	2/28/2019	11/13/2018 2:22	11/16/2018 1:31	11/16/2018 4:45	0.416	0.976	1.002	1.000
5.400%	6/1/2018	5/31/2019	11/9/2018 6:48	11/13/2018 1:52	11/13/2018 5:35	0.497	0.972	1.002	1.000
6.700%	7/1/2018	6/30/2019	11/9/2018 6:48	11/13/2018 1:52	11/13/2018 5:35	0.497	0.972	1.002	1.000
1.800%	11/1/2018	10/31/2019	11/9/2018 6:48	11/13/2018 1:52	11/13/2018 5:35	0.497	0.972	1.002	1.000
5.600%	3/1/2018	2/28/2019	11/9/2018 6:48	11/13/2018 1:52	11/13/2018 5:35	0.497	0.972	1.002	1.000
5.300%	5/1/2018	4/30/2019	11/9/2018 6:48	11/13/2018 2:22	11/13/2018 6:10	0.499	0.972	1.002	1.000
8.100%	6/1/2018	5/31/2019	11/13/2018 2:22	11/16/2018 1:31	11/16/2018 4:45	0.416	0.976	1.002	1.000
1.700%	7/1/2018	6/30/2019	11/13/2018 2:22	11/16/2018 1:31	11/16/2018 4:45	0.416	0.976	1.002	1.000
2.200%	11/1/2018	10/31/2019	11/13/2018 2:22	11/16/2018 1:31	11/16/2018 4:45	0.416	0.976	1.002	1.000
8.100%	6/1/2018	5/31/2019	11/9/2018 6:48	11/13/2018 2:22	11/13/2018 8:35	0.499	0.954	1.002	1.000
2.400%	7/1/2018	6/30/2019	11/9/2018 6:48	11/13/2018 2:22	11/13/2018 6:10	0.499	0.972	1.002	1.000
6.300%	11/1/2018	10/31/2019	11/9/2018 6:48	11/13/2018 1:22	11/13/2018 6:10	0.495	0.964	1.002	1.000
8.700%	3/1/2018	2/28/2019	11/13/2018 2:22	11/16/2018 1:31	11/16/2018 4:45	0.416	0.976	1.002	1.000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-D
Spike Exp Date : 12/19/2018
Spike Activity (dpm/ml): 288.42
Spike Volume Added: 0.10

LCS S/N : 1715-D
LCS Exp Date : 12/19/2018
LCS Activity (dpm/ml): 288.42
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2323	0.1640	1	0.4501	**0.2442**	58.11%	0.2000	0.1155	0.2763	0.2804		SAMPLE				
2	0.2042	0.1442	0.5	0.3541	**2.1475**	13.64%	3.2667	0.3559	0.4586	0.6523		SAMPLE				
3	0.2222	0.1569	1	0.4149	**0.4046**	37.92%	0.4000	0.1491	0.2956	0.3064		SAMPLE				
4	0.2303	0.1626	1	0.4189	**1.2814**	18.21%	1.3667	0.2380	0.4375	0.4933		SAMPLE				
5	0.2345	0.1655	1	0.4543	**1.5612**	18.56%	1.2667	0.2211	0.5341	0.6109		SAMPLE				
6	0.3153	0.2226	1	0.5467	**1.6576**	18.52%	1.6333	0.2687	0.5346	0.6475		SAMPLE				
7	0.1805	0.1275	1	0.3498	**1.6766**	15.69%	1.7667	0.2560	0.4763	0.5695		SAMPLE				
8	0.2457	0.1735	1	0.4382	**0.000E+00**	0.00%	0.0000	0.1155	0.2067	0.2068		SAMPLE				
9	0.1941	0.1371	1	0.3762	**2.6533**	15.36%	2.6000	0.3055	0.6111	0.8861		SAMPLE				
10	0.2818	0.1990	1	0.5026	**1.1871**	20.33%	1.1333	0.2261	0.4641	0.5030		SAMPLE				
11	0.1867	0.1318	1	0.3838	**2.2836**	15.39%	1.9000	0.2603	0.6133	0.7635		SAMPLE				
12	0.1715	0.1210	1	0.3322	**0.6008**	26.06%	0.6667	0.1700	0.3002	0.3189		SAMPLE				
13	0.1703	0.1202	1	0.3300	**0.0895**	100.22%	0.1000	0.1000	0.1755	0.1763		SAMPLE				
14	0.2498	0.1764	1	0.4545	**0.3051**	48.47%	0.3000	0.1453	0.2897	0.2932		SAMPLE				
15	0.3525	0.2489	1	0.6112	**0.4917**	41.80%	0.4333	0.1795	0.3992	0.4090		SAMPLE				
16	0.2344	0.1655	1	0.4542	**1.6429**	17.76%	1.3333	0.2261	0.5460	0.6192		SAMPLE				
17	0.1259	0.0889	1	0.2924	**1.0697**	21.17%	0.9333	0.1826	0.4101	0.4700		SAMPLE				
18	0.0746	0.0527	0.5	0.1734	**1.3365**	13.35%	1.9667	0.2603	0.3468	0.3993		SAMPLE				
19	0.1824	0.1288	0.5	0.3319	**0.000E+00**	0.00%	0.0000	0.1054	0.1535	0.1535		MB				
20	0.0670	0.0473	0.5	0.1556	**1.4440**	14.51%	2.3667	0.2848	0.3406	0.4604	463511005.1	DUP	39.2%	1.7270		
21	0.2352	0.1660	0.5	0.4278	**23.5243**	4.42%	24.5667	0.9110	1.7099	3.9597	463511005.1	MS			25.9836	82.3%
22	0.3089	0.2181	0.5	0.5425	**25.1942**	7.35%	23.7000	0.8975	1.8701	5.1382	463511005.1	MSD	6.9%	0.5045	25.9836	88.7%
23	0.1062	0.0750	0.5	0.2467	**15.3740**	9.84%	15.9000	0.7295	1.3826	3.7026		LCS			16.2397	94.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 13-NOV-2018

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	04:20	1	1.30E+05	129559	0.01		
LUCAS2	EFF	04:20	1	1.35E+05	134779	2.8		
LUCAS3	EFF	04:20	1	1.42E+05	142192	0.6		
LUCAS4	EFF	04:20	1	1.31E+05	130524	-1.1		
LUCAS5	EFF	04:20	1	1.36E+05	136044	1.56		
LUCAS6	EFF	04:20	1	1.32E+05	132176	-2.61		
LUCAS7	EFF	04:20	1	1.43E+05	142939	1.31		
LUCAS8	EFF	04:20	1	1.43E+05	142732	1.28		

Reviewed by: Elizabeth Krouse **Date:** 13-NOV-18

GEL Laboratories LLC

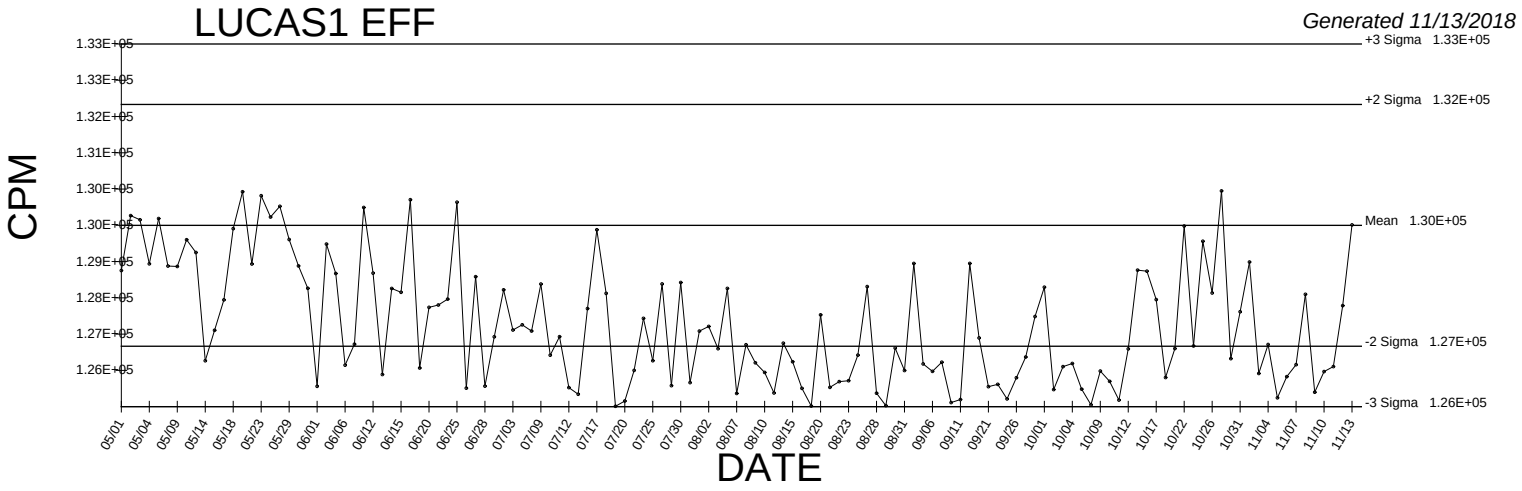
Ludlum Alpha Scintillation Counter Checks for 16-NOV-2018

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	04:00	1	1.28E+05	128174	-1.07		
LUCAS2	EFF	04:00	1	1.34E+05	133843	2.35		
LUCAS3	EFF	04:00	1	1.38E+05	137563	-1.63		
LUCAS4	EFF	04:00	1	1.30E+05	130407	-1.21		
LUCAS5	EFF	04:00	1	1.34E+05	133824	0.09		
LUCAS6	EFF	04:00	1	1.34E+05	133891	-0.83		
LUCAS7	EFF	04:00	1	1.43E+05	142608	0.9		
LUCAS8	EFF	04:00	1	1.31E+05	130563	-2.95		

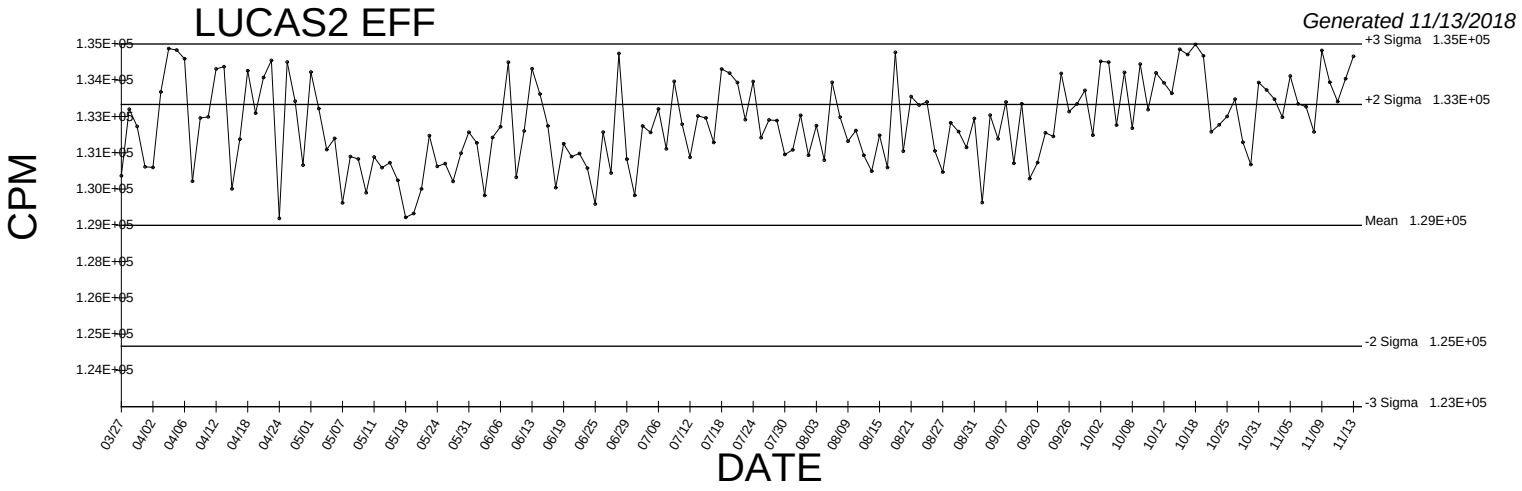
Reviewed by: Elizabeth Krouse **Date:** 16-NOV-18

GEL Laboratories LLC

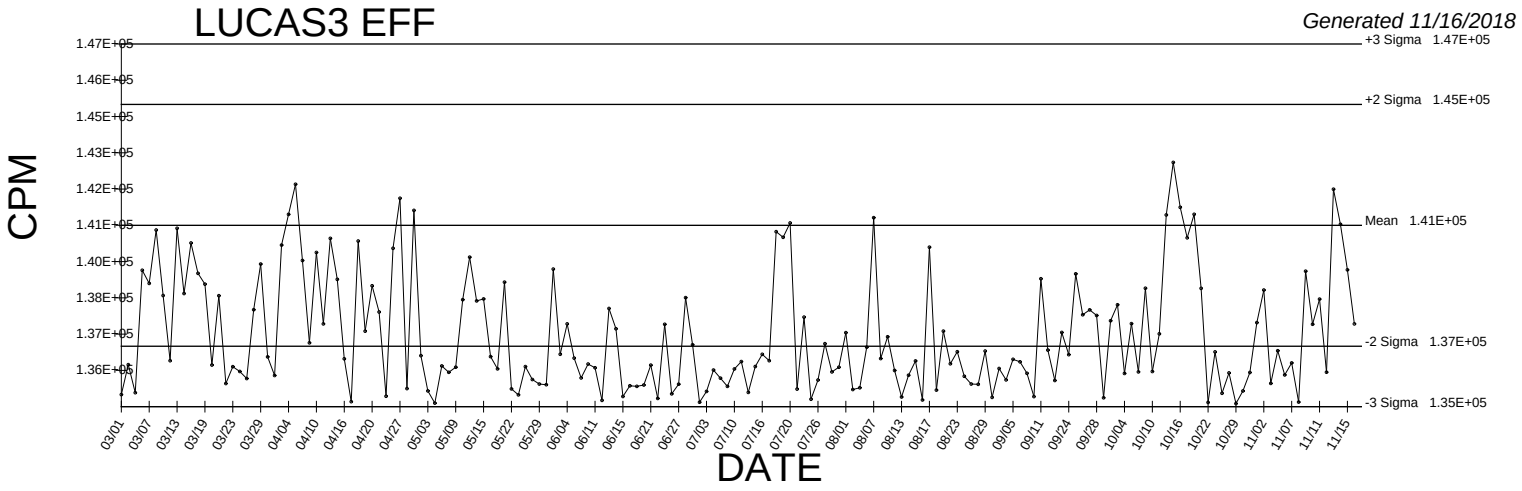
Efficiency Data



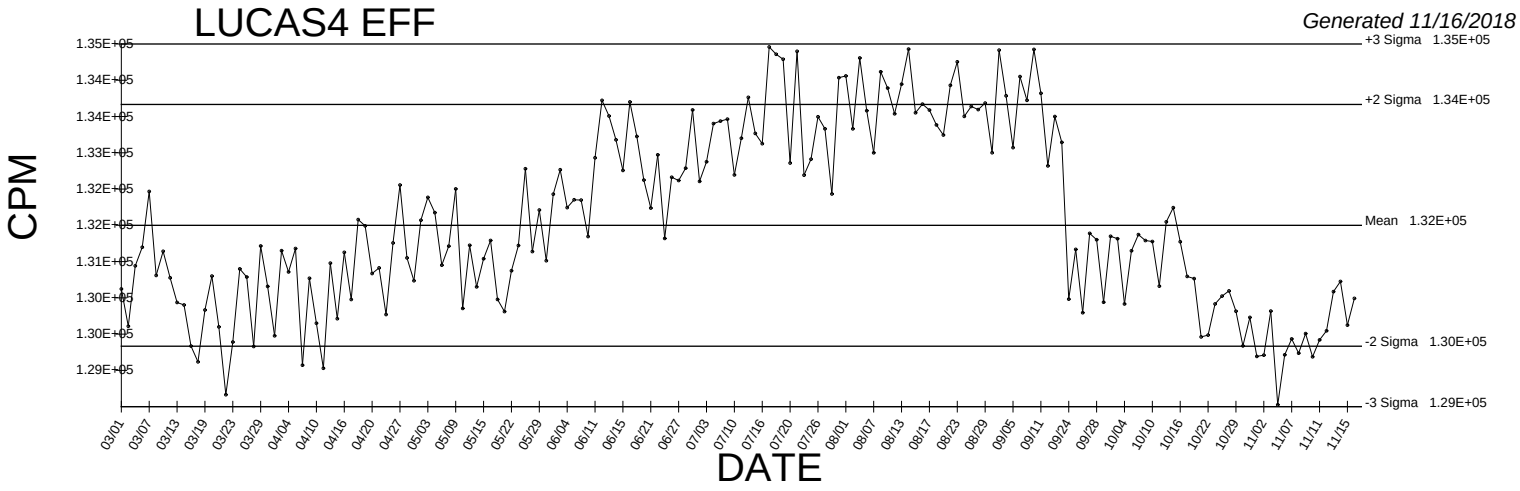
● Denotes Outlier



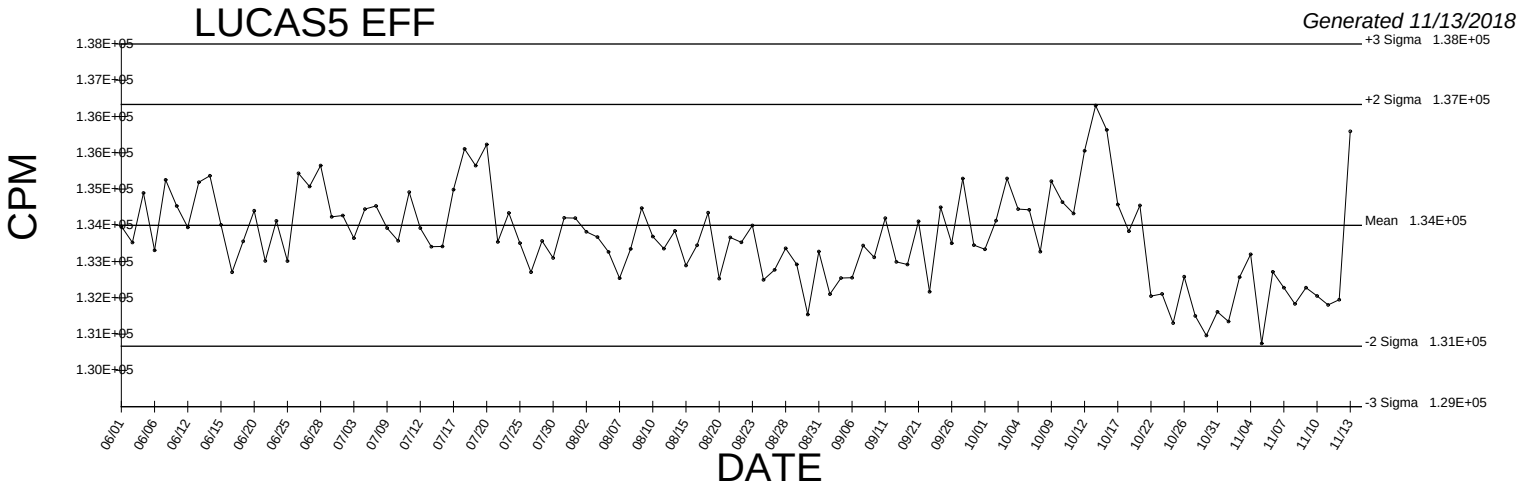
● Denotes Outlier



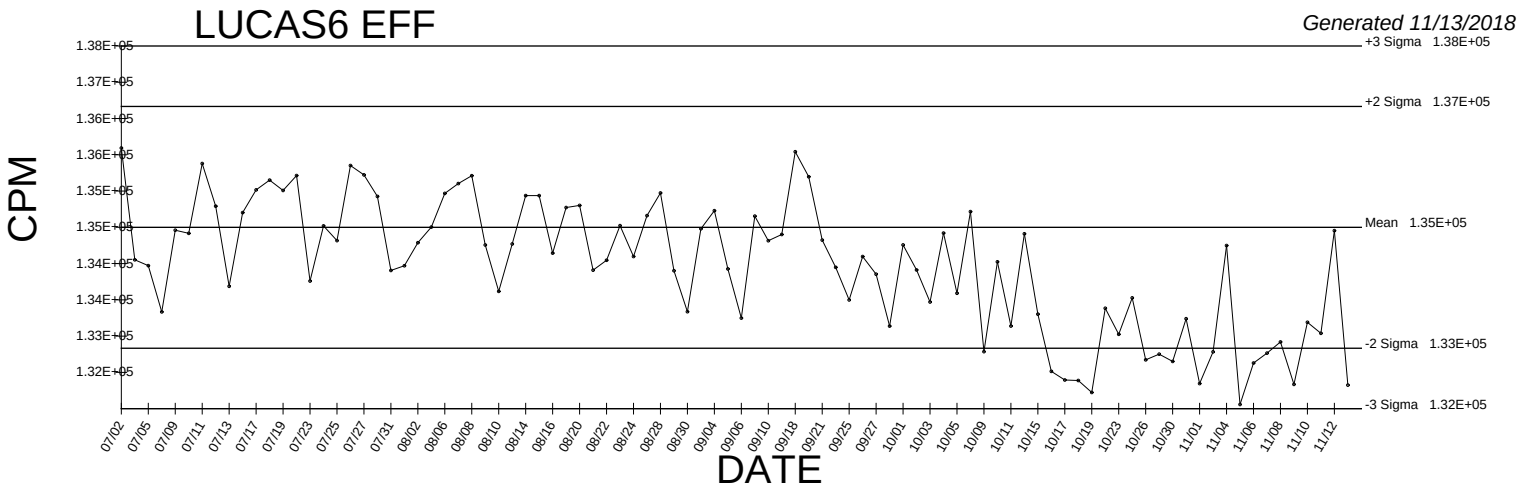
● Denotes Outlier



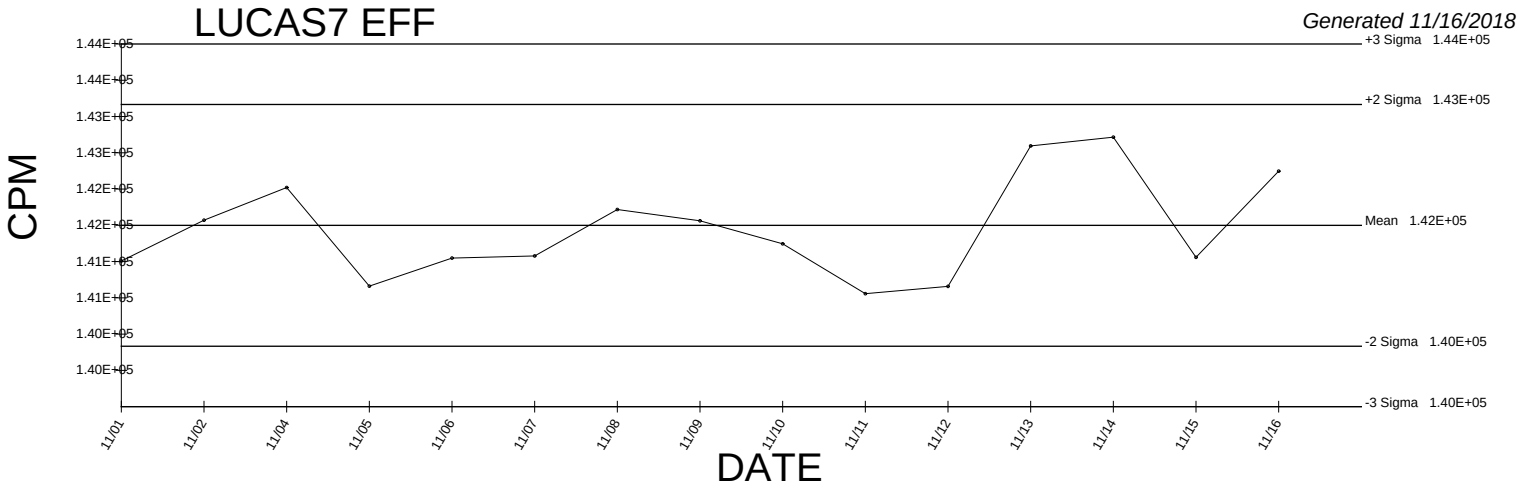
● Denotes Outlier



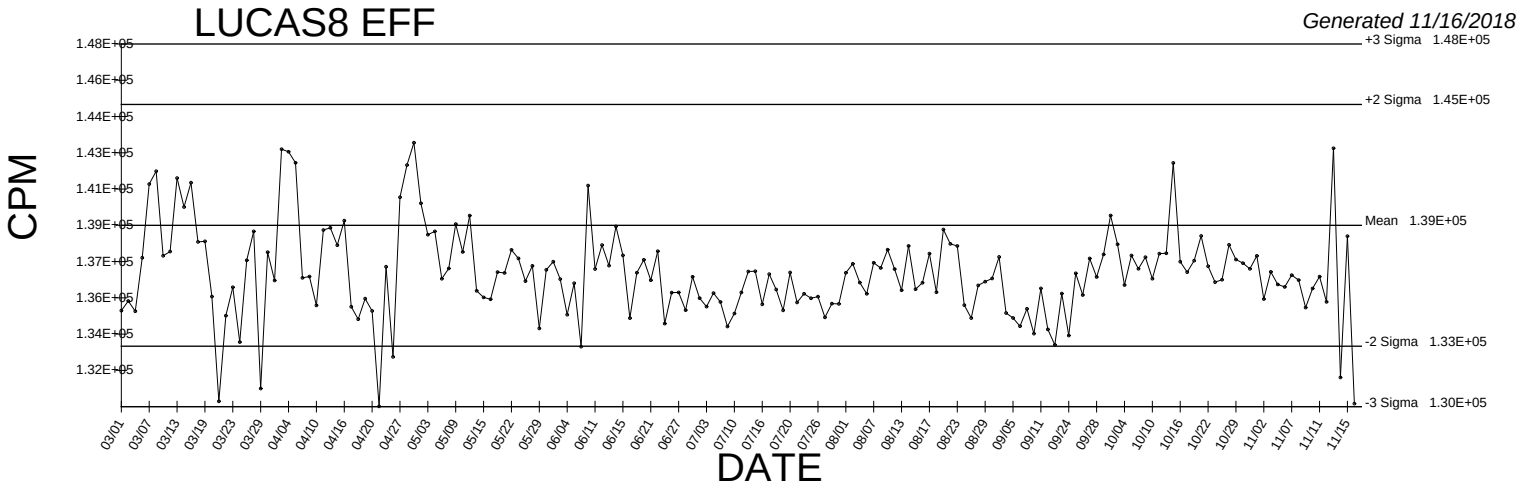
● Denotes Outlier



● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1715

98367

Ra-226 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 7 Product Code: 8226

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty* , % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Ra-226	5.844E+05	3.676E+04	1.0	2.1	4.7	09/09/2014

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities (other than decay products)<0.1%.
5.02193 g 0.1M HCl solution with approximately 30 µg/g Ba carrier.

Source Prepared by: R. Ormsby
R. Ormsby, Radiochemist

QC Approved: L. Tk
L. Tkavadze, Nuclear Metrologist

Date: 9 Sep 14

RECEIVED 9/10/14

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1715
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	09/09/2014
Ampoule Mass (g):	5.02193 g
Uncertainty:	+/- 2.35 %
LogBook No:	GL-CED-297-008

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Gregory Ramsay		
Prep Date:	07/06/2016		
Verification Date:	02/08/2017		
Expiration Date:	02/08/2018		
Primary Code:	1715-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9865 g		
Density(g/mL):	0.9967	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / (Ampoule Mass(g) *(Dilution Vol)) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / Density / (Ampoule Mass (g) * (Dilution Vol)) = Parent Activity (dpm/g)
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (5.02193 g * 100 mL) = 21900.3937 dpm/mL
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (0.9967 g/mL)/ (5.02193 g * 100 mL) = 21972.4854 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/06/2016	Gregory Ramsay	2.6261	200	1715-B	288.51 dpm/ml	01/25/2017	11/10/2018
02/08/2017	Gregory Ramsay	21.96	250	1715-C	1930.063 dpm/ml	02/08/2017	02/08/2018
12/19/2017	Gregory Ramsay	2.63	200	1715-D	288.938 dpm/ml	12/19/2017	12/19/2018

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1715-D

v1.0.2

Instrument	Yellow
Analyst	GXR1
Verification Prep Date	12/19/2017

Standard Information	
Isotope	Ra-226
Serial Number	1715-D
Isotope Halflife	1.6000E+03 Y
Reference Date	9/9/2014
Ref. Act. (DPM/mL)	288.938
Amount of Std. (mL)	0.5
Standard Prep Date	12/19/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	12/20/2017	773.48	70.40	11.00
2	12/20/2017	774.10	70.70	11.00
3	12/20/2017	772.98	73.30	11.00

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	59.40	0.422157	281.41	140.71
2	59.70	0.422157	282.83	141.42
3	62.30	0.422157	295.15	147.58

	dpm/mL
Mean Value =	286.47
Stdev =	7.555402963
Certificate Value* =	**288.5**
Two sigma =	15.111
10 % of Mean =	28.647
Rule A (Pass/Fail)	**Pass**
% Recovery	99.29%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**12/19/2018**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ra-226 source 1715-D by transferring 0.5 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCYellow for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 12/20/2017 using Ra-226 source 0299-H.

Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,
B = BKG cpm,
C = System efficiency (cpm/dpm), and
D = volume used for standard verification.

RAD-M-001

12/21/17

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR **Batch ID: 1819735**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
463427001	SAMPLE	PCW	LUCAS2	NOV-13-18 05:00:00	DONE	Lucas Cell	01-AUG-18 00:00
463530001	SAMPLE	PCW	LUCAS4	NOV-13-18 05:00:00	DONE	Lucas Cell	01-MAR-18 00:00
463530002	SAMPLE	PCW	LUCAS5	NOV-13-18 05:00:00	DONE	Lucas Cell	01-JUN-18 00:00
463530004	SAMPLE	PCW	LUCAS7	NOV-13-18 05:00:00	DONE	Lucas Cell	01-NOV-18 00:00
463530005	SAMPLE	PCW	LUCAS8	NOV-13-18 05:00:00	DONE	Lucas Cell	01-MAR-18 00:00
463530006	SAMPLE	PCW	LUCAS1	NOV-13-18 05:35:00	DONE	Lucas Cell	01-MAY-18 00:00
463530007	SAMPLE	PCW	LUCAS2	NOV-13-18 05:35:00	DONE	Lucas Cell	01-AUG-18 00:00
463530008	SAMPLE	PCW	LUCAS3	NOV-13-18 05:35:00	DONE	Lucas Cell	01-MAR-18 00:00
463530010	SAMPLE	PCW	LUCAS5	NOV-13-18 05:35:00	DONE	Lucas Cell	01-JUN-18 00:00
463530011	SAMPLE	PCW	LUCAS6	NOV-13-18 05:35:00	DONE	Lucas Cell	01-JUL-18 00:00
463541001	SAMPLE	PCW	LUCAS7	NOV-13-18 05:35:00	DONE	Lucas Cell	01-NOV-18 00:00
463646001	SAMPLE	PCW	LUCAS8	NOV-13-18 05:35:00	DONE	Lucas Cell	01-MAR-18 00:00
463646002	SAMPLE	PCW	LUCAS1	NOV-13-18 06:10:00	DONE	Lucas Cell	01-MAY-18 00:00
1204152950	MS	PCW	LUCAS6	NOV-13-18 06:10:00	DONE	Lucas Cell	01-JUL-18 00:00
1204152951	MSD	PCW	LUCAS7	NOV-13-18 06:10:00	DONE	Lucas Cell	01-NOV-18 00:00
463511005	SAMPLE	PCW	LUCAS3	NOV-13-18 08:35:00	DONE	Lucas Cell	01-MAR-18 00:00
1204152949	DUP	PCW	LUCAS5	NOV-13-18 08:35:00	DONE	Lucas Cell	01-JUN-18 00:00
463530003	SAMPLE	PCW	LUCAS3	NOV-16-18 04:45:00	DONE	Lucas Cell	01-MAR-18 00:00
463530009	SAMPLE	PCW	LUCAS4	NOV-16-18 04:45:00	DONE	Lucas Cell	01-MAR-18 00:00
463646003	SAMPLE	PCW	LUCAS5	NOV-16-18 04:45:00	DONE	Lucas Cell	01-JUN-18 00:00
463661005	SAMPLE	PCW	LUCAS6	NOV-16-18 04:45:00	DONE	Lucas Cell	01-JUL-18 00:00
1204152948	MB	PCW	LUCAS7	NOV-16-18 04:45:00	DONE	Lucas Cell	01-NOV-18 00:00
1204152952	LCS	PCW	LUCAS8	NOV-16-18 04:45:00	DONE	Lucas Cell	01-MAR-18 00:00

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Type III Data Package

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Project: PSEG Hudson
Groundwater and Water Samples
Collected on 12/03/18-12/04/18

SDG# GEJ61

GROUP	SAMPLE NUMBERS
2016606	9931001-9931010

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-18-27
AZ Cert. # AZ0780

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by: Dana M Kauffman **Date: 12/31/2018**

Dana M. Kauffman
Manager

Any questions or concerns you might have regarding this data package should be directed to your client representative, Kerri Sachtleben at (717)-556-7376.

2425 New Holland Pike, Lancaster, PA 17601 | 717-656-2300 | Fax: 717-656-2681 | www.LancasterLabs.com

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Sample Reference List for SDG Number GEJ61 with a Data Package Type of III

07701 - GEI Consultants, Inc.

Project: PSEG Hudson

Lab Sample Number	Client Sample ID	Collection Date	Date Received
9931001	MW-1	12/03/2018 11:15	12/07/2018 19:30
9931002	MW-2	12/03/2018 12:40	12/07/2018 19:30
9931003	MW-3	12/03/2018 11:20	12/07/2018 19:30
9931004	MW-4	12/03/2018 13:05	12/07/2018 19:30
9931005	MW-5	12/04/2018 09:55	12/07/2018 19:30
9931006	MW-6	12/04/2018 10:35	12/07/2018 19:30
9931007	MW-7	12/04/2018 13:55	12/07/2018 19:30
9931008	MW-8	12/04/2018 12:30	12/07/2018 19:30
9931009	MW-9	12/04/2018 12:15	12/07/2018 19:30
9931010	FB-20181203	12/03/2018 12:00	12/07/2018 19:30

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Sample pH Log

SDG: GEJ61

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9931001	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:34:08AM	12616
9931001	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:13:08PM	12665
9931001	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:15:12PM	12665
9931001	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:16:28AM	12616
9931001	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 10:13:04PM	12665
9931001	089B	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 9:55:27PM	12665
9931001	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:34:08AM	12616
9931001	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:34:08AM	12616
9931002	004A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:38:59AM	12616
9931002	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:16:28PM	12665
9931002	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:21:12PM	12665
9931002	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:16:44AM	12616
9931002	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 10:29:48PM	12665
9931002	330A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:38:59AM	12616
9931002	332A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:38:59AM	12616
9931003	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:42:57AM	12616
9931003	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 8:00:20PM	12665
9931003	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:14:55PM	12665
9931003	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:14:28AM	12616
9931003	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 10:05:18PM	12665
9931003	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:42:57AM	12616
9931003	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:42:57AM	12616
9931004	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:44:48AM	12616
9931004	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:19:38PM	12665
9931004	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:20:36PM	12665
9931004	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:11:23AM	12616
9931004	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 10:19:36PM	12665
9931004	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:44:48AM	12616
9931004	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:44:48AM	12616
9931005	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:45:42AM	12616
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9931006	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:37:57AM	12616
9931006	055A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 7:59:05PM	12665

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee
9931006	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:15:29PM	12665
9931006	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:16:15AM	12616
9931006	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 10:11:46PM	12665
9931006	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:37:57AM	12616
9931006	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:37:57AM	12616
9931007	004A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:41:21AM	12616
9931007	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:20:06PM	12665
9931007	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:20:55PM	12665
9931007	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:17:41AM	12616
9931007	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 9:29:24PM	12665
9931007	330A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:41:21AM	12616
9931007	332A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:41:21AM	12616
9931008	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:42:11AM	12616
9931008	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:19:50PM	12665
9931008	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:18:25PM	12665
9931008	070A	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:14:47AM	12616
9931008	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 9:50:45PM	12665
9931008	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:42:11AM	12616
9931008	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:42:11AM	12616
9931009	004A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:43:54AM	12616
9931009	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:19:08PM	12665
9931009	055B	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:20:19PM	12665
9931009	070A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:11:47AM	12616
9931009	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 10:03:19PM	12665
9931009	330A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:43:54AM	12616
9931009	332A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:43:54AM	12616
9931010	004A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:39:52AM	12616
9931010	055A	6	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 9:18:52PM	12665
9931010	055B	7	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/9/2018 8:00:05PM	12665
9931010	070A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 11:16:54AM	12616
9931010	089A	<2	<2	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/12/2018 10:26:24PM	12665
9931010	330A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:39:52AM	12616
9931010	332A	5	5-9	PK	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	12/10/2018 10:39:52AM	12616

LLI Sample Number	Bottle Code	Actual pH	Exp. pH	*pH Check Code	Adj. pH	Adjusted Date	Adjusted Time	Preservative Added	Preservative Lot #	LLI Supplied Bottle?	Sulfide Present?	Corrective Substance	CS Lot #	**Chlorine Present?	Corrective Substance	CS Lot #	Record Date	Employee

*pH Check Code Key
PK = Original container checked - pH is within the correct range. (No preservative was added)
PA = Original container checked - pH adjusted to correct range. (Preservative was added)
PV = Volatile container checked
PC = pH checked (unpreserved container)
SPK = Subsampled from an original container. Original container checked - pH is within correct range
SPA = Subsampled from an original container. Subsample container checked - pH adjusted to correct range.
SPC = Subsampled from an original container. pH checked (unpreserved container).
SUP = Subsampled from original container. Unable to be preserved due to the matrix of the sample.
UP = Unable to preserve due to matrix of the sample.
NA = Not applicable

**Chlorine Present Code Key
NA = Chlorine Not Checked
Y = Chlorine Present
N = Chlorine Not Present

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00259 Mercury

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

14044 ICP-WW, 3005A (tot rec) - U345

The sample is digested with nitric acid and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3005A, July 1992

14047 ICPMS - Water, 3020A - U345

The sample is digested with nitric and hydrochloric acid.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 3020A, July 1992

05713 WW SW846 Hg Digest

The sample is heated at 95 c with nitric acid, sulfuric acid, potassium persulfate, and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

07046 Barium
08014 Boron
01750 Calcium
07051 Chromium
07052 Cobalt
01756 Lithium
07036 Selenium
07022 Thallium

The solution resulting from the metals digestion is analyzed by Trace ICP.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6010D, Rev. 4, July 2014.

06024 Antimony
06025 Arsenic
06027 Beryllium
06028 Cadmium
06035 Lead
06038 Molybdenum

The solution resulting from the metals digestion is analyzed by ICP/MS.

Reference: Test Methods for Evaluating Solid Wastes, SW-846 Update V, Method 6020B, Rev.2, July 2014.

00224 Chloride
01504 Fluoride
00228 Sulfate

A small volume of sample is introduced into an ion chromatograph. The anions are then separated and measured by a system consisting of a guard column, separator column, suppressor, and conductivity detector.

Reference: Method 300.0, Revision 2.1 (1993), Methods for Chemical Analysis of Water and Wastes USEPA 600.

12152 pH

The activity of hydrogen ions in the sample is measured using a glass electrode and a reference electrode.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 4500-H+ B-2011

00212 Total Dissolved Solids

A well-mixed sample is filtered through a glass fiber filter. The filtrate is collected in a tared beaker, evaporated in a steam bath and dried in an oven at 180C +/- 2C to a constant weight. The increase in weight is the total dissolved solids.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2540 C-2011

12151 Temperature of pH

The temperature of the sample measured during the pH analysis.

Reference: Standard Methods for the Examination of Water and Wastewater, Method 2550 B-2010

Analysis Reports / Field Chain of Custody

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GEI Consultants, Inc.
400 Unicorn Park Drive
Wobern MA 01801

Report Date: December 28, 2018 11:34

Project: PSEG Hudson

Account #: 07701
Group Number: 2016606
SDG: GEJ61
PO Number: 1504710
State of Sample Origin: NJ

Electronic Copy To	GEI Consultants, Inc.	Attn: Jason Kohl
Electronic Copy To	GEI Consultants, Inc.	Attn: Data Group

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-1 Grab Groundwater	12/03/2018 11:15	9931001
MW-2 Grab Groundwater	12/03/2018 12:40	9931002
MW-3 Grab Groundwater	12/03/2018 11:20	9931003
MW-4 Grab Groundwater	12/03/2018 13:05	9931004
MW-5 Grab Groundwater	12/04/2018 09:55	9931005
MW-6 Grab Groundwater	12/04/2018 10:35	9931006
MW-7 Grab Groundwater	12/04/2018 13:55	9931007
MW-8 Grab Groundwater	12/04/2018 12:30	9931008
MW-9 Grab Groundwater	12/04/2018 12:15	9931009
FB-20181203 Grab Water	12/03/2018 12:00	9931010

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: GEI Consultants, Inc.
Project: PSEG Hudson
Sampling Date(s): 12/03/18 - 12/04/18
Laboratory Sample ID(s): 9931001-9931010
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Christiane S. Swelgart
Senior Specialist

12/28/2018



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Project Name: PSEG Hudson
ELLE Group #: 2016606

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.
Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Sample #s: 9931001-9931010

The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 9931001, 9931002, 9931003, 9931004, 9931005, 9931006, 9931007, 9931008, 9931009, 9931010

The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.

SW-846 6020B Rev.2, July 2014, Metals Dissolved

Sample #s: 9931001, 9931002, 9931003, 9931004, 9931005, 9931006, 9931007, 9931008, 9931009, 9931010

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.

EPA 300.0, Wet Chemistry

Sample #s: 9931004

The chloride value being higher than the Total Dissolved Solids result was confirmed by reanalysis for chloride.

SM 2540 C-2011, Wet Chemistry

Batch #: 18344921203A (Sample number(s): 9931001-9931005, 9931007-9931010 UNSPK: 9931008 BKG: 9931006, 9931008)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Sample Description: **MW-1 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 11:15
SDG#: GEJ61-01

GEI Consultants, Inc.
ELLE Sample #: GW 9931001
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.748	0.0010	0.0050	1
08014	Boron	7440-42-8	1.14	0.0120	0.0500	1
01750	Calcium	7440-70-2	390	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0056	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.239	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00076 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0020 J	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0027	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,490	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	117	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	10,800	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 11:15
SDG#: GEJ61-01

GEI Consultants, Inc.
ELLE Sample #: GW 9931001
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.8	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:34	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:11	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:34	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:34	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/20/2018 12:47	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:34	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:34	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:11	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 08:57	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:23	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 08:57	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:23	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:23	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:23	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 08:39	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 11:15
SDG#: GEJ61-01

GEI Consultants, Inc.
ELLE Sample #: GW 9931001
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315B	12/17/2018 23:36	Clinton M Wilson	2000
01504	Fluoride	EPA 300.0	1	18348120315B	12/15/2018 03:15	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315B	12/15/2018 03:32	Hallie A Burnett	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 20:16	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 20:16	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 12:40
SDG#: GEJ61-02

GEI Consultants, Inc.
ELLE Sample #: GW 9931002
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	2.24	0.0010	0.0050	1
08014	Boron	7440-42-8	0.927	0.0120	0.0500	1
01750	Calcium	7440-70-2	467	0.165	2.50	5
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0041 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0709	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0045	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0032	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,660	400	800	2000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	14.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	10,600	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 12:40
SDG#: GEJ61-02

GEI Consultants, Inc.
ELLE Sample #: GW 9931002
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.3	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:37	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:15	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:26	Cindy M Gehman	5
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:37	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/20/2018 12:50	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:15	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:37	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:15	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:12	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:27	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:12	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:27	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:27	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:27	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 08:52	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 12:40
SDG#: GEJ61-02

GEI Consultants, Inc.
ELLE Sample #: GW 9931002
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	2	18348120315A	12/14/2018 17:47	Hallie A Burnett	2000
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 17:30	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 17:30	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 20:21	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 20:21	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 11:20
SDG#: GEJ61-03

GEI Consultants, Inc.
ELLE Sample #: GW 9931003
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0322	0.0010	0.0050	1
08014	Boron	7440-42-8	0.206	0.0120	0.0500	1
01750	Calcium	7440-70-2	56.8	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D. K1	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0013 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0036	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0070	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	123	10.0	20.0	50
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	46.9	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	524	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 11:20
SDG#: GEJ61-03

GEI Consultants, Inc.
ELLE Sample #: GW 9931003
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.8	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:46	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:29	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:46	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:46	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:29	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:46	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:46	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:29	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:14	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:35	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:14	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:35	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:35	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:35	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 08:54	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 11:20
SDG#: GEJ61-03

GEI Consultants, Inc.
ELLE Sample #: GW 9931003
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/14/2018 18:21	Hallie A Burnett	50
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 18:04	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 18:04	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 19:55	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 19:55	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 13:05
SDG#: GEJ61-04

GEI Consultants, Inc.
ELLE Sample #: GW 9931004
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.229	0.0010	0.0050	1
08014	Boron	7440-42-8	0.967	0.0120	0.0500	1
01750	Calcium	7440-70-2	81.6	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D. K1	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0760	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00050 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0063	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	3,360	200	400	1000
	The chloride value being higher than the Total Dissolved Solids result was confirmed by reanalysis for chloride.					
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	221	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	3,280	400	1,200	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 13:05
SDG#: GEJ61-04

GEI Consultants, Inc.
ELLE Sample #: GW 9931004
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.2	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:49	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:33	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:49	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:49	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:33	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:49	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:49	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:33	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:17	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:37	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:17	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:37	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:37	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:37	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 08:56	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 13:05
SDG#: GEJ61-04

GEI Consultants, Inc.
ELLE Sample #: GW 9931004
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/14/2018 19:44	Hallie A Burnett	1000
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 19:27	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/17/2018 23:19	Clinton M Wilson	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 19:50	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 19:50	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 09:55
SDG#: GEJ61-05

GEI Consultants, Inc.
ELLE Sample #: GW 9931005
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0870	0.0010	0.0050	1
08014	Boron	7440-42-8	0.364	0.0120	0.0500	1
01750	Calcium	7440-70-2	99.5	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D. K1	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0270 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00078 J	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	623	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	4.7 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	1,640	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 09:55
SDG#: GEJ61-05

GEI Consultants, Inc.
ELLE Sample #: GW 9931005
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.4	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:53	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:36	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:53	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:53	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:36	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:53	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:53	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:36	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:19	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:38	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:19	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:38	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:38	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:38	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 08:58	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 09:55
SDG#: GEJ61-05

GEI Consultants, Inc.
ELLE Sample #: GW 9931005
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/14/2018 20:17	Hallie A Burnett	500
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 20:01	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 20:01	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 21:10	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 21:10	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 10:35
SDG#: GEJ61-06

GEI Consultants, Inc.
ELLE Sample #: GW 9931006
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0580	0.0010	0.0050	1
08014	Boron	7440-42-8	0.481	0.0120	0.0500	1
01750	Calcium	7440-70-2	95.4	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D. K1	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0155 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00094 J	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0022	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	368	100	200	500
01504	Fluoride	16984-48-8	0.43 J	0.25	0.50	5
00228	Sulfate	14808-79-8	29.6	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	900	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 10:35
SDG#: GEJ61-06

GEI Consultants, Inc.
ELLE Sample #: GW 9931006
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.0	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:56	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:40	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:56	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:56	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:40	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:56	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:56	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:40	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:21	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:40	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:21	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:40	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:40	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:40	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 09:00	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 10:35
SDG#: GEJ61-06

GEI Consultants, Inc.
ELLE Sample #: GW 9931006
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/14/2018 20:51	Hallie A Burnett	500
01504	Fluoride	EPA 300.0	2	18348120315A	12/21/2018 16:25	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 20:34	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203B	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 20:44	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 20:44	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 13:55
SDG#: GEJ61-07

GEI Consultants, Inc.
ELLE Sample #: GW 9931007
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0185	0.0010	0.0050	1
08014	Boron	7440-42-8	0.0848	0.0120	0.0500	1
01750	Calcium	7440-70-2	19.9	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D. K1	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0055	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	17.8	1.0	2.0	5
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	6.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	141	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 13:55
SDG#: GEJ61-07

GEI Consultants, Inc.
ELLE Sample #: GW 9931007
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.9	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:59	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:43	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:59	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:59	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:43	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:59	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 07:59	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:43	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:24	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:42	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:24	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:42	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:42	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:42	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 09:02	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 13:55
SDG#: GEJ61-07

GEI Consultants, Inc.
ELLE Sample #: GW 9931007
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/14/2018 21:08	Hallie A Burnett	5
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 21:08	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 21:08	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 20:25	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 20:25	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 12:30
SDG#: GEJ61-08

GEI Consultants, Inc.
ELLE Sample #: GW 9931008
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0427	0.0010	0.0050	1
08014	Boron	7440-42-8	0.247	0.0120	0.0500	1
01750	Calcium	7440-70-2	23.1	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0081	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0023	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.0015	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0025	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	380	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	32.3	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	722	80.0	240	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 12:30
SDG#: GEJ61-08

GEI Consultants, Inc.
ELLE Sample #: GW 9931008
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.1	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.0	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:02	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:47	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:02	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:02	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/20/2018 12:54	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:02	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:02	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:47	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:26	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:43	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:26	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:43	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:43	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:43	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 09:04	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 12:30
SDG#: GEJ61-08

GEI Consultants, Inc.
ELLE Sample #: GW 9931008
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/14/2018 22:31	Hallie A Burnett	500
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 21:41	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 21:41	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 19:59	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 19:59	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 12:15
SDG#: GEJ61-09

GEI Consultants, Inc.
ELLE Sample #: GW 9931009
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0289	0.0010	0.0050	1
08014	Boron	7440-42-8	0.132	0.0120	0.0500	1
01750	Calcium	7440-70-2	64.4	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D. K1	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0011 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0019 J	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0028	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	113	20.0	40.0	100
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	30.9	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	401	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 12:15
SDG#: GEJ61-09

GEI Consultants, Inc.
ELLE Sample #: GW 9931009
ELLE Group #: 2016606
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.2	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:04	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:50	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:04	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:04	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:50	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:04	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:04	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:50	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:29	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:45	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:29	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:45	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:45	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:45	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 09:11	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/04/2018 12:15
SDG#: GEJ61-09

GEI Consultants, Inc.
ELLE Sample #: GW 9931009
ELLE Group #: 2016606
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/21/2018 16:43	Ashlynn M Cornelius	100
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 22:48	Hallie A Burnett	5
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 22:48	Hallie A Burnett	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 20:11	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 20:11	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181203 Grab Water**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 12:00
SDG#: GEJ61-10FB

GEI Consultants, Inc.
ELLE Sample #: **GW 9931010**
ELLE Group #: **2016606**
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.0708 J	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D. K1	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181203 Grab Water**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 12:00
SDG#: GEJ61-10FB

GEI Consultants, Inc.
ELLE Sample #: GW 9931010
ELLE Group #: 2016606
Matrix: Water

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.9	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:07	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:53	Cindy M Gehman	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:07	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:07	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:53	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:07	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 08:07	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	183481404402	12/18/2018 23:53	Cindy M Gehman	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:05	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:31	Choon Y Tian	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/21/2018 09:05	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:31	Choon Y Tian	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	183511404702A	12/20/2018 18:31	Choon Y Tian	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	183511404702C	12/20/2018 18:31	Choon Y Tian	1
00259	Mercury	SW-846 7470A	1	183470571303	12/15/2018 09:13	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	183481404402	12/17/2018 05:40	Annamaria Kuhns	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-20181203 Grab Water**
PSEG Hudson / 1504710

Project Name: **PSEG Hudson**

Submittal Date/Time: 12/07/2018 19:30
Collection Date/Time: 12/03/2018 12:00
SDG#: GEJ61-10FB

GEI Consultants, Inc.
ELLE Sample #: GW 9931010
ELLE Group #: 2016606
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	183471404706	12/14/2018 03:44	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	2	183511404702	12/18/2018 04:51	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	183470571303	12/14/2018 10:15	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	18348120315A	12/14/2018 23:21	Hallie A Burnett	1
01504	Fluoride	EPA 300.0	1	18348120315A	12/14/2018 23:21	Hallie A Burnett	1
00228	Sulfate	EPA 300.0	1	18348120315A	12/14/2018 23:21	Hallie A Burnett	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	18344921203A	12/10/2018 15:57	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	18344003101A	12/10/2018 20:03	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	18344003101A	12/10/2018 20:03	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2016606
Reported: 12/28/2018 11:34

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 183470571303	Sample number(s): 9931001-9931010		
Mercury	N.D.	0.000050	0.00020
Batch number: 183481404402	Sample number(s): 9931001-9931010		
Barium	N.D.	0.0010	0.0050
Boron	N.D.	0.0120	0.0500
Calcium	N.D.	0.0330	0.500
Chromium	N.D.	0.0053	0.0150
Cobalt	N.D.	0.0015	0.0050
Lithium	N.D.	0.0110	0.0500
Selenium	N.D.	0.0210	0.0500
Thallium	N.D.	0.0140	0.0300
Batch number: 183511404702A	Sample number(s): 9931001-9931010		
Antimony	N.D.	0.00041	0.0020
Arsenic	N.D.	0.00068	0.0020
Beryllium	N.D.	0.000091	0.00050
Cadmium	N.D.	0.00015	0.0010
Lead	N.D.	0.0011	0.0030
Batch number: 183511404702C	Sample number(s): 9931001-9931010		
Molybdenum	N.D.	0.00031	0.0020
Batch number: 18348120315A	Sample number(s): 9931002-9931010		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18348120315B	Sample number(s): 9931001		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 18344921203A	Sample number(s): 9931001-9931005,9931007-9931010		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 18344921203B	Sample number(s): 9931006		
Total Dissolved Solids	N.D.	20.0	60.0

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2016606
Reported: 12/28/2018 11:34

LCS/LCSD

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 183470571303	Sample number(s): 9931001-9931010								
Mercury	0.00100	0.000846			85		80-120		
Batch number: 183481404402	Sample number(s): 9931001-9931010								
Barium	2.00	2.03			102		80-120		
Boron	2.00	1.94			97		80-120		
Calcium	4.00	4.20			105		80-120		
Chromium	0.200	0.204			102		80-120		
Cobalt	0.500	0.541			108		80-120		
Lithium	1.00	1.03			103		80-120		
Selenium	0.150	0.150			100		80-120		
Thallium	0.150	0.159			106		80-120		
Batch number: 183511404702A	Sample number(s): 9931001-9931010								
Antimony	0.00600	0.00525	0.00600	0.00519	87	87	80-120	1	20
Arsenic	0.0100	0.0115	0.0100	0.0102	115	102	80-120	13	20
Beryllium	0.00400	0.00407	0.00400	0.00424	102	106	80-120	4	20
Cadmium	0.00500	0.00526	0.00500	0.00506	105	101	80-120	4	20
Lead	0.0150	0.0157	0.0150	0.0156	105	104	80-120	1	20
Batch number: 183511404702C	Sample number(s): 9931001-9931010								
Molybdenum	0.0500	0.0528	0.0500	0.0518	106	104	80-120	2	20
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18348120315A	Sample number(s): 9931002-9931010								
Chloride	3.00	3.06			102		90-110		
Fluoride	0.750	0.704			94		90-110		
Sulfate	7.50	7.76			104		90-110		
Batch number: 18348120315B	Sample number(s): 9931001								
Chloride	3.00	3.06			102		90-110		
Fluoride	0.750	0.704			94		90-110		
Sulfate	7.50	7.76			104		90-110		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 18344921203A	Sample number(s): 9931001-9931005,9931007-9931010								
Total Dissolved Solids	200	198			99		62-127		
Batch number: 18344921203B	Sample number(s): 9931006								
Total Dissolved Solids	200	198			99		62-127		
	Std. Units	**Std. Units**	**Std. Units**	**Std. Units**					
Batch number: 18344003101A	Sample number(s): 9931001-9931010								
pH	7.00	7.00			100		95-105		

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GEI Consultants, Inc. Group Number: 2016606
Reported: 12/28/2018 11:34

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 183470571303	Sample number(s): 9931001-9931010 UNSPK: 9931001									
Mercury	N.D.	0.00100	0.000811	0.00100	0.000826	81	83	75-125	2	20
	mg/l	mg/l	mg/l	mg/l	mg/l					
Batch number: 18344921203A	Sample number(s): 9931001-9931005,9931007-9931010 UNSPK: 9931008									
Total Dissolved Solids	722	800	1528			101		62-127		
Batch number: 18344921203B	Sample number(s): 9931006 UNSPK: 9931008									
Total Dissolved Solids	722	800	1528			101		62-127		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	mg/l	mg/l		
Batch number: 183470571303	Sample number(s): 9931001-9931010 BKG: 9931001			
Mercury	N.D.	N.D.	0 (1)	20
	mg/l	mg/l		
Batch number: 18344921203A	Sample number(s): 9931001-9931005,9931007-9931010 BKG: 9931008			
Total Dissolved Solids	722	788	9* (1)	5
Batch number: 18344921203B	Sample number(s): 9931006 BKG: 9931006			
Total Dissolved Solids	900	884	2 (1)	5

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only
Acct. # 7701 Group # 2016606 Sample # 993101-10

COC # 571678

Client Information

Client: GEI Consultants, Inc.	Acct. #:
Project Name/#: PSEG Hudson / 1504710	PWSID #:
Project Manager: Jason Kohl	P.O. #:
Sampler: Anthony Shields	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

Matrix: Soil ☐ Sediment ☐ Tissue ☐ | Water ☑ Potable ☐ Ground ☑ NPDES ☐ Surface ☐ | Other: Aqueous

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Metals	Mercury	Chloride	Fluoride	Sulfate	NH4	TDS	Ra 226 + 228	Metals QC
MW-1	12-3-18	1115	✓		8	✓	✓	✓	✓	✓	✓	✓	✓	J
MW-2	12-3-18	1240	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
MW-3	12-3-18	1120	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
MW-4	12-3-18	1305	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
MW-5	12-4-18	0955	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
MW-6	12-4-18	1035	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
MW-7	12-4-18	1355	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
MW-8	12-4-18	1230	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
MW-9	12-4-18	1215	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	
FB-20181203	12-3-18	1200	✓		7	✓	✓	✓	✓	✓	✓	✓	✓	

Analysis Requested

Preservation and Filtration Codes

For Lab Use Only
FSC:
SCR#: 234852

Preservation Codes

H=HCl	T=Thiosulfate
N=HNO_3	B=NaOH
S=H_2SO_4	P=H_3PO_4
F=Field Filtered	O=Other

Remarks

Metals:
As, B, Ba, Be, Ca, Cd, Co, Cr, Li, Mn, Pb, Sb, Se, Tl

Turnaround Time (TAT) Requested (please circle)
Standard Rush
(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: JKohl@GEIConsultants.com

Data Package Options (circle if required)
Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)
Type III (Reduced non-CLP) NJ DKQP TX TRRP-13
NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Bottle Storage	11-30-18	1200		11-30-18	1200
				12-7-18	1645
	12-7-18	1930			
				12-7-18	1930

EDD Required? Yes No
If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:
UPS FedEx Other

Temperature upon receipt 1.2+2 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 235522

Group Number(s): 2016606

Client: GEI Consultants, Inc.

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	12/07/2018 19:30
Number of Packages:	4	Number of Projects:	2
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Melvin Sanchez (8943) at 22:46 on 12/07/2018

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-02	3.2	DT	Wet	Y	Bagged	N
2	DT42-02	1.4	DT	Wet	Y	Bagged	N
3	DT42-02	1.8	DT	Wet	Y	Bagged	N
4	DT42-02	1.2	DT	Wet	Y	Bagged	N

General Comments: Both 1000 mL botlles for MW-3 were half full.

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

Metals in Liquid Data

Case Narrative/Conformance Summary

Metals in Liquid

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

ICP Metals

Fraction: Metals in Liquid

Sample #	Client ID	Matrix Liquid	Solid	Comments
9931001	MW-1	X		
9931002	MW-2	X		
9931003	MW-3	X		
9931004	MW-4	X		
9931005	MW-5	X		
9931006	MW-6	X		
9931007	MW-7	X		
9931008	MW-8	X		
9931009	MW-9	X		
9931010	FB-20181203	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

All QC is within specification.

SAMPLE ANALYSIS:

Refer to analysis run log for samples requiring dilutions.

The instrument detection limits (IDLs) are used for determining the U flags on the initial and continuing calibration blanks. The highest IDL is selected when multiple

Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

ICP Metals

Fraction: Metals in Liquid

instruments are used for an analysis. The method detection limits (MDLs) are used for determining all other U flags.

(Sample number(s): 9931001-9931010)
The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.
(Sample number(s): 9931001-9931010: Analysis: 07036)
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.

(Sample number(s): 9931001-9931010: Analysis: 07022)
The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.

(Sample number(s): 9931001-9931010: Analysis: 06025)
The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

BKG – Background	AF - Cold Vapor Atomic Fluorescence
DUP – Duplicate	U - Below MDL
MS - Matrix Spike	B - Below LOQ
MSD - Matrix Spike Dup	N - Matrix Spike out of specifications
B – Blank	* - Duplicate out of specifications
Q - Laboratory Control Sample	E - Matrix Effects exist as proven by Serial Dilution or Spiked Dilution
Y - Laboratory Control Sample Duplicate	A - Post Digestion Spike
P - ICP Atomic Emission Spectrometer	L - Serial Dilution
MS - ICP Mass Spectrometry	R - Internal Standard Relative Intensity OOS
CV - Cold Vapor	NR - Not Required

Sample Data

Metals in Liquid

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931001, 9931001BKG % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.76	B		MS
7440-38-2	Arsenic	2.0	B		MS
7440-39-3	Barium	748			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	1140			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	390000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	5.6			P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	239			P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	2.7			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
_____

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931002 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	4.5			MS
7440-39-3	Barium	2240			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	927			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	467000			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	4.1	B		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	70.9			P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	3.2			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence
NR = Not Required

CONCENTRATION QUALIFIERS:
U = Below MDL,
B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931003 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.3	B		MS
7440-38-2	Arsenic	3.6			MS
7440-39-3	Barium	32.2			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	206			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	56800			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	7.0			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

_____
_____
_____
_____

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931004 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.50	B		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	229			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	967			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	81600			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	76.0			P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	6.3			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931005 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.78	B		MS
7440-39-3	Barium	87.0			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	364			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	99500			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	27.0	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931006 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.94	B		MS
7440-39-3	Barium	58.0			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	481			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	95400			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	15.5	B		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	2.2			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931007 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	18.5			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	84.8			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	19900			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	5.5			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931008 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	2.3			MS
7440-39-3	Barium	42.7			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	247			P
7440-43-9	Cadmium	1.5			MS
7440-70-2	Calcium	23100			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	8.1			P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	2.5			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931009 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	1.1	B		MS
7440-38-2	Arsenic	1.9	B		MS
7440-39-3	Barium	28.9			P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	132			P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	64400			P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	2.8			MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 1
INORGANIC ANALYSIS DATA SHEET
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Lab Sample ID: 9931010 % Solids: 0.0
Concentration Units: UG/L Date Received: 12/07/2018

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.41	U		MS
7440-38-2	Arsenic	0.68	U		MS
7440-39-3	Barium	1.0	U		P
7440-41-7	Beryllium	0.091	U		MS
7440-42-8	Boron	12.0	U		P
7440-43-9	Cadmium	0.15	U		MS
7440-70-2	Calcium	70.8	B		P
7440-47-3	Chromium	5.3	U		P
7440-48-4	Cobalt	1.5	U		P
7439-92-1	Lead	1.1	U		MS
7439-93-2	Lithium	11.0	U		P
7439-97-6	Mercury	0.050	U		CV
7439-98-7	Molybdenum	0.31	U		MS
7782-49-2	Selenium	21.0	U		P
7440-28-0	Thallium	14.0	U		P

Comments:

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METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence NR = Not Required	U = Below MDL, B = Below LOQ

Quality Control and Calibration Summary Forms

Metals in Liquid

QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ61
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Barium	183481404402	9931001
Boron		9931002
Calcium		9931003
Chromium		9931004
Cobalt		9931005
Lithium		9931006
Selenium		9931007
Thallium		9931008
		9931009
		9931010
		*31026BKG
		P34804BB
		P34804BQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

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QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ61
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Antimony	183511404702	9931001BKG
Arsenic		9931002
Beryllium		9931003
Cadmium		9931004
Lead		9931005
Molybdenum		9931006
		9931007
		9931008
		9931009
		9931010
		P35104BB
		P35104BQ
		P35104BY

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

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QUALITY CONTROL REFERENCE LIST

SDG No.: GEJ61
Matrix: WATER

Analyte	Batch Number	Lab Sample ID
Mercury	183470571303	9931001BKG
		9931001MS
		9931001MSD
		9931001DUP
		9931002
		9931003
		9931004
		9931005
		9931006
		9931007
		9931008
		9931009
		9931010
		P34771CB
		P34771CQ

LEGEND:

BKG = Background	B = Blank
DUP = Duplicate	Q = Laboratory Control Sample
MS = Matrix Spike	Y = Laboratory Control Sample Duplicate
MSD = Matrix Spike Duplicate	

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: P
Run Name: 1835202T70
Calibration Date(s): 12/18/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium		600.0	600.03	100.0	500.0	502.47	100.5	500.0	509.86	102.0
Boron										
Calcium		30000.0	30469.96	101.6	25000.0	25644.06	102.6	25000.0	25645.97	102.6
Chromium		600.0	596.64	99.4	500.0	501.03	100.2	500.0	505.74	101.1
Cobalt										
Lithium		600.0	602.23	100.4	500.0	513.19	102.6	500.0	531.72	106.3
Selenium		600.0	606.15	101.0	500.0	511.36	102.3	500.0	505.35	101.1
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: P
Run Name: 1835202T70
Calibration Date(s): 12/18/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium					500.0	513.01	102.6	500.0	495.24	99.0
Boron										
Calcium					25000.0	25691.68	102.8	25000.0	25169.26	100.7
Chromium					500.0	496.38	99.3	500.0	480.91	96.2
Cobalt										
Lithium					500.0	527.56	105.5	500.0	496.80	99.4
Selenium					500.0	505.02	101.0	500.0	486.43	97.3
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: P
Run Name: 1835208T72
Calibration Date(s): 12/18/2018 - 12/19/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron		600.0	643.17	107.2	500.0	500.61	100.1	500.0	509.67	101.9
Calcium		30000.0	30301.13	101.0	25000.0	25321.35	101.3	25000.0	25322.31	101.3
Chromium										
Cobalt		600.0	606.97	101.2	500.0	508.53	101.7	500.0	514.80	103.0
Lithium		600.0	620.48	103.4	500.0	517.23	103.4	500.0	524.23	104.8
Selenium										
Thallium		600.0	609.90	101.7	500.0	502.02	100.4	500.0	520.12	104.0

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: P
Run Name: 1835208T72
Calibration Date(s): 12/18/2018 - 12/19/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron					500.0	510.61	102.1	500.0	515.44	103.1
Calcium					25000.0	25203.49	100.8	25000.0	24842.10	99.4
Chromium										
Cobalt					500.0	520.97	104.2	500.0	519.57	103.9
Lithium					500.0	520.03	104.0			
Selenium										
Thallium					500.0	523.19	104.6	500.0	524.32	104.9

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: P
Run Name: 1835402T70
Calibration Date(s): 12/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium										
Chromium										
Cobalt		600.0	595.15	99.2	500.0	486.47	97.3	500.0	492.24	98.4
Lithium										
Selenium										
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: P
Run Name: 1835402T70
Calibration Date(s): 12/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium										
Chromium										
Cobalt					500.0	494.25	98.9	500.0	501.74	100.3
Lithium										
Selenium										
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: P
Run Name: 1835402T70
Calibration Date(s): 12/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Barium										
Boron										
Calcium										
Chromium										
Cobalt					500.0	508.53	101.7			
Lithium										
Selenium										
Thallium										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: MS
Run Name: 1835407E03
Calibration Date(s): 12/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony										
Arsenic	75	500.0	477.19	95.4	250.0	248.24	99.3	250.0	273.63	109.5
Beryllium										
Cadmium	111	50.0	48.05	96.1	25.0	26.24	105.0	25.0	26.25	105.0
Lead	208	50.0	49.29	98.6	25.0	25.89	103.6	25.0	25.61	102.4
Molybdenum	98	50.0	46.03	92.1	25.0	24.75	99.0	25.0	25.20	100.8

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: MS
Run Name: 1835407E03
Calibration Date(s): 12/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony										
Arsenic	75				250.0	266.03	106.4			
Beryllium										
Cadmium	111				25.0	27.14	108.6			
Lead	208				25.0	25.54	102.2			
Molybdenum	98				25.0	25.77	103.1			

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: MS
Run Name: 1835503E05
Calibration Date(s): 12/21/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121	50.0	50.61	101.2	25.0	23.70	94.8	25.0	23.65	94.6
Arsenic										
Beryllium	9	50.0	49.67	99.3	25.0	24.84	99.4	25.0	25.64	102.6
Cadmium										
Lead										
Molybdenum										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: MS
Run Name: 1835503E05
Calibration Date(s): 12/21/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)
Antimony	121				25.0	23.22	92.9	25.0	27.24	109.0
Arsenic										
Beryllium	9				25.0	25.27	101.1	25.0	25.25	101.0
Cadmium										
Lead										
Molybdenum										

(1) Control Limits: 90 - 110
(2) Control Limits: 90 - 110
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury		2.5	2.42	96.8	1.0	1.02	102.0	1.0	1.01	101.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	1.02	102.0	1.0	1.01	101.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	1.02	102.0	1.0	1.00	100.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018
Concentration Units: UG/L

Analyte	Mass	Initial Calibration			Continuing Calibration					
		True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)
Mercury					1.0	0.99	99.0	1.0	1.00	100.0

(1) Control Limits: 90 - 110
(2) Control Limits: 80 - 120
* Outside Limits. If Continuing Calibration is outside limits, high, only ND samples are accepted.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ61

Method: P
Run Name: 1835202T70
Calibration Date(s): 12/18/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium		5.0	4.91	98.2		
Boron						
Calcium		500.0	513.14	102.6		
Chromium		15.0	14.70	98.0		
Cobalt						
Lithium		50.0	47.82	95.6		
Selenium		50.0	47.25	94.5		
Thallium						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1835208T72
Calibration Date(s): 12/18/2018 - 12/19/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium						
Boron		50.0	49.44	98.9		
Calcium		500.0	509.39	101.9		
Chromium						
Cobalt		5.0	6.93	138.6		
Lithium		50.0	55.24	110.5		
Selenium						
Thallium		30.0	34.53	115.1		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Run Name: 1835402T70
Calibration Date(s): 12/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Barium						
Boron						
Calcium						
Chromium						
Cobalt		5.0	5.11	102.2		
Lithium						
Selenium						
Thallium						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: MS
Run Name: 1835407E03
Calibration Date(s): 12/20/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony						
Arsenic	75	2.0	2.00	100.0		
Beryllium						
Cadmium	111	1.0	1.14	114.0		
Lead	208	3.0	2.96	98.7		
Molybdenum	98	2.0	1.83	91.5		

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ61

Method: MS
Run Name: 1835503E05
Calibration Date(s): 12/21/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Antimony	121	2.0	2.09	104.5		
Arsenic						
Beryllium	9	0.5	0.56	112.0		
Cadmium						
Lead						
Molybdenum						

Control limits: 80% - 120%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 2B
LOW LEVEL CHECK STANDARD
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018
Concentration Units: UG/L

Analyte	Mass	Initial True	Initial Found	Initial %R	Final Found	Final %R
Mercury		0.2	0.21	105.0	0.22	110.0

Control limits: 50% - 150%

For 6010B - Control limits apply to values up to 10 times the true value of the low level check standard. If LLC is out of specification, high, results < RL are acceptable.
For 6010C - If Low Level Check (LLC) is out of specification, results > CCV are acceptable. If LLC is out of specification, high, results < RL are acceptable.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: P
Run Name: 1835202T70
Calibration Date(s): 12/18/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium		0.33	U	0.33	U	0.33	U	0.33	U		1.000	U	183481404402
Boron													
Calcium		33.4	U	33.4	U	33.4	U	33.4	U		33.000	U	183481404402
Chromium		0.96	U	0.96	U	0.96	U	0.96	U		5.300	U	183481404402
Cobalt													
Lithium		9.6	U	9.6	U	10.0	B	9.6	U		11.000	U	183481404402
Selenium		8.4	U	8.4	U	8.4	U	8.4	U		21.000	U	183481404402
Thallium													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: P
Run Name: 1835202T70
Calibration Date(s): 12/18/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium				0.33	U								
Boron													
Calcium				75.6	B								
Chromium				0.96	U								
Cobalt													
Lithium				9.6	U								
Selenium				8.4	U								
Thallium													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: P
Run Name: 1835208T72
Calibration Date(s): 12/18/2018 - 12/19/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron		8.4	U	8.4	U	8.4	U	8.4	U		12.000	U	183481404402
Calcium		33.4	U	33.4	U	-37.7	B	62.0	B				
Chromium													
Cobalt		3.2	B	0.82	B	0.54	B	0.54	U		1.500	U	183481404402
Lithium		9.6	U	9.6	U	9.6	U	9.6	U				
Selenium													
Thallium		3.8	U	3.8	U	3.8	U	3.8	U		14.000	U	183481404402

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: P
Run Name: 1835208T72
Calibration Date(s): 12/18/2018 - 12/19/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron				8.4	U								
Calcium				33.4	U								
Chromium													
Cobalt				0.54	U								
Lithium													
Selenium													
Thallium				3.8	U								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: P
Run Name: 1835402T70
Calibration Date(s): 12/20/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron													
Calcium													
Chromium													
Cobalt		0.54	U	0.54	U	0.54	U	0.54	U				
Lithium													
Selenium													
Thallium													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: P
Run Name: 1835402T70
Calibration Date(s): 12/20/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Barium													
Boron													
Calcium													
Chromium													
Cobalt				0.54	U	0.54	U						
Lithium													
Selenium													
Thallium													

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: MS
Run Name: 1835407E03
Calibration Date(s): 12/20/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony													
Arsenic	75	0.40	U	0.40	U	0.40	U	0.40	U	75	0.680	U	183511404702A
Beryllium													
Cadmium	111	0.14	U	0.14	U	0.14	U	0.14	U	111	0.150	U	183511404702A
Lead	208	0.20	U	0.20	U	0.20	U	0.20	U	208	1.100	U	183511404702A
Molybdenum	98	0.25	U	0.25	U	0.25	U	0.25	U	98	0.310	U	183511404702A

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: MS
Run Name: 1835503E05
Calibration Date(s): 12/21/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121	0.52	U	0.52	U	0.52	U	0.52	U	121	0.410	U	183511404702A
Arsenic													
Beryllium	9	0.067	U	0.067	U	0.067	U	0.067	U	9	0.091	U	183511404702A
Cadmium													
Lead													
Molybdenum													

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below IDL/MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: MS
Run Name: 1835503E05
Calibration Date(s): 12/21/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Antimony	121			0.52	U								
Arsenic													
Beryllium	9			0.067	U								
Cadmium													
Lead													
Molybdenum													

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018
Preparation Blank Matrix: WATER

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury		0.050	U	0.050	U	0.050	U	0.050	U		0.050	U	183470571303

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U	0.050	U				

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer	U= Below IDL/MDL
MS = ICP Mass Spectrometry	B= Below LOQ
CV = Cold Vapor	
AF = Cold Vapor Atomic Fluorescence	

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QUALITY ASSURANCE SUMMARY
FORM 3
BLANKS
SDG No.: GEJ61

Method: CV
Run Name: 1834901M09
Calibration Date(s): 12/15/2018

		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank (UG/L)			
Analyte	Mass		C	1	C	2	C	3	C	Mass		C	Batch Number
Mercury				0.050	U	0.050	U						

METHODS:	CONCENTRATION QUALIFIERS:
P = ICP Atomic Emission Spectrometer MS = ICP Mass Spectrometry CV = Cold Vapor AF = Cold Vapor Atomic Fluorescence	U= Below IDL/MDL B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ61

Instrument ID: 11016
Run Name: 1835202T70
Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found %R	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found %R	Final Found Sol. AB	Final Found %R
Aluminum	500000		502404	100.5						
Barium	0		1							
Boron										
Calcium	500000		495564	99.1						
Chromium	0		16							
Cobalt										
Iron	200000		200863	100.4						
Lithium	0		6							
Magnesium	500000		464944	93.0						
Selenium	0		-27							
Thallium										

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ61

Instrument ID: 16417
Run Name: 1835208T72
Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found %R	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found %R	Final Found Sol. AB	Final Found %R
Aluminum	500000		532647	106.5						
Barium										
Boron	0		10							
Calcium	500000		502555	100.5						
Chromium										
Cobalt	0		1							
Iron	200000		196085	98.0						
Lithium	0		5							
Magnesium	500000		451335	90.3						
Selenium										
Thallium	0		-3							

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4A
ICP-AES INTERFERENCE CHECK SAMPLE
SDG No.: GEJ61

Instrument ID: 11016
Run Name: 1835402T70
Concentration Units: ug/L

Analyte	True		Initial Found				Final Found			
	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
Aluminum	500000		503058	100.6						
Barium										
Boron										
Calcium	500000		497748	99.5						
Chromium										
Cobalt	0		1							
Iron	200000		199766	99.9						
Lithium										
Magnesium	500000		457986	91.6						
Selenium										
Thallium										

Control Limits: All Metals 80%-120%

QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ61

Instrument ID: 11332
Run Name: 1835407E03
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		94923	94.9		
Antimony							
Arsenic	75	0		1			
Beryllium							
Cadmium	111	0		0			
Calcium	44	300000		280842	93.6		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		254343	101.7		
Lead	208	0		0			
Magnesium	24	100000		98835	98.8		
Molybdenum	98	2000		1938	96.9		
Phosphorus	31	10000		NA			
Potassium	39	100000		107723	107.7		
Sodium	23	250000		243167	97.3		
Sulfur	34	10000		NA			
Titanium	47	2000		2118	105.9		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 4B
ICP-MS INTERFERENCE CHECK SAMPLE
SDG No.: GEJ61

Instrument ID: 19204
Run Name: 1835503E05
Concentration Units: ug/L

Analyte	Mass	True Sol. A	True Sol. AB	Found Sol. A	Found %R	Found Sol. AB	Found %R
Aluminum	27	100000		93411	93.4		
Antimony	121	0		1			
Arsenic							
Beryllium	9	0		0			
Cadmium							
Calcium	44	300000		247033	82.3		
Carbon	13	20000		NA			
Chloride	37	100000		NA			
Iron	57	250000		224496	89.8		
Lead							
Magnesium	24	100000		91268	91.3		
Molybdenum	98	2000		2086	104.3		
Phosphorus	31	10000		NA			
Potassium	39	100000		91426	91.4		
Sodium	23	250000		218949	87.6		
Sulfur	34	10000		NA			
Titanium	47	2000		2085	104.3		

Control Limits: All Metals 80%-120%

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QUALITY ASSURANCE SUMMARY
FORM 5A(MS/MSD)
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9931001BKG Matrix Spike Lab Sample ID: 9931001MS Matrix Spike Duplicate Lab Sample ID: 9931001MSD
Batch Number(s): 183470571303

		BKG Sample		MS Sample		MSD Sample		MS Spike	MSD Spike		MS		MSD				Control Limit		
Analyte	Mass	Result	C	Result	C	Result	C	Added	Added	Units	%R	Q	%R	Q	RPD	Q	%R	RPD	M
Mercury		0.0500	U	0.8107		0.8257		1.0000	1.0000	UG/L	81		83		2		75 - 125	20	CV

Note: Results shown are reported on an as-received basis.
If Matrix Spike/ Matrix Spike Duplicate were out of specification, see Post Digestion Spike form.

METHODS:
P = ICP Atomic Emission Spectrometer CV = Cold Vapor
MS = ICP Mass Spectrometry AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL, B= Below LOQ
FLAGS:
N = Matrix Spike OOS, * = Duplicate OOS

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QUALITY ASSURANCE SUMMARY
FORM 6
DUPLICATES
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9931001BKG 9931001DUP
Batch Number(s): 1834705713
03
Concentration Units: UG/L

Analyte	Mass	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Max RPD	Q	M
Mercury			0.0500	U	0.0500	U			CV	

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > Max OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample.

Note: Results shown are reported on an as-received basis.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
* = Duplicate Out of Spec

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QUALITY ASSURANCE SUMMARY
FORM 7
LABORATORY CONTROL SAMPLE
SDG No.: GEJ61
Matrix: WATER

Analyte	Mass	Batch Number	Units	True	Found	C	Control Limits (%)	%R	M	In Spec
Barium		183481404402	UG/L	2000.000	2030.960		80 - 120	102	P	Yes
Boron		183481404402	UG/L	2000.000	1935.970		80 - 120	97	P	Yes
Calcium		183481404402	UG/L	4000.000	4199.180		80 - 120	105	P	Yes
Chromium		183481404402	UG/L	200.000	203.680		80 - 120	102	P	Yes
Cobalt		183481404402	UG/L	500.000	541.200		80 - 120	108	P	Yes
Lithium		183481404402	UG/L	1000.000	1028.870		80 - 120	103	P	Yes
Mercury		183470571303	UG/L	1.000	0.846		80 - 120	85	CV	Yes
Selenium		183481404402	UG/L	150.000	149.850		80 - 120	100	P	Yes
Thallium		183481404402	UG/L	150.000	159.140		80 - 120	106	P	Yes

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 7(LCS/LCSD)
LABORATORY CONTROL SAMPLE/SAMPLE DUPLICATE
SDG No.: GEJ61
Matrix: WATER

Analyte	Mass	Lab Sample ID LCS	Lab Sample ID LCSD	Batch Number	Units	True	LCS Found	LCS C	LCS %R	LCSD Found	LCSD C	LCSD %R	Control Limits (%)	RPD	M	In Spec
Antimony	121	P35104BQ	P35104BY	183511404702	UG/L	6.000	5.247		87	5.192		87	80 - 120	1	MS	Yes
Arsenic	75	P35104BQ	P35104BY	183511404702	UG/L	10.000	11.536		115	10.159		102	80 - 120	13	MS	Yes
Beryllium	9	P35104BQ	P35104BY	183511404702	UG/L	4.000	4.071		102	4.240		106	80 - 120	4	MS	Yes
Cadmium	111	P35104BQ	P35104BY	183511404702	UG/L	5.000	5.261		105	5.060		101	80 - 120	4	MS	Yes
Lead	208	P35104BQ	P35104BY	183511404702	UG/L	15.000	15.736		105	15.623		104	80 - 120	1	MS	Yes
Molybdenum	98	P35104BQ	P35104BY	183511404702	UG/L	50.000	52.786		106	51.795		104	80 - 120	2	MS	Yes

RPD Control Limit: 20

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: *31026BKG Serial Dilution Lab Sample ID: *31026L
Batch Number(s): 183481404402
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Barium		211.2600		203.4500		4		P
Boron		156.5100		170.8000	B	9		P
Calcium		38500.6600		37868.8000		2		P
Chromium		5.3000	U	26.5000	U			P
Cobalt		2.4300	B	7.5000	U	100		P
Lithium		15.0200	B	55.0000	U	100		P
Selenium		21.0000	U	105.0000	U			P
Thallium		14.0000	U	70.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

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QUALITY ASSURANCE SUMMARY
FORM 9
SERIAL DILUTIONS
SDG No.: GEJ61
Matrix: WATER Level (low/med): LOW

Background Lab Sample ID: 9931001BKG Serial Dilution Lab Sample ID: 9931001L
Batch Number(s): 183511404702
Concentration Units: UG/L

Analyte	Mass	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Diff.	Q	M
Antimony	121	0.7577	B	2.0300	U	100		MS
Arsenic	75	1.9808	B	4.0397	B	104		MS
Beryllium	9	0.0910	U	0.4550	U			MS
Cadmium	111	0.1510	U	0.7550	U			MS
Lead	208	1.0700	U	5.3500	U			MS
Molybdenum	98	2.6967		2.9998	B	11		MS

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry

CONCENTRATION QUALIFIERS:
U= Below MDL
B= Below LOQ
FLAGS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution

Method: P
Instrument ID: 11016
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium	455.40		0.33
Boron			
Calcium	317.93		33.4
Chromium	267.72		0.96
Cobalt	228.62		0.53
Lithium	670.78		9.6
Selenium	196.09		8.4
Thallium			

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

Method: P
Instrument ID: 16417
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Barium			
Boron	249.67		8.4
Calcium	317.93		33.4
Chromium			
Cobalt	228.62		0.54
Lithium	670.78		6.9
Selenium			
Thallium	190.86		3.8

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10
INSTRUMENT DETECTION LIMITS (QUARTERLY)
SDG No.: GEJ61

Method: MS
Instrument ID: 11332
Date: 07/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony			
Arsenic	75		0.40
Beryllium			
Cadmium	111		0.14
Lead	208		0.20
Molybdenum	98		0.25

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

QUALITY ASSURANCE SUMMARY
FORM 10
INSTRUMENT DETECTION LIMITS (QUARTERLY)
SDG No.: GEJ61

Method: MS
Instrument ID: 19204
Date: 07/2018

Analyte	MASS (amu)	Background	IDL (UG/L)
Antimony	121		0.52
Arsenic			
Beryllium	9		0.067
Cadmium			
Lead			
Molybdenum			

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10
INSTRUMENT DETECTION LIMITS (QUARTERLY)
SDG No.: GEJ61

Method: CV
Instrument ID: 23283
Date: 07/2018

Analyte	Wavelength (nm)	Background	IDL (UG/L)
Mercury			0.050

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ61
Matrix: WATER

Method: P
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium	455.40		5.0	1.0
Boron	249.67		50.0	12.0
Calcium	317.93		500	33.0
Chromium				
Cobalt	228.62		5.0	1.5
Lithium	670.78		50.0	11.0
Selenium				
Thallium				

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ61
Matrix: WATER

Method: P
Date: 09/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Barium				
Boron				
Calcium				
Chromium	267.72		15.0	5.3
Cobalt				
Lithium				
Selenium	196.09		50.0	21.0
Thallium	190.86		30.0	14.0

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:
_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ61
Matrix: WATER

Method: MS
Date: 07/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony	121		2.0	0.41
Arsenic				
Beryllium	9		0.50	0.091
Cadmium	111		1.0	0.15
Lead				
Molybdenum	98		2.0	0.31

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ61
Matrix: WATER

Method: MS
Date: 09/2018

Analyte	Mass	Background	LOQ (UG/L)	MDL (UG/L)
Antimony				
Arsenic	75		2.0	0.68
Beryllium				
Cadmium				
Lead	208		3.0	1.1
Molybdenum				

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

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QUALITY ASSURANCE SUMMARY
FORM 10 MDL
METHOD DETECTION LIMITS (ANNUALLY)
SDG No.: GEJ61
Matrix: WATER

Method: CV
Date: 06/2018

Analyte	Wavelength (nm)	Background	LOQ (UG/L)	MDL (UG/L)
Mercury			0.20	0.050

The LOQ/MDL must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug/L.

Comments:

_____
_____
_____
_____

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

US EPA Tune Check Report

Operator Name	US19_USR_INS14259
Acq/Data Batch	C:\Agilent\ICPMH\1\DATA\~EPATUNEaa.b
Acq. Date-Time	12/20/2018 5:41:57 PM
Report Comment	ICP-MS #19204 (E05) Daily Tune Check
Instrument Name	G3281A JP12071581

[No Gas]

Sensitivity

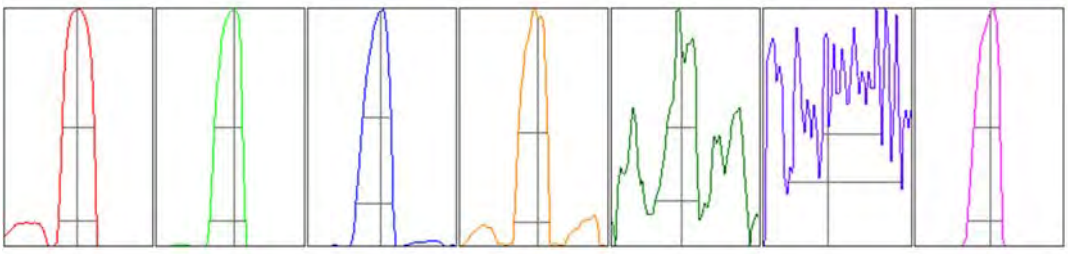
Mass	Conc. [ug/l]	Count	CPS	Resp (Required) [cps/ug/l]	Resp (Flag)	RSD%	RSD% (Required)
7	10.00	1129	11290.75			1.263	5.000
89	10.00	2194	21935.38			0.683	5.000
205	10.00	581	5806.88			0.857	5.000
70	1.00	39	388.73	0.00		8.088	
156	1.00	5	46.00	0.00		10.398	
220	1.00	2	22.40	0.00		14.672	
140	10.00	1440	14402.18	0.00		0.714	

Mass	RSD% (Flag)
7	
89	
205	
70	
156	
220	
140	

Mass	Rep#1 Count	Rep#2 Count	Rep#3 Count	Rep#4 Count	Rep#5 Count
7	1150	1119	1122	1117	1138
89	2184	2176	2205	2213	2190
205	580	580	587	582	574
70	39	36	41	43	36
156	4	5	4	4	5
220	3	3	2	2	2
140	1430	1440	1431	1444	1456

Integration Time [sec] 0.1

Resolution/Axis



US EPA Tune Check Report

Mass	Peak Height	Axis	Axis (Required)	Axis (Flag)
7	1794.04	7.00	6.90 - 7.10	
89	3956.19	89.10	88.90 - 89.10	
205	1057.51	205.00	204.90 - 205.10	
70	66.66	70.10	-	
156	6.60	155.95	-	
220	1.85	219.85	-	
140	2749.44	140.05	-	

Mass	W-50%	W-10%	W-10% (Required)	W-10% (Flag)
7	0.65	0.770	0.800	
89	0.58	0.728	0.800	
205	0.56	0.749	0.800	
70	0.60	0.720		
156	0.60	0.896		
220	1.19	2.275		
140	0.54	0.715		

Integration Time [sec]	0.1
Acquisition Time [sec]	260.3
Y Axis	Linear

Tune Parameters

Plasma Parameters

Plasma Mode	---	Nebulizer Gas	0.25 L/min	Dilution Gas	0.70 L/min
RF Power	1600 W	Option Gas	---	Auxiliary Gas	0.90 L/min
RF Matching	1.60 V	Nebulizer Pump	0.10 rps	Plasma Gas	15.0 L/min
Sample Depth	10.0 mm	S/C Temp	20 °C		

Lens Parameters

Extract 1	0.0 V	Omega Lens	4.1 V	Deflect	12.6 V
Extract 2	-100.0 V	Cell Entrance	-32 V	Plate Bias	-20 V
Omega Bias	-75 V	Cell Exit	-59 V		

Cell Parameters

Use Gas	No	3rd Gas Flow	---	Energy Discrimination	5.0 V
He Flow	0.0 mL/min	OctP Bias	-8.0 V		
H2 Flow	0.0 mL/min	OctP RF	180 V		

QP Parameters

Mass Gain	122	Axis Gain	0.9986	QP Bias	-3.0 V
Mass Offset	126	Axis Offset	0.06		

Hardware Settings

Torch

Torch H	1.0 mm	Torch V	-1.5 mm		

EM

Discriminator	4.5 mV	Analog HV	1742 V	Pulse HV	1501 V

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ61

Instrument ID: 11332
Run Name: 1835407E03

Start Date: 12/20/2018
End Date: 12/20/2018

Standard	Elements Applies to	Standard	Elements Applies to
IN-1-115	AS,MO	TB-1-159	CD,PB

Lab Sample ID	Time	Internal Standards %RI For: Element IN-1-115	Q	Element TB-1-159	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
S0	17:59	100		100											
S	18:00	106		108											
ICV	18:02	112		109											
ICB	18:04	98		97											
LLC	18:05	102		100											
ICSA	18:07	106		102											
LRS2	18:08	107		111											
LRS3	18:10	112		111											
CCS	18:12	97		94											
CCS	18:13	95		93											
CCV	18:15	104		99											
CCB	18:16	91		91											
P35104BB	18:18	100		100											
P35104BQ	18:19	102		101											
P35104BY	18:21	106		102											
9931001BKG	18:23	94		95											
9931001A	18:24	98		97											
9931001L	18:26	104		101											
9931002	18:27	96		98											
9931004	18:29														
9931010	18:31	100		96											
CCV	18:32	103		98											
CCB	18:34	98		94											
9931003	18:35	108		104											
9931004	18:37	99		96											
9931005	18:38	103		101											
9931006	18:40	100		98											
9931007	18:42	104		101											
9931008	18:43	106		106											
9931009	18:45	104		101											
ZZZZZZ	18:46														
ZZZZZZ	18:48														
ZZZZZZ	18:50														

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ61

Instrument ID: 11332 Start Date: 12/20/2018
Run Name: 1835407E03 End Date: 12/20/2018

Standard	Elements Applies to	Standard	Elements Applies to
IN-1-115	AS,MO	TB-1-159	CD,PB

Lab Sample ID	Time	Internal Standards %RI For: Element IN-1-115	Q	Element TB-1-159	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
CCV	18:51	104		102											
CCB	18:53	96		93											

LEGEND:
BKG = Background MS = Matrix Spike
DUP = Duplicate MSD = Matrix Spike Duplicate
L = Serial Dilution A = Post Digest Spike
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium LI = Lithium
BI = Bismuth SC = Scandium
GE = Germanium TB = Terbium
HO = Holmium Y = Yttrium
IN = Indium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ61

Instrument ID: 19204
Run Name: 1835503E05

Start Date: 12/21/2018
End Date: 12/21/2018

Standard	Elements Applies to	Standard	Elements Applies to
IN-3-115	SB	SC-1-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-1-45	Q	Element IN-3-115	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
S0	08:16	100		100											
S	08:18	100		98											
ICV	08:21	101		96											
ICB	08:24	102		93											
LLC	08:26	102		98											
ICSA	08:28	103		90											
LRS2	08:31	105		93											
LRS3	08:33	103		90											
CCS	08:36	99		93											
CCS	08:38	99		88											
CCV	08:40	101		93											
CCB	08:43	101		93											
P35104BB	08:45	99		93											
ZZZZZZ	08:48														
ZZZZZZ	08:50														
P35104BY	08:53	100		89											
P35104BY	08:55	100		99											
9931001BKG	08:57	100		85											
9931001A	09:00	104		90											
9931001L	09:02	111		99											
9931010	09:05	110		99											
CCV	09:07	110		100											
CCB	09:09	106		96											
9931002	09:12	105		96											
9931003	09:14	113		101											
9931004	09:17	110		92											
9931005	09:19	112		98											
9931006	09:21	110		102											
9931007	09:24	109		100											
9931008	09:26	107		97											
9931009	09:29	108		103											
ZZZZZZ	09:31														
ZZZZZZ	09:34														

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike

FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

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QUALITY ASSURANCE SUMMARY
FORM 16
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
SDG No.: GEJ61

Instrument ID: 19204
Run Name: 1835503E05

Start Date: 12/21/2018
End Date: 12/21/2018

Standard	Elements Applies to	Standard	Elements Applies to
IN-3-115	SB	SC-1-45	BE

Lab Sample ID	Time	Internal Standards %RI For: Element SC-1-45	Q	Element IN-3-115	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
CCV	09:36	109		104											
CCB	09:38	109		99											
P35104BQ	09:41	111		103											
P35104BQ	09:43	109		101											
ZZZZZZ	09:46														
ZZZZZZ	09:48														
ZZZZZZ	09:50														
ZZZZZZ	09:53														
ZZZZZZ	09:55														
CCV	09:58	105		94											
CCB	10:00	104		100											

LEGEND:
BKG = Background
DUP = Duplicate
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
FLAG:
R = Internal Standard Relative Intensity OOS

INTERNAL STANDARD ELEMENTS:
BE = Beryllium
BI = Bismuth
GE = Germanium
HO = Holmium
IN = Indium
LI = Lithium
SC = Scandium
TB = Terbium
Y = Yttrium

Preparation and Run Logs

Metals in Liquid

Method: P
Batch Number: 183481404402

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9931001	12/17/2018	50.00	50
9931002	12/17/2018	50.00	50
9931003	12/17/2018	50.00	50
9931004	12/17/2018	50.00	50
9931005	12/17/2018	50.00	50
9931006	12/17/2018	50.00	50
9931007	12/17/2018	50.00	50
9931008	12/17/2018	50.00	50
9931009	12/17/2018	50.00	50
9931010	12/17/2018	50.00	50
*31026BKG	12/17/2018	50.00	50
P34804BB	12/17/2018	50.00	50
P34804BQ	12/17/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: MS
Batch Number: 183511404702

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9931002	12/18/2018	50.00	50
9931003	12/18/2018	50.00	50
9931004	12/18/2018	50.00	50
9931005	12/18/2018	50.00	50
9931006	12/18/2018	50.00	50
9931007	12/18/2018	50.00	50
9931008	12/18/2018	50.00	50
9931009	12/18/2018	50.00	50
9931010	12/18/2018	50.00	50
9931001BKG	12/18/2018	50.00	50
P35104BB	12/18/2018	50.00	50
P35104BQ	12/18/2018	1.00	1
P35104BY	12/18/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Method: CV
Batch Number: 183470571303

Lab Sample ID	Date	Initial Volume(ml)	Final Volume(ml)
9931002	12/14/2018	40.00	40
9931003	12/14/2018	40.00	40
9931004	12/14/2018	40.00	40
9931005	12/14/2018	40.00	40
9931006	12/14/2018	40.00	40
9931007	12/14/2018	40.00	40
9931008	12/14/2018	40.00	40
9931009	12/14/2018	40.00	40
9931010	12/14/2018	40.00	40
9931001BKG	12/14/2018	40.00	40
9931001DUP	12/14/2018	40.00	40
9931001MSD	12/14/2018	40.00	40
9931001MS	12/14/2018	40.00	40
P34771CB	12/14/2018	40.00	40
P34771CQ	12/14/2018	1.00	1

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: P
Instrument ID: 11016
Run Name: 1835202T70

Run Start Date: 12/18/2018
Run End Date: 12/18/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: P
Instrument ID: 11016
Run Name: 1835202T70

Run Start Date: 12/18/2018
Run End Date: 12/18/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
CCV	1.00	08:16			X				X	X			X			X																									
CCB	1.00	08:19			X				X	X			X			X																									

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: P
Instrument ID: 16417
Run Name: 1835208T72

Run Start Date: 12/18/2018
Run End Date: 12/19/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: P
Instrument ID: 16417
Run Name: 1835208T72

Run Start Date: 12/18/2018
Run End Date: 12/19/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
CCV	1.00	00:00					X		X		X						X																								
CCB	1.00	00:04					X		X		X						X																								

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: P
Instrument ID: 11016
Run Name: 1835402T70

Run Start Date: 12/20/2018
Run End Date: 12/20/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
S0	1.00	10:52									X																														
S	1.00	10:55																																						
S	1.00	10:58									X																														
S	1.00	11:01																																						
ICV	1.00	11:04									X																														
ICB	1.00	11:06									X																														
LLC	1.00	11:09									X																														
ICSA	1.00	11:12									X																														
CCV	1.00	11:15									X																														
CCB	1.00	11:18									X																														
LRS2	1.00	11:21									X																														
LRS4	1.00	11:25									X																														
LRS3	1.00	11:28									X																														
LRS5	1.00	11:31									X																														
CCV	1.00	11:34									X																														
CCB	1.00	11:37									X																														
ZZZZZZ	1.00	11:40																																						
ZZZZZZ	1.00	11:43																																						
ZZZZZZ	1.00	11:46																																						
ZZZZZZ	1.00	11:49																																						
ZZZZZZ	1.00	11:53																																						
ZZZZZZ	1.00	11:56																																						
ZZZZZZ	1.00	11:59																																						
ZZZZZZ	5.00	12:02																																						
ZZZZZZ	1.00	12:05																																						
ZZZZZZ	1.00	12:08																																						
CCV	1.00	12:11									X																														
CCB	1.00	12:14									X																														
ZZZZZZ	1.00	12:17																																						
ZZZZZZ	1.00	12:20																																						
ZZZZZZ	1.00	12:23																																						
ZZZZZZ	1.00	12:26																																						
CCV	1.00	12:29									X																														
CCB	1.00	12:32									X																														
*31026BKG	1.00	12:35									X																														
ZZZZZZ	1.00	12:38																																						
ZZZZZZ	1.00	12:41																																						
*31026L	5.00	12:44									X																														

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: P
Instrument ID: 11016
Run Name: 1835402T70

Run Start Date: 12/20/2018
Run End Date: 12/20/2018

Lab Sample ID	D/F	Time	Analytes																																			
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																						
9931001	1.00	12:47									X																												
9931002	1.00	12:50									X																												
9931008	1.00	12:54									X																												
ZZZZZZ	1.00	12:57																																					
ZZZZZZ	1.00	13:00																																					
CCV	1.00	13:03									X																												
CCB	1.00	13:06									X																												

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: MS
Instrument ID: 11332
Run Name: 1835407E03

Run Start Date: 12/20/2018
Run End Date: 12/20/2018

| Lab Sample ID | D/F | Time | Analytes | | |

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: MS
Instrument ID: 19204
Run Name: 1835503E05

Run Start Date: 12/21/2018
Run End Date: 12/21/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
S0	1.00	08:16	X			X																																			
S	1.00	08:18	X			X																																			
ICV	1.00	08:21	X			X																																			
ICB	1.00	08:24	X			X																																			
LLC	1.00	08:26	X			X																																			
ICSA	1.00	08:28	X			X																																			
LRS2	1.00	08:31	X			X																																			
LRS3	1.00	08:33	X			X																																			
CCS	1.00	08:36	X			X																																			
CCS	1.00	08:38	X			X																																			
CCV	1.00	08:40	X			X																																			
CCB	1.00	08:43	X			X																																			
P35104BB	1.00	08:45	X			X																																			
ZZZZZZ	1.00	08:48																																							
ZZZZZZ	1.00	08:50																																							
P35104BY	1.00	08:53	X			X																																			
P35104BY	1.00	08:55																																							
9931001BKG	1.00	08:57	X			X																																			
9931001A	1.00	09:00																																							
9931001L	5.00	09:02	X			X																																			
9931010	1.00	09:05	X			X																																			
CCV	1.00	09:07	X			X																																			
CCB	1.00	09:09	X			X																																			
9931002	1.00	09:12	X			X																																			
9931003	1.00	09:14	X			X																																			
9931004	1.00	09:17	X			X																																			
9931005	1.00	09:19	X			X																																			
9931006	1.00	09:21	X			X																																			
9931007	1.00	09:24	X			X																																			
9931008	1.00	09:26	X			X																																			
9931009	1.00	09:29	X			X																																			
ZZZZZZ	1.00	09:31																																							
ZZZZZZ	1.00	09:34																																							
CCV	1.00	09:36	X			X																																			
CCB	1.00	09:38	X			X																																			
P35104BQ	1.00	09:41	X			X																																			
P35104BQ	1.00	09:43																																							
ZZZZZZ	1.00	09:46																																							

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- A = Post Digest Spike
- L = Serial Dilution
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: MS
Instrument ID: 19204
Run Name: 1835503E05

Run Start Date: 12/21/2018
Run End Date: 12/21/2018

Lab Sample ID	D/F	Time	Analytes																																			
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																						
ZZZZZZ	1.00	09:48																																					
ZZZZZZ	1.00	09:50																																					
ZZZZZZ	1.00	09:53																																					
ZZZZZZ	20.00	09:55																																					
CCV	1.00	09:58	X			X																																	
CCB	1.00	10:00	X			X																																	

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: CV
Instrument ID: 23283
Run Name: 1834901M09

Run Start Date: 12/15/2018
Run End Date: 12/15/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
S0	1.00	06:21												X																											
S0.2	1.00	06:23												X																											
S0.5	1.00	06:25												X																											
S1.0	1.00	06:27												X																											
S2.5	1.00	06:29												X																											
S5.0	1.00	06:31												X																											
ICV	1.00	06:33												X																											
ICB	1.00	06:35												X																											
CRA	1.00	06:37												X																											
CCV	1.00	06:39												X																											
CCB	1.00	06:41												X																											
ZZZZZZ	1.00	06:43																																							
ZZZZZZ	1.00	06:45																																							
ZZZZZZ	1.00	06:47																																							
ZZZZZZ	1.00	06:49																																							
ZZZZZZ	1.00	06:51																																							
ZZZZZZ	1.00	06:53																																							
ZZZZZZ	1.00	06:55																																							
ZZZZZZ	1.00	06:57																																							
ZZZZZZ	1.00	06:59																																							
ZZZZZZ	1.00	07:01																																							
CCV	1.00	07:04												X																											
CCB	1.00	07:06												X																											
ZZZZZZ	1.00	07:08																																							
ZZZZZZ	1.00	07:10																																							
ZZZZZZ	1.00	07:12																																							
ZZZZZZ	1.00	07:14																																							
ZZZZZZ	1.00	07:16																																							
ZZZZZZ	1.00	07:18																																							
ZZZZZZ	1.00	07:20																																							
ZZZZZZ	1.00	07:22																																							
ZZZZZZ	1.00	07:24																																							
ZZZZZZ	1.00	07:26																																							
CCV	1.00	07:28												X																											
CCB	1.00	07:30												X																											
ZZZZZZ	1.00	07:32																																							
ZZZZZZ	1.00	07:34																																							
ZZZZZZ	1.00	07:36																																							

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- A = Post Digest Spike
- L = Serial Dilution
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: CV
Instrument ID: 23283
Run Name: 1834901M09

Run Start Date: 12/15/2018
Run End Date: 12/15/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
ZZZZZZ	1.00	07:38																																							
ZZZZZZ	1.00	07:40																																							
ZZZZZZ	1.00	07:42																																							
ZZZZZZ	1.00	07:44																																							
ZZZZZZ	1.00	07:46																																							
ZZZZZZ	1.00	07:48																																							
ZZZZZZ	1.00	07:50																																							
CCV	1.00	07:52												X																											
CCB	1.00	07:54												X																											
ZZZZZZ	1.00	07:56																																							
ZZZZZZ	1.00	07:59																																							
ZZZZZZ	1.00	08:01																																							
ZZZZZZ	1.00	08:03																																							
ZZZZZZ	1.00	08:05																																							
ZZZZZZ	1.00	08:07																																							
ZZZZZZ	1.00	08:09																																							
ZZZZZZ	1.00	08:11																																							
ZZZZZZ	1.00	08:13																																							
ZZZZZZ	1.00	08:15																																							
CCV	1.00	08:17												X																											
CCB	1.00	08:19												X																											
ZZZZZZ	1.00	08:21																																							
ZZZZZZ	1.00	08:23																																							
ZZZZZZ	1.00	08:25																																							
ZZZZZZ	1.00	08:27																																							
ZZZZZZ	1.00	08:29																																							
ZZZZZZ	1.00	08:31																																							
P34771CB	1.00	08:33												X																											
P34771CQ	1.00	08:35												X																											
P34771CQ	1.00	08:37																																							
9931001BKG	1.00	08:39												X																											
CCV	1.00	08:41												X																											
CCB	1.00	08:43												X																											
9931001DUP	1.00	08:46												X																											
9931001MS	1.00	08:48												X																											
9931001MSD	1.00	08:50												X																											
9931002	1.00	08:52												X																											
9931003	1.00	08:54												X																											

METHODS:
- P = ICP Atomic Emission Spectrometer
- MS = ICP Mass Spectrometry
- CV = Cold Vapor
- AF = Cold Vapor Atomic Fluorescence

LEGEND:
- BKG = Background
- DUP = Duplicate
- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- A = Post Digest Spike
- L = Serial Dilution
- B = Blank
- Q = Laboratory Control Sample
- Y = Laboratory Control Sample Duplicate

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QUALITY ASSURANCE SUMMARY
FORM 14
ANALYSIS RUN LOG
SDG No.: GEJ61

Method: CV
Instrument ID: 23283
Run Name: 1834901M09

Run Start Date: 12/15/2018
Run End Date: 12/15/2018

Lab Sample ID	D/F	Time	Analytes																																					
			SB	AS	BA	BE	B	CD	CA	CR	CO	PB	LI	HG	MO	SE	TL																								
9931004	1.00	08:56												X																											
9931005	1.00	08:58												X																											
9931006	1.00	09:00												X																											
9931007	1.00	09:02												X																											
9931008	1.00	09:04												X																											
CCV	1.00	09:06												X																											
CCB	1.00	09:08												X																											
9931009	1.00	09:11												X																											
9931010	1.00	09:13												X																											
ZZZZZZ	1.00	09:15																																							
ZZZZZZ	1.00	09:17																																							
ZZZZZZ	1.00	09:19																																							
ZZZZZZ	1.00	09:21																																							
ZZZZZZ	1.00	09:23																																							
ZZZZZZ	1.00	09:25																																							
ZZZZZZ	1.00	09:27																																							
CRA	1.00	09:29												X																											
CCV	1.00	09:31												X																											
CCB	1.00	09:33												X																											

METHODS:
P = ICP Atomic Emission Spectrometer
MS = ICP Mass Spectrometry
CV = Cold Vapor
AF = Cold Vapor Atomic Fluorescence

LEGEND:
BKG = Background
DUP = Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
A = Post Digest Spike
L = Serial Dilution
B = Blank
Q = Laboratory Control Sample
Y = Laboratory Control Sample Duplicate

Instrumental Wet Chemistry Data

Case Narrative/Conformance Summary

Instrumental Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

Sample #	Client ID	Matrix Liquid	Solid	Comments
9931001	MW-1	X		
9931002	MW-2	X		
9931003	MW-3	X		
9931004	MW-4	X		
9931005	MW-5	X		
9931006	MW-6	X		
9931007	MW-7	X		
9931008	MW-8	X		
9931009	MW-9	X		
9931010	FB-20181203	X		Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

MS/MSD

Matrix QC may not be included if site-specific QC were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, laboratory spike data (LCS) are provided.

SAMPLE ANALYSIS:

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

Samples	Chloride	Fluoride	Sulfate
9931001	DF2000	DF5	DF50
9931002	DF2000	DF5	DF5
9931003	DF50	DF5	DF5
9931004	DF1000	DF5	DF50
9931005	DF500	DF5	DF5
9931006	DF500	DF5	DF5
9931007	DF5	DF5	DF5
9931008	DF500	DF5	DF5
9931009	DF100	DF5	DF5
9931010	DF1	DF1	DF1

(Sample number(s): 9931004: Analysis: 00224)
The chloride value being higher than the Total Dissolved Solids result was confirmed by reanalysis for chloride.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

Quality Control and Calibration Summary Forms

Instrumental Wet Chemistry

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Quality Control Reference List
Instrumental Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

Fraction: Instrumental Wet Chemistry

Batch Number	Sample Number	Analysis Date	Chloride	Fluoride	Sulfate
18348120315A	9931002	12/14/2018 17:30:00		X	X
	9931002	12/14/2018 17:47:00	X		
	9931003	12/14/2018 18:04:00		X	X
	9931003	12/14/2018 18:21:00	X		
	9931004	12/14/2018 19:27:00		X	
	9931004	12/14/2018 19:44:00	X		
	9931004	12/17/2018 23:19:00			X
	9931005	12/14/2018 20:01:00		X	X
	9931005	12/14/2018 20:17:00	X		
	9931006	12/14/2018 20:34:00			X
	9931006	12/14/2018 20:51:00	X		
	9931006	12/21/2018 16:25:00		X	
	9931007	12/14/2018 21:08:00	X	X	X
	9931008	12/14/2018 21:41:00		X	X
	9931008	12/14/2018 22:31:00	X		
	9931009	12/14/2018 22:48:00		X	X
	9931009	12/21/2018 16:43:00	X		
	9931010	12/14/2018 23:21:00	X	X	X
	P34820OB	12/14/2018 13:54:00	X	X	X
	P34820OQ	12/14/2018 13:37:00	X		X
	P34820OQ	12/17/2018 19:11:00		X	
18348120315B	9931001	12/15/2018 03:15:00		X	
	9931001	12/15/2018 03:32:00			X
	9931001	12/17/2018 23:36:00	X		

Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: GEJ61
Matrix: LIQUID

Fraction: Instrumental Wet Chemistry

18348120315A / P34820OB Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Chloride	IC	12/14/18	N.D.	mg/l	0.20	0.40
Fluoride	IC	12/14/18	N.D.	mg/l	0.050	0.10
Sulfate	IC	12/14/18	N.D.	mg/l	0.30	1.0

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Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ61
Matrix: LIQUID

Instrumental Water Quality

Fraction: Instrumental Wet Chemistry

LCS: P34820OQ	Batch: **18348120315A** (Sample number(s): 9931002-9931010) Batch: **18348120315B** (Sample number(s): 9931001)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Chloride	IC	3.00	3.06	NA	102	NA	90-110	NA	NA
Fluoride	IC	0.750	0.704	NA	94	NA	90-110	NA	NA
Sulfate	IC	7.50	7.76	NA	104	NA	90-110	NA	NA

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis/Anion Scan

SDG: GEJ61

Instrument ID: 18919
Calibration Date: 12/04/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.281281	1.033924	2.520746	5.109426	7.804229	0.9992	0.9996
Fluoride	0.064926	0.430258	1.142152	2.445807	3.872725	0.9993	0.9997
Sulfate	0.172605	0.618016	1.598239	3.329984	5.119110	0.9996	0.9998

Concentration units: mg/L

Batch Numbers: 18348120315A, 18348120315B
Run Start Dates: 12/14/2018
Run Names: 1834801D12

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	3.0060	100	7.5	7.5930	101	0.75	0.8225	110
ICB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0660	102	7.5	7.8296	104	0.75	0.7905	105
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.1346	104	7.5	7.9526	106	0.75	0.8737	116
CCB	0	ND	NA	0	ND	NA	0	ND	NA

* = Out of Specifications

Instrument ID: 12115
Calibration Date: 12/10/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	1.030185	2.165587	5.258500	10.990816	16.706969	0.9990	0.9995
Fluoride	0.167108	0.632801	1.681146	3.645534	5.913734	0.9987	0.9993
Sulfate	0.631483	1.341601	3.279257	6.951146	10.853394	0.9994	0.9997

Concentration units: mg/L

Batch Numbers: 18348120315A, 18348120315B
Run Start Dates: 12/14/2018
Run Names: 1834801D15

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.7175	91	7.5	6.9813	93	0.75	0.7137	95
ICB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.0740	102	7.5	7.8824	105	0.75	0.8115	108
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.1120	104	7.5	7.9732	106	0.75	0.8176	109
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	3.1346	104	7.5	8.1077	108	0.75	0.8544	114
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.9915	100	7.5	7.7740	104	0.75	0.8273	110
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2				7.5	8.1649	109	0.75	0.8590	115
CCB				0	ND	NA	0	ND	NA

* = Out of Specifications

Instrument ID: 24811
Calibration Date: 12/10/2018

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.669903	1.347072	3.341072	7.218949	10.919385	0.9997	0.9998
Fluoride	0.119335	0.487393	1.299083	2.860626	4.676210	0.9992	0.9996

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Concentration units: mg/L

Batch Numbers: 18348120315A
Run Start Dates: 12/20/2018
Run Names: 1835401D17

	Chloride			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec
ICV	3	2.7522	92	0.75	0.7535	100
ICB	0	ND	NA	0	ND	NA
CCV2	3	2.8217	94	0.75	0.7670	102
CCB	0	ND	NA	0	ND	NA
CCV2	3	2.8374	95	0.75	0.7685	102
CCB	0	ND	NA	0	ND	NA

* = Out of Specifications

Instrument ID: 17694
Calibration Date: 12/13/2018

Acceptance Range:
ICV/CCV: 90%-110%
ICB/CCB: < MDL

Analysis	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
Chloride	0.399180	0.922045	2.029498	4.095948	6.251883	0.9993	0.9996
Fluoride	0.086588	0.309096	0.877335	1.942084	3.111997	0.9998	0.9999
Sulfate	0.214959	0.447837	1.242362	2.644147	4.082716	0.9997	0.9998

Concentration units: mg/L

Batch Numbers: 18348120315A, 18348120315B
Run Start Dates: 12/17/2018
Run Names: 1835101D09

	Chloride			Sulfate			Fluoride		
Sample	True	Result	%Rec	True	Result	%Rec	True	Result	%Rec
ICV	3	2.8664	96	7.5	7.3557	98	0.75	0.7353	98
ICB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2							0.75	0.7092	95
CCB							0	ND	NA
CCV2	3	2.9282	98	7.5	7.4801	100	0.75	0.7442	99
CCB	0	ND	NA	0	ND	NA	0	ND	NA
CCV2	3	2.7450	92	7.5	7.1970	96			
CCB	0	ND	NA	0	ND	NA			

* = Out of Specifications

Fraction: Instrumental Wet Chemistry

00224: Chloride Analyte Name	Default MDL	Default LOQ	Units
Chloride	0.20	0.40	mg/l

01504: Fluoride Analyte Name	Default MDL	Default LOQ	Units
Fluoride	0.050	0.10	mg/l

00228: Sulfate Analyte Name	Default MDL	Default LOQ	Units
Sulfate	0.30	1.0	mg/l

Wet Chemistry Data

Case Narrative/Conformance Summary

Wet Chemistry

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

Water Quality

Fraction: Wet Chemistry

Sample #	Client ID	Matrix Liquid	Matrix Solid	DF	Comments
9931001	MW-1	X		1	
9931002	MW-2	X		1	
9931003	MW-3	X		1	
9931004	MW-4	X		1	
9931005	MW-5	X		1	
9931006	MW-6	X		1	
9931007	MW-7	X		1	
9931008	MW-8	X		1	
9931009	MW-9	X		1	
9931010	FB-20181203	X		1	Field Blank

See QC Reference List for Associated Batch QC Samples

SAMPLE RECEIPT:

Samples were received in good condition and within temperature requirements.

HOLDING TIME:

All holding times were met.

PREPARATION/EXTRACTION/DIGESTION:

No problems were encountered.

CALIBRATION/STANDARDIZATION:

All criteria were met.

QUALITY CONTROL AND NONCONFORMANCE SUMMARY:

Sample Duplicate

Method defined actions are taken for any failed matrix QC.

Batch#: 18344921203A (Sample number(s): 9931001-9931005, 9931007-9931010, UNSPK: 9931008, BKG: 9931006, 9931008)
The duplicate RPD for the following analyte(s) is outside the acceptance window: Total Dissolved Solids

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Case Narrative/Conformance Summary

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

Water Quality

Fraction: Wet Chemistry

SAMPLE ANALYSIS:

(Sample number(s): 9931001-9931010: Analysis: 12152)
The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

No other problems were encountered with the analysis of the samples.

Abbreviation Key

U = Unspiked (for MS/MSD)	LOQ = Limit of Quantitation
R = Matrix Spike (MS)	MDL = Method Detection Limit
M = Matrix Spike Duplicate (MSD)	ND = Not Detected
BKG = Background (for Duplicate)	J = Estimated Value
D = Duplicate (DUP)	NA = Not Applicable
HS = High Spike	ME = Method
LS = Low Spike	CO = Colorimetric
SS = Soluble Spike	G = Gravimetric
IS = Insoluble Spike	IR = Infrared Spectrophotometry
ISD = Insoluble Spike Duplicate	MTR = Meter
PDS = Post Digestion Spike	OD = Oven Dried
* = Out of Specification	TI = Titration
V = Visual	TOC = Total Organic Carbon
AK = Alpkem	IC = Ion Chromatography
TC = Total Carbon	RA = Rapid Analyzer

QC Summary

Wet Chemistry

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

Fraction: Wet Chemistry

Analysis	Batch Number	Sample Number	Analysis Date
Total Dissolved Solids	18344921203A	B344873B	12/10/2018 15:57
		L344873Q	12/10/2018 15:57
		9931001	12/10/2018 15:57
		9931002	12/10/2018 15:57
		9931003	12/10/2018 15:57
		9931004	12/10/2018 15:57
		9931005	12/10/2018 15:57
		9931007	12/10/2018 15:57
		9931008 UNSPK/BKG,MS,DUP	12/10/2018 15:57
		9931009	12/10/2018 15:57
		9931010	12/10/2018 15:57
Total Dissolved Solids	18344921203B	9931006 BKG,DUP	12/10/2018 15:57

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Quality Control Reference List
Water Quality

CLIENT: GEI Consultants, Inc.
SDG: GEJ61

Fraction: Wet Chemistry

Batch Number	Sample Number	Analysis Date	pH	Temperature of pH
18344003101A	9931001	12/10/2018 20:16:00	X	X
	9931002	12/10/2018 20:21:00	X	X
	9931003	12/10/2018 19:55:00	X	X
	9931004	12/10/2018 19:50:00	X	X
	9931005	12/10/2018 21:10:00	X	X
	9931006	12/10/2018 20:44:00	X	X
	9931007	12/10/2018 20:25:00	X	X
	9931008	12/10/2018 19:59:00	X	X
	9931009	12/10/2018 20:11:00	X	X
	9931010	12/10/2018 20:03:00	X	X
	P003101Q	12/10/2018 19:22:00	X	

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Quality Control Summary
Method Blank
Water Quality
SDG: GEJ61
Matrix: LIQUID

Fraction: Wet Chemistry

18344921203A / B344873B Parameter	ME	Analysis Date	Blank Results	Units	MDL	LOQ
Total Dissolved Solids	G	12/10/18	N.D.	mg/l	20.0	60.0

Water Quality
Fraction: Wet Chemistry

UNSPK: 9931008 MS: 9931008	Batch: **18344921203A** (Sample number(s): 9931001-9931005, 9931007-9931010) Batch: **18344921203B** (Sample number(s): 9931006)									
Parameter	**ME**	**Spike Added mg/l**	**Unspiked Conc mg/l**	**MS Conc mg/l**	**MSD Conc mg/l**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	800	722.	1528.	NA	101	NA	62-127	NA	NA

Comments:
(2) The unspiked sample result is greater than four times the spike added.
* = Out of Specification

Results are being reported on an as received basis.

Water Quality
Fraction: Wet Chemistry

BKG: 9931008 DUP: 9931008 **Parameter**	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Batch: **18344921203A** (Sample number(s): 9931001-9931005, 9931007-9931010)					
Total Dissolved Solids	G	722.	788.	9* (1)	5

BKG: 9931006 DUP: 9931006 **Parameter**	**ME**	**Unspiked Conc mg/l**	**DUP Conc mg/l**	**%RPD**	**%RPD Limits**
Batch: **18344921203B** (Sample number(s): 9931006)					
Total Dissolved Solids	G	900.	884.	2 (1)	5

Comments:
(1) The sample and/or duplicate result is less than five times the LOQ.
* = Out of Specification

Results are being reported on an as received basis.

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate(LCSD)

SDG: GEJ61
Matrix: LIQUID

Water Quality
Fraction: Wet Chemistry

LCS: P003101Q	Batch: **18344003101A** (Sample number(s): 9931001-9931010)								
Parameter	**ME**	**Spike Added Std. Units**	**LCS Conc Std. Units**	**LCSD Conc Std. Units**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
pH	MTR	7.00	7.00	NA	100	NA	95-105	NA	NA

LCS: L344873Q	Batch: **18344921203A** (Sample number(s): 9931001-9931005, 9931007-9931010) Batch: **18344921203B** (Sample number(s): 9931006)								
Parameter	**ME**	**Spike Added mg/l**	**LCS Conc mg/l**	**LCSD Conc mg/l**	**LCS %Rec**	**LCSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Total Dissolved Solids	G	200	198	NA	99	NA	62-127	NA	NA

Fraction: Wet Chemistry

12152: pH Analyte Name	Default MDL	Default LOQ	Units
pH	0.010	0.010	Std. Units

12151: Temperature of pH Analyte Name	Default MDL	Default LOQ	Units
Temperature of pH	0.010	0.010	Degrees C

00212: Total Dissolved Solids Analyte Name	Default MDL	Default LOQ	Units
Total Dissolved Solids	20.0	60.0	mg/l

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

January 04, 2019

Ms. Hannah Cottman
Eurofins Lancaster Laboratories
2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994

Re: NJ Radiochemistry Analyses
Work Order: 466630

Dear Ms. Cottman:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on December 11, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4289.

