FIRST ANNUAL CCR GROUNDWATER MONITORING and CORRECTIVE ACTION REPORT 2017

MARQUETTE BOARD OF LIGHT AND POWER SHIRAS STEAM PLANT MARQUETTE, MICHIGAN

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Acronyms

ASD	Alternate Source Demonstration
BGS	Below Ground Surface
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
GWMS	Groundwater Monitoring System
GWPS	Groundwater Protections Standard
IGLD85	International Great Lakes Datum of 1985
MBLP	Marquette Board of Light and Power
MCL	Maximum Contaminant Level
NPDES	National Pollutant Discharge Elimination System
SDWA	Safe Drinking Water Act
SSI	Statistically Significant Increase

1.0 Introduction

AECOM Technical Services of Michigan, Inc. (AECOM) was contracted by the Marquette Board of Light and Power (MBLP) to complete activities related to groundwater monitoring of the coal ash Holding Ponds at the Shiras Steam Plant, in Marquette, Michigan in accordance with 40 Code of Federal Regulations (CFR) Part 257, titled Disposal of Coal Combustion Residuals from Electric Utilities (CCR rule) published April 17, 2015. This report serves to report the groundwater monitoring and corrective action activities conducted in 2017.

1.1 Regulatory Background

The CCR rule established standards for the disposal of CCR in landfills and surface impoundments (CCR units). In particular, the rule set forth groundwater monitoring and corrective action requirements, including the requirement for an "annual groundwater monitoring and corrective action report" (annual report), with the first annual report due by January 31, 2018. The annual report is intended to document the status of the groundwater monitoring and corrective action program for each CCR unit, summarize key actions completed in the previous year, and project key activities for the upcoming year.

1.2 Facility Location and Operational History

The MBLP Shiras Steam Plant is located at East Hampton Street, in Marquette, Michigan along the shoreline of Lake Superior, as shown in Figures 1 and 2. The plant began operation in 1967 with the construction and operation of Unit 1. Unit 2 came on line in 1972 and Unit 3 in 1983.

The Shiras Steam Plant generating station has one CCR surface impoundment identified herein as the Holding Pond. The Holding Pond is located north of the generating station. The location of the Holding Pond is shown on Figure 1.

The MBLP Shiras Steam Plant includes three coal-fired power-generating units:

- Unit 1 10 megawatts (out-of-service with no plans to re-commission)
- Unit 2 21 megawatts (currently off-line)
- Unit 3 44 megawatts (currently operating)

1.3 CCR Unit Description

As shown in Appendix E, the Holding Pond is composed of 5 cells which are enclosed by steel sheet pile walls. It has been expanded and modified a number of times since initial construction. The south and west boundaries of the Holding Pond are formed by the shoreline of Lake Superior. The east and north boundaries of the Holding Pond are formed by sheet pile walls which were constructed in 1981. Because of the poor condition of the original north wall, an additional wall was constructed to replace it in 2013. The new wall was placed inside of the original existing north wall, which remains but no longer provides containment. The walls for the inner cells 1, 2, and 3 were constructed in 1990. There are also some abandoned sheet pile walls in place from previous configurations. The last change to the pond configuration was the addition of the north sheet pile wall in 2013 mentioned above.

The Holding Pond is operated as a zero-discharge facility during normal conditions and does not discharge water. All water discharged to the Holding Pond via sluicing or

precipitation is held within the ponds, pumped to a 300,000 gallon equalization/reuse storage tank, and/or recirculated to the plant. Low, medium, and high service water pumps recycle the reclaimed water for plant use. The normal operating level of the Holding Pond varies, but is approximately at elevation 606.0 feet International Great Lakes Datum of 1985 (IGLD85). All elevations are given according to IGLD85, unless noted otherwise. During emergency situations, an outfall weir at elevation 606.6 feet and an emergency overflow weir at elevation 607.4 feet, which are regulated via a NPDES permitted outfall (#004A), discharge water from the Holding Pond through the east wall directly into Lake Superior. However, discharge from the pond has been reserved for emergency situations and there have been only three to five discharges in the last fifteen years. The north and east perimeter sheet pile walls have a top elevation of 609.00 feet. The ordinary high water surface elevation of Lake Superior is 603.1 feet and is evaluated by the United States Army Corps of Engineers Detroit District.

1.4 Physical Setting and Geology

The site is located in the Peshekee Highlands section of the Superior Uplands physiographic province (MGS, 2013). The regional landscapes are dominated by bedrock-controlled ground surfaces that may have been modified by glacial scour and deposition. Bedrock in this region consists of chloritic slate and schist of the lower member of the Precambrian age Mona Schist (Gair and Thaden, 1968; TPT, 1994). The depth to bedrock in the vicinity of the site is variable and can be seen as outcrops in the area. In other areas, depth to bedrock is estimated to be 100 to 150 feet below ground surface (bgs). The surficial soils generally consist of sand with some finer silt lenses. Based on regional geology, there appears to be a deeper confined aquifer beneath the fine silty layer. Locally, this layer appears to be located approximately 40 feet bgs.

Boring logs from a Limited Site Investigation conducted at a location approximately 1,000 feet north from the CCR impoundment, indicate silty clay/clayey silt layers present at approximately 8 - 12 feet and 18 - 20 feet bgs (Mannik Smith, 2013). A cross section diagram for Swanson Tire site, approximately 860 feet west of the Shiras site, shows groundwater present from 9.0 to 9.5-feet bgs in the area, and flowing eastward towards Lake Superior and/or Orianna Brook, which discharges to Lake Superior adjacent to the north side of the Shiras CCR impoundment (Tri-Media, 2000).

2.0 Groundwater Monitoring and Corrective Action Process Overview

The groundwater monitoring and corrective action process is established in Parts 257.90 through 257.98 of the CCR rule. The process includes a phased approach to groundwater monitoring, leading (if applicable) to the establishment of groundwater protection standards (GWPSs) for each CCR unit. Groundwater monitoring is performed using a network of monitoring wells (groundwater monitoring system) that includes both wells to monitor background water quality (not impacted by the CCR unit) and wells placed at the downgradient boundary of the CCR unit. The first phase of groundwater monitoring is the Detection Monitoring phase, which focuses on a set of constituents (listed in Appendix III of the CCR rule) that are the more mobile components of CCR and represent indicators of possible impacts from CCR in groundwater. If statistically significant increases (SSIs) of any of the Appendix III constituents relative to background conditions are detected in the downgradient waste boundary wells, and cannot be demonstrated to be associated with a source other than the CCR unit, then groundwater monitoring moves into the second phase, Assessment Monitoring.

The second phase of groundwater monitoring focuses on the constituents listed in Appendix IV of the CCR rule. The Appendix IV constituents generally are less mobile and occur at lower concentrations in groundwater than the Appendix III constituents. Concentrations of Appendix IV constituents in downgradient wells are compared to GWPSs. The GWPSs, established for Appendix IV constituents only, are the higher of either the federal Safe Drinking Water Act (SDWA) maximum contaminant level (MCL) or the background concentration for each constituent.

If exceedances of the GWPSs are determined to be occurring in the downgradient boundary wells at statistically significant levels, and no alternative sources for the exceedances can be demonstrated, then both additional groundwater characterization and Assessment of Corrective Actions are initiated. Following Assessment of Corrective Measures, a remedy (or set of remedial activities) is selected and implemented as the groundwater Corrective Action Program for the CCR unit. According to the CCR rule, groundwater corrective action will continue until compliance with the GWPSs has been attained in all impacted wells, and sustained for a period of 3 consecutive years.

The process described above relies on appropriate sampling locations (wells), baseline data, and statistical methods to establish local background concentrations of the constituents in both Appendices III and IV, and to compare the concentrations in downgradient wells to background and/or maximum contaminant levels (MCLs).

3.0 Groundwater Activities in 2017

For each existing CCR unit that continued to receive CCR after October 2015, the rule requires that the following be performed prior to October 17, 2017, in order to support the process:

- Install and certify a groundwater monitoring system (GWMS) that is compliant with the rule, in the uppermost aquifer (and lower aquifers that are hydraulically interconnected to the uppermost aquifer) that underlies the unit.
- Develop a groundwater sampling and analysis program, including selection of statistical procedures.
- Collect and analyze a minimum of eight rounds of independent samples from the background and downgradient wells in the groundwater monitoring system.
- Begin evaluating the data to support Detection Monitoring for the Appendix III constituents.

The activities listed above were completed in calendar year 2017 and are described below.

3.1 Monitoring Well Installation, Development, and Testing

Five monitoring wells were installed in the vicinity of the Shiras Steam Plant Holding Pond as shown on Figure 2. Monitoring wells MW-1, MW-2, and MW-3 were installed hydraulically downgradient of the Holding Ponds. Monitoring wells MW-4 and MW-5 were installed hydraulically upgradient of the Holding Pond.

Monitoring wells were installed by Colman Engineering, with observation by AECOM personnel. Monitoring wells were advanced using a Geoprobe[™] 7822DT equipped with 4.25 inch Hollow Stem Augers (HSA). Downgradient wells MW-1, MW-2, and MW-3 were installed from a platform barge within the lake. Soil samples were collected with a macrocore sampler. Recovered soils were logged for lithology and moisture content. Boring logs were completed during drilling to characterize the subsurface lithology and to identify the uppermost aquifer. Monitoring well construction details are summarized in Table 1. Borehole lithology is summarized in Table 2. Complete boring logs and monitoring well construction details are provided in Appendix A.

Following installation, monitoring wells were developed using disposable polyethylene bailers to remove sand and sediment from the sand pack to facilitate the entry of representative groundwater to the screened interval.

Slug testing was performed following monitoring well development to determine the hydraulic conductivity of the aquifer. Slug tests were performed on MW-2 and MW-5 to assess the hydraulic characteristics of the uppermost aquifer.

Testing began with the measurement of the static water level and total depth. A known volume of water was removed and after the last bailer of water removed, a pressure transducer was lowered in the well to record the depth to water until the water level had recovered to approximately 90 percent of the initial head change.

Data from the slug tests performed at the site were processed and analyzed using AQTESOLV (Version 4.5), an aquifer test analysis software package that performs the

analyses (HydroSOLVE 2007). Further details of slug testing procedures and findings are presented in Appendix D.

The calculated hydraulic values at MW-2 and MW-5 range from 1.7×10^{-4} cm/sec to 3.0×10^{-5} cm/sec, with a Geometric mean of 1.1×10^{-4} cm/sec. The calculated hydraulic conductivity values are within range of the cited literature values consulted during the slug testing data analysis and are considered representative of the uppermost aquifer beneath the site.

3.2 Groundwater Monitoring Activities

Groundwater monitoring events for the reporting period include groundwater level measurements and eight baseline sampling events, beginning with the first event in July 2017 and concluding with the eighth event on October 5, 2017. Each Baseline Monitoring event was conducted in general accordance with procedures established the USEPA technical guidance document for low flow sampling (USEPA, 1996). Equipment calibration, monitoring well water level measurement, monitoring well purging and sampling, sample custody, sample shipping, laboratory analysis and documentation requirements are summarized in section 5.0 below.

Upon review of field sampling data, it was discovered the pH values for the 4th sampling event (August 29, 2017) were lower than all other sampling events for all monitoring wells. Further investigation indicated that a YSI DSS Pro was used for all sampling events except the August 29, 2017 sampling event. A rental YSI 556 was used during the August 29, 2017 sampling event which yielded lower than normal pH measurements. As a result, the field pH measurements for the August 29, 2017 sampling have been removed from the data set for statistical evaluation.

4.0 Monitoring System Evaluation

Monitoring wells for the CCR monitoring program were installed in the July. All monitoring system components were observed to be functional and in excellent condition at the conclusion of Baseline Monitoring events in October of 2017.

Groundwater flow conditions in the alluvial aquifer underlying the Holding Pond during the reporting period were measured and are represented by the potentiometric surface and groundwater flow directions indicated on Figures 3 through 10. As shown on these maps, groundwater flow is to the northeast with groundwater elevations ranging from approx. 609 feet, IGLD85 on the upgradient (southwest) side to approximately 606 feet, IGLD85 on the downgradient (northeast) side of the Holding Pond. These conditions are consistent with those anticipated for long-term monitoring of the CCR unit and with the assignment of background and downgradient monitoring locations noted in Section 3.1 above.

Measured groundwater elevations in the downgradient monitoring wells (MW-1, MW-2, and MW-3) are approximately 2 to 3 feet above the nominal surface elevation of Lake Superior. The artesian conditions of these water levels indicate the downgradient monitoring wells are properly installed in the uppermost aquifer, and that the uppermost aquifer is confined and is not hydraulically connected to Lake Superior in the area of the Holding Pond.

In downgradient monitoring wells, the boring logs indicate silty clay to clayey silt layers from approximately 5 feet below top of lake sediment to approximately 15 feet below top of lake sediment that serves as a confining layer.

The network includes the minimum required 3 downgradient monitoring wells because of the small size of the CCR unit. The downgradient perimeter of the unit is 185 feet in length so the maximum distance between downgradient wells is approximately 13 feet at MW-1 to 17 feet at MW-3. This separation will provide adequate coverage to monitor all potential pathways from the unit to the downgradient aquifer.

Based on the conditions identified in this section, the monitoring well network, as installed, meets the requirement for a groundwater monitoring system in the CCR rule 40 CFR Part 257.91.

5.0 Groundwater Sampling and Analysis

The following section summarizes the sampling and analysis tasks completed in support of the CCR rule in 2017.

Following the installation, development, and testing of the monitoring wells, groundwater sampling activities commenced on July 19, 2017. All 5 monitoring wells were sampled for the Detection Monitoring Program (Appendix III, CCR Rule) parameters (Boron, Calcium, Chloride, Fluoride, pH, Sulfate and Total Dissolved Solids) and the Assessment Monitoring Program (Appendix IV, CCR Rule) Parameters (Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Fluoride, Lead, Lithium, Mercury, Molybdenum, Selenium, Thallium, Radium 226 and 228 combined). A total of eight independent samples were collected from each well by October 5, 2017. The analytical data was used to determine background groundwater concentrations in accordance with Part 257.93 of the CCR Rule.

The wells were sampled using methodology outlined in the USEPA technical guidance document for low flow sampling (USEPA, 1996). The upgradient wells were opened to allow for equilibration and a water level tape was used to collect depth to water measurements to the nearest tenth of a foot prior to well purging. These readings were recorded on low-flow sampling forms.

A peristaltic pump was used at all wells for purging and sampling. New polyethylene and silicone tubing was used at each sampling location. Wells were purged at a low-flow rate (100-300mL/min). Purge water was collected into 5-gallon buckets and transferred to 55-gallon steel drums for later disposal by MBLP. A YSI® DSS Pro or a YSI® 556 with in-line flow-through cell was used to measure field parameters including pH, temperature, specific conductivity, oxidation reduction potential (ORP), dissolved oxygen (DO), and turbidity. Readings were recorded on low-flow sampling forms.

Once the groundwater quality parameters had stabilized for at least 3 consecutive readings, groundwater samples were collected. The tubing was disconnected from the flow through cell and the samples collected directly from the sample tubing into prepreserved laboratory containers. Bottles were labeled with the site name, sample identification, analysis type, preservation method, and date and time of collection before being placed immediately into a cooler of ice.

Groundwater samples were transferred, under chain of custody procedures, to Trace Analytical Laboratories, a State of Michigan certified laboratory for analysis of Appendix III and Appendix IV constituents. The analytical results are detailed in the analytical laboratory reports, presented in Appendix B, and include the analytical methods and data validation reports. Table 3 summarizes the analytical results for the eight sampling events.

6.0 Statistical Analysis

Statistical analyses were completed following EPA CCR rule and EPA (2009) and ASTM D6312-17 groundwater statistics guidance and are presented in Appendix C. DUMPStat, a statistical analysis program which meets these requirements, was used to analyze background and downgradient groundwater results.

Parametric and nonparametric prediction limits were selected in comparing downgradient groundwater concentrations to upgradient background. Of the Appendix III parameters, only field pH in monitoring wells MW-2 and MW-3 were found to have a statistically significant increase (SSI) above background field pH. Field pH does not display statistically significant increasing trends in MW-2 and MW-3; the difference between background field pH and downgradient may be naturally occurring. The results are not impacted by the removal of the August 29, 2017 pH measurements from the data set.

Few statistically significant trends were noted in the background data collected. A statistically significant increasing trend is noted for upgradient background monitoring well MW-4 for chloride. A statistically significant decreasing trend is noted for downgradient monitoring well MW-3 for sulfate.

7.0 Anticipated Future Activities

Based on the analytical results and statistical analysis of the eight Baseline Monitoring events, the following actions are anticipated:

- Due to the SSI for pH in downgradient monitoring wells MW-2 and MW-3, MBLP will initiate an Assessment Monitoring Program for the Holding Ponds at the Shiras Steam Plant as per the CCR rule, 40 CFR Part 257.95 or conduct an alternate source demonstration (ASD) for the elevated pH values, as per 40 CFR Part 257.94(e)(2).
- Assessment Monitoring and/or ASD must be conducted within 90 days.
- MBLP shall, no later than January 31, 2019, and annually thereafter, must prepare and annual groundwater monitoring and corrective action report for the preceding year.

8.0 References

ASTM D6312-17, 2017. <u>Standard Guide for Developing Appropriate Statistical</u> <u>Approaches for Groundwater Detection Monitoring Programs at Waste Disposal</u> <u>Facilities</u>, 15 p.

Gair, J.E., and Thaden, R.E., 1968, <u>Geology of the Marquette and Sands quadrangles</u>, <u>Marquette County, Michigan</u>: U.S. Geological Survey, Professional Paper 397, scale 1:24,000.

Mannik Smith Group, 2013. <u>Expanded Triage Program (ETP) – Limited Site</u> <u>Investigation, Superior Stop</u>. September 20, 2013.

MGS, 2013. <u>Physiographic Map of Michigan</u>, Michigan Geological Society, Web page as access January 4, 2018.

http://mgs.geology.wmich.edu/webmgs/physiography/physio.html

Tri-Media Consultants, 2000. <u>Feasibility Study and Corrective Action Plan For The</u> Leaking Underground Storage Tank Project At The Swanson Tire Center, Marquette, <u>Michigan</u>. September 28, 2000.

Twin Port Testing (TPT), 1994. <u>Narrative Excerpt from Phase I Hydrogeological Study</u>. July 1994.

United States Environmental Protection Agency (USEPA) 1996. <u>Low Stress (Low Flow)</u> <u>Purging and Sampling Procedure</u>, United States Environmental Protection Agency, July 30, 1996.

United States Environmental Protection Agency (USEPA), 2009. <u>Statistical Analysis of</u> <u>Groundwater Monitoring Data at RCRA Facilities</u>: Unified Guidance. EPA 530/R-09-007, 884 p. Certifications

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Certification Statement 40 CFR § 257.93(f)(6) – Statistical Approach for the Evaluation of Groundwater Monitoring Data for the CCR Management Area

CCR Unit: MBLP: Shiras Steam Plant; Holding Pond

I, <u>Ivan Martysz</u>, being a Registered Professional Engineer in good standing in the State of Michigan do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification is prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the statistical approach selected for the groundwater monitoring system, as described in this document, is appropriate for evaluating the groundwater monitoring data for the CCR management area. The statistical method(s) selected to evaluate the groundwater monitoring data for the CCR Unit is described below.

Ivan Martysz, P.E.

Printed Name

1/30/2018

Date



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Regulatory Guidance

Regulatory guidance provided in 40 CFR §257.90 specifies that a CCR groundwater monitoring program must include selection of the statistical procedures to be used for evaluating groundwater quality data as required by 40 CFR §257.93. Groundwater quality monitoring data has been collected under the detection monitoring program for the Holding Pond (single unit CCR site) including analysis of eight independent groundwater samples from each background and downgradient well as required by 40 CFR §257.94(b).

40 CFR §257.93(f) outlines the statistical methods available to evaluate groundwater monitoring data. The statistical test(s) chosen will be conducted separately for each constituent in each monitoring well and will be appropriate for the constituent data and the data set distribution.

In accordance with 40 CFR §257.93(f)(6), a qualified professional engineer must certify that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR unit.

Statistical Analysis Approach

When conducting statistical evaluations of groundwater data sets, it is most prudent to use a suite of statistical methods that are dependent on the character of the data and their distributions. For the groundwater data collected from the groundwater monitoring system at the Holding Pond, the statistical analyses will be based on an interwell approach for the purpose of determining if a CCR unit(s) has caused a statistically significant increase. The single unit groundwater monitoring system contains two upgradient and three downgradient wells that are installed in the uppermost aquifer; therefore, an interwell approach is considered appropriate. The statistical algorithms used for the interwell approach were chosen based on the groundwater constituent data and their distributions as well as consideration of natural seasonally- or spatially-varying groundwater constituent concentrations.

Eight rounds of baseline groundwater monitoring data were collected and analyzed for the 40 CFR § 257 Appendices III and IV constituents.

A preliminary, exploratory statistical analysis was performed on the eight rounds of baseline data to initially assess the constituent data to determine the most appropriate statistical approach(es) for the data. The data was examined for outliers and the percentage of non-detect values to verify that the data collected are suitable for statistical analysis. The data was also examined using goodness-of-fit tests to determine the most appropriate statistical distribution, time series plots, and areal maps to determine if

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seasonal or spatial variations in constituent concentrations are present. Based on this preliminary evaluation of the data, the final statistical approach selected is deemed appropriate for evaluating groundwater in accordance with the CCR rule.

The statistical approach for each detection monitoring event is summarized in Figure 1 below. All potentially applicable statistical methods are described in the following paragraphs in the event that any changes in data distributions or non-detect percentages occur as the dataset increases with future sampling events

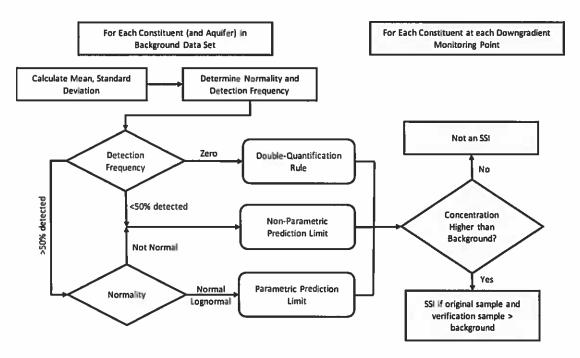


Figure 1. Flow chart for Detection Monitoring statistical evaluation (from EPRI, 2015).

Shapiro-Wilk W Test for Normal and Lognormal Distribution

The type of data distribution is required to be determined in order to select an appropriate statistical method [per CCR Rule 40 CFR 257.93(g)(1)]. The Shapiro-Wilk W test is a goodness-of-fit test (two-sided and parametric) on whether the data have been drawn from an underlying normal distribution (Gilbert, 1987). The null hypothesis H_a is that the population has a normal distribution. The alternative hypothesis H_a is that the population does not have a normal distribution. A goodness-of-fit test for lognormal distributions is performed by first taking the natural logarithm of all the data values and then applying

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the W test on the transformed data. The Shapiro-Wilk W test is valid for sample sizes less than or equal to 50 values. For data sets larger than 50, the Shapiro-Francia test is used (Gibbons, 1994).

Parametric Prediction Intervals for Future Compliance Values

The prediction interval method is one of the statistical methods cited in the CCR Rule [40 CFR 257.93(f)(3)]. Both parametric and non-parametric versions of this statistical test are available (as explained in the Unified Guidance USEPA, 2009), which is cited in the discussion section of the CCR Rule [p. 21401 K(3) and other places]. The parametric prediction interval method calculates upper and lower values, based on background data, against which future values from compliance locations will be compared (USEPA, 1989). This method calculates a parametric prediction interval from all pooled background data for a specified base period from one or more locations. The data are then used to compute a prediction interval for an initial period. The parameter value for each of the compliance location intervals is then compared to the upper bound of the prediction interval. A statistically significant exceedance time period is indicated when the value of an individual measurement for a compliance location exceeds the upper bound of the prediction interval, or the lower bound for pH.

The data or transformed data should be normally distributed. A minimum of four observations per period are recommended for the compliance location data. A minimum of a one year base period of background observations is recommended for construction of the prediction interval. The data should be free of outliers.

Non-Parametric Prediction Interval for Future Compliance Values

The prediction interval method is one of the statistical methods cited in the CCR Rule [40 CFR 257.93(f)(3)]. The non-parametric prediction interval calculates the prediction interval using pooled background data over a specified base period. The background data are pooled from one or more locations. The pooled background data are ranked and the minimum value is identified as the one-sided, lower prediction limit for pH only, P_{l_r} and an appropriate value is identified as the one-sided, upper prediction limit, P_{u_r} depending on the number of background samples (as described in Section 18.3.1 USEPA, 2009). Lower and upper, non-parametric, one-sided confidence limits are computed for the compliance locations. No assumption is made concerning the underlying distribution of the data. However, the assumption is made that the unknown distribution in the background and compliance datasets in the absence of contamination.

At least four background values and at least one compliance location are needed for this analysis. However, there need not be any actual data in the selected compliance locations if the user only wishes to determine the prediction intervals. If an individual measurement from a compliance location exceeds

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the upper limit, then a statistically significant exceedance is declared. Normally, only an exceedance of the upper limit is of concern, except for pH. A general discussion of estimating non-parametric prediction limits and alternative verification procedures is given in Gibbons (1994) and in Section 18.3.1 (USEPA, 2009).

Non-Parametric Prediction Interval for Future Compliance Median

The non-parametric prediction interval method is one of the statistical methods cited in the CCR Rule [40 CFR 257.93(f)(3)]. The USEPA (2009) describes in Section 18.3.1 of the Unified Guidance the various strategies available for setting the upper prediction limit when the background data are non-parametrically distributed and sufficient compliance data are available. In particular, the option of using the median of three future compliance measurements to test against the upper prediction limit is described on page 18-21. For that approach, the user is given the option of setting the upper prediction limit to either the largest, the 2^{nd} -to-largest, or the 3^{rd} -to-largest background measurement. The corresponding confidence limit for each of these choices is affected by the background sample size n_{bg} . The confidence level increases as n_{bg} increases. In addition, for the same sample size n_{bg} , the confidence level decreases as one selects values smaller than the maximum when the prediction limit is chosen to be the jth largest background measurement. A complete statistical table is given on page D-31 of the Unified Guidance (USEPA, 2009). Note that for the 95% confidence level, only 9 background data values are needed when selecting the maximum background measurement as the upper prediction limit, as compared to needing 24 background values when selecting the third-to-largest background measurement for the upper prediction limit.

Non-parametric Poisson Prediction Interval

The non-parametric prediction interval method is one of the statistical methods cited in the CCR Rule [40 CFR 257.93(f)(3)]. The Poisson prediction interval method calculates upper and lower, one-or twosided, non-parametric prediction limits, based on background data, against which future data from compliance wells will be compared. The Poisson distribution in statistics is used to model rare events. The Poisson model describes the behavior of a series of independent events that occur while taking a large number of observations. For the purposes of this document, an *event* occurs when the chemical concentration of a sample is above the level of detection. The probability of detection is low but it remains constant from observation to observation.

One of the key distinctions between the Poisson model and other non-parametric models is that the Poisson model utilizes the magnitude of the measured concentrations in its algorithm. Upon selecting a *scaling* parameter, all sampled concentrations for a particular chemical at a location are then converted into an equivalent number of *chemical units* or *counts*. The model then computes the average rate of

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occurrence of these counts for the chemical from a specified sample set. Finally, it predicts the lower and upper limit for an interval that will contain all of the future measurements of this chemical at the location.

The Poisson model can only be used if there is available at least one background measurement that is detected. As discussed in the Unified Guidance (USEPA, 2009, pp. 6-11 and 6-37), the Double Quantification Rule must be used when none of the background measurements are detected.

Double Quantification Rule

The Double Quantification Rule applies when all data from the background wells have no detected values for a particular constituent. If, during a sampling event, that particular constituent is detected in a downgradient well, a subsequent sample (resampling) would be collected from that well and analyzed. If the downgradient concentration for that constituent in that given well is higher than the reporting limit in both the original sample and in the verification resample, then a statistically significant increase determination would be made.

Statistical Methods for Non-Detect Values Less than 15 Percent

Additional statistical analysis methods may be applicable to upgradient and downgradient wells when non-detect values are less than 15 percent as described below.

Behrens-Fisher Student t-Analysis

The Student t-test is a one-sided, parametric test that compares the means from two data sets. If confidence ranges for the means overlap, then the two means are not significantly different. This test assumes normally-distributed data.

Satterthwaite's t-test (Iman and Conover, 1983) is a modified form of the standard t-test that is appropriate when the background and site distributions have unequal variances. Testing data sets with unequal variances are called Behrens-Fisher problems. The Student t-test makes three key assumptions: (1) that the two location data sets are independent; (2) not serially correlated; and (3) that both location data sets have normal distributions (Guttman et al.,1971; Gilbert, 1987). If these assumptions are not met, the Wilcoxon Rank-Sum test should be used for determining whether the means of two locations are different (Loftis, et al., 1987).

Wilcoxon Rank-Sum Analysis

The Wilcoxon Rank-Sum test is a one-sided, non-parametric test that compares the means from two data series. This method is an alternative statistical test method allowed under the CCR Rule [40 CFR

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257.93(f)(5)]. If confidence ranges for the means overlap, then the two means are not significantly different. If multiple background locations are specified, they are pooled. The evaluation is conducted for each compliance location/parameter combination, and determines whether the mean concentration of the specified parameter at the compliance location is statistically higher than the mean concentration of that parameter at the pooled background locations. The Wilcoxon Rank-Sum test assumes that: (1) both data sets contain random values from their respective populations, and (2) in addition to independence within each data set, there is mutual independence between the two sample sets. No assumptions are made about data distribution. The null hypothesis is that the two location means are equal, and the alternative hypothesis is that the two location means are different.

COAL COMBUSTION RESIDUALS RULE GROUNDWATER MONITORING SYSTEM CERTIFICATION MARQUETTE BOARD OF LIGHT AND POWER (MBLP)

HOLDING POND SHIRAS STEAM PLANT MARQUETTE, MICHIGAN

Certification Statement 40 CFR § 257.91(f) – Design and Construction of a Groundwater Monitoring System for an Existing CCR Surface Impoundment.

CCR Unit: MBLP; Shiras Steam Plant; Holding Pond

I, <u>Ivan Martysz</u>, being a Registered Professional Engineer in good standing in the State of Michigan, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification is prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the design and construction of the groundwater monitoring system as included in the First Annual CCR Groundwater Monitoring and Corrective Action Report, dated January 30, 2018 meets the requirements of 40 CFR § 257.91.

Ivan Martysz, P.E.

Printed Name

1/30/2018

Date



COAL COMBUSTION RESIDUALS RULE GROUNDWATER MONITORING SYSTEM CERTIFICATION MARQUETTE BOARD OF LIGHT AND POWER (MBLP)

HOLDING POND

SHIRAS STEAM PLANT

MARQUETTE, MICHIGAN

AECOM ("Consultant") has been retained by Marquette Board of Light and Power (MBLP) to provide certification of the groundwater monitoring system as required under 40 Code of Federal Regulations (CFR) § 257.91(f) of the HAZARDOUS AND SOLID WASTE MANAGEMENT SYSTEM; DISPOSAL OF COAL COMBUSTION RESIDUALS FROM ELECTRIC UTILITIES; FINAL RULE, 80 Fed. Reg. 21302 (Apr. 17, 2015) ("CCR Rule") for the coal combustion residual (CCR) unit(s) identified by MBLP at their Shiras Steam Plant located in Marquette, Michigan.

Requirements

Pursuant to 40 CFR § 257.90(b)(1), by October 17, 2017, the owner or operator of a CCR unit must install a groundwater monitoring system that meets the requirements of 40 CFR § 257.91. The groundwater monitoring system must meet the CCR Rule's performance standard, which requires the system to consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represent the quality of:

- (1) background groundwater that has not been affected by leakage from a CCR unit; and
- (2) groundwater passing the waste boundary of the CCR unit and monitoring all potential contaminant pathways.

The CCR unit identified at the site is located adjacent to the northern border of the Shiras Steam plant. The CCR Rule groundwater monitoring system requirement is addressed by a single unit system consisting of two (2) upgradient and three (3) downgradient monitoring wells. Information regarding the groundwater monitoring system design and construction has been provided to the qualified professional engineer as required by 40 CFR § 257.91(e)(1) and is included in the facility operating record per 40 CFR § 257.91(e)(1).

Limitations

The signature of Consultant's authorized representative on this document represents that to the best of Consultant's knowledge, information, and belief in the exercise of its professional judgment, it is Consultant's professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by Consultant are made on the basis of Consultant's experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

Tables

Table 1Monitoring Well Construction SummaryMarquette Board of Light and PowerShiras Steam Plant

Well ID	Easting	Northing	Well Installation Date	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Total Depth (feet)	Bottom Elevation (ft MSL)	Screen Length (feet)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Elevation (ft MSL)	Pump Depth (ft bgs)	Well Casing Material	Well Screen Material and Slot Size	Groundwater Flow Location	Program Use		
MW-1	637979.85	26147788.78	6/27/2017	606.46	N/A	20.00	576.99	5	24.5	29.5	581.99	576.99		0 is short at	2-inch stainless steel			Downgradient	
MW-2	638049.08	26147757.22	6/28/2017	605.66	N/A	22.00	576.73	5	23.8	28.8	581.73	576.73		8-inch steel casing		Downgradient			
MW-3	638111.37	26147729.99	6/29/2017	605.94	N/A	21.00	576.89	5	24	29	581.89	576.89		ocomy		Downgradient	Detection		
MW-4	637925.68	26147506.84	7/6/2017	624.27	622.27	47.00	577.67	5	65	75	1102.00 ^c	1092.00 ^c		N/A	2-inch PVC	Downgradient			
MW-5	637853.84	26147531.37	7/7/2017	623.87	621.87	45.00	579.07	15	89.5	100	1102.50 ^c	1092.50 ^c		N/A	2-1101 F VC	Downgradient			

Notes:

bgs = below ground surface

TOC = Top of Casing

ft MSL = feet above Mean Sea Level

ft BTOC = feet below top of casing

PVC = Polyvinyl Chloride

a = Ground Surface Elevation are approximate values from well construction logs

b = Total Depth is based on feet below ground surface from well construction logs

c = Screen Elevation calculated from approximate ground surface elevation from well construction logs

NA = Not available

Table 2 Borehole Lithology Summary Marquette Board of Light and Power Shiras Steam Plant

Location ID	MW-1	1	MW-2		MW-3		MW-4		MW-5	
Geologic Material Monitored	Unconsolidated		Unconsolidated		Unconsolidated		Unconsolidated		Unconsolidated	
Total Depth (feet bgs)		20 22			21		47	45		
Water Bearing Zone (feet bgs)	Drilled in lake sediment		Drilled in lake sediment		Drilled in lake sediment		Upland Well	Upland Well		
Screened Interval (feet bgs)	Diffied in lake sediment		Diffied in lake sediment		Diffied in lake Sediment					
Screened interval (leet bgs)	Danth	Danth		Denth		Danth		Danth		
	Depth (ft bgs) Lithologic Description	Depth (ft bgs)	Lithologic Description	Depth (ft bgs)	Lithologic Description	Depth (ft bgs)	Lithologic Description	Depth (ft bgs)	Lithologic Description	
	0 - 2.5 Light brown sand (saturated)	0 - 2.5	Light brown/gray fine/medium sand (saturated)	0 - 2.5	Light brown fine to medium sand (saturated)	0 - 5	Fine to medium sand	0 - 5	Fine to medium sand, coal and brick pieces	
	2.5 - 3 Medium to coarse sand (saturated)	2.5 - 5.5	Light brown fine-medium sand (saturated)	2.5 - 3	Fine to medium sand (saturated)		Black sand, slight odor	5 - 8.5	Light brown fine to medium sand	
	3 - 5 Light brown silt (saturated)	5.5 - 7.5	Light brown clayey silt (saturated)	3 - 5	Fine to coarse sand (saturated)		Brown fine to medium sand	8.5 - 8.75	Gravel, black fine to medium sand	
	5 - 10 Light brown silty clay/clayey silt (very moist)) 7.5 - 8.5	Light brown/gray fin to medium sand (slough)	5 - 7.5	Light brown silty clay (very moist)	5 - 10	Light brown fine to medium sand	8.75 - 10	Light brown fine to medium sand	
	10 - 12.5 Light brown silt (very moist)	8.5 - 15	Light brown clayey silt/silty clay (very moist)	7.5 - 8	Fine to coarse sand (slough)	10 - 15	Light brown medium to coarse sand	10 - 11	Brown silty sand	
	12.5 - 15 Light brown silt (tight) (moist)	15 - 17.5	Fine sand, silt, clayey silt (saturated)	8 - 10	Light brown silty clay (very moist)		Light brown silty clay, trace medium to coarse sand	11 - 15	Light brown fine to medium sand	
	15 - 16 Fine - medium sand (slough?) (saturated)	17.5 - 18	Fine to medium sand (slough?) (saturated)	10 - 12.5	Light brown clayey silt (very moist)	15 - 20	Light brown fine to medium sand (saturated)	15 - 16	Light brown fine to medium sand (odor)	
	16 - 18.5 Silty clay/clayey silt, trace gravel (saturated)	18 - 19	Light brown clay (moist/very moist)	12.5 - 12.7	Medium to coarse sand (slough?)		Tan/black fine to medium sand (saturated, odor)	16 - 19	Gray fine to medium sand (saturated, odor)	
	18.5 - 20 Light brown silt, trace gravel (saturated)	19 - 20	Silt, trace gravel (saturated)	12.7 - 14.7	Light brown silty clay (saturated)	20 - 25	Tan/black fine to medium sand (saturated)	19 - 20	Black sand, gravel, clay (saturated)	
		20 - 21	silt, clayey silt (saturated)	14.7 - 15	Light brown silt (saturated)	25 - 27	Light brown fine to medium sand (saturated)	20 - 22.5	Black sand, gravel (saturated)	
		21 - 22	fine silty sand, trace clay (saturated)	15 - 16	Fine sand, silt (saturated)	27 - 27.75	Light brown silty clay (moist)	22.5 - 25	Light brown fine to medium sand (saturated)	
				16 - 16.2	Light brown clayey silt (very moist)	27.75 - 28	Light brown silt (very moist)	25 - 30	Core stuck - dumped soil into drum. Light brown fine to medium sand (slough?)	
				16.2 - 17.5	Dark brown silt/fine sand	28 - 30	Light brown fine to medium sand (saturated)	30 - 35	Black rock, gravel, sand (slough?) (saturated)	
				17.5 - 18.5	Brown silty clay, trace gravel (saturated)	30 - 32	Tan fine to medium sand (saturated)	35 - 37	Gray-black fine to medium sand (saturated)	
				18.5 - 20	Dark brown silt/fine sand (very moist)	32 - 35	Light brown silty clay (very moist)	37 - 40	Light brown silt with gravel (saturated)	
				20 - 21	Brown silt/clayey silt (very moist)	35 - 40	Tan /gray fine to medium sand (saturated)	40 - 45	No recovery	
						40 - 43	Tan/gray fine to medium sand (saturated)			
						43 - 45	Light brown clayey silt (saturated)			
						45 - 47	No recovery			

Notes:

bgs = below ground surface (CL)/(ML)/(SW) = Unified Soil Classification System Code for primary grain size All wells constructed with 10-foot length screens

Table 3 Analytical Results Summary Marquette Board of Light and Power Shiras Steam Plant

		Lab Suite				CCR Appendix I	1						CCR Apr	oendix IV			
								Total									
		Analytical Constituent	Boron	Calcium	Chloride	Fluoride	Sulfate	Dissolved Solids (TDS)	рН	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead
		U.S. EPAMCL	NE	NE	NE	4.0	NE	NE	NE	6.0	10	2.0	4.0	5.0	100	NE	15
Location	Well ID	Units	µg/L	μg/L	mg/L	mg/L	mg/L	mg/L	SU	μg/L	μg/L	mg/L	μg/L	μg/L	μg/L	µg/L	μg/L
		7/19/2017	<300	100,000	230	<0.38	19	700	7.58	<2.0	6.6	0.21	<1.0	<1.0	<10.0	<20.0	17
		7/24/2017	<300	110,000	230	<0.38	20	800	7.45	<2.0	<5.0	0.15	<1.0	<1.0	<10.0	<20.0	<3.0
		8/23/2017	<300	120,000	260	<0.10	21	800	7.54	<2.0	<5.0	0.14	<1.0	<1.0	<10.0	<20.0	<3.0
		8/29/2017 9/6/2017	<300	130,000	270	<0.10	20	960	6.56	<2.0	<5.0	0.13	<1.0	<1.0	18	<20.0	<3.0
	MW-1	9/14/2017	<300	130,000	270	<0.10 <0.10	21	930	7.56 7.60	<2.0 <2.0	<5.0 <5.0	0.13	<1.0 <1.0	<1.0 <1.0	<10.0 <10.0	<20.0 <20.0	<3.0 <3.0
		9/28/2017	<300 530	110,000 120,000	290 270	<0.10	22 20	980 920	7.60	<2.0	<5.0	0.13	<1.0	<1.0	<10.0	<20.0	<3.0
		DUP 092817	<300	120,000	270	<0.10	20	920	7.58	<2.0	<5.0	0.13	<1.0	<1.0	<10.0	<20.0	<3.0
		10/5/2017	<300	130,000	270	<0.10	21	820	7.55	<2.0	<5.0	0.13	<1.0	<1.0	<10.0	<20.0	<3.0
		DUP 100517	<300	120.000	270	<0.10	21	880	7.55	<2.0	<5.0	0.13	<1.0	<1.0	<10.0	<20.0	<3.0
		7/19/2017	<300	51.000	60	<0.10	21	220	8.41	<2.0	<5.0	<0.14	<1.0	<1.0	<10.0	<20.0	<3.0
F		7/24/2017	<300	63,000	59	<0.38	21	350	8.09	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
liei		8/23/2017	<300	51,000	62	<0.10	26	190	8.13	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	240
Downgradient		8/29/2017	<300	52,000	61	<0.10	22	350	7.03	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
ıβι	MW-2	DUP 082917	<300	53,000	61	<0.10	22	320	7.03	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
N N		9/6/2017	<300	53,000	60	<0.10	21	310	8.15	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
Å		9/14/2017	<300	52,000	64	<0.10	23	300	8.13	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		9/28/2017	<300	58,000	65	<0.10	21	350	8.07	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		10/5/2017	<300	61,000	65	<0.10	21	310	7.99	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		7/19/2017	<300	68,000	98	<0.38	49	360	8.00	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
	MW-3	7/24/2017	<300	69,000	89	< 0.38	36	440	7.86	<2.0	<5.0	0.23	<1.0	<1.0	<10.0	<20.0	<3.0
		8/23/2017	<300	75,000	95	<0.10	44	300	7.81	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		8/29/2017	<300	62,000	86	<0.10	28	390	6.32	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		9/6/2017	<300	62,000	85	<0.10	26	380	7.77	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		9/14/2017	<300	57,000	83	<0.10	25	380	7.85	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		DUP 091417	<300	56,000	84	<0.10	24	380	7.85	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		9/28/2017 10/5/2017	<300	67,000	89	<0.10	20	440	8.09	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		7/19/2017	<300 <300	69,000 93.000	87 260	<0.10	21 19	350	8.10 7.92	<2.0 <2.0	<5.0 <5.0	<0.10 <0.10	<1.0 <1.0	<1.0	<10.0 <10.0	<20.0 <20.0	<3.0 <3.0
		7/24/2017	<300	89.000	280	<0.38	19	700 730	7.86	<2.0	<5.0	<0.10	<1.0	<1.0 <1.0	<10.0	<20.0	<3.0
		DUP 072417	<300	89,000	230	<0.38	19	710	7.86	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		8/23/2017	<300	100.000	300	<0.30	24	830	7.93	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
	MW-4	8/29/2017	<300	120,000	340	<0.10	47	1,000	7.32	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
	11111-4	9/6/2017	<300	110,000	340	0.2	53	1,000	7.75	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		9/14/2017	<300	100,000	360	0.18	49	1,000	7.77	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		9/28/2017	<300	160,000	370	0.12	46	1,200	7.74	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	3.1
eu		10/5/2017	<300	120,000	380	0.1	43	1,100	7.70	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
ibe		7/19/2017	<300	100,000	200	<0.38	25	640	7.36	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
Upgradient		DUP 071917	<300	100,000	190	<0.38	24	530	7.36	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
ia n		7/24/2017	<300	100,000	190	<0.38	21	730	7.17	<2.0	<5.0	0.16	<1.0	<1.0	<10.0	<20.0	<3.0
		8/23/2017	<300	110,000	210	<0.10	19	590	7.41	<2.0	<5.0	0.13	<1.0	<1.0	<10.0	<20.0	<3.0
		DUP 082317	<300	110,000	190	<0.10	19	620	7.41	<2.0	<5.0	0.13	<1.0	<1.0	<10.0	<20.0	<3.0
	MW-5	8/29/2017	<300	110,000	190	<0.10	18	750	6.76	<2.0	<5.0	0.12	<1.0	<1.0	<10.0	<20.0	<3.0
		9/6/2017	<300	100,000	190	<0.10	18	660	7.43	<2.0	<5.0	0.11	<1.0	<1.0	<10.0	<20.0	<3.0
		DUP 090617	<300	100,000	190	<0.10	18	730	7.43	<2.0	<5.0	0.11	<1.0	<1.0	<10.0	<20.0	<3.0
		9/14/2017	<300	96,000	200	<0.10	19	720	7.51	<2.0	<5.0	0.11	<1.0	<1.0	<10.0	<20.0	<3.0
		9/28/2017 10/5/2017	<300	120,000	190	<0.10	18	2,300	7.54	<2.0	<5.0	0.11	<1.0	<1.0	<10.0	<20.0	<3.0
		7/20/2017	<300	120,000	190	<0.10	18	700	7.45	<2.0	<5.0	0.12	<1.0	<1.0	<10.0	<20.0	<3.0
		7/20/2017	<300 <300	<1,000 <1,000	<10 <10	<0.38 <0.38	<2.5 <2.5	<10.0 <10.0	8.05	<2.0 <2.0	<5.0 <5.0	<0.10 <0.10	<1.0 <1.0	<1.0 <1.0	<10.0 <10.0	<20.0	<3.0 <3.0
		8/29/2017	<300	<1,000	<10	<0.38	<2.5	<10.0	7.94 N/A	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
	Equipment	9/6/2017	<300	<1,000	<10	<0.10	<1.0	10	N/A N/A	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
	Blank	9/14/2017	<300	<1,000	<10	<0.10	<1.0	<10	N/A N/A	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		9/28/2017	<300	<1,000	<10	<0.10	<1.0	10	N/A N/A	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		10/5/2017	<300	<1,000	<10	<0.10	<1.0	18	N/A	<2.0	<5.0	<0.10	<1.0	<1.0	<10.0	<20.0	<3.0
		10/0/2011	~300	~1,000	NI	<u></u> √0.10	<1.0 <	10	IN/A	~2.0	~J.U	∼ ∪. IU	<1.U	NI.U	NU.U	~∠0.0	<u>∽</u> 3.0

Bold Value indicates an exceedance of MCL mg/L = milligrams per liter (equiv alent to parts per million) µg/L = micrograms per liter (equiv alent to parts per billion) MCL = Maximum Contaminant Limit NE = Value has not been established SU = Standard Units

N/A = Not Analyzed

Table 3 Analytical Results Summary Marquette Board of Light and Power Shiras Steam Plant

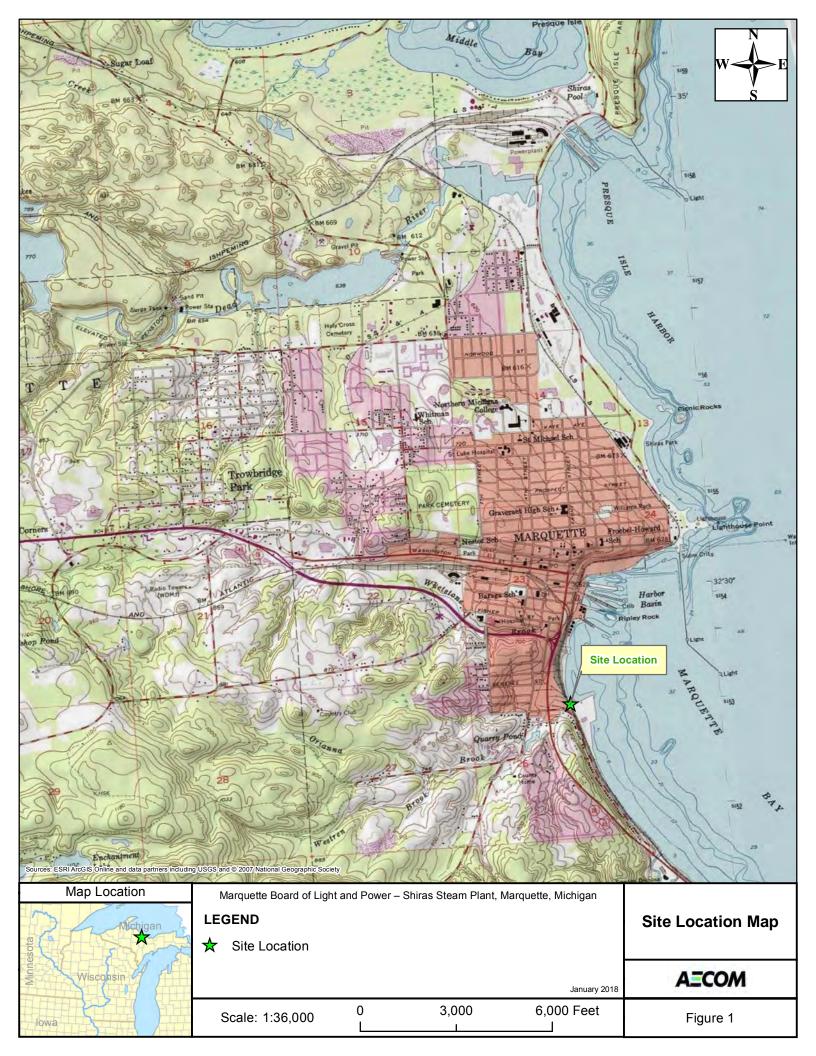
		Lab Suite	CCR Appendix IV										
		Analytical Constituent	Lithium	Mercury	Molybdenum	Radium 226 & 228 Combined	226	228	Selenium				
		U.S. EPAMCL	NE	2.0	NE	5	NE	NE	50				
Location	Well ID	Units	μg/L	μg/L	μg/L	pCi/L	pCi/L	pCi/L	µg/L				
		7/19/2017	<10.0	<0.20	<50.0	2.33	<1.00	2.33	<5.0				
		7/24/2017	<10.0	<0.20	<50.0	1.43	<1.00	1.43	<5.0				
		8/23/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		8/29/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	MW-1	9/6/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	11111-1	9/14/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		9/28/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		DUP 092817	<10.0	<0.20	<50.0	1.16	<1.00	1.16	<5.0				
		10/5/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		DUP 100517	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		7/19/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
ent	[7/24/2017	<10.0	<0.20	<50.0	1.56	<1.00	1.56	<5.0				
die	[8/23/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
Ira		8/29/2017	<10.0	<0.20	<50.0	2	<1.00	2	<5.0				
b u	MW-2	DUP 082917	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
Downgradient	[9/6/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	Ĩ	9/14/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		9/28/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	l l	10/5/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		7/19/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	l í	7/24/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		8/23/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		8/29/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	MW-3	9/6/2017	<10.0	<0.20	<50.0	1.05	<1.00	1.05	<5.0				
		9/14/2017	<10.0	<0.20	<50.0	1.17	<1.00	1.17	<5.0				
		DUP 091417	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	l l	9/28/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	l í	10/5/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		7/19/2017	<10.0	<0.20	<50.0	1.07	<1.00	1.07	<5.0				
	l l	7/24/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	1 1	DUP 072417	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		8/23/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	MW-4	8/29/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		9/6/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		9/14/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
÷		9/28/2017	13	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
en		10/5/2017	11	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
adi		7/19/2017	<10.0	<0.20	<50.0	1.51	<1.00	1.51	<5.0				
Upgradient	[DUP 071917	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
ä		7/24/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
-	[8/23/2017	<10.0	<0.20	<50.0	1.44	<1.00	1.44	<5.0				
	[DUP 082317	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	MW-5	8/29/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	[9/6/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		DUP 090617	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		9/14/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	[9/28/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		10/5/2017	13	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		7/20/2017	<10.0	<0.20	<50.0	1.24	<1.00	1.24	<5.0				
	[7/24/2017	<10.0	<0.20	<50.0	1.03	<1.00	1.03	<5.0				
	Equipment	8/29/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
		9/6/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	Blank	9/14/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	ן ו	9/28/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				
	i i	10/5/2017	<10.0	<0.20	<50.0	<1.00	<1.00	<1.00	<5.0				

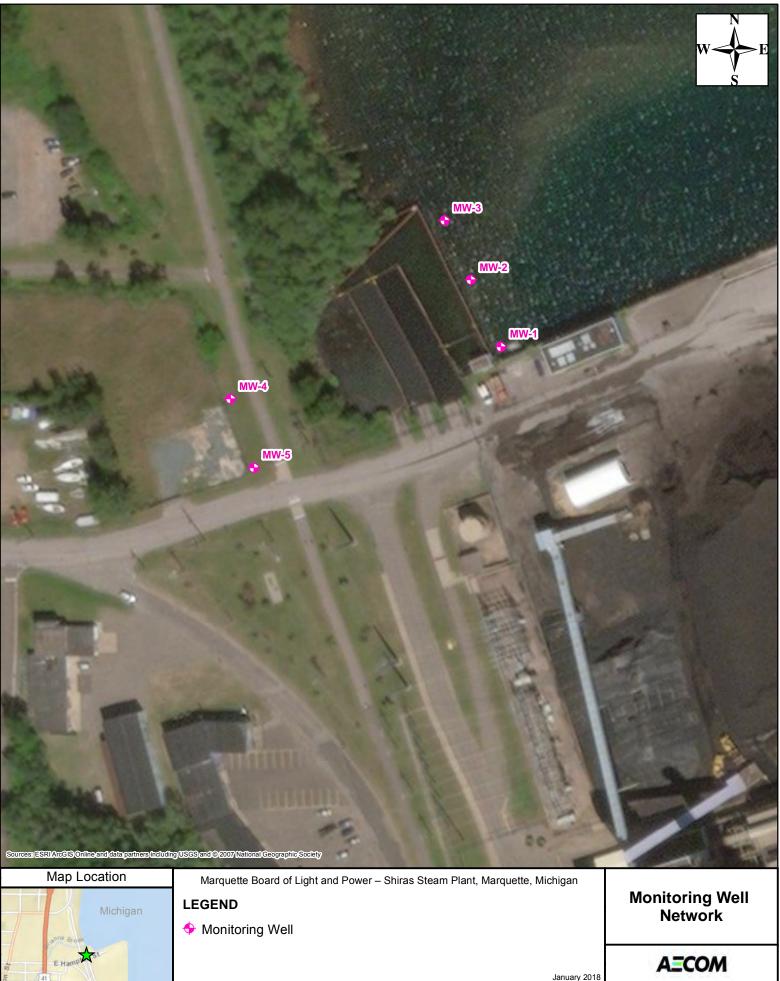
Bold Value indicates an exceedance of MCL mg/L = milligrams per liter (equivalent to parts per million) µg/L = micrograms per liter (equivalent to parts per billion) MCL = Maximum Contaminant Limit NE = Value has not been established SU = Standard Units

N/A = Not Analy zed

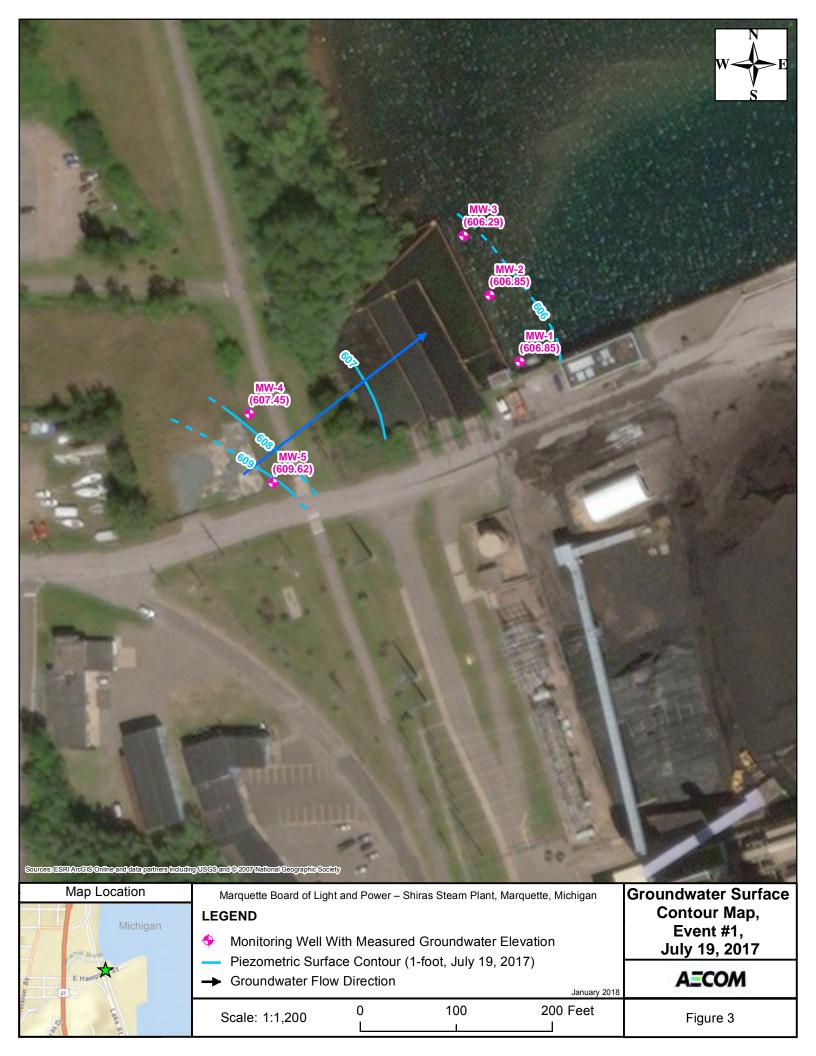
Í	
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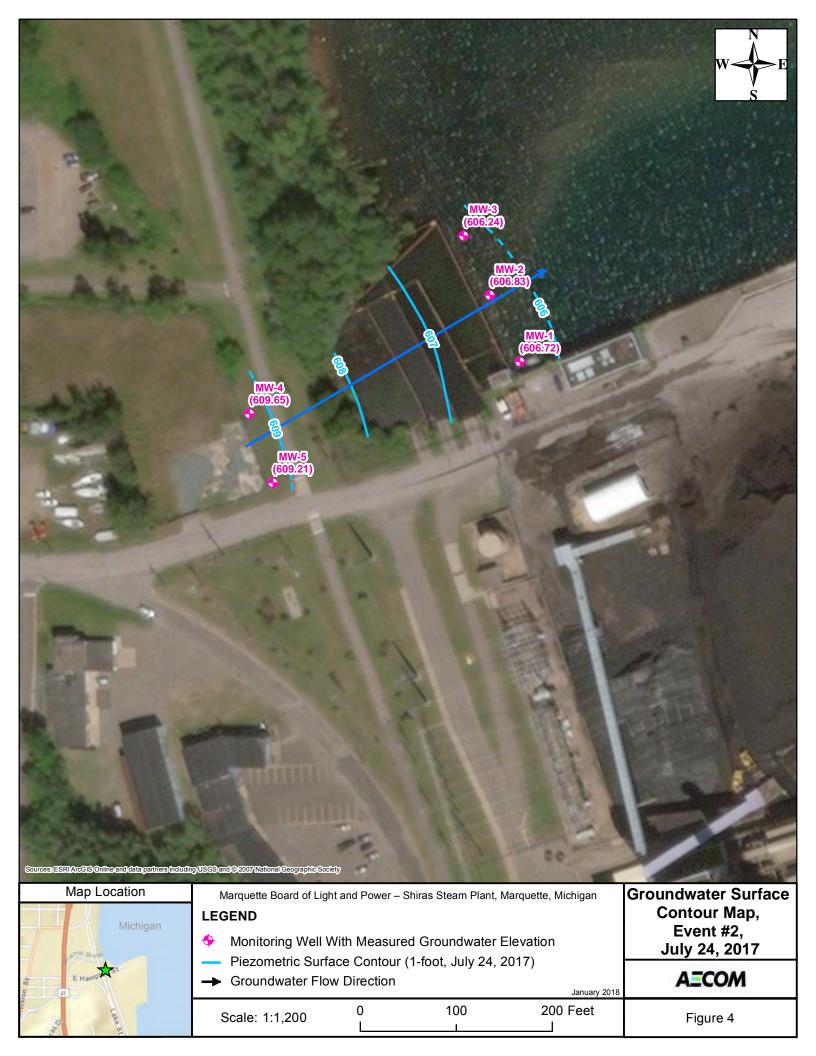
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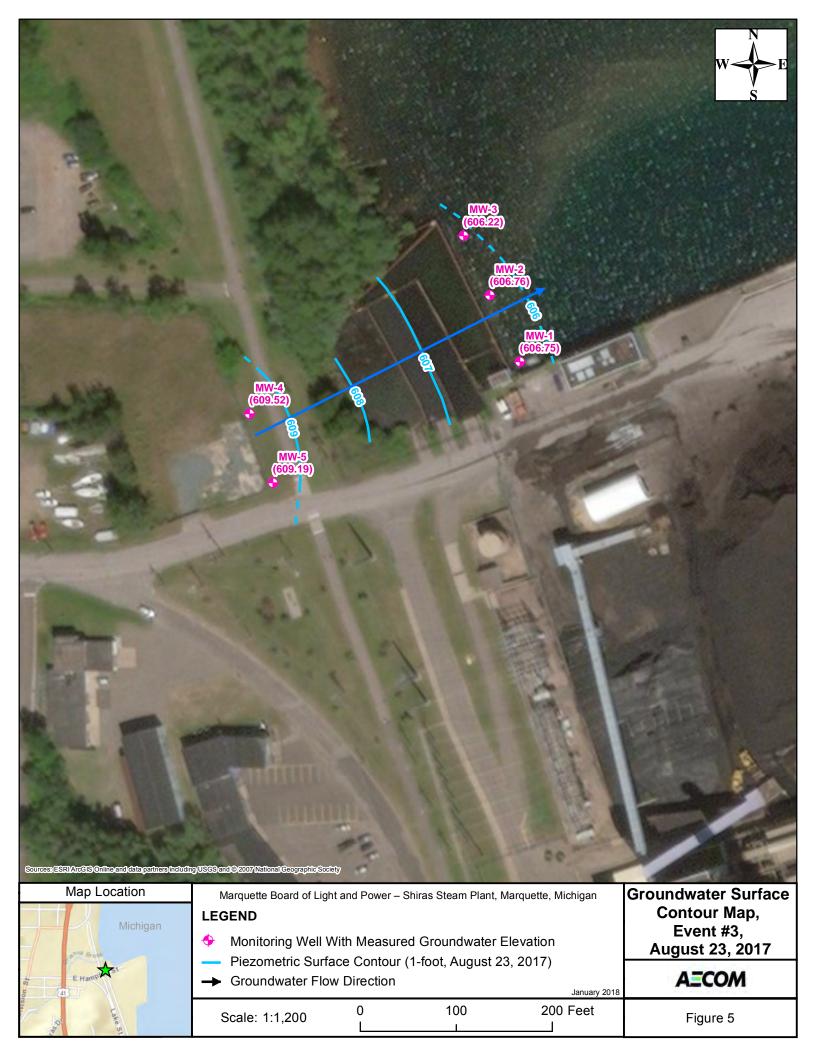


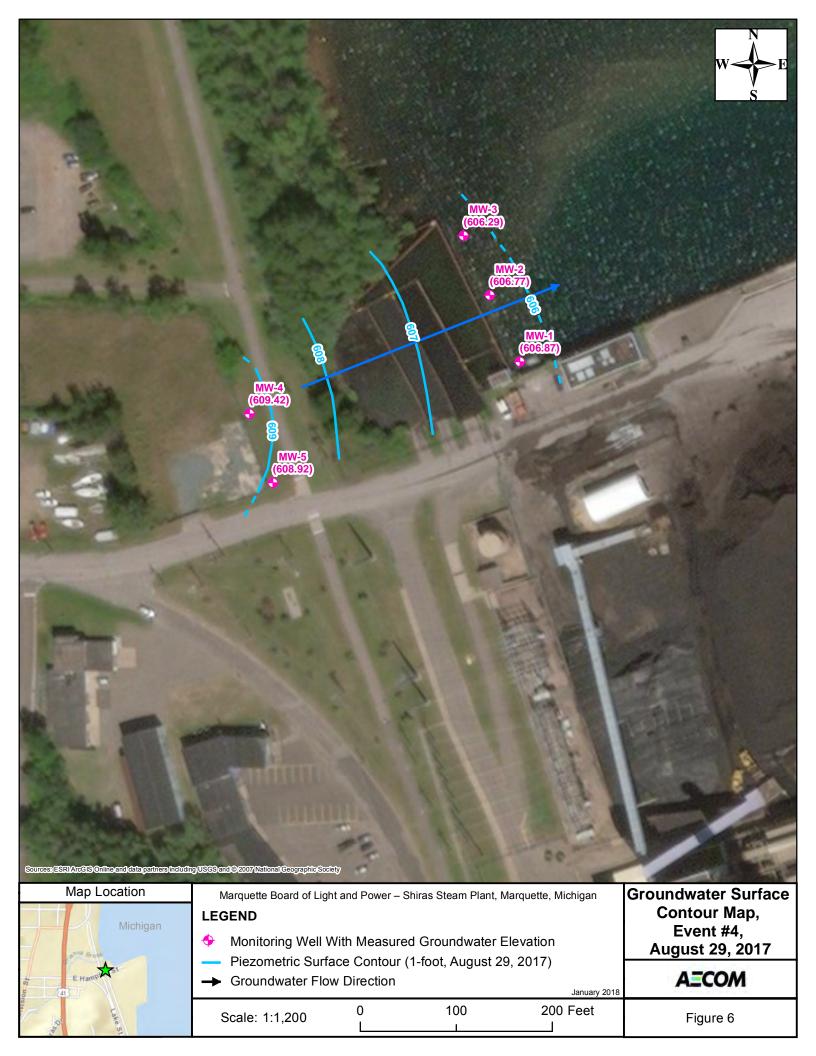


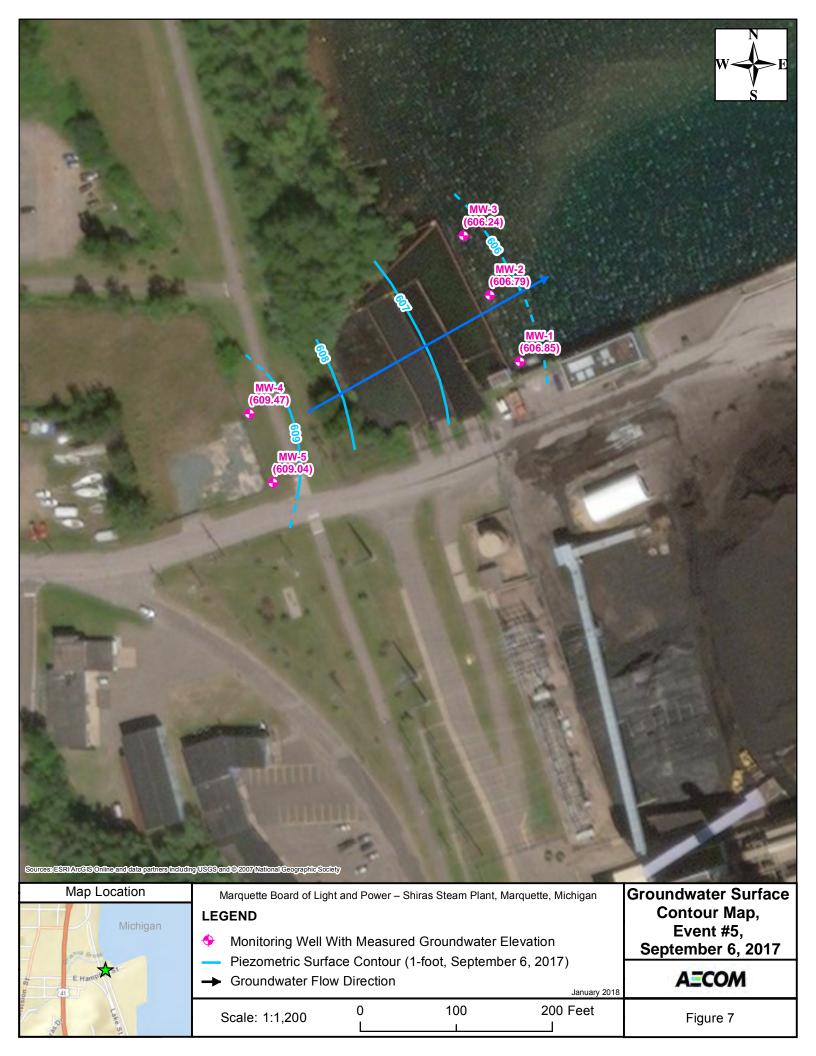
January 2018	
Scale: 1:1,200 0 100 200 Feet	Figure 2

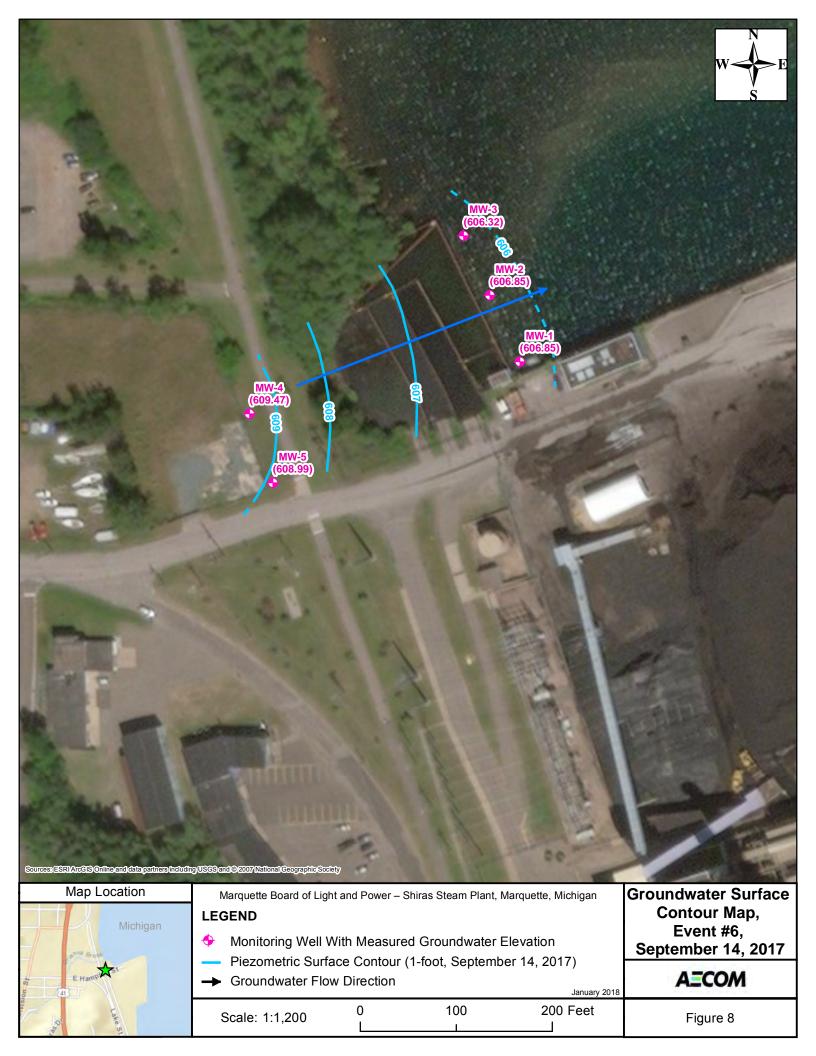


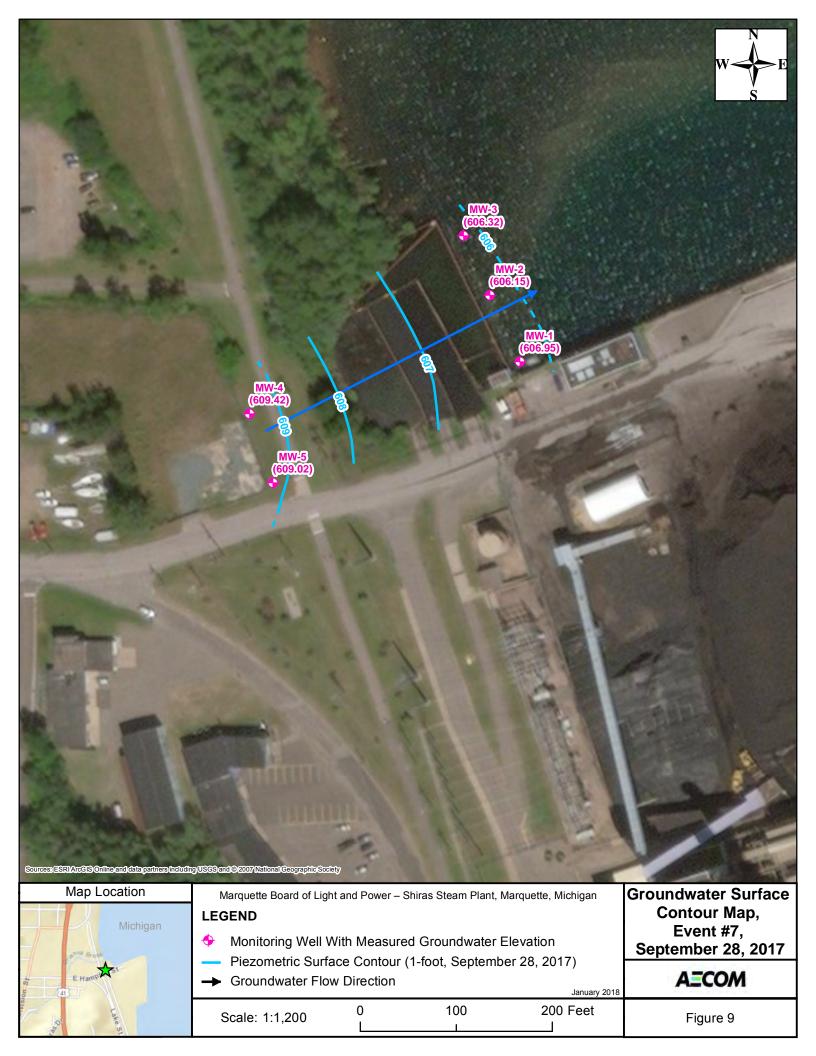


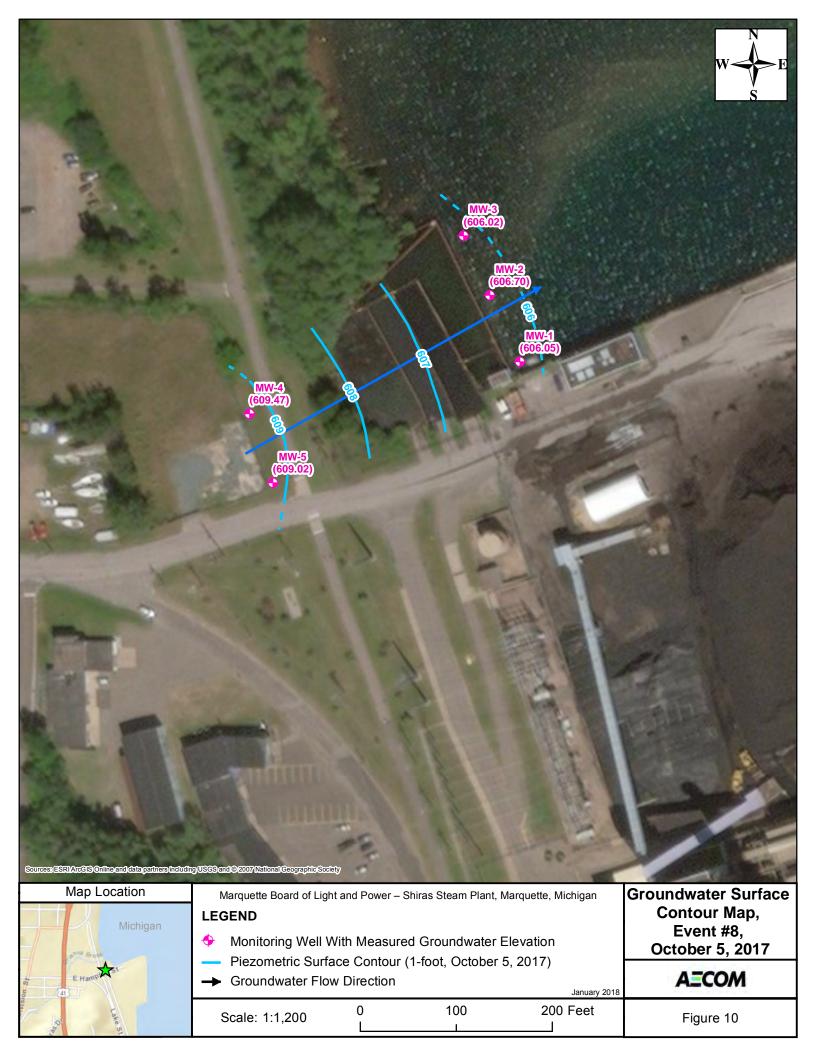










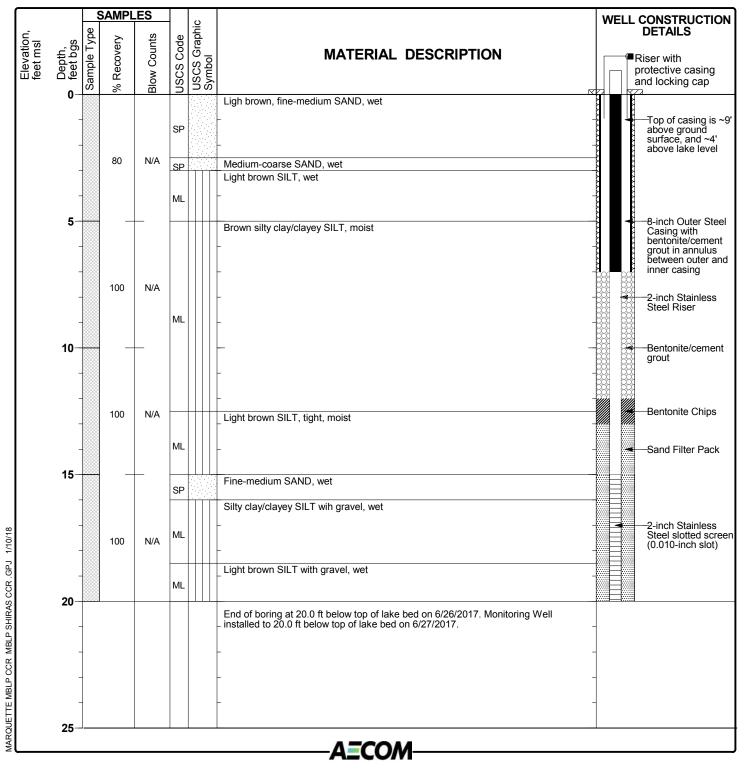


Appendices

Appendix A Boring Logs

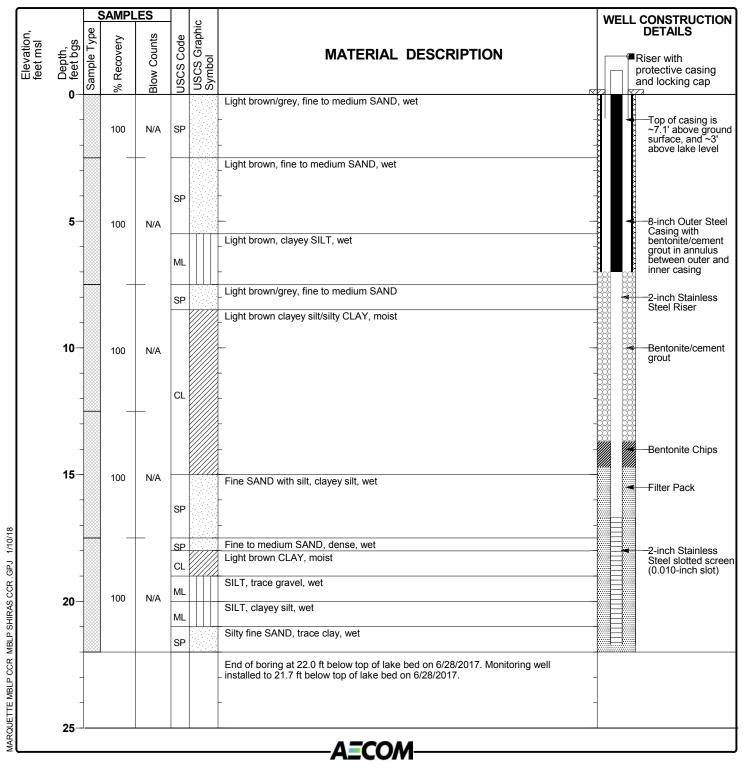
Log of MW-1

Date(s) Drilled and Installed	6/26/2017 - 6/27/2017	Logged By	Tom Flaminio	Reviewed By	S. Becker	
Drilling Method	4 1/4 Hollow Stem Auger	Drilling Contractor	Coleman Engineering	Total Depth of Borehole	20.0 feet, bgs	
Sampling Method	Macrocore	Water Level TOIC	0.1 (measured 7/19/2017)	TOC Elevation	606.95 ft, msl	
Size and Type of Well Casing	2-inch Stainless Steel	Screen Perforation	0.010" slotted	Northing (State Pl Easting (State Pla	lane) 637979.85 ft ane) 26147788.78 ft	
Seal or Backfill	Grout	Comments	Drilled with Geoprobe 7822DT, Depths measured from top of lake bed			



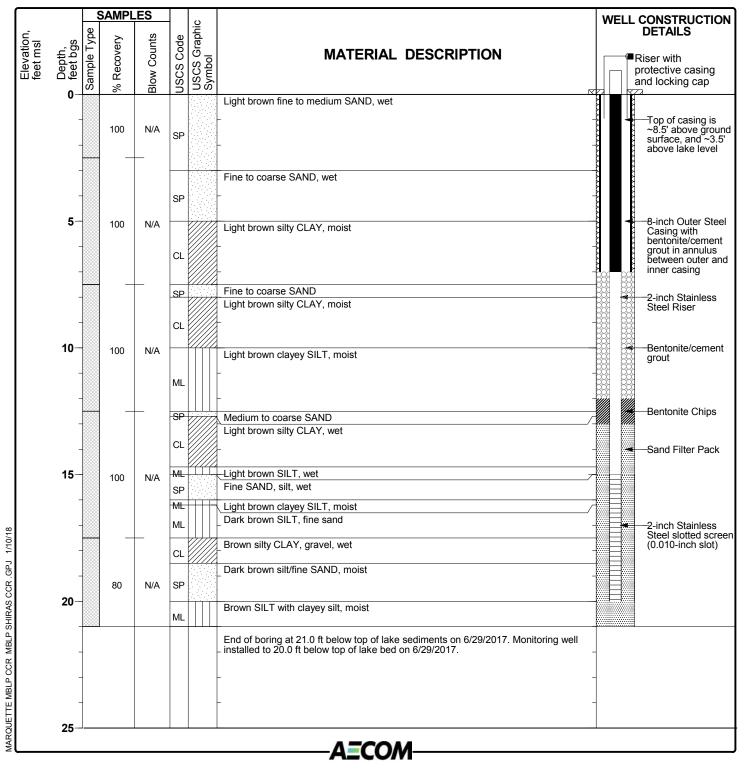
Log of MW-2

Date(s) Drilled and Installed	6/28/2017 - 6/28/2017	Logged By	Tom Flaminio	Reviewed By	S. Becker	
Drilling Method	4 1/4 Hollow Stem Auger	Drilling Contractor	Coleman Engineering	Total Depth of Borehole	22.0 feet, bgs	
Sampling Method	Macrocore	Water Level TOIC	0.1 (measured 7/19/2017)	TOC Elevation	606.95 ft, msl	
Size and Type of Well Casing	2-inch Stainless Steel	Screen Perforation	0.010" slotted	Northing (State Pla Easting (State Pla	lane) 638049.08 ft ane) 26147757.22 ft	
Seal or Backfill	Grout	Comments	Drilled with Geoprobe 7822DT, Depths measured from top of lake bed			



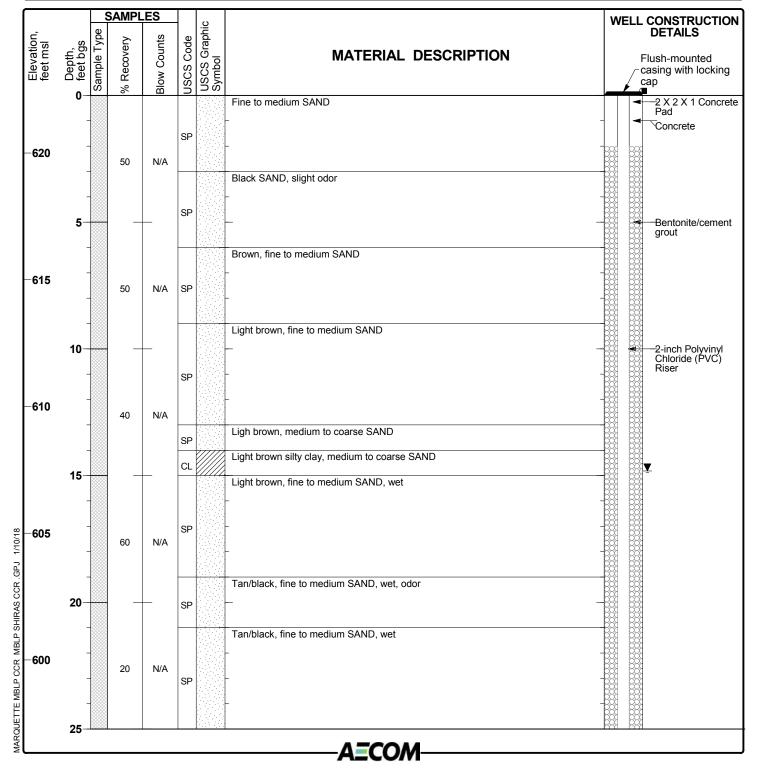
Log of MW-3

Date(s) Drilled and Installed	6/29/2017 - 6/29/2017	Logged By	Tom Flaminio	Reviewed By	S. Becker	
Drilling Method	4 1/4 Hollow Stem Auger	Drilling Contractor	Coleman Engineering	Total Depth of Borehole	21.0 feet, bgs	
Sampling Method	Macrocore	Water Level TOIC	0.13 (measured 7/19/2017)	TOC Elevation	606.42 ft, msl	
Size and Type of Well Casing	2-inch Stainless Steel	Screen Perforation	0.010" slotted	Northing (State Pl Easting (State Pla	lane) 638111.37 ft ane) 26147729.99 ft	
Seal or Backfill	Grout	Comments	Drilled with Geoprobe 7822DT, Depths measured from top of lake bed			



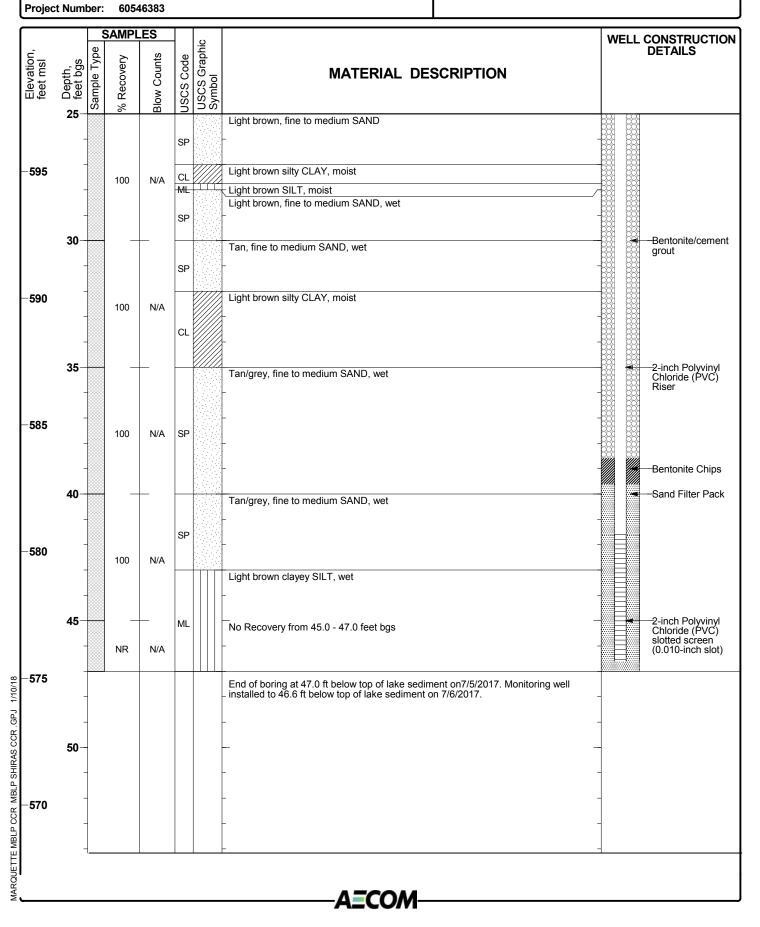
Log of MW-4

Date(s) Drilled and Installed	7/5/2017 - 7/6/2017	Logged By	Tom Flaminio	Reviewed By	S. Becker
Drilling Method	4 1/4 Hollow Stem Auger	Drilling Contractor	Coleman Engineering	Total Depth of Borehole	47.0 feet, bgs
Sampling Method	Macrocore	Water Level TOIC	16.82 (measured 7/19/2017)	TOC Elevation	624.27 ft, msl
Size and Type of Well Casing	2-inch Polyvinyl Chloride	Screen Perforation	0.010" slotted	Northing (State Pl Easting (State Pla	ane) 637925.68 ft nne) 26147506.84 ft
Seal or Backfill	Grout	Comments	Drilled with Geoprobe 7822DT		



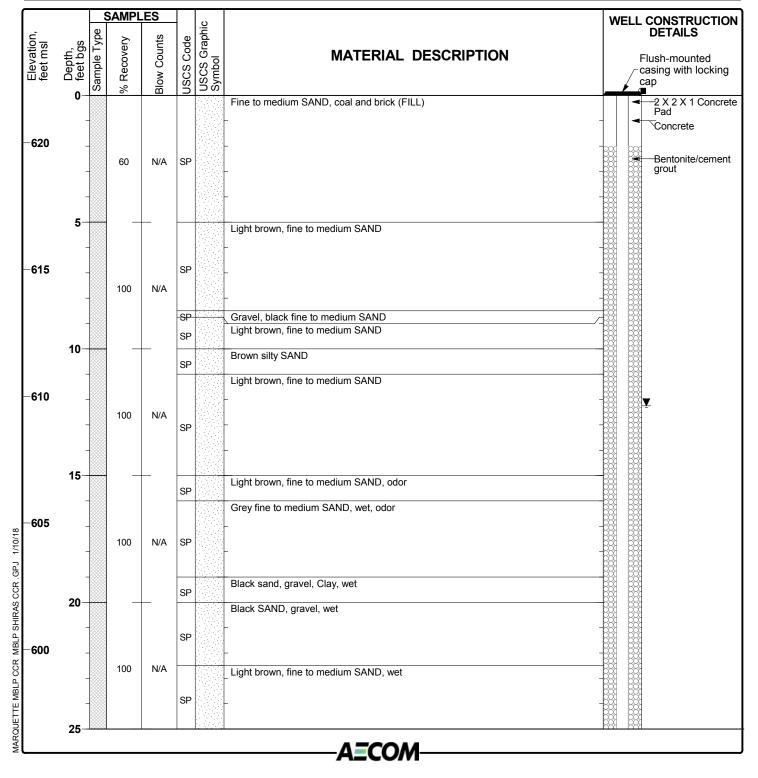
Log of MW-4

Sheet 2 of 2



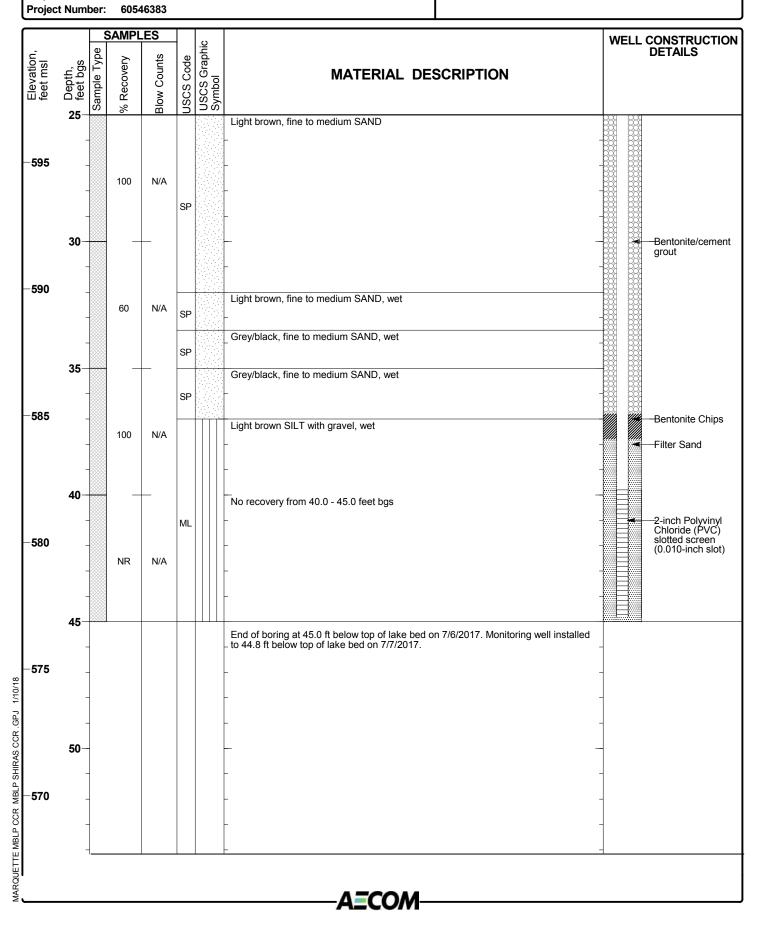
Log of MW-5

Date(s) Drilled and Installed	7/6/2017 - 7/7/2017	Logged By	Tom Flaminio	Reviewed By	S. Becker
Drilling Method	4 1/4 Hollow Stem Auger	Drilling Contractor	Coleman Engineering	Total Depth of Borehole	45.0 feet, bgs
Sampling Method	Macrocore	Water Level TOIC	14.25 (measured 7/19/2017)	TOC Elevation	623.87 ft, msl
Size and Type of Well Casing	2-inch Polyvinyl Chloride	Screen Perforation	0.010" slotted	Northing (State Pl Easting (State Pla	ane) 637853.84 ft ine) 26147531.37 ft
Seal or Backfill	Grout	Comments	Drilled with Geoprobe 7822DT		



Log of MW-5

Sheet 2 of 2



Appendix B Analytical Laboratory Reports



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project					
Laboratory:	Trace Analytical Laboratories and S	Trace Analytical Laboratories and Summit Environmental Technologies				
Work Order:	T17G390					
Analyses/Method:	Method: Metals (6010B/6020/7470A), General Chemistry (300.0/SM 2540C), Radiological (903.0/904.0)					
Validation Level:	Level 2					
Prepared by:	Lisa Smith (CEAC)/AECOM	Completed on: 9/1/2017				

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on July 19, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1	MW-1 MS/MSD for Hg MS for Radium 226&228 Lab Dup for TDS		T17G390-01
MW-2	Lab Dup for TDS	07/19/17	T17G390-02
MW-3		07/19/17	T17G390-03
MW-4		07/19/17	T17G390-04
MW-5		07/19/17	T17G390-05
Dup_071917	FD of MW-5	07/19/17	T17G390-06
Equipment Blank		07/20/17	T17G390-07

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- *Evaluation of Radiochemical Data Usability* (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- Holding times and sample preservation
- X Laboratory blanks and equipment blanks
- X Matrix spike (MS) and/or matrix spike duplicate (MSD) results



- X Laboratory duplicates
- ✓ Laboratory control sample (LCS) results
- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Selected data points were qualified as estimated (J) due to nonconformances of certain QC criteria, or B due to blank detections. Qualified sample results are presented in Table 1 and a summary is listed below. A detailed data validation discussion is provided in the Detailed Review Section.

- Three Radium-228 results were attributable to blank contamination, and qualified B.
- TDS laboratory duplicate precision limits were exceeded for two samples and results were qualified as estimated (J).
- Radium-228 had a low matrix spike recovery and one result was qualified as estimated (J).

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks and Equipment Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.



One equipment blank was associated with the groundwater samples collected. The equipment blank was nondetect with the exception of Radium-228 which was detected at a concentration of 1.24 ± 0.63 pCi/L. The normalized absolute difference (NAD) between blank and sample detects were between 0 and 1.96 indicating the Radium-288 detects are attributable to blank contamination and were qualified B.

MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Mercury MS/MSD results and Radium 226 and 228 MS results were provided for sample MW-1 from batch analysis. MS/MSD recoveries and RPDs were within criteria, with the exception of Radium-228. The laboratory reported a Radium-228 recovery of 69.1%, while the acceptable recovery range is 70% to 130%. The Radium-228 result for sample MW-1 was qualified as estimated (J).

Laboratory Duplicates

Laboratory duplicate analysis was performed for TDS samples MW-1 and MW-2. The RPDs for samples MW-1 and MW-2 were 13% and 12%, respectively, and exceeded the precision limit of 10%. TDS results for sample MW-1 and MW-2 were qualified as estimated (J).

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. The LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample Dup_071917 was collected as a field duplicate of sample MW-5. RPDs were within the 30% limit for groundwater samples, and were acceptable.

		Sample	Field Duplicate		
Analyte	Units	Result	Result	RPD	RPD Limit
MW-5/Dup_071917:					
Barium	ug/l	0.17	0.17	0	30
Calcium	mg/l	100	100	0	30
Chloride	mg/l	200	190	5.1	30
Sulfate	mg/l	25	24	4.1	30
Total Dissolved Solids	mg/l	640	530	19	30

Results qualified due to blank contamination (B), are not included in the table above.

Sample Results and Quantitation

Results were reported down to the reporting limits.

pH analysis was performed in the field to ensure that analyses were performed within the required hold time.



QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

Sample ID	Analyte	Units	Result	Validation Qualifiers	Validation Reason
MW-1	Radium-228	pCi/L	2.33 ± 0.73	BJ	eb,ms
MW-4	Radium-228	pCi/L	1.07 ± 0.49	В	eb
MW-5	Radium-228	pCi/L	1.51 ± 0.65	В	eb
MW-1	TDS	mg/L	700	J	ld
MW-2	TDS	mg/L	220	J	ld

Table 1 - Data Validation Summary of Qualified Data

Qualifier J	Definition The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
В	The NAD between blank and sample results indicate results are attributable to blank contamination
Reason Codes	Description
eb	Equipment blank contamination

Laboratory duplicate

Matrix spike

ld ms



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

August 18, 2017

Mr. Tom Flaminio AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 228-2333 Fax: (906) 226-8371

RE:	Trace Project	T17G390
	Client Project	MBLP CCR 60546383

Dear Mr. Flaminio:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE SUMMARY

Trace Project ID: Client Project ID:	T17G390 MBLP CCR 60546383				
Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17G390-01	MW-1	Ground Water	tvf	07/19/17 12:45	07/21/17 10:40
T17G390-02	MW-2	Ground Water	tvf	07/19/17 11:55	07/21/17 10:40
T17G390-03	MW-3	Ground Water	tvf	07/19/17 10:55	07/21/17 10:40
T17G390-04	MW-4	Ground Water	tvf	07/19/17 15:20	07/21/17 10:40
T17G390-05	MW-5	Ground Water	tvf	07/19/17 14:10	07/21/17 10:40
T17G390-06	Dup_071917	Ground Water	tvf	07/19/17	07/21/17 10:40
T17G390-07	Equipment Blank	Ground Water	tvf	07/20/17 14:30	07/21/17 10:40

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
Ν	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Note 623 : The relative percent difference between the sample and sample duplicate is out of control. The sample result should be considered estimated.
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Note Client : The analysis was performed on site at the time of sampling by the client.
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CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

рН	Note Client :	The analysis was performed on site at the time of sampling by the	-
	client.		
Trace ID: T17G390-05			
Analysis: SM 4500-H+ B-11			_
рН	Note Client : client.	The analysis was performed on site at the time of sampling by the	_
Trace ID: T17G390-07			
Analysis: SM 4500-H+ B-11			_
рН	Note Client : client	The analysis was performed on site at the time of sampling by the	-



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ANALYTICAL RESULTS

Client Project ID:	MBLP CCR 60546383
Trace Project ID:	T17G390

Trace ID: T17G390-01 Sample ID: MW-1			Collected: Received:	07/19/17 12:45 07/21/17 10:40		Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T070738									
Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T070741									
Barium	0.21 mg/L	0.10	1	07/25/17	kbc	07/26/17	nws		
Boron	<0.30 mg/L	0.30	1	07/25/17	kbc	07/26/17	nws		
Calcium	100 mg/L	1.0	1	07/25/17	kbc	07/26/17	nws		
Lithium	<0.010 mg/L	0.010	1	07/25/17	kbc	07/26/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T070741									
Antimony	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
Arsenic	0.0066 mg/L	0.0050	1	07/25/17	kbc	08/01/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/02/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/01/17	dtm		
Chromium	<0.010 mg/L	0.010	1	07/25/17	kbc	08/01/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	07/25/17	kbc	08/01/17	dtm		
Lead	0.017 mg/L	0.0030	1	07/25/17	kbc	08/01/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	07/25/17	kbc	08/01/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/02/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699									
Fluoride	<0.38 mg/L	0.38	5	07/21/17	nm	07/21/17	nm		
Chloride	230 mg/L	50	100	07/21/17	nm	07/24/17	nm		
Sulfate as SO4	19 mg/L	2.5	5	07/21/17	nm	07/21/17	nm		
Analysis Method: SM 2540 C-11									

Batch: T070773

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ANALYTICAL RESULTS

Trace Project ID:T17G390Client Project ID:MBLP CCR 60546383									
Trace ID: T17G390-01 Sample ID: MW-1			Collected: Received:	07/19/17 12: 07/21/17 10:		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED) BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	700 mg/L	40	4	07/26/17	arm	07/28/17	arm		
Analysis Method: SM 4500-H+ B-11 Batch: T070364 pH	7.58 pH Units		1	07/19/17	jm	07/19/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383

Trace ID: T17G390-02 Sample ID: MW-2			Date Collected: Date Received:		07/19/17 11:55 07/21/17 10:40		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T070738									
Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T070741									
Barium	<0.10 mg/L	0.10	1	07/25/17	kbc	07/26/17	nws		
Boron	<0.30 mg/L	0.30	1	07/25/17	kbc	07/26/17	nws		
Calcium	51 mg/L	1.0	1	07/25/17	kbc	07/26/17	nws		
Lithium	<0.010 mg/L	0.010	1	07/25/17	kbc	07/26/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T070741									
Antimony	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/01/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/02/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/01/17	dtm		
Chromium	<0.010 mg/L	0.010	1	07/25/17	kbc	08/01/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	07/25/17	kbc	08/01/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	07/25/17	kbc	08/01/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	07/25/17	kbc	08/01/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/02/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699									
Fluoride	<0.38 mg/L	0.38	5	07/21/17	nm	07/21/17	nm		
Chloride	60 mg/L	12	25	07/21/17	nm	07/24/17	nm		
Sulfate as SO4	22 mg/L	2.5	5	07/21/17	nm	07/21/17	nm		
Analysis Method: SM 2540 C-11									

Batch: T070773

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ANALYTICAL RESULTS

			07/19/17 11:55 07/21/17 10:40		Matrix:	Ground Water		
RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
220 mg/L	40	4	07/26/17	arm	07/28/17	arm		
8.41 pH Units		1	07/19/17	jm	07/19/17	jm	Client, N	
	220 mg/L	Date I RESULTS UNITS RDL 220 mg/L 40	220 mg/L 40 4	Date Received: 07/21/17 10: RESULTS UNITS RDL DILUTION PREPARED 220 mg/L 40 4 07/26/17	Date Received: 07/21/17 10:40 RESULTS UNITS RDL DILUTION PREPARED BY 220 mg/L 40 4 07/26/17 arm	Date Received: 07/21/17 10:40 RESULTS UNITS RDL DILUTION PREPARED BY ANALYZED 220 mg/L 40 4 07/26/17 arm 07/28/17	Date Received: 07/21/17 10:40 RESULTS UNITS RDL DILUTION PREPARED BY ANALYZED BY 220 mg/L 40 4 07/26/17 arm 07/28/17 arm	Date Received: 07/21/17 10:40 RESULTS UNITS RDL DILUTION PREPARED BY ANALYZED BY NOTES 220 mg/L 40 4 07/26/17 arm 07/28/17 arm



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ANALYTICAL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383

Trace ID: T17G390-03 Sample ID: MW-3			Date Collected: Date Received:		07/19/17 10:55 07/21/17 10:40		Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL	
METALS, TOTAL										
Analysis Method: EPA 7470A Batch: T070738										
Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws			
METALS, TOTAL										
Analysis Method: EPA 6010B Batch: T070741										
Barium	0.11 mg/L	0.10	1	07/25/17	kbc	07/26/17	nws			
Boron	<0.30 mg/L	0.30	1	07/25/17	kbc	07/26/17	nws			
Calcium	68 mg/L	1.0	1	07/25/17	kbc	07/26/17	nws			
Lithium	<0.010 mg/L	0.010	1	07/25/17	kbc	07/26/17	nws	Ν		
Analysis Method: EPA 6020 Batch: T070741										
Antimony	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm			
Arsenic	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/01/17	dtm			
Beryllium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/02/17	dtm			
Cadmium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/01/17	dtm			
Chromium	<0.010 mg/L	0.010	1	07/25/17	kbc	08/01/17	dtm			
Cobalt	<0.020 mg/L	0.020	1	07/25/17	kbc	08/01/17	dtm			
Lead	<0.0030 mg/L	0.0030	1	07/25/17	kbc	08/01/17	dtm			
Molybdenum	<0.050 mg/L	0.050	1	07/25/17	kbc	08/01/17	dtm	Ν		
Selenium	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/02/17	dtm			
Thallium	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm			
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699										
Fluoride	<0.38 mg/L	0.38	5	07/21/17	nm	07/21/17	nm			
Chloride	98 mg/L	12	25	07/21/17	nm	07/24/17	nm			
Sulfate as SO4	49 mg/L	2.5	5	07/21/17	nm	07/21/17	nm			

Analysis Method: SM 2540 C-11

Batch: T070773

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ANALYTICAL RESULTS

Trace Project ID:T17G390Client Project ID:MBLP CCR 60546383									
Trace ID: T17G390-03 Sample ID: MW-3			Collected: Received:	07/19/17 10: 07/21/17 10:		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	360 mg/L	40	4	07/26/17	arm	07/28/17	arm		
Analysis Method: SM 4500-H+ B-11 Batch: T070364									
рН	8.00 pH Units		1	07/19/17	jm	07/19/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383

PARAMETERS			Date Collected: Date Received:		07/19/17 15:20 07/21/17 10:40		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T070738									
Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T070741									
Barium	<0.10 mg/L	0.10	1	07/25/17	kbc	07/26/17	nws		
Boron	<0.30 mg/L	0.30	1	07/25/17	kbc	07/26/17	nws		
Calcium	93 mg/L	1.0	1	07/25/17	kbc	07/26/17	nws		
Lithium	<0.010 mg/L	0.010	1	07/25/17	kbc	07/26/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T070741									
Antimony	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/01/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/02/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/01/17	dtm		
Chromium	<0.010 mg/L	0.010	1	07/25/17	kbc	08/01/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	07/25/17	kbc	08/01/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	07/25/17	kbc	08/01/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	07/25/17	kbc	08/01/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/02/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699									
Fluoride	<0.38 mg/L	0.38	5	07/21/17	nm	07/21/17	nm		
Chloride	260 mg/L	50	100	07/21/17	nm	07/24/17	nm		
Sulfate as SO4	19 mg/L	2.5	5	07/21/17	nm	07/21/17	nm		

Batch: T070773

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ANALYTICAL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383									
Trace ID: T17G390-04 Sample ID: MW-4			Date Collected: Date Received:		07/19/17 15:20 07/21/17 10:40		Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	700 mg/L	40	4	07/26/17	arm	07/28/17	arm		
Analysis Method: SM 4500-H+ B-11 Batch: T070364									
рН	7.92 pH Units		1	07/19/17	jm	07/19/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383

PARAMETERS RESULTS UNITS RDL DILUTION PREPARED BY ANALYZED BY NOTES METALS, TOTAL Analysis Method: EPA 7470A Bach: 1707073 Bach: 1707073 Keb 07/25/17 Keb 07/27/17 nvs METALS, TOTAL Analysis Method: EPA 6810B Bath: 17070741 Bath 0.17 mg/L 0.10 1 07/25/17 Keb 07/26/17 nvs Bardin 0.17 mg/L 0.10 1 07/25/17 Keb 07/26/17 nvs Bardin 0.00 000 mg/L 0.30 1 07/25/17 Keb 07/26/17 nvs Bardin 0.00 000 mg/L 0.00 1 07/25/17 Keb 07/26/17 nvs Analysis Method: EPA 6820 Barch: 17070741 0.0020 1 07/25/17 Keb 08/01/17 dtm Analysis Method: EPA 6820 Barch: 1707074 0.0020 1 07/25/17 Keb 08/01/17 dtm Analysis Method: EPA 6820 Barch: 1070741 0.0010 1 07/25/17 Keb 08/01/17	07/19/17 14:10 Matrix: Ground Water 07/21/17 10:40		Date Collected: Date Received:			Trace ID: T17G390-05 Sample ID: MW-5
Analysis Method: EPA 7470A Bate::: T270739 Mercury <0.00020 mg/L	ON PREPARED BY ANALYZED BY NOTES MCL	PREPARED B	DILUTION	RDL	RESULTS UNITS	PARAMETERS
Bath: T070739 Mercury <0.00020 mg/L						METALS, TOTAL
METALS, TOTAL Batistis Methoad: EPA 60108 Batistis 7 2070741 Barium 0.17 mg/L 0.10 1 07/25/17 Kec 07/26/17 mws Boron <0.30 mg/L						
Analysis Method: EPA 6010B Batid: On 7 mg/L O.10 1 O7/25/17 Kbc O7/26/17 nws Boron <0.30 mg/L	07/25/17 kbc 07/27/17 nws	07/25/17 kb	1	0.00020	<0.00020 mg/L	Mercury
Barium 0.17 mg/L 0.10 1 07/26/17 kbc 07/26/17 nws Boron <0.30 mg/L						METALS, TOTAL
Boron -0.30 mg/L 0.30 1 07/25/17 kbc 07/25/17 nws Calcium 100 mg/L 1.0 1 07/25/17 kbc 07/26/17 nws Lithium -0.010 mg/L 0.010 1 07/25/17 kbc 07/26/17 nws N Analysis Method: EPA 6020 Batch:						
Calcium 100 mg/L 1.0 1 07/25/17 kbc 77/26/17 nws Lthium <0.010 mg/L	07/25/17 kbc 07/26/17 nws	07/25/17 kb	1	0.10	0.17 mg/L	Barium
Lithium < 0.010 mg/L 0.010 1 07/25/17 kbc 07/26/17 nws N Analysis Method: EPA 6020 Batch: 70070741 0.0020 mg/L 0.0020 1 07/25/17 kbc 08/01/17 dtm Antimony < 0.0020 mg/L	07/25/17 kbc 07/26/17 nws	07/25/17 kb	1	0.30	<0.30 mg/L	Boron
Analysis Method: EPA 6020 Batch: T070741 Antimony <0.0020 mg/L	07/25/17 kbc 07/26/17 nws	07/25/17 kb	1	1.0	100 mg/L	Calcium
Batch: T070741 Antimony <0.0020 mg/L 0.0020 1 07/25/17 kbc 08/01/17 dtm Arsenic <0.0050 mg/L	07/25/17 kbc 07/26/17 nws N	07/25/17 kb	1	0.010	<0.010 mg/L	Lithium
Arsenic <0.0050 mg/L 0.0050 1 07/25/17 kbc 08/01/17 dtm Beryllium <0.0010 mg/L						
Beryllium <0.0010 mg/L	07/25/17 kbc 08/01/17 dtm	07/25/17 kb	1	0.0020	<0.0020 mg/L	Antimony
Cadmium <0.0010 mg/L 0.0010 1 07/25/17 kbc 08/01/17 dtm Chomium <0.010 mg/L	07/25/17 kbc 08/01/17 dtm	07/25/17 kb	1	0.0050	<0.0050 mg/L	Arsenic
Chromium < 0.010 mg/L	07/25/17 kbc 08/02/17 dtm	07/25/17 kb	1	0.0010	<0.0010 mg/L	Beryllium
Cobalt <0.020 mg/L	07/25/17 kbc 08/01/17 dtm	07/25/17 kb	1	0.0010	<0.0010 mg/L	Cadmium
Lead <0.0030 mg/L	07/25/17 kbc 08/01/17 dtm	07/25/17 kb	1	0.010	<0.010 mg/L	Chromium
Molybdenum <0.050 mg/L 0.050 1 07/25/17 kbc 08/01/17 dtm N Selenium <0.0050 mg/L	07/25/17 kbc 08/01/17 dtm	07/25/17 kb	1	0.020	<0.020 mg/L	Cobalt
Selenium <0.0050 mg/L	07/25/17 kbc 08/01/17 dtm	07/25/17 kb	1	0.0030	<0.0030 mg/L	Lead
Thallium <0.0020 mg/L 0.0020 1 07/25/17 kbc 08/01/17 dtm WET CHEMISTRY Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699 5 07/21/17 nm 07/21/17 nm Fluoride <0.38 mg/L 0.38 5 07/21/17 nm 07/24/17 nm Chloride 200 mg/L 25 50 07/21/17 nm 07/24/17 nm	07/25/17 kbc 08/01/17 dtm N	07/25/17 kb	1	0.050	<0.050 mg/L	Molybdenum
WET CHEMISTRY Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699 Fluoride <0.38 mg/L	07/25/17 kbc 08/02/17 dtm	07/25/17 kb	1	0.0050	<0.0050 mg/L	Selenium
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699 Fluoride <0.38 mg/L	07/25/17 kbc 08/01/17 dtm	07/25/17 kb	1	0.0020	<0.0020 mg/L	Thallium
Batch: T070699 Fluoride <0.38 mg/L						WET CHEMISTRY
Chloride 200 mg/L 25 50 07/21/17 nm 07/24/17 nm						•
-	07/21/17 nm 07/21/17 nm	07/21/17 nn	5	0.38	<0.38 mg/L	Fluoride
	07/21/17 nm 07/24/17 nm	07/21/17 nn	50	25	200 mg/L	Chloride
Sulfate as SO4 25 mg/L 2.5 5 07/21/17 nm 07/21/17 nm	07/21/17 nm 07/21/17 nm	07/21/17 nn	5	2.5	25 mg/L	Sulfate as SO4

Batch: T070773

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ANALYTICAL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383									
Trace ID: T17G390-05 Sample ID: MW-5			Collected: Received:	07/19/17 14 07/21/17 10		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	D BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	640 mg/L	40	4	07/26/17	arm	07/28/17	arm		
Analysis Method: SM 4500-H+ B-11 Batch: T070364									
рН	7.36 pH Units		1	07/19/17	jm	07/19/17	jm	Client, N	



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NOTES

MCL

		ANALYTICA	L RESULTS					
Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383								
Trace ID: T17G390-06		Date	Collected:	07/19/17		Matrix:	Ground	Water
Sample ID: Dup_071917		Date	Received:	07/21/17 10:4	40			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTE
METALS, TOTAL								
Analysis Method: EPA 7470A Batch: T070738								
Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws	
METALS, TOTAL								
Analysis Method: EPA 6010B Batch: T070741								
Barium	0.17 mg/L	0.10	1	07/25/17	kbc	07/26/17	nws	
Boron	<0.30 mg/L	0.30	1	07/25/17	kbc	07/26/17	nws	
Calcium	100 mg/L	1.0	1	07/25/17	kbc	07/26/17	nws	
Lithium	<0.010 mg/L	0.010	1	07/25/17	kbc	07/26/17	nws	Ν
Analysis Method: EPA 6020 Batch: T070741								
Antimony	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/01/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/02/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/01/17	dtm	
Chromium	<0.010 mg/L	0.010	1	07/25/17	kbc	08/01/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	07/25/17	kbc	08/01/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	07/25/17	kbc	08/01/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	07/25/17	kbc	08/01/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/02/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm	
WET CHEMISTRY								
WET CHEMISTRY								
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699								
Fluoride	<0.38 mg/L	0.38	5	07/21/17	nm	07/21/17	nm	
Chloride	190 mg/L	25	50	07/21/17	nm	07/24/17	nm	
Sulfate as SO4	24 mg/L	2.5	5	07/21/17	nm	07/21/17	nm	

Analysis Method: SM 2540 C-11

Batch: T070773

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ANALYTICAL RESULTS

WET CHEM	ISTRY olved Solids	530 mg/L	40	4	07/26/17	arm	07/28/17	arm		
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
Trace ID: Sample ID:	T17G390-06 Dup_071917			Collected: Received:	07/19/17 07/21/17 10:4	0	Matrix:	Ground	Water	
Client Project	ID: MBLP CCR 60546383									



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ANALYTICAL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383

Trace ID: T17G390-07 Sample ID: Equipment Blank			Collected: Received:	07/20/17 14:30 07/21/17 10:40		Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T070738									
Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T070741									
Barium	<0.10 mg/L	0.10	1	07/25/17	kbc	07/26/17	nws		
Boron	<0.30 mg/L	0.30	1	07/25/17	kbc	07/26/17	nws		
Calcium	<1.0 mg/L	1.0	1	07/25/17	kbc	07/26/17	nws		
Lithium	<0.010 mg/L	0.010	1	07/25/17	kbc	07/26/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T070741									
Antimony	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/01/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/02/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	07/25/17	kbc	08/01/17	dtm		
Chromium	<0.010 mg/L	0.010	1	07/25/17	kbc	08/01/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	07/25/17	kbc	08/01/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	07/25/17	kbc	08/01/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	07/25/17	kbc	08/01/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	07/25/17	kbc	08/02/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	07/25/17	kbc	08/01/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070699									
Fluoride	<0.38 mg/L	0.38	5	07/21/17	nm	07/21/17	nm		
Chloride	<10 mg/L	10	5	07/21/17	nm	07/21/17	nm		
Sulfate as SO4	<2.5 mg/L	2.5	5	07/21/17	nm	07/21/17	nm		

Analysis Method: SM 2540 C-11

Batch: T070773

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ANALYTICAL RESULTS

Trace Project ID:T17G390Client Project ID:MBLP CCR 60546383									
Trace ID: T17G390-07 Sample ID: Equipment Blank			Collected: Received:	07/20/17 14: 07/21/17 10:-		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	<10 mg/L	10	1	07/26/17	arm	07/28/17	arm		
Analysis Method: SM 4500-H+ B-11 Batch: T070364									
рН	8.05 pH Units		1	07/20/17	jm	07/20/17	jm	Client, N	



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QUALITY CONTROL RESULTS

Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383

QC Batch: T070738	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T070738-BLK1

Parameter Units		Links Divide		Reporting Limit		Notes
Mercury	mg/L	<	0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T070738-B	S1				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00200	100	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T070738-MSD1				Original: T17G390-01							
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00220	0.00228	110	114	76-123	4	20	
				Project ID:							
			Client	Project ID:	MBLP CCR	60546383					
QC Batch: T070741		Analysis Description: Calcium, Total									
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids			Ar	nalysis Metł	nod: EPA 6	010B					

METHOD BLANK: T070741-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T070741-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.819	92	80-120	
Barium	mg/L	0.889	0.853	96	80-120	
Calcium	mg/L	8.89	8.88	100	80-120	
Lithium	mg/L	0.889	0.843	95	80-120	

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Trace Project ID: T17G390 Client Project ID: MBLP CCR 60546383

QC Batch: T070741 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Arsenic, Total Analysis Method: EPA 6020

METHOD BLANK: T070741-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.0050	0.0050	
Beryllium	mg/L	<0.0010	0.0010	
Cadmium	mg/L	<0.0010	0.0010	
Cobalt	mg/L	<0.020	0.020	
Chromium	mg/L	<0.010	0.010	
lolybdenum	mg/L	<0.050	0.050	
.ead	mg/L	<0.0030	0.0030	
Antimony	mg/L	<0.0020	0.0020	
Selenium	mg/L	<0.0050	0.0050	
Fhallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T070741-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0455	82	80-120	
Beryllium	mg/L	0.111	0.103	92	80-120	
Cadmium	mg/L	0.0278	0.0242	87	80-120	
Cobalt	mg/L	0.889	0.841	95	80-120	
Chromium	mg/L	0.0278	0.0257	93	80-120	
Molybdenum	mg/L	0.889	0.871	98	80-120	
Lead	mg/L	0.0556	0.0541	97	80-120	
Antimony	mg/L	0.0556	0.0471	85	80-120	
Selenium	mg/L	0.0556	0.0447	81	80-120	
Thallium	mg/L	0.0556	0.0524	94	80-120	
			Project ID: T17G390			

Client Project ID: MBLP CCR 60546383

QC Batch: T069765 QC Batch Method: EPA 200.2

Analysis Description: Metals Digestion

Analysis Method: EPA 200.2

Trace Project ID: T17G390

Client Project ID: MBLP CCR 60546383

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Γ	QC Batch: T070699	Analysis Description: Sulfate
I	QC Batch Method: IC Prep W	Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T070699-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

METHOD BLANK: T070699-BLK2

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T070699-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	95	90-110	
Fluoride	mg/L	0.500	0.495	99	90-110	
Sulfate as SO4	mg/L	2.50	2.45	98	90-110	

LABORATORY CONTROL SAMPLE: T070699-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes			
Chloride	mg/L	1.00	<10	96	90-110				
Fluoride	mg/L	0.500	0.490	98	90-110				
Sulfate as SO4	mg/L	2.50	2.46	98	90-110				
Trace Project ID: T17G390									

Client Project ID: MBLP CCR 60546383

QC Batch: T070773	Analysis Description: Total Dissolved Solids
QC Batch Method: SM 2540 C-11	Analysis Method: SM 2540 C-11

METHOD BLANK: T070773-BLK1

Parameter Units		Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

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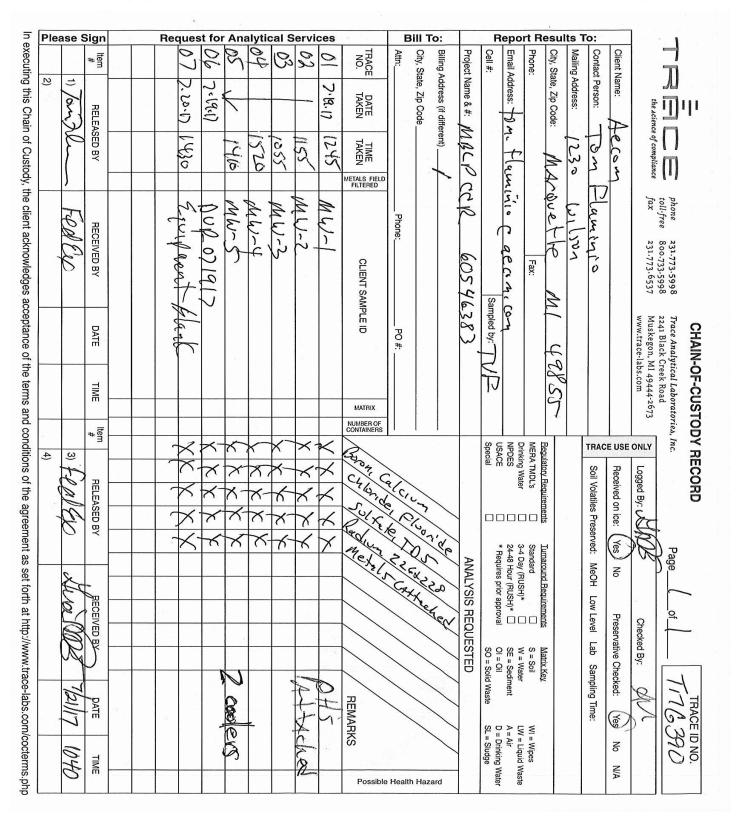
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Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit			Notes
Total Dissolved Solids	mg/L	501	471	94	80-120			
SAMPLE DUPLICATE: T0707	73-DUP1	Original: T17G390-01						
Parameter	Units	Original Result	DUP Result			RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	700	796			13	10	623
SAMPLE DUPLICATE: T0707		Original: T17G390-02 Original	DUP			RPD	Max	Notes
SAMPLE DUPLICATE: T0707 Parameter Total Dissolved Solids	Units					RPD	Max RPD 10	Notes 623
Parameter		Original Result 220 Trace	DUP Result				RPD	
Parameter	Units	Original Result 220 Trace	DUP Result 196 Project ID: T17G390 Project ID: MBLP CC				RPD	

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SAMPLE LOG IN CHECKLIST									
Trace ID #:7116390	Date: 7/21/17 Package Descri	ption: <u>Popler</u> Temperature: <u>1.4</u>							
Client Name: AECOM	Time: 10: 57	Logged in by:							
	Cooler Receipt								
Cooler/samples delivered by:									
		lelivery person:							
Commercial courier UPS FED EX US Mail									
Tracking Number:	Not Applicable								
Tracking #: <u>7796967910165</u>									
COC Seals present and intact on cooler? Not Applicable No Yes									
Custody seals signed by Client?	No Yes Client custody	seal # (if applicable):							
- Low D									
	Coolant and Temperature								
Type of Coolant Used	1								
Slurry w/ crushed, cubed, or chip ice		o <i>ler Temperature</i> Stick Thermometer CF = -0.6°C							
Multiple bags of ice around samples		ermometer $CF = -0.4^{\circ}C$							
Ice Packs/ Blue Ice	ture: 3.2 °C (check one below)								
No Coolant Presen	Stick Thermometer)								
Ice still present upon receipt (circle one):									
(Yes) No N/A									
	General								
	Yes No NA	Comments							
All bottles arrived unbroken with labels in g									
Each sample point is in a seale									
All bottle labels agree with Chain of Co Sufficient sample to run te									
pH checked and samples		0.44*							
Correct preservative adde									
Air bubbles abse									
COC filled out properly and sig	gned by client?								
COC signed in by TRACE sam	ple custodian?								
Was project manager called and sampl	les discussed?	<i>2</i>							
Notes: Equipment Bland	V	*EMD pH Test Strips Used:							
nows. Equippinent Mund	2								
		→ PH 0-2.5 Cot: HC563733 → PH 11.0-13.0 Lot: HC547328							
		Other:							
		Lot: HC563733 verified 6/21/16 AY							
		Lot: HC574761 verified 04/03/17 JS							
Form 70-A.21 Effective 7/5/17		TRACE Analytical Laboratories, Inc.							

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SAMPLE LOG IN CHECKLIST							
Trace ID #: TITA 390 Date: 7/21/17 Package Description: Collect Temperature: 1, 0 Client Name: AECOVI Time: 10', 50 Logged in by: C 1, 0							
Cooler Receipt							
Cooler/samples delivered by: Trace courier Hand delivered Name of delivery person: Commercial courier X UPS FED EX US Mail							
Tracking Number: Not Applicable Tracking #: <u>779696791065</u>							
COC Seals present and intact on cooler? Not Applicable No							
Custody seals signed by Client? No Seal # (if applicable):							
Coolant and Temperature							
Type of Coolant Used Cooler Temperature							
Slurry w/ crushed, cubed, or chip ice?							
•IR Thermometer CF = -0.4°C							

 Ice Packs/ Blue Ice :
 Representative Sample Temperature:
 3,0
 °C (check one below)

 No Coolant Present:
 Temp Blank (Stick Thermometer)

 Ice still present upon receipt (circle one):
 Client Sample (IR Thermometer)

 Yes
 No
 N/A

General								
Yes	No	NA	Comments					
All bottles arrived unbroken with labels in good condition?]					
Each sample point is in a sealed plastic bag?								
Labels filled out completely?								
All bottle labels agree with Chain of Custody (COC)?								
Sufficient sample to run tests requested?								
pH checked and samples at correct pH?			See Below*					
Correct preservative added to samples?]					
Air bubbles absent from VOAs?			<u>]</u>					
COC filled out properly and signed by client?		Ĺ						
COC signed in by TRACE sample custodian?]					
Was project manager called and samples discussed?]					
Notes:			*EMD pH Test Strips Used:					
			pH 0-2.5 pH 11.0-13.0 Lot: HC563733 D Lot: HC547328					
			Other:					
			Lot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS					
Form 70-A.21			TRACE Analytical Laboratories, Inc.					

Effective 7/5/17

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August 18, 2017

Mr. Tom Flaminio AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 228-2333 Fax: (906) 226-8371

RE: Trace ID: T17G390

Dear Mr. Flaminio:

Enclosed are your analytical results associated with your project for MBLP CCR 60546383. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from Summit Environmental Technologies.

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





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	ease s	Sign	F	leques	st for	Ana	alytic	cal S	ervi	ces		В	ill Te	o:		R	epo	rt Re	sul	ts T	o:	ar sa	1	
		ltem #		50	06	3	40	03	60	0	TRACE NO.	Attn:	City, Sta	Billing A	Project	Cell #:	Email Address:	Phone:	City, Sta	Mailing .	Contact	Client Name:		
2) In this Chain	1) Jours	RELEA		7.20.17	$2 \cdot (q \cdot l)$	K				7.19.17	DATE TAKEN		City, State, Zip Code_	Billing Address (if different)	Project Name & #:	-	5		City, State, Zip Code:	Mailing Address:	Contact Person:	ame: A	the science	μ
of Custody	l	RELEASED BY		0941		1416	1520	1055	1155	1245	TAKEN METALS FIELD FILTERED			rent)	MACPO		m. fleun		MA	1230	Ism	ecom	the science of compliance	
p (2) (4)	Feelly	RECEIVED BY		Equipart,	212160 JUB	MW-S	MULY	MW-2	MU-2	MW-1	CLIENT SAMPLE	Phone:			CCR 6054638		luminio r accini	Fax:	harovetle M	רשנל וען	Planinio		phone 231.773.5998 toll-free 800.733.5998 fax 231.773.6537	
rentance of the		DATE		black	-						IPLE ID	PO #:			283	Sampled by: TV	(0-4		22 h 11				<i>Trace Analytical Laboratories</i> , 2241 Black Creek Road Muskegon, MI 49444-2673 www.trace-labs.com	CHAIN-O
terme a		TIME									MATRIX					च			SS				al Laborat ek Road 49444-267 .com	F-CUS
		ltem #		~	×-	5		×-	×-	~	NUMBER OF CONTAINERS					Sp C	Z D	M			TRACE	USE	ries, I	TODY
4) Higher of the paragement of	3) Fealth	RELEASED BY		(x X X X	XXXX	XXXX		XXXX	XXXX XX		E XE	6	6	12/		·		MERA TMDL's Stan			Soil Volatiles Preserved:	Received on ice: (Yes)	Logged By: White	CHAIN-OF-CUSTODY RECORD
s oot forth at http://www.tr	Lin Mes	RECEIVED BY									A REAL	14 / / /	1 Strather	1 2 8/	ANALYSIS REQUESTED	* Requires prior approval OI = Oil SO = Sc					MeOH Low Level Lab Sa	No Preservative Checked:	geof Checked By:	-
the among and a del activity www.	7/21/17	PATE			-	2 coolers	z		444	OHS	REMARKS		///			OI = OI D = SO = Solid Waste SL :		Ŕ			킄	ecked: Yes	JULC3	TRACE ID NO.
	1040	TIME				à			tcher		Possible	Health	ı Haza	urd		D = Drinking Water SL = Sludge	= Liquid Waste Air	WI = Wipes				No N/A	V 0630	D NO.

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SAMPLE LOG IN CHECKLIST

Trace ID #: <u>7776390</u>	Date: 7/21/17	Package Description:	Cooler	Temperature: 1.4
Client Name: <u>AECOM</u>	Time	e: 10: 50	Logged in by:	Ans

Cooler Receipt								
Cooler/samples delivered by:	Trace courier							
	Hand delivered Name of delivery person:							
	Commercial courier 🔀 UPS FED EX 🔀 US Mail 🗔							
Tracking Number:	Not Applicable							
	Tracking #: 779696791065							
COC Seals present and intact on cooler?	Not Applicable No Yes							
Custody seals signed by Client?	No Ves Client custody seal # (if applicable):							

Coolant and Temperature								
Type of Coolant Used	Cooler Temperature							
Slurry w/ crushed, cubed, or chip ice?	<u>Correction Factors:</u> •Digital Stick Thermometer CF = -0.6°C							
Multiple bags of ice around samples?	•IR Thermometer CF = -0.4°C							
Ice Packs/ Blue Ice :	Representative Sample Temperature: <u>3, 2</u> °C (check one below)							
No Coolant Present:	Temp Blank (Stick Thermometer)							
Ice still present upon receipt (circle one):	Client Sample (IR Thermometer)							
(Yes) No N/A	Melt Water: °C (Use Digital Stick Thermometer)							

(Gene	eral		
Yes	No	NA	Co	mments
All bottles arrived unbroken with labels in good condition?				
Each sample point is in a sealed plastic bag?			· · · · · · · · · · · · · · · · · · ·	
Labels filled out completely?				
All bottle labels agree with Chain of Custody (COC)?				
Sufficient sample to run tests requested?				
pH checked and samples at correct pH?			See Below*	-
Correct preservative added to samples?	20 20			10 1
Air bubbles absent from VOAs?		X	1	
COC filled out properly and signed by client?		-		
COC signed in by TRACE sample custodian?				
Was project manager called and samples discussed?				<i>a</i>
Notes: Equipment Blank				H Test Strips Used:
• • • • • • • • • • • • • • • • • • •				63733 DH 11.0-13.0 Lot: HC547328
			Other:	
			Lot: HC563733 ve	erified 6/21/16 AY
			Lot: HC574761 ve	erified 04/03/17 JS
Form 70-A.21 Effective 7/5/17			TRACE	E Analytical Laboratories, Inc.

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SAMPLE LOG IN CHECKLIST

Trace ID #:	Date: 7/21/17	Package Description:	Caller	Temperature: 1.6
Client Name: <u>AECOM</u>	Time	: 10:5D	Logged in by:	Giver

Cooler Receipt							
Cooler/samples delivered by:	Trace courier						
	Hand delivered Name of delivery person:						
	Commercial courier 🔀 UPS FED EX US Mail						
Tracking Number:	☐ Not Applicable Tracking #: <u>719696791065</u>						
COC Seals present and intact on cooler?	Not Applicable No						
Custody seals signed by Client?	No Ses Client custody seal # (if applicable):						

Coolant and Temperature							
Type of Coolant Used	Cooler Temperature						
Slurry w/ crushed, cubed, or chip ice?	<u>Correction Factors:</u> •Digital Stick Thermometer CF = -0.6°C						
Multiple bags of ice around samples?	•IR Thermometer CF = -0.4°C						
Ice Packs/ Blue Ice :	Representative Sample Temperature: $3.O$ °C (check one below)						
No Coolant Present:	Temp Blank (Stick Thermometer)						
Ice still present upon receipt (circle one):	Client Sample (IR Thermometer)						
Yes No N/A	Melt Water: <u>l</u> (Use Digital Stick Thermometer)						

	Gene	eral		
Yes	No	NA		Comments
All bottles arrived unbroken with labels in good condition?			10	
Each sample point is in a sealed plastic bag?				
Labels filled out completely?				-
All bottle labels agree with Chain of Custody (COC)?				
Sufficient sample to run tests requested?				
pH checked and samples at correct pH?			See Below*	
Correct preservative added to samples?			-	
Air bubbles absent from VOAs?				
COC filled out properly and signed by client?				· · · · · · · · · · · · · · · · · · ·
COC signed in by TRACE sample custodian?				
Was project manager called and samples discussed?				
Notes:				*EMD pH Test Strips Used:
				Def H 0-2.5 Lot: HC563733 D PH 11.0-13.0 Lot: HC547328
				Other:
				Lot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS
Form 70-A.21 Effective 7/5/17				TRACE Analytical Laboratories, Inc.

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August 17, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17G390

Dear Jon Mink:

Order No.: 17071376

Summit Environmental Technologies, Inc. received 7 sample(s) on 7/25/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

fally Slow

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891



Case Narrative

WO#:17071376Date:8/17/2017

CLIENT:Trace Analytical Laboratories, Inc.Project:T17G390

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.