Sincerely,

Taylor Cannon for
Julie Robinson
Project Manager

Chain of Custody: 2016607
Enclosures

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Case Narrative

Receipt Narrative
for
Eurofins Lancaster Laboratories
SDG: 466630

January 04, 2019

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on December 11, 2018 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

Laboratory ID	Client ID
466630001	MW-1
466630002	MW-2
466630003	MW-3
466630004	MW-4
466630005	MW-5
466630006	MW-6
466630007	MW-7
466630008	MW-8
466630009	MW-9
466630010	FB-20181203

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

Taylor Cannon for
Julie Robinson
Project Manager

Chain of Custody and Supporting Documentation

Environmental Analysis Request/Chain of Custody

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466630 Acct. # _____ Group # 2016607 Sample # 9931011-20

Subcontractor:	GEL		
Project Name/#:	2016607	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler:		PWSID #:	
Phone #:	717-556-7383	Quote #:	
State where samples were collected:	NJ	For Compliance:	Yes ☑ No ☐

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water: Potable	Ground	Surface	NPDES	Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod)	Remarks
													Preservation and Filtration Codes	N	N	
MW-1	12/3/2018	1115	X					X					2	X	X	9931011
MW-2	12/3/2018	1240	X					X					2	X	X	9931012
MW-3	12/3/2018	1120	X					X					2	X	X	9931013
MW-4	12/3/2018	1305	X					X					2	X	X	9931014
MW-5	12/4/2018	0955	X					X					2	X	X	9931015
MW-6	12/4/2018	1035	X					X					2	X	X	9931016
MW-7	12/4/2018	1355	X					X					2	X	X	9931017
MW-8	12/4/2018	1230	X					X					2	X	X	9931018
MW-9	12/4/2018	1215	X					X					2	X	X	9931019
FB-20181203	12/3/2018	1200	X					X					2	X	X	9931020

For Lab Use Only

SF #: _____

SCR #: _____

Preservation Codes

H = HCl T = Thiosulfate

N = HNO_3 B = NaOH

S = H_2SO_4 P = H_3PO_4

F = Field Filtered O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐

(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: **Preservation Needed**

Rush results requested by(please check): E-Mail ☐ Phone ☐

E-mail Address: ELLE_Subcontracting@EurofinsUS.com

Phone: 717-556-7383

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NJ DKQP ☑ NYSDEC Category ☐ A or ☐ B

Level IV DOD ☐

EDD Required? Yes ☑ No ☐ If yes, format: Hazsite

Relinquished by:	Date	Time	Received by:	Date	Time
Hank Klatt	12-10-18	1703	Stacy Boone	12/11/18	950
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: LANC	SDG/AR/COC/Work Order: 466630
Received By: STACY BOONE	Date Received: 12/11/18 JR
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 5035 4245 5798 - 6C 5035 4245 5802 - 6C

Suspected Hazard Information	Yes	No	
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Ø CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	✓			Preservation Method: Wet Ice Ice Packs Dry Ice None Other: *all temperatures are recorded in Celsius TEMP: see above
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR3-17 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes___ No___ N/A___ Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials TMC Date 12/12/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

Laboratory Certifications

There are no "Data Exception Reports" associated with this analytical report.

List of current GEL Certifications as of 04 January 2019

State	Certification
Alaska	17−018
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA024
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122019−1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	9904
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−18−13
Utah NELAP	SC000122018−27
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Eurofins Lancaster Laboratories (LANC)
SDG #: 466630

Product: **GFPC, Ra228, Liquid**
Analytical Method: EPA 904.0/SW846 9320 Modified
Analytical Procedure: GL-RAD-A-063 REV# 2
Analytical Batch: 1830755

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
466630001	MW-1
466630002	MW-2
466630003	MW-3
466630004	MW-4
466630005	MW-5
466630006	MW-6
466630007	MW-7
466630008	MW-8
466630009	MW-9
466630010	FB-20181203
1204178239	Method Blank (MB)
1204178240	466630008(MW-8) Sample Duplicate (DUP)
1204178241	466630008(MW-8) Matrix Spike (MS)
1204178242	466630008(MW-8) Matrix Spike Duplicate (MSD)
1204178243	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Sample 1204178241 (MW-8MS) was recounted due to low recovery. The recount is reported. Samples 1204178240 (MW-8DUP) and 466630008 (MW-8) were recounted due to high relative percent difference/relative error ratio. The recounts are reported.

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204178241 (MW-8MS) and 1204178242 (MW-8MSD), aliquots were reduced to conserve sample volume.

Product: **Lucas Cell, Ra226, liquid**
Analytical Method: EPA 903.1 Modified
Analytical Procedure: GL-RAD-A-008 REV# 15
Analytical Batch: 1830869

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
466630001	MW-1
466630002	MW-2
466630003	MW-3
466630004	MW-4
466630005	MW-5
466630006	MW-6
466630007	MW-7
466630008	MW-8
466630009	MW-9
466630010	FB-20181203
1204178462	Method Blank (MB)
1204178463	466633007(FB-20181206) Sample Duplicate (DUP)
1204178464	466633007(FB-20181206) Matrix Spike (MS)
1204178465	466633007(FB-20181206) Matrix Spike Duplicate (MSD)
1204178466	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between MS and MSD
The Matrix Spike and Matrix Spike Duplicate (See Below) do not meet the duplication requirement; however, they both meet the spiked recovery requirement.

Sample	Analyte	Value
1204178464MS and 1204178465MSD (FB-20181206)	Radium-226	RPD 28* (0%-20%)

Technical Information

Recounts
Samples were degassed and recounted due to low recovery. Recounts are reported.

Miscellaneous Information

Additional Comments
The matrix spike and matrix spike duplicate, 1204178464 (FB-20181206MS) and 1204178465 (FB-20181206MSD), aliquots were reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report
for

LANC006 Eurofins Lancaster Laboratories

Client SDG: 466630 GEL Work Order: 466630

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria
** Analyte is a Tracer compound
U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: Heather McCarty **Name: Heather McCarty**

Date: 04 JAN 2019 **Title: Analyst II**

Sample Data Summary

GEL LABORATORIES LLC

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: January 4, 2019
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-1
Sample ID: 466630001
Matrix: Water
Collect Date: 03-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		3.26	+/-1.11	1.33	+/-1.42	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.0651	+/-0.180	0.360	+/-0.181	1.00	pCi/L			PCW	12/23/18	0400	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	83.2	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: January 4, 2019
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-2
Sample ID: 466630002
Matrix: Water
Collect Date: 03-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		2.83	+/-1.20	1.73	+/-1.42	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		2.00	+/-0.475	0.219	+/-0.592	1.00	pCi/L			PCW	12/23/18	0400	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	97.4	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: January 4, 2019
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-3
Sample ID: 466630003
Matrix: Water
Collect Date: 03-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.188	+/-0.606	1.13	+/-0.608	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.031	+/-0.161	0.343	+/-0.161	1.00	pCi/L			PCW	12/23/18	0400	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	93.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike

Lancaster, Pennsylvania 17601-5994

Report Date: January 4, 2019

Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-4
Sample ID: 466630004
Matrix: Water
Collect Date: 03-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	-0.394	+/-0.942	1.82	+/-0.942	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		0.459	+/-0.302	0.404	+/-0.309	1.00	pCi/L			PCW	12/23/18	0400	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	91.3	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: January 4, 2019
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-5
Sample ID: 466630005
Matrix: Water
Collect Date: 04-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.641	+/-0.607	0.979	+/-0.631	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.293	+/-0.321	0.527	+/-0.325	1.00	pCi/L			PCW	12/23/18	0400	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	100	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike

Lancaster, Pennsylvania 17601-5994 Report Date: January 4, 2019

Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-6
Sample ID: 466630006
Matrix: Water
Collect Date: 04-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		1.49	+/-0.874	1.30	+/-0.964	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	0.0586	+/-0.141	0.281	+/-0.141	1.00	pCi/L			PCW	12/23/18	0435	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	97.1	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike

Lancaster, Pennsylvania 17601-5994 Report Date: January 4, 2019

Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-7
Sample ID: 466630007
Matrix: Water
Collect Date: 04-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228		2.91	+/-1.08	1.36	+/-1.34	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		0.592	+/-0.316	0.363	+/-0.346	1.00	pCi/L			PCW	12/23/18	0435	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	83.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: January 4, 2019
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-8
Sample ID: 466630008
Matrix: Water
Collect Date: 04-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	0.530	+/-0.916	1.61	+/-0.928	3.00	pCi/L			JXC9	12/27/18	1337	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		2.06	+/-0.576	0.309	+/-0.659	1.00	pCi/L			PCW	12/23/18	0435	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	96.6	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: January 4, 2019
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: MW-9
Sample ID: 466630009
Matrix: Water
Collect Date: 04-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	-0.667	+/-0.632	1.40	+/-0.632	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226	U	-0.069	+/-0.166	0.425	+/-0.166	1.00	pCi/L			PCW	12/23/18	0435	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	93.8	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

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Certificate of Analysis

Company : Eurofins Lancaster Laboratories
Address : 2425 New Holland Pike
Lancaster, Pennsylvania 17601-5994
Report Date: January 4, 2019
Contact: Ms. Hannah Cottman
Project: NJ Radiochemistry Analyses

Client Sample ID: FB-20181203
Sample ID: 466630010
Matrix: Water
Collect Date: 03-DEC-18
Receive Date: 11-DEC-18
Collector: Client

Project: LANC00115
Client ID: LANC006

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Rad Gas Flow Proportional Counting														
GFPC, Ra228, Liquid "As Received"														
Radium-228	U	-0.327	+/-0.516	1.12	+/-0.516	3.00	pCi/L			JXC9	12/27/18	1139	1830755	1
Rad Radium-226														
Lucas Cell, Ra226, liquid "As Received"														
Radium-226		0.427	+/-0.249	0.251	+/-0.269	1.00	pCi/L			PCW	12/23/18	0435	1830869	2

The following Analytical Methods were performed

Method	Description
1	EPA 904.0/SW846 9320 Modified
2	EPA 903.1 Modified

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"	1830755	95.4	(15%-125%)

Notes:

The MDC is a sample specific MDC.
TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
Lc/LC: Critical Level
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Mtd.: Method
PF: Prep Factor
RL: Reporting Limit
TPU: Total Propagated Uncertainty

Quality Control Summary

QC Summary

Client : **Eurofins Lancaster Laboratories**
2425 New Holland Pike
Lancaster, Pennsylvania
Contact: **Ms. Hannah Cottman**
Workorder: **466630**

Report Date: January 4, 2019

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gas Flow										
Batch 1830755										
QC1204178240 466630008 DUP										
Radium-228	U	0.530	U	0.550	pCi/L	0		N/A	JXC9	12/27/1813:37
	Uncert:	+/-0.916		+/-1.02						
	TPU:	+/-0.928		+/-1.03						
QC1204178243 LCS										
Radium-228	16.8			19.8	pCi/L		118	(75%-125%)	JXC9	12/27/1811:38
	Uncert:			+/-2.21						
	TPU:			+/-5.83						
QC1204178239 MB										
Radium-228			U	0.715	pCi/L				JXC9	12/27/1811:38
	Uncert:			+/-0.988						
	TPU:			+/-1.01						
QC1204178241 466630008 MS										
Radium-228	50.7 U	0.530		41.1	pCi/L		81.1	(75%-125%)	JXC9	12/27/1813:37
	Uncert:	+/-0.916		+/-6.10						
	TPU:	+/-0.928		+/-12.7						
QC1204178242 466630008 MSD										
Radium-228	50.7 U	0.530		45.2	pCi/L	9.4	89.1	(0%-20%)	JXC9	12/27/1811:38
	Uncert:	+/-0.916		+/-6.11						
	TPU:	+/-0.928		+/-13.8						
Rad Ra-226										
Batch 1830869										
QC1204178463 466633007 DUP										
Radium-226	U	-0.0946	U	0.0943	pCi/L	0		N/A	PCW	12/23/1805:10
	Uncert:	+/-0.138		+/-0.163						
	TPU:	+/-0.138		+/-0.164						
QC1204178466 LCS										
Radium-226	26.0			23.1	pCi/L		88.8	(75%-125%)	PCW	12/23/1805:40
	Uncert:			+/-1.62						
	TPU:			+/-5.60						
QC1204178462 MB										
Radium-226			U	-0.0927	pCi/L				PCW	12/23/1805:10
	Uncert:			+/-0.160						
	TPU:			+/-0.160						
QC1204178464 466633007 MS										
Radium-226	130 U	-0.0946		147	pCi/L		113	(75%-125%)	PCW	12/23/1805:10
	Uncert:	+/-0.138		+/-9.78						
	TPU:	+/-0.138		+/-35.6						
QC1204178465 466633007 MSD										
Radium-226	130 U	-0.0946		111	pCi/L	28*	85.5	(0%-20%)	PCW	12/23/1805:10
	Uncert:	+/-0.138		+/-8.31						

QC Summary

Workorder: **466630**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Ra-226										
Batch 1830869										
				TPU:	+/-0.138		+/-20.2			

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

**	Analyte is a Tracer compound
<	Result is less than value reported
>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
** Indicates analyte is a surrogate/tracer compound.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptence criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 1830755 Check-list

This check-list was completed on 28-DEC-18 by Nat Long

This batch was reviewed by Nat Long on 28-DEC-18 and Kenshalla Oston on 02-JAN-19.

Batch ID:	**Product:**	**Description:** Gas Flow Radium 228
1830755	GFC28RAL	GL-RAD-A-009

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium−228 in Liquid

Batch ID: **1830755**
Analyst: Jasmine Conley (JXC9)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL−RAD−A−063 REV# 2
Instrument: GFC−51204863

Due Dates for Lab: 06−JAN−2019 **Package: 08−JAN−2019** **SDG: 10−JAN−2019**

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1204178243	Radium−228 SPIKE	1810−A	.1	mL
MS	1204178241	Radium−228 SPIKE	1810−A	.1	mL
MSD	1204178242	Radium−228 SPIKE	1810−A	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Aliquot (mL)	Ac−228 Ingrow (date)	Ac−228 Separation (date)
1	466630001	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
2	466630002	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
3	466630003	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
4	466630004	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
5	466630005	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
6	466630006	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
7	466630007	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
8	466630008	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
9	466630009	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
10	466630010	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
11	466633001	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
12	466633002	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
13	466633003	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
14	466633004	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
15	466633005	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
16	466633006	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
17	466633007	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
18	1204178239 MB	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
19	1204178240 DUP (466630008)	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46
20	1204178241 MS (466630008)	19−DEC−2018	3	100	12/20/18 13:45	12/27/18 09:46
21	1204178242 MSD (466630008)	19−DEC−2018	3	100	12/20/18 13:45	12/27/18 09:46
22	1204178243 LCS	19−DEC−2018	3	300	12/20/18 13:45	12/27/18 09:46

Reagent/Solvent Lot ID	Description	Amount
REGNT 2571685.11	2mL Cartridges	2 mL
REGNT 2662327.1	cerium 500 mg/L in 2%HCI	.2 mL
REGNT 2672182	RGF−1.5 Ammonium Sulfate	10 mL
REGNT 2832199.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL
REGNT 2832891.12	Hydrofluoric Acid Poly Bottle	3 mL
REGNT 2840709	RGF−16mg/mL Barium Chloride	1 mL
REGNT 2843889	RGF−1M Citric Acid	5 mL
REGNT 2861465	RGF−7M Nitric Acid	25 mL
REGNT 2869507	RGF−2M Hydrochloric Acid	20 mL
REGNT 2871623.21	16M	5 mL
REGNT 2873262	RGF−50% Potassium Carbonate	2 mL
WORK 0487−D	Barium−133 TRACER	.1 mL

Comments:

Pipet Id: RAD−GFC−1795419
Data Entry Date2: 19−DEC−2018 00:00

Radium-228 Liquid

Filename : RA228.XLS
File type : Excel
Version # : 1.4.2

Tracer S/N : 0487-D
Tracer Exp Date : 10/10/2019
Tracer Volume Added: 0.10

Batch : 1830755
Analyst : JAS02031
Prep Date : 12/19/2018
Ra-228 Method Uncertainty : 0.1268

Geometry: CeF on 25mm Filter

Procedure Code : GFC28RAL
Parmname : Radium-228
Required MDA : 3 pCi/L
Ra-228 Abundance : 1.00
Halflife of Ra-228 : 5.75 years
Halflife of Ac-228 : 6.15 hours

Sample Characteristics					**Tracer Calculations**					
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	466630001.1	0.3000	1.8459E-05	12/3/2018 11:15	172.7	7.61%	143.7	8.34%	0.1	0.000200
2	466630002.1	0.3000	1.8459E-05	12/3/2018 12:40	172.7	7.61%	168.3	7.71%	0.1	0.000200
3	466630003.1	0.3000	1.8459E-05	12/3/2018 11:20	172.7	7.61%	162.0	7.86%	0.1	0.000200
4	466630004.1	0.3000	1.8459E-05	12/3/2018 13:05	172.7	7.61%	157.6	7.97%	0.1	0.000200
5	466630005.1	0.3000	1.8459E-05	12/4/2018 9:55	172.7	7.61%	172.8	7.61%	0.1	0.000200
6	466630006.1	0.3000	1.8459E-05	12/4/2018 10:35	172.7	7.61%	167.7	7.72%	0.1	0.000200
7	466630007.1	0.3000	1.8459E-05	12/4/2018 13:55	172.7	7.61%	144.8	8.31%	0.1	0.000200
8	466630008.1	0.3000	1.8459E-05	12/4/2018 12:30	172.7	7.61%	166.9	7.74%	0.1	0.000200
9	466630009.1	0.3000	1.8459E-05	12/4/2018 12:15	172.7	7.61%	162.0	7.86%	0.1	0.000200
10	466630010.1	0.3000	1.8459E-05	12/3/2018 12:00	172.7	7.61%	164.8	7.79%	0.1	0.000200
11	466633001.1	0.3000	1.8459E-05	12/6/2018 10:10	172.7	7.61%	153.8	8.06%	0.1	0.000200
12	466633002.1	0.3000	1.8459E-05	12/6/2018 10:10	172.7	7.61%	170.9	7.65%	0.1	0.000200
13	466633003.1	0.3000	1.8459E-05	12/6/2018 13:30	172.7	7.61%	175.8	7.54%	0.1	0.000200
14	466633004.1	0.3000	1.8459E-05	12/6/2018 11:35	172.7	7.61%	176.0	7.54%	0.1	0.000200
15	466633005.1	0.3000	1.8459E-05	12/6/2018 12:40	172.7	7.61%	155.1	8.03%	0.1	0.000200
16	466633006.1	0.3000	1.8459E-05	12/6/2018 14:20	172.7	7.61%	178.0	7.50%	0.1	0.000200
17	466633007.1	0.3000	1.8459E-05	12/6/2018 12:00	172.7	7.61%	169.2	7.69%	0.1	0.000200
18	1204178239.1	0.3000	1.8459E-05	12/19/2018 0:00	172.7	7.61%	158.5	7.94%	0.1	0.000200
19	1204178240.1	0.3000	1.8459E-05	12/4/2018 12:30	172.7	7.61%	151.6	8.12%	0.1	0.000200
20	1204178241.1	0.1000	1.1370E-05	12/4/2018 12:30	172.7	7.61%	166.2	7.76%	0.1	0.000200
21	1204178242.1	0.1000	1.1370E-05	12/4/2018 12:30	172.7	7.61%	170.9	7.65%	0.1	0.000200
22	1204178243.1	0.3000	1.8459E-05	12/19/2018 0:00	172.7	7.61%	147.6	8.23%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-063
Instrument SOP: GL-RAD-I-016

Count raw Data

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
1	1A	60	20	81	1.350	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	83.2%	5.65%
2	1B	60	8	130	2.167	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	97.4%	5.42%
3	1C	60	7	29	0.483	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	93.8%	5.48%
4	1D	60	15	66	1.100	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	91.3%	5.52%
5	2A	60	12	34	0.567	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	100%	5.39%
6	2B	60	10	67	1.117	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	97.1%	5.43%
7	2C	60	35	77	1.283	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	83.8%	5.64%
8	9A	60	9	49	0.817	12/27/2018 13:37	12/20/2018 13:45	12/27/2018 9:46	0.992	0.648	1.000	1.057	96.6%	5.43%
9	4D	60	13	30	0.500	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	93.8%	5.48%
10	5A	60	14	23	0.383	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.992	0.808	1.000	1.057	95.4%	5.45%
11	5B	60	12	43	0.717	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.993	0.808	1.000	1.057	89.0%	5.55%
12	5C	60	14	46	0.767	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.993	0.807	1.000	1.057	98.9%	5.40%
13	5D	60	8	71	1.183	12/27/2018 11:39	12/20/2018 13:45	12/27/2018 9:46	0.993	0.807	1.000	1.057	102%	5.36%
14	11A	60	10	41	0.683	12/27/2018 11:38	12/20/2018 13:45	12/27/2018 9:46	0.993	0.809	1.000	1.057	102%	5.36%
15	11B	60	9	97	1.617	12/27/2018 11:38	12/20/2018 13:45	12/27/2018 9:46	0.993	0.809	1.000	1.057	89.8%	5.54%
16	11C	60	1	38	0.633	12/27/2018 11:38	12/20/2018 13:45	12/27/2018 9:46	0.993	0.809	1.000	1.057	103%	5.35%
17	11D	60	17	94	1.567	12/27/2018 11:38	12/20/2018 13:45	12/27/2018 9:46	0.993	0.809	1.000	1.057	98.0%	5.42%
18	12A	60	9	82	1.367	12/27/2018 11:38	12/20/2018 13:45	12/27/2018 9:46	0.997	0.810	1.000	1.057	91.7%	5.51%
19	9B	60	3	50	0.833	12/27/2018 13:37	12/20/2018 13:45	12/27/2018 9:46	0.992	0.648	1.000	1.057	87.8%	5.57%
20	9C	60	12	235	3.917	12/27/2018 13:37	12/20/2018 13:45	12/27/2018 9:46	0.992	0.648	1.000	1.057	96.2%	5.44%
21	12D	60	14	385	6.417	12/27/2018 11:38	12/20/2018 13:45	12/27/2018 9:46	0.992	0.810	1.000	1.057	98.9%	5.40%
22	13A	60	9	365	6.083	12/27/2018 11:38	12/20/2018 13:45	12/27/2018 9:46	0.997	0.809	1.000	1.057	85.5%	5.61%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2017	5/31/2019	0.6430	0.00738	0.470	12/21/2018 17:38	500
2	PIC	6/1/2017	5/31/2019	0.6519	0.00711	1.258	12/21/2018 17:38	500
3	PIC	6/1/2017	5/31/2019	0.6443	0.00847	0.426	12/21/2018 17:38	500
4	PIC	6/1/2017	5/31/2019	0.6504	0.00692	1.218	12/21/2018 17:38	500
5	PIC	6/1/2017	5/31/2019	0.6444	0.01914	0.358	12/21/2018 17:38	500
6	PIC	6/1/2017	5/31/2019	0.6448	0.02111	0.646	12/21/2018 17:38	500
7	PIC	6/1/2017	5/31/2019	0.6389	0.01274	0.496	12/21/2018 17:38	500
8	PIC	6/1/2017	5/31/2019	0.6688	0.00758	0.678	12/21/2018 17:37	500
9	PIC	6/1/2017	5/31/2019	0.6462	0.00773	0.704	12/21/2018 17:39	500
10	PIC	6/1/2017	5/31/2019	0.6766	0.00851	0.490	12/21/2018 17:39	500
11	PIC	6/1/2017	5/31/2019	0.6547	0.00426	0.488	12/21/2018 17:39	500
12	PIC	6/1/2017	5/31/2019	0.6704	0.00657	0.572	12/21/2018 17:39	500
13	PIC	6/1/2017	5/31/2019	0.6669	0.00925	1.362	12/21/2018 17:39	500
14	PIC	6/1/2017	5/31/2019	0.6648	0.01317	0.494	12/21/2018 17:33	500
15	PIC	6/1/2017	5/31/2019	0.6620	0.00697	0.894	12/21/2018 17:33	500
16	PIC	6/1/2017	5/31/2019	0.6578	0.01278	0.408	12/21/2018 17:33	500
17	PIC	6/1/2017	5/31/2019	0.6802	0.01068	1.346	12/21/2018 17:33	500
18	PIC	6/1/2017	5/31/2019	0.6732	0.01964	1.142	12/21/2018 17:33	500
19	PIC	6/1/2017	5/31/2019	0.6716	0.00754	0.702	12/21/2018 17:37	500
20	PIC	6/1/2017	5/31/2019	0.6373	0.00584	0.512	12/21/2018 17:37	500
21	PIC	6/1/2017	5/31/2019	0.6376	0.01845	1.608	12/21/2018 17:34	500
22	PIC	6/1/2017	5/31/2019	0.6527	0.00714	0.461	12/21/2018 17:33	1000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

* - RPD changed to 0% due to sample & dup activity below MDA

Spike S/N : 1810-A
Spike Exp Date : 5/23/2019
Spike Activity (dpm/ml): 112.00
Spike Volume Added: 0.10

LCS S/N : 1810-A
LCS Exp Date : 5/23/2019
LCS Activity (dpm/ml): 112.00
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	**2 SIGMA** Counting Uncertainty pCi/L	**2 SIGMA** Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.8079	0.5704	3	1.3259	**3.2577**	18.31%	0.8800	0.1531	1.1109	1.4220		SAMPLE				
2	1.1128	0.7856	3	1.7271	**2.8319**	22.31%	0.9087	0.1965	1.2005	1.4244		SAMPLE				
3	0.6809	0.4807	3	1.1253	**0.1879**	164.71%	0.0573	0.0944	0.6062	0.6084		SAMPLE				
4	1.1721	0.8275	3	1.8219	**-0.3937**	122.26%	-0.1180	0.1441	0.9424	0.9425		SAMPLE				
5	0.5849	0.4130	3	0.9795	**0.6408**	48.64%	0.2087	0.1008	0.6067	0.6314		SAMPLE				
6	0.8091	0.5712	3	1.3005	**1.4883**	30.53%	0.4707	0.1411	0.8744	0.9645		SAMPLE				
7	0.8288	0.5852	3	1.3552	**2.9107**	19.86%	0.7873	0.1496	1.0840	1.3443		SAMPLE				
8	1.0017	0.7072	3	1.6055	**0.5299**	88.40%	0.1387	0.1223	0.9163	0.9275		SAMPLE				
9	0.8727	0.6161	3	1.3956	**-0.6665**	48.70%	-0.2040	0.0987	0.6320	0.6322		SAMPLE				
10	0.6838	0.4828	3	1.1190	**-0.3273**	80.67%	-0.1067	0.0858	0.5163	0.5165		SAMPLE				
11	0.7553	0.5333	3	1.2364	**0.7767**	50.02%	0.2287	0.1137	0.7567	0.7855		SAMPLE				
12	0.7188	0.5074	3	1.1642	**0.5811**	60.86%	0.1947	0.1180	0.6904	0.7081		SAMPLE				
13	1.0840	0.7653	3	1.6766	**-0.5213**	84.03%	-0.1787	0.1498	0.8568	0.8569		SAMPLE				
14	0.6525	0.4607	3	1.0672	**0.5522**	59.02%	0.1893	0.1113	0.6359	0.6533		SAMPLE				
15	1.0003	0.7062	3	1.5786	**2.4016**	24.11%	0.7227	0.1695	1.1041	1.2823		SAMPLE				
16	0.5926	0.4184	3	0.9825	**0.6567**	47.64%	0.2253	0.1066	0.6091	0.6346		SAMPLE				
17	1.0949	0.7730	3	1.6943	**0.6542**	77.11%	0.2207	0.1697	0.9862	1.0020		SAMPLE				
18	1.0832	0.7647	3	1.6887	**0.7153**	70.71%	0.2247	0.1583	0.9880	1.0072		MB				
19	1.1172	0.7887	3	1.7869	**0.5501**	94.33%	0.1313	0.1237	1.0152	1.0262	466630008.1	DUP	* 0.0%			
20	2.7518	1.9428	3	4.4897	**41.1312**	9.34%	3.4047	0.2575	6.0970	12.6939	466630008.1	MS			50.6933	81.1%
21	3.7936	2.6783	3	5.8265	**45.1904**	8.96%	4.8087	0.3319	6.1135	13.7507	466630008.1	MSD	9.4%		50.6933	89.1%
22	0.7414	0.5234	3	1.2231	**19.8226**	8.01%	5.6223	0.3191	2.2054	5.8279		LCS			16.8172	117.9%

1830755r1.xls

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
466630001	1A	60	20	81	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630002	1B	60	8	130	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630003	1C	60	7	29	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630004	1D	60	15	66	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630005	2A	60	12	34	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630006	2B	60	10	67	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630007	2C	60	35	77	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630008	9A	60	9	49	12/27/2018 13:37	12/27/2018 14:37	PIC	1830755
466630009	4D	60	13	30	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466630010	5A	60	14	23	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466633001	5B	60	12	43	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466633002	5C	60	14	46	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466633003	5D	60	8	71	12/27/2018 11:39	12/27/2018 12:39	PIC	1830755
466633004	11A	60	10	41	12/27/2018 11:38	12/27/2018 12:38	PIC	1830755
466633005	11B	60	9	97	12/27/2018 11:38	12/27/2018 12:38	PIC	1830755
466633006	11C	60	1	38	12/27/2018 11:38	12/27/2018 12:38	PIC	1830755
466633007	11D	60	17	94	12/27/2018 11:38	12/27/2018 12:38	PIC	1830755
1204178239	12A	60	9	82	12/27/2018 11:38	12/27/2018 12:38	PIC	1830755
1204178240	9B	60	3	50	12/27/2018 13:37	12/27/2018 14:37	PIC	1830755
1204178241	9C	60	12	235	12/27/2018 13:37	12/27/2018 14:37	PIC	1830755
1204178242	12D	60	14	385	12/27/2018 11:38	12/27/2018 12:38	PIC	1830755
1204178243	13A	60	9	365	12/27/2018 11:38	12/27/2018 12:38	PIC	1830755

ASSAY 20-Dec-18 15:37:11

Protocol	id	8 Ba-133
Time	limit	
Count	limit	
Isotope	Ba-133	
Protocol	date	12/20/2018
Run	id.	2451

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
1	97	1	180.04	603.6	172.73	7.61		03:37:11
2	97	2	180.04	516.34	143.65	8.34	83.16	03:40:24
3	97	3	180.06	590.43	168.32	7.71	97.45	03:43:38
4	97	4	180.06	571.43	161.99	7.86	93.78	03:46:52
5	97	5	180.04	558.28	157.63	7.97	91.26	03:50:06
1	94	1	180.06	603.88	172.81	7.61	100.05	03:53:42
2	94	2	180.04	588.6	167.73	7.72	97.11	03:56:56
3	94	3	180.04	519.77	144.79	8.31	83.82	04:00:10
4	94	4	180.04	586.19	166.93	7.74	96.64	04:03:24
5	94	5	180.04	571.48	162.02	7.86	93.80	04:06:37
1	76	1	180.04	579.94	164.84	7.79	95.43	04:10:25
2	76	2	180.06	546.79	153.78	8.06	89.03	04:13:39
3	76	3	180.04	598.05	170.88	7.65	98.93	04:16:53
4	76	4	180.03	612.65	175.76	7.54	101.75	04:20:07
5	76	5	180.04	613.34	175.97	7.54	101.88	04:23:20
1	53	1	180.04	550.65	155.09	8.03	89.79	04:27:08
2	53	2	180.05	619.43	177.99	7.5	103.05	04:30:22
3	53	3	180.05	593.14	169.24	7.69	97.98	04:33:36
4	53	4	180.04	560.77	158.45	7.94	91.73	04:36:50
5	53	5	180.05	540.31	151.63	8.12	87.78	04:40:03
1	92	1	180.04	584.05	166.22	7.76	96.23	04:43:51
2	92	2	180.04	598.11	170.9	7.65	98.94	04:47:05
3	92	3	180.04	528.31	147.64	8.23	85.47	04:50:19

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Dec-2018

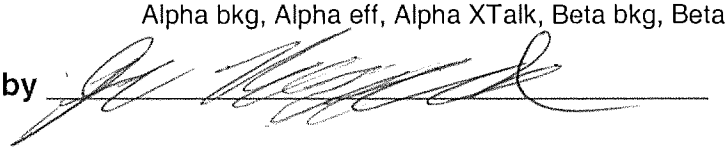
Detectors LB4100 A1 through J4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100B2	Above	Alpha bkg	27-Dec 10:59	60	0.367	-4.24E-2	0.351	+3.24
LB4100B2	Below	Alpha eff	27-Dec 09:21	5	7948	8083	10940	-3.28
LB4100B2	need 2nd	Alpha XTalk	27-Dec 09:21	5	0.289	0.207	0.293	+2.78
LB4100C1	need 2nd	Beta bkg	27-Dec 07:18	60	1.733	1.035	1.925	+1.71
LB4100E3	Above	Beta bkg	27-Dec 07:16	60	2.183	0.473	2.078	+3.39
LB4100F2	Above	Alpha bkg	27-Dec 07:16	60	0.283	-6.32E-2	0.279	+3.07
LB4100F2	need 2nd	Alpha XTalk	27-Dec 11:06	5	0.499	0.318	0.505	+2.80
LB4100G1	Above	Beta bkg	27-Dec 07:16	60	2.150	0.338	1.748	+4.71
LB4100I4	Above	Beta bkg	27-Dec 07:16	60	2.767	0.363	1.365	+11.39
LB4100J2	Above	Alpha bkg	27-Dec 07:16	60	0.383	-6.70E-2	0.379	+3.06
LB4100J4	Above	Alpha bkg	27-Dec 10:20	60	0.367	-4.35E-2	0.401	+2.54
PIC4A	Above	Alpha bkg	27-Dec 10:09	60	0.467	-4.12E-2	0.369	+4.42
PIC4A	need 2nd	Beta eff	27-Dec 09:48	5	52460	51390	55150	-1.29
PIC4C	Above	Alpha bkg	27-Dec 10:09	60	0.383	-7.27E-2	0.383	+3.00
PIC6B	Above	Alpha bkg	27-Dec 10:38	60	0.433	-2.58E-1	0.489	+2.55

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

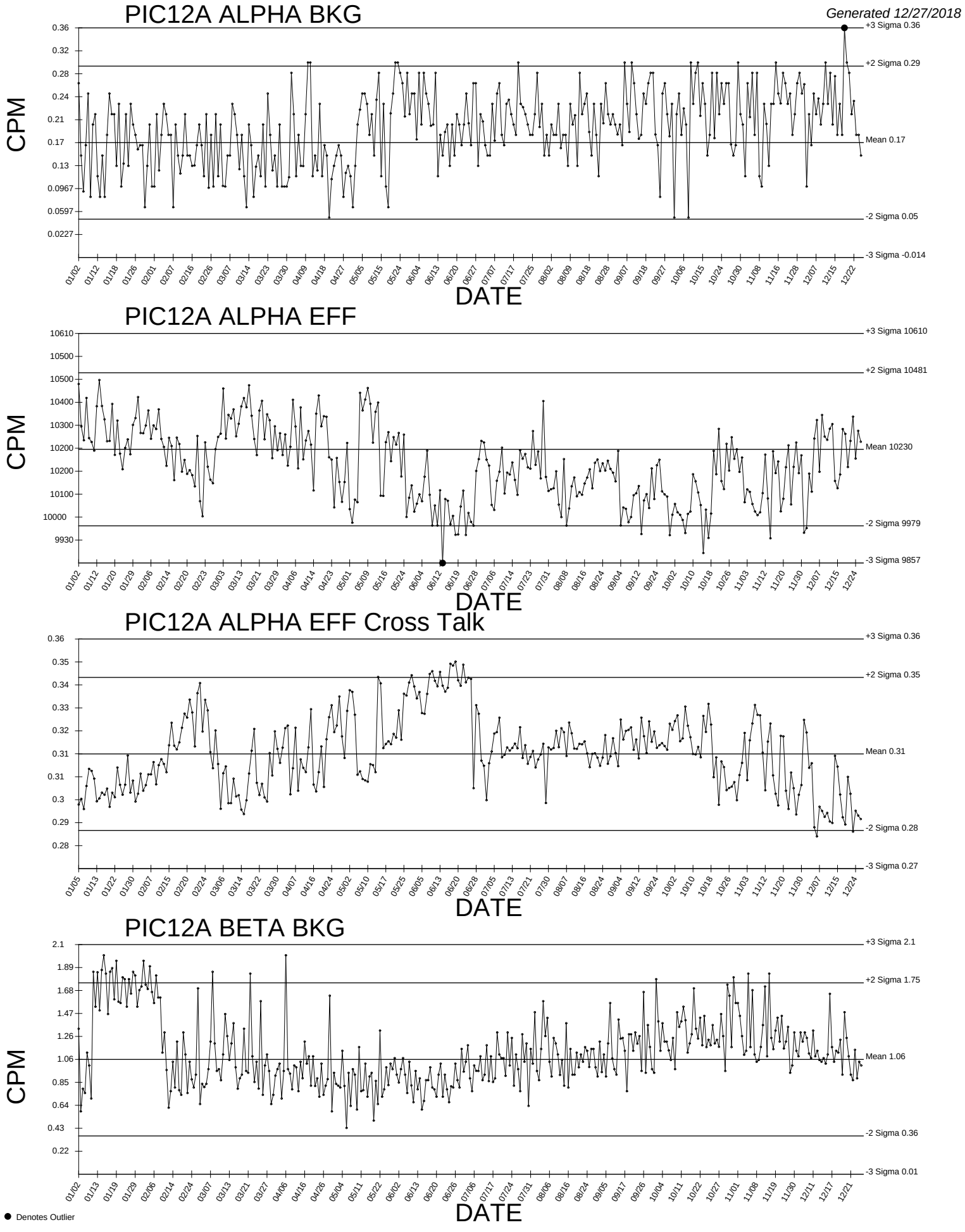
G5400W1W	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1X	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1Y	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
G5400W1Z	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100B3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100D4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC3A	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC6D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC13C	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

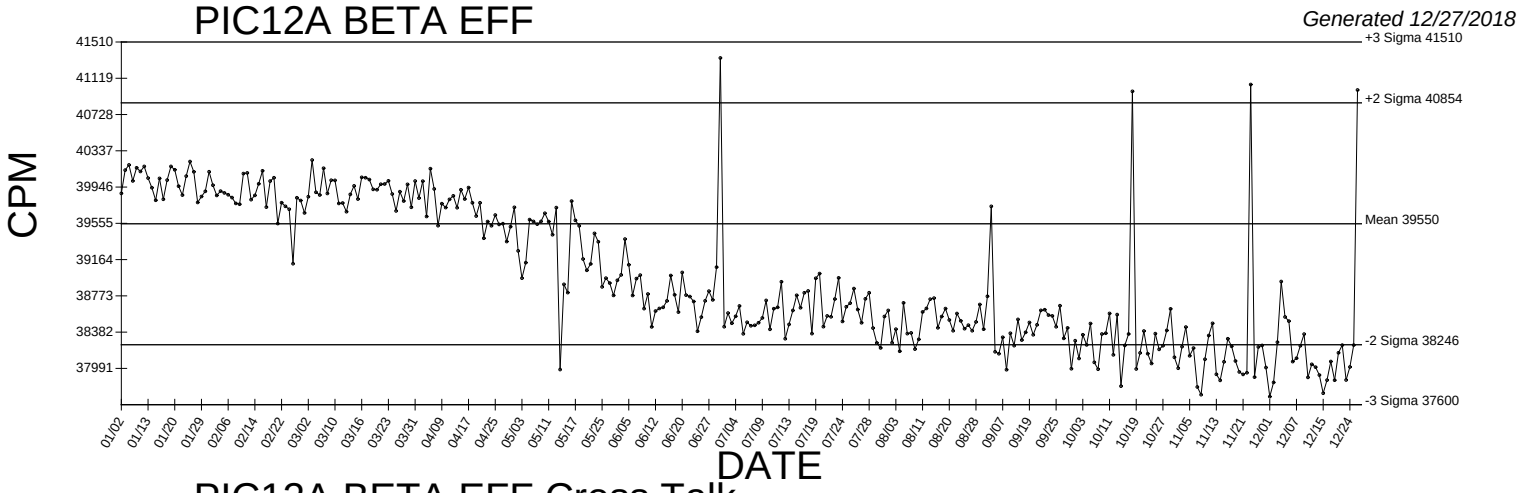
Reviewed by 

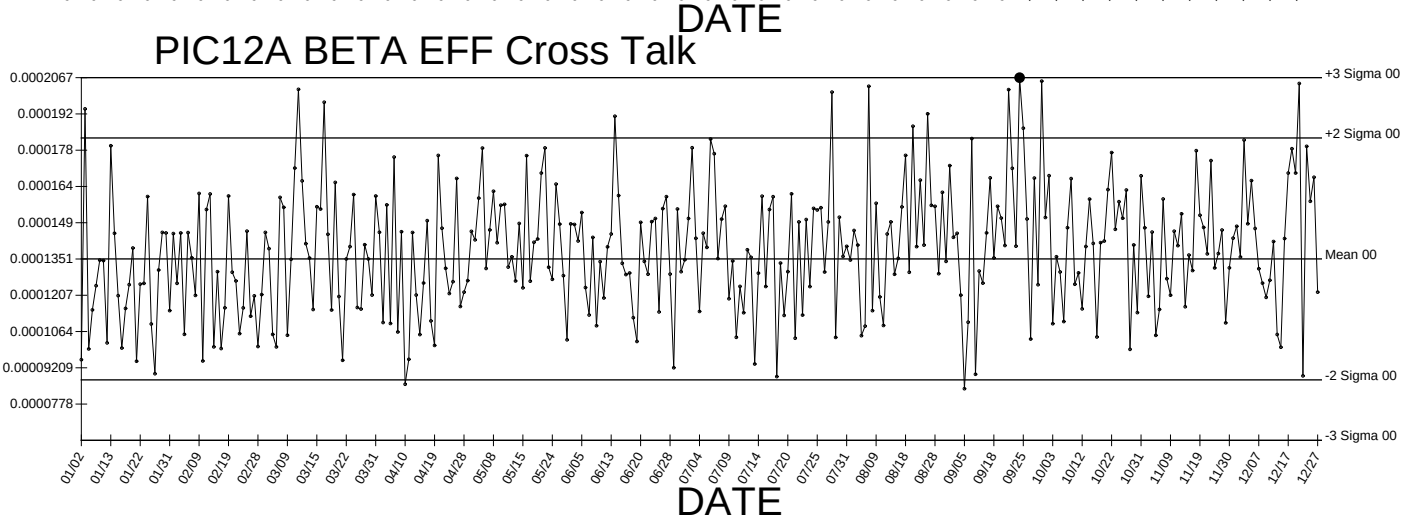
Date 12/27/18

GEL Laboratories LLC

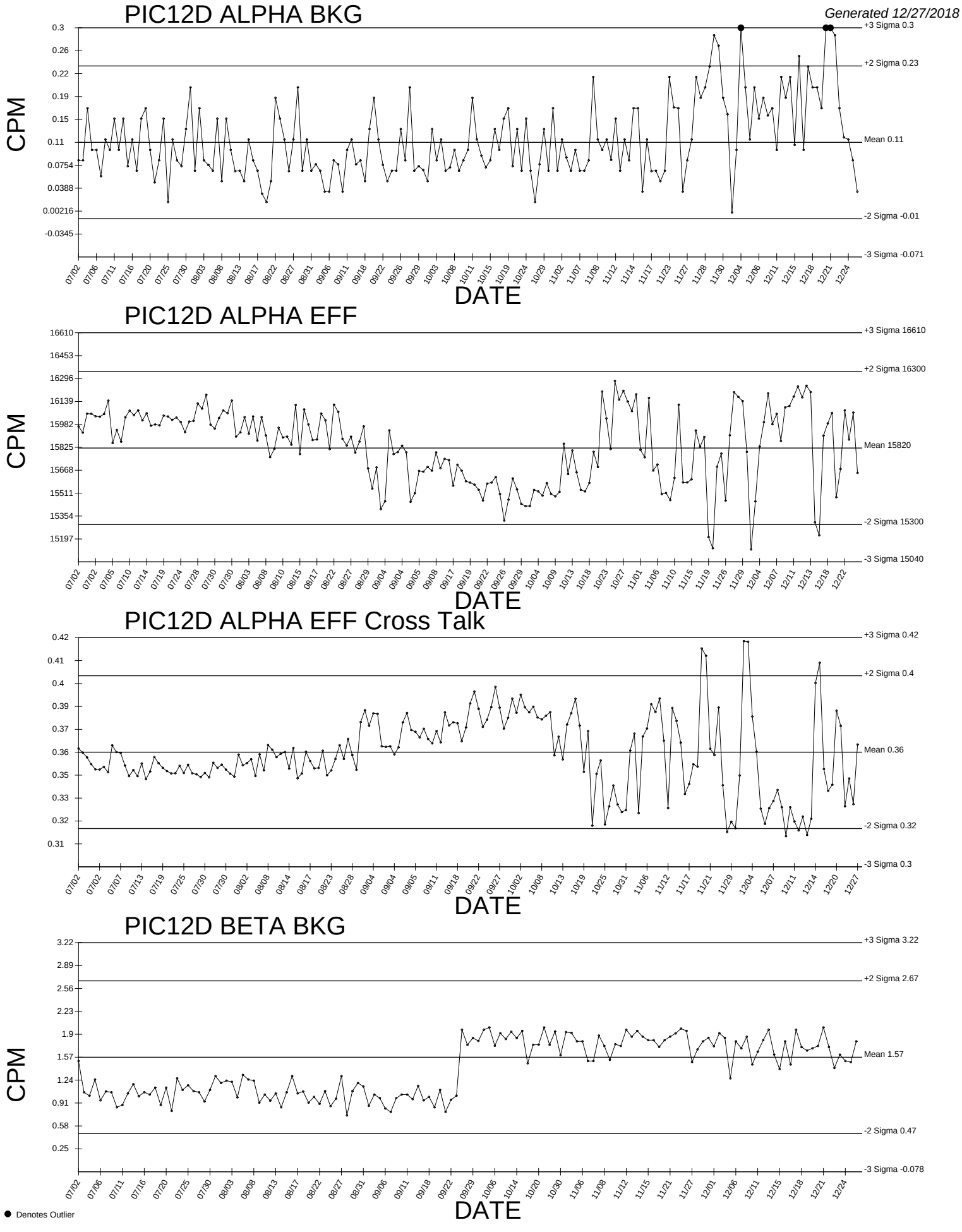
Background and Efficiency Data

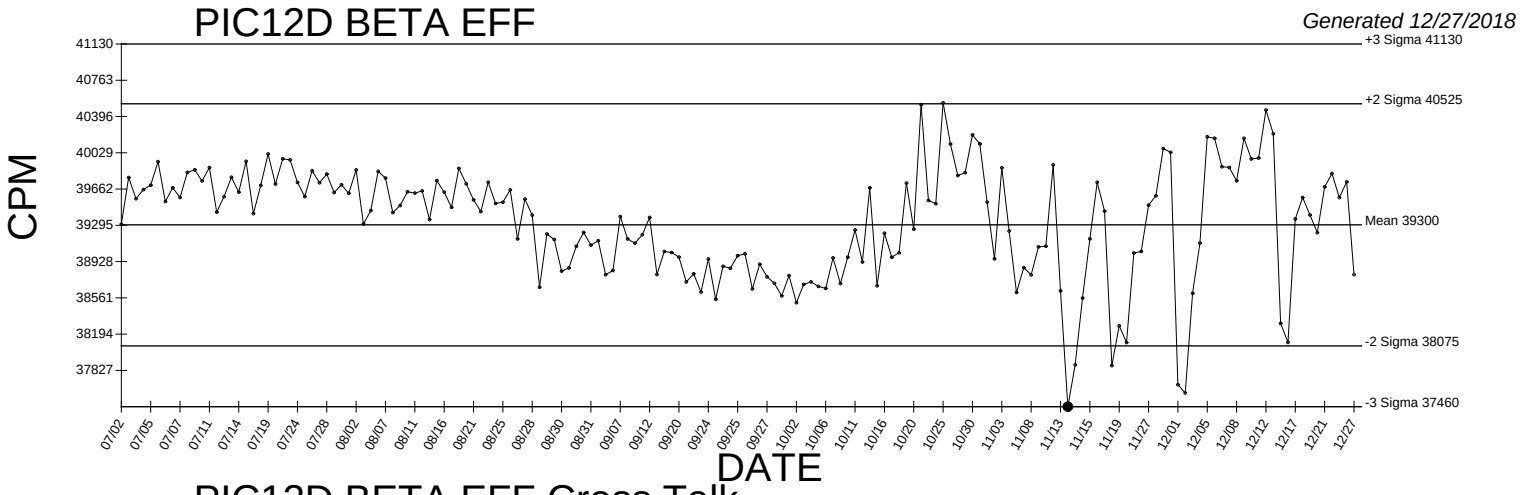

PIC12A ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.29
Mean 0.17
-2 Sigma 0.05
-3 Sigma -0.014
PIC12A ALPHA EFF
+3 Sigma 10610
+2 Sigma 10481
Mean 10230
-2 Sigma 9979
-3 Sigma 9857
PIC12A ALPHA EFF Cross Talk
+3 Sigma 0.36
+2 Sigma 0.35
Mean 0.31
-2 Sigma 0.28
-3 Sigma 0.27
PIC12A BETA BKG
+3 Sigma 2.1
+2 Sigma 1.75
Mean 1.06
-2 Sigma 0.36
-3 Sigma 0.01
Denotes Outlier

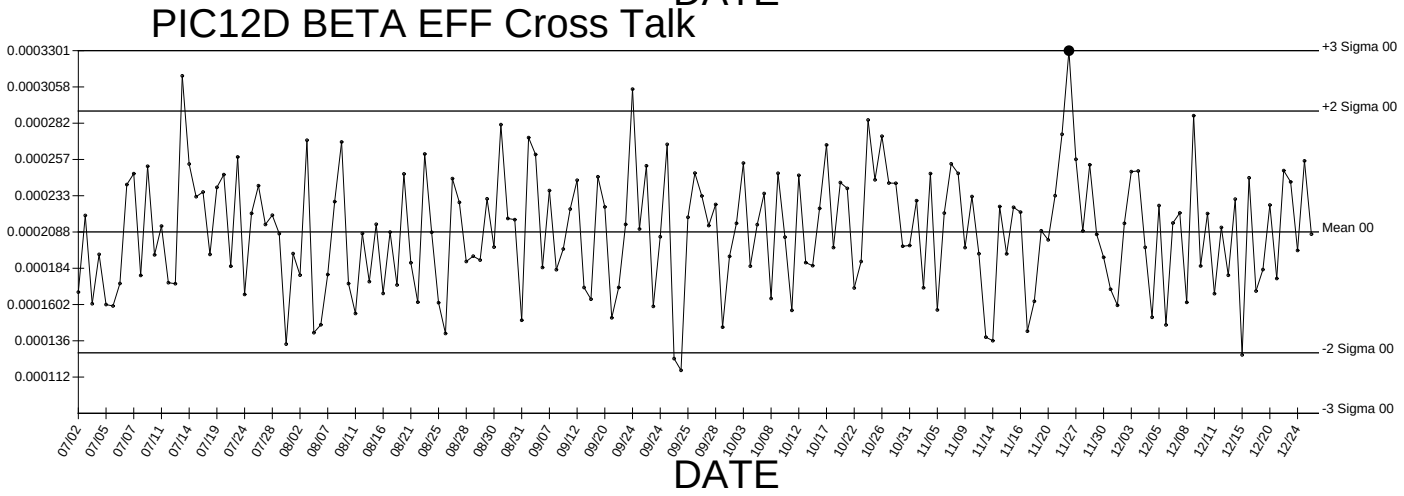




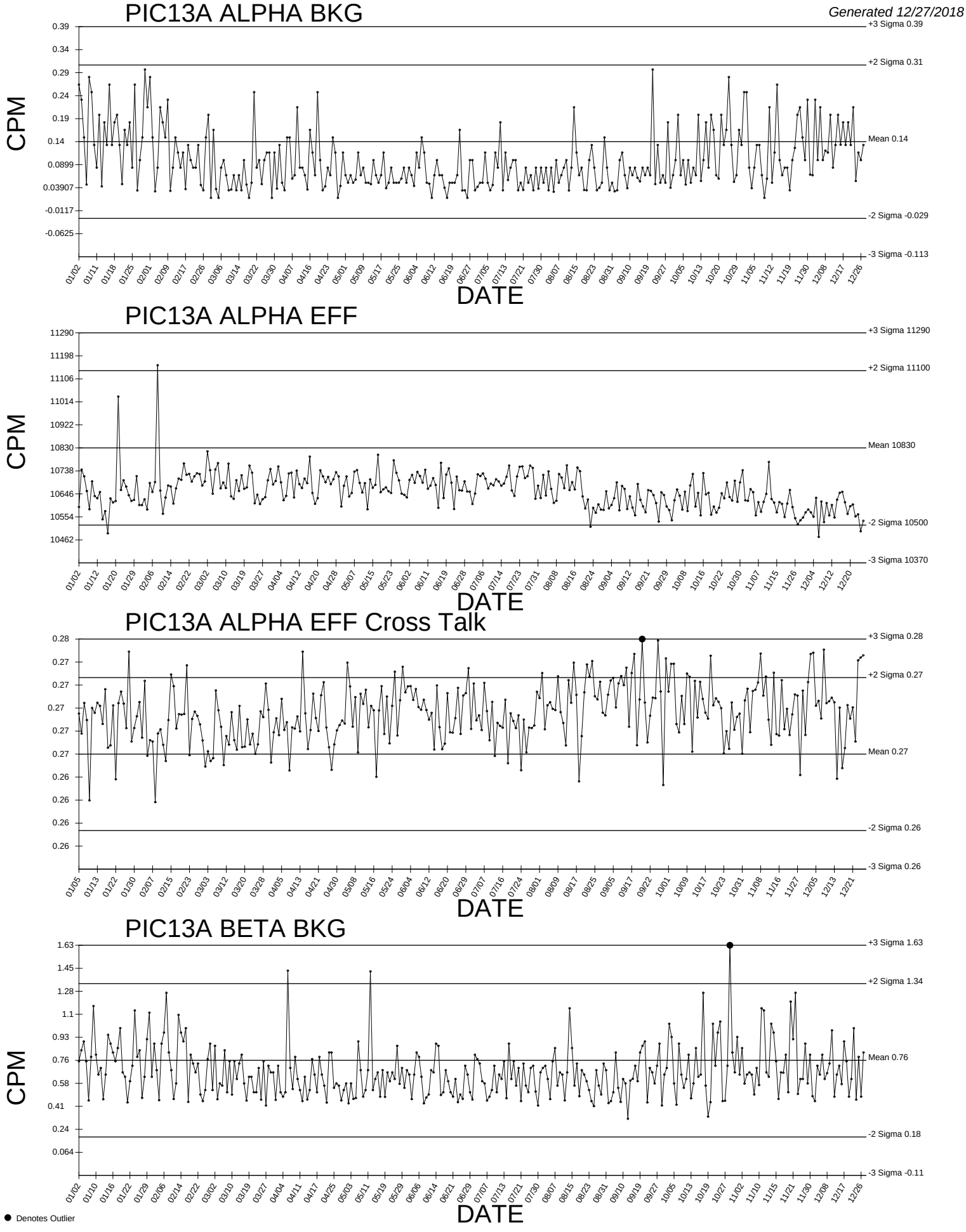
● Denotes Outlier

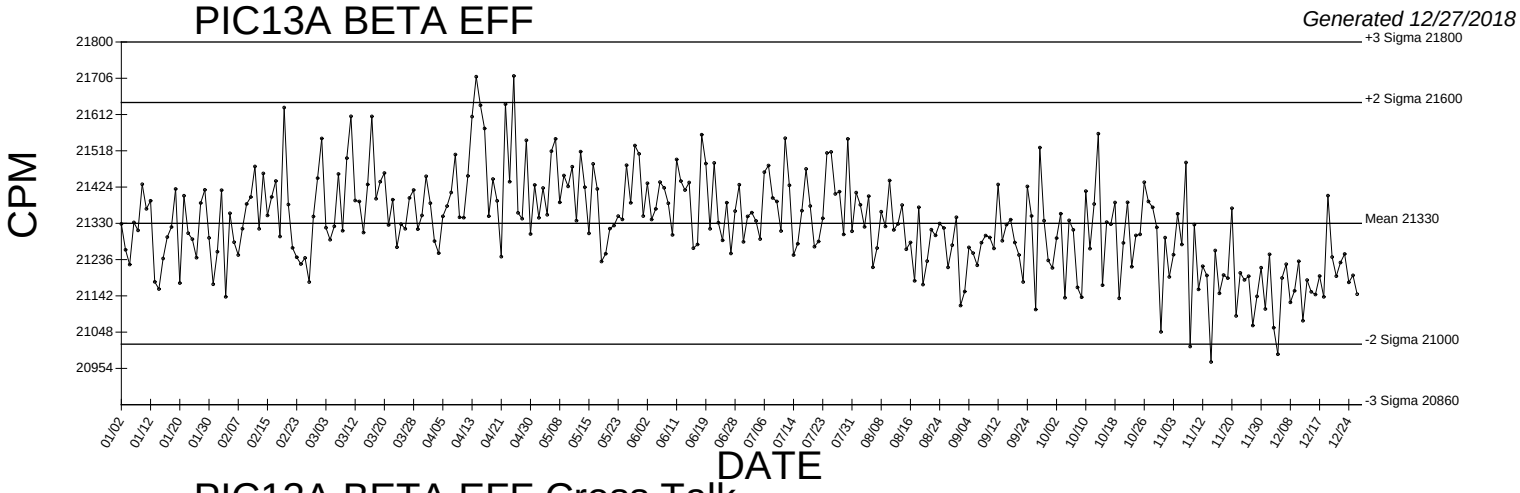

PIC12D ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.3
+2 Sigma 0.23
Mean 0.11
-2 Sigma -0.01
-3 Sigma -0.071
PIC12D ALPHA EFF
+3 Sigma 16610
+2 Sigma 16300
Mean 15820
-2 Sigma 15300
-3 Sigma 15040
PIC12D ALPHA EFF Cross Talk
+3 Sigma 0.42
+2 Sigma 0.4
Mean 0.36
-2 Sigma 0.32
-3 Sigma 0.3
PIC12D BETA BKG
+3 Sigma 3.22
+2 Sigma 2.67
Mean 1.57
-2 Sigma 0.47
-3 Sigma -0.078
Denotes Outlier

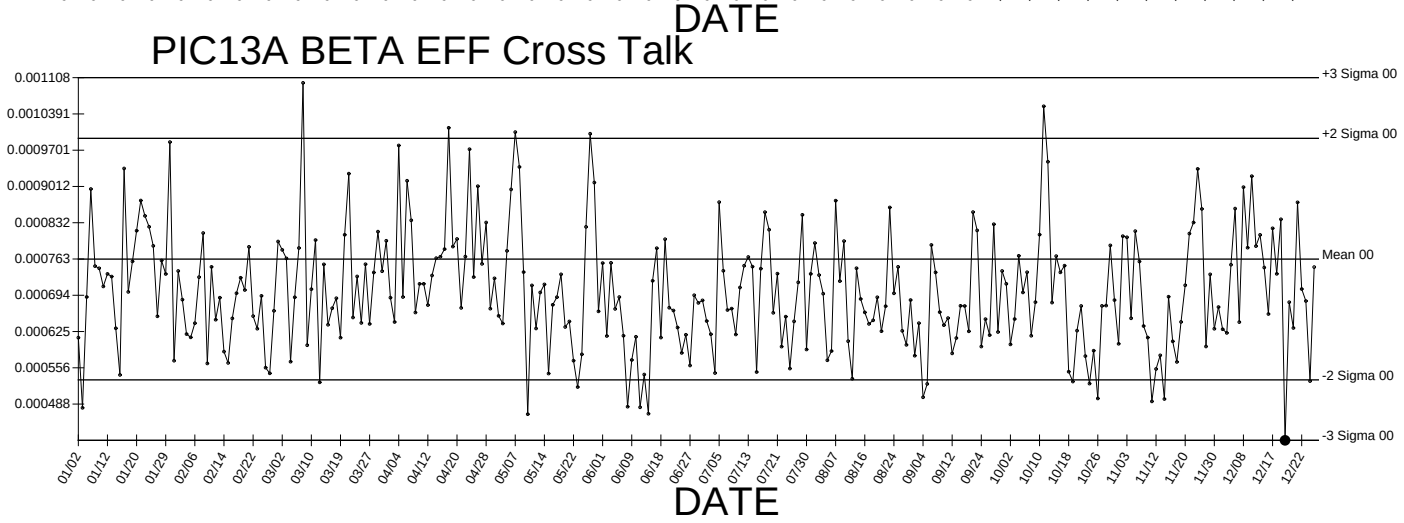




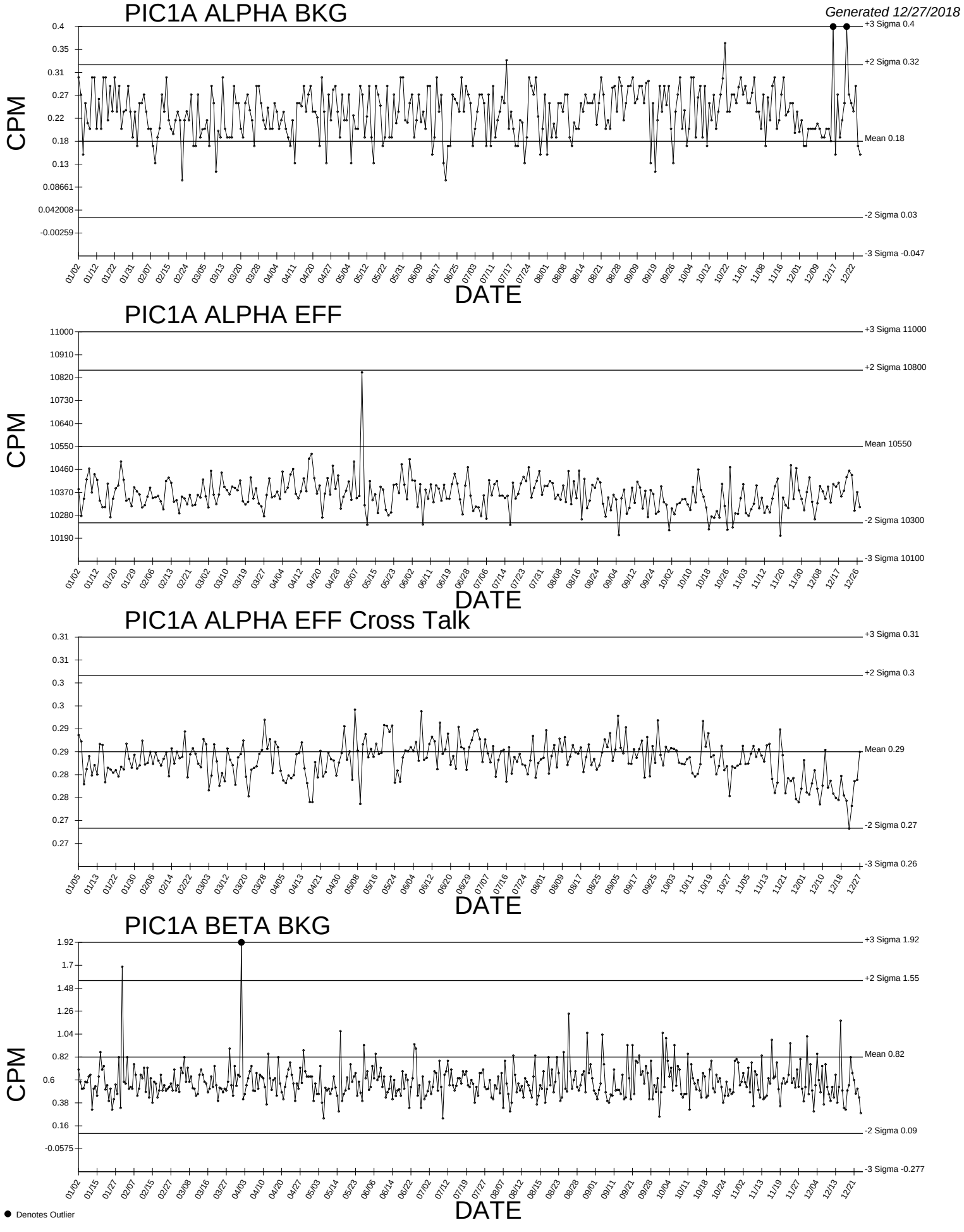
● Denotes Outlier

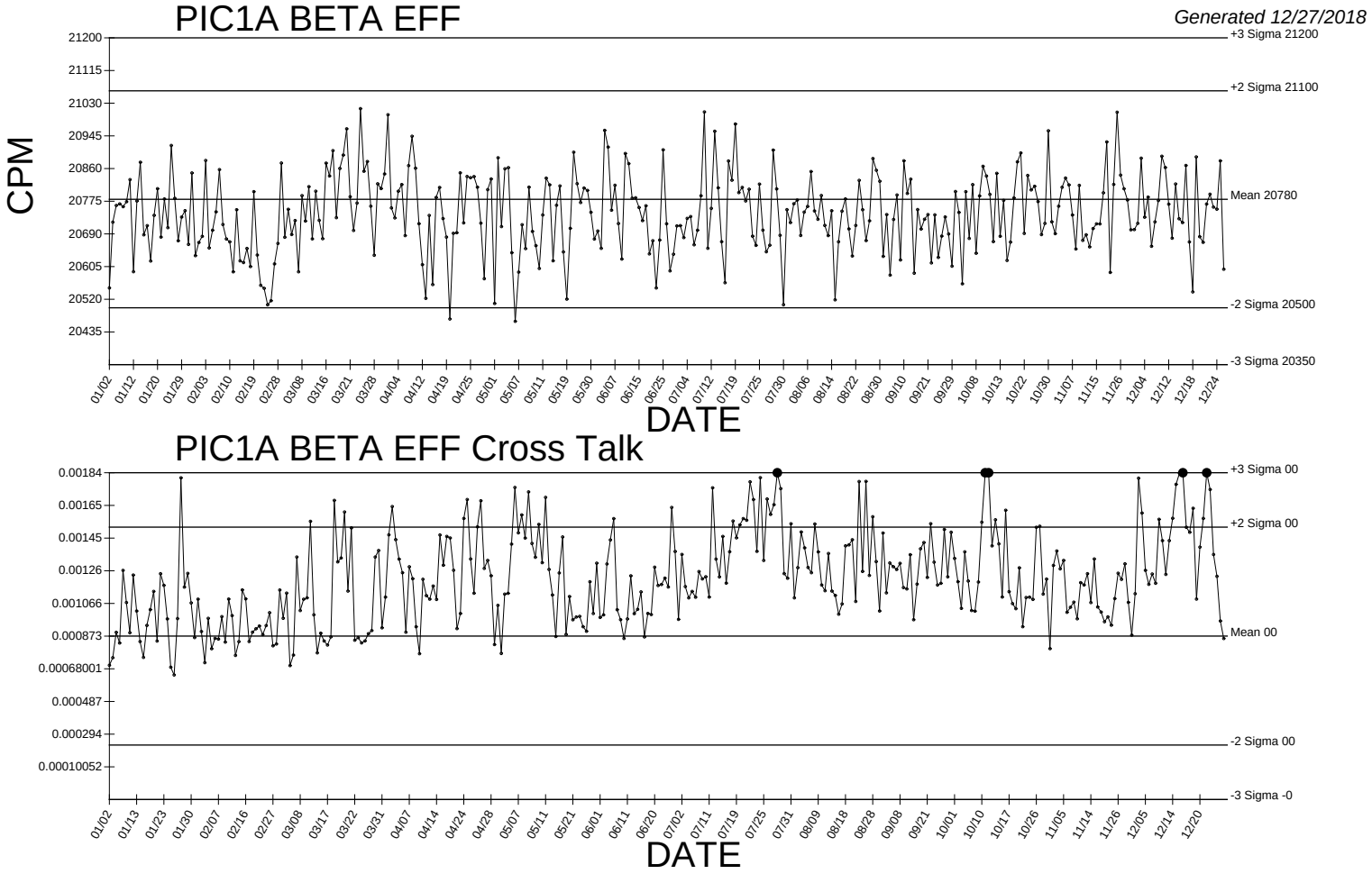

PIC13A ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.39
+2 Sigma 0.31
Mean 0.14
-2 Sigma -0.029
-3 Sigma -0.113
PIC13A ALPHA EFF
+3 Sigma 11290
+2 Sigma 11100
Mean 10830
-2 Sigma 10500
-3 Sigma 10370
PIC13A ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.27
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.26
PIC13A BETA BKG
+3 Sigma 1.63
+2 Sigma 1.34
Mean 0.76
-2 Sigma 0.18
-3 Sigma -0.11
Denotes Outlier



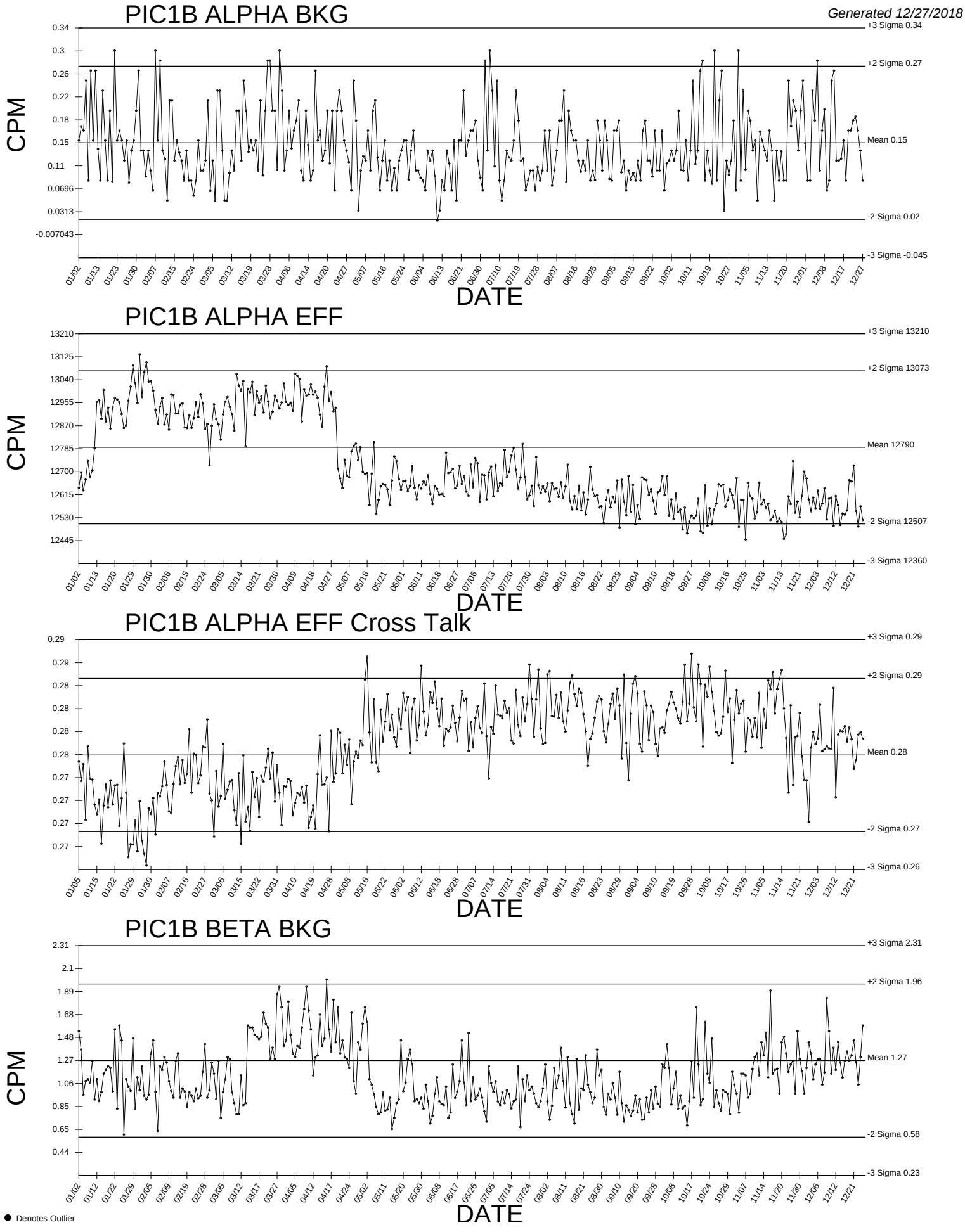


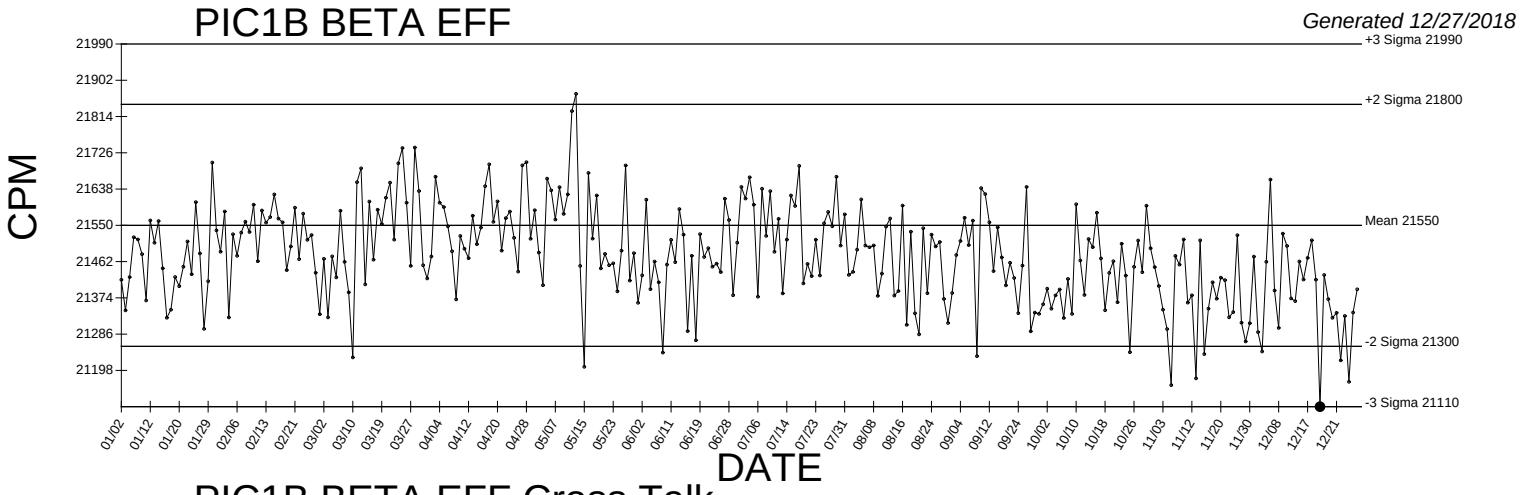
● Denotes Outlier

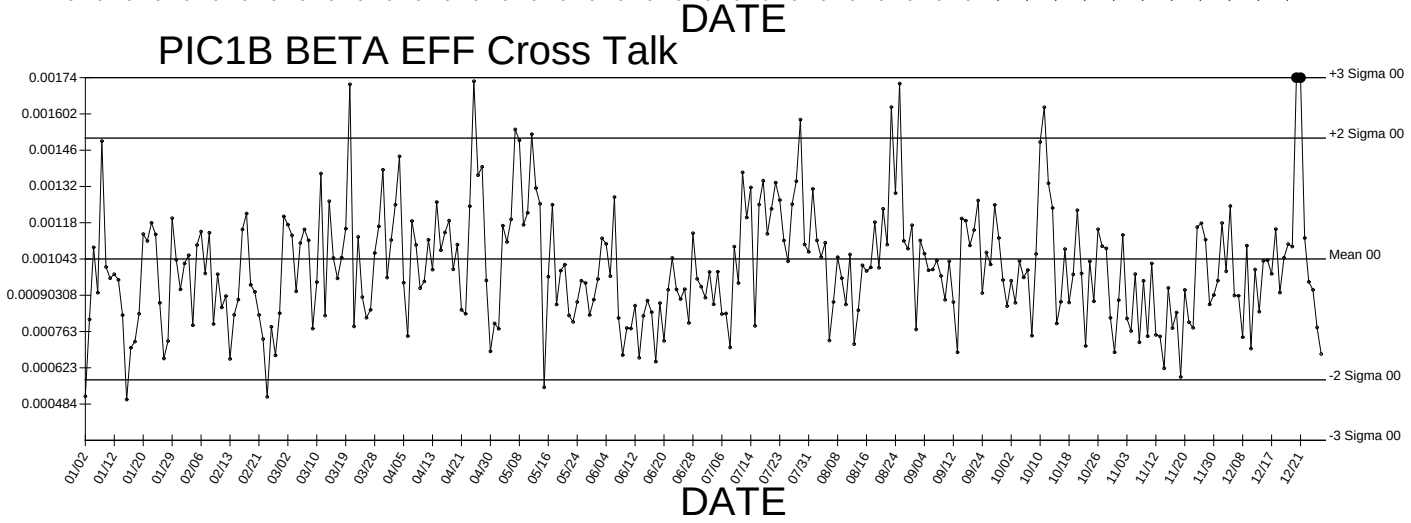

PIC1A ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.4
+2 Sigma 0.32
Mean 0.18
-2 Sigma 0.03
-3 Sigma -0.047
PIC1A ALPHA EFF
+3 Sigma 11000
+2 Sigma 10800
Mean 10550
-2 Sigma 10300
-3 Sigma 10100
PIC1A ALPHA EFF Cross Talk
+3 Sigma 0.31
+2 Sigma 0.3
Mean 0.29
-2 Sigma 0.27
-3 Sigma 0.26
PIC1A BETA BKG
+3 Sigma 1.92
+2 Sigma 1.55
Mean 0.82
-2 Sigma 0.09
-3 Sigma -0.277
Denotes Outlier



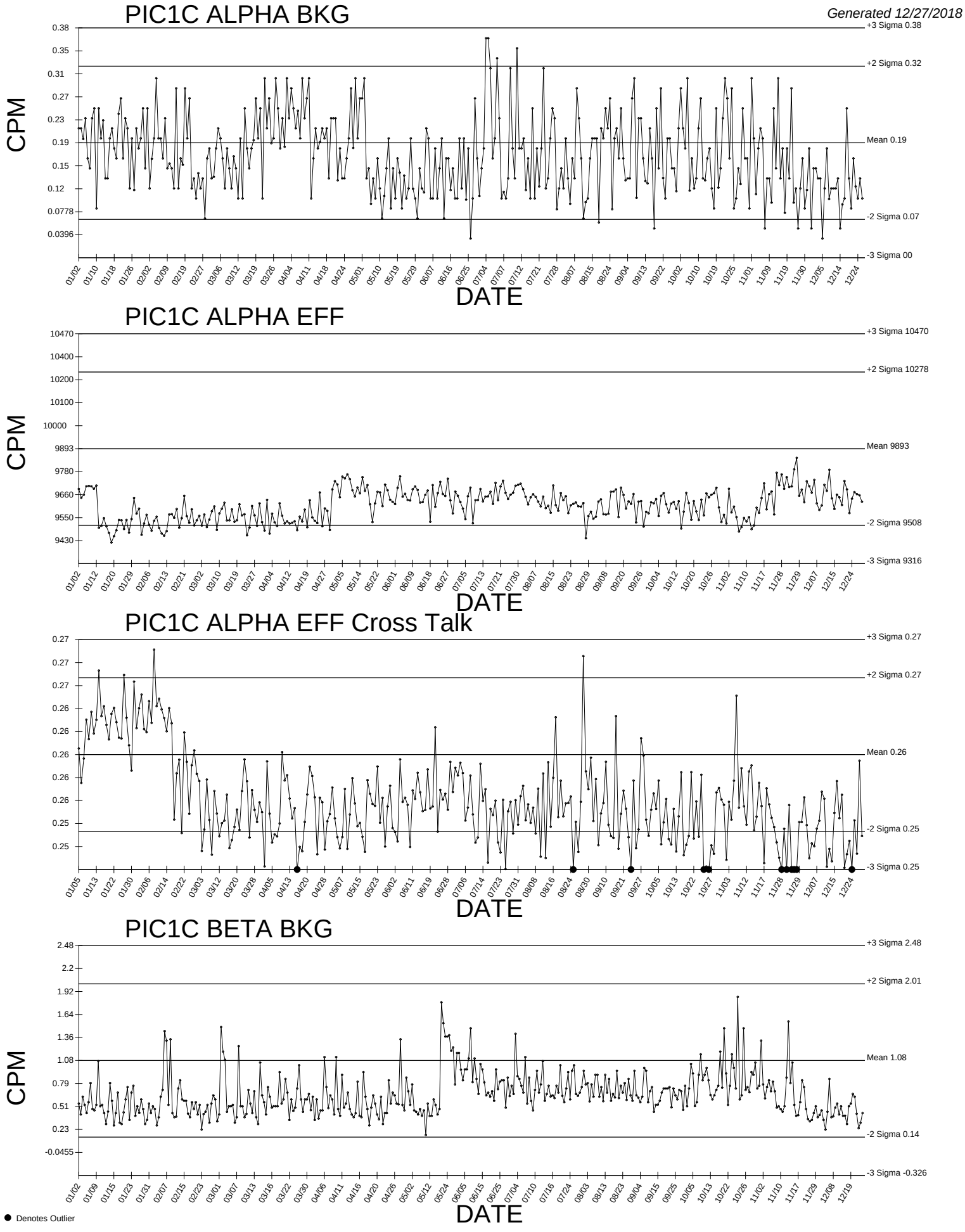
● Denotes Outlier

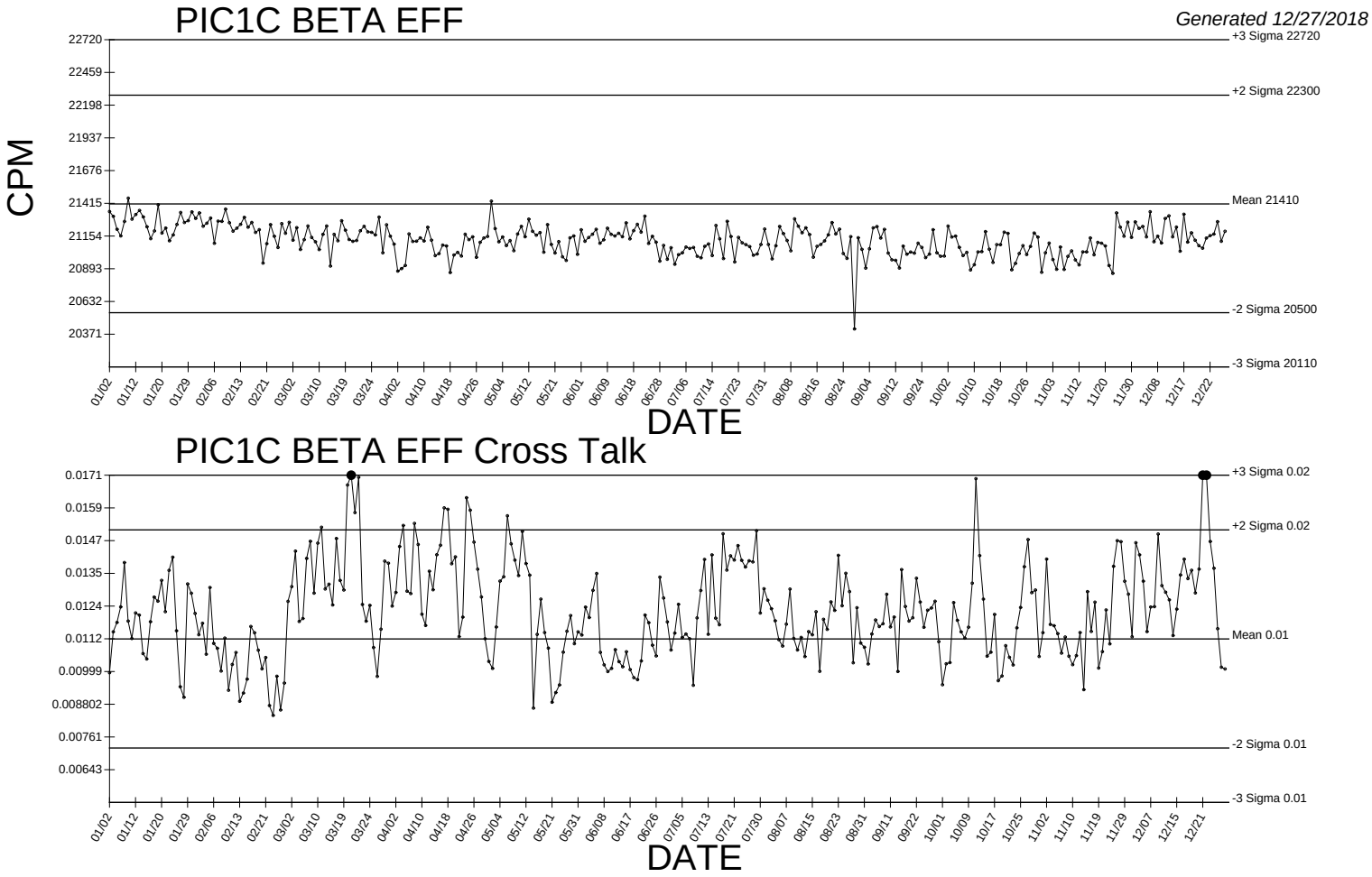

PIC1B ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.34
+2 Sigma 0.27
Mean 0.15
-2 Sigma 0.02
-3 Sigma -0.045
PIC1B ALPHA EFF
+3 Sigma 13210
+2 Sigma 13073
Mean 12790
-2 Sigma 12507
-3 Sigma 12360
PIC1B ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.29
Mean 0.28
-2 Sigma 0.27
-3 Sigma 0.26
PIC1B BETA BKG
+3 Sigma 2.31
+2 Sigma 1.96
Mean 1.27
-2 Sigma 0.58
-3 Sigma 0.23
● Denotes Outlier



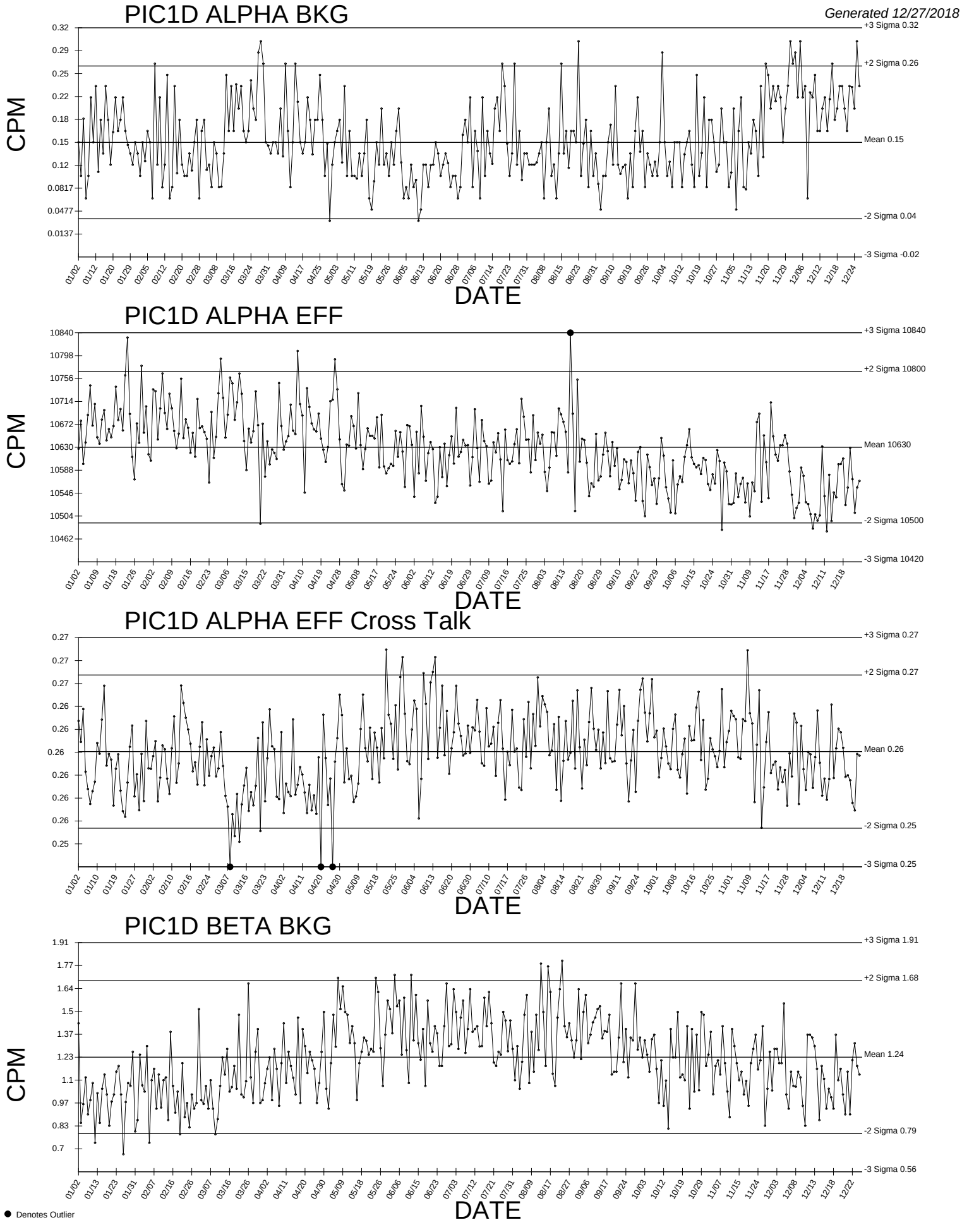


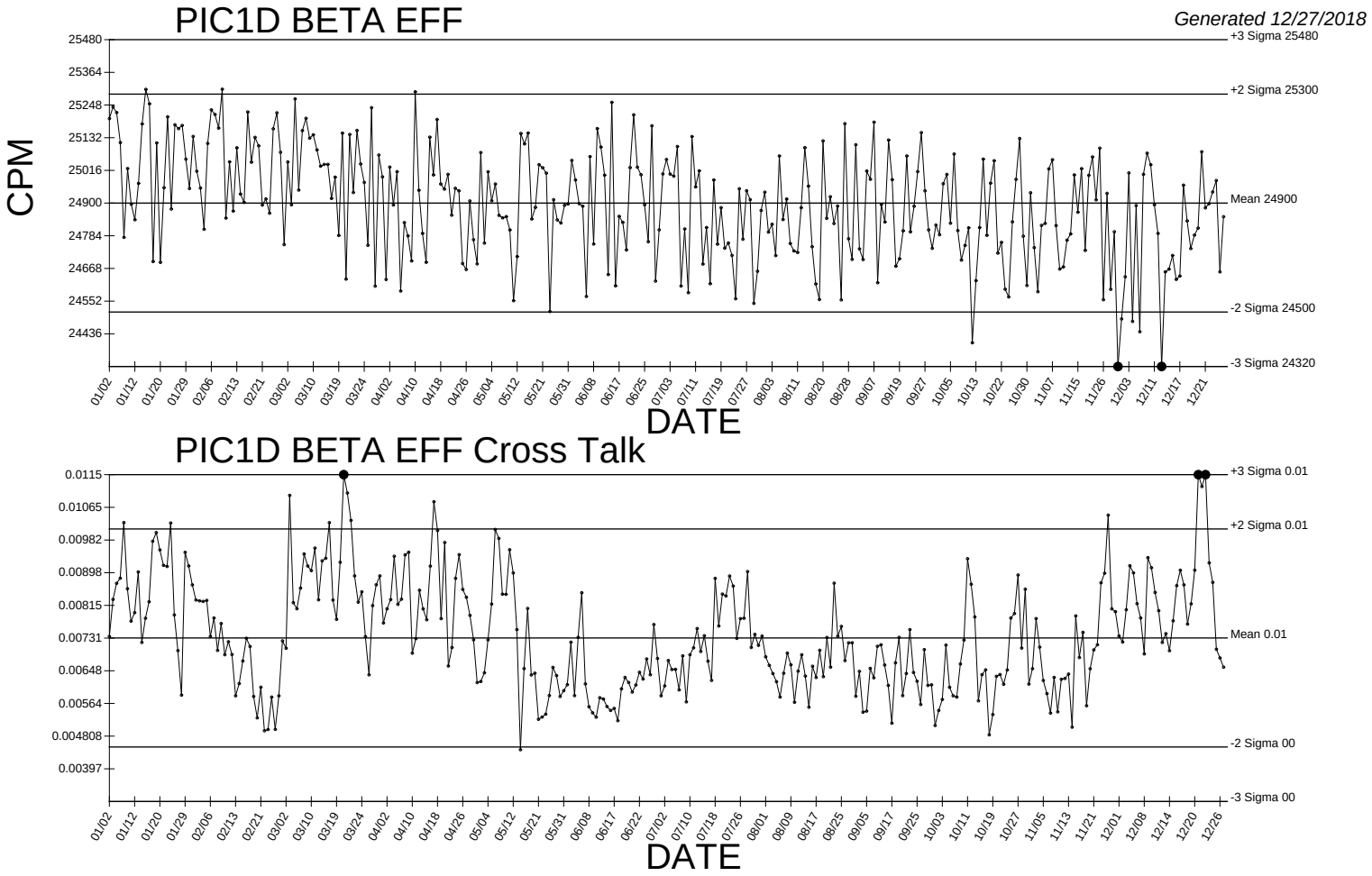
● Denotes Outlier


PIC1C ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.32
Mean 0.19
-2 Sigma 0.07
-3 Sigma 00
PIC1C ALPHA EFF
+3 Sigma 10470
+2 Sigma 10278
Mean 9893
-2 Sigma 9508
-3 Sigma 9316
PIC1C ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.25
-3 Sigma 0.25
PIC1C BETA BKG
+3 Sigma 2.48
+2 Sigma 2.01
Mean 1.08
-2 Sigma 0.14
-3 Sigma -0.326
Denotes Outlier

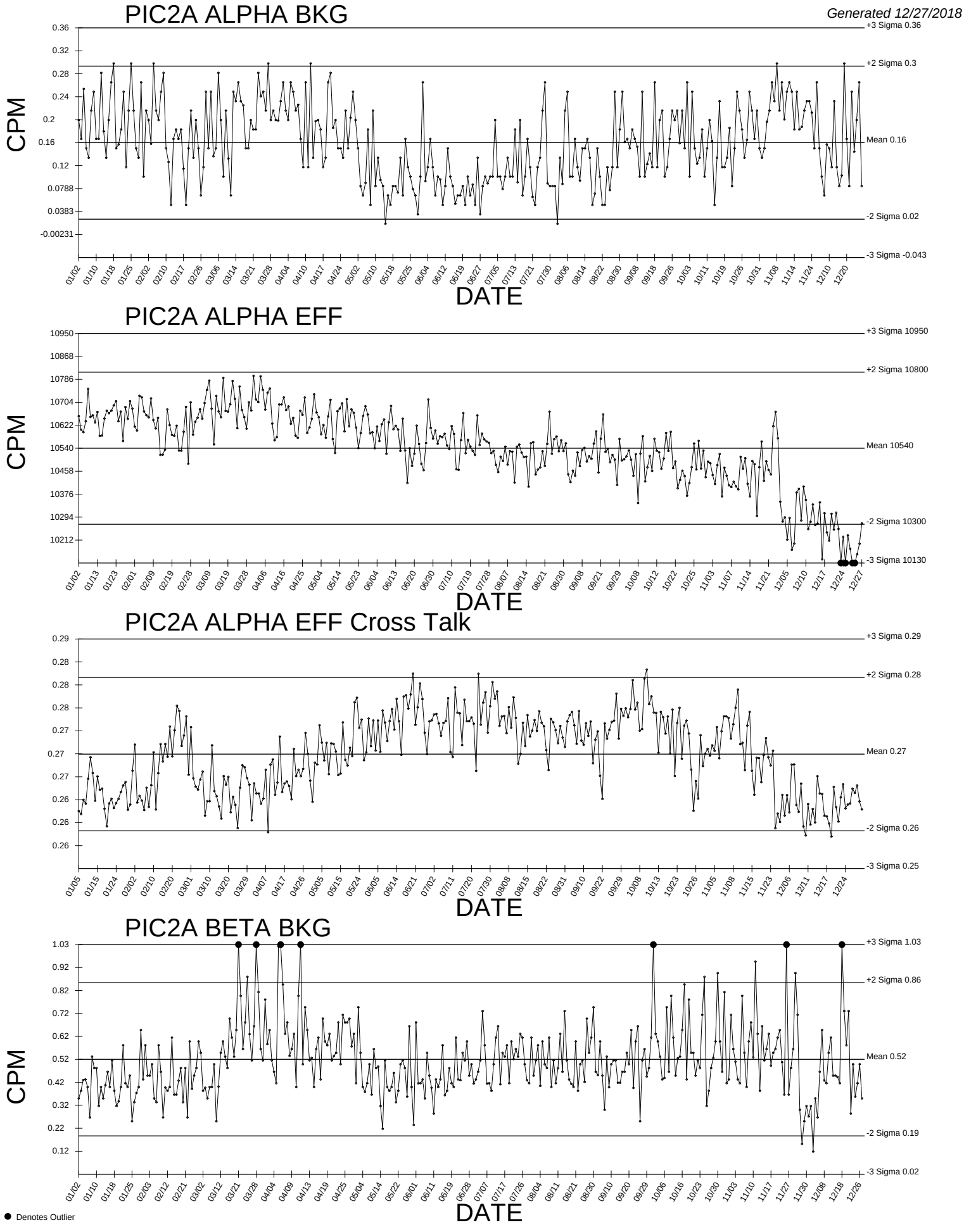


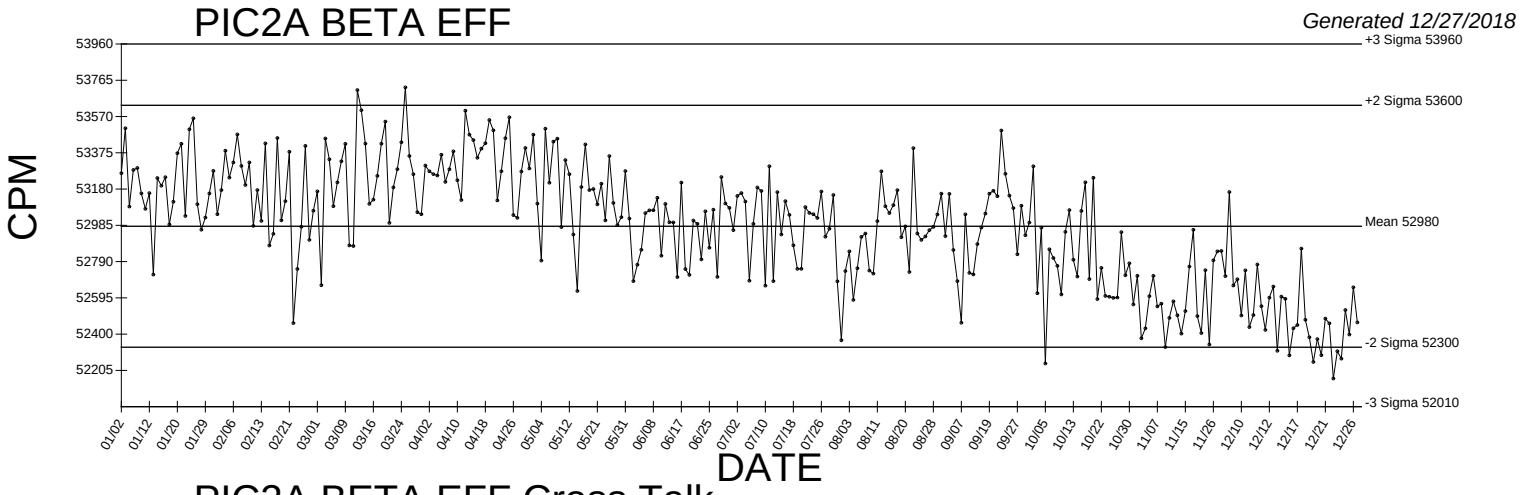
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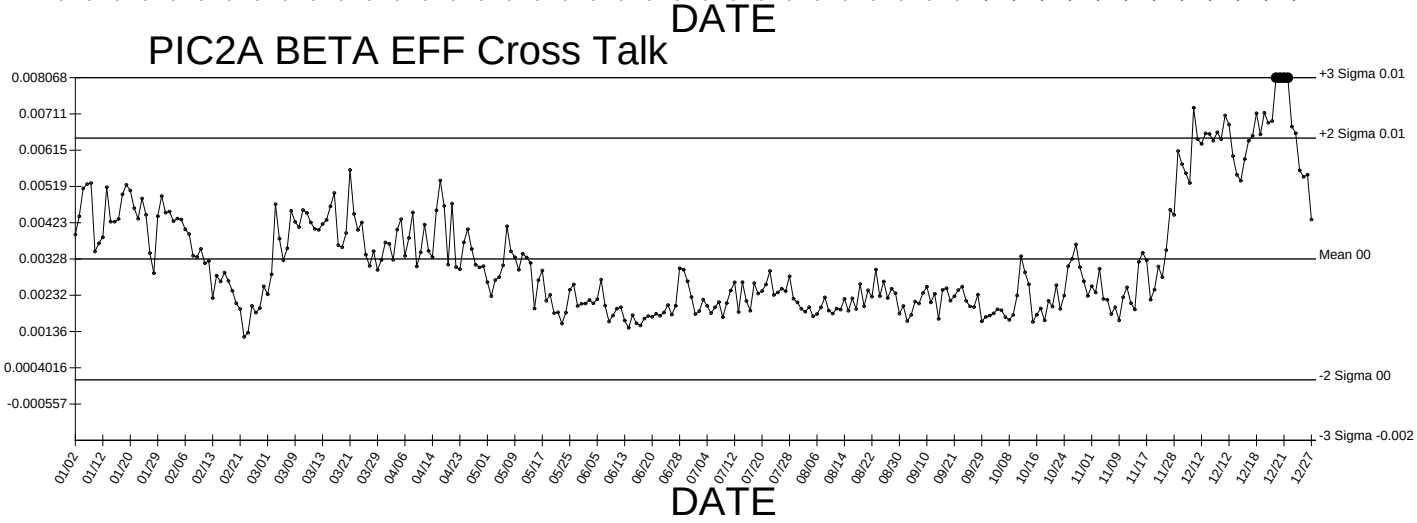

PIC1D ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.32
+2 Sigma 0.26
Mean 0.15
-2 Sigma 0.04
-3 Sigma -0.02
PIC1D ALPHA EFF
+3 Sigma 10840
+2 Sigma 10800
Mean 10630
-2 Sigma 10500
-3 Sigma 10420
PIC1D ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.25
-3 Sigma 0.25
PIC1D BETA BKG
+3 Sigma 1.91
+2 Sigma 1.68
Mean 1.24
-2 Sigma 0.79
-3 Sigma 0.56
Denotes Outlier



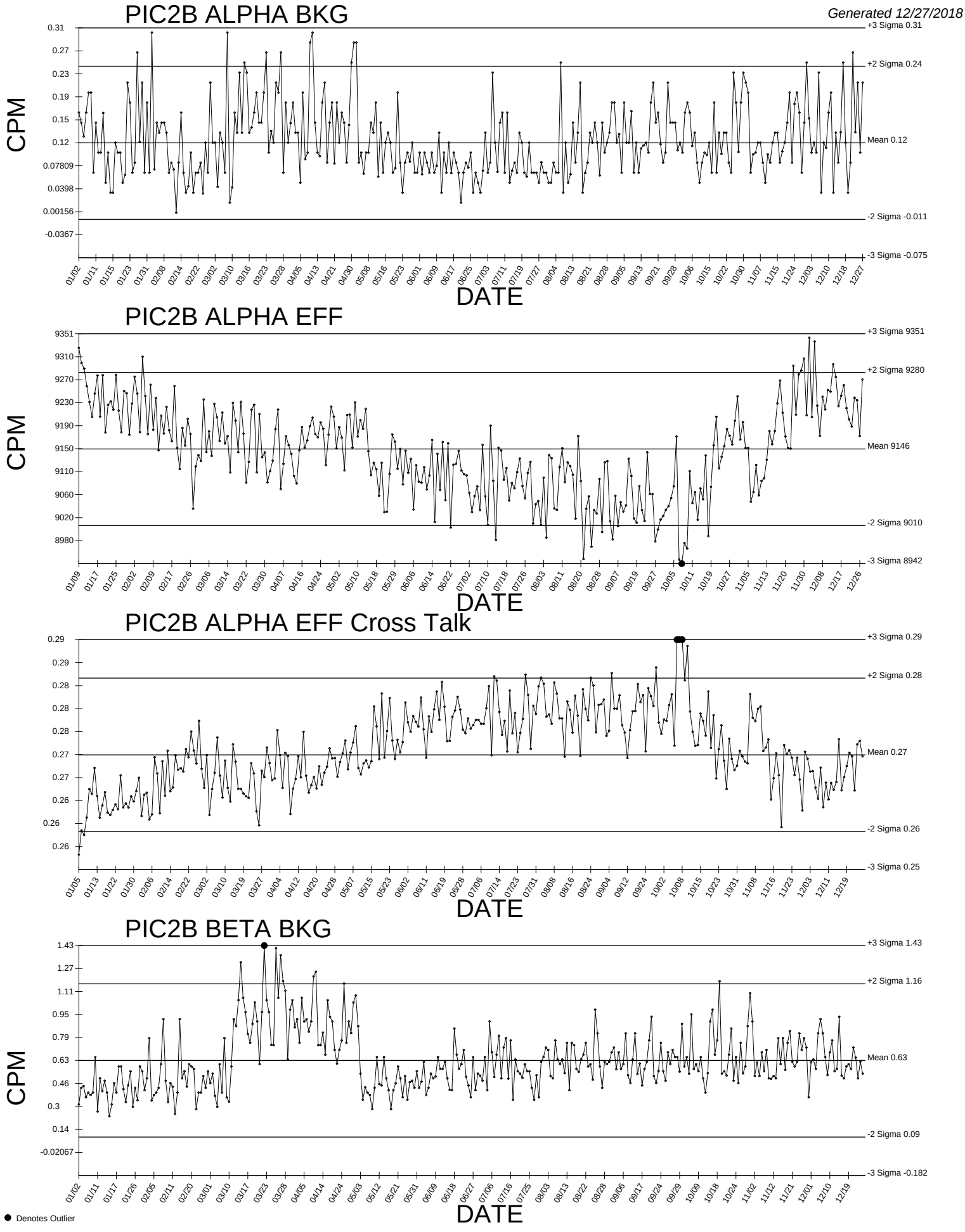
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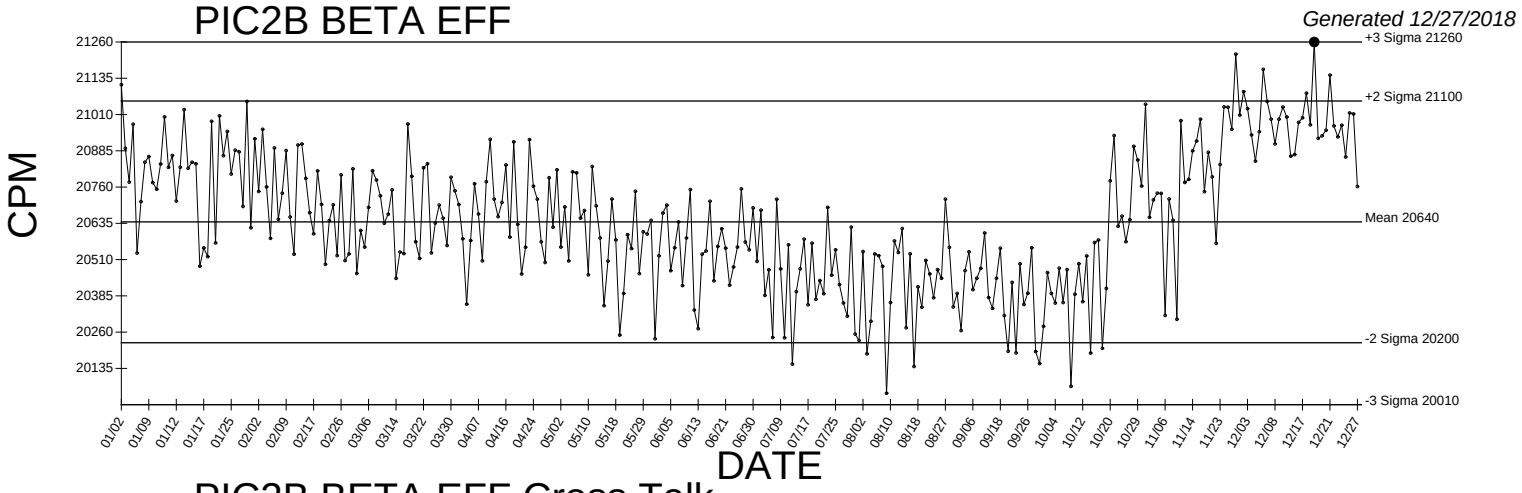

PIC2A ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.16
-2 Sigma 0.02
-3 Sigma -0.043
PIC2A ALPHA EFF
+3 Sigma 10950
+2 Sigma 10800
Mean 10540
-2 Sigma 10300
-3 Sigma 10130
PIC2A ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
PIC2A BETA BKG
+3 Sigma 1.03
+2 Sigma 0.86
Mean 0.52
-2 Sigma 0.19
-3 Sigma 0.02
Denotes Outlier

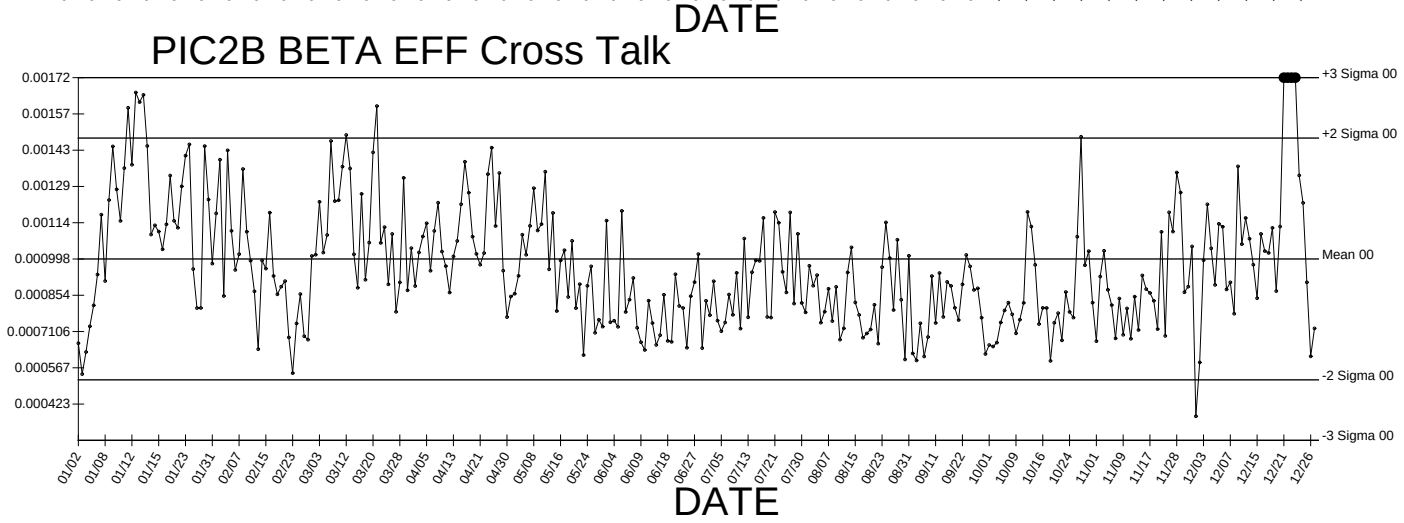




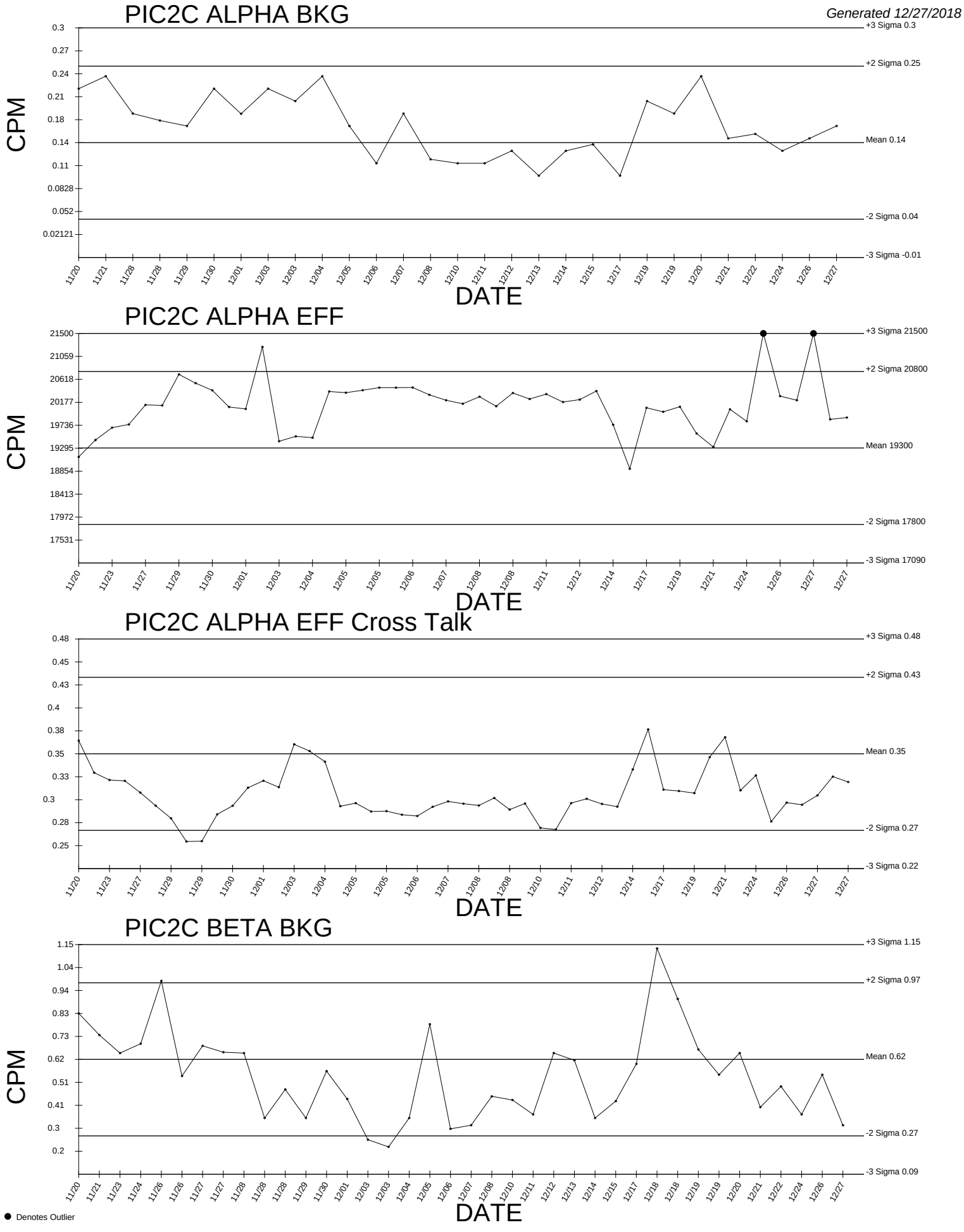
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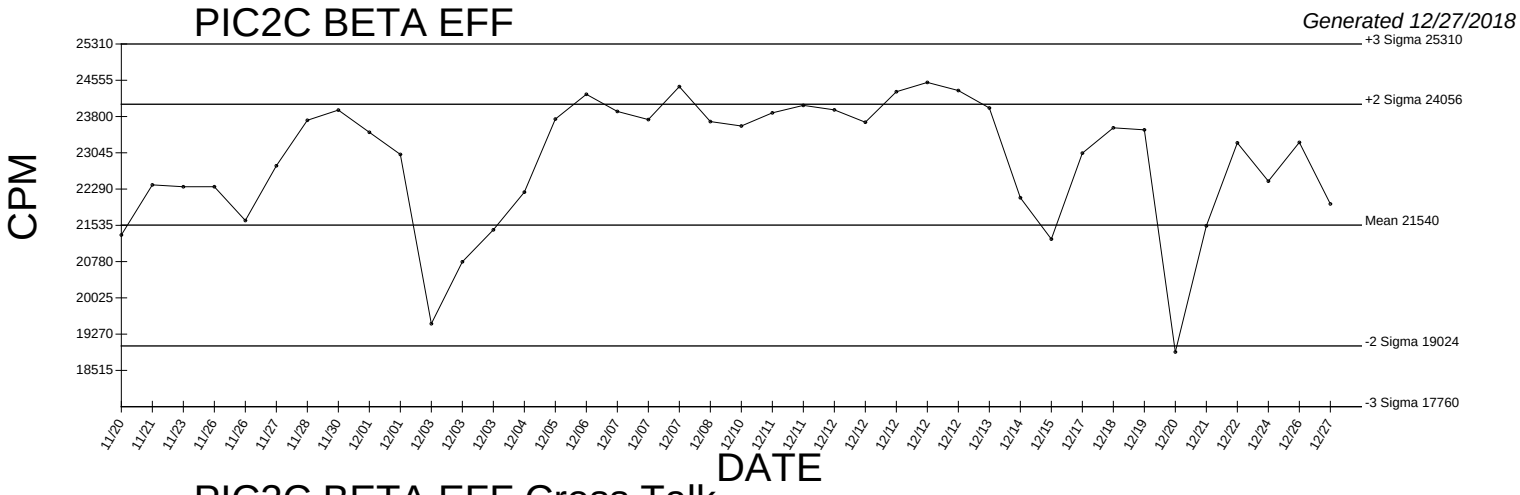

PIC2B ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.31
+2 Sigma 0.24
Mean 0.12
-2 Sigma -0.011
-3 Sigma -0.075
PIC2B ALPHA EFF
+3 Sigma 9351
+2 Sigma 9280
Mean 9146
-2 Sigma 9010
-3 Sigma 8942
PIC2B ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.28
Mean 0.27
-2 Sigma 0.26
-3 Sigma 0.25
PIC2B BETA BKG
+3 Sigma 1.43
+2 Sigma 1.16
Mean 0.63
-2 Sigma 0.09
-3 Sigma -0.182
Denotes Outlier

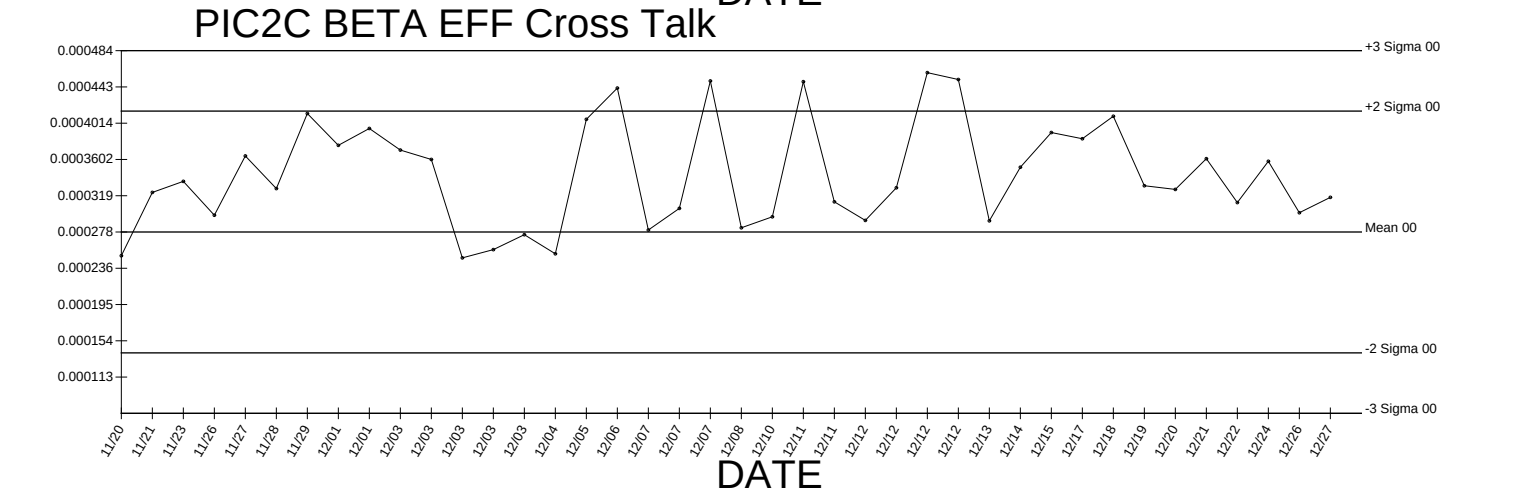




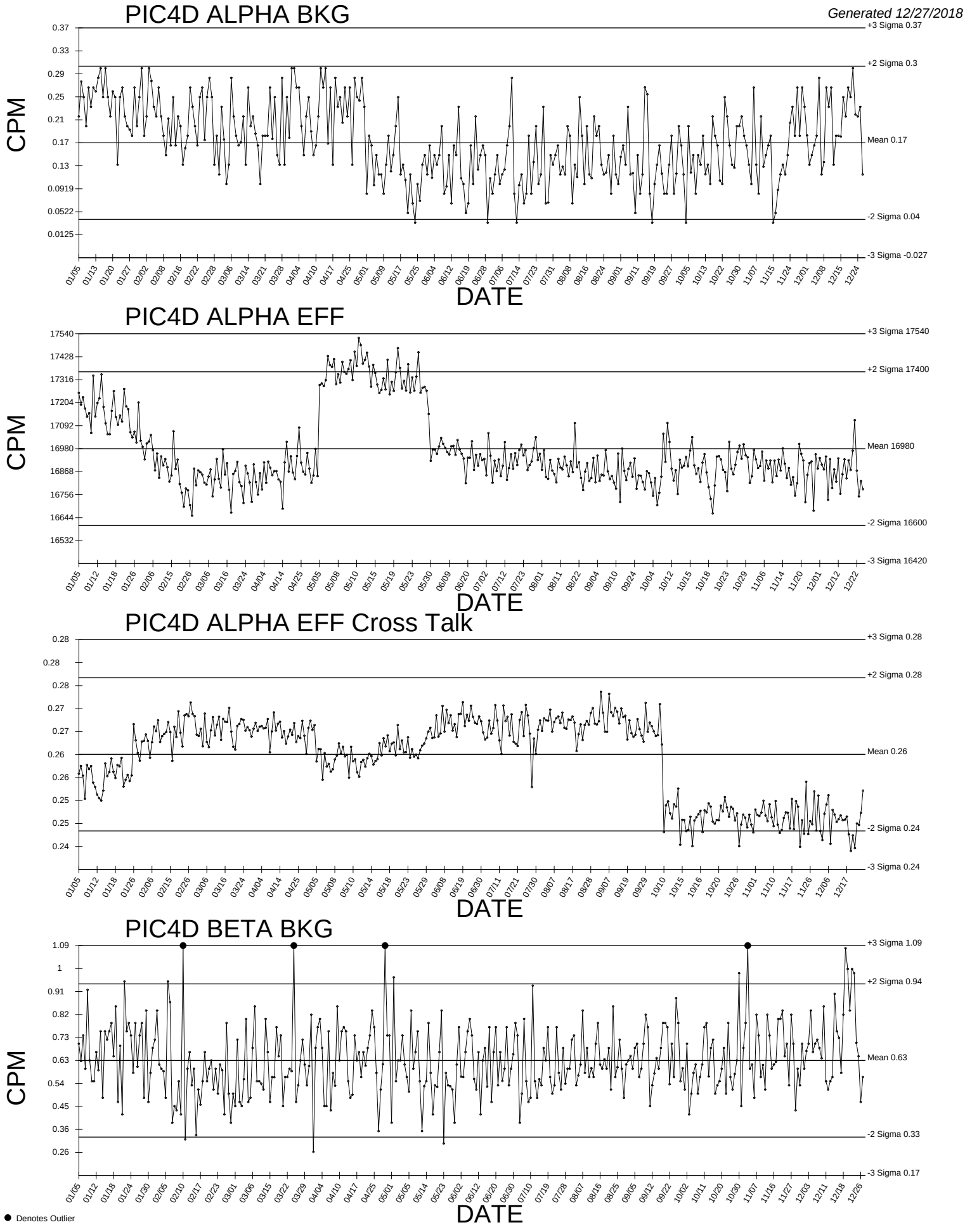
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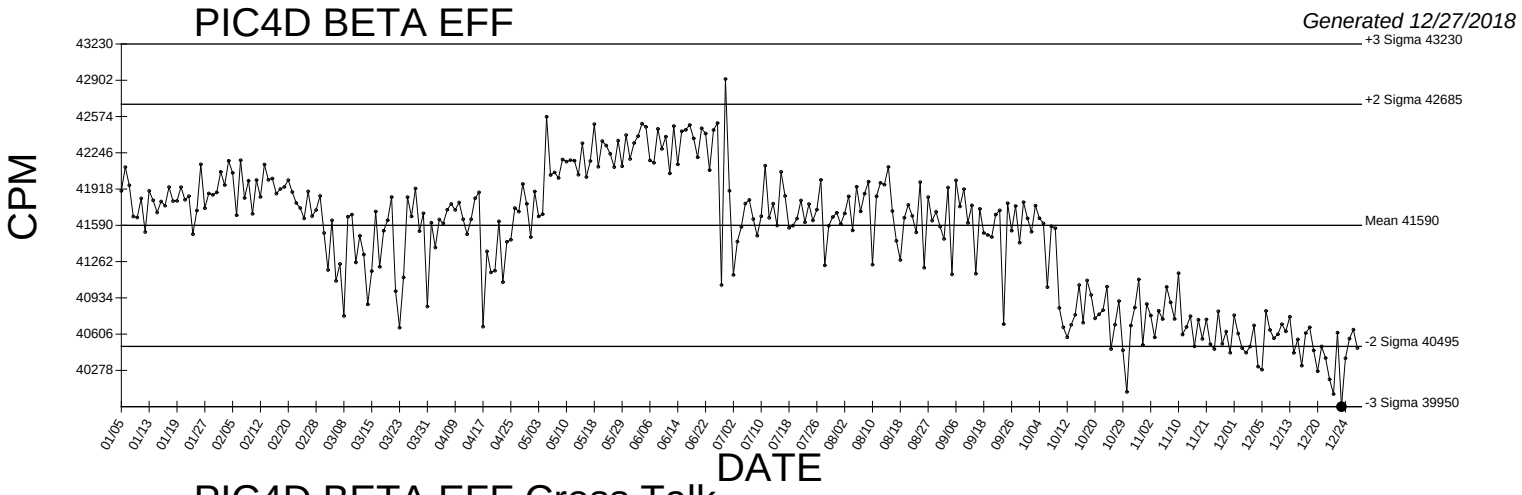