Workorder Sample Summary

WO#: 17071376 17-Aug-17

CLIENT:Trace Analytical Laboratories, Inc.Project:T17G390

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17071376-001	T17G390-01		7/19/2017 12:45:00 PM	7/25/2017 10:25:00 AM	Aqueous
17071376-002	T17G390-02		7/19/2017 11:55:00 AM	7/25/2017 10:25:00 AM	Aqueous
17071376-003	T17G390-03		7/19/2017 10:55:00 AM	7/25/2017 10:25:00 AM	Aqueous
17071376-004	T17G390-04		7/19/2017 3:20:00 PM	7/25/2017 10:25:00 AM	Aqueous
17071376-005	T17G390-05		7/19/2017 2:10:00 PM	7/25/2017 10:25:00 AM	Aqueous
17071376-006	T17G390-06		7/19/2017	7/25/2017 10:25:00 AM	Aqueous
17071376-007	T17G390-07		7/20/2017 2:30:00 PM	7/25/2017 10:25:00 AM	Aqueous



Analytical Report

(consolidated) WO#: **17071376** Date Reported: **8/17/2017**

CLIENT:	Trace Analytical Laboratories,	Inc. Collection Date: 7/19/2017 12:45:00 PM
Project:	T17G390	
Lab ID:	17071376-001	Matrix: AQUEOUS
Client Sample ID	T17G390-01	
Analyses	Resul	PQL Qual Units Uncertainty DF Date Analyzed

RADIUM-226 (EPA 903.0)			E	E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	pCi/L	± 0.1	1 1	8/17/2017 8:34:00 AM 8/17/2017 8:34:00 AM
RADIUM-228 (EPA 904.0)			E	E904.0	E903-904	Analyst: BRD
Radium-228 Yield	2.33 0.810	1.00	pCi/L	± 0.73	1	8/16/2017 3:09:00 PM 8/16/2017 3:09:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

(consolidated) WO#: **17071376** Date Reported: **8/17/2017**

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/19/2017 11:55:00 AM
Project:	T17G390	
Lab ID:	17071376-002	Matrix: AQUEOUS
Client Sample ID	T17G390-02	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

RADIUM-226 (EPA 903.0)			E	E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	pCi/L	± 0.18	1 1	8/17/2017 8:34:00 AM 8/17/2017 8:34:00 AM
RADIUM-228 (EPA 904.0)			E	5904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.48	1	8/16/2017 3:09:00 PM
Yield	1.00				1	8/16/2017 3:09:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

(consolidated) WO#: **17071376** Date Reported: **8/17/2017**

Analyses		Result	PQL Qual	Units Uncertaint	y DF Date Analyzed
Client Sample ID	T17G390-03				
Lab ID:	17071376-003			Matrix: A	AQUEOUS
Project:	T17G390				
CLIENT:	Trace Analytical Lab	ooratories, Inc.		Collection Date:	7/19/2017 10:55:00 AM

RADIUM-226 (EPA 903.0)			E	E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	pCi/L	± 0.15	1 1	8/17/2017 8:34:00 AM 8/17/2017 8:34:00 AM
RADIUM-228 (EPA 904.0)			E	E904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 1.00	1.00	pCi/L	± 0.39	1	8/16/2017 3:09:00 PM 8/16/2017 3:09:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

(consolidated) WO#: **17071376** Date Reported: **8/17/2017**

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/19/2017 3:20:00 PM
Project: Lab ID:	T17G390 17071376-004	Matrix: AQUEOUS
Client Sample I	D T17G390-04	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
RADIUM-226 (E	PA 903.0)	E903.0 E903-904 Analyst: BRD

			-			
Radium-226	ND	1.00	pCi/L	± 0.25	1	8/17/2017 8:34:00 AM
Yield	1.00				1	8/17/2017 8:34:00 AM
RADIUM-228 (EPA 904.0)			E	904.0	E903-904	Analyst: BRD
Radium-228	1.07	1.00	pCi/L	± 0.49	1	8/16/2017 3:09:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

(consolidated) WO#: **17071376** Date Reported: **8/17/2017**

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/19/2017 2:10:00 PM
Project:	T17G390	
Lab ID:	17071376-005	Matrix: AQUEOUS
Client Sample ID	T17G390-05	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

RADIUM-226 (EPA 903.0)			I	E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	pCi/L	± 0.24	1 1	8/17/2017 8:35:00 AM 8/17/2017 8:35:00 AM
RADIUM-228 (EPA 904.0)			I	E904.0	E903-904	Analyst: BRD
Radium-228	1.51	1.00	pCi/L	± 0.65	1	8/16/2017 3:09:00 PM
Yield	1.00				1	8/16/2017 3:09:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17071376

 Date Reported:
 8/17/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/19/2017
Project:	T17G390	
Lab ID:	17071376-006	Matrix: AQUEOUS
Client Sample II	T17G390-06	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
RADIUM-226 (EI	PA 903.0)	E903.0 E903-904 Analyst: BRD

Radium-226 Yield	ND 1.00	1.00	pCi/L	± 0.16	1 1	8/17/2017 8:35:00 AM 8/17/2017 8:35:00 AM
RADIUM-228 (EPA 904.0)			E	904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.35	1	8/16/2017 3:09:00 PM
Yield	1.00				1	8/16/2017 3:09:00 PM

Qualifiers:	
-------------	--

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17071376

 Date Reported:
 8/17/2017

CLIENT:	Trace Analytical Laboratories	, Inc.	Collect	tion Date: 7/2	20/2017 2:30:00 PM
Project:	T17G390				
Lab ID:	17071376-007			Matrix: AQ	QUEOUS
Client Sample ID	T17G390-07				
Analyses	Resu	lt PQL	Qual Units	Uncertainty	DF Date Analyzed

RADIUM-226 (EPA 903.0)			E	E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	pCi/L	± 0.13	1 1	8/17/2017 8:35:00 AM 8/17/2017 8:35:00 AM
RADIUM-228 (EPA 904.0)			E	E904.0	E903-904	Analyst: BRD
Radium-228 Yield	1.24 1.00	1.00	pCi/L	± 0.63	1 1	8/16/2017 3:10:00 PM 8/16/2017 3:10:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

QC SUMMARY REPORT

17071376 WO#:

17-Aug-17

	Trace Analytical Laboratories, Inc.		BatchID: 2	8306
Sample ID mb-2830		TestCode: Radium-228_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73520
Client ID: PBW	Batch ID: 28306	TestNo: E904.0 E903-904	Analysis Date: 8/16/2017	SeqNo: 1229916
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228	ND	1.00 0	0	
Yield	1.00	0	0	
Sample ID Ics-28306	S SampType: LCS	TestCode: Radium-228_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73520
Client ID: LCSW	Batch ID: 28306	TestNo: E904.0 E903-904	Analysis Date: 8/16/2017	SeqNo: 1229917
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228	5.33	1.00 5.000 0	107 70 130	
Yield	1.00	0	0	
Sample ID 17071190	-001aMS SampType: MS	TestCode: Radium-228_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73520
Client ID: BatchQC	Batch ID: 28306	TestNo: E904.0 E903-904	Analysis Date: 8/16/2017	SeqNo: 1229920
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228 Yield	4.52 1.00	1.00 5.000 1.068 1.000	69.1 70 130 0	S

Qualifiers:

- Value exceeds Maximum Contaminant Level. *
- В Analyte detected in the associated Method Blank
- Η Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits

Original



QC SUMMARY REPORT

WO#: 17071376

17-Aug-17

Client: Trace Project: T17C	e Analytical Laboratories, Inc. 3390		BatchID: 2	8306
Sample ID mb-28306	SampType: MBLK	TestCode: Radium-226_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73526
Client ID: PBW	Batch ID: 28306	TestNo: E903.0 E903-904	Analysis Date: 8/17/2017	SeqNo: 1230041
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226 Yield	ND 1.00	1.00		
Sample ID LCS-28306	SampType: LCS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73526
Client ID: LCSW	Batch ID: 28306	TestNo: E903.0 E903-904	Analysis Date: 8/17/2017	SeqNo: 1230043
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	4.03	1.00 5.000 0	80.6 70 130	
Sample ID 17071190-001	IaMS SampType: MS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73526
Client ID: BatchQC	Batch ID: 28306	TestNo: E903.0 E903-904	Analysis Date: 8/17/2017	SeqNo: 1230045
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	4.71	1.00 5.000 0	94.2 70 130	

Qualifiers:

*

- Value exceeds Maximum Contaminant Level.
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- P Second column confirmation exceeds

- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits

Original



Qualifiers and Acronyms

WO#: 17071376 Date: 8/17/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

DF

Dilution Factor

U	The compound was analyzed for but wa	s not detec	eted.
J			ection Limit but less than the Reporting Limit.
Н	The hold time for sample preparation ar		
D	The result is reported from a dilution.	5	
Ē	The result exceeded the linear range of	the calibrat	tion or is estimated due to interference.
MC	The result is below the Minimum Comp		
*	The result exceeds the Regulatory Limit		
m	Manual integration was used to determi		
d	Manual integration in which peak was d		Tesponse.
u N			l library search assuming a 1:1 response.
P	The second column confirmation exceed		
r C	The result has been confirmed by GC/N		interence.
x			ais was performed
л B/MB+	The result was not confirmed when GC. The analyte was detected in the associat		sis was performed.
G	•		opolyto
G OC-/+	The ICB or CCB contained reportable a		anaryte.
•	The CCV recovery failed low (-) or high The RPD was outside of accepted recov		
R/QDR	-	-	
QL-/+	The LCS or LCSD recovery failed low	· ·	
QLR	The LCS/LCSD RPD was outside of ac	•	•
QM-/+	The MS or MSD recovery failed low (-)		
QMR	The MS/MSD RPD was outside of acce		ery mints.
QV-/+	The ICV recovery failed low (-) or high		limita
S	The spike result was outside of accepted		
Z		i was perio	rmed; Please refer to the Case Narrative for
	additional information		
Acronyn	ns		
ND	N (D ())	DI	
ND	Not Detected	RL	Reporting Limit Method Detection Limit
QC MB	Quality Control Method Blank	MDL LOD	Level of Detection
LCS	Laboratory Control Sample	LOD	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	PQL	Practical Quantitation Limit
QCS	Quality Control Sample	CRQL	Contract Required Quantitation Limit
DUP	Duplicate	PL	Permit Limit
MS	Matrix Spike	RegLvl	Regulatory Limit
MSD	Matrix Spike Duplicate	MČL	Maximum Contamination Limit
RPD	Relative Percent Different	MinCL	Minimum Compound Limit
ICV	Initial Calibration Verification	RA	Reanalysis
ICB	Initial Calibration Blank	RE	Reextraction
CCV	Continuing Calibration Verification	TIC	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Response Factor

RF

SENDING LABORATORY:	i:		RECEIVING LABORATORY:	1
Trace Analytical Laboratories, Inc. 2241 Black Creek Road	ries, Inc.		Summit Environmental Technologies, Inc. 3310 Win Street	nologies, Inc.
Muskegon, MI 49444 Phone: 231.773.5998			Cuyahoga Falls, OH 44223 Phone :(330) 253-8211	
Fax: 231.773.6537 Project Manager: Jon Mink	nk		Fax: (330) 253-4489	
PO# 072/2	2017 AY	1		
Accounting Code:				-1 001
Sample ID: T17G390-01	Aqueous	Sampled: 07/19/17 12:45	170713	10 001
Subcontracted Work	07/28/17 15:00	00 07/19/18 12:45	Radiu	Radium 226/228
Containers Supplied:				
Sample ID: T17G390-02	Aqueous	Sampled: 07/19/17 11:55		
Subcontracted Work	07/28/17 15:00	00 07/19/18 11:55	Radiu	Radium 226/228
Containers Supplied:				
Sample ID: T17G390-03	Aqueous	Sampled: 07/19/17 10:55		
Subcontracted Work Containers Supplied:	07/28/17 15:00	00 07/19/18 10:55	Radiu	Radium 226/228
Sample ID: T17G390-04	Aqueous	Sampled: 07/19/17 15:20		
Subcontracted Work Containers Supplied:	07/28/17 15:00	0 07/19/18 15:20	Radiu	Radium 226/228
Sample ID: T17G390-05	Aqueous	Sampled: 07/19/17 14:10		
Subcontracted Work Containers Supplied:	07/28/17 15:00	0 07/19/18 14:10	Radiu	Radium 226/228
Sample ID: T17G390-06	Aqueous	Sampled: 07/19/17 00:00		
Subcontracted Work Containers Supplied:	07/28/17 15:00	0 07/19/18 00:00	Radiu	Radium 226/228
Rebarren Bir - A	Vii	72H7 Date	Received By Canphy	Date 125-17
			Received By	2

Sample ID: 117G390-07 Aqueous Sample Subcontracted Work 07/28/17 15:00 Containers Supplied:	Sampled: 07/20/17 14:30 :00 07/20/18 14:30	Radium 226/228
100- 2715.00%	Tror	
Released By Date	Received By Received By	M Canphu Date

	Comments:	Client contact	Will clier	Was clie	Do any . "Samp	Sample	Sufficier	Sufficier	Correct	Label(s	Sample	"If no, I	Sample	Sample	0-0-0	Radiole Use 1	Cooler	108	0-0-0	Custor	Tape o	Packa	Shippe	Numb	Client: Date R		Rev Effe
	n by:	ntact	Will client send new samples	Was client contacted about samples	Do any 40 mL viais contain bubbles** Y N N NA**Samples with bubbles s5mm are acceptable. Indicate bubble size if >5mm	Samples received within holding time	Sufficient sample for QC	Sufficient sample received	Correct containers used	Label(s) agree with C-O-C	Sample label(s) complete (ID, date, etc.)	"If no, list broken sample(s);	Sample containers intact*	Samples in separate bags	C-O-C filled out property	Radiological Testing Instrument serial #35127 V N N/A (see page 2 for scan results) Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately.	Cooler Temperature IR Gun #16020459 CF UrU ℃C	Biue ice	C-O-C in plastic	Custody Seals intact	Tape on cooler/box:	Packaging: Peanuts Bubble Wilap Paper Foam None Other	Shipper: Fed Ex UPS DHL Airborne US Postal Walk-in Pickup Other	Number of Coolers/Boxes:	Client: 4/02		Revision: 13 Effective Date: 07/17/17
			v samples	ad about s	bles s6m	within hold	or QC	eceived	used	0-0-0	mplete (If	ample(s);	s intact*	ate bags	operly	ng Instrun sample. If	ITE IR GU	Î		act	X	nuts Bub	UPS D	rs/Boxes:	1-25-1	ł	te: 07/1
				amples	mare acc	ling time), date, etc					sample is	in #160204	1				bie Wrap	HL Airbo		(4 1	0	7/17 Figure
- 1					eptable. Ir						2					#35127 \$ > 100 cp	159 CFU	presen				Paper F	rne US F		C/ Time Received:	0	1 Su
			×	×	Y ndicate b	C	~	(X)	Å	æ	×		Q	8°	X	om, the F		present atsext	0	¥	0	oam No	ostal V	1	1025	ooler	mmit
Page 10 of 12			z	z	N ubble size	z	C	z	z	z	z		z	z	z	Radiologic	Temp:///	melted	z	z	z	one Other	Valk-in Pi	NIA	1	Receip	Enviror
of 12		1			It >6mm	NA	NIA	NIA	NIA	NA	NA		NA	NA	NA	N/A Safety	-/ °C	NA	NIA		NA		ckup Othe		Order Number. 170 1157 (Cooler Receipt Form, Page 1 Initials of person inspecting cooler and samples:	7/17 Figure 1 – Summit Environmental Technologies. Inc.
																(see p	NA						n.		opened an	Page 1	Techn
																age 2 for ust be no						1			170 d sample	g cooler a	ologie
			*		1											scan res							1		s Inspected:	ind samp	
																ults) mediately									10	1	
																									7-25-17	25	

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SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

#: WC-03-1174		pH Strip (2.8-4.6) S	ET#: OES-01-	0250
ET#: OES-02-02:	99	Free DPD packet S	ET#: OES-01-	0290
Test Method	рн	Chlorine (+ or -)	CPM	Comments
CAN	2		30	
-	2		18	
	2		16	
	2		26	
	2		2	
-	2		06	
U	2		24	
	pH Strip SET (0-14)#: WC-03-1174 Total DPD packet SET#: OES-02-02: Disp. Pipette SET#:	#: WC-03-1174 ET#: OES-02-0239 JUAND	#: WC-03-1174 ET#: OES-02-0239 PUAD 2 PUAD 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	#: WC-03-1174 pH Strip (2.8-4.6) SE ET#: OES-02-0239 Free DPD packet SE free DPD packet SE function (+ or -) function (+ or -) 2 function (+ or -) 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

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Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project					
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies					
Work Order:	T17G439					
Analyses/Method:	Metals (6010B/6020/7470A), General Chemistry (300.0/SM 2540C), Radiological (903.0/904.0)					
Validation Level:	Level 2					
Prepared by:	Lisa Smith (CEAC)/AECOM Completed on: 9/5/2017					

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on July 24, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1		24-Jul-17	T17G439-03
MW-2		24-Jul-17	T17G439-04
MW-3		24-Jul-17	T17G439-05
MW-4		24-Jul-17	T17G439-02
MW-5	MS/MSD	24-Jul-17	T17G439-01
Dup 72117	FD of MW-4	24-Jul-17	T17G439-07
Equipment Blank 22417		24-Jul-17	T17G439-06

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- *Evaluation of Radiochemical Data Usability* (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- ✓ Holding times and sample preservation
- ✓ Laboratory blanks and equipment blanks
- X Matrix spike (MS) and/or matrix spike duplicate (MSD) results
- ✓ Laboratory duplicates
- ✓ Laboratory control sample (LCS) results



- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Selected data points were qualified as estimated due to nonconformances of certain QC criteria. Qualified sample results are presented in Table 1 and a summary is listed below. A detailed data validation discussion is provided in the Detailed Review Section.

- Calcium had a high RPD for the MW-5 matrix spike and one result was qualified as estimated (J).
- Radium-228 had a low matrix spike recovery and one result was qualified as estimated (UJ).

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

The sample collection date was listed for only the first three lines of the COC. The sample date was taken from the container labels, or inferred from the first three samples for the remaining samples listed on the COC. This minor omission does not impact data usability. No other discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks and Equipment Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.



One equipment blank was associated with the groundwater samples collected. Equipment blank results were nondetect indicating contamination did not occur.

MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Extra sample volume was collected for sample MW-5, and MS/MSD results were provided for all applicable analyses. MS/MSD recoveries and RPDs were within criteria, with the exception of calcium and Radium-228 as summarized in the table below.

Analyte	MS/MSD % Recovery	Recovery Limits	RPD	RPD Limit	Qualifications
MW-5:					
Calcium	108/ 136	75-125	22	20	The sample concentration was greater than 4 times the spike concentration and recovery results were not evaluated. The calcium result for MW-5 was qualified as estimated (J) due to the RPD exceedance.
Radium -228	69.1/	70-130			The Radium -228 result for MW-5 was nondetect and qualified as estimated (UJ).

Laboratory Duplicates

TDS laboratory duplicate analysis was performed on sample MW-5. The RPD was within the precision limit of 10% and was acceptable.

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. The LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample Dup 72117 was collected as a field duplicate of sample MW-4. RPDs were within the 30% limit for groundwater samples, and were acceptable.

Analyte MW-4/Dup 72117:	Units	Sample Result	Field Duplicate Result	RPD	RPD Limit
Calcium	mg/l	89	89	0	30
Chloride	mg/l	220	230	4.4	30
Sulfate	mg/l	18	19	5.4	30
Total Dissolved Solids	mg/l	730	710	2.8	30

Results qualified due to blank contamination (B), are not included in the table above.



Sample Results and Quantitation

Results were reported down to the reporting limits.

pH analysis was performed in the field to ensure that analyses were performed within the required hold time.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

Table 1 - Data Validation Summary of Qualified Data

Sample ID	Analyte	Units	Result	Validation Qualifiers	Validation Reason
MW-5	Calcium	mg/L	100	J	ms
MW-5	Radium-228	pCi/L	1.0 ± 0.17	UJ	ms

Qualifier J	Definition The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample detection limit. However, the reported detection limit is approximate and may or may not represent the actual limit of detection necessary to accurately and precisely measure the analyte in the sample.
Reason Codes	Description
ms	Matrix spike



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August 18, 2017

Mr. Tom Flaminio AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 228-2333 Fax: (906) 226-8371

RE:	Trace Project	T17G439
	Client Project	MBLP CCR 60546383

Dear Mr. Flaminio:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



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SAMPLE SUMMARY

Trace Project ID: Client Project ID:	T17G439 MBLP CCR 60546383				
Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17G439-01	MW-5	Water	tvf	07/24/17 07:50	07/25/17 13:10
T17G439-02	MW-4	Water	tvf	07/24/17 09:00	07/25/17 13:10
T17G439-03	MW-1	Water	tvf	07/24/17 11:30	07/25/17 13:10
T17G439-04	MW-2	Water	tvf	07/24/17 12:30	07/25/17 13:10
T17G439-05	MW-3	Water	tvf	07/24/17 13:05	07/25/17 13:10
T17G439-06	Equipment Blank 22417	Water	tvf	07/24/17 14:30	07/25/17 13:10
T17G439-07	Dup 72117	Water	tvf	07/24/17	07/25/17 13:10



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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
Ν	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.
NOT	

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: T070841-MSD2	
<u>Analysis: EPA 6010B</u> Calcium	Note 227 : The MSD recovery was out of control, resulting in an out of control RPD between the MS and MSD. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Trace ID: T17G439-01 <i>Analysis: SM 4500-H+ B-11</i>	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17G439-02 Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17G439-03 Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17G439-04 Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17G439-05	

CERTIFICATE OF ANALYSIS



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Analysis: SM 4500-H+ B-11

	рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
	ace ID: Analysis	T17G439-06 : SM 4500-H+ B-11		
-	рН		Note Client : client.	The analysis was performed on site at the time of sampling by the



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Matrix: Water

ΒY

nws

NOTES

MCL

ANALYZED

07/31/17

ANALYTICAL RESULTS

Date Collected:

Date Received:

RDL

0.00020

DILUTION

1

07/24/17 07:50

07/25/17 13:10

PREPARED

07/28/17

ΒY

kbc

Trace Project ID: Client Project ID:	T17G439 MBLP CCR 60546383	
	7G439-01 V-5	
PARAMETERS		RESULTS UNITS
METALS, TOTAL Analysis Method: Batch: T070 Mercury	EPA 7470A	<0.00020 mg/L
METALS, TOTAL Analysis Method: Batch: T070	EPA 6010B	

Batch: T070841								
Barium	0.16 mg/L	0.10	1	07/28/17	kbc	07/28/17	nws	
Boron	<0.30 mg/L	0.30	1	07/28/17	kbc	07/28/17	nws	
Calcium	100 mg/L	1.0	1	07/28/17	kbc	07/28/17	nws	
Lithium	<0.010 mg/L	0.010	1	07/28/17	kbc	07/28/17	nws	Ν
Analysis Method: EPA 6020								
Batch: T070841								
Antimony	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/02/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/01/17	dtm	
Chromium	<0.010 mg/L	0.010	1	07/28/17	kbc	08/01/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	07/28/17	kbc	08/01/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	07/28/17	kbc	08/01/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	07/28/17	kbc	08/01/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm	

WET CHEMISTRY

Analysis Method: EPA 300.0 Rev. 2.1							
Batch: T070745							
Fluoride	<0.38 mg/L	0.38	5	07/25/17	jek	07/25/17	jek
Chloride	190 mg/L	50	100	07/25/17	jek	07/26/17	jek
Sulfate as SO4	21 mg/L	2.5	5	07/25/17	jek	07/25/17	jek

Analysis Method: SM 2540 C-11

Batch: T070862

CERTIFICATE OF ANALYSIS



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ANALYTICAL RESULTS

Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383									
Trace ID: T17G439-01 Sample ID: MW-5			Collected: Received:	07/24/17 07:5 07/25/17 13:1		Matrix:	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	730 mg/L	40	4	07/28/17	kj	07/28/17	kj		
Analysis Method: SM 4500-H+ B-11 Batch: T070364									
рН	7.17 pH Units		1	07/24/17	jm	07/24/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID:	T17G439
Client Project ID:	MBLP CCR 60546383

Trace ID: Sample ID:	T17G439-02 MW-4			Collected: Received:	07/24/17 09:0 07/25/17 13:1		Matrix:	Water		
PARAMETER	s	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TO	DTAL									
-	hod: EPA 7470A <i>T070834</i>									
Mercury		<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
METALS, TO	DTAL									
-	hod: EPA 6010B T070841									
Barium		<0.10 mg/L	0.10	1	07/28/17	kbc	07/28/17	nws		
Boron		<0.30 mg/L	0.30	1	07/28/17	kbc	07/28/17	nws		
Calcium		89 mg/L	1.0	1	07/28/17	kbc	07/28/17	nws		
Lithium		<0.010 mg/L	0.010	1	07/28/17	kbc	07/28/17	nws	Ν	
-	hod: EPA 6020 T070841									
Antimony		<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm		
Arsenic		<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm		
Beryllium		<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/02/17	dtm		
Cadmium		<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/01/17	dtm		
Chromium		<0.010 mg/L	0.010	1	07/28/17	kbc	08/01/17	dtm		
Cobalt		<0.020 mg/L	0.020	1	07/28/17	kbc	08/01/17	dtm		
Lead		<0.0030 mg/L	0.0030	1	07/28/17	kbc	08/01/17	dtm		
Molybdenu	m	<0.050 mg/L	0.050	1	07/28/17	kbc	08/01/17	dtm	Ν	
Selenium		<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm		
Thallium		<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm		
WET CHEMI	STRY									
-	hod: EPA 300.0 Rev. 2.1 7070745									
Fluoride		<0.38 mg/L	0.38	5	07/25/17	jek	07/25/17	jek		
Chloride		220 mg/L	50	100	07/25/17	jek	07/26/17	jek		
Sulfate as	SO4	18 mg/L	2.5	5	07/25/17	jek	07/25/17	jek		
Analysis Met	hod: SM 2540 C-11									

Batch: T070862

CERTIFICATE OF ANALYSIS



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ANALYTICAL RESULTS

Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383									
Trace ID: T17G439-02 Sample ID: MW-4			Collected: Received:	07/24/17 09:0 07/25/17 13:1		Matrix:	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	730 mg/L	40	4	07/28/17	kj	07/28/17	kj		
Analysis Method: SM 4500-H+ B-11 Batch: T070364				07/04/47		07/04/47	•		
рН	7.86 pH Units		1	07/24/17	jm	07/24/17	jm	Client, N	



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Matrix: Water

ΒY

nws

nws

nws

nws

nws

dtm

dtm

dtm

dtm

dtm

dtm

dtm

dtm

dtm

dtm

jek

jek

jek

Ν

Ν

NOTES

MCL

ANALYZED

07/31/17

07/28/17

07/28/17

07/28/17

07/28/17

08/01/17

08/02/17

08/02/17

08/01/17

08/01/17

08/01/17

08/01/17

08/01/17

08/02/17

08/01/17

07/25/17

07/26/17

07/25/17

ANALYTICAL RESULTS

		ANALYTICA	L RESULTS		
Trace Project ID: T17G439					
Client Project ID: MBLP CCR 60546383					
Trace ID: T17G439-03		Date	Collected:	07/24/17 11:3	30
Sample ID: MW-1		Date	07/25/17 13:10		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY
METALS, TOTAL					
Analysis Method: EPA 7470A Batch: T070834					
Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc
METALS, TOTAL					
Analysis Method: EPA 6010B Batch: T070841					
Barium	0.15 mg/L	0.10	1	07/28/17	kbc
Boron	<0.30 mg/L	0.30	1	07/28/17	kbc
Calcium	110 mg/L	1.0	1	07/28/17	kbc
Lithium	<0.010 mg/L	0.010	1	07/28/17	kbc
Analysis Method: EPA 6020 Batch: T070841					
Antimony	<0.0020 mg/L	0.0020	1	07/28/17	kbc
Arsenic	<0.0050 mg/L	0.0050	1	07/28/17	kbc
Beryllium	<0.0010 mg/L	0.0010	1	07/28/17	kbc
Cadmium	<0.0010 mg/L	0.0010	1	07/28/17	kbc
Chromium	<0.010 mg/L	0.010	1	07/28/17	kbc
Cobalt	<0.020 mg/L	0.020	1	07/28/17	kbc
Lead	<0.0030 mg/L	0.0030	1	07/28/17	kbc
Molybdenum	<0.050 mg/L	0.050	1	07/28/17	kbc
Selenium	<0.0050 mg/L	0.0050	1	07/28/17	kbc
Thallium	<0.0020 mg/L	0.0020	1	07/28/17	kbc
WET CHEMISTRY					
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070745					
Fluoride	<0.38 mg/L	0.38	5	07/25/17	jek
Chloride	230 mg/L	50	100	07/25/17	jek
Sulfate as SO4	20 mg/L	2.5	5	07/25/17	jek

Analysis Method: SM 2540 C-11

Batch: T070862

CERTIFICATE OF ANALYSIS



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ANALYTICAL RESULTS

Trace Project Client Project										
Trace ID: Sample ID:	T17G439-03 MW-1			Collected: Received:	07/24/17 11:3 07/25/17 13:1		Matrix:	Water		
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEM	ISTRY olved Solids	800 mg/L	40	4	07/28/17	kj	07/28/17	kj		
Batch:	hod: SM 4500-H+ B-11 7070364	7 45			07/04/47		07/04/47		Olivert N	
рН		7.45 pH Units		1	07/24/17	jm	07/24/17	jm	Cli	ent, N



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ANALYTICAL RESULTS

Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383

Trace ID: T17G439-04 Sample ID: MW-2			Collected: Received:	07/24/17 12:3 07/25/17 13:1		Matrix:	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T070834									
Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T070841									
Barium	<0.10 mg/L	0.10	1	07/28/17	kbc	07/28/17	nws		
Boron	<0.30 mg/L	0.30	1	07/28/17	kbc	07/28/17	nws		
Calcium	63 mg/L	1.0	1	07/28/17	kbc	07/28/17	nws		
Lithium	<0.010 mg/L	0.010	1	07/28/17	kbc	07/28/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T070841									
Antimony	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/02/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/01/17	dtm		
Chromium	<0.010 mg/L	0.010	1	07/28/17	kbc	08/01/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	07/28/17	kbc	08/01/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	07/28/17	kbc	08/01/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	07/28/17	kbc	08/01/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070745									
Fluoride	<0.38 mg/L	0.38	5	07/25/17	jek	07/25/17	jek		
Chloride	59 mg/L	12	25	07/25/17	jek	07/26/17	jek		
Sulfate as SO4	21 mg/L	2.5	5	07/25/17	jek	07/25/17	jek		
Analysis Method: SM 2540 C-11									

Batch: T070862

CERTIFICATE OF ANALYSIS



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ANALYTICAL RESULTS

Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383									
Trace ID: T17G439-04 Sample ID: MW-2			Collected: Received:	07/24/17 12:3 07/25/17 13:1		Matrix:	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	350 mg/L	40	4	07/28/17	kj	07/28/17	kj		
Analysis Method: SM 4500-H+ B-11 Batch: T070364									
рН	8.09 pH Units		1	07/24/17	jm	07/24/17	jm	Client, N	



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Matrix: Water

ΒY

nws

nws

nws

nws

nws

dtm

Ν

Ν

NOTES

MCL

ANALYZED

07/31/17

07/28/17

07/28/17

07/28/17

07/28/17

08/01/17

ANALYTICAL RESULTS

Date Collected:

Date Received:

RDI

0.00020

0.10

0.30

1.0

0.010

DILUTION

1

1

1

1

1

1

07/24/17 13:05

07/25/17 13:10

PREPARED

07/28/17

07/28/17

07/28/17

07/28/17

07/28/17

07/28/17

ΒY

kbc

kbc

kbc

kbc

kbc

kbc

···	G439 P CCR 60546383	
Trace ID: T17G439- Sample ID: MW-3	05	
PARAMETERS	RESULTS UNI	TS
METALS, TOTAL Analysis Method: EPA 74 Batch: T070834 Mercury	170A <0.00020 mg/l	-
METALS, TOTAL Analysis Method: EPA 60 Batch: T070841 Barium Boron Calcium Lithium	010B 0.23 mg/l <0.30 mg/l 69 mg/l <0.010 mg/l	L

Analysis Method: EPA 6020 Batch: T070841							
Antimony	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm
Arsenic	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm
Beryllium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/02/17	dtm
Cadmium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/01/17	dtm
Chromium	<0.010 mg/L	0.010	1	07/28/17	kbc	08/01/17	dtm
Cobalt	<0.020 mg/L	0.020	1	07/28/17	kbc	08/01/17	dtm
Lead	<0.0030 mg/L	0.0030	1	07/28/17	kbc	08/01/17	dtm
Molybdenum	<0.050 mg/L	0.050	1	07/28/17	kbc	08/01/17	dtm
Selenium	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm

0.0020

WET CHEMISTRY

Thallium

Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070745							
Fluoride	<0.38 mg/L	0.38	5	07/25/17	jek	07/25/17	jek
Chloride	89 mg/L	25	50	07/25/17	jek	07/26/17	jek
Sulfate as SO4	36 mg/L	2.5	5	07/25/17	jek	07/25/17	jek

<0.0020 mg/L

Analysis Method: SM 2540 C-11

Batch: T070862

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ANALYTICAL RESULTS

Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383									
Trace ID: T17G439-05 Sample ID: MW-3			Collected: Received:	07/24/17 13:0 07/25/17 13:1		Matrix:	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	440 mg/L	40	4	07/28/17	kj	07/28/17	kj		
Analysis Method: SM 4500-H+ B-11 Batch: T070364									
рН	7.86 pH Units		1	07/24/17	jm	07/24/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID:T17G439Client Project ID:MBLP CCR 60546383

Trace ID: T17G439-06 Sample ID: Equipment Blank 22417			Collected: Received:	07/24/17 14:3 07/25/17 13:1		Matrix:	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T070834									
Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T070841									
Barium	<0.10 mg/L	0.10	1	07/28/17	kbc	07/28/17	nws		
Boron	<0.30 mg/L	0.30	1	07/28/17	kbc	07/28/17	nws		
Calcium	<1.0 mg/L	1.0	1	07/28/17	kbc	07/28/17	nws		
Lithium	<0.010 mg/L	0.010	1	07/28/17	kbc	07/28/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T070841									
Antimony	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/02/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/01/17	dtm		
Chromium	<0.010 mg/L	0.010	1	07/28/17	kbc	08/01/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	07/28/17	kbc	08/01/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	07/28/17	kbc	08/01/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	07/28/17	kbc	08/01/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070745									
Fluoride	<0.38 mg/L	0.38	5	07/25/17	jek	07/25/17	jek		
Chloride	<10 mg/L	10	5	07/25/17	jek	07/25/17	jek		
Sulfate as SO4	<2.5 mg/L	2.5	5	07/25/17	jek	07/25/17	jek		

Analysis Method: SM 2540 C-11

Batch: T070862

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ANALYTICAL RESULTS

Trace Project Client Project										
Trace ID: Sample ID:	T17G439-06 Equipment Blank 22417			Collected: Received:	07/24/17 14:3 07/25/17 13:1		Matrix:	Water		
PARAMETER	?S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEM	ISTRY									
Total Disso	olved Solids	<10 mg/L	10	1	07/28/17	kj	07/28/17	kj		

Analysis Method: SM 4500-H+ B-11

Batch: T070364							
рН	7.94 pH Units	1	07/24/17	jm	07/24/17	jm	Client, N



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MCL

ANALYTICAL RESULTS

		ANALYTICA	L RESULTS					
Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383								
Trace ID: T17G439-07 Sample ID: Dup 72117			Collected: Received:	07/24/17 07/25/17 13:	10	Matrix:	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTE
METALS, TOTAL								
Analysis Method: EPA 7470A Batch: T070834								
Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws	
METALS, TOTAL								
Analysis Method: EPA 6010B Batch: T070841								
Barium	<0.10 mg/L	0.10	1	07/28/17	kbc	07/28/17	nws	
Boron	<0.30 mg/L	0.30	1	07/28/17	kbc	07/28/17	nws	
Calcium	89 mg/L	1.0	1	07/28/17	kbc	07/28/17	nws	
Lithium	<0.010 mg/L	0.010	1	07/28/17	kbc	07/28/17	nws	Ν
Analysis Method: EPA 6020 Batch: T070841								
Antimony	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/02/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	07/28/17	kbc	08/01/17	dtm	
Chromium	<0.010 mg/L	0.010	1	07/28/17	kbc	08/01/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	07/28/17	kbc	08/01/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	07/28/17	kbc	08/01/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	07/28/17	kbc	08/01/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	07/28/17	kbc	08/02/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	07/28/17	kbc	08/01/17	dtm	
WET CHEMISTRY								
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T070745								
Fluoride	<0.38 mg/L	0.38	5	07/25/17	jek	07/25/17	jek	
Chloride	230 mg/L	50	100	07/25/17	jek	07/26/17	jek	
Sulfate as SO4	19 mg/L	2.5	5	07/25/17	jek	07/25/17	jek	

Analysis Method: SM 2540 C-11

Batch: T070862

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ANALYTICAL RESULTS

VET CHEMI	ISTRY									
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
race ID: Sample ID:	T17G439-07 Dup 72117			Collected: Received:	07/24/17 07/25/17 13:1	0	Matrix:	Water		
Client Project			Dete		07/04/47		Madain	10/-1		



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QUALITY CONTROL RESULTS

Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383

QC Batch Method: EPA 7470A Prep Analysis Method: EPA 7470A	
Alaysis Method. EFA 1470A FIEP	

METHOD BLANK: T070834-BLK1

Parameter	Units		Blank Result	Reporting Limit		Notes
Mercury	mg/L		<0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T070834-B	61				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00190	95	77-122	

MATRIX SPIKE / MATRIX S	SPIKE DUPLICATE: T07	70834-M	ISD1		Original:	T17G439-	·01				
Parameter		Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00185	0.00204	92	102	76-123	10	20	
			Trace	Project ID:	T17G439						
			Client	Project ID: I	MBLP CCR	60546383					
QC Batch: T070841				Ar	nalysis Des	cription: Bar	rium, Total				
QC Batch Method: EPA 3015 for Liquids	5 Microwave Assisted Dige	estions	stions Analysis Method: EPA 6010B								

METHOD BLANK: T070841-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T070841-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.868	98	80-120	
Barium	mg/L	0.889	0.910	102	80-120	
Calcium	mg/L	8.89	9.33	105	80-120	
Lithium	mg/L	0.889	0.880	99	80-120	

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MATRIX SPIKE / MATRIX SPIKE	E DUPLICATE:		-01								
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Boron	mg/L	0.0384	0.889	0.873	0.961	94	104	75-125	10	20	
Barium	mg/L	0.163	0.889	1.01	1.10	95	105	75-125	10	20	
Calcium	mg/L	104	8.89	114	116	108	136	75-125	22	20	227
Lithium	mg/L	0.00104	0.889	0.815	0.891	92	100	75-125	9	20	

Trace Project ID: T17G439

Client Project ID: MBLP CCR 60546383

QC Batch: T070841 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Antimony, Total

Analysis Method: EPA 6020

METHOD BLANK: T070841-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.0050	0.0050	
Beryllium	mg/L	<0.0010	0.0010	
Cadmium	mg/L	<0.0010	0.0010	
Cobalt	mg/L	<0.020	0.020	
Chromium	mg/L	<0.010	0.010	
Molybdenum	mg/L	<0.050	0.050	
Lead	mg/L	<0.0030	0.0030	
Antimony	mg/L	<0.0020	0.0020	
Selenium	mg/L	<0.0050	0.0050	
Thallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T070841-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0483	87	80-120	
Beryllium	mg/L	0.111	0.115	103	80-120	
Cadmium	mg/L	0.0278	0.0233	84	80-120	
Cobalt	mg/L	0.889	0.845	95	80-120	
Chromium	mg/L	0.0278	0.0253	91	80-120	
Molybdenum	mg/L	0.889	0.877	99	80-120	
Lead	mg/L	0.0556	0.0566	102	80-120	
Antimony	mg/L	0.0556	0.0471	85	80-120	
Selenium	mg/L	0.0556	0.0482	87	80-120	
Thallium	mg/L	0.0556	0.0535	96	80-120	

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Original: T17G439-01

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T070841-MSD2

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Arsenic	mg/L	0	0.0556	0.0420	0.0468	76	84	75-125	11	20	
Beryllium	mg/L	0	0.111	0.114	0.122	103	110	75-125	7	20	
Cadmium	mg/L	0	0.0278	0.0225	0.0249	81	90	75-125	10	20	
Cobalt	mg/L	0.000696	0.889	0.778	0.877	87	99	75-125	12	20	
Chromium	mg/L	0	0.0278	0.0282	0.0273	102	98	75-125	3	20	
Molybdenum	mg/L	0.00592	0.889	0.879	0.976	98	109	75-125	11	20	
Lead	mg/L	0.000430	0.0556	0.0573	0.0606	102	108	75-125	6	20	
Antimony	mg/L	0	0.0556	0.0584	0.0635	105	114	75-125	8	20	
Selenium	mg/L	0	0.0556	0.0466	0.0523	84	94	75-125	12	20	
Thallium	mg/L	0	0.0556	0.0517	0.0575	93	104	75-125	11	20	
				Project ID: 1 Project ID: 1		8 60546383					

QC Batch: T069765	Analysis Description: Metals Digestion
QC Batch Method: EPA 200.2	Analysis Method: EPA 200.2

	Client Project ID: MBLP CCR 60546383
QC Batch: T070745	Analysis Description: Sulfate
QC Batch Method: IC Prep W	Analysis Method: EPA 300.0 Rev. 2.1

Trace Project ID: T17G439

METHOD BLANK: T070745-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

METHOD BLANK: T070745-BLK2

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

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LABORATORY CONTROL SAMPLE: T070745-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	97	90-110	
Fluoride	mg/L	0.500	0.491	98	90-110	
Sulfate as SO4	mg/L	2.50	2.39	96	90-110	

LABORATORY CONTROL SAMPLE: T070745-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	97	90-110	
Fluoride	mg/L	0.500	0.501	100	90-110	
Sulfate as SO4	mg/L	2.50	2.43	97	90-110	

MATRIX SPIKE / MATRIX	SD1	Original: T17G439-01									
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Fluoride	mg/L	0	4.00	3.91	3.89	98	97	80-120	0.4	20	
Sulfate as SO4	mg/L	21.2	30.0	49.2	49.2	93	93	80-120	0.007	20	

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Chloride	mg/L	191	200	389	379	99	94	80-120	5	20	
			Trace F	Project ID: 1	17G439						
			Client F	Project ID: N	IBLP CCR	60546383					
QC Batch: T070862				An	alysis Des	cription: Tot	al Dissolved	Solids			

QC Batch: 10/0862	Analysis Description: Total Dissolved Solids	
QC Batch Method: SM 2540 C-11	Analysis Method: SM 2540 C-11	
		1

METHOD BLANK: T070862-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T070862-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	510	506	99	80-120	

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2-DUP1	Original: T17G	439-01				
Units	Original Result	DUP Result		RPD	Max RPD	Notes
mg/L	728	708		3	10	
		-				
		Client Project ID	MBLP CCR 60546383			
			Analysis Description: pH, SM 4500			
PREP ***			Analysis Method: SM 4500-H+ B-11			
	Units mg/L	Original Units Result mg/L 728	Original DUP Units Result Result mg/L 728 708 Trace Project ID Client Project ID	Original Units DUP Result mg/L 728 Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383	Original Result DUP Result RPD mg/L 728 708 3 Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383	Original Result DUP Result Max RPD mg/L 728 708 3 10 Trace Project ID: T17G439 Client Project ID: MBLP CCR 60546383



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SAMPLE LOG IN CHECKLI	ST
Trace ID #: TT76439 Date: 725117 Package Descripti Client Name: AECow Time: 13:10	on: <u>Coder#1</u> Temperature: <u>0,1</u> Logged in by: <u>15</u>
Or allow Develop	
	very person: ED EX X US Mail
Tracking #: 7797 970 3 COC Seals present and intact on cooler? Not Applicable No	DE4]Yes pal # (if applicable):
Coolant and Temperature	
Type of Coolant Used Cool Slurry w/ crushed, cubed, or chip ice? Correction Factors: •Digital St	k Thermometer)
General Yes No NA All bottles arrived unbroken with labels in good condition?	Comments
Notes: MW-5, MW-4, Dup-1	*EMD pH Test Strips Used: pH 0-2.5 pH 11.0-13.0 Lot: HC563733 □ Lot: HC547328 Other: Lot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS TRACE Analytical Laboratories, Inc.

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SAMPLE LOG IN CHECKLI	ST
Trace ID #: <u>176439</u> Date: <u>72517</u> Package Descripti Client Name: <u>AECOM</u> Time: <u>13:(0</u>	on: <u>Cooler#2</u> Temperature: <u>-0.5</u> Logged in by: <u>T</u>
Oradan Deselat	
Tracking Number: Not Applicable Tracking #: 771.7 11.70 COC Seals present and intact on cooler? Not Applicable No	very person: ED EX [US Mail] ろうひえ] Yes val # (if applicable):
Slurry w/ crushed, cubed, or chip ice? Correction Factors: •Digital St Multiple bags of ice around samples? ····································	k Thermometer)
General Yes No NA All bottles arrived unbroken with labels in good condition? Image: Condition of the second sec	Comments
Notes: MW-1, MW-2, MW-3 EB	*EMD pH Test Strips Used: pH 0-2.5 pH 11.0-13.0 Lot: HC563733 Lot: HC547328 Other: Lot: HC563733 verified 6/21/16 AY Lot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS TRACE Analytical Laboratories, Inc.

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August 18, 2017

Mr. Tom Flaminio AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 228-2333 Fax: (906) 226-8371

RE: Trace ID: T17G439

Dear Mr. Flaminio:

Enclosed are your analytical results associated with your project for MBLP CCR 60546383. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from Summit Environmental Technologies.

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





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Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444-2673 Bill To: Po# Contact Name: City, State, Zip Code: Phone Number: Billing Email Address: W1 = Wipes LW = Liquid Waste A = Air D = Drinking Water D = Drinking Water Metals Field W1 = Wipes LW = Liquid Waste A = Air D = Drinking Water Preservation With W1 With W1 With W1 With W1 With W1 With W1 With W1 With W1 With W1 With W1 With W1 With W2 With W1 With W1 With W1 With W1 With W1 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W2 With W		-agreement.	In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement	(4) terms as set fort	the client acknowledges the	In executing this Chain of Custody	, ,		3)	Ple	
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CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE LOG IN CHECKLIST

Trace ID #:	Date	: 7/25/17 F	Package Descripti	on: Coder#1	Temperature: 0,1		
Client Name:	AECOM	Time:	13:10	Logged in by:	JS		
		Cooler R	Receipt				
C	ooler/samples delivered by:	Trace courier	···· · ··				
а.,		Hand delivered	Name of deli	very person:			
	Comr	nercial courier		ED EX 🔀 US Mail			
	Tracking Number:	Not Applicable					
		Tracking #: <u>77</u>	97 ATO 3	064			
COC Seals pr	esent and intact on cooler?	Not Applicable	No]Yes			
Cust	ody seals signed by Client?	No Yes	Client custody se	al # (if applicable):			
			7				
		Coolant and To	emperature				
Тур	e of Coolant Used	/	-	er Temperature			
Slurry w	/ crushed, cubed, or chip ice? 📈	Correction Fact		ick Thermometer CF = -	0.6°C		
Multiple	bags of ice around samples?]	•IR Therm	ometer CF = -0.4°C			
	Ice Packs/ Blue Ice :	Representative	Sample Tempera	ture: <u>1,8</u>	°C (check one below)		
	No Coolant Present:		Temp Blank (Stic	k Thermometer)			
Ice still present	upon receipt (circle one):		Client Sample (IF				
Yes	No N/A	Melt Water:	none	°C (Use Digital Stick The	rmometer)		
General							
				0			
All bottles arriv	ed unbroken with labels in good co			Comment	S		
	ich sample point is in a sealed plas						
	Labels filled out com						
All bottle I	abels agree with Chain of Custody						
	Sufficient sample to run tests req	uested? 🔀 🔲 [
	pH checked and samples at cor	rect pH?	See Below	*			
	Correct preservative added to sa						
	Air bubbles absent from						
	DC filled out properly and signed b DC signed in by TRACE sample cu						
	t manager called and samples dis				· · · · · · · · · · · · · · · · · · ·		
Notes: Mr	2-5, MW-4, Nup-1			<u>*EMD pH Test S</u>	trips Used:		
				r⊠ ^{pH 0-2.5} Lot: HC563733 [pH 11.0-13.0 Lot: HC547328		
				Other:			
				Lot: HC563733 verified 6/21	/16 AY		
				Lot: HC574761 verified 04/0	3/17 JS		
Form 70-A.2				TRACE Analytic	al Laboratories, Inc.		
Effective 7/5	0/17						

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE LOG IN CHECKLIST

Trace ID #: <u>1176439</u>	Date: 7/25/17	Package Description:	Cooler#2	Temperature: -0.5
Client Name: <u>AECOM</u>	Time	»:]3:(0	Logged in by:	15

Cooler Receipt
Trace courier
Hand delivered Name of delivery person:
Commercial courier UPS FED EX 🔀 US Mail
Not Applicable
Tracking #: 7797 1970 3502
Not Applicable No Yes
No Yes Client custody seal # (if applicable):

C	Coolant and Temperature
Type of Coolant Used	Cooler Temperature
Slurry w/ crushed, cubed, or chip ice?	<u>Correction Factors:</u> •Digital Stick Thermometer CF = -0.6°C
Multiple bags of ice around samples?	•IR Thermometer CF = -0.4°C
Ice Packs/ Blue Ice :	Representative Sample Temperature: <u>1, 9</u> °C (check one below)
No Coolant Present:	Temp Blank (Stick Thermometer)
Ice still present upon receipt (circle one):	Client Sample (IR Thermometer)
(Yes) No N/A	Melt Water: °C (Use Digital Stick Thermometer)

	Gene	eral		
Yes	No	NA		Comments
All bottles arrived unbroken with labels in good condition?				
Each sample point is in a sealed plastic bag?	\mathbf{X}			
Labels filled out completely?				
All bottle labels agree with Chain of Custody (COC)?				
Sufficient sample to run tests requested?				
pH checked and samples at correct pH?			See Below*	
Correct preservative added to samples?			E.	
Air bubbles absent from VOAs?		\varkappa		
COC filled out properly and signed by client?				
COC signed in by TRACE sample custodian?				
Was project manager called and samples discussed?	X			
Notes: MW-1, MW-2, MW-3 EB	•	-		*EMD pH Test Strips Used:
				pH 0-2.5 pH 11.0-13.0
				Lot: HC563733 Lot: HC547328
				Other:
				: HC563733 verified 6/21/16 AY
			Lol	: HC574761 verified 04/03/17 JS
Form 70-A.21				TRACE Analytical Laboratories, Inc.
Effective 7/5/17				

CERTIFICATE OF ANALYSIS



August 17, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17G439

Dear Jon Mink:

Order No.: 17071537

Summit Environmental Technologies, Inc. received 7 sample(s) on 7/27/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

tally Slow

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891



Case Narrative

WO#: **17071537** Date: **8/17/2017**

CLIENT:Trace Analytical Laboratories, Inc.Project:T17G439

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.



Qualifiers and Acronyms

WO#: 17071537 Date: 8/17/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

DF

Dilution Factor

U	The compound was analyzed for but w	vas not detec	eted.				
J	The reported value is greater than the	Method Dete	ection Limit but less than the Reporting Limit.				
Н	The hold time for sample preparation						
D	The result is reported from a dilution.	2					
Е	-	f the calibrat	tion or is estimated due to interference.				
MC	The result is below the Minimum Con						
*	The result exceeds the Regulatory Lin						
m	Manual integration was used to determ						
d	Manual integration in which peak was						
N			l library search assuming a 1.1 response				
P	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response. The second column confirmation exceeded 25% difference.						
C	The result has been confirmed by GC/						
x	The result was not confirmed when G		rsis was performed				
A B/MB+	The analyte was detected in the associ		sis was performed.				
G D/ MID+	The ICB or CCB contained reportable		analyte				
QC-/+			anaryte.				
R/QDR	The CCV recovery failed low (-) or high (+).						
QL-/+	The RPD was outside of accepted recovery limits. The LCS or LCSD recovery failed low (-) or high (+).						
QL-/+ QLR	The LCS/LCSD RPD was outside of a	0					
OM-/+	The MS or MSD recovery failed low (•	•				
QMR	The MS/MSD RPD was outside of acc						
QVIX QV-/+	The ICV recovery failed low (-) or hig	-	ery mints.				
S S	The spike result was outside of accept		limite				
Z			ormed; Please refer to the Case Narrative for				
L	additional information	d was perio	fined, Tlease lefer to the Case Nathative for				
Acronyı	ms						
ND	Not Detected	RL	Reporting Limit				
QC	Quality Control	NL MDL	Method Detection Limit				
MB	Method Blank	LOD	Level of Detection				
LCS	Laboratory Control Sample	LOD	Level of Quantitation				
LCSD	Laboratory Control Sample Duplicate	PQL	Practical Quantitation Limit				
QCS	Quality Control Sample	CRQL	Contract Required Quantitation Limit				
DUP	Duplicate	PL	Permit Limit				
MS	Matrix Spike	RegLvl	Regulatory Limit				
MSD	Matrix Spike Duplicate	MCL	Maximum Contamination Limit				
RPD	Relative Percent Different	MinCL	Minimum Compound Limit				
ICV	Initial Calibration Verification	RA	Reanalysis				
ICB	Initial Calibration Blank	RE	Reextraction				
CCV	Continuing Calibration Verification	TIC	Tentatively Identified Compound				
CCB	Continuing Calibration Blank	RT	Retention Time				
RLC	Reporting Limit Check	CF	Calibration Factor				

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Response Factor

RF



Workorder Sample Summary

WO#: **17071537** *17-Aug-17*

CLIENT:Trace Analytical Laboratories, Inc.Project:T17G439

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17071537-001	T17G439-01		7/24/2017 7:50:00 AM	7/27/2017 10:30:00 AM	Water
17071537-002	T17G439-02		7/24/2017 9:00:00 AM	7/27/2017 10:30:00 AM	Water
17071537-003	T17G439-03		7/24/2017 11:30:00 AM	7/27/2017 10:30:00 AM	Water
17071537-004	T17G439-04		7/24/2017 12:30:00 PM	7/27/2017 10:30:00 AM	Water
17071537-005	T17G439-05		7/24/2017 1:05:00 PM	7/27/2017 10:30:00 AM	Water
17071537-006	T17G439-06		7/24/2017 2:30:00 PM	7/27/2017 10:30:00 AM	Water
17071537-007	T17G439-07		7/24/2017	7/27/2017 10:30:00 AM	Water



Analytical Report

 (consolidated)

 WO#:
 17071537

 Date Reported:
 8/17/2017

CLIENT:	Trace Analytical Laboratories	s, Inc.	Collect	tion Date: 7/24/2	017 7:50:00 AM
Project:	T17G439				
Lab ID:	17071537-001			Matrix: WATE	ER
Client Sample ID	T17G439-01				
Analyses	Resu	ult PQL	Qual Units	Uncertainty	DF Date Analyzed

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.17	1	8/17/2017 8:35:00 AM
Yield	1.00					1	8/17/2017 8:35:00 AM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.38	1	8/16/2017 3:10:00 PM
Yield	1.00					1	8/16/2017 3:10:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17071537

 Date Reported:
 8/17/2017

Client Sample ID Analyses	T17G439-02 Result	POL Qual Units Uncertainty DF Date Analyzed
Lab ID:	17071537-002	Matrix: WATER
Project:	T17G439	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/24/2017 9:00:00 AM

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.11	1	8/17/2017 8:35:00 AM
Yield	1.00					1	8/17/2017 8:35:00 AM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.5	1	8/16/2017 3:10:00 PM
Yield	1.00					1	8/16/2017 3:10:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17071537

 Date Reported:
 8/17/2017

Project: T17G439 Lab ID: 17071537-003		
L b ID 17071527 002		
Lab ID: 17071537-003		Matrix: WATER
Client Sample ID T17G439-03		
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

			l	E903.0	E903-904	Analyst: BRD
ND 1.00	1.00	U	pCi/L	± 0.11	1 1	8/17/2017 10:13:00 AN 8/17/2017 10:13:00 AN
				E904.0	E903-904	Analyst: BRD
1.43	1.00		pCi/L	± 0.69	1	8/16/2017 5:08:00 PM 8/16/2017 5:08:00 PM
	1.00	1.00 1.43 1.00	1.00 1.43 1.00	ND 1.00 U pCi/L 1.00 1.43 1.00 pCi/L	1.00 E904.0 1.43 1.00 pCi/L ± 0.69	ND 1.00 U pCi/L ± 0.11 1 1.00 E904.0 E903-904 1.43 1.00 pCi/L ± 0.69 1

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17071537

 Date Reported:
 8/17/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	T17G439-04	
Lab ID:	17071537-004	Matrix: WATER
Project:	T17G439	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/24/2017 12:30:00 PM

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.11	1	8/17/2017 10:13:00 AN
Yield	1.00		Ū	P 0 % 1		1	8/17/2017 10:13:00 AN
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
RADIUM-228 (EPA 904.0) Radium-228	1.56	1.00		pCi/L	E904.0 ± 0.65	E903-904	Analyst: BRD 8/16/2017 5:08:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17071537

 Date Reported:
 8/17/2017

Analyses		Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	T17G439-05		
Lab ID:	17071537-005		Matrix: WATER
Project:	T17G439		
CLIENT:	Trace Analytical Labora	atories, Inc.	Collection Date: 7/24/2017 1:05:00 PM

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.09	1 1	8/17/2017 10:14:00 AN 8/17/2017 10:14:00 AN
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 1.00	1.00	U	pCi/L	± 0.44	1 1	8/16/2017 5:08:00 PM 8/16/2017 5:08:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17071537

 Date Reported:
 8/17/2017

	A 000 0)	FONS 0 FONS-004 Analyst: BPD
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	T17G439-06	
Lab ID:	17071537-006	Matrix: WATER
Project:	T17G439	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/24/2017 2:30:00 PM

RADIUM-226 (EPA 903.0)				6	-903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.24	1	8/17/2017 10:14:00 AN
Yield	1.00					1	8/17/2017 10:14:00 AN
RADIUM-228 (EPA 904.0)				E	E904.0	E903-904	Analyst: BRD
RADIUM-228 (EPA 904.0) Radium-228	1.03	1.00		E pCi/L	± 0.62	E903-904	Analyst: BRD 8/16/2017 5:08:00 PM

Qualifiers:

- * Value exceeds Maximum Contaminant Level.
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: <u>http://www.settek.com</u>

Analytical Report

 (consolidated)

 WO#:
 17071537

 Date Reported:
 8/17/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 7/24/2017
Project:	T17G439	
Lab ID:	17071537-007	Matrix: WATER
Client Sample ID	T17G439-07	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.2	1	8/17/2017 10:14:00 AN
Yield	1.00					1	8/17/2017 10:14:00 AN
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.75	1	8/16/2017 5:08:00 PM
Yield	0.540					1	8/16/2017 5:08:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

QC SUMMARY REPORT

17071537 WO#:

17-Aug-17

	race Analytical Laboratories, Inc. 17G439		BatchID: 2	8306
Sample ID mb-28306	SampType: MBLK	TestCode: Radium-228 Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73520
Client ID: PBW	Batch ID: 28306	TestNo: E904.0 E903-904	Analysis Date: 8/16/2017	SeqNo: 1229916
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228	ND	1.00 0	0	U
Yield	1.00	0	0	
Sample ID Ics-28306	1 21	TestCode: Radium-228_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73520
Client ID: LCSW	Batch ID: 28306	TestNo: E904.0 E903-904 PQL SPK value SPK Ref Val	Analysis Date: 8/16/2017	SeqNo: 1229917
Analyte	Result		%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228	5.33	1.00 5.000 0	107 70 130	
Yield	1.00	0	0	
Sample ID 17071190		TestCode: Radium-228_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73520
Client ID: BatchQC	Batch ID: 28306	TestNo: E904.0 E903-904 PQL SPK value SPK Ref Val	Analysis Date: 8/16/2017	SeqNo: 1229920
Analyte	Result		%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228	4.52	1.00 5.000 1.068	69.1 70 130	S
Yield	1.00	1.000	0	

Qualifiers:

- Value exceeds Maximum Contaminant Level. *
- В Analyte detected in the associated Method Blank
- Η Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits

Original



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

QC SUMMARY REPORT

17071537 WO#:

17-Aug-17

	ee Analytical Laboratories, Inc. G439		BatchID: 2	8306
Sample ID mb-28306	SampType: MBLK	TestCode: Radium-226_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73526
Client ID: PBW	Batch ID: 28306	TestNo: E903.0 E903-904	Analysis Date: 8/17/2017	SeqNo: 1230041
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226 Yield	ND 1.00	1.00		U
Sample ID LCS-28306	SampType: LCS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73526
Client ID: LCSW	Batch ID: 28306	TestNo: E903.0 E903-904	Analysis Date: 8/17/2017	SeqNo: 1230043
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	4.03	1.00 5.000 0	80.6 70 130	
Sample ID 17071190-00	1aMS SampType: MS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 8/10/2017	RunNo: 73526
Client ID: BatchQC	Batch ID: 28306	TestNo: E903.0 E903-904	Analysis Date: 8/17/2017	SeqNo: 1230045
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	4.71	1.00 5.000 0	94.2 70 130	

Qualifiers:

*

- Value exceeds Maximum Contaminant Level.
- В Analyte detected in the associated Method Blank
- Η Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits

Original

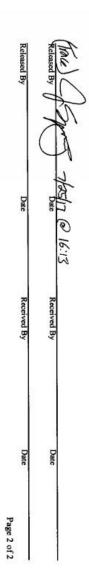
SUBCONTRACT ORDER Trace Analytical Laboratories, Inc. T17G439

Received By Date Page 1 of 2	By Date	Released By
		TAXA AND AND AND AND AND AND AND AND AND AN
Received By 7/27/17 1030	Chr Haners	Have
	Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Container
Radium 226/228	Subcontracted Work 08/01/17 15:00 07/24/18 14:30	Subcontra
	Sample ID: T17G439-06 Aqueous Sampled: 07/24/17 14:30	Sample II
	Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Containes
Radium 226/228	Subcontracted Work 08/01/17 15:00 07/24/18 13:05	Subcontra
	Sample ID: T17G439-05 Aqueous Sampled: 07/24/17 13:05	Sample II
	Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Container I-PL100
Radium 226/228	Subcontracted Work 08/01/17 15:00 07/24/18 12:30	Subcontra
	Sample ID: T17G439-04 Aqueous Sampled: 07/24/17 12:30	Sample II
	Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Containe 1-PL100
Radium 226/228	Subcontracted Work 08/01/17 15:00 07/24/18 11:30	Subcontra
and the second se	Sample ID: 717C439-03 Aqueous Sampled: 07/24/17 11:30	Sample H
	Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Containe 1-PL100
Radium 226/228	Subcontracted Work 08/01/17 15:00 07/24/18 09:00	Subcontra
	Sample ID: T17G439-02 Aqueous Sampled: 07/24/17 09:00	Sample II
H <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Containe 1-PL100
Radium 226/228	Subcontracted Work 08/01/17 15:00 07/24/18 07:50	Subcontra
	Sample ID: T17G439-01 Aqueous Sampled: 07/24/17 07:50	Sample II
10+1251-00-25	ng Code:	Accounting Code:
200 14V - Levi Carl		
Pac (949) 233-4489	Fax: 231.773.6537 Project Manager: Jon Mink	Fax: 231.773.65 Project Manager:
Phone :(330) 253-8211	Mussegon, Al 49444 Phone: 231.773.5998	Phone: 2:
310 Win Street	Trace Analytical Laboratories, Inc. 2241 Black Creek Road	Trace An 2241 Bla
RECEIVING LABORATORY:	SENDING LABORATORY;	SENDING

frace Analytical Laboratories,	SUBCONTRACT ORDER
Inc.	3

Trace Analytical Laboratories, I T17G439

Sample ID: T17G439-07	mpled	Radium 226/228
Subcontracted Work Containers Supplied:	08/01/17 15:00 07/24/18 00:00	
51233-001 6000		



Page 2 of 4 Page 15 of 17

		Comments:	Logged in by:	Date/Time:	Client contact:	Will client send new samples	Was client contacted about samples	Do any 40 mL viais contain bubbles** **Samples with bubbles s6mm are acceptable	Samples received within holding time	Sufficient sample for QC	Sufficient sample received	Correct containers used	Label(s) agree with C-O-C	Sample label(s) complete (ID, date, etc.)	(a) and a second se	the list bakes sensitive	Samples in separate bags	C-O-C filled out property	Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately.	Radiological Testing Instrument serial #3	Cooler Temperature IR Gun #16020459 CFÙ.℃°C	IceBlue ice	C-O-C in plastic	Custody Seats intact	Tape on cooler/box:	Packaging: Peanuts Bubble Wrap Paper Foam	Shipper: Fed Ex UP3 DHL Airborne	Number of Coolers/Boxes:	Date Received: 1127 Time R	71,7	client: The	rigure	SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17
	Page 10 of 12					۲ z	۲ z	Y N lable. Indicate bubble size	N B	N N N) ≺(z	N X	ردر ۲	ج ء		ę z	رج ۲	x x	> 100 cpm, the Radiolog	35127 N N	Temp	ent melt	⊙ z	۲. z	⊙ ≈(None Ot	US Postal Walk-in	NA	Time Received: 1050 De	3	2	1 – Summit Envir Cooler Recei	
14 31 1736	of 12		1	1	1			a if Xanim:	NA	NIA	NIA	NIA	NA	NIA		NA	NA	NIA	fical Safety Officer must b	NA	4.0	Ð	NA	(N)	NIA		Pickup Other:		Date cooler(s) opened and samples inspected:	Order Number;	Initials of person inspecting cooler and samples	rigure 1 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 1	
						¥													 rer acan results) notified immediately. 										imples inspected: 7/27	15.510/1	boler and samples: CSC		

SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip SET (0-14)#: WC-03-1174	4)#: WC-03-1174		pH Strip (2.8-4.6) SET#: OES-01-0250	ET#: OES-01	-0250
Total DPD packet SET#: OES-02-0239	SET#: OES-02-02	239	Free DPD packet SET#: OES-01-0290	ET#: OES-01	-0290
Disp. Pipette SET#:	7				
Sample ID	Test Method	PH	Chlorine (+ or -)	CPM	Comments
-	520/222	2		a	12
2		لر		71	
٤		2		31	
4		2		17	
ς,		2		14	
1	t-	2		24	
7	4	q		24	

 19 = Permanganate Interference 504, 1, 508, 513, 1, 225,2,547, 548, 1, 549, 1, 531,2, 1613 methods checked for <u>Total</u> chlorine 522,2 chaoked for <u>Fine</u> chlorine 531,2 pH is checked for -3.8 (SET# OES-01-0149) 524,2 = pH and Chlorine checked by lab analyst

Page 11 of 12



Data Validation Report

Project:	Marquette Board of Light and Powe	er (MBLP) Project
Laboratory:	Trace Analytical Laboratories and S	Summit Environmental Technologies
Work Order:	T17H507	
Analyses/Method:	Metals (6010B/6020/7470A), Gene Radiological (903.0/904.0)	ral Chemistry (300.0/SM 2540C),
Validation Level:	Level 2	
Prepared by:	Lisa Smith (CEAC)/AECOM	Completed on: 12/29/2017

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on August 23, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1		23-Aug-17	T17H507-01
MW-2		23-Aug-17	T17H507-02
MW-3		23-Aug-17	T17H507-03
MW-4	MS/MSD for Metals and Method 300.0; Lab Dup for TDS	23-Aug-17	T17H507-05
MW-5		23-Aug-17	T17H507-04
Dup_082317	FD of MW-5	23-Aug-17	T17H507-06

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- *Evaluation of Radiochemical Data Usability* (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- Holding times and sample preservation
- ✓ Laboratory blanks and equipment blanks
- ✓ Matrix spike (MS) and/or matrix spike duplicate (MSD) results
- ✓ Laboratory duplicates



- ✓ Laboratory control sample (LCS) results
- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Results were acceptable without qualification. Detailed discussions of the quality control (QC) results are included in the following report.

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.

MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Extra sample volume was collected for sample MW-4, and MS/MSD results were provided for all analyses performed by Trace. MS/MSD recoveries and RPDs were within criteria. Non-project MS/MSDs provided from batch analyses are not applicable and were not evaluated.



Laboratory Duplicates

TDS laboratory duplicate analysis was performed on sample MW-4. The RPD was within the precision limit of 10% and was acceptable.

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample Dup_082317 was collected as a field duplicate of sample MW-5. RPDs were within the 30% limit for groundwater samples, and were acceptable.

		Sample	Field Duplicate		
Analyte	Units	Result	Result	RPD	RPD Limit
MW-5/Dup_082317:					
Barium	mg/l	0.13	0.13	0	30
Calcium	mg/l	110	110	0	30
Chloride	mg/l	210	190	10	30
Sulfate	mg/l	19	19	0	30
Total Dissolved Solids	mg/l	590	620	5.0	30

Sample Results and Quantitation

Results were reported down to the reporting limits.

pH analysis was performed in the field to ensure that analyses were performed within the required hold time.



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

September 27, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE:	Trace Project	T17H507
	Client Project	MBLP CCR Investigation

Dear Mr. Lindberg:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE SUMMARY

Trace Project ID:	T17H507	
Client Project ID:	MBLP CCR Investigation	

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17H507-01	MW-1	Ground Water	tvf	08/23/17 09:35	08/24/17 09:34
T17H507-02	MW-2	Ground Water	tvf	08/23/17 10:15	08/24/17 09:34
T17H507-03	MW-3	Ground Water	tvf	08/23/17 11:05	08/24/17 09:34
T17H507-04	MW-5	Ground Water	tvf	08/23/17 13:40	08/24/17 09:34
T17H507-05	MW-4	Ground Water	tvf	08/23/17 14:55	08/24/17 09:34
T17H507-06	Dup_082317	Ground Water	tvf	08/23/17	08/24/17 09:34

Report ID: T17H507 TRACE_QC FINAL 09 27 17 0842



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
Ν	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID:	T17H507-01		
Analysis	: SM 4500-H+ B-11		
рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID:	T17H507-02		
Analysis	: SM 4500-H+ B-11		
рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID:	T17H507-03		
Analysis	: SM 4500-H+ B-11		
рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID:	T17H507-04		
Analysis	: SM 4500-H+ B-11		
рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID:	T17H507-05		
Analysis	:: SM 4500-H+ B-11		
pН		Note Client : client.	The analysis was performed on site at the time of sampling by the

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ANALYTICAL RESULTS

		ANALYTICA	LRESULIS					
Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigatio	n							
Trace ID: T17H507-01		Date	Collected:	08/23/17 09	:35	Matrix:	Ground	Water
Sample ID: MW-1		Date	Received:	08/24/17 09	:34			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED) BY	ANALYZED	BY	NOT
METALS, TOTAL								
Analysis Method: EPA 7470A Batch: T071505								
Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws	
METALS, TOTAL								
Analysis Method: EPA 6010B Batch: T071450								
Barium	0.14 mg/L	0.10	1	08/25/17	kbc	09/05/17	nws	
Boron	<0.30 mg/L	0.30	1	08/25/17	kbc	09/05/17	nws	
Calcium	120 mg/L	5.0	10	08/25/17	kbc	09/05/17	nws	
Lithium	<0.010 mg/L	0.010	1	08/25/17	kbc	09/05/17	nws	Ν
Analysis Method: EPA 6020 Batch: T071450								
Antimony	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm	
Chromium	<0.010 mg/L	0.010	1	08/25/17	kbc	08/30/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	08/25/17	kbc	08/30/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	08/25/17	kbc	08/30/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	08/25/17	kbc	08/30/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm	
WET CHEMISTRY								
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071419								
Fluoride	<0.10 mg/L	0.10	1	08/24/17	jek	08/24/17	jek	
Chloride	260 mg/L	10	100	08/24/17	jek	08/26/17	jek	
Sulfate as SO4	21 mg/L	1.0	1	08/24/17	jek	08/26/17	jek	

Analysis Method: SM 2540 C-11

Batch: T071409

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ANALYTICAL RESULTS

Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigation	n								
Trace ID: T17H507-01 Sample ID: MW-1		Date Collected: Date Received:		08/23/17 09:35 08/24/17 09:34		Matrix:	Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	800 mg/L	20	2	08/24/17	nm	08/25/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	7.54 pH Units		1	08/23/17	jm	08/23/17	jm	Client, N	



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Matrix: Ground Water

ΒY

nws

nws

nws

nws

nws

dtm

dtm

dtm

dtm

dtm

dtm

dtm

dtm

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		ANALYTICA	L RESULTS			
Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigation	on					
Trace ID: T17H507-02 Sample ID: MW-2			Date Collected: Date Received:		15 34	Matrix:
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED
METALS, TOTAL						
Analysis Method: EPA 7470A Batch: T071505						
Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17
METALS, TOTAL						
Analysis Method: EPA 6010B Batch: T071450						
Barium	<0.10 mg/L	0.10	1	08/25/17	kbc	09/05/17
Boron	<0.30 mg/L	0.30	1	08/25/17	kbc	09/05/17
Calcium	51 mg/L	1.0	1	08/25/17	kbc	09/05/17
Lithium	<0.010 mg/L	0.010	1	08/25/17	kbc	09/05/17
Analysis Method: EPA 6020 Batch: T071450						
Antimony	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17
Arsenic	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17
Beryllium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17
Cadmium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17
Chromium	<0.010 mg/L	0.010	1	08/25/17	kbc	08/30/17
Cobalt	<0.020 mg/L	0.020	1	08/25/17	kbc	08/30/17
Lead	0.24 mg/L	0.0030	1	08/25/17	kbc	08/30/17
Molybdenum	<0.050 mg/L	0.050	1	08/25/17	kbc	08/30/17
Selenium	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17
Thallium	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17
WET CHEMISTRY						
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071419						
Fluoride	<0.10 mg/L	0.10	1	08/24/17	jek	08/24/17
Chloride	62 mg/L	10	25	08/24/17	jek	08/26/17
Sulfate as SO4	26 mg/L	5.0	25	08/24/17	jek	08/26/17

Analysis Method: SM 2540 C-11

Batch: T071409

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ANALYTICAL RESULTS

Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigation	1								
Trace ID: T17H507-02 Sample ID: MW-2			Collected: Received:	08/23/17 10: 08/24/17 09:		Matrix:	Ground	l Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	190 mg/L	20	2	08/24/17	nm	08/25/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	8.13 pH Units		1	08/23/17	jm	08/23/17	jm	Client, N	



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Matrix: Ground Water

ΒY

nws

nws

nws

nws

nws

dtm

dtm

dtm

dtm

dtm

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NOTES

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ANALYZED

08/29/17

09/05/17

09/05/17

09/05/17

09/05/17

08/30/17

08/30/17

08/30/17

08/30/17

08/30/17

08/30/17

08/30/17

08/30/17

08/30/17

08/30/17

08/24/17

08/26/17

08/26/17

ANALYTICAL RESULTS

	ANALYTICAL RESULTS								
Trace Project ID: T17H507									
Client Project ID: MBLP CCR Investigation									
Trace ID: T17H507-03			Collected:	08/23/17 11:05					
Sample ID: MW-3		Date	Received:	08/24/17 09:	34				
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY				
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071505									
Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc				
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071450									
Barium	<0.10 mg/L	0.10	1	08/25/17	kbc				
Boron	<0.30 mg/L	0.30	1	08/25/17	kbc				
Calcium	75 mg/L	1.0	1	08/25/17	kbc				
Lithium	<0.010 mg/L	0.010	1	08/25/17	kbc				
Analysis Method: EPA 6020 Batch: T071450									
Antimony	<0.0020 mg/L	0.0020	1	08/25/17	kbc				
Arsenic	<0.0050 mg/L	0.0050	1	08/25/17	kbc				
Beryllium	<0.0010 mg/L	0.0010	1	08/25/17	kbc				
Cadmium	<0.0010 mg/L	0.0010	1	08/25/17	kbc				
Chromium	<0.010 mg/L	0.010	1	08/25/17	kbc				
Cobalt	<0.020 mg/L	0.020	1	08/25/17	kbc				
Lead	<0.0030 mg/L	0.0030	1	08/25/17	kbc				
Molybdenum	<0.050 mg/L	0.050	1	08/25/17	kbc				
Selenium	<0.0050 mg/L	0.0050	1	08/25/17	kbc				
Thallium	<0.0020 mg/L	0.0020	1	08/25/17	kbc				
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071419									
Fluoride	<0.10 mg/L	0.10	1	08/24/17	jek				
Chloride	95 mg/L	10	100	08/24/17	jek				
Sulfate as SO4	44 mg/L	20	100	08/24/17	jek				

Analysis Method: SM 2540 C-11

Batch: T071409

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ANALYTICAL RESULTS

Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigatio	n								
Trace ID: T17H507-03 Sample ID: MW-3		Date Collected: Date Received:		08/23/17 11:05 08/24/17 09:34		Matrix:	Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	300 mg/L	20	2	08/24/17	nm	08/25/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	7.81 pH Units		1	08/23/17	jm	08/23/17	jm	Client, N	



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		ANALYTICA	L RESULTS					
Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigation	n							
Trace ID: T17H507-04			Collected:	08/23/17 13:4		Matrix:	Ground	Water
Sample ID: MW-5			Received:	08/24/17 09:3			5)(NOT
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTE
METALS, TOTAL								
Analysis Method: EPA 7470A Batch: T071505								
Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws	
METALS, TOTAL								
Analysis Method: EPA 6010B Batch: T071450								
Barium	0.13 mg/L	0.10	1	08/25/17	kbc	09/05/17	nws	
Boron	<0.30 mg/L	0.30	1	08/25/17	kbc	09/05/17	nws	
Calcium	110 mg/L	1.0	1	08/25/17	kbc	09/05/17	nws	
Lithium	<0.010 mg/L	0.010	1	08/25/17	kbc	09/05/17	nws	Ν
Analysis Method: EPA 6020 Batch: T071450								
Antimony	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm	
Chromium	<0.010 mg/L	0.010	1	08/25/17	kbc	08/30/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	08/25/17	kbc	08/30/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	08/25/17	kbc	08/30/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	08/25/17	kbc	08/30/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm	
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071419								
Fluoride	<0.10 mg/L	0.10	1	08/24/17	jek	08/24/17	jek	
Chloride	210 mg/L	10	100	08/24/17	jek	08/26/17	jek	
Sulfate as SO4	19 mg/L	1.0	1	08/24/17	jek	08/26/17	jek	

Analysis Method: SM 2540 C-11

Batch: T071409

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ANALYTICAL RESULTS

Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigation	1								
Trace ID: T17H507-04 Sample ID: MW-5			Collected: Received:	08/23/17 13: 08/24/17 09:		Matrix:	Ground	l Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	590 mg/L	20	2	08/24/17	nm	08/25/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	7.41 pH Units		1	08/23/17	jm	08/23/17	jm	Client, N	



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Matrix: Ground Water

ΒY

ANALYZED

00/00/47

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ANALYTICAL RESULTS

Date Collected:

Date Received:

RDL

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DILUTION

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08/23/17 14:55

08/24/17 09:34

00/00/47

PREPARED BY

1.1

Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigatio	on
Trace ID: T17H507-05 Sample ID: MW-4	
PARAMETERS	RESULTS UNITS
METALS, TOTAL Analysis Method: EPA 7470A Batch: T071505 Mercury	<0.00020 mg/L
METALS, TOTAL	
Analysis Method: EPA 6010B Batch: T071450	
Barium	<0.10 mg/L

Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws	
METALS, TOTAL								
Analysis Method: EPA 6010B Batch: T071450								
Barium	<0.10 mg/L	0.10	1	08/25/17	kbc	09/05/17	nws	
Boron	<0.30 mg/L	0.30	1	08/25/17	kbc	09/05/17	nws	
Calcium	100 mg/L	1.0	1	08/25/17	kbc	09/05/17	nws	
Lithium	<0.010 mg/L	0.010	1	08/25/17	kbc	09/05/17	nws	Ν
Analysis Method: EPA 6020 Batch: T071450								
Antimony	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm	
Chromium	<0.010 mg/L	0.010	1	08/25/17	kbc	08/30/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	08/25/17	kbc	08/30/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	08/25/17	kbc	08/30/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	08/25/17	kbc	08/30/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm	

WET CHEMISTRY

Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071419							
Fluoride	<0.10 mg/L	0.10	1	08/24/17	jek	08/24/17	jek
Chloride	300 mg/L	10	100	08/24/17	jek	08/26/17	jek
Sulfate as SO4	24 mg/L	1.0	5	08/24/17	jek	08/26/17	jek

Analysis Method: SM 2540 C-11

Batch: T071409

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ANALYTICAL RESULTS

Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigation									
Trace ID: T17H507-05 Sample ID: MW-4			Collected: Received:	08/23/17 14: 08/24/17 09:		Matrix:	Ground	l Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	830 mg/L	20	2	08/24/17	nm	08/25/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	7.93 pH Units		1	08/23/17	jm	08/23/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace ID: T17H507-06 Sample ID: Dup_082317			Collected: Received:	08/23/17 08/24/17 09:3	34	Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MC
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071505									
Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071450									
Barium	0.13 mg/L	0.10	1	08/25/17	kbc	09/05/17	nws		
Boron	<0.30 mg/L	0.30	1	08/25/17	kbc	09/05/17	nws		
Calcium	110 mg/L	1.0	1	08/25/17	kbc	09/05/17	nws		
Lithium	<0.010 mg/L	0.010	1	08/25/17	kbc	09/05/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T071450									
Antimony	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	08/25/17	kbc	08/30/17	dtm		
Chromium	<0.010 mg/L	0.010	1	08/25/17	kbc	08/30/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	08/25/17	kbc	08/30/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	08/25/17	kbc	08/30/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	08/25/17	kbc	08/30/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	08/25/17	kbc	08/30/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	08/25/17	kbc	08/30/17	dtm		
NET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071419									
Fluoride	<0.10 mg/L	0.10	1	08/24/17	jek	08/24/17	jek		
Chloride	190 mg/L	10	100	08/24/17	, jek	08/26/17	, jek		
Sulfate as SO4	19 mg/L	1.0	1	08/24/17	jek	08/26/17	jek		

Analysis Method: SM 2540 C-11

Batch: T071409

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ANALYTICAL RESULTS

WET CHEM	ISTRY	620 mg/L	20	2	08/24/17	nm	08/25/17	nm		
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
Trace ID: Sample ID:	T17H507-06 Dup_082317			Collected: Received:	08/23/17 08/24/17 09:3	4	Matrix:	Ground \	Water	
Client Project	ID: MBLP CCR Investigation									



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QUALITY CONTROL RESULTS

Trace Project ID: T17H507 Client Project ID: MBLP CCR Investigation

QC Batch: T071505	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T071505-BLK1

Parameter	Units		Blank Result	Reporting Limit		Notes
Mercury	mg/L	<	0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T071505-B	S1				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00204	102	77-122	

MATRIX SPIKE / MATRIX SI	PIKE DUPLICATE: TO)71505-M	ISD1	Original: T17H507-05							
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00220	0.00222	110	111	76-123	0.9	20	
			Trace	Project ID:	T17H507						
			Client	Project ID:	MBLP CCR	Investigati	on				
QC Batch: T071450				Ai	nalysis Des	cription: Lit	hium, Total				
QC Batch Method: EPA 3015 for Liquids	Microwave Assisted Dig	estions Analysis Method: EPA 6010B									

METHOD BLANK: T071450-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T071450-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.842	95	80-120	
Barium	mg/L	0.889	0.881	99	80-120	
Calcium	mg/L	8.89	8.55	96	80-120	
Lithium	mg/L	0.889	0.791	89	80-120	

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MATRIX SPIKE / MATRIX SPIK	SD1	Original: T17H507-05									
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Boron	mg/L	0.0978	0.889	0.994	1.02	101	104	75-125	3	20	
Barium	mg/L	0.0844	0.889	0.918	0.930	94	95	75-125	1	20	
Calcium	mg/L	102	8.89	109	109	85	80	75-125	6	20	
Lithium	mg/L	0	0.889	0.737	0.744	83	84	75-125	0.9	20	

Trace Project ID: T17H507

Client Project ID: MBLP CCR Investigation

QC Batch: T071450 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Selenium, Total Analysis Method: EPA 6020

METHOD BLANK: T071450-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.0050	0.0050	
Beryllium	mg/L	<0.0010	0.0010	
Cadmium	mg/L	<0.0010	0.0010	
Cobalt	mg/L	<0.020	0.020	
Chromium	mg/L	<0.010	0.010	
Molybdenum	mg/L	<0.050	0.050	
Lead	mg/L	<0.0030	0.0030	
Antimony	mg/L	<0.0020	0.0020	
Selenium	mg/L	<0.0050	0.0050	
Thallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T071450-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0512	92	80-120	
Beryllium	mg/L	0.111	0.0900	81	80-120	
Cadmium	mg/L	0.0278	0.0260	93	80-120	
Cobalt	mg/L	0.889	0.909	102	80-120	
Chromium	mg/L	0.0278	0.0295	106	80-120	
Molybdenum	mg/L	0.889	0.909	102	80-120	
Lead	mg/L	0.0556	0.0551	99	80-120	
Antimony	mg/L	0.0556	0.0567	102	80-120	
Selenium	mg/L	0.0556	0.0476	86	80-120	
Thallium	mg/L	0.0556	0.0547	99	80-120	

CERTIFICATE OF ANALYSIS



Original: T17H507-05

231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071450-MSD1

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Arsenic	mg/L	0.00108	0.0556	0.0509	0.0503	90	89	75-125	1	20	
Beryllium	mg/L	0	0.111	0.0902	0.0945	81	85	75-125	5	20	
Cadmium	mg/L	0	0.0278	0.0246	0.0248	89	89	75-125	0.7	20	
Cobalt	mg/L	0.000580	0.889	0.849	0.862	95	97	75-125	2	20	
Chromium	mg/L	0	0.0278	0.0271	0.0273	98	98	75-125	0.6	20	
Molybdenum	mg/L	0.0255	0.889	0.916	0.924	100	101	75-125	0.9	20	
Lead	mg/L	0	0.0556	0.0503	0.0506	91	91	75-125	0.6	20	
Antimony	mg/L	0.000693	0.0556	0.0678	0.0664	121	118	75-125	2	20	
Selenium	mg/L	0	0.0556	0.0426	0.0452	77	81	75-125	6	20	
Thallium	mg/L	0	0.0556	0.0496	0.0506	89	91	75-125	2	20	
				Project ID: 1 Project ID: N		Investigatio	'n				

QC Batch: T069765	Analysis Description: Metals Digestion
QC Batch Method: EPA 200.2	Analysis Method: EPA 200.2

	Trace Project ID: T17H507	
	Client Project ID: MBLP CCR Investigation	
QC Batch: T071419	Analysis Description: Sulfate	
QC Batch Method: IC Prep W	Analysis Method: EPA 300.0 Rev. 2.1	

METHOD BLANK: T071419-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.10	0.10	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<0.50	0.50	

METHOD BLANK: T071419-BLK2

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.10	0.10	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<0.50	0.50	

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LABORATORY CONTROL SAMPLE: T071419-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	0.995	99	90-110	
Fluoride	mg/L	0.500	0.474	95	90-110	
Sulfate as SO4	mg/L	2.50	2.46	98	90-110	

LABORATORY CONTROL SAMPLE: T071419-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	0.998	100	90-110	
Fluoride	mg/L	0.500	0.499	100	90-110	
Sulfate as SO4	mg/L	2.50	2.43	97	90-110	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071419-MSD1					Original: T17H507-05						
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Fluoride	mg/L	0	4.00	4.31	4.08	108	102	80-120	5	20	
Sulfate as SO4	mg/L	24.2	30.0	51.3	51.7	90	92	80-120	2	20	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071419-MSD3					Original: T17H507-05						
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Chloride	mg/L	303	200	483	482	90	90	80-120	0.6	20	
Fluoride	mg/L	0	80.0	76.8	76.3	96	95	80-120	0.6	20	
Sulfate as SO4	mg/L	24.2	600	594	567	95	90	80-120	5	20	
				Project ID: 1 Project ID: 1		R Investigati	on				

QC Batch: T071409	Analysis Description: Total Dissolved Solids
QC Batch Method: SM 2540 C-11	Analysis Method: SM 2540 C-11

METHOD BLANK: T071409-BLK1

Parameter	Units		Blank Result	Reporting Limit		Notes
Total Dissolved Solids	mg/L		<10	10		
LABORATORY CONTROL SA	AMPLE: T071409-BS	61				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes

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Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit			Notes
Total Dissolved Solids	mg/L	526	506	96	80-120			
SAMPLE DUPLICATE: T0714	109-DUP1	Original: T17H507	-05					
Parameter	Units	Original Result	DUP Result			RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	830	780			6	10	
		Tr	ace Project ID: T17H507					
		CI	ient Project ID: MBLP CCR	Investigation				
QC Batch: T070922			Analysis Des	cription: pH, SM 450	00			
QC Batch Method: *** DEFAULT PREP *** Analysis Method: SM 4500-H+ B-11					8-11			

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		rement.	bs.com/terms-of-agre	orth at www.trace-la	ed in the Tree	nowledges the	tody, the client ack	In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.	In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement. Check this box if you would not like your samples analyzed if terceived outside of the conditions outlined in the Tence Sample Accordance Deliver at wour trace labs.com/dawnhode	Check this box	
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alth Haz			day 8.	C. de, f	T		Sampled By:	erty two	MALIP COIL INV	Project Name: M	Project
zards?			26/ (At	1/20 2/00/ 1/D		later	D = Drinking Water	OI = Oil	rr Approval	* Requires Prior Approval]
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	Trace ID No. 507	Th 4507	Phone 231.773.5998 Fax 888.979.4469	Phone 2: Fax 888.	ries, Inc.	al Laborato eek Road	Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskenon MI 49444-2673				
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231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE LOG IN CHECKL	IST #12					
Trace ID #:	ion: <u>COO/C/</u> Temperature: O.9					
Client Name: <u>A Econ</u> Time: <u>7:34</u>	Logged in by:					
Cooler/samples delivered by: Trace courier						
	ivery person:					
Commercial courier 🔀 UPS	FED EX 💭 US Mail 📃					
Tracking Number: Not Applicable Tracking #:874/884	29158					
COC Seals present and intact on cooler?	Yes					
Custody seals signed by Client? No Yes Client custody s	eal # (if applicable):					
Coolant and Temperature						
	ler Temperature					
	tick Thermometer CF = -0.6°C					
Multiple bags of ice around samples?	nometer CF = -0.4° C					
Ice Packs/ Blue Ice : Representative Sample Tempera	ature: 3_0 °C (check one below)					
No Coolant Present:) Temp Blank (Sti	ck Thermometer)					
Ice still present upon receipt (circle one):	R Thermometer)					
Yes No N/A Melt Water: <u>1000</u>	_°C (Use Digital Stick Thermometer)					
General						
Yes No NA	Comments					
All bottles arrived unbroken with labels in good condition?						
Each sample point is in a sealed plastic bag?						
Labels filled out completely?						
All bottle labels agree with Chain of Custody (COC)?						
Sufficient sample to run tests requested?						
pH checked and samples at correct pH?	V*					
Correct preservative added to samples?						
COC filled out properly and signed by client?						
COC signed in by TRACE sample custodian?						
Was project manager called and samples discussed?						
Notes:	*EMD pH Test Strips Used:					
	→ □ pH 0-2.5 pH 11.0-13.0 Lot: HC563733 □ Lot: HC547328					
	Other:					
	Lot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS					

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SAMPLE LOG IN CHECKLIST
Trace ID #: TT1 H507 Date: 824-17 Package Description: COO/CP Temperature: -0.8 Client Name: AFCON1 Time: 9:34 Logged in by: CAL
Cooler Receipt
Cooler/samples delivered by: Trace courier Hand delivered Name of delivery person: Commercial courier 🔀 UPS FED EX 🖉 US Mail
Tracking Number: Not Applicable Tracking #: <u>787488463309</u>
COC Seals present and intact on cooler?
Custody seals signed by Client? No Yes Client custody seal # (if applicable):

Coolant and Temperature					
Type of Cool	ant Used	Cooler Temperature			
Slurry w/ crushed, c	cubed, or chip ice?	Correction Factors: •Digital Stick Thermometer CF = -0.6°C			
Multiple bags of ice	around samples?	•IR Thermometer CF = -0.4°C			
lce	e Packs/ Blue Ice :	Representative Sample Temperature: °C (check one below)			
No	o Coolant Present:	Temp Blank (Stick Thermometer)			
Ice still present upon receip	pt (circle one):	Client Sample (IR Thermometer)			
Aos N	lo N/A	Melt Water: <u>flone</u> °C (Use Digital Stick Thermometer)			

General						
Yes	No	NA	Comments			
All bottles arrived unbroken with labels in good condition?						
Each sample point is in a sealed plastic bag?	æ					
Labels filled out completely?						
All bottle labels agree with Chain of Custody (COC)?						
Sufficient sample to run tests requested?			2			
pH checked and samples at correct pH? 👽			See Below*			
Correct preservative added to samples?						
Air bubbles absent from VOAs?		0				
COC filled out properly and signed by client?						
COC signed in by TRACE sample custodian?						
Was project manager called and samples discussed?	X					
Notes:			*EMD pH Test Strips Used:			
			pH 0-2.5 pH 11.0-13.0 Lot: HC563733 Lot: HC547328			
			Other:			
			Lot: HC563733 verified 6/21/16 AY			
			Lot: HC574761 verified 04/03/17 JS			
Form 70-A.21 Effective 7/5/17			TRACE Analytical Laboratories, Inc.			

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231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

September 27, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE: Trace ID: T17H507

Dear Mr. Lindberg:

Enclosed are your analytical results associated with your project for MBLP CCR Investigation. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from: Summit Environmental Technologies.

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

CERTIFICATE OF ANALYSIS

231-773-5998 Phone Trace Analytical Laboratories, Inc. 2241 Black Creek Road 888-979-4469 Fax Muskegon, MI 49444-2673 ANALYTICAL LABORATORIES, INC. www.trace-labs.com SAMPLE LOG IN CHECKLIST TT7H507 Date: 8-24-17 Trace ID #: Package Description: 00 Temperature: AECOM Client Name: Time: 9:34 Logged in by: **Cooler Receipt** Cooler/samples delivered by: Trace courier Hand delivered Name of delivery person: Commercial courier UPS FED EX US Mail Not Applicable Tracking Number: Tracking #: Not Applicable COC Seals present and intact on cooler? No Yes Custody seals signed by Client? No Yes Client custody seal # (if applicable): **Coolant and Temperature** Type of Coolant Used **Cooler Temperature** Slurry w/ crushed, cubed, or chip ice? **Correction Factors:** •Digital Stick Thermometer CF = -0.6°C Multiple bags of ice around samples? •IR Thermometer CF = -0.4°C Ice Packs/ Blue Ice : Representative Sample Temperature: 5 C°C (check one below) No Coolant Present: 🗶 Temp Blank (Stick Thermometer) Ice still present upon receipt (circle one): Client Sample (IR Thermometer) Yes No N/A Melt Water: °C (Use Digital Stick Thermometer) General Yes No Comments NA All bottles arrived unbroken with labels in good condition? Each sample point is in a sealed plastic bag? Labels filled out completely? All bottle labels agree with Chain of Custody (COC)? Sufficient sample to run tests requested? pH checked and samples at correct pH? \r See Below* Correct preservative added to samples? Air bubbles absent from VOAs? 50 COC filled out properly and signed by client? 2 COC signed in by TRACE sample custodian? Was project manager called and samples discussed? Notes: *EMD pH Test Strips Used: pH 11.0-13.0 ₩^{pH 0-2.5} Lot: HC563733 Lot: HC547328 Other: ot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS Form 70-A.21 TRACE Analytical Laboratories, Inc. Effective 7/5/17

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	SAI	MPLE LOG I	N CHECKLIS	##2	
Trace ID #: TF7	H507 Date	8:24-17	Package Description:	Cooler	Temperature: -0.8
Client Name:	AECOM	Time:	7:34	Logged in by: _	GA

	Cooler Receipt
Cooler/samples delivered by:	Trace courier
	Hand delivered Name of delivery person:
	Commercial courier 🔀 UPS FED EX 🖉 US Mail
Tracking Number:	□Not Applicable Tracking #: <u>7874884833</u>
COC Seals present and intact on cooler?	Not Applicable No Yes
Custody seals signed by Client?	No Yes Client custody seal # (if applicable):

Coolant and Temperature						
Type of Coolant Used	Cooler Temperature					
Slurry w/ crushed, cubed, or chip ice?	<u>Correction Factors:</u> •Digital Stick Thermometer CF = -0.6°C					
Multiple bags of ice around samples?	•IR Thermometer CF = -0.4°C					
Ice Packs/ Blue Ice :	Representative Sample Temperature: °C (check one below)					
No Coolant Present:	Temp Blank (Stick Thermometer)					
Ice still present upon receipt (circle one):	Client Sample (IR Thermometer)					
Hes No N/A	Melt Water: 1000 °C (Use Digital Stick Thermometer)					

General						
Yes	No	NA	Comments			
All bottles arrived unbroken with labels in good condition?]			
Each sample point is in a sealed plastic bag?	æ]			
Labels filled out completely?]			
All bottle labels agree with Chain of Custody (COC)?]			
Sufficient sample to run tests requested?]			
pH checked and samples at correct pH? 귳			See Below*			
Correct preservative added to samples?]			
Air bubbles absent from VOAs?		0]			
COC filled out properly and signed by client?]			
COC signed in by TRACE sample custodian?]			
Was project manager called and samples discussed?	\checkmark]			
Notes:			*EMD pH Test Strips Used:			
			→ DFH 0-2.5 DFH 11.0-13.0 CLot: HC563733 → Lot: HC547328			
	·^ · _ ·		CLot: HC563733			
			Other:			
			Lot: HC563733 verified 6/21/16 AY			
			Lot: HC574761 verified 04/03/17 JS			
Form 70-4 21			TRACE Applytical Laboratorica, Inc.			

Form 70-A.21 Effective 7/5/17

E Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS



September 26, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17H507

Dear Jon Mink:

Order No.: 17081538

Summit Environmental Technologies, Inc. received 6 sample(s) on 8/28/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

tally Slow

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891



Case Narrative

WO#:17081538Date:9/26/2017

CLIENT:Trace Analytical Laboratories, Inc.Project:T17H507

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

Revised report provided 27Sep17; matrix updated to goundwater.



Workorder Sample Summary

WO#: 17081538 27-Sep-17

CLIENT:Trace Analytical Laboratories, Inc.Project:T17H507

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17081538-001	T17H507-01		8/23/2017 9:35:00 AM	8/28/2017 10:05:00 AM	Groundwater
17081538-002	T17H507-02		8/23/2017 10:15:00 AM	8/28/2017 10:05:00 AM	Groundwater
17081538-003	T17H507-03		8/23/2017 11:05:00 AM	8/28/2017 10:05:00 AM	Groundwater
17081538-004	T17H507-04		8/23/2017 1:40:00 PM	8/28/2017 10:05:00 AM	Groundwater
17081538-005	T17H507-05		8/23/2017 2:55:00 PM	8/28/2017 10:05:00 AM	Groundwater
17081538-006	T17H507-06		8/23/2017	8/28/2017 10:05:00 AM	Groundwater



Analytical Report

 (consolidated)

 WO#:
 17081538

 Date Reported:
 9/26/2017

Analyses	Resul	POL Qual Units Uncertain	nty DF Date Analyzed
Client Sample ID	T17H507-01		
Lab ID:	17081538-001	Matrix:	GROUNDWATER
Project:	T17H507		
CLIENT:	Trace Analytical Laboratories,	Inc. Collection Date:	8/23/2017 9:35:00 AM

Analyses	Kesuit			Uncertaint	y DI L	ate Analyzeu
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.45	1	9/14/2017 8:41:00 AM
Yield	1.00				1	9/14/2017 8:41:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.78	1	9/25/2017 3:19:00 PM
Yield	1.00				1	9/25/2017 3:19:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17081538

 Date Reported:
 9/26/2017

Analyses	Result	POL Qual Units Uncertain	nty DF Date Analyzed
Client Sample ID	T17H507-02		
Lab ID:	17081538-002	Matrix:	GROUNDWATER
Project:	T17H507		
CLIENT:	Trace Analytical Laboratories, I	nc. Collection Date:	8/23/2017 10:15:00 AM

Anaryses	Result	FQL Qua		Uncertaint	y Dr L	ate Analyzeu
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.16	1	9/14/2017 8:41:00 AM
Yield	1.00				1	9/14/2017 8:41:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.73	1	9/25/2017 3:21:00 PM
Yield	1.00				1	9/25/2017 3:21:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17081538

 Date Reported:
 9/26/2017

Analyses	Resul	POL Qual Units Uncertain	nty DF Date Analyzed
Client Sample ID	Т17Н507-03		
Lab ID:	17081538-003	Matrix:	GROUNDWATER
Project:	T17H507		
CLIENT:	Trace Analytical Laboratories,	Inc. Collection Date:	8/23/2017 11:05:00 AM

Analyses	Kesuit		i Units	Uncertaint	y DI L	Jate Analyzeu
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.14	1	9/14/2017 8:39:00 AM
Yield	1.00				1	9/14/2017 8:39:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.75	1	9/13/2017 4:35:00 PM
Yield	0.960				1	9/13/2017 4:35:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17081538

 Date Reported:
 9/26/2017

Analyses	Result	PQL Qual Units Uncertain	nty DF Date Analyzed
Client Sample ID	T17H507-04		
Lab ID:	17081538-004	Matrix:	GROUNDWATER
Project:	T17H507		
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date:	8/23/2017 1:40:00 PM

	11000110				J 21 2	
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.26	1	9/14/2017 8:39:00 AM
Yield	1.00				1	9/14/2017 8:39:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	1.44	1.00	pCi/L	± 0.53	1	9/25/2017 3:52:00 PM
Yield	1.00				1	9/25/2017 3:52:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17081538

 Date Reported:
 9/26/2017

Analyses	Result	PQL Qual Units Uncertain	nty DF Date Analyzed
Client Sample ID	T17H507-05		
Lab ID:	17081538-005	Matrix:	GROUNDWATER
Project:	T17H507		
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date:	8/23/2017 2:55:00 PM

RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.12	1	9/14/2017 8:39:00 AM
Yield	1.00				1	9/14/2017 8:39:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.93	1	9/13/2017 4:35:00 PM
Yield	1.00				1	9/13/2017 4:35:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17081538

 Date Reported:
 9/26/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 8/23/2017
Project:	T17H507	
Lab ID:	17081538-006	Matrix: GROUNDWATER
Client Sample ID	T17H507-06	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

RADIUM-226 (903.0)			E	E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.38	1	9/14/2017 10:41:00 AM
Yield	1.00				1	9/14/2017 10:41:00 AM
RADIUM-228 (904.0)			E	E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.5	1	9/25/2017 3:52:00 PM
Yield	0.870				1	9/25/2017 3:52:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

QC SUMMARY REPORT

WO#: 17081538

27-Sep-17

Client: Project:	Trace Analytical Laboratorie T17H507	s, Inc.			BatchII	0: 28705
Sample ID mb-287 Client ID: PBW	205 SampType: MBL Batch ID: 2870		228_ Units: pCi/L E903-904		Prep Date: 9/8/2017 alysis Date: 9/13/2017	RunNo: 74700 SeqNo: 1260875
Analyte	Rest	ult PQL SPK value	SPK Ref Val	%REC Lo	owLimit HighLimit RPD R	ef Val %RPD RPDLimit Qual
Radium-228 Yield	N 0.83	ID 1.00 30	0 0	0 0		
Sample ID LCS-28 Client ID: LCSW	705 SampType: LCS Batch ID: 2870	TestCode: Radium-2	228_ Units: pCi/L E903-904		Prep Date: 9/8/2017 alysis Date: 9/13/2017	RunNo: 74700 SeqNo: 1260877
Analyte	Rest		SPK Ref Val		owLimit HighLimit RPD R	
Radium-228 Yield	4.4 0.87		0 0	89.2 0	70 130	
Sample ID 170814 Client ID: BatchC		TestCode: Radium-2 5 TestNo: E904.0	228_ Units: pCi/L E903-904		Prep Date: 9/8/2017 alysis Date: 9/13/2017	RunNo: 74700 SeqNo: 1260880
Analyte	Resi	ult PQL SPK value	SPK Ref Val	%REC Lo	owLimit HighLimit RPD R	ef Val %RPD RPDLimit Qual
Radium-228 Yield	7.3 1.0		0 0.8900	146 0	70 130	S

Qualifiers:

- Value exceeds Maximum Contaminant Level. *
- В Analyte detected in the associated Method Blank
- Η Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits



QC SUMMARY REPORT

17081538 WO#:

27-Sep-17

Client: Project:	Trace Analy T17H507	ytical Laboratories, Inc.				BatchID:	28705		
	17081539-001adup BatchQC	SampType: DUP Batch ID: 28705	TestCode: Radium-2 TestNo: E904.0	28_ Units: pCi/L E903-904		Prep Date: 9/8/2017 Analysis Date: 9/13/2017	RunNo: 74 SeqNo: 12		
Analyte		Result		SPK Ref Val	%REC	LowLimit HighLimit RPD Ref Va	·		Qual
Radium-228 Yield		ND 0.700	1.00	0 0	0 0	0.7200	_	20	R
	17081539-002adup BatchQC	SampType: DUP Batch ID: 28705	TestCode: Radium-2 TestNo: E904.0	28_ Units: pCi/L E903-904		Prep Date: 9/8/2017 Analysis Date: 9/13/2017	RunNo: 74 SeqNo: 12		
Analyte		Result	PQL SPK value	SPK Ref Val	%REC	LowLimit HighLimit RPD Ref Va	I %RPD	RPDLimit	Qual
Radium-228 Yield		ND 1.00	1.00	0 0	0 0	1.000	_	20	R

Qualifiers:

Η

Value exceeds Maximum Contaminant Level. *

- В Analyte detected in the associated Method Blank
- Holding times for preparation or analysis exceeded

Value is below Minimum Compound Limit. MC

Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND

PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits



QC SUMMARY REPORT

WO#: 17081538

27-Sep-17

Client: Trace Project: T17F	e Analytical Laboratories, Inc. 1507		BatchID: 2	8705
Sample ID mb-28705	SampType: MBLK	TestCode: Radium-226_ Units: pCi/L	Prep Date: 9/8/2017	RunNo: 74705
Client ID: PBW	Batch ID: 28705	TestNo: E903.0 E903-904	Analysis Date: 9/14/2017	SeqNo: 1261035
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226 Yield	ND 1.00	1.00		
Sample ID 17081417-001	IaMS SampType: MS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 9/8/2017	RunNo: 74705
Client ID: BatchQC	Batch ID: 28705	TestNo: E903.0 E903-904	Analysis Date: 9/14/2017	SeqNo: 1261040
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	4.55	1.00 5.000 0	91.0 70 130	
Sample ID 17081539-001	ladup SampType: DUP	TestCode: Radium-226_ Units: pCi/L	Prep Date: 9/8/2017	RunNo: 74705
Client ID: BatchQC	Batch ID: 28705	TestNo: E903.0 E903-904	Analysis Date: 9/14/2017	SeqNo: 1261053
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226 Yield	ND 1.00	1.00	0 1.000	0 20 0 0

Qualifiers:

- * Value exceeds Maximum Contaminant Level.
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- P Second column confirmation exceeds

- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits



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Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: <u>http://www.settek.com</u>

QC SUMMARY REPORT

WO#: 17081538

27-Sep-17

Client: Trace Project: T17H	Analytical Laboratories, Inc. 507				BatchID:	28705	
Sample ID 17081539-002	adup SampType: DUP	TestCode: Radium-2	26_ Units: pCi/L	Prep [Date: 9/8/2017	RunNo: 74705	
Client ID: BatchQC	Batch ID: 28705	TestNo: E903.0	E903-904	Analysis [Date: 9/14/2017	SeqNo: 1261055	
Analyte	Result	PQL SPK value	SPK Ref Val	%REC LowLim	t HighLimit RPD Ref V	al %RPD RPDLimit	Qual
Radium-226 Yield	ND 1.00	1.00			1.00	0 0 20 00 0 0	
Sample ID Ics-28705	SampType: LCS	TestCode: Radium-2	26_ Units: pCi/L	Prep [Date: 9/8/2017	RunNo: 74705	
Client ID: LCSW	Batch ID: 28705	TestNo: E903.0	E903-904	Analysis [Date: 9/14/2017	SeqNo: 1261061	
Analyte	Result	PQL SPK value	SPK Ref Val	%REC LowLim	t HighLimit RPD Ref V	al %RPD RPDLimit	Qual
Radium-226	3.76	1.00 5.000	0	75.2 7	0 130		
Sample ID Icsd-28705	SampType: LCSD	TestCode: Radium-2	26_ Units: pCi/L	Prep [Date: 9/8/2017	RunNo: 74705	
Client ID: LCSS02	Batch ID: 28705	TestNo: E903.0	E903-904	Analysis I	Date: 9/14/2017	SeqNo: 1261062	
Analyte	Result	PQL SPK value	SPK Ref Val	%REC LowLim	t HighLimit RPD Ref V	al %RPD RPDLimit	Qual
Radium-226	3.78	1.00 5.000	0	75.6 7	0 130 3.76	60 0.531 20	

Qualifiers:

*

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- Value exceeds Maximum Contaminant Level.
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- P Second column confirmation exceeds

- **D** Analyte detected in the associated Method
- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits



Qualifiers and Acronyms

WO#: 17081538 Date: 9/26/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

DF

Dilution Factor

U	The compound was analyzed for but w	as not detec	eted.
J			ection Limit but less than the Reporting Limit.
н	The hold time for sample preparation a		
D	The result is reported from a dilution.	,	
Ē		the calibrat	tion or is estimated due to interference.
MC	The result is below the Minimum Com		
*	The result exceeds the Regulatory Lim	•	
m	Manual integration was used to determ		
m d	Manual integration in which peak was		response.
			librory goardh assuming a 1:1 rasponse
N			l library search assuming a 1:1 response.
P	The second column confirmation exce		illerence.
C	The result has been confirmed by GC/		
X	The result was not confirmed when GO		sis was performed.
B/MB+	The analyte was detected in the associa		_
G	The ICB or CCB contained reportable		analyte.
QC-/+	The CCV recovery failed low (-) or high		
R/QDR	The RPD was outside of accepted reco	•	
QL-/+	The LCS or LCSD recovery failed low	(-) or high	(+).
QLR	The LCS/LCSD RPD was outside of a	ccepted reco	overy limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+	-).
QMR	The MS/MSD RPD was outside of acc	epted recov	ery limits.
QV-/+	The ICV recovery failed low (-) or hig	h (+).	
S	The spike result was outside of accepted	ed recovery	limits.
Z			rmed; Please refer to the Case Narrative for
	additional information	•	
Acronyn	ne		
Actonyi	115		
ND	Not Detected	RL	Reporting Limit
QC	Quality Control	MDL	Method Detection Limit
мв	Method Blank	LOD	Level of Detection
LCS	Laboratory Control Sample	LOQ	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	PQL	Practical Quantitation Limit
QCS	Quality Control Sample	CRQL	Contract Required Quantitation Limit
DUP	Duplicate	PL	Permit Limit
MS	Matrix Spike	RegLvl	Regulatory Limit
MSD	Matrix Spike Duplicate	MCL	Maximum Contamination Limit
RPD	Relative Percent Different	MinCL	Minimum Compound Limit
ICV	Initial Calibration Verification	RA	Reanalysis
ICB	Initial Calibration Blank	RE	Reextraction
CCV	Continuing Calibration Verification	TIC	Tentatively Identified Compound
CCB	Continuing Calibration Blank Benerting Limit Check	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Response Factor

RF

124 v Base Crown Road Anaropyn, wraewer an Anaropyn SENDRG LABORATORY: Trace Analytical Laboratories, Inc. 224 Black Creek Read Musilegen, Mi 49444 Phone 221, 773, 5998 Fax: 231, 775, 537 Physici Manage: Jon Mittle	511	SUBCONTRACT ORDER T17H507 BECETVING LABORATORY: 310 Win Street Coyadoge Falls, CH 4423 Phone: (330) 253-4489
PO# 0824 2017 15	1451	10113-2-011-16(c)
Sample (D: 717HS07-01	Aquetous Sampled: 08/23/17 09:35	17081538-001 00414
Subcontracted Work 08/31/17 15:00 08/2 Contrarers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	08/31/17 15:00 08/23/18 09:35	
Sample ID: 11711507-02	Aquesters Sampled: 08/23/17 10:15	
*:	08/31/17 15:00 08/23-18 10:15 -PL1000 pH <2 w/ HNO	Radium 226/228
Sample 1D: T17H547-83	Aqueous Sampled: 00/23/47 11:05	
Subsonineers Work 08/37/17-15.00 08/2 Continuers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	08/31/17 15:00 08/23/18 11:05 -PL 1000 pH <2 w/ HNO	Rushiwe 226-228
Sample ID: T17HS07-04	Aqueous Sampled: 08/23/17 13:40	
Subcentrated Work 06/3/17 15:00 08:2 Contenners Supplied 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	04/31/17 15:00 08:23/18 13:40 -PL1000 pH <2 w/ HNO	Padium 226/228
Sample 1D: T17H507-05	Aqueous Sampled: 08/23/17 14:55	
Subcontracted Work Containers Supplied 1-PL1000 pH <2 w/ HNO 1	08/31/17 15:00 08/23-18 14:55 -PL1000 pH <2 w/ HNO 1-PL1000	Subcommuned Werk 08/31/17 15:00 (82/21/31 14:55 Radium 22/02/28 Constance: Supplied 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO
(Track) Clerkow	5 Theyhralbico	S:
Carley /	Date	
Released By	Date	Received By Date

Page 1 of 2

Page 1 of 4

	¢~1 0003	i we	Subcontrusted Work Containers Supplied 1-PL/1000 pH <2 wi HNG	Sample ID: T17H507-06		Traca Avalıtıcal Laboratmete, int 284 t Bleck Croak Riber Munaagon, Mi alasse,2073
	1.10 812 32-9-1 00018	Hoff 255-col press	Subcontracted Work 08:31:17 15:00 08:23:18:00:00 Containert Supplied 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <3 w/ HNO		SUB	
			Hadium 200-228		SUBCONTRACT ORDER T17H507	
C					∥,	AND Press

(Trace) (

Starting @16:00

Released

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Oane Dane

Page 2 of 2

Page 2 of 4

Figure 1-Summit Environmental Technologies, Inc. Figure 1-Summit Environmental Technologies, Inc. Cooler Reading Form, Page 1 Sever Fort E (19) Oct. Atoms US New Year Technologies, Inc. Sever Fort E (19) Oct. Atoms US New Year Technologies, Inc. Sever Fort E (19) Oct. Atoms US New Year Technologies, Inc. Technologies Technologies Technologies and Technologies, Inc. Sever Fort E (19) Oct. Atoms US New Year Technologies, Inc. Technologies Technologies Technologies Technologies, Inc. Sever Fort E (19) Oct. Atoms US New Year Technologies T
MSMSD Val MSMSD VAL MSMSD

Page 3 of 4

Rev Date: 07/17/17 Receipt

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

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ple pH Check, Chio rime Check and/or Radio gical Scan

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552.2 checked 531.2 pH is che 524.2 - pH and 7, 548.1, 549.1, 531.2, 1813 m fre 1 (BETH DES-01-0148) Indiad by lab analyst tor Lotal chlorine

Page 11 of 12

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Page 4 of 4



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project		
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies		
Work Order:	T17H658		
Analyses/Method:	Metals (6010B/6020/7470A), General Chemistry (300.0/SM 2540C), Radiological (903.0/904.0)		
Validation Level:	Level 2		
Prepared by:	Lisa Smith (CEAC)/AECOM Completed on: 12/29/2017		

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on August 29, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1	MS/MSD for Metals and Method 300.0; Lab Dup for TDS	29-Aug-17	T17H658-01
MW-2		29-Aug-17	T17H658-02
MW-3		29-Aug-17	T17H658-03
MW-4		29-Aug-17	T17H658-05
MW-5		29-Aug-17	T17H658-04
Dup 082917	FD of MW-2	29-Aug-17	T17H658-07
Equipment Blank 082917		29-Aug-17	T17H658-06

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- *Evaluation of Radiochemical Data Usability* (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- Holding times and sample preservation
- ✓ Laboratory blanks and equipment blanks
- ✓ Matrix spike (MS) and/or matrix spike duplicate (MSD) results



- ✓ Laboratory duplicates
- ✓ Laboratory control sample (LCS) results
- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Results were acceptable without qualification. Detailed discussions of the quality control (QC) results are included in the following report.

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks and Equipment Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.

Analytes were not detected in the equipment rinsate blank, indicating field contamination did not occur.



MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Extra sample volume was collected for MS/MSD analysis for MW-1; and MS/MSD results were provided for sample MW-1 for all analyses performed by Trace. MS/MSD recoveries and RPDs were within criteria, with the exception of calcium as summarized in the table below. Non-project MS/MSDs provided from batch analyses are not applicable and were not evaluated.

Analyte	MS/MSD % Recovery	Recovery Limits	RPD	RPD Limit	Qualifications
MW-1:					
Calcium	24/ 90	75-125	115 (4.4 ^a)	20	The sample concentration was greater than 4 times the spike concentration and results were acceptable without qualification.

^a The analytical method indicates the RPD should be calculated using the result values (rather than recoveries as reported by the laboratory). The RPD was acceptable.

Laboratory Duplicates

TDS laboratory duplicate analysis was performed on sample MW-1. The RPD was within the precision limit of 10% and was acceptable.

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample Dup 082917 was collected as a field duplicate of sample MW-2. RPDs were within the 30% limit for groundwater samples, and were acceptable.

		Sample	Field Duplicate		
Analyte	Units	Result	Result	RPD	RPD Limit
MW-2/Dup 082917:					
Calcium	mg/l	52	53	1.9	30
Chloride	mg/l	61	61	0	30
Sulfate	mg/l	22	22	0	30
Total Dissolved Solids	mg/l	350	320	9.0	30
Radium-228	pCi/L	2.0 ± 0.68	1.0 ± 0.32 U		30

Sample Results and Quantitation

Results were reported down to the reporting limits.

Dilutions were required for due to high analyte concentration. In addition, anions (chloride, fluoride, and sulfate) were reported from a five times dilution for the equipment blank and results reported as non-detect. The laboratory did not provide a reason for the dilution.



pH analysis was performed in the field to ensure that analyses were performed within the required hold time.



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

September 25, 2017

Mr. Tom Flaminio AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 228-2333 Fax: (906) 226-8371

RE:	Trace Project	T17H658
	Client Project	MBLP CCR Investigation

Dear Mr. Flaminio:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



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SAMPLE SUMMARY

Trace Project ID:	T17H658
Client Project ID:	MBLP CCR Investigation

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17H658-01	MW-1	Ground Water	tvf	08/29/17 10:00	08/31/17 10:22
T17H658-02	MW-2	Ground Water	tvf	08/29/17 11:15	08/31/17 10:22
T17H658-03	MW-3	Ground Water	tvf	08/29/17 12:20	08/31/17 10:22
T17H658-04	MW-5	Ground Water	tvf	08/29/17 14:05	08/31/17 10:22
T17H658-05	MW-4	Ground Water	tvf	08/29/17 15:25	08/31/17 10:22
T17H658-06	Equipment Blank 082917	Ground Water	tvf	08/29/17 16:30	08/31/17 10:22
T17H658-07	Dup 082917	Ground Water	t∨f	08/29/17	08/31/17 10:22

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
Ν	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.
NOTE.	Complex for veletiles that have been extracted with a water missible solvent were corrected for the

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: T071646-MSD1 Analysis: EPA 6010B	
Calcium	Note 226 : The MS recovery was out of control, resulting in an out of control RPD between the MS and MSD. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Trace ID: T17H658-01 Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17H658-02	
Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17H658-03	
Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17H658-04	
Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17H658-05	

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Analysis: SM 4500-H+ B-11

рΗ

Note Client : The analysis was performed on site at the time of sampling by the client.



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ANALYTICAL RESULTS

Trace ID: T17H658-01 Sample ID: MW-1			Collected: Received:	08/29/17 10: 08/31/17 10:		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071591									
Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071646									
Barium	0.13 mg/L	0.10	1	09/05/17	nws	09/06/17	nws		
Boron	<0.30 mg/L	0.30	1	09/05/17	nws	09/06/17	nws		
Calcium	130 mg/L	5.0	10	09/05/17	nws	09/06/17	nws		
Lithium	<0.010 mg/L	0.010	1	09/05/17	nws	09/06/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T071646									
Antimony	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/11/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/08/17	dtm		
Chromium	0.018 mg/L	0.010	1	09/05/17	nws	09/08/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/05/17	nws	09/08/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/05/17	nws	09/08/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/05/17	nws	09/08/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071662									
Fluoride	<0.10 mg/L	0.10	5	09/05/17	nm	09/05/17	nm		
Chloride	270 mg/L	10	100	09/05/17	nm	09/06/17	nm		
Sulfate as SO4	20 mg/L	1.0	5	09/05/17	nm	09/05/17	nm		

Analysis Method: SM 2540 C-11

Batch: T071654

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ANALYTICAL RESULTS

Trace Project ID: T17H658 Client Project ID: MBLP CCR Investigation									
Trace ID: T17H658-01 Sample ID: MW-1				08/29/17 10: 08/31/17 10::	Matrix:	Ground	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	960 mg/L	10	1	09/05/17	nm	09/06/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	6.56 pH Units		1	08/29/17	jm	08/29/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace ID: T17H658-02 Sample ID: MW-2			Date Collected: Date Received:		08/29/17 11:15 08/31/17 10:22		Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	M	
IETALS, TOTAL										
Analysis Method: EPA 7470A Batch: T071591										
Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws			
METALS, TOTAL										
Analysis Method: EPA 6010B Batch: T071646										
Barium	<0.10 mg/L	0.10	1	09/05/17	nws	09/06/17	nws			
Boron	<0.30 mg/L	0.30	1	09/05/17	nws	09/06/17	nws			
Calcium	52 mg/L	1.0	1	09/05/17	nws	09/06/17	nws			
Lithium	<0.010 mg/L	0.010	1	09/05/17	nws	09/06/17	nws	Ν		
Analysis Method: EPA 6020 Batch: T071646										
Antimony	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm			
Arsenic	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm			
Beryllium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/11/17	dtm			
Cadmium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/08/17	dtm			
Chromium	<0.010 mg/L	0.010	1	09/05/17	nws	09/08/17	dtm			
Cobalt	<0.020 mg/L	0.020	1	09/05/17	nws	09/08/17	dtm			
Lead	<0.0030 mg/L	0.0030	1	09/05/17	nws	09/08/17	dtm			
Molybdenum	<0.050 mg/L	0.050	1	09/05/17	nws	09/08/17	dtm	Ν		
Selenium	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm			
Thallium	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm			
VET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071662										
Fluoride	<0.10 mg/L	0.10	5	09/05/17	nm	09/05/17	nm			
Chloride	61 mg/L	10	25	09/05/17	nm	09/06/17	nm			
Sulfate as SO4	22 mg/L	1.0	5	09/05/17	nm	09/05/17	nm			

Analysis Method: SM 2540 C-11

Batch: T071654

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ANALYTICAL RESULTS

Trace Project ID: T17H658 Client Project ID: MBLP CCR Investigation									
Trace ID: T17H658-02 Sample ID: MW-2		Date Collected: Date Received:		08/29/17 11:15 08/31/17 10:22		Matrix:	Ground		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	350 mg/L	10	1	09/05/17	nm	09/06/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	7.03 pH Units		1	08/29/17	jm	08/29/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace ID: T17H658-03 Sample ID: MW-3			Date Collected: Date Received:		08/29/17 12:20 08/31/17 10:22		Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED) BY	ANALYZED	BY	NOTES	МС	
METALS, TOTAL										
Analysis Method: EPA 7470A Batch: T071591										
Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws			
METALS, TOTAL										
Analysis Method: EPA 6010B Batch: T071646										
Barium	<0.10 mg/L	0.10	1	09/05/17	nws	09/06/17	nws			
Boron	<0.30 mg/L	0.30	1	09/05/17	nws	09/06/17	nws			
Calcium	62 mg/L	1.0	1	09/05/17	nws	09/06/17	nws			
Lithium	<0.010 mg/L	0.010	1	09/05/17	nws	09/06/17	nws	Ν		
Analysis Method: EPA 6020 Batch: T071646										
Antimony	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm			
Arsenic	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm			
Beryllium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/11/17	dtm			
Cadmium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/08/17	dtm			
Chromium	<0.010 mg/L	0.010	1	09/05/17	nws	09/08/17	dtm			
Cobalt	<0.020 mg/L	0.020	1	09/05/17	nws	09/08/17	dtm			
Lead	<0.0030 mg/L	0.0030	1	09/05/17	nws	09/08/17	dtm			
Molybdenum	<0.050 mg/L	0.050	1	09/05/17	nws	09/08/17	dtm	Ν		
Selenium	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm			
Thallium	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm			
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071662										
Fluoride	<0.10 mg/L	0.10	5	09/05/17	nm	09/05/17	nm			
Chloride	86 mg/L	10	25	09/05/17	nm	09/06/17	nm			
Sulfate as SO4	28 mg/L	1.0	5	09/05/17	nm	09/05/17	nm			

Analysis Method: SM 2540 C-11

Batch: T071654

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ANALYTICAL RESULTS

Trace Project ID: T17H658 Client Project ID: MBLP CCR Investigation									
Trace ID: T17H658-03 Sample ID: MW-3		Date Collected: Date Received:		08/29/17 12:20 08/31/17 10:22		Matrix:	Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	390 mg/L	10	1	09/05/17	nm	09/06/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	6.32 pH Units		1	08/29/17	jm	08/29/17	jm	Client, N	

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ANALYTICAL RESULTS

Trace ID: T17H658-04 Sample ID: MW-5			Collected: Received:		08/29/17 14:05 08/31/17 10:22		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED) BY	ANALYZED	BY	NOTES	МС
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071591									
Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071646									
Barium	0.12 mg/L	0.10	1	09/05/17	nws	09/06/17	nws		
Boron	<0.30 mg/L	0.30	1	09/05/17	nws	09/06/17	nws		
Calcium	110 mg/L	1.0	1	09/05/17	nws	09/06/17	nws		
Lithium	<0.010 mg/L	0.010	1	09/05/17	nws	09/06/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T071646									
Antimony	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/11/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/08/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/05/17	nws	09/08/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/05/17	nws	09/08/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/05/17	nws	09/08/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/05/17	nws	09/08/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071662									
Fluoride	<0.10 mg/L	0.10	5	09/05/17	nm	09/05/17	nm		
Chloride	190 mg/L	10	100	09/05/17	nm	09/06/17	nm		
Sulfate as SO4	18 mg/L	1.0	5	09/05/17	nm	09/05/17	nm		

Analysis Method: SM 2540 C-11

Batch: T071654

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ANALYTICAL RESULTS

Trace Project ID: T17H658 Client Project ID: MBLP CCR Investigation									
Trace ID: T17H658-04 Sample ID: MW-5		Date Collected: Date Received:		08/29/17 14:05 08/31/17 10:22		Matrix:	Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	750 mg/L	10	1	09/05/17	nm	09/06/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	6.76 pH Units		1	08/29/17	jm	08/29/17	jm	Client, N	

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NOTES

MCL

		ANALYTICA	L RESULTS					
Trace Project ID: T17H658								
Client Project ID: MBLP CCR Investigati	on							
Trace ID: T17H658-05		Date	Collected:	08/29/17 15:2	25	Matrix:	Ground	Water
Sample ID: MW-4		Date	Received:	08/31/17 10:2	22			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTE
METALS, TOTAL								
Analysis Method: EPA 7470A Batch: T071591								
Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws	
METALS, TOTAL								
Analysis Method: EPA 6010B Batch: T071646								
Barium	<0.10 mg/L	0.10	1	09/05/17	nws	09/06/17	nws	
Boron	<0.30 mg/L	0.30	1	09/05/17	nws	09/06/17	nws	
Calcium	120 mg/L	5.0	10	09/05/17	nws	09/06/17	nws	
Lithium	<0.010 mg/L	0.010	1	09/05/17	nws	09/06/17	nws	Ν
Analysis Method: EPA 6020 Batch: T071646								
Antimony	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/11/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/08/17	dtm	
Chromium	<0.010 mg/L	0.010	1	09/05/17	nws	09/08/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	09/05/17	nws	09/08/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	09/05/17	nws	09/08/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	09/05/17	nws	09/08/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm	
WET CHEMISTRY								
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071662								
Fluoride	<0.10 mg/L	0.10	5	09/05/17	nm	09/05/17	nm	
	0							
Chloride	340 mg/L	10	100	09/05/17	nm	09/06/17	nm	

Analysis Method: SM 2540 C-11

Batch: T071654

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ANALYTICAL RESULTS

Trace Project ID: T17H658 Client Project ID: MBLP CCR Investigation	1								
Trace ID: T17H658-05 Sample ID: MW-4			Collected: Received:	08/29/17 15: 08/31/17 10:		Matrix:	Ground	l Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	1000 mg/L	20	2	09/05/17	nm	09/06/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T070922 pH	7.32 pH Units		1	08/29/17	jm	08/29/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17H658 Client Project ID: MBLP CCR Investigation

Trace ID: T17H658-06 Sample ID: Equipment Blank 082917			Collected: Received:	08/29/17 16: 08/31/17 10:		Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071591									
Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071646									
Barium	<0.10 mg/L	0.10	1	09/05/17	nws	09/06/17	nws		
Boron	<0.30 mg/L	0.30	1	09/05/17	nws	09/06/17	nws		
Calcium	<1.0 mg/L	1.0	1	09/05/17	nws	09/06/17	nws		
Lithium	<0.010 mg/L	0.010	1	09/05/17	nws	09/06/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T071646									
Antimony	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/11/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/08/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/05/17	nws	09/08/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/05/17	nws	09/08/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/05/17	nws	09/08/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/05/17	nws	09/08/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071662									
Fluoride	<0.10 mg/L	0.10	5	09/05/17	nm	09/05/17	nm		
Chloride	<10 mg/L	10	5	09/05/17	nm	09/05/17	nm		
Sulfate as SO4	<1.0 mg/L	1.0	5	09/05/17	nm	09/05/17	nm		

Analysis Method: SM 2540 C-11

Batch: T071654

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ANALYTICAL RESULTS

Trace Project Client Project										
Trace ID:	T17H658-06		Date (Collected:	08/29/17 16:30)	Matrix:	Ground	Water	
Sample ID:	Equipment Blank 082917		Date F	Received:	08/31/17 10:22	2				
PARAMETER	RS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL

WET CHEMISTRY

Total Dissolved Solids <10 mg/L 10 1 09/05/17 nm 09/06/17 nm



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ANALYTICAL RESULTS

Trace ID: T17H658-07 Sample ID: Dup 082917			Date Collected: Date Received:		22	Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071591									
Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071646									
Barium	<0.10 mg/L	0.10	1	09/05/17	nws	09/06/17	nws		
Boron	<0.30 mg/L	0.30	1	09/05/17	nws	09/06/17	nws		
Calcium	53 mg/L	1.0	1	09/05/17	nws	09/06/17	nws		
Lithium	<0.010 mg/L	0.010	1	09/05/17	nws	09/06/17	nws	Ν	
Analysis Method: EPA 6020 Batch: T071646									
Antimony	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/11/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/05/17	nws	09/08/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/05/17	nws	09/08/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/05/17	nws	09/08/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/05/17	nws	09/08/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/05/17	nws	09/08/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/05/17	nws	09/08/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/05/17	nws	09/08/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071662									
Fluoride	<0.10 mg/L	0.10	5	09/05/17	nm	09/05/17	nm		
Chloride	61 mg/L	10	25	09/05/17	nm	09/06/17	nm		
Sulfate as SO4	22 mg/L	1.0	5	09/05/17	nm	09/05/17	nm		

Batch: T071654

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ANALYTICAL RESULTS

WET CHEMISTRY									
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
Sample ID: Dup 082917		Date F	Received:	08/31/17 10:2	2				
Trace ID: T17H658-07		Date (Collected:	08/29/17		Matrix:	Ground	Water	
Client Project ID: MBLP CCR Investigation									



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QUALITY CONTROL RESULTS

Trace Project ID: T17H658

Client Project ID: MBLP CCR Investigation

QC Batch: T071591	
QC Batch Method: EPA 7470A Prep	

Analysis Description: Mercury, Total, EPA 7470/7471 Analysis Method: EPA 7470A

METHOD BLANK: T071591-BLK1

Parameter	Units		Blank Result	Reporting Limit		Notes
Mercury	mg/L	•	<0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T071591-B	S1				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00206	103	77-122	

MATRIX SPIKE / MATRIX SP	PIKE DUPLICATE: TO)71591-M	SD1		Original:	T17H658-	01				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00218	0.00214	109	107	76-123	2	20	
				Project ID: Project ID:		Investigati	on				
QC Batch: T071646			<u>c</u> iloint	,	nalysis Des	0					
QC Batch: 1071646 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids				Ai	nalysis Metł	nod: EPA 6	010B				

METHOD BLANK: T071646-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T071646-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.827	93	80-120	
Barium	mg/L	0.889	0.844	95	80-120	
Calcium	mg/L	8.89	8.51	96	80-120	
Lithium	mg/L	0.889	0.795	89	80-120	

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MATRIX SPIKE / MATRIX SPIKE	DUPLICATE:	T071646-M	SD1		Original:	T17H658-	01				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Boron	mg/L	0.0590	0.889	0.961	0.965	101	102	75-125	0.5	20	
Barium	mg/L	0.135	0.889	0.984	0.972	96	94	75-125	1	20	
Calcium	mg/L	132	8.89	134	140	24	90	75-125	115	20	226
Lithium	mg/L	0	0.889	0.765	0.765	86	86	75-125	0.05	20	

Trace Project ID: T17H658

Client Project ID: MBLP CCR Investigation

QC Batch: T071646 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Antimony, Total

Analysis Method: EPA 6020

METHOD BLANK: T071646-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.0050	0.0050	
Beryllium	mg/L	<0.0010	0.0010	
Cadmium	mg/L	<0.0010	0.0010	
Cobalt	mg/L	<0.020	0.020	
Chromium	mg/L	<0.010	0.010	
Molybdenum	mg/L	<0.050	0.050	
Lead	mg/L	<0.0030	0.0030	
Antimony	mg/L	<0.0020	0.0020	
Selenium	mg/L	<0.0050	0.0050	
Thallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T071646-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0486	88	80-120	
Beryllium	mg/L	0.111	0.102	92	80-120	
Cadmium	mg/L	0.0278	0.0225	81	80-120	
Cobalt	mg/L	0.889	0.940	106	80-120	
Chromium	mg/L	0.0278	0.0236	85	80-120	
Molybdenum	mg/L	0.889	0.936	105	80-120	
Lead	mg/L	0.0556	0.0513	92	80-120	
Antimony	mg/L	0.0556	0.0573	103	80-120	
Selenium	mg/L	0.0556	0.0463	83	80-120	
Thallium	mg/L	0.0556	0.0517	93	80-120	

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Original: T17H658-01

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071646-MSD1

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Arsenic	mg/L	0.000757	0.0556	0.0595	0.0565	106	100	75-125	5	20	
Beryllium	mg/L	0	0.111	0.102	0.102	92	92	75-125	0.4	20	
Cadmium	mg/L	0.000175	0.0278	0.0304	0.0281	109	100	75-125	8	20	
Cobalt	mg/L	0.00140	0.889	0.931	0.938	105	105	75-125	0.7	20	
Chromium	mg/L	0.0184	0.0278	0.0474	0.0452	105	96	75-125	8	20	
Molybdenum	mg/L	0.00413	0.889	0.964	0.966	108	108	75-125	0.2	20	
Lead	mg/L	0.000278	0.0556	0.0559	0.0547	100	98	75-125	2	20	
Antimony	mg/L	0	0.0556	0.0686	0.0636	123	114	75-125	8	20	
Selenium	mg/L	0	0.0556	0.0541	0.0491	97	88	75-125	10	20	
Thallium	mg/L	0	0.0556	0.0563	0.0546	101	98	75-125	3	20	
				Project ID: 1 Project ID: 1		R Investigatio	on				

QC Batch: T069765	Analysis Description: Metals Digestion
QC Batch Method: EPA 200.2	Analysis Method: EPA 200.2

-

METHOD BLANK: T071662-BLK1

Parameter	Units	Blank Result	Reporting Limit	Note
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

METHOD BLANK: T071662-BLK2

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

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LABORATORY CONTROL SAMPLE: T071662-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	95	90-110	
Fluoride	mg/L	0.500	0.466	93	90-110	
Sulfate as SO4	mg/L	2.50	2.40	96	90-110	

LABORATORY CONTROL SAMPLE: T071662-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	95	90-110	
Fluoride	mg/L	0.500	0.465	93	90-110	
Sulfate as SO4	mg/L	2.50	2.41	96	90-110	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071662-MSD1					Original: T17H658-01						
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Fluoride	mg/L	0	4.00	3.97	3.78	99	95	80-120	5	20	
Sulfate as SO4	mg/L	20.2	30.0	48.5	49.0	94	96	80-120	2	20	
				Project ID: 1 Project ID: 1		Investigati	on				
QC Batch: T071654		Analysis Description: Total Dissolved Solids									

QC Batch Method: SM 2540 C-11

Analysis Method: SM 2540 C-11

METHOD BLANK: T071654-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T071654-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	508	506	100	80-120	

SAMPLE DUPLICATE: T071654-DUP1 Original: T17H658-01

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	964	964	0	10	

Trace Project ID: T17H658

Client Project ID: MBLP CCR Investigation

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QC Batch: T070922 QC Batch Method: *** DEFAULT PREP *** Analysis Description: pH, SM 4500 Analysis Method: SM 4500-H+ B-11



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/	Ple	ase	Sig	1	1158 5	8	10	1 -		1-5	2 ~		5-		Trace	Project				Email /	Office Phone:	City, Si	Mailing	Report To:	Compa	Repo		1
Check this box if you would not like you	3)	1 lan / Vinn	I Viceased by			V Dup	1630 Equil.	MM 000/	1225 Min-	In son	1220 110	1112 MM	8.29.11 1000 Mil		Collected Collected	Project Name: MBLD CCK	* Requires Prior Approval	4 Day* 24 Hour* 3 Day*	ud Indentified	Email Address: today the construction	Phone:	City, State, Zip Code:	Mailing Address:	DMH	Company Name: A-C(SVM	Report Results To:	ANALYTICAL LABORATORIES, INC.	111
In executing this Chain of Custor Ir samples analyzed if received ou		ted by	Keceived By			012917	nent Blenk 012	M.S.M.SO		Ś	5	1-2	1-		v Client Sample ID	Investigation	OI = Oil	W = Water SI = Sludne	Matrix Key: S = Soil / Solid	@ gecon.com	Cell Phone:			approved			RIES, INC.	
Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the Trace Sample Accentance Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the conditions outlined in the trace Policy of the co	4)	2) test	Date Time Rel					*		×			N 4 X	Filtered	trix per of	Sampled By: TVP	king Water	Waste	WI = Wipes	Billing Email Address:	Phone Number:	City, State, Zip Code:	Billing Address (if different):		PO# 60,546383	Bill To:	Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444-2673	CHAIN-OF-CUSTODY RECORD
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		2/18/2	Received By Date 1											Remarks					Analysis Requested	-	Þ.	MeOH Low Level [Soil Volatiles Preserved (nincle if applicable):	Checked By:	Indce Use:		TITH 658	Page of
		10:22	Time										F	Possible	Health	n Hazaro	ds?		$\left \right $			Lab						-

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SAMPLE LOG IN CHECKI	LIST
Trace ID #: <u>171H658</u> Date: <u>8 31 7</u> Package Descrip Client Name: <u>AECOM</u> Time: <u>)</u> 0:27	otion: <u>Coder 样</u> 」Temperature: <u>-0、</u> Logged in by: <u></u>
Cooler/samples delivered by: Trace courier Hand delivered Name of de Cooler/samples delivered UPS	elivery person: FED EX 🔽 US Mail
Tracking Number: Not Applicable Tracking #: 7701 4852 COC Seals present and intact on cooler? Not Applicable No	
Coolant and Temperature	ler Temperature
Multiple bags of ice around samples? Ice Packs/ Blue Ice : No Coolant Present: Temp Blank (Sti	Stick Thermometer CF = -0.6°C mometer CF = -0.4°C ature: $\underline{\int O}$ °C (check one below) ck Thermometer) R Thermometer) _ °C (Use Digital Stick Thermometer)
General Yes No NA All bottles arrived unbroken with labels in good condition? Each sample point is in a sealed plastic bag?	Comments
Correct preservative added to samples? X	
lotes: Dup 082912, Mul-3, Mul-4, Mul-2 Form 70-A.21 Effective 7/5/17	*EMD pH Test Strips Used: pH 0-2.5 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 11.0-13.0 Lot: HC563733 bH 0-2.5 bH 0-2.5 bH 0-2.5 bH 11.0-13.0 Lot: HC563733 bH 0-2.5 Lot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS TRACE Analytical Laboratories, Inc.