PIC2C ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.3
+2 Sigma 0.25
Mean 0.14
-2 Sigma 0.04
-3 Sigma -0.01
PIC2C ALPHA EFF
+3 Sigma 21500
+2 Sigma 20800
Mean 19300
-2 Sigma 17800
-3 Sigma 17090
PIC2C ALPHA EFF Cross Talk
+3 Sigma 0.48
+2 Sigma 0.43
Mean 0.35
-2 Sigma 0.27
-3 Sigma 0.22
PIC2C BETA BKG
+3 Sigma 1.15
+2 Sigma 0.97
Mean 0.62
-2 Sigma 0.27
-3 Sigma 0.09
● Denotes Outlier

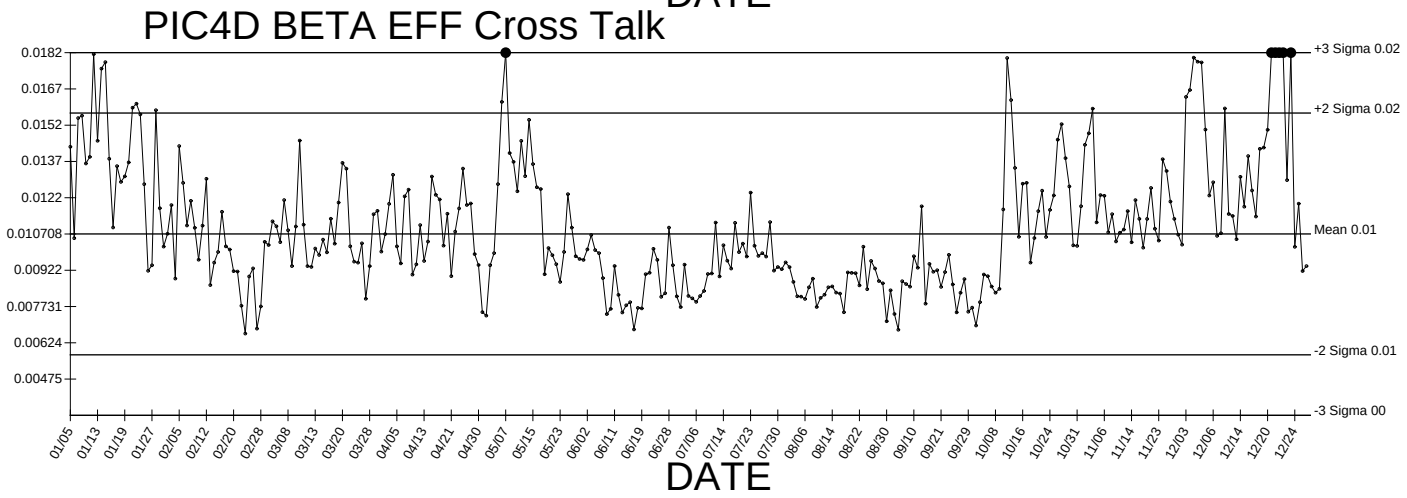




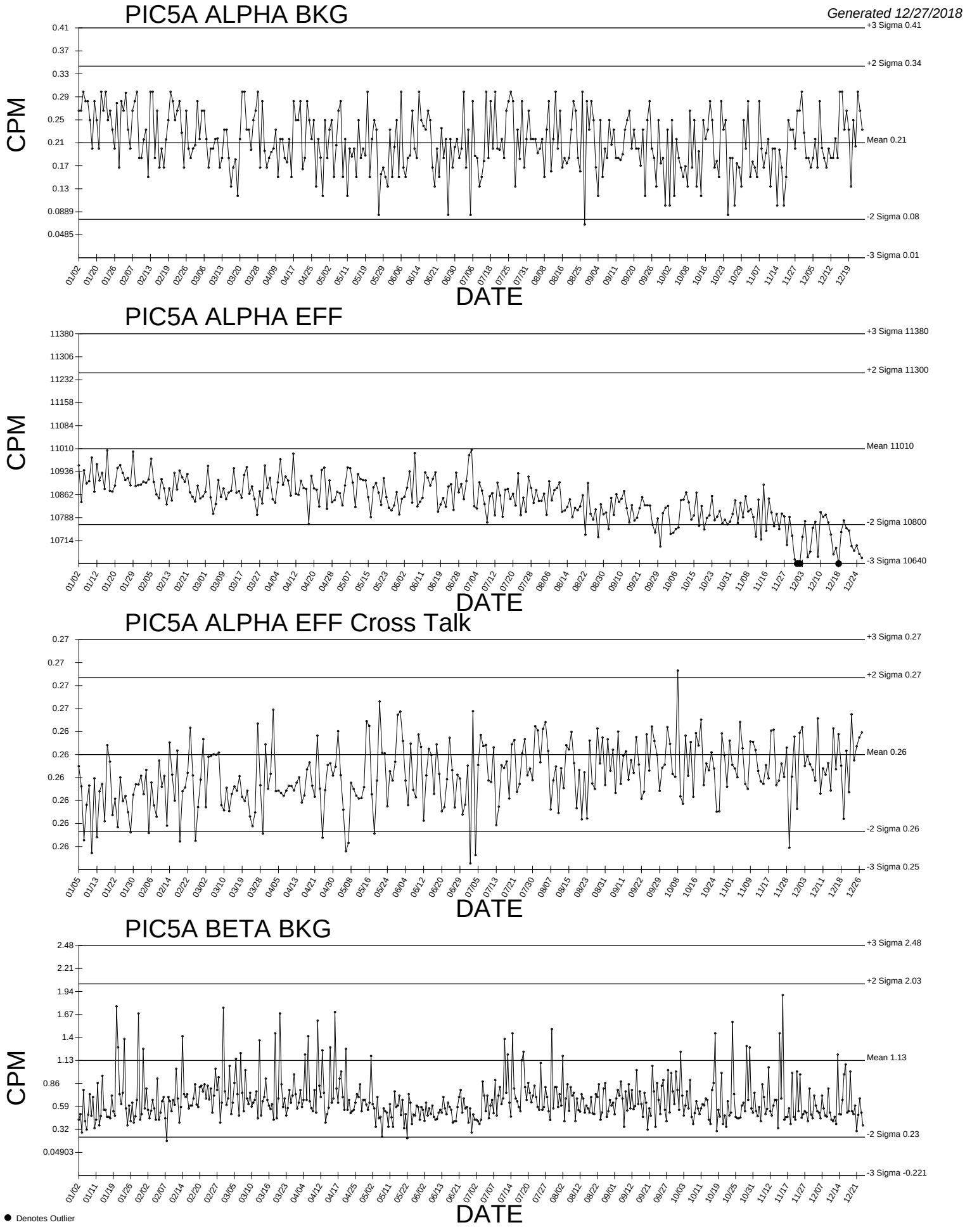
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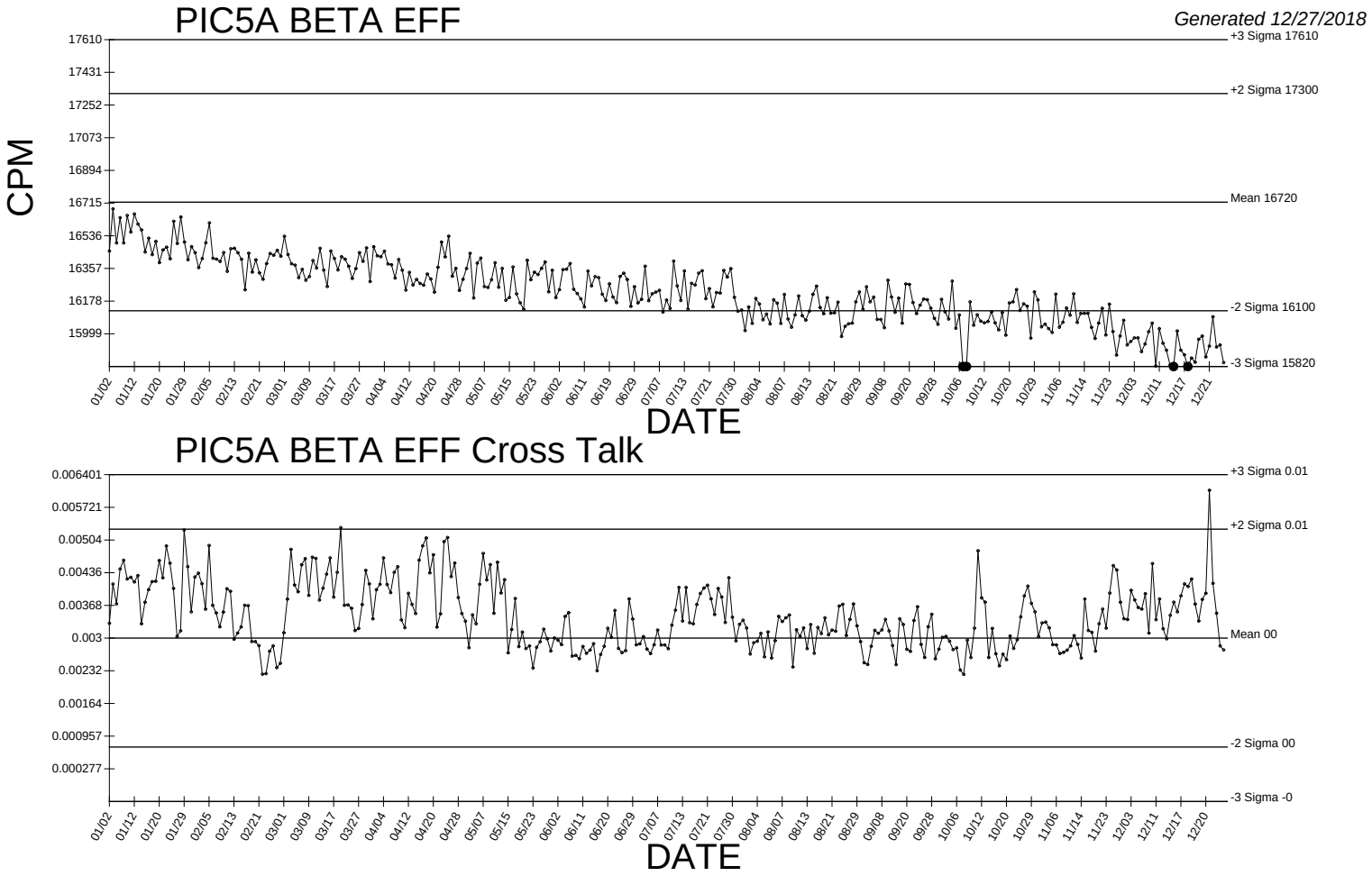

PIC4D ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.37
+2 Sigma 0.3
Mean 0.17
-2 Sigma 0.04
-3 Sigma -0.027
PIC4D ALPHA EFF
+3 Sigma 17540
+2 Sigma 17400
Mean 16980
-2 Sigma 16600
-3 Sigma 16420
PIC4D ALPHA EFF Cross Talk
+3 Sigma 0.28
+2 Sigma 0.28
Mean 0.26
-2 Sigma 0.24
-3 Sigma 0.24
PIC4D BETA BKG
+3 Sigma 1.09
+2 Sigma 0.94
Mean 0.63
-2 Sigma 0.33
-3 Sigma 0.17
Denotes Outlier



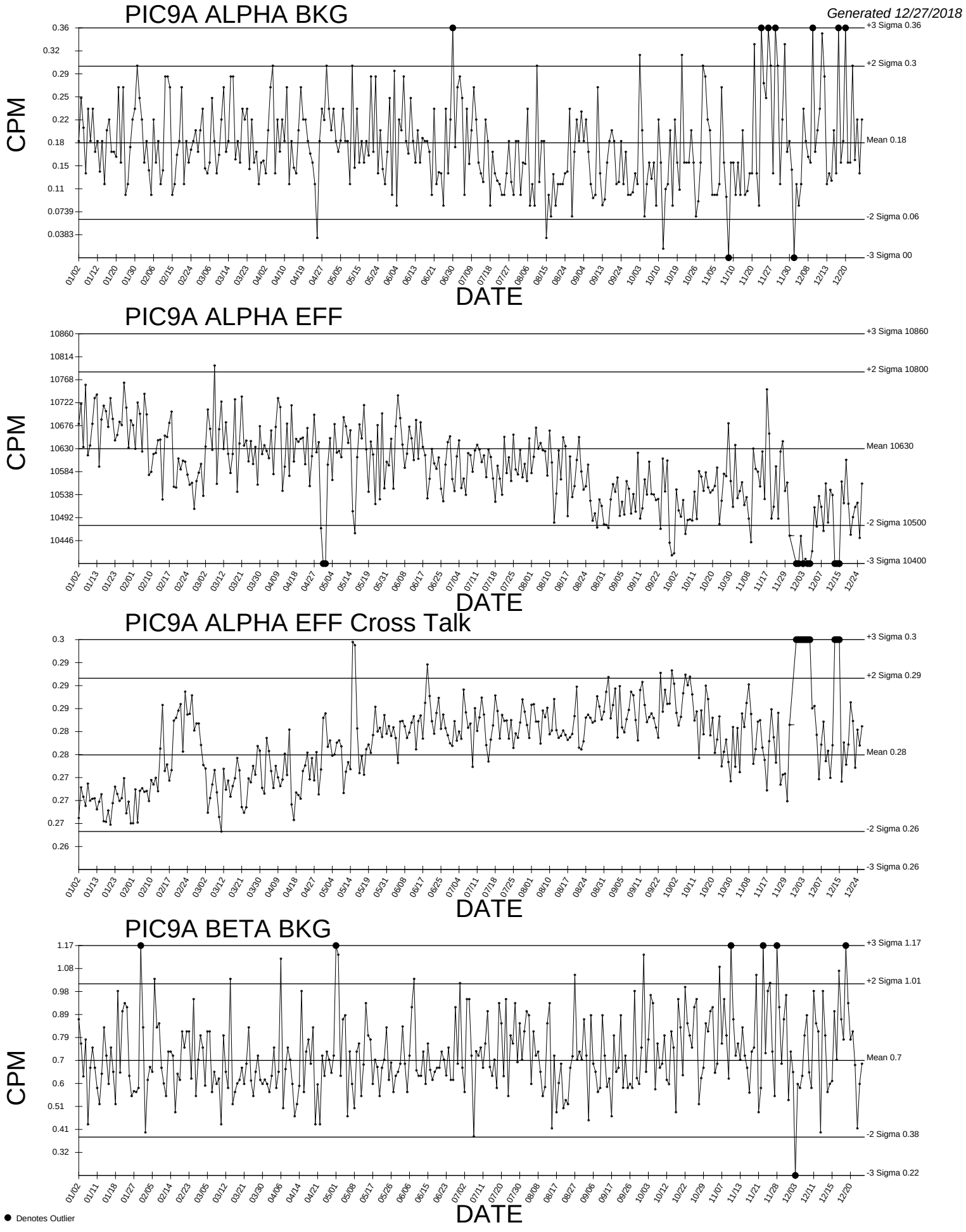


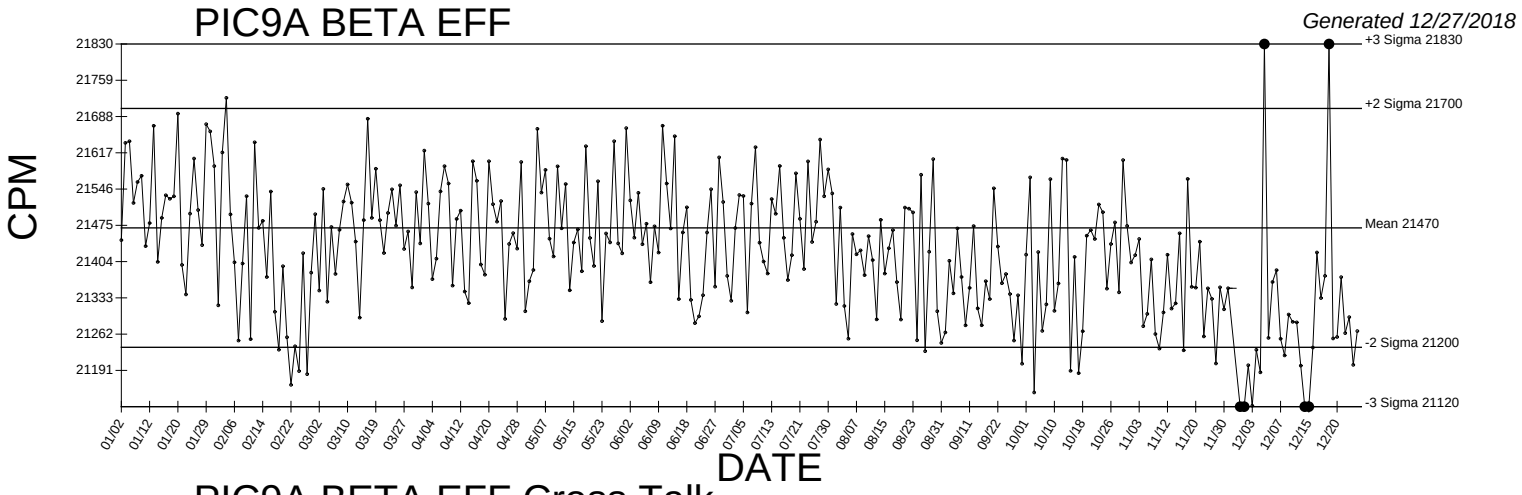
● Denotes Outlier

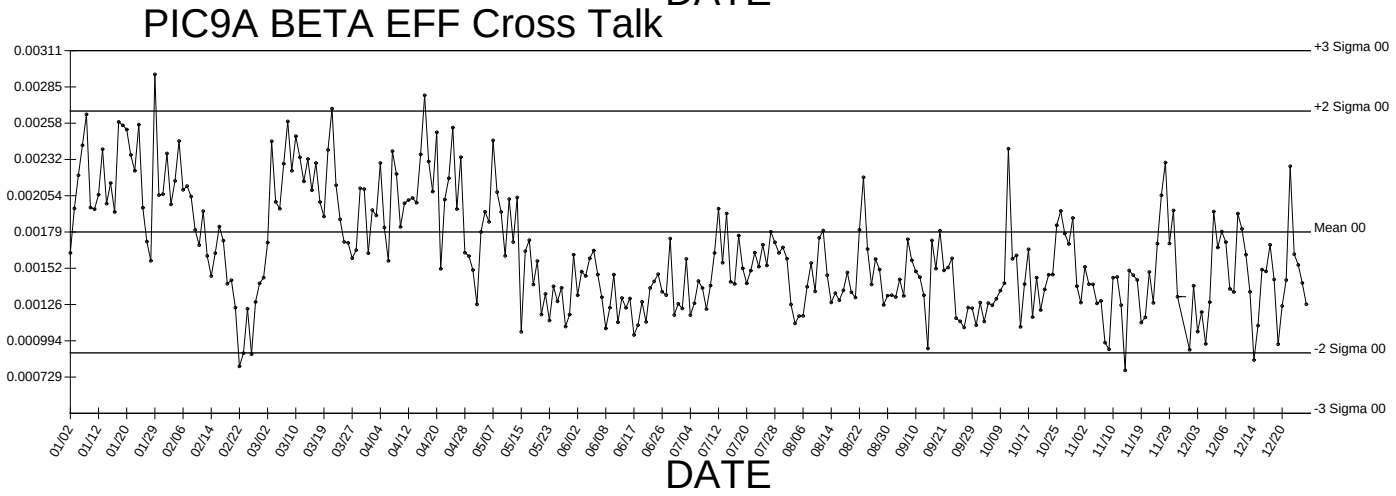

PIC5A ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.41
+2 Sigma 0.34
Mean 0.21
-2 Sigma 0.08
-3 Sigma 0.01
PIC5A ALPHA EFF
+3 Sigma 11380
+2 Sigma 11300
Mean 11010
-2 Sigma 10800
-3 Sigma 10640
PIC5A ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.27
Mean 0.26
-2 Sigma 0.26
-3 Sigma 0.25
PIC5A BETA BKG
+3 Sigma 2.48
+2 Sigma 2.03
Mean 1.13
-2 Sigma 0.23
-3 Sigma -0.221
Denotes Outlier



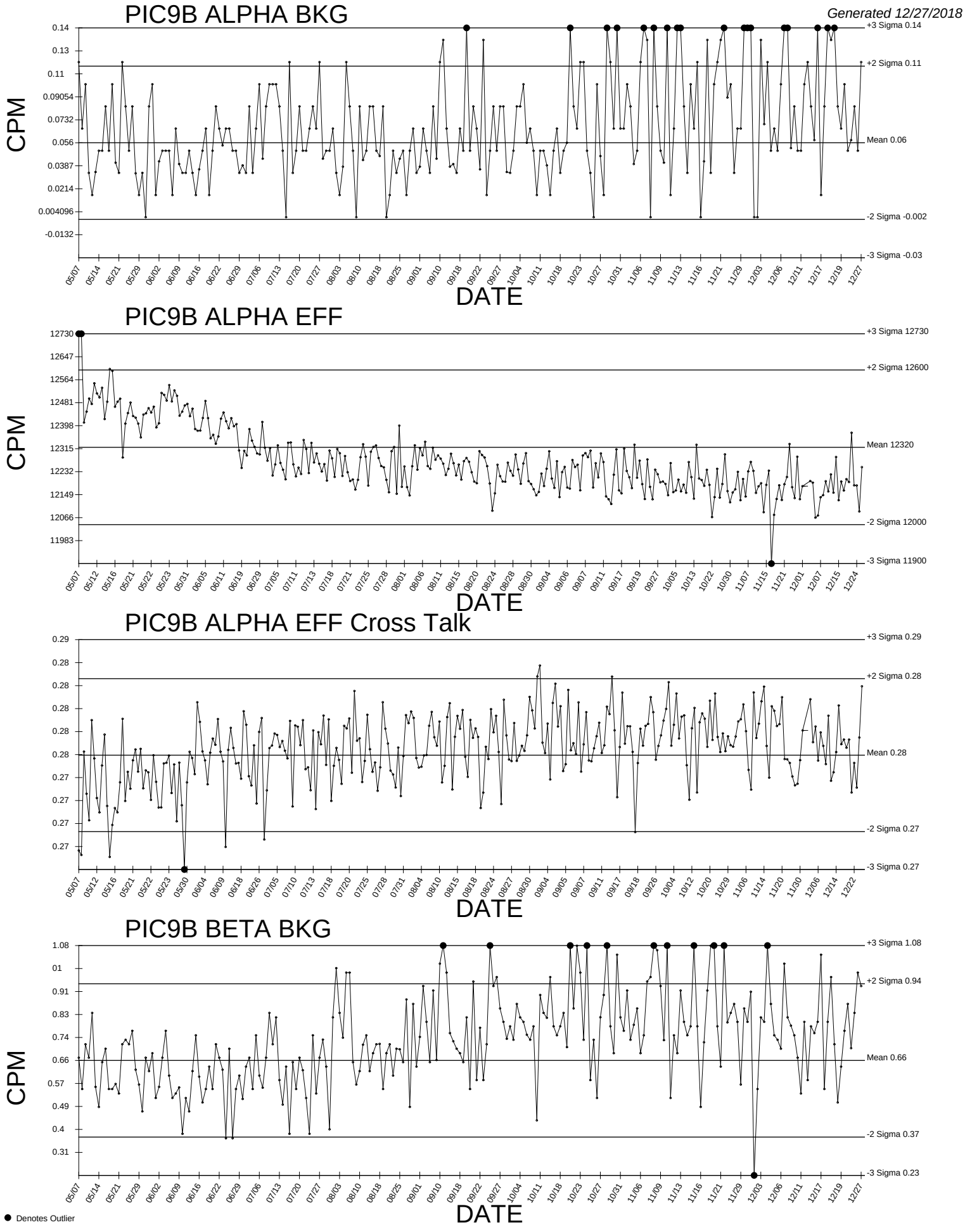
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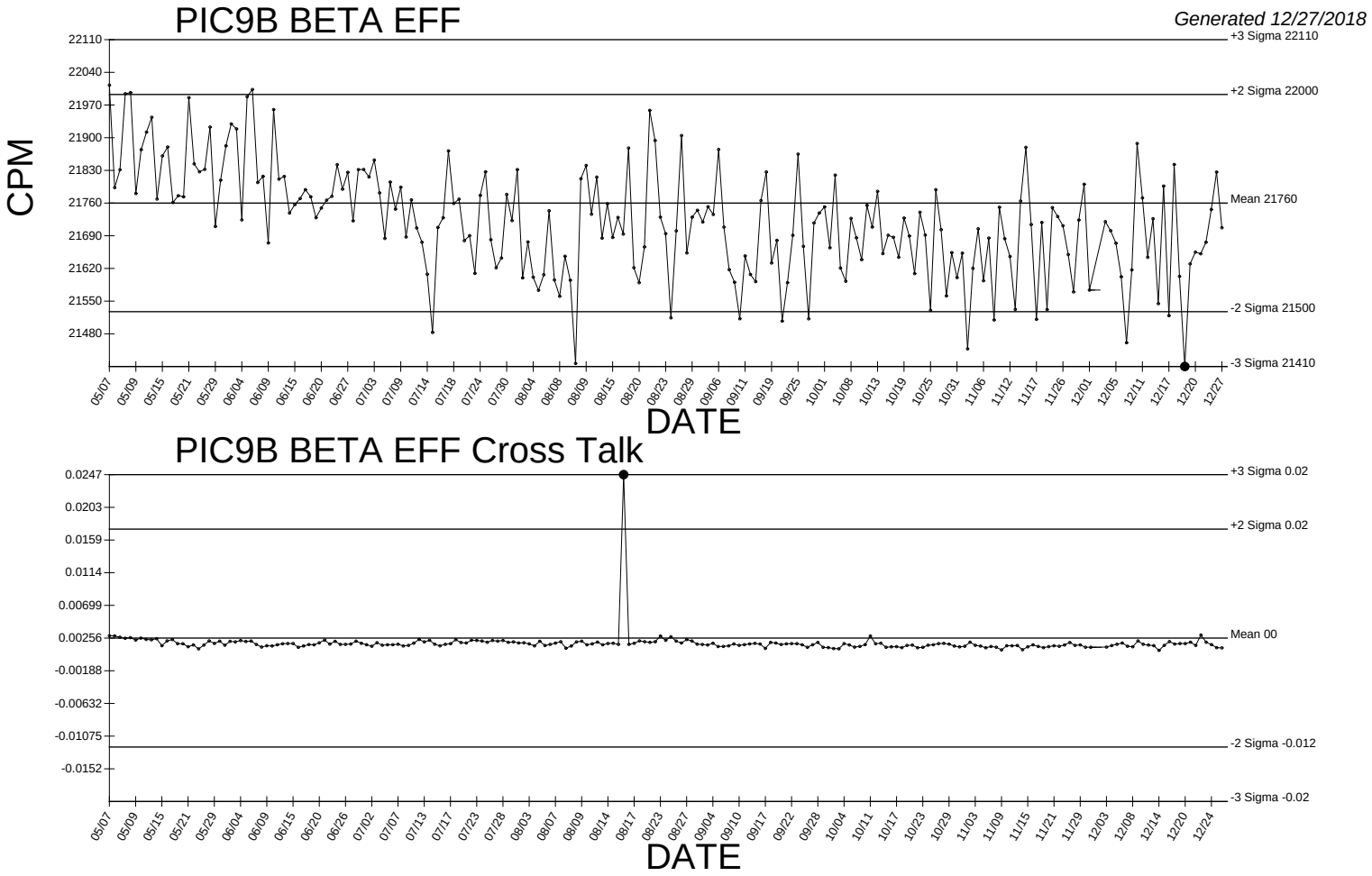

PIC9A ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.36
+2 Sigma 0.3
Mean 0.18
-2 Sigma 0.06
-3 Sigma 00
PIC9A ALPHA EFF
+3 Sigma 10860
+2 Sigma 10800
Mean 10630
-2 Sigma 10500
-3 Sigma 10400
PIC9A ALPHA EFF Cross Talk
+3 Sigma 0.3
+2 Sigma 0.29
Mean 0.28
-2 Sigma 0.26
-3 Sigma 0.26
PIC9A BETA BKG
+3 Sigma 1.17
+2 Sigma 1.01
Mean 0.7
-2 Sigma 0.38
-3 Sigma 0.22
Denotes Outlier



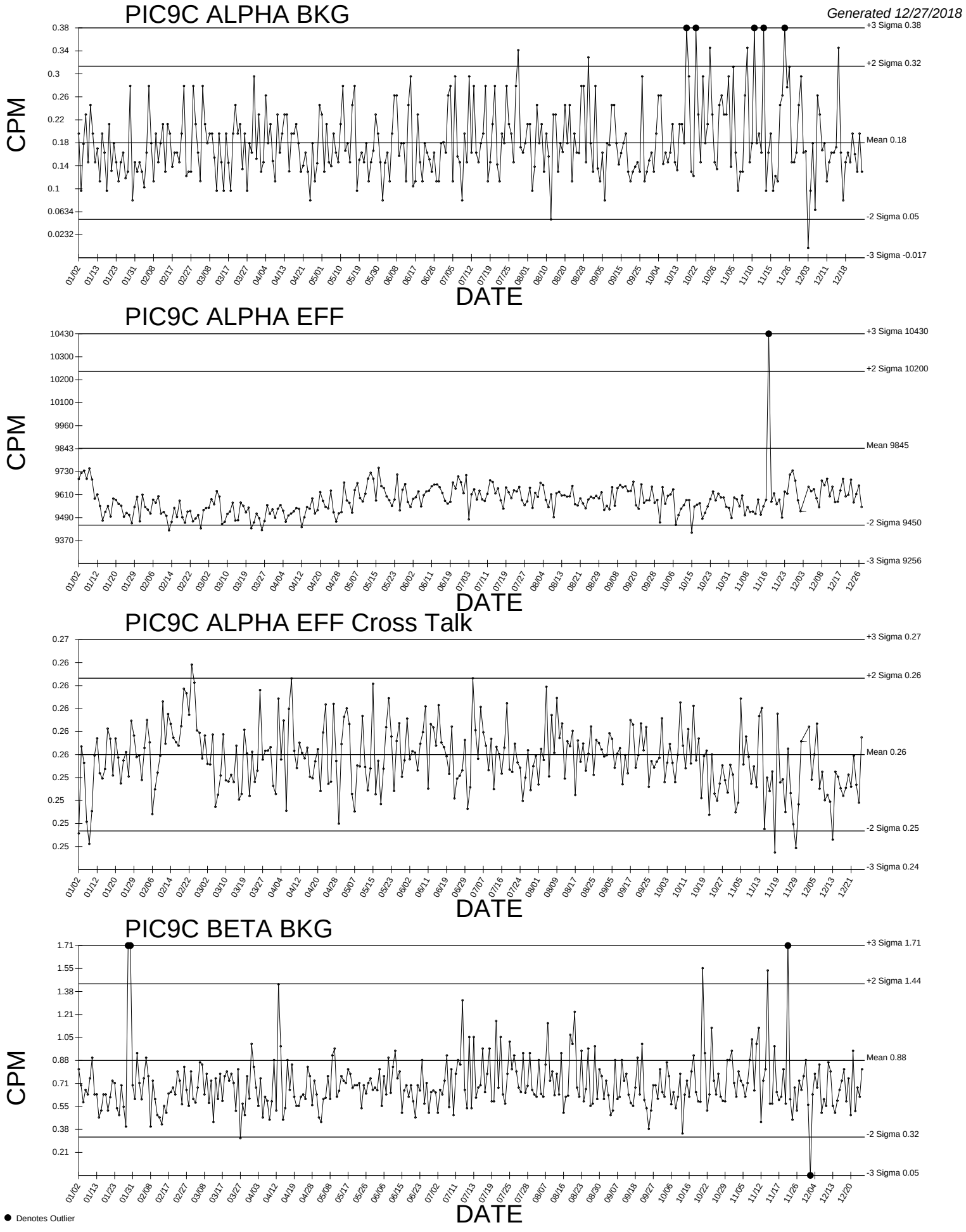


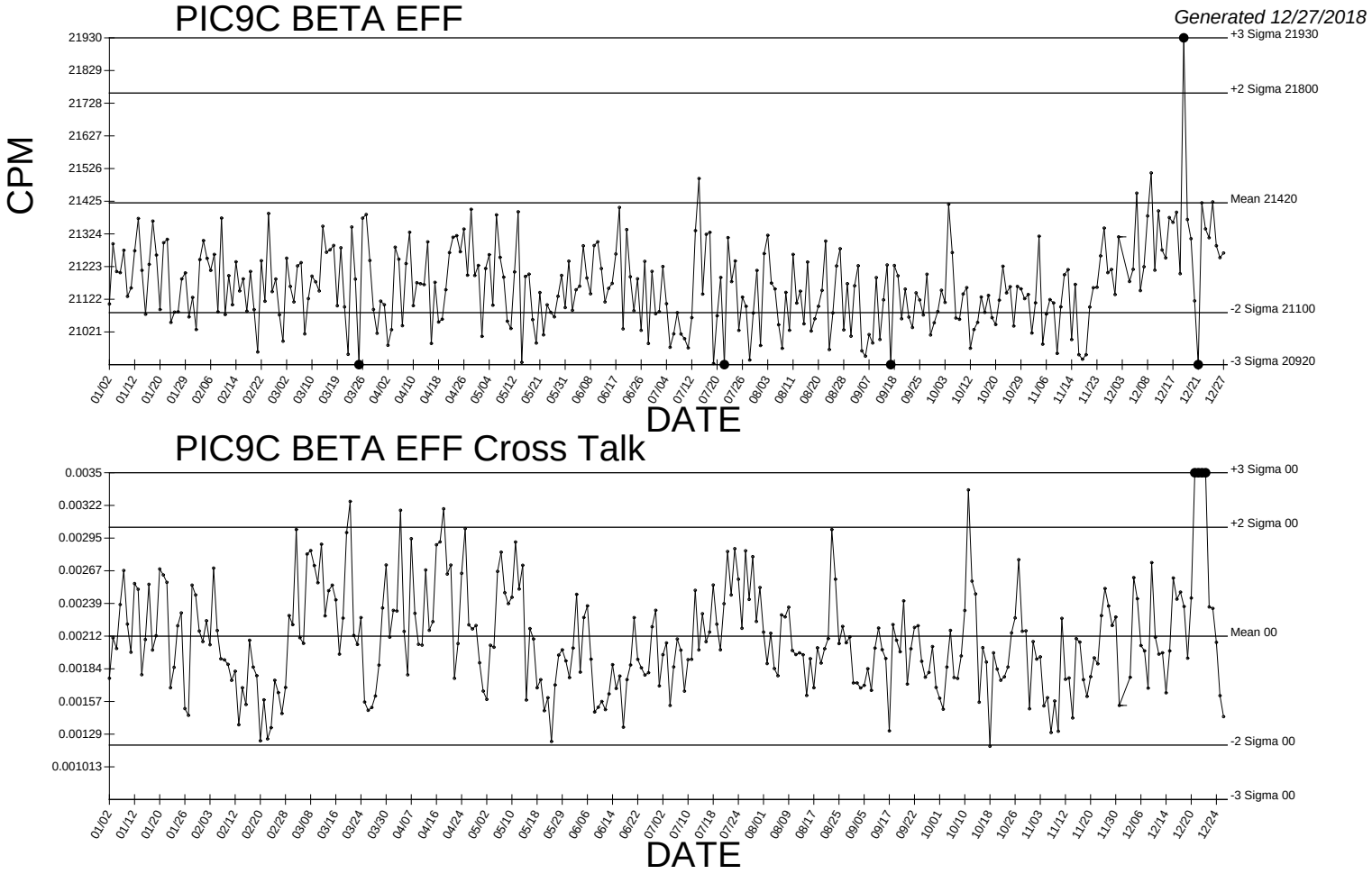
● Denotes Outlier


PIC9B ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.14
+2 Sigma 0.11
Mean 0.06
-2 Sigma -0.002
-3 Sigma -0.03
PIC9B ALPHA EFF
+3 Sigma 12730
+2 Sigma 12600
Mean 12320
-2 Sigma 12000
-3 Sigma 11900
PIC9B ALPHA EFF Cross Talk
+3 Sigma 0.29
+2 Sigma 0.28
Mean 0.28
-2 Sigma 0.27
-3 Sigma 0.27
PIC9B BETA BKG
+3 Sigma 1.08
+2 Sigma 0.94
Mean 0.66
-2 Sigma 0.37
-3 Sigma 0.23
Denotes Outlier



● Denotes Outlier


PIC9C ALPHA BKG
Generated 12/27/2018
CPM
DATE
+3 Sigma 0.38
+2 Sigma 0.32
Mean 0.18
-2 Sigma 0.05
-3 Sigma -0.017
PIC9C ALPHA EFF
+3 Sigma 10430
+2 Sigma 10200
Mean 9845
-2 Sigma 9450
-3 Sigma 9256
PIC9C ALPHA EFF Cross Talk
+3 Sigma 0.27
+2 Sigma 0.26
Mean 0.26
-2 Sigma 0.25
-3 Sigma 0.24
PIC9C BETA BKG
+3 Sigma 1.71
+2 Sigma 1.44
Mean 0.88
-2 Sigma 0.32
-3 Sigma 0.05
Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

0487

National Institute of Standards & Technology

0487

Certificate

Standard Reference Material 4251C
Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive barium-133 chloride, non-radioactive barium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains barium-133 with a total activity of approximately 2.5 MBq. Barium-133 decays by electron capture and during the decay process X-rays and gamma rays with energies from 4 to 400 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least June 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
October 1994

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

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Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have an acid concentration and a carrier concentration comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

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PROPERTIES OF SRM 4251C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4251C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.015 ± 0.002) g•mL^{-1} at 22.1 °C** [b]*		
Solution mass	**(5.054 ± 0.001) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L^{-1})	Mass Fraction (g•g^{-1})
	H_2O HCl $BaCl_2$ $^{133}BaCl_2$	54 1.0 6×10^{-4} 4×10^{-7}	0.96 0.04 1.2×10^{-4} 8×10^{-8}
Radiological Properties:			
Radionuclide	**Barium-133**		
Reference time	**1200 EST, 1 September 1993**		
Massic activity of the solution [c] (Activity per unit mass of solution)	**4.876×10^5 Bq•g^{-1}**		
Relative expanded uncertainty (k=2)	**0.52%** [d]		
Photon-emitting impurities	None detected [e]		
Half lives used	Barium-133: (10.52 ± 0.13) a [f] Radium-226: (1600 ± 7) a [f]		
Measuring instrument	Pressurized "4π"γ ionization chamber A calibrated using a barium-133 solution whose activity was determined by 4π(e+X)-γ-anticoincidence counting		

*Notes and references are on pages 5 and 6.

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EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [g]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [h]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
PIC A net response per gram of SRM 4251C, measured relative to RRS20 [j]	Standard deviation of the mean for 1000 repeated measurements (A)	0.008	1.0	0.01
PIC A background response, measured relative to RRS20	Standard deviation of the mean for >150 repeated measurements (A)	0.25	0.001 [k]	0.00
PIC A net response for RRS200, measured relative to RRS20	Standard deviation of the mean for >100 repeated measurements (A)	0.06	1.0	0.06
PIC A net response per Bq of barium-133 in solution, measured relative to RRS200.	Standard deviation of the mean for 240 repeated measurements (A)	0.02	1.0	0.02
Gravimetric measurements	Estimated (B)	0.01	1.0	0.01
Half life of barium-133 Half life of radium-226	Standard uncertainty of the half life (A)	1.24 [m] 0.44 [m]	0.004 [n] 0.004 [n]	0.00 0.00
Activity used to calibrate PIC A net response per Bq of barium-133 in solution	Standard uncertainty of the activity determined by $4\pi(e+X)$-γ-anticoincidence counting. (B)	0.22	1.0	0.22
Live-time [p]	Estimated (B)	0.10	1.0	0.10
PIC A charge collection	Estimated (B)	0.05	1.0	0.05
Source Positioning	Estimated (B)	0.05	1.0	0.05
Photon-emitting impurities	Limit of detection for Cs-134 (B) [q]	100.	0.00002	0.00
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.26
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.52

*Notes and references are on pages 5 and 6.

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NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	100	1.5	0.2

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for photon-emitting impurities are:
600 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 12 and 75 keV,
150 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 84 and 379 keV, and
3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 387 and 2700 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of barium-133.

[f] The stated uncertainty is the standard uncertainty. See reference [5].

[g] Relative standard uncertainty of the input quantity x_i.

[h] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[i] Relative component of combined standard uncertainty of output quantity y, rounded to two decimal places. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

RC-S-035-002e

[j] The response of pressurized ionization chamber A (PIC A) is determined from measurement of the time required to collect a given amount of charge on a stable fixed capacitor. All of the response measurements in the NIST pressurized ionization chambers are made relative to the response of one or more artifact standards. These artifact standards consist of microgram quantities of aged radium-226 in small welded stainless-steel capsules. These capsules are encapsulated in plastic rods whose dimensions are similar to those of the standard NIST ampoule. The artifact standards are called **Radium Reference Sources** and are designated as RRSx, where x is the nominal mass (in micrograms) of radium-226 in the capsule.

[k] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background response)/(average net sample response)

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated oscillator.

[q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i$ = 100%. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of Ba-133)}·{(Bq of impurity)/(Bq of Ba-133)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), April 1994.

RC-S-035-002f

Standard Traceability Log Rad

Source Material Info	
Parent Code:	0487
Prepared By:	Angela Johnson
Carrier Conc:	0.1 M HCL
Reference Date:	09/01/1993
Ampoule Mass (g):	5.054 g
Uncertainty:	+/- .26 %
LogBook No:	RC S 035 002

A Solution Material Info			
Isotope:	Barium-133		
Prepared By:	Angela Johnson		
Prep Date:	10/31/2002		
Verification Date:	10/10/2018		
Expiration Date:	10/10/2019		
Primary Code:	0487-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.7696 g		
Density(g/mL):	0.9984	Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (bq/g)) * (conversion dpm to bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (100 mL) = 1395394.1760 dpm/mL
(4.7696 g) * (487600 bq/g) * (60 dpm/bq) / (0.9984 g/mL) / (100 mL) = 1397609.3930 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
12/18/2015	Gregory Ramsay	15.0062	1000	0487-B	20972.806 dpm/mL	11/18/2016	11/18/2017
01/17/2017	Bethany Fiem	15.1795	1000	0487-C	21215.0117 dpm/mL	01/17/2017	01/17/2018
11/08/2017	Bethany Fiem	15.5573	1000	0487-D	21708.5658 dpm/mL	10/10/2018	10/10/2019

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ba-133 Standard 0487-D

v1.0.2

Instrument	YELLOW
Analyst	BXF1
Verification Prep Date	10/10/2018

Standard Information	
Isotope	Ba-133
Serial Number	0487-D
Isotope Halflife	3.8410E+03 D
Reference Date	9/1/1993
Ref. Act. (DPM/mL)	21708.5658
Amount of Std. (mL)	1.0
Standard Prep Date	11/8/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	10/11/2018	761.95	3290.62	19.66
2	10/11/2018	761.95	3210.30	19.66
3	10/11/2018	760.37	3256.97	19.66

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	3270.96	0.763851	4282.20	4282.20
2	3190.64	0.763851	4177.04	4177.04
3	3237.31	0.763851	4238.14	4238.14

	dpm/mL
Mean Value =	4232.46
Stdev =	52.80544344
Certificate Value* =	**4148.3**
Two sigma =	105.611
10 % of Mean =	423.246
Rule A (Pass/Fail)	**Pass**
% Recovery	102.03%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**10/10/2019**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ba-133 source 0487-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCYELLOW for Ba-133 source standard verification. The Ba-133 efficiency calibration which was used for verification calculations was performed on 10/10/2018 using Ba-133 source 1601-A.

Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

10-11-18

11/14/18

National Institute of Standards & Technology

Certificate

Received 3-9-17

Standard Reference Material® 4339b

1810

Radium-228 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive radium-228 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4339b consists of approximately 5 mL of a solution, whose composition is specified in Tables 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **radium-228** massic activity value, at a **Reference Time of 1200 EST, 07 October 2010**, is:

$$\mathbf{(195 \pm 14)\ Bq \cdot g^{-1}}$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, Becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Tables 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analyses.

Expiration of Certification: The certification of **SRM 4339b** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Radiological and Chemical Hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the Physical Measurement Laboratory, Radiation and Biomolecular Physics Division, Radioactivity Group, M.P. Unterweger, Group Leader. The overall technical direction and physical measurement leading to certification and photon-emitting impurity analyses were provided by L. Pibida of the NIST Radioactivity Group, with production assistance by J. LaRosa, R. Collé, and L. Laureano-Pérez. Alpha-emitting impurity analyses were provided by J. LaRosa.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Lisa R. Karam, Chief
Radiation and Biomolecular Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 14 November 2012

Robert L. Watters, Jr., Director
Office of Reference Materials

CLCEN-707-103

Table 1. Certified Massic Activity of SRM 4339b

Radionuclide	**Radium-228[a]**
Reference time	**1200 EST, 07 October 2010**
Massic activity of the solution	**195 Bq g^{-1}**
Relative expanded uncertainty ($k = 2$)	**7.2 %[b]**

[a] The final ^{228}Ra purification from the ^{232}Th mother solution was performed on 02 September 2010 0920 EST.
[b] The uncertainties on certified values are expanded uncertainties, $U = ku_c$. The quantity u_c is the combined standard uncertainty calculated according to the ISO and NIST Guides [4,5]. The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ and was chosen to obtain what is assumed to be an approximate 95 % level of confidence.

Table 2. Uncertified Information of SRM 4339b

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	1.3 mol L^{-1} HNO_3 with 19.8 µg g^{-1} Ba^{+2}
Solution density	(1.034 ± 0.002) g mL^{-1} at 20.8 °C[a]
Solution mass	(5.180 ± 0.003) g[a]
Photon-emitting impurities	^{226}Ra: < 0.5 Bq g^{-1}[b]
Alpha-emitting impurities	^{232}Th: < 0.08 Bq g^{-1}[c]
Half-lives used	^{228}Ra: (5.75 ± 0.04) a[d] [6] ^{228}Ac: (6.15 ± 0.02) h [7] ^{226}Ra: (1600 ± 7) a [8] ^{232}Th: (14.02 ± 0.06) x 10^9 a [9]
Calibration methods (and instruments)	The certified massic activity for ^{228}Ra was obtained by high-resolution gamma-ray spectrometry of three master solution ampoules (eleven separate determinations), as measured on three to five different spectrometers and geometries on each ampoule, and used assumed nuclear data for probabilities per decay for 16 gamma-ray transitions. Confirmatory measurements were performed by 2πα spectrometry of ingrown ^{228}Th with a planar, ion-implanted Si detector.

[a] The stated uncertainty is two times the standard uncertainty. See reference 5.
[b] Based on gamma-ray spectrometry of forced-fitted peak at 186.2 keV and assuming a probability per decay of 0.0355 [6].
[c] The maximum ^{232}Th activity concentration in ^{228}Ra.
[d] The stated uncertainty is the standard uncertainty. See reference 5.

Table 3. Uncertainty Evaluation for the Massic Activity of SRM 4339b

	Uncertainty component	Assessment Type[a]	Relative standard uncertainty contribution on massic activity of ^{228}Ra (%)
1	Gamma-ray spectrometry precision; relative standard deviation of the grand mean on the average massic gamma-ray emission rates for 16 measured ^{228}Ac gamma-ray transitions. Each mean in the grand mean is based on 11 determinations with three sources in three to five different detectors. The uncertainty in the determination of the massic gamma-ray emission rate for any one transition in a given determination ranged from typically 0.5 % to 1.5 %. The relative standard deviation of the mean for the average of the 16 lines, for any one determination, was typically 1 %; whereas the relative standard deviation of the grand mean for the average of the 16 lines across all 11 determinations is 0.34 %[b]. Data passes normality test.	A	0.84
2	Uncertainty due to assumed gamma-ray probabilities per decay for the measured ^{228}Ac transitions [7]. The uncertainty on each transition has a shared (correlated) component of 2.5 % (see comments in [7]).	B	3.5
3	Detection efficiencies not embodied within component 1	B	0.4
4	Mass determinations for dilution factors and counting source preparations	B	0.1
5	Decay corrections for ^{228}Ra half-life uncertainty of 0.7 % [6]	B	0.003
6	Effect of ^{228}Ra and ^{228}Ac half-life uncertainties on secular equilibrium ratio	B	0.02
Relative combined standard uncertainty			**3.6**
Relative expanded uncertainty (k = 2)			**7.2**

[a] Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.
[b] Average massic gamma-ray emission rates of 11 geometries (R_γ) for 16 measured ^{228}Ac gamma-ray transitions with their respective energy (E_γ); assumed gamma-ray probabilities per decay (I_γ) and standard deviation of the mean (S_m).

E_γ (keV)	Assumed I_γ (%) [1]	Mean R_γ (s^{-1} g^{-1})(i)	S_m (%)(ii)
129.065	2.50	1347	0.38
153.967	0.754	421.6	0.40
209.249	3.97	2264	0.55
270.245	3.55	2014	0.33
328.004	3.04	1822	0.43
338.32	11.4	6712	0.43
409.46	2.02	1185	0.29
463.002	4.45	2645	0.33
755.313	1.03	593.3	0.46
772.291	1.52	899.2	0.53
794.942	4.31	2588	0.35
835.704	1.7	995.3	0.42
911.196	26.2	15609	0.29
964.786	4.99	3007	0.35
968.96	15.9	9582	0.30
1588.2	3.06	1889	0.28

(i) Grand mean for n = 11 determinations with three sources in three to five different detectors.
(ii) Relative standard deviation of the grand mean on R_γ for n = 11.

INSTRUCTIONS FOR HANDLING AND STORAGE

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. The ampoule should be opened only by persons qualified to handle both radioactive material and alkaline and/or acidic solutions. Appropriate shielding and/or distance should be used to minimize personnel exposure. Refer to SDS for further information.

Storage: SRM 4339b should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

REFERENCES

[1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*, available at http://www.nist.gov/pml/div682/grp04/srm.cfm (accessed Nov 2012). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.

[2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 19 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 18 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Nov 2012).

[4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement;* (ISO GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France (2008); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Nov 2012).

[5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://physics.nist.gov/Pubs/ (accessed Nov 2012).

[6] Luca, A.; June 2009, ^{228}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-228_tables.pdf (accessed Nov 2012).

[7] Pearce, A.; January 2010, ^{228}Ac. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ac-228_tables.pdf (accessed Nov 2012).

[8] Christé, V. and M.M. Bé; December 2006, ^{226}Ra. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-226_tables.pdf (accessed Nov 2012).

[9] Arinc, A.; September 2008, ^{232}Th. LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Th-232_tables.pdf (accessed Nov 2012).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1810
Prepared By:	Tim Chandler
Carrier Conc:	1.3M HNO3
Reference Date:	10/07/2010
Ampoule Mass (g):	5.18 g
Uncertainty:	+/- 3.6 %
LogBook No:	GL-CED-297-103

A Solution Material Info			
Isotope:	Radium-228 SPIKE		
Prepared By:	Bethany Fiem		
Prep Date:	05/23/2018		
Verification Date:	05/23/2018		
Expiration Date:	05/23/2019		
Primary Code:	1810-A		
Dilution(mL):	200 mL		
Mass of Parent(g):	5.1447 g		
Density(g/mL):	1.0178	Balance ID:	B733529066

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / (Dilution Vol) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq/g)) * (conversion dpm to Bq) / Density (g/mL)/ (Dilution Vol) = Parent Activity (dpm/g)
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (200 mL) = 300.9650 dpm/mL
(5.1447 g) * (195 Bq/g) * (60 dpm/Bq) / (1.0178 g/mL) / (200 mL) = 295.7015 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 1810-A Jar

v1.1.2
BMF
5/23/2018

Isotope	Result
Ra-228	pCi/L
Ra-228 N1	29340
Ra-228 N2	28510
Ra-228 N3	29320

Mean Value (Counting) =	29056.67	pCi/L	**107.165**	**Fail**	*Exception taken due to the high uncertainty of the certified value
Stdev =	473.533	pCi/L		**Rule B (Pass/Fail)**	
Certificate Value =	27114.0	pCi/L			
Two sigma =	947.0656436				
10 % of Mean =	2905.666667				
Rule A (Pass/Fail)	**Pass**				

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
Rule B = The determined mean value shall be within 5% of the certificate value.

5-23-18

5/25/18

Runlogs

Instrument Run Log

Instrument Type: GFPC **Batch ID: 1830755**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1204178239	MB	JXC9	PIC12A	DEC-27-18 11:38:19	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204178242	MSD	JXC9	PIC12D	DEC-27-18 11:38:28	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204178243	LCS	JXC9	PIC13A	DEC-27-18 11:38:31	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466633004	SAMPLE	JXC9	PIC11A	DEC-27-18 11:38:33	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466633005	SAMPLE	JXC9	PIC11B	DEC-27-18 11:38:37	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466633006	SAMPLE	JXC9	PIC11C	DEC-27-18 11:38:41	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466633007	SAMPLE	JXC9	PIC11D	DEC-27-18 11:38:45	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630001	SAMPLE	JXC9	PIC1A	DEC-27-18 11:39:15	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630002	SAMPLE	JXC9	PIC1B	DEC-27-18 11:39:18	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630003	SAMPLE	JXC9	PIC1C	DEC-27-18 11:39:20	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630004	SAMPLE	JXC9	PIC1D	DEC-27-18 11:39:23	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630005	SAMPLE	JXC9	PIC2A	DEC-27-18 11:39:25	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630006	SAMPLE	JXC9	PIC2B	DEC-27-18 11:39:28	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630007	SAMPLE	JXC9	PIC2C	DEC-27-18 11:39:31	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630009	SAMPLE	JXC9	PIC4D	DEC-27-18 11:39:37	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630010	SAMPLE	JXC9	PIC5A	DEC-27-18 11:39:43	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466633001	SAMPLE	JXC9	PIC5B	DEC-27-18 11:39:45	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466633002	SAMPLE	JXC9	PIC5C	DEC-27-18 11:39:50	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466633003	SAMPLE	JXC9	PIC5D	DEC-27-18 11:39:51	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204178240	DUP	JXC9	PIC9B	DEC-27-18 13:37:04	DONE	CeF on 25mm Filter	01-JUN-17 00:00
1204178241	MS	JXC9	PIC9C	DEC-27-18 13:37:08	DONE	CeF on 25mm Filter	01-JUN-17 00:00
466630008	SAMPLE	JXC9	PIC9A	DEC-27-18 13:37:12	DONE	CeF on 25mm Filter	01-JUN-17 00:00

Lucas Cell Raw Data

Batch 1830869 Check-list

This check-list was completed on 23-DEC-18 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 23-DEC-18 and Elizabeth Krouse on 26-DEC-18.

Batch ID: 1830869

Product: LUC26RAL

Description: Lucas Cell Radium 226 GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous?	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences (RPD) between the MS and MSD recoveries within the acceptance limits?		No	
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Radium-226 Queue Sheet

22-DEC-18

GEL Laboratories, Radiochemistry Division

Batch #: 1830869 Analyst: PCW First Client Due Date: 01/10/2019 12/27/18 Internal Due Date: 01/06/2019

Spike Isotope: Radium-226 Spike Code: 17150 Expiration Date: 12/4/19 Vol: 0.1 End Initial/Degas Date/Time: 12/19/18 0815

LCS Isotope: Radium-226 LCS Code: 17510 Expiration Date: 12/11/19 Vol: 0.1 End LN De-em Date: 12/23/18

Bkg Count Time: 30 (Min) Sample Count Time: 30 (Min) Start Count Date: 12/23/18

Prep Date: 12/12/18 Pipet ID: 27(109) Balance ID: 18(50257) Initials: MW Witness: MG

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Position (Label)	Aliquot (mL or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
466626001-1	IR10SW01B11	SAMPLE		SURFACE WA	1 pCi/L	LANC001	1	500	0100	0400	106	1	1	2
466626002-1	IR10SW02B11	SAMPLE		SURFACE WA	1 pCi/L	LANC001	2	500	0100	0400	201	2	3	24
466627001-1	IR10SW-ROAD	SAMPLE		SURFACE WA	1 pCi/L	LANC001	3	500	0100	0400	307	3	1	17
466630001-1	MW-1	SAMPLE		WATER	1 pCi/L	LANC006	4	500	0100	0400	408	4	3	5
466630002-1	MW-2	SAMPLE		WATER	1 pCi/L	LANC006	5	500	0100	0400	508	5	1	71
466630003-1	MW-3	SAMPLE		WATER	1 pCi/L	LANC006	6	500	0100	0400	606	6	3	4
466630004-1	MW-4	SAMPLE		WATER	1 pCi/L	LANC006	7	500	0100	0400	705	7	4	18
466630005-1	MW-5	SAMPLE		WATER	1 pCi/L	LANC006	8	500	0100	0400	802	8	6	14
466630006-1	MW-6	SAMPLE		WATER	1 pCi/L	LANC006	9	500	0125	0435	104	1	2	4
466630007-1	MW-7	SAMPLE		WATER	1 pCi/L	LANC006	10	500	0125	0435	203	2	3	21
466630008-1	MW-8	SAMPLE		WATER	1 pCi/L	LANC006	11	500	0125	0435	305	3	1	58
466630009-1	MW-9	SAMPLE		WATER	1 pCi/L	LANC006	12	500	0125	0435	401	4	4	2
466630010-1	FB-20181203	SAMPLE		WATER	1 pCi/L	LANC006	13	500	0125	0435	504	5	1	14
466633001-1	MW-1	SAMPLE		WATER	1 pCi/L	LANC006	14	500	0125	0435	606	6	8	15
466633002-1	MW-2	SAMPLE		WATER	1 pCi/L	LANC006	15	500	0125	0435	703	7	4	11
466633003-1	MW-3	SAMPLE		WATER	1 pCi/L	LANC006	16	500	0125	0435	803	8	8	21
466633004-1	MW-4	SAMPLE		WATER	1 pCi/L	LANC006	17	500	0150	0510	108	1	1	6
466633005-1	MW-5	SAMPLE		WATER	1 pCi/L	LANC006	18	500	0150	0510	207	2	2	25
466633006-1	MW-6	SAMPLE		WATER	1 pCi/L	LANC006	19	500	0150	0510	308	3	8	28
466633007-1	FB-20181206	SAMPLE		WATER	1 pCi/L	LANC006	20	500	0150	0510	401	4	4	1
1204178462-1	MB for batch 1830869	MB		SURFACE WA	1 pCi/L	QC ACCOUNT	21	500	0150	0510	503	5	5	2
1204178463-1	FB-20181206(466633007DUP)	DUP		WATER	1 pCi/L	QC ACCOUNT	22	500	0150	0510	601	6	2	5
1204178464-1	FB-20181206(466633007MS)	MS		WATER	1 pCi/L	QC ACCOUNT	23	100	0150	0510	702	7	2	877
1204178465-1	FB-20181206(466633007MSD)	MSD		WATER	1 pCi/L	QC ACCOUNT	24	100	0150	0510	804	8	1	689
1204178466-1	LCS for batch 1830869	LCS		SURFACE WA	1 pCi/L	QC ACCOUNT	25	500	0215	0540	105	1	3	791

Comments: RETURNS ER

Data Reviewed By: 12/27/18

Radium-226 Liquid

Filename : RA226.XLS
File type : Excel
Version # : 1.3.2

Batch : 1830869
Analyst : PETE049
Prep Date : 12/12/2018
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 1 pCi/L
Halflife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halflife of Rn-222: 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					**Count Raw Data**							
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
1	466626001.1	0.5000	2.0256E-05	12/5/2018 13:10	106	30	2	0.067	1	0.033	30	2.1070
2	466626002.1	0.5000	2.0256E-05	12/5/2018 13:20	201	30	24	0.800	3	0.100	30	2.0070
3	466627001.1	0.5000	2.0256E-05	12/5/2018 13:25	307	30	17	0.567	1	0.033	30	1.8050
4	466630001.1	0.5000	2.0256E-05	12/3/2018 11:15	408	30	5	0.167	3	0.100	30	1.8510
5	466630002.1	0.5000	2.0256E-05	12/3/2018 12:40	508	30	71	2.367	1	0.033	30	2.1080
6	466630003.1	0.5000	2.0256E-05	12/3/2018 11:20	606	30	4	0.133	3	0.100	30	1.9430
7	466630004.1	0.5000	2.0256E-05	12/3/2018 13:05	705	30	18	0.600	4	0.133	30	1.8350
8	466630005.1	0.5000	2.0256E-05	12/4/2018 9:55	802	30	14	0.467	6	0.200	30	1.6450
9	466630006.1	0.5000	2.0256E-05	12/4/2018 10:35	104	30	4	0.133	2	0.067	30	2.0520
10	466630007.1	0.5000	2.0256E-05	12/4/2018 13:55	203	30	21	0.700	3	0.100	30	1.8290
11	466630008.1	0.5000	2.0256E-05	12/4/2018 12:30	305	30	52	1.733	1	0.033	30	1.4880
12	466630009.1	0.5000	2.0256E-05	12/4/2018 12:15	407	30	2	0.067	4	0.133	30	1.7420
13	466630010.1	0.5000	2.0256E-05	12/3/2018 12:00	504	30	14	0.467	1	0.033	30	1.8310
14	466633001.1	0.5000	2.0256E-05	12/6/2018 10:10	608	30	15	0.500	8	0.267	30	1.9750
15	466633002.1	0.5000	2.0256E-05	12/6/2018 10:10	703	30	11	0.367	4	0.133	30	1.9130
16	466633003.1	0.5000	2.0256E-05	12/6/2018 13:30	803	30	21	0.700	8	0.267	30	1.4750
17	466633004.1	0.5000	2.0256E-05	12/6/2018 11:35	108	30	6	0.200	1	0.033	30	2.0290
18	466633005.1	0.5000	2.0256E-05	12/6/2018 12:40	207	30	25	0.833	2	0.067	30	1.9750
19	466633006.1	0.5000	2.0256E-05	12/6/2018 14:20	308	30	28	0.933	8	0.267	30	1.4570
20	466633007.1	0.5000	2.0256E-05	12/6/2018 12:00	401	30	1	0.033	4	0.133	30	1.9020
21	1204178462.1	0.5000	2.0256E-05	12/12/2018 0:00	503	30	2	0.067	5	0.167	30	1.9410
22	1204178463.1	0.5000	2.0256E-05	12/6/2018 12:00	601	30	5	0.167	2	0.067	30	1.9080
23	1204178464.1	0.1000	1.1370E-05	12/6/2018 12:00	702	30	877	29.233	2	0.067	30	1.7830
24	1204178465.1	0.1000	1.1370E-05	12/6/2018 12:00	804	30	689	22.967	1	0.033	30	1.8590
25	1204178466.1	0.5000	2.0256E-05	12/12/2018 0:00	105	30	791	26.367	3	0.100	30	2.0440

Pipet, 0.1 ml Stdev : +/-	0.000200	ml
Pipet, 0.5 ml Stdev : +/-	0.001000	ml
Pipet, 1 ml Stdev : +/-	0.002000	ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
4.700%	5/1/2018	4/30/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
8.300%	8/1/2018	7/31/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
6.300%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
7.000%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
5.200%	6/1/2018	5/31/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
2.400%	7/1/2018	6/30/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
1.800%	11/1/2018	10/31/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
5.600%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:00	12/23/2018 4:00	0.511	0.978	1.002	1.000
7.800%	5/1/2018	4/30/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
9.900%	8/1/2018	7/31/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
2.900%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
6.600%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
9.700%	6/1/2018	5/31/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
9.100%	7/1/2018	6/30/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
6.700%	11/1/2018	10/31/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
2.200%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:25	12/23/2018 4:35	0.513	0.976	1.002	1.000
6.700%	5/1/2018	4/30/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
2.100%	8/1/2018	7/31/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
9.500%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
0.500%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
8.100%	6/1/2018	5/31/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
8.500%	7/1/2018	6/30/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
9.300%	11/1/2018	10/31/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
4.200%	3/1/2018	2/28/2019	12/19/2018 2:15	12/23/2018 1:50	12/23/2018 5:10	0.514	0.975	1.002	1.000
9.300%	5/1/2018	4/30/2019	12/19/2018 2:15	12/23/2018 2:15	12/23/2018 5:40	0.516	0.975	1.002	1.000

Notes:
1 - Results are decay corrected to Sample Date/Time
2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
3 - Spike Nominals are decay corrected to Sample Date/Time

* - RPD changed to 0% due to sample & dup activity below MDA

Spike S/N : 1715-D
Spike Exp Date : 12/4/2019
Spike Activity (dpm/ml): 288.41
Spike Volume Added: 0.10

LCS S/N : 1715-D
LCS Exp Date : 12/4/2019
LCS Activity (dpm/ml): 288.41
LCS Volume Added: 0.10

Results

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	**2 SIGMA** Counting Uncertainty pCi/L	**2 SIGMA** Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.0942	0.0665	1	0.2187	**0.0286**	173.27%	0.0333	0.0577	0.0970	0.0971		SAMPLE				
2	0.1712	0.1209	1	0.3318	**0.6300**	26.10%	0.7000	0.1732	0.3055	0.3349		SAMPLE				
3	0.1099	0.0776	1	0.2553	**0.5337**	27.25%	0.5333	0.1414	0.2774	0.2953		SAMPLE				
4	0.1857	0.1311	1	0.3597	**0.0651**	141.59%	0.0667	0.0943	0.1803	0.1808		SAMPLE				
5	0.0941	0.0664	1	0.2186	**1.9994**	13.19%	2.3333	0.2828	0.4750	0.5920		SAMPLE				
6	0.1769	0.1249	1	0.3427	**0.0310**	264.59%	0.0333	0.0882	0.1607	0.1608		SAMPLE				
7	0.2162	0.1527	1	0.4038	**0.4594**	33.55%	0.4667	0.1563	0.3017	0.3093		SAMPLE				
8	0.2954	0.2086	1	0.5270	**0.2928**	56.18%	0.2667	0.1491	0.3208	0.3252		SAMPLE				
9	0.1365	0.0964	1	0.2806	**0.0586**	122.72%	0.0667	0.0816	0.1406	0.1412		SAMPLE				
10	0.1876	0.1324	1	0.3634	**0.5915**	28.96%	0.6000	0.1633	0.3155	0.3465		SAMPLE				
11	0.1331	0.0940	1	0.3091	**2.0601**	14.57%	1.7000	0.2427	0.5764	0.6591		SAMPLE				
12	0.2274	0.1605	1	0.4246	**-0.0690**	122.65%	-0.0667	0.0816	0.1657	0.1658		SAMPLE				
13	0.1082	0.0764	1	0.2512	**0.4268**	31.33%	0.4333	0.1291	0.2492	0.2692		SAMPLE				
14	0.2836	0.2003	1	0.4918	**0.2130**	69.11%	0.2333	0.1599	0.2861	0.2902		SAMPLE				
15	0.2071	0.1462	1	0.3866	**0.2199**	55.73%	0.2333	0.1291	0.2385	0.2423		SAMPLE				
16	0.3798	0.2681	1	0.6585	**0.5297**	41.48%	0.4333	0.1795	0.4301	0.4375		SAMPLE				
17	0.0974	0.0688	1	0.2263	**0.1479**	53.34%	0.1667	0.0882	0.1534	0.1560		SAMPLE				
18	0.1416	0.1000	1	0.2910	**0.6988**	22.69%	0.7667	0.1732	0.3094	0.3267		SAMPLE				
19	0.3838	0.2710	1	0.6655	**0.8236**	31.47%	0.6667	0.2000	0.4843	0.5217		SAMPLE				
20	0.2079	0.1468	1	0.3882	**-0.0946**	74.54%	-0.1000	0.0745	0.1383	0.1383		SAMPLE				
21	0.2278	0.1608	1	0.4144	**-0.0927**	88.56%	-0.1000	0.0882	0.1603	0.1604		MB				
22	0.1465	0.1035	1	0.3013	**0.0943**	88.60%	0.1000	0.0882	0.1631	0.1644	466633007.1	DUP	* 0.0%			
23	0.7841	0.5536	1	1.6120	**147.2298**	9.90%	29.1667	0.9883	9.7777	35.6021	466633007.1	MS			129.9133	113.3%
24	0.5318	0.3754	1	1.2350	**111.0320**	5.68%	22.9333	0.8756	8.3088	20.2351	466633007.1	MSD	28.0%		129.9133	85.5%
25	0.1671	0.1180	1	0.3239	**23.0780**	9.96%	26.2667	0.9393	1.6175	5.6044		LCS			25.9825	88.8%

Continuing Calibration Data

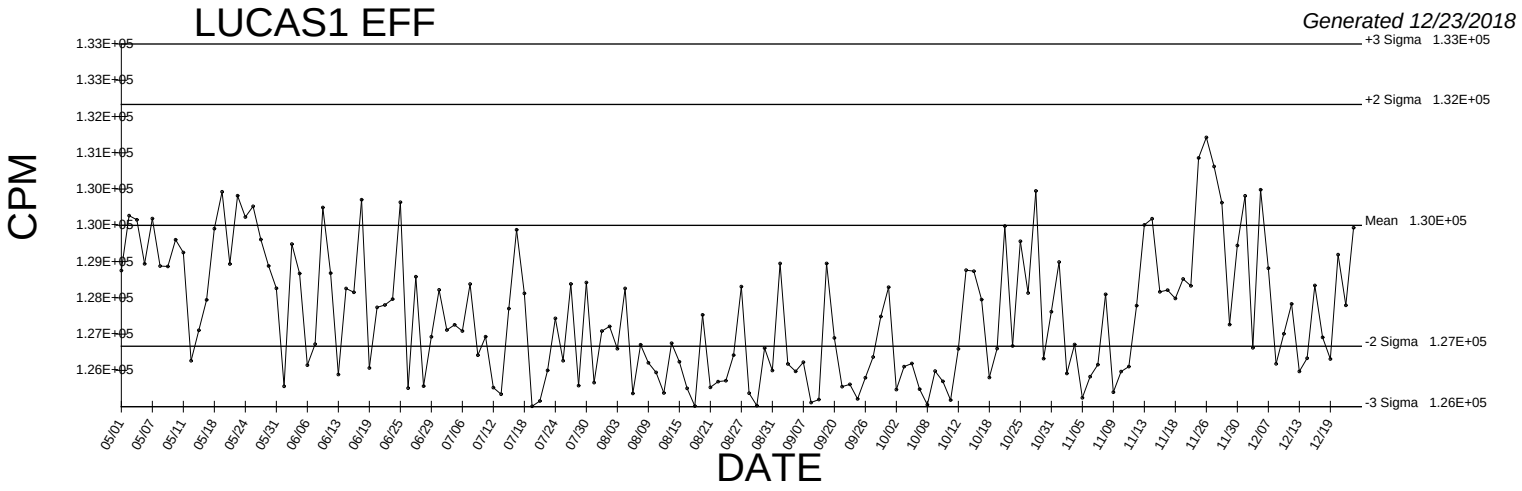
Ludlum Alpha Scintillation Counter Checks for 23-DEC-2018

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	03:00	1	1.29E+05	129499	-0.04		
LUCAS2	EFF	03:00	1	1.33E+05	132679	1.8		
LUCAS3	EFF	03:00	1	1.37E+05	137474	-1.67		
LUCAS4	EFF	03:00	1	1.31E+05	130988	-0.65		
LUCAS5	EFF	03:00	1	1.37E+05	137495	2.52		
LUCAS6	EFF	03:00	1	1.33E+05	132567	-2.21		
LUCAS7	EFF	03:00	1	1.42E+05	142406	0.64		
LUCAS8	EFF	03:00	1	1.46E+05	145500	2.24		

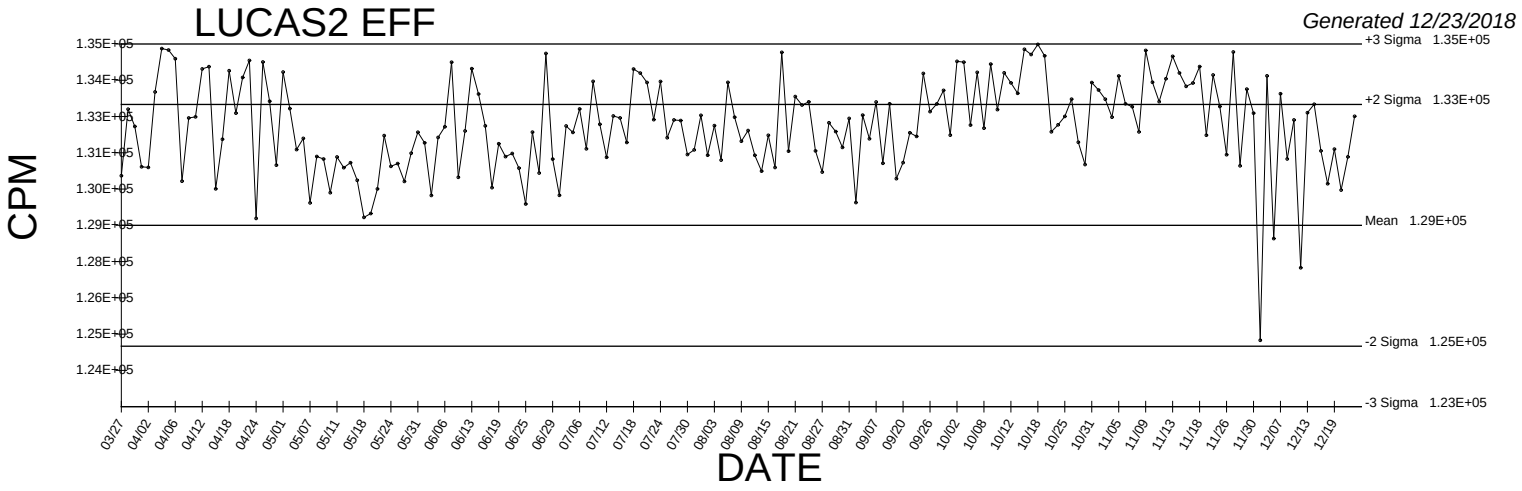
Reviewed by: Lyndsey Pace **Date:** 23-DEC-18

GEL Laboratories LLC

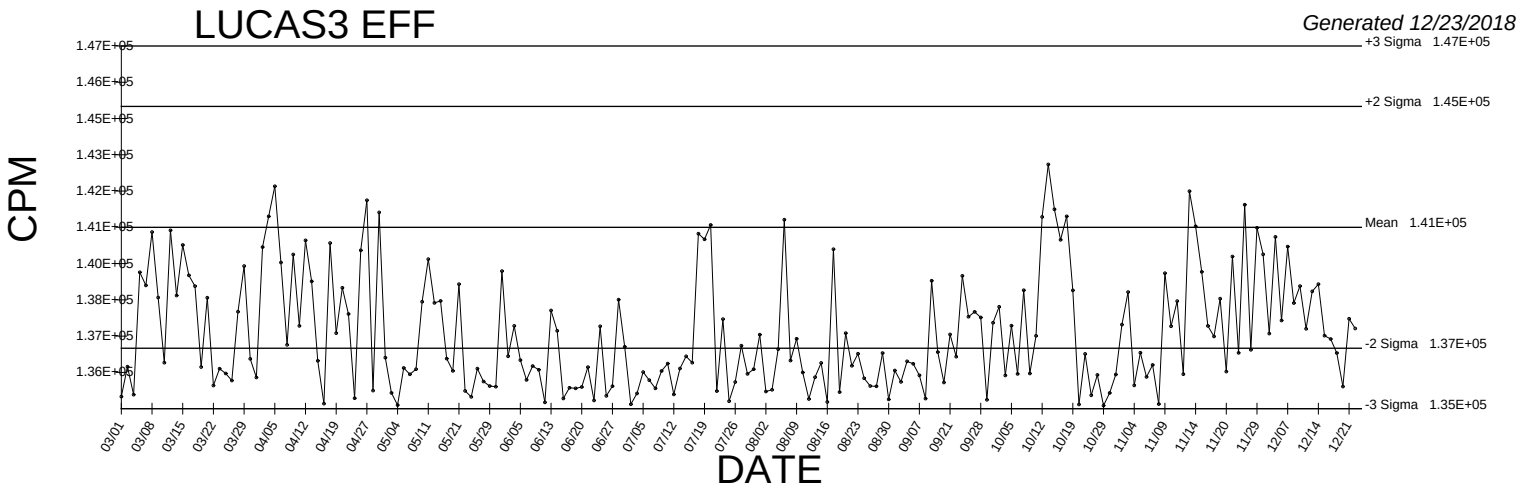
Efficiency Data



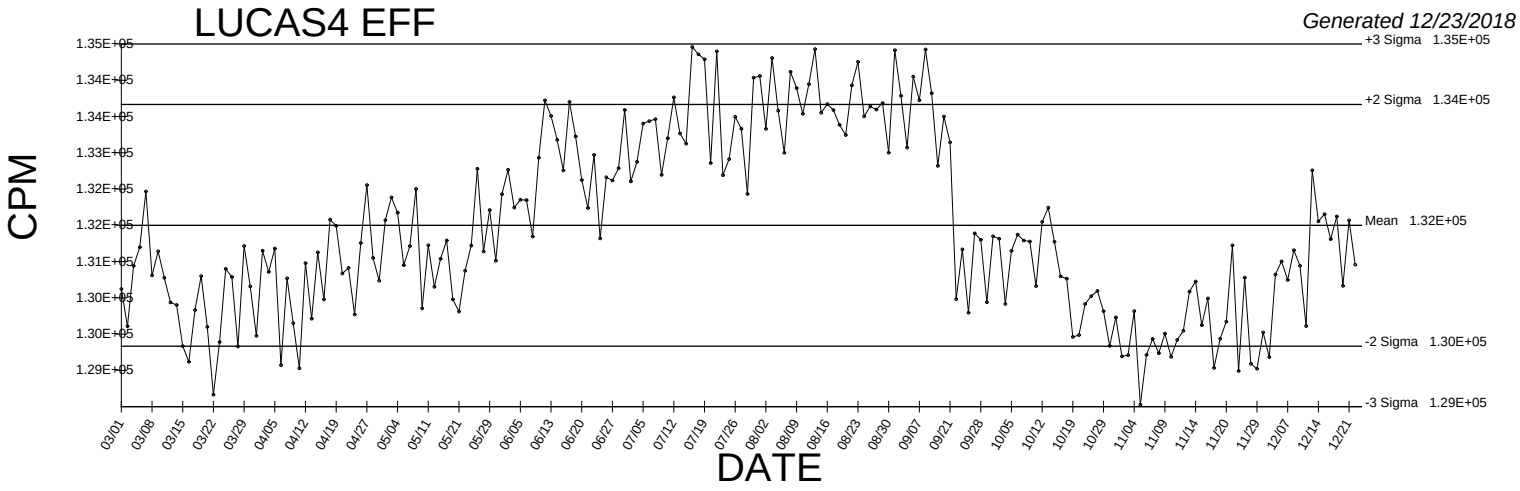
● Denotes Outlier



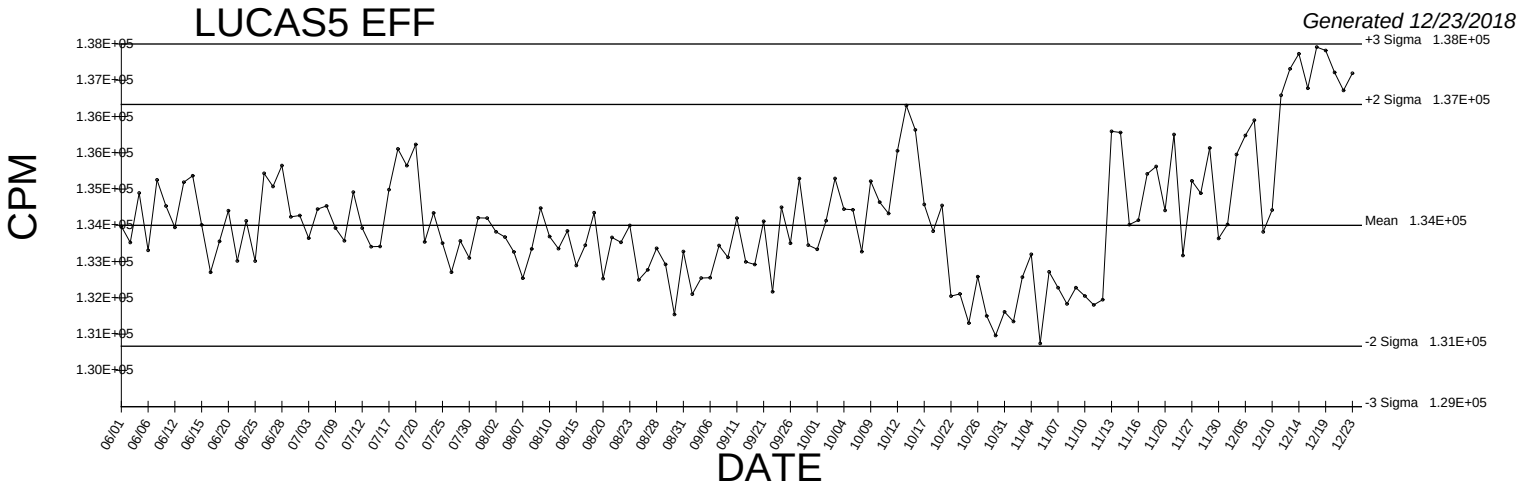
● Denotes Outlier



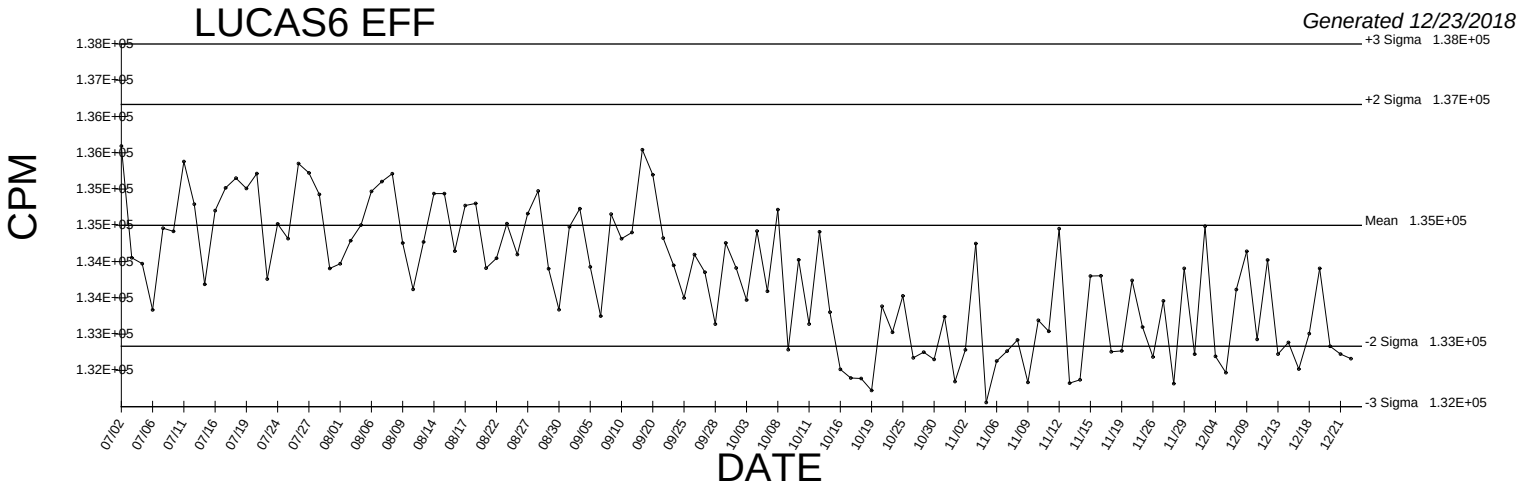
● Denotes Outlier



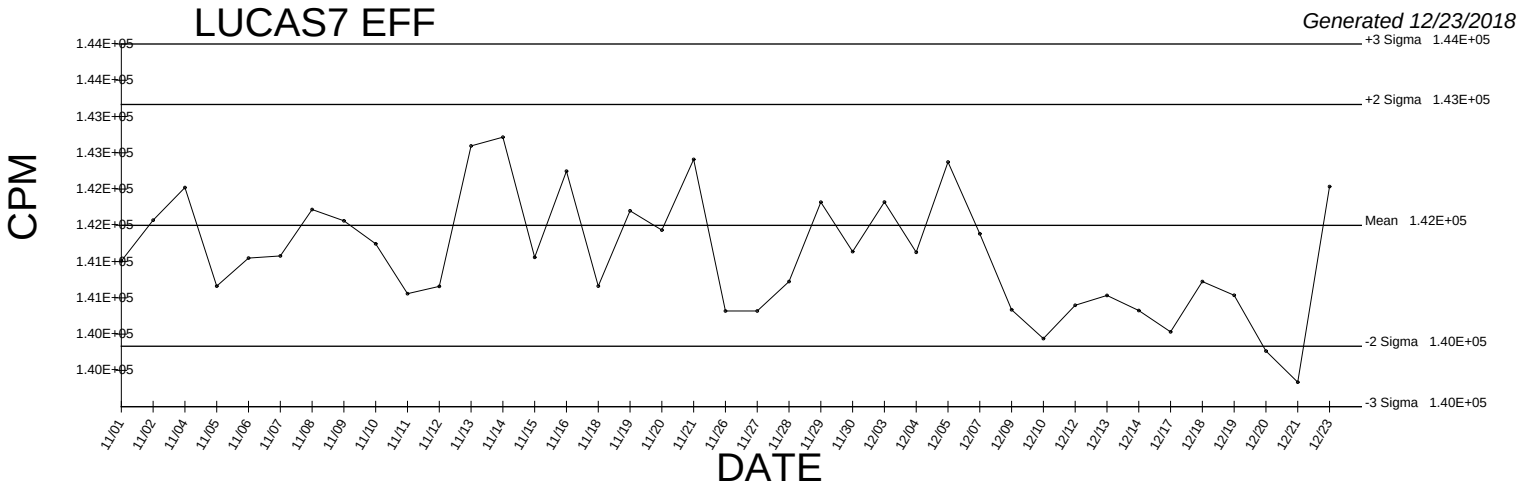
● Denotes Outlier



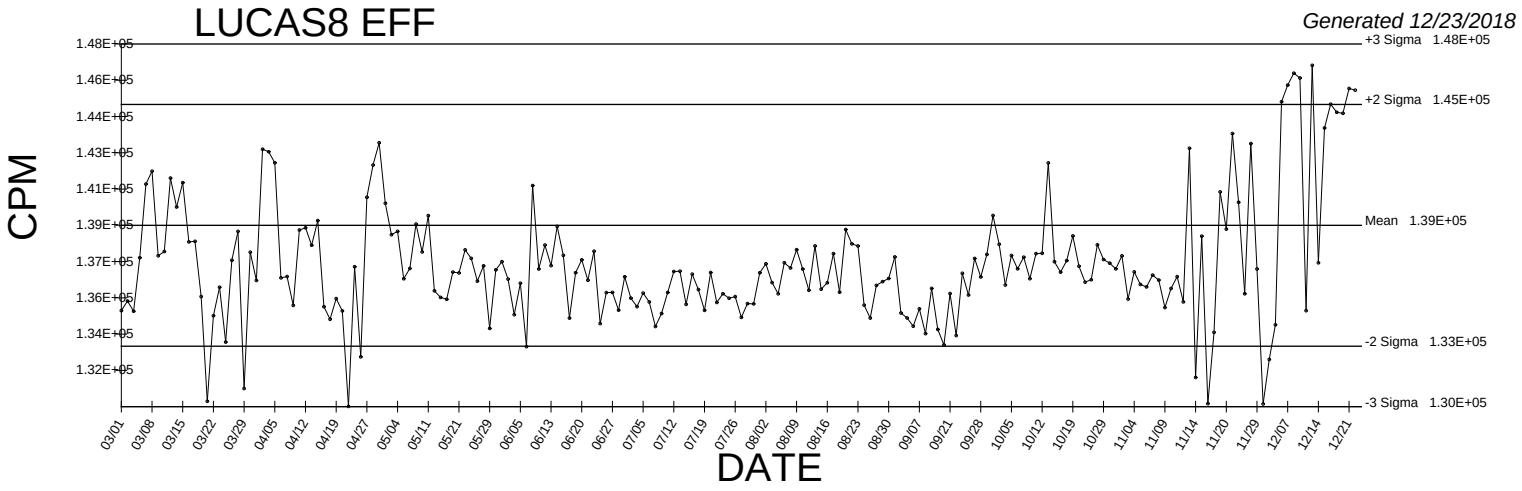
● Denotes Outlier



● Denotes Outlier



● Denotes Outlier



● Denotes Outlier

RAD Standards Traceability

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

1715

98367

Ra-226 5 mL Liquid in Flame Sealed Vial

Customer: GEL Laboratories, LLC
P.O. No.: GEL 1408580, Item 7 Product Code: 8226

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty* , % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Ra-226	5.844E+05	3.676E+04	1.0	2.1	4.7	09/09/2014

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities (other than decay products)<0.1%.
5.02193 g 0.1M HCl solution with approximately 30 µg/g Ba carrier.

Source Prepared by: R. Ormsby
R. Ormsby, Radiochemist

QC Approved: L. Tk
L. Tkavadze, Nuclear Metrologist

Date: 9 Sep 14

RECEIVED 9/10/14

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Standard Traceability Log Rad

Source Material Info	
Parent Code:	1715
Prepared By:	Gregory Ramsay
Carrier Conc:	0.1M HCl
Reference Date:	09/09/2014
Ampoule Mass (g):	5.02193 g
Uncertainty:	+/- 2.35 %
LogBook No:	GL-CED-297-008

A Solution Material Info			
Isotope:	Radium-226		
Prepared By:	Gregory Ramsay		
Prep Date:	07/06/2016		
Verification Date:	12/04/2018		
Expiration Date:	12/04/2019		
Primary Code:	1715-A		
Dilution(mL):	100 mL		
Mass of Parent(g):	4.9865 g		
Density(g/mL):	0.9967	Balance ID:	C31514

Calculations Converting parent activity to dpm/mL|dpm/g

(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / (Ampoule Mass(g) *(Dilution Vol)) = Parent Activity (dpm/mL)
(Mass of parent(g)) * (Parm Activity (Bq)) * (conversion dpm to Bq) / Density / (Ampoule Mass (g) * (Dilution Vol)) = Parent Activity (dpm/g)
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (5.02193 g * 100 mL) = 21900.3937 dpm/mL
(4.9865 g) * (36760 Bq) * (60 dpm/Bq) / (0.9967 g/mL)/ (5.02193 g * 100 mL) = 21972.4854 dpm/g

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
07/06/2016	Gregory Ramsay	2.6261	200	1715-B	288.51 dpm/ml	01/25/2017	11/10/2018
02/08/2017	Gregory Ramsay	21.96	250	1715-C	1930.063 dpm/ml	02/08/2017	02/08/2018
12/19/2017	Gregory Ramsay	2.63	200	1715-D	288.938 dpm/ml	12/04/2018	12/04/2019

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 1715-D

v1.0.2

Instrument	YELLOW
Analyst	BXF1
Verification Prep Date	12/4/2018

Standard Information	
Isotope	Ra-226
Serial Number	1715-D
Isotope Halflife	1.6000E+03 Y
Reference Date	9/9/2014
Ref. Act. (DPM/mL)	288.93
Amount of Std. (mL)	1.0
Standard Prep Date	12/19/2017

Std #	Count Date	Quench Number	Gross cpm	Bkg cpm
1	12/10/2018	762.97	228.60	5.30
2	12/10/2018	762.63	237.90	5.30
3	12/10/2018	762.63	239.80	5.30

Std #	Net cpm	Calculated Avg. Eff.	Standard dpm/mL	Measured dpm
1	223.30	0.838318	266.37	266.37
2	232.60	0.838318	277.46	277.46
3	234.50	0.838318	279.73	279.73

	dpm/mL
Mean Value =	274.52
Stdev =	7.149564487
Certificate Value* =	**288.4**
Two sigma =	14.299
10 % of Mean =	27.452
Rule A (Pass/Fail)	**Pass**
% Recovery	95.19%
Rule B (Pass/Fail)	**Pass**
Expiration Date	**12/4/2019**

Verification Rules

Rule A = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule B = The determined mean value shall be within 5% of the certificate value.

*** Certificate Value is decay corrected to Count Date.**

The analyst prepared three standard verification sources for Ra-226 source 1715-D by transferring 1 mL portions of the standard into glass liquid scintillation vials. 10 mL of Ecoscint Ultra liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 10 mL of Ecoscint Ultra liquid scintillation cocktail. The standard verification vials and background source were dark adapted for at least two hours and counted on LSCYELLOW for Ra-226 source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 12/4/2018 using Ra-226 source 0024-A.

Standard results for each verification source was calculated as follows:

Source dpm/mL = (A - B)/(C)(D)

where:

A = Ver. source cpm,

B = BKG cpm,

C = System efficiency (cpm/dpm), and

D = volume used for standard verification.

RAD-M-001

12-11-18

12/12/18

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR **Batch ID: 1830869**

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
466626001	SAMPLE	PCW	LUCAS1	DEC-23-18 04:00:00	DONE	Lucas Cell	01-MAY-18 00:00
466626002	SAMPLE	PCW	LUCAS2	DEC-23-18 04:00:00	DONE	Lucas Cell	01-AUG-18 00:00
466627001	SAMPLE	PCW	LUCAS3	DEC-23-18 04:00:00	DONE	Lucas Cell	01-MAR-18 00:00
466630001	SAMPLE	PCW	LUCAS4	DEC-23-18 04:00:00	DONE	Lucas Cell	01-MAR-18 00:00
466630002	SAMPLE	PCW	LUCAS5	DEC-23-18 04:00:00	DONE	Lucas Cell	01-JUN-18 00:00
466630003	SAMPLE	PCW	LUCAS6	DEC-23-18 04:00:00	DONE	Lucas Cell	01-JUL-18 00:00
466630004	SAMPLE	PCW	LUCAS7	DEC-23-18 04:00:00	DONE	Lucas Cell	01-NOV-18 00:00
466630005	SAMPLE	PCW	LUCAS8	DEC-23-18 04:00:00	DONE	Lucas Cell	01-MAR-18 00:00
466630006	SAMPLE	PCW	LUCAS1	DEC-23-18 04:35:00	DONE	Lucas Cell	01-MAY-18 00:00
466630007	SAMPLE	PCW	LUCAS2	DEC-23-18 04:35:00	DONE	Lucas Cell	01-AUG-18 00:00
466630008	SAMPLE	PCW	LUCAS3	DEC-23-18 04:35:00	DONE	Lucas Cell	01-MAR-18 00:00
466630009	SAMPLE	PCW	LUCAS4	DEC-23-18 04:35:00	DONE	Lucas Cell	01-MAR-18 00:00
466630010	SAMPLE	PCW	LUCAS5	DEC-23-18 04:35:00	DONE	Lucas Cell	01-JUN-18 00:00
466633001	SAMPLE	PCW	LUCAS6	DEC-23-18 04:35:00	DONE	Lucas Cell	01-JUL-18 00:00
466633002	SAMPLE	PCW	LUCAS7	DEC-23-18 04:35:00	DONE	Lucas Cell	01-NOV-18 00:00
466633003	SAMPLE	PCW	LUCAS8	DEC-23-18 04:35:00	DONE	Lucas Cell	01-MAR-18 00:00
466633004	SAMPLE	PCW	LUCAS1	DEC-23-18 05:10:00	DONE	Lucas Cell	01-MAY-18 00:00
466633005	SAMPLE	PCW	LUCAS2	DEC-23-18 05:10:00	DONE	Lucas Cell	01-AUG-18 00:00
466633006	SAMPLE	PCW	LUCAS3	DEC-23-18 05:10:00	DONE	Lucas Cell	01-MAR-18 00:00
466633007	SAMPLE	PCW	LUCAS4	DEC-23-18 05:10:00	DONE	Lucas Cell	01-MAR-18 00:00
1204178462	MB	PCW	LUCAS5	DEC-23-18 05:10:00	DONE	Lucas Cell	01-JUN-18 00:00
1204178463	DUP	PCW	LUCAS6	DEC-23-18 05:10:00	DONE	Lucas Cell	01-JUL-18 00:00
1204178464	MS	PCW	LUCAS7	DEC-23-18 05:10:00	DONE	Lucas Cell	01-NOV-18 00:00
1204178465	MSD	PCW	LUCAS8	DEC-23-18 05:10:00	DONE	Lucas Cell	01-MAR-18 00:00
1204178466	LCS	PCW	LUCAS1	DEC-23-18 05:40:00	DONE	Lucas Cell	01-MAY-18 00:00

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

WCD Group
1108 Old Thomasville Rd.
High Point NC 27260

Report Date: February 21, 2019 19:08

Project: PSEG Hudson

Account #: 44064
Group Number: 2027519
SDG: WCD01
PO Number: 18-11432
State of Sample Origin: NJ

Electronic Copy To	WCD Group	Attn: Scott McDonald
Electronic Copy To	WCD Group	Attn: Jim Blaney

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-8 Grab Groundwater	01/29/2019 09:50	9978092
MW-5 Grab Groundwater	01/29/2019 10:20	9978093
MW-6 Grab Groundwater	01/29/2019 12:05	9978094
MW-7 Grab Groundwater	01/29/2019 12:20	9978095
MW-1 Grab Groundwater	01/29/2019 14:35	9978096
MW-4 Grab Groundwater	01/29/2019 14:50	9978097
FB Grab Water	01/29/2019 15:30	9978098
MW-9 Grab Groundwater	01/30/2019 11:15	9978099
MW-2 Grab Groundwater	01/30/2019 13:20	9978100
MW-3 Grab Groundwater	01/30/2019 15:15	9978101
FB-2 Grab Water	01/30/2019 15:45	9978102

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: WCD Group
Project: PSEG Hudson
Sampling Date(s): 01/29/19 - 01/30/19
Laboratory Sample ID(s): 9978092-9978102
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Dorothy M Love

Dorothy M. Love
Director

02/21/2019



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Project Name: PSEG Hudson
ELLE Group #: 2027519

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.

Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Sample #s: 9978092-9978102

The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 9978092, 9978093, 9978094, 9978095, 9978096, 9978097, 9978098, 9978099, 9978100, 9978101, 9978102

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.

Sample #s: 9978092, 9978093, 9978094, 9978095, 9978096, 9978097, 9978098, 9978099, 9978100, 9978101, 9978102

The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.

EPA 300.0, Wet Chemistry

Batch #: 19039987215A (Sample number(s): 9978094-9978102 UNSPK: 9978095 BKG: 9978095)

The recovery(ies) for the following analyte(s) in the MS were below the acceptance window: Fluoride

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Fluoride

Sample Description: **MW-8 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 09:50
SDG#: WCD01-01

WCD Group
ELLE Sample #: GW 9978092
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0173	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.148	0.0120	0.0500	1
01750	Calcium	7440-70-2	6.62	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0065	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00078 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00043 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0015 J	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	80.0	4.0	8.0	20
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	20.3	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	322	40.0	120	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 09:50
SDG#: WCD01-01

WCD Group
ELLE Sample #: GW 9978092
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:14	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:04	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:04	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:07	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:04	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:04	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 09:50
SDG#: WCD01-01

WCD Group
ELLE Sample #: GW 9978092
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:04	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 13:39	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987115B	02/12/2019 08:20	Clinton M Wilson	20
01504	Fluoride	EPA 300.0	1	19039987115B	02/09/2019 09:03	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987115B	02/09/2019 09:03	Clinton M Wilson	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 19:16	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 19:16	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 10:20
SDG#: WCD01-02

WCD Group
ELLE Sample #: GW 9978093
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.118	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.336	0.0120	0.0500	1
01750	Calcium	7440-70-2	145	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0467 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	1,270	100	200	500
01504	Fluoride	16984-48-8	0.35 J	0.25	0.50	5
00228	Sulfate	14808-79-8	14.1	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,700	400	1,200	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 10:20
SDG#: WCD01-02

WCD Group
ELLE Sample #: GW 9978093
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:31	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:31	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:45	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:31	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:31	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:31	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:31	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:31	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:06	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:06	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:09	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:06	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:06	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 10:20
SDG#: WCD01-02

WCD Group
ELLE Sample #: GW 9978093
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:06	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 13:48	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987115B	02/09/2019 09:46	Clinton M Wilson	500
01504	Fluoride	EPA 300.0	1	19039987115B	02/09/2019 09:17	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987115B	02/09/2019 09:17	Clinton M Wilson	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 18:54	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 18:54	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 12:05
SDG#: WCD01-03

WCD Group
ELLE Sample #: GW 9978094
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0275	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.288	0.0120	0.0500	1
01750	Calcium	7440-70-2	54.1	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0230 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0081	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	122	10.0	20.0	50
01504	Fluoride	16984-48-8	0.52	0.25	0.50	5
00228	Sulfate	14808-79-8	43.6	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	474	80.0	240	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 12:05
SDG#: WCD01-03

WCD Group
ELLE Sample #: GW 9978094
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:34	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:34	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:48	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:34	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:34	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:34	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:34	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:34	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:08	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:08	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:11	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:08	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:08	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 12:05
SDG#: WCD01-03

WCD Group
ELLE Sample #: GW 9978094
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:08	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 13:50	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/09/2019 10:57	Clinton M Wilson	50
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 10:42	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 10:42	Clinton M Wilson	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201B	02/04/2019 15:39	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 18:50	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 18:50	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 12:20
SDG#: WCD01-04

WCD Group
ELLE Sample #: GW 9978095
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0213	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.0683	0.0120	0.0500	1
01750	Calcium	7440-70-2	21.0	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D. K4	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0047	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	13.1	1.0	2.0	5
01504	Fluoride	16984-48-8	0.41 J	0.25	0.50	5
00228	Sulfate	14808-79-8	4.8 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	141	40.0	120	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 12:20
SDG#: WCD01-04

WCD Group
ELLE Sample #: GW 9978095
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.9	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:50	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:43	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:50	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:43	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:50	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:43	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:43	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:43	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:11	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:11	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:18	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:11	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:11	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 12:20
SDG#: WCD01-04

WCD Group
ELLE Sample #: GW 9978095
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:11	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 13:52	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/09/2019 10:00	Clinton M Wilson	5
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 10:00	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 10:00	Clinton M Wilson	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202B	02/05/2019 18:42	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202B	02/05/2019 18:42	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 14:35
SDG#: WCD01-05

WCD Group
ELLE Sample #: GW 9978096
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.748	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	1.15	0.0120	0.0500	1
01750	Calcium	7440-70-2	368	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0041 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0509	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00075 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0017 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0024	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	9,520	500	1,000	2500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	112	6.0	20.0	20
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	11,000	1,600	4,800	10

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 14:35
SDG#: WCD01-05

WCD Group
ELLE Sample #: GW 9978096
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:53	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:46	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:53	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:46	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:53	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:53	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:46	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:46	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:20	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:13	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:20	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:13	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:13	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 14:35
SDG#: WCD01-05

WCD Group
ELLE Sample #: GW 9978096
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:13	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 13:54	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/12/2019 08:38	Clinton M Wilson	2500
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 11:39	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 14:01	Clinton M Wilson	20
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 18:34	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 18:34	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 14:50
SDG#: WCD01-06

WCD Group
ELLE Sample #: GW 9978097
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.358	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.994	0.0120	0.0500	1
01750	Calcium	7440-70-2	95.6	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0278 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00096 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0051	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	4,700	200	400	1000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	227	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	6,100	800	2,400	10

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 14:50
SDG#: WCD01-06

WCD Group
ELLE Sample #: GW 9978097
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	23.0	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.1	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:56	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:49	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:56	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:49	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:56	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:56	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:49	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:49	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:22	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:15	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:22	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:15	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:15	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 14:50
SDG#: WCD01-06

WCD Group
ELLE Sample #: GW 9978097
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:15	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 13:56	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/12/2019 08:56	Clinton M Wilson	1000
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 14:30	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 14:58	Clinton M Wilson	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 18:09	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 18:09	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 15:30
SDG#: WCD01-07FB

WCD Group
ELLE Sample #: **GW 9978098**
ELLE Group #: **2027519**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D. K4	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.122 J	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 15:30
SDG#: WCD01-07FB

WCD Group
ELLE Sample #: **GW 9978098**
ELLE Group #: **2027519**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:52	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:52	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:59	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:52	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:59	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 19:59	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:52	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:52	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:17	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:17	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:35	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:17	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:17	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:17	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 13:58	Parker D Lindstrom	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/29/2019 15:30
SDG#: WCD01-07FB

WCD Group
ELLE Sample #: GW 9978098
ELLE Group #: 2027519
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/09/2019 15:26	Clinton M Wilson	1
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 15:26	Clinton M Wilson	1
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 15:26	Clinton M Wilson	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 18:02	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 18:02	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 11:15
SDG#: WCD01-08

WCD Group
ELLE Sample #: GW 9978099
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.276	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.235	0.0120	0.0500	1
01750	Calcium	7440-70-2	57.3	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0371 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0028	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0074	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	106	10.0	20.0	50
01504	Fluoride	16984-48-8	0.52	0.25	0.50	5
00228	Sulfate	14808-79-8	33.3	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	480	40.0	120	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 11:15
SDG#: WCD01-08

WCD Group
ELLE Sample #: GW 9978099
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.8	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.1	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:01	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:55	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:01	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:55	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:01	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:01	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:55	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:55	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:19	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:19	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:24	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:19	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:19	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 11:15
SDG#: WCD01-08

WCD Group
ELLE Sample #: GW 9978099
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:19	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 14:00	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/09/2019 16:23	Clinton M Wilson	50
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 16:09	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 16:09	Clinton M Wilson	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 18:23	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 18:23	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 13:20
SDG#: WCD01-09

WCD Group
ELLE Sample #: GW 9978100
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	2.15	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.970	0.0120	0.0500	1
01750	Calcium	7440-70-2	424	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0032 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0697	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00057 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0029	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0032	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	11,100	500	1,000	2500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	13.2	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	12,000	1,600	4,800	10

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 13:20
SDG#: WCD01-09

WCD Group
ELLE Sample #: GW 9978100
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:04	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:58	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:04	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:58	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:04	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/14/2019 21:08	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:58	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 22:58	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:26	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:26	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:26	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:26	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:26	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 13:20
SDG#: WCD01-09

WCD Group
ELLE Sample #: GW 9978100
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:26	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 14:02	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/12/2019 09:14	Clinton M Wilson	2500
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 16:37	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 16:37	Clinton M Wilson	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921201A	02/04/2019 15:39	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 19:20	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 19:20	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 15:15
SDG#: WCD01-10

WCD Group
ELLE Sample #: GW 9978101
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0641	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.329	0.0120	0.0500	1
01750	Calcium	7440-70-2	81.2	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00095 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0024	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0102	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	452	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	40.0	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	988	160	480	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 15:15
SDG#: WCD01-10

WCD Group
ELLE Sample #: GW 9978101
ELLE Group #: 2027519
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:07	Cindy M Gehman	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:02	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:07	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:02	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:07	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:07	Cindy M Gehman	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:02	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:02	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:28	Choon Y Tian	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:28	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:28	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:28	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:28	Bradley M Berlot	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 15:15
SDG#: WCD01-10

WCD Group
ELLE Sample #: GW 9978101
ELLE Group #: 2027519
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:28	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 14:04	Parker D Lindstrom	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/09/2019 17:48	Clinton M Wilson	500
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 17:20	Clinton M Wilson	5
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 17:20	Clinton M Wilson	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921202A	02/04/2019 15:12	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 19:24	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 19:24	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-2 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 15:45
SDG#: WCD01-11FB

WCD Group
ELLE Sample #: **GW 9978102**
ELLE Group #: **2027519**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D. K4	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.111 J	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D. K4	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D. K4	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	The NJ DKQP analyte list requirement was not met for metals. The client specified list is reported.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-2 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 15:45
SDG#: WCD01-11FB

WCD Group
ELLE Sample #: **GW 9978102**
ELLE Group #: **2027519**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.
All Depts: FOLLOW NJ DKQP PROTOCOL / REQUIREMENTS !!!!!!!!!!!!!!!!
See Project Notes.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:05	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:05	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:10	Cindy M Gehman	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:05	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190371404403	02/12/2019 20:10	Cindy M Gehman	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:05	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:05	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190371404403	02/11/2019 23:05	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:30	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:30	Bradley M Berlot	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/18/2019 09:50	Choon Y Tian	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:30	Bradley M Berlot	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190381404701A	02/13/2019 18:30	Bradley M Berlot	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190381404701C	02/13/2019 18:30	Bradley M Berlot	1
00259	Mercury	SW-846 7470A	1	190380571301	02/10/2019 14:06	Parker D Lindstrom	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-2 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 01/31/2019 16:52
Collection Date/Time: 01/30/2019 15:45
SDG#: WCD01-11FB

WCD Group
ELLE Sample #: GW 9978102
ELLE Group #: 2027519
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190371404403	02/07/2019 05:33	James L Mertz	1
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190381404701	02/08/2019 05:00	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190380571301	02/08/2019 07:15	Annamaria Kuhns	1
00224	Chloride	EPA 300.0	1	19039987215A	02/09/2019 18:02	Clinton M Wilson	1
01504	Fluoride	EPA 300.0	1	19039987215A	02/09/2019 18:02	Clinton M Wilson	1
00228	Sulfate	EPA 300.0	1	19039987215A	02/09/2019 18:02	Clinton M Wilson	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	19035921202A	02/04/2019 15:12	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19036004202A	02/05/2019 18:27	Kristen Wroblewski	1
12152	pH	SM 4500-H+ B-2011	1	19036004202A	02/05/2019 18:27	Kristen Wroblewski	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: WCD Group
Reported: 02/21/2019 19:08

Group Number: 2027519

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 190371404403	Sample number(s): 9978092-9978102		
Barium	N.D.	0.0010	0.0050
Boron	N.D.	0.0120	0.0500
Calcium	N.D.	0.0330	0.500
Chromium	N.D.	0.0053	0.0150
Cobalt	N.D.	0.0015	0.0050
Lithium	N.D.	0.0110	0.0500
Selenium	N.D.	0.0210	0.0500
Thallium	N.D.	0.0140	0.0300
Batch number: 190380571301	Sample number(s): 9978092-9978102		
Mercury	N.D.	0.000050	0.00020
Batch number: 190381404701A	Sample number(s): 9978092-9978102		
Antimony	N.D.	0.00041	0.0020
Arsenic	N.D.	0.00068	0.0020
Beryllium	N.D.	0.000091	0.00050
Cadmium	N.D.	0.00015	0.0010
Lead	N.D.	0.0011	0.0030
Batch number: 190381404701C	Sample number(s): 9978092-9978102		
Molybdenum	N.D.	0.00031	0.0020
Batch number: 19039987115B	Sample number(s): 9978092-9978093		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 19039987215A	Sample number(s): 9978094-9978102		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 19035921201A	Sample number(s): 9978092-9978093,9978095-9978100		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 19035921201B	Sample number(s): 9978094		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 19035921202A	Sample number(s): 9978101-9978102		
Total Dissolved Solids	N.D.	20.0	60.0

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: WCD Group
Reported: 02/21/2019 19:08

Group Number: 2027519

LCS/LCSD

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 190371404403	Sample number(s): 9978092-9978102								
Barium	2.00	2.10			105		80-120		
Boron	2.00	1.99			100		80-120		
Calcium	4.00	4.61			115		80-120		
Chromium	0.200	0.211			106		80-120		
Cobalt	0.500	0.542			108		80-120		
Lithium	1.00	1.09			109		80-120		
Selenium	0.150	0.144			96		80-120		
Thallium	0.150	0.161			107		80-120		
Batch number: 190380571301	Sample number(s): 9978092-9978102								
Mercury	0.00100	0.000866			87		80-120		
Batch number: 190381404701A	Sample number(s): 9978092-9978102								
Antimony	0.00600	0.00601			100		80-120		
Arsenic	0.0100	0.00969			97		80-120		
Beryllium	0.00400	0.00391			98		80-120		
Cadmium	0.00500	0.00503			101		80-120		
Lead	0.0150	0.0150			100		80-120		
Batch number: 190381404701C	Sample number(s): 9978092-9978102								
Molybdenum	0.0500	0.0504			101		80-120		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 19039987115B	Sample number(s): 9978092-9978093								
Chloride	3.00	2.83			94		90-110		
Fluoride	0.750	0.748			100		90-110		
Sulfate	7.50	7.59			101		90-110		
Batch number: 19039987215A	Sample number(s): 9978094-9978102								
Chloride	3.00	2.77			92		90-110		
Fluoride	0.750	0.736			98		90-110		
Sulfate	7.50	7.46			100		90-110		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 19035921201A	Sample number(s): 9978092-9978093,9978095-9978100								
Total Dissolved Solids	200	207			104		62-127		
Batch number: 19035921201B	Sample number(s): 9978094								
Total Dissolved Solids	200	207			104		62-127		
Batch number: 19035921202A	Sample number(s): 9978101-9978102								
Total Dissolved Solids	200	203			102		62-127		
	Std. Units	**Std. Units**	**Std. Units**	**Std. Units**					

*- Outside of specification
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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: WCD Group
Reported: 02/21/2019 19:08

Group Number: 2027519

LCS/LCSD (continued)

Analysis Name	LCS Spike Added Std. Units	LCS Conc Std. Units	LCSD Spike Added Std. Units	LCSD Conc Std. Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 19036004202A	Sample number(s): 9978092-9978094,9978096-9978102								
pH	7.00	6.99			100		95-105		
Batch number: 19036004202B	Sample number(s): 9978095								
pH	7.00	6.99			100		95-105		

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 190371404403	Sample number(s): 9978092-9978102 UNSPK: 9978092									
Barium	0.0173	2.00	2.15	2.00	2.19	107	108	75-125	2	20
Boron	0.148	2.00	2.14	2.00	2.17	100	101	75-125	1	20
Calcium	6.62	4.00	10.99	4.00	11.23	109	115	75-125	2	20
Chromium	N.D.	0.200	0.205	0.200	0.207	102	104	75-125	1	20
Cobalt	0.00647	0.500	0.528	0.500	0.539	104	106	75-125	2	20
Lithium	N.D.	1.00	1.06	1.00	1.09	106	109	75-125	2	20
Selenium	N.D.	0.150	0.156	0.150	0.162	104	108	75-125	4	20
Thallium	N.D.	0.150	0.164	0.150	0.172	109	114	75-125	5	20
	mg/l	mg/l	mg/l	mg/l	mg/l					
Batch number: 19039987215A	Sample number(s): 9978094-9978102 UNSPK: 9978095									
Chloride	13.11	10	24.07			110		90-110		
Fluoride	0.408	2.50	2.60			88*		90-110		
Sulfate	4.80	25	28.32			94		90-110		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc mg/l	DUP Conc mg/l	DUP RPD	DUP RPD Max
Batch number: 190371404403	Sample number(s): 9978092-9978102 BKG: 9978092			
Barium	0.0173	0.0170	2 (1)	20
Boron	0.148	0.146	2 (1)	20
Calcium	6.62	6.70	1	20

*- Outside of specification
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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: WCD Group
Reported: 02/21/2019 19:08

Group Number: 2027519

Laboratory Duplicate (continued)

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	mg/l	mg/l		
Chromium	N.D.	N.D.	0 (1)	20
Cobalt	0.00647	0.00653	1 (1)	20
Lithium	N.D.	N.D.	0 (1)	20
Selenium	N.D.	N.D.	0 (1)	20
Thallium	N.D.	N.D.	0 (1)	20
	mg/l	mg/l		
Batch number: 19039987215A	Sample number(s): 9978094-9978102 BKG: 9978095			
Chloride	13.11	13.28	1	15
Fluoride	0.408	N.D.	200* (1)	15
Sulfate	4.80	4.90	2 (1)	15
	Degrees C	Degrees C		
Batch number: 19036004202B	Sample number(s): 9978095 BKG: 9978095			
Temperature of pH	22.46	22.43	0	5
	mg/l	mg/l		
Batch number: 19035921201B	Sample number(s): 9978094 BKG: 9978094			
Total Dissolved Solids	474	462	3 (1)	5
	Std. Units	Std. Units		
Batch number: 19036004202B	Sample number(s): 9978095 BKG: 9978095			
pH	7.86	7.73	2	4

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # 44064 Group # 2027519 Sample # 9978092-102

Client: WCD Group	
Project Name/#: Former PSEG Hudson	Site ID #:
Project Manager: Jim Blaney	P.O. #:
Sampler: Fabio Iannacci, Tristan Morgan	PWSID #:
Phone #:	Quote #:
State where sample(s) were collected: NJ	

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Water (Ground)	Potable	Surface	NPDES	Other:	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 228, Ra 226	Metals QC	Remarks
MW-8	1/29/19	9:50	X				X					8	X	X	X	X	X	X	X	X	X	Metals: Ba, B, Ca, Cr
MW-5	1/29/19	10:20	X				X					7	X	X	X	X	X	X	X	X		Co, Li, Se, Tl, Sb, As
MW-6	1/29/19	12:05	X				X					7	X	X	X	X	X	X	X	X		Be, Cd, Pb, Mo, Hg
MW-7	1/29/19	12:20	X				X					7	X	X	X	X	X	X	X	X		Lab to filter
MW-1	1/29/19	14:35	X				X					7	X	X	X	X	X	X	X	X		
MW-4	1/29/19	14:50	X				X					7	X	X	X	X	X	X	X	X		
FB	1/29/19	15:30	X				X					7	X	X	X	X	X	X	X	X		

Analyses Requested / Preservation Codes

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes
H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: jblaney@wcdgroup.com

Phone: 609-730-0007

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐
Type III (Reduced non-CLP) ☐ CT RCP ☐
Type IV (CLP SOW) ☐ TX TRRP-13 ☐
Type VI (Raw Data Only) ☐

EDD Required? Yes ☐ No ☐ If yes, format: _____

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	1/31/19	1028	[signature]		1028
[signature]	1/31/19	13:55	[signature]	1/31/19	13:55
[signature] 1/31/19		16:52			
			[signature]	1/31/19	1652

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.8-2.6 °C

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # 44064 Group # 2027519 Sample # 9978092-102

| | | |

eurofins | Lancaster Laboratories Environmental

Sample Administration Receipt Documentation Log

Doc Log ID: 239954

Group Number(s): 2027519

Client: WCD Group

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	01/31/2019 16:52
Number of Packages:	5	Number of Projects:	3
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Ariel Garcia (15332) at 20:21 on 01/31/2019

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-02	0.8	DT	Wet	Y	Loose	N
2	32170023	2.6	IR	Wet	Y	Loose	N
3	32170023	1.1	IR	Wet	Y	Loose	N
4	32170023	2.3	IR	Wet	Y	Loose	N
5	DT42-02	0.8	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

WCD Group
1108 Old Thomasville Rd.
High Point NC 27260

Report Date: March 13, 2019 15:00

Project: PSEG Hudson

Account #: 44064
Group Number: 2027520
PO Number: 18-11432
State of Sample Origin: NJ

Electronic Copy To	WCD Group	Attn: Scott McDonald
Electronic Copy To	WCD Group	Attn: Jim Blaney

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-8 Grab Groundwater	01/29/2019 09:50	9978103
MW-5 Grab Groundwater	01/29/2019 10:20	9978104
MW-6 Grab Groundwater	01/29/2019 12:05	9978105
MW-7 Grab Groundwater	01/29/2019 12:20	9978106
MW-1 Grab Groundwater	01/29/2019 14:35	9978107
MW-4 Grab Groundwater	01/29/2019 14:50	9978108
FB Grab Groundwater	01/29/2019 15:30	9978109
MW-9 Grab Groundwater	01/30/2019 11:15	9978110
MW-2 Grab Groundwater	01/30/2019 13:20	9978111
MW-3 Grab Groundwater	01/30/2019 15:15	9978112
FB-2 Grab Groundwater	01/30/2019 15:45	9978113

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Sample Description:	**MW-8 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978103**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/29/2019 09:50		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-5 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978104**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/29/2019 10:20		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-6 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978105**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/29/2019 12:05		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-6766 • www.EurofinsUS.com/LancLabsEnv

Sample Description:	**MW-7 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 9978106** **2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/29/2019 12:20		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-1 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978107**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/29/2019 14:35		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-4 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978108**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/29/2019 14:50		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**FB Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978109**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/29/2019 15:30		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-9 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978110**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/30/2019 11:15		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-2 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978111**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/30/2019 13:20		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-3 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 9978112**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/30/2019 15:15		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**FB-2 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 9978113**
		ELLE Group #:	**2027520**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	01/31/2019 16:52		
Collection Date/Time:	01/30/2019 15:45		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

Environmental Analysis Request/Chain of Custody

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Acct. # 44064 Group # 2027520 Sample # 9978103-113

Client: WCD Group	
Project Name/#: Former PSEG Hudson	Site ID #:
Project Manager: Jim Blaney	P.O. #:
Sampler: Fabio Iannacci, Tristan Morgan	PWSID #:
Phone #:	Quote #:
State where sample(s) were collected: NJ	

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Water (Potable, Ground, NPDES)	Surface	Other:	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 228, Ra 226	Metals QC
MW-8	1/29/19	9:50	X				X			8	X	X	X	X	X	X	X	X	X
MW-5	1/29/19	10:20	X				X			7	X	X	X	X	X	X	X	X	
MW-6	1/29/19	12:05	X				X			7	X	X	X	X	X	X	X	X	
MW-7	1/29/19	12:20	X				X			7	X	X	X	X	X	X	X	X	
MW-1	1/29/19	14:35	X				X			7	X	X	X	X	X	X	X	X	
MW-4	1/29/19	14:50	X				X			7	X	X	X	X	X	X	X	X	
FB	1/29/19	15:30	X				X			7	X	X	X	X	X	X	X	X	

Analyses Requested — Preservation Codes

For Lab Use Only

SF #: _____

SCR #: _____

Preservation Codes

H = HCl | T = Thiosulfate

N = HNO_3 | B = NaOH

S = H_2SO_4 | P = H_3PO_4

O = Other

Remarks

Metals: Ba, B, Ca, Cr

Co, Li, Se, Tl, Sb, As

Be, Cd, Pb, Mo, Hg

Lab to filter

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐

(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: jblaney@wcdgroup.com

Phone: 609-730-0007

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type IV (CLP SOW) ☐ TX TRRP-13 ☐

Type VI (Raw Data Only) ☐

EDD Required? Yes ☐ No ☐ If yes, format: _____

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	1/31/19	1028	[signature]		1028
[signature]	1/31/19	1355	[signature]	1/31/19	1355
[signature]	1/31/19	1652			
			[signature]	1/31/19	1652

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.8-2.6 °C

Environmental Analysis Request/Chain of Custody

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Acct. # 44064 Group # 2027520 Sample # 9978103-113

Client: WCD Group	
Project Name/#: Former PSEG Hudson	Site ID #:
Project Manager: Jim Blaney	P.O. #:
Sampler: Fabio Iannacci	PWSID #:
Phone #:	Quote #:
State where sample(s) were collected: NJ	

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Water: Potable	Ground	NPDES	Surface	Other:	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 228, Ra 226
MW-9	1/30/19	11:15	X				X					7	X	X	X	X	X	X	X	X
MW-2	1/30/19	13:20	X				X					7	X	X	X	X	X	X	X	X
MW-3	1/30/19	15:15	X				X					7	X	X	X	X	X	X	X	X
FB-2	1/30/19	15:45	X				X					7	X	X	X	X	X	X	X	X

Analyses Requested / Preservation Codes

For Lab Use Only
SF #:
SCR #:

Preservation Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 P = H_3PO_4
O = Other

Remarks
- Metals: Ba, B, Ca, Cr
- Co, Li, Se, Tl, Sb, As
- Be, Cd, Pb, Mo, Hg
- Lab to filter

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: jblaney@wcdgroup.com

Phone: 609-730-0007

Data Package Options (please check if required)

Type I (Validation/non-CLP)	☐	MA MCP	☐
Type III (Reduced non-CLP)	☐	CT RCP	☐
Type IV (CLP SOW)	☐	TX TRRP-13	☐
Type VI (Raw Data Only)	☐		

EDD Required? Yes ☐ No ☐ If yes, format: _____

Relinquished by:	Date	Time	Received by:	Date	Time
	1/31/19	1028		1/31/19	1029
	1/31/19	13:58		1/31/19	13:55
	1/31/19	1652			
				1/31/19	1652

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.8-2.6 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 239954

Group Number(s): 2027520

Client: WCD Group

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	01/31/2019 16:52
Number of Packages:	5	Number of Projects:	3
State/Province of Origin:	NJ		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Ariel Garcia (15332) at 20:21 on 01/31/2019

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-02	0.8	DT	Wet	Y	Loose	N
2	32170023	2.6	IR	Wet	Y	Loose	N
3	32170023	1.1	IR	Wet	Y	Loose	N
4	32170023	2.3	IR	Wet	Y	Loose	N
5	DT42-02	0.8	DT	Wet	Y	Loose	N

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Lancaster, PA 17605-2425
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F : 717-656-2681
www.LancasterLabs.com

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-32827-1
Client Project/Site: Ra-226/228: GW Monitoring

For:
Eurofins Lancaster Laboratories Env LLC
2425 New Holland Pike
Lancaster, Pennsylvania 17601

Attn: Jenifer Lewis

Authorized for release by:
3/6/2019 10:21:22 AM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

LINKS
Review your project results through TotalAccess
Have a Question? Ask The Expert
Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 160-32827-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Eurofins Lancaster Laboratories Env LLC

Project: Ra-226/228: GW Monitoring

Report Number: 160-32827-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 2/5/2019 9:20 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.9º C and 1.1º C.