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SAMPLE	LOG	IN	CHECKLIST	

Trace ID #:	TF7H658	Date: 8/31/17	Package Description:	Coder#2	Temperature: -1.B
Client Name:	AECOM	Tir	me: 10:26	Logged in by:	B

	Cooler Receipt
Cooler/samples delivered by:	Trace courier
	Hand delivered Name of delivery person:
	Commercial courier UPS FED EX 🔀 US Mail
Tracking Number:	Not Applicable
	Tracking #:
COC Seals present and intact on cooler?	Not Applicable No Yes
Custody seals signed by Client?	No Yes Client custody seal # (if applicable):

(Coolant and Temperature						
Type of Coolant Used	Cooler Temperature						
Slurry w/ crushed, cubed, or chip ice?	<u>Correction Factors:</u> •Digital Stick Thermometer CF = -0.6°C						
Multiple bags of ice around samples?	•IR Thermometer CF = -0.4°C						
Ice Packs/ Blue Ice :	Representative Sample Temperature: C °C (check one below)						
No Coolant Present:	Temp Blank (Stick Thermometer)						
Ice still present upon receipt (circle one):	Client Sample (IR Thermometer)						
Yes No N/A	Melt Water: °C (Use Digital Stick Thermometer)						

	Gene	eral	
Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?			
Each sample point is in a sealed plastic bag?			
Labels filled out completely?			
All bottle labels agree with Chain of Custody (COC)?			
Sufficient sample to run tests requested?			
pH checked and samples at correct pH?			See Below*
Correct preservative added to samples?			
Air bubbles absent from VOAs?		X)	
COC filled out properly and signed by client?			
COC signed in by TRACE sample custodian?			
Was project manager called and samples discussed?	\sim		
Notes: MW-5 Equip Blank, mm	2-1		*EMD pH Test Strips Used:
			→ PH 0-2.5 PH 11.0-13.0 Lot: HC563733 → Lot: HC547328
			Lot: HC563733 verified 6/21/16 AY
· · · · · · · · · · · · · · · · · · ·			Lot: HC574761 verified 04/03/17 JS
Form 70-A.21			TRACE Analytical Laboratories, Inc.
Effective 7/5/17			,

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September 25, 2017

Mr. Tom Flaminio AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 228-2333 Fax: (906) 226-8371

RE: Trace ID: T17H658

Dear Mr. Flaminio:

Enclosed are your analytical results associated with your project for MBLP CCR Investigation. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from: Summit Environmental Technologies

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





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6	Remarks		Chiller Sulfa Radi	HCI HNO3 H2SO4 NaOH Other	Matrix Number of Containers Cool	Metals Fiel Filtered (Y /	Client Sample ID		Time Collected		No.
			de F te - Un 2	1 <u>, C</u>	TY.	Sampled By:	investigation	CC/ In	MBLD	Project Name:	Projec
			26/228 26/228	lcium	iter	LW = Liquid Waste A = Air D = Drinking Water	W = Water SL = Sludge OI = Oil	☐ 24 Hour* >roval	4 Day* 22 3 Day* * Requires Prior Approval]
	s Requested	Analysis					Matrix Key:	1ents: 48 Hour*	Standard 0 48 H	Standard	
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Excellent.	Soil Volatiles Preserved (sinch if and	Soi			(if different):	Billing Address (if different):				Mailing Address:	Mailing
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	Trace Use:			6383	14500	PO#		-Clarn	7	Company Name:	Comp
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	658	80 H	Phone 231.773.5998 Fax 888.979.4469 www.trace-labs.com		Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444-2673	Trace Analytical Laboratori 2241 Black Creek Road Muskegon, MI 49444-2673	s, INC.			ANALYTICAL	. 1
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SAMPLE LOG IN CHECKLIST

Trace ID #: <u>TTTH 658</u> Date: <u>8/31/17</u> Package Descrip Client Name: <u>AECOM</u> Time: <u>10:</u> 77	ntion: <u>Corder 栟</u> I Temperature: <u>-0.5</u> Logged in by:5
Commercial courier UPS Tracking Number: Not Applicable Tracking #: 2701 4852 COC Seals present and intact on cooler? Not Applicable No	Plivery person: FED EX 🗹 US Mail) <i>f C</i>] Yes seal # (if applicable):
Coolant and Temperature Type of Coolant Used	ler Temperature
•IR Therm Ice Packs/ Blue Ice : Representative Sample Tempera	ck Thermometer)
General Yes No NA All bottles arrived unbroken with labels in good condition? Each sample point is in a sealed plastic bag? Labels filled out completely?	Comments
All bottle labels agree with Chain of Custody (COC)?	*
Notes: Dup 082912, MW-3, MW-4, MW-2 Form 70-A.21 Effective 7/5/17	*EMD pH Test Strips Used: □

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SAMPLE LOG IN CHECKLIST

Trace ID #:	TTYH658	Date: 831/17	Package Description:	Coder#2	Temperature: -1.B
Client Name:	AECON	T	ime: 10:26	Logged in by:	F

Cooler Receipt	
Cooler/samples delivered by: Trace courier	
	ivery person:
Commercial courier UPS	FED EX 🔀 US Mail
Tracking Number: Not Applicable	
Tracking #: <u>7701 4852</u>	1605
COC Seals present and intact on cooler?	Yes
Custody seals signed by Client? No Yes Client custody se	eal # (if applicable):
Coolant and Temperature	
	er Temperature
	tick Thermometer CF = -0.6°C
	nometer CF = -0.4° C
Ice Packs/ Blue Ice : Representative Sample Tempera	
No Coolant Present: Temp Blank (Stic Ice still present upon receipt (circle one):	100 million (100 m
Yes No N/A Melt Water: WMC	°C (Use Digital Stick Thermometer)
General	
Yes No NA	Comments
All bottles arrived unbroken with labels in good condition?	
Each sample point is in a sealed plastic bag?	
Labels filled out completely?	
All bottle labels agree with Chain of Custody (COC)?	· · · · · · · · · · · · · · · · · · ·
Sufficient sample to run tests requested?	*
Correct preservative added to samples?	
Air bubbles absent from VOAs?	
COC filled out properly and signed by client?	
COC signed in by TRACE sample custodian?	
Was project manager called and samples discussed?	
Notes: MW-S Equip Blank, MW-1	*EMD pH Test Strips Used:
	- pH 0-2.5 pH 11.0-13.0 Lot: HC563733 Lot: HC547328
	Lot: HC563733
	Other:
	Lot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS
Form 70-A.21	
Effective 7/5/17	TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

September 22, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17H658

Dear Jon Mink:

Order No.: 17090138

Summit Environmental Technologies, Inc. received 7 sample(s) on 9/5/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

ly Slow

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: <u>http://www.settek.com</u>

Case Narrative

WO#:	17090138
Date:	9/22/2017

CLIENT:Trace Analytical Laboratories, Inc.Project:T17H658

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.



Summit Environmental Technologies, In 3310 Win S Cuyahoga Falls, Ohio 4422 TEL: (330) 253-8211 FAX: (330) 253-448 Website: <u>http://www.settek.co</u>

Qualifiers and Acronyms

WO#: 17090138 Date: 9/22/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

RLC

DF

Reporting Limit Check

Dilution Factor

U	The compound was analyzed for but wa	as not detec	eted.
J	The reported value is greater than the N	Iethod Dete	ection Limit but less than the Reporting Limit.
Н	The hold time for sample preparation a		1 0
D	The result is reported from a dilution.	ind, or undry	
E	The result exceeded the linear range of	the colibrat	tion or is astimated due to interforence
MC	The result is below the Minimum Com		
*	The result exceeds the Regulatory Limit		
m	Manual integration was used to determine	ine the area	response.
d	Manual integration in which peak was	deleted	
Ν	The result is presumptive based on a M	ass Spectra	l library search assuming a 1:1 response.
Р	The second column confirmation excee		
Ċ	The result has been confirmed by GC/M	AS.	
x	The result was not confirmed when GC		sis was performed
B/MB+	The analyte was detected in the associa	-	
G	The ICB or CCB contained reportable a		analyte
OC-/+	The CCV recovery failed low (-) or hig		anaryte.
R/QDR	The RPD was outside of accepted recov		
•			(\cdot)
QL-/+	The LCS or LCSD recovery failed low		
QLR	The LCS/LCSD RPD was outside of ac	-	-
QM-/+	The MS or MSD recovery failed low (-		
QMR	The MS/MSD RPD was outside of acce		ery limits.
QV-/+	The ICV recovery failed low (-) or high		
S	The spike result was outside of accepte		
Z	Deviation; A deviation from the method	d was perfo	ormed; Please refer to the Case Narrative for
	additional information		
Acronyr	ns		
•			
ND	Not Detected	RL	Reporting Limit
QC	Quality Control	MDL	Method Detection Limit
мв	Method Blank	LOD	Level of Detection
LCS	Laboratory Control Sample	LOQ	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	PQL	Practical Quantitation Limit
QCS	Quality Control Sample	CRQL	Contract Required Quantitation Limit
DUP	Duplicate	PL	Permit Limit
MS	Matrix Spike	RegLvl	Regulatory Limit
MSD	Matrix Spike Duplicate	MČL	Maximum Contamination Limit
RPD	Relative Percent Different	MinCL	Minimum Compound Limit
ICV	Initial Calibration Verification	RA	Reanalysis
ICB	Initial Calibration Blank	RE	Reextraction
CCV	Continuing Calibration Verification	TIC	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
DIC	Deporting Limit Cheele	CE	Calibration Easter

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

CF

RF

Calibration Factor

Response Factor



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: <u>http://www.settek.com</u>

Workorder Sample Summary WO#: 17090138

#: 17090138 22-Sep-17

CLIENT:Trace Analytical Laboratories, Inc.Project:T17H658

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17090138-001	T17H658-01		8/29/2017 10:00:00 AM	9/5/2017 10:00:00 AM	Aqueous
17090138-002	T17H658-02		8/29/2017 11:15:00 AM	9/5/2017 10:00:00 AM	Aqueous
17090138-003	T17H658-03		8/29/2017 12:20:00 PM	9/5/2017 10:00:00 AM	Aqueous
17090138-004	T17H658-04		8/29/2017 2:05:00 PM	9/5/2017 10:00:00 AM	Aqueous
17090138-005	T17H658-05		8/29/2017 3:25:00 PM	9/5/2017 10:00:00 AM	Aqueous
17090138-006	T17H658-06		8/29/2017 4:30:00 PM	9/5/2017 10:00:00 AM	Aqueous
17090138-007	T17H658-07		8/29/2017	9/5/2017 10:00:00 AM	Aqueous



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Analytical Report

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	T17H658-01	
Lab ID:	17090138-001	Matrix: AQUEOUS
Project:	T17H658	
CLIENT:	Trace Analytical Laboratories, Ind	c. Collection Date: 8/29/2017 10:00:00 AM

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Deduce 000		1.00		• ••••	. 0.40	4	0/00/0047 0.40.00 DM
Radium-226	ND	1.00	U	pCi/L	± 0.12	1	9/20/2017 2:10:00 PM
Yield	1.00					1	9/20/2017 2:10:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
RADIUM-228 (EPA 904.0) Radium-228	ND	1.00	U	pCi/L	E904.0 ± 0.41	E903-904 1	Analyst: BRD 9/19/2017 3:32:00 PM

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	Е	Value above quantitation range
	Н	Holding times for preparation or analysis exceeded	М	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	Ν	Tentatively identified compounds
	ND	Not Detected	0	RSD is greater than RSDlimit
	Р	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

RADIUM-226 (EF	24 002 0)	E903.0 E903-904 Analyst: BRD
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	T17H658-02	
Lab ID:	17090138-002	Matrix: AQUEOUS
Project:	T17H658	
CLIENT:	Trace Analytical Laboratories, I	nc. Collection Date: 8/29/2017 11:15:00 AM

RADIOM-220 (EI A 303.0)					2303.0	L303-304	
Radium-226	ND	1.00	U	pCi/L	± 0.14	1	9/20/2017 2:10:00 PM
		1.00	0	poi/L	± 0.14	1	
Yield	1.00					1	9/20/2017 2:10:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	2.00	1.00		pCi/L	± 0.68	1	9/19/2017 3:32:00 PM

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	Е	Value above quantitation range
	Н	Holding times for preparation or analysis exceeded	Μ	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	Ν	Tentatively identified compounds
	ND	Not Detected	0	RSD is greater than RSDlimit
	Р	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

RADIUM-226 (EP	A 903.0)				E903.0	E903-904	Analyst: BRD
Analyses		Result	PQL Qu	al Units	Uncertaint	y DF I	Date Analyzed
Client Sample ID	T17H658-03						
Lab ID:	17090138-003				Matrix: A	QUEOUS	
Project:	T17H658						
CLIENT:	Trace Analytical Lal	ooratories, Inc.		Colle	ction Date: 8	/29/2017 1	2:20:00 PM

Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.17	1 1	9/20/2017 2:10:00 PM 9/20/2017 2:10:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.77	1	9/19/2017 3:32:00 PM
Yield	1.00					1	9/19/2017 3:32:00 PM

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	Е	Value above quantitation range
	Н	Holding times for preparation or analysis exceeded	М	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	Ν	Tentatively identified compounds
	ND	Not Detected	0	RSD is greater than RSDlimit
	Р	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

CLIENT:	Trace Analytical Laboratories, Inc			Collect	tion Date: 8/	29/2017 2	2:05:00 PM
Project:	T17H658						
Lab ID:	17090138-004				Matrix: A	QUEOUS	
Client Sample II	T 17H658-04						
Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
Analyses RADIUM-226 (El		PQL	Qual	Units		DF 1 E903-904	v

Yield	1.00					1	9/20/2017 2:10:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.46	1	9/19/2017 3:32:00 PM
Yield	1.00					1	9/19/2017 3:32:00 PM

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	Е	Value above quantitation range
	Н	Holding times for preparation or analysis exceeded	М	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	Ν	Tentatively identified compounds
	ND	Not Detected	0	RSD is greater than RSDlimit
	Р	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 8/29/2017 3:25:00 PM				
Project:	T17H658					
Lab ID:	17090138-005	Matrix: AQUEOUS				
Client Sample ID	T17H658-05					
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed				
RADIUM-226 (EP	A 903.0)	E903.0 E903-904 Analyst: B				
Radium-226	ND	1.00 U pCi/L ± 0.18 1 9/20/2017 2:11:00				
Vield	1.00	1 0/20/2017 2:11:00				

Yield	1.00				1	9/20/2017 2:11:00 PM
RADIUM-228 (EPA 904.0)			E	904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.44	1	9/19/2017 3:32:00 PM
Yield	1.00				1	9/19/2017 3:32:00 PM

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	Е	Value above quantitation range
	Н	Holding times for preparation or analysis exceeded	М	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	Ν	Tentatively identified compounds
	ND	Not Detected	0	RSD is greater than RSDlimit
	Р	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

 (consolidated)

 WO#:
 17090138

 Date Reported:
 9/22/2017

Analyst: BRD

9/19/2017 3:33:00 PM

9/19/2017 3:33:00 PM

CLIENT:	Trace Analytical Laboratorie	es, Inc.			Collect	tion Date: 8	/29/2017 4	:30:00 PM
Project:	T17H658							
Lab ID:	17090138-006			Matrix: AQUEOUS				
Client Sample ID	T17H658-06							
Analyses	Res	sult	PQL	Qual	Units	Uncertainty	y DF]	Date Analyzed
RADIUM-226 (EF	PA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226		ND	1.00) U	pCi/L	± 0.16	1	9/20/2017 2:11:00 PM
Yield		1.00					1	9/20/2017 2:11:00 PM

E904.0

E903-904

1 1

RADIUM-228 (EPA 904.0)

Radium-228	ND	1.00	U	pCi/L	± 0.33
Yield	1.00				

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	Е	Value above quantitation range
	Н	Holding times for preparation or analysis exceeded	М	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	Ν	Tentatively identified compounds
	ND	Not Detected	0	RSD is greater than RSDlimit
	Р	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 8/29/2017
Project:	T17H658	
Lab ID:	17090138-007	Matrix: AQUEOUS
Client Sample ID	T17H658-07	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
RADIUM-226 (EF	'A 903.0)	E903.0 E903-904 Analyst: BRD
Radium-226	ND	1.00 U pCi/L ± 0.14 1 9/20/2017 2:42:00 PM
Viala	1.00	

Yield	1.00					1	9/20/2017 2:42:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.32	1	9/19/2017 3:33:00 PM
Yield	1.00					1	9/19/2017 3:33:00 PM

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	Е	Value above quantitation range
	Н	Holding times for preparation or analysis exceeded	М	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	Ν	Tentatively identified compounds
	ND	Not Detected	0	RSD is greater than RSDlimit
	Р	Second column confirmation exceeds	PL	Permit Limit



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QC SUMMARY REPORT

WO#: 17090138

22-Sep-17

	ce Analytical Laboratories, Inc. 7H658		BatchID: 2	28784
Sample ID: mb-28784 Client ID: PBW	SampType: MBLK Batch ID: 28784	TestCode: Radium-228_ Units: pC TestNo: E904.0 E903-904	Frep Date: 9/13/2017 Analysis Date: 9/19/2017	RunNo: 74966 SeqNo: 1267569
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228 Yield	ND 1.00	1.00 0 0	0 0	U
Sample ID: LCS-28784	SampType: LCS	TestCode: Radium-228_ Units: pC		RunNo: 74966
Client ID: LCSW	Batch ID: 28784	TestNo: E904.0 E903-904	Analysis Date: 9/19/2017	SeqNo: 1267572
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228 Yield	5.35 1.00	1.00 5.000 0 0	107 70 130 0	
Sample ID: 17090211-00	01aMS SampType: MS	TestCode: Radium-228_ Units: pC	Fi/L Prep Date: 9/13/2017	RunNo: 74966
Client ID: BatchQC	Batch ID: 28784	TestNo: E904.0 E903-904	Analysis Date: 9/19/2017	SeqNo: 1267574
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-228 Yield	5.71 1.00	1.00 5.000 0 1.000	114 70 130 0	

Qualifiers:

01

.

- Value exceeds Maximum Contaminant Level. *
- В Analyte detected in the associated Method Blank
- Н Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- 0 RSD is greater than RSDlimit
 - R RPD outside accepted recovery limits
- Original



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QC SUMMARY REPORT

WO#: 17090138

22-Sep-17

	ace Analytical Laboratories, Inc. 7H658		BatchID: 28784
Sample ID: mb-28784 Client ID: PBW	SampType: MBLK Batch ID: 28784		Date: 9/13/2017 RunNo: 74971 Date: 9/20/2017 SeqNo: 1267727
Analyte	Result	PQL SPK value SPK Ref Val %REC LowLim	t HighLimit RPD Ref Val %RPD RPDLimit Qual
Radium-226 Yield	ND 0.990	1.00	U
Sample ID: Ics-28784	SampType: LCS	TestCode: Radium-226_ Units: pCi/L Prep I	Date: 9/13/2017 RunNo: 74971
Client ID: LCSW	Batch ID: 28784	TestNo: E903.0 E903-904 Analysis	Date: 9/20/2017 SeqNo: 1267728
Analyte	Result	PQL SPK value SPK Ref Val %REC LowLim	it HighLimit RPD Ref Val %RPD RPDLimit Qual
Radium-226	4.78	1.00 5.000 0 95.6 7	0 130
Sample ID: Icsd-28784	SampType: LCSD	TestCode: Radium-226_ Units: pCi/L Prep I	Date: 9/13/2017 RunNo: 74971
Client ID: LCSS02	Batch ID: 28784	TestNo: E903.0 E903-904 Analysis	Date: 9/20/2017 SeqNo: 1267729
Analyte	Result	PQL SPK value SPK Ref Val %REC LowLim	it HighLimit RPD Ref Val %RPD RPDLimit Qual
Radium-226	5.33	1.00 5.000 0 107 7	0 130 4.780 10.9 20
Sample ID: 17090211-	001aMS SampType: MS	TestCode: Radium-226_ Units: pCi/L Prep I	Date: 9/13/2017 RunNo: 74971
Client ID: BatchQC	Batch ID: 28784	TestNo: E903.0 E903-904 Analysis	Date: 9/20/2017 SeqNo: 1267732
Analyte	Result	PQL SPK value SPK Ref Val %REC LowLim	it HighLimit RPD Ref Val %RPD RPDLimit Qual
н н	alue exceeds Maximum Contaminant Leve olding times for preparation or analysis exc alue is below Minimum Compound Limit.	B Analyte detected in the associated Method Blank eded J Analyte detected below quantitation limits ND Not Detected	 E Value above quantitation range M Manual Integration used to determine O RSD is greater than RSDlimit

Value is below Minimum Compound Limit. MC

Р Second column confirmation exceeds ND Not Detected

PL Permit Limit

- IVI Manual Integration used to determine
- 0 RSD is greater than RSDlimit
- R RPD outside accepted recovery limits



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QC SUMMARY REPORT

WO#: **17090138**

22-Sep-17

Original

Client: Project:	Trace Analy T17H658	ytical Laboratories, Inc.						I	BatchID: 2	8784		
Sample ID: 170 Client ID: Bat	090211-001aMS tchQC	SampType: MS Batch ID: 28784		de: Radium-2 No: E903.0	26_ Units: pCi/L E903-904		Prep Da Analysis Da	te: 9/13/20 te: 9/20/20		RunNo: 749 SeqNo: 120		
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226		5.11	1.00	5.000	0	102	70	130				

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

P Second column confirmation exceeds

- B Analyte detected in the associated Method Blank
- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SUBCONTRACT ORDER

T17H658

RECEIVING LABORATORY: SENDING LABORATORY: Summit Environmental Technologies, Inc. Trace Analytical Laboratories, Inc. 3310 Win Street 2241 Black Creek Road Cuyahoga Falls, OH 44223 Muskegon, MI 49444 Phone :(330) 253-8211 Phone: 231.773.5998 Fax: (330) 253-4489 Fax: 231.773.6537 Project Manager: Jon Mink 0831201752 PO # Accounting Code: Sampled: 08/29/17 10:00 Sample ID: T17H658-01 Aqueous Radium 226/228 09/08/17 15:00 08/29/18 10:00 Subcontracted Work Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO Sampled: 08/29/17 11:15 Sample ID: T17H658-02 Aqueous Radium 226/228 08/29/18 11:15 09/08/17 15:00 Subcontracted Work Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO Sampled: 08/29/17 12:20 Aqueous Sample ID: T17H658-03 Radium 226/228 08/29/18 12:20 09/08/17 15:00 Subcontracted Work Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO Sampled: 08/29/17 14:05 Aqueous Sample ID: T17H658-04 Radium 226/228 08/29/18 14:05 09/08/17 15:00 Subcontracted Work Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO Sampled: 08/29/17 15:25 Aqueous Sample ID: T17H658-05 Radium 226/228 08/29/18 15:25 09/08/17 15:00 Subcontracted Work Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO SNCamphen 9-5-17 17 @ 16:00 831 Received By Date Received By Date Released By Page 1 of 2

SUBCONTRACT ORDER T17H658							
Sample ID: T17H658-06 Aqueous Sampled: 08/29/17 16:30							
Subcontracted Work Containers Supplied:	09/08/17 15:00 08/29/18 16:30 0 1-PL1000 pH <2 w/ HNO	Radium 226/228					
Sample ID: T17H658-07	Aqueous Sampled: 08/29/17 00:00						
Subcontracted Work Containers Supplied: 1-PL1000 pH <2 w/ HNO	09/08/17 15:00 08/29/18 00:00 1-PL1000 pH <2 w/ HNO.	Radium 226/228					
rsc	00-100						
Trace) Jam	Stall Mel6:00 Date Received B	SWCpbu Date					

SOP: Sample Receipt **Revision: 13** Effective Date: 07/17/17

Figure 1 - Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 1 Initials of person inspecting cooler and samples: nace Client: Order Number:____ 17090138 Date Received: 9-5-17 Time Received: 1000 Date cooler(s) opened and samples inspected: 9.5 Number of Coolers/Boxes:_____ N/A Shipper: Fed Ex UPS DHL Airborne US Postal Walk-in Pickup Other:____ Packaging: Peanuts Bubble Wrap Paper Foam None Other:_ Tape on cooler/box: a N N/A **Custody Seals intact** Y N NA C-O-C in plastic a N N/A ice____ Blue ice __ present absent melted N/A Cooler Temperature IR Gun #16020459 CRO C Temp: 10-3 °C N/A Radiological Testing Instrument serial #35127 N N/A (see page 2 for scan results) Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately. C-O-C filled out properly N N/A Samples in separate bags N N/A Sample containers intact* N N/A "If no, list broken sample(s): Sample label(s) complete (ID, date, etc.) N N/A CCCCCC Label(s) agree with C-O-C N N/A Correct containers used N N/A Sufficient sample received N N/A Sufficient sample for QC N N/A Samples received within holding time N N/A Do any 40 mL vials contain bubbles** Y N **Samples with bubbles ≤6mm are acceptable. Indicate bubble size if (NHA 6mm Was client contacted about samples Y N Will client send new samples Y N Client contact: Date/Time:_ Logged in by:_ volume for QC for sayole extra Comments:

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SOP: Sample Receipt **Revision: 13** Effective Date: 07/17/17

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

pH Strip SET (0-	14)#: WC-03-1174		pH Strip (2.8-4.6) SET#: OES-01-0250 Free DPD packet SET#: OES-01-0290				
Total DPD packe	t SET#: OES-02-02	39					
Disp. Pipette SE	T#:						
Sample ID	Test Method	рН	Chlorine (+ or -)	CPM	Comments		
1	KAD	2		29			
2		2		24			
3		2		13			
4		2		12			
5		2		23			
4		2		14			
7		2		20			

mpla pH Chack Chiasing Ch. C.

P = Permanganate interference 504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for <u>Total</u> chlorine 552.2 checked for <u>Free</u> chlorine 531.2 pH is checked for ~3.8 (SET# OES-01-0149) 524.2 = pH and Chlorine checked by lab analyst

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Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project					
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies					
Work Order:	T17l125					
Analyses/Method: Metals (6010B/6020/7470A), General Chemistry (300.0/SM 25400 Radiological (903.0/904.0)						
Validation Level:	Level 2					
Prepared by:	Lisa Smith (CEAC)/AECOM Completed on: 12/29/2017					

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on September 6, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1		6-Sep-17	T17I125-01
MW-2		6-Sep-17	T17l125-02
MW-3		6-Sep-17	T17l125-03
MW-4	MS for Radium 226 and 228	6-Sep-17	T17l125-05
MW-5	MS/MSD for Metals and Method 300.0; Lab Dup for TDS	6-Sep-17	T17I125-04
DUP090617	FD of MW-5	6-Sep-17	T17I125-06
Equipment Blank 090617	Laboratory Duplicate for Radium 226 and 228	6-Sep-17	T17I125-07

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- Evaluation of Radiochemical Data Usability (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- Holding times and sample preservation
- Laboratory blanks and equipment blanks
- ✓ Matrix spike (MS) and/or matrix spike duplicate (MSD) results



- ✓ Laboratory duplicates
- ✓ Laboratory control sample (LCS) results
- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Results were acceptable without qualification. Detailed discussions of the quality control (QC) results are included in the following report.

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.

One equipment blank was associated with the groundwater samples collected. The equipment blank was non-detect with the exception of TDS which was detected at a concentration of 10 mg/L. Groundwater concentrations of TDS were greater than 5 times the equipment blank concentration, and qualifications were not required.



MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Extra sample volume was collected for MS/MSD analysis, and MS/MSD results were provided for sample MW-5 all analyses performed by Trace. Matrix spikes were performed on sample MW-4 for radium 226 and 228. MS/MSD recoveries and RPDs were within criteria, with the exception of chloride as summarized in the table below.

Analyte	MS/MSD % Recovery	Recovery Limits	RPD	RPD Limit	Qualifications
MW-5:					
Chloride	795/761	80-120	4	20	The sample concentration was greater than 4 times the spike concentration and results were acceptable without qualification.

Laboratory Duplicates

TDS laboratory duplicate analysis was performed on sample MW-5, and radium-226 and 226 laboratory duplicate analysis was performed on the equipment blank. The RPDs were within the precision limit of 10% and were acceptable.

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample DUP090617 was collected as a field duplicate of sample MW-5. RPDs were within the 30% limit for groundwater samples, and were acceptable.

		Sample	Field Duplicate		
Analyte	Units	Result	Result	RPD	RPD Limit
MW-5/DUP090617:					
Barium	mg/l	0.11	0.11	0	30
Calcium	mg/l	100	100	0	30
Chloride	mg/l	190	190	0	30
Sulfate	mg/l	18	18	0	30
Total Dissolved Solids	mg/l	660	730	10	30

Sample Results and Quantitation

Results were reported down to the reporting limits.

Dilutions were required for due to high analyte concentration.

pH analysis was performed in the field to ensure that analyses were performed within the required hold time.



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October 12, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE:	Trace Project	T17I125
	Client Project	MBLP CCR 60546383

Dear Mr. Lindberg:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



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SAMPLE SUMMARY

Trace Project ID: Client Project ID:	T17I125 MBLP CCR 60546383				
Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17I125-01	MW-1	Ground Water	Client	09/06/17 09:50	09/08/17 10:12
T17I125-02	MW-2	Ground Water	Client	09/06/17 10:35	09/08/17 10:12
T17I125-03	MW-3	Ground Water	Client	09/06/17 11:20	09/08/17 10:12
T17I125-04	MW-5	Ground Water	Client	09/06/17 13:45	09/08/17 10:12
T17I125-05	MW-4	Ground Water	Client	09/06/17 15:10	09/08/17 10:12
T17I125-06	DUP090617	Ground Water	Client	09/06/17	09/08/17 10:12
T17I125-07	Equipment Blank 090617	Ground Water	Client	09/06/17 16:30	09/08/17 10:12



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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
Ν	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: T071781-MS1							
Analysis: EPA 300.0 Rev. 2.1							
Chloride	Note 222 : The MS and MSD recoveries were out of control. Because the sample background concentration of this analyte is greater than four times the spike amount, no data require qualification.						
Trace ID: T071781-MSD1							
Analysis: EPA 300.0 Rev. 2.1							
Chloride	Note 222 : The MS and MSD recoveries were out of control. Because the sample background concentration of this analyte is greater than four times the spike amount, no data require qualification.						
Trace ID: T17I125-01							
Analysis: SM 4500-H+ B-11							
рН	Note Client : The analysis was performed on site at the time of sampling by the client.						
Trace ID: T17I125-02							
Analysis: SM 4500-H+ B-11							
рН	Note Client : The analysis was performed on site at the time of sampling by the client.						
Trace ID: T17I125-03							
Analysis: SM 4500-H+ B-11							
pH	Note Client : The analysis was performed on site at the time of sampling by the client.						

CERTIFICATE OF ANALYSIS



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Trace ID:	T17I125-04		
Analysis: S	SM 4500-H+ B-11		
рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID:	T17I125-05		
Analysis: S	SM 4500-H+ B-11		
рН		Note Client : client.	The analysis was performed on site at the time of sampling by the



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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383

PARAMETERS RESULTS UN METALS, TOTAL Analysis Method: EPA 7470A Batch: T071904 Mercury Mercury <0.00020 mg METALS, TOTAL Analysis Method: EPA 6010B Batch: T071846 0.13 mg Boron <0.30 mg Calcium 130 mg Lithium <0.010 mg Analysis Method: EPA 6020 Batch: T071846 Antimony <0.0020 mg Arsenic <0.0020 mg Cadmium <0.0010 mg Chromium <0.0010 mg Cobalt <0.0020 mg Molybdenum <0.0020 mg Molybdenum <0.0020 mg Molybdenum <0.0020 mg Molybdenum <0.0020 mg	/L 0.00020 /L 0.10 /L 0.30 /L 5.0
Analysis Method: EPA 7470A Batch: T071904 Mercury <0.00020 mg METALS, TOTAL Analysis Method: EPA 6010B Batch: T071846 Barium 0.13 mg Boron <0.30 mg Calcium 130 mg Lithium <0.010 mg Analysis Method: EPA 6020 30 mg Batch: T071846 400020 mg Analysis Method: EPA 6020 30 mg Batch: T071846 400020 mg Ansenic <0.0020 mg Cadmium <0.0010 mg Cadmium <0.0010 mg Chromium <0.0010 mg Cobalt <0.0020 mg Lead <0.0030 mg Molybdenum <0.0050 mg Selenium <0.0050 mg Thallium <0.0020 mg	/L 0.10 /L 0.30 /L 5.0
Batch: T071904 <0.00020 mg	/L 0.10 /L 0.30 /L 5.0
Mercury <0.00020 mg	/L 0.10 /L 0.30 /L 5.0
METALS, TOTAL Analysis Method: EPA 6010B Batch: T071846 Barium 0.13 mg Boron <0.30 mg	/L 0.10 /L 0.30 /L 5.0
Analysis Method: EPA 6010B Batch: T071846 Barium 0.13 mg Boron <0.30 mg	/L 0.30
Batch: T071846 0.13 mg Boron <0.30 mg	/L 0.30
Boron<0.30 mgCalcium130 mgLithium<0.010 mg	/L 0.30
Calcium130 mgLithium<0.010 mg	/L 5.0
Lithium <0.010 mg Analysis Method: EPA 6020 Batch: T071846 Antimony <0.0020 mg Arsenic <0.0050 mg Beryllium <0.0010 mg Cadmium <0.0010 mg Chromium <0.0010 mg Chromium <0.0010 mg Cobalt <0.020 mg Lead <0.0030 mg Molybdenum <0.050 mg Selenium <0.0050 mg Thallium <0.0020 mg	
Analysis Method: EPA 6020 Batch: T071846 Antimony <0.0020 mg	′L 0.010
Batch: T071846 Antimony <0.0020 mg	
Arsenic<0.0050 mgBeryllium<0.0010 mg	
Beryllium<0.0010 mgCadmium<0.0010 mg	/L 0.0020
Cadmium<0.0010 mgChromium<0.010 mg	/L 0.0050
Chromium<0.010 mgCobalt<0.020 mg	/L 0.0010
Cobalt <0.020 mg	/L 0.0010
Lead <0.0030 mg Molybdenum <0.050 mg Selenium <0.0050 mg Thallium <0.0020 mg	/L 0.010
Molybdenum <0.050 mg Selenium <0.0050 mg Thallium <0.0020 mg	/L 0.020
Selenium <0.0050 mg Thallium <0.0020 mg	/L 0.0030
Thallium <0.0020 mg	/L 0.050
	/L 0.0050
	/L 0.0020
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781	
Fluoride <0.10 mg	
Chloride 270 mg	/L 0.10
Sulfate as SO4 21 mg	

Batch: T071857

CERTIFICATE OF ANALYSIS



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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383									
Trace ID: T17I125-01 Sample ID: MW-1			Collected: Received:	09/06/17 09: 09/08/17 10:		Matrix:	Ground	l Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	930 mg/L	20	2	09/12/17	nm	09/13/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T071632									
рН	7.56 pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383

Trace ID: T17I125-02 Sample ID: MW-2			Date Collected: Date Received:		09/06/17 10:35 09/08/17 10:12		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCI
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T071904									
Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071846									
Barium	<0.10 mg/L	0.10	1	09/12/17	nws	09/14/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/12/17	nws	09/14/17	dtm		
Calcium	53 mg/L	1.0	1	09/12/17	nws	09/14/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071846									
Antimony	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/12/17	nws	09/14/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/12/17	nws	09/14/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/12/17	nws	09/14/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781									
Fluoride	<0.10 mg/L	0.10	1	09/08/17	nm	09/11/17	nm		
Chloride	60 mg/L	10	25	09/08/17	nm	09/08/17	nm		
Sulfate as SO4	21 mg/L	1.0	5	09/08/17	nm	09/08/17	nm		

Batch: T071857

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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383									
Trace ID: T17I125-02 Sample ID: MW-2		Date Collected: Date Received:		09/06/17 10:35 09/08/17 10:12		Matrix:	Ground		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	310 mg/L	20	2	09/12/17	nm	09/13/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T071632									
рН	8.15 pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	

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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383

Trace ID: T17I125-03 Sample ID: MW-3			Date Collected: Date Received:		09/06/17 11:20 09/08/17 10:12		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T071904									
Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071846									
Barium	<0.10 mg/L	0.10	1	09/12/17	nws	09/14/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/12/17	nws	09/14/17	dtm		
Calcium	62 mg/L	1.0	1	09/12/17	nws	09/14/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071846									
Antimony	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/12/17	nws	09/14/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/12/17	nws	09/14/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/12/17	nws	09/14/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781									
Fluoride	<0.10 mg/L	0.10	1	09/08/17	nm	09/11/17	nm		
Chloride	85 mg/L	10	25	09/08/17	nm	09/08/17	nm		
Sulfate as SO4	26 mg/L	1.0	5	09/08/17	nm	09/08/17	nm		

Batch: T071857

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ANALYTICAL RESULTS

Trace Project ID: T171125 Client Project ID: MBLP CCR 60546383									
Trace ID: T17I125-03 Sample ID: MW-3			Collected: Received:	09/06/17 11:2 09/08/17 10:		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	380 mg/L	20	2	09/12/17	nm	09/13/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T071632									
рН	7.77 pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383

Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781 Fluoride <0.10 mg/L 0.10 1 09/08/17 nm 09/011/17 nm Chloride 190 mg/L 10 50 09/08/17 nm 09/08/17 nm	ace ID: T17I125-04 ample ID: MW-5			Collected: Received:	09/06/17 13:4 09/08/17 10:1		Matrix: Ground Water			
Analysis Method: EPA 7470A Bath: T071904 Subscription <th>ARAMETERS</th> <th>RESULTS UNITS</th> <th>RDL</th> <th>DILUTION</th> <th>PREPARED</th> <th>BY</th> <th>ANALYZED</th> <th>BY</th> <th>NOTES</th> <th>MCI</th>	ARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCI
Bath: T071904 Mercury <0.00020 mg/L 0.00020 1 09/14/17 nvs 09/15/17 nvs METALS, TOTAL Analysis Method: EXABUSE Batics: T071946 1 09/12/17 nvs 09/14/17 dtm Boron <0.30 mg/L	ETALS, TOTAL									
Mercury <000020 mg/L 0.0020 1 09/14/17 nws 09/15/17 nws METALS, TOTAL Bate:: T071846	nalysis Method: EPA 7470A									
METAL 5, TOTAL Baticity TOT/B4G Bartum 0.11 mg/L 0.10 1 09/12/17 nws 09/14/17 dtm Bartum 0.30 mg/L 0.30 1 09/12/17 nws 09/14/17 dtm Boron <0.000 mg/L 0.00 1 09/12/17 nws 09/14/17 dtm Calclum 000 mg/L 0.010 1 09/12/17 nws 09/14/17 dtm Anithon 0.010 mg/L 0.010 1 09/12/17 nws 09/14/17 dtm N Anithon 0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dtm N Anithon 0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dtm Arisenic 0.0010 mg/L 0.0010 1 09/12/17 nws 09/14/17 dtm Chorinium 0.0020 mg/L	Batch: T071904									
Analysis Method: EPA 69010B Batich: T071846 0.11 mg/L 0.10 1 09/12/17 mws 09/14/17 dtm Boron <0.30 mg/L	Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
Batch: TO71846 Barium 0.11 mg/L 0.00 1 09/12/17 nws 09/14/17 dtm Boron <0.30 mg/L 0.30 1 09/12/17 nws 09/14/17 dtm Calcium 100 mg/L 1.0 1 09/12/17 nws 09/14/17 dtm Lithium <0.010 mg/L 0.010 1 09/12/17 nws 09/14/17 dtm Analysis Method: EPA 6020 Barch: TO71846 0.0020 1 09/12/17 nws 09/14/17 dtm N Antimony <0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dtm Arsenic <0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dtm Beryllium <0.0010 mg/L 0.0010 1 09/12/17 nws 09/14/17 dtm Cadmium <0.0010 mg/L 0.0101 1 09/12/17 nws 09/14/17 dtm Cable <0.0020 mg/L 0.0010 1 09/12/17 nws 09/14/17	ETALS, TOTAL									
Boron -0.30 mg/L 0.30 1 09/12/17 nws 09/14/17 dm Calcium 100 mg/L 1.0 1 09/12/17 nws 09/14/17 dm Lithium -0.010 mg/L 0.010 1 09/12/17 nws 09/14/17 dm N Analysis Method: EPA 6020 Batch: 7071846 0 0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dm Analysis Method: EPA 6020 Batch: 7071846 0 0 0 09/12/17 nws 09/14/17 dm Ansenic <0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dm Beryllium <0.0010 mg/L 0.0010 1 09/12/17 nws 09/14/17 dm Cobalt <0.0010 mg/L 0.0010 1 09/12/17 nws 09/14/17 dm Lead <0.010 mg/L 0.0010 1 09/12/17 nws 09/14/17 dm										
Calcium 100 mg/L 1.0 1 09/12/17 nws 09/14/17 dtm Lithium <0.010 mg/L	Barium	0.11 mg/L	0.10	1	09/12/17	nws	09/14/17	dtm		
Lithium <0.010 mg/L 0.010 1 09/12/17 nws 09/14/17 dtm N Analysis Method: EPA 6020 Batch: T071846 0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dtm Ansenic <0.0020 mg/L	Boron	<0.30 mg/L	0.30	1	09/12/17	nws	09/14/17	dtm		
Analysis Method: EPA 6020 Batch: 7071846 Antimony <0.0020 mg/L	Calcium	100 mg/L	1.0	1	09/12/17	nws	09/14/17	dtm		
Batch: T071846 Antimony <0.0020 mg/L	Lithium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm	Ν	
Arsenic <0.0050 mg/L	-									
Beryllium <0.0010 mg/L	Antimony	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
Camium <0.0010 mg/L 0.0010 1 09/12/17 nws 09/14/17 dtm Chromium <0.010 mg/L	Arsenic	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Chromium < 0.010 mg/L	Beryllium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Cobalt <0.020 mg/L	Cadmium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Lead <0.0030 mg/L	Chromium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm		
Molybdenum <0.050 mg/L 0.050 1 09/12/17 nws 09/14/17 dtm N Selenium <0.0050 mg/L	Cobalt	<0.020 mg/L	0.020	1	09/12/17	nws	09/14/17	dtm		
Selenium <0.0050 mg/L	Lead	<0.0030 mg/L	0.0030	1	09/12/17	nws	09/14/17	dtm		
Thallium <0.0020 mg/L 0.0020 1 09/12/17 nws 09/14/17 dtm WET CHEMISTRY Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781 -	Molybdenum	<0.050 mg/L	0.050	1	09/12/17	nws	09/14/17	dtm	Ν	
WET CHEMISTRY Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781 Fluoride <0.10 mg/L	Selenium	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781 Fluoride <0.10 mg/L	Thallium	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781 Fluoride <0.10 mg/L										
Chloride 190 mg/L 10 50 09/08/17 nm 09/08/17 nm	nalysis Method: EPA 300.0 Rev. 2.1									
•	Fluoride	<0.10 mg/L	0.10	1	09/08/17	nm	09/11/17	nm		
	Chloride	190 mg/L	10	50	09/08/17	nm	09/08/17	nm		
Sulfate as SO4 18 mg/L 1.0 5 09/08/17 nm 09/08/17 nm	Sulfate as SO4	18 mg/L	1.0	5	09/08/17	nm	09/08/17	nm		

Batch: T071857

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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383									
Trace ID: T17I125-04 Sample ID: MW-5			Collected: Received:	09/06/17 13:4 09/08/17 10:1		Matrix:	Ground	l Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	660 mg/L	20	2	09/12/17	nm	09/13/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T071632									
рН	7.43 pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383

Trace ID: T17I125-05 Sample ID: MW-4			Collected: Received:	09/06/17 15: 09/08/17 10:		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
		RDL	DIEGHION				51	NOTEO	WIGE
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071904									
Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071846									
Barium	<0.10 mg/L	0.10	1	09/12/17	nws	09/14/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/12/17	nws	09/14/17	dtm		
Calcium	110 mg/L	1.0	1	09/12/17	nws	09/14/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071846									
Antimony	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/12/17	nws	09/14/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/12/17	nws	09/14/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/12/17	nws	09/14/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781									
Fluoride	0.20 mg/L	0.10	1	09/08/17	nm	09/11/17	nm		
Chloride	340 mg/L	10	100	09/08/17	nm	09/08/17	nm		
Sulfate as SO4	53 mg/L	1.0	5	09/08/17	nm	09/08/17	nm		

Analysis Method: SM 2540 C-11

Batch: T071857

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ANALYTICAL RESULTS

Trace Project ID:T17I125Client Project ID:MBLP CCR 60546383									
Trace ID: T17I125-05 Sample ID: MW-4			Collected: Received:	09/06/17 15: ⁻ 09/08/17 10: ⁻		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	1000 mg/L	20	2	09/12/17	nm	09/13/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T071632									
рН	7.75 pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	

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ANALYTICAL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383

Trace ID: T17I125-06 Sample ID: DUP090617			Collected: Received:	09/06/17 09/08/17 10:1	12	Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T071904									
Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071846									
Barium	0.11 mg/L	0.10	1	09/12/17	nws	09/14/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/12/17	nws	09/14/17	dtm		
Calcium	100 mg/L	1.0	1	09/12/17	nws	09/14/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071846									
Antimony	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/12/17	nws	09/14/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/12/17	nws	09/14/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/12/17	nws	09/14/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781									
Fluoride	<0.10 mg/L	0.10	1	09/08/17	nm	09/11/17	nm		
Chloride	190 mg/L	10	50	09/08/17	nm	09/08/17	nm		
Sulfate as SO4	18 mg/L	1.0	5	09/08/17	nm	09/08/17	nm		
Analysis Method: SM 2540 C-11									

Batch: T071857

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ANALYTICAL RESULTS

	ISTRY olved Solids	730 mg/L	20	2	09/12/17	nm	09/13/17	nm		
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
Trace ID: Sample ID:	T17I125-06 DUP090617			Collected: Received:	09/06/17 09/08/17 10:1	2	Matrix:	Ground	Water	
Client Project	ID: MBLP CCR 60546383									



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ANALYTICAL RESULTS

Trace Project ID:T17I125Client Project ID:MBLP CCR 60546383

Trace ID: T17I125-07 Sample ID: Equipment Blank 090617			Collected: Received:	09/06/17 16: 09/08/17 10:		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T071904									
Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071846									
Barium	<0.10 mg/L	0.10	1	09/12/17	nws	09/14/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/12/17	nws	09/14/17	dtm		
Calcium	<1.0 mg/L	1.0	1	09/12/17	nws	09/14/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071846									
Antimony	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/12/17	nws	09/14/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/12/17	nws	09/14/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/12/17	nws	09/14/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/12/17	nws	09/14/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/12/17	nws	09/14/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/12/17	nws	09/14/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/12/17	nws	09/14/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071781									
Fluoride	<0.10 mg/L	0.10	1	09/08/17	nm	09/11/17	nm		
Chloride	<10 mg/L	10	1	09/08/17	nm	09/11/17	nm		
Sulfate as SO4	<1.0 mg/L	1.0	1	09/08/17	nm	09/11/17	nm		

Analysis Method: SM 2540 C-11

Batch: T071857

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ANALYTICAL RESULTS

Trace Project Client Project										
Trace ID:	T17I125-07		Date	Collected:	09/06/17 16:30)	Matrix:	Ground	l Water	
Sample ID:	Equipment Blank 090617		Date I	Received:	09/08/17 10:12	2				
PARAMETER	RS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL

WET CHEMISTRY

Total Dissolved Solids 10 mg/L 10 1 09/12/17 nm 09/13/17 nm



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QUALITY CONTROL RESULTS

Trace Project ID: T17I125 Client Project ID: MBLP CCR 60546383

QC Batch: T071904	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T071904-BLK1

Parameter	Units		Blank Result	Reporting Limit		Notes
Mercury	mg/L		<0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T071904-B	61				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00187	94	77-122	

MATRIX SPIKE / MATRIX SP	PIKE DUPLICATE: TO	71904-M	SD1	1 Original: T17I125-04							
Parameter		Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00175	0.00184	88	92	76-123	5	20	
			Trace	Project ID:	T17I125						
			Client	Project ID:	MBLP CCR	60546383					
QC Batch: T071846				Aı	nalysis Deso	cription: Bar	rium, Total				
QC Batch Method: EPA 3015 for Liquids	Microwave Assisted Dige	estions		Ar	nalysis Metł	nod: EPA 6	010B				

METHOD BLANK: T071846-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T071846-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.831	94	80-120	
Barium	mg/L	0.889	0.850	96	80-120	
Calcium	mg/L	8.89	8.41	95	80-120	
Lithium	mg/L	0.889	0.799	90	80-120	

CERTIFICATE OF ANALYSIS



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Original: T17I125-04 MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071846-MSD1 Spike MS MSD Original MSD MS % Rec Max RPD Notes Units Parameter Result Conc. Result % Rec RPD Result % Rec Limit mg/L 0.0320 0.889 0.853 90 3 20 Boron 0.828 92 75-125 0.113 0.889 75-125 2 Barium mg/L 0.956 0.943 95 93 20 103 8.89 75-125 8 20 Calcium mg/L 111 112 97 105 Lithium mg/L 0 0.889 0.789 0.766 89 86 75-125 3 20

Trace Project ID: T17I125

Client Project ID: MBLP CCR 60546383

QC Batch: T071846 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Antimony, Total Analysis Method: EPA 6020

METHOD BLANK: T071846-BLK1

Arsenic mg/L <0.0050	Note
Cadmium mg/L <0.0010 0.0010 Cobalt mg/L <0.020	
Cobalt mg/L <0.020 0.020 Chromium mg/L <0.010	
Chromium mg/L <0.010 0.010 Molybdenum mg/L <0.050	
Molybdenum mg/L <0.050 0.050 ead mg/L <0.0030	
ead mg/L <0.0030 0.0030 intimony mg/L <0.0020	
Intimony mg/L <0.0020 0.0020 elenium mg/L <0.0050	
elenium mg/L <0.0050 0.0050	
hallium mg/L <0.0020 0.0020	

LABORATORY CONTROL SAMPLE: T071846-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0537	97	80-120	
Beryllium	mg/L	0.111	0.101	91	80-120	
Cadmium	mg/L	0.0278	0.0268	97	80-120	
Cobalt	mg/L	0.889	0.895	101	80-120	
Chromium	mg/L	0.0278	0.0288	104	80-120	
Molybdenum	mg/L	0.889	0.882	99	80-120	
Lead	mg/L	0.0556	0.0555	100	80-120	
Antimony	mg/L	0.0556	0.0557	100	80-120	
Selenium	mg/L	0.0556	0.0538	97	80-120	
Thallium	mg/L	0.0556	0.0563	101	80-120	

CERTIFICATE OF ANALYSIS



Original: T17I125-04

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071846-MSD1

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Arsenic	mg/L	0	0.0556	0.0579	0.0554	104	100	75-125	4	20	
Beryllium	mg/L	0	0.111	0.101	0.0948	91	85	75-125	7	20	
Cadmium	mg/L	0	0.0278	0.0287	0.0268	103	96	75-125	7	20	
Cobalt	mg/L	0	0.889	0.881	0.855	99	96	75-125	3	20	
Chromium	mg/L	0	0.0278	0.0307	0.0293	111	105	75-125	5	20	
Molybdenum	mg/L	0.00570	0.889	0.898	0.878	100	98	75-125	2	20	
Lead	mg/L	0	0.0556	0.0543	0.0534	98	96	75-125	2	20	
Antimony	mg/L	0	0.0556	0.0775	0.0662	140	119	75-125	16	20	
Selenium	mg/L	0	0.0556	0.0596	0.0541	107	97	75-125	10	20	
Thallium	mg/L	0	0.0556	0.0561	0.0538	101	97	75-125	4	20	
				Project ID: 「 Project ID: I		60546383					
QC Batch: T071726 QC Batch Method: EPA 200.2	Analysis Description: Metals Digestion Analysis Method: EPA 200.2										
			Trace	Project ID: ⁻	F17I125						

Client Project ID: MBLP CCR 60546383								
QC Batch: T071781	Analysis Description: Sulfate							
QC Batch Method: IC Prep W	Analysis Method: EPA 300.0 Rev. 2.1							

METHOD BLANK: T071781-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

METHOD BLANK: T071781-BLK2

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

CERTIFICATE OF ANALYSIS



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METHOD BLANK: T071781-BLK3

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T071781-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	95	90-110	
Fluoride	mg/L	0.500	0.512	102	90-110	
Sulfate as SO4	mg/L	2.50	2.50	100	90-110	

LABORATORY CONTROL SAMPLE: T071781-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	98	90-110	
Fluoride	mg/L	0.500	0.495	99	90-110	
Sulfate as SO4	mg/L	2.50	2.58	103	90-110	

LABORATORY CONTROL SAMPLE: T071781-BS3

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	96	90-110	
Fluoride	mg/L	0.500	0.456	91	90-110	
Sulfate as SO4	mg/L	2.50	2.48	99	90-110	

MATRIX SPIKE / MATRIX SPIKE D	SD1		Original:									
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes	
Chloride	mg/L	193	10.0	272	269	795	761	80-120	4	20	222	
Fluoride	mg/L	0	4.00	4.29	3.81	107	95	80-120	12	20		
Sulfate as SO4	mg/L	18.3	30.0	46.2	45.7	93	91	80-120	2	20		
			Trace I	Project ID: 1	[17]125							
			Client I	Project ID: N	MBLP CCR	60546383						
QC Batch: T071857				An	alysis Des	cription: Tot	al Dissolved	l Solids				
QC Batch Method: SM 2540 C-11	Analysis Method: SM 2540 C-11											

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METHOD BLANK: T071857-BLK1

Parameter	Units		Blank Result	Reporting Limit				Notes
Total Dissolved Solids	mg/L		<10	10				
LABORATORY CONTROL SA	AMPLE: T071857-	·BS1						
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit			Notes
Total Dissolved Solids	mg/L	503	511	102	80-120			
SAMPLE DUPLICATE: T0718	357-DUP1	Original: T17I125-	04					
Parameter	Units	Original Result	DUP Result			RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	662	682			3	10	
			ace Project ID:T17I12 ient Project ID:MBLP					
QC Batch: T071632			Analysis	Description: pH, SM 450)0			
QC Batch Method: *** DEFAUL	T PREP ***		Analysis	Method: SM 4500-H+ B	-11			



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Trace Use: Logged By: Checked By: MeOH Low Level Lab Sampling Time: IS Requested IS Requested Remarks R	Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.	P In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.	3)	20101 12 10101 10101 10101 10101 10 10101	Released By Received By Date Time Released By Released By	Market and a second sec	13 V 163ª Zdunmant Mark 090617 V 1911 11 KXXX		56 1510 MW-4 14 14 14 14 14 14 14 14 14 14 14 14 14	45 1345 MW-S MSI MSO 11 51111 XKXXX			2 1 235 MW-2 11 11 11 11 11 11 12 12 12 12 12 12 12	XXXXX 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	No. Collected Collected Collected Collected Collected Collected Filtered (Y / N) Matrix Number of Cool HCI HNO, H250, NaOH Other CULA AC Cool HCI HNO, COLLANC	Project Name: Sampled By:	res Prior Approval OI = Oil D = Drinking Water	SL=Sludge A=Air	equirements: Matrix Key: Analys	Email Address: 14426 aprov. (or Billing Email Address:	Office Phone: Cell Phone: Phone Number:	City, State, Zip Code: City, State, Zip Code:	Mailing Address: Billing Address (if different):	Report To: Lance Lever Contact Name:	Company Name: Actsury PO# 60546383		ANALYTICAL LABORATORIES, INC. Muskegon, MI 49444-2673 www.trace-labs.com		
	Sample Acceptance Policy at www.trace-labs.com/downloads.	th at www.trace-labs.com/terms-of-agreement	the offer	AN NE	<u>ک</u> ر ا		X	X	****	XXXX	XXXXX	C X X X	5	XXXX	Boron	15			Analysis Requested		Sampling Time:	MeOH Low Level	Soil Volatiles Preserved	Checked By:	Logged By:	Trace Use:	111)	

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SAMPLE LOG IN CHECKLIST	
Trace ID #: TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT	Temperature: 0,9
Cooler Receipt	
Cooler/samples delivered by: Trace courier	
Hand delivered Name of delivery person: Commercial courier UPS FED EX US Mail	
Tracking #: <u>77020581097</u>	
COC Seals present and intact on cooler? Not Applicable No Yes	
Custody seals signed by Client? No Yes Client custody seal # (if applicable):	
Coolant and Temperature	
Type of Coolant Used Cooler Temperature	
Slurry w/ crushed, cubed, or chip ice? X <u>Correction Factors:</u> • Digital Stick Thermometer CF = -0.0	3°C
Multiple bags of ice around samples?	
	(check one below)
No Coolant Present:	
Ice still present upon receipt (circle one):	
Yes No N/A Melt Water: <u>107</u> °C (Use Digital Stick Therm	ometer)
General	
Yes No NA Comments	
All bottles arrived unbroken with labels in good condition?	
Each sample point is in a sealed plastic bag?	
Labels filled out completely?	
All bottle labels agree with Chain of Custody (COC)?	
Sufficient sample to run tests requested?	
pH checked and samples at correct pH?	
Correct preservative added to samples?	
Air bubbles absent from VOAs?	
COC filled out properly and signed by client?	
COC signed in by TRACE sample custodian?	
Was project manager called and samples discussed?	
Notes: <u>*EMD pH Test Stri</u>	ps Used:
мрн 0-2.5	pH 11.0-13.0
→ PH 0-2.5 Lot: HC563733	Lot: HC547328
Other:	
Lot: HC563733 verified 6/21/10	
Lot: HC574761 verified 04/03/1	7 JS
Form 70-A.21 TRACE Analytical Effective 7/5/17	Laboratories, Inc.

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

October 12, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE: Trace ID: T17I125

Dear Mr. Lindberg:

Enclosed are your analytical results associated with your project for MBLP CCR 60546383. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from Summit Environmental Technologies.

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





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	PI	ease	Sig	n		Jul 9-8-1	1×	10	96	5	5	- m			Trace No.	Project Name:	DQX	Turna	Email Address:	Office Phone:	City, Sta	Mailing Address	Report To:	Compar	Repor	Þ	
Check thi	1	3) / 0	2			1-8-17	K	-	-	-		×.	-	9.6.1)	Date Collected	Name:	*X Standard 4 Day* 3 Day* * Require:	round R	-	hone:	City, State, Zip Code:	Address:	[<u>0</u> ;	Company Name:	Report Results To:		
Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.			14	Released By			1630		1510	1345	1345	1120	1035	10953	Time Collected	1	Standard 48 4 Day* 22 3 Day* * Requires Prior Approval	Turnaround Requirements:	anct.		de:		La's	A	ls To:	ANALYTICAL LABORATORIES, INC.	
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side of th	In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement			Date			2									Sampled By:	WI = Wipes LW = Liquid A = Air D = Drinkinç		Billing Er	Phone Number:	City, Stat	Billing Ac	Contact Name:	PO#	Bill To:	Trace Analytical Laboratories, Inc 2241 Black Creek Road Muskegon, MI 49444-2673	G
le conditio	nt acknow						4							Z	Metals Field Filtered (Y / N)	By:	WI = Wipes LW = Liquid Waste A = Air D = Drinking Water		Billing Email Address:	umber:	City, State, Zip Code:	Billing Address (if different):		6		alytical I ck Creel n, MI 49	HAIN-0
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CERTIFICATE OF ANALYSIS



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SAMP	LE LOG IN CHECKLIST	
Trace ID #: T177126 Date: 4 Client Name: AECOM 1	Time: Logged in by:	erature: <u>0.9</u>
	Oral Desit	
Hand Commercia Tracking Number: Trac	Not Applicable acking #:NoYes	
Type of Coolant Used Slurry w/ crushed, cubed, or chip ice? Multiple bags of ice around samples? Ice Packs/ Blue Ice : No Coolant Present: Ice still present upon receipt (circle one): Yes No No No	Coolant and Temperature Cooler Temperature Correction Factors: • Digital Stick Thermometer CF = -0.6°C • IR Thermometer CF = -0.4°C Representative Sample Temperature: 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ① 0 ② 0 ② 0 ② 0 ② 0 ③ 0 ③ 0 ③ 0 ③ 0 ③ 0 ③ 0 ③ 0 ③ 0 ○ 0 ○ 0 ○ 0 ○ 0 ○ 0 ○ 0 ○ </td <td>k one below) r)</td>	k one below) r)
	General	
All bottles arrived unbroken with labels in good condition Each sample point is in a sealed plastic back Labels filled out complete All bottle labels agree with Chain of Custody (CO Sufficient sample to run tests requeste pH checked and samples at correct p Correct preservative added to sample Air bubbles absent from VO/ COC filled out properly and signed by clien COC signed in by TRACE sample custodia Was project manager called and samples discussed	Yes No NA Comments ion?	
Notes:	*EMD pH Test Strips Us	sed.
Form 70-A.21 Effective 7/5/17	рн	 11.0-13.0 : HC547328

CERTIFICATE OF ANALYSIS



October 09, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17I125

Dear Jon Mink:

Order No.: 17090596

Summit Environmental Technologies, Inc. received 7 sample(s) on 9/12/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

tour Store

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891

Page 1 of 15



Case Narrative

WO#:	17090596
Date:	10/9/2017

CLIENT:Trace Analytical Laboratories, Inc.Project:T17I125

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

Revised report provided 13Oct17. The matrix was updated to



Workorder Sample Summary

WO#: 17090596 13-Oct-17

CLIENT:Trace Analytical Laboratories, Inc.Project:T17I125

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17090596-001	TH17I125-01		9/6/2017 9:50:00 AM	9/12/2017 10:15:00 AM	Aqueous
17090596-002	TH17I125-02		9/6/2017 10:35:00 AM	9/12/2017 10:15:00 AM	Aqueous
17090596-003	TH17I125-03		9/6/2017 11:20:00 AM	9/12/2017 10:15:00 AM	Aqueous
17090596-004	TH17I125-04		9/6/2017 1:45:00 PM	9/12/2017 10:15:00 AM	Aqueous
17090596-005	TH17I125-05		9/6/2017 3:10:00 PM	9/12/2017 10:15:00 AM	Aqueous
17090596-006	TH171125-06		9/6/2017	9/12/2017 10:15:00 AM	Aqueous
17090596-007	TH171125-07		9/6/2017 4:30:00 PM	9/12/2017 10:15:00 AM	Aqueous



Analytical Report

 (consolidated)

 WO#:
 17090596

 Date Reported:
 10/9/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/6/2017 9:50:00 AM
Project:	T17I125	
Lab ID:	17090596-001	Matrix: AQUEOUS
Client Sample ID	TH17I125-01	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

					-	-
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.15	1	9/26/2017 8:18:00 AM
Yield	1.00				1	9/26/2017 8:18:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.79	1	9/25/2017 3:17:00 PM
Yield	0.830				1	9/25/2017 3:17:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17090596

 Date Reported:
 10/9/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	TH17I125-02	
Lab ID:	17090596-002	Matrix: AQUEOUS
Project:	T17I125	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/6/2017 10:35:00 AM

e e					0	v
RADIUM-226 (903.0)			E	E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.18	1	9/26/2017 8:18:00 AM
Yield	1.00				1	9/26/2017 8:18:00 AM
RADIUM-228 (904.0)			E	E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.54	1	9/25/2017 3:18:00 PM
Yield	1.00				1	9/25/2017 3:18:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17090596

 Date Reported:
 10/9/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed				
Client Sample ID	TH17I125-03					
Lab ID:	17090596-003	Matrix: AQUEOUS				
Project:	T17I125					
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/6/2017 11:20:00 AM				

J		e e			•	
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.17	1	9/26/2017 8:18:00 AM
Yield	1.00				1	9/26/2017 8:18:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	1.05	1.00	pCi/L	± 0.62	1	9/25/2017 3:18:00 PM
Yield	1.00				1	9/25/2017 3:18:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17090596

 Date Reported:
 10/9/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed						
Client Sample ID	TH17I125-04							
Lab ID:	17090596-004	Matrix: AQUEOUS						
Project:	T17I125							
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/6/2017 1:45:00 PM						

RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.15	1	9/26/2017 8:17:00 AM
Yield	1.00				1	9/26/2017 8:17:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.44	1	9/25/2017 3:17:00 PM
Yield	1.00				1	9/25/2017 3:17:00 PM

Qualifiers:

- * Value exceeds Maximum Contaminant Level.
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17090596

 Date Reported:
 10/9/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/6/2017 3:10:00 PM
Project:	T17I125	
Lab ID:	17090596-005	Matrix: AQUEOUS
Client Sample ID	TH17I125-05	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

-					-	-
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.13	1	9/26/2017 8:18:00 AM
Yield	1.00				1	9/26/2017 8:18:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.68	1	10/6/2017 1:59:00 PM
Yield	1.00		·		1	10/6/2017 1:59:00 PM

Qualifiers:

- * Value exceeds Maximum Contaminant Level.
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17090596

 Date Reported:
 10/9/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/6/2017						
Project:	T17I125							
Lab ID:	17090596-006	Matrix: AQUEOUS						
Client Sample I	D TH171125-06							
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed						
RADIUM-226 (9	03.0)	E903.0 E903-904 Analyst: BRD						

Radium-226 Yield	ND 1.00	1.00	pCi/L	± 0.14	1 1	9/26/2017 8:18:00 AM 9/26/2017 8:18:00 AM
RADIUM-228 (904.0)			E	904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 1.00	1.00	pCi/L	± 0.72	1 1	9/25/2017 3:19:00 PM 9/25/2017 3:19:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17090596

 Date Reported:
 10/9/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	TH171125-07	
Lab ID:	17090596-007	Matrix: AQUEOUS
Project:	T17I125	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/6/2017 4:30:00 PM

•						•
RADIUM-226 (903.0)			E	E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	pCi/L	± 0.15	1	9/26/2017 8:19:00 AM
Yield	1.00				1	9/26/2017 8:19:00 AM
RADIUM-228 (904.0)			E	E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.79	1	9/25/2017 3:19:00 PM
Yield	1.00				1	9/25/2017 3:19:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

QC SUMMARY REPORT

17090596 WO#:

13-Oct-17

Client: Project:	Trace Analytical La T17I125	boratories, Inc.]	BatchID:	28872		
Sample ID mb-28	•	ype: MBLK		TestCode: Radium-228_ Units: pCi/L			Prep Da			RunNo: 75166		
Client ID: PBW	Batch	n ID: 28872	TestN	lo: E904.0	E903-904		Analysis Da	ate: 9/25/2	017	SeqNo: 12	72160	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		ND	1.00		0	0						
Yield		0.970			0	0						
Sample ID Ics-28	872 SampT	ype: LCS	TestCoo	de: Radium-2	28_ Units: pCi/L		Prep Da	ate: 9/21/2	017	RunNo: 75	166	
Client ID: LCSW	Batch	n ID: 28872	TestN	lo: E904.0	E903-904		Analysis Da	ate: 9/25/2	017	SeqNo: 12	72161	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.66	1.00	5.000	0	93.2	70	130				
Yield		0.960			0	0						
Sample ID Icsd-2	8872 SampT	ype: LCSD	TestCoo	de: Radium-2	28_ Units: pCi/L		Prep Da	ate: 9/21/2	017	RunNo: 75	166	
Client ID: LCSS	D2 Batch	n ID: 28872	TestN	lo: E904.0	E903-904		Analysis Da	ate: 9/25/2	017	SeqNo: 12	72162	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.44	1.00	5.000	0	88.8	70	130	4.660	4.79	20	
Yield		0.890			0	0			0.9600	7.57		

Qualifiers:

- Value exceeds Maximum Contaminant Level. *
- В Analyte detected in the associated Method Blank
- Н Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits
- Revision v1 Page 11 of 15



QC SUMMARY REPORT

17090596 WO#:

13-Oct-17

Client:	Trace Analy	ytical Laboratories, Inc.										
Project:	T17I125		BatchID: 28872									
Sample ID	17090596-004aMS	SampType: MS	TestCoo	de: Radium-2	28_ Units: pCi/L		Prep Date	e: 9/21/2	017	RunNo: 75 ′	166	
Client ID:	TH17I125-04	Batch ID: 28872	TestN	lo: E904.0	E903-904		Analysis Date	e: 9/25/2	017	SeqNo: 127	72166	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3	4.93	1.00	5.000	0	98.6	70	130				
Yield		1.00			1.000	0						
Sample ID	17090596-007adup	SampType: DUP	TestCoo	le: Radium-2	28_ Units: pCi/L		Prep Date	e: 9/21/2	017	RunNo: 75 '	166	
Client ID:	TH171125-07	Batch ID: 28872	TestN	lo: E904.0	E903-904		Analysis Date	e: 9/25/2	017	SeqNo: 127	72184	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3	ND	1.00		0	0			0	0	20	
Yield		1.00			0	0			1.000	0		

Qualifiers:

Value exceeds Maximum Contaminant Level. *

Analyte detected in the associated Method Blank

Н Holding times for preparation or analysis exceeded

Value is below Minimum Compound Limit. MC

Р Second column confirmation exceeds

- В
- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits
- Revision v1 Page 12 of 15



QC SUMMARY REPORT

WO#: 17090596

13-Oct-17

Client: Project:	Trace Analy T17I125	ytical Laboratories, Inc.		BatchID: 2	8872		
Sample ID Client ID:		SampType: MBLK Batch ID: 28872	TestCode: Radium-226_ Units: pCi/L TestNo: E903.0 E903-904	Prep Date: 9/21/2017 Analysis Date: 9/26/2017	RunNo: 75177 SeqNo: 1272431		
Analyte		Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual		
Radium-226 Yield	5	ND 1.00	1.00				
Sample ID	lcs-28872	SampType: LCS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 9/21/2017	RunNo: 75177		
Client ID:	LCSW	Batch ID: 28872	TestNo: E903.0 E903-904	Analysis Date: 9/26/2017	SeqNo: 1272432		
Analyte		Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual		
Radium-226	6	4.30	1.00 5.000 0	86.0 70 130			
Sample ID	17090596-004aMS	SampType: MS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 9/21/2017	RunNo: 75177		
Client ID:	TH17I125-04	Batch ID: 28872	TestNo: E903.0 E903-904	Analysis Date: 9/26/2017	SeqNo: 1272436		
Analyte		Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual		
Radium-226	3	4.60	1.00 5.000 0	92.0 70 130			
Radium-226 Sample ID	3 17090596-007adup	4.60 SampType: DUP	1.00 5.000 0 TestCode: Radium-226_ Units: pCi/L	92.0 70 130 Prep Date: 9/21/2017	RunNo: 75177		
Sample ID					RunNo: 75177 SeqNo: 1272445		

MC Value is below Minimum Compound Limit.