For GFPC analyses, the following sample was analyzed at a reduced aliquot due to sediment in the sample matrix: MW-5 (160-32827-2).

RADIUM-226 (GFPC)

Job ID: 160-32827-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Samples MW-8 (160-32827-1), MW-5 (160-32827-2), MW-6 (160-32827-3), MW-7 (160-32827-4), MW-1 (160-32827-5), MW-4 (160-32827-6), FB (160-32827-7), MW-9 (160-32827-8), MW-2 (160-32827-9), MW-3 (160-32827-10) and FB-2 (160-32827-11) were analyzed for Radium-226 (GFPC) in accordance with EPA Method 903.0. The samples were prepared on 02/08/2019 and analyzed on 03/04/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228 (GFPC)

Samples MW-8 (160-32827-1), MW-5 (160-32827-2), MW-6 (160-32827-3), MW-7 (160-32827-4), MW-1 (160-32827-5), MW-4 (160-32827-6), FB (160-32827-7), MW-9 (160-32827-8), MW-2 (160-32827-9), MW-3 (160-32827-10) and FB-2 (160-32827-11) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 02/08/2019 and analyzed on 02/28/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Environmental Analysis Request/Chain of Custody

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Acct. # _____ Group # 2027520 Sample # 9978103-13

Subcontractor:	TestAmerica-St. Louis		
Project Name/#:	2027520	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler:		PWSID #:	
Phone #:	717-556-7383	Quote #:	
State where samples were collected:	NJ	For Compliance:	Yes ☑ No ☐

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water: Potable	Ground	Surface	NPDES	Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod)	Remarks
MW-8	1/29/2019	0950	X					X					2	X	X	9978103
MW-5	1/29/2019	1020	X					X					2	X	X	9978104
MW-6	1/29/2019	1205	X					X					2	X	X	9978105
MW-7	1/29/2019	1220	X					X					2	X	X	9978106
MW-1	1/29/2019	1435	X					X					2	X	X	9978107
MW-4	1/29/2019	1450	X					X					2	X	X	9978108
FB	1/29/2019	1530	X					X					2	X	X	9978109
MW-9	1/30/2019	1115	X					X					2	X	X	9978110
MW-2	1/30/2019	1320	X					X					2	X	X	9978111
MW-3	1/30/2019	1515	X					X					2	X	X	9978112
FB-2	1/30/2019	1545	X					X					2	X	X	9978113

Preservation and Filtration Codes: ok to preserve upon receipt.

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 P = H_3PO_4
F = Field Filtered O = Other

160-32827 Chain of Custody

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: ELLE_Subcontracting@EurofinsUS.com

Phone: 717-556-7383

Data Package Options (please check if required) ☐ Full Data Package

Type I (Validation/non-CLP)	☐	MA MCP	☐
Type III (Reduced non-CLP)	☐	CT RCP	☐
Type VI (Raw Data Only)	☐	TX TRRP-13	☐
NJ DKQP	☑	NYSDEC Category	☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: HazSite

Relinquished by:	Date	Time	Received by:	Date	Time
Kathey Binkley	2-4-19	1615	[signature]	2-5-19	0920
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

Login Sample Receipt Checklist

Client: Eurofins Lancaster Laboratories Env LLC

Job Number: 160-32827-1

Login Number: 32827
List Number: 1
Creator: Press, Nicholas B

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Ra-226/228: GW Monitoring

TestAmerica Job ID: 160-32827-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Ra-226/228: GW Monitoring

TestAmerica Job ID: 160-32827-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency
None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Ra-226/228: GW Monitoring

TestAmerica Job ID: 160-32827-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-32827-1	MW-8	Water	01/29/19 09:50	02/05/19 09:20
160-32827-2	MW-5	Water	01/29/19 10:20	02/05/19 09:20
160-32827-3	MW-6	Water	01/29/19 12:05	02/05/19 09:20
160-32827-4	MW-7	Water	01/29/19 12:20	02/05/19 09:20
160-32827-5	MW-1	Water	01/29/19 14:35	02/05/19 09:20
160-32827-6	MW-4	Water	01/29/19 14:50	02/05/19 09:20
160-32827-7	FB	Water	01/29/19 15:30	02/05/19 09:20
160-32827-8	MW-9	Water	01/30/19 11:15	02/05/19 09:20
160-32827-9	MW-2	Water	01/30/19 13:20	02/05/19 09:20
160-32827-10	MW-3	Water	01/30/19 15:15	02/05/19 09:20
160-32827-11	FB-2	Water	01/30/19 15:45	02/05/19 09:20

Client Sample ID: MW-8
Lab Sample ID: 160-32827-1
Date Collected: 01/29/19 09:50
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.169		0.0914	0.0927	1.00	0.105	pCi/L	02/08/19 12:54	03/04/19 06:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.7*		*40 - 110*	*02/08/19 12:54*	*03/04/19 06:18*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0767	U	0.192	0.193	1.00	0.333	pCi/L	02/08/19 13:25	02/28/19 09:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.7*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*
Y Carrier	*86.7*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*

Client Sample ID: MW-5
Lab Sample ID: 160-32827-2
Date Collected: 01/29/19 10:20
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.368		0.154	0.157	1.00	0.145	pCi/L	02/08/19 12:54	03/04/19 06:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.0*		*40 - 110*	*02/08/19 12:54*	*03/04/19 06:18*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.789		0.327	0.335	1.00	0.455	pCi/L	02/08/19 13:25	02/28/19 09:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.0*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*
Y Carrier	*85.6*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*

Client Sample ID: MW-6
Lab Sample ID: 160-32827-3
Date Collected: 01/29/19 12:05
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.238		0.112	0.114	1.00	0.122	pCi/L	02/08/19 12:54	03/04/19 06:18	1

Client Sample ID: MW-6
Lab Sample ID: 160-32827-3
Date Collected: 01/29/19 12:05
Matrix: Water
Date Received: 02/05/19 09:20

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.7		40 - 110	02/08/19 12:54	03/04/19 06:18	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.191	U	0.227	0.227	1.00	0.374	pCi/L	02/08/19 13:25	02/28/19 09:52	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.7		40 - 110	02/08/19 13:25	02/28/19 09:52	1
Y Carrier	86.7		40 - 110	02/08/19 13:25	02/28/19 09:52	1

Client Sample ID: MW-7
Lab Sample ID: 160-32827-4
Date Collected: 01/29/19 12:20
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.00810	U	0.0825	0.0825	1.00	0.169	pCi/L	02/08/19 12:54	03/04/19 06:18	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.4		40 - 110	02/08/19 12:54	03/04/19 06:18	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.137	U	0.204	0.204	1.00	0.343	pCi/L	02/08/19 13:25	02/28/19 09:52	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.4		40 - 110	02/08/19 13:25	02/28/19 09:52	1
Y Carrier	85.6		40 - 110	02/08/19 13:25	02/28/19 09:52	1

Client Sample ID: MW-1
Lab Sample ID: 160-32827-5
Date Collected: 01/29/19 14:35
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**1.32**		0.225	0.254	1.00	0.108	pCi/L	02/08/19 12:54	03/04/19 08:25	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	100		40 - 110	02/08/19 12:54	03/04/19 08:25	1

Client Sample ID: MW-1
Lab Sample ID: 160-32827-5
Date Collected: 01/29/19 14:35
Matrix: Water
Date Received: 02/05/19 09:20

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.78		0.317	0.357	1.00	0.310	pCi/L	02/08/19 13:25	02/28/19 09:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*100*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*
Y Carrier	*85.2*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*

Client Sample ID: MW-4
Lab Sample ID: 160-32827-6
Date Collected: 01/29/19 14:50
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.363		0.130	0.134	1.00	0.122	pCi/L	02/08/19 12:54	03/04/19 08:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.0*		*40 - 110*	*02/08/19 12:54*	*03/04/19 08:25*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.171	U	0.224	0.224	1.00	0.372	pCi/L	02/08/19 13:25	02/28/19 09:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.0*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*
Y Carrier	*90.5*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:52*	*1*

Client Sample ID: FB
Lab Sample ID: 160-32827-7
Date Collected: 01/29/19 15:30
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0233	U	0.0447	0.0448	1.00	0.116	pCi/L	02/08/19 12:54	03/04/19 08:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.0*		*40 - 110*	*02/08/19 12:54*	*03/04/19 08:25*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.113	U	0.208	0.208	1.00	0.354	pCi/L	02/08/19 13:25	02/28/19 09:53	1

Client Sample ID: FB

Lab Sample ID: 160-32827-7

Date Collected: 01/29/19 15:30

Matrix: Water

Date Received: 02/05/19 09:20

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	95.0		40 - 110	02/08/19 13:25	02/28/19 09:53	1
Y Carrier	87.5		40 - 110	02/08/19 13:25	02/28/19 09:53	1

Client Sample ID: MW-9

Lab Sample ID: 160-32827-8

Date Collected: 01/30/19 11:15

Matrix: Water

Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.180**		0.0954	0.0967	1.00	0.103	pCi/L	02/08/19 12:54	03/04/19 08:25	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.2		40 - 110	02/08/19 12:54	03/04/19 08:25	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0634	U	0.200	0.200	1.00	0.351	pCi/L	02/08/19 13:25	02/28/19 09:53	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.2		40 - 110	02/08/19 13:25	02/28/19 09:53	1
Y Carrier	87.1		40 - 110	02/08/19 13:25	02/28/19 09:53	1

Client Sample ID: MW-2

Lab Sample ID: 160-32827-9

Date Collected: 01/30/19 13:20

Matrix: Water

Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**2.07**		0.272	0.330	1.00	0.0965	pCi/L	02/08/19 12:54	03/04/19 08:25	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	105		40 - 110	02/08/19 12:54	03/04/19 08:25	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**2.73**		0.364	0.443	1.00	0.302	pCi/L	02/08/19 13:25	02/28/19 09:53	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	105		40 - 110	02/08/19 13:25	02/28/19 09:53	1
Y Carrier	84.9		40 - 110	02/08/19 13:25	02/28/19 09:53	1

Client Sample ID: MW-3
Lab Sample ID: 160-32827-10
Date Collected: 01/30/19 15:15
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.132	U	0.0975	0.0982	1.00	0.136	pCi/L	02/08/19 12:54	03/04/19 08:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.0*		*40 - 110*	*02/08/19 12:54*	*03/04/19 08:25*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0483	U	0.228	0.228	1.00	0.415	pCi/L	02/08/19 13:25	02/28/19 09:53	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.0*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:53*	*1*
Y Carrier	*89.7*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:53*	*1*

Client Sample ID: FB-2
Lab Sample ID: 160-32827-11
Date Collected: 01/30/19 15:45
Matrix: Water
Date Received: 02/05/19 09:20

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0705	U	0.0637	0.0640	1.00	0.0910	pCi/L	02/08/19 12:54	03/04/19 08:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.2*		*40 - 110*	*02/08/19 12:54*	*03/04/19 08:25*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0160	U	0.177	0.177	1.00	0.324	pCi/L	02/08/19 13:25	02/28/19 09:56	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.2*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:56*	*1*
Y Carrier	*90.1*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:56*	*1*

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-414196/23-A
Matrix: Water
Analysis Batch: 417562

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 414196

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.03794	U	0.0514	0.0516	1.00	0.135	pCi/L	02/08/19 12:54	03/04/19 10:42	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.1*		*40 - 110*	*02/08/19 12:54*	*03/04/19 10:42*	*1*

Lab Sample ID: LCS 160-414196/1-A
Matrix: Water
Analysis Batch: 417536

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 414196

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	8.876		0.986	1.00	0.125	pCi/L	78	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.9*		*40 - 110*

Lab Sample ID: LCSD 160-414196/2-A
Matrix: Water
Analysis Batch: 417536

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 414196

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226			11.4	8.447		0.934	1.00	0.0873	pCi/L	74	68 - 137	0.22	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*105*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-414198/23-A
Matrix: Water
Analysis Batch: 417284

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 414198

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2392	U	0.221	0.222	1.00	0.357	pCi/L	02/08/19 13:25	02/28/19 09:56	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.1*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:56*	*1*
Y Carrier	*87.9*		*40 - 110*	*02/08/19 13:25*	*02/28/19 09:56*	*1*

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Ra-226/228: GW Monitoring

TestAmerica Job ID: 160-32827-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-414198/1-A
Matrix: Water
Analysis Batch: 417283

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 414198

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			9.44	9.104		1.06	1.00	0.355	pCi/L	96	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*97.9*		*40 - 110*
Y Carrier	*84.9*		*40 - 110*

Lab Sample ID: LCSD 160-414198/2-A
Matrix: Water
Analysis Batch: 417283

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 414198

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			9.44	8.652		0.985	1.00	0.327	pCi/L	92	56 - 140	0.22	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*105*		*40 - 110*
Y Carrier	*92.3*		*40 - 110*

QC Association Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Ra-226/228: GW Monitoring

TestAmerica Job ID: 160-32827-1

Rad

Prep Batch: 414196

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-32827-1	MW-8	Total/NA	Water	PrecSep-21	
160-32827-2	MW-5	Total/NA	Water	PrecSep-21	
160-32827-3	MW-6	Total/NA	Water	PrecSep-21	
160-32827-4	MW-7	Total/NA	Water	PrecSep-21	
160-32827-5	MW-1	Total/NA	Water	PrecSep-21	
160-32827-6	MW-4	Total/NA	Water	PrecSep-21	
160-32827-7	FB	Total/NA	Water	PrecSep-21	
160-32827-8	MW-9	Total/NA	Water	PrecSep-21	
160-32827-9	MW-2	Total/NA	Water	PrecSep-21	
160-32827-10	MW-3	Total/NA	Water	PrecSep-21	
160-32827-11	FB-2	Total/NA	Water	PrecSep-21	
MB 160-414196/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-414196/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-414196/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 414198

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-32827-1	MW-8	Total/NA	Water	PrecSep_0	
160-32827-2	MW-5	Total/NA	Water	PrecSep_0	
160-32827-3	MW-6	Total/NA	Water	PrecSep_0	
160-32827-4	MW-7	Total/NA	Water	PrecSep_0	
160-32827-5	MW-1	Total/NA	Water	PrecSep_0	
160-32827-6	MW-4	Total/NA	Water	PrecSep_0	
160-32827-7	FB	Total/NA	Water	PrecSep_0	
160-32827-8	MW-9	Total/NA	Water	PrecSep_0	
160-32827-9	MW-2	Total/NA	Water	PrecSep_0	
160-32827-10	MW-3	Total/NA	Water	PrecSep_0	
160-32827-11	FB-2	Total/NA	Water	PrecSep_0	
MB 160-414198/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-414198/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-414198/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Ra-226/228: GW Monitoring

TestAmerica Job ID: 160-32827-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
160-32827-1	MW-8	99.7
160-32827-2	MW-5	95.0
160-32827-3	MW-6	94.7
160-32827-4	MW-7	94.4
160-32827-5	MW-1	100
160-32827-6	MW-4	95.0
160-32827-7	FB	95.0
160-32827-8	MW-9	91.2
160-32827-9	MW-2	105
160-32827-10	MW-3	87.0
160-32827-11	FB-2	98.2
LCS 160-414196/1-A	Lab Control Sample	97.9
LCSD 160-414196/2-A	Lab Control Sample Dup	105
MB 160-414196/23-A	Method Blank	99.1

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
160-32827-1	MW-8	99.7	86.7
160-32827-2	MW-5	95.0	85.6
160-32827-3	MW-6	94.7	86.7
160-32827-4	MW-7	94.4	85.6
160-32827-5	MW-1	100	85.2
160-32827-6	MW-4	95.0	90.5
160-32827-7	FB	95.0	87.5
160-32827-8	MW-9	91.2	87.1
160-32827-9	MW-2	105	84.9
160-32827-10	MW-3	87.0	89.7
160-32827-11	FB-2	98.2	90.1
LCS 160-414198/1-A	Lab Control Sample	97.9	84.9
LCSD 160-414198/2-A	Lab Control Sample Dup	105	92.3
MB 160-414198/23-A	Method Blank	99.1	87.9

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

WCD Group
1108 Old Thomasville Rd.
High Point NC 27260

Report Date: April 28, 2019 00:55

Project: PSEG Hudson

Account #: 44064
Group Number: 2034655
SDG: WCD05
PO Number: 18-11432
State of Sample Origin: NJ

Electronic Copy To	WCD Group	Attn: Scott McDonald
Electronic Copy To	WCD Group	Attn: Jim Blaney

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-5 Grab Groundwater	03/18/2019 09:55	1013785
MW-8 Grab Groundwater	03/18/2019 09:55	1013786
MW-6 Grab Groundwater	03/18/2019 11:15	1013787
MW-7 Grab Groundwater	03/18/2019 11:20	1013788
MW-1 Grab Groundwater	03/18/2019 13:05	1013789
MW-9 Grab Groundwater	03/18/2019 13:10	1013790
MW-4 Grab Groundwater	03/18/2019 14:50	1013791
FB-01 Grab Water	03/18/2019 13:55	1013792
MW-2 Grab Groundwater	03/19/2019 10:10	1013793
MW-3 Grab Groundwater	03/19/2019 11:50	1013794
FB-02 Grab Water	03/19/2019 12:45	1013795

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: WCD Group
Project: PSEG Hudson
Sampling Date(s): 03/18/19 - 03/19/19
Laboratory Sample ID(s): 1013785-1013795
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011; SW-846 6010D Rev.4, July 2014; SW-846 6020B Rev.2, July 2014; SW-846 7470A

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	No
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

Kenneth Boley
Senior Specialist, Quality Assurance

04/28/2019



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Project Name: PSEG Hudson
ELLE Group #: 2034655

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.

Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Sample #s: 1013785-1013795

The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.

Analysis Specific Comments:

SW-846 6010D Rev.4, July 2014, Metals Dissolved

Sample #s: 1013785, 1013786, 1013787, 1013788, 1013789, 1013790, 1013791, 1013792, 1013793, 1013794, 1013795

The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.

Sample #s: 1013785, 1013786, 1013787, 1013788, 1013789, 1013790, 1013791, 1013792, 1013793, 1013794, 1013795

The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.

SW-846 6020B Rev.2, July 2014, Metals Dissolved

Batch #: 190841404707A (Sample number(s): 1013785-1013795 UNSPK: 1013787 BKG: 1013787)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Antimony, Arsenic

SM 2540 C-2011, Wet Chemistry

Batch #: 19081921203A (Sample number(s): 1013785, 1013788-1013792 UNSPK: 1013785 BKG: 1013785-1013786)

The duplicate RPD for the following analyte(s) exceeded the acceptance window: Total Dissolved Solids

Sample Description: **MW-5 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 09:55
SDG#: WCD05-01

WCD Group
ELLE Sample #: GW 1013785
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.108	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.342	0.0120	0.0500	1
01750	Calcium	7440-70-2	140	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0233 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K3K2K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00074 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00082 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0024	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	1,430	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	10.0	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,370	400	1,200	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 09:55
SDG#: WCD05-01

WCD Group
ELLE Sample #: GW 1013785
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.3	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:54	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 21:54	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:13	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:13	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:13	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:13	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:13	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190850571303	03/28/2019 07:57	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190841404402	03/25/2019 08:50	Denise L Trimby	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-5 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 09:55
SDG#: WCD05-01

WCD Group
ELLE Sample #: GW 1013785
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571303	03/27/2019 10:05	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	19098520115A	04/08/2019 18:00	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	19098520115A	04/08/2019 17:46	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19098520115A	04/08/2019 17:46	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921203A	03/22/2019 15:10	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:25	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:25	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 09:55
SDG#: WCD05-02

WCD Group
ELLE Sample #: GW 1013786
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0162	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.132	0.0120	0.0500	1
01750	Calcium	7440-70-2	6.76	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0080	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K3K2K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00049 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00081 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	0.00019 J	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0014 J	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	69.9	10.0	20.0	50
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	26.6	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	306	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 09:55
SDG#: WCD05-02

WCD Group
ELLE Sample #: GW 1013786
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.2	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:58	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 21:58	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:15	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:15	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:15	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:15	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:15	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190850571303	03/28/2019 07:55	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190841404402	03/25/2019 08:50	Denise L Trimby	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 09:55
SDG#: WCD05-02

WCD Group
ELLE Sample #: GW 1013786
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571303	03/27/2019 10:05	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	19099520115A	04/09/2019 13:58	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	19099520115A	04/09/2019 13:16	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19099520115A	04/09/2019 13:16	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921203B	03/22/2019 15:10	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:48	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:48	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 11:15
SDG#: WCD05-03

WCD Group
ELLE Sample #: GW 1013787
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0189	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.251	0.0120	0.0500	1
01750	Calcium	7440-70-2	45.3	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00047 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.00098 J	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0129	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	78.9	10.0	20.0	50
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	47.6	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	373	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 11:15
SDG#: WCD05-03

WCD Group
ELLE Sample #: GW 1013787
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.3	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:58	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 21:25	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 21:54	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 21:54	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 21:54	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 21:54	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 21:54	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190860571308	03/28/2019 07:10	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190821404402	03/25/2019 15:40	JoElla L Rice	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 11:15
SDG#: WCD05-03

WCD Group
ELLE Sample #: GW 1013787
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571302	03/26/2019 19:00	Barbara A Kane	1
05713	WW SW846 Hg Digest	SW-846 7470A	2	190860571308	03/27/2019 18:15	Barbara A Kane	1
00224	Chloride	EPA 300.0	1	19099520115A	04/09/2019 13:01	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	19099520115A	04/09/2019 12:47	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19099520115A	04/09/2019 12:47	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921202B	03/22/2019 14:43	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 20:00	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 20:00	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 11:20
SDG#: WCD05-04

WCD Group
ELLE Sample #: GW 1013788
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0178	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.0739	0.0120	0.0500	1
01750	Calcium	7440-70-2	22.2	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.00044 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0048	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	16.3	1.0	2.0	5
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	7.8	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	141	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 11:20
SDG#: WCD05-04

WCD Group
ELLE Sample #: GW 1013788
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	8.0	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:05	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 22:01	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:18	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:18	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:18	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:18	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:18	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190860571308	03/28/2019 07:16	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190821404402	03/25/2019 15:40	JoElla L Rice	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 11:20
SDG#: WCD05-04

WCD Group
ELLE Sample #: GW 1013788
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571302	03/26/2019 19:00	Barbara A Kane	1
05713	WW SW846 Hg Digest	SW-846 7470A	2	190860571308	03/27/2019 18:15	Barbara A Kane	1
00224	Chloride	EPA 300.0	1	19098520115A	04/08/2019 16:07	Ashlynn M Cornelius	5
01504	Fluoride	EPA 300.0	1	19098520115A	04/08/2019 16:07	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19098520115A	04/08/2019 16:07	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921203A	03/22/2019 15:10	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:56	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:56	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:05
SDG#: WCD05-05

WCD Group
ELLE Sample #: GW 1013789
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.673	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	1.17	0.0120	0.0500	1
01750	Calcium	7440-70-2	361	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0027 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0765	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0031	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0030	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0039	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,180	400	800	2000
01504	Fluoride	16984-48-8	0.86	0.25	0.50	5
00228	Sulfate	14808-79-8	113	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	11,400	1,600	4,800	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:05
SDG#: WCD05-05

WCD Group
ELLE Sample #: GW 1013789
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.6	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:40	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:40	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:40	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:40	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:40	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:40	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190841404402	04/01/2019 10:24	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190841404402	04/01/2019 10:24	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 22:05	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:20	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:20	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:20	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:20	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:20	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190860571308	03/28/2019 07:18	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190841404402	03/25/2019 08:50	Denise L Trimby	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:05
SDG#: WCD05-05

WCD Group
ELLE Sample #: GW 1013789
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571302	03/26/2019 19:00	Barbara A Kane	1
05713	WW SW846 Hg Digest	SW-846 7470A	2	190860571308	03/27/2019 18:15	Barbara A Kane	1
00224	Chloride	EPA 300.0	2	19098520115A	04/09/2019 14:14	Ashlynn M Cornelius	2000
01504	Fluoride	EPA 300.0	1	19098520115A	04/08/2019 16:35	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19098520115A	04/08/2019 16:49	Ashlynn M Cornelius	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921203A	03/22/2019 15:10	Amy L Hankins	10
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 20:04	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 20:04	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:10
SDG#: WCD05-06

WCD Group
ELLE Sample #: GW 1013790
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.156	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.131	0.0120	0.0500	1
01750	Calcium	7440-70-2	45.1	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0268 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0125	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0073	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	48.7	20.0	40.0	100
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	26.9	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	293	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:10
SDG#: WCD05-06

WCD Group
ELLE Sample #: GW 1013790
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.6	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:08	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 22:08	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:22	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:22	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:22	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:22	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:22	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190860571308	03/28/2019 07:20	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190821404402	03/25/2019 15:40	JoElla L Rice	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:10
SDG#: WCD05-06

WCD Group
ELLE Sample #: GW 1013790
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571302	03/26/2019 19:00	Barbara A Kane	1
05713	WW SW846 Hg Digest	SW-846 7470A	2	190860571308	03/27/2019 18:15	Barbara A Kane	1
00224	Chloride	EPA 300.0	1	19099520115A	04/09/2019 15:08	Ashlynn M Cornelius	100
01504	Fluoride	EPA 300.0	1	19099520115A	04/09/2019 14:54	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19099520115A	04/09/2019 14:54	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921203A	03/22/2019 15:10	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:21	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:21	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 14:50
SDG#: WCD05-07

WCD Group
ELLE Sample #: GW 1013791
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.416	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.787	0.0120	0.0500	1
01750	Calcium	7440-70-2	94.1	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0223 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0015 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0048	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	1,690	200	400	1000
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	273	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	7,600	800	2,400	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 14:50
SDG#: WCD05-07

WCD Group
ELLE Sample #: GW 1013791
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.4	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.6	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:18	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 22:12	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:25	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:25	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:25	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:25	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:25	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190850571303	03/28/2019 07:51	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190821404402	03/25/2019 15:40	JoElla L Rice	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 14:50
SDG#: WCD05-07

WCD Group
ELLE Sample #: GW 1013791
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571303	03/27/2019 10:05	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	19099520115A	04/12/2019 05:14	Hallie A Burnett	1000
01504	Fluoride	EPA 300.0	1	19099520115A	04/09/2019 14:12	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19099520115A	04/09/2019 14:26	Ashlynn M Cornelius	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921203A	03/22/2019 15:10	Amy L Hankins	10
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:33	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:33	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-01 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:55
SDG#: WCD05-08FB

WCD Group
ELLE Sample #: **GW 1013792**
ELLE Group #: **2034655**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.0126 J	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.0472 J	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D. K3K4	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D.	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **FB-01 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:55
SDG#: WCD05-08FB

WCD Group
ELLE Sample #: **GW 1013792**
ELLE Group #: **2034655**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.3	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.0	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190841404402	03/27/2019 19:44	Elaine F Stoltzfus	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 22:16	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:27	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:27	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:27	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:27	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:27	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190850571303	03/28/2019 07:53	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190841404402	03/25/2019 08:50	Denise L Trimby	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-01 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/18/2019 13:55
SDG#: WCD05-08FB

WCD Group
ELLE Sample #: **GW 1013792**
ELLE Group #: **2034655**
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571303	03/27/2019 10:05	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	19098520115A	04/08/2019 18:28	Ashlynn M Cornelius	1
01504	Fluoride	EPA 300.0	1	19098520115A	04/08/2019 18:28	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	19098520115A	04/08/2019 18:28	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921203A	03/22/2019 15:10	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:44	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:44	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 10:10
SDG#: WCD05-09

WCD Group
ELLE Sample #: GW 1013793
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	1.91	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.833	0.0120	0.0500	1
01750	Calcium	7440-70-2	430	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	0.0037 J	0.0015	0.0050	1
01756	Lithium	7439-93-2	0.0467 J	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0022	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0044	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0030	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	6,470	1,000	2,000	5000
01504	Fluoride	16984-48-8	0.77	0.25	0.50	5
00228	Sulfate	14808-79-8	14.6	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	10,600	1,600	4,800	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 10:10
SDG#: WCD05-09

WCD Group
ELLE Sample #: GW 1013793
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.6	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:01	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 22:19	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:29	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:29	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:29	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:29	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:29	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190860571308	03/28/2019 07:22	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190821404402	03/25/2019 15:40	JoElla L Rice	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 10:10
SDG#: WCD05-09

WCD Group
ELLE Sample #: GW 1013793
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571302	03/26/2019 19:00	Barbara A Kane	1
05713	WW SW846 Hg Digest	SW-846 7470A	2	190860571308	03/27/2019 18:15	Barbara A Kane	1
00224	Chloride	EPA 300.0	1	19099520115A	04/12/2019 05:32	Hallie A Burnett	5000
01504	Fluoride	EPA 300.0	1	19099520115A	04/09/2019 15:23	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19099520115A	04/09/2019 15:23	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921202A	03/22/2019 14:43	Amy L Hankins	10
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:29	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:29	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 11:50
SDG#: WCD05-10

WCD Group
ELLE Sample #: GW 1013794
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	0.0260	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	0.196	0.0120	0.0500	1
01750	Calcium	7440-70-2	39.6	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	0.0013 J	0.00041	0.0020	1
06025	Arsenic	7440-38-2	0.0029	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	0.0117	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	61.6	10.0	20.0	50
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	32.5	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	344	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 11:50
SDG#: WCD05-10

WCD Group
ELLE Sample #: GW 1013794
ELLE Group #: 2034655
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.9	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 06:11	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/25/2019 22:23	Bradley M Berlot	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:32	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:32	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:32	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:32	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:32	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190860571308	03/28/2019 07:24	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190821404402	03/25/2019 15:40	JoElla L Rice	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Grab Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 11:50
SDG#: WCD05-10

WCD Group
ELLE Sample #: GW 1013794
ELLE Group #: 2034655
Matrix: Groundwater

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571302	03/26/2019 19:00	Barbara A Kane	1
05713	WW SW846 Hg Digest	SW-846 7470A	2	190860571308	03/27/2019 18:15	Barbara A Kane	1
00224	Chloride	EPA 300.0	1	19098520115A	04/08/2019 18:56	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	19098520115A	04/08/2019 18:42	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19098520115A	04/08/2019 18:42	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19081921202A	03/22/2019 14:43	Amy L Hankins	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:41	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:41	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-02 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 12:45
SDG#: WCD05-11FB

WCD Group
ELLE Sample #: **GW 1013795**
ELLE Group #: **2034655**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Metals Dissolved	**SW-846 6010D Rev.4, July 2014**		**mg/l**	**mg/l**	**mg/l**	
07046	Barium	7440-39-3	N.D.	0.0010	0.0050	1
	The NJ DKQP analyte list requirement was not met for Metals. The client specified list is reported.					
08014	Boron	7440-42-8	N.D.	0.0120	0.0500	1
01750	Calcium	7440-70-2	0.0473 J	0.0330	0.500	1
07051	Chromium	7440-47-3	N.D.	0.0053	0.0150	1
07052	Cobalt	7440-48-4	N.D.	0.0015	0.0050	1
01756	Lithium	7439-93-2	N.D.	0.0110	0.0500	1
07036	Selenium	7782-49-2	N.D.	0.0210	0.0500	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
07022	Thallium	7440-28-0	N.D.	0.0140	0.0300	1
	The NJ DKQP required reporting limit could not be attained using the laboratory LOQ. The analyte was evaluated using the MDL.					
	SW-846 6020B Rev.2, July 2014		**mg/l**	**mg/l**	**mg/l**	
06024	Antimony	7440-36-0	N.D. K1	0.00041	0.0020	1
06025	Arsenic	7440-38-2	N.D.	0.00068	0.0020	1
06027	Beryllium	7440-41-7	N.D.	0.000091	0.00050	1
06028	Cadmium	7440-43-9	N.D.	0.00015	0.0010	1
06035	Lead	7439-92-1	N.D.	0.0011	0.0030	1
06038	Molybdenum	7439-98-7	N.D.	0.00031	0.0020	1
	SW-846 7470A		**mg/l**	**mg/l**	**mg/l**	
00259	Mercury	7439-97-6	N.D.	0.000050	0.00020	1
03277	**Lab Filtration - Metals**					
	The holding time was not met for dissolved sample filtration. The filtration time for dissolved metals is to be within 15 minutes from collection. Since the filtration occurred after receipt in the laboratory, the 15 minute criteria was exceeded. This sample was not collected per applicable Clean Water Act (40CFR136) or SW-846 regulations.					
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	

*=This limit was used in the evaluation of the final result

Sample Description: **FB-02 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 12:45
SDG#: WCD05-11FB

WCD Group
ELLE Sample #: **GW 1013795**
ELLE Group #: **2034655**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**SM 2550 B-2010**		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.7	0.010	0.010	1
Wet Chemistry	**SM 4500-H+ B-2011**		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	5.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07046	Barium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
08014	Boron	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
01750	Calcium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
07051	Chromium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
07052	Cobalt	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
01756	Lithium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
07036	Selenium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
07022	Thallium	SW-846 6010D Rev.4, July 2014	1	190821404402	04/04/2019 05:55	Lisa J Cooke	1
06024	Antimony	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:39	Patrick J Engle	1
06025	Arsenic	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:39	Patrick J Engle	1
06027	Beryllium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:39	Patrick J Engle	1
06028	Cadmium	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:39	Patrick J Engle	1
06035	Lead	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:39	Patrick J Engle	1
06038	Molybdenum	SW-846 6020B Rev.2, July 2014	1	190841404707A	04/18/2019 22:39	Patrick J Engle	1
00259	Mercury	SW-846 7470A	1	190850571303	03/28/2019 07:49	Damary Valentin	1
14044	ICP-WW, 3005A (tot rec) - U345	SW-846 3005A	1	190821404402	03/25/2019 15:40	JoElla L Rice	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-02 Grab Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 03/20/2019 16:10
Collection Date/Time: 03/19/2019 12:45
SDG#: WCD05-11FB

WCD Group
ELLE Sample #: **GW 1013795**
ELLE Group #: **2034655**
Matrix: Water

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14047	ICPMS - Water, 3020A - U345	SW-846 3020A	1	190841404707	03/26/2019 08:35	Denise L Trimby	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	190850571303	03/27/2019 10:05	Denise L Trimby	1
00224	Chloride	EPA 300.0	1	19098520115A	04/08/2019 19:10	Ashlynn M Cornelius	1
01504	Fluoride	EPA 300.0	1	19098520115A	04/08/2019 19:10	Ashlynn M Cornelius	1
00228	Sulfate	EPA 300.0	1	19098520115A	04/08/2019 19:10	Ashlynn M Cornelius	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	19084921203A	03/25/2019 19:55	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19081008201A	03/22/2019 19:52	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19081008201A	03/22/2019 19:52	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: WCD Group
Reported: 04/28/2019 00:55

Group Number: 2034655

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 190821404402	Sample number(s): 1013787-1013788,1013790-1013791,1013793-1013795		
Barium	N.D.	0.0010	0.0050
Boron	N.D.	0.0120	0.0500
Calcium	N.D.	0.0330	0.500
Chromium	N.D.	0.0053	0.0150
Cobalt	N.D.	0.0015	0.0050
Lithium	N.D.	0.0110	0.0500
Selenium	N.D.	0.0210	0.0500
Thallium	N.D.	0.0140	0.0300
Batch number: 190841404402	Sample number(s): 1013785-1013786,1013789,1013792		
Barium	N.D.	0.0010	0.0050
Boron	N.D.	0.0120	0.0500
Calcium	N.D.	0.0330	0.500
Chromium	N.D.	0.0053	0.0150
Cobalt	N.D.	0.0015	0.0050
Lithium	N.D.	0.0110	0.0500
Selenium	N.D.	0.0210	0.0500
Thallium	N.D.	0.0140	0.0300
Batch number: 190841404707A	Sample number(s): 1013785-1013795		
Antimony	0.00053 J	0.00041	0.0020
Arsenic	N.D.	0.00068	0.0020
Beryllium	N.D.	0.000091	0.00050
Cadmium	N.D.	0.00015	0.0010
Lead	N.D.	0.0011	0.0030
Molybdenum	N.D.	0.00031	0.0020
Batch number: 190850571303	Sample number(s): 1013785-1013786,1013791-1013792,1013795		
Mercury	N.D.	0.000050	0.00020
Batch number: 190860571308	Sample number(s): 1013787-1013790,1013793-1013794		
Mercury	N.D.	0.000050	0.00020
Batch number: 19098520115A	Sample number(s): 1013785,1013788-1013789,1013792,1013794-1013795		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 19099520115A	Sample number(s): 1013786-1013787,1013790-1013791,1013793		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: WCD Group
Reported: 04/28/2019 00:55

Group Number: 2034655

Method Blank (continued)

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Sulfate	N.D.	0.30	1.0
Batch number: 19081921202A	Sample number(s): 1013793-1013794		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 19081921202B	Sample number(s): 1013787		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 19081921203A	Sample number(s): 1013785,1013788-1013792		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 19081921203B	Sample number(s): 1013786		
Total Dissolved Solids	N.D.	20.0	60.0
Batch number: 19084921203A	Sample number(s): 1013795		
Total Dissolved Solids	N.D.	20.0	60.0

LCS/LCSD

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 190821404402	Sample number(s): 1013787-1013788,1013790-1013791,1013793-1013795								
Barium	2.00	1.99			99		80-120		
Boron	2.00	1.87			93		80-120		
Calcium	4.00	4.03			101		80-120		
Chromium	0.200	0.200			100		80-120		
Cobalt	0.500	0.504			101		80-120		
Lithium	1.00	0.991			99		80-120		
Selenium	0.150	0.161			107		80-120		
Thallium	0.150	0.151			101		80-120		
Batch number: 190841404402	Sample number(s): 1013785-1013786,1013789,1013792								
Barium	2.00	2.09			104		80-120		
Boron	2.00	1.87			93		80-120		
Calcium	4.00	4.06			102		80-120		
Chromium	0.200	0.202			101		80-120		
Cobalt	0.500	0.525			105		80-120		
Lithium	1.00	1.02			102		80-120		
Selenium	0.150	0.152			101		80-120		
Thallium	0.150	0.145			97		80-120		
Batch number: 190841404707A	Sample number(s): 1013785-1013795								
Antimony	0.00600	0.00638	0.00600	0.00652	106	109	80-120	2	20
Arsenic	0.0100	0.0102	0.0100	0.0104	102	104	80-120	2	20

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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: WCD Group
Reported: 04/28/2019 00:55

Group Number: 2034655

LCS/LCSD (continued)

Analysis Name	LCS Spike Added mg/l	LCS Conc mg/l	LCSD Spike Added mg/l	LCSD Conc mg/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Beryllium	0.00400	0.00396	0.00400	0.00392	99	98	80-120	1	20
Cadmium	0.00500	0.00522	0.00500	0.00504	104	101	80-120	4	20
Lead	0.0150	0.0156	0.0150	0.0155	104	103	80-120	1	20
Molybdenum	0.0500	0.0506	0.0500	0.0523	101	105	80-120	3	20
Batch number: 190850571303	Sample number(s): 1013785-1013786,1013791-1013792,1013795								
Mercury	0.00100	0.000844			84		80-120		
Batch number: 190860571308	Sample number(s): 1013787-1013790,1013793-1013794								
Mercury	0.00100	0.000929			93		80-120		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 19098520115A	Sample number(s): 1013785,1013788-1013789,1013792,1013794-1013795								
Chloride	3.00	3.05			102		90-110		
Fluoride	0.750	0.715			95		90-110		
Sulfate	7.50	7.83			104		90-110		
Batch number: 19099520115A	Sample number(s): 1013786-1013787,1013790-1013791,1013793								
Chloride	3.00	2.92			97		90-110		
Fluoride	0.750	0.727			97		90-110		
Sulfate	7.50	7.41			99		90-110		
	mg/l	**mg/l**	**mg/l**	**mg/l**					
Batch number: 19081921202A	Sample number(s): 1013793-1013794								
Total Dissolved Solids	200	197			99		62-127		
Batch number: 19081921202B	Sample number(s): 1013787								
Total Dissolved Solids	200	197			99		62-127		
Batch number: 19081921203A	Sample number(s): 1013785,1013788-1013792								
Total Dissolved Solids	200	198			99		62-127		
Batch number: 19081921203B	Sample number(s): 1013786								
Total Dissolved Solids	200	198			99		62-127		
Batch number: 19084921203A	Sample number(s): 1013795								
Total Dissolved Solids	200	195	200	203	98	102	62-127	4	14
	Std. Units	**Std. Units**	**Std. Units**	**Std. Units**					
Batch number: 19081008201A	Sample number(s): 1013785-1013795								
pH	7.00	7.01			100		95-105		

*- Outside of specification
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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: WCD Group
Reported: 04/28/2019 00:55

Group Number: 2034655

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 190841404707A	Sample number(s): 1013785-1013795 UNSPK: 1013787									
Antimony	0.000468	0.00600	0.00635	0.00600	0.00701	98	109	75-125	10	20
Arsenic	0.000978	0.0100	0.0115	0.0100	0.0112	105	102	75-125	3	20
Beryllium	N.D.	0.00400	0.00380	0.00400	0.00373	95	93	75-125	2	20
Cadmium	N.D.	0.00500	0.00507	0.00500	0.00482	101	96	75-125	5	20
Lead	N.D.	0.0150	0.0153	0.0150	0.0157	102	105	75-125	3	20
Molybdenum	0.0129	0.0500	0.0640	0.0500	0.0615	102	97	75-125	4	20
	mg/l	mg/l	mg/l	mg/l	mg/l					
Batch number: 19081921203A	Sample number(s): 1013785,1013788-1013792 UNSPK: 1013785									
Total Dissolved Solids	2370	8000	10310			99		62-127		
Batch number: 19081921203B	Sample number(s): 1013786 UNSPK: 1013785									
Total Dissolved Solids	2370	8000	10310			99		62-127		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc mg/l	DUP Conc mg/l	DUP RPD	DUP RPD Max
Batch number: 190841404707A	Sample number(s): 1013785-1013795 BKG: 1013787			
Antimony	0.000468	N.D.	200* (1)	20
Arsenic	0.000978	0.000704	33* (1)	20
Beryllium	N.D.	N.D.	0 (1)	20
Cadmium	N.D.	N.D.	0 (1)	20
Lead	N.D.	N.D.	0 (1)	20
Molybdenum	0.0129	0.0125	3	20
	mg/l	mg/l		
Batch number: 19081921202B	Sample number(s): 1013787 BKG: 1013787			
Total Dissolved Solids	373	376	1 (1)	5
Batch number: 19081921203A	Sample number(s): 1013785,1013788-1013792 BKG: 1013785			
Total Dissolved Solids	2370	2640	11* (1)	5
Batch number: 19081921203B	Sample number(s): 1013786 BKG: 1013786			
Total Dissolved Solids	306	311	2 (1)	5

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only

Acct. # 44064 Group # 2034655 Sample # 1013785-95

COC # 575158

Client Information

Client: WCD Group | Acct. #:

Project Name/#: Former PSEG Hudson | PWSID #:

Project Manager: Jim Blaney | P.O. #:

Sampler: Fabio Iannacco, Tristan Morgan | Quote #:

State where samples were collected: NJ | For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water: Potable ☐ Ground ☒ NPDES ☐ Surface ☐ | Other: ____

Analysis Requested

Preservation and Filtration Codes

For Lab Use Only

FSC:

SCR#: 240276

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Report to follow previous

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 228, Ra 226	Remarks
MW-5	3/18/19	9:55	X		7	X	X	X	X	X	X	X	X	Metals: Ba, B
MW-8	3/18/19	9:55	X		7	X	X	X	X	X	X	X	X	Ca, Cr, Co, Li, Se
MW-6	3/18/19	11:15	X		7	X	X	X	X	X	X	X	X	Tl, Sb, As, Be, Cd
MW-7	3/18/19	11:20	X		7	X	X	X	X	X	X	X	X	Pb, Mo, Hg
MW-1	3/18/19	13:05	X		7	X	X	X	X	X	X	X	X	Lab to filter
MW-9	3/18/19	13:10	X		7	X	X	X	X	X	X	X	X	
MW-4	3/18/19	14:50	X		7	X	X	X	X	X	X	X	X	
FB-01	3/18/19	13:55	X		7	X	X	X	X	X	X	X	X	

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: jblaney@wcdgroup.com 609-730-0007

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	3/19/19	1505		3/19/19	1505
	3/20/19	1030		3/20/19	1030
	3/20/19	1610		Date	Time
	Date	Time		Date	Time
	Date	Time		Date	Time

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Temperature upon receipt 3.8-1.8-2.0 °C

3 KMZ 2123 3/21/19

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories Environmental use only

Acct. # 44064 Group # 2034655 Sample # 1013785-95

COC # 575159

Client Information

Client: WCD Group	Acct. #:
Project Name/#: Former PSEG Hudson	PWSID #:
Project Manager: Jim Blaney	P.O. #:
Sampler: Fabio Iannacco	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

Matrix: Soil ☐ Sediment ☐ Tissue ☐ | Water ☒ Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: ___

Total # of Containers

Analysis Requested — Preservation and Filtration Codes

For Lab Use Only

FSC: ___

SCR#: 240276

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 228, Ra 226	Remarks
MW-2	3/19/19	10:10			7	X	X	X	X	X	X	X	X	Report to follow Previous Metals: Ba, B, Ca, Cr, Co, Li, Se, Tl, Sb, As, Be, Cd, Pb, Mo, Hg Lab to filter
MW-3	3/19/19	11:50			7	X	X	X	X	X	X	X	X	
FB-02	3/19/19	12:45			7	X	X	X	X	X	X	X	X	

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days: ___

609-730-0007

E-mail address: jblaney@wcdgroup.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Fabio	3/19/19	1505		3/19/19	1505
	3/20/19	1030		3/20/19	1030
	3/20/19	16:16		Date	Time
	Date	Time		Date	Time
	Date	Time		Date	Time

EDD Required? Yes No

If yes, format: ___

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:

UPS ___ FedEx ___ Other ___

Temperature upon receipt 3.8-1.0-2.2c

3 KMZ 2123 3/21/19

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Sample Administration Receipt Documentation Log

Doc Log ID: 244160

Group Number(s): 2034655

Client: WCD Group

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	03/20/2019 16:10
Number of Packages:	3	Number of Projects:	1

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Juan Carrion (16518) at 03:37 on 03/21/2019

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-02	3.8	DT	Wet	Y	Bagged	N
2	DT42-02	1.0	DT	Wet	Y	Bagged	N
3	DT42-02	2.0	DT	Wet	Y	Bagged	N

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

WCD Group
1108 Old Thomasville Rd.
High Point NC 27260

Report Date: May 03, 2019 13:30

Project: PSEG Hudson

Account #: 44064
Group Number: 2034656
PO Number: 18-11432

Electronic Copy To WCD Group Attn: Scott McDonald
Electronic Copy To WCD Group Attn: Jim Blaney

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-5 Grab Groundwater	03/18/2019 09:55	1013796
MW-8 Grab Groundwater	03/18/2019 09:55	1013797
MW-6 Grab Groundwater	03/18/2019 11:15	1013798
MW-7 Grab Groundwater	03/18/2019 11:20	1013799
MW-1 Grab Groundwater	03/18/2019 13:05	1013800
MW-9 Grab Groundwater	03/18/2019 13:10	1013801
MW-4 Grab Groundwater	03/18/2019 14:50	1013802
FB-01 Grab Water	03/18/2019 13:55	1013803
MW-2 Grab Groundwater	03/19/2019 10:10	1013804
MW-3 Grab Groundwater	03/19/2019 11:50	1013805
FB-02 Grab Water	03/19/2019 12:45	1013806

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Sample Description:	**MW-5 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 1013796**
		ELLE Group #:	**2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 09:55		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-8 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1013797** **2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 09:55		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-6 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 1013798**
		ELLE Group #:	**2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 11:15		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-7 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1013799** **2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 11:20		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-1 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 1013800**
		ELLE Group #:	**2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 13:05		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-9 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 1013801**
		ELLE Group #:	**2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 13:10		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-4 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 1013802**
		ELLE Group #:	**2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 14:50		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**FB-01 Grab Water** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 1013803**
		ELLE Group #:	**2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/18/2019 13:55		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-2 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 1013804**
Project Name:	**PSEG Hudson**	**ELLE Group #:**	**2034656**
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/19/2019 10:10		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-3 Grab Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 1013805**
Project Name:	**PSEG Hudson**	**ELLE Group #:**	**2034656**
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/19/2019 11:50		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**FB-02 Grab Water** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 1013806**
		ELLE Group #:	**2034656**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	03/20/2019 16:10		
Collection Date/Time:	03/19/2019 12:45		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

Environmental Analysis Request/Chain of Custody

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Acct. # 44064 Group # 2034656 Sample # 1013796-806

COC # 575158

Client Information

Client: WCD Group	Acct. #:
Project Name/#: Former PSEG Hudson	PWSID #:
Project Manager: Jim Blaney	P.O. #:
Sampler: Fabio Iannacco, Tristan Morgan	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

Matrix: Soil ☐ Sediment ☐ Tissue ☐ | Water ☒ Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: ____

Analysis Requested — Preservation and Filtration Codes

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 228, Ra 226	Remarks
MW-5	3/18/19	9:55	X		7	X	X	X	X	X	X	X	X	Metals: Ba, B
MW-8	3/18/19	9:55	X		7	X	X	X	X	X	X	X	X	Ca, Cr, Co, Li, Se
MW-6	3/18/19	11:15	X		7	X	X	X	X	X	X	X	X	Tl, Sb, As, Be, Cd
MW-7	3/18/19	11:20	X		7	X	X	X	X	X	X	X	X	Pb, Mo, Hg
MW-1	3/18/19	13:05	X		7	X	X	X	X	X	X	X	X	Lab to filter
MW-9	3/18/19	13:10	X		7	X	X	X	X	X	X	X	X	
MW-4	3/18/19	14:50	X		7	X	X	X	X	X	X	X	X	
FB-01	3/18/19	13:55	X		7	X	X	X	X	X	X	X	X	

For Lab Use Only

FSC:

SCR#: 240276

Preservation Codes

H=HCl	T=Thiosulfate
N=HNO_3	B=NaOH
S=H_2SO_4	P=H_3PO_4
F=Field Filtered	O=Other

Remarks

Report to follow previous

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: jblaney@wcdgroup.com 609-730-0007

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	3/19/19	1500		3/19/19	1500
	3/20/19	1030		3/20/19	1030
	3/20/19	1610			
				3-20-19	1610

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Temperature upon receipt: 3.8-1.0-2.0 °C

3 Kms 212 3/21

Environmental Analysis Request/Chain of Custody

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Acct. # 44064 Group # 2034656 Sample # 1013796-806

COC # 575159

Client Information

Client: WCD Group	Acct. #:
Project Name/#: Former PSEG Hudson	PWSID #:
Project Manager: Tim Blaney	P.O. #:
Sampler: Fabio Iannacco	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water ☒ | Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: ☐

Analysis Requested

Preservation and Filtration Codes

For Lab Use Only

FSC:

SCR#: 240276

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 228, Ra 226
MW-2	3/19/19	10:10			7	X	X	X	X	X	X	X	X
MW-3	3/19/19	11:50			7	X	X	X	X	X	X	X	X
FB-02	3/19/19	12:45			7	X	X	X	X	X	X	X	X

Remarks

Report to follow Previous

Metals: Ba, B, Ca, Cr, Co, Li, Se, Tl, Sb, As, Be, Cd, Pb, Mo, Hg

Lab to filter

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

609-730-0007

E-mail address: jblaney@wcdgroup.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) NJ DKQP TX TRRP-13

NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Fabio	3/19/19	1505		3/19/19	1505
	3/20/19	1030		3/20/19	1030
	3/20/19	1610		Date	Time
	Date	Time		Date	Time
	Date	Time		Date	Time 1610

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:

UPS FedEx Other

Temperature upon receipt 3.8-1.0-2.2C

③ KM2 2123 3/21/19

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Sample Administration Receipt Documentation Log

Doc Log ID: 244160

Group Number(s): 2034656

Client: WCD Group

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	03/20/2019 16:10
Number of Packages:	3	Number of Projects:	1

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Juan Carrion (16518) at 03:37 on 03/21/2019

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-02	3.8	DT	Wet	Y	Bagged	N
2	DT42-02	1.0	DT	Wet	Y	Bagged	N
3	DT42-02	2.0	DT	Wet	Y	Bagged	N

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ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-33399-1
Client Project/Site: Ra-226/228: GW Monitoring

For:
Eurofins Lancaster Laboratories Env LLC
2425 New Holland Pike
Lancaster, Pennsylvania 17601

Attn: Jenifer Lewis

Authorized for release by:
4/30/2019 10:42:03 AM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 160-33399-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Eurofins Lancaster Laboratories Env LLC

Project: Ra-226/228: GW Monitoring

Report Number: 160-33399-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 3/22/2019 9:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.1° C and 2.7° C.

RADIUM-226 (GFPC)

Samples MW-5 (160-33399-1), MW-8 (160-33399-2), MW-6 (160-33399-3), MW-7 (160-33399-4), MW-1 (160-33399-5), MW-9 (160-33399-6), MW-4 (160-33399-7), FB-01 (160-33399-8), MW-2 (160-33399-9), MW-3 (160-33399-10) and FB-02 (160-33399-11) were

Job ID: 160-33399-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

analyzed for Radium-226 (GFPC) in accordance with EPA Method 903.0. The samples were prepared on 04/04/2019 and analyzed on 04/28/2019 and 04/29/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228 (GFPC)

Samples MW-5 (160-33399-1), MW-8 (160-33399-2), MW-6 (160-33399-3), MW-7 (160-33399-4), MW-1 (160-33399-5), MW-9 (160-33399-6), MW-4 (160-33399-7), FB-01 (160-33399-8), MW-2 (160-33399-9), MW-3 (160-33399-10) and FB-02 (160-33399-11) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 04/04/2019 and analyzed on 04/17/2019 and 04/18/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # _____ Group # 2034656 Sample # 1013796-806

Subcontractor:	TestAmerica-St. Louis		
Project Name/#:	2034656	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler:		PWSID #:	
Phone #:	717-556-7383	Quote #:	
State where samples were collected:	NJ	For Compliance: Yes ☑ No ☐	

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water: Potable	Ground	Surface	NPDES	Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod)	Preservation and Filtration Codes: N	N	N	N	N	N	N	N	I	Remarks
MW-5	3/18/2019	0955	X					X					2	X	X										1013796
MW-8	3/18/2019	0955	X					X					2	X	X										1013797
MW-6	3/18/2019	1115	X					X					2	X	X										1013798
MW-7	3/18/2019	1120	X					X					2	X	X										1013799
MW-1	3/18/2019	1305	X					X					2	X	X										1013800
MW-9	3/18/2019	1310	X					X					2	X	X										1013801
MW-4	3/18/2019	1450	X					X					2	X	X										1013802
FB-01	3/18/2019	1355	X					X					2	X	X										1013803
MW-2	3/19/2019	1010	X					X					2	X	X										1013804
MW-3	3/19/2019	1150	X					X					2	X	X										1013805
FB-02	3/19/2019	1245	X					X					2	X	X										1013806

ok to preserve upon receipt.

③ HL22313 3-21-19

160-33399 Chain of Custody

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes

H = HCl	T = Thiosulfate
N = HNO_3	B = NaOH
S = H_2SO_4	P = H_3PO_4
F = Field Filtered	O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: ELLE_Subcontracting@EurofinsUS.com

Phone: 717-556-7383

Data Package Options (please check if required) ☐ Full Data Package

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NJ DKQP ☑ NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: HazSite

	Relinquished by:	Date	Time	Received by:	Date	Time
1	[signature]	3-21-19	1730	[signature]	3-22-19	0910
2						
3						
4						
5						

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

Login Sample Receipt Checklist

Client: Eurofins Lancaster Laboratories Env LLC

Job Number: 160-33399-1

Login Number: 33399
List Number: 1
Creator: Press, Nicholas B

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33399-1
Project/Site: Ra-226/228: GW Monitoring

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33399-1
Project/Site: Ra-226/228: GW Monitoring

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency
None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33399-1
Project/Site: Ra-226/228: GW Monitoring

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-33399-1	MW-5	Water	03/18/19 09:55	03/22/19 09:10
160-33399-2	MW-8	Water	03/18/19 09:55	03/22/19 09:10
160-33399-3	MW-6	Water	03/18/19 11:15	03/22/19 09:10
160-33399-4	MW-7	Water	03/18/19 11:20	03/22/19 09:10
160-33399-5	MW-1	Water	03/18/19 13:05	03/22/19 09:10
160-33399-6	MW-9	Water	03/18/19 13:10	03/22/19 09:10
160-33399-7	MW-4	Water	03/18/19 14:50	03/22/19 09:10
160-33399-8	FB-01	Water	03/18/19 13:55	03/22/19 09:10
160-33399-9	MW-2	Water	03/19/19 10:10	03/22/19 09:10
160-33399-10	MW-3	Water	03/19/19 11:50	03/22/19 09:10
160-33399-11	FB-02	Water	03/19/19 12:45	03/22/19 09:10

Client Sample ID: MW-5
Lab Sample ID: 160-33399-1
Date Collected: 03/18/19 09:55
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.514		0.173	0.180	1.00	0.156	pCi/L	04/04/19 14:52	04/28/19 16:13	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	78.8		40 - 110	04/04/19 14:52	04/28/19 16:13	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.05		0.490	0.499	1.00	0.713	pCi/L	04/04/19 16:40	04/18/19 10:25	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	78.8		40 - 110	04/04/19 16:40	04/18/19 10:25	1
Y Carrier	87.9		40 - 110	04/04/19 16:40	04/18/19 10:25	1

Client Sample ID: MW-8
Lab Sample ID: 160-33399-2
Date Collected: 03/18/19 09:55
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.107	U	0.0783	0.0789	1.00	0.112	pCi/L	04/04/19 14:52	04/28/19 16:13	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	97.6		40 - 110	04/04/19 14:52	04/28/19 16:13	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.143	U	0.245	0.245	1.00	0.415	pCi/L	04/04/19 16:40	04/18/19 10:25	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	97.6		40 - 110	04/04/19 16:40	04/18/19 10:25	1
Y Carrier	91.2		40 - 110	04/04/19 16:40	04/18/19 10:25	1

Client Sample ID: MW-6
Lab Sample ID: 160-33399-3
Date Collected: 03/18/19 11:15
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0603	U	0.0689	0.0691	1.00	0.111	pCi/L	04/04/19 14:52	04/28/19 16:13	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	86.1		40 - 110	04/04/19 14:52	04/28/19 16:13	1

Client Sample ID: MW-6
Lab Sample ID: 160-33399-3
Date Collected: 03/18/19 11:15
Matrix: Water
Date Received: 03/22/19 09:10

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.280	U	0.276	0.277	1.00	0.447	pCi/L	04/04/19 16:40	04/18/19 10:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.1*		*40 - 110*	*04/04/19 16:40*	*04/18/19 10:25*	*1*
Y Carrier	*88.2*		*40 - 110*	*04/04/19 16:40*	*04/18/19 10:25*	*1*

Client Sample ID: MW-7
Lab Sample ID: 160-33399-4
Date Collected: 03/18/19 11:20
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0623	U	0.0625	0.0628	1.00	0.0962	pCi/L	04/04/19 14:52	04/28/19 16:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*04/04/19 14:52*	*04/28/19 16:13*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.100	U	0.276	0.276	1.00	0.476	pCi/L	04/04/19 16:40	04/18/19 10:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*04/04/19 16:40*	*04/18/19 10:25*	*1*
Y Carrier	*89.7*		*40 - 110*	*04/04/19 16:40*	*04/18/19 10:25*	*1*

Client Sample ID: MW-1
Lab Sample ID: 160-33399-5
Date Collected: 03/18/19 13:05
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**1.28**		0.199	0.230	1.00	0.0948	pCi/L	04/04/19 14:52	04/28/19 16:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*04/04/19 14:52*	*04/28/19 16:13*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.85**		0.370	0.407	1.00	0.407	pCi/L	04/04/19 16:40	04/18/19 10:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*04/04/19 16:40*	*04/18/19 10:25*	*1*

Client Sample ID: MW-1
Lab Sample ID: 160-33399-5
Date Collected: 03/18/19 13:05
Matrix: Water
Date Received: 03/22/19 09:10

Method: 904.0 - Radium-228 (GFPC) (Continued)

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Y Carrier	93.1		40 - 110	04/04/19 16:40	04/18/19 10:25	1

Client Sample ID: MW-9
Lab Sample ID: 160-33399-6
Date Collected: 03/18/19 13:10
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0239	U	0.0532	0.0533	1.00	0.0971	pCi/L	04/04/19 17:19	04/28/19 17:57	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	95.9		40 - 110	04/04/19 17:19	04/28/19 17:57	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0817	U	0.211	0.211	1.00	0.365	pCi/L	04/04/19 17:54	04/17/19 09:08	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	95.9		40 - 110	04/04/19 17:54	04/17/19 09:08	1
Y Carrier	84.5		40 - 110	04/04/19 17:54	04/17/19 09:08	1

Client Sample ID: MW-4
Lab Sample ID: 160-33399-7
Date Collected: 03/18/19 14:50
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**1.07**		0.169	0.195	1.00	0.0666	pCi/L	04/04/19 17:19	04/28/19 17:55	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	98.5		40 - 110	04/04/19 17:19	04/28/19 17:55	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.48**		0.318	0.346	1.00	0.352	pCi/L	04/04/19 17:54	04/17/19 09:09	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	98.5		40 - 110	04/04/19 17:54	04/17/19 09:09	1
Y Carrier	84.5		40 - 110	04/04/19 17:54	04/17/19 09:09	1

Client Sample ID: FB-01
Lab Sample ID: 160-33399-8
Date Collected: 03/18/19 13:55
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0216	U	0.0405	0.0406	1.00	0.0736	pCi/L	04/04/19 17:19	04/28/19 17:55	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.2*		*40 - 110*	*04/04/19 17:19*	*04/28/19 17:55*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0307	U	0.228	0.228	1.00	0.402	pCi/L	04/04/19 17:54	04/17/19 09:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.2*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*
Y Carrier	*82.2*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*

Client Sample ID: MW-2
Lab Sample ID: 160-33399-9
Date Collected: 03/19/19 10:10
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**2.07**		0.233	0.298	1.00	0.0940	pCi/L	04/04/19 17:19	04/29/19 10:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*102*		*40 - 110*	*04/04/19 17:19*	*04/29/19 10:39*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**2.59**		0.397	0.463	1.00	0.387	pCi/L	04/04/19 17:54	04/17/19 09:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*102*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*
Y Carrier	*82.2*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*

Client Sample ID: MW-3
Lab Sample ID: 160-33399-10
Date Collected: 03/19/19 11:50
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0481	U	0.0513	0.0514	1.00	0.0808	pCi/L	04/04/19 17:19	04/28/19 17:55	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.4*		*40 - 110*	*04/04/19 17:19*	*04/28/19 17:55*	*1*

Client Sample ID: MW-3
Lab Sample ID: 160-33399-10
Date Collected: 03/19/19 11:50
Matrix: Water
Date Received: 03/22/19 09:10

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0324	U	0.204	0.204	1.00	0.362	pCi/L	04/04/19 17:54	04/17/19 09:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.4*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*
Y Carrier	*83.0*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*

Client Sample ID: FB-02
Lab Sample ID: 160-33399-11
Date Collected: 03/19/19 12:45
Matrix: Water
Date Received: 03/22/19 09:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0299	U	0.0484	0.0485	1.00	0.0846	pCi/L	04/04/19 17:19	04/28/19 17:55	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*40 - 110*	*04/04/19 17:19*	*04/28/19 17:55*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.245	U	0.258	0.259	1.00	0.422	pCi/L	04/04/19 17:54	04/17/19 09:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.6*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*
Y Carrier	*83.4*		*40 - 110*	*04/04/19 17:54*	*04/17/19 09:09*	*1*

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-422688/23-A
Matrix: Water
Analysis Batch: 425986

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 422688

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.02035	U	0.0528	0.0529	1.00	0.0978	pCi/L	04/04/19 14:52	04/28/19 17:56	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*04/04/19 14:52*	*04/28/19 17:56*	*1*

Lab Sample ID: LCS 160-422688/1-A
Matrix: Water
Analysis Batch: 426002

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 422688

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	9.155		0.958	1.00	0.0665	pCi/L	81	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*101*		*40 - 110*

Lab Sample ID: MB 160-422776/24-A
Matrix: Water
Analysis Batch: 425986

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 422776

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.002617	U	0.0456	0.0456	1.00	0.0958	pCi/L	04/04/19 17:19	04/28/19 19:45	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.3*		*40 - 110*	*04/04/19 17:19*	*04/28/19 19:45*	*1*

Lab Sample ID: LCS 160-422776/1-A
Matrix: Water
Analysis Batch: 425986

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 422776

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	9.455		0.994	1.00	0.0815	pCi/L	83	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*90.9*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-422774/23-A
Matrix: Water
Analysis Batch: 424352

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 422774

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.04507	U	0.216	0.216	1.00	0.397	pCi/L	04/04/19 16:40	04/18/19 10:26	1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110	04/04/19 16:40	04/18/19 10:26	1
Y Carrier	88.6		40 - 110	04/04/19 16:40	04/18/19 10:26	1

Lab Sample ID: LCS 160-422774/1-A
Matrix: Water
Analysis Batch: 424353

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 422774

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			9.29	9.377		1.06	1.00	0.352	pCi/L	101	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	101		40 - 110
Y Carrier	91.2		40 - 110

Lab Sample ID: MB 160-422779/24-A
Matrix: Water
Analysis Batch: 424310

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 422779

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2493	U	0.240	0.241	1.00	0.389	pCi/L	04/04/19 17:54	04/17/19 09:18	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	97.3		40 - 110	04/04/19 17:54	04/17/19 09:18	1
Y Carrier	86.0		40 - 110	04/04/19 17:54	04/17/19 09:18	1

Lab Sample ID: LCS 160-422779/1-A
Matrix: Water
Analysis Batch: 424263

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 422779

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			9.29	10.04		1.17	1.00	0.405	pCi/L	108	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	90.9		40 - 110
Y Carrier	84.5		40 - 110

QC Association Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33399-1
Project/Site: Ra-226/228: GW Monitoring

Rad

Prep Batch: 422688

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-33399-1	MW-5	Total/NA	Water	PrecSep-21	
160-33399-2	MW-8	Total/NA	Water	PrecSep-21	
160-33399-3	MW-6	Total/NA	Water	PrecSep-21	
160-33399-4	MW-7	Total/NA	Water	PrecSep-21	
160-33399-5	MW-1	Total/NA	Water	PrecSep-21	
MB 160-422688/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-422688/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 422774

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-33399-1	MW-5	Total/NA	Water	PrecSep_0	
160-33399-2	MW-8	Total/NA	Water	PrecSep_0	
160-33399-3	MW-6	Total/NA	Water	PrecSep_0	
160-33399-4	MW-7	Total/NA	Water	PrecSep_0	
160-33399-5	MW-1	Total/NA	Water	PrecSep_0	
MB 160-422774/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-422774/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Prep Batch: 422776

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-33399-6	MW-9	Total/NA	Water	PrecSep-21	
160-33399-7	MW-4	Total/NA	Water	PrecSep-21	
160-33399-8	FB-01	Total/NA	Water	PrecSep-21	
160-33399-9	MW-2	Total/NA	Water	PrecSep-21	
160-33399-10	MW-3	Total/NA	Water	PrecSep-21	
160-33399-11	FB-02	Total/NA	Water	PrecSep-21	
MB 160-422776/24-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-422776/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 422779

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-33399-6	MW-9	Total/NA	Water	PrecSep_0	
160-33399-7	MW-4	Total/NA	Water	PrecSep_0	
160-33399-8	FB-01	Total/NA	Water	PrecSep_0	
160-33399-9	MW-2	Total/NA	Water	PrecSep_0	
160-33399-10	MW-3	Total/NA	Water	PrecSep_0	
160-33399-11	FB-02	Total/NA	Water	PrecSep_0	
MB 160-422779/24-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-422779/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33399-1
Project/Site: Ra-226/228: GW Monitoring

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
160-33399-1	MW-5	78.8
160-33399-2	MW-8	97.6
160-33399-3	MW-6	86.1
160-33399-4	MW-7	89.4
160-33399-5	MW-1	92.9
160-33399-6	MW-9	95.9
160-33399-7	MW-4	98.5
160-33399-8	FB-01	98.2
160-33399-9	MW-2	102
160-33399-10	MW-3	99.4
160-33399-11	FB-02	95.6
LCS 160-422688/1-A	Lab Control Sample	101
LCS 160-422776/1-A	Lab Control Sample	90.9
MB 160-422688/23-A	Method Blank	101
MB 160-422776/24-A	Method Blank	97.3

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
160-33399-1	MW-5	78.8	87.9
160-33399-2	MW-8	97.6	91.2
160-33399-3	MW-6	86.1	88.2
160-33399-4	MW-7	89.4	89.7
160-33399-5	MW-1	92.9	93.1
160-33399-6	MW-9	95.9	84.5
160-33399-7	MW-4	98.5	84.5
160-33399-8	FB-01	98.2	82.2
160-33399-9	MW-2	102	82.2
160-33399-10	MW-3	99.4	83.0
160-33399-11	FB-02	95.6	83.4
LCS 160-422774/1-A	Lab Control Sample	101	91.2
LCS 160-422779/1-A	Lab Control Sample	90.9	84.5
MB 160-422774/23-A	Method Blank	101	88.6
MB 160-422779/24-A	Method Blank	97.3	86.0

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

WCD Group
1108 Old Thomasville Rd.
High Point NC 27260

Report Date: May 09, 2019 18:17

Project: PSEG Hudson

Account #: 44064
Group Number: 2037300
SDG: WCD07
PO Number: 18-11432
State of Sample Origin: NJ

Electronic Copy To	WCD Group	Attn: Scott McDonald
Electronic Copy To	WCD Group	Attn: Jim Blaney

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-5 Groundwater	04/01/2019 09:30	1026578
MW-8 Groundwater	04/01/2019 09:30	1026579
MW-7 Groundwater	04/01/2019 10:55	1026580
MW-6 Groundwater	04/01/2019 11:20	1026581
MW-9 Groundwater	04/01/2019 12:20	1026582
MW-1 Groundwater	04/01/2019 13:00	1026583
FB-01 Water	04/01/2019 13:35	1026584
MW-4 Groundwater	04/02/2019 09:00	1026585
MW-2 Groundwater	04/02/2019 11:30	1026586
MW-3 Groundwater	04/02/2019 13:10	1026587
FB-02 Water	04/02/2019 14:15	1026588

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Eurofins Lancaster Laboratories Environmental
Client: WCD Group
Project: PSEG Hudson
Sampling Date(s): 04/01/19 - 04/02/19
Laboratory Sample ID(s): 1026578-1026588
List DKQP Methods Used (e.g., 8260, 8270, et cetera)
EPA 300.0; SM 2540 C-2011; SM 2550 B-2010; SM 4500-H+ B-2011

		Yes or No
1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	Yes
1A	Were the method specified handling, preservation, and holding time requirements met?	No
1B	***EPH Method*:** Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes
3	Were samples received at an appropriate temperature (</=6° C)?	Yes
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	Yes
5A	Were reporting limits* specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	Yes
5B	Were these reporting limits met?	No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	Yes
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Data of Known Quality."
***The Limit of Quantitation (LOQ) meets requirements for the Reporting Limit (RL) as defined in the NJDEP Data of Known Quality performance standards, unless otherwise noted.**

05/09/2019

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Project Name: PSEG Hudson
ELLE Group #: 2037300

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.

Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

EPA 300.0, Wet Chemistry

Sample #s: 1026583

Reporting limits were raised due to interference from the sample matrix.

Sample Description: **MW-5 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/01/2019 09:30
SDG#: WCD07-01

WCD Group
ELLE Sample #: GW 1026578
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	1,100	100	200	500
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	6.7	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	2,200	160	480	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.5	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19108520117B	04/18/2019 18:30	Ashlynn M Cornelius	500
01504	Fluoride	EPA 300.0	1	19108520117B	04/18/2019 17:56	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19108520117B	04/18/2019 17:56	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003202A	04/05/2019 19:13	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003202A	04/05/2019 19:13	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-8 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/01/2019 09:30
SDG#: WCD07-02

WCD Group
ELLE Sample #: GW 1026579
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	83.8	10.0	20.0	50
01504	Fluoride	16984-48-8	N.D.	0.25	0.50	5
00228	Sulfate	14808-79-8	26.3	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	359	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.2	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19108520117B	04/18/2019 19:39	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	19108520117B	04/18/2019 18:47	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19108520117B	04/18/2019 18:47	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003201B	04/05/2019 17:46	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003201B	04/05/2019 17:46	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-7 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/01/2019 10:55
SDG#: WCD07-03

WCD Group
ELLE Sample #: GW 1026580
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	47.3	10.0	20.0	50
01504	Fluoride	16984-48-8	0.68	0.25	0.50	5
00228	Sulfate	14808-79-8	3.4 J	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	206	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.4	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.4	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19108520117B	04/18/2019 20:30	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	19108520117B	04/18/2019 20:13	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19108520117B	04/18/2019 20:13	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003202A	04/05/2019 19:21	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003202A	04/05/2019 19:21	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-6 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/01/2019 11:20
SDG#: WCD07-04

WCD Group
ELLE Sample #: GW 1026581
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	107	10.0	20.0	50
01504	Fluoride	16984-48-8	0.72	0.25	0.50	5
00228	Sulfate	14808-79-8	48.6	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	464	40.0	120	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.9	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19108520117B	04/18/2019 21:21	Ashlynn M Cornelius	50
01504	Fluoride	EPA 300.0	1	19108520117B	04/18/2019 21:04	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19108520117B	04/18/2019 21:04	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003201A	04/05/2019 18:34	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003201A	04/05/2019 18:34	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-9 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/01/2019 12:20
SDG#: WCD07-05

WCD Group
ELLE Sample #: GW 1026582
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	29.8	1.0	2.0	5
01504	Fluoride	16984-48-8	0.74	0.25	0.50	5
00228	Sulfate	14808-79-8	15.8	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	222	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.7	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19108520117B	04/18/2019 21:55	Ashlynn M Cornelius	5
01504	Fluoride	EPA 300.0	1	19108520117B	04/18/2019 21:55	Ashlynn M Cornelius	5
00228	Sulfate	EPA 300.0	1	19108520117B	04/18/2019 21:55	Ashlynn M Cornelius	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003201A	04/05/2019 18:46	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003201A	04/05/2019 18:46	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-1 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/01/2019 13:00
SDG#: WCD07-06

WCD Group
ELLE Sample #: GW 1026583
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,180	1,000	2,000	5000
01504	Fluoride	16984-48-8	N.D.	2.5	5.0	50
	Reporting limits were raised due to interference from the sample matrix.					
00228	Sulfate	14808-79-8	105	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	11,100	1,600	4,800	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.9	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.4	0.010	0.010	1
	The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.					

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	2	19108520117B	04/19/2019 19:31	Anna Campanella	5000
01504	Fluoride	EPA 300.0	2	19108520117B	04/18/2019 23:38	Ashlynn M Cornelius	50
00228	Sulfate	EPA 300.0	1	19108520117B	04/18/2019 23:38	Ashlynn M Cornelius	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	19095003201A	04/05/2019 19:05	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003201A	04/05/2019 19:05	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-01 Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/01/2019 13:35
SDG#: WCD07-07FB

WCD Group
ELLE Sample #: **GW 1026584**
ELLE Group #: **2037300**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.6	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.8	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19109963117A	04/20/2019 04:55	Anna Campanella	1
01504	Fluoride	EPA 300.0	1	19109963117A	04/20/2019 04:55	Anna Campanella	1
00228	Sulfate	EPA 300.0	1	19109963117A	04/20/2019 04:55	Anna Campanella	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003201A	04/05/2019 18:50	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003201A	04/05/2019 18:50	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-4 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/02/2019 09:00
SDG#: WCD07-08

WCD Group
ELLE Sample #: GW 1026585
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	3,570	1,000	2,000	5000
01504	Fluoride	16984-48-8	3.0	0.25	0.50	5
00228	Sulfate	14808-79-8	321	15.0	50.0	50
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	6,300	800	2,400	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.9	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.3	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19109963117A	04/20/2019 13:24	Anna Campanella	5000
01504	Fluoride	EPA 300.0	1	19109963117A	04/22/2019 12:06	Anna Campanella	5
00228	Sulfate	EPA 300.0	3	19109963117A	04/22/2019 12:23	Anna Campanella	50
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	19095003202A	04/05/2019 19:46	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003202A	04/05/2019 19:46	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-2 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/02/2019 11:30
SDG#: WCD07-09

WCD Group
ELLE Sample #: GW 1026586
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	7,370	500	1,000	2500
01504	Fluoride	16984-48-8	3.0	0.25	0.50	5
00228	Sulfate	14808-79-8	13.8	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	10,700	1,600	4,800	10
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	21.4	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.2	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19109963117A	04/20/2019 05:29	Anna Campanella	2500
01504	Fluoride	EPA 300.0	1	19109963117A	04/20/2019 05:12	Anna Campanella	5
00228	Sulfate	EPA 300.0	1	19109963117A	04/20/2019 05:12	Anna Campanella	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	10
12151	Temperature of pH	SM 2550 B-2010	1	19095003201A	04/05/2019 18:38	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003201A	04/05/2019 18:38	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **MW-3 Groundwater**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/02/2019 13:10
SDG#: WCD07-10

WCD Group
ELLE Sample #: GW 1026587
ELLE Group #: 2037300
Matrix: Groundwater

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	250	10.0	20.0	50
01504	Fluoride	16984-48-8	0.77	0.25	0.50	5
00228	Sulfate	14808-79-8	61.8	1.5	5.0	5
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	710	80.0	240	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.4	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	7.7	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19109963117A	04/20/2019 03:47	Anna Campanella	50
01504	Fluoride	EPA 300.0	1	19109963117A	04/20/2019 03:30	Anna Campanella	5
00228	Sulfate	EPA 300.0	1	19109963117A	04/20/2019 03:30	Anna Campanella	5
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003202A	04/05/2019 19:49	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003202A	04/05/2019 19:49	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Sample Description: **FB-02 Water**
Former PSEG Hudson

Project Name: **PSEG Hudson**

Submittal Date/Time: 04/03/2019 18:50
Collection Date/Time: 04/02/2019 14:15
SDG#: WCD07-11FB

WCD Group
ELLE Sample #: **GW 1026588**
ELLE Group #: **2037300**
Matrix: Water

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	**mg/l**	
00224	Chloride	16887-00-6	N.D.	0.20	0.40	1
01504	Fluoride	16984-48-8	N.D.	0.050	0.10	1
00228	Sulfate	14808-79-8	N.D.	0.30	1.0	1
	SM 2540 C-2011		**mg/l**	**mg/l**	**mg/l**	
00212	Total Dissolved Solids	n.a.	N.D.	20.0	60.0	1
	SM 2550 B-2010		**Degrees C**	**Degrees C**	**Degrees C**	
12151	Temperature of pH	n.a.	22.0	0.010	0.010	1
	SM 4500-H+ B-2011		**Std. Units**	**Std. Units**	**Std. Units**	
12152	pH	n.a.	6.5	0.010	0.010	1

The 40 CFR Part 136 requires that this analysis be performed immediately (within 15 minutes) upon sample collection. Because this was not possible, the result may not be used for reporting purposes.

Sample Comments

State of New Jersey Lab Certification No. PA011
This sample was lab filtered for dissolved metals.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
00224	Chloride	EPA 300.0	1	19109963117A	04/20/2019 05:46	Anna Campanella	1
01504	Fluoride	EPA 300.0	1	19109963117A	04/20/2019 05:46	Anna Campanella	1
00228	Sulfate	EPA 300.0	1	19109963117A	04/20/2019 05:46	Anna Campanella	1
00212	Total Dissolved Solids	SM 2540 C-2011	1	19095921201A	04/05/2019 17:05	Angelica Cintron	1
12151	Temperature of pH	SM 2550 B-2010	1	19095003201A	04/05/2019 19:01	Jeremy L Bolf	1
12152	pH	SM 4500-H+ B-2011	1	19095003201A	04/05/2019 19:01	Jeremy L Bolf	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: WCD Group
Reported: 05/09/2019 18:17

Group Number: 2037300

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	mg/l	mg/l	mg/l
Batch number: 19108520117B	Sample number(s): 1026578-1026583		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 19109963117A	Sample number(s): 1026584-1026588		
Chloride	N.D.	0.20	0.40
Fluoride	N.D.	0.050	0.10
Sulfate	N.D.	0.30	1.0
Batch number: 19095921201A	Sample number(s): 1026578-1026588		
Total Dissolved Solids	N.D.	20.0	60.0

LCS/LCSD

Analysis Name	LCS Spike Added	LCS Conc	LCSD Spike Added	LCSD Conc	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
	mg/l	mg/l	mg/l	mg/l					
Batch number: 19108520117B	Sample number(s): 1026578-1026583								
Chloride	3.00	2.87			96		90-110		
Fluoride	0.750	0.755			101		90-110		
Sulfate	7.50	7.58			101		90-110		
Batch number: 19109963117A	Sample number(s): 1026584-1026588								
Chloride	3.00	2.95			98		90-110		
Fluoride	0.750	0.791			105		90-110		
Sulfate	7.50	7.45			99		90-110		
	mg/l	mg/l	mg/l	mg/l					
Batch number: 19095921201A	Sample number(s): 1026578-1026588								
Total Dissolved Solids	200	199			100		62-127		
	Std. Units	Std. Units	Std. Units	Std. Units					
Batch number: 19095003201A	Sample number(s): 1026581-1026584,1026586,1026588								
pH	7.00	6.94			99		95-105		
Batch number: 19095003201B	Sample number(s): 1026579								
pH	7.00	6.94			99		95-105		

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: WCD Group
Reported: 05/09/2019 18:17

Group Number: 2037300

LCS/LCSD (continued)

Analysis Name	LCS Spike Added Std. Units	LCS Conc Std. Units	LCSD Spike Added Std. Units	LCSD Conc Std. Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 19095003202A	Sample number(s): 1026578,1026580,1026585,1026587								
pH	7.00	6.99			100		95-105		

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc mg/l	MS Spike Added mg/l	MS Conc mg/l	MSD Spike Added mg/l	MSD Conc mg/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 19095921201A	Sample number(s): 1026578-1026588 UNSPK: 1026587									
Total Dissolved Solids	710	800	1512			100		62-127		

Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc	DUP Conc	DUP RPD	DUP RPD Max
	Degrees C	Degrees C		
Batch number: 19095003201B	Sample number(s): 1026579 BKG: 1026579			
Temperature of pH	21.19	21.31	1	5
Batch number: 19095003202A	Sample number(s): 1026578,1026580,1026585,1026587 BKG: 1026578			
Temperature of pH	22.54	22.86	1	5
	mg/l	mg/l		
Batch number: 19095921201A	Sample number(s): 1026578-1026588 BKG: 1026587			
Total Dissolved Solids	710	722	2 (1)	5
	Std. Units	Std. Units		
Batch number: 19095003201B	Sample number(s): 1026579 BKG: 1026579			
pH	6.73	6.81	1	4
Batch number: 19095003202A	Sample number(s): 1026578,1026580,1026585,1026587 BKG: 1026578			
pH	6.79	6.78	0	4

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # 11464 For Eurofins Lancaster Laboratories Environmental use only Group # 283300 Sample # 1026578-88

COC # 574621

Client Information

Client: WCD Group	Acct. #:
Project Name/#: Former PSEG Hudson	PWSID #:
Project Manager: Jim Blaney	P.O. #:
Sampler: Fabio Iannucci, Trixton Mulgrew	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

Matrix: Soil ☐ Sediment ☐ Tissue ☐ | Water ☒ Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: ____

Analysis Requested — Preservation and Filtration Codes

For Lab Use Only
FSC: ____
SCR#: ____

Preservation Codes
H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra226, Ra228	Remarks
MW-5	4/1/19	9:30			7	X	X	X	X	X	X	X	X	Report to follow previous Metals: Ba, B, Ca, Cr, Co, Li, Se, Tl, Sb, As, Be, Cd, Pb, Mo, Hg Lab to filter
MW-8	4/1/19	9:30			7	X	X	X	X	X	X	X	X	
MW-7	4/1/19	10:55			7	X	X	X	X	X	X	X	X	
MW-6	4/1/19	11:20			7	X	X	X	X	X	X	X	X	
MW-9	4/1/19	12:20			7	X	X	X	X	X	X	X	X	
MW-1	4/1/19	13:00			7	X	X	X	X	X	X	X	X	
FB-01	4/1/19	13:35			7	X	X	X	X	X	X	X	X	

Turnaround Time (TAT) Requested (please circle)
Standard Rush
(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days: ____

E-mail address: Jblaney@wcdgroup.com 609-730-0007

Data Package Options (circle if required)
Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)
Type III (Reduced non-CLP) NJ DKQP TX TRRP-13
NYSDEC Category A or B MA MCP CT RCP

	Date	Time		Date	Time
Relinquished by	4/3/19	12:30	Received by		
Relinquished by	4/3/19	18:50	Received by		
Relinquished by			Received by		
Relinquished by			Received by		
Relinquished by			Received by	4/3/19	18:50

EDD Required? Yes No
If yes, format: ____

Site-Specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Temperature upon receipt 3.3-3.1-2.2 °C

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

For Eurofins Lancaster Laboratories Environmental use only
Acct. # 444064 Group # 2037300 Sample # 1026578-88

COC # 574620

Client Information

Client: WCD Group
Acct. #:
Project Name/#: Former PSEG Hudson
PWSID #:
Project Manager: Jim Blaney
P.O. #:
Sampler: Fabio Iannacco
Quote #:
State where samples were collected: NJ
For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ Water: Potable ☐ Ground ☒ NPDES ☐ Surface ☐ Other: ☐

Analysis Requested

Preservation and Filtration Codes

For Lab Use Only

FSC:
SCR#: 240879

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 226/Ra 228	Remarks
MW-4	4/2/19	9:00			7	X	X	X	X	X	X	X	X	Report to full list previous. Metals: Ba, B, Ca, Cr, Co, Li, Se, Tl, Sb, As, Be, Cd, Pb, Mo, Hg Lab to filter
MW-2	4/2/19	11:30			7	X	X	X	X	X	X	X	X	
MW-3	4/2/19	13:10			7	X	X	X	X	X	X	X	X	
FB-02	4/2/19	14:15			7	X	X	✓	X	X	X	X	X	

Turnaround Time (TAT) Requested (please circle)
Standard Rush
(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days: 6001-730-0003

E-mail address: JBlaney@wcdgrp.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) Type VI (Raw Data Only)
Type III (Reduced non-CLP) NJ DKQP TX TRRP-13
NYSDEC Category A or B MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	4/3/19	12:30		4/3/19	12:30
	4/3/19	18:50			
				4/3/19	18:50

EDD Required? Yes No
If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt 33.3-3.1 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 245423

Group Number(s): 2037300

Client: WCD

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	04/03/2019 18:50
Number of Packages:	3	Number of Projects:	1

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Juan Carrion (16518) at 23:46 on 04/03/2019

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-03	3.3	DT	Wet	Y	Loose	N
2	DT42-03	3.1	DT	Wet	Y	Loose	N
3	DT42-03	2.3	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

eurofins | Environment Testing TestAmerica



ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-111850-1
Client Project/Site: Metals Analysis Group #2037300

For:
Eurofins Lancaster Laboratories Env LLC
2425 New Holland Pike
Lancaster, Pennsylvania 17601

Attn: Hannah Cottman

Authorized for release by:
5/8/2019 4:43:16 PM

Leslie Howell, Project Manager I
(330)966-9266
leslie.howell@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Qualifiers

Metals

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Job ID: 240-111850-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

Job Narrative
240-111850-1

Comments
No additional comments.

Receipt
The samples were received on 5/1/2019 10:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.4º C and 2.0º C.

Metals
Method(s) 7470A: The following samples were analyzed outside of analytical holding time due to analysis for Mercury being requested outside of analytical holding time for Mercury MW-5 (240-111850-1), MW-8 (240-111850-2), MW-7 (240-111850-3), MW-6 (240-111850-4), MW-9 (240-111850-5), MW-1 (240-111850-6), FB-01 (240-111850-7), MW-4 (240-111850-8), MW-2 (240-111850-9), FB-02 (240-111850-10) and MW-3 (240-111850-11).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	TAL CAN
6020B	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL CAN
7470A	Preparation, Mercury	SW846	TAL CAN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

Sample Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-111850-1	MW-5	Water	04/01/19 09:30	05/01/19 10:00
240-111850-2	MW-8	Water	04/01/19 09:30	05/01/19 10:00
240-111850-3	MW-7	Water	04/01/19 10:55	05/01/19 10:00
240-111850-4	MW-6	Water	04/01/19 11:20	05/01/19 10:00
240-111850-5	MW-9	Water	04/01/19 12:20	05/01/19 10:00
240-111850-6	MW-1	Water	04/01/19 13:00	05/01/19 10:00
240-111850-7	FB-01	Water	04/01/19 13:35	05/01/19 10:00
240-111850-8	MW-4	Water	04/02/19 09:00	05/01/19 10:00
240-111850-9	MW-2	Water	04/02/19 11:30	05/01/19 10:00
240-111850-10	FB-02	Water	04/02/19 14:15	05/01/19 10:00
240-111850-11	MW-3	Water	04/01/19 13:10	05/01/19 10:00

Detection Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-5 — Lab Sample ID: 240-111850-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	290		100		ug/L	1		6010D	Total Recoverable
Calcium	130000		5000		ug/L	1		6010D	Total Recoverable

Client Sample ID: MW-8 — Lab Sample ID: 240-111850-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	160		100		ug/L	1		6010D	Total Recoverable
Calcium	7600		5000		ug/L	1		6010D	Total Recoverable

Client Sample ID: MW-7 — Lab Sample ID: 240-111850-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	110		100		ug/L	1		6010D	Total Recoverable
Calcium	29000		5000		ug/L	1		6010D	Total Recoverable

Client Sample ID: MW-6 — Lab Sample ID: 240-111850-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	290		100		ug/L	1		6010D	Total Recoverable
Calcium	47000		5000		ug/L	1		6010D	Total Recoverable
Molybdenum	10		5.0		ug/L	1		6020B	Total Recoverable

Client Sample ID: MW-9 — Lab Sample ID: 240-111850-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	120		100		ug/L	1		6010D	Total Recoverable
Calcium	40000		5000		ug/L	1		6010D	Total Recoverable
Arsenic	7.6		5.0		ug/L	1		6020B	Total Recoverable
Molybdenum	10		5.0		ug/L	1		6020B	Total Recoverable

Client Sample ID: MW-1 — Lab Sample ID: 240-111850-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	1300		100		ug/L	1		6010D	Total Recoverable
Barium	800		200		ug/L	1		6010D	Total Recoverable
Calcium	350000		5000		ug/L	1		6010D	Total Recoverable
Lithium	89		50		ug/L	1		6010D	Total Recoverable

Client Sample ID: FB-01 — Lab Sample ID: 240-111850-7

No Detections.

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Canton

Detection Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-4 — Lab Sample ID: 240-111850-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	960		100		ug/L	1		6010D	Total Recoverable
Barium	310		200		ug/L	1		6010D	Total Recoverable
Calcium	96000		5000		ug/L	1		6010D	Total Recoverable

Client Sample ID: MW-2 — Lab Sample ID: 240-111850-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	940		100		ug/L	1		6010D	Total Recoverable
Barium	2300		200		ug/L	1		6010D	Total Recoverable
Calcium	430000		5000		ug/L	1		6010D	Total Recoverable
Lithium	78		50		ug/L	1		6010D	Total Recoverable

Client Sample ID: FB-02 — Lab Sample ID: 240-111850-10

No Detections.

Client Sample ID: MW-3 — Lab Sample ID: 240-111850-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	250		100		ug/L	1		6010D	Total Recoverable
Calcium	76000		5000		ug/L	1		6010D	Total Recoverable
Molybdenum	7.4		5.0		ug/L	1		6020B	Total Recoverable

This Detection Summary does not include radiochemical test results.

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-5
Lab Sample ID: 240-111850-1
Date Collected: 04/01/19 09:30
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**290**		100		ug/L		05/02/19 14:00	05/06/19 21:59	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 21:33	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 21:33	1
Calcium	**130000**		5000		ug/L		05/02/19 14:00	05/03/19 21:33	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 21:33	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:33	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:33	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 21:33	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:12	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:12	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:12	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:12	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:12	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:12	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:05	1

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-8
Lab Sample ID: 240-111850-2
Date Collected: 04/01/19 09:30
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**160**		100		ug/L		05/02/19 14:00	05/06/19 22:03	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 21:38	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 21:38	1
Calcium	**7600**		5000		ug/L		05/02/19 14:00	05/03/19 21:38	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 21:38	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:38	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:38	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 21:38	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:14	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:14	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:14	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:14	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:14	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:14	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:07	1

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-7
Lab Sample ID: 240-111850-3
Date Collected: 04/01/19 10:55
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**110**		100		ug/L		05/02/19 14:00	05/06/19 22:08	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 21:42	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 21:42	1
Calcium	**29000**		5000		ug/L		05/02/19 14:00	05/03/19 21:42	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 21:42	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:42	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:42	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 21:42	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:17	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:17	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:17	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:17	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:17	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:17	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:09	1

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-6
Lab Sample ID: 240-111850-4
Date Collected: 04/01/19 11:20
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**290**		100		ug/L		05/02/19 14:00	05/06/19 22:13	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 21:47	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 21:47	1
Calcium	**47000**		5000		ug/L		05/02/19 14:00	05/03/19 21:47	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 21:47	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:47	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:47	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 21:47	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:19	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:19	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:19	1
Molybdenum	**10**		5.0		ug/L		05/02/19 14:00	05/03/19 16:19	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:19	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:19	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:11	1

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-9
Lab Sample ID: 240-111850-5
Date Collected: 04/01/19 12:20
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**120**		100		ug/L		05/02/19 14:00	05/06/19 22:18	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 21:52	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 21:52	1
Calcium	**40000**		5000		ug/L		05/02/19 14:00	05/03/19 21:52	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 21:52	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:52	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:52	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 21:52	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.6**		5.0		ug/L		05/02/19 14:00	05/03/19 16:22	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:22	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:22	1
Molybdenum	**10**		5.0		ug/L		05/02/19 14:00	05/03/19 16:22	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:22	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:22	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:13	1

Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-1
Lab Sample ID: 240-111850-6
Date Collected: 04/01/19 13:00
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**1300**		100		ug/L		05/02/19 14:00	05/06/19 22:22	1
Barium	**800**		200		ug/L		05/02/19 14:00	05/03/19 21:57	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 21:57	1
Calcium	**350000**		5000		ug/L		05/02/19 14:00	05/03/19 21:57	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 21:57	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:57	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 21:57	1
Lithium	**89**		50		ug/L		05/02/19 14:00	05/03/19 21:57	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:24	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:24	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:24	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:24	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:24	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:24	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:15	1

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: FB-01
Lab Sample ID: 240-111850-7
Date Collected: 04/01/19 13:35
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	<100		100		ug/L		05/02/19 14:00	05/06/19 22:36	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 22:11	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 22:11	1
Calcium	<5000		5000		ug/L		05/02/19 14:00	05/03/19 22:11	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 22:11	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:11	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:11	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 22:11	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:26	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:26	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:26	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:26	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:26	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:26	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:17	1

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-4
Lab Sample ID: 240-111850-8
Date Collected: 04/02/19 09:00
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**960**		100		ug/L		05/02/19 14:00	05/06/19 22:41	1
Barium	**310**		200		ug/L		05/02/19 14:00	05/03/19 22:15	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 22:15	1
Calcium	**96000**		5000		ug/L		05/02/19 14:00	05/03/19 22:15	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 22:15	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:15	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:15	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 22:15	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:29	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:29	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:29	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:29	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:29	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:29	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:19	1

Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-2
Lab Sample ID: 240-111850-9
Date Collected: 04/02/19 11:30
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**940**		100		ug/L		05/02/19 14:00	05/06/19 22:46	1
Barium	**2300**		200		ug/L		05/02/19 14:00	05/03/19 22:20	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 22:20	1
Calcium	**430000**		5000		ug/L		05/02/19 14:00	05/03/19 22:20	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 22:20	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:20	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:20	1
Lithium	**78**		50		ug/L		05/02/19 14:00	05/03/19 22:20	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:36	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:36	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:36	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:36	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:36	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:36	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:21	1

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: FB-02
Lab Sample ID: 240-111850-10
Date Collected: 04/02/19 14:15
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	<100		100		ug/L		05/02/19 14:00	05/06/19 22:51	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 22:25	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 22:25	1
Calcium	<5000		5000		ug/L		05/02/19 14:00	05/03/19 22:25	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 22:25	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:25	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:25	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 22:25	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:38	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:38	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:38	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:38	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:38	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:38	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:27	1

Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Client Sample ID: MW-3
Lab Sample ID: 240-111850-11
Date Collected: 04/01/19 13:10
Matrix: Water
Date Received: 05/01/19 10:00

Method: 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**250**		100		ug/L		05/02/19 14:00	05/06/19 22:56	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 22:30	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 22:30	1
Calcium	**76000**		5000		ug/L		05/02/19 14:00	05/03/19 22:30	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 22:30	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:30	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 22:30	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 22:30	1

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 16:41	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:41	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:41	1
Molybdenum	**7.4**		5.0		ug/L		05/02/19 14:00	05/03/19 16:41	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 16:41	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 16:41	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20	H	0.20		ug/L		05/02/19 14:00	05/03/19 14:29	1

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 240-379347/1-A
Matrix: Water
Analysis Batch: 379542

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 379347

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	<100		100		ug/L		05/02/19 14:00	05/03/19 20:43	1
Barium	<200		200		ug/L		05/02/19 14:00	05/03/19 20:43	1
Chromium	<10		10		ug/L		05/02/19 14:00	05/03/19 20:43	1
Calcium	<5000		5000		ug/L		05/02/19 14:00	05/03/19 20:43	1
Cobalt	<10		10		ug/L		05/02/19 14:00	05/03/19 20:43	1
Selenium	<20		20		ug/L		05/02/19 14:00	05/03/19 20:43	1
Thallium	<20		20		ug/L		05/02/19 14:00	05/03/19 20:43	1
Lithium	<50		50		ug/L		05/02/19 14:00	05/03/19 20:43	1

Lab Sample ID: LCS 240-379347/2-A
Matrix: Water
Analysis Batch: 379542

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 379347

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1030		ug/L		103	80 - 120
Barium	2000	1930		ug/L		97	80 - 120
Chromium	200	176		ug/L		88	80 - 120
Calcium	50000	44800		ug/L		90	80 - 120
Cobalt	500	463		ug/L		93	80 - 120
Selenium	2000	2070		ug/L		103	80 - 120
Thallium	2000	1890		ug/L		95	80 - 120
Lithium	1000	927		ug/L		93	80 - 120

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 240-379347/1-A
Matrix: Water
Analysis Batch: 379745

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 379347

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 15:47	1
Beryllium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 15:47	1
Cadmium	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 15:47	1
Molybdenum	<5.0		5.0		ug/L		05/02/19 14:00	05/03/19 15:47	1
Lead	<1.0		1.0		ug/L		05/02/19 14:00	05/03/19 15:47	1
Antimony	<2.0		2.0		ug/L		05/02/19 14:00	05/03/19 15:47	1

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-379351/1-A
Matrix: Water
Analysis Batch: 379776

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 379351

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.20		0.20		ug/L		05/02/19 14:00	05/03/19 13:46	1

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: LCS 240-379351/2-A
Matrix: Water
Analysis Batch: 379776

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 379351

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			5.00	4.80		ug/L		96	80 - 120		

QC Association Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Metals

Prep Batch: 379347

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-111850-1	MW-5	Total Recoverable	Water	3005A	
240-111850-2	MW-8	Total Recoverable	Water	3005A	
240-111850-3	MW-7	Total Recoverable	Water	3005A	
240-111850-4	MW-6	Total Recoverable	Water	3005A	
240-111850-5	MW-9	Total Recoverable	Water	3005A	
240-111850-6	MW-1	Total Recoverable	Water	3005A	
240-111850-7	FB-01	Total Recoverable	Water	3005A	
240-111850-8	MW-4	Total Recoverable	Water	3005A	
240-111850-9	MW-2	Total Recoverable	Water	3005A	
240-111850-10	FB-02	Total Recoverable	Water	3005A	
240-111850-11	MW-3	Total Recoverable	Water	3005A	
MB 240-379347/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-379347/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-379347/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 379351

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-111850-1	MW-5	Total/NA	Water	7470A	
240-111850-2	MW-8	Total/NA	Water	7470A	
240-111850-3	MW-7	Total/NA	Water	7470A	
240-111850-4	MW-6	Total/NA	Water	7470A	
240-111850-5	MW-9	Total/NA	Water	7470A	
240-111850-6	MW-1	Total/NA	Water	7470A	
240-111850-7	FB-01	Total/NA	Water	7470A	
240-111850-8	MW-4	Total/NA	Water	7470A	
240-111850-9	MW-2	Total/NA	Water	7470A	
240-111850-10	FB-02	Total/NA	Water	7470A	
240-111850-11	MW-3	Total/NA	Water	7470A	
MB 240-379351/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-379351/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 379542

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-111850-1	MW-5	Total Recoverable	Water	6010D	379347
240-111850-2	MW-8	Total Recoverable	Water	6010D	379347
240-111850-3	MW-7	Total Recoverable	Water	6010D	379347
240-111850-4	MW-6	Total Recoverable	Water	6010D	379347
240-111850-5	MW-9	Total Recoverable	Water	6010D	379347
240-111850-6	MW-1	Total Recoverable	Water	6010D	379347
240-111850-7	FB-01	Total Recoverable	Water	6010D	379347
240-111850-8	MW-4	Total Recoverable	Water	6010D	379347
240-111850-9	MW-2	Total Recoverable	Water	6010D	379347
240-111850-10	FB-02	Total Recoverable	Water	6010D	379347
240-111850-11	MW-3	Total Recoverable	Water	6010D	379347
MB 240-379347/1-A	Method Blank	Total Recoverable	Water	6010D	379347
LCS 240-379347/2-A	Lab Control Sample	Total Recoverable	Water	6010D	379347

Analysis Batch: 379745

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-111850-1	MW-5	Total Recoverable	Water	6020B	379347
240-111850-2	MW-8	Total Recoverable	Water	6020B	379347

Metals (Continued)

Analysis Batch: 379745 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-111850-3	MW-7	Total Recoverable	Water	6020B	379347
240-111850-4	MW-6	Total Recoverable	Water	6020B	379347
240-111850-5	MW-9	Total Recoverable	Water	6020B	379347
240-111850-6	MW-1	Total Recoverable	Water	6020B	379347
240-111850-7	FB-01	Total Recoverable	Water	6020B	379347
240-111850-8	MW-4	Total Recoverable	Water	6020B	379347
240-111850-9	MW-2	Total Recoverable	Water	6020B	379347
240-111850-10	FB-02	Total Recoverable	Water	6020B	379347
240-111850-11	MW-3	Total Recoverable	Water	6020B	379347
MB 240-379347/1-A	Method Blank	Total Recoverable	Water	6020B	379347
LCS 240-379347/3-A	Lab Control Sample	Total Recoverable	Water	6020B	379347

Analysis Batch: 379776

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-111850-1	MW-5	Total/NA	Water	7470A	379351
240-111850-2	MW-8	Total/NA	Water	7470A	379351
240-111850-3	MW-7	Total/NA	Water	7470A	379351
240-111850-4	MW-6	Total/NA	Water	7470A	379351
240-111850-5	MW-9	Total/NA	Water	7470A	379351
240-111850-6	MW-1	Total/NA	Water	7470A	379351
240-111850-7	FB-01	Total/NA	Water	7470A	379351
240-111850-8	MW-4	Total/NA	Water	7470A	379351
240-111850-9	MW-2	Total/NA	Water	7470A	379351
240-111850-10	FB-02	Total/NA	Water	7470A	379351
240-111850-11	MW-3	Total/NA	Water	7470A	379351
MB 240-379351/1-A	Method Blank	Total/NA	Water	7470A	379351
LCS 240-379351/2-A	Lab Control Sample	Total/NA	Water	7470A	379351

Analysis Batch: 379949

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-111850-1	MW-5	Total Recoverable	Water	6010D	379347
240-111850-2	MW-8	Total Recoverable	Water	6010D	379347
240-111850-3	MW-7	Total Recoverable	Water	6010D	379347
240-111850-4	MW-6	Total Recoverable	Water	6010D	379347
240-111850-5	MW-9	Total Recoverable	Water	6010D	379347
240-111850-6	MW-1	Total Recoverable	Water	6010D	379347
240-111850-7	FB-01	Total Recoverable	Water	6010D	379347
240-111850-8	MW-4	Total Recoverable	Water	6010D	379347
240-111850-9	MW-2	Total Recoverable	Water	6010D	379347
240-111850-10	FB-02	Total Recoverable	Water	6010D	379347
240-111850-11	MW-3	Total Recoverable	Water	6010D	379347

Lab Chronicle

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Client Sample ID: MW-5

Date Collected: 04/01/19 09:30
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 21:33	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 21:59	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:12	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:05	AJC	TAL CAN

Client Sample ID: MW-8

Date Collected: 04/01/19 09:30
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 21:38	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:03	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:14	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:07	AJC	TAL CAN

Client Sample ID: MW-7

Date Collected: 04/01/19 10:55
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 21:42	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:08	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:17	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:09	AJC	TAL CAN

Client Sample ID: MW-6

Date Collected: 04/01/19 11:20
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 21:47	RKT	TAL CAN

Lab Chronicle

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Client Sample ID: MW-6
Date Collected: 04/01/19 11:20
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:13	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:19	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:11	AJC	TAL CAN

Client Sample ID: MW-9
Date Collected: 04/01/19 12:20
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 21:52	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:18	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:22	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:13	AJC	TAL CAN

Client Sample ID: MW-1
Date Collected: 04/01/19 13:00
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 21:57	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:22	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:24	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:15	AJC	TAL CAN

Client Sample ID: FB-01
Date Collected: 04/01/19 13:35
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 22:11	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:36	WKD	TAL CAN

Lab Chronicle

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Client Sample ID: FB-01
Date Collected: 04/01/19 13:35
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:26	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:17	AJC	TAL CAN

Client Sample ID: MW-4
Date Collected: 04/02/19 09:00
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 22:15	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:41	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:29	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:19	AJC	TAL CAN

Client Sample ID: MW-2
Date Collected: 04/02/19 11:30
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 22:20	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:46	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:36	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:21	AJC	TAL CAN

Client Sample ID: FB-02
Date Collected: 04/02/19 14:15
Date Received: 05/01/19 10:00

Lab Sample ID: 240-111850-10
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 22:25	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:51	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:38	DSH	TAL CAN

Lab Chronicle

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Metals Analysis Group #2037300

Job ID: 240-111850-1

Client Sample ID: FB-02

Lab Sample ID: 240-111850-10

Date Collected: 04/02/19 14:15

Matrix: Water

Date Received: 05/01/19 10:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:27	AJC	TAL CAN

Client Sample ID: MW-3

Lab Sample ID: 240-111850-11

Date Collected: 04/01/19 13:10

Matrix: Water

Date Received: 05/01/19 10:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379542	05/03/19 22:30	RKT	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6010D		1	379949	05/06/19 22:56	WKD	TAL CAN
Total Recoverable	Prep	3005A			379347	05/02/19 14:00	SLD	TAL CAN
Total Recoverable	Analysis	6020B		1	379745	05/03/19 16:41	DSH	TAL CAN
Total/NA	Prep	7470A			379351	05/02/19 14:00	SLD	TAL CAN
Total/NA	Analysis	7470A		1	379776	05/03/19 14:29	AJC	TAL CAN

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

Accreditation/Certification Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 240-111850-1
Project/Site: Metals Analysis Group #2037300

Laboratory: Eurofins TestAmerica, Canton

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
New Jersey	NELAP	2	OH001	06-30-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
6020B	3005A	Water	Antimony
6020B	3005A	Water	Arsenic
6020B	3005A	Water	Beryllium
6020B	3005A	Water	Cadmium
6020B	3005A	Water	Lead
6020B	3005A	Water	Molybdenum

2.2/C2.0

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # _____ Group # 2037300 Sample # 1026578-88

Subcontractor:	TestAmerica-Edison		
Project Name/#:	2037300	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler: FI		PWSID #:	
Phone #:	717-556-7383	Quote #:	
State where samples were collected:	NJ	For Compliance: Yes ☑ No ☐	

	Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil ☐ Sediment ☐ Tissue ☐	Water ☑ Ground ☐ Potable ☐	Other: Surface ☐ NPDES ☐	Total # of Containers	Analyses Requested: SW-846 7470A - Hg	6010D - Ca, Li, Tl, Se, Ba, Cr, Co, B	6020B - Sb, As, Be, Cd, Pb, Mo	Preservation and Filtration Codes: N N N	Remarks
1	MW-5	4/1/2019	0930				X		1	X	X	X		1026578
2	MW-8	4/1/2019	0930				X		1	X	X	X		1026579
3	MW-7	4/1/2019	1055				X		1	X	X	X		1026580
4	MW-6	4/1/2019	1120				X		1	X	X	X		1026581
5	MW-9	4/1/2019	1220				X		1	X	X	X		1026582
6	MW-1	4/1/2019	1300				X		1	X	X	X		1026583
7	FB-01	4/1/2019	1335				X		1	X	X	X		1026584
8	MW-4	4/2/2019	0900				X		1	X	X	X		1026585
9	MW-2	4/2/2019	1130				X		1	X	X	X		1026586
	~~MW-3~~	~~4/2/2019~~	~~1310~~		(3)	HCL 213	X 4-30-19		~~1~~	~~X~~	~~X~~	~~X~~		~~1026587~~
10	FB-02	4/2/2019	1415				X		1	X	X	X		1026588

240-111850 Chain of Custody

For Lab Use Only
SF #: _____
SCR #: _____

n Codes
T = Thiosulfate
B = NaOH
P = H_3PO_4
O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: 5-day Standard

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: ELLE_Subcontracting@EurofinsUS.com

Phone: 717-556-7383

Data Package Options (please check if required) ☐ Full Data Package

Type I (Validation/non-CLP)	☐	MA MCP	☐
Type III (Reduced non-CLP)	☐	CT RCP	☐
Type VI (Raw Data Only)	☐	TX TRRP-13	☐
NJ DKQP	☑	NYSDEC Category	☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: HazSite7

Relinquished by:	Date	Time	Received by:	Date	Time
Hannah Cottman	4-30-19	0858	Brad Ebert	4/30/19	9:45
Brad Ebert	4/30/19	15:40		4/30/19	1540
TAEL	4/30/19	1900		5-1-19	1000
	Date	Time		Date	Time
	Date	Time		Date	Time

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

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7045 0717

3.2°C IR9 NoCS

5/8/2019

0.6 / C0.4

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # _____ Group # 2037300 Sample # 1026578-88

Subcontractor:	~~TestAmerica-Edison~~ Canton (3) HLC 2213 4-30-19		
Project Name/#:	2037300	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler: FI		PWSID #:	
Phone #:	717-556-7383	Quote #:	
State where samples were collected:	NJ	For Compliance: Yes ☑ No ☐	

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water: Potable	Ground	NPDES	Surface	Other:	Total # of Containers	Analyses Requested: SW-846 7470A - Hg (N)	6010D - Ca, Li, Tl, Se, Ba, Cr, Co, B (N)	6020B - Sb, As, Be, Cd, Pb, Mo (N)	Remarks
~~MW-5~~ (8) Previously shipped. HLC 2213 4-30-19	~~4/1/2019~~	~~0930~~						X						X	X	X	~~1026578~~
MW-8	4/1/2019	0930						X						X	X	X	~~1026579~~
MW-7	4/1/2019	1055						X						X	X	X	1026580
MW-6	4/1/2019	1120						X						X	X	X	1026581
MW-9	4/1/2019	1220						X						X	X	X	1026582
MW-1	4/1/2019	1300						X						X	X	X	1026583
FB-01	4/1/2019	1335						X						X	X	X	1026584
MW-4	4/2/2019	0900						X						X	X	X	1026585
~~MW-2~~	~~4/2/2019~~	~~1130~~						X						X	X	X	~~1026586~~
MW-3	4/2/2019	1310						X						X	X	X	1026587
~~FB-02~~ (8) HLC 2213 4-30-19	~~4/2/2019~~	~~1415~~						X						X	X	X	~~1026588~~

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 P = H_3PO_4
F = Field Filtered O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed: 5-day Standard

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: ELLE_Subcontracting@EurofinsUS.com

Phone: 717-556-7383

Data Package Options (please check if required) ☐ Full Data Package

Type I (Validation/non-CLP)	☐	MA MCP	☐
Type III (Reduced non-CLP)	☐	CT RCP	☐
Type VI (Raw Data Only)	☐	TX TRRP-13	☐
NJ DKQP	☑	NYSDEC Category	☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: HazSite7

Relinquished by:	Date	Time	Received by:	Date	Time
Hannah Cottman	4-30-19	1712		5-1-19	1000
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

TestAmerica Canton Sample Receipt Form/Narrative **Login # :** 111850
Canton Facility

Client Lancaster Laboratories Site Name _____ Cooler unpacked by: MM

Cooler Received on 5-1-19 Opened on 5-1-19

FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # TA Foam Box Client Cooler Box Other _____

Packing material used: ~~Bubble Wrap~~ Foam ~~Plastic Bag~~ None Other _____

COOLANT: (Wet Ice) Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF **-0.2** °C) Observed Cooler Temp. 2.2 °C Corrected Cooler Temp. 2.0 °C
   IR GUN #36 (CF **+0.7**°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity _____ Yes (No)
   -Were the seals on the outside of the cooler(s) signed & dated? Yes No (NA)
   -Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes (No)
   -Were tamper/custody seals intact and uncompromised? (Yes) No NA
3. Shippers' packing slip attached to the cooler(s)? (Yes) No
4. Did custody papers accompany the sample(s)? (Yes) No
5. Were the custody papers relinquished & signed in the appropriate place? (Yes) No
6. Was/were the person(s) who collected the samples clearly identified on the COC? (Yes) No
7. Did all bottles arrive in good condition (Unbroken)? (Yes) No
8. Could all bottle labels be reconciled with the COC? (Yes) No
9. Were correct bottle(s) used for the test(s) indicated? (Yes) No
10. Sufficient quantity received to perform indicated analyses? (Yes) No
11. Are these work share samples? Yes (No)
    If yes, Questions 12-16 have been checked at the originating laboratory.
12. Were all preserved sample(s) at the correct pH upon receipt? Yes No (NA) pH Strip Lot# **HC984738**
13. Were VOAs on the COC? Yes (No)
14. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this. Yes No (NA)
15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes (No)
16. Was a LL Hg or Me Hg trip blank present? _____ Yes (No)

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

17. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by: MS

18. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

19. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

TestAmerica Canton Sample Receipt Form/Narrative **Login # :** 111950
Canton Facility

Client Lancaster Laboratories Site Name _____ Cooler unpacked by: MM

Cooler Received on 5-1-19 Opened on 5-1-19

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # TA Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF **-0.2** °C) Observed Cooler Temp. 0.6 °C Corrected Cooler Temp. 0.4 °C
   IR GUN #36 (CF **+0.7**°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity _____	Yes	No
-Were the seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
-Were tamper/custody seals intact and uncompromised?	Yes	No NA
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels be reconciled with the COC?	Yes	No
9. Were correct bottle(s) used for the test(s) indicated?	Yes	No
10. Sufficient quantity received to perform indicated analyses?	Yes	No
11. Are these work share samples?	Yes	No
If yes, Questions 12-16 have been checked at the originating laboratory.		
12. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC984738**
13. Were VOAs on the COC?	Yes	No
14. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes	No
16. Was a LL Hg or Me Hg trip blank present? _____	Yes	No

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

17. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by: MS

18. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

19. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

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ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

WCD Group
1108 Old Thomasville Rd.
High Point NC 27260

Report Date: August 05, 2019 17:36

Project: PSEG Hudson

Account #: 44064
Group Number: 2037301
PO Number: 18-11432

Electronic Copy To	WCD Group	Attn: Scott McDonald
Electronic Copy To	WCD Group	Attn: Jim Capritti
Electronic Copy To	Ransom Environmental	Attn: Gregory Casabona

Respectfully Submitted,

Kerri Sachtleben

(717)-556-7376

To view our laboratory's current scopes of accreditation please go to https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/ . Historical copies may be requested through your project manager.



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SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
MW-5 Groundwater	04/01/2019 09:30	1026589
MW-8 Groundwater	04/01/2019 09:30	1026590
MW-7 Groundwater	04/01/2019 10:55	1026591
MW-6 Groundwater	04/01/2019 11:20	1026592
MW-9 Groundwater	04/01/2019 12:20	1026593
MW-1 Groundwater	04/01/2019 13:00	1026594
FB-01 Water	04/01/2019 13:35	1026595
MW-4 Groundwater	04/02/2019 09:00	1026596
MW-2 Groundwater	04/02/2019 11:30	1026597
MW-3 Groundwater	04/02/2019 13:10	1026598
FB-02 Water	04/02/2019 14:15	1026599

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Sample Description:	**MW-5 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 1026589**
Project Name:	**PSEG Hudson**	**ELLE Group #:**	**2037301**
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/01/2019 09:30		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-8 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1026590** **2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/01/2019 09:30		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-7 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1026591** **2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/01/2019 10:55		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

Sample Description:	**MW-6 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 1026592**
Project Name:	**PSEG Hudson**	**ELLE Group #:**	**2037301**
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/01/2019 11:20		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-9 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1026593** **2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/01/2019 12:20		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-1 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1026594** **2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/01/2019 13:00		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**FB-01 Water** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	**GW 1026595**
		ELLE Group #:	**2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/01/2019 13:35		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-4 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1026596** **2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/02/2019 09:00		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-2 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:** **ELLE Group #:**	 **GW 1026597** **2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/02/2019 11:30		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**MW-3 Groundwater** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 1026598**
		ELLE Group #:	**2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/02/2019 13:10		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

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Sample Description:	**FB-02 Water** **Former PSEG Hudson**	**WCD Group** **ELLE Sample #:**	 **GW 1026599**
		ELLE Group #:	**2037301**
Project Name:	**PSEG Hudson**		
Submittal Date/Time:	04/03/2019 18:50		
Collection Date/Time:	04/02/2019 14:15		

Sample Comments

The analyses for Ra 226 and Ra 228 were subcontracted to another laboratory.
See Attached Reports.

Environmental Analysis Request/Chain of Custody

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Acct. # 114064 | For Eurofins Lancaster Laboratories Environmental use only: Group # 2037301 Sample # LRC 589-99

COC # 574621

Client Information

Client: WCD Group	Acct. #:
Project Name/#: Former PSEG Hudson	PWSID #:
Project Manager: Jim Blaney	P.O. #:
Sampler: Fabio Iannucci, Tristan Morgan	Quote #:
State where samples were collected: NJ	For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water ☒ Potable ☐ Ground ☐ NPDES ☐ Surface ☐ | Other: ____

Analysis Requested

Preservation and Filtration Codes

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Radium 226, Ra 228	Remarks
MW-5	4/1/19	9:30			7	X	X	X	X	X	X	X	X	Report to follow previous Metals: Ba, B, Ca, Cr, Co, Li, Se, Tl, Sb, As, Be, Cd, Pb, Mo, Hg Lab to filter
MW-8	4/1/19	9:30			7	X	X	X	X	X	X	X	X	
MW-7	4/1/19	10:55			7	X	X	X	X	X	X	X	X	
MW-6	4/1/19	11:20			7	X	X	X	X	X	X	X	X	
MW-9	4/1/19	12:20			7	X	X	X	X	X	X	X	X	
MW-1	4/1/19	13:00			7	X	X	X	X	X	X	X	X	
FB-01	4/1/19	13:35			7	X	X	X	X	X	X	X	X	

For Lab Use Only

FSC: ____

SCR#: ____

Preservation Codes

H=HCl	T=Thiosulfate
N=HNO_3	B=NaOH
S=H_2SO_4	P=H_3PO_4
F=Field Filtered	O=Other

Turnaround Time (TAT) Requested (please circle)

Standard | Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days: ____

E-mail address: JBlaney@wcdgroup.com 609-730-0007

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	4/3/19	12:30		4/3/19	12:30
	4/3/19	18:30			
				4/3/19	18:50

EDD Required? Yes No

If yes, format: ____

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Temperature upon receipt 33-3.1-33 °C

Environmental Analysis Request/Chain of Custody

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Acct. # 144064 For Eurofins Lancaster Laboratories Environmental use only Group # 737301 Sample # 126589-99

COC # 574620

Client Information

Client: WCD Group | Acct. #:

Project Name/#: Former PSEG Harden | PWSID #:

Project Manager: Jim Blaney | P.O. #:

Sampler: Fabio Iannacco | Quote #:

State where samples were collected: NJ | For Compliance: Yes ☐ No ☐

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water: Potable ☐ Ground ☒ NPDES ☐ Surface ☐ | Other: ☐

Analysis Requested

Preservation and Filtration Codes

For Lab Use Only: FSC: | SCR#: 240879

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	Dissolved Metals	Dissolved Hg	Chloride	Fluoride	Sulfate	pH	TDS	Ra 226, Ra 228	Remarks
MW-4	4/2/19	9:00			7	X	X	X	X	X	X	X	X	Report to follow previous Metals: Ba, B, Ca, Cr, Co, Li, Se, Tl, Sb, As, Be, Cd, Pb, Mo, Hg Lab to filter
MW-2	4/2/19	11:30			7	X	X	X	X	X	X	X	X	
MW-3	4/2/19	13:10			7	X	X	X	X	X	X	X	X	
FB-02	4/2/19	14:15			7	X	X	V	X	X	X	X	X	

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Requested TAT in business days:

E-mail address: JBlaney@wcdgroup.com 609-730-0003

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
	4/3/19	12:30		4/3/19	12:30
	4/3/19	18:50			
				4/3/19	18:50

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS FedEx Other

Temperature upon receipt 3.3-3.1 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 245423

Group Number(s): 2037301

Client: WCD

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	04/03/2019 18:50
Number of Packages:	3	Number of Projects:	1

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Juan Carrion (16518) at 23:46 on 04/03/2019

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT42-03	3.3	DT	Wet	Y	Loose	N
2	DT42-03	3.1	DT	Wet	Y	Loose	N
3	DT42-03	2.3	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

eurofins | Environment Testing TestAmerica



ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-33674-1
Client Project/Site: Eurofins Lancaster Rad - 2037301

For:
Eurofins Lancaster Laboratories Env LLC
2425 New Holland Pike
Lancaster, Pennsylvania 17601

Attn: Hannah Cottman

Authorized for release by:
8/5/2019 12:51:52 PM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 160-33674-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Eurofins Lancaster Laboratories Env LLC

Project: Eurofins Lancaster Rad - 2037301

Report Number: 160-33674-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 4/9/2019 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 2.4º C and 5.8º C.