Р Second column confirmation exceeds ND Not Detected

PL Permit Limit

RSD is greater than RSDlimit 0

R

RPD outside accepted recovery limits



QC SUMMARY REPORT

WO#: **17090596**

13-Oct-17

Client: Project:	Trace Analy T17I125	tical Laboratories, Inc.						I	BatchID: 2	28872		
	17090596-007adup TH171125-07	SampType: DUP Batch ID: 28872		le: Radium-2 lo: E903.0	26_ Units: pCi/L E903-904		Prep Da Analysis Da	te: 9/21/20 te: 9/26/20		RunNo: 75 4 SeqNo: 12 7		
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226		ND	1.00						0	0	20	
Yield		1.00							1.000	0	0	

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

P Second column confirmation exceeds

- B Analyte detected in the associated Method Blank
- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits
- Revision v1 Page 14 of 15



Qualifiers and Acronyms

WO#: 17090596 Date: 10/9/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

DF

Dilution Factor

\mathbf{U}	The compound was analyzed for but w							
J	The reported value is greater than the I	Method Dete	ection Limit but less than the Reporting Limit.					
Н	The hold time for sample preparation a							
D	The result is reported from a dilution.	2						
Е		the calibrat	tion or is estimated due to interference.					
MC	The result is below the Minimum Com							
*	The result exceeds the Regulatory Lim	•						
m	Manual integration was used to determ							
d	Manual integration in which peak was		response.					
u N			l library search assuming a 1:1 response.					
P	The second column confirmation exce							
r C			merence.					
x	The result has been confirmed by GC/							
	The result was not confirmed when GC	•	sis was performed.					
B/MB+	The analyte was detected in the associa		1.4					
G	The ICB or CCB contained reportable		analyte.					
QC-/+	The CCV recovery failed low (-) or his							
R/QDR	The RPD was outside of accepted reco							
QL-/+	The LCS or LCSD recovery failed low (-) or high (+). The LCS/LCSD RPD was outside of accepted recovery limits							
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.							
QM-/+	The MS or MSD recovery failed low (-) or high (+).							
QMR	The MS/MSD RPD was outside of accepted recovery limits.							
QV-/+	The ICV recovery failed low (-) or high (+).							
S	The spike result was outside of accepted recovery limits.							
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for							
	additional information							
Acronyn	ns							
ND	Not Detected	RL	Reporting Limit					
QC	Quality Control	MDL	Method Detection Limit					
MB	Method Blank	LOD	Level of Detection					
LCS	Laboratory Control Sample	LOQ	Level of Quantitation					
LCSD	Laboratory Control Sample Duplicate	PQL	Practical Quantitation Limit					
QCS	Quality Control Sample	CRQL	Contract Required Quantitation Limit					
DUP	Duplicate	PL	Permit Limit					
MS	Matrix Spike	RegLvl	Regulatory Limit					
MSD	Matrix Spike Duplicate	MCL	Maximum Contamination Limit					
RPD	Relative Percent Different	MinCL	Minimum Compound Limit					
ICV	Initial Calibration Verification	RA	Reanalysis					
ICB	Initial Calibration Blank	RE	Reextraction					
CCV	Continuing Calibration Verification	TIC RT	Tentatively Identified Compound Retention Time					
CCB	Continuing Calibration Blank Benorting Limit Check		Calibration Factor					
RLC	Reporting Limit Check	CF	Cambration Factor					

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Response Factor

RF

Date 	Received By	Date 48-17 Ro	Released By
8	Radium 226/228	Sampled: 09/06/17 15:10 15:00 09/06/18 15:10 pH <2 w/ HNO.	Sample ID: T171125-05 Aqueous Sampled: 09/0 Subcontracted Work 09/15/17 15:00 09/0 Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO
01111 2 110 000111 01 88	Radium 226/228 Radium 226/228 2 w/ HNO LEL1000 pH <2 w/ HNC	15:00 09/06/18 11:20 <u>pH <2 w/ HNO</u> <u>Sampled: 09/06/17 13:45</u> 15:00 09/06/18 13:45 pH <2 w/ HNO 1-PL1000 pH <	Subcontracted Work 09/15/17 15:00 09/06/18 11:20 Radium 226/228 Containers Supplied: PL1000 pH <2 w/ HNO
28	Radium 226/228 . Radium 226/228	15:00 09/06/18 09:50 PH <2 w/ HNO. Sampled: 09/06/17 10:35 15:00 09/06/18 10:35 PH <2 w/ HNO. Sampled: 09/06/17 11:20	Subcontracted Work 09/15/17 15:00 09/0 Containers Supplied: -PL1000 pH <2 w/ HNO
1-101 1007	17690594-WI	2 - 3 - ~	PO# <u>OTO22017023</u> ~ Accounting Code: Sample ID: T171125-01 Aqueous Sampl
s, Inc.	ANALYTICAL LABORATORIES, INC. SUBCONTRACTORDER T171125 <u>RECEIVING LABORATORY:</u> Summit Environmental Technologies, Inc. 3310 Win Street Cuyahoga Falls, OH 44223 Phone :(330) 253-489 Fax: (330) 253-4489	ANALYTICA	2241 Black Craek Road Muskegon, MI 48444-2673 SENDING LABORATORY: Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 Phone: 231.773.6537 Fax: 231.773.6537 Project Manager: Jon Mink

Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444-2973	stories, Inc. Freek Road		ANALYTICAL LABORATORIES, INC.
		SUBCO	SUBCONTRACT ORDER
			T171125
Sample ID: T171125-06	Aqueous St	Aqueous Ssmpled: 09/06/17 00:00	
Subcontracted Work	09/15/17 15:00	09/06/18 00:00	Radium 226/228
Containers Supplied: 1-PL1000 pH <2 w/ HNO: 1-PL1000 pH <2 w/ HNO:	1-PL1000 pH <	2 w/ HNO.	
Sample ID: T171125-07	Aqueous Sa	Aqueous Sampled: 09/06/17 16:30	
Subcontracted Work	09/15/17 15:00	09/06/18 16:30	Radium 226/228
Cantainers Supplied: 1-PL1000 pH <2 w/ HNO: 1-PL1000 pH <2 w/ HNO:	1-PL1000 pH <	2 w/ HNO	

Released By Released By Date Received Date 9-12-12 Date Page 2 of 2 5101

÷

1

Page 10 of 12	Logged in by:	Date/Time	Client contact:	Will client send new samples Y N	Was client contacted about semples Y N	"Samples with butbles somm are acceptable. Indicate bubble size if Acom	() z	Sufficient sample for CC	Sufficient sample received	Correct containers used	Laber(s) agree with C-O-C	Sample label(s) complete (ID, data, etc.)	*If no, list broken semple(s);	Sample containers intect*	COC filed out property I I I I I I I I I I I I I I I I I I I	Radiological Testing Instrument serial \$35/27 (Y) NUA Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Salavo creation (see page 2 for scan results)	Temp: 18.6	ent metted	Ÿ	Custody Seals Intact		Packaging: Peanuts Bubbia Wrac Paper Forman	Shipper: Fed Ex (UPS) DHI Althorne the Design of the Desig	Time Received: 1015 Date cooler(s) opened and sar	O-1)-1/ Order Number	The actual Initials of person inspection on	Figure 1 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 1	LINECUVE LAR(E) 0//1//17	Revision: 13	SOP: Sample Receipt
				×											st be notified immediately.	ge 2 for scan results)					1			nd samples inspected: QI-D-17	115 SV h01	· ANB	nologies, Inc.			

SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip (28-4.6) SETN: OES-01-0250

pH Strip SET (0-14)#: WC-03-1174

Test Method pH Chlorine (t or -) 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Total DPD packet SET#: OES-02-0239 Disp. Pipette SET#:	1#:	BC	Free DFD packet SET#: OES-01-0280	SET#: OES-0
	Sample ID	Test Method	모	Chlorine I+ or -1	
	_		N		5
	2		2		N
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	r		~		24
	7		٢		27
2	5		٢		13
2	6		٢		24
	7		2		28
			_		

532.2 checked for Fine chlorine 531.2 pH is checked for ~3.8 (SET# OES-01-0149) 534.2 = pH and Chlorine checked by isb analyst

Page 11 of 12



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project					
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies					
Work Order:	T17I272					
Analyses/Method:	Metals (6010B/6020/7470A), General Chemistry (300.0/SM 2540C), Radiological (903.0/904.0)					
Validation Level:	Level 2					
Prepared by:	Lisa Smith (CEAC)/AECOM Completed on: 12/29/2017					

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on September 14, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1		14-Sep-17	T17I272-01
MW-2	MS for Radium 228	14-Sep-17	T17l272-02
MW-3		14-Sep-17	T17l272-03
MW-4		14-Sep-17	T17l272-04
MW-5	MS/MSD for Metals and Method 300.0; MS for Radium 226; Lab Dup for TDS	14-Sep-17	T17I272-05
Dup-091417	FD of MW-3	14-Sep-17	T17l272-06
Equipment Blank		14-Sep-17	T17l272-07

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- Evaluation of Radiochemical Data Usability (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- Holding times and sample preservation
- Laboratory blanks and equipment blanks
- ✓ Matrix spike (MS) and/or matrix spike duplicate (MSD) results



- ✓ Laboratory duplicates
- ✓ Laboratory control sample (LCS) results
- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Results were acceptable without qualification. Detailed discussions of the quality control (QC) results are included in the following report.

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.

Analytes were not detected in the equipment rinsate blank, indicating field contamination did not occur.



MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Extra sample volume was collected for MS/MSD analysis, and MS/MSD results were provided for sample MW-5 all analyses performed by Trace and radium-226, and the matrix spike was performed on sample MW-2 for radium 228. MS/MSD recoveries and RPDs were within criteria, with the exceptions listed in the table below. The chloride MS/MSD was reanalyzed at dilution and recoveries and RPDs were in control.

Analyte	MS/MSD % Recovery	Recovery Limits	RPD	RPD Limit	Qualifications
MW-5:					
Antimony	129/ 108	75-125	17	20	The antimony result for sample MW- 5 is non-detect and is acceptable without qualification.
Calcium	87/ 74	75-125	1.0 ^a	20	Sample concentrations were greater
Chloride	718/702	80-120	2	20	than 4 times the spike concentration and results were acceptable without qualification.

^a RPD calculated using sample values as indicated in the analytical method (rather than recoveries).

Laboratory Duplicates

TDS laboratory duplicate analysis was performed on sample MW-5. The RPD was within the precision limit of 10% and was acceptable.

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample Dup-091417 was collected as a field duplicate of sample MW-3. RPDs were within the 30% limit for groundwater samples, and were acceptable.

Analyte MW-3/Dup-091417:	Units	Sample Result	Field Duplicate Result	RPD	RPD Limit
Calcium	mg/l	57	56	5.4	30
Chloride	mg/l	83	84	1.2	30
Sulfate	mg/l	25	24	4.1	30
Total Dissolved Solids	mg/l	380	380	0	30

Sample Results and Quantitation

Results were reported down to the reporting limits.

Dilutions were required for due to high analyte concentration.

pH analysis was performed in the field to ensure that analyses were performed within the required hold time.



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

October 13, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE:	Trace Project	T17I272
	Client Project	MBLP CCR INVEST 60546383

Dear Mr. Lindberg:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE SUMMARY

Trace Project ID:T17I272Client Project ID:MBLP CCR INVEST 60546383

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17l272-01	MW-1	Ground Water	adj/ll	09/14/17 10:15	09/15/17 11:34
T17I272-02	MW-2	Ground Water	adj/ll	09/14/17 10:50	09/15/17 11:34
T17I272-03	MW-3	Ground Water	adj/ll	09/14/17 11:30	09/15/17 11:34
T17I272-04	MW-4	Ground Water	adj/ll	09/14/17 13:55	09/15/17 11:34
T17I272-05	MW-5	Ground Water	adj/ll	09/14/17 13:00	09/15/17 11:34
T17I272-06	Dup-091417	Ground Water	adj/ll	09/14/17	09/15/17 11:34
T17I272-07	Equipment Blank	Aqueous	adj/ll	09/14/17 14:00	09/15/17 11:34

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: T071980-MS1 Analysis: EPA 6020	
Antimony	Note 208 : The MS recovery was out of control. Because the MSD recovery and the RPD between the MS and the MSD were in control, no data require qualification.
Trace ID: T071980-MSD1 Analysis: EPA 6010B	
Calcium	Note 209 : The MSD recovery was out of control. Because the MS recovery and the RPD between the MS and the MSD were in control, no data require qualification.
Trace ID: T17I272-01 Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17I272-02 Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17I272-03 Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17I272-04 Analysis: SM 4500-H+ B-11	

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рН	Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID: T17l272-05 Analysis: SM 4500-H+ B-11		
pH	Note Client : client.	The analysis was performed on site at the time of sampling by the



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ANALYTICAL RESULTS

 Trace Project ID:
 T17I272

 Client Project ID:
 MBLP CCR INVEST 60546383

Trace ID: T17I272-01 Sample ID: MW-1			Collected: Received:	09/14/17 10:1 09/15/17 11:3		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072052									
Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071980									
Barium	0.13 mg/L	0.10	1	09/18/17	nws	09/18/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/18/17	nws	09/18/17	dtm		
Calcium	110 mg/L	1.0	1	09/18/17	nws	09/18/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/18/17	nws	09/18/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071980									
Antimony	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/18/17	nws	10/06/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/18/17	nws	09/21/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/18/17	nws	09/21/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/18/17	nws	09/21/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/18/17	nws	09/21/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/18/17	nws	09/21/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071952									
Fluoride	<0.10 mg/L	0.10	1	09/15/17	jek	09/15/17	jek		
Chloride	290 mg/L	10	100	09/18/17	nws	09/18/17	nm		
Sulfate as SO4	22 mg/L	1.0	1	09/15/17	jek	09/15/17	jek		

Batch: T072093

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ANALYTICAL RESULTS

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
Sample ID: MW-1		Date	Received:	09/15/17 11:3	4				
Trace ID: T17I272-01		Date	Date Collected:		5	Matrix:	Ground	Water	

Analysis Method: SM 4500-H+ B-11

Batch: T071632							
рН	7.60 pH Units	1	09/14/17	jm	09/14/17	jm	Client, N

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ANALYTICAL RESULTS

Trace Project ID:T17I272Client Project ID:MBLP CCR INVEST 60546383

Trace ID: T17l272-02 Sample ID: MW-2			Collected: Received:	09/14/17 10:5 09/15/17 11:3		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCI
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072052									
Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071980									
Barium	<0.10 mg/L	0.10	1	09/18/17	nws	09/18/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/18/17	nws	09/18/17	dtm		
Calcium	52 mg/L	1.0	1	09/18/17	nws	09/18/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/18/17	nws	09/18/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071980									
Antimony	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/18/17	nws	10/06/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/18/17	nws	09/21/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/18/17	nws	09/21/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/18/17	nws	09/21/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/18/17	nws	09/21/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/18/17	nws	09/21/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071952									
Fluoride	<0.10 mg/L	0.10	1	09/15/17	jek	09/15/17	jek		
Chloride	64 mg/L	10	25	09/18/17	nws	09/18/17	nm		
Sulfate as SO4	23 mg/L	1.0	1	09/15/17	jek	09/15/17	jek		

Batch: T072093

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ANALYTICAL RESULTS

Client Project	ID: MBLP CCR INVES									
Trace ID:	T17I272-02			Collected:	09/14/17 10:50	D	Matrix:	Ground	Water	
Sample ID:	MW-2	MW-2			09/15/17 11:34	1				
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL

WET CHEMISTRY

Total Dissolved Solids	300 mg/L	40	4	09/21/17	nm	09/22/17	nm	
Analysis Method: SM 4500-H+ B-11 Batch: T071632								
рН	8.13 pH Units		1	09/14/17	jm	09/14/17	jm	Client, N



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ANALYTICAL RESULTS

Trace Project ID:T17I272Client Project ID:MBLP CCR INVEST 60546383

Trace ID: T17l272-03 Sample ID: MW-3			Collected: Received:	09/14/17 11:3 09/15/17 11:3		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072052									
Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071980									
Barium	<0.10 mg/L	0.10	1	09/18/17	nws	09/18/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/18/17	nws	09/18/17	dtm		
Calcium	57 mg/L	1.0	1	09/18/17	nws	09/18/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/18/17	nws	09/18/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071980									
Antimony	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/18/17	nws	10/06/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/18/17	nws	09/21/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/18/17	nws	09/21/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/18/17	nws	09/21/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/18/17	nws	09/21/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/18/17	nws	09/21/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071952									
Fluoride	<0.10 mg/L	0.10	1	09/15/17	jek	09/15/17	jek		
Chloride	83 mg/L	10	25	09/18/17	nws	09/18/17	nm		
Sulfate as SO4	25 mg/L	1.0	1	09/15/17	jek	09/15/17	jek		
Analysis Method: SM 2540 C-11									

Batch: T072093

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ANALYTICAL RESULTS

Sample ID: MW-	3		Date	Received:	09/15/17 11:34		09/15/17 11:34		09/15/17 11:34					
Trace ID: T17I	272-03		Date	Date Collected: 09/14/17 11:30			Matrix:	Ground Water						

1

09/14/17

jm

09/14/17

jm

Client, N

Total Dissolved Solids

Total Dissolved Solids	380 mg/L	40	4	09/21/17	nm	09/22/17	nm
Analysis Method: SM 4500-H+ B-11 Batch: T071632							

7.85 pH Units

pН

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ANALYTICAL RESULTS

Trace Project ID:T17I272Client Project ID:MBLP CCR INVEST 60546383

Trace ID: T17I272-04 Sample ID: MW-4			Collected: Received:	09/14/17 13:5 09/15/17 11:3		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072052									
Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071980									
Barium	<0.10 mg/L	0.10	1	09/18/17	nws	09/18/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/18/17	nws	09/18/17	dtm		
Calcium	100 mg/L	1.0	1	09/18/17	nws	09/18/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/18/17	nws	09/18/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071980									
Antimony	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/18/17	nws	10/06/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/18/17	nws	09/21/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/18/17	nws	09/21/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/18/17	nws	09/21/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/18/17	nws	09/21/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/18/17	nws	09/21/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071952									
Fluoride	0.18 mg/L	0.10	1	09/15/17	jek	09/15/17	jek		
Chloride	360 mg/L	10	100	09/18/17	nws	09/18/17	nm		
Sulfate as SO4	49 mg/L	1.0	5	09/15/17	jek	09/15/17	jek		

Analysis Method: SM 2540 C-11 Batch: T072093

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ANALYTICAL RESULTS

Client Project	ID: MBLP CCR INVES	ST 60546383								
Trace ID:	T17I272-04		Date	Collected:	09/14/17 13:55	5	Matrix:	Ground	Water	
Sample ID:	MW-4		Date	Received:	09/15/17 11:34	1				
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL

WET CHEMISTRY

Total Dissolved Solids	1000 mg/L	40	4	09/21/17	nm	09/22/17	nm	
Analysis Method: SM 4500-H+ B-11 Batch: T071632								
рН	7.77 pH Units		1	09/14/17	jm	09/14/17	jm	Client, N



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ANALYTICAL RESULTS

 Trace Project ID:
 T17I272

 Client Project ID:
 MBLP CCR INVEST 60546383

Trace ID: T17l272-05 Sample ID: MW-5			Collected: Received:	09/14/17 13: 09/15/17 11:		Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072052									
Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071980									
Barium	0.11 mg/L	0.10	1	09/18/17	nws	09/18/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/18/17	nws	09/18/17	dtm		
Calcium	96 mg/L	1.0	1	09/18/17	nws	09/18/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/18/17	nws	09/18/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071980									
Antimony	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/18/17	nws	10/06/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/18/17	nws	09/21/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/18/17	nws	09/21/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/18/17	nws	09/21/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/18/17	nws	09/21/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/18/17	nws	09/21/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071952									
Fluoride	<0.10 mg/L	0.10	1	09/15/17	jek	09/15/17	jek		
Chloride	200 mg/L	10	100	09/18/17	nws	09/18/17	nm		
Sulfate as SO4	19 mg/L	1.0	1	09/15/17	jek	09/15/17	jek		
Analysis Method: SM 2540 C-11									

Batch: T072093

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ANALYTICAL RESULTS

Trace Project Client Project		ST 60546383								
Trace ID: Sample ID:	T17I272-05 MW-5			Collected: Received:	09/14/17 13:00 09/15/17 11:34		Matrix:	Ground	Water	
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL

40

4

1

09/21/17

09/14/17

nm

jm

09/22/17

09/14/17

nm

jm

Client, N

Total Dissolved Solids

Analysis Method: SM 4500-H+ B-11			
Batch: T071632			

720 mg/L

pH 7.51 pH Units



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ANALYTICAL RESULTS

 Trace Project ID:
 T17I272

 Client Project ID:
 MBLP CCR INVEST 60546383

Trace ID: T17I272-06 Sample ID: Dup-091417			Collected: Received:	09/14/17 09/15/17 11:	34	Matrix:	Ground	Water	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072052									
Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071980									
Barium	<0.10 mg/L	0.10	1	09/18/17	nws	09/18/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/18/17	nws	09/18/17	dtm		
Calcium	56 mg/L	1.0	1	09/18/17	nws	09/18/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/18/17	nws	09/18/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071980									
Antimony	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/18/17	nws	10/06/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/18/17	nws	09/21/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/18/17	nws	09/21/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/18/17	nws	09/21/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/18/17	nws	09/21/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/18/17	nws	09/21/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071952									
Fluoride	<0.10 mg/L	0.10	1	09/15/17	jek	09/15/17	jek		
Chloride	84 mg/L	10	25	09/18/17	nws	09/18/17	nm		
Sulfate as SO4	24 mg/L	1.0	1	09/15/17	jek	09/15/17	jek		
Analysis Method: SM 2540 C-11									

Batch: T072093

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ANALYTICAL RESULTS

	Collected:	09/14/17	1	Matrix:	Ground	Water	
	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
6 17 RESULTS UN	17 Date R	17 Date Received:	17 Date Received: 09/15/17 11:34	Image: Description Date Received: 09/15/17 11:34	Image: Non-Section Control of Co	17 Date Received: 09/15/17 11:34	Image: Non-Section Control (1997) Date Received: 09/15/17 11:34

Total Dissolved Solids 380 mg/L 40 4 09/21/17 nm 09/22/17 nm



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ANALYTICAL RESULTS

Trace Project ID:T17I272Client Project ID:MBLP CCR INVEST 60546383

Trace ID: T17I272-07 Sample ID: Equipment Blank			Collected: Received:	09/14/17 14 09/15/17 11:		Matrix: Aqueous			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072052									
Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T071980									
Barium	<0.10 mg/L	0.10	1	09/18/17	nws	09/18/17	dtm		
Boron	<0.30 mg/L	0.30	1	09/18/17	nws	09/18/17	dtm		
Calcium	<1.0 mg/L	1.0	1	09/18/17	nws	09/18/17	dtm		
Lithium	<0.010 mg/L	0.010	1	09/18/17	nws	09/18/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T071980									
Antimony	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	09/18/17	nws	10/06/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	09/18/17	nws	09/21/17	dtm		
Chromium	<0.010 mg/L	0.010	1	09/18/17	nws	09/21/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	09/18/17	nws	09/21/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	09/18/17	nws	09/21/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	09/18/17	nws	09/21/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	09/18/17	nws	09/21/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	09/18/17	nws	09/21/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T071952									
Fluoride	<0.10 mg/L	0.10	1	09/15/17	jek	09/15/17	jek		
Chloride	<10 mg/L	10	1	09/15/17	jek	09/15/17	jek		
Sulfate as SO4	<1.0 mg/L	1.0	1	09/15/17	jek	09/15/17	jek		

Analysis Method: SM 2540 C-11

Batch: T072093

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ANALYTICAL RESULTS

Trace Project ID:	T17I272	
Client Project ID:	MBLP CCR INVEST 60546383	
		=

Trace ID: T17I272-07 Sample ID: Equipment Blank		Date Collected: Date Received:		09/14/17 14:00 09/15/17 11:34		Matrix: Aqueous		S	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Total Dissolved Solids	<10 mg/L	10	1	09/21/17	nm	09/22/17	nm		



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QUALITY CONTROL RESULTS

Trace Project ID: T17I272 Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T072052	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T072052-BLK1

Parameter	Units		Blank Result	Reporting Limit		Notes
Mercury	mg/L		<0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T072052-BS	61				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00216	108	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T072052-MSD1				Original: T17I272-05							
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00218	0.00192	109	96	76-123	13	20	
	Trace Project ID: T17I272 Client Project ID: MBLP CCR INVEST 60546383										
QC Batch: T071980			0.011		nalysis Des						
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids				Aı	nalysis Metl	nod: EPA 6	010B				

METHOD BLANK: T071980-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T071980-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.796	90	80-120	
Barium	mg/L	0.889	0.826	93	80-120	
Calcium	mg/L	8.89	7.96	90	80-120	
Lithium	mg/L	0.889	0.769	87	80-120	

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071980-MSD1				Original: T17I272-05							
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Boron	mg/L	0.0326	0.889	0.842	0.832	91	90	75-125	1	20	
Barium	mg/L	0.111	0.889	0.923	0.904	91	89	75-125	2	20	
Calcium	mg/L	96.4	8.89	104	103	87	74	75-125	16	20	209
Lithium	mg/L	0	0.889	0.745	0.749	84	84	75-125	0.6	20	

Trace Project ID: T17I272

Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T071980 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Antimony, Total

Analysis Method: EPA 6020

METHOD BLANK: T071980-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.0050	0.0050	
Beryllium	mg/L	<0.0010	0.0010	
Cadmium	mg/L	<0.0010	0.0010	
Cobalt	mg/L	<0.020	0.020	
Chromium	mg/L	<0.010	0.010	
Molybdenum	mg/L	<0.050	0.050	
Lead	mg/L	<0.0030	0.0030	
Antimony	mg/L	<0.0020	0.0020	
Selenium	mg/L	<0.0050	0.0050	
Thallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T071980-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0524	94	80-120	
Beryllium	mg/L	0.111	0.0980	88	80-120	
Cadmium	mg/L	0.0278	0.0280	101	80-120	
Cobalt	mg/L	0.889	0.869	98	80-120	
Chromium	mg/L	0.0278	0.0333	120	80-120	
Molybdenum	mg/L	0.889	0.908	102	80-120	
Lead	mg/L	0.0556	0.0543	98	80-120	
Antimony	mg/L	0.0556	0.0625	112	80-120	
Selenium	mg/L	0.0556	0.0568	102	80-120	
Thallium	mg/L	0.0556	0.0516	93	80-120	

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Original: T17I272-05

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071980-MSD1

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Arsenic	mg/L	0	0.0556	0.0539	0.0531	97	96	75-125	1	20	
Beryllium	mg/L	0	0.111	0.0928	0.0974	84	88	75-125	5	20	
Cadmium	mg/L	0	0.0278	0.0276	0.0286	100	103	75-125	3	20	
Cobalt	mg/L	0	0.889	0.826	0.832	93	94	75-125	0.7	20	
Chromium	mg/L	0	0.0278	0.0272	0.0275	98	99	75-125	1	20	
Molybdenum	mg/L	0.00550	0.889	0.919	0.939	103	105	75-125	2	20	
Lead	mg/L	0.000250	0.0556	0.0514	0.0498	92	89	75-125	3	20	
Antimony	mg/L	0	0.0556	0.0716	0.0602	129	108	75-125	17	20	
Selenium	mg/L	0.00153	0.0556	0.0582	0.0571	102	100	75-125	2	20	
Thallium	mg/L	0	0.0556	0.0508	0.0496	91	89	75-125	2	20	
				Project ID: 1 Project ID: 1		NVEST 60)546383				
QC Batch: T071726 QC Batch Method: EPA 200.2						cription: Me hod: EPA 2	tals Digestic 00.2	on			
				Project ID: 1 Project ID: 1		NVEST 60)546383				
QC Batch: T071952 QC Batch Method: IC Prep W						cription: Sul hod: EPA 3	fate 00.0 Rev. 2	.1			

METHOD BLANK: T071952-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T071952-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	95	90-110	
Fluoride	mg/L	0.500	0.478	96	90-110	
Sulfate as SO4	mg/L	2.50	2.56	102	90-110	

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Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Chloride	mg/L	200	10.0	271	270	718	702	80-120	2	20	
Fluoride	mg/L	0	4.00	3.82	3.80	96	95	80-120	0.6	20	
Sulfate as SO4	mg/L	18.8	30.0	46.5	46.3	92	92	80-120	0.6	20	
			Trac	e Project ID: T	17 272						
			Clier	t Project ID: N	ABLP CCF	R INVEST 6	0546383				
QC Batch: T071985				An	alysis Des	scription: Ch	loride				
QC Batch Method: IC Prep W				An	alysis Met	hod: EPA 3	800.0 Rev. 2	.1			
METHOD BLANK: T071985-BLK1											
Parameter	Units			Blank Result		Reporting Limit					Notes
Chloride	mg/L			<10		10					
LABORATORY CONTROL SAMPL	.E: T071985										
		Spi	iko	LCS		LCS	6	% Rec			
Parameter	Units	Co		Resul		% Re	ec	Limit			Notes
Parameter Chloride	Units mg/L		nc.			% Re 94					Notes
Chloride	mg/L	Co 1.(nc. 00	Resu	t	94		Limit			Notes
Chloride	mg/L	Co 1.(T071985-M	nc. 00 SD1	Resul <10	t Original	94 : T17I272-0	95	Limit 90-110		Max	Notes
Chloride MATRIX SPIKE / MATRIX SPIKE D	mg/L	Co 1.(nc. 00	Resu	t	94		Limit	RPD	Max RPD	
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter	mg/L	Co 1.(T071985-M Original	nc. 00 SD1 Spike	Resul <10 MS	t Original MSD	94 : T17I272-0 MS	95 MSD	Limit 90-110 % Rec	RPD 2		
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter	mg/L DUPLICATE: Units	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405 e Project ID: 1	Original: MSD Result 408	94 • T17I272-0 MS <u>% Rec</u> 103	95 MSD % Rec 104	Limit 90-110 % Rec Limit		RPD	
	mg/L DUPLICATE: Units	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405	Original: MSD Result 408	94 • T17I272-0 MS <u>% Rec</u> 103	95 MSD % Rec 104	Limit 90-110 % Rec Limit		RPD	Notes
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride QC Batch: T072093	mg/L DUPLICATE: Units	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405 e Project ID: T it Project ID: M An	Original MSD Result 408 171272 //BLP CCF alysis Des	94 • T17I272-0 MS <u>% Rec</u> 103 • RINVEST 60 • scription: Tot	95 MSD % Rec 104 0546383 tal Dissolver	Limit 90-110 % Rec Limit 80-120		RPD	
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride	mg/L DUPLICATE: Units	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405 e Project ID: T it Project ID: M An	Original MSD Result 408 171272 //BLP CCF alysis Des	94 • T17I272-0 MS <u>% Rec</u> 103 R INVEST 60	95 MSD % Rec 104 0546383 tal Dissolver	Limit 90-110 % Rec Limit 80-120		RPD	
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride QC Batch: T072093	mg/L DUPLICATE: Units	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405 e Project ID: T it Project ID: M An	Original MSD Result 408 171272 //BLP CCF alysis Des	94 • T17I272-0 MS <u>% Rec</u> 103 • RINVEST 60 • scription: Tot	95 MSD % Rec 104 0546383 tal Dissolver	Limit 90-110 % Rec Limit 80-120		RPD	
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride QC Batch: T072093	mg/L DUPLICATE: Units	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405 e Project ID: T it Project ID: M An	Original MSD Result 408 171272 //BLP CCF alysis Des	94 • T17I272-0 MS <u>% Rec</u> 103 • RINVEST 60 • scription: Tot	95 MSD % Rec 104 0546383 tal Dissolver	Limit 90-110 % Rec Limit 80-120		RPD	
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride QC Batch: T072093 QC Batch Method: SM 2540 C-11	mg/L DUPLICATE: Units	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405 e Project ID: T it Project ID: M An	Original MSD Result 408 171272 /BLP CCF alysis Des alysis Met	94 T17I272-0 MS % Rec 103 R INVEST 60 scription: Tol scription: Tol hod: SM 25 Reporting	95 MSD % Rec 104 0546383 tal Dissolver	Limit 90-110 % Rec Limit 80-120		RPD	
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride QC Batch: T072093 QC Batch Method: SM 2540 C-11 METHOD BLANK: T072093-BLK1	mg/L DUPLICATE: Units mg/L	Co 1.0 T071985-M Original Result	nc. 00 SD1 Spike Conc. 200 Trac	Resul <10 MS Result 405 e Project ID: 1 tt Project ID: 1 An An Blank	Original MSD Result 408 171272 /BLP CCF alysis Des alysis Met	94 T17I272-0 MS <u>% Rec</u> 103 R INVEST 60 scription: Tol scription: Tol scription: SM 25	95 MSD % Rec 104 0546383 tal Dissolver	Limit 90-110 % Rec Limit 80-120		RPD	Notes
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride QC Batch: T072093 QC Batch Method: SM 2540 C-11 METHOD BLANK: T072093-BLK1 Parameter Total Dissolved Solids	mg/L DUPLICATE: Units mg/L	Co 1.0 T071985-M Original Result 200	nc. 00 SD1 Spike Conc. 200 Trac	Result <10 MS Result 405 e Project ID: 1 at Project ID: 1 An An An Blank Result	Original MSD Result 408 171272 /BLP CCF alysis Des alysis Met	94 T17I272-0 MS % Rec 103 R INVEST 60 scription: Tot thod: SM 25 Reporting Limit	95 MSD % Rec 104 0546383 tal Dissolver	Limit 90-110 % Rec Limit 80-120		RPD	Notes
Chloride MATRIX SPIKE / MATRIX SPIKE E Parameter Chloride QC Batch: T072093 QC Batch Method: SM 2540 C-11 METHOD BLANK: T072093-BLK1 Parameter	mg/L DUPLICATE: Units mg/L	Co 1.0 T071985-M Original Result 200	nc. 200 SD1 Spike Conc. 200 Trac Clier ke	Result <10 MS Result 405 e Project ID: 1 at Project ID: 1 An An An Blank Result	Original MSD Result 408 171272 ABLP CCF alysis Des alysis Met	94 T17I272-0 MS % Rec 103 R INVEST 60 scription: Tot thod: SM 25 Reporting Limit	95 MSD % Rec 104 0546383 tal Dissolver 540 C-11	Limit 90-110 % Rec Limit 80-120		RPD	Notes

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SAMPLE DUPLICATE: T0720	93-DUP1	Original: T17I	272-05				
Parameter	Units	Original Result	DUP Result		RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	724	780		7	10	
			Trace Project ID Client Project ID	: T17I272 : MBLP CCR INVEST 60546383			
QC Batch: T071632 QC Batch Method: *** DEFAUL	T PREP ***			Analysis Description: pH, SM 4500 Analysis Method: SM 4500-H+ B-11			

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SAMPLE LOG IN CHECKLI	ST
Trace ID #: TITI222 Date: 9-15-17 Package Description Client Name: AFECOM Time: 1/-32	on: <u>CO/P</u> Tepperature: <u>O. 4</u> E/ Logged in by: <u>A</u>
Cooler/samples delivered by: Trace courier Cooler/samples delivered by: Trace courier Hand delivered Name of delivered Commercial courier UPS Tracking Number: Not Applicable Tracking #: Not Applicable	very person: ED EX
Custody seals signed by Client?	al # (if applicable):
Slurry w/ crushed, cubed, or chip ice? <u>Correction Factors:</u> •Digital St	k Thermometer)
General Yes No NA	Comments
All bottles arrived unbroken with labels in good condition?	*
Notes:	*EMD pH Test Strips Used: pH 0-2.5 pH 11.0-13.0 Lot: HC563733 Lot: HC547328 Other:

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October 13, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE: Trace ID: T17I272

Dear Mr. Lindberg:

Enclosed are your analytical results associated with your project for MBLP CCR INVEST 60546383. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from Summit Environmental Technologies.

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





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SAM	PLE LOG II	N CH	IECKLIST		
Trace ID #: <u>T17722</u> Date: Client Name: <u>AFECOM</u>	9- <i>15</i> -17 Time:		ge Description: // - 3 <i>c/</i>	Logged in by:	Temperature:4
			-		
	Cooler F	Rece	eipt		
	Trace courier				
	Ind delivered		ame of delivery		
Comme	rcial courier	UP		EX <u>र</u> US Mail	
Tracking Number:	Not Applicable	•			
	Tracking #:				
	Not Applicable			es	
Custody seals signed by Client?	No Yes	Clier	t custody seal #	# (if applicable): -	
	Coolant and T	ſemp			
	Correction For			Temperature	0.010
Slurry w/ crushed, cubed, or chip ice?	Correction Fac	tors:	_	Thermometer CF = -	0.6°C
Multiple bags of ice around samples?	Depresentativ	. Com	•IR Thermom ole Temperature	eter CF = -0.4° C	•••••
No Coolant Present:	Representative		o Blank (Stick T		°C (check one below)
ce still present upon receipt (circle one):			t Sample (IR Th		
Yes) No N/A	ا∟ Melt Water:	Unicit	\cap	Use Digital Stick The	rmometer)
			.010		
	Gene	eral			
	Yes No	NA		Comment	s
All bottles arrived unbroken with labels in good con	dition?				
Each sample point is in a sealed plasti	c bag?				
Labels filled out comp	letely?				
All bottle labels agree with Chain of Custody (coc)?				
Sufficient sample to run tests requ					
pH checked and samples at corre			See Below*		
Correct preservative added to sar			-		
Air bubbles absent from V		ĽЩ	(.		
COC filled out properly and signed by COC signed in by TRACE sample cust					
Was project manager called and samples discu		H	·		· · · · · · · · · · · · · · · · · · ·
			Γ		
Notes:				<u>*EMD pH Test S</u>	
· · · · · · · · · · · · · · · · · · ·				pH 0-2.5 Lot: HC563733	pH 11.0-13.0 Lot: HC547328
				Other:	
				_ot: HC563733 verified 6/2	1/16 AY
				ot: HC574761 verified 04/	
Form 70-A.21				TRACE Analyti	cal Laboratories, Inc.
Effective 7/5/17					

CERTIFICATE OF ANALYSIS



October 09, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17I272

Dear Jon Mink:

Order No.: 17091007

Summit Environmental Technologies, Inc. received 7 sample(s) on 9/19/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

tally Slow

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891



Case Narrative

WO#: 17091007 Date: 10/9/2017

CLIENT: Trace Analytical Laboratories, Inc. **Project:** T17I272

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.



Dilution Factor

DF

Summit Environmental Technologies, In 3310 Win S Cuyahoga Falls, Ohio 4422 TEL: (330) 253-8211 FAX: (330) 253-448 Website: <u>http://www.settek.co</u>

Qualifiers and Acronyms

WO#:17091007Date:10/9/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but w						
J	The reported value is greater than the I	Method Dete	ection Limit but less than the Reporting Limit.				
Н	The hold time for sample preparation a						
D	The result is reported from a dilution.	-					
Е		the calibrat	tion or is estimated due to interference.				
MC	The result exceeded the linear range of the calibration or is estimated due to interference. The result is below the Minimum Compound Limit.						
*	The result is below the Minimum Compound Limit. The result exceeds the Regulatory Limit or Maximum Contamination Limit.						
m	Manual integration was used to determine the area response.						
d	Manual integration in which peak was deleted						
u N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.						
P	The second column confirmation exce						
r C	The result has been confirmed by GC/		merence.				
x	J						
	The result was not confirmed when GO		sis was performed.				
B/MB+	The analyte was detected in the associa		1.4				
G	The ICB or CCB contained reportable		analyte.				
QC-/+	The CCV recovery failed low (-) or his						
R/QDR	The RPD was outside of accepted reco						
QL-/+	The LCS or LCSD recovery failed low						
QLR	The LCS/LCSD RPD was outside of a						
QM-/+	The MS or MSD recovery failed low (
QMR	The MS/MSD RPD was outside of acc		ery limits.				
QV-/+	The ICV recovery failed low (-) or high (+).						
S	The spike result was outside of accepted recovery limits.						
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for						
	additional information						
Acronyn	ns						
ND	Not Detected	RL	Reporting Limit				
QC	Quality Control	MDL	Method Detection Limit				
MB	Method Blank	LOD	Level of Detection				
LCS	Laboratory Control Sample LOQ Level of Quantitation						
LCSD	Laboratory Control Sample Duplicate PQL Practical Quantitation Limit						
QCS	Quality Control Sample CRQL Contract Required Quantitation Limit						
DUP	Duplicate PL Permit Limit						
MS	Matrix Spike	RegLvl	Regulatory Limit				
MSD	Matrix Spike Duplicate	MCL	Maximum Contamination Limit				
RPD	Relative Percent Different	MinCL	Minimum Compound Limit				
ICV ICP	Initial Calibration Verification	RA RE	Reanalysis				
ICB CCV	Initial Calibration Blank Continuing Calibration Verification	KE TIC	Reextraction Tentatively Identified Compound				
CCB	Continuing Calibration Vermication	RT	Retention Time				
RLC	Reporting Limit Check	CF	Calibration Factor				
KLC DE	Reporting Linit Check						

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Response Factor

RF

Original



Workorder Sample Summary

WO#: **17091007** *09-Oct-17*

CLIENT:Trace Analytical Laboratories, Inc.Project:T17I272

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17091007-001	T17I272-01		9/14/2017 10:15:00 AM	9/19/2017 10:20:00 AM	Aqueous
17091007-002	T17I272-02		9/14/2017 10:50:00 AM	9/19/2017 10:20:00 AM	Aqueous
17091007-003	T17I272-03		9/14/2017 11:30:00 AM	9/19/2017 10:20:00 AM	Aqueous
17091007-004	T17I272-04		9/14/2017 1:55:00 PM	9/19/2017 10:20:00 AM	Aqueous
17091007-005	T17I272-05		9/14/2017 1:00:00 PM	9/19/2017 10:20:00 AM	Aqueous
17091007-006	T17I272-06		9/14/2017	9/19/2017 10:20:00 AM	Aqueous
17091007-007	T17I272-07		9/14/2017 2:00:00 PM	9/19/2017 10:20:00 AM	Aqueous



Analytical Report

 (consolidated)

 WO#:
 17091007

 Date Reported:
 10/9/2017

Analyses	Result	POI Qual Units Uncertainty DF Date Analyzed
Client Sample II	D: T17I272-01	
Lab ID:	17091007-001	Matrix: AQUEOUS
Project:	T17I272	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/14/2017 10:15:00 AM

Analyses	Result	PQL (Zuai	Units	Uncertaint	y DF L	Jate Analyzed
RADIUM-226 (903.0)					E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.12	1 1	10/7/2017 9:56:00 AM 10/7/2017 9:56:00 AM
RADIUM-228 (904.0)					E904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 1.00	1.00	U	pCi/L	± 0.42	1 1	10/6/2017 2:00:00 PM 10/6/2017 2:00:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17091007

 Date Reported:
 10/9/2017

Analyses	Result	t POL Qual Units Uncertainty DF Date Analyze	d
Client Sample ID	: T17I272-02		
Lab ID:	17091007-002	Matrix: AQUEOUS	
Project:	T17I272		
CLIENT:	Trace Analytical Laboratories, I	Inc. Collection Date: 9/14/2017 10:50:00 AM	

Anaryses	Kesuit	rųl ų	ual Ullus	Uncertaint	y Df L	Jate Analyzeu
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U pCi/L	± 0.11	1	10/7/2017 9:56:00 AM
Yield	1.00				1	10/7/2017 9:56:00 AM
RADIUM-228 (904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.58	1	10/6/2017 2:00:00 PM
Yield	1.00				1	10/6/2017 2:00:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17091007

 Date Reported:
 10/9/2017

Analyses	Result	POL Oual Units Uncertainty DF Date Analyzed
Client Sample ID	: T17I272-03	
Lab ID:	17091007-003	Matrix: AQUEOUS
Project:	T17I272	
CLIENT:	Trace Analytical Laboratories, In	c. Collection Date: 9/14/2017 11:30:00 AM

Anaryses	Kesuit	PQL Q	yuai	Units	Uncertaint	y Dr L	ate Analyzeu
RADIUM-226 (903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.12	1	10/7/2017 9:57:00 AM
Yield	1.00					1	10/7/2017 9:57:00 AM
RADIUM-228 (904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	1.17	1.00		pCi/L	± 0.54	1	10/6/2017 2:00:00 PM
Yield	1.00					1	10/6/2017 2:00:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17091007

 Date Reported:
 10/9/2017

Analyses	Result	POL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	: T17I272-04	
Lab ID:	17091007-004	Matrix: AQUEOUS
Project:	T17I272	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/14/2017 1:55:00 PM

inary ses	Result	TQL	Zuai	Onts	Oncertaint	y DI L	ate Maryzeu
RADIUM-226 (903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.15	1	10/7/2017 9:57:00 AM
Yield	1.00					1	10/7/2017 9:57:00 AM
RADIUM-228 (904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.37	1	10/6/2017 2:01:00 PM
Yield	1.00					1	10/6/2017 2:01:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

ND Not Detected

P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17091007

 Date Reported:
 10/9/2017

Analyses	Result	POL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	: T17I272-05	
Lab ID:	17091007-005	Matrix: AQUEOUS
Project:	T17I272	
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/14/2017 1:00:00 PM

Anaryses	Kesuit	IQL	Zuai	Units	Uncertaint	y DF L	ate Analyzeu
RADIUM-226 (903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.16	1	10/7/2017 9:55:00 AM
Yield	1.00					1	10/7/2017 9:55:00 AM
RADIUM-228 (904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.47	1	10/6/2017 1:59:00 PM
Yield	0.950					1	10/6/2017 1:59:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17091007

 Date Reported:
 10/9/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/14/2017
Project:	T17I272	
Lab ID:	17091007-006	Matrix: AQUEOUS
Client Sample	ID: T17I272-06	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

T Mary Seb	Result	I QL V	zuui	emis	encer tunit	y DI L	Jute Milling Zeu
RADIUM-226 (903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.08	1	10/7/2017 9:57:00 AM
Yield	1.00					1	10/7/2017 9:57:00 AM
RADIUM-228 (904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.35	1	10/6/2017 2:01:00 PM
Yield	1.00					1	10/6/2017 2:01:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17091007

 Date Reported:
 10/9/2017

Analyses	Result	POL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	: T17I272-07	
Lab ID:	17091007-007	Matrix: AQUEOUS
Project:	T17I272	
CLIENT:	Trace Analytical Laboratories, In	c. Collection Date: 9/14/2017 2:00:00 PM

Analyses	Kesuit	IQL	Zuai	Units	Uncertaint	y DI L	ate Analyzeu
RADIUM-226 (903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.11	1	10/7/2017 9:57:00 AM
Yield	1.00					1	10/7/2017 9:57:00 AM
RADIUM-228 (904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.44	1	10/6/2017 2:01:00 PM
Yield	1.00					1	10/6/2017 2:01:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

ND Not Detected

P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



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Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: <u>http://www.settek.com</u>

QC SUMMARY REPORT

WO#: 17091007

09-Oct-17

	Trace Analy T17I272	tical Laboratories, Inc.						BatchID:	29079		
Sample ID: mb-2907	79	SampType: MBLK	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Dat	ie: 10/4/2017	RunNo: 757	737	
Client ID: PBW		Batch ID: 29079	Test	No: E904.0	E903-904		Analysis Dat	te: 10/6/2017	SeqNo: 128	36301	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		ND	1.00		0	0					U
Yield		1.00			0	0					
Sample ID: LCS-290)79	SampType: LCS	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Dat	e: 10/4/2017	RunNo: 757	737	
Client ID: LCSW		Batch ID: 29079	Test	No: E904.0	E903-904		Analysis Dat	te: 10/6/2017	SeqNo: 128	36303	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.35	1.00	5.000	0	87.0	70	130			
Yield		1.00			0	0					
Sample ID: 1709100	7-005aMS	SampType: MS	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Dat	e: 10/4/2017	RunNo: 75 7	737	
Client ID: T17I272-	-05	Batch ID: 29079	Test	No: E904.0	E903-904		Analysis Dat	te: 10/6/2017	SeqNo: 128	36306	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.31	1.00	5.000	0.7826	70.5	70	130			
Yield		1.00			0.9500	0					

Qualifiers:

01

.

- * Value exceeds Maximum Contaminant Level.
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- P Second column confirmation exceeds

- B Analyte detected in the associated Method I
- J Analyte detected below quantitation limits
 - ND Not Detected
 - PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits

Original



QC SUMMARY REPORT

WO#: 17091007

09-Oct-17

Client: Project:	Trace Anal T17I272	ytical Laboratories, Inc.						B	atchID: 2	9079		
Sample ID: mb-2	29079	SampType: MBLK	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Da	ite: 10/4/20	17	RunNo: 756	370	
Client ID: PBW	I	Batch ID: 29079	Test	lo: E904.0	E903-904		Analysis Da	ite: 10/6/20	17	SeqNo: 128	34827	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		ND	1.00		0	0						U
Yield		1.00			0	0						
Sample ID: LCS	-29079	SampType: LCS	TestCoo	de: Radium-2	28_ Units: pCi/L		Prep Da	ite: 10/4/20	17	RunNo: 756	570	
Client ID: LCS	w	Batch ID: 29079	TestN	lo: E904.0	E903-904		Analysis Da	ite: 10/6/20	17	SeqNo: 128	34829	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.88	1.00	5.000	0	97.5	70	130				
Yield		1.00			0	0						

Qualifiers:

Η

* Value exceeds Maximum Contaminant Level.

- B Analyte detected in the associated Method Blank
- Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

P Second column confirmation exceeds

- B Analyte detected in the associated Method I
- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits

Original



QC SUMMARY REPORT

WO#: 17091007

09-Oct-17

Client: Project:	Trace Analy T17I272	tical Laboratories, Inc.		BatchID: 2	9079
Sample ID: mb-29 Client ID: PBW	079	SampType: MBLK Batch ID: 29079	TestCode: Radium-226_ Units: pCi/L TestNo: E903.0 E903-904	Prep Date: 10/4/2017 Analysis Date: 10/7/2017	RunNo: 75751 SeqNo: 1286503
Analyte		Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226 Yield		ND 1.00	1.00		U
Sample ID: Ics-29)79	SampType: LCS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75751
Client ID: LCSW		Batch ID: 29079	TestNo: E903.0 E903-904	Analysis Date: 10/7/2017	SeqNo: 1286504
Analyte		Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226		5.35	1.00 5.000 0	107 70 130	
Sample ID: Icsd-2	9079	SampType: LCSD	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75751
Client ID: LCSS	2	Batch ID: 29079	TestNo: E903.0 E903-904	Analysis Date: 10/7/2017	SeqNo: 1286505
Analyte		Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226		4.78	1.00 5.000 0	95.6 70 130 5.350	11.3 20
Sample ID: 17091(07-005aMS	SampType: MS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75751
Sample ID: 17091(Client ID: T17127		SampType: MS Batch ID: 29079	TestCode: Radium-226_ Units: pCi/L TestNo: E903.0 E903-904	Prep Date: 10/4/2017 Analysis Date: 10/7/2017	RunNo: 75751 SeqNo: 1286508

MC Value is below Minimum Compound Limit.

P Second column confirmation exceeds

ND Not Detected

PL Permit Limit

RSD is greater than RSDlimit 0

RPD outside accepted recovery limits R



QC SUMMARY REPORT

WO#: 17091007

09-Oct-17

Client: Project:	Trace Analy T17I272	tical Laboratories, Inc.						B	atchID: 2	9079		
	091007-005aMS 7I272-05	SampType: MS Batch ID: 29079		de: Radium-2 No: E903.0	26_ Units: pCi/L E903-904		Prep Da Analysis Da	ite: 10/4/20 ite: 10/7/20		RunNo: 757 SeqNo: 128	-	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226		4.75	1.00	5.000	0	95.0	70	130				

Qualifiers:

- * Value exceeds Maximum Contaminant Level.
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- P Second column confirmation exceeds

- B Analyte detected in the associated Method Blank
- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits

Original



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SUBCONTRACT ORDER

T17I272

RECEIVING LABORATORY:

SENDING LABORATORY:

Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 Phone: 231.773.5998 Fax: 231.773.6537 Project Manager: Jon Mink Summit Environmental Technologies, Inc. 3310 Win Street Cuyahoga Falls, OH 44223 Phone :(330) 253-8211 Fax: (330) 253-4489

Sample ID: T171272-01	Aqueous	Sampled: 09/14/17 10:15	
Subcontracted Work	09/22/17 15	:00 09/14/18 10:15	Radium 226/228
Containers Supplied: 1-PL1000 pH <2 w/ HN	O 1-PL1000 p	H <2 w/ HNO	
Sample ID: T17I272-02	Aqueous	Sampled: 09/14/17 10:50	
Subcontracted Work	09/22/17 15	:00 09/14/18 10:50	Radium 226/228
Containers Supplied: 1-PL1000 pH <2 w/ HN0	O 1-PL1000 p	H <2 w/ HNO	
Sample ID: T171272-03	Aqueous	Sampled: 09/14/17 11:30	
Subcontracted Work	09/22/17 15	:00 09/14/18 11:30	Radium 226/228
Containers Supplied: 1-PL1000 pH <2 w/ HN(O 1-PL1000 pl	H <2 w/ HNO	
Sample ID: T171272-04	Aqueous	Sampled: 09/14/17 13:55	
Subcontracted Work	09/22/17 15	:00 09/14/18 13:55	Radium 226/228
Containers Supplied: 1-PL1000 pH <2 w/ HN0	O 1-PL1000 pl	H <2 w/ HNO	
Sample ID: T171272-05	Aqueous	Sampled: 09/14/17 13:00	
Subcontracted Work Containers Supplied:	09/22/17 15		extra Volume for QC
	~9/m	170910	H <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 07-001 007 CSL 9-19-17 1020 Received By Date
(INC) C ST	\bigcirc	Date	Date Date

2241 Black Creek R Muskegon, MI 49444-2		979-4469 Fax trace-labs.com
	SUBCONTRACT ORDER	
	T17I272	

Sample 10. 11/12/2-00	Aqueous Sampled. 09/14/17 00:00	
Subcontracted Work	09/22/17 15:00 09/14/18 00:00	Radium 226/228
Containers Supplied:		
1-PL1000 pH <2 w/ HN0	O 1-PL1000 pH <2 w/ HNO	
Sample ID: T171272-07	Aqueous Sampled: 09/14/17 14:00	
Subcontracted Work	09/22/17 15:00 09/14/18 14:00	Radium 226/228
Containers Supplied:		
1-PL1000 pH <2 w/ HN0	0 1-PL1000 pH <2 w/ HNO	

· · · · · · · · · · · · · · · · · · ·	752 Las 10	0-20016021	
(Kale) Chan	glosme n:00		1
Released By	Date	Received By	

Date

Released	By

Received By

Page 2 of 2

Date

Date

SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

Figure 1 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 1

Ŧ				11
Irace		Initia	als of person	inspecting cooler and samples:
Client:			er Number:	7091007 -
Date Received:Time R	teceived: 102	Q Dat	e cooler(s) o	pened and samples inspected: 2-19-17
Number of Coolers/Boxes:	1	N/A		
Shipper: Fed Ex UPS DHL Airbor	ne US Postal W	alk-in P	ickup Other	
Packaging: Peanuts Bubble Wrap				
Tape on cocler/box:	G	N	N/A	
Custody Seals intact	Y	N	NA	
C-O-C in plastic		N	N/A	
Ice Blue ice	present absent	metted	(N/A)	
Cooler Temperature IR Gun #1602045	12 CFOLOC	Temp:2	1.9.0	N/A
Radiological Testing Instrument serial # Use 1 sheet per sample. If sample is >	35127 Y 100 cpm, the R	N adiologic	N/A Safety Of	(see page 2 for scan results) ffcer must be notified immediately.
C-O-C filled out property	(\mathbf{P})	N	N/A	
Samples in separate bags	Y	N	N/A	
Sample containers intact*	$\overline{\mathbf{v}}$	N	N/A	
*If no, list broken sample(s):				
Sample label(s) complete (ID, date, etc.)	D	N	N/A	
Label(s) agree with C-O-C	Ø	N	N/A	
Correct containers used	T	N	N/A	
ufficient sample received	X	N	N/A	
ufficient sample for QC	Ŷ	(N)	N/A	
amples received within holding time	\$	N	N/A	
o any 40 mL visis contain bubbles** Samples with bubbles ≲6mm are accepta	Y bis. Indicate bub	N bie size W		
as client contacted about samples	Y	N		
il client send new samples	Y	N		,
ent contact:		33 5250		
te/Time:				
ged in by:			7	
mments:		-	-	

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SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

Presente in presente in the	-14)#: WC-03-1174		pH Strip (2.8-4.6) SET#: OES-01-0250 Free DPD packet SET#: OES-01-0290				
	H SET#: OES-02-02	:39					
Disp. Pipette SE							
Sample ID	Test Method	pН	Chlorine (+ or -)	CPM	Comments		
	<u> </u>	Z		35			
2		2		25	40		
3		2		19			
4		2		32			
_5		2		18			
6		2		21			
7		2		19			
					-		
<u> </u>					•••••		
		_					
Permanganate interfe	547, 548, 1, 549, 1, 53	1.2. 1813	methods checked for To				

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Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project					
Laboratory:	Trace Analytical Laboratories and Su	Trace Analytical Laboratories and Summit Environmental Technologies				
Work Order:	T17I537					
Analyses/Method:	Metals (6010B/6020/7470A), Genera Radiological (903.0/904.0)	al Chemistry (300.0/SM 2540C),				
Validation Level:	Level 2					
Prepared by:	Lisa Smith (CEAC)/AECOM	Completed on: 12/29/2017				

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on September 28, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1		28-Sep-17	T17I537-01
MW-2	MS/MSD; Lab Dup for TDS	28-Sep-17	T17l537-02
MW-3		28-Sep-17	T17I537-03
MW-4		28-Sep-17	T17I537-04
MW-5		28-Sep-17	T17I537-05
Dup-092817	FD of MW-1	28-Sep-17	T17I537-06
Equipment Blank		28-Sep-17	T17I537-07

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- Evaluation of Radiochemical Data Usability (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- ✓ Holding times and sample preservation
- ✓ Laboratory blanks and equipment blanks
- ✓ Matrix spike (MS) and/or matrix spike duplicate (MSD) results
- ✓ Laboratory duplicates



- ✓ Laboratory control sample (LCS) results
- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Results were acceptable without qualification. Detailed discussions of the quality control (QC) results are included in the following report.

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.

One equipment blank was associated with the groundwater samples collected. The equipment blank was non-detect with the exception of TDS which was detected at a concentration of 10 mg/L. Groundwater concentrations of TDS were greater than 5 times the equipment blank concentration, and qualifications were not required.



MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Extra sample volume was collected for MS/MSD analysis, and MS/MSD results were provided for sample MW-2 (MS only for radium 226 and 228). MS/MSD recoveries and RPDs were within criteria, with the exceptions listed in the table below. The chloride MS/MSD was reanalyzed with and recoveries and RPDs were in control.

Analyte	MS/MSD % Recovery	Recovery Limits	RPD	RPD Limit	Qualifications			
MW-2:								
Calcium	127/97	75-125	3.8 ^a	20	Sample concentrations were greater			
Chloride	194/185	80-120	5	20	than 4 times the spike concentratio and results were acceptable withou qualification.			
Fluoride	182/128	80-120	35	20	The fluoride result for sample MW-2 was non-detect and was acceptable without qualification.			

^a RPD calculated using sample values as indicated in the analytical method (rather than recoveries, as reported by the laboratory).

Laboratory Duplicates

TDS laboratory duplicate analysis was performed on sample MW-2. The RPD was within the precision limit of 10% and was acceptable.

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample Dup-092817 was collected as a field duplicate of sample MW-1. RPDs were within the 30% limit for groundwater samples, or results were within \pm the reporting limit (RL) and were acceptable.

Analyte	Units	Sample Result	Field Duplicate Result	RPD	RPD Limit
MW-1/Dup-092817:					
Barium	mg/l	0.13	0.13	0	30
Boron	mg/l	0.53	<0.30	±RL	30
Calcium	mg/l	120	120	0	30
Chloride	mg/l	270	270	0	30
Sulfate	mg/l	20	21	4.9	30
Total Dissolved Solids	mg/l	920	990	7.3	30

Sample Results and Quantitation

Results were reported down to the reporting limits.

Dilutions were required for due to high analyte concentration.



pH analysis was performed in the field to ensure that analyses were performed within the required hold time.