RADIUM-226 (GFPC)

Samples MW-5 (160-33674-1), MW-8 (160-33674-2), MW-7 (160-33674-3), MW-6 (160-33674-4), MW-9 (160-33674-5), MW-1 (160-33674-6), FB-01 (160-33674-7), MW-4 (160-33674-8), MW-2 (160-33674-9), MW-3 (160-33674-10) and FB-02 (160-33674-11) were

Job ID: 160-33674-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

analyzed for Radium-226 (GFPC) in accordance with EPA Method 903.0. The samples were prepared on 06/10/2019 and analyzed on 08/01/2019.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: MW-5 (160-33674-1), MW-8 (160-33674-2), MW-7 (160-33674-3), MW-6 (160-33674-4), MW-9 (160-33674-5), MW-1 (160-33674-6), FB-01 (160-33674-7), MW-4 (160-33674-8), MW-2 (160-33674-9), MW-3 (160-33674-10) and FB-02 (160-33674-11). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

The following samples were prepared at a reduced aliquot due to yellow discoloration and suspended solids: MW-5 (160-33674-1) and MW-6 (160-33674-4). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228 (GFPC)

Samples MW-5 (160-33674-1), MW-8 (160-33674-2), MW-7 (160-33674-3), MW-6 (160-33674-4), MW-9 (160-33674-5), MW-1 (160-33674-6), FB-01 (160-33674-7), MW-4 (160-33674-8), MW-2 (160-33674-9), MW-3 (160-33674-10) and FB-02 (160-33674-11) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 04/21/2019 and analyzed on 05/09/2019.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: MW-5 (160-33674-1), MW-8 (160-33674-2), MW-7 (160-33674-3), MW-6 (160-33674-4), MW-9 (160-33674-5), MW-1 (160-33674-6), FB-01 (160-33674-7), MW-4 (160-33674-8), MW-2 (160-33674-9), MW-3 (160-33674-10) and FB-02 (160-33674-11). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

The following samples were prepared at a reduced aliquot due to yellow discoloration and suspended solids: MW-5 (160-33674-1) and MW-6 (160-33674-4). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # _____ Group # 2037301 Sample # 1026589-99

Subcontractor:	TestAmerica-St. Louis		
Project Name/#:	2037301	Site ID #:	
Requestor	Hannah Cottman	P.O. #:	NA
Sampler Initials:	FI	PWSID #:	
Phone #:	717-556-7383	Quote #:	
State where samples were collected:	NJ	For Compliance:	Yes ☑ No ☐

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Sediment	Tissue	Water (Potable, Ground, Surface, NPDES)	Other:	Total # of Containers	Analyses Requested: Radium-226 (EPA 903.1)	Radium-228 (EPA 904.0 mod)	Remarks
MW-5	4/1/2019	0930	X					X		2	X	X	1026589
MW-8	4/1/2019	0930	X					X		2	X	X	1026590
MW-7	4/1/2019	1055	X					X		2	X	X	1026591
MW-6	4/1/2019	1120	X					X		2	X	X	1026592
MW-9	4/1/2019	1220	X					X		2	X	X	1026593
MW-1	4/1/2019	1300	X					X		2	X	X	1026594
FB-01	4/1/2019	1335	X					X		2	X	X	1026595
MW-4	4/2/2019	0900	X					X		2	X	X	1026596
MW-2	4/2/2019	1130	X					X		2	X	X	1026597
MW-3	4/2/2019	1310	X					X		2	X	X	1026598
FB-02	4/2/2019	1415	X					X		2	X	X	1026599

ok to preserve upon receipt.

160-33674 Chain of Custody

For Lab Use Only

SF #: _____

SCR #: _____

Preservation Codes

H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 P = H_3PO_4
F = Field Filtered O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: ELLE_Subcontracting@EurofinsUS.com

Phone: 717-556-7383

Data Package Options (please check if required) ☑ Full Data Package

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NJ DKQP ☐ NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: HazSite EDD

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	4-8-19	1630	[signature]	4-9-19	0838
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt _____ °C

Login Sample Receipt Checklist

Client: Eurofins Lancaster Laboratories Env LLC

Job Number: 160-33674-1
SDG Number:

Login Number: 33674
List Number: 1
Creator: Press, Nicholas B

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33674-1
Project/Site: Eurofins Lancaster Rad - 2037301

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33674-1
Project/Site: Eurofins Lancaster Rad - 2037301

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency
None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Eurofins Lancaster Rad - 2037301

Job ID: 160-33674-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-33674-1	MW-5	Water	04/01/19 09:30	04/09/19 08:30	
160-33674-2	MW-8	Water	04/01/19 09:30	04/09/19 08:30	
160-33674-3	MW-7	Water	04/01/19 10:55	04/09/19 08:30	
160-33674-4	MW-6	Water	04/01/19 11:20	04/09/19 08:30	
160-33674-5	MW-9	Water	04/01/19 12:20	04/09/19 08:30	
160-33674-6	MW-1	Water	04/01/19 13:00	04/09/19 08:30	
160-33674-7	FB-01	Water	04/01/19 13:35	04/09/19 08:30	
160-33674-8	MW-4	Water	04/02/19 09:00	04/09/19 08:30	
160-33674-9	MW-2	Water	04/02/19 11:30	04/09/19 08:30	
160-33674-10	MW-3	Water	04/02/19 13:10	04/09/19 08:30	
160-33674-11	FB-02	Water	04/02/19 14:15	04/09/19 08:30	

Client Sample ID: MW-5
Lab Sample ID: 160-33674-1
Date Collected: 04/01/19 09:30
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.495		0.159	0.165	1.00	0.157	pCi/L	06/10/19 07:00	08/01/19 18:06	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	75.1		40 - 110	06/10/19 07:00	08/01/19 18:06	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.00478	U	0.289	0.289	1.00	0.512	pCi/L	04/21/19 13:53	05/09/19 08:32	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	98.0		40 - 110	04/21/19 13:53	05/09/19 08:32	1
Y Carrier	95.0		40 - 110	04/21/19 13:53	05/09/19 08:32	1

Client Sample ID: MW-8
Lab Sample ID: 160-33674-2
Date Collected: 04/01/19 09:30
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0779	U	0.0972	0.0974	1.00	0.161	pCi/L	06/10/19 07:00	08/01/19 18:06	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	80.2		40 - 110	06/10/19 07:00	08/01/19 18:06	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0221	U	0.178	0.178	1.00	0.315	pCi/L	04/21/19 13:53	05/09/19 08:32	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110	04/21/19 13:53	05/09/19 08:32	1
Y Carrier	96.8		40 - 110	04/21/19 13:53	05/09/19 08:32	1

Client Sample ID: MW-7
Lab Sample ID: 160-33674-3
Date Collected: 04/01/19 10:55
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.118		0.0862	0.0868	1.00	0.116	pCi/L	06/10/19 07:00	08/01/19 20:16	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	74.6		40 - 110	06/10/19 07:00	08/01/19 20:16	1

Client Sample ID: MW-7
Lab Sample ID: 160-33674-3
Date Collected: 04/01/19 10:55
Matrix: Water
Date Received: 04/09/19 08:30

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.232	U	0.184	0.186	1.00	0.290	pCi/L	04/21/19 13:53	05/09/19 08:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.5*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:32*	*1*
Y Carrier	*97.9*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:32*	*1*

Client Sample ID: MW-6
Lab Sample ID: 160-33674-4
Date Collected: 04/01/19 11:20
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.208**		0.114	0.116	1.00	0.147	pCi/L	06/10/19 07:00	08/01/19 20:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*40 - 110*	*06/10/19 07:00*	*08/01/19 20:16*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.423	U	0.332	0.334	1.00	0.527	pCi/L	04/21/19 13:53	05/09/19 08:33	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.1*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:33*	*1*
Y Carrier	*92.3*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:33*	*1*

Client Sample ID: MW-9
Lab Sample ID: 160-33674-5
Date Collected: 04/01/19 12:20
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.00104	U	0.0689	0.0689	1.00	0.145	pCi/L	06/10/19 07:00	08/01/19 20:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*71.5*		*40 - 110*	*06/10/19 07:00*	*08/01/19 20:16*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.411**		0.230	0.233	1.00	0.345	pCi/L	04/21/19 13:53	05/09/19 08:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.0*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:32*	*1*

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33674-1
Project/Site: Eurofins Lancaster Rad - 2037301

Client Sample ID: MW-9
Lab Sample ID: 160-33674-5
Date Collected: 04/01/19 12:20
Matrix: Water
Date Received: 04/09/19 08:30

Method: 904.0 - Radium-228 (GFPC) (Continued)

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Y Carrier	93.5		40 - 110	04/21/19 13:53	05/09/19 08:32	1

Client Sample ID: MW-1
Lab Sample ID: 160-33674-6
Date Collected: 04/01/19 13:00
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.39		0.229	0.261	1.00	0.116	pCi/L	06/10/19 07:00	08/01/19 20:16	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	85.9		40 - 110	06/10/19 07:00	08/01/19 20:16	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.03		0.331	0.381	1.00	0.333	pCi/L	04/21/19 13:53	05/09/19 08:36	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	96.3		40 - 110	04/21/19 13:53	05/09/19 08:36	1
Y Carrier	93.5		40 - 110	04/21/19 13:53	05/09/19 08:36	1

Client Sample ID: FB-01
Lab Sample ID: 160-33674-7
Date Collected: 04/01/19 13:35
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0342	U	0.0636	0.0637	1.00	0.147	pCi/L	06/10/19 07:00	08/01/19 20:15	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	81.9		40 - 110	06/10/19 07:00	08/01/19 20:15	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0328	U	0.164	0.164	1.00	0.302	pCi/L	04/21/19 13:53	05/09/19 08:36	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110	04/21/19 13:53	05/09/19 08:36	1
Y Carrier	93.8		40 - 110	04/21/19 13:53	05/09/19 08:36	1

Client Sample ID: MW-4
Lab Sample ID: 160-33674-8
Date Collected: 04/02/19 09:00
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.478		0.164	0.169	1.00	0.161	pCi/L	06/10/19 07:00	08/01/19 20:14	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	80.2		40 - 110	06/10/19 07:00	08/01/19 20:14	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.173	U	0.182	0.182	1.00	0.296	pCi/L	04/21/19 13:53	05/09/19 08:37	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	95.8		40 - 110	04/21/19 13:53	05/09/19 08:37	1
Y Carrier	97.6		40 - 110	04/21/19 13:53	05/09/19 08:37	1

Client Sample ID: MW-2
Lab Sample ID: 160-33674-9
Date Collected: 04/02/19 11:30
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.46		0.303	0.375	1.00	0.141	pCi/L	06/10/19 07:00	08/01/19 21:02	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	88.7		40 - 110	06/10/19 07:00	08/01/19 21:02	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.62		0.375	0.446	1.00	0.359	pCi/L	04/21/19 13:53	05/09/19 08:37	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	95.2		40 - 110	04/21/19 13:53	05/09/19 08:37	1
Y Carrier	91.2		40 - 110	04/21/19 13:53	05/09/19 08:37	1

Client Sample ID: MW-3
Lab Sample ID: 160-33674-10
Date Collected: 04/02/19 13:10
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.144	U	0.112	0.113	1.00	0.165	pCi/L	06/10/19 07:00	08/01/19 21:04	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	78.2		40 - 110	06/10/19 07:00	08/01/19 21:04	1

Client Sample ID: MW-3
Lab Sample ID: 160-33674-10
Date Collected: 04/02/19 13:10
Matrix: Water
Date Received: 04/09/19 08:30

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0308	U	0.187	0.187	1.00	0.331	pCi/L	04/21/19 13:53	05/09/19 08:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.2*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:37*	*1*
Y Carrier	*91.6*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:37*	*1*

Client Sample ID: FB-02
Lab Sample ID: 160-33674-11
Date Collected: 04/02/19 14:15
Matrix: Water
Date Received: 04/09/19 08:30

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0525	U	0.0705	0.0707	1.00	0.118	pCi/L	06/10/19 07:00	08/01/19 21:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.9*		*40 - 110*	*06/10/19 07:00*	*08/01/19 21:17*	*1*

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.383**		0.191	0.194	1.00	0.275	pCi/L	04/21/19 13:53	05/09/19 08:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*102*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:37*	*1*
Y Carrier	*93.8*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:37*	*1*

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-431211/23-A
Matrix: Water
Analysis Batch: 437577

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 431211

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.03190	U	0.0900	0.0901	1.00	0.165	pCi/L	06/10/19 07:00	08/01/19 23:34	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.5*		*40 - 110*	*06/10/19 07:00*	*08/01/19 23:34*	*1*

Lab Sample ID: LCS 160-431211/1-A
Matrix: Water
Analysis Batch: 437612

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 431211

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			15.1	15.08		1.56	1.00	0.147	pCi/L	100	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*79.4*		*40 - 110*

Lab Sample ID: LCSD 160-431211/2-A
Matrix: Water
Analysis Batch: 437612

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 431211

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226			15.1	14.30		1.49	1.00	0.134	pCi/L	94	75 - 125	0.26	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*78.5*		*40 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-424888/23-A
Matrix: Water
Analysis Batch: 427793

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 424888

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.4870		0.241	0.245	1.00	0.355	pCi/L	04/21/19 13:53	05/09/19 08:39	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.6*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:39*	*1*
Y Carrier	*93.5*		*40 - 110*	*04/21/19 13:53*	*05/09/19 08:39*	*1*

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Eurofins Lancaster Rad - 2037301

Job ID: 160-33674-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-424888/1-A
Matrix: Water
Analysis Batch: 427794

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 424888

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			9.23	8.477		0.957	1.00	0.292	pCi/L	92	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*103*		*40 - 110*
Y Carrier	*96.4*		*40 - 110*

Lab Sample ID: LCSD 160-424888/2-A
Matrix: Water
Analysis Batch: 427794

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 424888

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			9.23	7.356		0.860	1.00	0.303	pCi/L	80	75 - 125	0.62	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*102*		*40 - 110*
Y Carrier	*95.3*		*40 - 110*

QC Association Summary

Client: Eurofins Lancaster Laboratories Env LLC
Job ID: 160-33674-1
Project/Site: Eurofins Lancaster Rad - 2037301

Rad

Prep Batch: 424888

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-33674-1	MW-5	Total/NA	Water	PrecSep_0	
160-33674-2	MW-8	Total/NA	Water	PrecSep_0	
160-33674-3	MW-7	Total/NA	Water	PrecSep_0	
160-33674-4	MW-6	Total/NA	Water	PrecSep_0	
160-33674-5	MW-9	Total/NA	Water	PrecSep_0	
160-33674-6	MW-1	Total/NA	Water	PrecSep_0	
160-33674-7	FB-01	Total/NA	Water	PrecSep_0	
160-33674-8	MW-4	Total/NA	Water	PrecSep_0	
160-33674-9	MW-2	Total/NA	Water	PrecSep_0	
160-33674-10	MW-3	Total/NA	Water	PrecSep_0	
160-33674-11	FB-02	Total/NA	Water	PrecSep_0	
MB 160-424888/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-424888/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-424888/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Prep Batch: 431211

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-33674-1	MW-5	Total/NA	Water	PrecSep-21	
160-33674-2	MW-8	Total/NA	Water	PrecSep-21	
160-33674-3	MW-7	Total/NA	Water	PrecSep-21	
160-33674-4	MW-6	Total/NA	Water	PrecSep-21	
160-33674-5	MW-9	Total/NA	Water	PrecSep-21	
160-33674-6	MW-1	Total/NA	Water	PrecSep-21	
160-33674-7	FB-01	Total/NA	Water	PrecSep-21	
160-33674-8	MW-4	Total/NA	Water	PrecSep-21	
160-33674-9	MW-2	Total/NA	Water	PrecSep-21	
160-33674-10	MW-3	Total/NA	Water	PrecSep-21	
160-33674-11	FB-02	Total/NA	Water	PrecSep-21	
MB 160-431211/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-431211/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-431211/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Tracer/Carrier Summary

Client: Eurofins Lancaster Laboratories Env LLC
Project/Site: Eurofins Lancaster Rad - 2037301

Job ID: 160-33674-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)
160-33674-1	MW-5	75.1
160-33674-2	MW-8	80.2
160-33674-3	MW-7	74.6
160-33674-4	MW-6	79.4
160-33674-5	MW-9	71.5
160-33674-6	MW-1	85.9
160-33674-7	FB-01	81.9
160-33674-8	MW-4	80.2
160-33674-9	MW-2	88.7
160-33674-10	MW-3	78.2
160-33674-11	FB-02	79.9
LCS 160-431211/1-A	Lab Control Sample	79.4
LCSD 160-431211/2-A	Lab Control Sample Dup	78.5
MB 160-431211/23-A	Method Blank	82.5

Tracer/Carrier Legend

Ba Carrier = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)
160-33674-1	MW-5	98.0	95.0
160-33674-2	MW-8	101	96.8
160-33674-3	MW-7	95.5	97.9
160-33674-4	MW-6	90.1	92.3
160-33674-5	MW-9	89.0	93.5
160-33674-6	MW-1	96.3	93.5
160-33674-7	FB-01	104	93.8
160-33674-8	MW-4	95.8	97.6
160-33674-9	MW-2	95.2	91.2
160-33674-10	MW-3	95.2	91.6
160-33674-11	FB-02	102	93.8
LCS 160-424888/1-A	Lab Control Sample	103	96.4
LCSD 160-424888/2-A	Lab Control Sample Dup	102	95.3
MB 160-424888/23-A	Method Blank	94.6	93.5

Tracer/Carrier Legend

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

APPENDIX C

Normality Testing

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Coefficient of Variation Normality Test

Constituent: Antimony, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.4579	1	Yes
	square root	0.2387	1	Yes
	square	0.8623	1	Yes
	cube root	0.1615	1	Yes
	cube	1.252	1	No
	natural log	-0.07688	1	Yes
	x^4	1.623	1	No
	x^5	1.949	1	No
	x^6	2.211	1	No
MW-2 (n = 8)				
	no	0.6068	1	Yes
	square root	0.3329	1	Yes
	square	0.9228	1	Yes
	cube root	0.2262	1	Yes
	cube	1.042	1	No
	natural log	-0.1011	1	Yes
	x^4	1.09	1	No
	x^5	1.12	1	No
	x^6	1.149	1	No
MW-3 (n = 8)				
	no	0.3755	1	Yes
	square root	0.201	1	Yes
	square	0.6852	1	Yes
	cube root	0.1375	1	Yes
	cube	0.972	1	Yes
	natural log	-0.06463	1	Yes
	x^4	1.24	1	No
	x^5	1.481	1	No
	x^6	1.691	1	No
MW-4 (bg) (n = 8)				
	no	0.5319	1	Yes
	square root	0.2589	1	Yes
	square	1.078	1	No
	cube root	0.1708	1	Yes
	cube	1.545	1	No
	natural log	-0.07108	1	Yes
	x^4	1.893	1	No
	x^5	2.139	1	No
	x^6	2.312	1	No
MW-5 (n = 8)				
	no	0.2418	1	Yes
	square root	0.1456	1	Yes
	square	0.3421	1	Yes
	cube root	0.1034	1	Yes
	cube	0.3808	1	Yes
	natural log	-0.05545	1	Yes
	x^4	0.3954	1	Yes
	x^5	0.4009	1	Yes
	x^6	0.4029	1	Yes
MW-6 (n = 8)				
	no	0.2991	1	Yes
	square root	0.1947	1	Yes
	square	0.3788	1	Yes
	cube root	0.1422	1	Yes
	cube	0.3981	1	Yes
	natural log	-0.08006	1	Yes
	x^4	0.4027	1	Yes
	x^5	0.4037	1	Yes
	x^6	0.404	1	Yes
MW-7 (bg) (n = 8)				
	no	0.3056	1	Yes

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Coefficient of Variation Normality Test

Constituent: Antimony, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.2011	1	Yes
	square	0.3819	1	Yes
	cube root	0.1474	1	Yes
	cube	0.3992	1	Yes
	natural log	-0.08359	1	Yes
	x^4	0.403	1	Yes
	x^5	0.4038	1	Yes
	x^6	0.404	1	Yes
MW-8 (bg) (n = 8)				
	no	0.2947	1	Yes
	square root	0.1906	1	Yes
	square	0.3766	1	Yes
	cube root	0.1388	1	Yes
	cube	0.3973	1	Yes
	natural log	-0.07782	1	Yes
	x^4	0.4024	1	Yes
	x^5	0.4037	1	Yes
	x^6	0.404	1	Yes
MW-9 (n = 8)				
	no	0.4255	1	Yes
	square root	0.2432	1	Yes
	square	0.6483	1	Yes
	cube root	0.169	1	Yes
	cube	0.7619	1	Yes
	natural log	-0.08279	1	Yes
	x^4	0.8263	1	Yes
	x^5	0.8682	1	Yes
	x^6	0.8989	1	Yes
Pooled Background (bg) (n = 24)				
	no	0.423	1	Yes
	square root	0.249	1	Yes
	square	0.6136	1	Yes
	cube root	0.1749	1	Yes
	cube	0.6953	1	Yes
	natural log	-0.08742	1	Yes
	x^4	0.7332	1	Yes
	x^5	0.753	1	Yes
	x^6	0.7646	1	Yes

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Coefficient of Variation Normality Test

Constituent: Arsenic, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.4161	1	Yes
	square root	0.1944	1	Yes
	square	0.9246	1	Yes
	cube root	0.1265	1	Yes
	cube	1.452	1	No
	natural log	-0.06	1	Yes
	x^4	1.905	1	No
	x^5	2.24	1	No
	x^6	2.465	1	No
MW-2 (n = 8)				
	no	0.2731	1	Yes
	square root	0.1349	1	Yes
	square	0.5525	1	Yes
	cube root	0.08948	1	Yes
	cube	0.8266	1	Yes
	natural log	-0.04769	1	Yes
	x^4	1.088	1	No
	x^5	1.334	1	No
	x^6	1.56	1	No
MW-3 (n = 8)				
	no	0.3699	1	Yes
	square root	0.2117	1	Yes
	square	0.6172	1	Yes
	cube root	0.1486	1	Yes
	cube	0.8363	1	Yes
	natural log	-0.08438	1	Yes
	x^4	1.042	1	No
	x^5	1.232	1	No
	x^6	1.402	1	No
MW-4 (bg) (n = 8)				
	no	0.3377	1	Yes
	square root	0.2093	1	Yes
	square	0.4696	1	Yes
	cube root	0.1504	1	Yes
	cube	0.5314	1	Yes
	natural log	-0.08671	1	Yes
	x^4	0.5656	1	Yes
	x^5	0.586	1	Yes
	x^6	0.5983	1	Yes
MW-5 (n = 8)				
	no	0.6639	1	Yes
	square root	0.313	1	Yes
	square	1.283	1	No
	cube root	0.2024	1	Yes
	cube	1.629	1	No
	natural log	-0.08421	1	Yes
	x^4	1.771	1	No
	x^5	1.823	1	No
	x^6	1.841	1	No
MW-6 (n = 8)				
	no	0.5443	1	Yes
	square root	0.2981	1	Yes
	square	0.8576	1	Yes
	cube root	0.2033	1	Yes
	cube	1.009	1	No
	natural log	-0.09935	1	Yes
	x^4	1.091	1	No
	x^5	1.15	1	No
	x^6	1.205	1	No
MW-7 (bg) (n = 8)				
	no	0.5222	1	Yes

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Coefficient of Variation Normality Test

Constituent: Arsenic, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.3023	1	Yes
	square	0.7599	1	Yes
	cube root	0.2101	1	Yes
	cube	0.8687	1	Yes
	natural log	-0.1078	1	Yes
	x^4	0.9483	1	Yes
	x^5	1.032	1	No
	x^6	1.129	1	No
MW-8 (bg) (n = 8)				
	no	0.575	1	Yes
	square root	0.3009	1	Yes
	square	0.9995	1	Yes
	cube root	0.2025	1	Yes
	cube	1.278	1	No
	natural log	-0.09408	1	Yes
	x^4	1.462	1	No
	x^5	1.591	1	No
	x^6	1.685	1	No
MW-9 (n = 8)				
	no	0.6847	1	Yes
	square root	0.334	1	Yes
	square	1.364	1	No
	cube root	0.2201	1	Yes
	cube	1.906	1	No
	natural log	-0.1178	1	Yes
	x^4	2.273	1	No
	x^5	2.5	1	No
	x^6	2.636	1	No
Pooled Background (bg) (n = 24)				
	no	0.4749	1	Yes
	square root	0.2725	1	Yes
	square	0.7146	1	Yes
	cube root	0.1894	1	Yes
	cube	0.8394	1	Yes
	natural log	-0.09734	1	Yes
	x^4	0.9252	1	Yes
	x^5	1.004	1	No
	x^6	1.091	1	No

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Coefficient of Variation Normality Test

Constituent: Barium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.07265	1	Yes
	square root	0.03621	1	Yes
	square	0.146	1	Yes
	cube root	0.02412	1	Yes
	cube	0.2198	1	Yes
	natural log	-0.2298	1	Yes
	x^4	0.2936	1	Yes
	x^5	0.3671	1	Yes
	x^6	0.4401	1	Yes
MW-2 (n = 8)				
	no	0.06548	1	Yes
	square root	0.03318	1	Yes
	square	0.1274	1	Yes
	cube root	0.02222	1	Yes
	cube	0.1858	1	Yes
	natural log	0.08781	1	Yes
	x^4	0.2407	1	Yes
	x^5	0.2923	1	Yes
	x^6	0.3407	1	Yes
MW-3 (n = 8)				
	no	0.8301	1	Yes
	square root	0.4095	1	Yes
	square	1.471	1	No
	cube root	0.2689	1	Yes
	cube	1.778	1	No
	natural log	-0.2933	1	Yes
	x^4	1.915	1	No
	x^5	1.996	1	No
	x^6	2.062	1	No
MW-4 (bg) (n = 8)				
	no	0.5807	1	Yes
	square root	0.3047	1	Yes
	square	0.9994	1	Yes
	cube root	0.2052	1	Yes
	cube	1.271	1	No
	natural log	-0.3708	1	Yes
	x^4	1.464	1	No
	x^5	1.62	1	No
	x^6	1.756	1	No
MW-5 (n = 8)				
	no	0.3705	1	Yes
	square root	0.1789	1	Yes
	square	0.765	1	Yes
	cube root	0.1176	1	Yes
	cube	1.124	1	No
	natural log	-0.1587	1	Yes
	x^4	1.406	1	No
	x^5	1.609	1	No
	x^6	1.748	1	No
MW-6 (n = 8)				
	no	0.6799	1	Yes
	square root	0.3714	1	Yes
	square	1.174	1	No
	cube root	0.2553	1	Yes
	cube	1.555	1	No
	natural log	-0.3075	1	Yes
	x^4	1.843	1	No
	x^5	2.06	1	No
	x^6	2.225	1	No
MW-7 (bg) (n = 8)				
	no	1.071	1	No

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Coefficient of Variation Normality Test

Constituent: Barium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.4797	1	Yes
	square	2.114	1	No
	cube root	0.3045	1	Yes
	cube	2.596	1	No
	natural log	-0.2555	1	Yes
	x^4	2.756	1	No
	x^5	2.806	1	No
	x^6	2.821	1	No
MW-8 (bg) (n = 8)				
	no	0.7936	1	Yes
	square root	0.4124	1	Yes
	square	1.509	1	No
	cube root	0.2795	1	Yes
	cube	2.079	1	No
	natural log	-0.3009	1	Yes
	x^4	2.438	1	No
	x^5	2.634	1	No
	x^6	2.733	1	No
MW-9 (n = 8)				
	no	1.09	1	No
	square root	0.5199	1	Yes
	square	2.076	1	No
	cube root	0.3404	1	Yes
	cube	2.562	1	No
	natural log	-0.4958	1	Yes
	x^4	2.738	1	No
	x^5	2.797	1	No
	x^6	2.817	1	No
Pooled Background (bg) (n = 24)				
	no	0.9628	1	Yes
	square root	0.4966	1	Yes
	square	1.727	1	No
	cube root	0.3331	1	Yes
	cube	2.265	1	No
	natural log	-0.3878	1	Yes
	x^4	2.651	1	No
	x^5	2.948	1	No
	x^6	3.19	1	No

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Coefficient of Variation Normality Test

Constituent: Beryllium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-2 (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-3 (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-4 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-5 (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Beryllium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-9 (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
Pooled Background (bg) (n = 24)				
	no	0	1	Yes
	square root	3.2e-16	1	Yes
	square	0	1	Yes
	cube root	3.6e-16	1	Yes
	cube	6.3e-16	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	6.0e-16	1	Yes
	x^6	3.9e-16	1	Yes

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Coefficient of Variation Normality Test

Constituent: Boron, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.06641	1	Yes
	square root	0.03264	1	Yes
	square	0.1375	1	Yes
	cube root	0.02163	1	Yes
	cube	0.2137	1	Yes
	natural log	0.5052	1	Yes
	x^4	0.2949	1	Yes
	x^5	0.3813	1	Yes
	x^6	0.4728	1	Yes
MW-2 (n = 8)				
	no	0.06593	1	Yes
	square root	0.03312	1	Yes
	square	0.1305	1	Yes
	cube root	0.02211	1	Yes
	cube	0.1934	1	Yes
	natural log	-0.5718	1	Yes
	x^4	0.2545	1	Yes
	x^5	0.3137	1	Yes
	x^6	0.3708	1	Yes
MW-3 (n = 8)				
	no	0.4842	1	Yes
	square root	0.2521	1	Yes
	square	0.8648	1	Yes
	cube root	0.1696	1	Yes
	cube	1.152	1	No
	natural log	-0.5253	1	Yes
	x^4	1.386	1	No
	x^5	1.592	1	No
	x^6	1.777	1	No
MW-4 (bg) (n = 8)				
	no	0.2182	1	Yes
	square root	0.1085	1	Yes
	square	0.4398	1	Yes
	cube root	0.07215	1	Yes
	cube	0.6605	1	Yes
	natural log	2.354	1	No
	x^4	0.8744	1	Yes
	x^5	1.076	1	No
	x^6	1.262	1	No
MW-5 (n = 8)				
	no	0.391	1	Yes
	square root	0.1881	1	Yes
	square	0.813	1	Yes
	cube root	0.1235	1	Yes
	cube	1.203	1	No
	natural log	-0.4355	1	Yes
	x^4	1.518	1	No
	x^5	1.756	1	No
	x^6	1.933	1	No
MW-6 (n = 8)				
	no	0.5372	1	Yes
	square root	0.2819	1	Yes
	square	0.9287	1	Yes
	cube root	0.1899	1	Yes
	cube	1.182	1	No
	natural log	-0.8686	1	Yes
	x^4	1.35	1	No
	x^5	1.472	1	No
	x^6	1.568	1	No
MW-7 (bg) (n = 8)				
	no	0.5568	1	Yes

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Coefficient of Variation Normality Test

Constituent: Boron, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.2849	1	Yes
	square	0.9992	1	Yes
	cube root	0.1903	1	Yes
	cube	1.293	1	No
	natural log	-0.2826	1	Yes
	x^4	1.483	1	No
	x^5	1.609	1	No
	x^6	1.697	1	No
MW-8 (bg) (n = 8)				
	no	0.3598	1	Yes
	square root	0.1835	1	Yes
	square	0.672	1	Yes
	cube root	0.1228	1	Yes
	cube	0.918	1	Yes
	natural log	-0.2409	1	Yes
	x^4	1.104	1	No
	x^5	1.245	1	No
	x^6	1.354	1	No
MW-9 (n = 8)				
	no	0.6166	1	Yes
	square root	0.316	1	Yes
	square	1.121	1	No
	cube root	0.2112	1	Yes
	cube	1.499	1	No
	natural log	-0.4544	1	Yes
	x^4	1.789	1	No
	x^5	2.018	1	No
	x^6	2.199	1	No
Pooled Background (bg) (n = 24)				
	no	0.943	1	Yes
	square root	0.5044	1	Yes
	square	1.475	1	No
	cube root	0.3381	1	Yes
	cube	1.777	1	No
	natural log	-0.868	1	Yes
	x^4	2.037	1	No
	x^5	2.291	1	No
	x^6	2.539	1	No

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Coefficient of Variation Normality Test

Constituent: Cadmium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.4005	1	Yes
	square root	0.2567	1	Yes
	square	0.5303	1	Yes
	cube root	0.1868	1	Yes
	cube	0.5794	1	Yes
	natural log	-0.09241	1	Yes
	x^4	0.6004	1	Yes
	x^5	0.6096	1	Yes
	x^6	0.6138	1	Yes
MW-2 (n = 8)				
	no	0.3464	1	Yes
	square root	0.2115	1	Yes
	square	0.4878	1	Yes
	cube root	0.1511	1	Yes
	cube	0.5509	1	Yes
	natural log	-0.07263	1	Yes
	x^4	0.5821	1	Yes
	x^5	0.5984	1	Yes
	x^6	0.607	1	Yes
MW-3 (n = 8)				
	no	0.3318	1	Yes
	square root	0.2293	1	Yes
	square	0.3923	1	Yes
	cube root	0.1714	1	Yes
	cube	0.4022	1	Yes
	natural log	-0.09078	1	Yes
	x^4	0.4038	1	Yes
	x^5	0.404	1	Yes
	x^6	0.4041	1	Yes
MW-4 (bg) (n = 8)				
	no	0.1886	1	Yes
	square root	0.1075	1	Yes
	square	0.2926	1	Yes
	cube root	0.07487	1	Yes
	cube	0.3474	1	Yes
	natural log	-0.03504	1	Yes
	x^4	0.3755	1	Yes
	x^5	0.3897	1	Yes
	x^6	0.3969	1	Yes
MW-5 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	1.5e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	1.5e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-7 (bg) (n = 8)				
	no	0.3143	1	Yes

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Coefficient of Variation Normality Test

Constituent: Cadmium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.2099	1	Yes
	square	0.3857	1	Yes
	cube root	0.1548	1	Yes
	cube	0.4004	1	Yes
	natural log	-0.08004	1	Yes
	x^4	0.4033	1	Yes
	x^5	0.4039	1	Yes
	x^6	0.404	1	Yes
MW-8 (bg) (n = 8)				
	no	0.6808	1	Yes
	square root	0.3591	1	Yes
	square	1.194	1	No
	cube root	0.2433	1	Yes
	cube	1.543	1	No
	natural log	-0.1028	1	Yes
	x^4	1.776	1	No
	x^5	1.941	1	No
	x^6	2.067	1	No
MW-9 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	1.5e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
Pooled Background (bg) (n = 24)				
	no	0.4107	1	Yes
	square root	0.2332	1	Yes
	square	0.7451	1	Yes
	cube root	0.164	1	Yes
	cube	1.167	1	No
	natural log	-0.07767	1	Yes
	x^4	1.69	1	No
	x^5	2.258	1	No
	x^6	2.796	1	No

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Coefficient of Variation Normality Test

Constituent: Calcium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.04346	1	Yes
	square root	0.02185	1	Yes
	square	0.08593	1	Yes
	cube root	0.01459	1	Yes
	cube	0.1274	1	Yes
	natural log	0.007407	1	Yes
	x^4	0.1678	1	Yes
	x^5	0.2072	1	Yes
	x^6	0.2455	1	Yes
MW-2 (n = 8)				
	no	0.0387	1	Yes
	square root	0.01928	1	Yes
	square	0.0779	1	Yes
	cube root	0.01284	1	Yes
	cube	0.1176	1	Yes
	natural log	0.006316	1	Yes
	x^4	0.1576	1	Yes
	x^5	0.1981	1	Yes
	x^6	0.2389	1	Yes
MW-3 (n = 8)				
	no	0.5773	1	Yes
	square root	0.2623	1	Yes
	square	1.315	1	No
	cube root	0.1691	1	Yes
	cube	1.984	1	No
	natural log	0.1129	1	Yes
	x^4	2.414	1	No
	x^5	2.638	1	No
	x^6	2.743	1	No
MW-4 (bg) (n = 8)				
	no	0.2433	1	Yes
	square root	0.1172	1	Yes
	square	0.5199	1	Yes
	cube root	0.07716	1	Yes
	cube	0.8199	1	Yes
	natural log	0.04822	1	Yes
	x^4	1.126	1	No
	x^5	1.421	1	No
	x^6	1.688	1	No
MW-5 (n = 8)				
	no	0.2394	1	Yes
	square root	0.1184	1	Yes
	square	0.4888	1	Yes
	cube root	0.07865	1	Yes
	cube	0.7469	1	Yes
	natural log	0.04853	1	Yes
	x^4	1.01	1	No
	x^5	1.271	1	No
	x^6	1.52	1	No
MW-6 (n = 8)				
	no	0.4536	1	Yes
	square root	0.2373	1	Yes
	square	0.8149	1	Yes
	cube root	0.1602	1	Yes
	cube	1.104	1	No
	natural log	0.1103	1	Yes
	x^4	1.348	1	No
	x^5	1.561	1	No
	x^6	1.747	1	No
MW-7 (bg) (n = 8)				
	no	0.2596	1	Yes

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Coefficient of Variation Normality Test

Constituent: Calcium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.1311	1	Yes
	square	0.5032	1	Yes
	cube root	0.08756	1	Yes
	cube	0.7231	1	Yes
	natural log	0.07905	1	Yes
	x^4	0.9171	1	Yes
	x^5	1.087	1	No
	x^6	1.235	1	No
MW-8 (bg) (n = 8)				
	no	0.5951	1	Yes
	square root	0.342	1	Yes
	square	0.8956	1	Yes
	cube root	0.2371	1	Yes
	cube	1.083	1	No
	natural log	0.2666	1	Yes
	x^4	1.244	1	No
	x^5	1.392	1	No
	x^6	1.527	1	No
MW-9 (n = 8)				
	no	0.3691	1	Yes
	square root	0.1892	1	Yes
	square	0.6903	1	Yes
	cube root	0.1269	1	Yes
	cube	0.9556	1	Yes
	natural log	0.09065	1	Yes
	x^4	1.173	1	No
	x^5	1.354	1	No
	x^6	1.51	1	No
Pooled Background (bg) (n = 24)				
	no	0.8324	1	Yes
	square root	0.438	1	Yes
	square	1.447	1	No
	cube root	0.2964	1	Yes
	cube	1.91	1	No
	natural log	0.2539	1	Yes
	x^4	2.337	1	No
	x^5	2.754	1	No
	x^6	3.143	1	No

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Coefficient of Variation Normality Test

Constituent: Chloride Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.2698	1	Yes
	square root	0.1541	1	Yes
	square	0.4426	1	Yes
	cube root	0.1078	1	Yes
	cube	0.5988	1	Yes
	natural log	0.04064	1	Yes
	x^4	0.7701	1	Yes
	x^5	0.9614	1	Yes
	x^6	1.167	1	No
MW-2 (n = 8)				
	no	0.2746	1	Yes
	square root	0.1418	1	Yes
	square	0.5417	1	Yes
	cube root	0.09591	1	Yes
	cube	0.836	1	Yes
	natural log	0.03364	1	Yes
	x^4	1.158	1	No
	x^5	1.485	1	No
	x^6	1.791	1	No
MW-3 (n = 8)				
	no	0.9949	1	Yes
	square root	0.5005	1	Yes
	square	1.898	1	No
	cube root	0.3365	1	Yes
	cube	2.442	1	No
	natural log	0.1779	1	Yes
	x^4	2.68	1	No
	x^5	2.772	1	No
	x^6	2.807	1	No
MW-4 (bg) (n = 8)				
	no	0.4795	1	Yes
	square root	0.2649	1	Yes
	square	0.8234	1	Yes
	cube root	0.1829	1	Yes
	cube	1.12	1	No
	natural log	0.07261	1	Yes
	x^4	1.39	1	No
	x^5	1.631	1	No
	x^6	1.84	1	No
MW-5 (n = 8)				
	no	0.5763	1	Yes
	square root	0.2618	1	Yes
	square	1.314	1	No
	cube root	0.1689	1	Yes
	cube	1.983	1	No
	natural log	0.06769	1	Yes
	x^4	2.413	1	No
	x^5	2.636	1	No
	x^6	2.741	1	No
MW-6 (n = 8)				
	no	1.292	1	No
	square root	0.6411	1	Yes
	square	2.247	1	No
	cube root	0.4221	1	Yes
	cube	2.643	1	No
	natural log	0.2072	1	Yes
	x^4	2.771	1	No
	x^5	2.81	1	No
	x^6	2.823	1	No
MW-7 (bg) (n = 8)				
	no	0.6508	1	Yes

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Coefficient of Variation Normality Test

Constituent: Chloride Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.3378	1	Yes
	square	1.177	1	No
	cube root	0.227	1	Yes
	cube	1.597	1	No
	natural log	0.197	1	Yes
	x^4	1.932	1	No
	x^5	2.189	1	No
	x^6	2.379	1	No
MW-8 (bg) (n = 8)				
	no	0.6637	1	Yes
	square root	0.3968	1	Yes
	square	0.963	1	Yes
	cube root	0.2788	1	Yes
	cube	1.19	1	No
	natural log	0.167	1	Yes
	x^4	1.423	1	No
	x^5	1.654	1	No
	x^6	1.869	1	No
MW-9 (n = 8)				
	no	0.983	1	Yes
	square root	0.5845	1	Yes
	square	1.4	1	No
	cube root	0.4077	1	Yes
	cube	1.66	1	No
	natural log	0.2454	1	Yes
	x^4	1.888	1	No
	x^5	2.093	1	No
	x^6	2.269	1	No
Pooled Background (bg) (n = 24)				
	no	1.462	1	No
	square root	0.9344	1	Yes
	square	1.967	1	No
	cube root	0.6628	1	Yes
	cube	2.348	1	No
	natural log	0.3634	1	Yes
	x^4	2.716	1	No
	x^5	3.062	1	No
	x^6	3.371	1	No

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Coefficient of Variation Normality Test

Constituent: Chromium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0	1	Yes
	square root	1.2e-16	1	Yes
	square	0	1	Yes
	cube root	2.4e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-2 (n = 8)				
	no	0	1	Yes
	square root	1.2e-16	1	Yes
	square	0	1	Yes
	cube root	2.4e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-3 (n = 8)				
	no	0	1	Yes
	square root	1.2e-16	1	Yes
	square	0	1	Yes
	cube root	2.4e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-4 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.2e-16	1	Yes
	square	0	1	Yes
	cube root	2.4e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-5 (n = 8)				
	no	0.2129	1	Yes
	square root	0.1243	1	Yes
	square	0.3171	1	Yes
	cube root	0.08726	1	Yes
	cube	0.3652	1	Yes
	natural log	-0.06747	1	Yes
	x^4	0.3868	1	Yes
	x^5	0.3965	1	Yes
	x^6	0.4007	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	1.2e-16	1	Yes
	square	0	1	Yes
	cube root	2.4e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Chromium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	1.2e-16	1	Yes
	square	0	1	Yes
	cube root	2.4e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.2e-16	1	Yes
	square	0	1	Yes
	cube root	2.4e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-9 (n = 8)				
	no	0.2432	1	Yes
	square root	0.1467	1	Yes
	square	0.3431	1	Yes
	cube root	0.1042	1	Yes
	cube	0.3815	1	Yes
	natural log	-0.08201	1	Yes
	x^4	0.3957	1	Yes
	x^5	0.401	1	Yes
	x^6	0.4029	1	Yes
Pooled Background (bg) (n = 24)				
	no	0	1	Yes
	square root	2.3e-16	1	Yes
	square	0	1	Yes
	cube root	3.4e-16	1	Yes
	cube	3.8e-16	1	Yes
	natural log	0	1	Yes
	x^4	4.0e-16	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Cobalt, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.2613	1	Yes
	square root	0.1331	1	Yes
	square	0.5143	1	Yes
	cube root	0.08947	1	Yes
	cube	0.7732	1	Yes
	natural log	-0.05072	1	Yes
	x^4	1.038	1	No
	x^5	1.301	1	No
	x^6	1.55	1	No
MW-2 (n = 8)				
	no	0.1894	1	Yes
	square root	0.09308	1	Yes
	square	0.3883	1	Yes
	cube root	0.06167	1	Yes
	cube	0.5894	1	Yes
	natural log	-0.03268	1	Yes
	x^4	0.7849	1	Yes
	x^5	0.9682	1	Yes
	x^6	1.135	1	No
MW-3 (n = 8)				
	no	0	1	Yes
	square root	2.1e-16	1	Yes
	square	0	1	Yes
	cube root	1.7e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-4 (bg) (n = 8)				
	no	0.1489	1	Yes
	square root	0.082	1	Yes
	square	0.246	1	Yes
	cube root	0.05646	1	Yes
	cube	0.3073	1	Yes
	natural log	-0.03368	1	Yes
	x^4	0.3453	1	Yes
	x^5	0.3685	1	Yes
	x^6	0.3827	1	Yes
MW-5 (n = 8)				
	no	0	1	Yes
	square root	2.1e-16	1	Yes
	square	0	1	Yes
	cube root	1.7e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	2.1e-16	1	Yes
	square	0	1	Yes
	cube root	1.7e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Cobalt, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	2.1e-16	1	Yes
	square	0	1	Yes
	cube root	1.7e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-8 (bg) (n = 8)				
	no	0.2943	1	Yes
	square root	0.153	1	Yes
	square	0.5397	1	Yes
	cube root	0.1032	1	Yes
	cube	0.7396	1	Yes
	natural log	-0.06225	1	Yes
	x^4	0.9044	1	Yes
	x^5	1.044	1	No
	x^6	1.167	1	No
MW-9 (n = 8)				
	no	0.2211	1	Yes
	square root	0.1301	1	Yes
	square	0.3246	1	Yes
	cube root	0.09166	1	Yes
	cube	0.3702	1	Yes
	natural log	-0.05673	1	Yes
	x^4	0.3898	1	Yes
	x^5	0.398	1	Yes
	x^6	0.4015	1	Yes
Pooled Background (bg) (n = 24)				
	no	0.2508	1	Yes
	square root	0.1207	1	Yes
	square	0.5487	1	Yes
	cube root	0.0796	1	Yes
	cube	0.8952	1	Yes
	natural log	-0.0447	1	Yes
	x^4	1.269	1	No
	x^5	1.637	1	No
	x^6	1.972	1	No

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Coefficient of Variation Normality Test

Constituent: Fluoride Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.2335	1	Yes
	square root	0.106	1	Yes
	square	0.5562	1	Yes
	cube root	0.06836	1	Yes
	cube	0.9566	1	Yes
	natural log	-0.3066	1	Yes
	x^4	1.392	1	No
	x^5	1.802	1	No
	x^6	2.141	1	No
MW-2 (n = 8)				
	no	1.058	1	No
	square root	0.4298	1	Yes
	square	2.242	1	No
	cube root	0.2622	1	Yes
	cube	2.697	1	No
	natural log	-1.464	1	Yes
	x^4	2.801	1	No
	x^5	2.823	1	No
	x^6	2.827	1	No
MW-3 (n = 8)				
	no	0.2339	1	Yes
	square root	0.1144	1	Yes
	square	0.4997	1	Yes
	cube root	0.07593	1	Yes
	cube	0.809	1	Yes
	natural log	-0.3277	1	Yes
	x^4	1.151	1	No
	x^5	1.499	1	No
	x^6	1.821	1	No
MW-4 (bg) (n = 8)				
	no	1.128	1	No
	square root	0.4528	1	Yes
	square	2.337	1	No
	cube root	0.2741	1	Yes
	cube	2.737	1	No
	natural log	-1.289	1	Yes
	x^4	2.813	1	No
	x^5	2.826	1	No
	x^6	2.828	1	No
MW-5 (n = 8)				
	no	0.1102	1	Yes
	square root	0.05895	1	Yes
	square	0.1926	1	Yes
	cube root	0.0402	1	Yes
	cube	0.2531	1	Yes
	natural log	-0.1709	1	Yes
	x^4	0.2969	1	Yes
	x^5	0.3283	1	Yes
	x^6	0.3506	1	Yes
MW-6 (n = 8)				
	no	0.1797	1	Yes
	square root	0.08562	1	Yes
	square	0.396	1	Yes
	cube root	0.05618	1	Yes
	cube	0.6502	1	Yes
	natural log	-0.2391	1	Yes
	x^4	0.9356	1	Yes
	x^5	1.237	1	No
	x^6	1.535	1	No
MW-7 (bg) (n = 8)				
	no	0.2281	1	Yes

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Coefficient of Variation Normality Test

Constituent: Fluoride Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.1099	1	Yes
	square	0.4895	1	Yes
	cube root	0.07237	1	Yes
	cube	0.7801	1	Yes
	natural log	-0.2666	1	Yes
	x^4	1.087	1	No
	x^5	1.393	1	No
	x^6	1.679	1	No
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.7e-16	1	Yes
	square	0	1	Yes
	cube root	1.5e-16	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-9 (n = 8)				
	no	0.2813	1	Yes
	square root	0.145	1	Yes
	square	0.5493	1	Yes
	cube root	0.09786	1	Yes
	cube	0.8331	1	Yes
	natural log	-0.3983	1	Yes
	x^4	1.137	1	No
	x^5	1.446	1	No
	x^6	1.739	1	No
Pooled Background (bg) (n = 24)				
	no	0.8877	1	Yes
	square root	0.2972	1	Yes
	square	2.985	1	No
	cube root	0.1732	1	Yes
	cube	4.436	1	No
	natural log	-0.6034	1	Yes
	x^4	4.814	1	No
	x^5	4.884	1	No
	x^6	4.896	1	No

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Coefficient of Variation Normality Test

Constituent: Lead, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-2 (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-3 (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-4 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-5 (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Lead, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
MW-9 (n = 8)				
	no	0	1	Yes
	square root	1.4e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.7e-16	1	Yes
	x^5	0	1	Yes
	x^6	1.4e-16	1	Yes
Pooled Background (bg) (n = 24)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	3.9e-16	1	Yes
	cube	5.0e-16	1	Yes
	natural log	-6.2e-16	1	Yes
	x^4	1.6e-16	1	Yes
	x^5	6.4e-16	1	Yes
	x^6	2.8e-16	1	Yes

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Coefficient of Variation Normality Test

Constituent: Lithium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.7719	1	Yes
	square root	0.3463	1	Yes
	square	1.682	1	No
	cube root	0.2215	1	Yes
	cube	2.315	1	No
	natural log	-0.2307	1	Yes
	x^4	2.62	1	No
	x^5	2.745	1	No
	x^6	2.795	1	No
MW-2 (n = 8)				
	no	0.2531	1	Yes
	square root	0.1284	1	Yes
	square	0.4881	1	Yes
	cube root	0.08599	1	Yes
	cube	0.7025	1	Yes
	natural log	-0.09345	1	Yes
	x^4	0.8988	1	Yes
	x^5	1.081	1	No
	x^6	1.251	1	No
MW-3 (n = 8)				
	no	0.4024	1	Yes
	square root	0.2438	1	Yes
	square	0.5516	1	Yes
	cube root	0.1728	1	Yes
	cube	0.598	1	Yes
	natural log	-0.1753	1	Yes
	x^4	0.6117	1	Yes
	x^5	0.6156	1	Yes
	x^6	0.6168	1	Yes
MW-4 (bg) (n = 8)				
	no	0.4643	1	Yes
	square root	0.2367	1	Yes
	square	0.9045	1	Yes
	cube root	0.159	1	Yes
	cube	1.317	1	No
	natural log	-0.1603	1	Yes
	x^4	1.674	1	No
	x^5	1.959	1	No
	x^6	2.175	1	No
MW-5 (n = 8)				
	no	0.4293	1	Yes
	square root	0.2292	1	Yes
	square	0.7265	1	Yes
	cube root	0.1556	1	Yes
	cube	0.9065	1	Yes
	natural log	-0.1389	1	Yes
	x^4	1.012	1	No
	x^5	1.079	1	No
	x^6	1.125	1	No
MW-6 (n = 8)				
	no	0.4203	1	Yes
	square root	0.2309	1	Yes
	square	0.6781	1	Yes
	cube root	0.1582	1	Yes
	cube	0.8206	1	Yes
	natural log	-0.1464	1	Yes
	x^4	0.901	1	Yes
	x^5	0.95	1	Yes
	x^6	0.9823	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Lithium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-9 (n = 8)				
	no	0.1934	1	Yes
	square root	0.1056	1	Yes
	square	0.3253	1	Yes
	cube root	0.07248	1	Yes
	cube	0.414	1	Yes
	natural log	-0.07407	1	Yes
	x^4	0.4739	1	Yes
	x^5	0.5149	1	Yes
	x^6	0.5435	1	Yes
Pooled Background (bg) (n = 24)				
	no	0.2697	1	Yes
	square root	0.1315	1	Yes
	square	0.625	1	Yes
	cube root	0.08779	1	Yes
	cube	1.14	1	No
	natural log	-0.0892	1	Yes
	x^4	1.803	1	No
	x^5	2.524	1	No
	x^6	3.18	1	No

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Coefficient of Variation Normality Test

Constituent: Mercury, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-2 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-3 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-4 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-5 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Mercury, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
MW-9 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	0	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	1.6e-16	1	Yes
	x^6	0	1	Yes
Pooled Background (bg) (n = 24)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	4.1e-16	1	Yes
	natural log	-4.3e-16	1	Yes
	x^4	1.3e-16	1	Yes
	x^5	3.1e-16	1	Yes
	x^6	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.2051	1	Yes
	square root	0.1026	1	Yes
	square	0.4089	1	Yes
	cube root	0.06843	1	Yes
	cube	0.6103	1	Yes
	natural log	-0.03589	1	Yes
	x^4	0.8082	1	Yes
	x^5	1.001	1	No
	x^6	1.186	1	No
MW-2 (n = 8)				
	no	0.1979	1	Yes
	square root	0.09762	1	Yes
	square	0.404	1	Yes
	cube root	0.06477	1	Yes
	cube	0.6127	1	Yes
	natural log	-0.03367	1	Yes
	x^4	0.8178	1	Yes
	x^5	1.013	1	No
	x^6	1.194	1	No
MW-3 (n = 8)				
	no	0.3182	1	Yes
	square root	0.1597	1	Yes
	square	0.6233	1	Yes
	cube root	0.1065	1	Yes
	cube	0.9056	1	Yes
	natural log	-0.06953	1	Yes
	x^4	1.162	1	No
	x^5	1.394	1	No
	x^6	1.6	1	No
MW-4 (bg) (n = 8)				
	no	0.2373	1	Yes
	square root	0.1186	1	Yes
	square	0.4729	1	Yes
	cube root	0.07904	1	Yes
	cube	0.7034	1	Yes
	natural log	-0.04653	1	Yes
	x^4	0.927	1	Yes
	x^5	1.141	1	No
	x^6	1.344	1	No
MW-5 (n = 8)				
	no	0.59	1	Yes
	square root	0.4087	1	Yes
	square	0.7155	1	Yes
	cube root	0.3047	1	Yes
	cube	0.766	1	Yes
	natural log	-0.184	1	Yes
	x^4	0.7938	1	Yes
	x^5	0.8095	1	Yes
	x^6	0.818	1	Yes
MW-6 (n = 8)				
	no	0.8484	1	Yes
	square root	0.5304	1	Yes
	square	1.266	1	No
	cube root	0.3849	1	Yes
	cube	1.569	1	No
	natural log	-0.235	1	Yes
	x^4	1.808	1	No
	x^5	2.005	1	No
	x^6	2.169	1	No
MW-7 (bg) (n = 8)				
	no	0.2065	1	Yes

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Coefficient of Variation Normality Test

Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.09961	1	Yes
	square	0.4418	1	Yes
	cube root	0.06561	1	Yes
	cube	0.7025	1	Yes
	natural log	-0.03668	1	Yes
	x^4	0.9795	1	Yes
	x^5	1.259	1	No
	x^6	1.527	1	No
MW-8 (bg) (n = 8)				
	no	0.4702	1	Yes
	square root	0.2479	1	Yes
	square	0.8592	1	Yes
	cube root	0.1681	1	Yes
	cube	1.21	1	No
	natural log	-0.08978	1	Yes
	x^4	1.536	1	No
	x^5	1.827	1	No
	x^6	2.071	1	No
MW-9 (n = 8)				
	no	0.4989	1	Yes
	square root	0.2816	1	Yes
	square	0.837	1	Yes
	cube root	0.196	1	Yes
	cube	1.133	1	No
	natural log	-0.1246	1	Yes
	x^4	1.406	1	No
	x^5	1.648	1	No
	x^6	1.852	1	No
Pooled Background (bg) (n = 24)				
	no	0.3679	1	Yes
	square root	0.2022	1	Yes
	square	0.6619	1	Yes
	cube root	0.1401	1	Yes
	cube	0.9553	1	Yes
	natural log	-0.08531	1	Yes
	x^4	1.26	1	No
	x^5	1.57	1	No
	x^6	1.879	1	No

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Coefficient of Variation Normality Test

Constituent: pH Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.02822	1	Yes
	square root	0.01415	1	Yes
	square	0.05609	1	Yes
	cube root	0.009444	1	Yes
	cube	0.0836	1	Yes
	natural log	0.01403	1	Yes
	x^4	0.1108	1	Yes
	x^5	0.1376	1	Yes
	x^6	0.164	1	Yes
MW-2 (n = 8)				
	no	0.02819	1	Yes
	square root	0.01418	1	Yes
	square	0.05573	1	Yes
	cube root	0.009469	1	Yes
	cube	0.0826	1	Yes
	natural log	0.01413	1	Yes
	x^4	0.1088	1	Yes
	x^5	0.1343	1	Yes
	x^6	0.1592	1	Yes
MW-3 (n = 8)				
	no	0.02189	1	Yes
	square root	0.01092	1	Yes
	square	0.04402	1	Yes
	cube root	0.007272	1	Yes
	cube	0.06638	1	Yes
	natural log	0.01055	1	Yes
	x^4	0.08898	1	Yes
	x^5	0.1118	1	Yes
	x^6	0.1349	1	Yes
MW-4 (bg) (n = 8)				
	no	0.03411	1	Yes
	square root	0.01696	1	Yes
	square	0.069	1	Yes
	cube root	0.01128	1	Yes
	cube	0.1047	1	Yes
	natural log	0.01664	1	Yes
	x^4	0.1413	1	Yes
	x^5	0.1787	1	Yes
	x^6	0.2171	1	Yes
MW-5 (n = 8)				
	no	0.03047	1	Yes
	square root	0.01529	1	Yes
	square	0.06051	1	Yes
	cube root	0.0102	1	Yes
	cube	0.09012	1	Yes
	natural log	0.01564	1	Yes
	x^4	0.1193	1	Yes
	x^5	0.148	1	Yes
	x^6	0.1763	1	Yes
MW-6 (n = 8)				
	no	0.02396	1	Yes
	square root	0.01196	1	Yes
	square	0.04807	1	Yes
	cube root	0.007968	1	Yes
	cube	0.07233	1	Yes
	natural log	0.01193	1	Yes
	x^4	0.09673	1	Yes
	x^5	0.1213	1	Yes
	x^6	0.146	1	Yes
MW-7 (bg) (n = 8)				
	no	0.0413	1	Yes

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Coefficient of Variation Normality Test

Constituent: pH Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.02065	1	Yes
	square	0.0826	1	Yes
	cube root	0.01376	1	Yes
	cube	0.1239	1	Yes
	natural log	0.02009	1	Yes
	x^4	0.165	1	Yes
	x^5	0.206	1	Yes
	x^6	0.2469	1	Yes
MW-8 (bg) (n = 8)				
	no	2.619	1	No
	square root	1.501	1	No
	square	2.826	1	No
	cube root	0.8874	1	Yes
	cube	2.828	1	No
	natural log	0.64	1	Yes
	x^4	2.828	1	No
	x^5	2.828	1	No
	x^6	2.828	1	No
MW-9 (n = 8)				
	no	0.039	1	Yes
	square root	0.0193	1	Yes
	square	0.07966	1	Yes
	cube root	0.01282	1	Yes
	cube	0.122	1	Yes
	natural log	0.019	1	Yes
	x^4	0.1662	1	Yes
	x^5	0.2121	1	Yes
	x^6	0.26	1	Yes
Pooled Background (bg) (n = 24)				
	no	3.914	1	No
	square root	1.316	1	No
	square	4.886	1	No
	cube root	0.6369	1	Yes
	cube	4.899	1	No
	natural log	0.4225	1	Yes
	x^4	4.899	1	No
	x^5	4.899	1	No
	x^6	4.899	1	No

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Coefficient of Variation Normality Test

Constituent: Radium-226 Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	1.208	1	No
	square root	0.4998	1	Yes
	square	2.364	1	No
	cube root	0.3051	1	Yes
	cube	2.729	1	No
	natural log	1.316	1	No
	x^4	2.807	1	No
	x^5	2.823	1	No
	x^6	2.827	1	No
MW-2 (n = 8)				
	no	0.3799	1	Yes
	square root	0.1725	1	Yes
	square	0.8942	1	Yes
	cube root	0.1113	1	Yes
	cube	1.468	1	No
	natural log	0.3621	1	Yes
	x^4	1.973	1	No
	x^5	2.333	1	No
	x^6	2.555	1	No
MW-3 (n = 8)				
	no	0.5429	1	Yes
	square root	0.2371	1	Yes
	square	1.317	1	No
	cube root	0.151	1	Yes
	cube	2.041	1	No
	natural log	6.957	1	No
	x^4	2.485	1	No
	x^5	2.692	1	No
	x^6	2.777	1	No
MW-4 (bg) (n = 8)				
	no	0.561	1	Yes
	square root	0.283	1	Yes
	square	1.097	1	No
	cube root	0.1891	1	Yes
	cube	1.591	1	No
	natural log	-2.464	1	Yes
	x^4	2	1	No
	x^5	2.302	1	No
	x^6	2.505	1	No
MW-5 (n = 8)				
	no	1.176	1	No
	square root	0.522	1	Yes
	square	2.24	1	No
	cube root	0.3286	1	Yes
	cube	2.657	1	No
	natural log	-7.28	1	Yes
	x^4	2.778	1	No
	x^5	2.813	1	No
	x^6	2.824	1	No
MW-6 (n = 8)				
	no	1.355	1	No
	square root	0.6276	1	Yes
	square	2.416	1	No
	cube root	0.4047	1	Yes
	cube	2.741	1	No
	natural log	-2060	1	Yes
	x^4	2.81	1	No
	x^5	2.825	1	No
	x^6	2.828	1	No
MW-7 (bg) (n = 8)				
	no	1.621	1	No

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Coefficient of Variation Normality Test

Constituent: Radium-226 Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.7139	1	Yes
	square	2.637	1	No
	cube root	0.4444	1	Yes
	cube	2.806	1	No
	natural log	-13.16	1	Yes
	x^4	2.826	1	No
	x^5	2.828	1	No
	x^6	2.828	1	No
MW-8 (bg) (n = 8)				
	no	2.525	1	No
	square root	1.384	1	No
	square	2.822	1	No
	cube root	0.8289	1	Yes
	cube	2.828	1	No
	natural log	4.069	1	No
	x^4	2.828	1	No
	x^5	2.828	1	No
	x^6	2.828	1	No
MW-9 (n = 8)				
	no	0.5381	1	Yes
	square root	0.3055	1	Yes
	square	0.9736	1	Yes
	cube root	0.2149	1	Yes
	cube	1.449	1	No
	natural log	-2.879	1	Yes
	x^4	1.898	1	No
	x^5	2.251	1	No
	x^6	2.491	1	No
Pooled Background (bg) (n = 24)				
	no	3.445	1	No
	square root	1.214	1	No
	square	4.797	1	No
	cube root	0.638	1	Yes
	cube	4.888	1	No
	natural log	35.92	1	No
	x^4	4.898	1	No
	x^5	4.899	1	No
	x^6	4.899	1	No

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Coefficient of Variation Normality Test

Constituent: Radium-228 Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.2622	1	Yes
	square root	0.1307	1	Yes
	square	0.5183	1	Yes
	cube root	0.08694	1	Yes
	cube	0.7523	1	Yes
	natural log	0.291	1	Yes
	x^4	0.9549	1	Yes
	x^5	1.124	1	No
	x^6	1.263	1	No
MW-2 (n = 8)				
	no	0.2846	1	Yes
	square root	0.1385	1	Yes
	square	0.5853	1	Yes
	cube root	0.0913	1	Yes
	cube	0.8728	1	Yes
	natural log	0.2308	1	Yes
	x^4	1.125	1	No
	x^5	1.334	1	No
	x^6	1.503	1	No
MW-3 (n = 8)				
	no	0.08372	1	Yes
	square root	0.04399	1	Yes
	square	0.1516	1	Yes
	cube root	0.02981	1	Yes
	cube	0.2061	1	Yes
	natural log	0.08669	1	Yes
	x^4	0.2495	1	Yes
	x^5	0.2837	1	Yes
	x^6	0.3106	1	Yes
MW-4 (bg) (n = 8)				
	no	0.1912	1	Yes
	square root	0.1093	1	Yes
	square	0.2954	1	Yes
	cube root	0.07619	1	Yes
	cube	0.3496	1	Yes
	natural log	0.2473	1	Yes
	x^4	0.3769	1	Yes
	x^5	0.3906	1	Yes
	x^6	0.3974	1	Yes
MW-5 (n = 8)				
	no	0.389	1	Yes
	square root	0.2325	1	Yes
	square	0.5507	1	Yes
	cube root	0.1641	1	Yes
	cube	0.6155	1	Yes
	natural log	0.7013	1	Yes
	x^4	0.647	1	Yes
	x^5	0.6678	1	Yes
	x^6	0.6848	1	Yes
MW-6 (n = 8)				
	no	0.2758	1	Yes
	square root	0.1435	1	Yes
	square	0.5372	1	Yes
	cube root	0.09735	1	Yes
	cube	0.823	1	Yes
	natural log	0.2924	1	Yes
	x^4	1.136	1	No
	x^5	1.458	1	No
	x^6	1.763	1	No
MW-7 (bg) (n = 8)				
	no	0.01065	1	Yes

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Coefficient of Variation Normality Test

Constituent: Radium-228 Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.005354	1	Yes
	square	0.02105	1	Yes
	cube root	0.003576	1	Yes
	cube	0.03122	1	Yes
	natural log	0.009836	1	Yes
	x^4	0.04115	1	Yes
	x^5	0.05084	1	Yes
	x^6	0.06031	1	Yes
MW-8 (bg) (n = 8)				
	no	0.06018	1	Yes
	square root	0.03114	1	Yes
	square	0.1123	1	Yes
	cube root	0.021	1	Yes
	cube	0.1572	1	Yes
	natural log	0.05992	1	Yes
	x^4	0.1957	1	Yes
	x^5	0.2286	1	Yes
	x^6	0.2565	1	Yes
MW-9 (n = 8)				
	no	0.342	1	Yes
	square root	0.2417	1	Yes
	square	0.3954	1	Yes
	cube root	0.1823	1	Yes
	cube	0.4029	1	Yes
	natural log	0.8267	1	Yes
	x^4	0.4039	1	Yes
	x^5	0.404	1	Yes
	x^6	0.4041	1	Yes
Pooled Background (bg) (n = 24)				
	no	0.1105	1	Yes
	square root	0.06352	1	Yes
	square	0.1718	1	Yes
	cube root	0.04444	1	Yes
	cube	0.2075	1	Yes
	natural log	0.1388	1	Yes
	x^4	0.2301	1	Yes
	x^5	0.2458	1	Yes
	x^6	0.2576	1	Yes

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Coefficient of Variation Normality Test

Constituent: Selenium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-2 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-3 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-4 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-5 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Selenium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
MW-9 (n = 8)				
	no	0	1	Yes
	square root	1.3e-16	1	Yes
	square	0	1	Yes
	cube root	1.6e-16	1	Yes
	cube	0	1	Yes
	natural log	-1.6e-16	1	Yes
	x^4	0	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes
Pooled Background (bg) (n = 24)				
	no	0	1	Yes
	square root	3.8e-16	1	Yes
	square	0	1	Yes
	cube root	1.5e-16	1	Yes
	cube	4.4e-16	1	Yes
	natural log	-1.5e-16	1	Yes
	x^4	0	1	Yes
	x^5	6.9e-16	1	Yes
	x^6	4.3e-16	1	Yes

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Coefficient of Variation Normality Test

Constituent: Sulfate Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.3488	1	Yes
	square root	0.2462	1	Yes
	square	0.4116	1	Yes
	cube root	0.1858	1	Yes
	cube	0.436	1	Yes
	natural log	0.1598	1	Yes
	x^4	0.4598	1	Yes
	x^5	0.4869	1	Yes
	x^6	0.5171	1	Yes
MW-2 (n = 8)				
	no	0.1209	1	Yes
	square root	0.05837	1	Yes
	square	0.259	1	Yes
	cube root	0.03847	1	Yes
	cube	0.4151	1	Yes
	natural log	0.04176	1	Yes
	x^4	0.5885	1	Yes
	x^5	0.7767	1	Yes
	x^6	0.9756	1	Yes
MW-3 (n = 8)				
	no	0.8403	1	Yes
	square root	0.3856	1	Yes
	square	1.747	1	No
	cube root	0.2483	1	Yes
	cube	2.334	1	No
	natural log	0.1608	1	Yes
	x^4	2.614	1	No
	x^5	2.735	1	No
	x^6	2.787	1	No
MW-4 (bg) (n = 8)				
	no	0.5057	1	Yes
	square root	0.2517	1	Yes
	square	0.995	1	Yes
	cube root	0.1671	1	Yes
	cube	1.438	1	No
	natural log	0.08285	1	Yes
	x^4	1.817	1	No
	x^5	2.12	1	No
	x^6	2.348	1	No
MW-5 (n = 8)				
	no	0.6037	1	Yes
	square root	0.3095	1	Yes
	square	1.134	1	No
	cube root	0.2079	1	Yes
	cube	1.572	1	No
	natural log	0.3672	1	Yes
	x^4	1.917	1	No
	x^5	2.177	1	No
	x^6	2.367	1	No
MW-6 (n = 8)				
	no	0.7126	1	Yes
	square root	0.4605	1	Yes
	square	0.9386	1	Yes
	cube root	0.3333	1	Yes
	cube	1.07	1	No
	natural log	0.3984	1	Yes
	x^4	1.176	1	No
	x^5	1.263	1	No
	x^6	1.333	1	No
MW-7 (bg) (n = 8)				
	no	0.6275	1	Yes

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Coefficient of Variation Normality Test

Constituent: Sulfate Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.3004	1	Yes
	square	1.302	1	No
	cube root	0.197	1	Yes
	cube	1.873	1	No
	natural log	0.2847	1	Yes
	x^4	2.267	1	No
	x^5	2.508	1	No
	x^6	2.648	1	No
MW-8 (bg) (n = 8)				
	no	0.198	1	Yes
	square root	0.09981	1	Yes
	square	0.3891	1	Yes
	cube root	0.06671	1	Yes
	cube	0.5726	1	Yes
	natural log	0.06319	1	Yes
	x^4	0.7484	1	Yes
	x^5	0.9166	1	Yes
	x^6	1.077	1	No
MW-9 (n = 8)				
	no	0.4905	1	Yes
	square root	0.2376	1	Yes
	square	1.009	1	No
	cube root	0.1565	1	Yes
	cube	1.466	1	No
	natural log	0.1331	1	Yes
	x^4	1.813	1	No
	x^5	2.059	1	No
	x^6	2.234	1	No
Pooled Background (bg) (n = 24)				
	no	1.509	1	No
	square root	0.906	1	Yes
	square	2.182	1	No
	cube root	0.6181	1	Yes
	cube	2.783	1	No
	natural log	0.4715	1	Yes
	x^4	3.336	1	No
	x^5	3.794	1	No
	x^6	4.145	1	No

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Coefficient of Variation Normality Test

Constituent: Thallium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-2 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-3 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-4 (bg) (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-5 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-6 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-7 (bg) (n = 8)				
	no	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Thallium, dissolved Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-8 (bg) (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
MW-9 (n = 8)				
	no	0	1	Yes
	square root	0	1	Yes
	square	0	1	Yes
	cube root	0	1	Yes
	cube	0	1	Yes
	natural log	-1.4e-16	1	Yes
	x^4	0	1	Yes
	x^5	1.5e-16	1	Yes
	x^6	1.5e-16	1	Yes
Pooled Background (bg) (n = 24)				
	no	0	1	Yes
	square root	6.5e-16	1	Yes
	square	0	1	Yes
	cube root	3.6e-16	1	Yes
	cube	3.8e-16	1	Yes
	natural log	-3.9e-16	1	Yes
	x^4	4.0e-16	1	Yes
	x^5	0	1	Yes
	x^6	0	1	Yes

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Coefficient of Variation Normality Test

Constituent: Total Dissolved Solids Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-1 (n = 8)				
	no	0.2547	1	Yes
	square root	0.1242	1	Yes
	square	0.5471	1	Yes
	cube root	0.08228	1	Yes
	cube	0.8863	1	Yes
	natural log	0.02629	1	Yes
	x^4	1.254	1	No
	x^5	1.617	1	No
	x^6	1.939	1	No
MW-2 (n = 8)				
	no	0.2072	1	Yes
	square root	0.09927	1	Yes
	square	0.4458	1	Yes
	cube root	0.0652	1	Yes
	cube	0.7054	1	Yes
	natural log	0.02018	1	Yes
	x^4	0.9706	1	Yes
	x^5	1.225	1	No
	x^6	1.457	1	No
MW-3 (n = 8)				
	no	0.7805	1	Yes
	square root	0.3916	1	Yes
	square	1.391	1	No
	cube root	0.2593	1	Yes
	cube	1.722	1	No
	natural log	0.1097	1	Yes
	x^4	1.887	1	No
	x^5	1.987	1	No
	x^6	2.063	1	No
MW-4 (bg) (n = 8)				
	no	0.3045	1	Yes
	square root	0.1627	1	Yes
	square	0.5536	1	Yes
	cube root	0.1113	1	Yes
	cube	0.7822	1	Yes
	natural log	0.03988	1	Yes
	x^4	0.9972	1	Yes
	x^5	1.195	1	No
	x^6	1.37	1	No
MW-5 (n = 8)				
	no	0.4486	1	Yes
	square root	0.2066	1	Yes
	square	1.021	1	No
	cube root	0.1339	1	Yes
	cube	1.612	1	No
	natural log	0.04883	1	Yes
	x^4	2.09	1	No
	x^5	2.409	1	No
	x^6	2.598	1	No
MW-6 (n = 8)				
	no	0.9252	1	Yes
	square root	0.4561	1	Yes
	square	1.709	1	No
	cube root	0.2999	1	Yes
	cube	2.198	1	No
	natural log	0.1244	1	Yes
	x^4	2.474	1	No
	x^5	2.628	1	No
	x^6	2.715	1	No
MW-7 (bg) (n = 8)				
	no	0.3954	1	Yes

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Coefficient of Variation Normality Test

Constituent: Total Dissolved Solids Analysis Run 2/19/2020 11:09 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Well	Transformation	Calculated	Critical	Normal
MW-7 (bg) (n = 8) cont.				
	square root	0.1977	1	Yes
	square	0.766	1	Yes
	cube root	0.1314	1	Yes
	cube	1.075	1	No
	natural log	0.07291	1	Yes
	x^4	1.311	1	No
	x^5	1.483	1	No
	x^6	1.604	1	No
MW-8 (bg) (n = 8)				
	no	0.4249	1	Yes
	square root	0.2334	1	Yes
	square	0.6795	1	Yes
	cube root	0.1598	1	Yes
	cube	0.8148	1	Yes
	natural log	0.07839	1	Yes
	x^4	0.8918	1	Yes
	x^5	0.9438	1	Yes
	x^6	0.9852	1	Yes
MW-9 (n = 8)				
	no	0.7742	1	Yes
	square root	0.4037	1	Yes
	square	1.37	1	No
	cube root	0.2711	1	Yes
	cube	1.818	1	No
	natural log	0.1252	1	Yes
	x^4	2.157	1	No
	x^5	2.399	1	No
	x^6	2.561	1	No
Pooled Background (bg) (n = 24)				
	no	1.291	1	No
	square root	0.7804	1	Yes
	square	1.688	1	No
	cube root	0.5335	1	Yes
	cube	1.938	1	No
	natural log	0.2247	1	Yes
	x^4	2.193	1	No
	x^5	2.449	1	No
	x^6	2.689	1	No

APPENDIX D

Outlier Testing

Outlier Analysis

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 11:27 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, dissolved (mg/L)	MW-1	No	n/a	n/a	NP (nrm)	NaN	8	0.002439	0.001484	unknown	ShapiroWilk
Antimony, dissolved (mg/L)	MW-2	n/a	n/a	n/a	NP (nrm)	NaN	8	0.00131	0.0007949	unknown	ShapiroWilk
Antimony, dissolved (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	0.001249	0.000469	normal	ShapiroWilk
Antimony, dissolved (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.000...	0.0005226	normal	ShapiroWilk
Antimony, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.001843	0.0004455	unknown	ShapiroWilk
Antimony, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.001809	0.0005409	unknown	ShapiroWilk
Antimony, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.001805	0.0005515	unknown	ShapiroWilk
Antimony, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.001811	0.0005339	unknown	ShapiroWilk
Antimony, dissolved (mg/L)	MW-9	No	n/a	n/a	NP (nrm)	NaN	8	0.001499	0.0006377	unknown	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-1	No	n/a	n/a	NP (nrm)	NaN	8	0.002825	0.001375	unknown	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-2	No	n/a	n/a	EPA 1989	0.05	8	0.004212	0.001059	normal	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-3	No	n/a	n/a	Dixon`s	0.05	8	0.003237	0.001315	normal	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.001811	0.0004584	unknown	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-5	No	n/a	n/a	NP (nrm)	NaN	8	0.001579	0.001194	unknown	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-6	No	n/a	n/a	NP (nrm)	NaN	8	0.002196	0.001261	unknown	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.001774	0.0009303	ln(x)	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.001986	0.00149	ln(x)	ShapiroWilk
Arsenic, dissolved (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	0.005163	0.003535	normal	ShapiroWilk
Barium, dissolved (mg/L)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	0.7321	0.05319	normal	ShapiroWilk
Barium, dissolved (mg/L)	MW-2	No	n/a	n/a	EPA 1989	0.05	8	2.155	0.1411	normal	ShapiroWilk
Barium, dissolved (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	0.0939	0.07794	ln(x)	ShapiroWilk
Barium, dissolved (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.2203	0.1279	normal	ShapiroWilk
Barium, dissolved (mg/L)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	0.1224	0.04536	ln(x)	ShapiroWilk
Barium, dissolved (mg/L)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	0.09135	0.06211	normal	ShapiroWilk
Barium, dissolved (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.05678	0.06078	ln(x)	ShapiroWilk
Barium, dissolved (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.07501	0.05953	normal	ShapiroWilk
Barium, dissolved (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	0.2074	0.2261	ln(x)	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-1	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-2	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Beryllium, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0005	0	unknown	ShapiroWilk
Boron, dissolved (mg/L)	**MW-1**	**Yes**	**1.3**	**4/1/2019**	**Dixon`s**	**0.05**	**8**	**1.138**	**0.07555**	**normal**	**ShapiroWilk**
Boron, dissolved (mg/L)	MW-2	No	n/a	n/a	EPA 1989	0.05	8	0.8919	0.0588	normal	ShapiroWilk
Boron, dissolved (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	0.4195	0.2031	normal	ShapiroWilk
Boron, dissolved (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	1.119	0.244	normal	ShapiroWilk
Boron, dissolved (mg/L)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	0.466	0.1822	normal	ShapiroWilk
Boron, dissolved (mg/L)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	0.592	0.318	normal	ShapiroWilk
Boron, dissolved (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.1544	0.08596	normal	ShapiroWilk
Boron, dissolved (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.2284	0.08217	normal	ShapiroWilk
Boron, dissolved (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	0.2959	0.1824	normal	ShapiroWilk
Cadmium, dissolved (mg/L)	MW-1	No	n/a	n/a	NP (nrm)	NaN	8	0.000...	0.0003309	unknown	ShapiroWilk
Cadmium, dissolved (mg/L)	MW-2	No	n/a	n/a	NP (nrm)	NaN	8	0.000...	0.0002935	unknown	ShapiroWilk
Cadmium, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.000895	0.000297	unknown	ShapiroWilk

Outlier Analysis

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Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Cadmium, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.001	0	unknown	ShapiroWilk
Cadmium, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0009	0.0002828	unknown	ShapiroWilk
Cadmium, dissolved (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.000...	0.0005667	normal	ShapiroWilk
Cadmium, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.001	0	unknown	ShapiroWilk
Calcium, dissolved (mg/L)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	377.5	16.41	normal	ShapiroWilk
Calcium, dissolved (mg/L)	MW-2	No	n/a	n/a	EPA 1989	0.05	8	439.6	17.01	normal	ShapiroWilk
Calcium, dissolved (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	75.28	43.45	ln(x)	ShapiroWilk
Calcium, dissolved (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	110	26.77	normal	ShapiroWilk
Calcium, dissolved (mg/L)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	127.7	30.56	normal	ShapiroWilk
Calcium, dissolved (mg/L)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	93.46	42.4	normal	ShapiroWilk
Calcium, dissolved (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	28.85	7.489	normal	ShapiroWilk
Calcium, dissolved (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	21.12	12.57	normal	ShapiroWilk
Calcium, dissolved (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	74.24	27.4	normal	ShapiroWilk
Chloride (mg/L)	**MW-1**	**Yes**	**9520,2840**	**1/29/2019...**	**Dixon`s**	**0.05**	**8**	**6908**	**1863**	**normal**	**ShapiroWilk**
Chloride (mg/L)	**MW-2**	**Yes**	**11100,3770**	**1/30/2019...**	**Dixon`s**	**0.05**	**8**	**7278**	**1998**	**normal**	**ShapiroWilk**
Chloride (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	530.7	528	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	3771	1808	normal	ShapiroWilk
Chloride (mg/L)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	1253	721.9	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	683.9	883.5	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	39.59	25.76	normal	ShapiroWilk
Chloride (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	305.6	202.8	normal	ShapiroWilk
Chloride (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	355.3	349.3	normal	ShapiroWilk
Chromium, dissolved (mg/L)	MW-1	n/a	n/a	n/a	NP (nrm)	NaN	8	0.015	0	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-2	n/a	n/a	n/a	NP (nrm)	NaN	8	0.015	0	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.015	0	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.015	0	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.01395	0.00297	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.015	0	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.015	0	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.015	0	unknown	ShapiroWilk
Chromium, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.01381	0.003359	unknown	ShapiroWilk
Cobalt, dissolved (mg/L)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	0.005325	0.00225	normal	ShapiroWilk
Cobalt, dissolved (mg/L)	**MW-2**	**Yes**	**0.01**	**4/2/2019**	**Dixon`s**	**0.05**	**8**	**0.004437**	**0.002311**	**normal**	**ShapiroWilk**
Cobalt, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.005	0	unknown	ShapiroWilk
Cobalt, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.00475	0.0007071	unknown	ShapiroWilk
Cobalt, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.005	0	unknown	ShapiroWilk
Cobalt, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.005	0	unknown	ShapiroWilk
Cobalt, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.005	0	unknown	ShapiroWilk
Cobalt, dissolved (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.007075	0.002158	normal	ShapiroWilk
Cobalt, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.004637	0.001025	unknown	ShapiroWilk
Fluoride (mg/L)	MW-1	n/a	n/a	n/a	NP (nrm)	NaN	8	0.545	0.1273	unknown	ShapiroWilk
Fluoride (mg/L)	**MW-2**	**Yes**	**3**	**4/2/2019**	**NP (nrm)**	**NaN**	**8**	**0.8338**	**0.8817**	**unknown**	**ShapiroWilk**
Fluoride (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.5125	0.1199	unknown	ShapiroWilk
Fluoride (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.7925	0.8937	unknown	ShapiroWilk
Fluoride (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.4813	0.05303	unknown	ShapiroWilk
Fluoride (mg/L)	**MW-6**	**Yes**	**0.72**	**4/1/2019**	**NP (nrm)**	**NaN**	**8**	**0.5113**	**0.09188**	**unknown**	**ShapiroWilk**
Fluoride (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.4613	0.1052	normal	ShapiroWilk
Fluoride (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.5	0	unknown	ShapiroWilk

Outlier Analysis

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Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Lead, dissolved (mg/L)	MW-2	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lead, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lead, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lead, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lead, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lead, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lead, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lead, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.003	0	unknown	ShapiroWilk
Lithium, dissolved (mg/L)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	0.08581	0.06624	ln(x)	ShapiroWilk
Lithium, dissolved (mg/L)	MW-2	No	n/a	n/a	EPA 1989	0.05	8	0.06386	0.01617	normal	ShapiroWilk
Lithium, dissolved (mg/L)	MW-3	No	n/a	n/a	NP (nrm)	NaN	8	0.04108	0.01653	unknown	ShapiroWilk
Lithium, dissolved (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.05346	0.02482	normal	ShapiroWilk
Lithium, dissolved (mg/L)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	0.04066	0.02398	normal	ShapiroWilk
Lithium, dissolved (mg/L)	MW-6	No	n/a	n/a	NP (nrm)	NaN	8	0.03678	0.01546	unknown	ShapiroWilk
Lithium, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Lithium, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Lithium, dissolved (mg/L)	MW-9	No	n/a	n/a	NP (nrm)	NaN	8	0.04549	0.008797	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-1	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-2	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Mercury, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.0002	0	unknown	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	0.0034	0.0008159	normal	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-2	No	n/a	n/a	EPA 1989	0.05	8	0.003425	0.0007978	normal	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	0.01068	0.003397	normal	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.006387	0.001423	normal	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-5	No	n/a	n/a	NP (nrm)	NaN	8	0.001644	0.0007952	unknown	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	0.005008	0.0047	normal	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.005462	0.00107	normal	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.003425	0.001641	normal	ShapiroWilk
Molybdenum, dissolved (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	0.006775	0.00338	normal	ShapiroWilk
pH (SU)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	7.563	0.2134	normal	ShapiroWilk
pH (SU)	MW-2	No	n/a	n/a	NP (nrm)	NaN	8	7.525	0.2121	unknown	ShapiroWilk
pH (SU)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	7.888	0.1727	normal	ShapiroWilk
pH (SU)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	7.588	0.2588	normal	ShapiroWilk
pH (SU)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	7.113	0.2167	normal	ShapiroWilk
pH (SU)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	7.4	0.1773	normal	ShapiroWilk
pH (SU)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	7.813	0.3227	normal	ShapiroWilk
pH (SU)	**MW-8 (bg)**	**Yes**	**727**	**8/1/2018**	**Dixon`s**	**0.05**	**8**	**97.18**	**254.5**	**normal**	**ShapiroWilk**
pH (SU)	**MW-9**	**Yes**	**8.1**	**1/30/2019**	**Dixon`s**	**0.05**	**8**	**7.475**	**0.2915**	**normal**	**ShapiroWilk**
Radium-226 (pCi/L)	**MW-1**	**Yes**	**2.65,9.9**	**11/1/2018...**	**Dixon`s**	**0.05**	**8**	**2.509**	**3.029**	**normal**	**ShapiroWilk**
Radium-226 (pCi/L)	**MW-2**	**Yes**	**4.7**	**10/2/2018**	**Dixon`s**	**0.05**	**8**	**2.493**	**0.9469**	**normal**	**ShapiroWilk**
Radium-226 (pCi/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	1.16	0.6298	unknown	ShapiroWilk
Radium-226 (pCi/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.9116	0.5114	normal	ShapiroWilk

Outlier Analysis

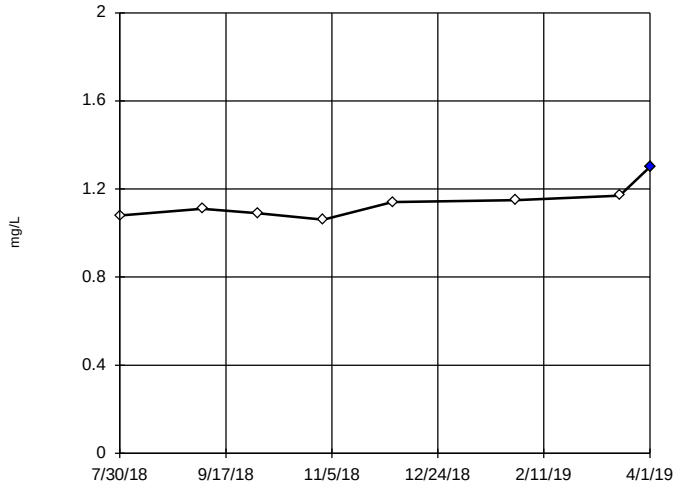
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Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Radium-226 (pCi/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	1.848	2.996	ln(x)	ShapiroWilk
Radium-226 (pCi/L)	**MW-8 (bg)**	**Yes**	**72.8**	**10/1/2018**	**Dixon`s**	**0.05**	**8**	**10.04**	**25.36**	**normal**	**ShapiroWilk**
Radium-226 (pCi/L)	MW-9	No	n/a	n/a	NP (nrm)	NaN	8	0.9308	0.5008	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	2.51	0.6581	normal	ShapiroWilk
Radium-228 (pCi/L)	MW-2	No	n/a	n/a	NP (nrm)	NaN	8	3.29	0.9362	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	2.914	0.244	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	2.81	0.5374	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-5	No	n/a	n/a	NP (nrm)	NaN	8	2.429	0.9447	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-6	No	n/a	n/a	NP (nrm)	NaN	8	1.686	1.243	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	2.989	0.03182	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	2.938	0.1768	unknown	ShapiroWilk
Radium-228 (pCi/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	2.676	0.9153	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-1	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-2	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Selenium, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.05	0	unknown	ShapiroWilk
Sulfate (mg/L)	**MW-1**	**Yes**	**15.2**	**7/30/2018**	**Dixon`s**	**0.05**	**8**	**102.9**	**35.9**	**normal**	**ShapiroWilk**
Sulfate (mg/L)	**MW-2**	**Yes**	**19**	**7/30/2018**	**Dixon`s**	**0.05**	**8**	**14.98**	**1.81**	**normal**	**ShapiroWilk**
Sulfate (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	94.16	79.13	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-4 (bg)	No	n/a	n/a	EPA 1989	0.05	8	438.5	221.7	normal	ShapiroWilk
Sulfate (mg/L)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	6.613	3.992	normal	ShapiroWilk
Sulfate (mg/L)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	27.2	19.38	normal	ShapiroWilk
Sulfate (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	8.625	5.412	normal	ShapiroWilk
Sulfate (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	8	24.53	4.856	normal	ShapiroWilk
Sulfate (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	34.4	16.87	normal	ShapiroWilk
Thallium, dissolved (mg/L)	MW-1	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-2	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-3	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-4 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-5	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-6	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-7 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-8 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Thallium, dissolved (mg/L)	MW-9	n/a	n/a	n/a	NP (nrm)	NaN	8	0.03	0	unknown	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-1	No	n/a	n/a	EPA 1989	0.05	8	11380	2898	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-2	No	n/a	n/a	NP (nrm)	NaN	8	12288	2546	unknown	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-3	No	n/a	n/a	EPA 1989	0.05	8	1337	1043	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-4 (bg)	No	n/a	n/a	Dixon`s	0.05	8	7200	2192	normal	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-5	No	n/a	n/a	EPA 1989	0.05	8	2550	1144	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-6	No	n/a	n/a	EPA 1989	0.05	8	1448	1339	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-7 (bg)	No	n/a	n/a	EPA 1989	0.05	8	227	89.77	normal	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-8 (bg)	No	n/a	n/a	NP (nrm)	NaN	8	657.5	279.4	unknown	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-9	No	n/a	n/a	EPA 1989	0.05	8	883.3	683.8	normal	ShapiroWilk

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Dixon's Outlier Test

MW-1



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 1.138.
Std. Dev. = 0.07555.
1.3: c = 0.5909
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9586
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

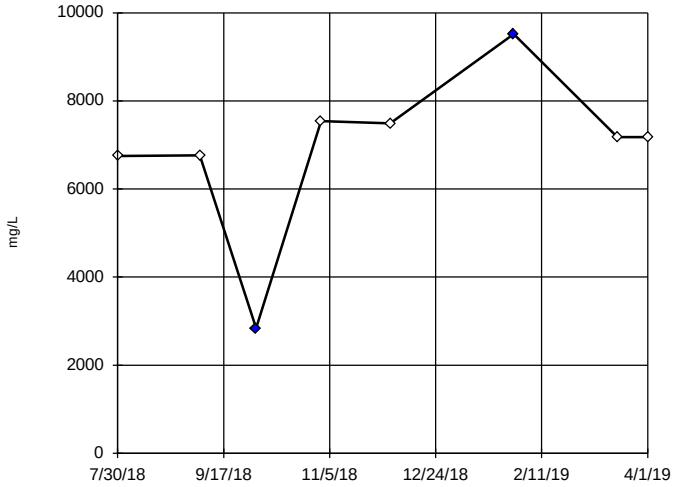
Constituent: Boron, dissolved Analysis Run 2/19/2020 11:21 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-1



n = 8

Statistical outliers are drawn as solid.
Testing for 1 high and 1 low outliers.
Mean = 6908.
Std. Dev. = 1863.
9520: c = 0.7148
tabl = 0.554.
2840: c = 0.8319
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.8738
Critical = 0.826
The distribution, after removal of suspect values, was found to be normally distributed.

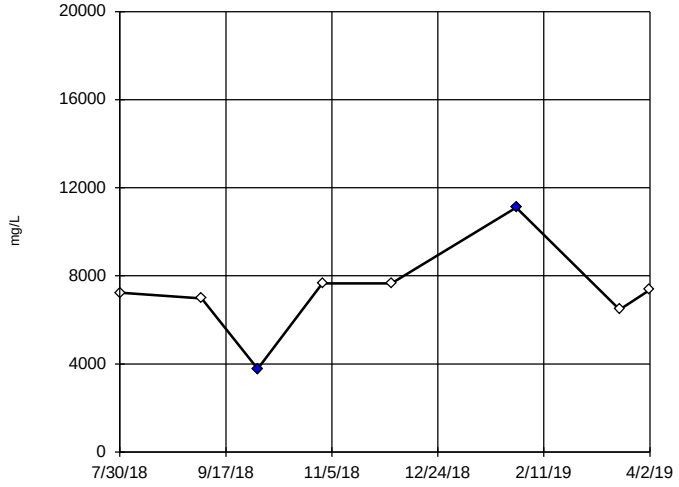
Constituent: Chloride Analysis Run 2/19/2020 11:22 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-2



n = 8

Statistical outliers are drawn as solid.
Testing for 1 high and 1 low outliers.
Mean = 7278.
Std. Dev. = 1998.
11100: c = 0.743
tabl = 0.554.
3770: c = 0.6941
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.914
Critical = 0.826
The distribution, after removal of suspect values, was found to be normally distributed.

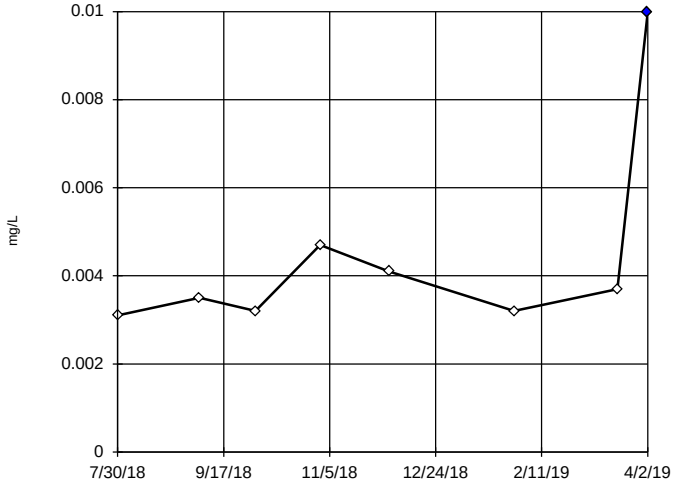
Constituent: Chloride Analysis Run 2/19/2020 11:22 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-2



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 0.004437.
Std. Dev. = 0.002311.
<0.01: c = 0.7794
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.8816
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

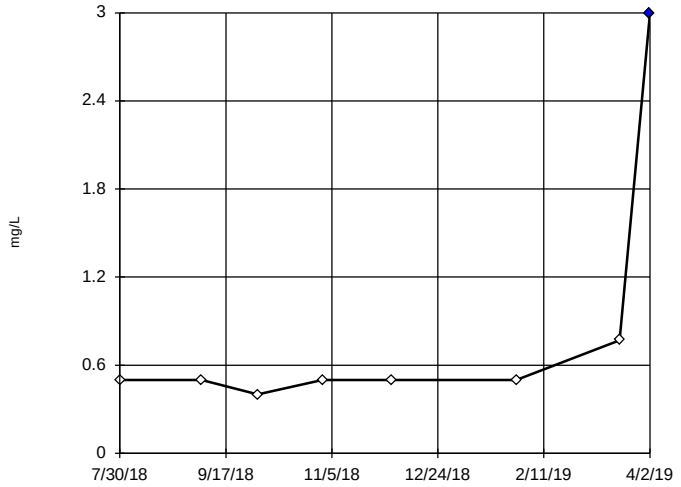
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 11:23 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Tukey's Outlier Screening

MW-2



n = 8

Outlier is drawn as solid.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.1 alpha level.

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

High cutoff = 1.186, low cutoff = 0.2616, based on IQR multiplier of 3.

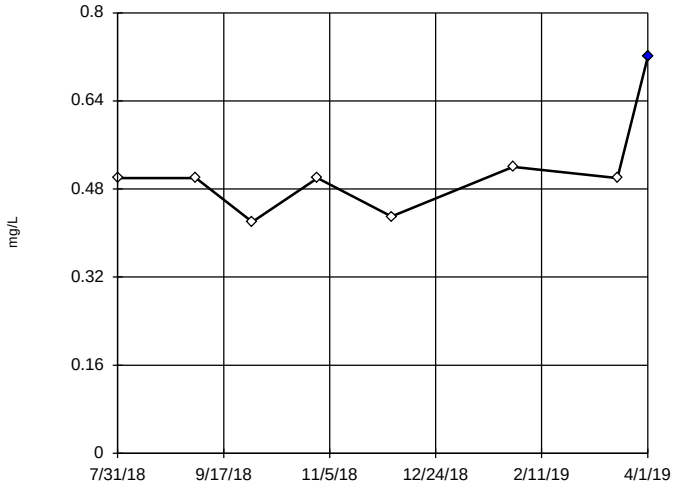
Constituent: Fluoride Analysis Run 2/19/2020 11:23 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Tukey's Outlier Screening

MW-6



n = 8

Outlier is drawn as solid.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.1 alpha level.

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

High cutoff = 0.6781, low cutoff = 0.3487, based on IQR multiplier of 3.

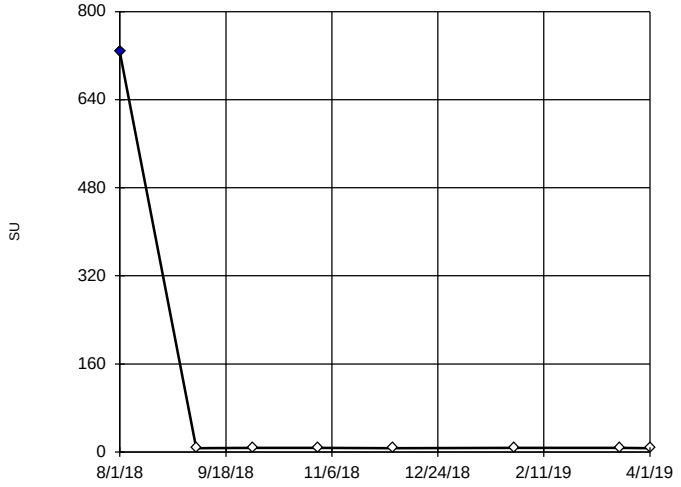
Constituent: Fluoride Analysis Run 2/19/2020 11:23 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-8 (bg)



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 97.18.
Std. Dev. = 254.5.
727: c = 0.9993
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9132
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

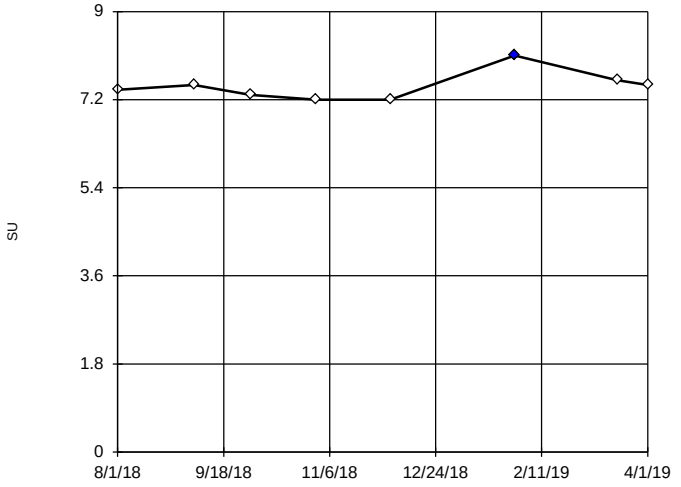
Constituent: pH Analysis Run 2/19/2020 11:24 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-9



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 7.475.
Std. Dev. = 0.2915.
8.1: c = 0.5556
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9128
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

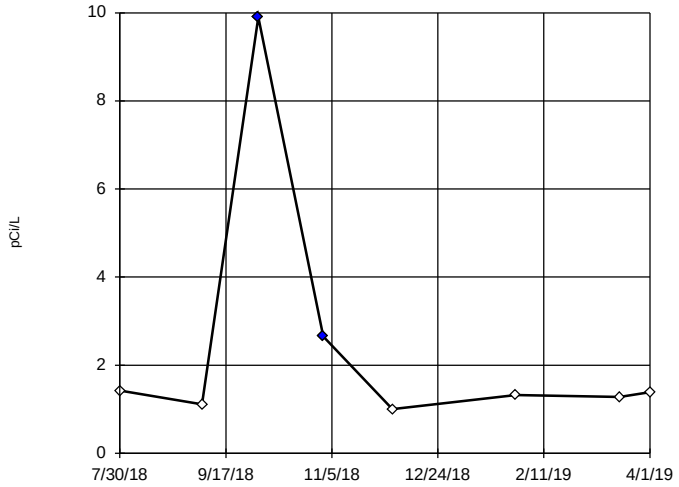
Constituent: pH Analysis Run 2/19/2020 11:24 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-1



n = 8

Statistical outliers are drawn as solid.
Testing for 2 high outliers.
Mean = 2.509.
Std. Dev. = 3.029.
2.65: c = 0.7987
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9097
Critical = 0.826
The distribution, after removal of suspect values, was found to be normally distributed.

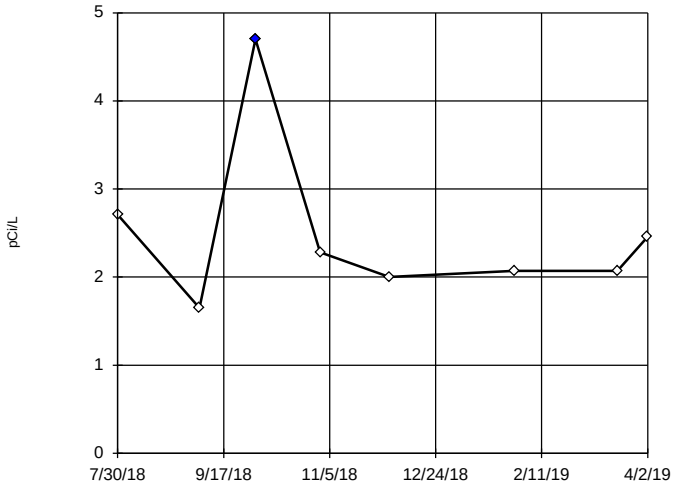
Constituent: Radium-226 Analysis Run 2/19/2020 11:24 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-2



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 2.493.
Std. Dev. = 0.9469.
4.7: c = 0.737
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9737
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

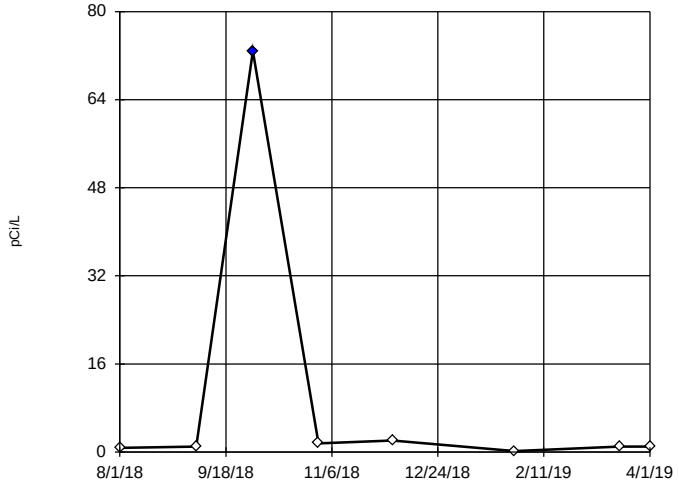
Constituent: Radium-226 Analysis Run 2/19/2020 11:24 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-8 (bg)



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high and 1 low outliers.
Mean = 10.04.
Std. Dev. = 25.36.
72.8: c = 0.9819
tabl = 0.554.
0.169: c = 0.3104
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.8394
Critical = 0.826
The distribution, after removal of suspect value, was found to be normally distributed.

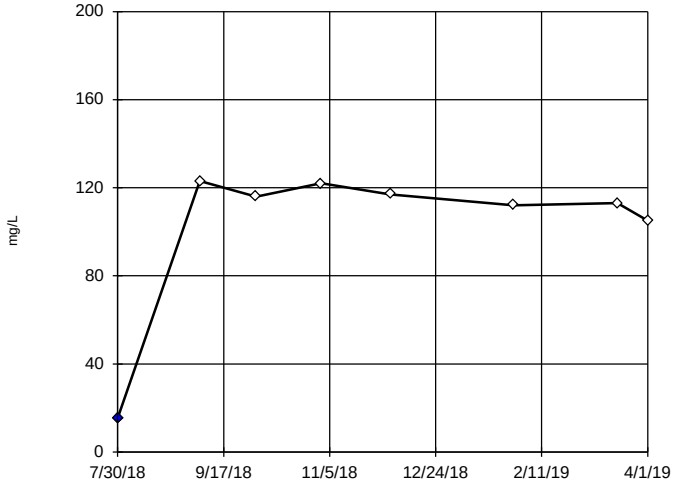
Constituent: Radium-226 Analysis Run 2/19/2020 11:24 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-1



n = 8

Statistical outlier is drawn as solid.
Testing for 1 low outlier.
Mean = 102.9.
Std. Dev. = 35.9.
15.2: c = 0.8408
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9549
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

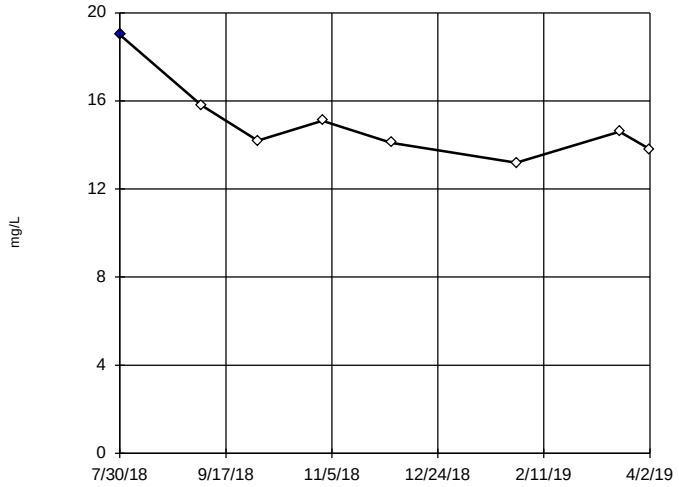
Constituent: Sulfate Analysis Run 2/19/2020 11:25 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Dixon's Outlier Test

MW-2



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 14.98.
Std. Dev. = 1.81.
19: c = 0.6154
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9832
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

Constituent: Sulfate Analysis Run 2/19/2020 11:25 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

APPENDIX E

Summary Statistics, Box Plots, and Time Series Plots

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Summary Report

Constituent: Antimony, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 70
Wells = 9
Minimum Value = 0.00044
Maximum Value = 0.0031
Mean Value = 0.001555
Median Value = 0.002
Standard Deviation = 0.0006357
Coefficient of Variation = 0.4088
Skewness = -0.5194

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	3	0.00075	0.0031	0.001689	0.0018	0.0007732	0.4579	0.4008
MW-2	8	3	0.00052	0.0022	0.00131	0.00133	0.0007949	0.6068	0.01309
MW-3	8	1	0.00048	0.002	0.001249	0.0013	0.000469	0.3755	0.01662
MW-4 (bg)	8	1	0.00046	0.002	0.0009825	0.00086	0.0005226	0.5319	0.9783
MW-5	8	7	0.00074	0.002	0.001843	0.002	0.0004455	0.2418	-2.268
MW-6	8	7	0.00047	0.002	0.001809	0.002	0.0005409	0.2991	-2.268
MW-7 (bg)	8	7	0.00044	0.002	0.001805	0.002	0.0005515	0.3056	-2.268
MW-8 (bg)	8	7	0.00049	0.002	0.001811	0.002	0.0005339	0.2947	-2.268
MW-9	8	4	0.00053	0.002	0.001499	0.00185	0.0006377	0.4255	-0.6188

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Summary Report

Constituent: Arsenic, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 49
Wells = 9
Minimum Value = 0.00069
Maximum Value = 0.0125
Mean Value = 0.002754
Median Value = 0.003
Standard Deviation = 0.001824
Coefficient of Variation = 0.6624
Skewness = 2.381

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	1	0.0017	0.0049	0.002575	0.00215	0.001071	0.4161	1.364
MW-2	8	1	0.0029	0.0059	0.003963	0.00385	0.001082	0.2731	0.559
MW-3	8	1	0.0009	0.0045	0.002988	0.00295	0.001105	0.3699	-0.524
MW-4 (bg)	8	6	0.00069	0.003	0.002561	0.003	0.0008649	0.3377	-1.531
MW-5	8	2	0.00078	0.003	0.001454	0.000985	0.0009651	0.6639	1.081
MW-6	8	2	0.00075	0.0034	0.002071	0.00225	0.001127	0.5443	-0.05231
MW-7 (bg)	8	4	0.00075	0.0036	0.002274	0.003	0.001187	0.5222	-0.4276
MW-8 (bg)	8	1	0.0007	0.0032	0.001736	0.00155	0.0009984	0.575	0.3892
MW-9	8	0	0.0019	0.0125	0.005163	0.00425	0.003535	0.6847	1.151

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Summary Report

Constituent: Barium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 6
Wells = 9
Minimum Value = 0.0162
Maximum Value = 2.3
Mean Value = 0.4171
Median Value = 0.117
Standard Deviation = 0.658
Coefficient of Variation = 1.577
Skewness = 2.047

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	0.672	0.808	0.7321	0.7315	0.05319	0.07265	0.2726
MW-2	8	0	1.91	2.3	2.155	2.195	0.1411	0.06548	-0.7754
MW-3	8	1	0.026	0.233	0.0939	0.06395	0.07794	0.8301	1.041
MW-4 (bg)	8	0	0.0815	0.416	0.2203	0.189	0.1279	0.5807	0.3653
MW-5	8	1	0.0821	0.2	0.1224	0.112	0.04536	0.3705	0.8693
MW-6	8	1	0.0189	0.2	0.09135	0.0817	0.06211	0.6799	0.5474
MW-7 (bg)	8	1	0.0178	0.2	0.05678	0.03495	0.06078	1.071	1.875
MW-8 (bg)	8	1	0.0162	0.2	0.07501	0.06375	0.05953	0.7936	1.119
MW-9	8	1	0.0289	0.731	0.2074	0.1395	0.2261	1.09	1.748

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Summary Report

Constituent: Beryllium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 72
Wells = 9
Minimum Value = 0.0005
Maximum Value = 0.0005
Mean Value = 0.0005
Median Value = 0.0005
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-2	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-3	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-4 (bg)	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-5	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-6	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-7 (bg)	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-8 (bg)	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN
MW-9	8	8	0.0005	0.0005	0.0005	0.0005	0	0	NaN

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Summary Report

Constituent: Boron, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 0
Wells = 9
Minimum Value = 0.0683
Maximum Value = 1.53
Mean Value = 0.5893
Median Value = 0.477
Standard Deviation = 0.3939
Coefficient of Variation = 0.6684
Skewness = 0.4216

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	1.06	1.3	1.138	1.125	0.07555	0.06641	1.255
MW-2	8	0	0.814	0.97	0.8919	0.912	0.0588	0.06593	-0.2265
MW-3	8	0	0.196	0.74	0.4195	0.418	0.2031	0.4842	0.2725
MW-4 (bg)	8	0	0.787	1.53	1.119	1.067	0.244	0.2182	0.4428
MW-5	8	0	0.29	0.802	0.466	0.404	0.1822	0.391	0.9331
MW-6	8	0	0.251	1.04	0.592	0.538	0.318	0.5372	0.2802
MW-7 (bg)	8	0	0.0683	0.282	0.1544	0.1305	0.08596	0.5568	0.4905
MW-8 (bg)	8	0	0.132	0.337	0.2284	0.219	0.08217	0.3598	0.2005
MW-9	8	0	0.12	0.62	0.2959	0.2545	0.1824	0.6166	0.646

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Summary Report

Constituent: Cadmium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 71
Wells = 9
Minimum Value = 0.00016
Maximum Value = 0.0018
Mean Value = 0.0009154
Median Value = 0.001
Standard Deviation = 0.0002745
Coefficient of Variation = 0.2999
Skewness = -1.046

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	6	0.00016	0.001	0.0008263	0.001	0.0003309	0.4005	-1.338
MW-2	8	6	0.00024	0.001	0.0008475	0.001	0.0002935	0.3464	-1.401
MW-3	8	7	0.00016	0.001	0.000895	0.001	0.000297	0.3318	-2.268
MW-4 (bg)	8	7	0.0005	0.001	0.0009375	0.001	0.0001768	0.1886	-2.268
MW-5	8	8	0.001	0.001	0.001	0.001	0	0	NaN
MW-6	8	8	0.001	0.001	0.001	0.001	0	0	NaN
MW-7 (bg)	8	7	0.0002	0.001	0.0009	0.001	0.0002828	0.3143	-2.268
MW-8 (bg)	8	1	0.00019	0.0018	0.0008325	0.00069	0.0005667	0.6808	0.6427
MW-9	8	8	0.001	0.001	0.001	0.001	0	0	NaN

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Summary Report

Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 0
Wells = 9
Minimum Value = 6.62
Maximum Value = 467
Mean Value = 149.8
Median Value = 95.5
Standard Deviation = 146.1
Coefficient of Variation = 0.9759
Skewness = 1.117

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	350	396	377.5	381	16.41	0.04346	-0.4853
MW-2	8	0	419	467	439.6	436	17.01	0.0387	0.4246
MW-3	8	0	39.6	175	75.28	66.4	43.45	0.5773	1.659
MW-4 (bg)	8	0	81.6	164	110	96.95	26.77	0.2433	1.04
MW-5	8	0	91.8	185	127.7	129.5	30.56	0.2394	0.5789
MW-6	8	0	45.3	160	93.46	97.65	42.4	0.4536	0.2071
MW-7 (bg)	8	0	19.9	39.9	28.85	28.95	7.489	0.2596	0.1795
MW-8 (bg)	8	0	6.62	37.5	21.12	24	12.57	0.5951	-0.1149
MW-9	8	0	40	116	74.24	70.3	27.4	0.3691	0.2148

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Summary Report

Constituent: Chloride Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 0
Wells = 9
Minimum Value = 13.1
Maximum Value = 11100
Mean Value = 2347
Median Value = 697.5
Standard Deviation = 2979
Coefficient of Variation = 1.269
Skewness = 1.17

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	2840	9520	6908	7180	1863	0.2698	-1.156
MW-2	8	0	3770	11100	7278	7300	1998	0.2746	0.2345
MW-3	8	0	61.6	1720	530.7	400.5	528	0.9949	1.544
MW-4 (bg)	8	0	1150	6610	3771	3645	1808	0.4795	0.01705
MW-5	8	0	623	2910	1253	1100	721.9	0.5763	1.664
MW-6	8	0	78.9	2740	683.9	401	883.5	1.292	1.787
MW-7 (bg)	8	0	13.1	87.1	39.59	36.8	25.76	0.6508	0.6757
MW-8 (bg)	8	0	69.9	598	305.6	364.5	202.8	0.6637	-0.07353
MW-9	8	0	29.8	947	355.3	202	349.3	0.983	0.6014

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Summary Report

Constituent: Chromium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 72
Wells = 9
Minimum Value = 0.0055
Maximum Value = 0.015
Mean Value = 0.01475
Median Value = 0.015
Standard Deviation = 0.001484
Coefficient of Variation = 0.1006
Skewness = -5.782

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	8	0.015	0.015	0.015	0.015	0	0	NaN
MW-2	8	8	0.015	0.015	0.015	0.015	0	0	NaN
MW-3	8	8	0.015	0.015	0.015	0.015	0	0	NaN
MW-4 (bg)	8	8	0.015	0.015	0.015	0.015	0	0	NaN
MW-5	8	7	0.0066	0.015	0.01395	0.015	0.00297	0.2129	-2.268
MW-6	8	8	0.015	0.015	0.015	0.015	0	0	NaN
MW-7 (bg)	8	8	0.015	0.015	0.015	0.015	0	0	NaN
MW-8 (bg)	8	8	0.015	0.015	0.015	0.015	0	0	NaN
MW-9	8	7	0.0055	0.015	0.01381	0.015	0.003359	0.2432	-2.268

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Summary Report

Constituent: Cobalt, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 66
Wells = 9
Minimum Value = 0.0021
Maximum Value = 0.009
Mean Value = 0.004928
Median Value = 0.005
Standard Deviation = 0.001063
Coefficient of Variation = 0.2158
Skewness = 0.9564

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	1	0.0027	0.0069	0.0047	0.0046	0.001228	0.2613	0.2428
MW-2	8	1	0.0031	0.005	0.003812	0.0036	0.000722	0.1894	0.6266
MW-3	8	8	0.005	0.005	0.005	0.005	0	0	NaN
MW-4 (bg)	8	7	0.003	0.005	0.00475	0.005	0.0007071	0.1489	-2.268
MW-5	8	8	0.005	0.005	0.005	0.005	0	0	NaN
MW-6	8	8	0.005	0.005	0.005	0.005	0	0	NaN
MW-7 (bg)	8	8	0.005	0.005	0.005	0.005	0	0	NaN
MW-8 (bg)	8	1	0.0037	0.009	0.00645	0.00665	0.001898	0.2943	-0.1434
MW-9	8	7	0.0021	0.005	0.004637	0.005	0.001025	0.2211	-2.268

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Summary Report

Constituent: Fluoride Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 62
Wells = 9
Minimum Value = 0.26
Maximum Value = 3
Mean Value = 0.5693
Median Value = 0.5
Standard Deviation = 0.4246
Coefficient of Variation = 0.7458
Skewness = 5.308

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	7	0.5	0.86	0.545	0.5	0.1273	0.2335	2.268
MW-2	8	5	0.4	3	0.8338	0.5	0.8817	1.058	2.205
MW-3	8	6	0.33	0.77	0.5125	0.5	0.1199	0.2339	0.9744
MW-4 (bg)	8	6	0.34	3	0.7925	0.5	0.8937	1.128	2.249
MW-5	8	7	0.35	0.5	0.4813	0.5	0.05303	0.1102	-2.268
MW-6	8	4	0.42	0.72	0.5113	0.5	0.09188	0.1797	1.535
MW-7 (bg)	8	2	0.36	0.68	0.4613	0.445	0.1052	0.2281	1.088
MW-8 (bg)	8	8	0.5	0.5	0.5	0.5	0	0	NaN
MW-9	8	4	0.26	0.74	0.4863	0.5	0.1368	0.2813	0.193

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Summary Report

Constituent: Lead, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 72
Wells = 9
Minimum Value = 0.003
Maximum Value = 0.003
Mean Value = 0.003
Median Value = 0.003
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-2	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-3	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-4 (bg)	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-5	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-6	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-7 (bg)	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-8 (bg)	8	8	0.003	0.003	0.003	0.003	0	0	NaN
MW-9	8	8	0.003	0.003	0.003	0.003	0	0	NaN

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Summary Report

Constituent: Lithium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 62
Wells = 9
Minimum Value = 0.0138
Maximum Value = 0.239
Mean Value = 0.05121
Median Value = 0.05
Standard Deviation = 0.02869
Coefficient of Variation = 0.5602
Skewness = 4.004

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	0.0372	0.239	0.08581	0.0637	0.06624	0.7719	1.739
MW-2	8	0	0.043	0.0891	0.06386	0.06635	0.01617	0.2531	0.1057
MW-3	8	6	0.0138	0.05	0.04108	0.05	0.01653	0.4024	-1.156
MW-4 (bg)	8	1	0.0223	0.0994	0.05346	0.04985	0.02482	0.4643	0.6082
MW-5	8	2	0.015	0.05	0.03441	0.03565	0.01477	0.4293	-0.1118
MW-6	8	4	0.0155	0.05	0.03678	0.04355	0.01546	0.4203	-0.372
MW-7 (bg)	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-8 (bg)	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-9	8	6	0.0268	0.05	0.04549	0.05	0.008797	0.1934	-1.473

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Summary Report

Constituent: Mercury, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 72
Wells = 9
Minimum Value = 0.0002
Maximum Value = 0.0002
Mean Value = 0.0002
Median Value = 0.0002
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-2	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-3	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-4 (bg)	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-5	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-6	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-7 (bg)	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-8 (bg)	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN
MW-9	8	8	0.0002	0.0002	0.0002	0.0002	0	0	NaN

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Summary Report

Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 12:40 PM
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 22
Wells = 9
Minimum Value = 0.00032
Maximum Value = 0.0164
Mean Value = 0.005314
Median Value = 0.0045
Standard Deviation = 0.003278
Coefficient of Variation = 0.6169
Skewness = 1.123

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	1	0.0024	0.0045	0.003337	0.0033	0.0006844	0.2051	0.3
MW-2	8	1	0.0026	0.0045	0.003362	0.0032	0.0006653	0.1979	0.5683
MW-3	8	0	0.007	0.0164	0.01068	0.01085	0.003397	0.3182	0.3878
MW-4 (bg)	8	1	0.0045	0.0089	0.006325	0.0064	0.001501	0.2373	0.3557
MW-5	8	5	0.00037	0.0045	0.003206	0.0045	0.001892	0.59	-0.7915
MW-6	8	2	0.00032	0.0129	0.005382	0.0045	0.004567	0.8484	0.4273
MW-7 (bg)	8	1	0.0043	0.0077	0.0054	0.00515	0.001115	0.2065	1.091
MW-8 (bg)	8	1	0.0014	0.0061	0.003362	0.0035	0.001581	0.4702	0.2944
MW-9	8	0	0.0018	0.012	0.006775	0.0072	0.00338	0.4989	-0.04057

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Summary Report

Constituent: pH Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 0
Wells = 9
Minimum Value = 6.7
Maximum Value = 727
Mean Value = 17.5
Median Value = 7.5
Standard Deviation = 84.79
Coefficient of Variation = 4.844
Skewness = 8.307

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	7.2	7.8	7.563	7.6	0.2134	0.02822	-0.4199
MW-2	8	0	7.2	7.7	7.525	7.6	0.2121	0.02819	-0.8279
MW-3	8	0	7.7	8.2	7.888	7.85	0.1727	0.02189	0.5588
MW-4 (bg)	8	0	7.3	8.1	7.588	7.55	0.2588	0.03411	0.7808
MW-5	8	0	6.8	7.4	7.113	7.15	0.2167	0.03047	-0.4403
MW-6	8	0	7.2	7.7	7.4	7.4	0.1773	0.02396	0.3289
MW-7 (bg)	8	0	7.4	8.3	7.813	7.85	0.3227	0.0413	0.07118
MW-8 (bg)	8	0	6.7	727	97.18	7.3	254.5	2.619	2.268
MW-9	8	0	7.2	8.1	7.475	7.45	0.2915	0.039	1.225

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Summary Report

Constituent: Radium-226 Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 22
Wells = 9
Minimum Value = 0.118
Maximum Value = 72.8
Mean Value = 2.559
Median Value = 1
Standard Deviation = 8.582
Coefficient of Variation = 3.354
Skewness = 7.789

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	1	1	9.9	2.509	1.355	3.029	1.208	2.15
MW-2	8	0	1.65	4.7	2.493	2.175	0.9469	0.3799	1.779
MW-3	8	6	0.601	2.68	1.16	1	0.6298	0.5429	2.025
MW-4 (bg)	8	1	0.363	1.92	0.9116	0.9065	0.5114	0.561	0.812
MW-5	8	1	0.368	5.02	1.323	0.757	1.556	1.176	1.944
MW-6	8	2	0.208	7.72	1.811	1	2.454	1.355	2.03
MW-7 (bg)	8	3	0.118	9.21	1.848	1	2.996	1.621	2.202
MW-8 (bg)	8	3	0.169	72.8	10.04	1	25.36	2.525	2.266
MW-9	8	5	0.18	1.87	0.9308	1	0.5008	0.5381	0.309

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Summary Report

Constituent: Radium-228 Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 46
Wells = 9
Minimum Value = 0.411
Maximum Value = 4.87
Mean Value = 2.832
Median Value = 3
Standard Deviation = 0.6814
Coefficient of Variation = 0.2406
Skewness = -0.8214

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	1	1.78	3.49	2.51	2.335	0.6581	0.2622	0.3635
MW-2	8	0	2.47	4.87	3.29	2.78	0.9362	0.2846	0.7416
MW-3	8	7	2.31	3	2.914	3	0.244	0.08372	-2.268
MW-4 (bg)	8	7	1.48	3	2.81	3	0.5374	0.1912	-2.268
MW-5	8	5	0.789	3	2.429	3	0.9447	0.389	-1.103
MW-6	8	5	1.49	4.46	2.936	3	0.8098	0.2758	0.1299
MW-7 (bg)	8	7	2.91	3	2.989	3	0.03182	0.01065	-2.268
MW-8 (bg)	8	7	2.5	3	2.938	3	0.1768	0.06018	-2.268
MW-9	8	7	0.411	3	2.676	3	0.9153	0.342	-2.268

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Summary Report

Constituent: Selenium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 72
Wells = 9
Minimum Value = 0.05
Maximum Value = 0.05
Mean Value = 0.05
Median Value = 0.05
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-2	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-3	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-4 (bg)	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-5	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-6	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-7 (bg)	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-8 (bg)	8	8	0.05	0.05	0.05	0.05	0	0	NaN
MW-9	8	8	0.05	0.05	0.05	0.05	0	0	NaN

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Summary Report

Constituent: Sulfate Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 9
Wells = 9
Minimum Value = 2
Maximum Value = 864
Mean Value = 83.54
Median Value = 26.75
Standard Deviation = 150.9
Coefficient of Variation = 1.806
Skewness = 3.183

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	15.2	123	102.9	114.5	35.9	0.3488	-2.155
MW-2	8	0	13.2	19	14.98	14.4	1.81	0.1209	1.477
MW-3	8	0	32.5	274	94.16	70.2	79.13	0.8403	1.641
MW-4 (bg)	8	0	221	864	438.5	407	221.7	0.5057	0.7623
MW-5	8	0	2	14.1	6.613	5.7	3.992	0.6037	0.7327
MW-6	8	0	3.3	48.6	27.2	30.9	19.38	0.7126	-0.2074
MW-7 (bg)	8	1	3.4	20.1	8.625	7	5.412	0.6275	1.237
MW-8 (bg)	8	0	17.5	32.3	24.53	24.8	4.856	0.198	0.1288
MW-9	8	0	15.8	67.1	34.4	29	16.87	0.4905	0.9922

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Summary Report

Constituent: Thallium, dissolved Analysis Run 2/19/2020 12:40 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 72
Wells = 9
Minimum Value = 0.03
Maximum Value = 0.03
Mean Value = 0.03
Median Value = 0.03
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-2	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-3	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-4 (bg)	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-5	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-6	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-7 (bg)	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-8 (bg)	8	8	0.03	0.03	0.03	0.03	0	0	NaN
MW-9	8	8	0.03	0.03	0.03	0.03	0	0	NaN

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Summary Report

Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:40 PM
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

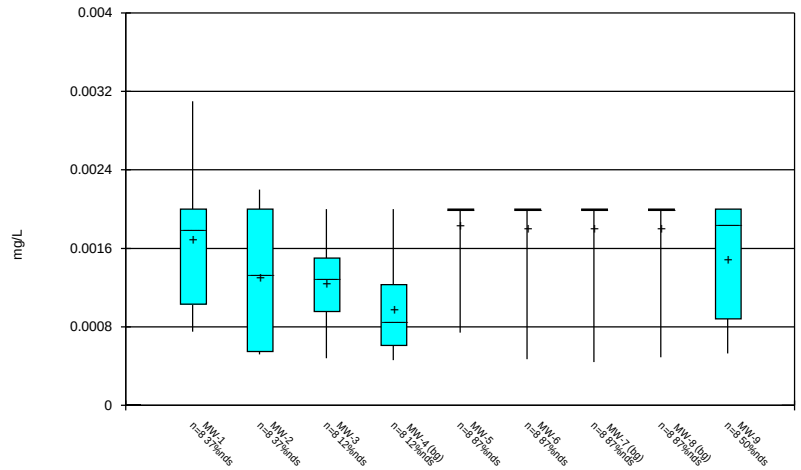
For observations made between 7/30/2018 and 4/2/2019, a summary of the selected data set:

Observations = 72
ND/Trace = 0
Wells = 9
Minimum Value = 141
Maximum Value = 17600
Mean Value = 4219
Median Value = 1655
Standard Deviation = 4808
Coefficient of Variation = 1.14
Skewness = 1.086

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
MW-1	8	0	7140	17600	11380	11050	2898	0.2547	1.02
MW-2	8	0	10400	17300	12288	11150	2546	0.2072	1.18
MW-3	8	0	344	3180	1337	973	1043	0.7805	0.9482
MW-4 (bg)	8	0	3280	10400	7200	7180	2192	0.3045	-0.2368
MW-5	8	0	1640	5120	2550	2285	1144	0.4486	1.536
MW-6	8	0	373	4290	1448	1015	1339	0.9252	1.313
MW-7 (bg)	8	0	141	361	227	214.5	89.77	0.3954	0.4998
MW-8 (bg)	8	0	306	916	657.5	775	279.4	0.4249	-0.3886
MW-9	8	0	222	2200	883.3	670	683.8	0.7742	0.8423

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Box & Whiskers Plot

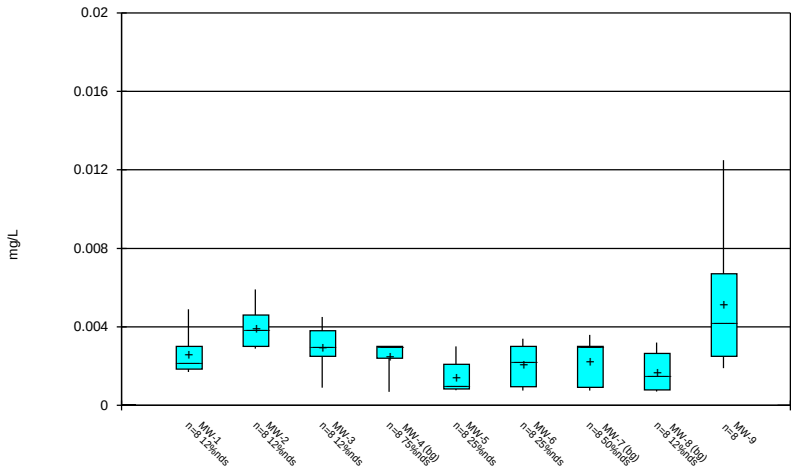


Constituent: Antimony, dissolved Analysis Run 2/19/2020 10:50 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

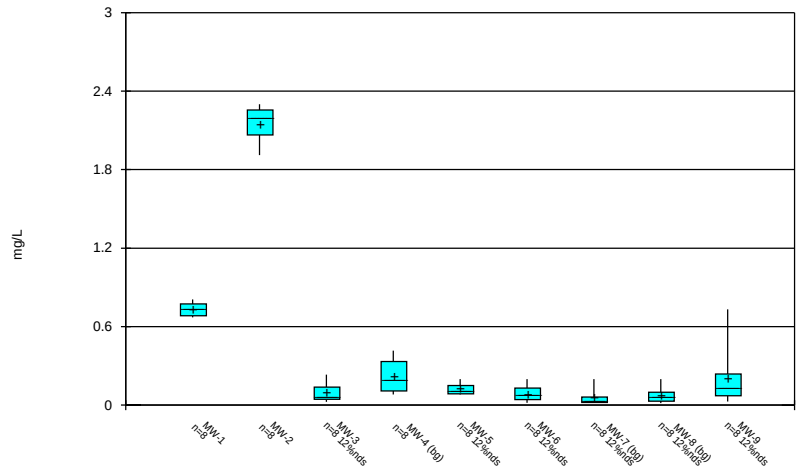


Constituent: Arsenic, dissolved Analysis Run 2/19/2020 10:50 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

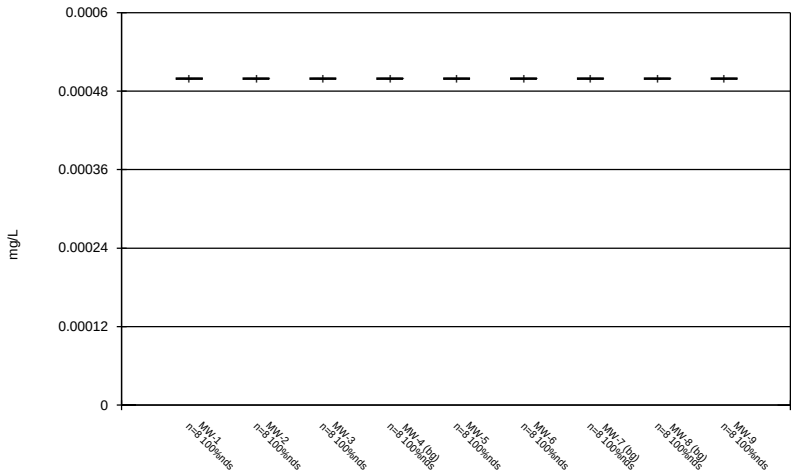


Constituent: Barium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

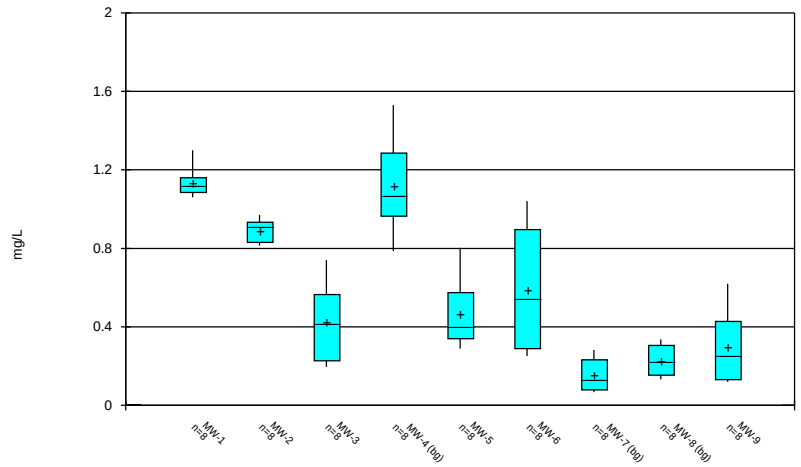


Constituent: Beryllium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

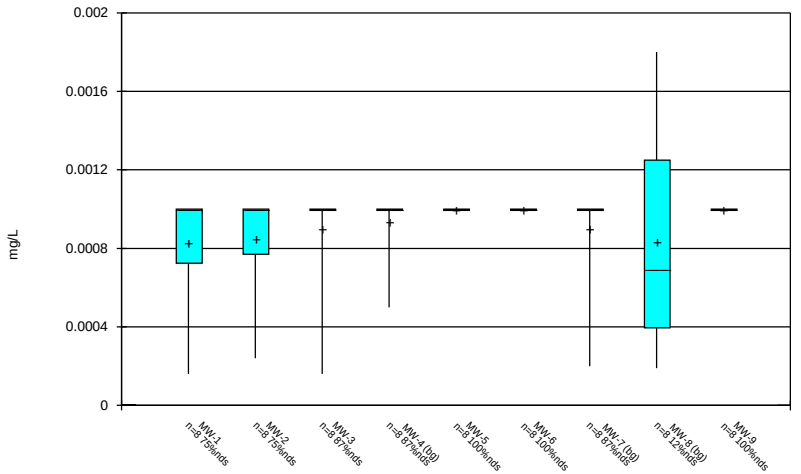


Constituent: Boron, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

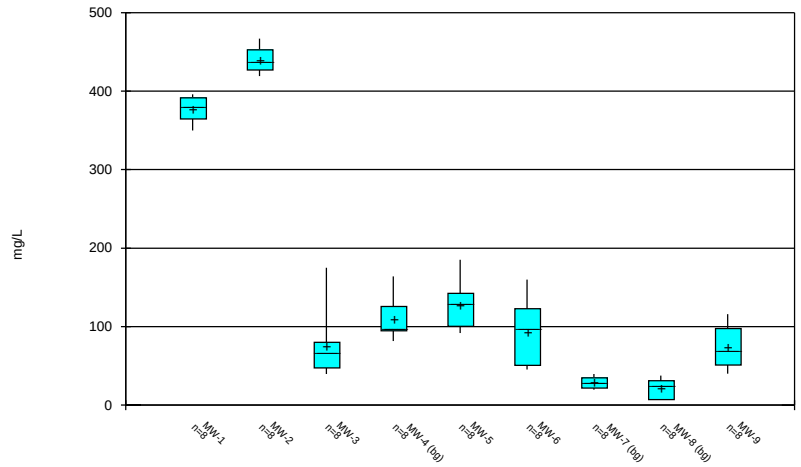


Constituent: Cadmium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

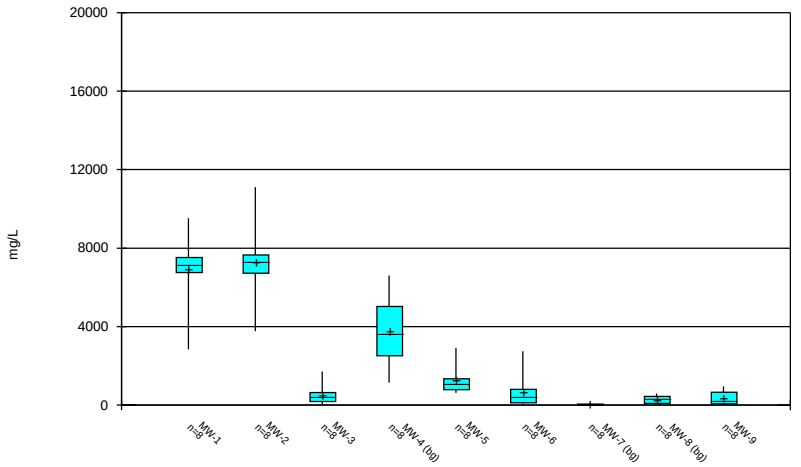


Constituent: Calcium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

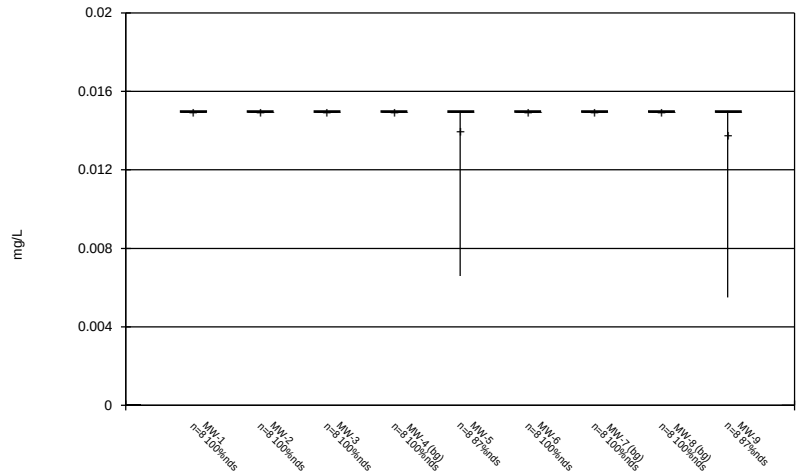


Constituent: Chloride Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

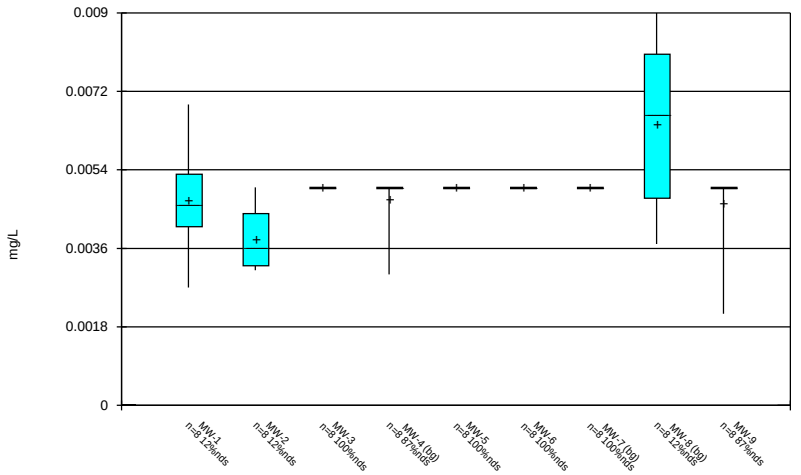


Constituent: Chromium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

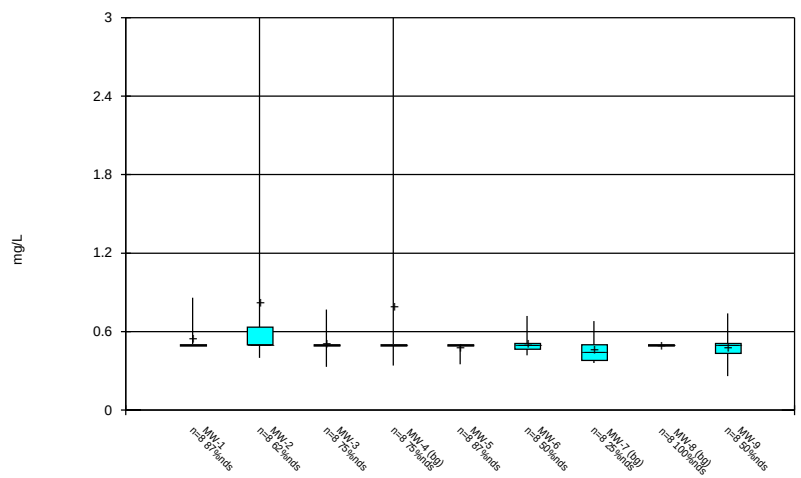


Constituent: Cobalt, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

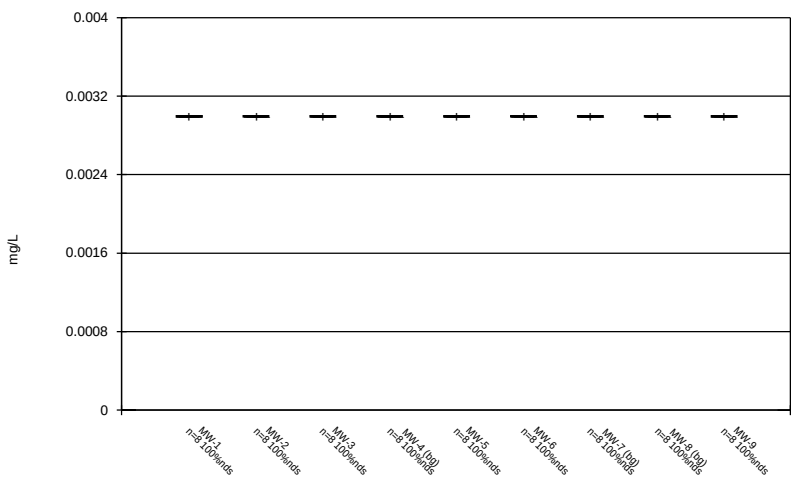


Constituent: Fluoride Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

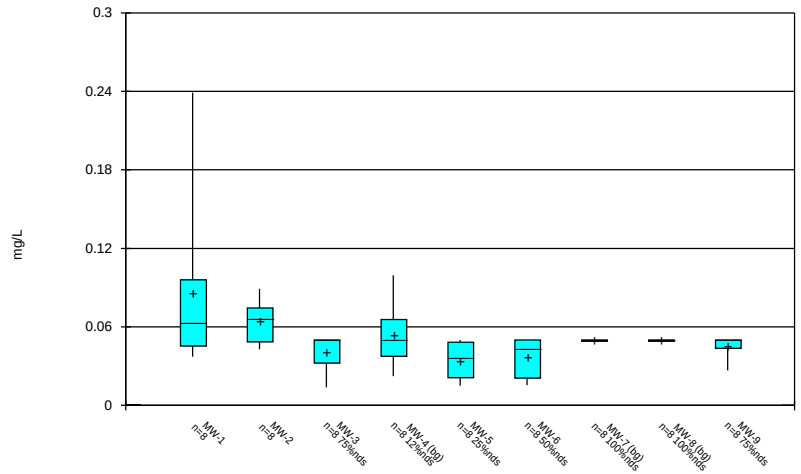


Constituent: Lead, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

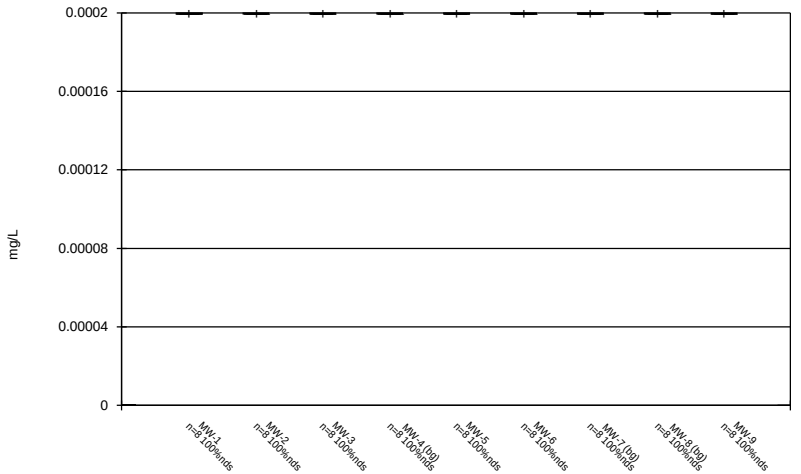


Constituent: Lithium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

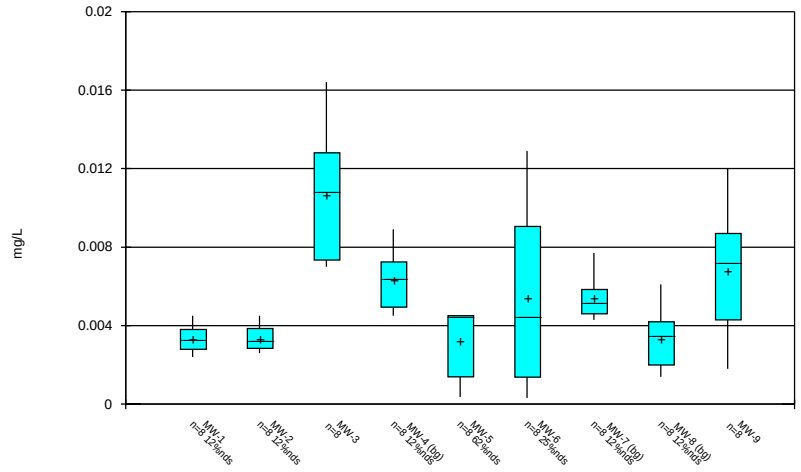


Constituent: Mercury, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

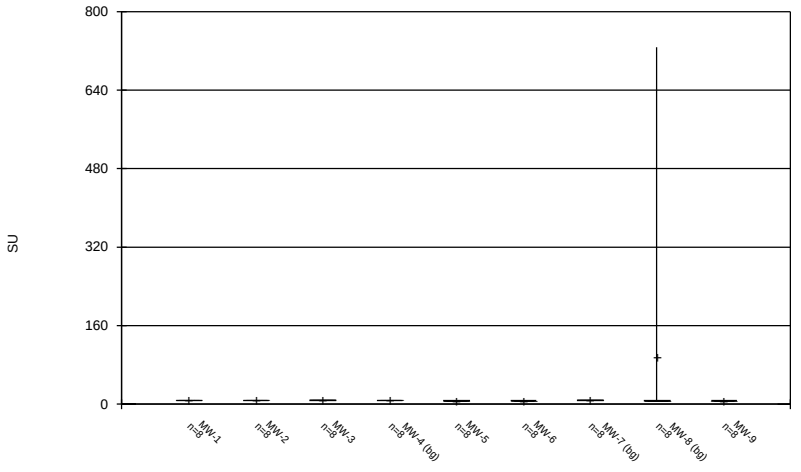


Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

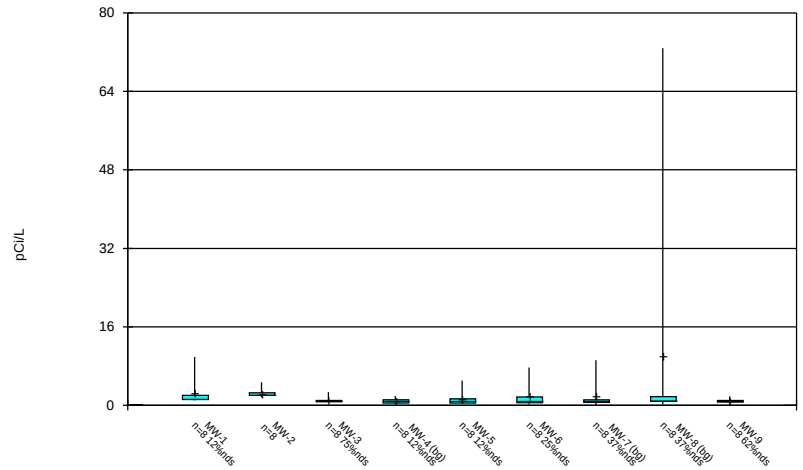


Constituent: pH Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

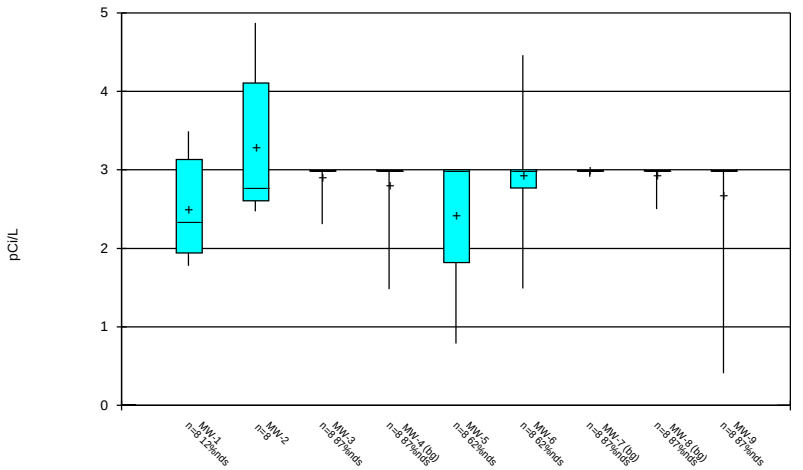


Constituent: Radium-226 Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

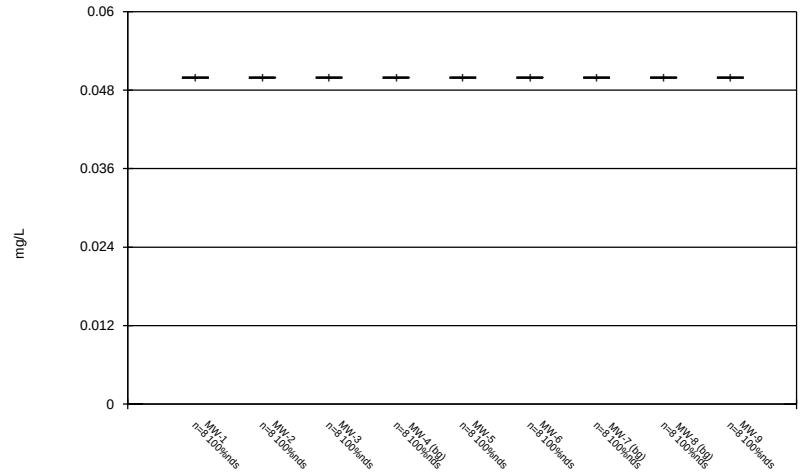


Constituent: Radium-228 Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

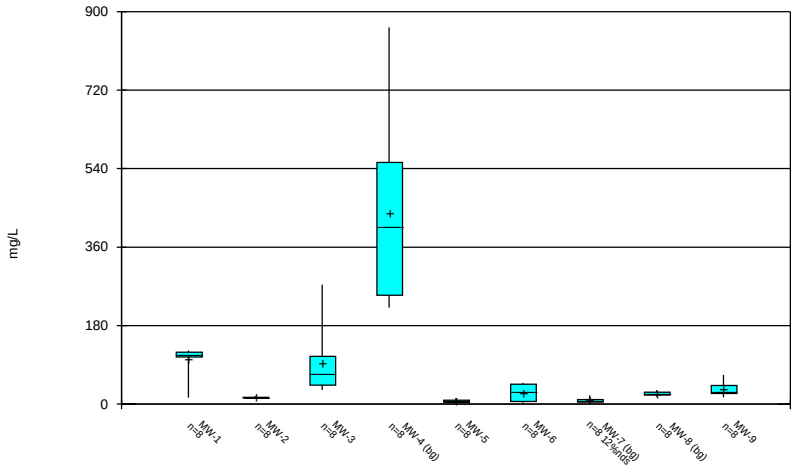


Constituent: Selenium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot

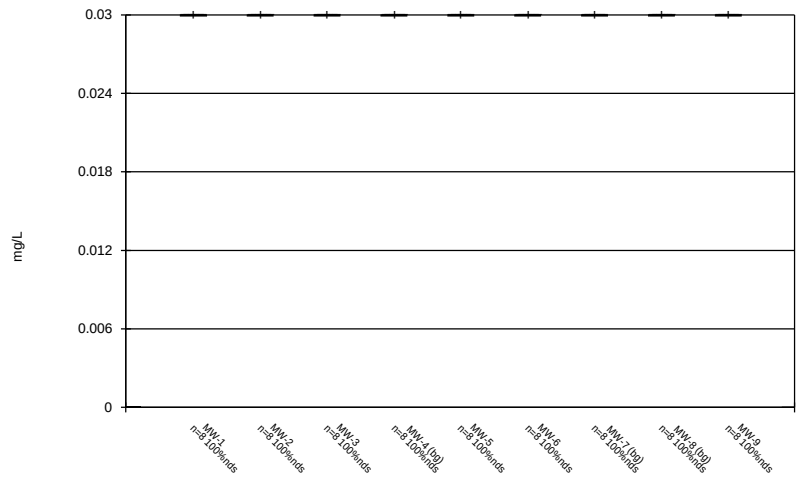


Constituent: Sulfate Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Box & Whiskers Plot

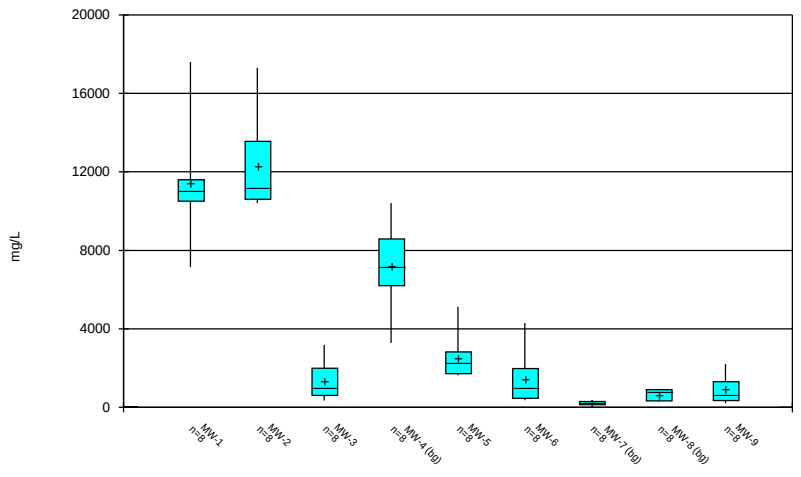


Constituent: Thallium, dissolved Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 2/19/2020 10:51 AM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Box & Whiskers Plot

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 11:04 AM

Constituent	Well	N	Mean	Std. Dev.	Std. Err.	Median	Min.	Max.	%NDs
Antimony, dissolved (mg/L)	MW-1	8	0.001689	0.0007732	0.0002734	0.0018	0.00075	0.0031	37.5
Antimony, dissolved (mg/L)	MW-2	8	0.00131	0.0007949	0.000281	0.00133	0.00052	0.0022	37.5
Antimony, dissolved (mg/L)	MW-3	8	0.001249	0.000469	0.0001658	0.0013	0.00048	0.002	12.5
Antimony, dissolved (mg/L)	MW-4 (bg)	8	0.000...	0.0005226	0.0001848	0.00086	0.00046	0.002	12.5
Antimony, dissolved (mg/L)	MW-5	8	0.001843	0.0004455	0.0001575	0.002	0.00074	0.002	87.5
Antimony, dissolved (mg/L)	MW-6	8	0.001809	0.0005409	0.0001913	0.002	0.00047	0.002	87.5
Antimony, dissolved (mg/L)	MW-7 (bg)	8	0.001805	0.0005515	0.000195	0.002	0.00044	0.002	87.5
Antimony, dissolved (mg/L)	MW-8 (bg)	8	0.001811	0.0005339	0.0001888	0.002	0.00049	0.002	87.5
Antimony, dissolved (mg/L)	MW-9	8	0.001499	0.0006377	0.0002255	0.00185	0.00053	0.002	50
Arsenic, dissolved (mg/L)	MW-1	8	0.002575	0.001071	0.0003788	0.00215	0.0017	0.0049	12.5
Arsenic, dissolved (mg/L)	MW-2	8	0.003963	0.001082	0.0003826	0.00385	0.0029	0.0059	12.5
Arsenic, dissolved (mg/L)	MW-3	8	0.002988	0.001105	0.0003907	0.00295	0.0009	0.0045	12.5
Arsenic, dissolved (mg/L)	MW-4 (bg)	8	0.002561	0.0008649	0.0003058	0.003	0.00069	0.003	75
Arsenic, dissolved (mg/L)	MW-5	8	0.001454	0.0009651	0.0003412	0.000985	0.00078	0.003	25
Arsenic, dissolved (mg/L)	MW-6	8	0.002071	0.001127	0.0003986	0.00225	0.00075	0.0034	25
Arsenic, dissolved (mg/L)	MW-7 (bg)	8	0.002274	0.001187	0.0004198	0.003	0.00075	0.0036	50
Arsenic, dissolved (mg/L)	MW-8 (bg)	8	0.001736	0.0009984	0.000353	0.00155	0.0007	0.0032	12.5
Arsenic, dissolved (mg/L)	MW-9	8	0.005163	0.003535	0.00125	0.00425	0.0019	0.0125	0
Barium, dissolved (mg/L)	MW-1	8	0.7321	0.05319	0.0188	0.7315	0.672	0.808	0
Barium, dissolved (mg/L)	MW-2	8	2.155	0.1411	0.04989	2.195	1.91	2.3	0
Barium, dissolved (mg/L)	MW-3	8	0.0939	0.07794	0.02756	0.06395	0.026	0.233	12.5
Barium, dissolved (mg/L)	MW-4 (bg)	8	0.2203	0.1279	0.04522	0.189	0.0815	0.416	0
Barium, dissolved (mg/L)	MW-5	8	0.1224	0.04536	0.01604	0.112	0.0821	0.2	12.5
Barium, dissolved (mg/L)	MW-6	8	0.09135	0.06211	0.02196	0.0817	0.0189	0.2	12.5
Barium, dissolved (mg/L)	MW-7 (bg)	8	0.05678	0.06078	0.02149	0.03495	0.0178	0.2	12.5
Barium, dissolved (mg/L)	MW-8 (bg)	8	0.07501	0.05953	0.02105	0.06375	0.0162	0.2	12.5
Barium, dissolved (mg/L)	MW-9	8	0.2074	0.2261	0.07993	0.1395	0.0289	0.731	12.5
Beryllium, dissolved (mg/L)	MW-1	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-2	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-3	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-4 (bg)	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-5	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-6	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-7 (bg)	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-8 (bg)	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Beryllium, dissolved (mg/L)	MW-9	8	0.0005	0	0	0.0005	0.0005	0.0005	100
Boron, dissolved (mg/L)	MW-1	8	1.138	0.07555	0.02671	1.125	1.06	1.3	0
Boron, dissolved (mg/L)	MW-2	8	0.8919	0.0588	0.02079	0.912	0.814	0.97	0
Boron, dissolved (mg/L)	MW-3	8	0.4195	0.2031	0.07182	0.418	0.196	0.74	0
Boron, dissolved (mg/L)	MW-4 (bg)	8	1.119	0.244	0.08627	1.067	0.787	1.53	0
Boron, dissolved (mg/L)	MW-5	8	0.466	0.1822	0.06442	0.404	0.29	0.802	0
Boron, dissolved (mg/L)	MW-6	8	0.592	0.318	0.1124	0.538	0.251	1.04	0
Boron, dissolved (mg/L)	MW-7 (bg)	8	0.1544	0.08596	0.03039	0.1305	0.0683	0.282	0
Boron, dissolved (mg/L)	MW-8 (bg)	8	0.2284	0.08217	0.02905	0.219	0.132	0.337	0
Boron, dissolved (mg/L)	MW-9	8	0.2959	0.1824	0.0645	0.2545	0.12	0.62	0
Cadmium, dissolved (mg/L)	MW-1	8	0.000...	0.0003309	0.000117	0.001	0.00016	0.001	75
Cadmium, dissolved (mg/L)	MW-2	8	0.000...	0.0002935	0.0001038	0.001	0.00024	0.001	75
Cadmium, dissolved (mg/L)	MW-3	8	0.000895	0.000297	0.000105	0.001	0.00016	0.001	87.5

Box & Whiskers Plot

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 11:04 AM

Constituent	Well	N	Mean	Std. Dev.	Std. Err.	Median	Min.	Max.	%NDs
Cadmium, dissolved (mg/L)	MW-6	8	0.001	0	0	0.001	0.001	0.001	100
Cadmium, dissolved (mg/L)	MW-7 (bg)	8	0.0009	0.0002828	0.0001	0.001	0.0002	0.001	87.5
Cadmium, dissolved (mg/L)	MW-8 (bg)	8	0.000...	0.0005667	0.0002004	0.00069	0.00019	0.0018	12.5
Cadmium, dissolved (mg/L)	MW-9	8	0.001	0	0	0.001	0.001	0.001	100
Calcium, dissolved (mg/L)	MW-1	8	377.5	16.41	5.8	381	350	396	0
Calcium, dissolved (mg/L)	MW-2	8	439.6	17.01	6.015	436	419	467	0
Calcium, dissolved (mg/L)	MW-3	8	75.28	43.45	15.36	66.4	39.6	175	0
Calcium, dissolved (mg/L)	MW-4 (bg)	8	110	26.77	9.466	96.95	81.6	164	0
Calcium, dissolved (mg/L)	MW-5	8	127.7	30.56	10.8	129.5	91.8	185	0
Calcium, dissolved (mg/L)	MW-6	8	93.46	42.4	14.99	97.65	45.3	160	0
Calcium, dissolved (mg/L)	MW-7 (bg)	8	28.85	7.489	2.648	28.95	19.9	39.9	0
Calcium, dissolved (mg/L)	MW-8 (bg)	8	21.12	12.57	4.444	24	6.62	37.5	0
Calcium, dissolved (mg/L)	MW-9	8	74.24	27.4	9.688	70.3	40	116	0
Chloride (mg/L)	MW-1	8	6908	1863	658.8	7180	2840	9520	0
Chloride (mg/L)	MW-2	8	7278	1998	706.6	7300	3770	11100	0
Chloride (mg/L)	MW-3	8	530.7	528	186.7	400.5	61.6	1720	0
Chloride (mg/L)	MW-4 (bg)	8	3771	1808	639.4	3645	1150	6610	0
Chloride (mg/L)	MW-5	8	1253	721.9	255.2	1100	623	2910	0
Chloride (mg/L)	MW-6	8	683.9	883.5	312.4	401	78.9	2740	0
Chloride (mg/L)	MW-7 (bg)	8	39.59	25.76	9.109	36.8	13.1	87.1	0
Chloride (mg/L)	MW-8 (bg)	8	305.6	202.8	71.71	364.5	69.9	598	0
Chloride (mg/L)	MW-9	8	355.3	349.3	123.5	202	29.8	947	0
Chromium, dissolved (mg/L)	MW-1	8	0.015	0	0	0.015	0.015	0.015	100
Chromium, dissolved (mg/L)	MW-2	8	0.015	0	0	0.015	0.015	0.015	100
Chromium, dissolved (mg/L)	MW-3	8	0.015	0	0	0.015	0.015	0.015	100
Chromium, dissolved (mg/L)	MW-4 (bg)	8	0.015	0	0	0.015	0.015	0.015	100
Chromium, dissolved (mg/L)	MW-5	8	0.01395	0.00297	0.00105	0.015	0.0066	0.015	87.5
Chromium, dissolved (mg/L)	MW-6	8	0.015	0	0	0.015	0.015	0.015	100
Chromium, dissolved (mg/L)	MW-7 (bg)	8	0.015	0	0	0.015	0.015	0.015	100
Chromium, dissolved (mg/L)	MW-8 (bg)	8	0.015	0	0	0.015	0.015	0.015	100
Chromium, dissolved (mg/L)	MW-9	8	0.01381	0.003359	0.001187	0.015	0.0055	0.015	87.5
Cobalt, dissolved (mg/L)	MW-1	8	0.0047	0.001228	0.0004342	0.0046	0.0027	0.0069	12.5
Cobalt, dissolved (mg/L)	MW-2	8	0.003812	0.000722	0.0002553	0.0036	0.0031	0.005	12.5
Cobalt, dissolved (mg/L)	MW-3	8	0.005	0	0	0.005	0.005	0.005	100
Cobalt, dissolved (mg/L)	MW-4 (bg)	8	0.00475	0.0007071	0.00025	0.005	0.003	0.005	87.5
Cobalt, dissolved (mg/L)	MW-5	8	0.005	0	0	0.005	0.005	0.005	100
Cobalt, dissolved (mg/L)	MW-6	8	0.005	0	0	0.005	0.005	0.005	100
Cobalt, dissolved (mg/L)	MW-7 (bg)	8	0.005	0	0	0.005	0.005	0.005	100
Cobalt, dissolved (mg/L)	MW-8 (bg)	8	0.00645	0.001898	0.0006711	0.00665	0.0037	0.009	12.5
Cobalt, dissolved (mg/L)	MW-9	8	0.004637	0.001025	0.0003625	0.005	0.0021	0.005	87.5
Fluoride (mg/L)	MW-1	8	0.545	0.1273	0.045	0.5	0.5	0.86	87.5
Fluoride (mg/L)	MW-2	8	0.8338	0.8817	0.3117	0.5	0.4	3	62.5
Fluoride (mg/L)	MW-3	8	0.5125	0.1199	0.04237	0.5	0.33	0.77	75
Fluoride (mg/L)	MW-4 (bg)	8	0.7925	0.8937	0.316	0.5	0.34	3	75
Fluoride (mg/L)	MW-5	8	0.4813	0.05303	0.01875	0.5	0.35	0.5	87.5
Fluoride (mg/L)	MW-6	8	0.5113	0.09188	0.03248	0.5	0.42	0.72	50
Fluoride (mg/L)	MW-7 (bg)	8	0.4613	0.1052	0.0372	0.445	0.36	0.68	25
Fluoride (mg/L)	MW-8 (bg)	8	0.5	0	0	0.5	0.5	0.5	100

Box & Whiskers Plot

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 11:04 AM

Constituent	Well	N	Mean	Std. Dev.	Std. Err.	Median	Min.	Max.	%NDs
Lead, dissolved (mg/L)	MW-2	8	0.003	0	0	0.003	0.003	0.003	100
Lead, dissolved (mg/L)	MW-3	8	0.003	0	0	0.003	0.003	0.003	100
Lead, dissolved (mg/L)	MW-4 (bg)	8	0.003	0	0	0.003	0.003	0.003	100
Lead, dissolved (mg/L)	MW-5	8	0.003	0	0	0.003	0.003	0.003	100
Lead, dissolved (mg/L)	MW-6	8	0.003	0	0	0.003	0.003	0.003	100
Lead, dissolved (mg/L)	MW-7 (bg)	8	0.003	0	0	0.003	0.003	0.003	100
Lead, dissolved (mg/L)	MW-8 (bg)	8	0.003	0	0	0.003	0.003	0.003	100
Lead, dissolved (mg/L)	MW-9	8	0.003	0	0	0.003	0.003	0.003	100
Lithium, dissolved (mg/L)	MW-1	8	0.08581	0.06624	0.02342	0.0637	0.0372	0.239	0
Lithium, dissolved (mg/L)	MW-2	8	0.06386	0.01617	0.005716	0.06635	0.043	0.0891	0
Lithium, dissolved (mg/L)	MW-3	8	0.04108	0.01653	0.005844	0.05	0.0138	0.05	75
Lithium, dissolved (mg/L)	MW-4 (bg)	8	0.05346	0.02482	0.008776	0.04985	0.0223	0.0994	12.5
Lithium, dissolved (mg/L)	MW-5	8	0.03441	0.01477	0.005223	0.03565	0.015	0.05	25
Lithium, dissolved (mg/L)	MW-6	8	0.03678	0.01546	0.005465	0.04355	0.0155	0.05	50
Lithium, dissolved (mg/L)	MW-7 (bg)	8	0.05	0	0	0.05	0.05	0.05	100
Lithium, dissolved (mg/L)	MW-8 (bg)	8	0.05	0	0	0.05	0.05	0.05	100
Lithium, dissolved (mg/L)	MW-9	8	0.04549	0.008797	0.00311	0.05	0.0268	0.05	75
Mercury, dissolved (mg/L)	MW-1	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-2	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-3	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-4 (bg)	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-5	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-6	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-7 (bg)	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-8 (bg)	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Mercury, dissolved (mg/L)	MW-9	8	0.0002	0	0	0.0002	0.0002	0.0002	100
Molybdenum, dissolved (mg/L)	MW-1	8	0.003337	0.0006844	0.000242	0.0033	0.0024	0.0045	12.5
Molybdenum, dissolved (mg/L)	MW-2	8	0.003362	0.0006653	0.0002352	0.0032	0.0026	0.0045	12.5
Molybdenum, dissolved (mg/L)	MW-3	8	0.01068	0.003397	0.001201	0.01085	0.007	0.0164	0
Molybdenum, dissolved (mg/L)	MW-4 (bg)	8	0.006325	0.001501	0.0005308	0.0064	0.0045	0.0089	12.5
Molybdenum, dissolved (mg/L)	MW-5	8	0.003206	0.001892	0.0006688	0.0045	0.00037	0.0045	62.5
Molybdenum, dissolved (mg/L)	MW-6	8	0.005382	0.004567	0.001615	0.0045	0.00032	0.0129	25
Molybdenum, dissolved (mg/L)	MW-7 (bg)	8	0.0054	0.001115	0.0003942	0.00515	0.0043	0.0077	12.5
Molybdenum, dissolved (mg/L)	MW-8 (bg)	8	0.003362	0.001581	0.000559	0.0035	0.0014	0.0061	12.5
Molybdenum, dissolved (mg/L)	MW-9	8	0.006775	0.00338	0.001195	0.0072	0.0018	0.012	0
pH (SU)	MW-1	8	7.563	0.2134	0.07545	7.6	7.2	7.8	0
pH (SU)	MW-2	8	7.525	0.2121	0.075	7.6	7.2	7.7	0
pH (SU)	MW-3	8	7.888	0.1727	0.06105	7.85	7.7	8.2	0
pH (SU)	MW-4 (bg)	8	7.588	0.2588	0.09149	7.55	7.3	8.1	0
pH (SU)	MW-5	8	7.113	0.2167	0.07662	7.15	6.8	7.4	0
pH (SU)	MW-6	8	7.4	0.1773	0.06268	7.4	7.2	7.7	0
pH (SU)	MW-7 (bg)	8	7.813	0.3227	0.1141	7.85	7.4	8.3	0
pH (SU)	MW-8 (bg)	8	97.18	254.5	89.98	7.3	6.7	727	0
pH (SU)	MW-9	8	7.475	0.2915	0.1031	7.45	7.2	8.1	0
Radium-226 (pCi/L)	MW-1	8	2.509	3.029	1.071	1.355	1	9.9	12.5
Radium-226 (pCi/L)	MW-2	8	2.493	0.9469	0.3348	2.175	1.65	4.7	0
Radium-226 (pCi/L)	MW-3	8	1.16	0.6298	0.2227	1	0.601	2.68	75
Radium-226 (pCi/L)	MW-4 (bg)	8	0.9116	0.5114	0.1808	0.9065	0.363	1.92	12.5

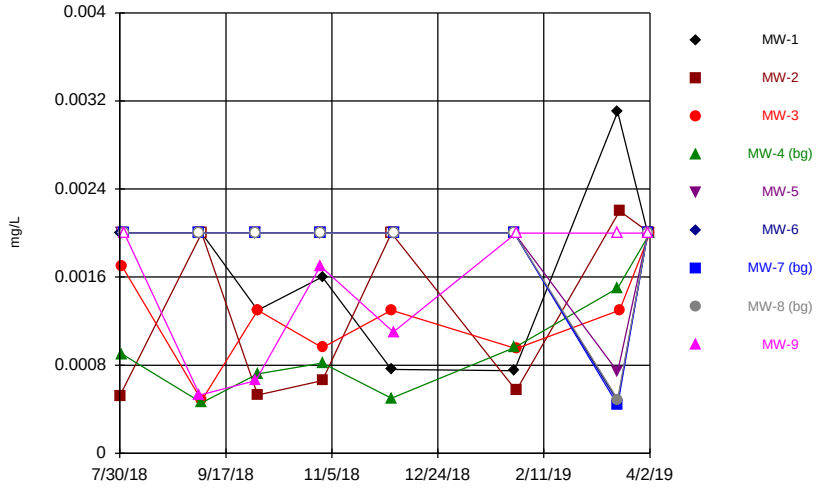
Box & Whiskers Plot

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 11:04 AM

Constituent	Well	N	Mean	Std. Dev.	Std. Err.	Median	Min.	Max.	%NDs
Radium-226 (pCi/L)	MW-7 (bg)	8	1.848	2.996	1.059	1	0.118	9.21	37.5
Radium-226 (pCi/L)	MW-8 (bg)	8	10.04	25.36	8.967	1	0.169	72.8	37.5
Radium-226 (pCi/L)	MW-9	8	0.9308	0.5008	0.1771	1	0.18	1.87	62.5
Radium-228 (pCi/L)	MW-1	8	2.51	0.6581	0.2327	2.335	1.78	3.49	12.5
Radium-228 (pCi/L)	MW-2	8	3.29	0.9362	0.331	2.78	2.47	4.87	0
Radium-228 (pCi/L)	MW-3	8	2.914	0.244	0.08625	3	2.31	3	87.5
Radium-228 (pCi/L)	MW-4 (bg)	8	2.81	0.5374	0.19	3	1.48	3	87.5
Radium-228 (pCi/L)	MW-5	8	2.429	0.9447	0.334	3	0.789	3	62.5
Radium-228 (pCi/L)	MW-6	8	2.936	0.8098	0.2863	3	1.49	4.46	62.5
Radium-228 (pCi/L)	MW-7 (bg)	8	2.989	0.03182	0.01125	3	2.91	3	87.5
Radium-228 (pCi/L)	MW-8 (bg)	8	2.938	0.1768	0.0625	3	2.5	3	87.5
Radium-228 (pCi/L)	MW-9	8	2.676	0.9153	0.3236	3	0.411	3	87.5
Selenium, dissolved (mg/L)	MW-1	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-2	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-3	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-4 (bg)	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-5	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-6	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-7 (bg)	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-8 (bg)	8	0.05	0	0	0.05	0.05	0.05	100
Selenium, dissolved (mg/L)	MW-9	8	0.05	0	0	0.05	0.05	0.05	100
Sulfate (mg/L)	MW-1	8	102.9	35.9	12.69	114.5	15.2	123	0
Sulfate (mg/L)	MW-2	8	14.98	1.81	0.64	14.4	13.2	19	0
Sulfate (mg/L)	MW-3	8	94.16	79.13	27.98	70.2	32.5	274	0
Sulfate (mg/L)	MW-4 (bg)	8	438.5	221.7	78.4	407	221	864	0
Sulfate (mg/L)	MW-5	8	6.613	3.992	1.411	5.7	2	14.1	0
Sulfate (mg/L)	MW-6	8	27.2	19.38	6.853	30.9	3.3	48.6	0
Sulfate (mg/L)	MW-7 (bg)	8	8.625	5.412	1.913	7	3.4	20.1	12.5
Sulfate (mg/L)	MW-8 (bg)	8	24.53	4.856	1.717	24.8	17.5	32.3	0
Sulfate (mg/L)	MW-9	8	34.4	16.87	5.966	29	15.8	67.1	0
Thallium, dissolved (mg/L)	MW-1	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-2	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-3	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-4 (bg)	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-5	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-6	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-7 (bg)	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-8 (bg)	8	0.03	0	0	0.03	0.03	0.03	100
Thallium, dissolved (mg/L)	MW-9	8	0.03	0	0	0.03	0.03	0.03	100
Total Dissolved Solids (mg/L)	MW-1	8	11380	2898	1025	11050	7140	17600	0
Total Dissolved Solids (mg/L)	MW-2	8	12288	2546	900.1	11150	10400	17300	0
Total Dissolved Solids (mg/L)	MW-3	8	1337	1043	368.9	973	344	3180	0
Total Dissolved Solids (mg/L)	MW-4 (bg)	8	7200	2192	775.1	7180	3280	10400	0
Total Dissolved Solids (mg/L)	MW-5	8	2550	1144	404.5	2285	1640	5120	0
Total Dissolved Solids (mg/L)	MW-6	8	1448	1339	473.5	1015	373	4290	0
Total Dissolved Solids (mg/L)	MW-7 (bg)	8	227	89.77	31.74	214.5	141	361	0
Total Dissolved Solids (mg/L)	MW-8 (bg)	8	657.5	279.4	98.77	775	306	916	0
Total Dissolved Solids (mg/L)	MW-9	8	883.3	683.8	241.8	670	222	2200	0

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Time Series

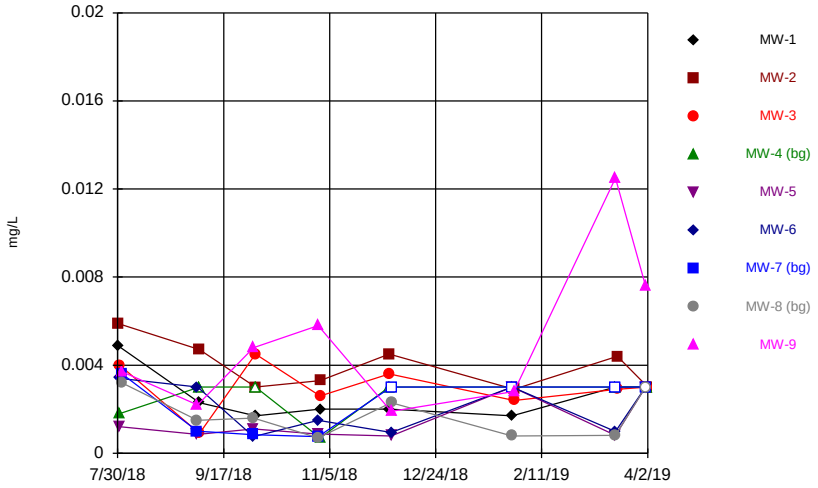


Constituent: Antimony, dissolved Analysis Run 2/19/2020 12:44 PM

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Hollow symbols indicate censored values.

Time Series

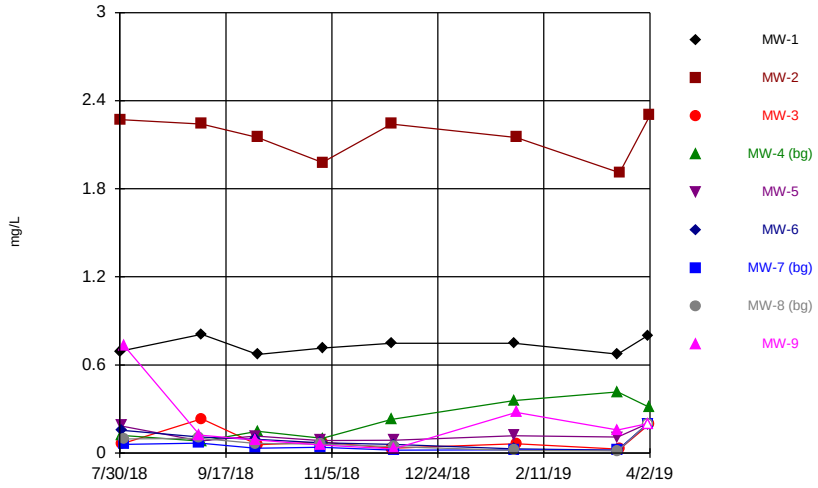


Constituent: Arsenic, dissolved Analysis Run 2/19/2020 12:44 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

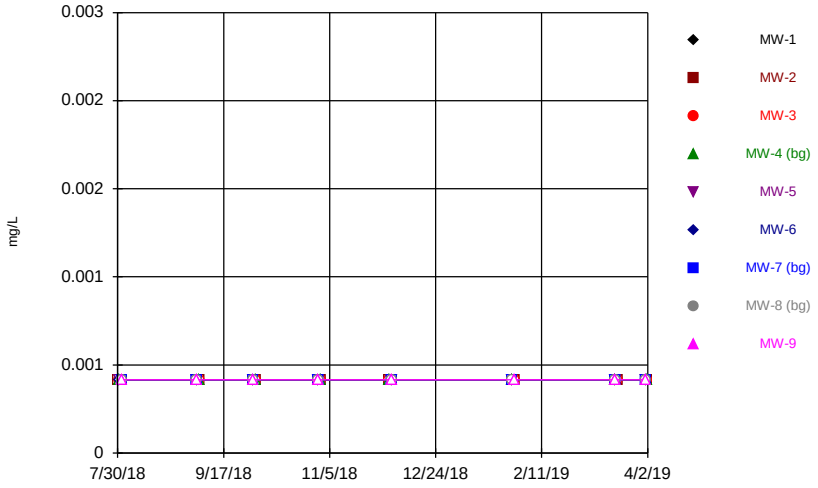


Constituent: Barium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

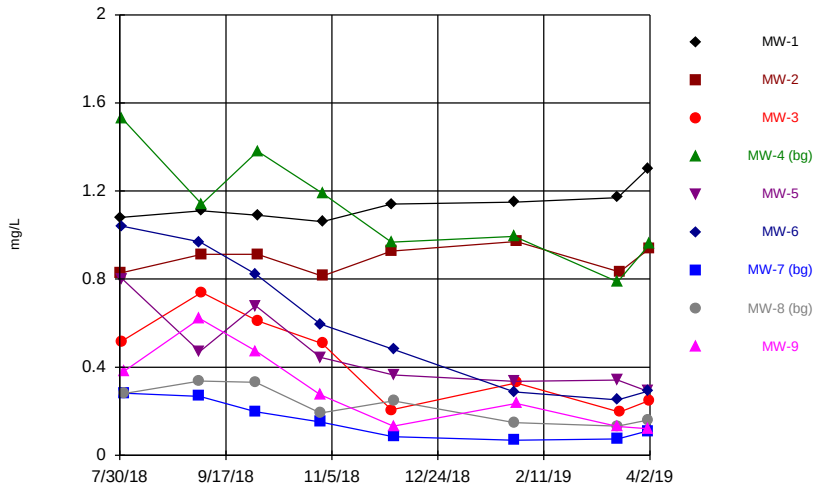


Constituent: Beryllium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Time Series



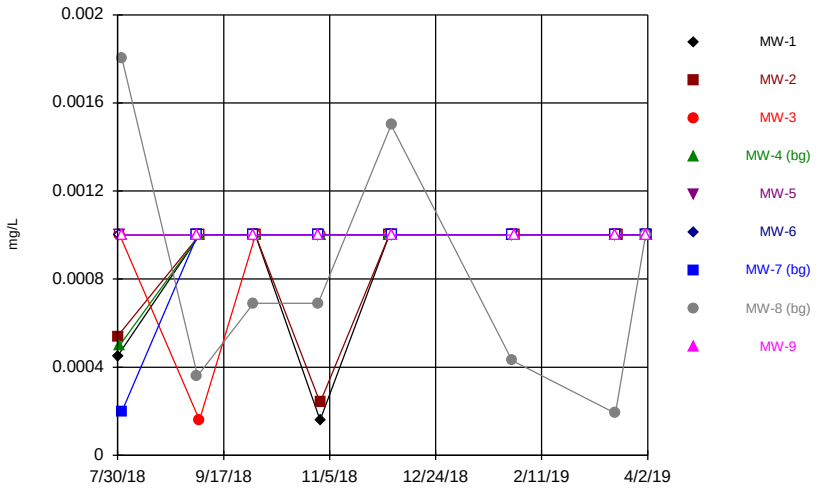
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Hollow symbols indicate censored values.

Time Series

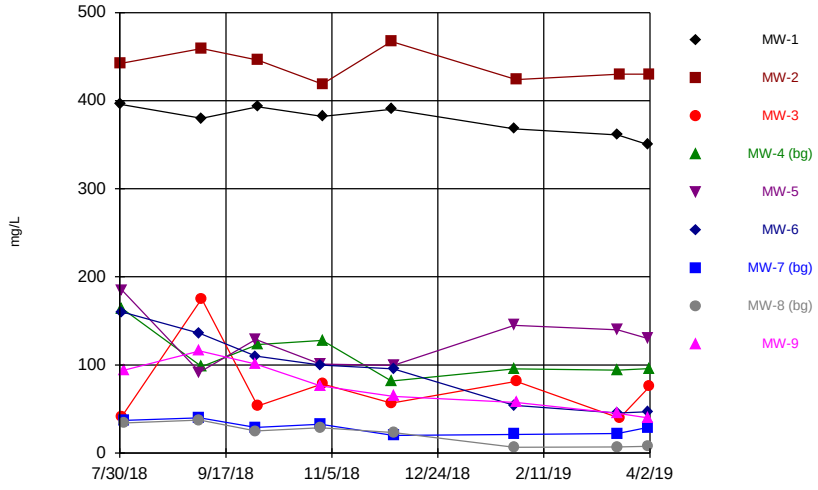


Constituent: Cadmium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Time Series

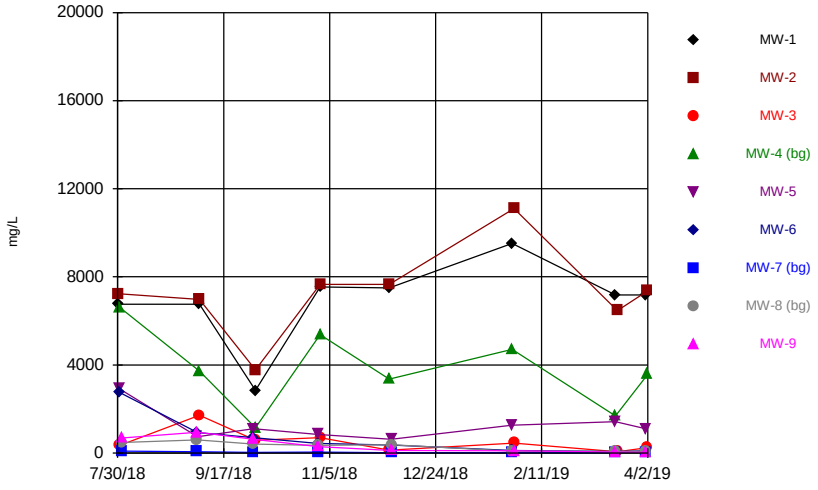


Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Time Series

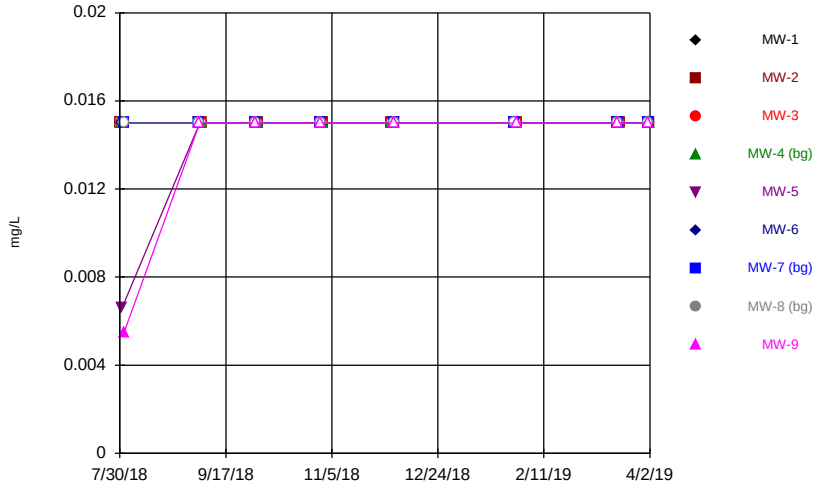


Constituent: Chloride Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

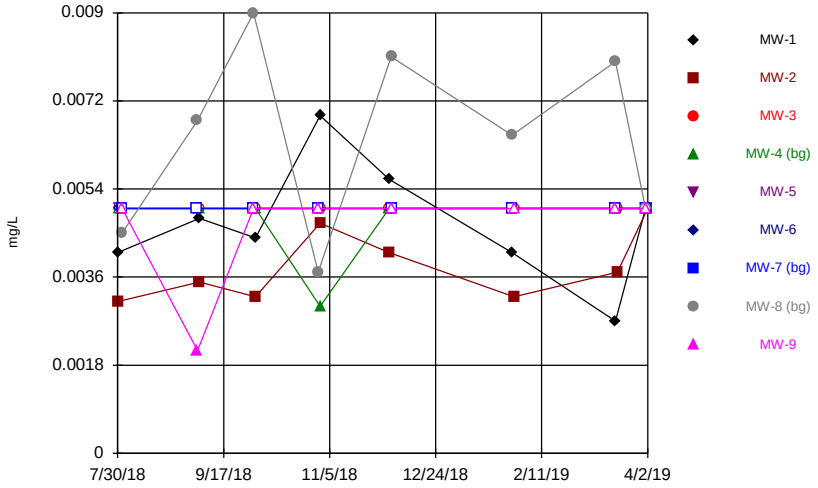


Constituent: Chromium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

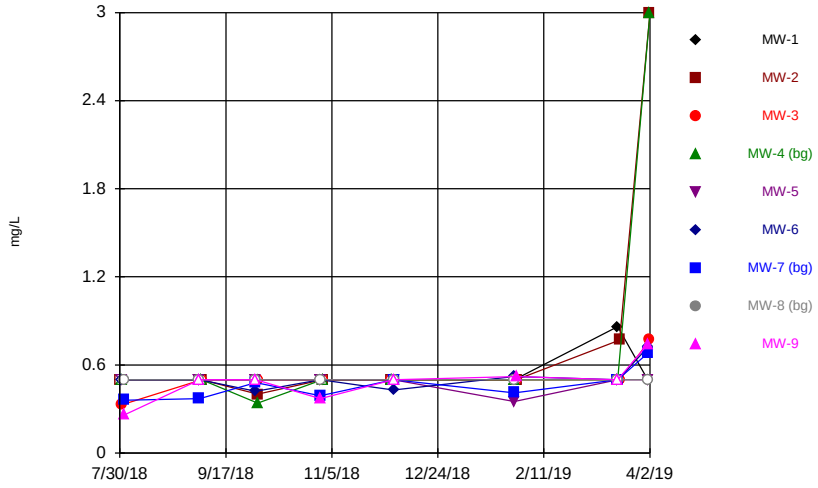


Constituent: Cobalt, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

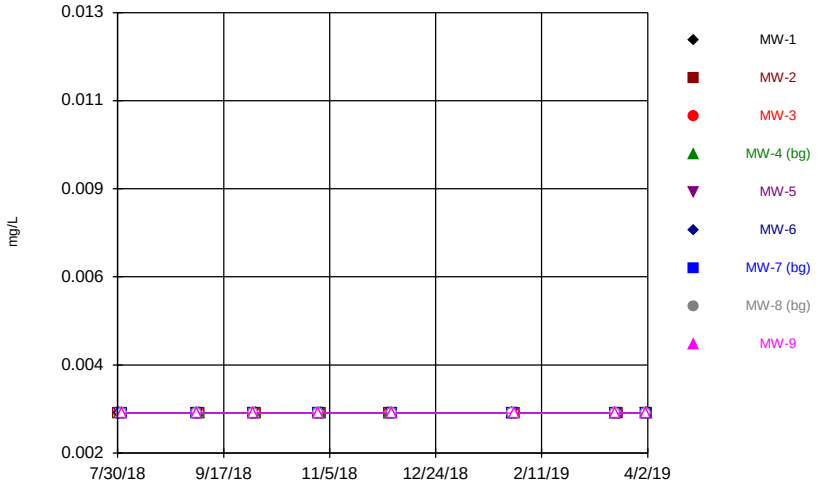


Constituent: Fluoride Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

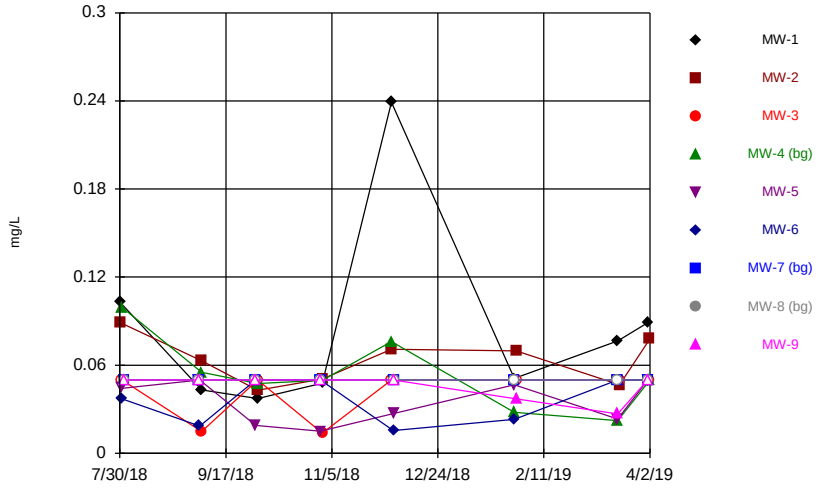


Constituent: Lead, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

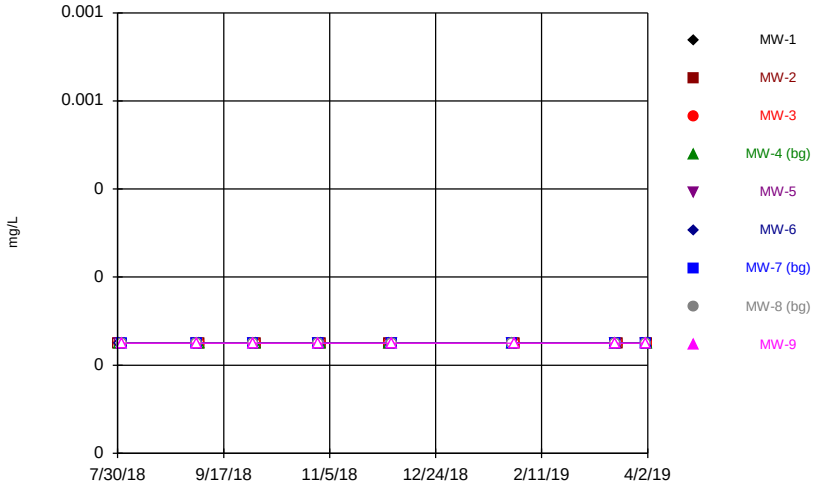


Constituent: Lithium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

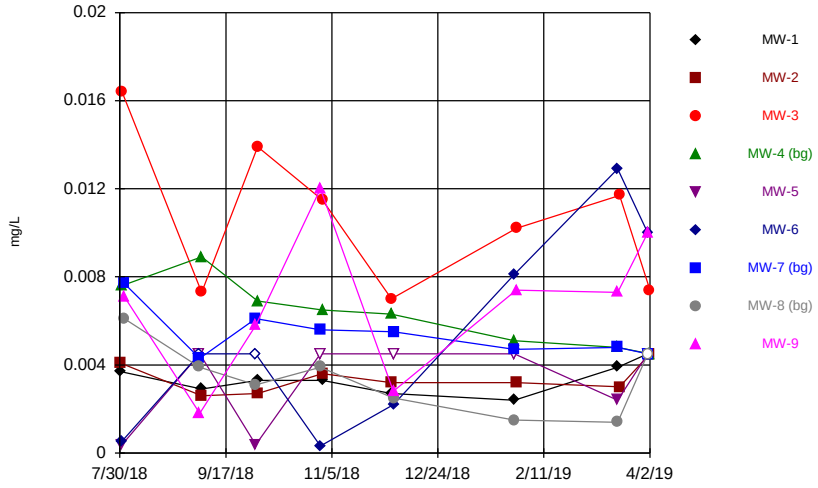


Constituent: Mercury, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

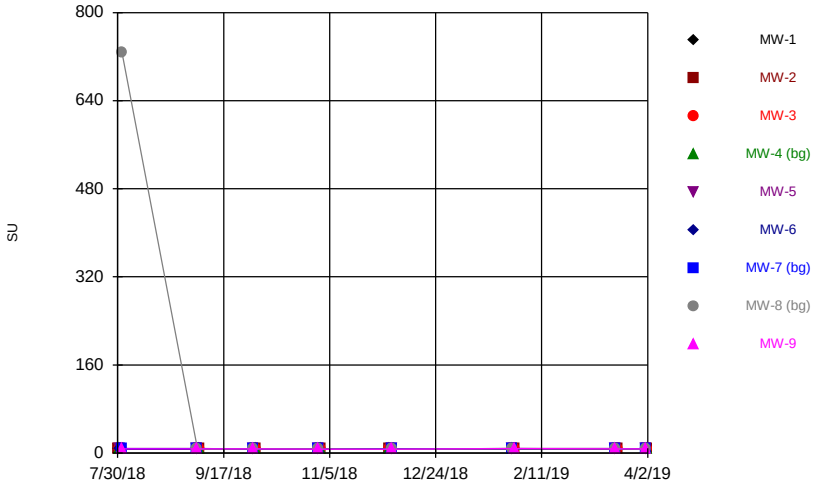


Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Time Series

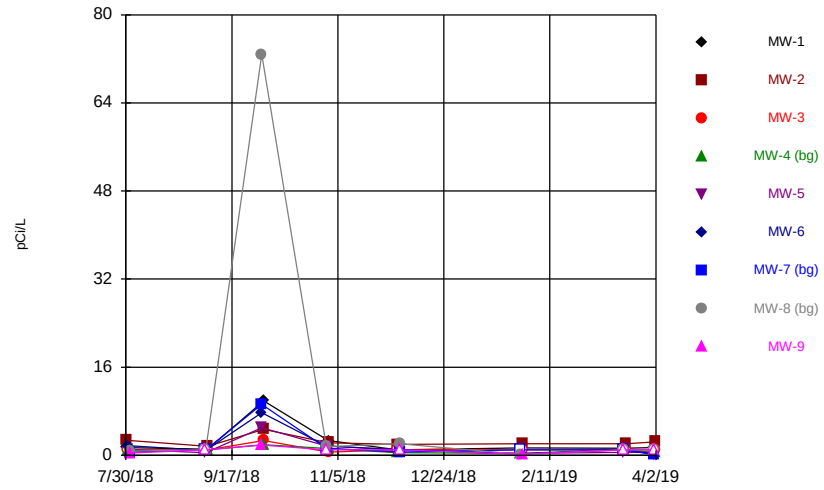


Constituent: pH Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

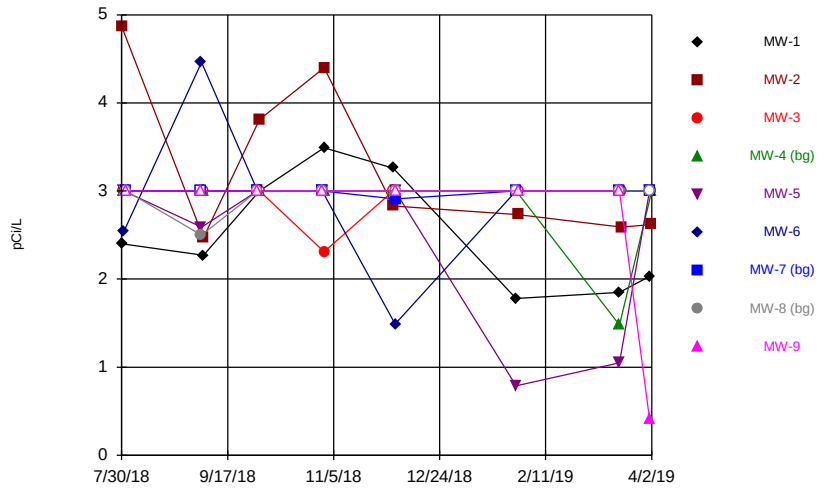


Constituent: Radium-226 Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

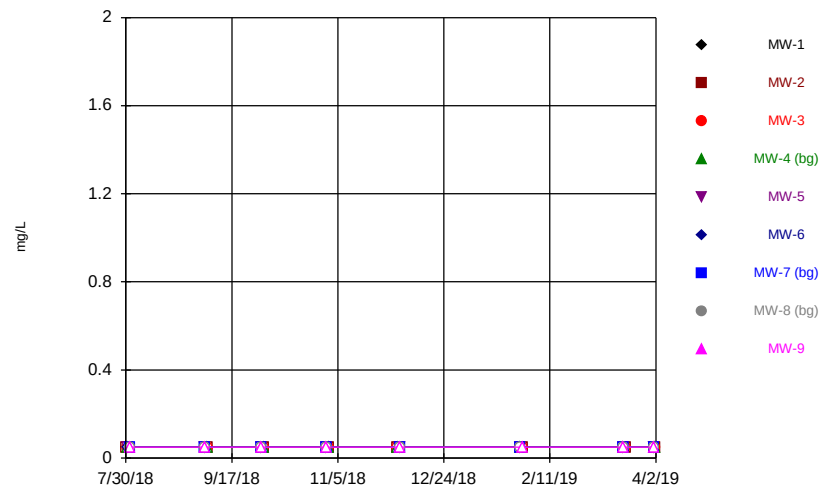


Constituent: Radium-228 Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

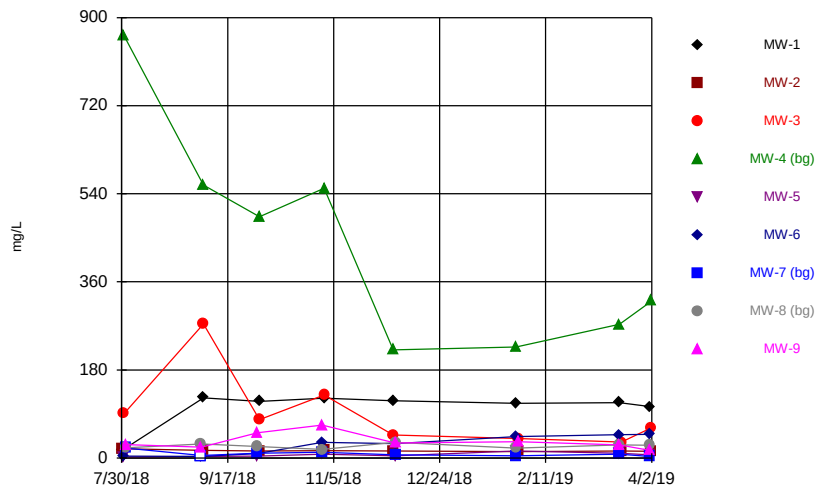


Constituent: Selenium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

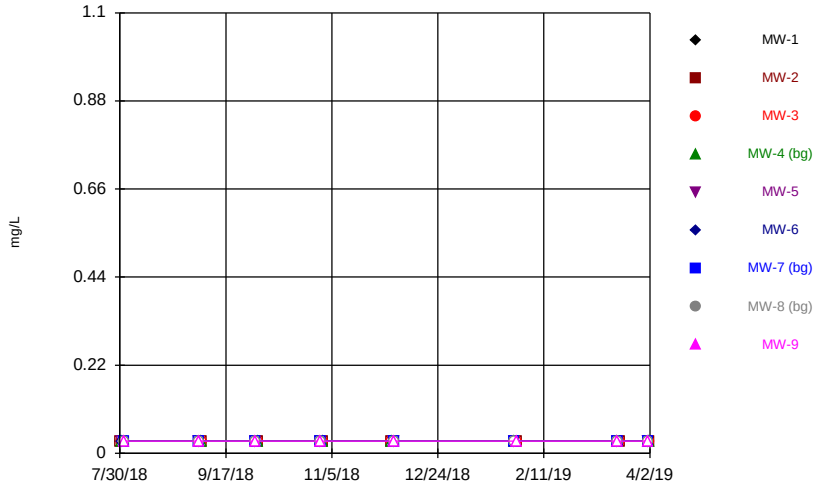


Constituent: Sulfate Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Time Series

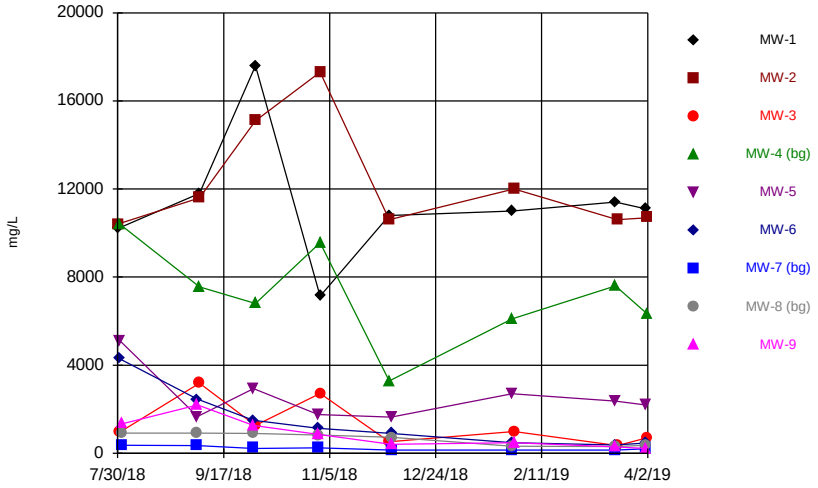


Constituent: Thallium, dissolved Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Time Series



Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:45 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

APPENDIX F

Appendix III Constituent Mann-Kendall Trend Tests

Trend Test

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 1:00 PM

Constituent	Well	Slope	Critical	Sig.	N	%NDs	Alpha
Boron, dissolved (mg/L)	MW-1	0.1743	21	No	8	0	0.01
Boron, dissolved (mg/L)	MW-2	0.05918	21	No	8	0	0.01
Boron, dissolved (mg/L)	MW-3	-0.7723	-21	No	8	0	0.01
Boron, dissolved (mg/L)	MW-4 (bg)	-0.8457	-21	No	8	0	0.01
Boron, dissolved (mg/L)	**MW-5**	**-0.5811**	**-21**	**Yes**	**8**	**0**	**0.01**
Boron, dissolved (mg/L)	**MW-6**	**-1.249**	**-21**	**Yes**	**8**	**0**	**0.01**
Boron, dissolved (mg/L)	MW-7 (bg)	-0.3335	-21	No	8	0	0.01
Boron, dissolved (mg/L)	MW-8 (bg)	-0.2687	-21	No	8	0	0.01
Boron, dissolved (mg/L)	**MW-9**	**-0.698**	**-21**	**Yes**	**8**	**0**	**0.01**
Calcium, dissolved (mg/L)	MW-1	-55.9	-21	No	8	0	0.01
Calcium, dissolved (mg/L)	MW-2	-25.48	-21	No	8	0	0.01
Calcium, dissolved (mg/L)	MW-3	3.692	21	No	8	0	0.01
Calcium, dissolved (mg/L)	MW-4 (bg)	-65.39	-21	No	8	0	0.01
Calcium, dissolved (mg/L)	MW-5	12.95	21	No	8	0	0.01
Calcium, dissolved (mg/L)	**MW-6**	**-169.5**	**-21**	**Yes**	**8**	**0**	**0.01**
Calcium, dissolved (mg/L)	MW-7 (bg)	-21.52	-21	No	8	0	0.01
Calcium, dissolved (mg/L)	MW-8 (bg)	-51.33	-21	No	8	0	0.01
Calcium, dissolved (mg/L)	**MW-9**	**-99.13**	**-21**	**Yes**	**8**	**0**	**0.01**
Chloride (mg/L)	MW-1	767.4	21	No	8	0	0.01
Chloride (mg/L)	MW-2	973.8	21	No	8	0	0.01
Chloride (mg/L)	MW-3	-846.9	-21	No	8	0	0.01
Chloride (mg/L)	MW-4 (bg)	-3835	-21	No	8	0	0.01
Chloride (mg/L)	MW-5	258.5	21	No	8	0	0.01
Chloride (mg/L)	**MW-6**	**-1669**	**-21**	**Yes**	**8**	**0**	**0.01**
Chloride (mg/L)	MW-7 (bg)	-69.67	-21	No	8	0	0.01
Chloride (mg/L)	MW-8 (bg)	-733.4	-21	No	8	0	0.01
Chloride (mg/L)	**MW-9**	**-1174**	**-21**	**Yes**	**8**	**0**	**0.01**
Fluoride (mg/L)	MW-1	0	21	No	8	87.5	0.01
Fluoride (mg/L)	MW-2	0.4664	21	No	8	62.5	0.01
Fluoride (mg/L)	MW-3	0	21	No	8	75	0.01
Fluoride (mg/L)	MW-4 (bg)	0	21	No	8	75	0.01
Fluoride (mg/L)	MW-5	0	-21	No	8	87.5	0.01
Fluoride (mg/L)	MW-6	0.05352	21	No	8	50	0.01
Fluoride (mg/L)	MW-7 (bg)	0.2678	21	No	8	25	0.01
Fluoride (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Fluoride (mg/L)	MW-9	0.4018	21	No	8	50	0.01
pH (SU)	MW-1	-0.5625	-21	No	8	0	0.01
pH (SU)	MW-2	-0.4484	-21	No	8	0	0.01
pH (SU)	MW-3	-0.1943	-21	No	8	0	0.01
pH (SU)	MW-4 (bg)	-0.2848	-21	No	8	0	0.01
pH (SU)	MW-5	-0.3185	-21	No	8	0	0.01
pH (SU)	MW-6	0	-21	No	8	0	0.01
pH (SU)	MW-7 (bg)	-0.6833	-21	No	8	0	0.01
pH (SU)	MW-8 (bg)	-1.31	-21	No	8	0	0.01
pH (SU)	MW-9	0.1692	21	No	8	0	0.01
Sulfate (mg/L)	MW-1	-16.41	-21	No	8	0	0.01
Sulfate (mg/L)	MW-2	-5.113	-21	No	8	0	0.01
Sulfate (mg/L)	MW-3	-100.4	-21	No	8	0	0.01

Trend Test

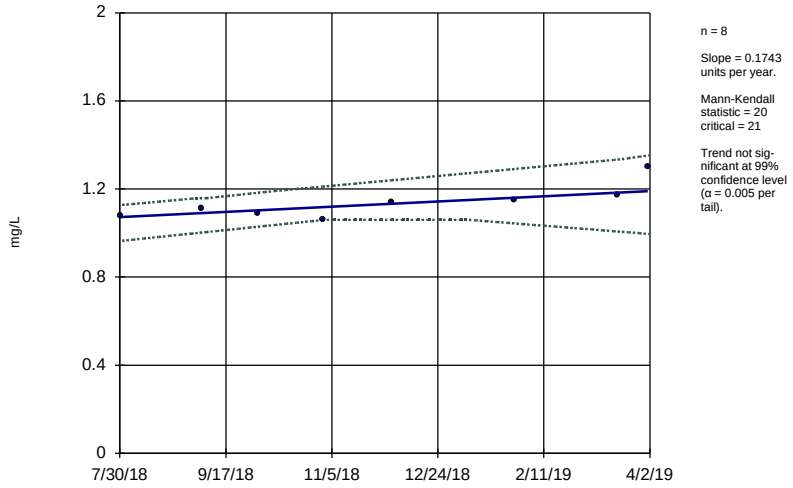
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 1:00 PM

Constituent	Well	Slope	Critical	Sig.	N	%NDs	Alpha
Sulfate (mg/L)	**MW-6**	**77.27**	**21**	**Yes**	**8**	**0**	**0.01**
Sulfate (mg/L)	MW-7 (bg)	-11.81	-21	No	8	12.5	0.01
Sulfate (mg/L)	MW-8 (bg)	6.593	21	No	8	0	0.01
Sulfate (mg/L)	MW-9	-15.51	-21	No	8	0	0.01
Total Dissolved Solids (mg/L)	MW-1	1100	21	No	8	0	0.01
Total Dissolved Solids (mg/L)	MW-2	152.1	21	No	8	0	0.01
Total Dissolved Solids (mg/L)	MW-3	-1452	-21	No	8	0	0.01
Total Dissolved Solids (mg/L)	MW-4 (bg)	-4059	-21	No	8	0	0.01
Total Dissolved Solids (mg/L)	MW-5	-1263	-21	No	8	0	0.01
Total Dissolved Solids (mg/L)	**MW-6**	**-3453**	**-21**	**Yes**	**8**	**0**	**0.01**
Total Dissolved Solids (mg/L)	MW-7 (bg)	-274.5	-21	No	8	0	0.01
Total Dissolved Solids (mg/L)	**MW-8 (bg)**	**-990.9**	**-21**	**Yes**	**8**	**0**	**0.01**
Total Dissolved Solids (mg/L)	**MW-9**	**-1888**	**-21**	**Yes**	**8**	**0**	**0.01**

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Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 0.1743 units per year.

Mann-Kendall statistic = 20 critical = 21

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

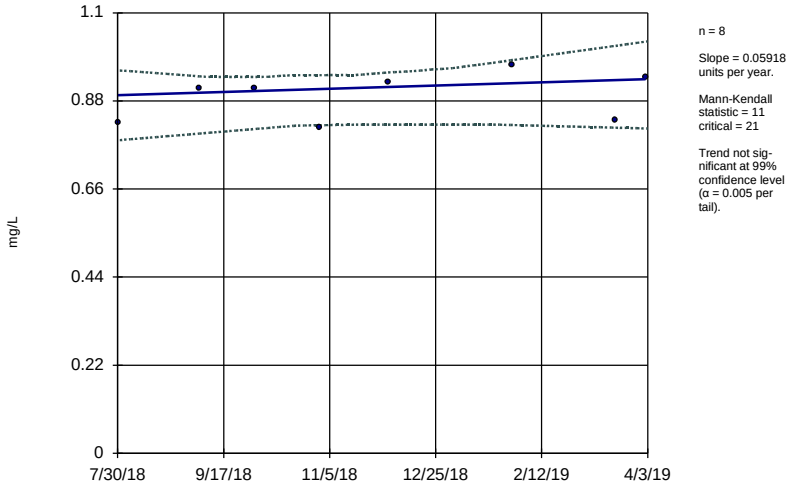
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0.05918 units per year.

Mann-Kendall statistic = 11 critical = 21

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

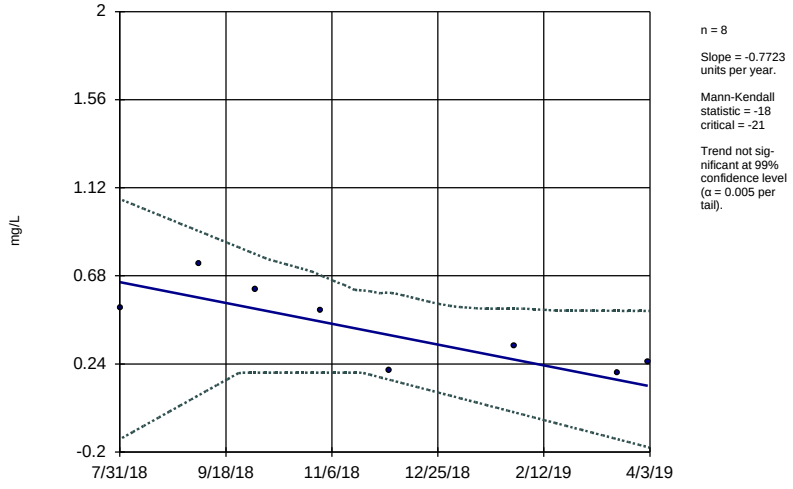
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = -0.7723 units per year.

Mann-Kendall statistic = -18 critical = -21

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

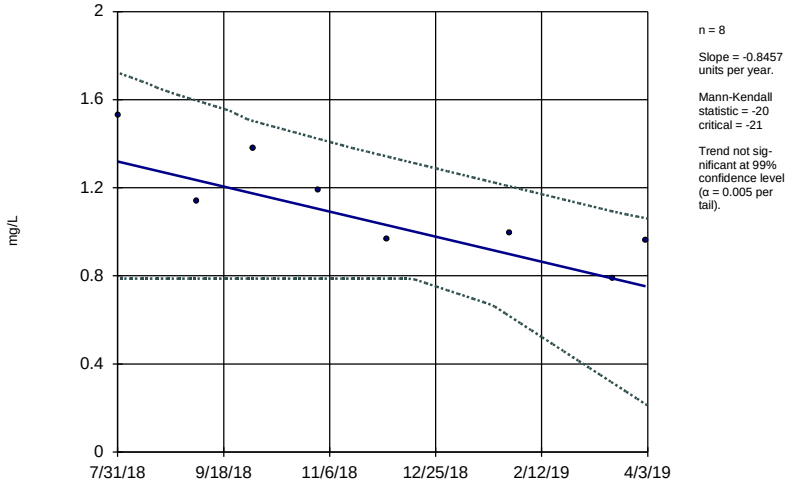
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -0.8457 units per year.

Mann-Kendall statistic = -20 critical = -21

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

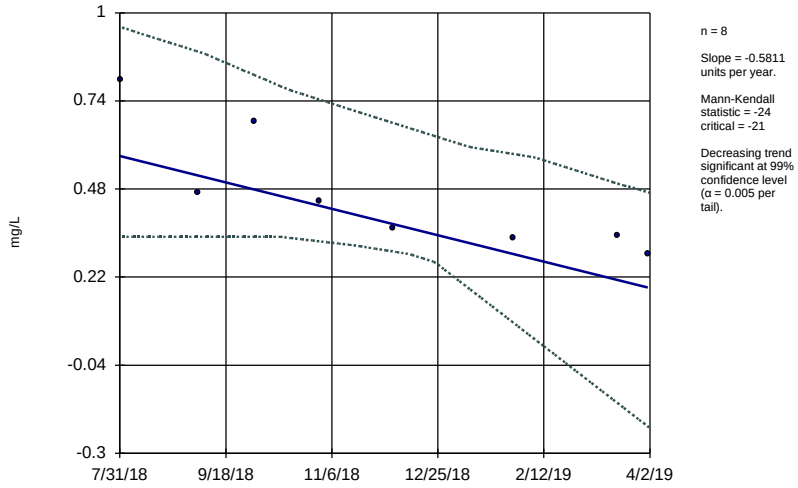
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = -0.5811 units per year.

Mann-Kendall statistic = -24
critical = -21

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

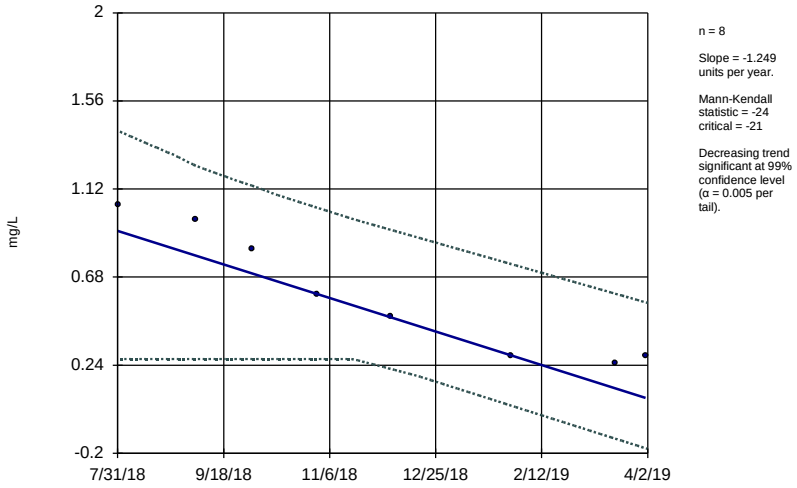
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = -1.249 units per year.

Mann-Kendall statistic = -24
critical = -21

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

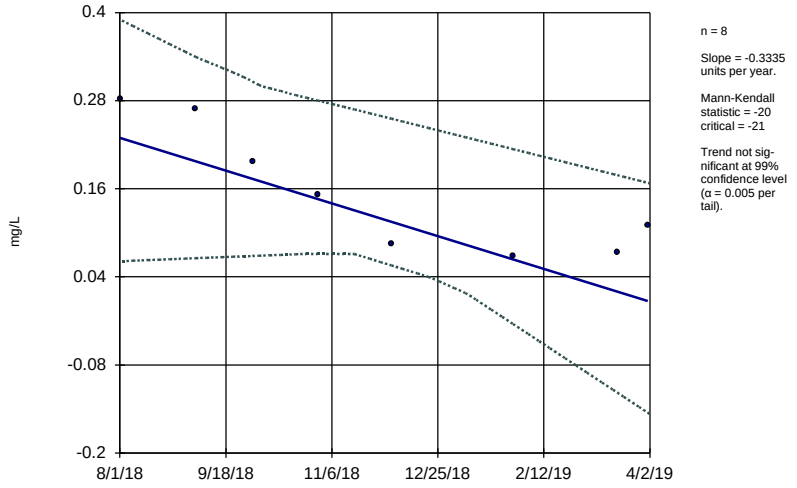
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -0.3335 units per year.

Mann-Kendall statistic = -20
critical = -21

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

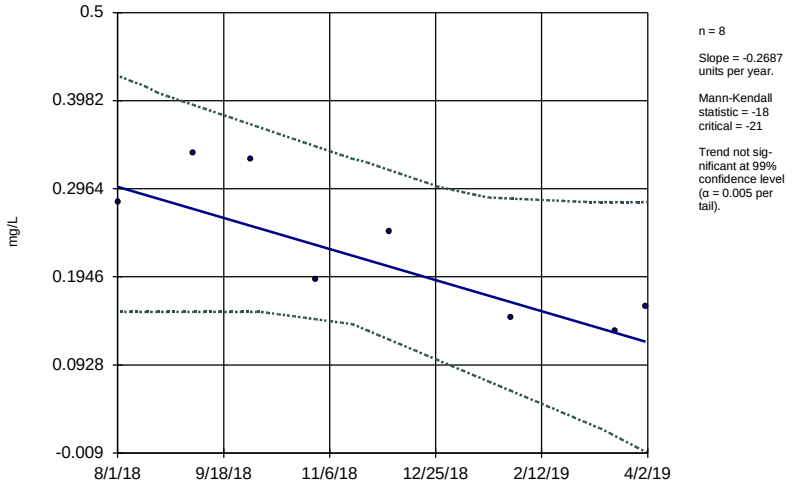
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -0.2687 units per year.

Mann-Kendall statistic = -18
critical = -21

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

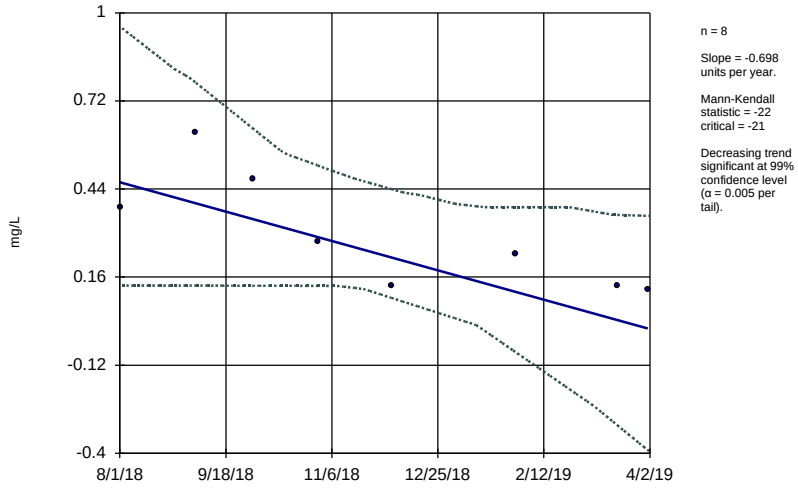
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = -0.698 units per year.

Mann-Kendall statistic = -22
critical = -21

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

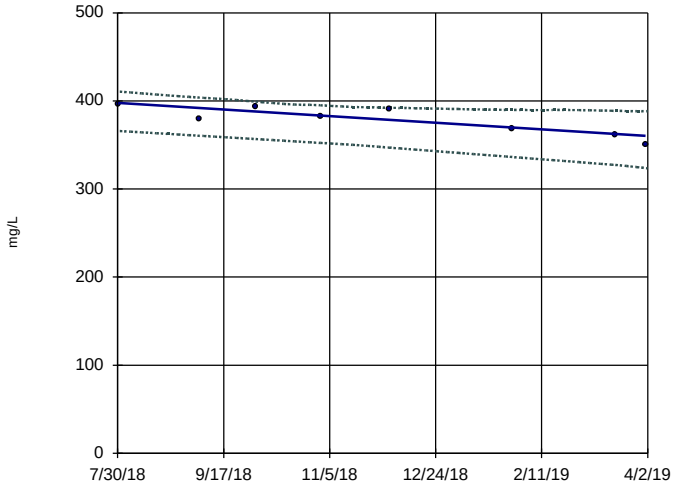
Constituent: Boron, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = -55.9 units per year.

Mann-Kendall statistic = -20
critical = -21

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

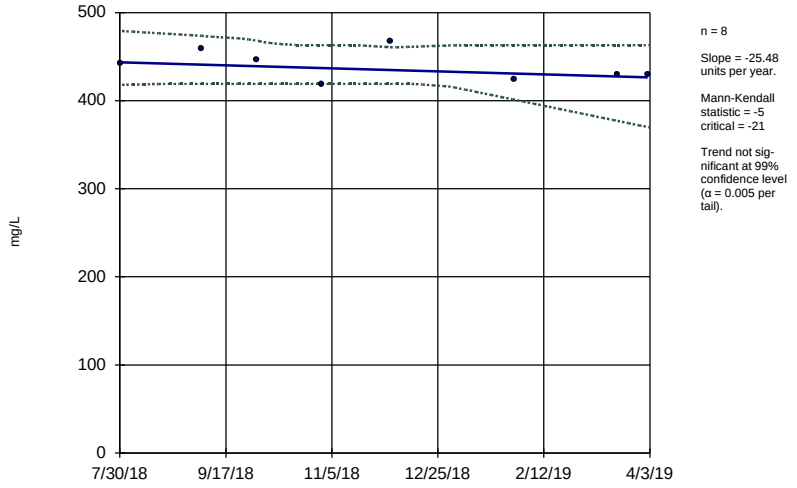
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = -25.48 units per year.

Mann-Kendall statistic = -5
critical = -21

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

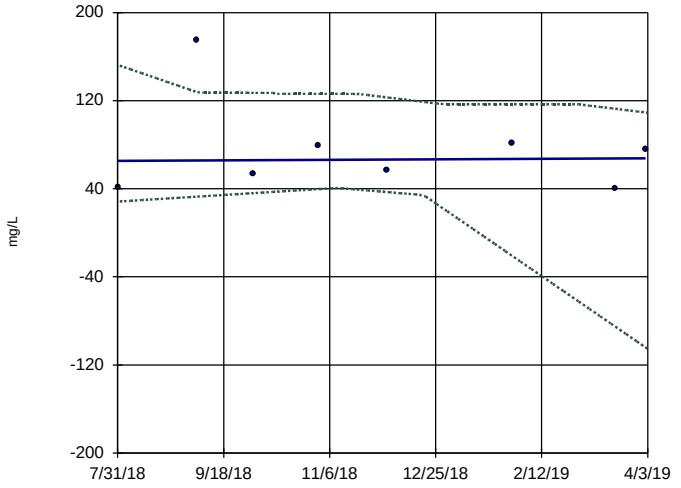
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 3.692 units per year.

Mann-Kendall statistic = 0
critical = 21

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

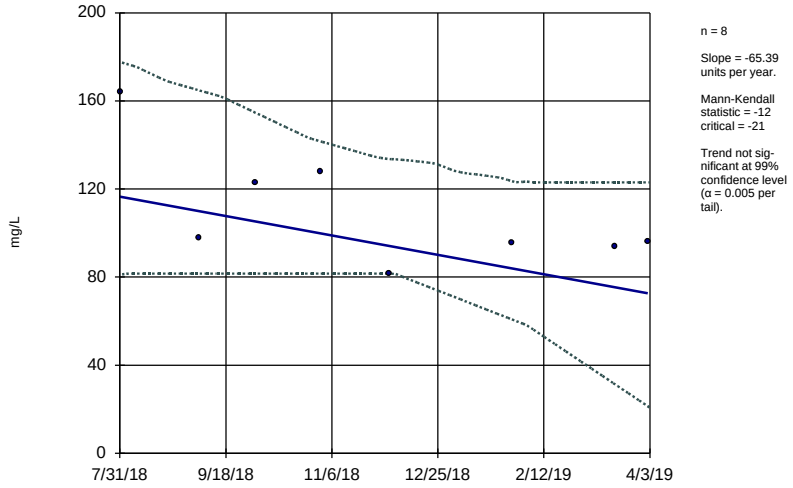
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -65.39 units per year.

Mann-Kendall statistic = -12 critical = -21

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

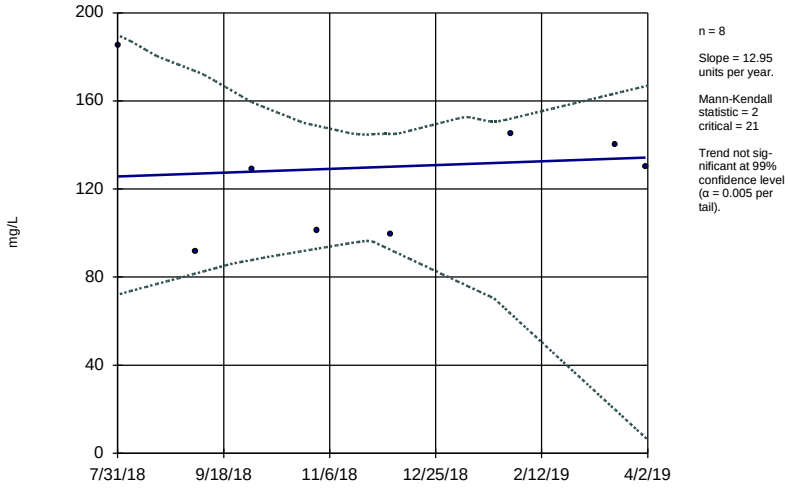
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 12.95 units per year.

Mann-Kendall statistic = 2 critical = 21

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

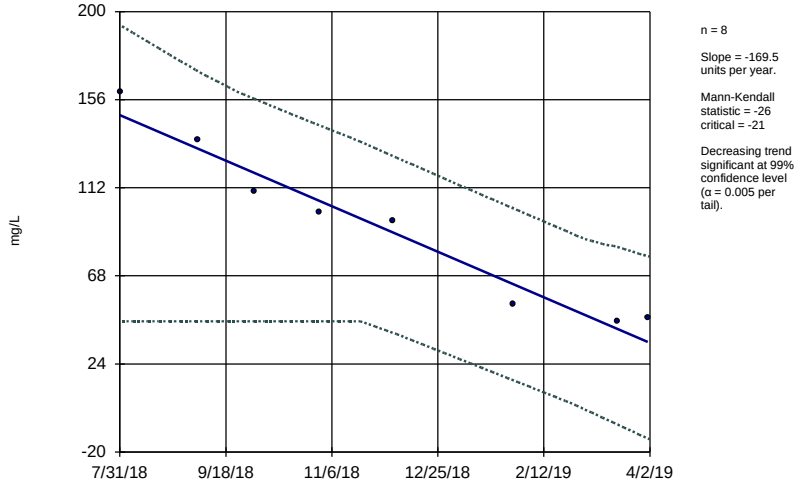
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:57 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = -169.5 units per year.

Mann-Kendall statistic = -26 critical = -21

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

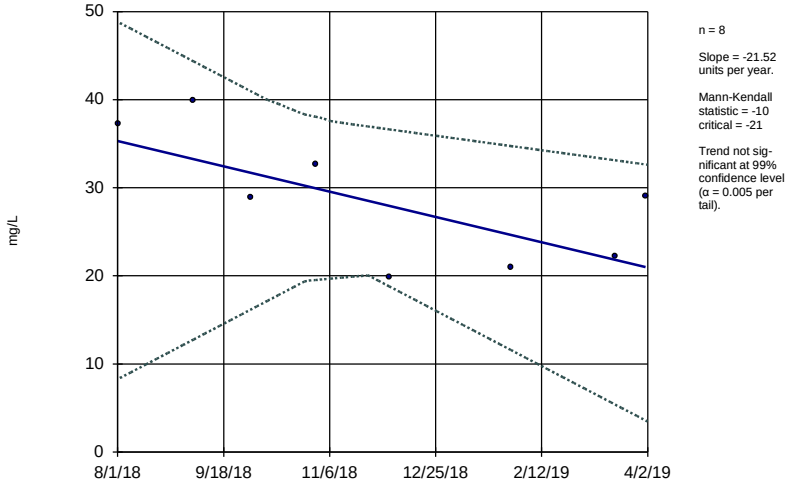
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -21.52 units per year.

Mann-Kendall statistic = -10 critical = -21

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

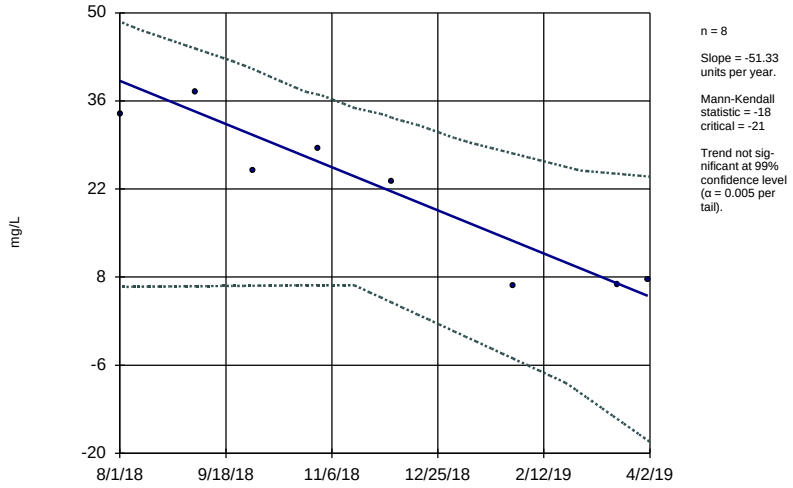
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -51.33 units per year.

Mann-Kendall statistic = -18 critical = -21

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

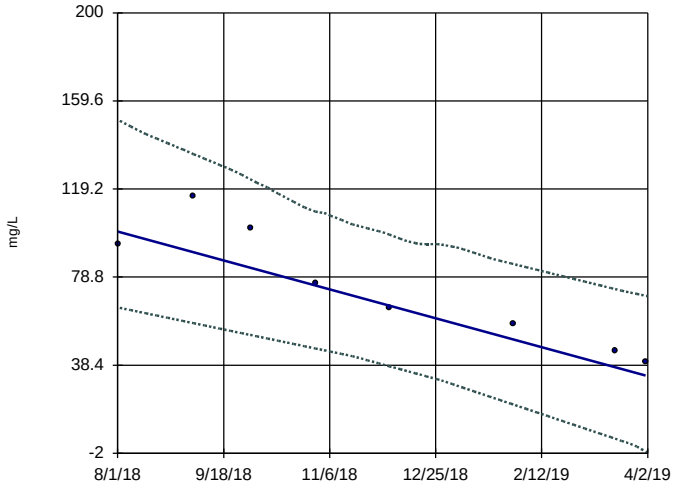
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = -99.13 units per year.

Mann-Kendall statistic = -24 critical = -21

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

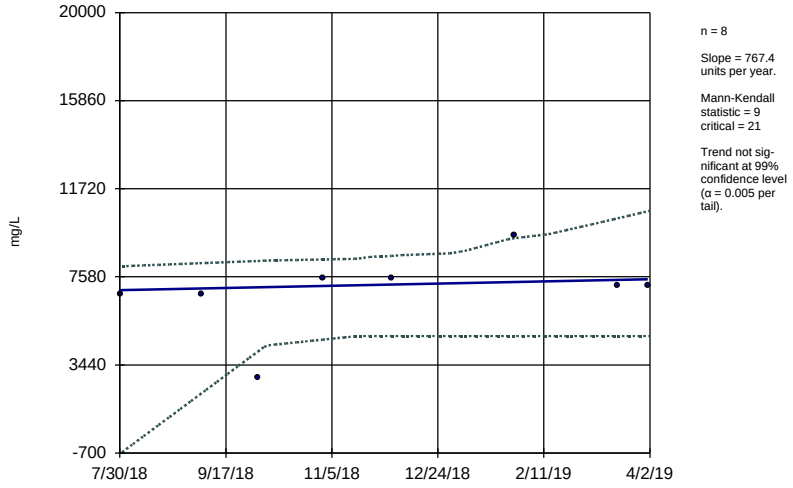
Constituent: Calcium, dissolved Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 767.4 units per year.

Mann-Kendall statistic = 9 critical = 21

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

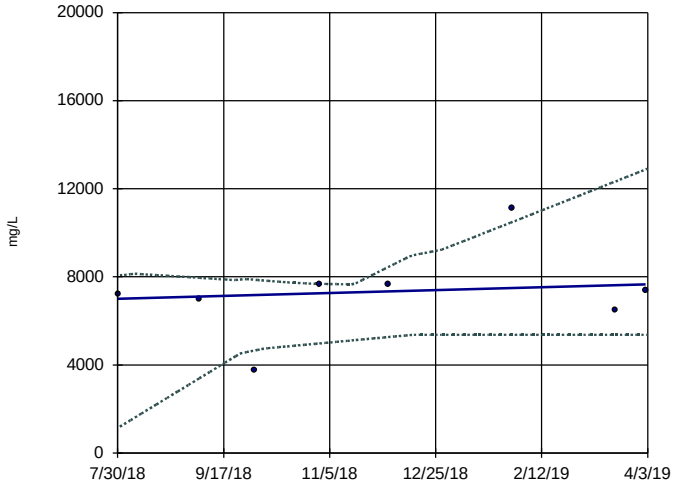
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 973.8 units per year.

Mann-Kendall statistic = 6 critical = 21

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

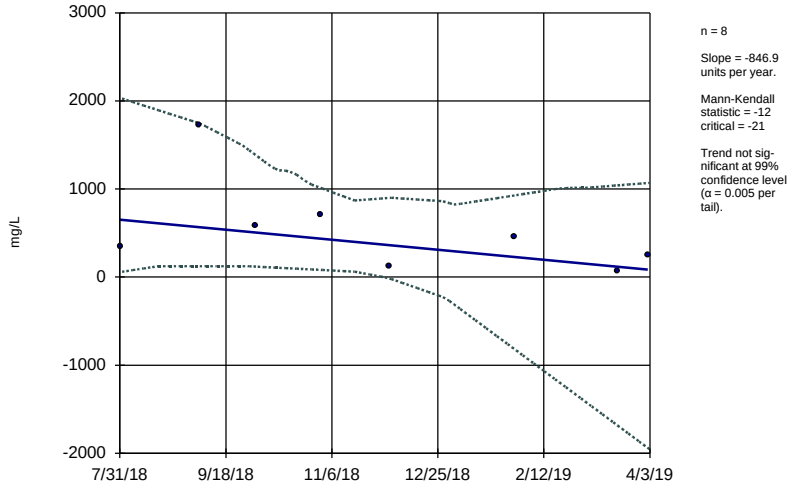
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = -846.9 units per year.

Mann-Kendall statistic = -12 critical = -21

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

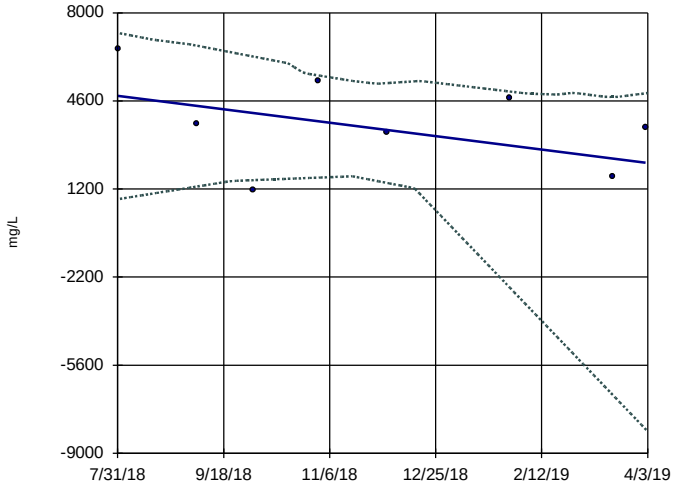
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -3835 units per year.

Mann-Kendall statistic = -8 critical = -21

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

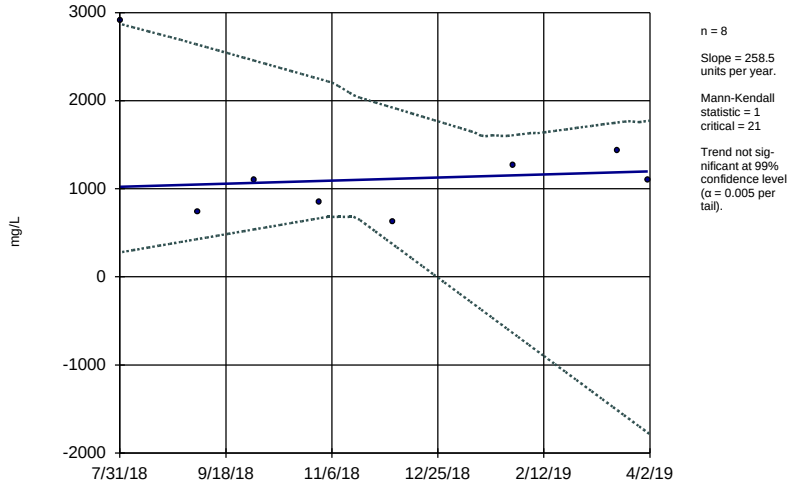
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 258.5 units per year.

Mann-Kendall statistic = 1 critical = 21

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

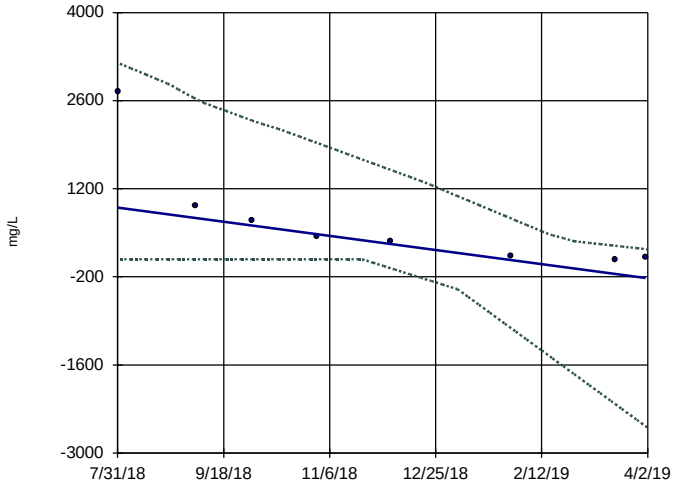
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = -1669 units per year.

Mann-Kendall statistic = -26 critical = -21

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

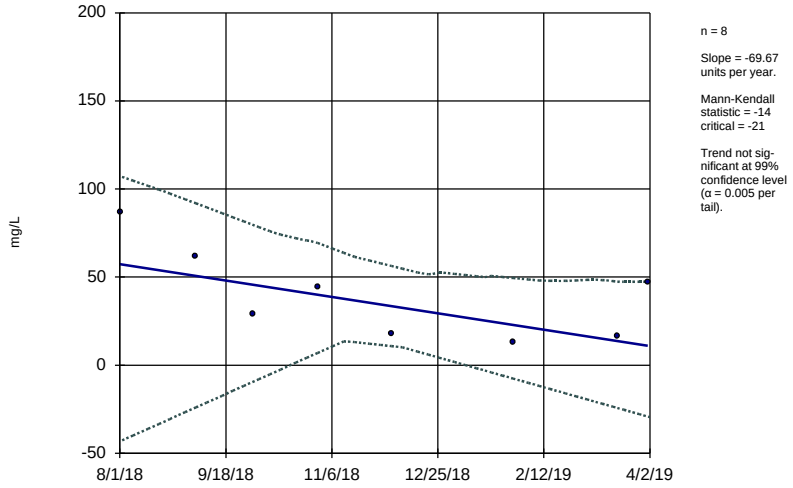
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -69.67 units per year.

Mann-Kendall statistic = -14 critical = -21

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

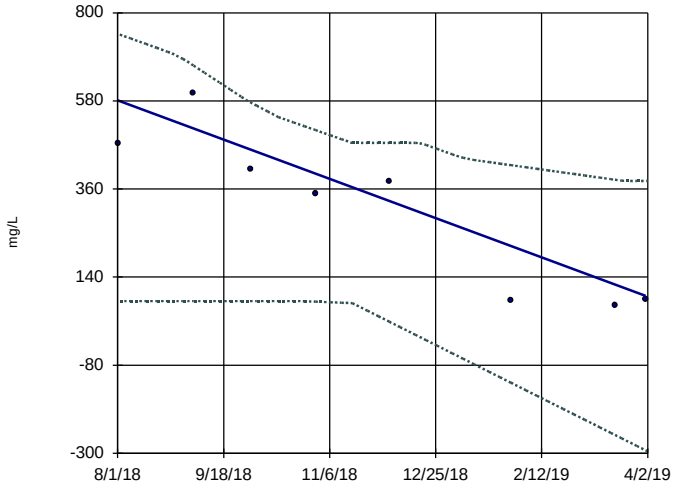
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -733.4 units per year.

Mann-Kendall statistic = -20 critical = -21

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

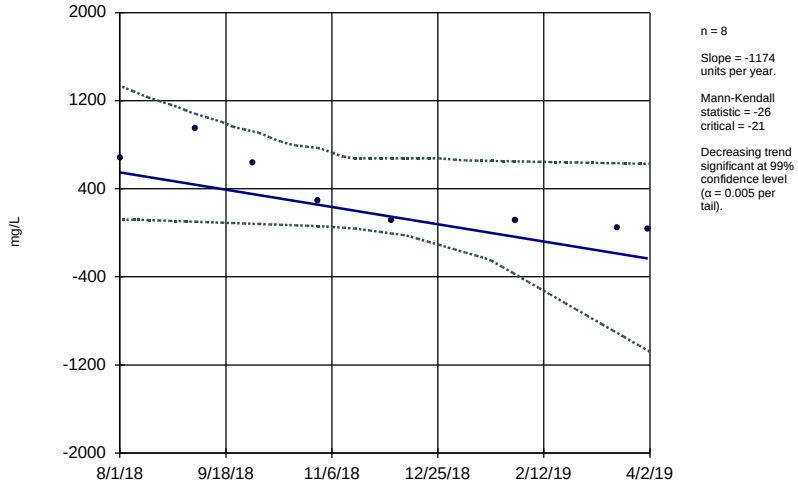
Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = -1174 units per year.

Mann-Kendall statistic = -26 critical = -21

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

Constituent: Chloride Analysis Run 2/19/2020 12:58 PM

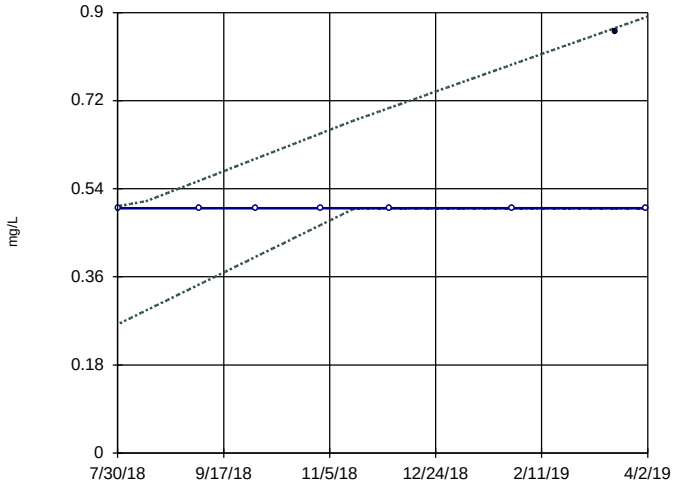
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 5 critical = 21

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

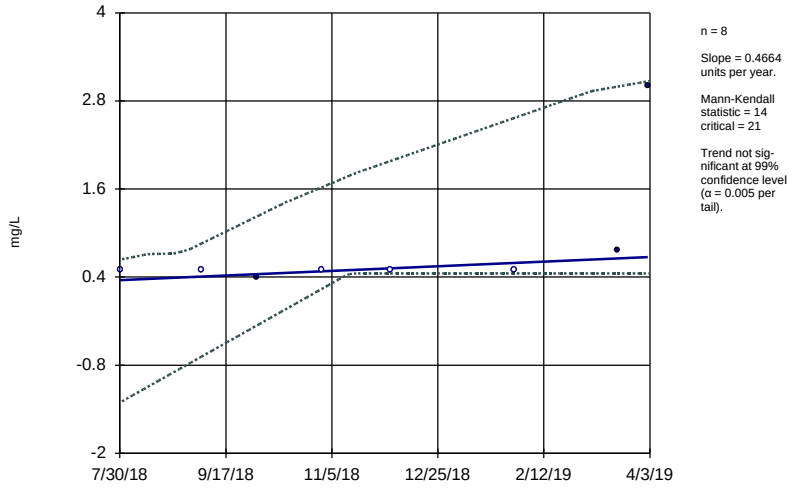
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0.4664 units per year.