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November 07, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE:	Trace Project	T17I537
	Client Project	MBLP CCR 60546383

Dear Mr. Lindberg:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



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SAMPLE SUMMARY

Trace Project ID: Client Project ID:	T17I537 MBLP CCR 60546383				
Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17I537-01	MW-1	Aqueous	ll/djl	09/28/17 10:30	09/29/17 15:03
T17I537-02	MW-2	Aqueous	ll/djl	09/28/17 11:25	09/29/17 15:03
T17I537-03	MW-3	Aqueous	ll/djl	09/28/17 12:25	09/29/17 15:03
T17I537-04	MW-4	Aqueous	ll/djl	09/28/17 13:38	09/29/17 15:03
T17I537-05	MW-5	Aqueous	ll/djl	09/28/17 12:55	09/29/17 15:03
T17I537-06	Dup-092817	Aqueous	ll/djl	09/28/17	09/29/17 15:03
T17I537-07	Equip Blank	Aqueous	ll/djl	09/28/17 14:00	09/29/17 15:03

CERTIFICATE OF ANALYSIS



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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
Ν	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.
NOTE	Samples for valatiles that have been extracted with a water missible solvent were corrected for the

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: T072306-MSD1 Analysis: EPA 6010B						
Calcium	Note 226 : The MS recovery was out of control, resulting in an out of control RPD between the MS and MSD. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.					
Trace ID: T072325-MS1 Analysis: EPA 300.0 Rev. 2.1						
Chloride	Note 211 : The MS and MSD recoveries were out of control high. The result for this analyte, in non-spiked version of the sample, must be considered estimated.					
Trace ID: T072325-MS2 Analysis: EPA 300.0 Rev. 2.1						
Fluoride	Note 211 : The MS and MSD recoveries were out of control high. The result for this analyte, in non-spiked version of the sample, must be considered estimated.					
Trace ID: T17I537-01 Analysis: SM 4500-H+ B-11						
pH	Note Client : The analysis was performed on site at the time of sampling by the client.					
Trace ID: T17I537-02 Analysis: SM 4500-H+ B-11						
pH	Note Client : The analysis was performed on site at the time of sampling by the client.					
Trace ID: T17I537-03						

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Analysis: SM 4500-H+ B-11

рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID:	T17I537-04		
Analysis	s: SM 4500-H+ B-11		
рН		Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID:	T17I537-05		
Analysis	s: SM 4500-H+ B-11		
		Note Client :	The analysis was performed on site at the time of sampling by the



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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

Trace ID: T17I537-01 Sample ID: MW-1			Collected: Received:	09/28/17 10:3 09/29/17 15:0		Matrix:	Aqueou	s	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T072302									
Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072306									
Barium	0.13 mg/L	0.10	1	10/02/17	nws	10/03/17	dtm		
Boron	0.53 mg/L	0.30	1	10/02/17	nws	10/03/17	dtm		
Calcium	120 mg/L	5.0	10	10/02/17	nws	10/03/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/02/17	nws	10/03/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072306									
Antimony	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/02/17	nws	10/09/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/02/17	nws	10/09/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/02/17	nws	10/09/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/02/17	nws	10/09/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325									
Fluoride	<0.10 mg/L	0.10	5	10/03/17	kcs	10/03/17	kcs		
Chloride	270 mg/L	10	100	10/03/17	kcs	10/04/17	kcs		
Sulfate as SO4	20 mg/L	1.0	5	10/03/17	kcs	10/03/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072383

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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383									
Trace ID: T17I537-01 Sample ID: MW-1			Collected: Received:	09/28/17 10: 09/29/17 15:		Matrix:	Aqueou	IS	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	920 mg/L	40	4	10/04/17	nm	10/05/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307									
рН	7.58 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

Trace ID: T17I537-02 Sample ID: MW-2			Collected: Received:	09/28/17 11:2 09/29/17 15:0		Matrix:	Aqueou	S	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T072302									
Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072306									
Barium	<0.10 mg/L	0.10	1	10/02/17	nws	10/03/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/02/17	nws	10/03/17	dtm		
Calcium	58 mg/L	1.0	1	10/02/17	nws	10/03/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/02/17	nws	10/03/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072306									
Antimony	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/02/17	nws	10/09/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/02/17	nws	10/09/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/02/17	nws	10/09/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/02/17	nws	10/09/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325									
Fluoride	<0.10 mg/L	0.10	5	10/03/17	kcs	10/03/17	kcs		
Chloride	65 mg/L	10	50	10/03/17	kcs	10/04/17	kcs		
Sulfate as SO4	21 mg/L	1.0	5	10/03/17	kcs	10/03/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072383

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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383									
Trace ID: T17I537-02 Sample ID: MW-2			Collected: Received:	09/28/17 11:2 09/29/17 15:0		Matrix:	Aqueou	IS	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	350 mg/L	40	4	10/04/17	nm	10/05/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307									
рН	8.07 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

Metal.S, TOTAL Analysis Method: EPA 7470A Batch: T072302 Mercury <0.00020 mg/L 0.00020 1 10/02/17 nws 10/02/17 dtm METALS, TOTAL Analysis Method: EPA 6010B Batch: T072306 Batch: T072306 Batch: T072306 1 10/02/17 nws 10/03/17 dtm Boron <0.30 mg/L 0.30 1 10/02/17 nws 10/03/17 dtm Calcium 67 mg/L 1.0 1 10/02/17 nws 10/03/17 dtm Libium <0.010 mg/L 0.010 1 10/02/17 nws 10/03/17 dtm N Analysis Method: EPA 6020 Batch: T072306 1 10/02/17 nws 10/09/17 dtm N Analysis Method: EPA 6020 Batch: T072306 1 10/02/17 nws 10/09/17 dtm Cadmium <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dtm		IEOUS	Aqueous	Matrix:		09/28/17 12:25 09/29/17 15:03	Collected: Received:			Trace ID: T17I537-03 Sample ID: MW-3
Analysis Method: EPA 7470A Bate:: T072302 Mercury <0.00020 mg/L 0.00020 1 10/02/17 nws 10/02/17 dm< Mercury <0.00020 mg/L 0.00020 1 10/02/17 nws 10/02/17 dm< Mercury <0.00020 mg/L 0.10 1 10/02/17 nws 10/03/17 dm Batim <0.10 mg/L 0.10 1 10/02/17 nws 10/03/17 dm Boron <0.010 mg/L 0.010 1 10/02/17 nws 10/03/17 dm Lithium <0.010 mg/L 0.010 1 10/02/17 nws 10/03/17 dm N Antimony <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dm N Antimony <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dm N Antimony <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dm N Cadnium <0.0010 mg/L 0.0010 1 10/02/17	TES MCI	BY NOTES	BY	ANALYZED	BY	PREPARED	DILUTION	RDL	RESULTS UNITS	PARAMETERS
Batch: T072302 Mercury <0.00020 mg/L 0.00020 1 10/02/17 nws 10/02/17 dtt METALS, TOTAL Statistics Statis Statis Statis										METALS, TOTAL
Mercury <0.00020 mg/L 0.00020 1 1002/17 nws 1002/17 dm METALS, TOTAL Analysis Method: EPA 6010B Batch: 7072306 - - 10002/17 nws 1003/17 dtm Boron <0.010 mg/L										Analysis Method: EPA 7470A
METALS, TOTAL Batich: T072306 Barium <0.10 mg/L 0.10 1 10/02/17 nws 10/03/17 dtm Boron <0.30 mg/L 0.30 1 10/02/17 nws 10/03/17 dtm Calcium 67 mg/L 0.0 1 10/02/17 nws 10/03/17 dtm Lithium <0.010 mg/L 0.010 1 10/02/17 nws 10/03/17 dtm N Anayosis Method: EPA 6020 Batch: 7072306 1 10/02/17 nws 10/09/17 dtm N Ansenic <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dtm Arsenic <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dtm Cadmium <0.0010 mg/L 0.0010 1 10/02/17 nws 10/09/17 dtm Cobalt <0.020 mg/L 0.0010 1 10/02/17 nws 10/09/17 dtm										Batch: T072302
Analysis Method: EPA 6910B Batich: T072306 Solution		.m	dtm	10/02/17	nws	10/02/17	1	0.00020	<0.00020 mg/L	Mercury
Batch: T072306 Barium <0.10 mg/L										METALS, TOTAL
Boron 0.30 mg/L 0.30 1 10/02/17 nws 10/03/17 dtm Calcium 67 mg/L 1.0 1 10/02/17 nws 10/03/17 dtm Lithium <0.010 mg/L 0.010 1 10/02/17 nws 10/03/17 dtm N Analysis Method: EPA 6020 Batch: 7072306 Satch: 7072306 1 10/02/17 nws 10/09/17 dtm N Aratysis Method: EPA 6020 Batch: 7072306 0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dtm Arsenic <0.0020 mg/L 0.0050 1 10/02/17 nws 10/09/17 dtm Beryllum <0.0010 mg/L 0.0010 1 10/02/17 nws 10/09/17 dtm Cobalt <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dtm Lead <0.0020 mg/L 0.0030 1 10/02/17 nws 10/09/17 dtm Selenium <										
Calcium 67 mg/L 1.0 1 10/02/17 nws 10/03/17 dtm Lithium <0.010 mg/L		ım	dtm	10/03/17	nws	10/02/17	1	0.10	<0.10 mg/L	Barium
Lithium < 0.010 mg/L 0.010 1 10/02/17 nws 10/03/17 dtm N Analysis Method: EPA 6020 Batch: 7072306 1 10/02/17 nws 10/09/17 dtm 4 Arsenic < 0.0020 mg/L		ſm	dtm	10/03/17	nws	10/02/17	1	0.30	<0.30 mg/L	Boron
Analysis Method: EPA 6020 Batch: T072306 Antimony <0.0020 mg/L		tm	dtm	10/03/17	nws	10/02/17	1	1.0	67 mg/L	Calcium
Batch: T072306 Antimony <0.0020 mg/L	1	.m N	dtm	10/03/17	nws	10/02/17	1	0.010	<0.010 mg/L	Lithium
Arsenic <0.0050 mg/L 0.0050 1 10/02/17 nws 10/09/17 dtm Beryllium <0.0010 mg/L										•
Beryllium <0.0010 mg/L 0.0010 1 10/02/17 nws 10/09/17 dtm Cadmium <0.0010 mg/L		im	dtm	10/09/17	nws	10/02/17	1	0.0020	<0.0020 mg/L	Antimony
Cadmium <0.0010 mg/L		ſm	dtm	10/09/17	nws	10/02/17	1	0.0050	<0.0050 mg/L	Arsenic
Chromium <0.010 mg/L		ſm	dtm	10/09/17	nws	10/02/17	1	0.0010	<0.0010 mg/L	Beryllium
Cobalt <0.020 mg/L		im	dtm	10/09/17	nws	10/02/17	1	0.0010	<0.0010 mg/L	Cadmium
Lead <0.0030 mg/L		im	dtm	10/09/17	nws	10/02/17	1	0.010	<0.010 mg/L	Chromium
Molybdenum <0.050 mg/L 0.050 1 10/02/17 nws 10/09/17 dtm N Selenium <0.0050 mg/L		im	dtm	10/09/17	nws	10/02/17	1	0.020	<0.020 mg/L	Cobalt
Selenium <0.0050 mg/L		im	dtm	10/09/17	nws	10/02/17	1	0.0030	<0.0030 mg/L	Lead
Thallium <0.0020 mg/L 0.0020 1 10/02/17 nws 10/09/17 dtm WET CHEMISTRY Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325 Image: Toron 10 mg/L 0.10 5 10/03/17 kcs 10/03/17 kcs Fluoride <0.10 mg/L 0.10 5 10/03/17 kcs 10/03/17 kcs	1	im N	dtm	10/09/17	nws	10/02/17	1	0.050	<0.050 mg/L	Molybdenum
WET CHEMISTRY Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325 Fluoride <0.10 mg/L		im	dtm	10/09/17	nws	10/02/17	1	0.0050	<0.0050 mg/L	Selenium
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325 Fluoride <0.10 mg/L		:m	dtm	10/09/17	nws	10/02/17	1	0.0020	<0.0020 mg/L	Thallium
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325 Fluoride <0.10 mg/L										WET CHEMISTRY
Chloride 89 mg/L 10 50 10/03/17 kcs 10/04/17 kcs										-
		cs	kcs	10/03/17	kcs	10/03/17	5	0.10	<0.10 mg/L	Fluoride
		cs	kcs	10/04/17	kcs	10/03/17	50	10	89 mg/L	Chloride
Sulfate as SO4 20 mg/L 1.0 5 10/03/17 kcs 10/03/17 kcs		cs	kcs	10/03/17	kcs	10/03/17	5	1.0	20 mg/L	Sulfate as SO4

Batch: T072383

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ANALYTICAL RESULTS

Trace Project ID: T17I537									
Client Project ID: MBLP CCR 60546383									
Trace ID: T17I537-03		Data	Collected:	09/28/17 12:2	05	Matrix	A	_	
						Matrix:	Aqueou	s	
Sample ID: MW-3		Date	Received:	09/29/17 15:0)3				
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Total Dissolved Solids	440 mg/L	40	4	10/04/17	nm	10/05/17	nm		
Analysis Method: SM 4500-H+ B-11									
Batch: T072307									
рН	8.09 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

Trace ID: T17I537-04 Sample ID: MW-4			Collected: Received:	09/28/17 13:3 09/29/17 15:0		Matrix:	Aqueou	S	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T072302									
Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072306									
Barium	0.12 mg/L	0.10	1	10/02/17	nws	10/03/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/02/17	nws	10/03/17	dtm		
Calcium	160 mg/L	5.0	10	10/02/17	nws	10/03/17	dtm		
Lithium	0.013 mg/L	0.010	1	10/02/17	nws	10/03/17	dtm	N	
Analysis Method: EPA 6020 Batch: T072306									
Antimony	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/02/17	nws	10/09/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/02/17	nws	10/09/17	dtm		
Lead	0.0031 mg/L	0.0030	1	10/02/17	nws	10/09/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/02/17	nws	10/09/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325									
Fluoride	<0.10 mg/L	0.10	5	10/03/17	kcs	10/03/17	kcs		
Chloride	370 mg/L	50	500	10/03/17	kcs	10/04/17	kcs		
Sulfate as SO4	46 mg/L	1.0	5	10/03/17	kcs	10/03/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072383

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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383									
Trace ID: T17I537-04 Sample ID: MW-4			Collected: Received:	09/28/17 13:3 09/29/17 15:0		Matrix:	Aqueou	s	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	1200 mg/L	40	4	10/04/17	nm	10/05/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307									
рН	7.74 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

Trace ID: T17I537-05 Sample ID: MW-5			Collected: Received:	09/28/17 12: 09/29/17 15:		Matrix:	Aqueou	S	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T072302									
Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072306									
Barium	0.11 mg/L	0.10	1	10/02/17	nws	10/03/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/02/17	nws	10/03/17	dtm		
Calcium	120 mg/L	5.0	10	10/02/17	nws	10/03/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/02/17	nws	10/03/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072306									
Antimony	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/02/17	nws	10/09/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/02/17	nws	10/09/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/02/17	nws	10/09/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/02/17	nws	10/09/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325									
Fluoride	<0.10 mg/L	0.10	5	10/03/17	kcs	10/03/17	kcs		
Chloride	190 mg/L	10	100	10/03/17	kcs	10/04/17	kcs		
Sulfate as SO4	18 mg/L	1.0	5	10/03/17	kcs	10/03/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072383

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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383									
Client Project ID: MBLP CCR 60546383									
Trace ID: T17I537-05		Date	Collected:	09/28/17 12:5	55	Matrix:	Aqueou	S	
Sample ID: MW-5		Date	Received:	09/29/17 15:0)3				
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Total Dissolved Solids	2300 mg/L	40	4	10/04/17	nm	10/05/17	nm		
Analysis Method: SM 4500-H+ B-11									
Batch: T072307									
рН	7.54 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

Trace ID: T17I537-06 Sample ID: Dup-092817			Collected: Received:	09/28/17 09/29/17 15:0	03	Matrix:	Aqueou	S	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T072302									
Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072306									
Barium	0.13 mg/L	0.10	1	10/02/17	nws	10/03/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/02/17	nws	10/03/17	dtm		
Calcium	120 mg/L	5.0	10	10/02/17	nws	10/03/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/02/17	nws	10/03/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072306									
Antimony	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/02/17	nws	10/09/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/02/17	nws	10/09/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/02/17	nws	10/09/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/02/17	nws	10/09/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325									
Fluoride	<0.10 mg/L	0.10	5	10/03/17	kcs	10/03/17	kcs		
Chloride	270 mg/L	10	100	10/03/17	kcs	10/04/17	kcs		
Sulfate as SO4	21 mg/L	1.0	5	10/03/17	kcs	10/03/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072383

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ANALYTICAL RESULTS

WET CHEM	ISTRY olved Solids	990 mg/L	40	4	10/04/17	nm	10/05/17	nm		
PARAMETER	S	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
Trace ID: Sample ID:	T17I537-06 Dup-092817			Collected: Received:	09/28/17 09/29/17 15:0	3	Matrix:	Aqueou	S	
Client Project	ID: MBLP CCR 60546383									



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ANALYTICAL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

Trace ID: T17I537-07 Sample ID: Equip Blank			Collected: Received:	09/28/17 14:0 09/29/17 15:0		Matrix:	Aqueou	5	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072302									
Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072306									
Barium	<0.10 mg/L	0.10	1	10/02/17	nws	10/03/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/02/17	nws	10/03/17	dtm		
Calcium	<1.0 mg/L	1.0	1	10/02/17	nws	10/03/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/02/17	nws	10/03/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072306									
Antimony	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/02/17	nws	10/09/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/02/17	nws	10/09/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/02/17	nws	10/09/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/02/17	nws	10/09/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/02/17	nws	10/09/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/02/17	nws	10/09/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/02/17	nws	10/09/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072325									
Fluoride	<0.10 mg/L	0.10	5	10/03/17	kcs	10/03/17	kcs		
Chloride	<10 mg/L	10	5	10/03/17	kcs	10/03/17	kcs		
Sulfate as SO4	<1.0 mg/L	1.0	5	10/03/17	kcs	10/03/17	kcs		

Analysis Method: SM 2540 C-11

Batch: T072383

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ANALYTICAL RESULTS

Sample ID: Equip Blank Date Received: 09/29/17 15:03 PARAMETERS RESULTS UNITS RDL DILUTION PREPARED BY ANALYZED BY NOTES	
	MCL
Trace ID: T17I537-07 Date Collected: 09/28/17 14:00 Matrix: Aqueous	



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QUALITY CONTROL RESULTS

Trace Project ID: T17I537 Client Project ID: MBLP CCR 60546383

QC Batch: T072302	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T072302-BLK1

Parameter	Units		Blank Reporting Result Limit			Notes
Mercury	mg/L		<0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T072302-B	\$1				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00196	98	77-122	

MATRIX SPIKE / MATRIX S	Original: T17I537-02										
Parameter		Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00195	0.00199	97	100	76-123	2	20	
			Trace	Project ID:	T17I537						
			Client	Project ID:	MBLP CCR	60546383					
QC Batch: T072306				Aı	nalysis Deso	cription: Ba	rium, Total				
QC Batch Method: EPA 3015 for Liquids	5 Microwave Assisted Dige	estions		Ar	nalysis Meth	nod: EPA 6	010B				

METHOD BLANK: T072306-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T072306-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.797	90	80-120	
Barium	mg/L	0.889	0.831	93	80-120	
Calcium	mg/L	8.89	8.57	96	80-120	
Lithium	mg/L	0.889	0.882	99	80-120	

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MATRIX SPIKE / MATRIX SPIKE	DUPLICATE:	T072306-M	SD1		Original:	T17I537-0)2				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Boron	mg/L	0.176	0.889	0.910	0.876	83	79	75-125	5	20	
Barium	mg/L	0.0493	0.889	0.940	0.907	100	96	75-125	4	20	
Calcium	mg/L	57.5	8.89	68.8	66.2	127	97	75-125	26	20	226
Lithium	mg/L	0.00557	0.889	0.909	0.910	102	102	75-125	0.06	20	

Trace Project ID: T17I537

Client Project ID: MBLP CCR 60546383

QC Batch: T072306 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Antimony, Total

Analysis Method: EPA 6020

METHOD BLANK: T072306-BLK1

Parameter	Units	Blank Result	Reporting Limit	١
rsenic	mg/L	<0.0050	0.0050	
eryllium	mg/L	<0.0010	0.0010	
admium	mg/L	<0.0010	0.0010	
obalt	mg/L	<0.020	0.020	
nromium	mg/L	<0.010	0.010	
olybdenum	mg/L	<0.050	0.050	
ad	mg/L	<0.0030	0.0030	
ntimony	mg/L	<0.0020	0.0020	
elenium	mg/L	<0.0050	0.0050	
hallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T072306-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0525	94	80-120	
Beryllium	mg/L	0.111	0.0953	86	80-120	
Cadmium	mg/L	0.0278	0.0263	95	80-120	
Cobalt	mg/L	0.889	0.836	94	80-120	
Chromium	mg/L	0.0278	0.0276	99	80-120	
Molybdenum	mg/L	0.889	0.817	92	80-120	
Lead	mg/L	0.0556	0.0527	95	80-120	
Antimony	mg/L	0.0556	0.0511	92	80-120	
Selenium	mg/L	0.0556	0.0518	93	80-120	
Thallium	mg/L	0.0556	0.0530	95	80-120	

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T072306-MSD1 Original: T17I537-02 Spike MS Original MSD

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Arsenic	mg/L	0.00139	0.0556	0.0546	0.0544	96	96	75-125	0.2	20	
Beryllium	mg/L	0	0.111	0.0953	0.0964	86	87	75-125	1	20	
Cadmium	mg/L	0	0.0278	0.0270	0.0267	97	96	75-125	1	20	
Cobalt	mg/L	0.000369	0.889	0.851	0.839	96	94	75-125	1	20	
Chromium	mg/L	0	0.0278	0.0279	0.0282	100	102	75-125	1	20	
Molybdenum	mg/L	0.000869	0.889	0.843	0.865	95	97	75-125	3	20	
Lead	mg/L	0.000486	0.0556	0.0525	0.0521	94	93	75-125	0.7	20	
Antimony	mg/L	0	0.0556	0.0583	0.0599	105	108	75-125	3	20	
Selenium	mg/L	0	0.0556	0.0543	0.0547	98	98	75-125	0.7	20	
Thallium	mg/L	0	0.0556	0.0539	0.0528	97	95	75-125	2	20	
				Project ID: 1 Project ID: 1		8 60546383					
QC Batch: T071726	Analysis Description: Metals Digestion										
QC Batch Method: EPA 200.2				Ar	alysis Met	hod: EPA 2	00.2				
L			Trace	Project ID: 1	F17I537						

	Client Project ID: MBLP CCR 60546383
QC Batch: T072325	Analysis Description: Sulfate
QC Batch Method: IC Prep W	Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T072325-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

METHOD BLANK: T072325-BLK2

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	
Fluoride	mg/L	<0.10	0.10	
Sulfate as SO4	mg/L	<1.0	1.0	

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LABORATORY CONTROL SAMPLE: T072325-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	95	90-110	
Fluoride	mg/L	0.500	0.458	92	90-110	
Sulfate as SO4	mg/L	2.50	2.42	97	90-110	

LABORATORY CONTROL SAMPLE: T072325-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	97	90-110	
Fluoride	mg/L	0.500	0.479	96	90-110	
Sulfate as SO4	mg/L	2.50	2.46	99	90-110	

MATRIX SPIKE / MATRIX	SPIKE DUPLICATE:	T072325-M	SD1		Original:	T17I537-0)2				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Chloride	mg/L	64.7	10.0	84.1	83.2	194	185	80-120	5	20	
Fluoride	mg/L	0	4.00	4.58	3.91	115	98	80-120	16	20	
Sulfate as SO4	mg/L	21.1	30.0	48.9	49.2	92	94	80-120	1	20	

MATRIX SPIKE / MATRIX SPIKE D	UPLICATE:	T072325-M	SD2		Original:	T17I537-0)2				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Chloride	mg/L	64.7	100	174	164	109	100	80-120	9	20	
Fluoride	mg/L	0	40.0	73.0	51.0	182	128	80-120	35	20	
Sulfate as SO4	mg/L	21.1	300	326	314	102	97	80-120	4	20	
				Project ID: 1 Project ID: 1		₹ 60546383	i				
QC Batch: T072383				An							
QC Batch Method: SM 2540 C-11				Ar	nalysis Met	hod: SM 25	540 C-11				

METHOD BLANK: T072383-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

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Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit			Notes
Total Dissolved Solids	mg/L	524	533	102	80-120			
SAMPLE DUPLICATE: T0723	383-DUP1	Original: T17I537-0	2					
Parameter	Units	Original Result	DUP Result			RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	352	380			8	10	
			ce Project ID: T17I537 ent Project ID: MBLP CCR	60546383				
QC Batch: T072307			Analysis Deso	cription: pH, SM 450	0			
QC Batch Method: *** DEFAU	_T PREP ***		Analysis Meth	nod: SM 4500-H+ B	-11			

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Ple	eas		gn	7 4	6	2	2	2	lu .	6	1 9/28/12	Trace Date No. Collected	Project Name: MBLP	4 Day* 3 Day* * Requires	Turnaround Requirements:	Email Address:	Office Phone: 30	City, State, Zip Code: Marcallen	Mailing Address: 1230	Report To: 26	Company Name:	Report Results To:	ANALYT
	1		Released By	1460)	125	1255/		1225	1125	1030	Time Collected	IBLA CC.	Standard 48 Hour 4 Day" 24 Hour 3 Day" * Requires Prior Approval	equirements	lance.lin	6-226-	e: Marco		LANCE 1	ABCON	s To:	
		l'al	1 1	EQUIP	DUP-0	NW-2	MW -S	MW -4	MW 3	MW -2	MW-1		R INVEST.	24 Hour* 24 Hour* 270Val	n	Shagp	2086K	RENE	WILSON SY	LINDSERG	2		ANALYTICAL LABORATORIES, INC.
(4) (4) (4) (4) (4) (4) (4) (4) (4) (4)		75 87	Received By	BLRNK	192817	ms/mso						Client Sample ID	7. 60546383	S = Soil / Soiid W = Water SL = Sludge OJ = Oil	Matrix Key:	lindberg paccon, com	Office Phone: 706-226-4980 Cell Phone: 906-869-06 1 Phone Number	11 49855	Y	8			s, INC.
I stody. the client ackr		2/28/12	Date	¢							Ň	Metals Field	Sampled By:	WI = Wipes LW = Liquid Waste A = Air D = Drinking Water		Billing Email Address:	Phone Number	City, State, Zip Code	Billing Address (if different):	Contact Name:	PO #	Bill To:	Trace Analytical Laboratori 2241 Black Creek Road Muskegon, MI 49444-2673
1 14) Nowledges the term		1200 2)	Time	√ ¥ 3	8	54	V	ω	2	113	16 43	Filtered (Y / N) Matrix Number of Containers Cool HCI	14/054	aste ater		dress:		Code:	(if different):				Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444-2673
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ww.trace-labs.com		Ð	Released By	XXX X	XXX	XXXX	XXX	XXX	XXX	XXX	XXX	CHEDRI SULTAN RADIU	ne] n 2;	2002153 7205 06/328									Phone 231.773.5998 Fax 888.979.4469 www.trace-labs.com
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ent	\langle	Z	Received By												sis Requested		Sampling Time:	MeOH	Soil Volatiles Pres	Checked By:	Logged By:	Trace Use:	$\left[\begin{array}{c} \mathbf{J} \end{array} \right]$
		9/25/1-1	Date									Remarks						Low Level	Soil Volatiles Preserved (circle if applicable):	No	~~		Trace ID No.
		<i>К</i> .	Time			-						ຜ Possible Hea	lith Haz	ards?				Lab	cable):				

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Trace ID #: TTME 537	Date: 9-24-17 Package Description: Oober Temperature: 04
Client Name: <u>A E Com</u>	Time: <u>15</u> : 03 Logged in by: <u>C</u>
	Cooler Receipt
Cooler/samples delivered by:	
	Hand delivered Name of delivery person:
	Commercial courier 🔽 UPS FED EX US Mail
Tracking Number:	: Not Applicable Tracking #: 770874337685
COC Seals present and intact on cooler?	Not Applicable No Yes
Custody seals signed by Client?	
	Coolant and Temperature
Type of Coolant Used	Cooler Temperature
Slurry w/ crushed, cubed, or chip ice	
Multiple bags of ice around samples	
Ice Packs/ Blue Ice	
No Coolant Presen	
Ice still present upon receipt (circle one):	A Melt Water: Client Sample (IR Thermometer)
Ves No N/A	A Melt Water: °C (Use Digital Stick Thermometer)
	General
	General Yes No NA Comments
All bottles arrived unbroken with labels in g	Yes No NA Comments
All bottles arrived unbroken with labels in g Each sample point is in a seale	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of C	Yes No NA Comments good condition?
Each sample point is in a seale Labels filled o All bottle labels agree with Chain of C Sufficient sample to run te	Yes No NA Comments good condition?
Each sample point is in a seale Labels filled o All bottle labels agree with Chain of C Sufficient sample to run te pH checked and samples	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of Cu Sufficient sample to run te pH checked and samples Correct preservative adde	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of Co Sufficient sample to run te pH checked and samples Correct preservative adde Air bubbles abse	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of C Sufficient sample to run te pH checked and samples Correct preservative adde Air bubbles abse COC filled out properly and sig	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of Co Sufficient sample to run te pH checked and samples Correct preservative adde Air bubbles abse	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of Cu Sufficient sample to run te pH checked and samples Correct preservative adde Air bubbles abse COC filled out properly and sig COC signed in by TRACE sam	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of Cu Sufficient sample to run te pH checked and samples Correct preservative adde Air bubbles abse COC filled out properly and sig COC signed in by TRACE sam Was project manager called and sampl	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of Cu Sufficient sample to run te pH checked and samples Correct preservative adde Air bubbles abse COC filled out properly and sig COC signed in by TRACE sam Was project manager called and sampl	Yes No NA Comments good condition?
Each sample point is in a seal Labels filled o All bottle labels agree with Chain of Cu Sufficient sample to run te pH checked and samples Correct preservative adde Air bubbles abse COC filled out properly and sig COC signed in by TRACE sam Was project manager called and sampl	Yes No NA Comments good condition?

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Trace ID #: Da Client Name:ATFCOM	ate: <u>9~24-17</u> F Time:	Package Description (5こ <i>o</i> 3	n: <u>() Stef</u> Temperature: <u>-0.6</u> Logged in by:
	Cooler R	eceipt	
Cooler/samples delivered by:	Trace courier		
	Hand delivered nmercial courier 🖌	Name of delive	
•••••••••••••••••••••••••••••••••••••••	···· <u>····</u> ····························		D EX
Tracking Number:	Not Applicable	107743	37614
COC Seals present and intact on cooler?	Not Applicable		Yes
Custody seals signed by Client?		Client custody sea	
	Coolant and T	omporaturo	
Type of Coolant Used			Temperature
Slurry w/ crushed, cubed, or chip ice?	Correction Fact		< Thermometer CF = -0.6°C
Multiple bags of ice around samples?		•IR Thermor	meter CF = -0_4°C
Ice Packs/ Blue Ice :	Representative	Sample Temperatu	re:°C (check one below)
No Coolant Present:		Temp Blank (Stick	Thermometer)
ce still present upon receipt (circle one):	X	Client Sample (IR 1	Thermometer)
(Yeş No N/A	Melt Water:	None.	C (Use Digital Stick Thermometer)
<u>} /</u>			
	Gener	ral	
	Yes No	ral NA	Comments
All bottles arrived unbroken with labels in good	Yes No		Comments
Each sample point is in a sealed pl	Yes No condition? astic bag?		Comments
Each sample point is in a sealed pl Labels filled out co	Yes No condition?		Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custoo	Yes No condition?		Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custoo Sufficient sample to run tests re	Yes No condition?	NA	Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custoo Sufficient sample to run tests ro pH checked and samples at co	Yes No condition?		Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custoo Sufficient sample to run tests ro pH checked and samples at co Correct preservative added to	Yes No condition?	NA	Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custoo Sufficient sample to run tests ro pH checked and samples at co Correct preservative added to Air bubbles absent fro	Yes No condition?	NA	Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custon Sufficient sample to run tests ru pH checked and samples at co Correct preservative added to Air bubbles absent fro COC filled out properly and signed	Yes No condition?	NA	Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custoo Sufficient sample to run tests ro pH checked and samples at co Correct preservative added to Air bubbles absent fro	Yes No condition?	NA	Comments
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custon Sufficient sample to run tests ru pH checked and samples at co Correct preservative added to Air bubbles absent fro COC filled out properly and signed COC signed in by TRACE samples d Was project manager called and samples d	Yes No condition?	NA	
Each sample point is in a sealed pl Labels filled out or All bottle labels agree with Chain of Custon Sufficient sample to run tests ru pH checked and samples at co Correct preservative added to Air bubbles absent fro COC filled out properly and signed COC signed in by TRACE sample of	Yes No condition?	NA	*EMD pH Test Strips Used:
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custon Sufficient sample to run tests ru pH checked and samples at co Correct preservative added to Air bubbles absent fro COC filled out properly and signed COC signed in by TRACE samples d Was project manager called and samples d	Yes No condition?	NA	* <u>EMD pH Test Strips Used:</u> pH 0-2.5 pH 11.0-13.0
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custon Sufficient sample to run tests ru pH checked and samples at co Correct preservative added to Air bubbles absent fro COC filled out properly and signed COC signed in by TRACE samples d Was project manager called and samples d	Yes No condition?	NA	*EMD pH Test Strips Used: pH 0-2.5 Lot: HC563733 PH 11.0-13.0 Lot: HC547328
Each sample point is in a sealed pl Labels filled out co All bottle labels agree with Chain of Custon Sufficient sample to run tests ru pH checked and samples at co Correct preservative added to Air bubbles absent fro COC filled out properly and signed COC signed in by TRACE samples d Was project manager called and samples d	Yes No condition?	NA	* <u>EMD pH Test Strips Used:</u> pH 0-2.5 pH 11.0-13.0

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231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

November 07, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE: Trace ID: T17I537

Dear Mr. Lindberg:

Enclosed are your analytical results associated with your project for MBLP CCR 60546383. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from Summit Environmental Technologies.

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

Project Name: MBLP CCR INVEST. Report Results To: Trace No. Turnaround Requirements: Please Sign mail Address: Jance, lind ffice Phone: 906-226-4980 Cell Phone: 906-869-06 Phone Number leport To: LANCE LINDSERG 5 5 S ompany Name: RECOM 2 ailing Address: 1230 WILSON 57 a day* , State, Zip Code: Marcavente Standard ANALYTICAL Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads 1/28/12 * Requires Prior Approval Collected 6 Date Time Collected 1030 1255 1466 355 125 □ 48 Hour* □ 24 Hour* LABORATORIES, EQUIP NW-2 MW -5 MW MW NW 008-092812 MW -2 berg paccon, com 4 w -SS4 121 BLANK ZC. executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement. 66546383 $\left(\prod \right)$ Client Sample ID te USU Received By 49853 13 OI = OilS = Soil / Solid SL = Sludge W = Water Matrix Key 2241 Black Creek Road Muskegon, MI 49444-2673 Trace Analytical Laboratories, Inc. 2/28/12 A = Air LW = Liquid Waste Bill To: Sampled By: D = Drinking Water WI = Wipes PO # Billing Email Address: Site Silling Address (if different) Contact Name , State, Zip Code Date CHAIN-OF-CUSTODY RECORD Metals Field 5 2 Filtered (Y / N) 4 2 Matrix 1200 Time 45 Number o 4 P r Container 051 w V S w ŝ 2) HCI Preservation HNO H2SO4 NaOH Feed Other Released By 3 BORONIC ALCOUM T Phone 231.773.5998 www.trace-labs.com Fax 888.979.4469 SI < X 21017 226 1228 3 METRUS (AMACINES) ľ Analysis Requested Received By Soil Volatiles Preserved (circle if a Sampling Time: .ogged By:race Use: hecked By: MeOH Page 7253 Trace ID No. Low Level 129/2 Date Remarks applicable): g, 2.3 Lab Time Possible Health Hazards?

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This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

Trace Analytical Laboratories, Inc.

2241 Black Creek Road

Muskegon, MI 49444-2673



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SAI	MPLE LOG	IN CH	ECKLIST	H-	1
Trace ID #: <u>TINE 537</u> Date Client Name: <u>A E-COM</u>	: <u>]-2]-1</u> 7 	Package e:i5`: a	Description:(3	Logged in by: _	Temperature: <u>_04</u> C/A
Comm	Cooler Trace courier	Na UPS[D t me of delivery pe		
Tracking Number:	Not Applicat	7708 □ N	74337 • • • • • • • • • • • • • • • • • • •	applicable):	
Type of Coolant Used Slurry w/ crushed, cubed, or chip ice? Multiple bags of ice around samples? Ice Packs/ Blue Ice : No Coolant Present: Ice still present upon receipt (circle one): (es) No No N/A	Coolant and	actors: ve Sample	Cooler Ten Digital Stick The IR Thermometer Temperature: Blank (Stick Ther cample (IR Therm	r CF = -0.4° CF = -0.4° CF = -0.4° CF = -0.4° CF = -0.4° CF = -0.4° CF = -0.4° CF = -0.4°	°C (check one below)
All bottles arrived unbroken with labels in good co	Yes No	eral		Comments	;
Each sample point is in a sealed plast Labels filled out com All bottle labels agree with Chain of Custody Sufficient sample to run tests requ pH checked and samples at corre Correct preservative added to sa Air bubbles absent from COC filled out properly and signed by COC signed in by TRACE sample cus Was project manager called and samples disc	pletely?		ee Below*		
Notes:			[]	*EMD pH Test St pH 0-2.5 Lot: HC563733 C Other: C563733 verified 6/21/ C574761 verified 04/03	pH 11.0-13.0 Lot: HC547328
Form 70-A.21 Effective 7/5/17				TRACE Analytica	al Laboratories, Inc.

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231-773-5998 Phone Trace Analytical Laboratories, Inc. 2241 Black Creek Road 888-979-4469 Fax Muskegon, MI 49444-2673 ANALYTICAL LABORATORIES, INC. www.trace-labs.com SAMPLE LOG IN CHECKLIST TETE53 9-24-17 Trace ID #: Date: Package Description: FCOM 15:03 **Client Name:** Time: Logged in by: **Cooler Receipt** Cooler/samples delivered by: Trace courier Hand delivered Name of delivery person: Commercial courier UPS FED EX **US Mail** Not Applicable Tracking Number: Tracking #: COC Seals present and intact on cooler? Not Applicable No lYes Custody seals signed by Client? Client custody seal # (if applicable): No Yes **Coolant and Temperature** Type of Coolant Used **Cooler Temperature** Slurry w/ crushed, cubed, or chip ice? Correction Factors: Digital Stick Thermometer CF = -0.6°C Multiple bags of ice around samples? •IR Thermometer CF = -0.4°C Ice Packs/ Blue Ice : Representative Sample Temperature: °C (check one below) No Coolant Present: Temp Blank (Stick Thermometer) Ice still present upon receipt (circle one): Client Sample (IR Thermometer) Y/eş NON No N/A Melt Water: °C (Use Digital Stick Thermometer) General Yes No NA Comments All bottles arrived unbroken with labels in good condition? Each sample point is in a sealed plastic bag? Labels filled out completely? All bottle labels agree with Chain of Custody (COC)? Sufficient sample to run tests requested? pH checked and samples at correct pH? See Below* Correct preservative added to samples? Air bubbles absent from VOAs? COC filled out properly and signed by client? COC signed in by TRACE sample custodian? Was project manager called and samples discussed? Notes: *EMD pH Test Strips Used: pH 0-2.5 pH 11.0-13.0 С Lot: HC563733 Lot: HC547328 Other: ot: HC563733 verified 6/21/16 AY Lot: HC574761 verified 04/03/17 JS Form 70-A.21 TRACE Analytical Laboratories, Inc. Effective 7/5/17

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October 24, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17I537

Dear Jon Mink:

Order No.: 17100130

Summit Environmental Technologies, Inc. received 7 sample(s) on 10/3/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

fally Slow

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891



Case Narrative

WO#:17100130Date:10/24/2017

CLIENT:Trace Analytical Laboratories, Inc.Project:T17I537

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.



Workorder Sample Summary

WO#: 17100130 24-Oct-17

CLIENT:Trace Analytical Laboratories, Inc.Project:T17I537

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17100130-001	T17I537-01		9/28/2017 10:30:00 AM	10/3/2017 12:50:00 PM	Aqueous
17100130-002	T17I537-02		9/28/2017 11:25:00 AM	10/3/2017 12:50:00 PM	Aqueous
17100130-003	T17I537-03		9/28/2017 12:25:00 PM	10/3/2017 12:50:00 PM	Aqueous
17100130-004	T17I537-04		9/28/2017 1:38:00 PM	10/3/2017 12:50:00 PM	Aqueous
17100130-005	T17I537-05		9/28/2017 12:55:00 PM	10/3/2017 12:50:00 PM	Aqueous
17100130-006	T17I537-06		9/28/2017	10/3/2017 12:50:00 PM	Aqueous
17100130-007	T17I537-07		9/28/2017 2:00:00 PM	10/3/2017 12:50:00 PM	Aqueous



Analytical Report

 (consolidated)

 WO#:
 17100130

 Date Reported:
 10/24/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed					
Client Sample ID	T17I537-01						
Lab ID:	17100130-001	Matrix: AQUEOUS					
Project:	T17I537						
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/28/2017 10:30:00 AM					

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.12	1	10/24/2017 10:26:00 A
Yield	1.00					1	10/24/2017 10:26:00 A
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.47	1	10/23/2017 3:46:00 PM
Yield	1.00					1	10/23/2017 3:46:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100130

 Date Reported:
 10/24/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed					
Client Sample ID	T17I537-02						
Lab ID:	17100130-002	Matrix: AQUEOUS					
Project:	T17I537						
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/28/2017 11:25:00 AM					

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.12	1	10/24/2017 10:26:00 A
Yield	1.00					1	10/24/2017 10:26:00 A
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.32	1	10/23/2017 3:46:00 PN
Yield	1.00					1	10/23/2017 3:46:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100130

 Date Reported:
 10/24/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed					
Client Sample ID	T17I537-03						
Lab ID:	17100130-003	Matrix: AQUEOUS					
Project:	T17I537						
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/28/2017 12:25:00 PM					

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.14	1 1	10/24/2017 10:26:00 A 10/24/2017 10:26:00 A
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 1.00	1.00	U	pCi/L	± 0.37	1 1	10/23/2017 3:47:00 PN 10/23/2017 3:47:00 PN

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100130

 Date Reported:
 10/24/2017

CLIENT:	Trace Analytical Laboratories, Inc	Collection Date: 9/28/2017 1:38:00 PM			
Project:	T17I537				
Lab ID:	17100130-004	Matrix: AQUEOUS			
Client Sample ID	T17I537-04				
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed			

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.15	1 1	10/24/2017 10:26:00 A 10/24/2017 10:26:00 A
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 1.00	1.00		pCi/L	± 0.44	1 1	10/23/2017 3:47:00 PN 10/23/2017 3:47:00 PN

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100130

 Date Reported:
 10/24/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed					
Client Sample ID	T17I537-05						
Lab ID:	17100130-005	Matrix: AQUEOUS					
Project:	T17I537						
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/28/2017 12:55:00 PM					

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.11	1	10/24/2017 10:26:00 A
Yield	1.00					1	10/24/2017 10:26:00 A
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.43	1	10/23/2017 3:47:00 PM
Yield	1.00					1	10/23/2017 3:47:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100130

 Date Reported:
 10/24/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/28/2017		
Project:	T17I537			
Lab ID:	17100130-006	Matrix: AQUEOUS		
Client Sample ID	T17I537-06			
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed		
RADIUM-226 (EF	PA 903.0)	E903.0 E903-904 Analyst: BRD		

Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.08	1 1	10/24/2017 10:23:00 A 10/24/2017 10:23:00 A
RADIUM-228 (EPA 904.0)				I	E904.0	E903-904	Analyst: BRD
Radium-228	1.16	1.00		pCi/L	± 0.4	1	10/23/2017 3:44:00 PN
Yield	1.00					1	10/23/2017 3:44:00 PN

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100130

 Date Reported:
 10/24/2017

CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 9/28/2017 2:00:00 PM					
Project:	T17I537						
Lab ID:	17100130-007	Matrix: AQUEOUS					
Client Sample ID	T17I537-07						
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed					

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.12	1	10/24/2017 10:23:00 A
Yield	1.00					1	10/24/2017 10:23:00 A
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.34	1	10/23/2017 3:44:00 PM
Yield	1.00					1	10/23/2017 3:44:00 PN

Qualifiers:

* Value exceeds Maximum Contaminant Level.

H Holding times for preparation or analysis exceeded

MC Value is below Minimum Compound Limit.

- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



QC SUMMARY REPORT

WO#: 17100130

24-Oct-17

	Trace Analy T17I537	tical Laboratories, Inc.					BatchID: 29323					
Sample ID Ics-29323 Client ID: LCSW		SampType: LCS Batch ID: 29323	TestCode: Radium-228 _ Units: pCi/L TestNo: E904.0 E903-904				e: 10/20/2017 e: 10/23/2017	RunNo: 76386 SeqNo: 1301295				
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit RPD Ref Val	%RPD RPDLimit	Qual		
Radium-228 Yield		3.57 0.720	1.00	5.000	0 0	71.4 0	70	130				
Sample ID 1710013	30-002aMS	SampType: MS	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Date	e: 10/20/2017	RunNo: 76386			
Client ID: T17I537	-02	Batch ID: 29323	Test	No: E904.0	E903-904		Analysis Date	e: 10/23/2017	SeqNo: 1301299			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit RPD Ref Val	%RPD RPDLimit	Qual		
Radium-228 Yield		4.19 1.00	1.00	5.000	0 1.000	83.7 0	70	130				
Sample ID MB-293	23	SampType: MBLK	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Date	e: 10/20/2017	RunNo: 76386			
Client ID: PBW		Batch ID: 29323	Test	No: E904.0	E903-904		Analysis Date	e: 10/23/2017	SeqNo: 1301319			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit RPD Ref Val	%RPD RPDLimit	Qual		
Radium-228 Yield		ND 1.00	1.00		0 0	0 0				U		

- **Qualifiers:**
- * Value exceeds Maximum Contaminant Level.
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- P Second column confirmation exceeds

- J Analyte detected below quantitation limits
- ND Not Detected
- PL Permit Limit

- E Value above quantitation range
- M Manual Integration used to determine
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits

Original



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

QC SUMMARY REPORT

WO#: 17100130

24-Oct-17

Client: Trace Project: T1715	Analytical Laboratories, Inc. 37		BatchID: 2	9323
Sample ID mb-29323	SampType: MBLK	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/20/2017	RunNo: 76391
Client ID: PBW	Batch ID: 29323	TestNo: E903.0 E903-904	Analysis Date: 10/24/2017	SeqNo: 1301383
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226 Yield	ND 1.00	1.00		U
Sample ID Ics-29323	SampType: LCS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/20/2017	RunNo: 76391
Client ID: LCSW	Batch ID: 29323	TestNo: E903.0 E903-904	Analysis Date: 10/24/2017	SeqNo: 1301384
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	5.21	1.00 5.000 0	104 70 130	
Sample ID 17100130-002a	MS SampType: MS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/20/2017	RunNo: 76391
Client ID: T17I537-02	Batch ID: 29323	TestNo: E903.0 E903-904	Analysis Date: 10/24/2017	SeqNo: 1301388
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	8.52	1.00 10.00 0	85.2 70 130	

Qualifiers:

*

- Value exceeds Maximum Contaminant Level.
- В Analyte detected in the associated Method Blank
- Η Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits

Original



Summit Environmental Technologies, In 3310 Win S Cuyahoga Falls, Ohio 4422 TEL: (330) 253-8211 FAX: (330) 253-448 Website: http://www.settek.co.

Qualifiers and Acronyms

WO#: 17100130 Date: 10/24/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

DF

Dilution Factor

U	The compound was analyzed for but w	vas not detec	cted.						
J	The reported value is greater than the	Method Det	ection Limit but less than the Reporting Limit.						
Н	The hold time for sample preparation	and/or analy	sis was exceeded.						
D	The result is reported from a dilution.	2							
Ε		f the calibra	tion or is estimated due to interference.						
MC	The result is below the Minimum Con								
*	The result exceeds the Regulatory Lin	•							
m	Manual integration was used to determ								
d	Manual integration in which peak was								
N			l library search assuming a 1:1 response.						
P	The second column confirmation exce								
Ĉ	The result has been confirmed by GC/								
X	The result was not confirmed when G		sis was performed.						
B/MB									
G	The ICB or CCB contained reportable amounts of analyte.								
QC-/+	The CCV recovery failed low (-) or high (+).								
R/QD	The RPD was outside of accepted recovery limits.								
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).								
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.								
QM-/-	The MS or MSD recovery failed low (-) or high (+).								
QMR									
QV-/+									
Š	The spike result was outside of accept		limits						
Z			ormed; Please refer to the Case Narrative for						
2	additional information	ou wus perio							
Acros									
Acror	Tyms								
ND	Not Detected	RL	Reporting Limit						
QC	Quality Control	MDL	Method Detection Limit						
ŇВ	Method Blank	LOD	Level of Detection						
LCS	Laboratory Control Sample	LOQ	Level of Quantitation						
LCSD	Laboratory Control Sample Duplicate	PQL	Practical Quantitation Limit						
QCS	Quality Control Sample	CRQL	Contract Required Quantitation Limit						
DUP	Duplicate	PL	Permit Limit						
MS	Matrix Spike	RegLvl	Regulatory Limit						
MSD	Matrix Spike Duplicate	MCL	Maximum Contamination Limit						
RPD	Relative Percent Different	MinCL	Minimum Compound Limit						
ICV ICB	Initial Calibration Verification	RA	Reanalysis						
CCV	Initial Calibration Blank Continuing Calibration Verification	RE TIC	Reextraction Tentatively Identified Compound						
CCB	Continuing Calibration Verification Continuing Calibration Blank	RT	Retention Time						
RLC	Reporting Limit Check	CF	Calibration Factor						
NLU	Reporting Linit Check								

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Response Factor

RF

Page 1 of 2	Repeived By Date	Date	Released By
0075	100130-001-0	9/29/17 @ 16:00 Date	Kace Ky
			Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO
	Radium 226/228	10/06/17 15:00 09/28/18 12:55	Subcontracted Work
		Aqueous Sampled: 09/28/17 12:55	Sample ID: T171537-05
		Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Containers Supplied: 1-PL1000 pH <2 w/ HNO
	Radium 226/228	10/06/17 15:00 09/28/18 13:38	Subcontracted Work
		Aqueous Sampled: 09/28/17 13:38	Sample ID: T171537-04
		Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	Containers Supplied: 1-PL1000 pH <2 w/ HNO
	Radium 226/228	10/06/17 15:00 09/28/18 12:25	Subcontracted Work
		Aqueous Sampled: 09/28/17 12:25	Sample ID: T171537-03
-PL1000 pH <2 w/ HNO	Containers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1) 1-PL1000 pH <2 w/ HNO 1-PL1000 J	Containers Supplied: 1-PL1000 pH <2 w/ HNC
	Radium 226/228	10/06/17 15:00 09/28/18 11:25	Subcontracted Work
		Aqueous Sampled: 09/28/17 11:25	Sample ID: T171537-02
		Lontainers Supplied: 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO	1-PL1000 pH <2 w/ HNC
	Radium 226/228	10/06/17 15:00 09/28/18 10:30	Subcontracted Work
		Aqueous Sampled: 09/28/17 10:30	Sample ID: T17I537-01
			Accounting Code:
		ESTLOREEDO	PO# 0929:
	Fax: (330) 253-4489	link	Fax: 231.773.6537 Project Manager: Jon Mink
	Cuyahoga Falls, OH 44223 Phone :(330) 251-8211		Phone: 231.773.5998
9	Summit Environmental Technologies, Inc. 3310 Win Street	tories, Inc.	Trace Analytical Laboratories, Inc. 2241 Black Creek Road
	RECEIVING LABORATORY:	ay:	SENDING LABORATORY:
	T171537	SU	
888-979-4469 Fax www.trace-labs.com	ANALYTICAL LABORATORIES, INC.	-	Muskegon,
231-773-5998 Phone		alytical Laboratories, Inc. 2241 Black Creek Road	Trace Analytical Laboratories, Inc. 2241 Black Creek Road

Hades Store	Sample ID: T171537-06 Aqueous Subcontracted Work 10/06/17 15:0 Containers Supplied: 10/06/17 15:0 Subcontracted Work 10/06/17 15:0 Subcontracted Work 10/06/17 15:0 Subcontracted Work 10/06/17 15:0 I-PL/1000 pH <2 w/ HNO 1-PL1000 pH Dubcontracted Work 10/06/17 15:0 Subcontracted Work 10/06/17 15:0 PL1000 pH <2 w/ HNO 1-PL1000 pH
- 160 -08100 15 - 160 -08100 15 Date Received By Date Received By	Sampl 5:00 15:00 15:00
Received By Received By	ANALYTICAL LABORATORIES, INC. SUBCONTRACT ORDER T171537 09/28/17 00:00 Radium 226/228 09/28/17 14:00 Radium 226/228 09/28/18 14:00 Radium 226/228
Date Date Page 2 of 2	www.trace-labs.com

Page 10 of 12	Logged in by: Comments:	Date/Time:	Client contact	Will client send new samples Y N	Was client contacted about samples Y N	Do any 40 mL vials contain bubbles** Y N **Samples with bubbles <5mm are acceptable. Indicate bubble size if >6mm:	Samples received within holding time Y N N/A	Sufficient sample for QC (Y) N NIA	a	Correct containers used	6	(ID, date, etc.)	"It no, list broken sample(s):	Sample containers intact*	Samples in separate bags Y N N/A	C-O-C filed out property	Radiological Testing Instrument serial #35127 N NA (see page 2 for scan results) Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately	Cooler Temperature IR Gun #16020459 CF2. C Temp. 16.3 °C N	IceBlue ice present absent melted (VA)	Custody Seals intact Y N NA	Tape on cooler/box:	Packaging: Peanuts Bubble Wrap Paper Foam None Other.	Shipper: Fed Ex UPS DHL Airborne US Postal Walk-in Pickup Other		Date Received: 10-3-17 Time Received: 1250 Date contents) ones		Figure 1 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 1	Effective Date: 07/17/17	
				*									/	1			ee page 2 for scan results) If must be notified immediately	NIA						N/A		Initials of person inspecting cooler and samples: A MP	schnologies, Inc. ge 1	F	

SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip (2.8-4.6) SET#: OES-01-0250

pH Strip SET (0-14)#: WC-03-1174

Total DPD packe	Total DPD packet SET#: OES-02-0239	239	Free DPD packet SET#: OES-01-0290	SET#: OES-01	-0290
Disp. Pipette SET#:	T#:				
Sample ID	Toot Mothod				
an and man	DOINGIN 100 1	nd	Chlorine (+ or -)	CPM	Comments
		2		30	
2		2		0	
2		2		Ø	
Ч		2		-0	
S		2		10	
2		١		1	
Je		1		24	
2		2		16	
X					~
×					
				_	

P = Permanganate interference 504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for <u>Total</u> chlorine 552.2 checked for <u>Free</u> chlorine 531.2 pH is checked for ~3.8 (SET# OES-01-0149) 524.2 = pH and Chlorine checked by lab analyst

Page 11 of 12



Data Validation Report

Project:	Marquette Board of Light and Powe	er (MBLP) Project
Laboratory:	Trace Analytical Laboratories and S	Summit Environmental Technologies
Work Order:	T17J162	
Analyses/Method:	Metals (6010B/6020/7470A), Gene Radiological (903.0/904.0)	ral Chemistry (300.0/SM 2540C),
Validation Level:	Level 2	
Prepared by:	Lisa Smith (CEAC)/AECOM	Completed on: 1/2/2018

The groundwater samples listed below were collected by AECOM for the MBLP Combustible Coal Residuals (CCR) Impoundment Groundwater Monitoring Project on October 5, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1	MS/MSD;	5-Oct-17	T17J162-01
	Lab Dup for TDS		
MW-2		5-Oct-17	T17J162-02
MW-3		5-Oct-17	T17J162-03
MW-4		5-Oct-17	T17J162-04
MW-5		5-Oct-17	T17J162-05
Dup-100517	FD of MW-1	5-Oct-17	T17J162-06
Equipment Blank		5-Oct-17	T17J162-07

Data validation activities were conducted with reference to:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017);
- *Evaluation of Radiochemical Data Usability* (United States Department of Energy (1997).

The National Data Validation Functional Guidelines were modified to accommodate the non-CLP methodologies. In the absence of method-specific information, laboratory quality control (QC) limits, was used as appropriate as the basis for validation actions.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody (COC)/sample integrity)
- ✓ Holding times and sample preservation
- ✓ Laboratory blanks and equipment blanks
- ✓ Matrix spike (MS) and/or matrix spike duplicate (MSD) results
- ✓ Laboratory duplicates



- ✓ Laboratory control sample (LCS) results
- ✓ Field duplicate results
- ✓ Sample results and quantitation

The symbol (\checkmark) indicates that no validation qualifiers were applied based on this parameter. The symbol (\checkmark) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

SUMMARY

The data appear valid as reported and may be used for decision making purposes. Results were acceptable without qualification. Detailed discussions of the quality control (QC) results are included in the following report.

DETAILED REVIEW

Data Completeness

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No discrepancies were noted.

Holding Times/Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with temperature and preservation requirements.

Samples were properly preserved and received within temperature requirements. Samples were analyzed within holding times.

Laboratory Method Blanks

Laboratory method blanks are analyzed to assess contamination from laboratory procedures. Method blanks were analyzed at the correct frequency. Analytes were not detected in the method blanks.

One equipment blank was associated with the groundwater samples collected. The equipment blank was non-detect with the exception of TDS which was detected at a concentration of 18 mg/L. Groundwater concentrations of TDS were greater than 5 times the equipment blank concentration, and qualifications were not required.



MS/MSD Results

Matrix spikes are analyzed to determine the effects of sample matrix on the measurement methodology. Extra sample volume was collected for MS/MSD analysis, and MS/MSD results were provided for sample MW-1 (MS only for radium 226 and 228). MS/MSD recoveries and RPDs were within criteria, with the exceptions listed in the table below.

Analyte	MS/MSD % Recovery	Recovery Limits	RPD	RPD Limit	Qualifications
MW-1:					
Calcium	19/-17	75-125	2.3 ^a	20	Sample concentrations were greater than 4 times the spike concentration and results were acceptable without qualification.
Antimony	141/ 114	75-125	21	20	The antimony result for sample MW- 1 was non-detect and was acceptable without qualification.

^a RPD calculated using sample values as indicated in the analytical method (rather than recoveries, as reported by the laboratory).

Laboratory Duplicates

TDS laboratory duplicate analysis was performed on sample MW-1. The RPD was within the precision limit of 10% and was acceptable.

LCS Results

LCSs are analyzed to monitor the accuracy of the analytical method independent of matrix effects. LCSs were analyzed at the correct frequency and were within the laboratory specified QC limits.

Field Duplicate Results

Sample Dup-100517 was collected as a field duplicate of sample MW-1. RPDs were within the 30% limit for groundwater samples, and were acceptable.

		Sample	Field Duplicate		
Analyte	Units	Result	Result	RPD	RPD Limit
MW-1/Dup-100517:					
Barium	mg/l	0.13	0.14	7.4	30
Calcium	mg/l	130	120	8.0	30
Chloride	mg/l	280	270	3.6	30
Sulfate	mg/l	21	21	0	30
Total Dissolved Solids	mg/l	820	880	7.1	30

Sample Results and Quantitation

Results were reported down to the reporting limits.

Dilutions were required for due to high analyte concentration.

pH analysis was performed in the field to ensure that analyses were performed within the required hold time.



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November 13, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE:	Trace Project	T17J162
	Client Project	MBLP CCR 60546383

Dear Mr. Lindberg:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager Enclosures



NJDEP Accreditation No. MI008



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SAMPLE SUMMARY

Trace Project ID: Client Project ID:	T17J162 MBLP CCR 60546383				
Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T17J162-01	MW-1	Ground Water	ll/ncb	10/05/17 09:30	10/06/17 11:31
T17J162-02	MW-2	Ground Water	ll/ncb	10/05/17 11:30	10/06/17 11:31
T17J162-03	MW-3	Ground Water	ll/ncb	10/05/17 12:15	10/06/17 11:31
T17J162-04	MW-4	Ground Water	ll/ncb	10/05/17 14:00	10/06/17 11:31
T17J162-05	MW-5	Ground Water	ll/ncb	10/05/17 14:40	10/06/17 11:31
T17J162-06	Dup-100517	Ground Water	ll/ncb	10/05/17	10/06/17 11:31
T17J162-07	Equipment Blank	Aqueous	ll/ncb	10/05/17 14:00	10/06/17 11:31

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
Ν	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.
NOTE	

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture. Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: T072457-MSD1	
Analysis: EPA 6010B	
Calcium Analysis: EPA 6020	Note 223 : The MS and MSD recoveries and the RPD were out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Antimony	Note 201 : The MS recovery was out of control high, resulting in an out of control RPD between the MS and the MSD. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.
Trace ID: T17J162-01	
Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17J162-02	
Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17J162-03	
Analysis: SM 4500-H+ B-11	
рН	Note Client : The analysis was performed on site at the time of sampling by the client.
Trace ID: T17J162-04	
Analysis: SM 4500-H+ B-11	

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рН	Note Client : client.	The analysis was performed on site at the time of sampling by the
Trace ID: T17J162-05 Analysis: SM 4500-H+ B-11		
pH	Note Client : client.	The analysis was performed on site at the time of sampling by the



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ANALYTICAL RESULTS

Trace Project Client Project		7J162 LP CCR 60546383
Trace ID: Sample ID:	T17J162 MW-1	-01

Trace ID: T17J162-01 Sample ID: MW-1					10/05/17 09:30 10/06/17 11:31		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072526									
Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072457									
Barium	0.13 mg/L	0.10	1	10/10/17	nws	10/13/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/10/17	nws	10/13/17	dtm		
Calcium	130 mg/L	5.0	10	10/10/17	nws	10/13/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072457									
Antimony	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/10/17	nws	10/13/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/10/17	nws	10/13/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/10/17	nws	10/13/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									

Batch: T072469							
Fluoride	<0.10 mg/L	0.10	5	10/09/17	kcs	10/09/17	kcs
Chloride	280 mg/L	10	100	10/09/17	kcs	10/09/17	kcs
Sulfate as SO4	21 mg/L	1.0	5	10/09/17	kcs	10/09/17	kcs

Analysis Method: SM 2540 C-11

Batch: T072440

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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383									
Trace ID: T17J162-01 Sample ID: MW-1			Date Collected: Date Received:		10/05/17 09:30 10/06/17 11:31		Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	820 mg/L	40	4	10/06/17	nm	10/09/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307 pH	7.55 pH Units		1	10/05/17	jm	10/05/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-02 Sample ID: MW-2			Date Collected: Date Received:		10/05/17 11:30 10/06/17 11:31		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T072526									
Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072457									
Barium	<0.10 mg/L	0.10	1	10/10/17	nws	10/13/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/10/17	nws	10/13/17	dtm		
Calcium	61 mg/L	5.0	10	10/10/17	nws	10/16/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072457									
Antimony	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/10/17	nws	10/13/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/10/17	nws	10/13/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/10/17	nws	10/13/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072469									
Fluoride	<0.10 mg/L	0.10	5	10/09/17	kcs	10/09/17	kcs		
Chloride	65 mg/L	10	50	10/09/17	kcs	10/09/17	kcs		
Sulfate as SO4	21 mg/L	1.0	5	10/09/17	kcs	10/09/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072440

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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383									
Trace ID: T17J162-02 Sample ID: MW-2			Date Collected: Date Received:		10/05/17 11:30 10/06/17 11:31		Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	310 mg/L	40	4	10/06/17	nm	10/09/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307 pH	7.99 pH Units		1	10/05/17	jm	10/05/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-03 Sample ID: MW-3			Collected: Received:	10/05/17 12:15 10/06/17 11:31		Matrix: Ground Water			
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072526									
Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072457									
Barium	<0.10 mg/L	0.10	1	10/10/17	nws	10/13/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/10/17	nws	10/13/17	dtm		
Calcium	69 mg/L	5.0	10	10/10/17	nws	10/16/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072457									
Antimony	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/10/17	nws	10/13/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/10/17	nws	10/13/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/10/17	nws	10/13/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072469									
Fluoride	<0.10 mg/L	0.10	5	10/09/17	kcs	10/09/17	kcs		
Chloride	87 mg/L	10	50	10/09/17	kcs	10/09/17	kcs		
Sulfate as SO4	21 mg/L	1.0	5	10/09/17	kcs	10/09/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072440

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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383									
Trace ID: T17J162-03 Sample ID: MW-3		Date Collected: Date Received:		10/05/17 12:15 10/06/17 11:31		Matrix:	Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY Total Dissolved Solids	350 mg/L	40	4	10/06/17	nm	10/09/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307 pH	8.10 pH Units		1	10/05/17	jm	10/05/17	jm	Client, N	

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Report ID: T17J162 TRACE_QC FINAL 11 13 17 1045



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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-04 Sample ID: MW-4			Date Collected: Date Received:		10/05/17 14:00 10/06/17 11:31		Matrix: Ground Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T072526									
Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072457									
Barium	0.10 mg/L	0.10	1	10/10/17	nws	10/13/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/10/17	nws	10/13/17	dtm		
Calcium	120 mg/L	5.0	10	10/10/17	nws	10/13/17	dtm		
Lithium	0.011 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072457									
Antimony	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/10/17	nws	10/13/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/10/17	nws	10/13/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/10/17	nws	10/13/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072469									
Fluoride	<0.10 mg/L	0.10	5	10/09/17	kcs	10/09/17	kcs		
Chloride	380 mg/L	25	250	10/09/17	kcs	10/09/17	kcs		
Sulfate as SO4	43 mg/L	1.0	5	10/09/17	kcs	10/09/17	kcs		
Analysis Method: SM 2540 C-11									

Batch: T072440

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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383									
Trace ID: T17J162-04 Sample ID: MW-4					10/05/17 14:00 10/06/17 11:31		Ground Water		
PARAMETERS RESULTS UNI		RDL	DILUTION	PREPARED BY		ANALYZED	BY NOTES		MCL
WET CHEMISTRY Total Dissolved Solids	1100 mg/L	40	4	10/06/17	nm	10/09/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307 pH	7.70 pH Units		1	10/05/17	jm	10/05/17	jm	Client, N	



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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-05 Sample ID: MW-5			Collected: Received:	10/05/17 14: 10/06/17 11:		Matrix:	Ground	Water		
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL	
METALS, TOTAL										
Analysis Method: EPA 7470A Batch: T072526										
Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws			
METALS, TOTAL										
Analysis Method: EPA 6010B Batch: T072457										
Barium	0.12 mg/L	0.10	1	10/10/17	nws	10/13/17	dtm			
Boron	<0.30 mg/L	0.30	1	10/10/17	nws	10/13/17	dtm			
Calcium	120 mg/L	5.0	10	10/10/17	nws	10/13/17	dtm			
Lithium	0.013 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	Ν		
Analysis Method: EPA 6020 Batch: T072457										
Antimony	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm			
Arsenic	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm			
Beryllium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm			
Cadmium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm			
Chromium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm			
Cobalt	<0.020 mg/L	0.020	1	10/10/17	nws	10/13/17	dtm			
Lead	<0.0030 mg/L	0.0030	1	10/10/17	nws	10/13/17	dtm			
Molybdenum	<0.050 mg/L	0.050	1	10/10/17	nws	10/13/17	dtm	Ν		
Selenium	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm			
Thallium	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm			
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072469										
Fluoride	<0.10 mg/L	0.10	5	10/09/17	kcs	10/09/17	kcs			
Chloride	190 mg/L	10	100	10/09/17	kcs	10/09/17	kcs			
Sulfate as SO4	18 mg/L	1.0	5	10/09/17	kcs	10/09/17	kcs			
Analysis Method: SM 2540 C-11										

Batch: T072440

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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383									
Trace ID: T17J162-05 Sample ID: MW-5		Date Date	10/05/17 14: 10/06/17 11:	Matrix:	Ground	Water			
PARAMETERS RESULTS UNITS		RDL	DILUTION	PREPARED BY		ANALYZED	BY NOTES		MCL
WET CHEMISTRY Total Dissolved Solids	700 mg/L	40	4	10/06/17	nm	10/09/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T072307 pH	7.45 pH Units		1	10/05/17	jm	10/05/17	jm	Client, N	

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Matrix: Ground Water

ΒY

NOTES

MCL

ANALYTICAL RESULTS

Date Collected:

Date Received:

RDL

DILUTION

10/05/17

10/06/17 11:31

PREPARED

ΒY

ANALYZED

Trace Project ID:	T17J162	
Client Project ID:	MBLP CCR 60546383	
Trace ID: T	17J162-06	
Sample ID: D	0up-100517	
PARAMETERS		RESULTS UNITS
METALS, TOTA	L	
Analysis Method	i: EPA 7470A	

Analysis Method: EPA 7470A Batch: T072526								
Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws	
,	J J J J J							
METALS, TOTAL								
Analysis Method: EPA 6010B Batch: T072457								
Barium	0.14 mg/L	0.10	1	10/10/17	nws	10/13/17	dtm	
Boron	<0.30 mg/L	0.30	1	10/10/17	nws	10/13/17	dtm	
Calcium	120 mg/L	5.0	10	10/10/17	nws	10/13/17	dtm	
Lithium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	Ν
Analysis Method: EPA 6020 Batch: T072457								
Antimony	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm	
Arsenic	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm	
Beryllium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm	
Cadmium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm	
Chromium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	
Cobalt	<0.020 mg/L	0.020	1	10/10/17	nws	10/13/17	dtm	
Lead	<0.0030 mg/L	0.0030	1	10/10/17	nws	10/13/17	dtm	
Molybdenum	<0.050 mg/L	0.050	1	10/10/17	nws	10/13/17	dtm	Ν
Selenium	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm	
Thallium	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm	

WET CHEMISTRY

Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072469							
Fluoride	<0.10 mg/L	0.10	5	10/09/17	kcs	10/09/17	kcs
Chloride	270 mg/L	10	100	10/09/17	kcs	10/09/17	kcs
Sulfate as SO4	21 mg/L	1.0	5	10/09/17	kcs	10/09/17	kcs

Analysis Method: SM 2540 C-11

Batch: T072440

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ANALYTICAL RESULTS

WET CHEM	ISTRY olved Solids	880 mg/L	40	4	10/06/17	nm	10/09/17	nm		
PARAMETER	RS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
Trace ID: Sample ID:	T17J162-06 Dup-100517			Collected: Received:	10/05/17 10/06/17 11:3	1	Matrix:	Ground	Water	
Client Project	t ID: MBLP CCR 60546383	}								



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ANALYTICAL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-07 Sample ID: Equipment Blank			Collected: Received:	10/05/17 14:0 10/06/17 11:3		Matrix:	Aqueou	S	
PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCI
METALS, TOTAL									
Analysis Method: EPA 7470A Batch: T072526									
Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
METALS, TOTAL									
Analysis Method: EPA 6010B Batch: T072457									
Barium	<0.10 mg/L	0.10	1	10/10/17	nws	10/13/17	dtm		
Boron	<0.30 mg/L	0.30	1	10/10/17	nws	10/13/17	dtm		
Calcium	<1.0 mg/L	1.0	1	10/10/17	nws	10/13/17	dtm		
Lithium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm	Ν	
Analysis Method: EPA 6020 Batch: T072457									
Antimony	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
Arsenic	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Beryllium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Cadmium	<0.0010 mg/L	0.0010	1	10/10/17	nws	10/13/17	dtm		
Chromium	<0.010 mg/L	0.010	1	10/10/17	nws	10/13/17	dtm		
Cobalt	<0.020 mg/L	0.020	1	10/10/17	nws	10/13/17	dtm		
Lead	<0.0030 mg/L	0.0030	1	10/10/17	nws	10/13/17	dtm		
Molybdenum	<0.050 mg/L	0.050	1	10/10/17	nws	10/13/17	dtm	Ν	
Selenium	<0.0050 mg/L	0.0050	1	10/10/17	nws	10/13/17	dtm		
Thallium	<0.0020 mg/L	0.0020	1	10/10/17	nws	10/13/17	dtm		
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1 Batch: T072491									
Fluoride	<0.10 mg/L	0.10	5	10/10/17	nm	10/10/17	nm		
Chloride	<10 mg/L	10	5	10/10/17	nm	10/10/17	nm		
Sulfate as SO4	<1.0 mg/L	1.0	5	10/10/17	nm	10/10/17	nm		

Analysis Method: SM 2540 C-11

Batch: T072544

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ANALYTICAL RESULTS

Sample ID: Equipment Blank Date Received: 10/06/17 11:31 PARAMETERS RESULTS UNITS RDL DILUTION PREPARED BY ANALYZED	D BY NOTES	MCL
Sample ID: Equipment Blank Date Received: 10/06/17 11:31		
	: Aqueous	