Mann-Kendall statistic = 14
critical = 21

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

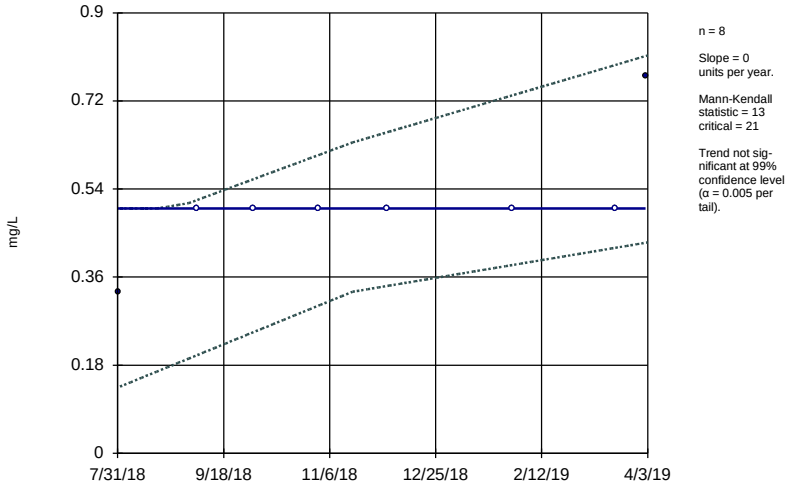
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 13
critical = 21

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

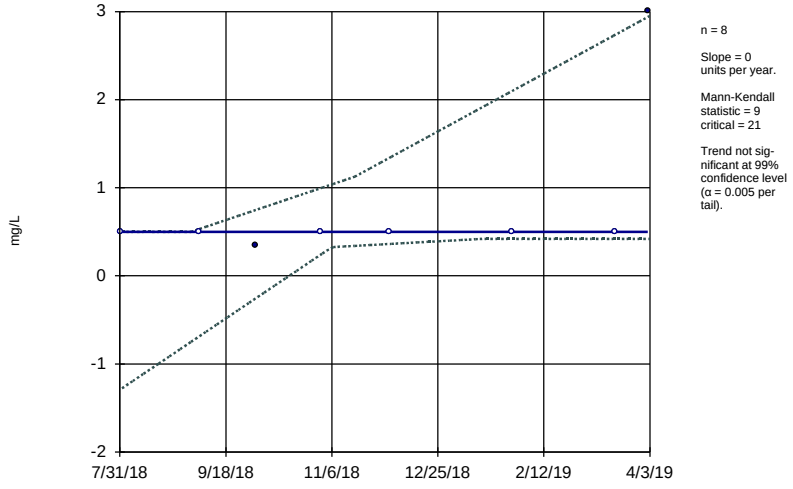
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 9
critical = 21

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

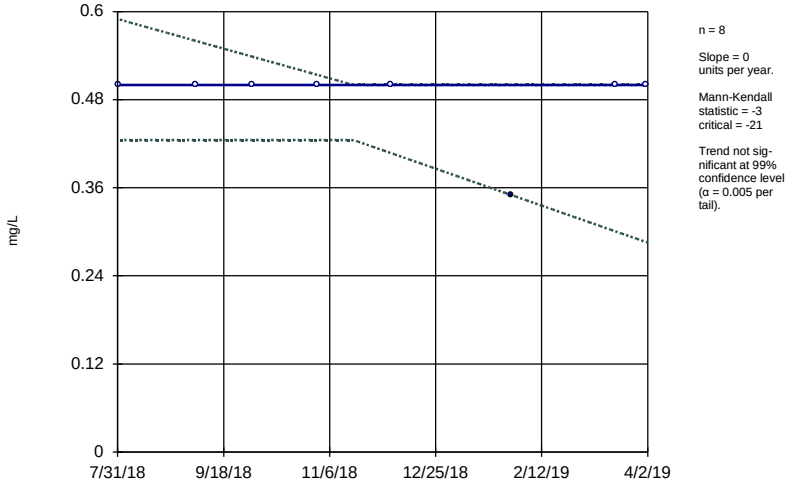
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -3
critical = -21

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

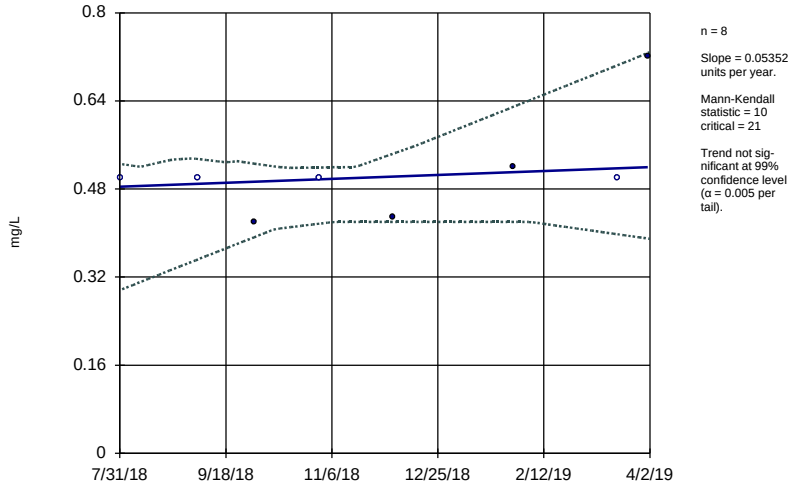
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0.05352 units per year.

Mann-Kendall statistic = 10
critical = 21

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

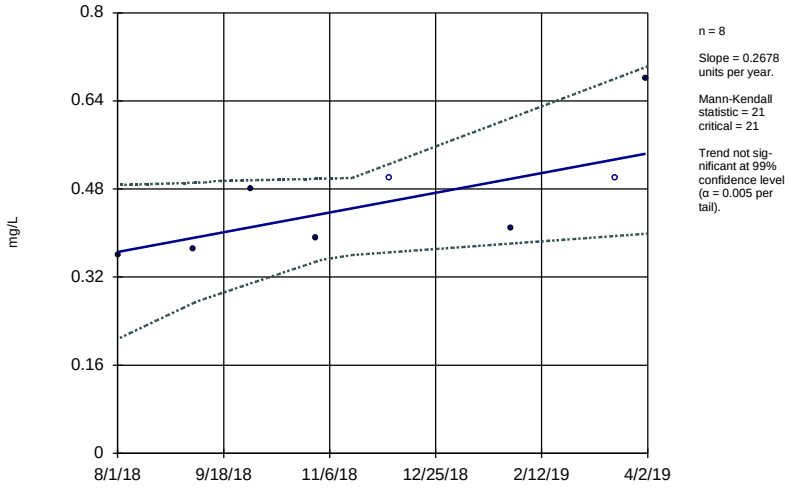
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = 0.2678 units per year.

Mann-Kendall statistic = 21
critical = 21

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

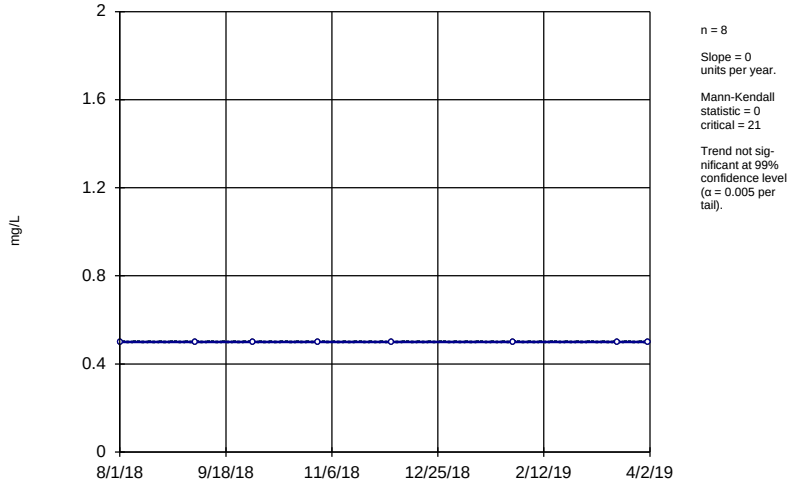
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0
critical = 21

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

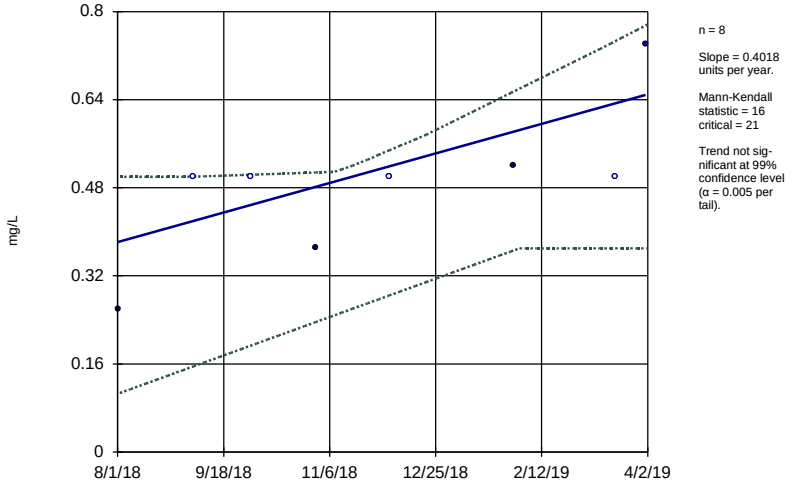
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0.4018 units per year.

Mann-Kendall statistic = 16
critical = 21

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

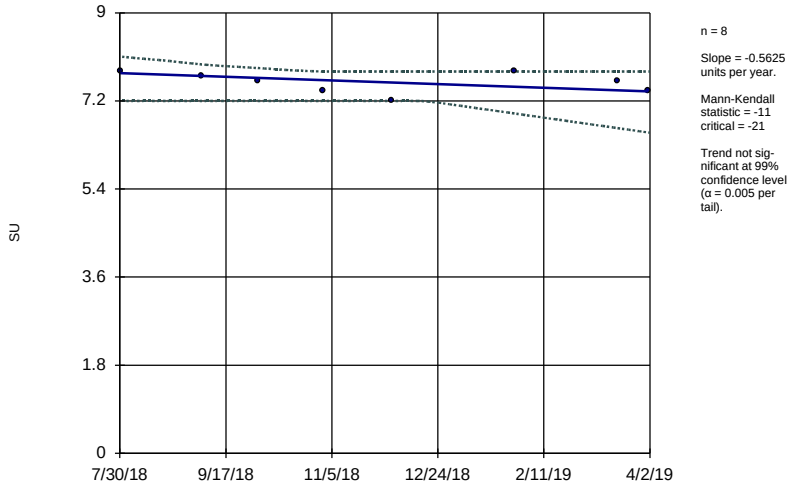
Constituent: Fluoride Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



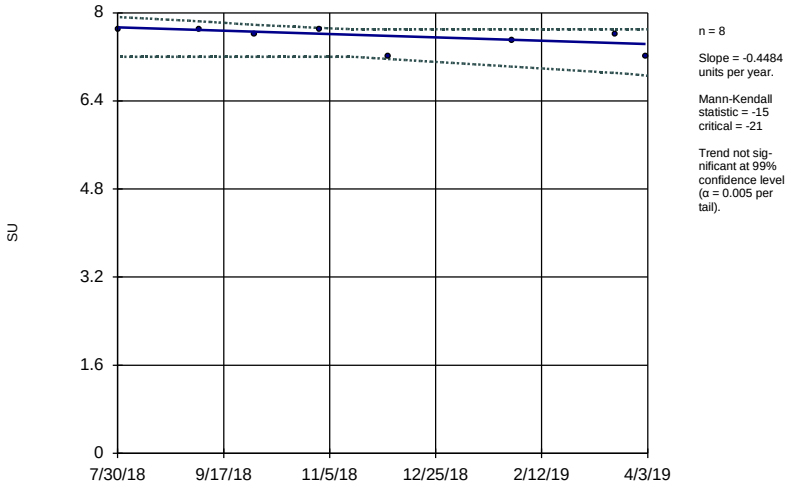
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



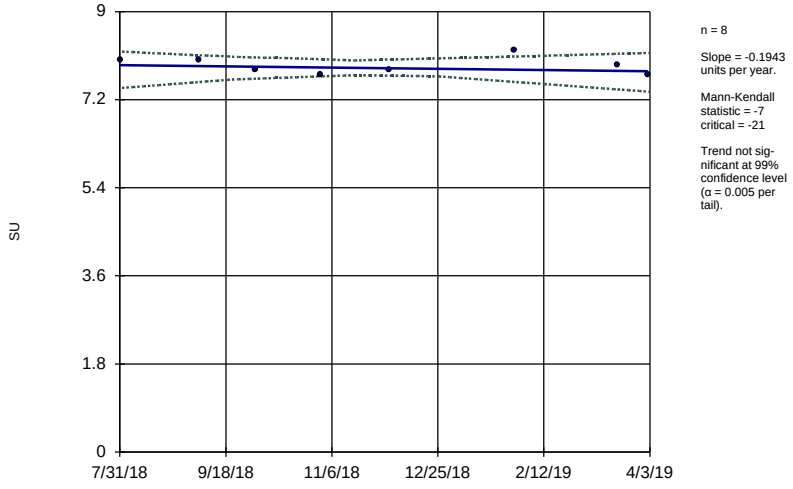
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



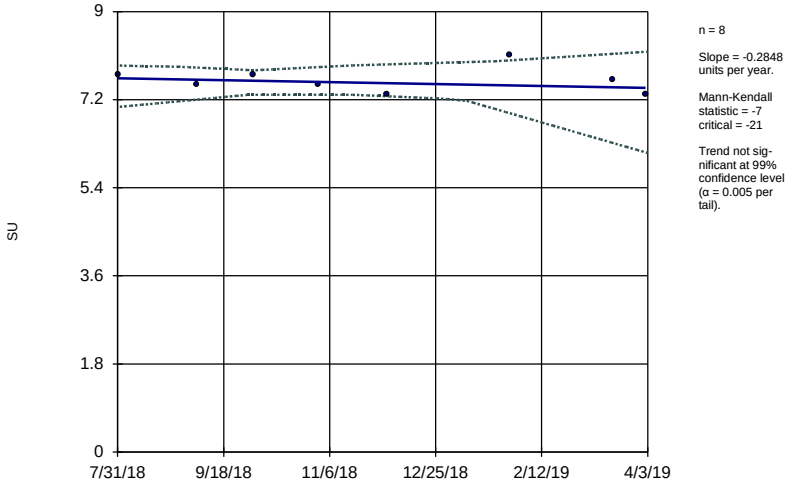
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



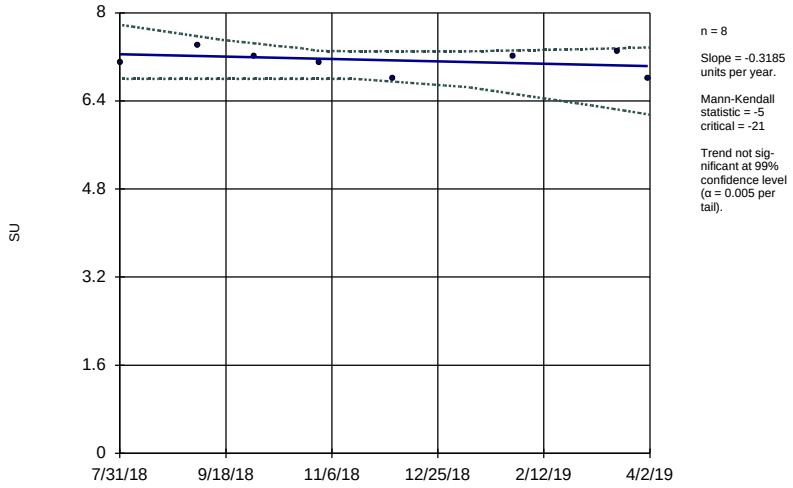
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = -0.3185 units per year.

Mann-Kendall statistic = -5
critical = -21

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

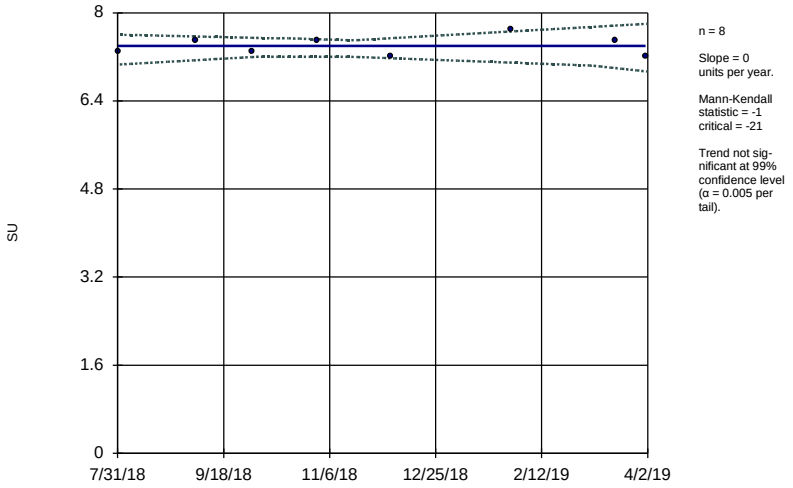
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -1
critical = -21

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

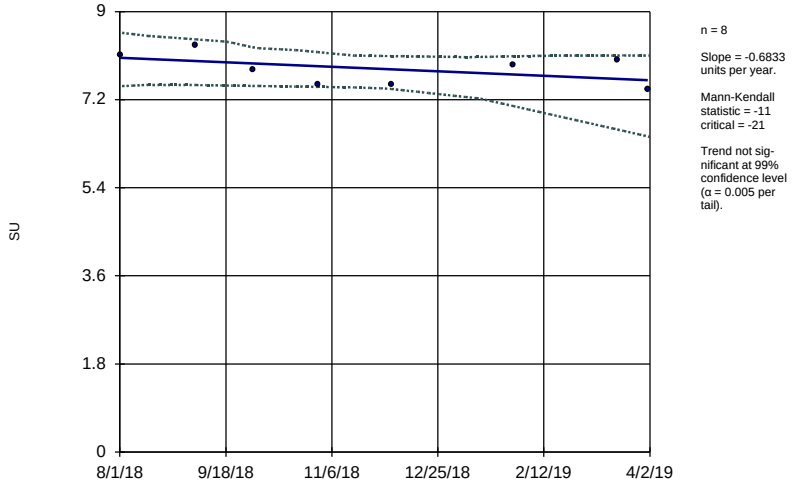
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -0.6833 units per year.

Mann-Kendall statistic = -11
critical = -21

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

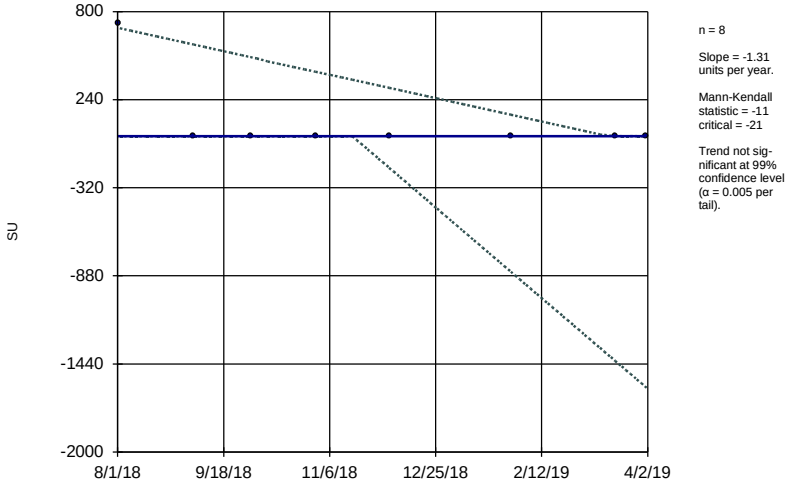
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -1.31 units per year.

Mann-Kendall statistic = -11
critical = -21

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

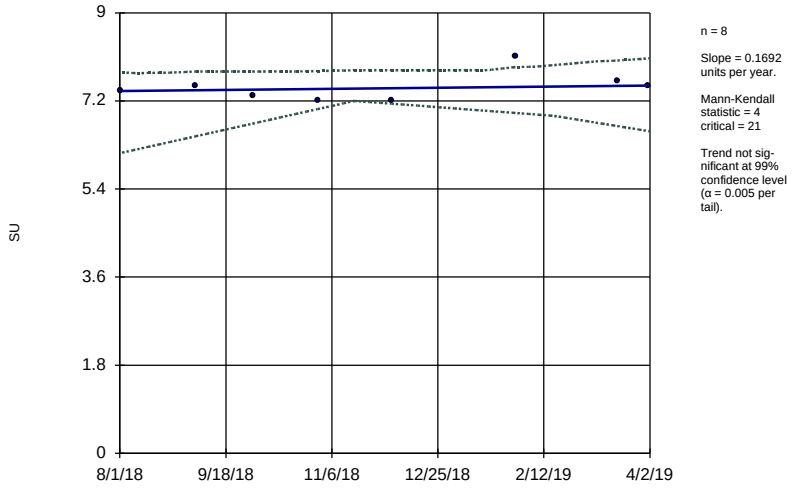
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0.1692 units per year.

Mann-Kendall statistic = 4
critical = 21

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

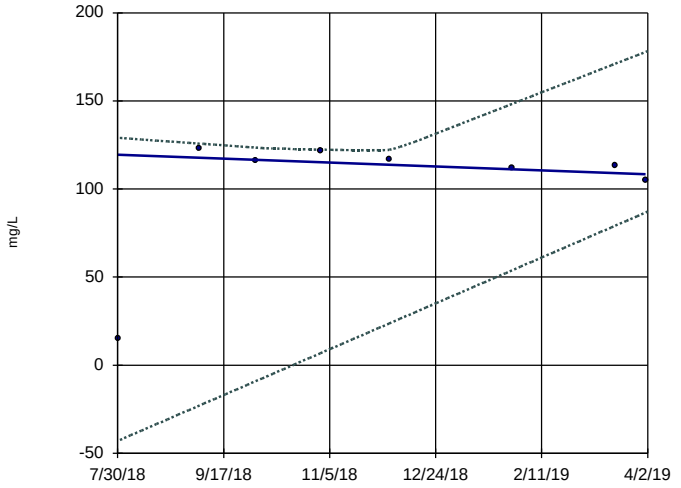
Constituent: pH Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = -16.41 units per year.

Mann-Kendall statistic = -8
critical = -21

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

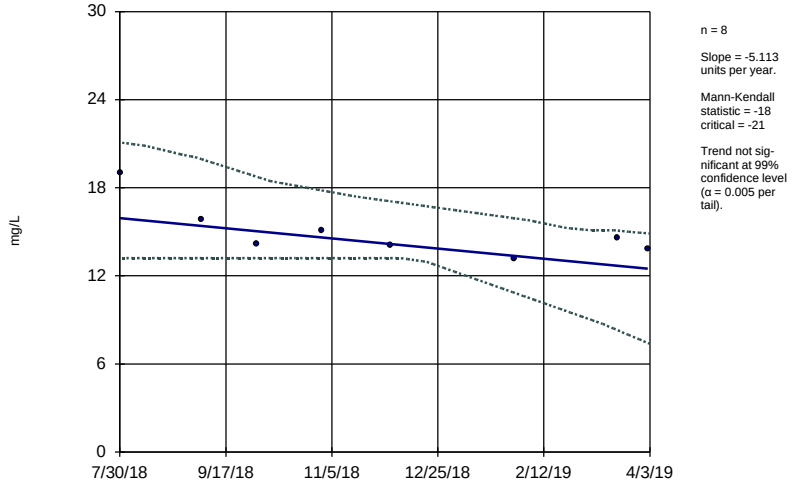
Constituent: Sulfate Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = -5.113 units per year.

Mann-Kendall statistic = -18
critical = -21

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

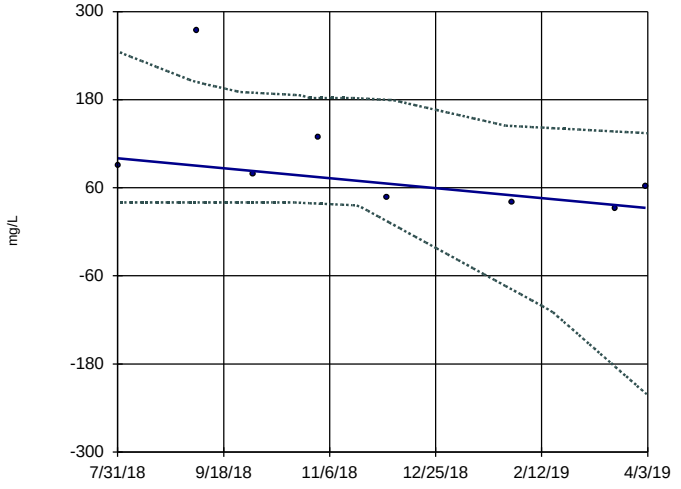
Constituent: Sulfate Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = -100.4 units per year.

Mann-Kendall statistic = -16
critical = -21

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

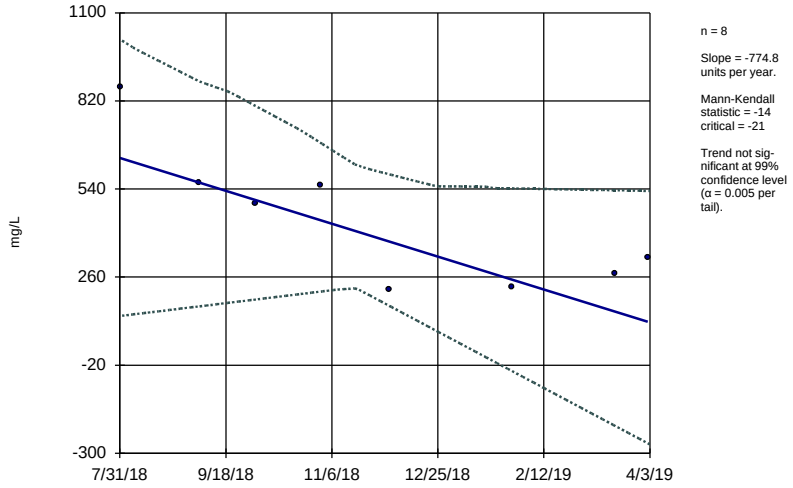
Constituent: Sulfate Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -774.8 units per year.

Mann-Kendall statistic = -14 critical = -21

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

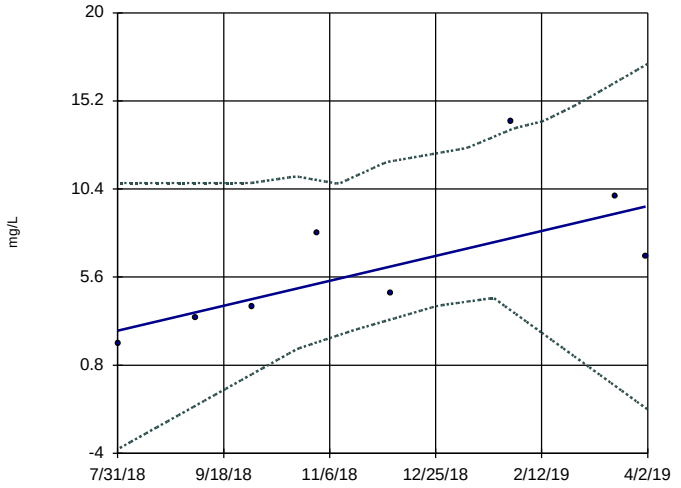
Constituent: Sulfate Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 10.1 units per year.

Mann-Kendall statistic = 18 critical = 21

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

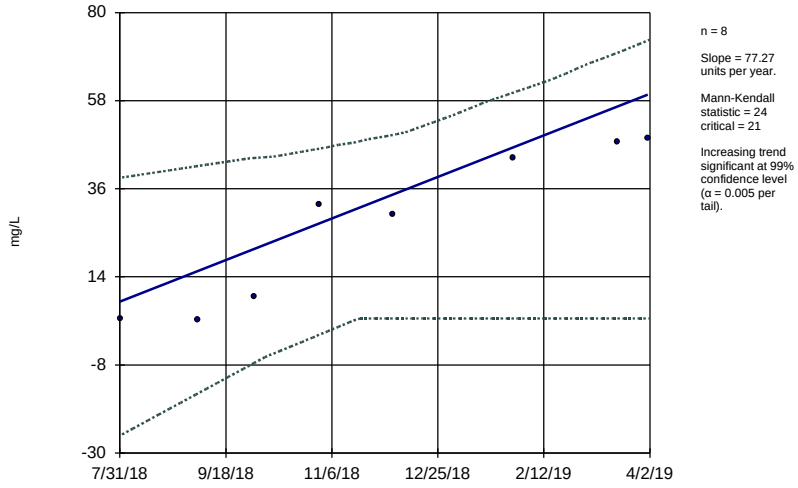
Constituent: Sulfate Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 77.27 units per year.

Mann-Kendall statistic = 24 critical = 21

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

Constituent: Sulfate Analysis Run 2/19/2020 12:58 PM

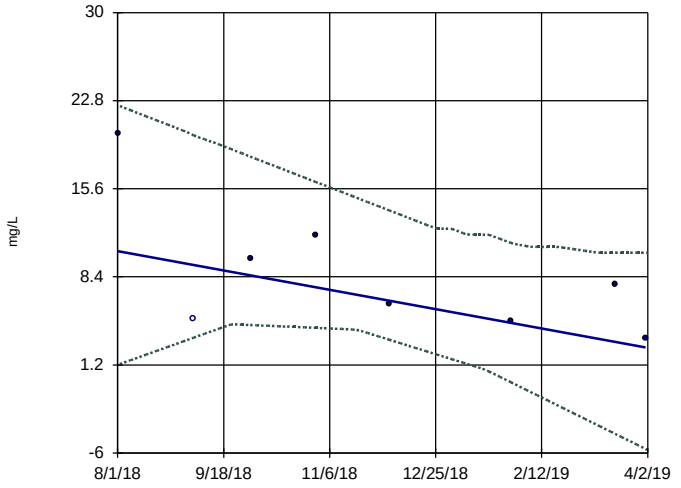
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -11.81 units per year.

Mann-Kendall statistic = -14 critical = -21

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

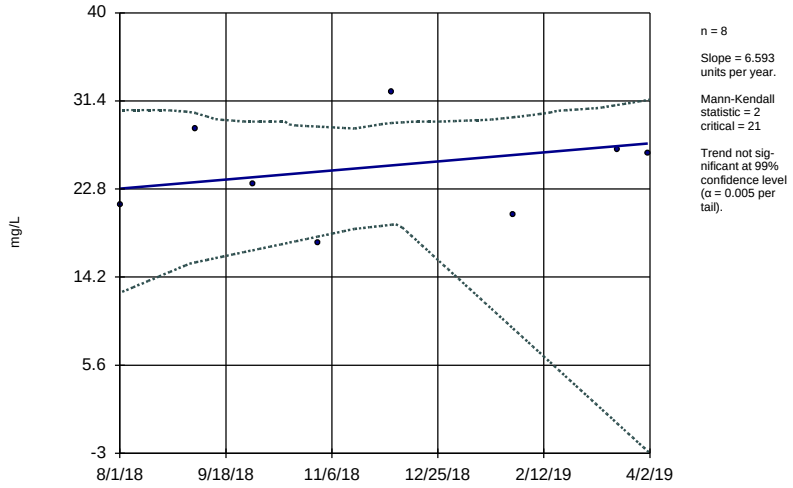
Constituent: Sulfate Analysis Run 2/19/2020 12:58 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = 6.593 units per year.

Mann-Kendall statistic = 2 critical = 21

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

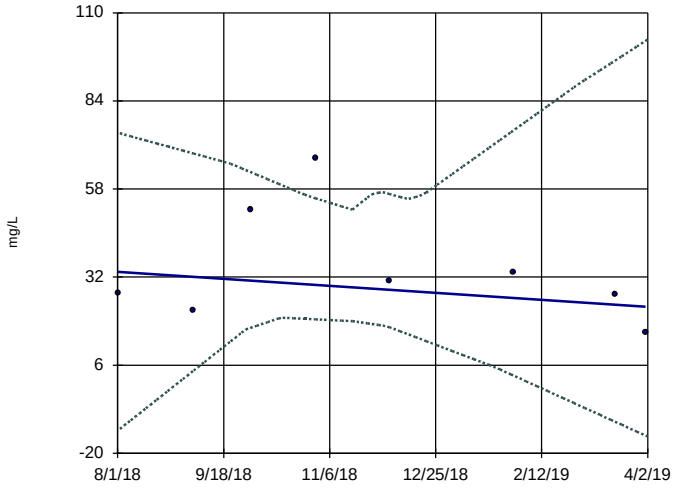
Constituent: Sulfate Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = -15.51 units per year.

Mann-Kendall statistic = -6 critical = -21

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

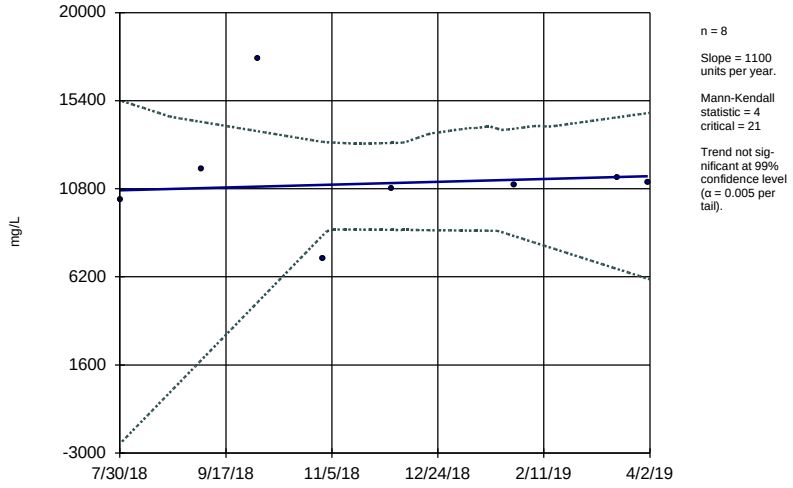
Constituent: Sulfate Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 1100 units per year.

Mann-Kendall statistic = 4 critical = 21

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

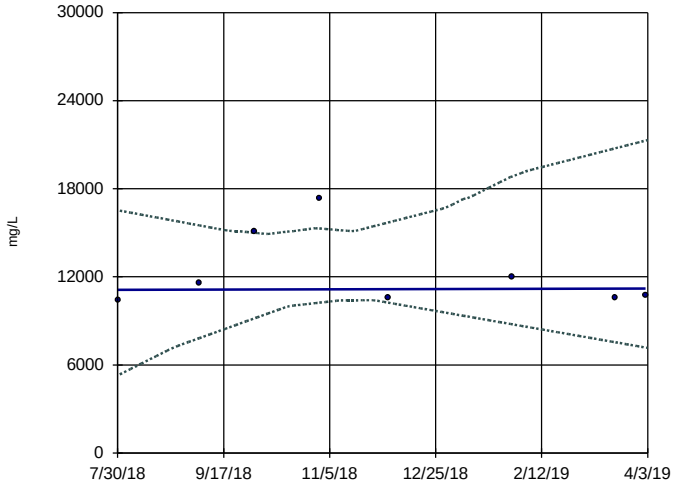
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 152.1 units per year.

Mann-Kendall statistic = 1 critical = 21

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

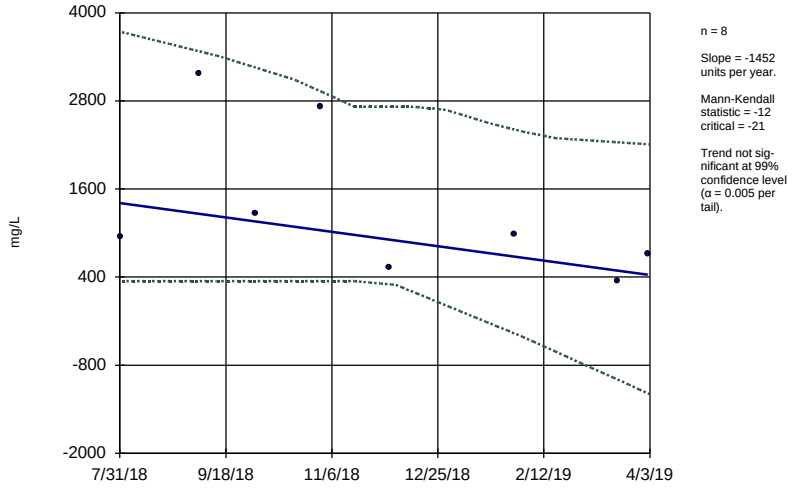
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = -1452 units per year.

Mann-Kendall statistic = -12 critical = -21

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

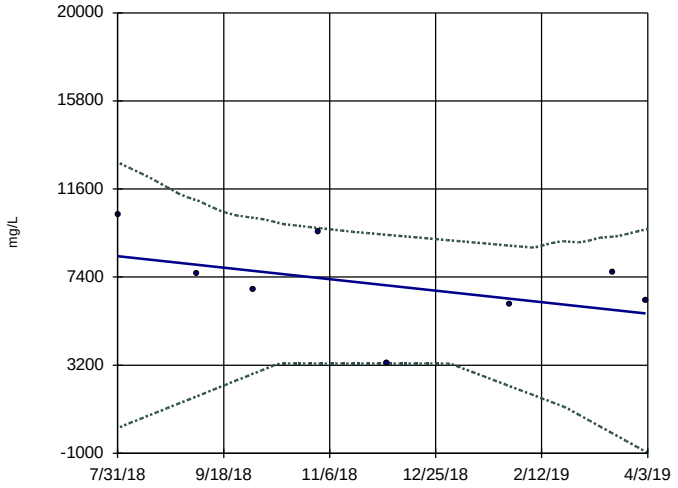
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -4059 units per year.

Mann-Kendall statistic = -10 critical = -21

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

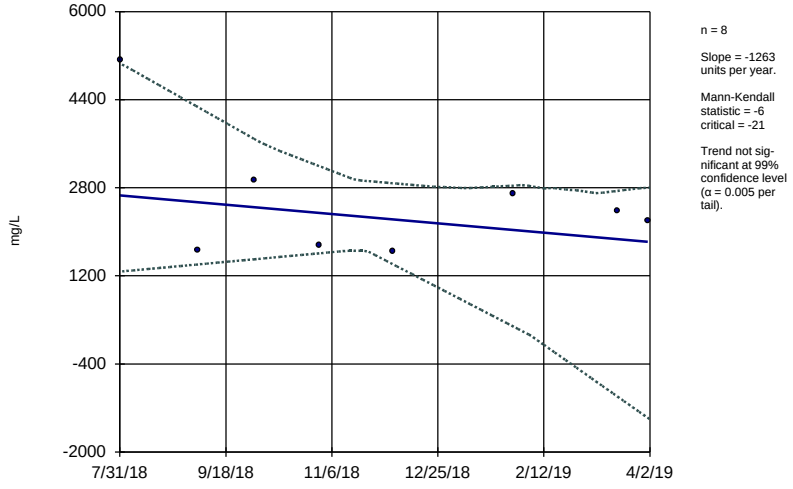
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = -1263 units per year.

Mann-Kendall statistic = -6 critical = -21

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

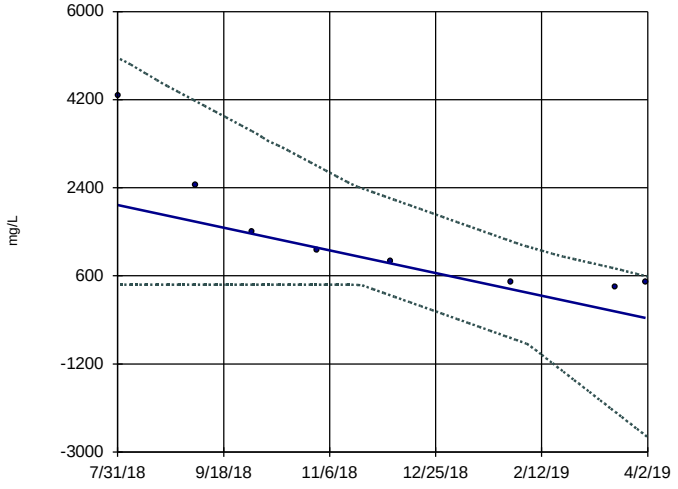
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = -3453 units per year.

Mann-Kendall statistic = -26 critical = -21

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

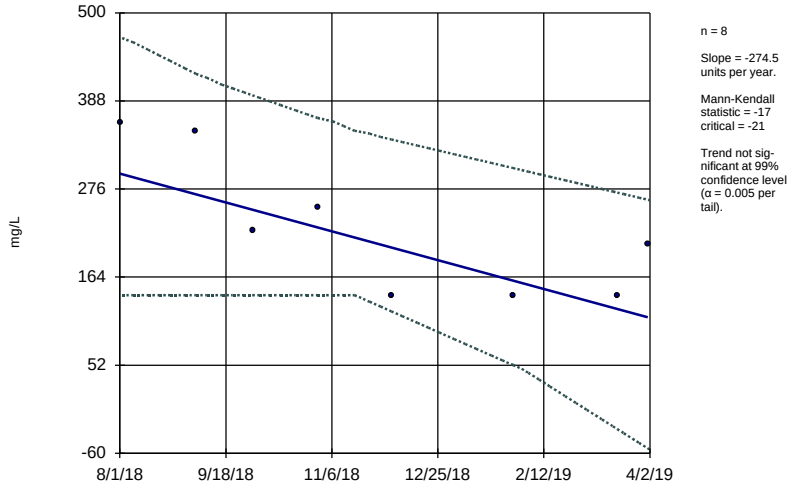
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -274.5 units per year.

Mann-Kendall statistic = -17 critical = -21

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

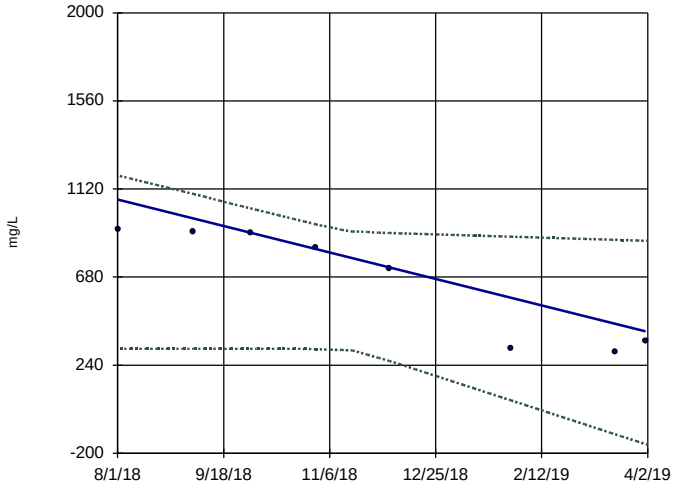
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -990.9 units per year.

Mann-Kendall statistic = -24 critical = -21

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

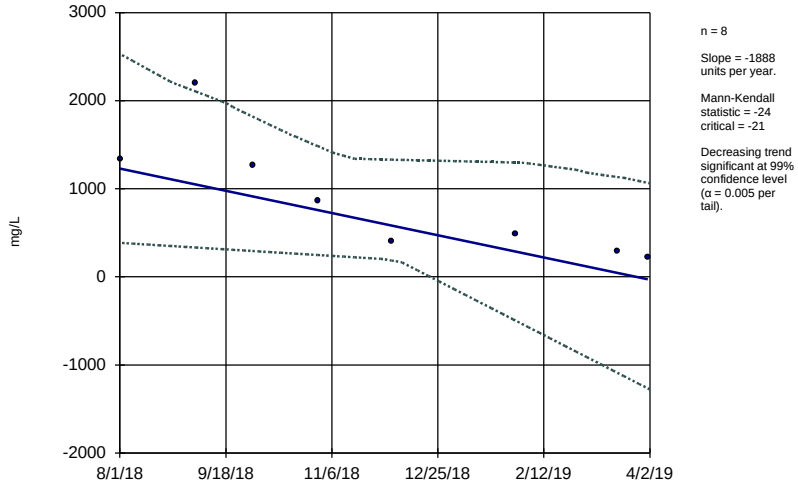
Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = -1888 units per year.

Mann-Kendall statistic = -24 critical = -21

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

Constituent: Total Dissolved Solids Analysis Run 2/19/2020 12:59 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

APPENDIX G

Appendix IV Constituent Mann-Kendall Trend Test

Trend Test

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 2:14 PM

Constituent	Well	Slope	Critical	Sig.	N	%NDs	Alpha
Antimony, dissolved (mg/L)	MW-1	-0.00...	-21	No	8	37.5	0.01
Antimony, dissolved (mg/L)	MW-2	0.000...	21	No	8	37.5	0.01
Antimony, dissolved (mg/L)	MW-3	0.000...	21	No	8	12.5	0.01
Antimony, dissolved (mg/L)	MW-4 (bg)	0.001672	21	No	8	12.5	0.01
Antimony, dissolved (mg/L)	MW-5	0	-21	No	8	87.5	0.01
Antimony, dissolved (mg/L)	MW-6	0	-21	No	8	87.5	0.01
Antimony, dissolved (mg/L)	MW-7 (bg)	0	-21	No	8	87.5	0.01
Antimony, dissolved (mg/L)	MW-8 (bg)	0	-21	No	8	87.5	0.01
Antimony, dissolved (mg/L)	MW-9	0.001514	21	No	8	50	0.01
Arsenic, dissolved (mg/L)	MW-1	0.000...	21	No	8	12.5	0.01
Arsenic, dissolved (mg/L)	MW-2	-0.00...	-21	No	8	12.5	0.01
Arsenic, dissolved (mg/L)	MW-3	0.001246	21	No	8	12.5	0.01
Arsenic, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	75	0.01
Arsenic, dissolved (mg/L)	MW-5	0.000...	21	No	8	25	0.01
Arsenic, dissolved (mg/L)	MW-6	0.000145	21	No	8	25	0.01
Arsenic, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	50	0.01
Arsenic, dissolved (mg/L)	MW-8 (bg)	-0.00...	21	No	8	12.5	0.01
Arsenic, dissolved (mg/L)	MW-9	0.00622	21	No	8	0	0.01
Barium, dissolved (mg/L)	MW-1	0.09756	21	No	8	0	0.01
Barium, dissolved (mg/L)	MW-2	-0.2051	-21	No	8	0	0.01
Barium, dissolved (mg/L)	MW-3	-0.04102	-21	No	8	12.5	0.01
Barium, dissolved (mg/L)	MW-4 (bg)	0.4711	21	No	8	0	0.01
Barium, dissolved (mg/L)	MW-5	0.02592	21	No	8	12.5	0.01
Barium, dissolved (mg/L)	MW-6	-0.1865	-21	No	8	12.5	0.01
Barium, dissolved (mg/L)	MW-7 (bg)	-0.04281	-21	No	8	12.5	0.01
Barium, dissolved (mg/L)	MW-8 (bg)	-0.1287	-21	No	8	12.5	0.01
Barium, dissolved (mg/L)	MW-9	-0.3115	-21	No	8	12.5	0.01
Beryllium, dissolved (mg/L)	MW-1	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-2	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-3	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-5	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-6	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Beryllium, dissolved (mg/L)	MW-9	0	21	No	8	100	0.01
Cadmium, dissolved (mg/L)	MW-1	0	21	No	8	75	0.01
Cadmium, dissolved (mg/L)	MW-2	0	21	No	8	75	0.01
Cadmium, dissolved (mg/L)	MW-3	0	21	No	8	87.5	0.01
Cadmium, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	87.5	0.01
Cadmium, dissolved (mg/L)	MW-5	0	21	No	8	100	0.01
Cadmium, dissolved (mg/L)	MW-6	0	21	No	8	100	0.01
Cadmium, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	87.5	0.01
Cadmium, dissolved (mg/L)	MW-8 (bg)	-0.00...	-21	No	8	12.5	0.01
Cadmium, dissolved (mg/L)	MW-9	0	21	No	8	100	0.01
Chromium, dissolved (mg/L)	MW-1	0	21	No	8	100	0.01
Chromium, dissolved (mg/L)	MW-2	0	21	No	8	100	0.01
Chromium, dissolved (mg/L)	MW-3	0	21	No	8	100	0.01

Trend Test

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 2:14 PM

Constituent	Well	Slope	Critical	Sig.	N	%NDs	Alpha
Chromium, dissolved (mg/L)	MW-6	0	21	No	8	100	0.01
Chromium, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Chromium, dissolved (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Chromium, dissolved (mg/L)	MW-9	0	21	No	8	87.5	0.01
Cobalt, dissolved (mg/L)	MW-1	0.002515	21	No	8	12.5	0.01
Cobalt, dissolved (mg/L)	MW-2	0.002693	21	No	8	12.5	0.01
Cobalt, dissolved (mg/L)	MW-3	0	21	No	8	100	0.01
Cobalt, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	87.5	0.01
Cobalt, dissolved (mg/L)	MW-5	0	21	No	8	100	0.01
Cobalt, dissolved (mg/L)	MW-6	0	21	No	8	100	0.01
Cobalt, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Cobalt, dissolved (mg/L)	MW-8 (bg)	0.005597	21	No	8	12.5	0.01
Cobalt, dissolved (mg/L)	MW-9	0	21	No	8	87.5	0.01
Fluoride (mg/L)	MW-1	0	21	No	8	87.5	0.01
Fluoride (mg/L)	MW-2	0.4664	21	No	8	62.5	0.01
Fluoride (mg/L)	MW-3	0	21	No	8	75	0.01
Fluoride (mg/L)	MW-4 (bg)	0	21	No	8	75	0.01
Fluoride (mg/L)	MW-5	0	-21	No	8	87.5	0.01
Fluoride (mg/L)	MW-6	0.05352	21	No	8	50	0.01
Fluoride (mg/L)	MW-7 (bg)	0.2678	21	No	8	25	0.01
Fluoride (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Fluoride (mg/L)	MW-9	0.4018	21	No	8	50	0.01
Lead, dissolved (mg/L)	MW-1	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-2	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-3	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-5	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-6	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Lead, dissolved (mg/L)	MW-9	0	21	No	8	100	0.01
Lithium, dissolved (mg/L)	MW-1	0.05259	21	No	8	0	0.01
Lithium, dissolved (mg/L)	MW-2	0.000...	21	No	8	0	0.01
Lithium, dissolved (mg/L)	MW-3	0	21	No	8	75	0.01
Lithium, dissolved (mg/L)	MW-4 (bg)	-0.06518	-21	No	8	12.5	0.01
Lithium, dissolved (mg/L)	MW-5	0.007078	21	No	8	25	0.01
Lithium, dissolved (mg/L)	MW-6	0.0055	21	No	8	50	0.01
Lithium, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Lithium, dissolved (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Lithium, dissolved (mg/L)	MW-9	0	-21	No	8	75	0.01
Mercury, dissolved (mg/L)	MW-1	0	21	No	8	100	0.01
Mercury, dissolved (mg/L)	MW-2	0	21	No	8	100	0.01
Mercury, dissolved (mg/L)	MW-3	0	21	No	8	100	0.01
Mercury, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	100	0.01
Mercury, dissolved (mg/L)	MW-5	0	21	No	8	100	0.01
Mercury, dissolved (mg/L)	MW-6	0	21	No	8	100	0.01
Mercury, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Mercury, dissolved (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01

Trend Test

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 2:14 PM

Constituent	Well	Slope	Critical	Sig.	N	%NDs	Alpha
Molybdenum, dissolved (mg/L)	MW-2	0.001044	21	No	8	12.5	0.01
Molybdenum, dissolved (mg/L)	MW-3	-0.00...	-21	No	8	0	0.01
Molybdenum, dissolved (mg/L)	**MW-4 (bg)**	**-0.00...**	**-21**	**Yes**	**8**	**12.5**	**0.01**
Molybdenum, dissolved (mg/L)	MW-5	0.000...	21	No	8	62.5	0.01
Molybdenum, dissolved (mg/L)	MW-6	0.01482	21	No	8	25	0.01
Molybdenum, dissolved (mg/L)	MW-7 (bg)	-0.00...	-21	No	8	12.5	0.01
Molybdenum, dissolved (mg/L)	MW-8 (bg)	-0.00...	-21	No	8	12.5	0.01
Molybdenum, dissolved (mg/L)	MW-9	0.004591	21	No	8	0	0.01
pH (SU)	MW-1	-0.5625	-21	No	8	0	0.01
pH (SU)	MW-2	-0.4484	-21	No	8	0	0.01
pH (SU)	MW-3	-0.1943	-21	No	8	0	0.01
pH (SU)	MW-4 (bg)	-0.2848	-21	No	8	0	0.01
pH (SU)	MW-5	-0.3185	-21	No	8	0	0.01
pH (SU)	MW-6	0	-21	No	8	0	0.01
pH (SU)	MW-7 (bg)	-0.6833	-21	No	8	0	0.01
pH (SU)	MW-8 (bg)	-1.31	-21	No	8	0	0.01
pH (SU)	MW-9	0.1692	21	No	8	0	0.01
Radium-226 (pCi/L)	MW-1	-0.2103	-21	No	8	12.5	0.01
Radium-226 (pCi/L)	MW-2	-0.1855	-21	No	8	0	0.01
Radium-226 (pCi/L)	MW-3	0	-21	No	8	75	0.01
Radium-226 (pCi/L)	MW-4 (bg)	-0.7586	-21	No	8	12.5	0.01
Radium-226 (pCi/L)	MW-5	-1.127	-21	No	8	12.5	0.01
Radium-226 (pCi/L)	MW-6	-2.262	-21	No	8	25	0.01
Radium-226 (pCi/L)	MW-7 (bg)	-0.7218	-21	No	8	37.5	0.01
Radium-226 (pCi/L)	MW-8 (bg)	0	-21	No	8	37.5	0.01
Radium-226 (pCi/L)	MW-9	0	21	No	8	62.5	0.01
Radium-228 (pCi/L)	MW-1	-0.8317	-21	No	8	12.5	0.01
Radium-228 (pCi/L)	MW-2	-2.106	-21	No	8	0	0.01
Radium-228 (pCi/L)	MW-3	0	21	No	8	87.5	0.01
Radium-228 (pCi/L)	MW-4 (bg)	0	-21	No	8	87.5	0.01
Radium-228 (pCi/L)	MW-5	0	-21	No	8	62.5	0.01
Radium-228 (pCi/L)	MW-6	-1.618	-21	No	8	62.5	0.01
Radium-228 (pCi/L)	MW-7 (bg)	0	-21	No	8	87.5	0.01
Radium-228 (pCi/L)	MW-8 (bg)	0	21	No	8	87.5	0.01
Radium-228 (pCi/L)	MW-9	0	-21	No	8	87.5	0.01
Selenium, dissolved (mg/L)	MW-1	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-2	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-3	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-5	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-6	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Selenium, dissolved (mg/L)	MW-9	0	21	No	8	100	0.01
Thallium, dissolved (mg/L)	MW-1	0	21	No	8	100	0.01
Thallium, dissolved (mg/L)	MW-2	0	21	No	8	100	0.01
Thallium, dissolved (mg/L)	MW-3	0	21	No	8	100	0.01
Thallium, dissolved (mg/L)	MW-4 (bg)	0	21	No	8	100	0.01

Trend Test

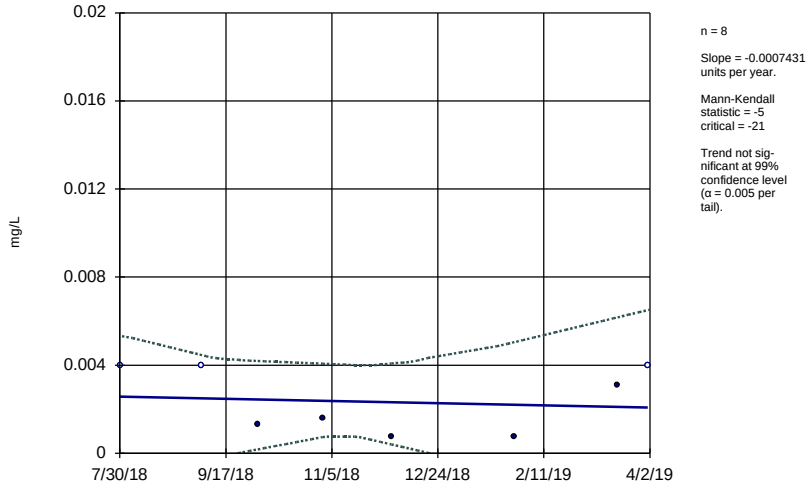
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database Printed 2/19/2020, 2:14 PM

Constituent	Well	Slope	Critical	Sig.	N	%NDs	Alpha
Thallium, dissolved (mg/L)	MW-7 (bg)	0	21	No	8	100	0.01
Thallium, dissolved (mg/L)	MW-8 (bg)	0	21	No	8	100	0.01
Thallium, dissolved (mg/L)	MW-9	0	21	No	8	100	0.01

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Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = -0.0007431 units per year.

Mann-Kendall statistic = -5
critical = -21

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

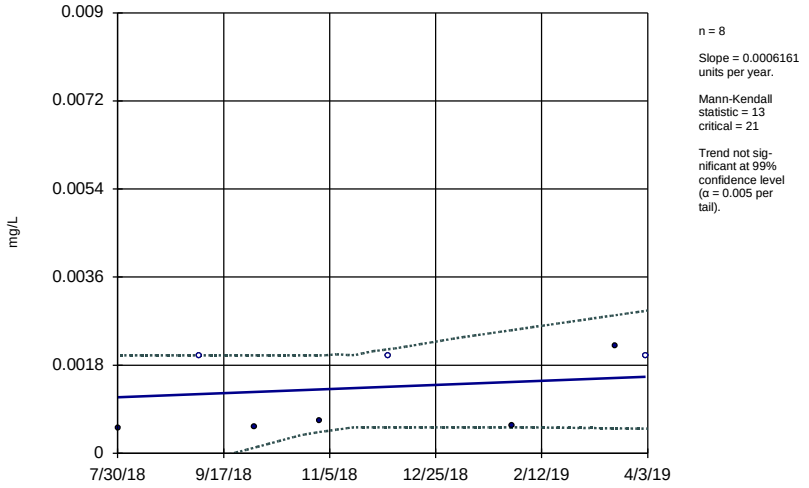
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:09 PM

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Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0.0006161 units per year.

Mann-Kendall statistic = 13
critical = 21

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

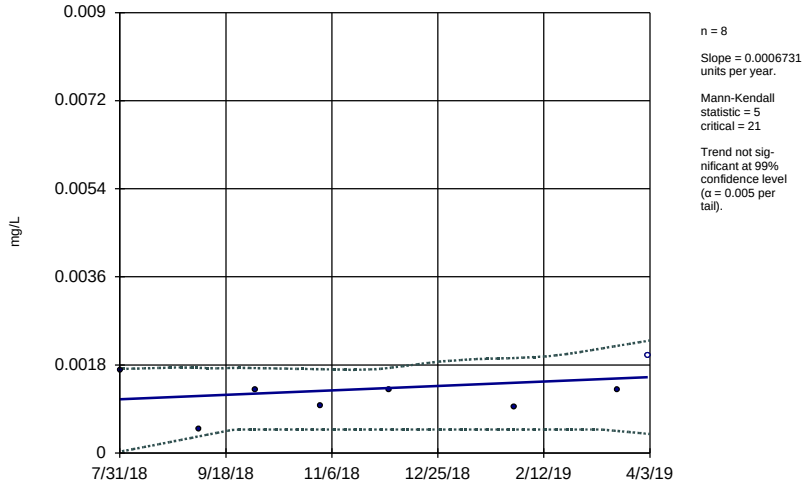
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0.0006731 units per year.

Mann-Kendall statistic = 5
critical = 21

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

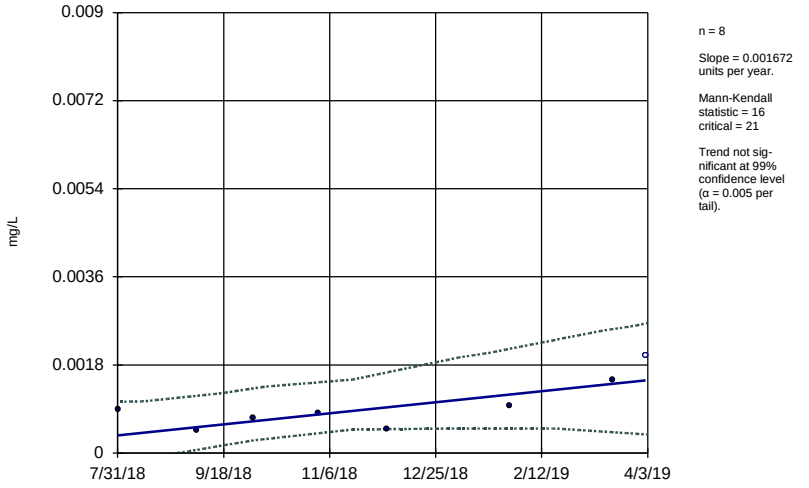
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0.001672 units per year.

Mann-Kendall statistic = 16
critical = 21

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

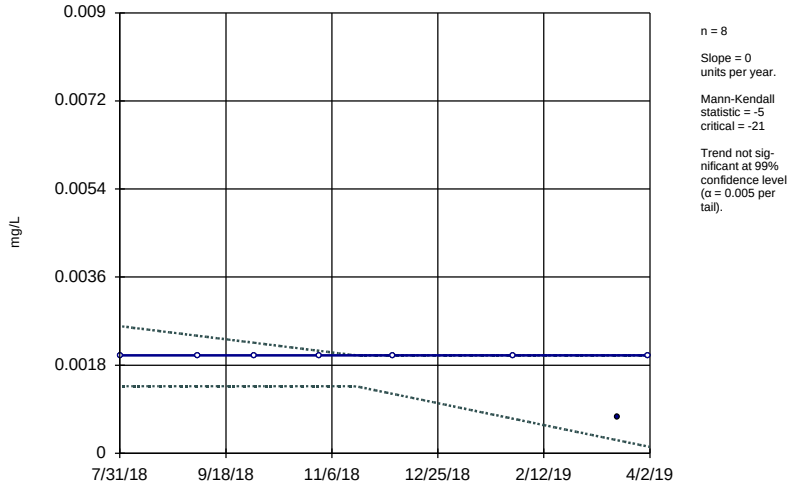
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



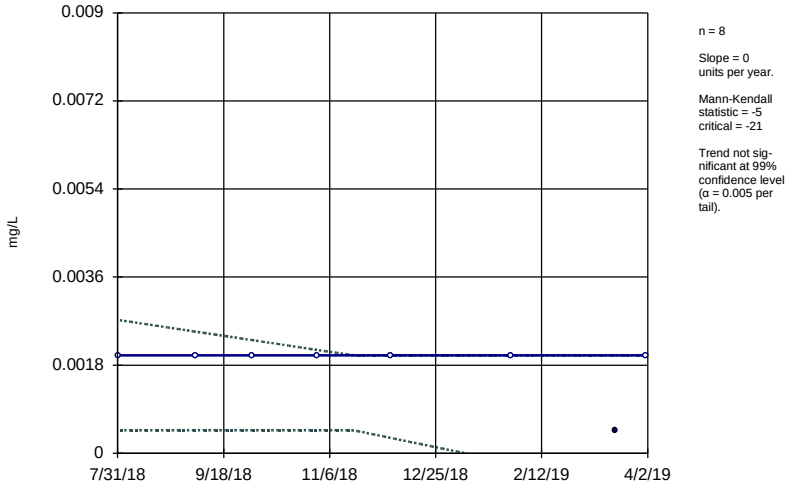
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



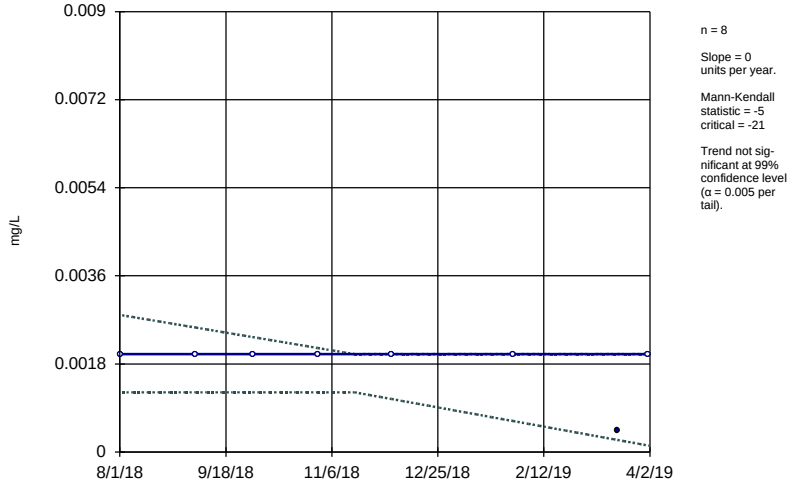
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



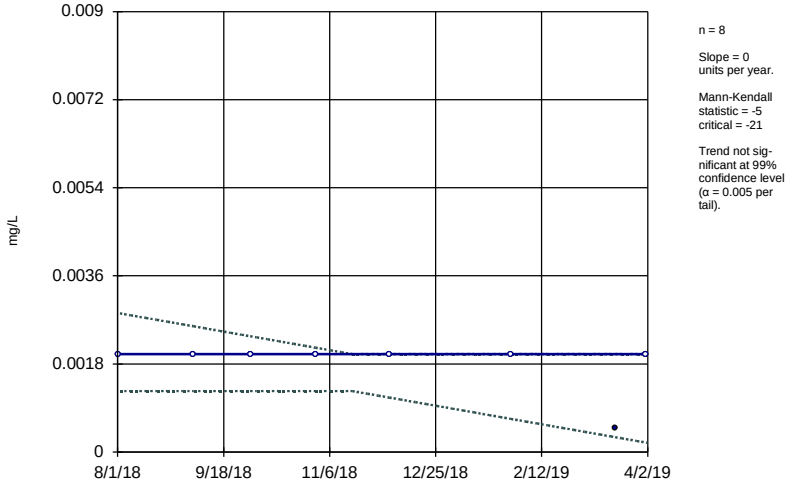
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

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Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



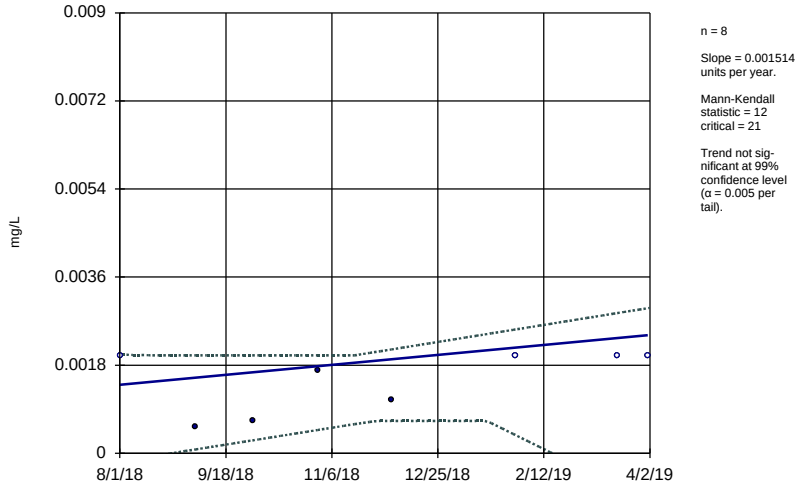
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0.001514 units per year.

Mann-Kendall statistic = 12
critical = 21

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

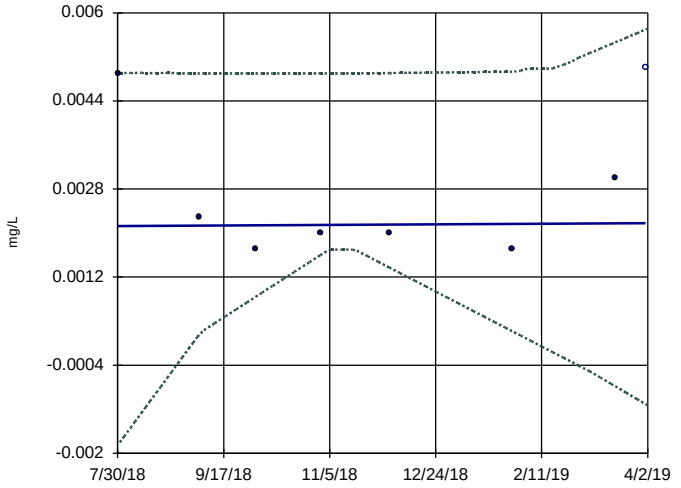
Constituent: Antimony, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 0.00007449 units per year.

Mann-Kendall statistic = 2
critical = 21

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

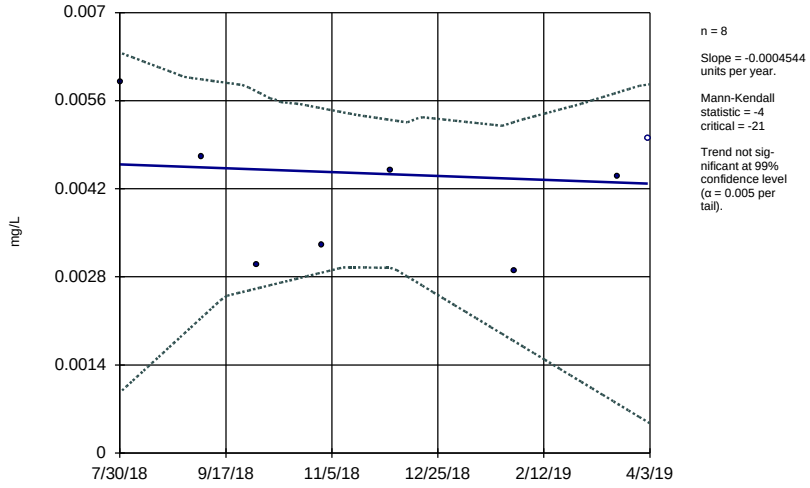
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = -0.0004544 units per year.

Mann-Kendall statistic = -4
critical = -21

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

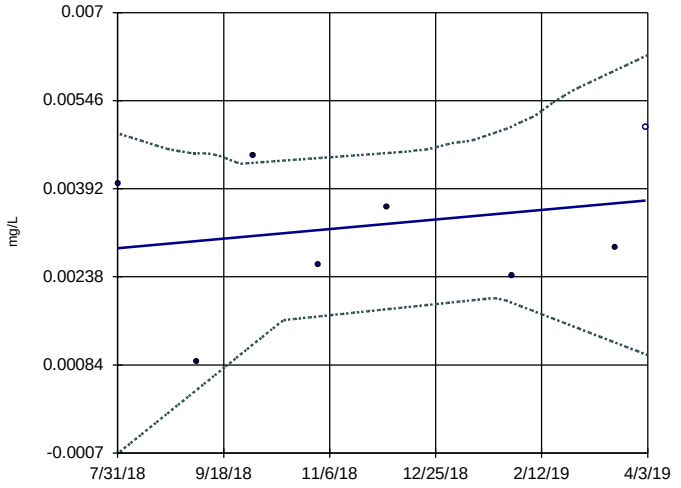
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0.001246 units per year.

Mann-Kendall statistic = 4
critical = 21

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

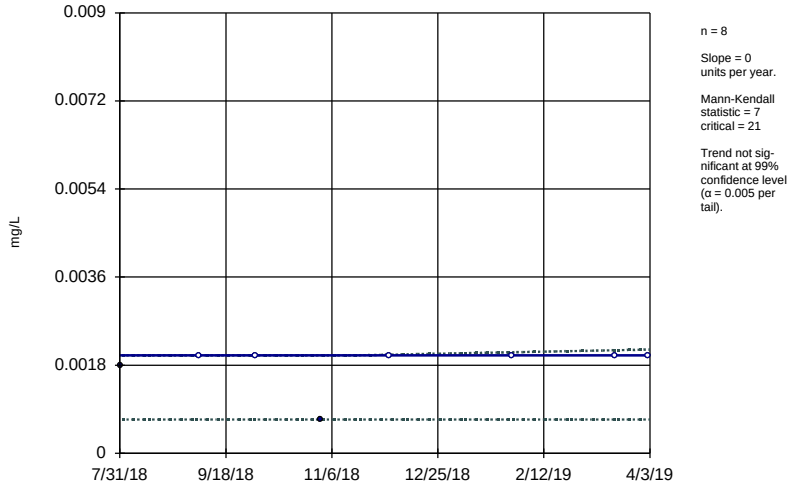
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 7 critical = 21

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

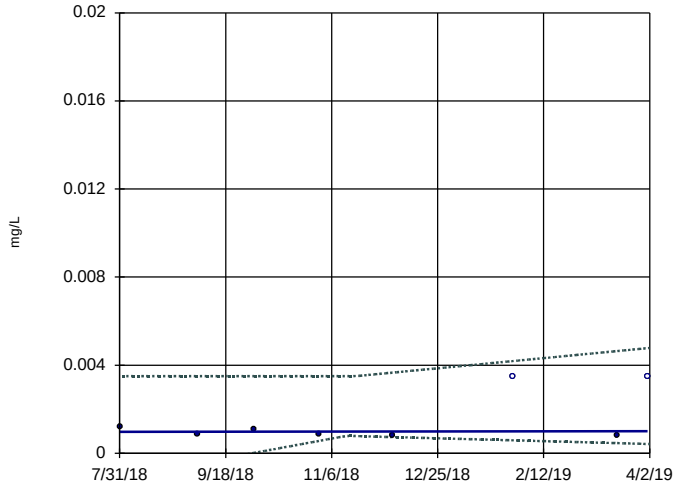
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0.00003259 units per year.

Mann-Kendall statistic = 1 critical = 21

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

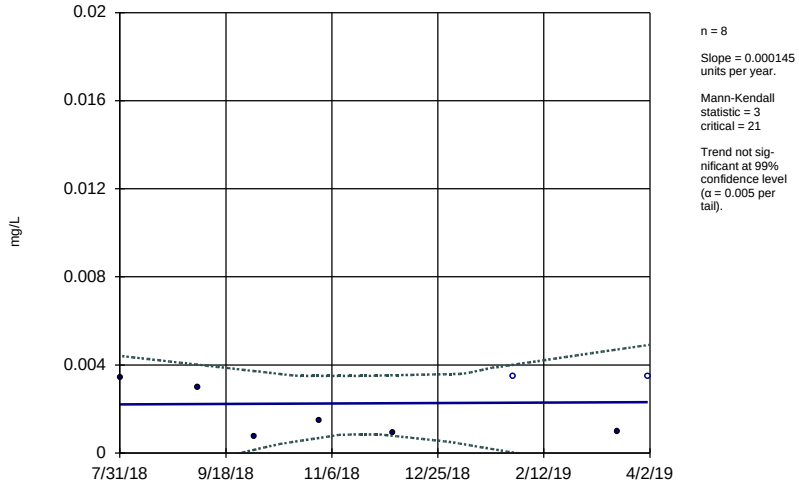
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0.000145 units per year.

Mann-Kendall statistic = 3 critical = 21

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

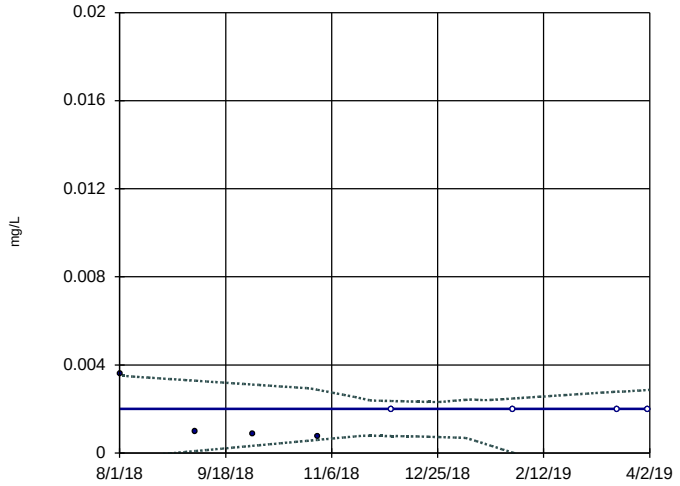
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 2 critical = 21

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

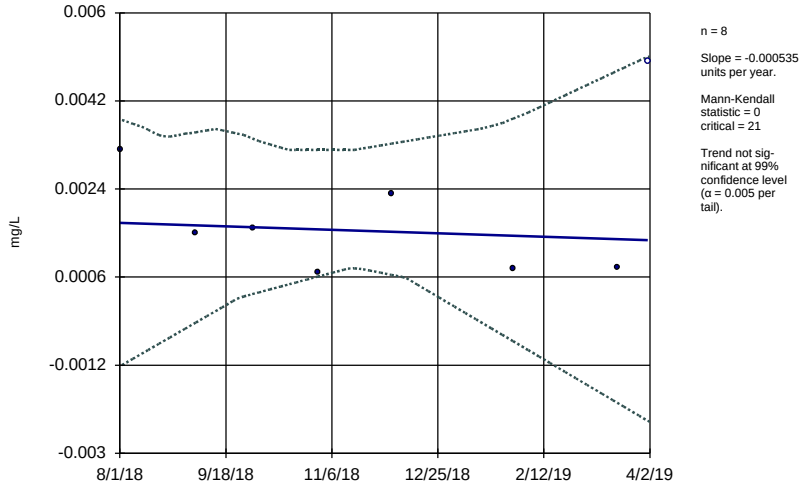
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



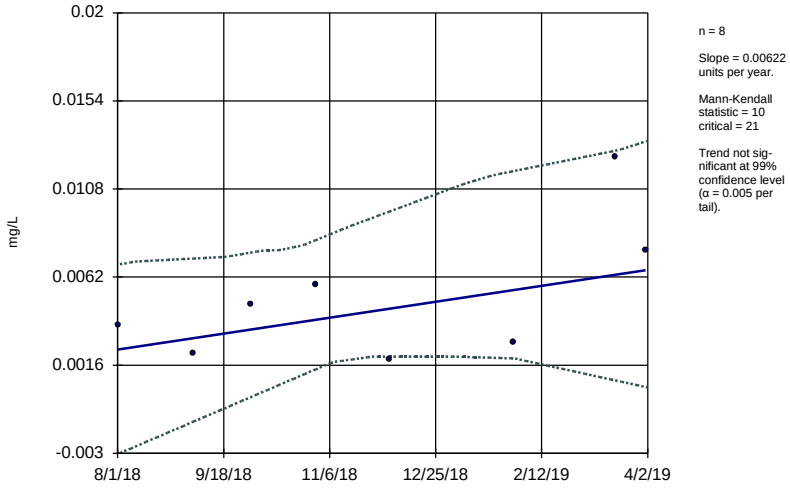
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



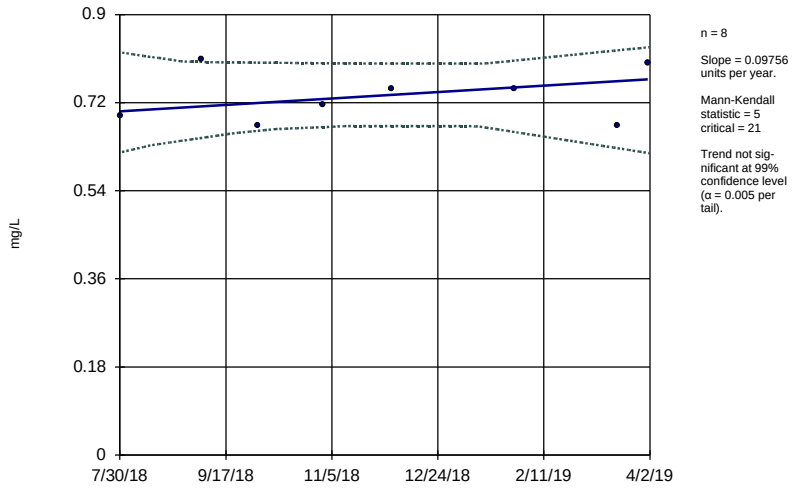
Constituent: Arsenic, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



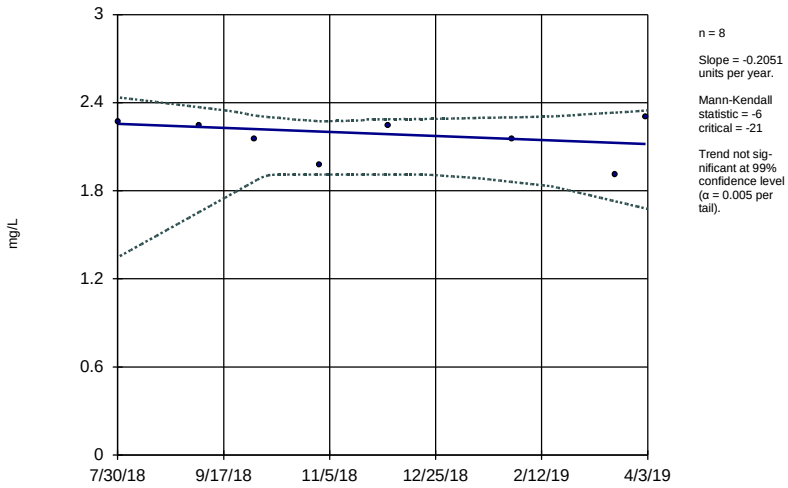
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



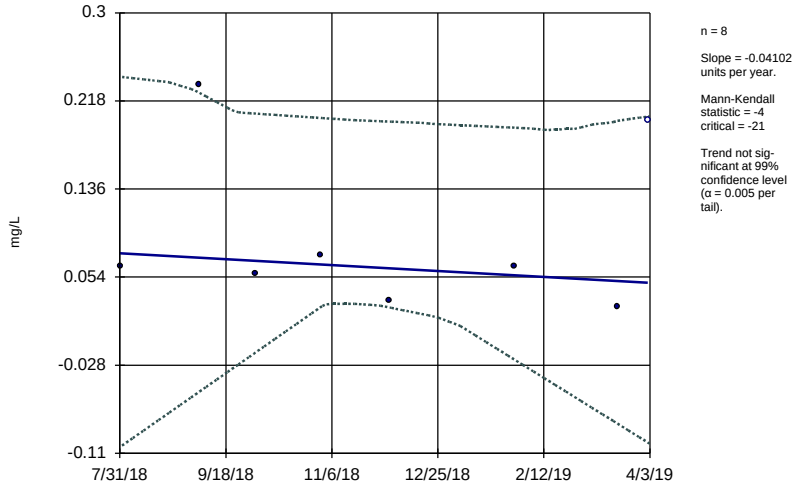
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = -0.04102 units per year.

Mann-Kendall statistic = -4
critical = -21

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

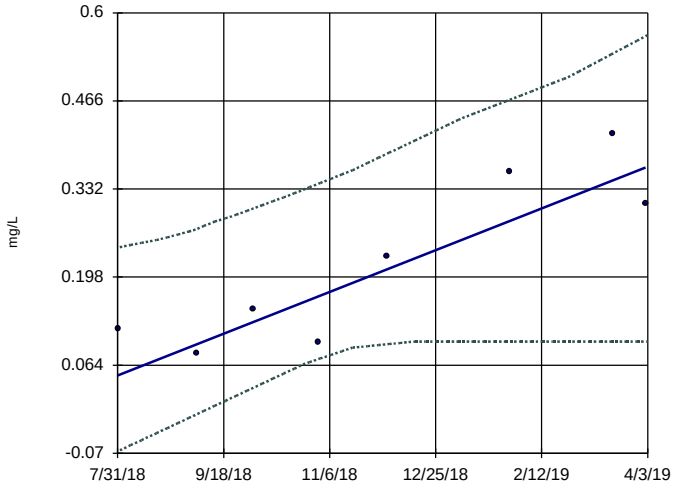
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0.4711 units per year.

Mann-Kendall statistic = 18
critical = 21

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

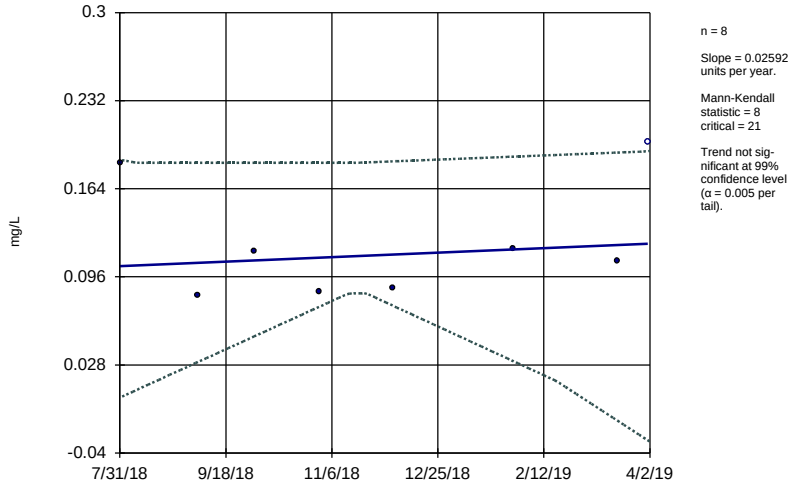
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0.02592 units per year.

Mann-Kendall statistic = 8
critical = 21

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

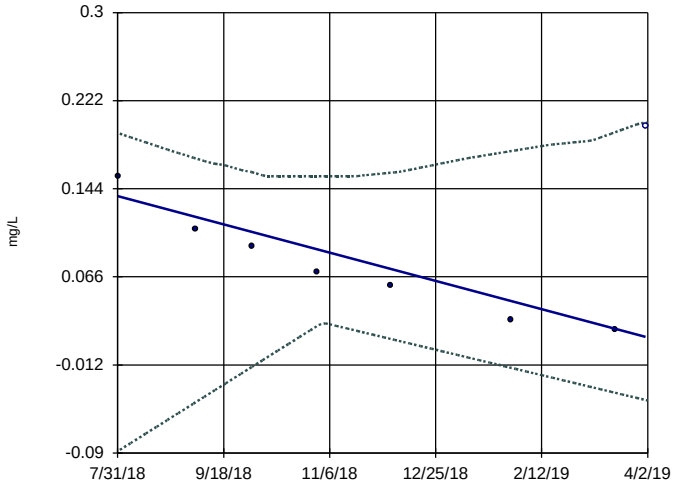
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = -0.1865 units per year.

Mann-Kendall statistic = -14
critical = -21

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

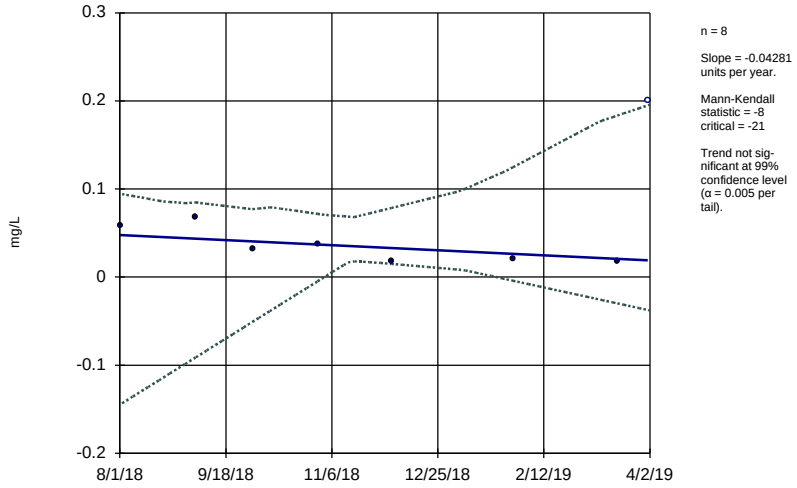
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -0.04281 units per year.

Mann-Kendall statistic = -8
critical = -21

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

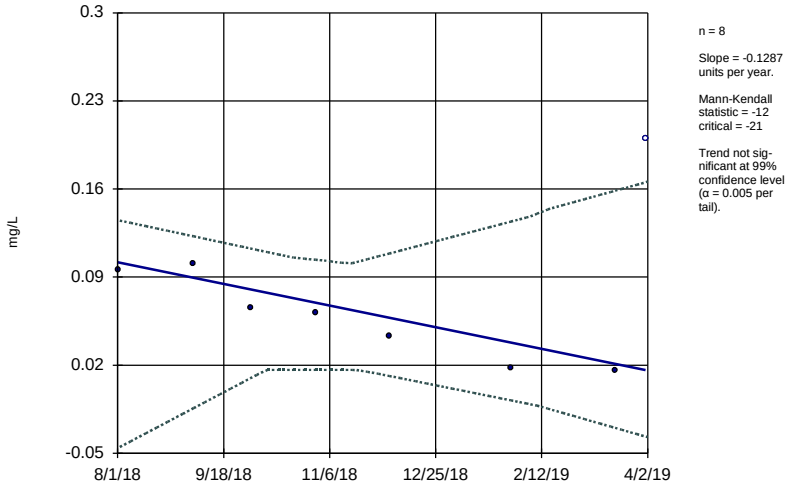
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -0.1287 units per year.

Mann-Kendall statistic = -12
critical = -21

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

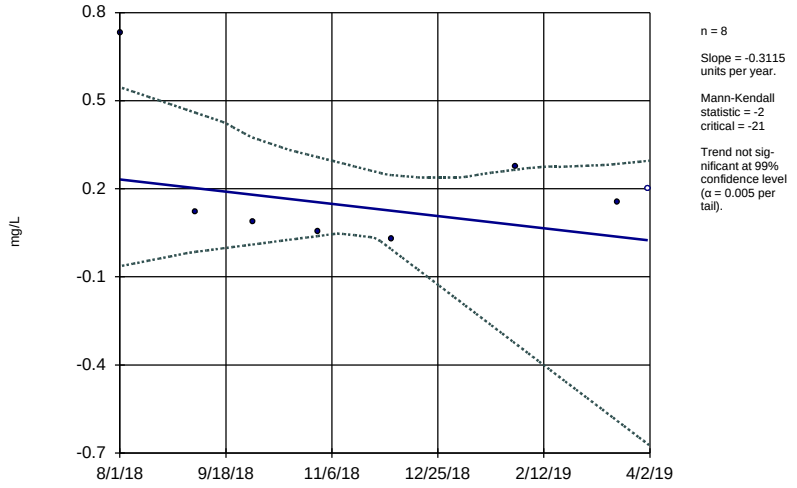
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = -0.3115 units per year.

Mann-Kendall statistic = -2
critical = -21

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

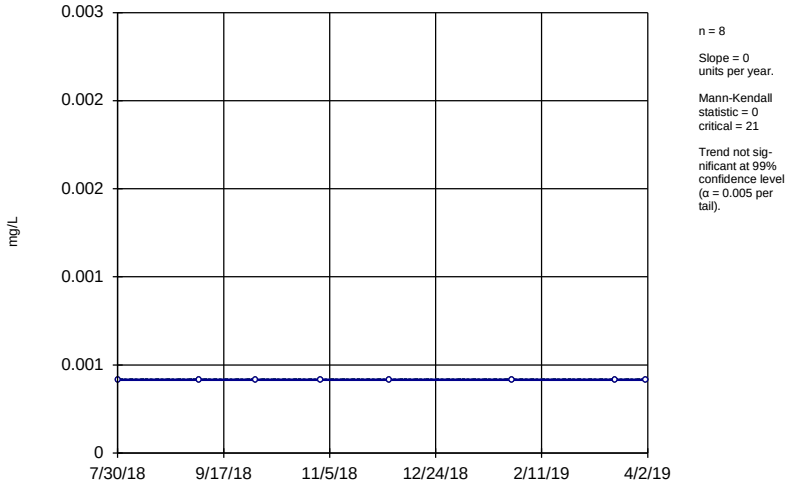
Constituent: Barium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0
critical = 21

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

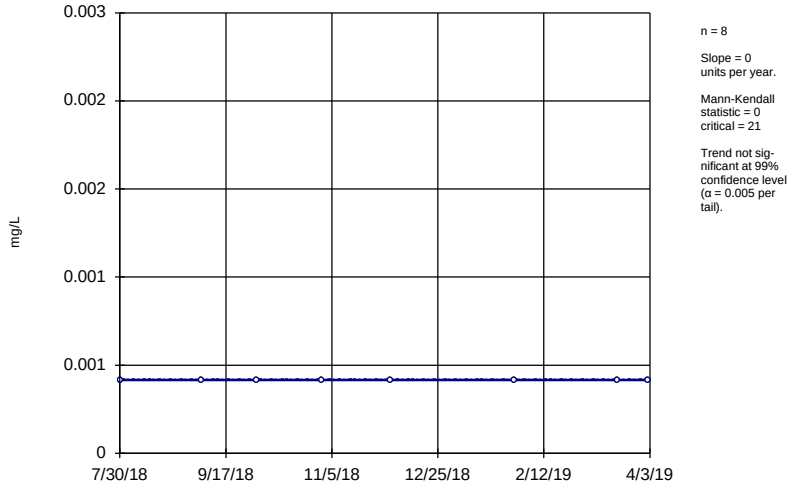
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



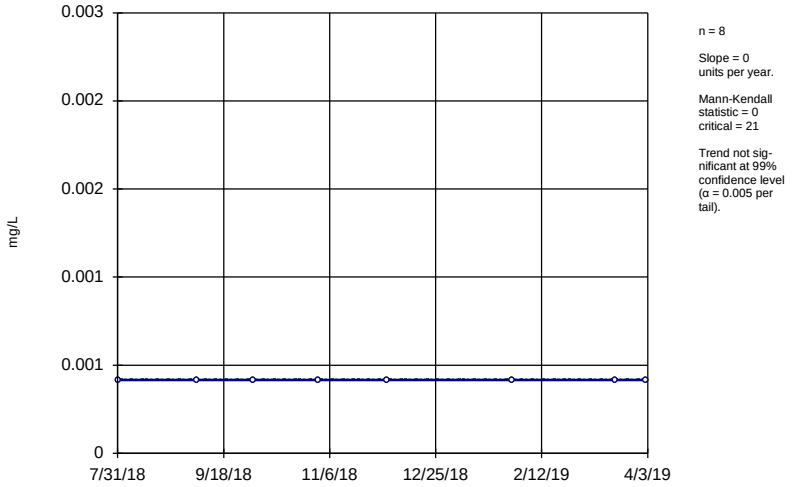
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



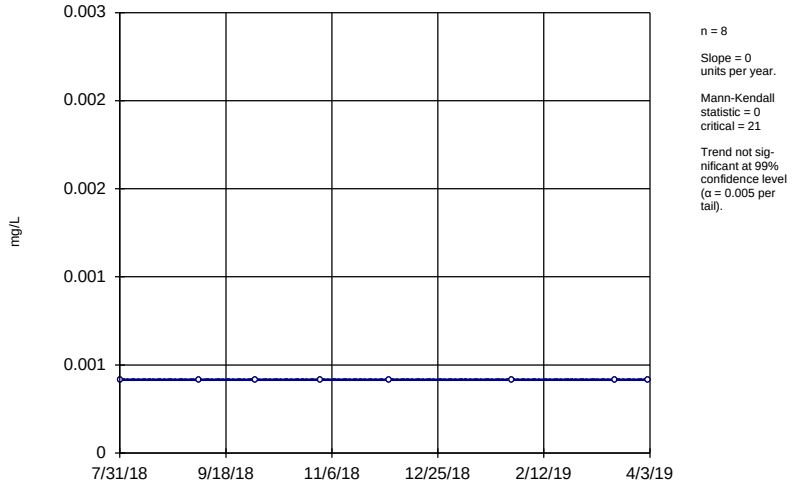
Constituent: Beryllium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



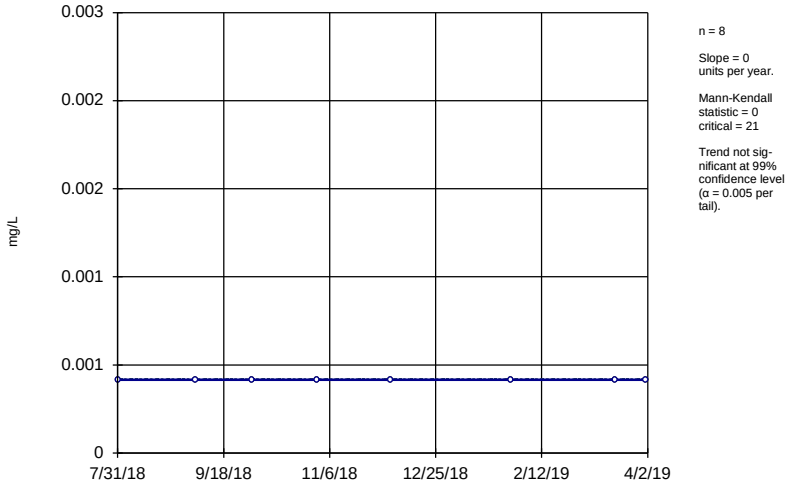
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



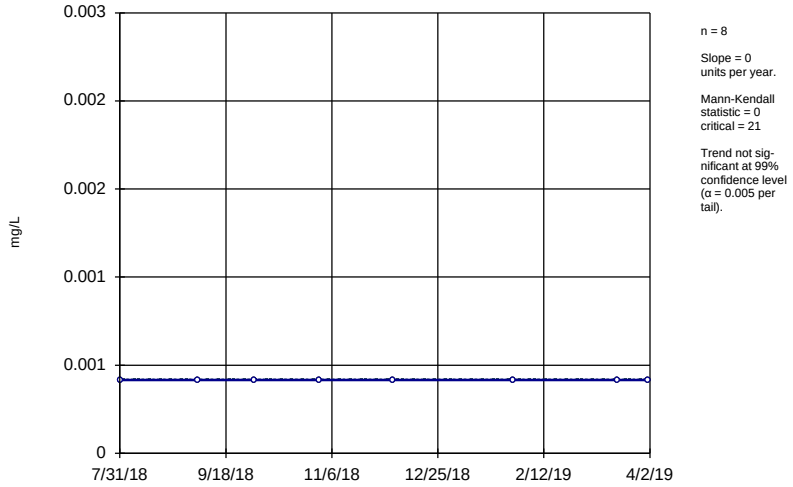
Constituent: Beryllium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



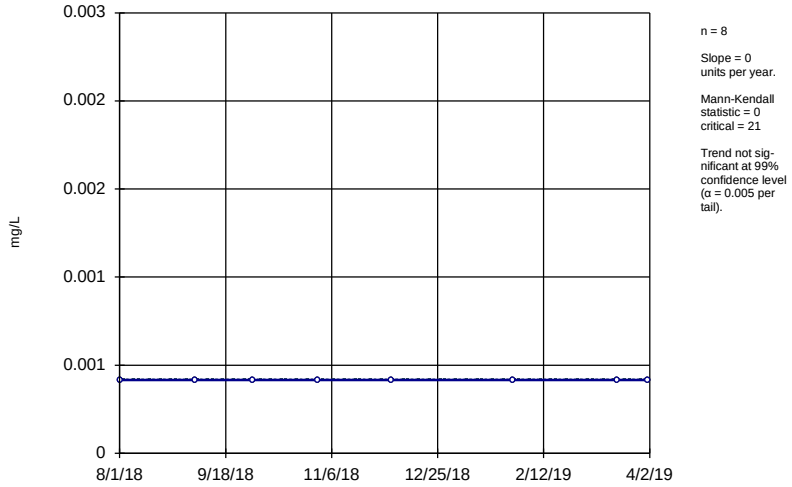
Constituent: Beryllium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



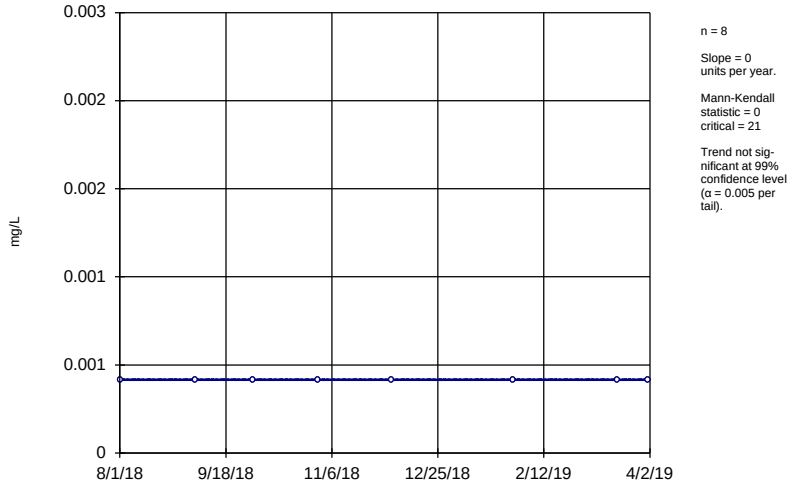
Constituent: Beryllium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



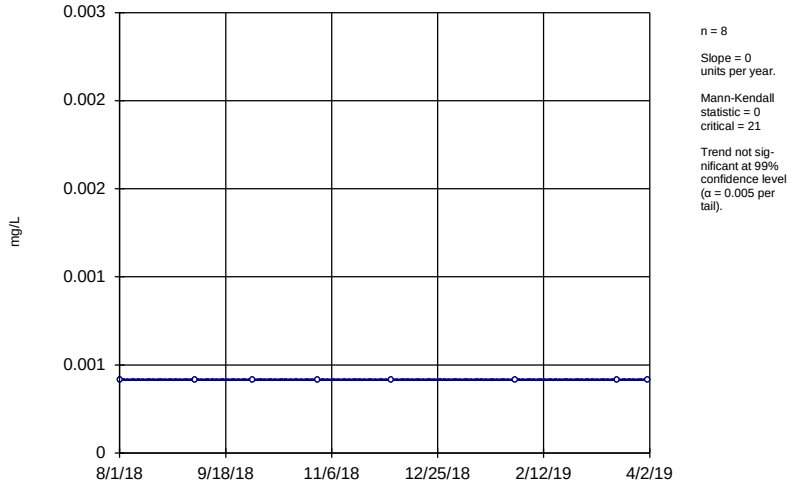
Constituent: Beryllium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



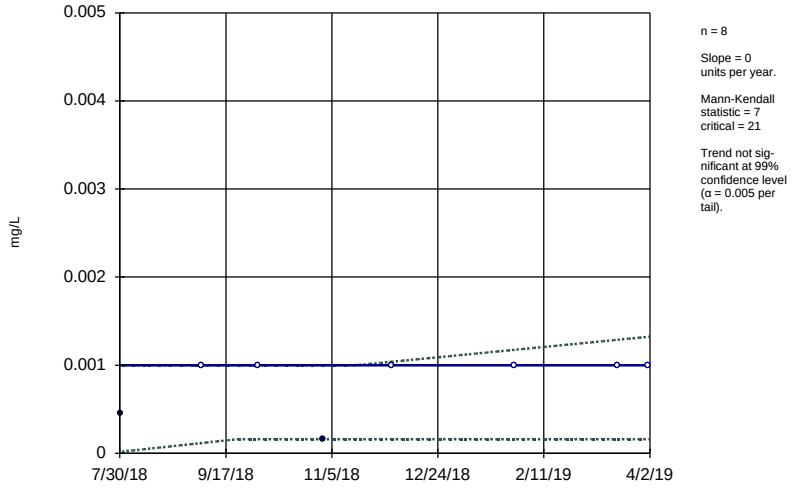
Constituent: Beryllium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 7 critical = 21

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

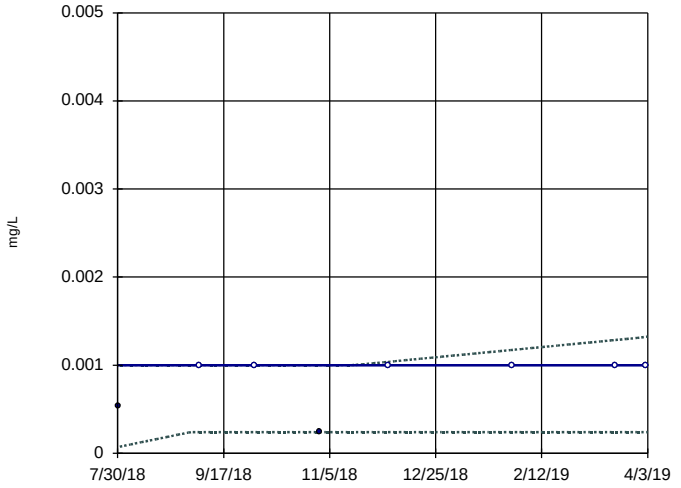
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 7 critical = 21

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

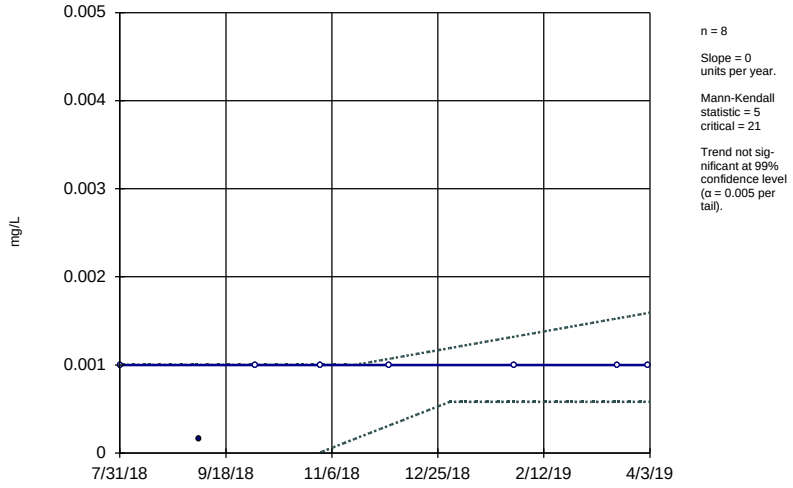
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 5 critical = 21

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

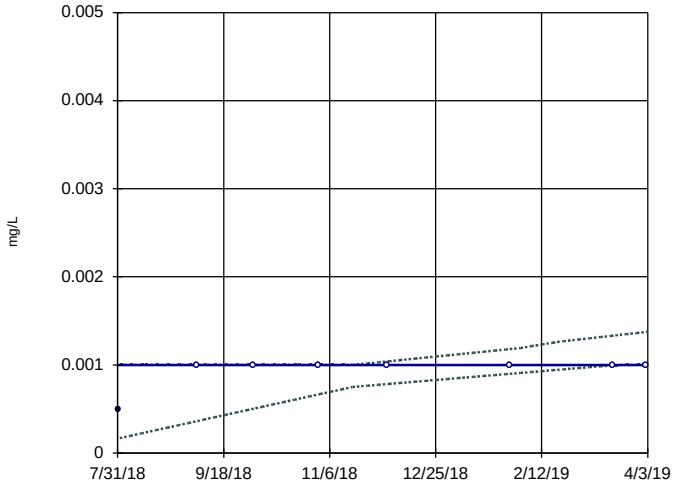
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 7 critical = 21

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

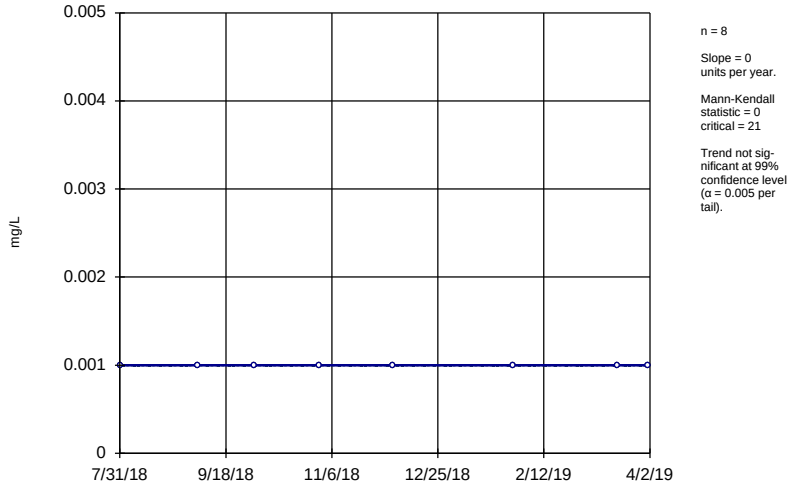
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:10 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

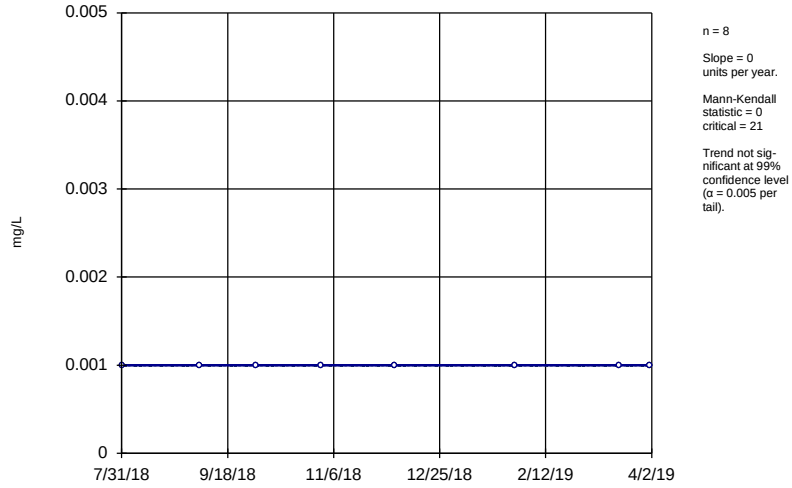
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

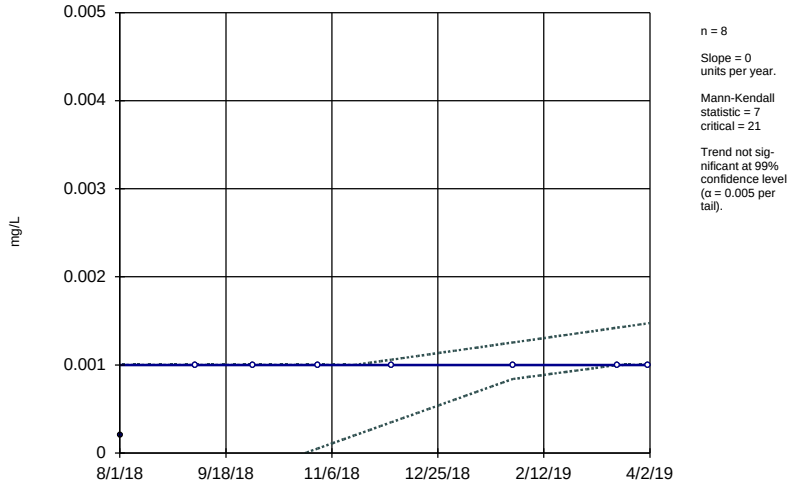
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 7 critical = 21

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

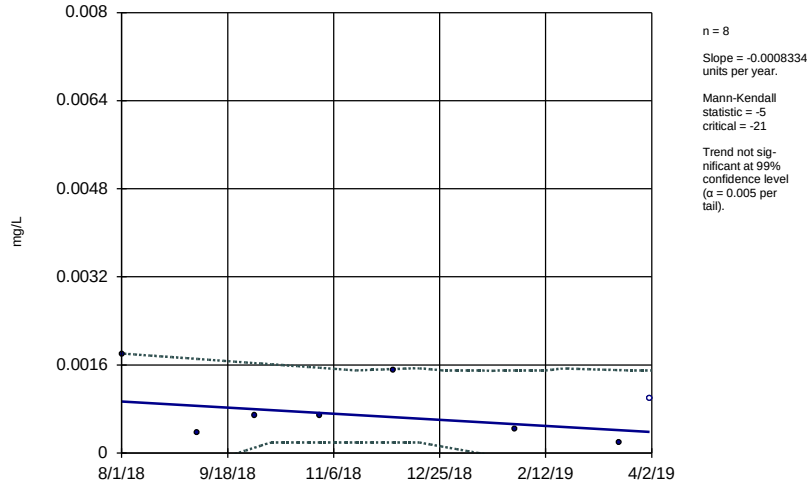
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -0.0008334 units per year.

Mann-Kendall statistic = -5 critical = -21

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

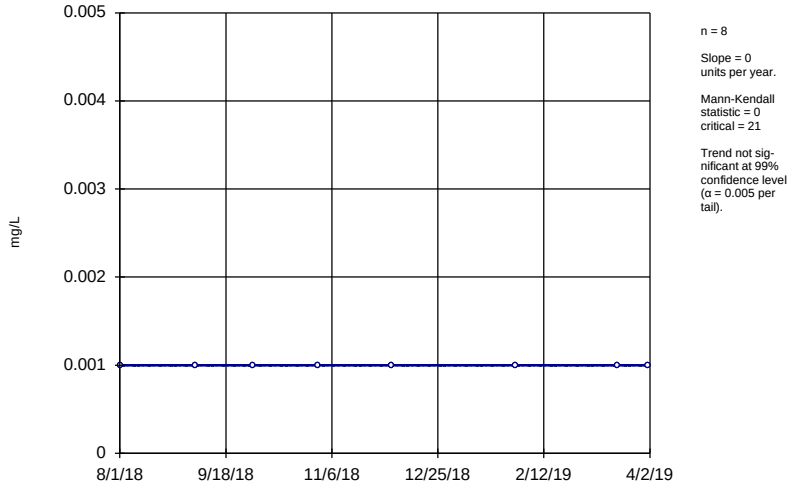
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



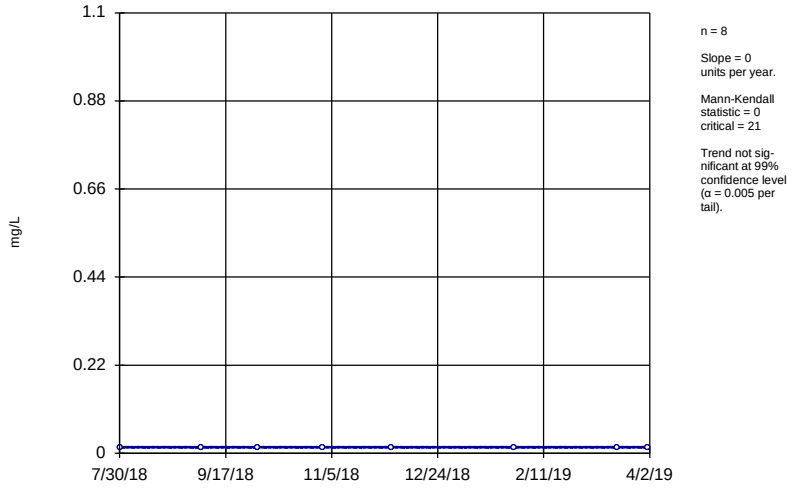
Constituent: Cadmium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



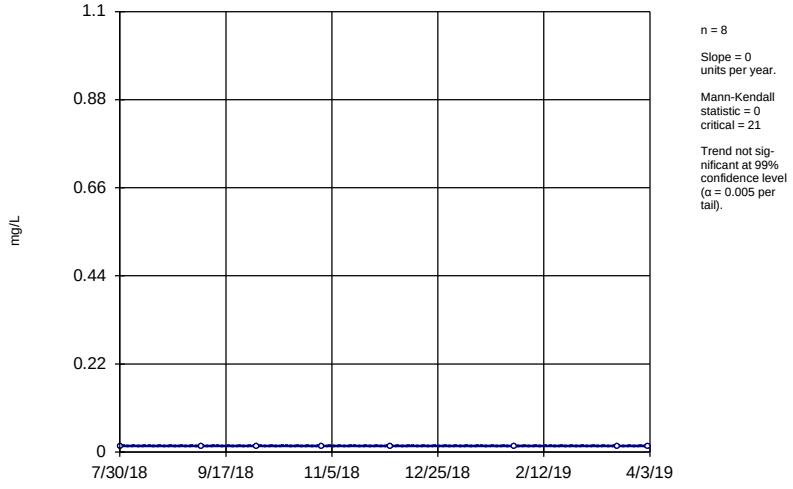
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



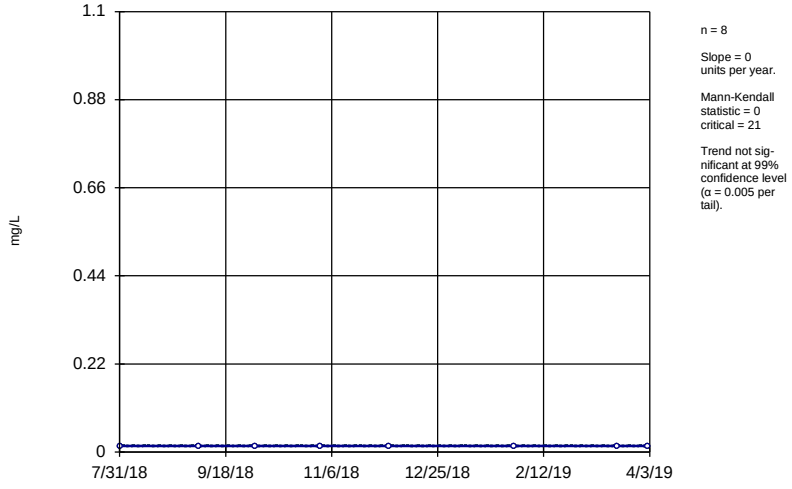
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



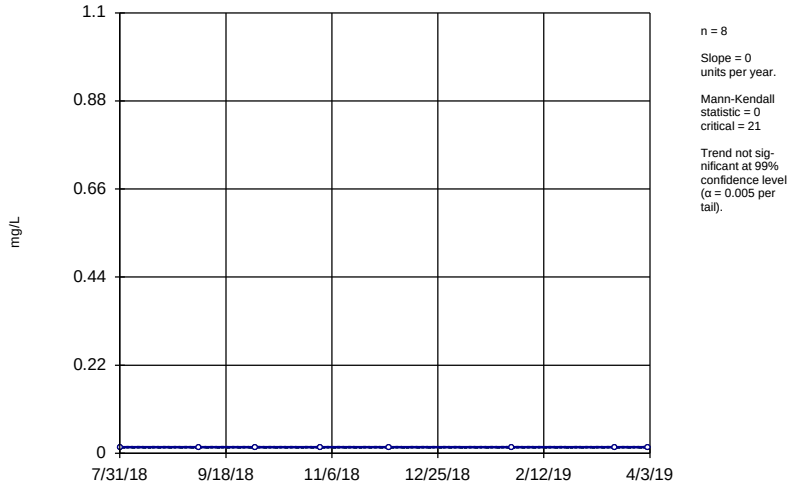
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



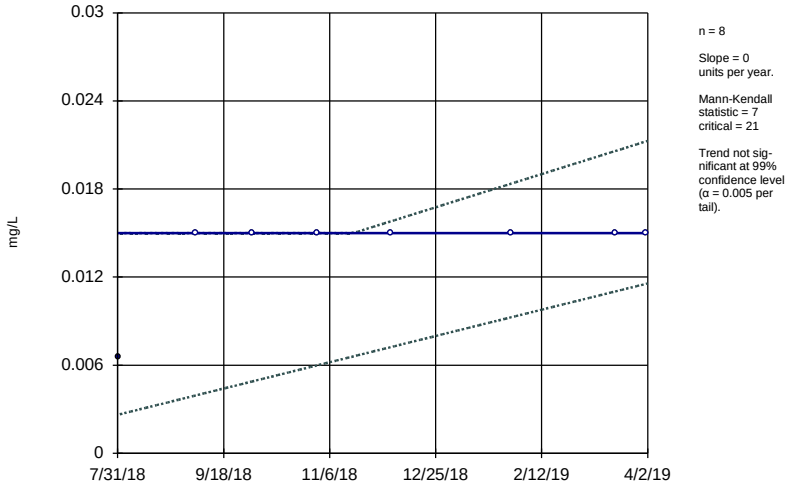
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



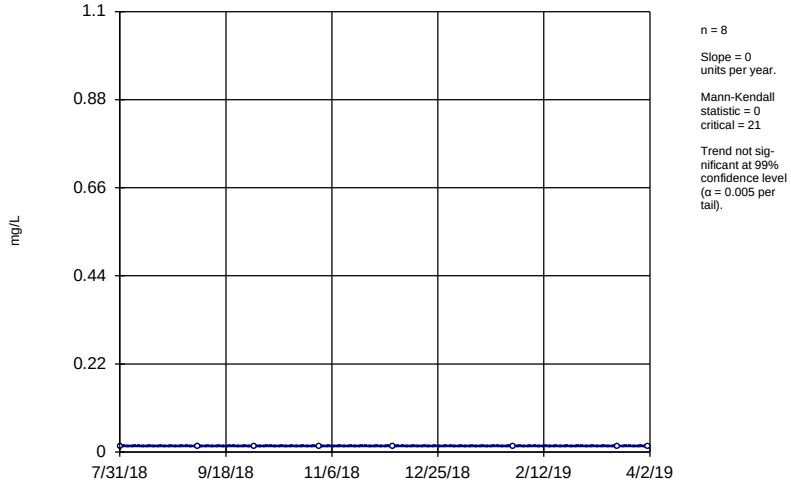
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



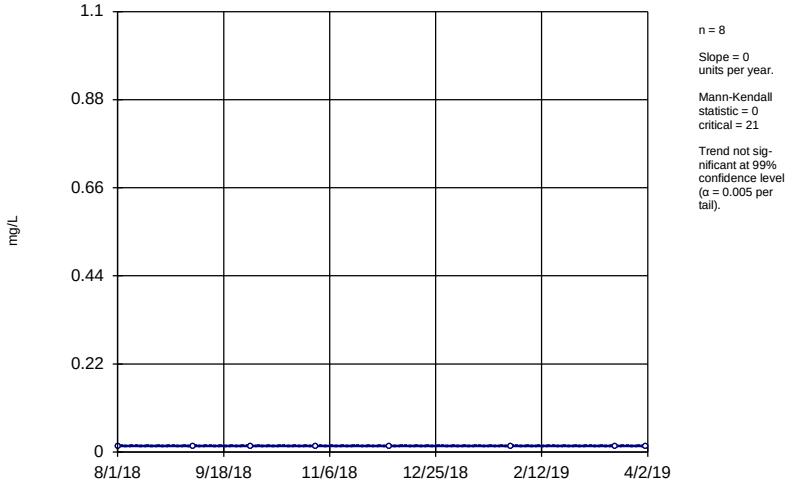
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



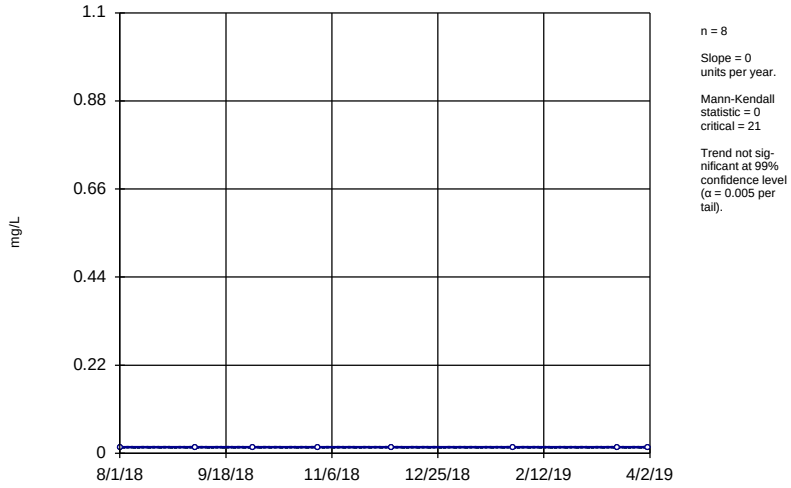
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

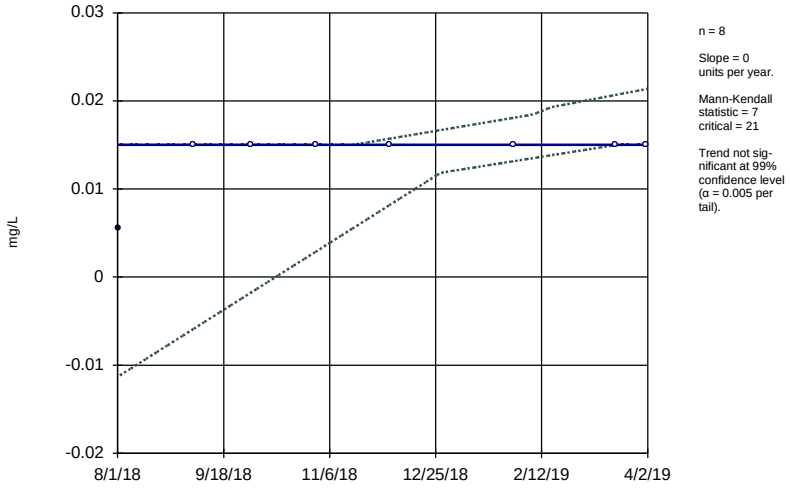
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 7 critical = 21

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

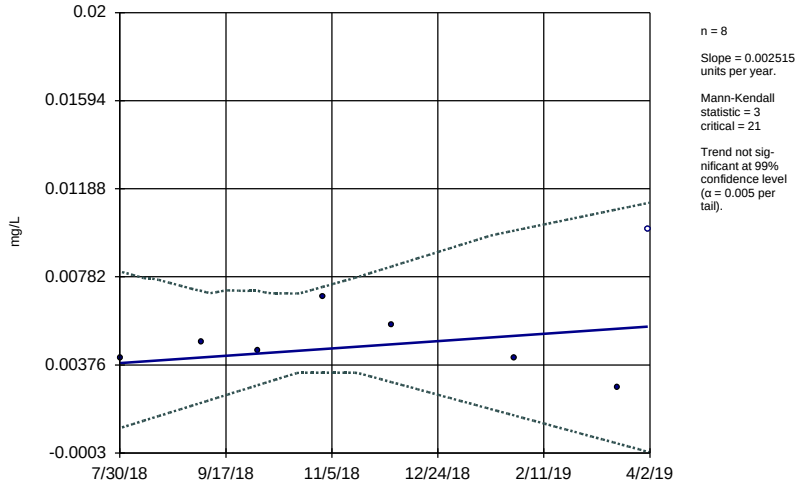
Constituent: Chromium, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 0.002515 units per year.

Mann-Kendall statistic = 3 critical = 21

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

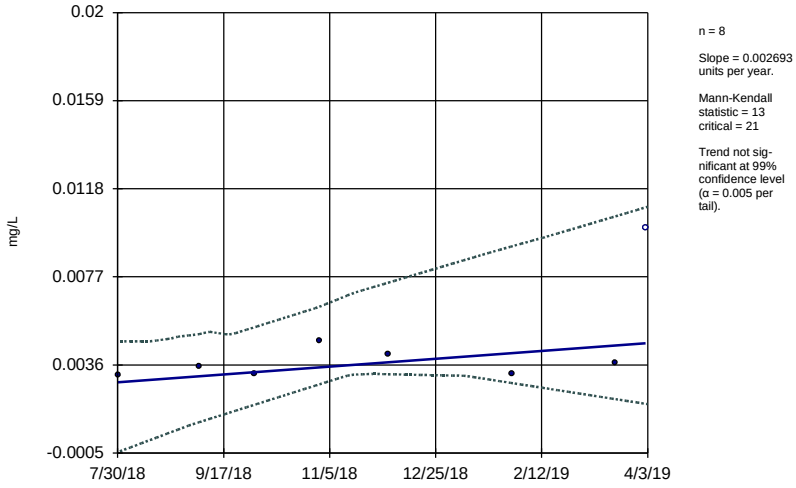
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0.002693 units per year.

Mann-Kendall statistic = 13 critical = 21

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

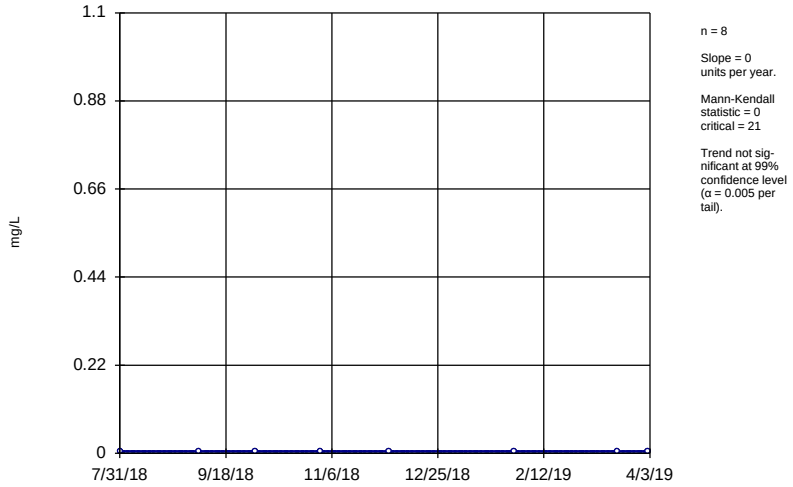
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

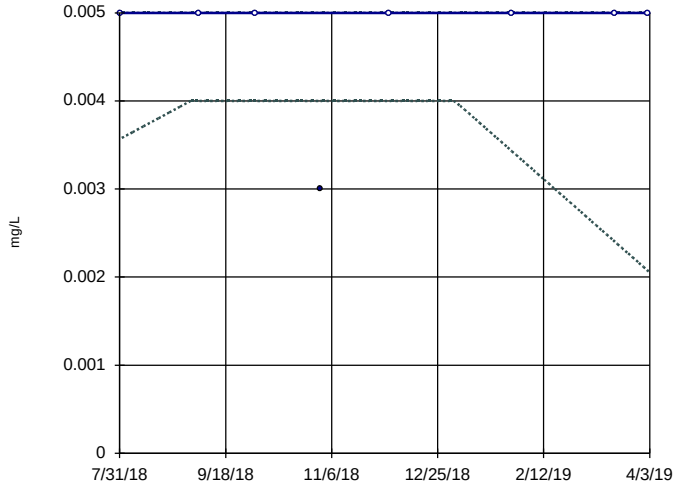
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 1 critical = 21

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

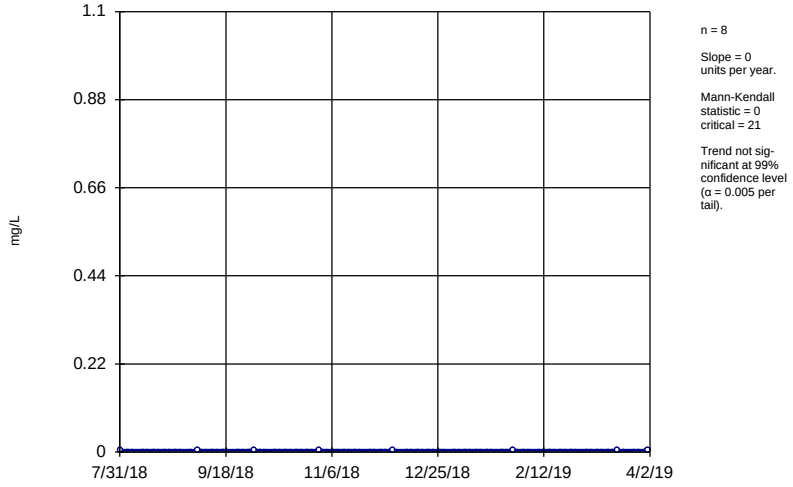
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

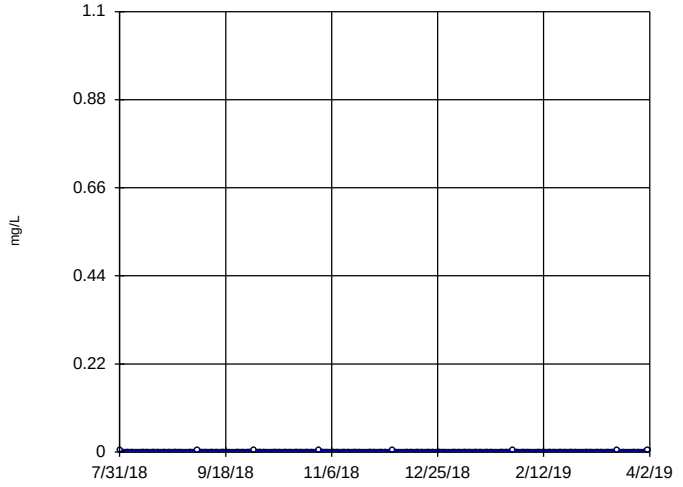
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

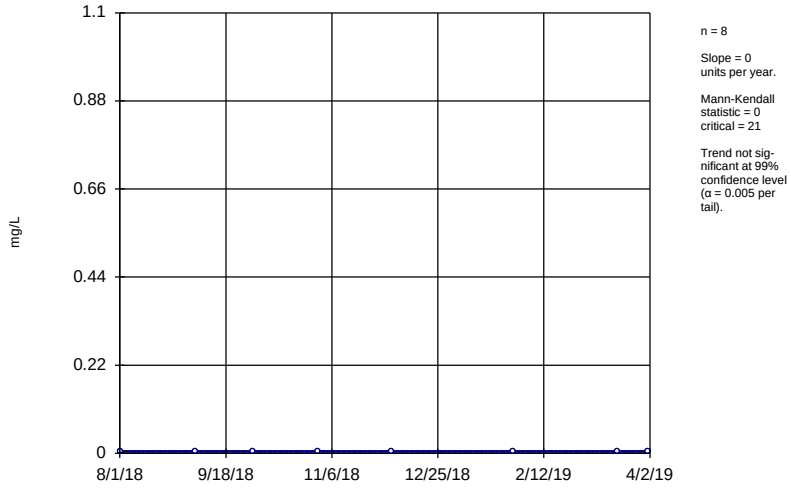
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



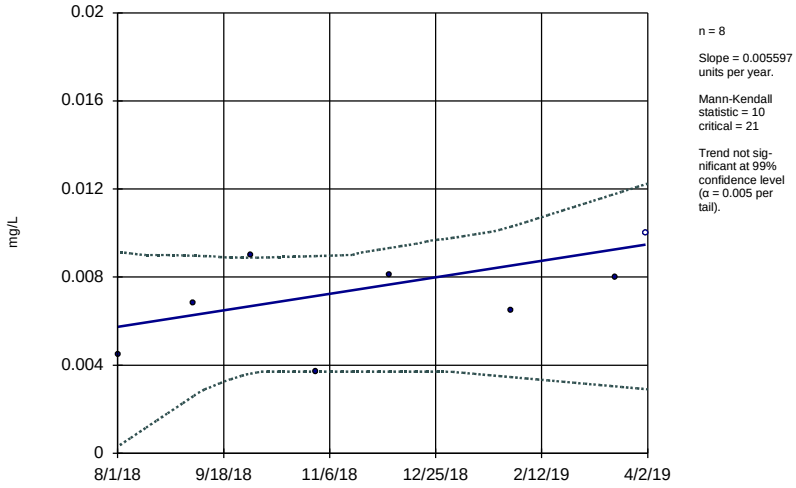
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



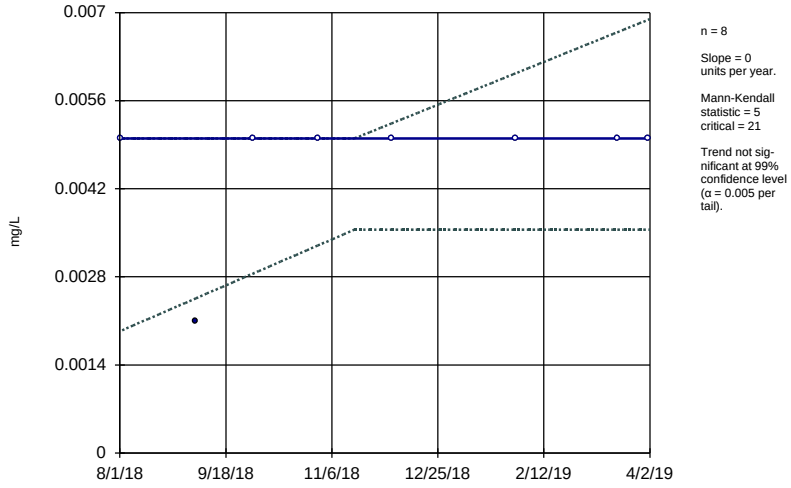
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



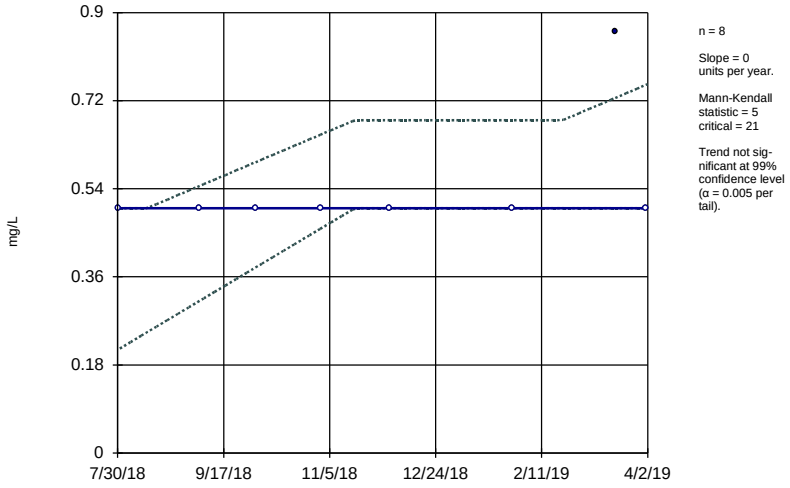
Constituent: Cobalt, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



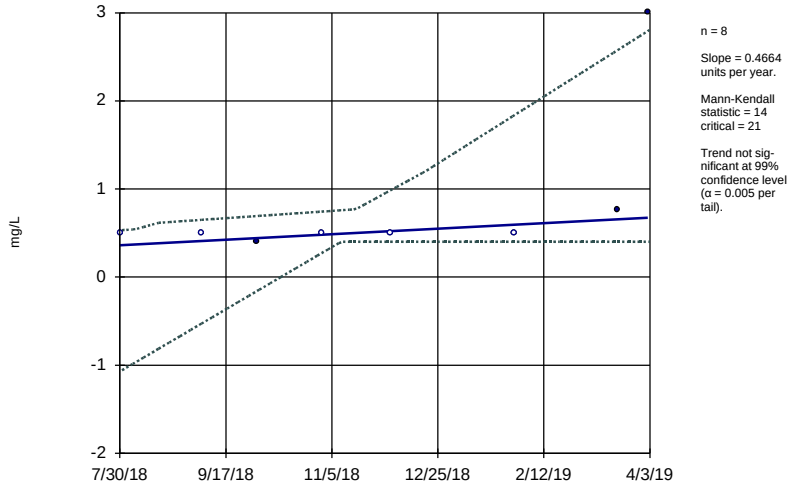
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0.4664 units per year.

Mann-Kendall statistic = 14
critical = 21

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

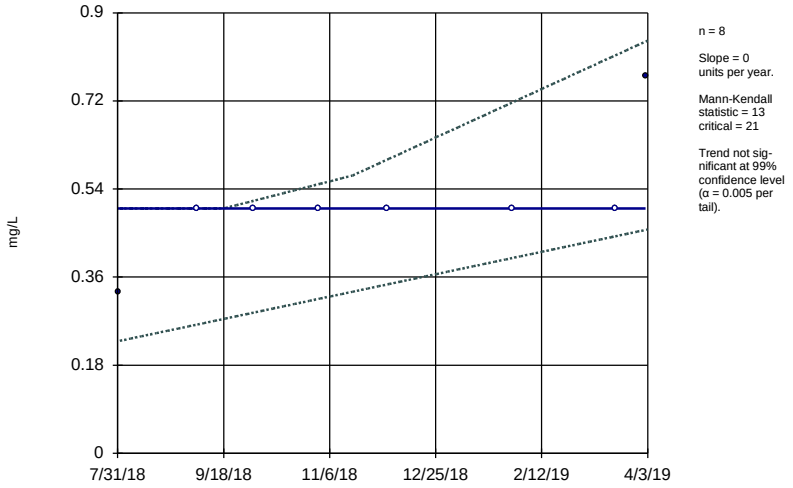
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 13
critical = 21

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

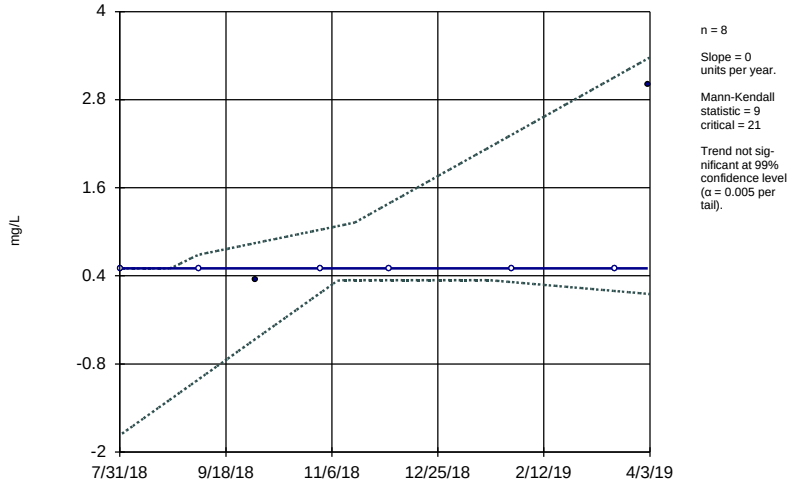
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 9
critical = 21

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

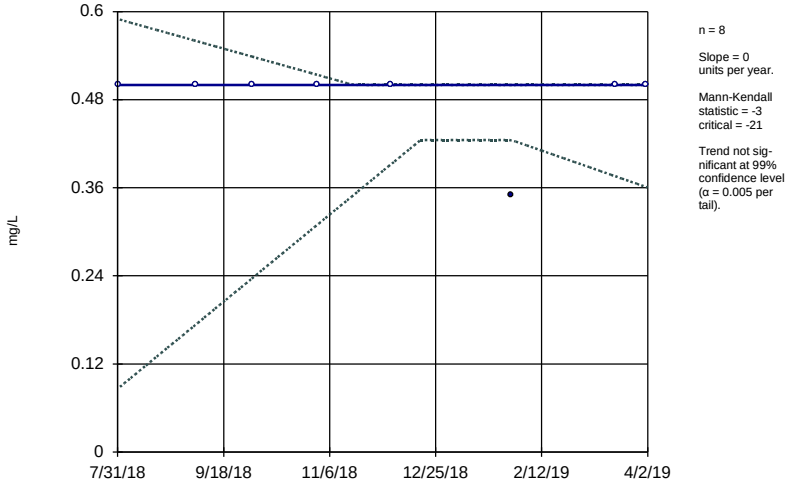
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -3
critical = -21

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

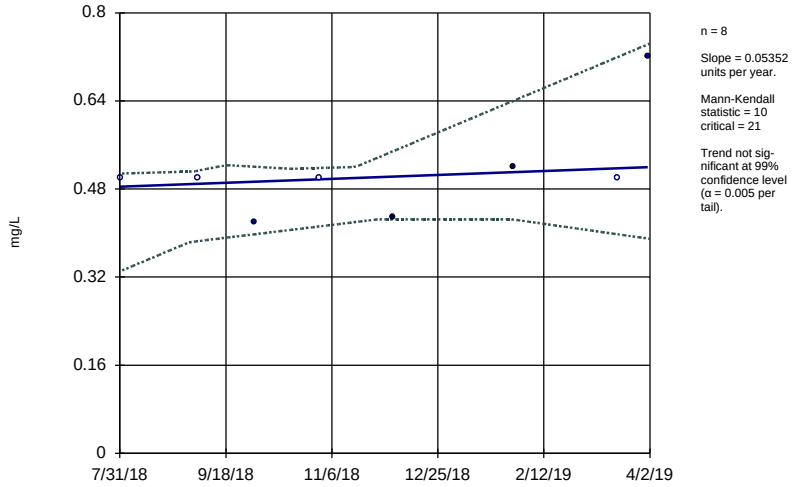
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0.05352 units per year.

Mann-Kendall statistic = 10
critical = 21

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

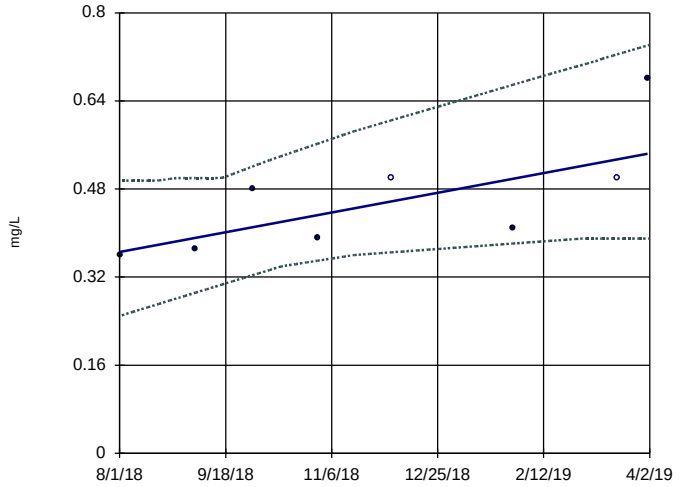
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = 0.2678 units per year.

Mann-Kendall statistic = 21
critical = 21

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

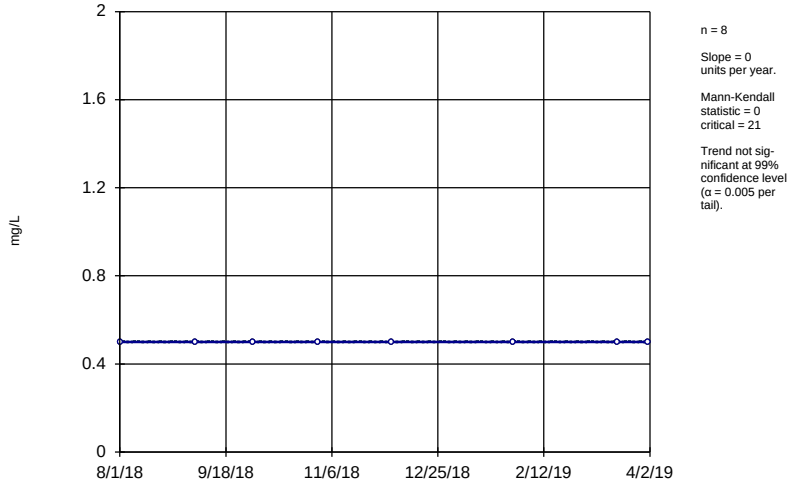
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0
critical = 21

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

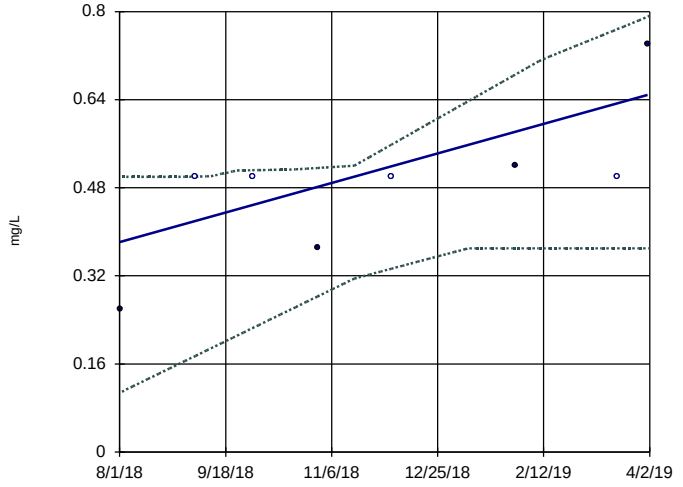
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0.4018 units per year.

Mann-Kendall statistic = 16
critical = 21

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

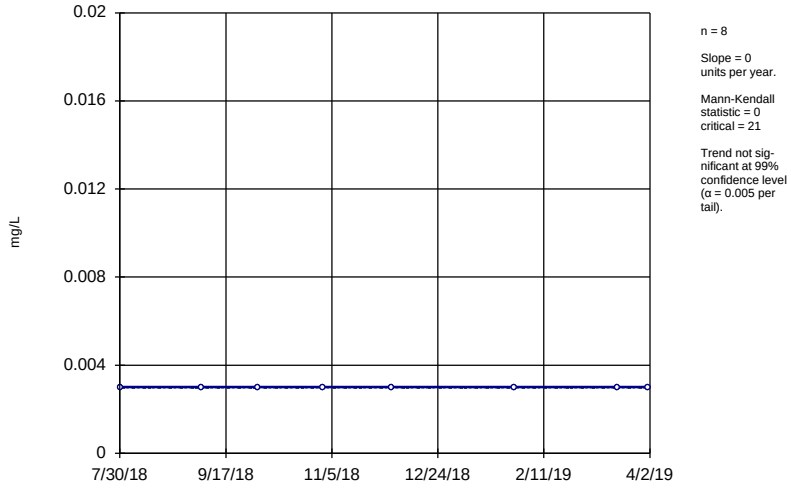
Constituent: Fluoride Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



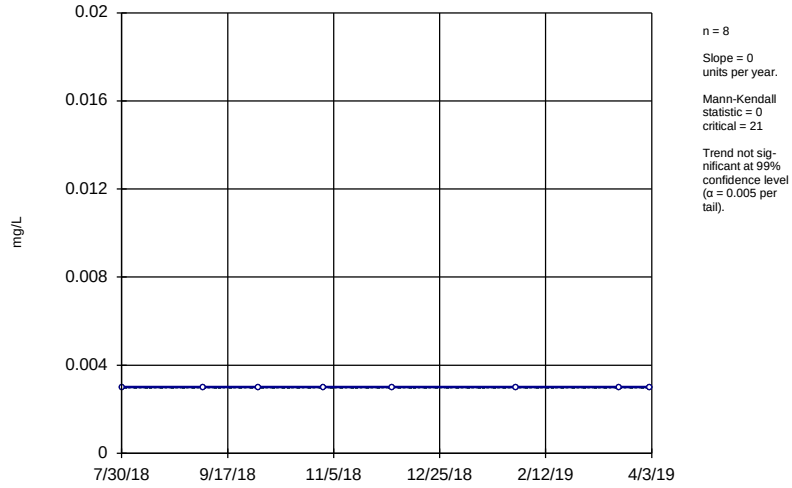
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



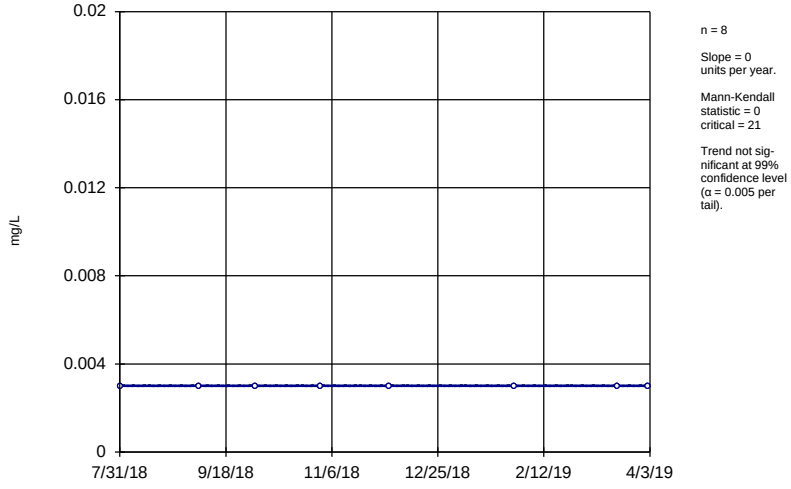
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



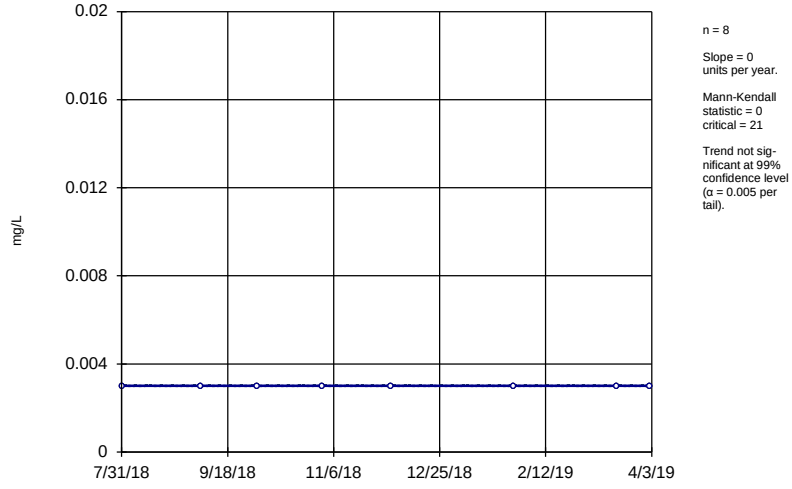
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



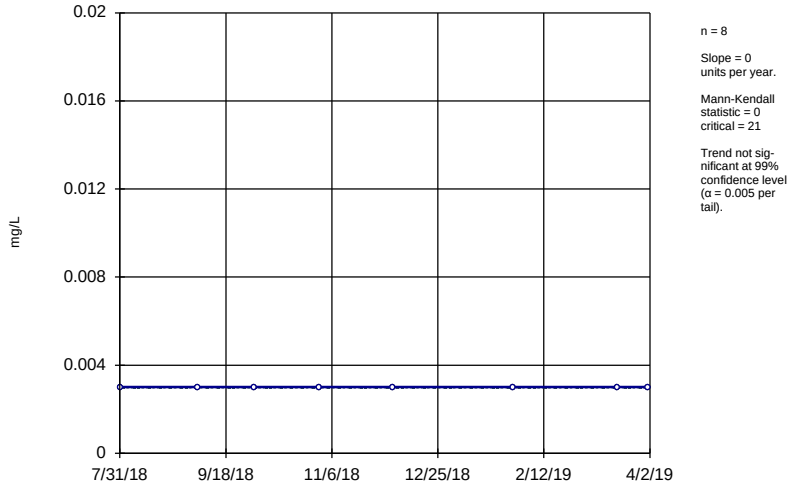
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



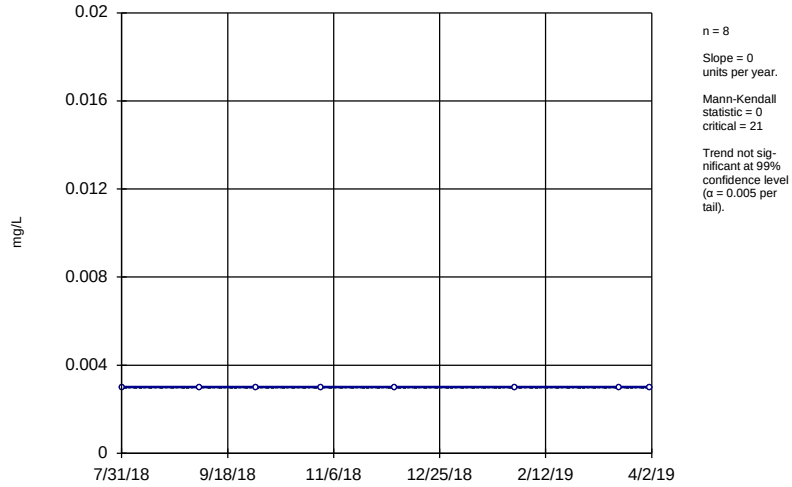
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



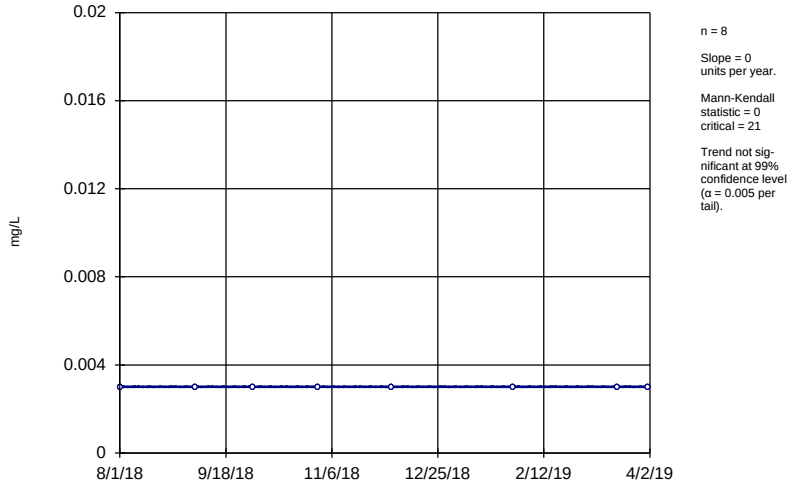
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



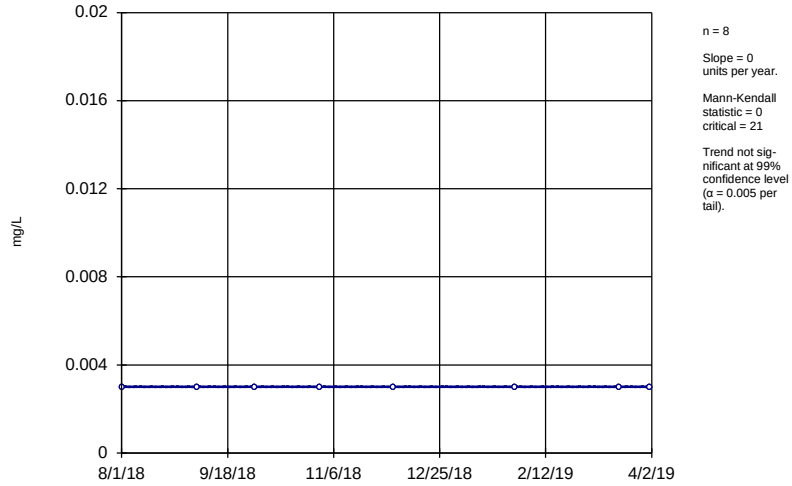
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



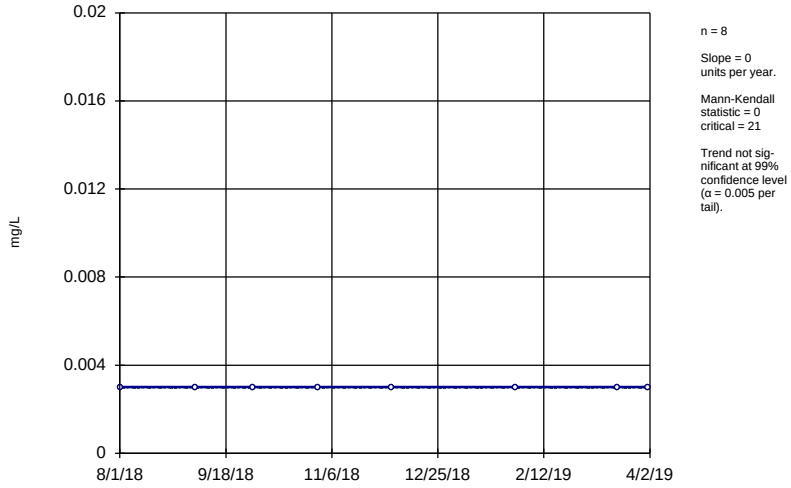
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



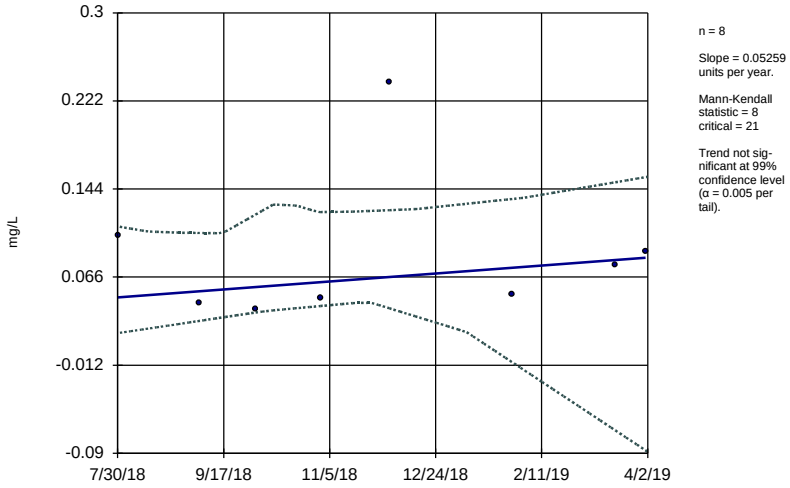
Constituent: Lead, dissolved Analysis Run 2/19/2020 2:11 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



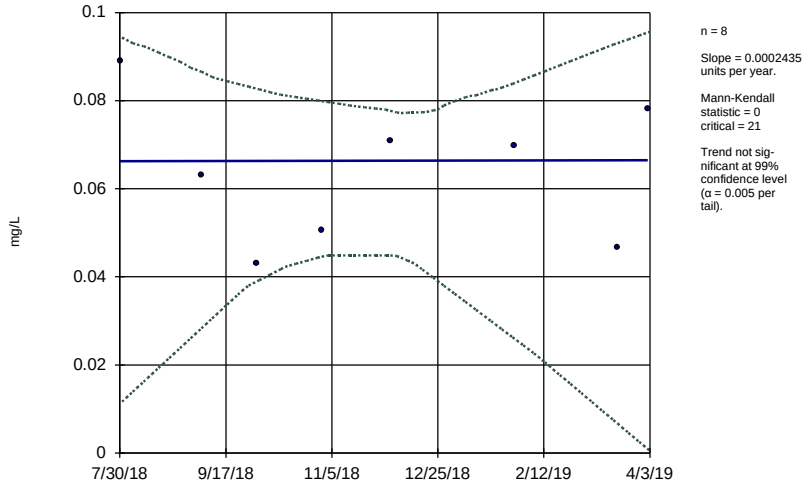
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



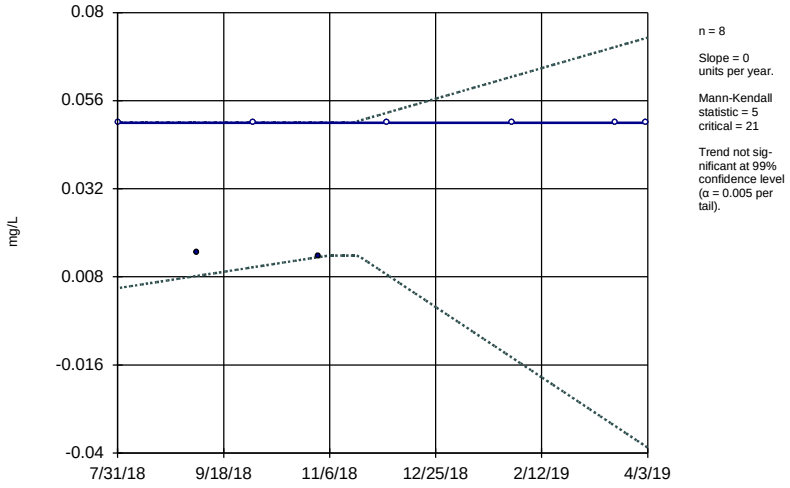
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



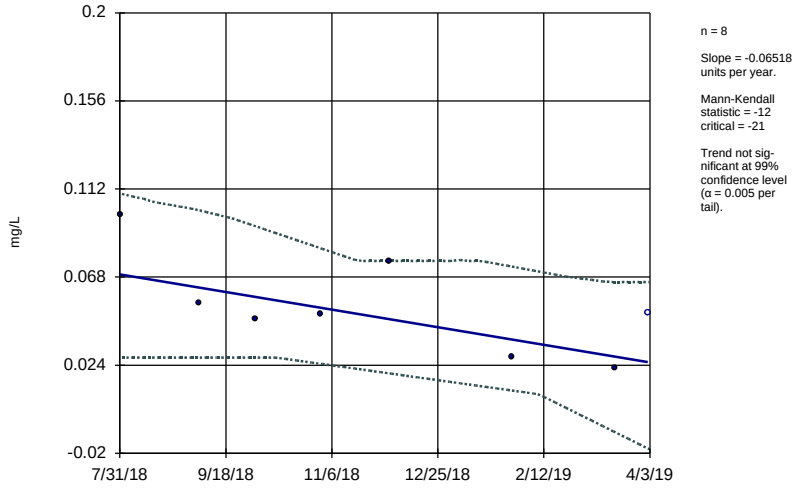
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -0.06518 units per year.

Mann-Kendall statistic = -12
critical = -21

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

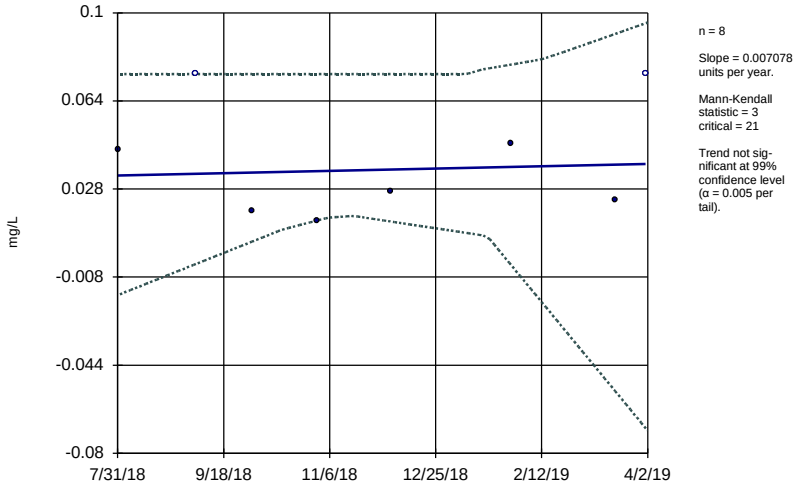
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0.007078 units per year.

Mann-Kendall statistic = 3
critical = 21

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

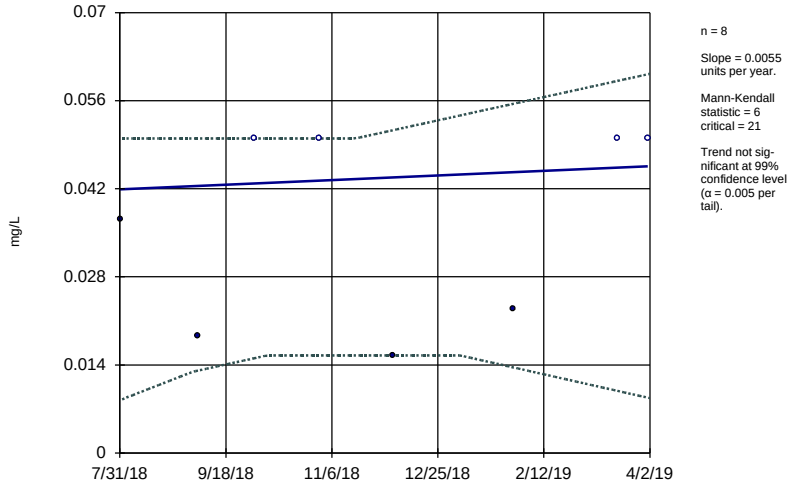
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0.0055 units per year.

Mann-Kendall statistic = 6
critical = 21

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

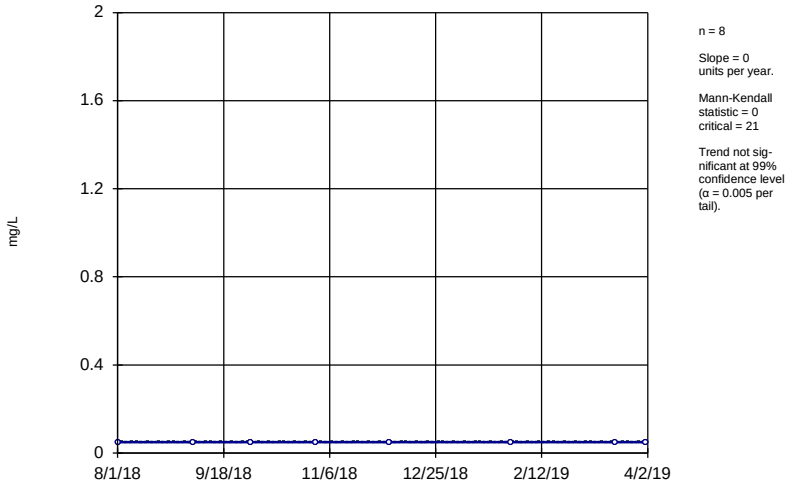
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0
critical = 21

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

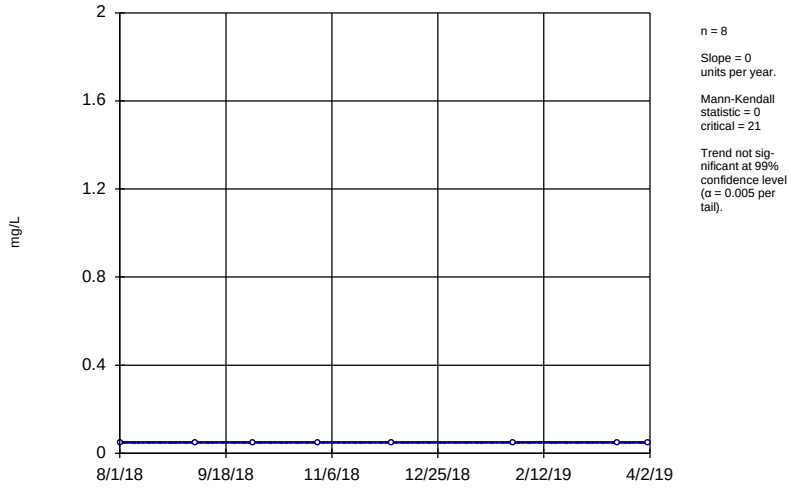
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

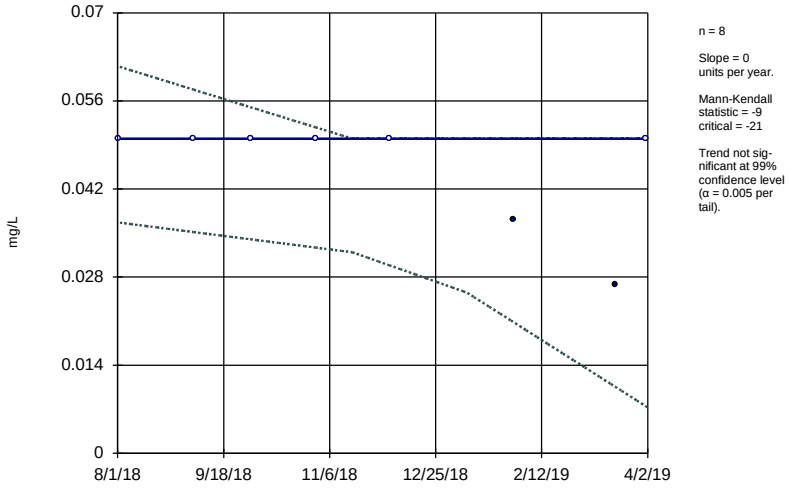
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -9 critical = -21

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

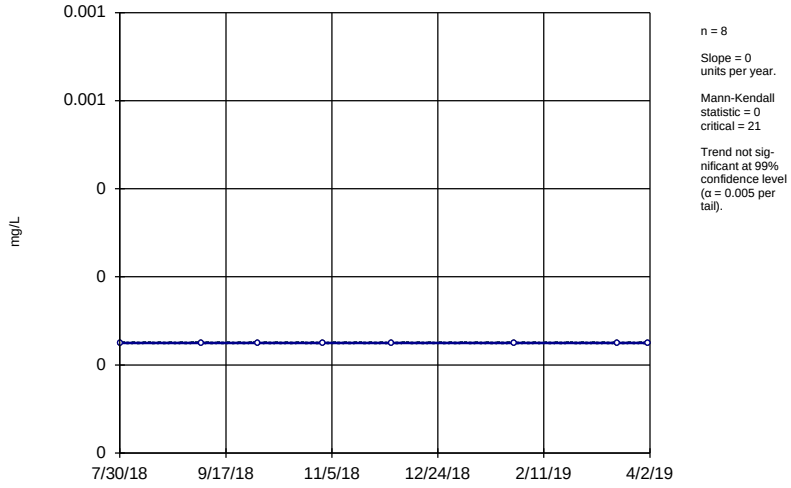
Constituent: Lithium, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

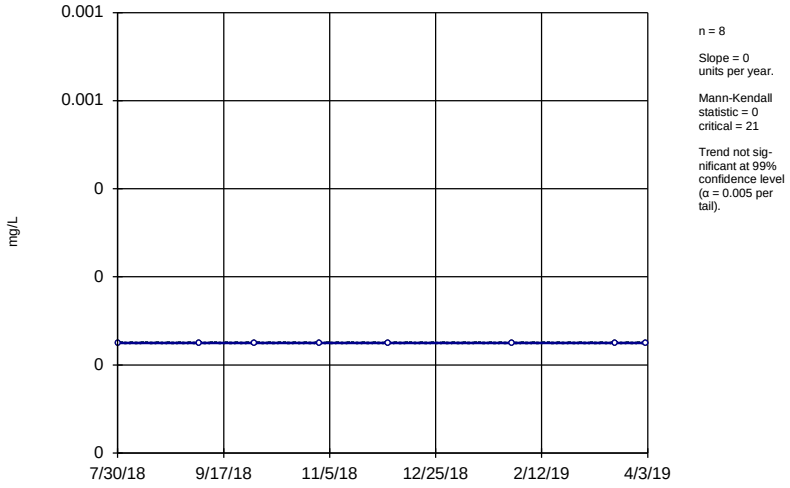
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

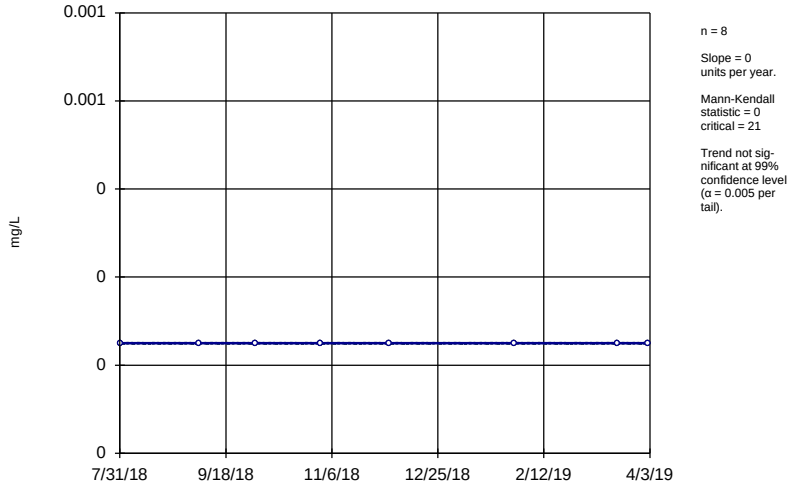
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

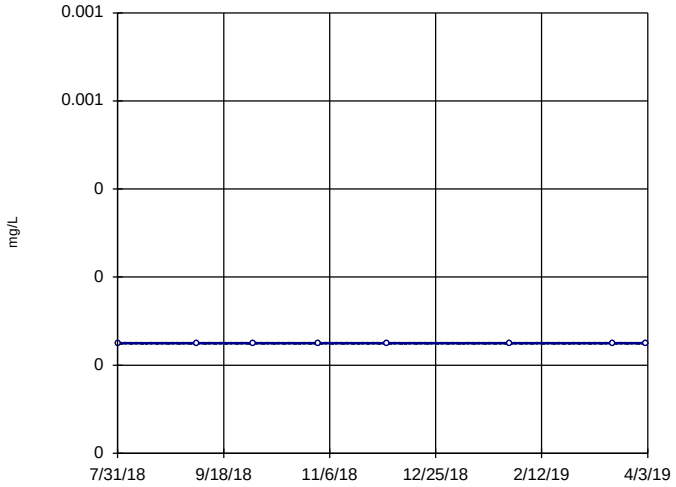
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

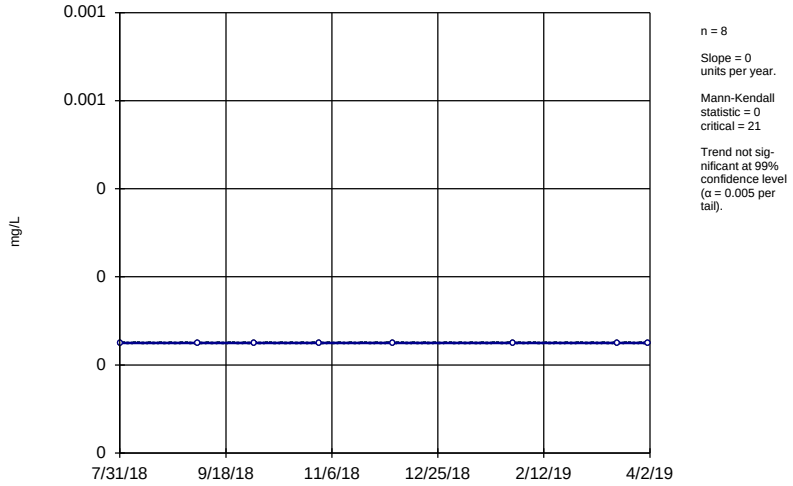
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

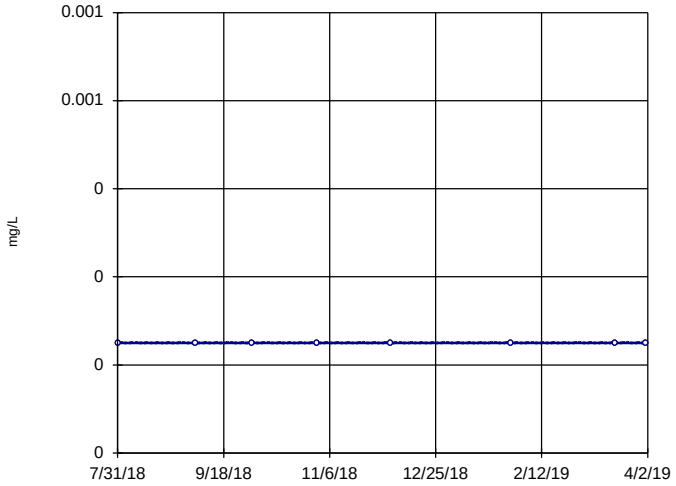
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

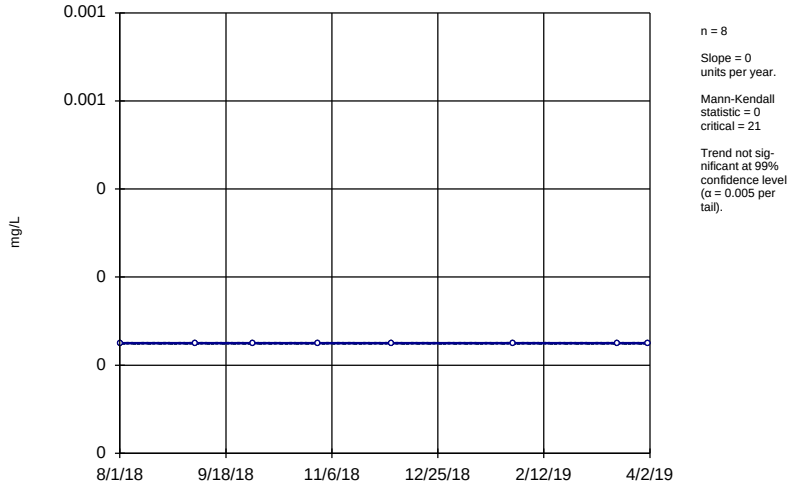
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



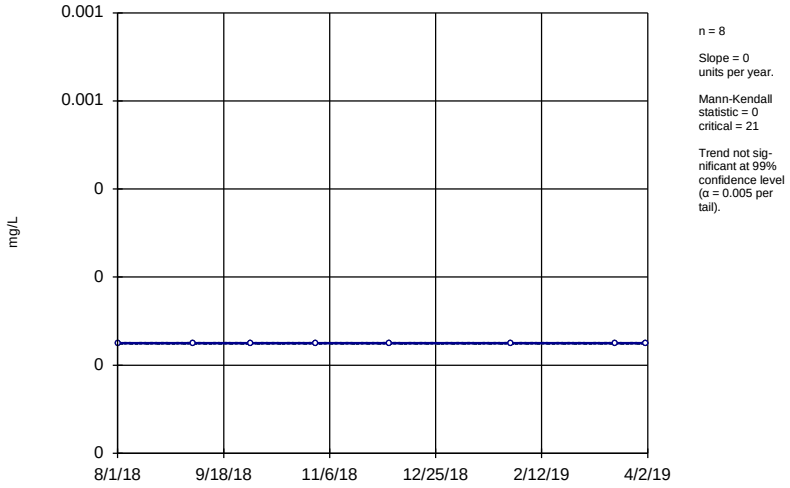
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



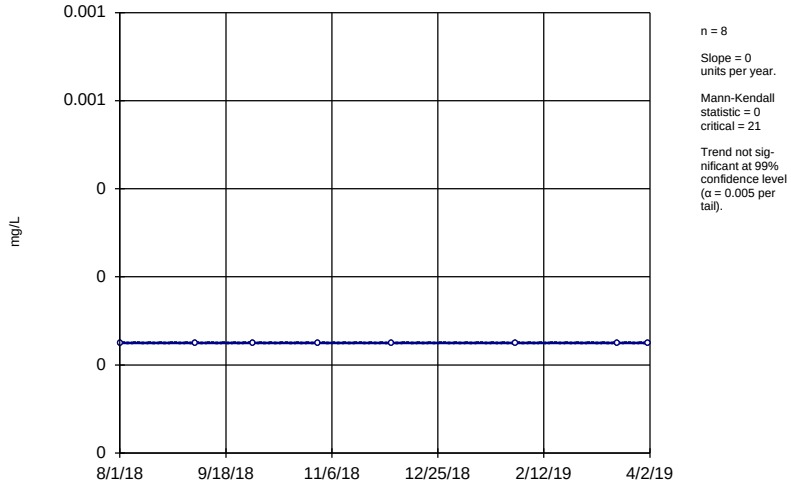
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



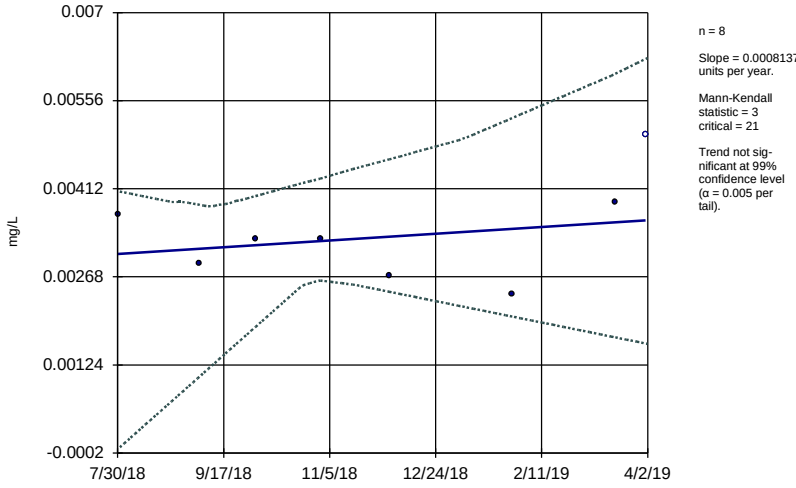
Constituent: Mercury, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



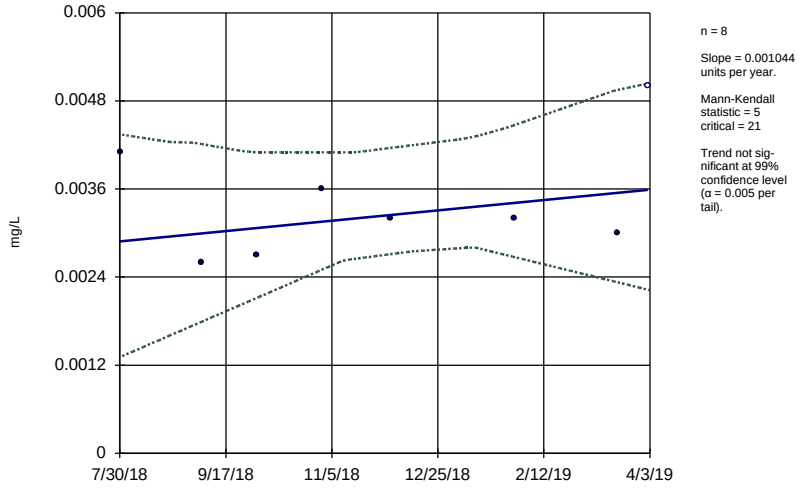
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = 0.001044 units per year.

Mann-Kendall statistic = 5
critical = 21

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

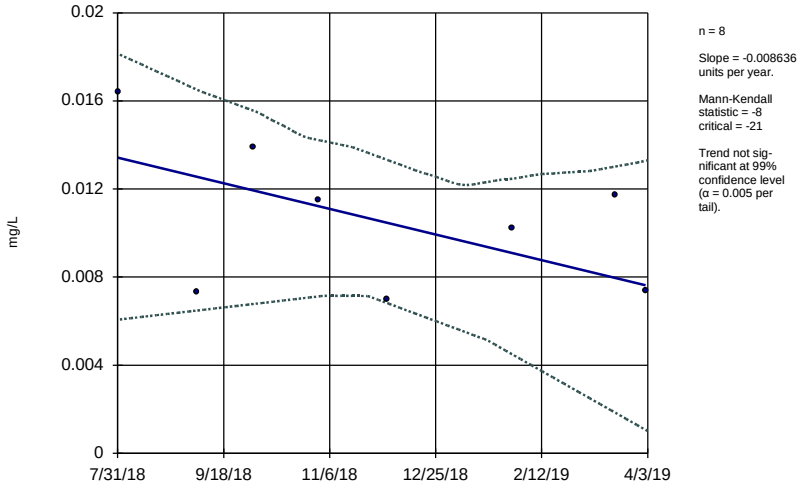
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = -0.008636 units per year.

Mann-Kendall statistic = -8
critical = -21

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

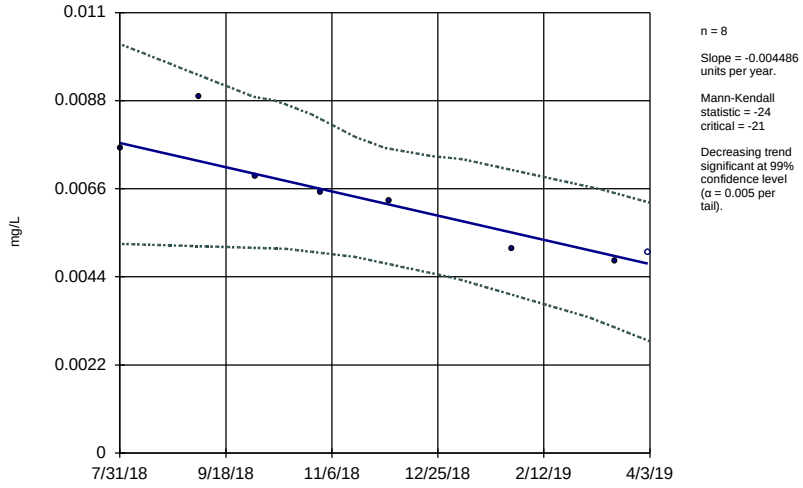
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -0.004486 units per year.

Mann-Kendall statistic = -24
critical = -21

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

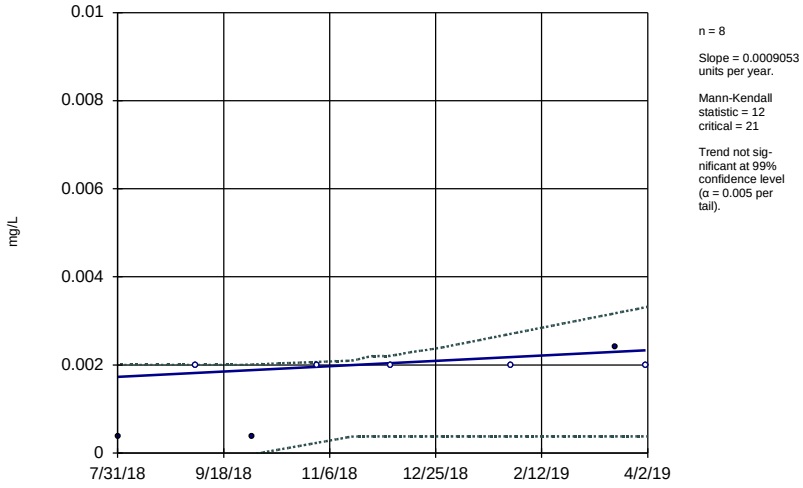
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0.0009053 units per year.

Mann-Kendall statistic = 12
critical = 21

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

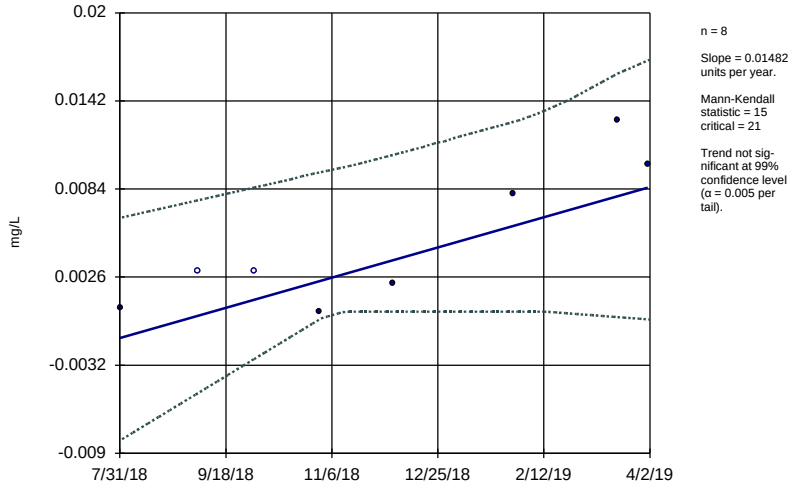
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = 0.01482 units per year.

Mann-Kendall statistic = 15
critical = 21

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

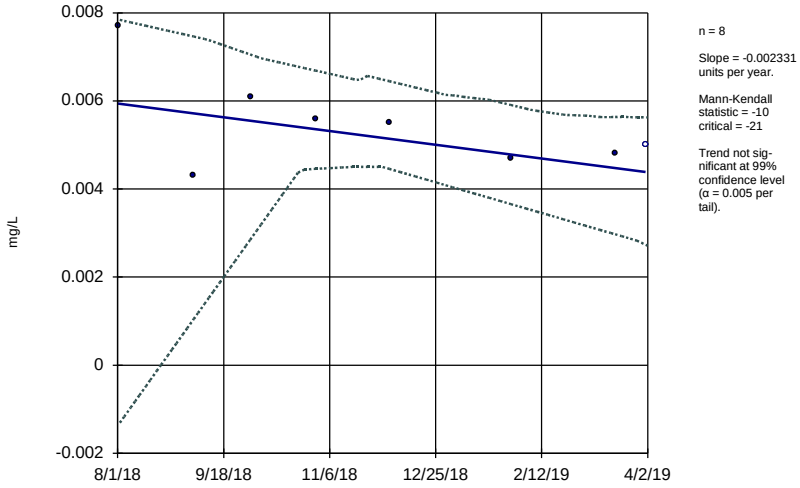
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -0.002331 units per year.

Mann-Kendall statistic = -10
critical = -21

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

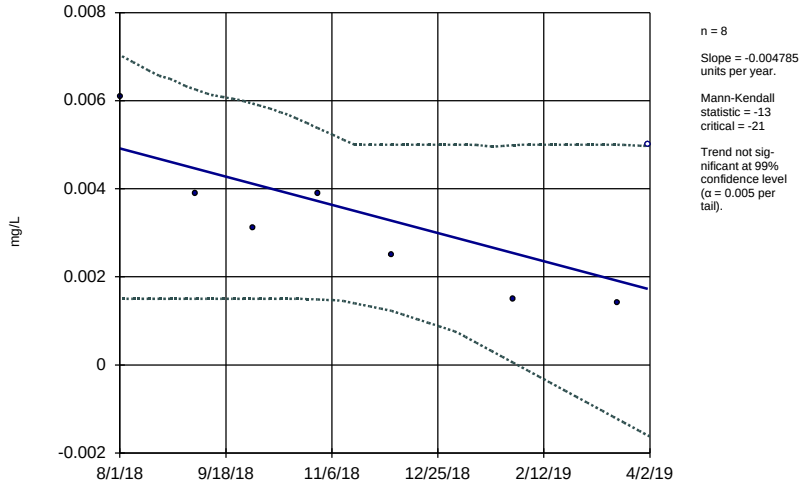
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = -0.004785 units per year.

Mann-Kendall statistic = -13
critical = -21

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

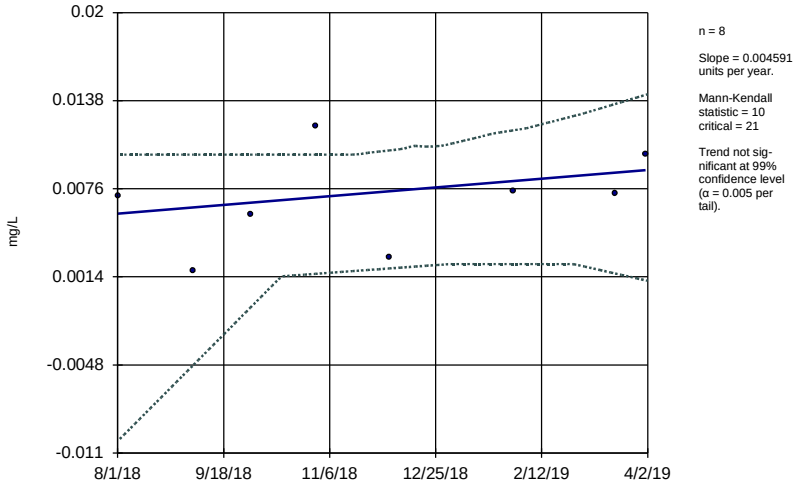
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0.004591 units per year.

Mann-Kendall statistic = 10
critical = 21

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

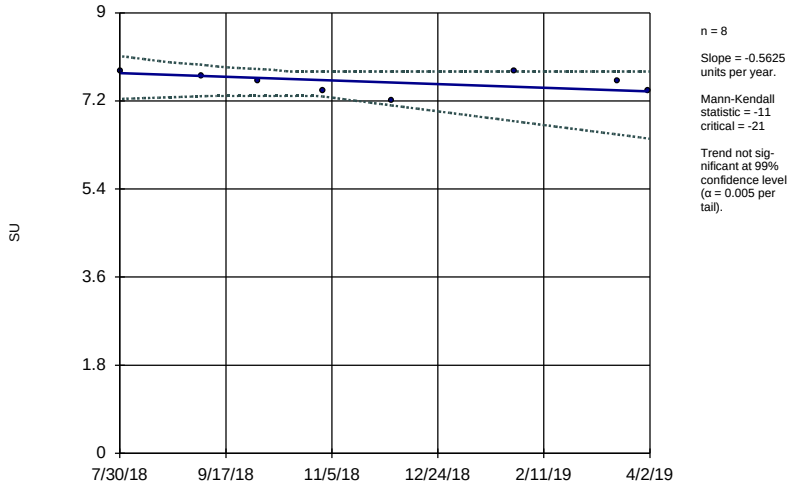
Constituent: Molybdenum, dissolved Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-1



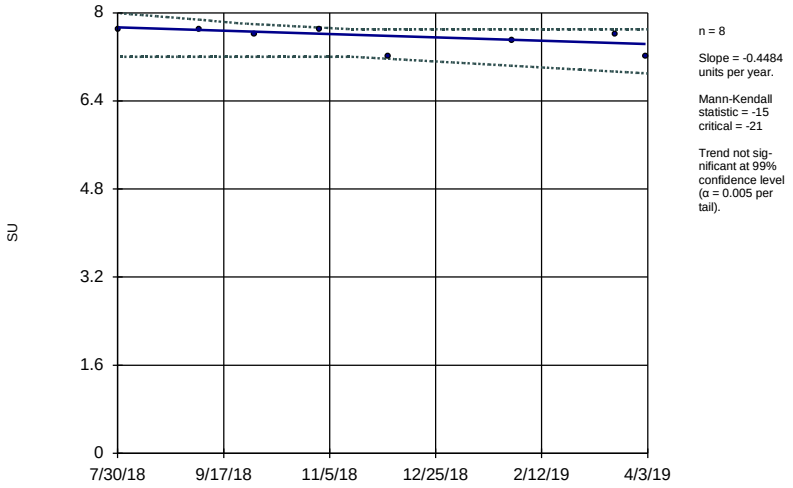
Constituent: pH Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



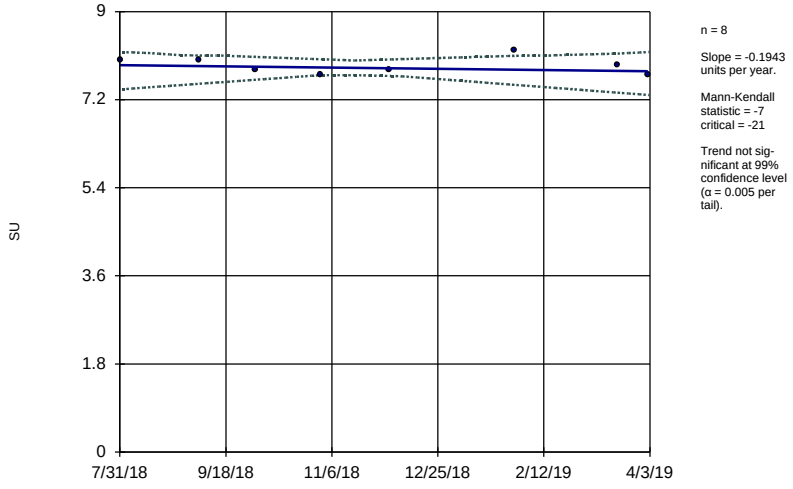
Constituent: pH Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-3



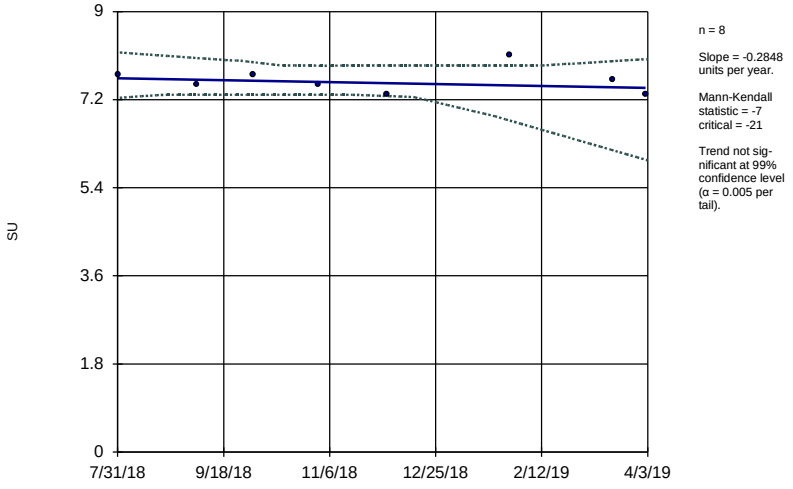
Constituent: pH Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-4 (bg)



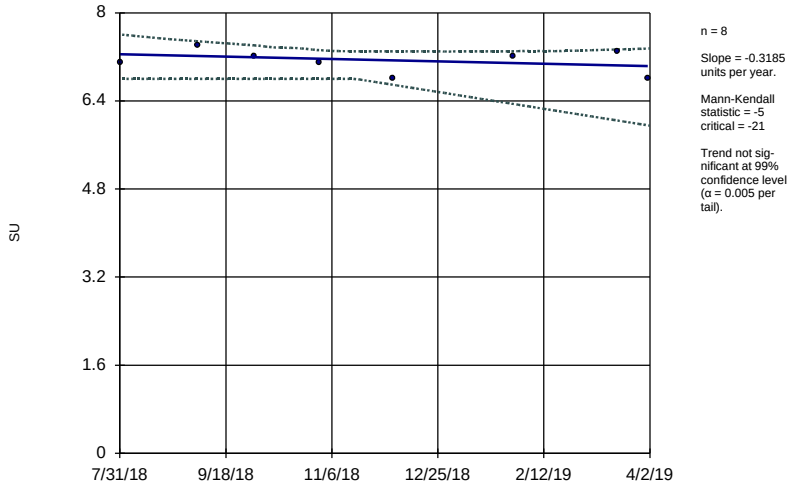
Constituent: pH Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-5



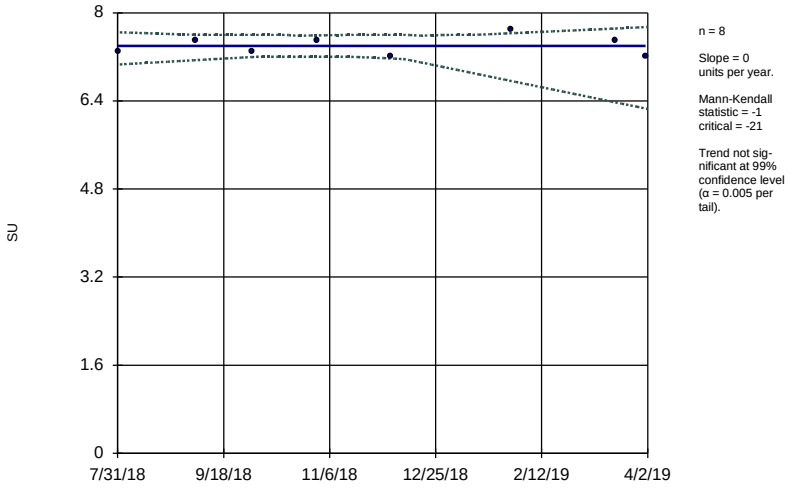
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-6



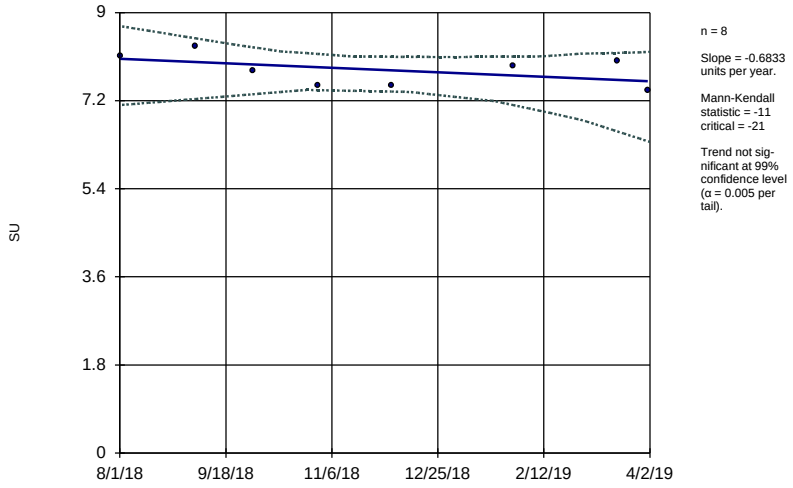
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-7 (bg)



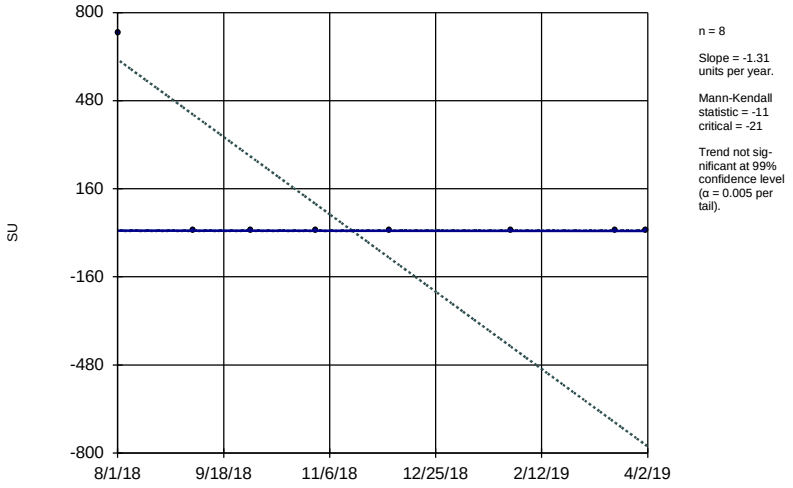
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-8 (bg)



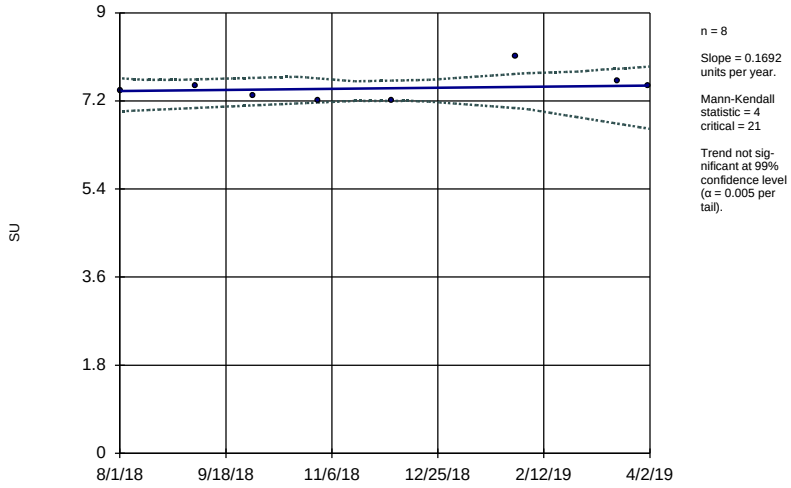
Constituent: pH Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0.1692 units per year.

Mann-Kendall statistic = 4
critical = 21

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

Constituent: pH Analysis Run 2/19/2020 2:12 PM

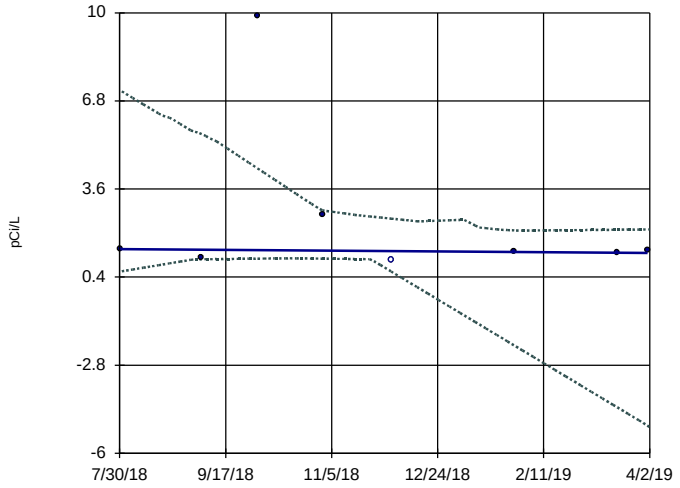
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = -0.2103 units per year.

Mann-Kendall statistic = -4
critical = -21

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

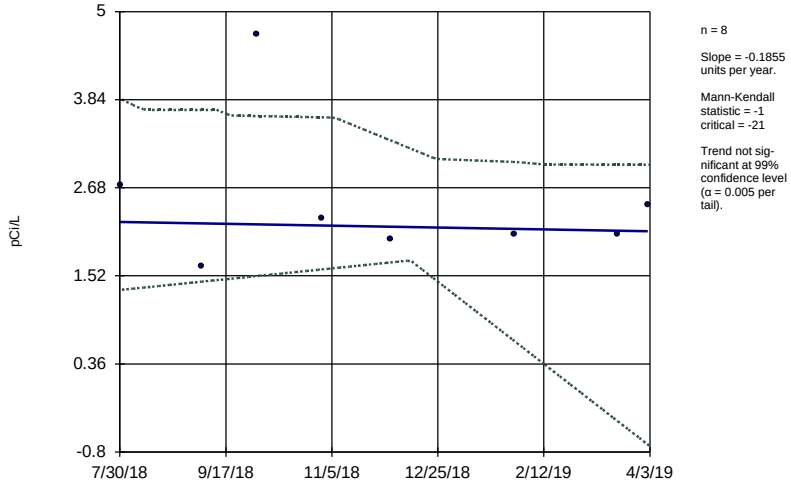
Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = -0.1855 units per year.

Mann-Kendall statistic = -1
critical = -21

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

Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

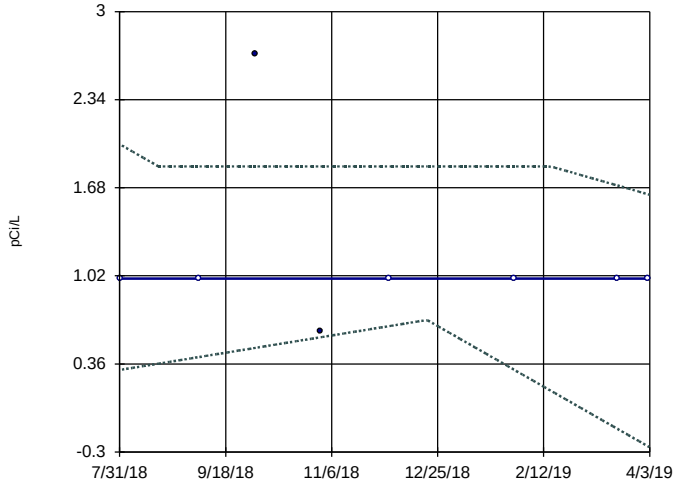
Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -1
critical = -21

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

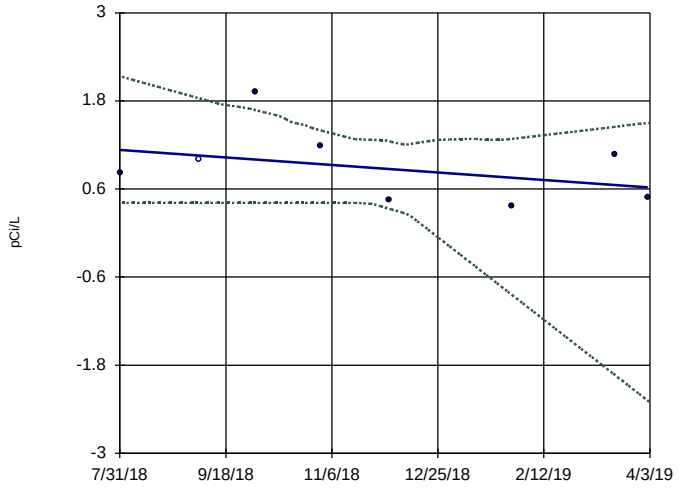
Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = -0.7586 units per year.

Mann-Kendall statistic = -6 critical = -21

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

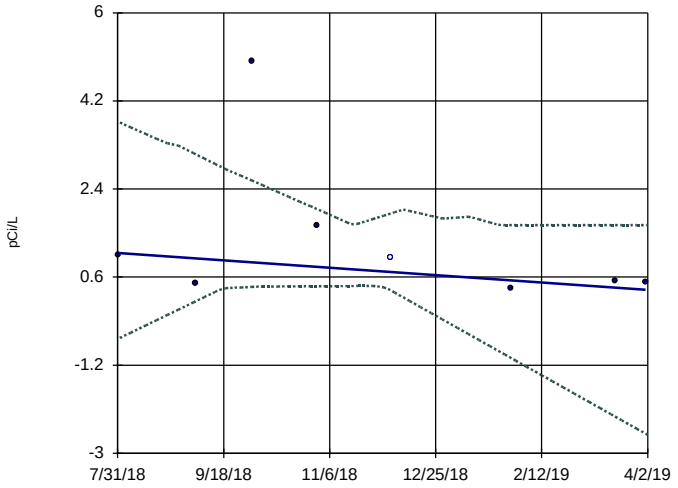
Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = -1.127 units per year.

Mann-Kendall statistic = -10 critical = -21

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

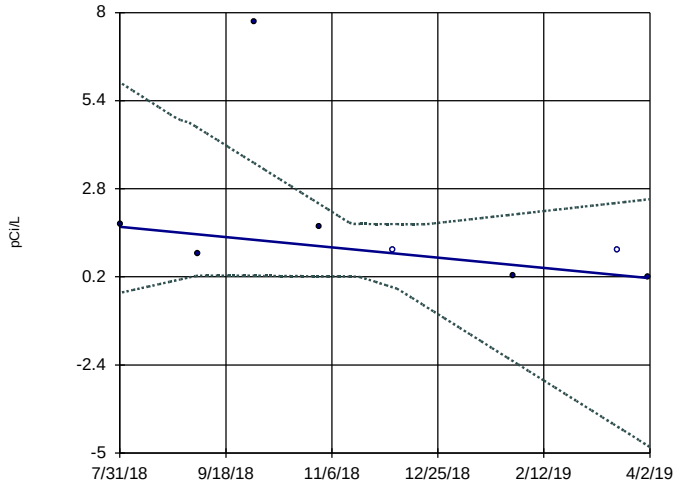
Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = -2.262 units per year.

Mann-Kendall statistic = -15 critical = -21

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

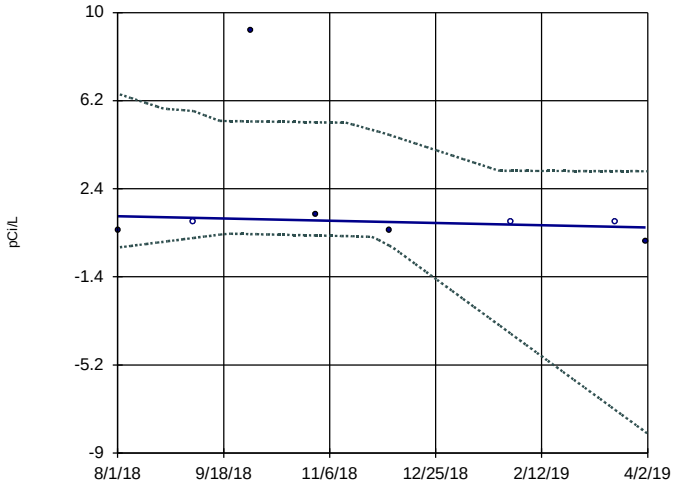
Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



n = 8

Slope = -0.7218 units per year.

Mann-Kendall statistic = -5 critical = -21

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

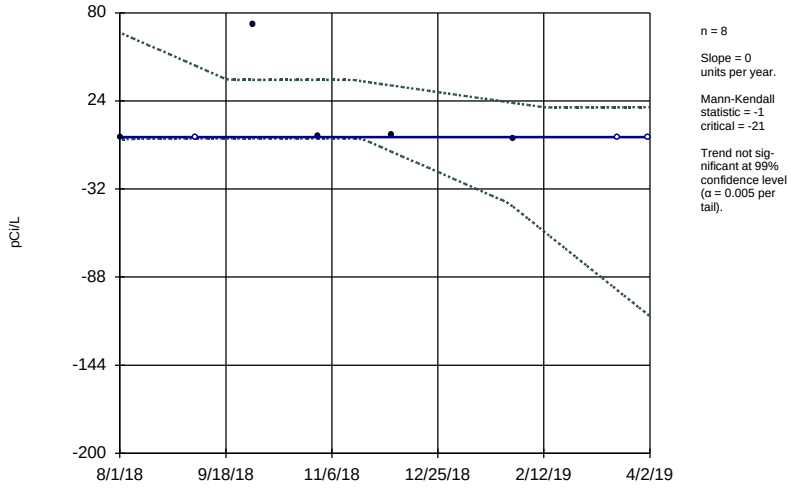
Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -1 critical = -21

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

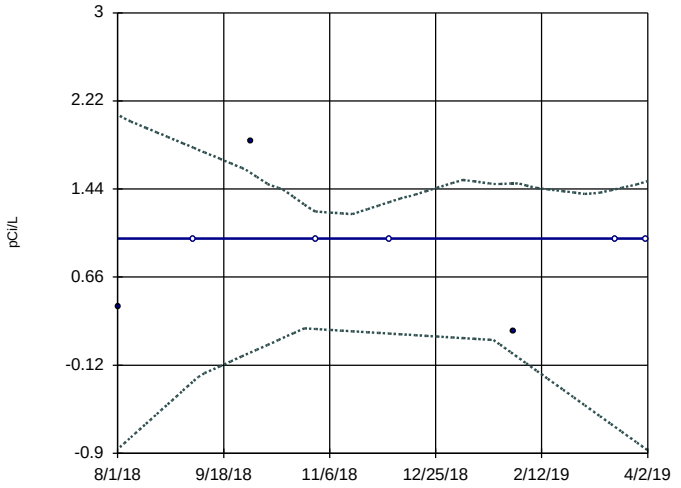
Constituent: Radium-226 Analysis Run 2/19/2020 2:12 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

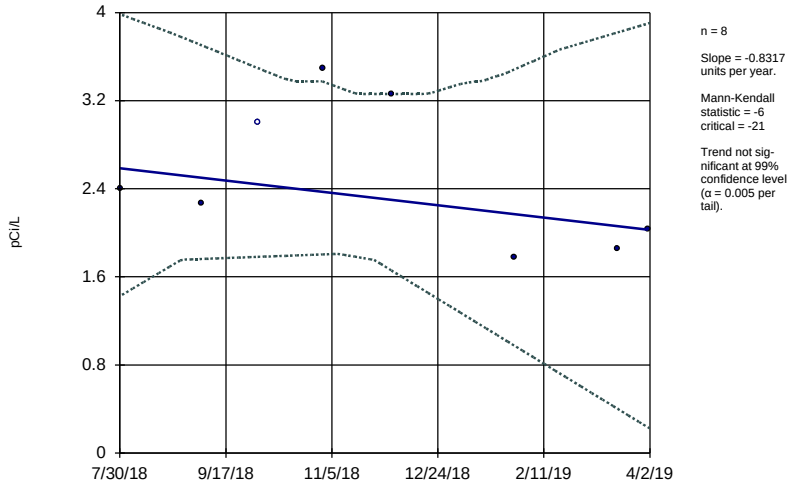
Constituent: Radium-226 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



n = 8

Slope = -0.8317 units per year.

Mann-Kendall statistic = -6 critical = -21

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

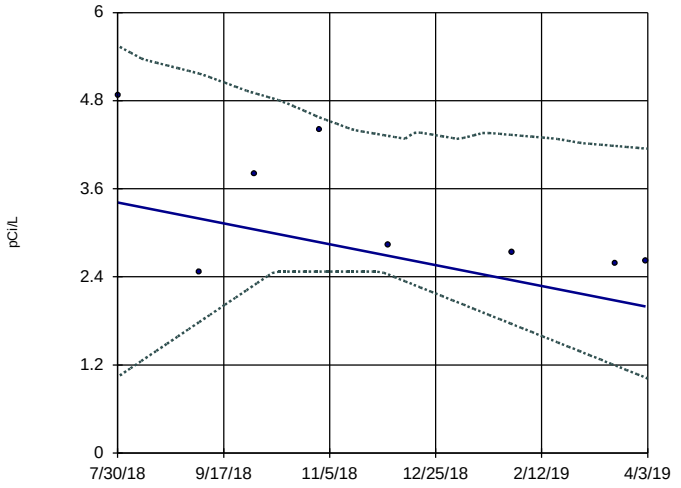
Constituent: Radium-228 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG

Sen's Slope and 99% Confidence Band

MW-2



n = 8

Slope = -2.106 units per year.

Mann-Kendall statistic = -12 critical = -21

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

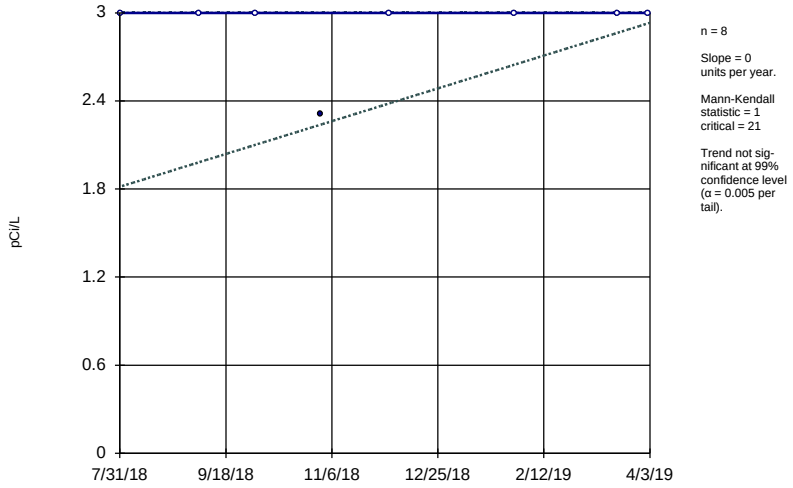
Constituent: Radium-228 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 1 critical = 21

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

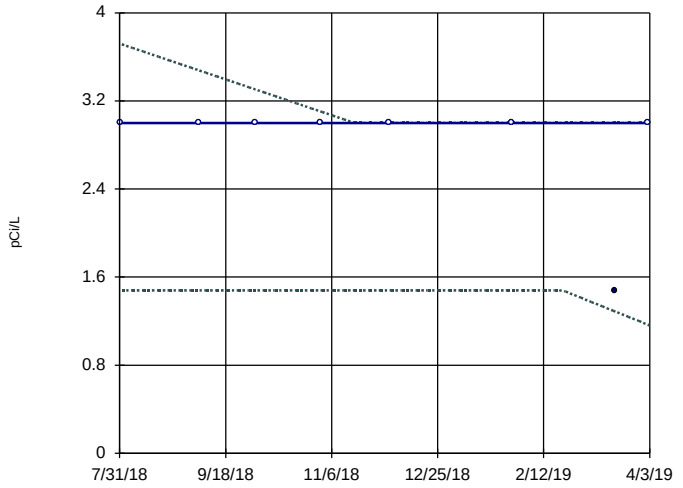
Constituent: Radium-228 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -5 critical = -21

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

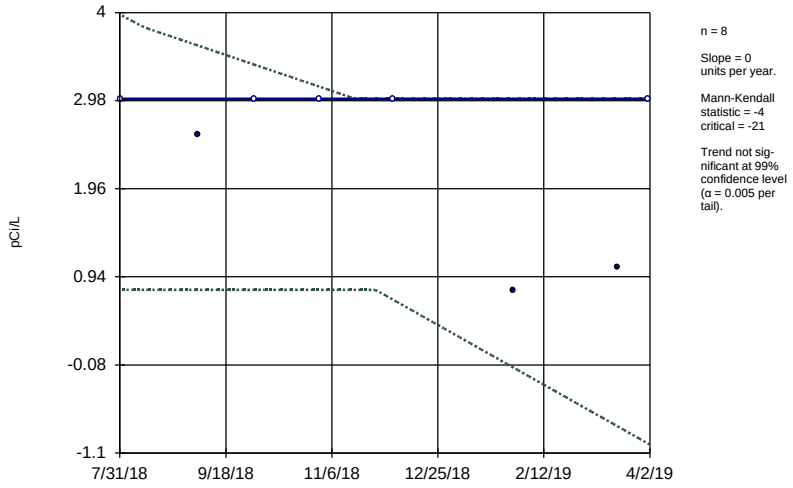
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = -4 critical = -21

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

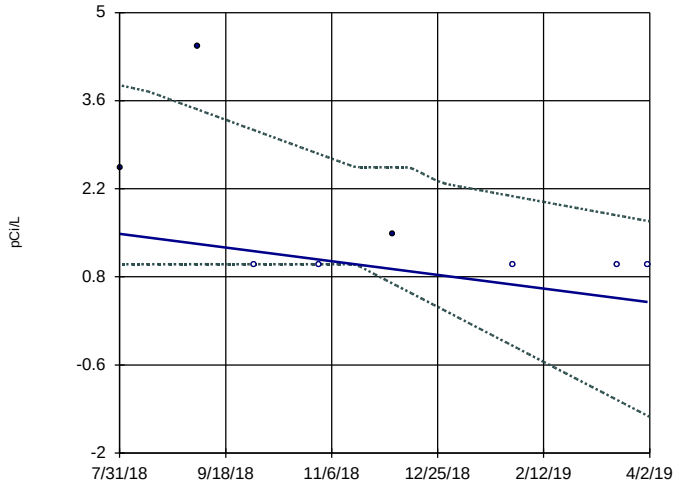
Constituent: Radium-228 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



n = 8

Slope = -1.618 units per year.

Mann-Kendall statistic = -12 critical = -21

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

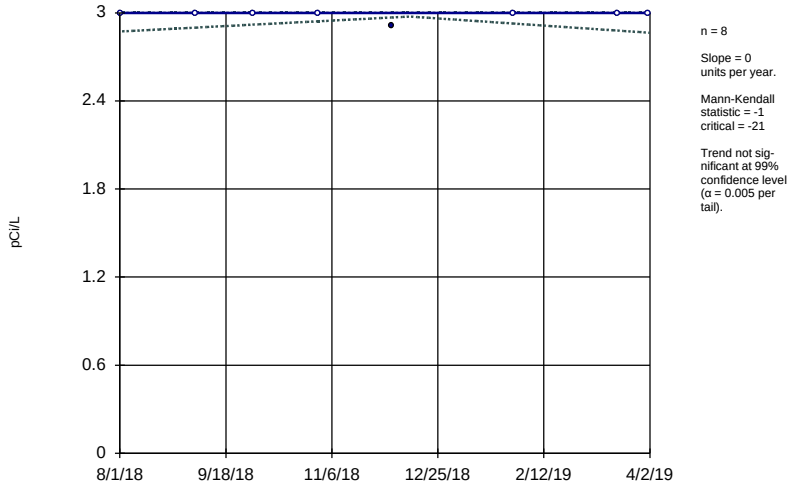
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



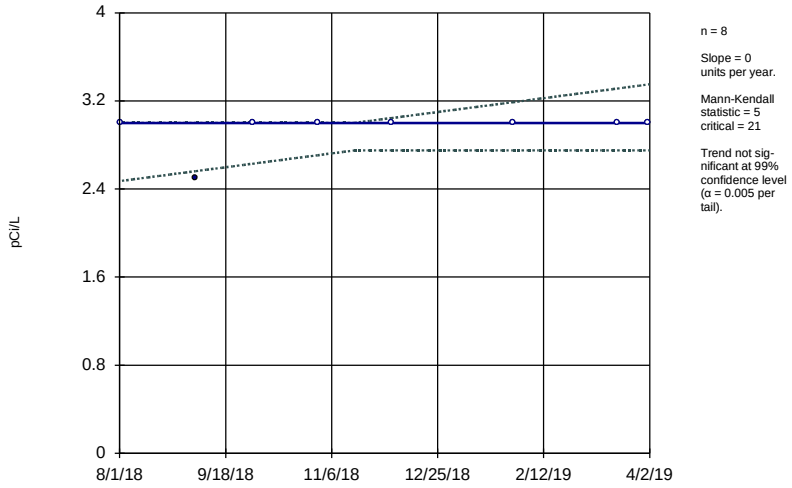
Constituent: Radium-228 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



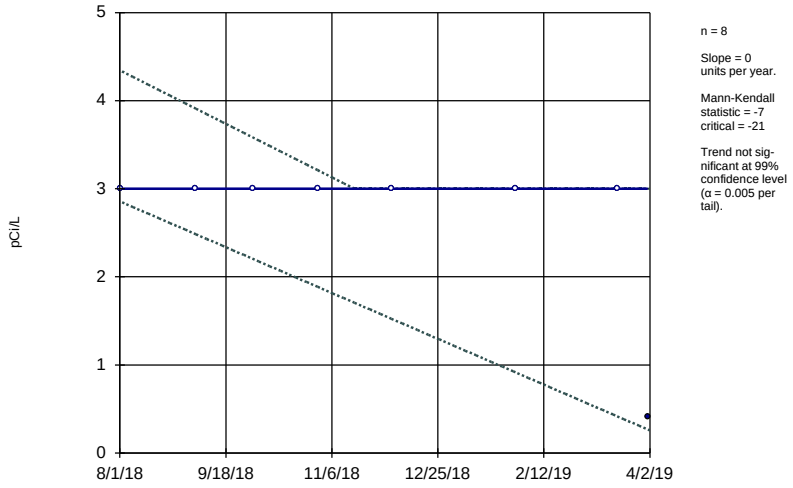
Constituent: Radium-228 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



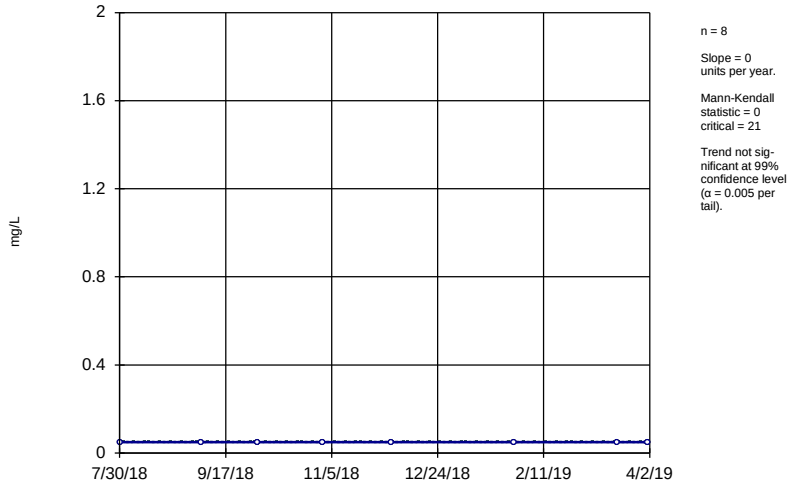
Constituent: Radium-228 Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



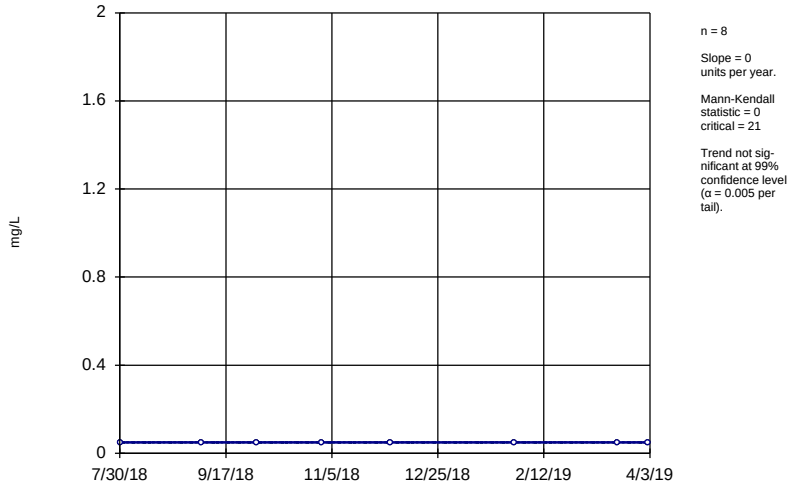
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



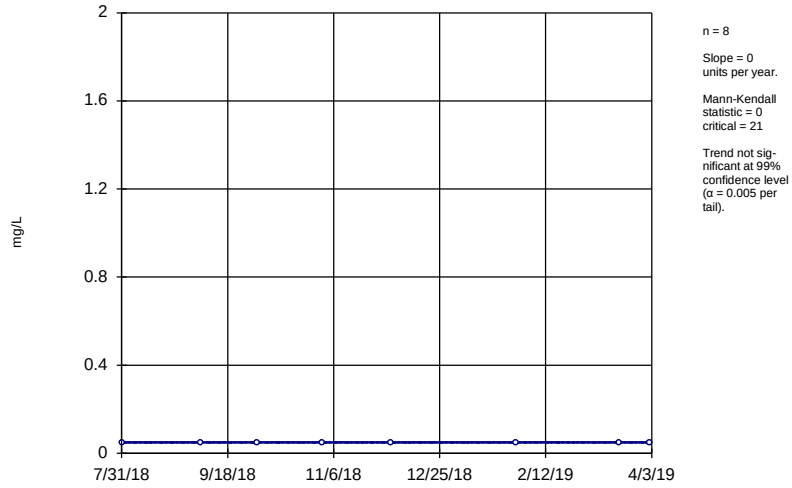
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



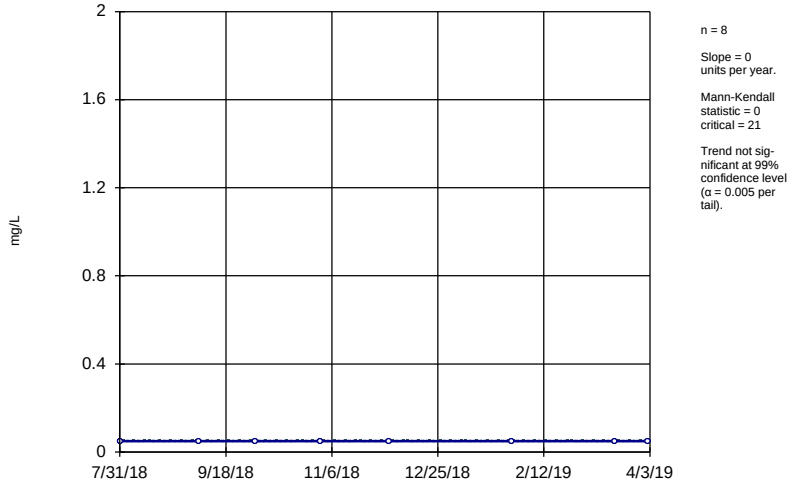
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



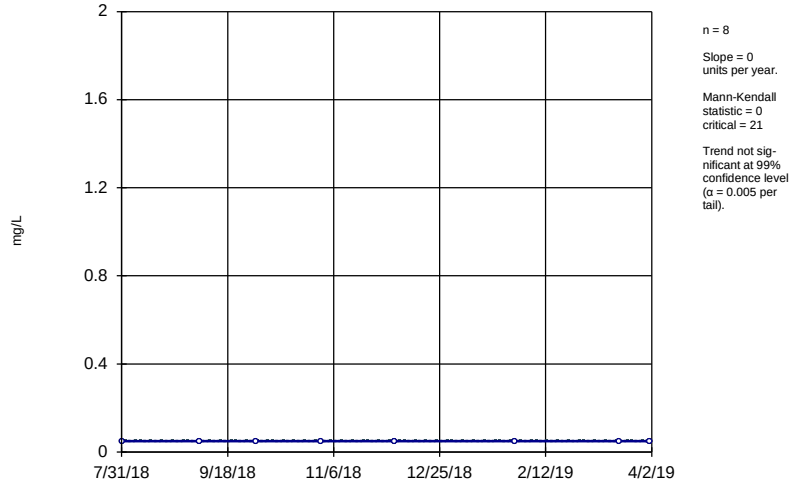
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



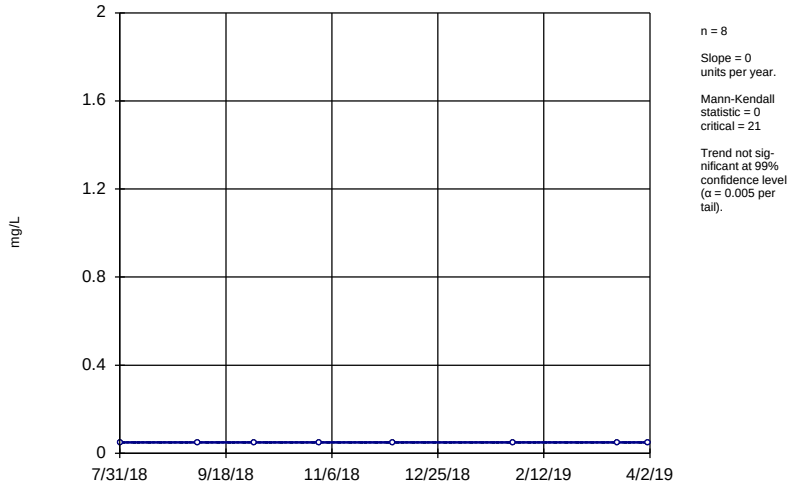
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



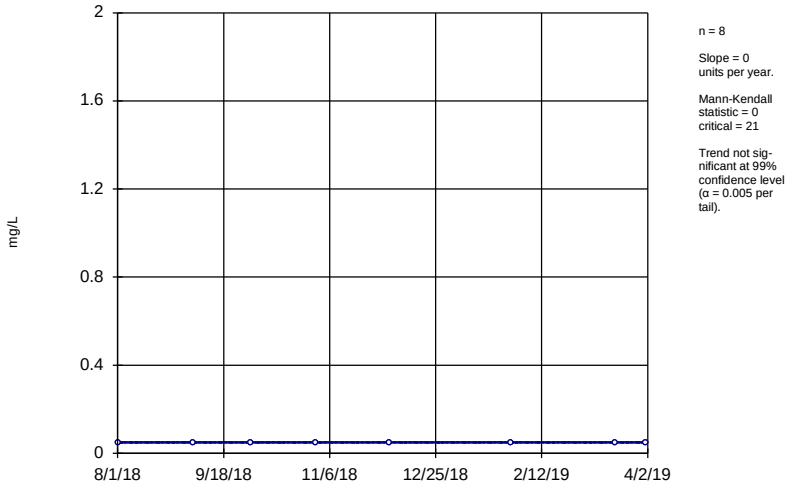
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



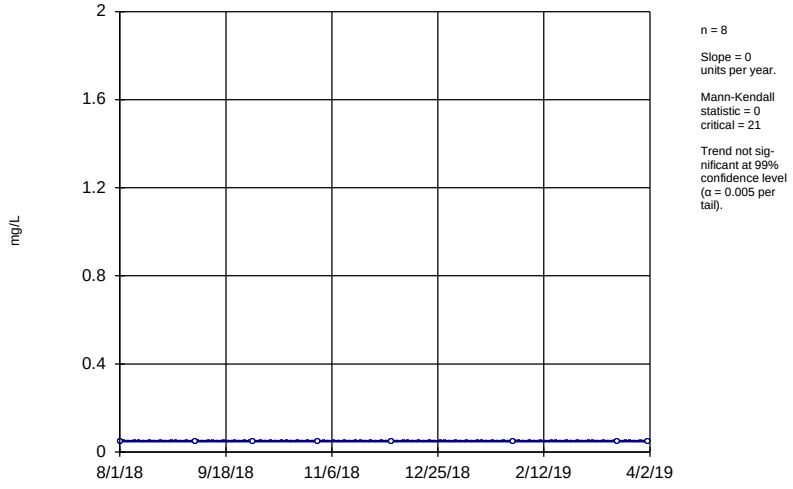
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



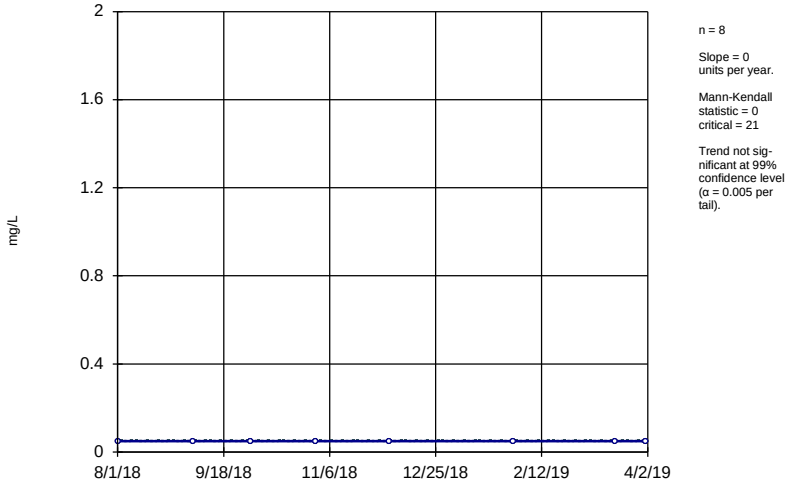
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



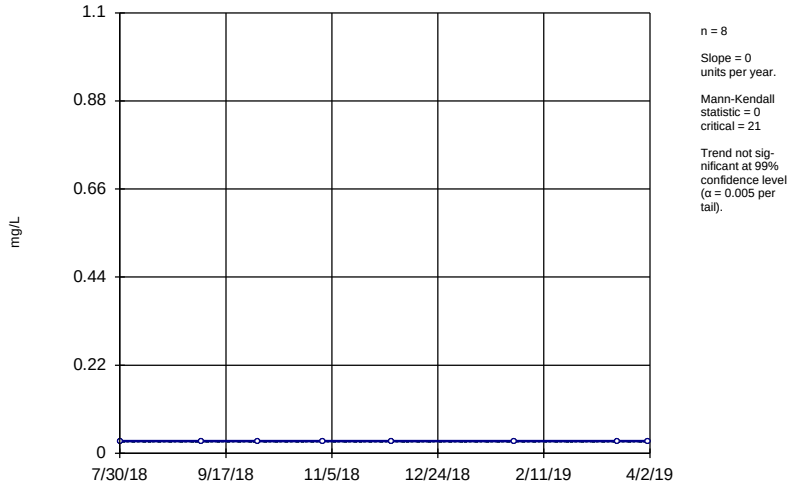
Constituent: Selenium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-1



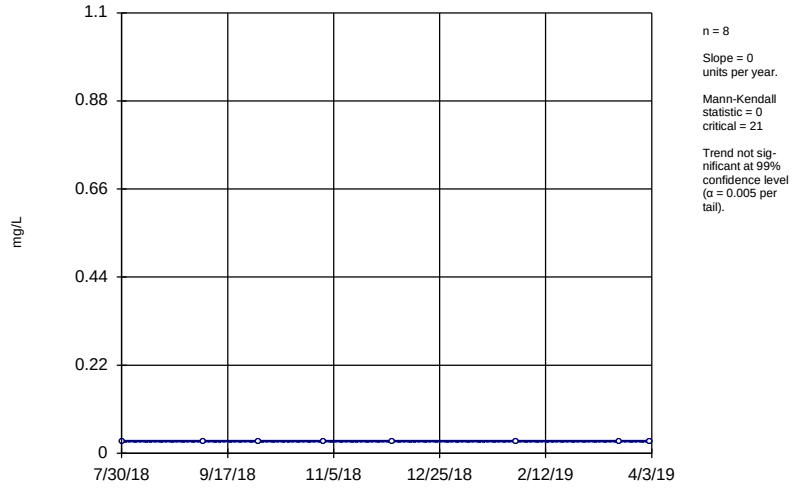
Constituent: Thallium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-2



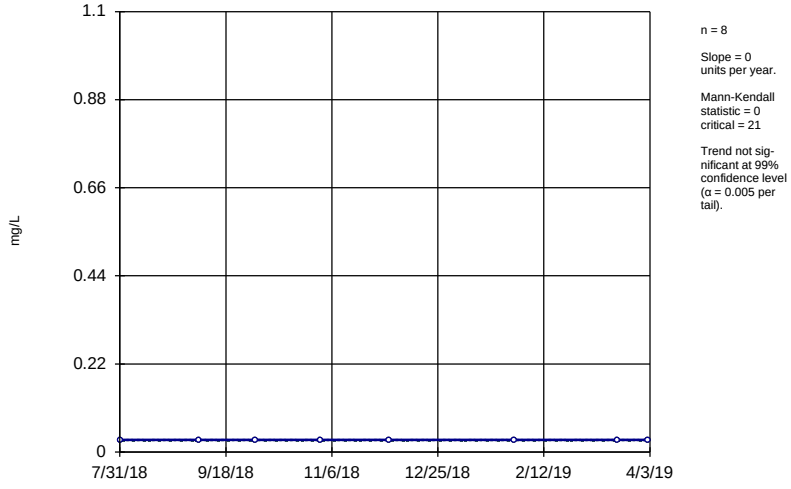
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-3



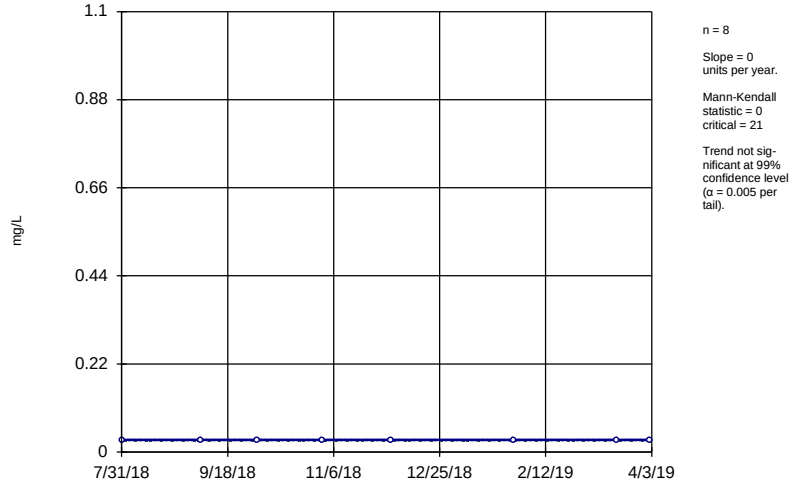
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-4 (bg)



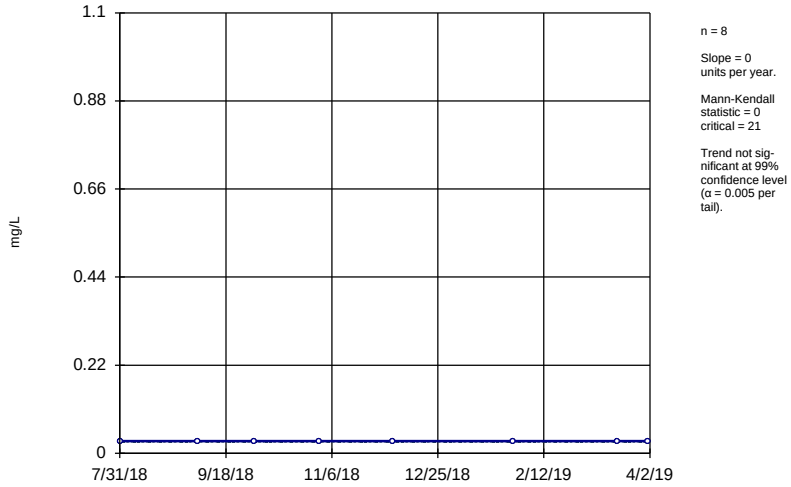
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Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-5



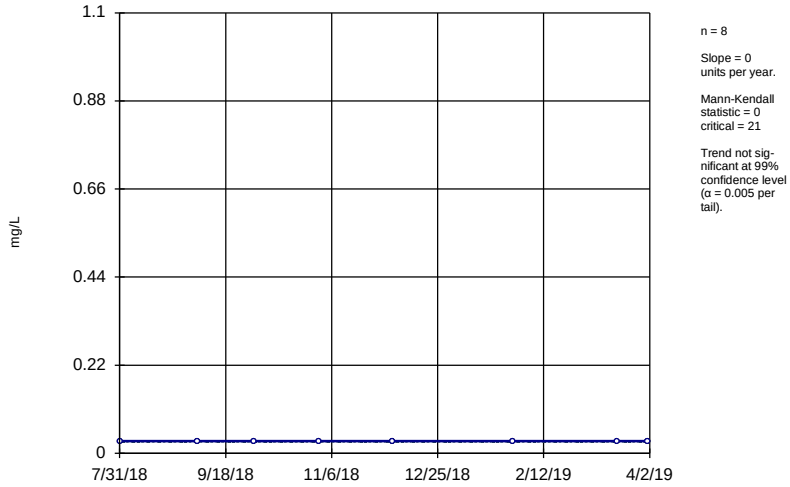
Constituent: Thallium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-6



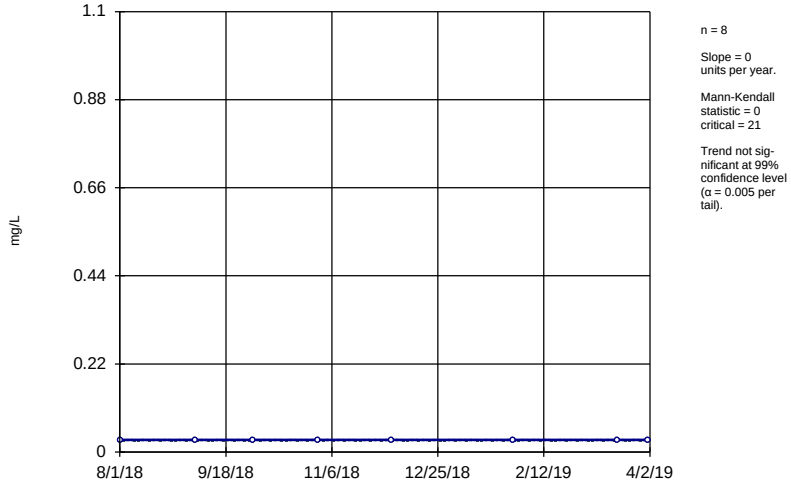
Constituent: Thallium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-7 (bg)



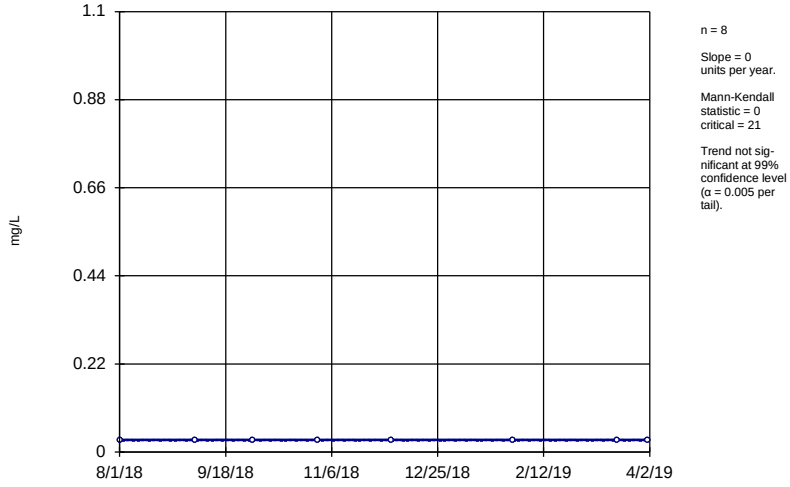
Constituent: Thallium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-8 (bg)



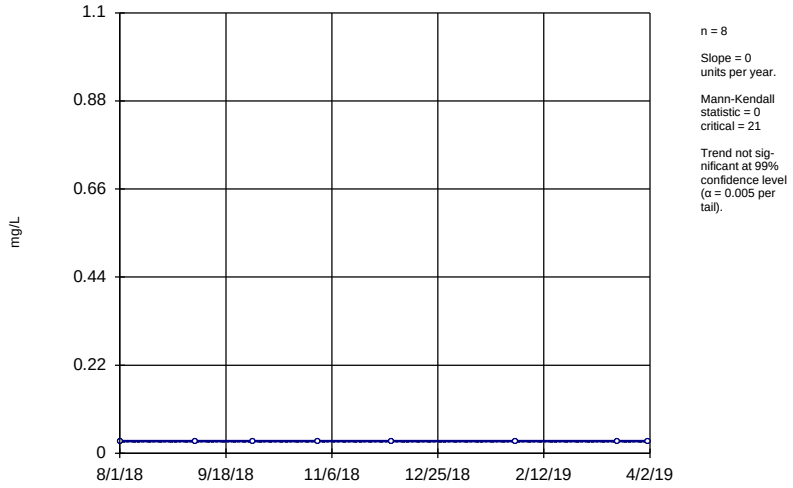
Constituent: Thallium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database

Sanitas™ v.9.6.25 Software licensed to Weaver Consultants Group. UG
Hollow symbols indicate censored values.

Sen's Slope and 99% Confidence Band

MW-9



n = 8

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 21

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

Constituent: Thallium, dissolved Analysis Run 2/19/2020 2:13 PM

Former Hudson Generating Station Client: Weaver Consultants Group Data: Hudson CCR Database