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QUALITY CONTROL RESULTS

Trace Project ID: T17J162 Client Project ID: MBLP CCR 60546383

QC Batch: T072526	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T072526-BLK1

Parameter	Units		Blank Result	Reporting Limit		Notes
Mercury	mg/L		<0.00020	0.00020		
LABORATORY CONTR	OL SAMPLE: T072526-BS	61				
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00204	102	77-122	

MATRIX SPIKE / MATRIX SP	PIKE DUPLICATE: TO	72526-M	ISD1		Original:	T17J162-0	01				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00210	0.00199	105	100	76-123	5	20	
			Trace	Project ID:	T17J162						
			Client	Project ID:	MBLP CCR	60546383					
QC Batch: T072457				Ai	nalysis Dese	cription: Ba	rium, Total				
QC Batch Method: EPA 3015 for Liquids	Microwave Assisted Dig	estions		Ai	nalysis Metł	nod: EPA 6	010B				

METHOD BLANK: T072457-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.30	0.30	
Barium	mg/L	<0.10	0.10	
Calcium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T072457-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	0.889	0.821	92	80-120	
Barium	mg/L	0.889	0.850	96	80-120	
Calcium	mg/L	8.89	8.59	97	80-120	
Lithium	mg/L	0.889	0.840	95	80-120	

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MATRIX SPIKE / MATRIX SPIKE	E DUPLICATE:	T072457-M	SD1		Original:	T17J162-	01				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Boron	mg/L	0.0635	0.889	0.911	0.894	95	93	75-125	2	20	
Barium	mg/L	0.132	0.889	0.976	0.958	95	93	75-125	2	20	
Calcium	mg/L	130	8.89	131	128	19	-17	75-125	2510	20	223
Lithium	mg/L	0.00868	0.889	0.844	0.831	94	93	75-125	2	20	

Trace Project ID: T17J162

Client Project ID: MBLP CCR 60546383

QC Batch: T072457 QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids Analysis Description: Antimony, Total

Analysis Method: EPA 6020

METHOD BLANK: T072457-BLK1

Parameter	Units	Blank Result	Reporting Limit	١
rsenic	mg/L	<0.0050	0.0050	
eryllium	mg/L	<0.0010	0.0010	
admium	mg/L	<0.0010	0.0010	
obalt	mg/L	<0.020	0.020	
nromium	mg/L	<0.010	0.010	
olybdenum	mg/L	<0.050	0.050	
ad	mg/L	<0.0030	0.0030	
ntimony	mg/L	<0.0020	0.0020	
elenium	mg/L	<0.0050	0.0050	
hallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T072457-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.0556	0.0514	92	80-120	
Beryllium	mg/L	0.111	0.110	99	80-120	
Cadmium	mg/L	0.0278	0.0267	96	80-120	
Cobalt	mg/L	0.889	0.907	102	80-120	
Chromium	mg/L	0.0278	0.0288	104	80-120	
Molybdenum	mg/L	0.889	0.881	99	80-120	
Lead	mg/L	0.0556	0.0578	104	80-120	
Antimony	mg/L	0.0556	0.0586	106	80-120	
Selenium	mg/L	0.0556	0.0499	90	80-120	
Thallium	mg/L	0.0556	0.0569	102	80-120	

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		Original	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Result	Result	% Rec	% Rec	Limit	RPD	RPD	Notes
Arsenic	mg/L	0	0.0556	0.0569	0.0533	102	96	75-125	6	20	
Beryllium	mg/L	0.000211	0.111	0.105	0.105	94	94	75-125	0.02	20	
Cadmium	mg/L	0.000113	0.0278	0.0290	0.0270	104	97	75-125	7	20	
Cobalt	mg/L	0.00130	0.889	0.891	0.876	100	98	75-125	2	20	
Chromium	mg/L	0.00276	0.0278	0.0318	0.0324	104	107	75-125	2	20	
Molybdenum	mg/L	0.00439	0.889	0.950	0.928	106	104	75-125	2	20	
ead	mg/L	0	0.0556	0.0572	0.0536	103	97	75-125	6	20	
Antimony	mg/L	0.000760	0.0556	0.0792	0.0642	141	114	75-125	21	20	201
Selenium	mg/L	0	0.0556	0.0601	0.0539	108	97	75-125	11	20	
Fhallium	mg/L	0	0.0556	0.0563	0.0551	101	99	75-125	2	20	
QC Batch: T071726 QC Batch Method: EPA 200.2					alysis Meth	nod: EPA 2	tals Digestic	n 			
QC Batch: T072469 QC Batch Method: IC Prep W				An	alysis Des	cription: Sul	fate 00.0 Rev. 2.	1			
METHOD BLANK: T072469-BLK	(1										
	Units			Blank Result	F	Reporting Limit					Notes
Parameter						10					
Parameter Chloride	mg/L			<10		10					
Chloride	mg/L mg/L			<10 <0.10		0.10					
Chloride Fluoride	-		•								
	mg/L mg/L	-BS1	•	<0.10		0.10					

Parameter	Units	Conc.	Result	% Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	94	90-110	
Fluoride	mg/L	0.500	0.458	92	90-110	
Sulfate as SO4	mg/L	2.50	2.41	96	90-110	

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Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Fluoride	mg/L	0	4.00	4.03	4.13	101	103	80-120	2	20	
Sulfate as SO4	mg/L	20.6	30.0	49.0	49.1	95	95	80-120	0.3	20	
MATRIX SPIKE / MATRIX SPIK	E DUPLICATE:	T072469-MS	D2		Original:	T17J162-	01				
Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Chloride	mg/L	275	200	466	466	95	95	80-120	0.2	20	
				Project ID:T Project ID:N		8 60546383					
QC Batch: T072491			0.0000	-		cription: Flu	oride				
QC Batch Method: IC Prep W					-	-	00.0 Rev. 2	.1			
METHOD BLANK: T072491-BL	K1										
Parameter	Units			Blank Result		Reporting					Notes
	mg/L			<10		Limit 10					
Chloride	IIIQ/L										
Fluoride	-		<	<0.10		0.10					
	mg/L mg/L			<0.10 <1.0		0.10 1.0					
Fluoride	mg/L mg/L	BS1									
Fluoride Sulfate as SO4	mg/L mg/L	BS1 Spik Conc	e		t			% Rec Limit			Notes
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM	mg/L mg/L MPLE: T072491-	Spik	e 2.	<1.0	t	1.0 LCS					Notes
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM Parameter	mg/L mg/L MPLE: T072491- Units	Spik Conc	e 2.)	<1.0 LCS Resul		1.0 LCS % Re		Limit			Notes
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM Parameter Chloride	mg/L mg/L MPLE: T072491- Units mg/L	Spik Cond 1.00	e 2.) 0	<1.0 LCS Resul <10		1.0 LCS % Re 94		Limit 90-110			Notes
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM Parameter Chloride Fluoride	mg/L mg/L MPLE: T072491- Units mg/L mg/L	Spike Cond 1.00 0.50	e 2.) 0) Trace F	<1.0 LCS Resul <10 0.461	- 17J162	1.0 LCS % Re 94 92 96		Limit 90-110 90-110			Notes
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM Parameter Chloride Fluoride	mg/L mg/L MPLE: T072491- Units mg/L mg/L	Spike Cond 1.00 0.50	e 2.) 0) Trace F	<1.0 LCS Resul <10 0.461 2.41 Project ID: T Project ID: N	17J162 IBLP CCF	1.0 LCS % Re 94 92 96 8 60546383		Limit 90-110 90-110 90-110			Notes
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM Parameter Chloride Fluoride Sulfate as SO4	mg/L mg/L MPLE: T072491- Units mg/L mg/L mg/L	Spike Cond 1.00 0.50	e 2.) 0) Trace F	<1.0 LCS Resul <10 0.461 2.41 Project ID: T Project ID: N An	17J162 IBLP CCF alysis Des	1.0 LCS % Re 94 92 96 8 60546383	al Dissolved	Limit 90-110 90-110 90-110			Notes
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM Parameter Chloride Fluoride Sulfate as SO4 QC Batch: T072440	mg/L mg/L MPLE: T072491- Units mg/L mg/L mg/L	Spike Cond 1.00 0.50	e 2.) 0) Trace F	<1.0 LCS Resul <10 0.461 2.41 Project ID: T Project ID: N An	17J162 IBLP CCF alysis Des	1.0 LCS % Re 94 92 96 8 60546383 cription: Tot	al Dissolved	Limit 90-110 90-110 90-110			Notes
Fluoride Sulfate as SO4 Parameter Chloride Fluoride Sulfate as SO4 QC Batch: T072440 QC Batch Method: SM 2540 C-1	mg/L mg/L MPLE: T072491- Units mg/L mg/L mg/L	Spike Cond 1.00 0.50	e 2.) O Client F Client F	<1.0 LCS Resul <10 0.461 2.41 Project ID: T Project ID: N An	17J162 1BLP CCF alysis Des alysis Met	1.0 LCS % Re 94 92 96 8 60546383 cription: Tot	al Dissolved	Limit 90-110 90-110 90-110			
Fluoride Sulfate as SO4 LABORATORY CONTROL SAM Parameter Chloride Fluoride Sulfate as SO4 QC Batch: T072440 QC Batch Method: SM 2540 C-1: METHOD BLANK: T072440-BL	mg/L mg/L MPLE: T072491- Units mg/L mg/L mg/L	Spike Cond 1.00 0.50	e 2.) Trace F Client F E R	<1.0 LCS Resul <10 0.461 2.41 Project ID: T Project ID: M An An	17J162 1BLP CCF alysis Des alysis Met	1.0 LCS % Re 94 92 96 R 60546383 cription: Tot hod: SM 25 Reporting	al Dissolved	Limit 90-110 90-110 90-110			
Fluoride Sulfate as SO4 ABORATORY CONTROL SAM Parameter Chloride Fluoride Sulfate as SO4 QC Batch: T072440 QC Batch Method: SM 2540 C-1 METHOD BLANK: T072440-BL Parameter	mg/L mg/L MPLE: T072491- Units mg/L mg/L 1 1 LK1 Units mg/L	Spik Conc 1.00 0.50 2.50	e 2.) Trace F Client F E R	<1.0 LCS Resul <10 0.461 2.41 Project ID: T Project ID: M An An Blank Result	17J162 1BLP CCF alysis Des alysis Met	1.0 LCS % Re 94 92 96 8 60546383 cription: Tot hod: SM 25 Reporting Limit	al Dissolved	Limit 90-110 90-110 90-110			Notes



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Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit			Notes
Total Dissolved Solids	mg/L	515	507	98	80-120			
SAMPLE DUPLICATE: T072440-DI	UP1	Original: T17J162-	01					
Parameter	Units	Original Result	DUP Result			RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	816	892			9	10	
		Tra	ce Project ID: T17J16	52				
		Clie	ent Project ID: MBLP	CCR 60546383				
QC Batch: T072544			Analysis	Description: Total Disso	lved Solids			
QC Batch Method: SM 2540 C-11			Analysis	Method: SM 2540 C-11				
METHOD BLANK: T072544-BLK1								
METHOD BLANK: T072544-BLK1	Units		Blank Result	Reporting				Notes
	Units mg/L			Reporting Limit 10				Notes
Parameter	mg/L	-BS1	Result	Limit				Notes
Parameter Fotal Dissolved Solids	mg/L	- BS1 Spike Conc.	Result	Limit	% Rec Limit			Notes
Parameter Total Dissolved Solids LABORATORY CONTROL SAMPL Parameter	mg/L E: T072544	Spike	Result <10 LCS	Limit 10 LCS				
Parameter Total Dissolved Solids LABORATORY CONTROL SAMPL	mg/L E: T072544 Units	Spike Conc. 527 Tra	Result <10 LCS Result	Limit 10 LCS % Rec 106	Limit			
Parameter Total Dissolved Solids	mg/L E: T072544 Units	Spike Conc. 527 Tra	Result <10 LCS Result 556 Ice Project ID: T17J16 ent Project ID: MBLP	Limit 10 LCS % Rec 106	Limit 80-120			

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Please S	Sign			6		M	c	2	لو	- 12	Trace No. C	Project Na	X Standard 4 Day* 3 Day* * Requires	Turnsround	Email Addre	Office Phone:	City, State, 2	Mailing Address:	Report To:	Company Na	Report Re	ANA	
have the second this Cha	Released By Received By	1	V 1400 Earlenow BLANK	- DUP-100512	093 Mm-1 MS/MSD	1440 MM-S	1400 MM-4	E-MW SICI	1 1130 111 -2	1-111 0593 (1/2/01	Date Time Client Sample ID Client Sample ID	Project Name: HIBLIP CCL INVEST 60546383	Hour	Turnaround Boquirements: Matrix Kev:		Cell Phone:	×	· ·	Report To: LANCE LINDBERG	Company Name: AECOH	Report Results To:	ANALYTICAL LABORATORIES, INC.	
of Custody, the client acknowledges the terms as set forth at www.trace-la	101/10 1700 2)			51					11143111 XXXXX	1 W 93 U XXXXXX	Motals Field Filtered (Y / N Matrix Number of Containers Cool HCI HNO3 HSCA NaOH Other BORDI CHION SCLOMI RADIC	Sampled By: 22/NCB	Solid WI = Wipes Pr LW = Liquid Waste Ige A = Air D = Drinking Water ALC JUMA PROVINCE PROVINE PROVINCE PROVINE PROVINCE PROVINCE PROVI		Billing Email Address:	Phone Number:	City, State, Zip Code:	Billing Address (if different):	Contact Name:	PO# 60546383	Bill To:	Trace Analytical Laboratories, Inc.Phone 231.773.59982241 Black Creek RoadFax 888.979.4469Muskegon, MI 49444-2673www.trace-labs.com	CHAIN-OF-CUSTODY RECORD
nent.	(1/27 10/6/1-1 11:3)	Received By Date Time									Remarks		anade?	Analysis Requested		Sampling Time:		Preser	Checked By: UT	Logged By	Trace Use:		Page oi

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

Pleas	e Sig	gn			1		1.1						Trace No.	Project Name:	002	Turnard	Email Address:	Office Phone:	City, Statu	Mailing Address:	Report To	Company	Report	₽ _	
	X	0			<		-				-	21/5/01			De verman 4 Dey 22 3 Dey • Requires Prior Approval	Turnaround Requirements:	dress:	one:	e, Zip Code		Report To: LANCE	Company Name: ACCOM	Report Results To:		
12	24	Released By			1400	1	093D	1440	1400	SICI	1130	6930	Time Collected	H0100	hior Appro	quireme			SUM	1230		rea	To:		1
/	M N	By/ 1A		•	EBURAN	8010-10	NW-1 +	HW-5	HW-4	MW-3	MW-2	MW-1		CCA INVEST	aroval 24 Hour	. .		Cell	City, State, Zip Code: A APACL SETTE, 141	willson st	LINDBERG	24		ANALYTICAL LABORATORIES, INC.	111
ŝ	Fed A	Received By		0.000000	SLANK	loosis	MS/MSD						Client Sample ID	- 60546383	s - son / son W = Water SL = Sludge OI = Oil	Matrix Key:	-	Cell Phone:	1 49866	0.025					
of Custody, the client a	16	Date						,						Sampled By:	pe A = Air D = Drinking Water		Billing Email Address:	Phone Number	City, State, Zip Code:	Billing Addr	Contact Name:	PO#	Bill To:	Trace Analy 2241 Black Muskegon,	옃
acknowledges the ta	1700	Time			JV443	143	1.154	43	473	43	143	1W43	Metals Field Filtered (Y / N) Matrix Number of Containers Cool	x LL/NCB	l Waste) Water	-	i Address:	ber.	Zip Code:	Billing Address (if different):	ne:	60546		Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444-2673	CHAIN-OF-CUSTODY RECORD
4) erms as set forth a	2) Fed	Re				1	/ 1		1 1	1 0			HCI HNO3 H ₂ SO4 NaOh Other	6	Y							383		es, Inc.	ODY RECOR
t www.trace-labs	F	Released By			XXXX	XXX	XXX	XXX		XX	XX	(X X)	BORON CHIORI SULJEAT	$\frac{1}{\epsilon}$	ELUDAIDE	7-1								Phone 231.773.5998 Fax 888.979.4469 www.trace-labs.com	e
.com/terms-of-ag	2		ć		KX X	× X		XX	XX	XX	X	XX	RADIU MEMA	~ : - 5 (anacres	A								Phone 231.773.5998 Fax 888.979.4469 www.trace-labs.com	
Pennent.	· Kerl	Received By														Analysis Request		Sampling Time:	MeOH	Soli Volatiles	Checked By:	Logged By: -	Trace Use:		
	10/10/	Date											R			sted		18	Low Level	Soil Volatiles Preserved (circle if applicable);	E17	た	*	Trace ID No.	Page/
	51	Time	1										Remarks Possible Hea	Ith Max					Lab	applicable):				, No.	_ot /

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE LOG IN CHECH	KLIST
Trace ID #: 1775162 Date: 10/2/17 Package Desc Client Name: AECOM Time: 11:3)	cription: <u>Corler</u> Temperature: <u>-0, 9</u> Logged in by: <u>TS</u>
Commercial courier UPS Tracking Number: Not Applicable Tracking #: <u>7764</u> 31 COC Seals present and intact on cooler? Not Applicable No	f delivery person; FED EX US Mail 38 9855 Yes dy seal # (if applicable):
Coolant and Temperatu Type of Coolant Used	Ire Cooler Temperature
Slurry w/ crushed, cubed, or chip ice? Correction Factors: •Digi Multiple bags of ice around samples? •IR T Ice Packs/ Blue Ice : Representative Sample Terr No Coolant Present: Temp Blank Ice still present upon receipt (circle one): Client Sample	tal Stick Thermometer CF = -0.2°C hermometer CF = -0.5°C hperature: °C (check one below) ((Stick Thermometer) ble (IR Thermometer)
Yes No N/A Melt Water:	✓ °C (Use Digital Stick Thermometer)
Yes No NA All bottles arrived unbroken with labels in good condition?	Comments
Notes:	*EMD pH Test Strips Used: pH 0-2.5 pH 11.0-13.0 Lot: HC573059 Other:
Form 70-A.22 Effective 10/2/17	TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAM	PLE LOG IN CHECKLIS	т
Trace ID #:」「フー」「ピン Date:	101017 Package Description	: <u>Covler</u> Temperature: -0,9
Client Name: AECom	Time: 10-36	Logged in by: JS
Cooler/samples delivered by: T	Cooler Receipt	
	nd delivered Name of deliver	ery person:
Comme	cial courier UPS FE	D EX US Mail
Tracking Number:	Not Applicable	
	racking #: <u>7704</u> 5225 5	126
		Yes
Custody seals signed by Client?	o Yes Client custody sea	# (if applicable):
	oolant and Temperature	
Type of Coolant Used	-	Temperature
Slurry w/ crushed, cubed, or chip ice?		
Multiple bags of ice around samples? •IR Thermometer CF = -0.5°C Ice Packs/ Blue Ice : Representative Sample Temperature: 2.3 °C (check one below)		
ce still present upon receipt (circle one):	Client Sample (IR	Thermometer)
Xes No N/A	Melt Water: None	C (Use Digital Stick Thermometer)
	General Yes No NA	Commente
All bottles arrived unbroken with labels in good cond	٥	Comments
Each sample point is in a sealed plastic		
Labels filled out compl	etely?	
All bottle labels agree with Chain of Custody (C	oc)? 🔀 🗖 🗖 🔤 🔤	
Sufficient sample to run tests reque	sted? 🔀 🔲 🦳	
pH checked and samples at correct pH?		
Correct preservative added to same	ples? 🔼 🔛 🖵 💷	
Air bubbles absent from V		
COC filled out properly and signed by c		
COC signed in by TRACE sample custo Was project manager called and samples discu		
Notes:		*EMD pH Test Strips Used:
		□ DH 11.0-13.0 Lot: HC573059 □ DH 11.0-13.0 Lot: HC547328
Form 70-A.22		TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

November 13, 2017

Mr. Lance Lindberg AECOM 1230 Wilson Marquette, MI 49855

Phone: (906) 226-4980 Fax: (906) 226-8371

RE: Trace ID: T17J162

Dear Mr. Lindberg:

Enclosed are your analytical results associated with your project for MBLP CCR 60546383. The results of this report relate only to the samples listed in the body of this report.

The results were obtained from Summit Environmental Technologies.

Thank you for working with Trace. If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink Senior Project Manager

Enclosures





231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

Please	Sig	311		7 4							15/01	Trace Date No. Collected	Project Name:	∑ Standard ☐ 4 Day 3 Day * Require	Turnaround	Email Address:	Office Phone:	City, State, Zip	Mailing Address	Report To:	Company Name	Report Results To:	ANAL	
In execution this Chain	W Led	A Released By A Received By		1400 EQUIPARTS SLANE	- DUP-100512	020 1-WM 020	1440 MW-5	1400 MM-4	5-MW SICI	1130 MN-2	1-MM 693 MW-1	cted Collected Collected	" HOLP CCA INVEST GOSY6383	iour,	Turnaround Requirements: Matrix Kev:		Cell Phone:	City, State, Zip Code: 119402 2017E, 141 49866	Mailing Address: 1230 WILSON SY.	Report To: LANCE LINDBERG	Company Name: AECOM	ults To:	ANALYTICAL LABORATORIES, INC.	i fi i
Austoria the client acknowledges the larms as set forth a	1200 a El	Date Time Released By								XXXXX II XVIII	1 W 43 1 XXXXX	Metals Field Filterod (Y / N) Mathy Number of Containers Cool HCI Photo NaOh Other BOMDA CHLORI SULFAT RADUL	Sampled By: 2 4/NCB	M WI = Wipes LW = Liquid Waste D = Dhinking Water 1 LC LUM 200 R 106 205 206 205 206 205 207 207 207 207 207 207 207 207		Billing Email Address:	Phone Number:	City, State, Zip Code:	Billing Address (if different);	Contact Name:	10# 60546383	Bill To:	Trace Analytical Laboratories, Inc.Phone 231.773.59982241 Black Creek RoadFax 888.979.4469Muskegon, MI 49444-2673www.trace-labs.com	CHAIN-OF-CUSTODY RECORD
	1 1-10101	Received By Date Time										Remarks Possible Hea	lýn Hez		Analysis Regulation		Sampling Time:	MeOH Low Level Lab	Soil Volatiles Preserved (circle if applicable):	checked By: C/+	Logged By:	Trace Use:	TT7 IT62	Page / of /

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE LC	DG IN CHECKLIST
Trace ID #: <u>1775162</u> Date: <u>196177</u> Client Name: <u>AECOM</u>	Package Description: <u>Corle</u> Temperature: <u>-0, 9</u> Time: <u>11:3</u> Logged in by: <u>15</u>
Cooler/samples delivered by: Trace courie Hand delivered Commercial courie Tracking Number: Not App	d Name of delivery person; r UPS FED EX 🔀 US Mail
Tracking #: COC Seals present and intact on cooler?	77:04 3138 9855
Coolant a	and Temperature
Multiple bags of ice around samples?	Cooler Temperature ion Factors: • Digital Stick Thermometer CF = -0.2°C • IR Thermometer CF = -0.5°C entative Sample Temperature:). 4 °C (check one below) Image: Strain
	General
Yes All bottles arrived unbroken with labels in good condition? Each sample point is in a sealed plastic bag? Labels filled out completely? All bottle labels agree with Chain of Custody (COC)? Sufficient sample to run tests requested? pH checked and samples at correct pH? Correct preservative added to samples? Air bubbles absent from VOAs? COC filled out properly and signed by client? COC signed in by TRACE sample custodian?	No NA Comments
Notes:	*EMD pH Test Strips Used: pH 0-2.5 pH 11.0-13.0 Lot: HC573059 Lot: HC547328 Other: Other:
Form 70-A.22 Effective 10/2/17	TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SAMPLE LOG IN CHECKLIS	ST
Trace ID #: ITAIL Date: IOIOIM Package Descriptio Client Name: AECOM Time: 16:36	n: <u>Cervles</u> Temperature: <u>-0.</u> Logged in by: <u>5</u>
Coolor Possint	
Cooler/samples delivered by: Trace courier	
Hand delivered Mare of deliv	en/ person:
Tracking Number: Not Applicable	
	9126
COC Seals present and intact on cooler? Not Applicable No	Yes
Custody seals signed by Client? No Yes Client custody sea	
Coolant and Tomporature	
Coolant and Temperature Type of Coolant Used	r Temperature
	ck Thermometer CF = -0.2°C
	ometer CF = -0.5°C
Ice Packs/ Blue Ice : Representative Sample Temperati	
No Coolant Present: Temp Blank (Sticl	
Ice still present upon receipt (circle one):	Thermometer)
Yes No N/A Melt Water:	°C (Use Digital Stick Thermometer)
General	
Yes No NA	Comments
All bottles arrived unbroken with labels in good condition?	
Each sample point is in a sealed plastic bag?	
Labels filled out completely?	
Sufficient sample to run tests requested?	
pH checked and samples at correct pH?	·
Correct preservative added to samples?	
Air bubbles absent from VOAs?	
COC filled out properly and signed by client?	
COC signed in by TRACE sample custodian?	
Was project manager called and samples discussed?	
Notes:	*EMD pH Test Strips Used:
	Defit 0-2.5 Lot: HC573059 DH 11.0-13.0 Lot: HC547328
	Lot: HC573059 Lot: HC547328
	Other:
Form 70-A.22	
Form 70-A.22 Effective 10/2/17	TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS



November 10, 2017

Jon Mink Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 TEL: (231) 773-5998 FAX: (231) 773-6537

RE: T17J162

Dear Jon Mink:

Order No.: 17100766

Summit Environmental Technologies, Inc. received 7 sample(s) on 10/12/2017 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

tally Slow

Holly Florea Project Manager

3310 Win St. Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891

Page 1 of 14



Case Narrative

 WO#:
 17100766

 Date:
 11/10/2017

CLIENT:Trace Analytical Laboratories, Inc.Project:T17J162

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered "not certified."

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.



Workorder Sample Summary

WO#: 17100766 10-Nov-17

CLIENT:Trace Analytical Laboratories, Inc.Project:T17J162

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17100766-001	T17J162-01		10/5/2017 9:30:00 AM	10/12/2017 10:10:00 AM	Aqueous
17100766-002	T17J162-02		10/5/2017 11:30:00 AM	10/12/2017 10:10:00 AM	Aqueous
17100766-003	T17J162-03		10/5/2017 12:15:00 PM	10/12/2017 10:10:00 AM	Aqueous
17100766-004	T17J162-04		10/5/2017 2:00:00 PM	10/12/2017 10:10:00 AM	Aqueous
17100766-005	T17J162-05		10/5/2017 2:40:00 PM	10/12/2017 10:10:00 AM	Aqueous
17100766-006	T17J162-06		10/5/2017	10/12/2017 10:10:00 AM	Aqueous
17100766-007	T17J162-07		10/5/2017 2:00:00 PM	10/12/2017 10:10:00 AM	Aqueous



Analytical Report

 (consolidated)

 WO#:
 17100766

 Date Reported:
 11/10/2017

Client Sample ID	T17J162-01	
Lab ID:	17100766-001	Matrix: AQUEOUS
Project:	T17J162	
CLIENT:	Trace Analytical Laboratories,	Inc. Collection Date: 10/5/2017 9:30:00 AM

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.11	1 1	11/2/2017 4:25:00 PM 11/2/2017 4:25:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 0.950	1.00		pCi/L	± 0.68	1 1	11/1/2017 3:44:00 PM 11/1/2017 3:44:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100766

 Date Reported:
 11/10/2017

Analyses		Result	PQL Qual	Units Uncertainty	DF Date Analyzed
Client Sample ID	T17J162-02				
Lab ID:	17100766-002			Matrix: AQ	QUEOUS
Project:	T17J162				
CLIENT:	Trace Analytical Lab	ooratories, Inc.	(Collection Date: 10,	/5/2017 11:30:00 AM

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226 Yield	ND 1.00	1.00	U	pCi/L	± 0.15	1 1	11/2/2017 4:28:00 PM 11/2/2017 4:28:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228 Yield	ND 1.00	1.00		pCi/L	± 0.64	1 1	11/8/2017 3:39:00 PM 11/8/2017 3:39:00 PM

Qualifiers:

- * Value exceeds Maximum Contaminant Level.
- H Holding times for preparation or analysis exceeded
- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100766

 Date Reported:
 11/10/2017

CLIENT:	Trace Analytical Laboratories, Inc	Collection Date: 10/5/2017 12:15:00 PM
Project:	T17J162	
Lab ID:	17100766-003	Matrix: AQUEOUS
Client Sample ID	T17J162-03	
Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.18	1	11/2/2017 4:28:00 PM
Yield	1.00					1	11/2/2017 4:28:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.63	1	11/1/2017 3:42:00 PM
Yield	1.00					1	11/1/2017 3:42:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100766

 Date Reported:
 11/10/2017

Analyses		Result	PQL Qual Units Uncertainty DF Date Analyzed
Client Sample ID	T17J162-04		
Lab ID:	17100766-004		Matrix: AQUEOUS
Project:	T17J162		
CLIENT:	Trace Analytical La	boratories, Inc.	Collection Date: 10/5/2017 2:00:00 PM

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.15	1	11/2/2017 4:28:00 PM
Yield	1.00					1	11/2/2017 4:28:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.56	1	11/1/2017 3:42:00 PM
Yield	1.00					1	11/1/2017 3:42:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100766

 Date Reported:
 11/10/2017

Analyses		Result	PQL Qual Uni	its Uncertainty	DF Date Analyzed	
Client Sample ID	T17J162-05					
Lab ID:	17100766-005		Matrix: AQUEOUS			
Project:	T17J162					
CLIENT:	Trace Analytical La	boratories, Inc.	Collection Date: 10/5/2017 2:40:00 PM			

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.17	1	11/2/2017 4:28:00 PM
Yield	1.00					1	11/2/2017 4:28:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.77	1	11/1/2017 3:43:00 PM
Yield	1.00					1	11/1/2017 3:43:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100766

 Date Reported:
 11/10/2017

CLIENT:	Trace Analytical Labora	tories, Inc.	Collection Date: 10/5/2017					
Project:	T17J162							
Lab ID:	17100766-006					Matrix: A	QUEOUS	5
Client Sample	ID T17J162-06							
Analyses		Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RADIUM-226	(EPA 903.0)					E903.0	E903-904	4 Analyst: BRD
Radium-226		ND	1.00	U	pCi/L	± 0.23	1	11/2/2017 4:28:00 PM

1001011 220			• p•=	= 0.20		
Yield	1.00				1	11/2/2017 4:28:00 PM
RADIUM-228 (EPA 904.0)				E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	pCi/L	± 0.74	1	11/1/2017 3:43:00 PM
Yield	1.00				1	11/1/2017 3:43:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



Analytical Report

 (consolidated)

 WO#:
 17100766

 Date Reported:
 11/10/2017

Analyses	Result	PQL Qual Units Uncertainty DF Date Analyzed				
Client Sample ID	T17J162-07					
Lab ID:	17100766-007	Matrix: AQUEOUS				
Project:	T17J162					
CLIENT:	Trace Analytical Laboratories, Inc.	Collection Date: 10/5/2017 2:00:00 PM				

RADIUM-226 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.2	1	11/2/2017 4:27:00 PM
Yield	1.00					1	11/2/2017 4:27:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 1.04	1	11/1/2017 3:43:00 PM
Yield	1.00					1	11/1/2017 3:43:00 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level.

- MC Value is below Minimum Compound Limit.
- ND Not Detected
- P Second column confirmation exceeds

- E Value above quantitation range
- M Manual Integration used to determine area response
- N Tentatively identified compounds
- O RSD is greater than RSDlimit
- PL Permit Limit



QC SUMMARY REPORT

17100766 WO#:

10-Nov-17

Client: Project:	Trace Anal T17J162	ytical Laboratories, Inc.						Ι	BatchID: 2	29465		
Sample ID Ics-2 Client ID: LCS		SampType: LCS Batch ID: 29465		de: Radium-2 No: E904.0	28_ Units: pCi/L E903-904		Prep Dat Analysis Dat			RunNo: 76 9 SeqNo: 13 1		
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228 Yield		3.63 0.790	1.00	5.000	0 0	72.7 0	70	130				
Sample ID Icsd-	-29465	SampType: LCSD	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Dat	te: 10/27/2	2017	RunNo: 76	915	
Client ID: LCS	S02	Batch ID: 29465	Test	No: E904.0	E903-904		Analysis Dat	te: 11/1/20	017	SeqNo: 13	14133	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228 Yield		4.15 0.700	1.00	5.000	0 0	82.9 0	70	130	3.633 0.7900	13.2 12.1	20	
Sample ID 1710	0766-001aMS	SampType: MS	TestCo	de: Radium-2	28_ Units: pCi/L		Prep Dat	te: 10/27/2	2017	RunNo: 76	915	
Client ID: T17J	162-01	Batch ID: 29465	Test	No: E904.0	E903-904		Analysis Dat	te: 11/1/20	017	SeqNo: 13	14136	
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228 Yield		4.97 1.00	1.00	5.000	0.8501 0.9500	82.4 0	70	130				

- **Qualifiers:**
- Value exceeds Maximum Contaminant Level. *
- В Analyte detected in the associated Method Blank
- Н Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits
- Original Page 11 of 14



Summit Environmental Technologies, Inc. 3310 Win St. Cuyahoga Falls, Ohio 44223 TEL: (330) 253-8211 FAX: (330) 253-4489 Website: http://www.settek.com

QC SUMMARY REPORT

17100766 WO#:

10-Nov-17

Client: Project:	Trace Ana T17J162	lytical Laboratories, Inc.	BatchID: 29465									
Sample ID MI Client ID: PE		SampType: MBLK Batch ID: 29465		le: Radium-2 lo: E904.0	28_ Units: pCi/L E903-904		Prep Da Analysis Da	te: 10/27/2 te: 11/1/20		RunNo: 76 SeqNo: 13		
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228 Yield		ND 1.00	1.00		0 0	0 0						U

Qualifiers:

Value exceeds Maximum Contaminant Level. *

Н Holding times for preparation or analysis exceeded

Value is below Minimum Compound Limit. MC

Р Second column confirmation exceeds

- В Analyte detected in the associated Method Blank
- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits
- Original Page 12 of 14



QC SUMMARY REPORT

17100766 WO#:

10-Nov-17

Client: Trace A Project: T17J16	Analytical Laboratories, Inc.		BatchID: 2	9465
Sample ID mb-29465	SampType: MBLK	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/27/2017	RunNo: 76922
Client ID: PBW	Batch ID: 29465	TestNo: E903.0 E903-904	Analysis Date: 11/2/2017	SeqNo: 1314246
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226 Yield	ND 1.00	1.00		U
Sample ID LCS-29465	SampType: LCS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/27/2017	RunNo: 76922
Client ID: LCSW	Batch ID: 29465	TestNo: E903.0 E903-904	Analysis Date: 11/2/2017	SeqNo: 1314248
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	4.67	1.00 5.000 0	93.4 70 130	
Sample ID 17100766-001al	MS SampType: MS	TestCode: Radium-226_ Units: pCi/L	Prep Date: 10/27/2017	RunNo: 76922
Client ID: T17J162-01	Batch ID: 29465	TestNo: E903.0 E903-904	Analysis Date: 11/2/2017	SeqNo: 1314251
Analyte	Result	PQL SPK value SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Radium-226	4.47	1.00 5.000 0	89.4 70 130	

Qualifiers:

*

- Value exceeds Maximum Contaminant Level.
- В Analyte detected in the associated Method Blank
- Н Holding times for preparation or analysis exceeded
- Value is below Minimum Compound Limit. MC
- Р Second column confirmation exceeds

- J Analyte detected below quantitation limits
- Not Detected ND
- PL Permit Limit

- Е Value above quantitation range
- Μ Manual Integration used to determine
- RSD is greater than RSDlimit 0
- R RPD outside accepted recovery limits
- Original Page 13 of 14



Qualifiers and Acronyms

WO#: 17100766 Date: 11/10/2017

These commonly used Qualifiers and Acronyms may or may not be present in this report.

The compound was analyzed for but was not detected.

Qualifiers

U

DF

Dilution Factor

U	The compound was analyzed for but was not detected.										
J	The reported value is greater than the	Method Dete	ection Limit but less than the Reporting Limit.								
Н	The hold time for sample preparation a										
D	The result is reported from a dilution.	2									
Е	1	f the calibrat	tion or is estimated due to interference.								
MC	The result is below the Minimum Com										
*	The result exceeds the Regulatory Limit or Maximum Contamination Limit.										
m	Manual integration was used to determ										
d	Manual integration in which peak was										
Ň			l library search assuming a 1:1 response.								
P	The second column confirmation exce										
Ċ	The result has been confirmed by GC/										
x	The result was not confirmed when G		sis was performed.								
B/MB+	The analyte was detected in the associ										
G	The ICB or CCB contained reportable		analyte.								
QC-/+	The CCV recovery failed low (-) or hi										
R/ODR	The RPD was outside of accepted reco										
OL-/+	The LCS or LCSD recovery failed low	•									
QLR	The LCS/LCSD RPD was outside of a	ccepted reco	overy limits.								
QM-/+	The MS or MSD recovery failed low (
QMR	The MS/MSD RPD was outside of acc										
QV-/+	The ICV recovery failed low (-) or hig		5								
S	The spike result was outside of accept	ed recovery	limits.								
Z			rmed; Please refer to the Case Narrative for								
	additional information										
Acronyn	ns										
ND	Not Detected	RL	Reporting Limit								
QC	Quality Control	MDL	Method Detection Limit								
MB	Method Blank	LOD	Level of Detection								
LCS	Laboratory Control Sample	LOQ	Level of Quantitation								
LCSD	Laboratory Control Sample Duplicate	PQL	Practical Quantitation Limit								
QCS	Quality Control Sample	CRQL	Contract Required Quantitation Limit								
DUP	Duplicate	PL	Permit Limit								
MS	Matrix Spike	RegLvl	Regulatory Limit								
MSD	Matrix Spike Duplicate	MČL	Maximum Contamination Limit								
RPD	Relative Percent Different	MinCL	Minimum Compound Limit								
ICV	Initial Calibration Verification	RA	Reanalysis								
ICB	Initial Calibration Blank	RE	Reextraction								
CCV	Continuing Calibration Verification	TIC	Tentatively Identified Compound								
ССВ	Continuing Calibration Blank	RT	Retention Time								
RLC	Reporting Limit Check	CF	Calibration Factor								
DE		DE	D								

RF Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SUBCONTRACT ORDER

T17J162

SENDING LABORATORY:

Trace Analytical Laboratories, Inc. 2241 Black Creek Road Muskegon, MI 49444 Phone: 231.773.5998 Fax: 231.773.6537 Project Manager: Jon Mink

10/13/17 15:00

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc. 3310 Win Street Cuyahoga Falls, OH 44223 Phone :(330) 253-8211 Fax: (330) 253-4489

Radium 226/228

PO#_101020	MISI	1711	D11 011	
Accounting Code:		14100	766-001-	007
Sample ID: T17J162-01	Aqueous	Sampled: 10/05/17 09:30		

Subcontracted Work Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

10/05/18 09:30

Sample ID: T17J162-02	Aqueous Sampled: 10/05/17 11:30	and the second s
Subcontracted Work	10/13/17 15:00 10/05/18 11:30	Radium 226/228
Containers Supplied:		
1-PL1000 pH <2 w/ HN0	O 1-PL1000 pH <2 w/ HNO	
Sample ID: T17J162-03	Aqueous Sampled: 10/05/17 12:15	
Subcontracted Work	10/13/17 15:00 10/05/18 12:15	Radium 226/228
Containers Supplied:		
1-PL1000 pH <2 w/ HNC	0 1-PL1000 pH <2 w/ HNO	
Sample ID: T17J162-04	Aqueous Sampled: 10/05/17 14:00	
Subcontracted Work	10/13/17 15:00 10/05/18 14:00	Radium 226/228
Containers Supplied:		
1-PL1000 pH <2 w/ HNC) 1-PL1000 pH <2 w/ HNO	
Sample ID: T17J162-05	Aqueous Sampled: 10/05/17 14:40	
Subcontracted Work	10/13/17 15:00 10/05/18 14:40	Radium 226/228
Containers Supplied:		
DI 1000 II - 2 / ID 10) 1-PL1000 pH <2 w/ HNO	

Released By Date Received By Date Released By Date

Received By

Page 1 of 2

Date



231-773-5998 Phone 888-979-4469 Fax www.trace-labs.com

SUBCONTRACT ORDER

T17J162

Sample ID: T17J162-06	Aqueous Sampled: 10/05/17 00:00	
Subcontracted Work	10/13/17 15:00 10/05/18 00:00	Radium 226/228
Containers Supplied: 1-PL1000 pH <2 w/ HN0	O 1-PL1000 pH <2 w/ HNO	Maurun 220/220
Sample ID: T17J162-07	Aqueous Sampled: 10/05/17 14:00	
Subcontracted Work	10/13/17 15:00 10/05/18 14:00	Radium 226/228
Containers Supplied: 1-PL1000 pH <2 w/ HNC) 1-PL1000 pH <2 w/ HNO	Naurum 220/228

(Trace) (Span	icholy	@16:00
Released By	f()	Date	(10.00

Received By

Date

Date

Released By

Received By

Page 2 of 2

Page 3 of 4

SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

	Cooler	Receip	nmental ot Form,	Technologies, Inc. Page 1
ClientYace	_		als of person er Number:	Inspecting cooler and samples: <u>A</u>
Date Received: 10-12-17 Time Rec	ceived: 10/c			
Number of Coolers/Boxes: /		N/A	C COOIGI(S) 0	pened and samples inspected: 10 -1 2 - c
Shipper: Fed Ex DPS DHL Airborne	US Postal N			
Packaging: Peanuts Bubble Wrap Pa				r
Tape on cooler/box:	and the second	N		
Custody Seals intact	Ŷ	10	N/A	
C-O-C in plastic	0	N	(N/A)	
Inc. Division	U	N	N/A	
	present absen	t melted	(N/A)	
Cooler Temperature IR Gun #16020459		Temp:	7.6°C	N/A
Radiological Testing Instrument serial # <u>35</u> Use 1 sheet per sample. If sample is >	100 cpm, the F	N	N/A	(see page 2 for scan results)
C-O-C filled out property	$(\tilde{\mathbf{r}})$	N	N/A	incer must be notified immediately.
Samples in separate bags	Y	N	N/A	
Sample containers intact*	$\widehat{\mathbf{r}}$	N	N/A	
If no, list broken sample(s):	0			
Sample label(s) complete (ID, date, etc.)	P	N	N/A	
abel(s) agree with C-O-C	S	N	N/A	
orrect containers used	Ý	N	N/A	
ufficient sample received	-	N	N/A	
ufficient sample for QC	Y	N		
amples received within holding time	X	N	N/A	
o any 40 mL visis contain bubbles** Samples with bubbles ≤6mm are accepta	v		N/A N/A	
as client contacted about samples	Y	N		
	Y	N		>
ill client send new samples				
Real Annual and Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annua				
ient contact:			-	
fill client send new samples lient contact: ate/Time: gged in by:			-	

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SOP: Sample Receipt Revision: 13 Effective Date: 07/17/17

Figure 2 - Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip SET (0-14)#: WC-03-1174	pH Strip (2.8-4.6) SET#: OES-01-0250
Total DPD packet SET#: OES-02-0239	Free DPD packet SET#: OES-01-0290
Disp. Pipette SET#:	

Sample ID	Test Method	pH	Chlorine (+ or -)	CPM	Comments
1		2		36	
2		2		24	
3		2		26	
4		2		22	
5		2		16	
Dap-100517		2		28	
7		2		27	
	-				
					1
					-

P = Permanganate interference 504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for <u>Total</u> chlorine 552.2 checked for <u>Free</u> chlorine 531.2 pH is checked for ~3.8 (SET# OES-01-0149) 524.2 = pH and Chlorine checked by lab analyst

Appendix C Statistical Analysis



AECOM 2985 South Ridge Road, Suite B Green Bay WI 54304 USA aecom.com

Project name: Marquette Board of Light and Power

Project ref: 60546383.1.2.B

From: R. Henning

Date: January 9, 2018

To: Lance Lindberg

CC: Shaun Becker

Memorandum

Subject: Groundwater Statistics

Statistical analyses were completed on background and downgradient groundwater data collected from the Marquette Board of Light and Power (MBLP) Shiras Steam Plant. This data was collected as part of meeting the requirements of US EPA CCR Rule. The statistical analysis process included the following:

- · Review site specific information
- · Select upgradient (or background) wells and downgradient wells
- · Create a statistical database for the background data
- Compute detection frequencies in upgradient and downgradient wells
- Compute tests of normality and lognormality
- · Based on detection frequency and tests of statistical distribution (normal or lognormal) compute prediction limits
 - For detection frequency \geq 50%, and data Normal in distribution, compute a Normal prediction limit
 - o For detection frequency ≥ 50%, and data Lognormal in distribution, compute a Lognormal prediction limit
 - o For detection frequency ≥ 50%, and data neither Normal or Lognormal in distribution, compute a nonparametric prediction limit
 - For detection frequency >0% and < 50%, compute a nonparametric prediction limit
 - For detection frequency equal to zero (=0%), compute lab specific prediction limit equal to quantitation limit (= QL)
- · Compute false positive and false negative rates for entire monitoring program based on observed conditions
 - If the false positive rate is greater than 5% (> 5%), increase the number of background samples or change verification resampling plan (i.e., Pass 1 of 3 resamples versus Pass 1 of 2)
 - Compare upgradient versus downgradient wells using the background data
 - o Note any wells which exceed the prediction limits
 - § Note an initial statistically significant increase (SSI) if downgradient is greater than background
 - For downgradient wells which exceed prediction limit, resample well
 - § If the resample does not exceed the prediction limit, resume detection monitoring
 - § If the resample exceeds the prediction limit, conduct an alternate source demonstration (ASD)

The methodology is consistent with EPA regulation 40 CFR 264.97(h), 40 CFR 257.93 (§257.93(d), §257.93(e), §257.93(f) and §257.93(g)), EPA (2009) and ASTM D6312-17 guidance. Statistical analyses were completed using DUMPStat, a statistical analysis program which meets these requirements.

Site data was reviewed in order to determine upgradient and downgradient monitoring wells. Wells MW-4 and MW-5 have been identified as upgradient background wells based on groundwater data collected from these wells. Wells MW-1, MW-2

and MW-3 have been identified as downgradient wells. Groundwater data was collected at eight sampling events over the time period from July 2017 through October 2017.

All monitoring wells were sampled for Appendix III and Appendix IV parameters. Detection frequencies for each well and each parameter were tabulated. Table 1 presents a summary of detection frequencies for Appendix III parameters for all monitoring wells sample results. Table 2 presents a summary of detection frequencies for Appendix IV parameters for all monitoring wells sample results.

Monitoring results were loaded into DUMPStat, a database and a statistical analysis program. DUMPStat was setup to perform the following:

- · Check the data for outliers using Dixon's test
- · Test the data for normality (normal and lognormal distribution) using Shapiro-Wilk test
- · Based on results of normality test, compute either a normal, lognormal or nonparametric prediction limit

All DUMPStat output is presented in Attachment A. Table 3 presents the results of Shapiro-Wilk test of normality for the background data for the Appendix III parameters. Based on the analysis, normal prediction limits were computed for Total Calcium and Chloride and nonparametric prediction limits were computed for Total Boron, Fluoride, Field pH, Sulfate and Total Dissolved Solids. Table 4 presents summary statistics and prediction limits based on background data from wells MW-4 and MW-5.

All downgradient data for parameter-well combinations were compared to the prediction limits. Table 5 presents the historical downgradient data for parameter-well combinations which failed the current statistical comparisons for Appendix III parameters.

The historical monitoring results indicate a prediction limit exceedance for Boron in well MW-1. This was the only detection of boron in eight sample events. The sampling event after this was a nondetect and invalidates the initial exceedance. Wells MW-1 and MW-3 historical monitoring results indicate a prediction limit exceedance for field pH. The field pH results are statistically significantly different (SSI) than upgradient background field pH. There are no trends in field pH for these wells. The sample results may indicate a natural variation in groundwater.

Time series plots of the Appendix III parameters were created for all monitoring wells (Attachment A). A significant increasing trend is noted for upgradient background monitoring well MW-4 for chloride. A significant decreasing trend is noted for downgradient monitoring well MW-3 for sulfate.

Groundwater results for Appendix IV parameters are presented in Attachment A. In general, most of the Appendix IV results were nondetect. One exception is for Total Lead. MW-1 had an initial Total Lead result of 17 μ g/L which exceeds the EPA GWPS of 15 μ g/L. After the initial sampling event, all Total Lead results in MW-1 were nondetect. MW-2 had a Total Lead result of 240 μ g/L for third sampling event which exceeds the EPA GWPS of 15 μ g/L. Prior to and after the sampling event, all Total Lead results in MW-2 were nondetect.

SUMMARY

Statistical analyses were completed following EPA CCR rule and EPA (2009) and ASTM D6312-17 groundwater statistics guidance. DUMPStat, a statistical analysis program which meets these requirements, was used to analyze background and downgradient groundwater results. Parametric and nonparametric prediction limits were selected in comparing downgradient groundwater concentrations to upgradient background. Of the Appendix III parameters, only field pH in monitoring wells MW-2 and MW-3 were found to have a statistically significant increase (SSI) above background field pH. Field pH does not display statistically significant increasing trends in MW-2 and MW-3; the difference between background field pH and downgradient may be naturally occurring.

Few statistically significant trends were noted in the background data collected. A statistically significant increasing trend is noted for upgradient background monitoring well MW-4 for chloride. A statistically significant decreasing trend is noted for downgradient monitoring well MW-3 for sulfate.

In general, most of the Appendix IV results were nondetect. Two wells, MW-1 and MW-2 had detected lead concentrations above EPA GWPS of $15 \mu g/L$ in sample results. The detections were isolated with no confirmation of these detections.

Recommendations

- · Implement semi-annual monitoring using background prediction limits for Appendix III parameters as comparison
- · Implement Pass 1 of 2 resampling for all SSIs in order to validate or invalidate an SSI
- Analyze and update background every two years, with calendar year 2020 as first year when background can be updated

REFERENCES

U.S. Environmental Protection Agency (US EPA), 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance. EPA 530/R-09-007, 884 p.

ASTM D6312-17, 2017. Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities, 15 p.

ATTACHMENT A – DUMPStat Output for Marquette Board of Light and Power Shiras Steam Plant

Table 1 Summary of Detection Frequencies for Appendix III Parameters Marquette Board of Light and Power Shiras Steam Plant

	Detection					
Parameter	Frequency	MW-1	MW-2	MW-3	MW-4	MW-5
Boron	n	8	8	8	8	8
	ND	7	8	8	8	8
	%ND	88%	100%	100%	100%	100%
Calcium	n	8	8	8	8	8
	ND	0	0	0	0	0
	%ND	0%	0%	0%	0%	0%
Chloride	n	8	8	8	8	8
	ND	0	0	0	0	0
	%ND	0%	0%	0%	0%	0%
Fluoride	n	8	8	8	8	8
	ND	8	8	8	6	8
	%ND	100%	100%	100%	75%	100%
рН	n	8	8	8	8	8
	ND	0	0	0	0	0
	%ND	0%	0%	0%	0%	0%
Sulfate	n	8	8	8	8	8
	ND	0	0	0	0	0
	%ND	0%	0%	0%	0%	0%
Total Dissolved Solids (TDS)	n	8	8	8	8	8
	ND	0	0	0	0	0
	%ND	0%	0%	0%	0%	0%

Notes:

n - sample size

ND - count of nondetect values in sample

%ND - percentage of nondetects in sample

Table 2Summary of Detection Frequencies for Appendix IV ParametersMarquette Board of Light and PowerShiras Steam Plant

	Detection					
Parameter	Frequency	MW-1	MW-2	MW-3	MW-4	MW-5
Antimony	n	8		8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Arsenic	n	8	8	8	8	8
	ND	7	8	8	8	8
	%ND	88%	100%	100%	100%	100%
Barium	n	8	8	8	8	8
	ND	0	8	6	6	0
	%ND	0%	100%	75%	75%	0%
Beryllium	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Cadmium	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Chromium	n	8	8	8	8	8
	ND	7	8	8	8	8
	%ND	88%	100%	100%	100%	100%
Cobalt	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Lead	n	8	8	8	8	8
	ND	7	7	8	7	8
	%ND	88%	88%	100%	88%	100%
Lithium	n	8	8	8	8	8
	ND	8	8	8	6	7
	%ND	100%	100%	100%	75%	88%
Mercury	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Molybdenum	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Selenium	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Thallium	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%
Radium-226	n	8	8	8	8	8
	ND	8	8	8	8	8
	%ND	100%	100%	100%	100%	100%

Table 2 Summary of Detection Frequencies for Appendix IV Parameters Marquette Board of Light and Power Shiras Steam Plant

Parameter	Detection Frequency	MW-1	MW-2	MW-3	MW-4	MW-5
Radium-228	n	8	8	8	8	8
	ND	6	6	6	7	6
	%ND	75%	75%	75%	88%	75%

Notes:

n - sample size

ND - count of nondetect values in sample

%ND - percentage of nondetects in sample

Table 3 Shapiro-Wilk Test of Normality for Background Marquette Board of Power and Light Shiras Steam Plant

		Detection			Critical	
Parameter	N (detects)	Frequency	G raw	G log	Value	Limit Type
Boron, Total	0	0.000				Nonparametric
Calcium, Total	16	1.000	1.701	1.33	2.326	Normal
Chloride	16	1.000	2.264	2.54	2.326	Normal
Fluoride	2	0.125				Nonparametric
pH, Field	16	1.000	2.697	2.812	2.326	Nonparametric
Sulfate	16	1.000	3.079	3.146	2.326	Nonparametric
Total Dissolved Solids	16	1.000	3.566	2.945	2.326	Nonparametric

Notes:

Fit to distribution is confirmed if G < critical value

If detection frequency is <50%, nonparametric or Poisson limit is used

Table 4 Summary Statistics and Prediction Limits Marquette Board of Power and Light Shiras Steam Plant

							Prediction	
Parameter	Units	Model Type	n	Detect	x	S	Limit	Confidence ¹
Boron, Total	mg/L	Nonparametric	16	0			0.3000	0.99
Calcium, Total	mg/L	Normal	16	16	109.2500	16.9647	154.7222	
Chloride	mg/L	Normal	16	16	258.1250	76.0016	461.8401	
Fluoride	mg/L	Nonparametric	16	2			0.2000	0.99
pH, Field	SU	Nonparametric	16	16			6.76 - 7.93	0.99
Sulfate	mg/L	Nonparametric	16	16			53.0000	0.99
Total Dissolved Solids	mg/L	Nonparametric	16	16			2300.0000	0.99

Notes:

¹ - Confidence level for passing initial test or one verification resample at all downgradient wells for a single parameter (nonparametric test only) Model type refers to type of prediction limit

For lognormal test, mean and standard deviation are in lognormal units and prediction limit in original units

All sample sizes and statistics are based on outlier free data

For nonparametric limits, median reporting limits are substituted for extreme reporting limit values.

Table 5 Historical Downgradient Data for Constituent-Well Combinations which Failed the Current Statistical Evaluation Marquette Board of Power and Light Shiras Steam Plant

Boron, Total mg/L MW-1 7/19/2017 ND 0.300 0. Boron, Total mg/L MW-1 7/24/2017 ND 0.300 0. Boron, Total mg/L MW-1 8/23/2017 ND 0.300 0. Boron, Total mg/L MW-1 8/29/2017 ND 0.300 0. Boron, Total mg/L MW-1 8/29/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/28/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-2 7/24/2017 8.09 6.76 - 7 pH, Field	n	Prediction						
Boron, Total mg/L MW-1 7/24/2017 ND 0.300 0. Boron, Total mg/L MW-1 8/23/2017 ND 0.300 0. Boron, Total mg/L MW-1 8/23/2017 ND 0.300 0. Boron, Total mg/L MW-1 8/29/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/14/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/28/2017 0.530 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. PH, Field SU MW-2 7/24/2017 8.09 6.76 - 7 PH, Field SU MW-2<	SSI	Limit	Result	Qualifier	Date	Well	Units	Parameter
Boron, Total mg/L MW-1 8/23/2017 ND 0.300 0. Boron, Total mg/L MW-1 8/29/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/14/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/28/2017 0.530 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. PH, Field SU MW-2 7/24/2017 8.13 6.76 - 7 PH, Field SU MW-2<	00	0.300	0.300	ND	7/19/2017	MW-1	mg/L	Boron, Total
Boron, Total mg/L MW-1 8/29/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/14/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/14/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/28/2017 0.530 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. PH, Field SU MW-2 7/24/2017 8.09 6.76 - 7 PH, Field SU MW-2 9/6/2017 8.13 6.76 - 7 PH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 PH, Field SU MW-2 9/28/2017	00	0.300	0.300	ND	7/24/2017	MW-1	mg/L	Boron, Total
Boron, Total mg/L MW-1 9/6/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/14/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/28/2017 0.530 0. Boron, Total mg/L MW-1 9/28/2017 0.530 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-2 7/19/2017 8.41 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/6/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.00 6.76 - 7<	00	0.300	0.300	ND	8/23/2017	MW-1	mg/L	Boron, Total
Boron, Total mg/L MW-1 9/14/2017 ND 0.300 0. Boron, Total mg/L MW-1 9/28/2017 0.530 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. pH, Field SU MW-2 7/19/2017 8.41 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/29/2017 7.03 6.76 - 7 pH, Field SU MW-2 9/6/2017 8.15 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Fiel	00	0.300	0.300	ND	8/29/2017	MW-1	mg/L	Boron, Total
Boron, Total mg/L MW-1 9/28/2017 0.530 0. Boron, Total mg/L MW-1 10/5/2017 ND 0.300 0. pH, Field SU MW-2 7/19/2017 8.41 6.76 - 7 pH, Field SU MW-2 7/24/2017 8.09 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/29/2017 7.03 6.76 - 7 pH, Field SU MW-2 9/6/2017 8.15 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU M	00	0.300	0.300	ND	9/6/2017	MW-1	mg/L	Boron, Total
Boron, Totalmg/LMW-110/5/2017ND0.3000.pH, FieldSUMW-27/19/20178.416.76 - 7pH, FieldSUMW-27/24/20178.096.76 - 7pH, FieldSUMW-28/23/20178.136.76 - 7pH, FieldSUMW-28/29/20177.036.76 - 7pH, FieldSUMW-29/6/20178.156.76 - 7pH, FieldSUMW-29/6/20178.136.76 - 7pH, FieldSUMW-29/28/20178.136.76 - 7pH, FieldSUMW-29/28/20178.076.76 - 7pH, FieldSUMW-29/28/20178.076.76 - 7pH, FieldSUMW-37/19/20177.996.76 - 7pH, FieldSUMW-37/24/20177.866.76 - 7pH, FieldSUMW-37/24/20177.816.76 - 7pH, FieldSUMW-38/23/20177.816.76 - 7	00	0.300	0.300	ND	9/14/2017	MW-1	mg/L	Boron, Total
pH, Field SU MW-2 7/19/2017 8.41 6.76 - 7 pH, Field SU MW-2 7/24/2017 8.09 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/23/2017 7.03 6.76 - 7 pH, Field SU MW-2 8/29/2017 7.03 6.76 - 7 pH, Field SU MW-2 9/6/2017 8.15 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 <td< td=""><td>00 > PL</td><td>0.300</td><td>0.530</td><td></td><td>9/28/2017</td><td>MW-1</td><td>mg/L</td><td>Boron, Total</td></td<>	00 > PL	0.300	0.530		9/28/2017	MW-1	mg/L	Boron, Total
pH, Field SU MW-2 7/24/2017 8.09 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/29/2017 7.03 6.76 - 7 pH, Field SU MW-2 9/6/2017 8.15 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.07 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	00	0.300	0.300	ND	10/5/2017	MW-1	mg/L	Boron, Total
pH, Field SU MW-2 8/23/2017 8.13 6.76 - 7 pH, Field SU MW-2 8/29/2017 7.03 6.76 - 7 pH, Field SU MW-2 9/6/2017 7.03 6.76 - 7 pH, Field SU MW-2 9/6/2017 8.15 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	8.41		7/19/2017	MW-2	SU	pH, Field
pH, Field SU MW-2 8/29/2017 7.03 6.76 - 7 pH, Field SU MW-2 9/6/2017 8.15 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.07 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	8.09		7/24/2017	MW-2	SU	pH, Field
pH, Field SU MW-2 9/6/2017 8.15 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/14/2017 8.07 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	8.13		8/23/2017	MW-2	SU	pH, Field
pH, Field SU MW-2 9/14/2017 8.13 6.76 - 7 pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93	6.76 - 7.93	7.03		8/29/2017	MW-2	SU	pH, Field
pH, Field SU MW-2 9/28/2017 8.07 6.76 - 7 pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	8.15		9/6/2017	MW-2	SU	pH, Field
pH, Field SU MW-2 10/5/2017 7.99 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	8.13		9/14/2017	MW-2	SU	pH, Field
pH, Field SU MW-3 7/19/2017 8.00 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	8.07		9/28/2017	MW-2	SU	pH, Field
pH, Field SU MW-3 7/24/2017 7.86 6.76 - 7 pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	7.99		10/5/2017	MW-2	SU	pH, Field
pH, Field SU MW-3 8/23/2017 7.81 6.76 - 7	93 > PL	6.76 - 7.93	8.00		7/19/2017	MW-3	SU	pH, Field
	93	6.76 - 7.93	7.86		7/24/2017	MW-3	SU	pH, Field
pH, Field SU MW-3 8/29/2017 6.32 6.76 - 7	93	6.76 - 7.93	7.81		8/23/2017	MW-3	SU	pH, Field
	93	6.76 - 7.93	6.32		8/29/2017	MW-3	SU	pH, Field
pH, Field SU MW-3 9/6/2017 7.77 6.76 - 7	93	6.76 - 7.93	7.77		9/6/2017	MW-3	SU	pH, Field
pH, Field SU MW-3 9/14/2017 7.85 6.76 - 7	93	6.76 - 7.93	7.85		9/14/2017	MW-3	SU	pH, Field
pH, Field SU MW-3 9/28/2017 8.09 6.76 - 7	93 > PL	6.76 - 7.93	8.09		9/28/2017	MW-3	SU	pH, Field
pH, Field SU MW-3 10/5/2017 8.10 6.76 - 7	93 > PL	6.76 - 7.93	8.10		10/5/2017	MW-3	SU	pH, Field

Notes:

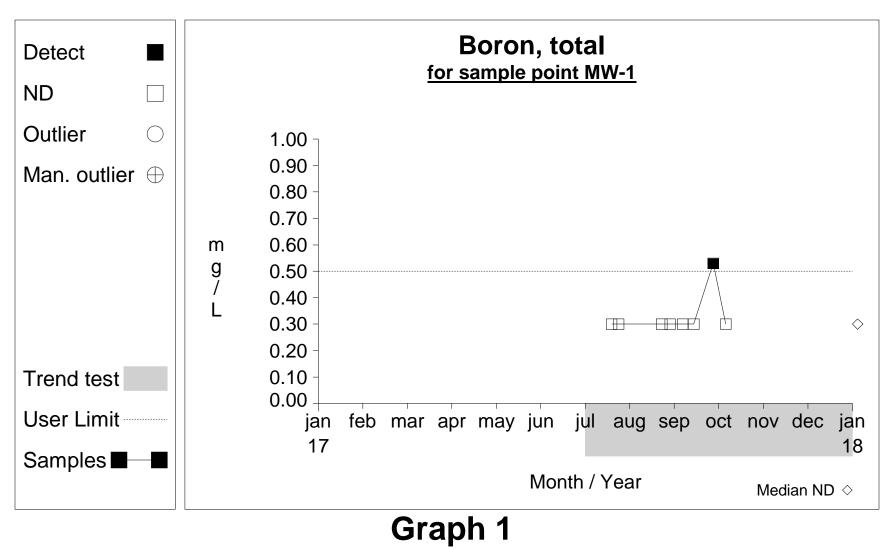
>PL - results exceeds prediction limit; significantly increased over background

ND = not detected, result = detection limit

Marquette BLP

Analysis prepared on: 1/4/2018

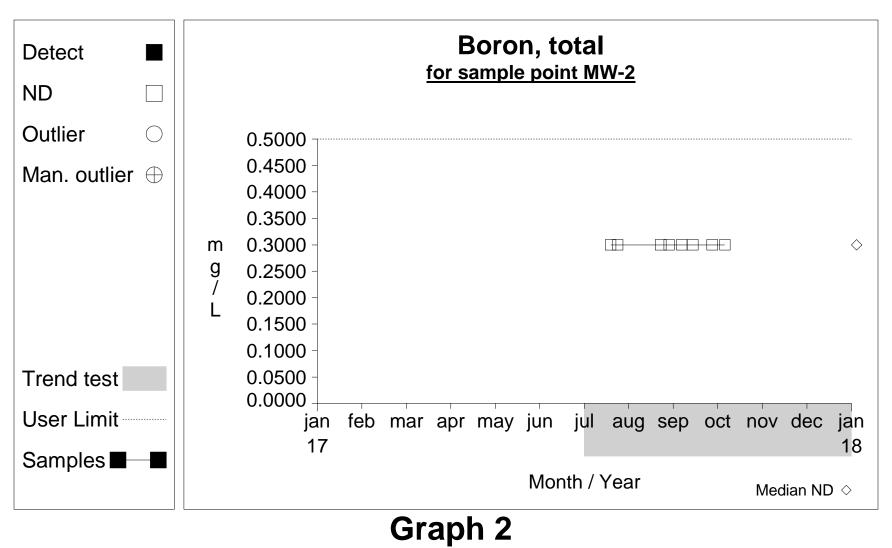
Time Series



Prepared by: AECOM

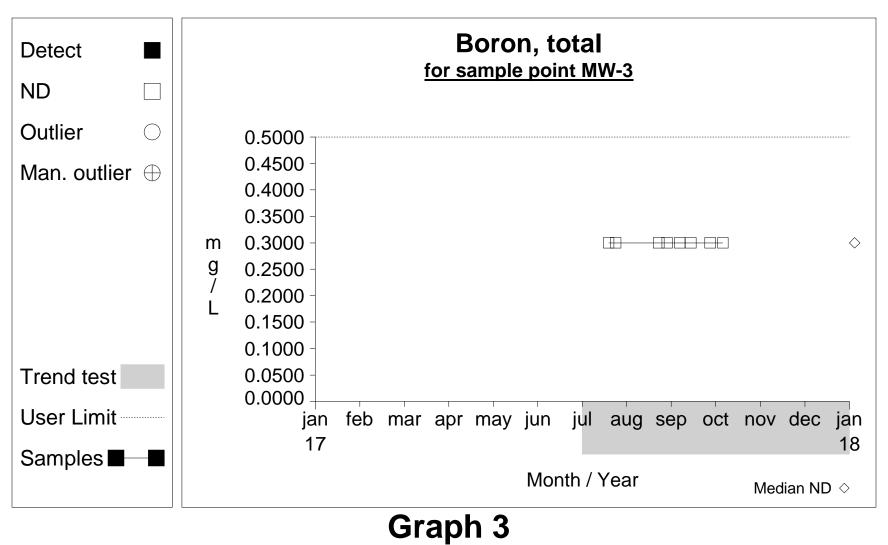
Marquette BLP

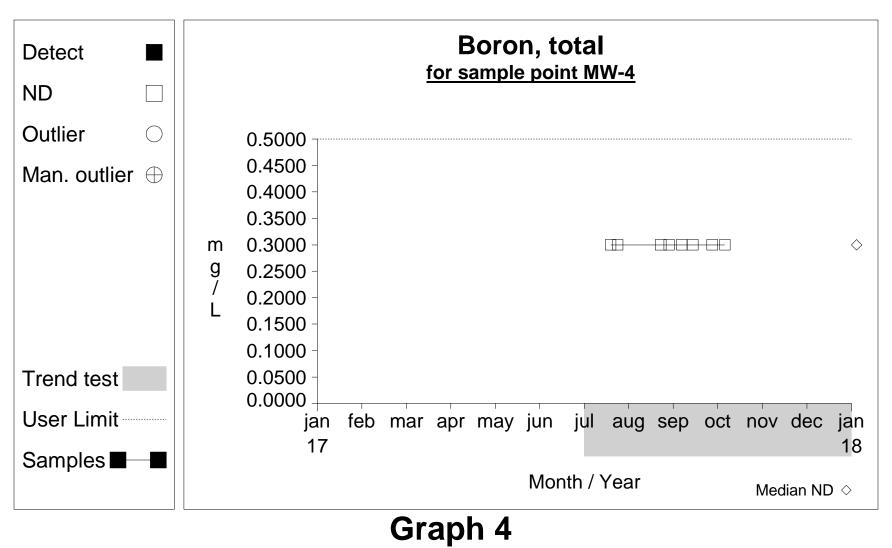
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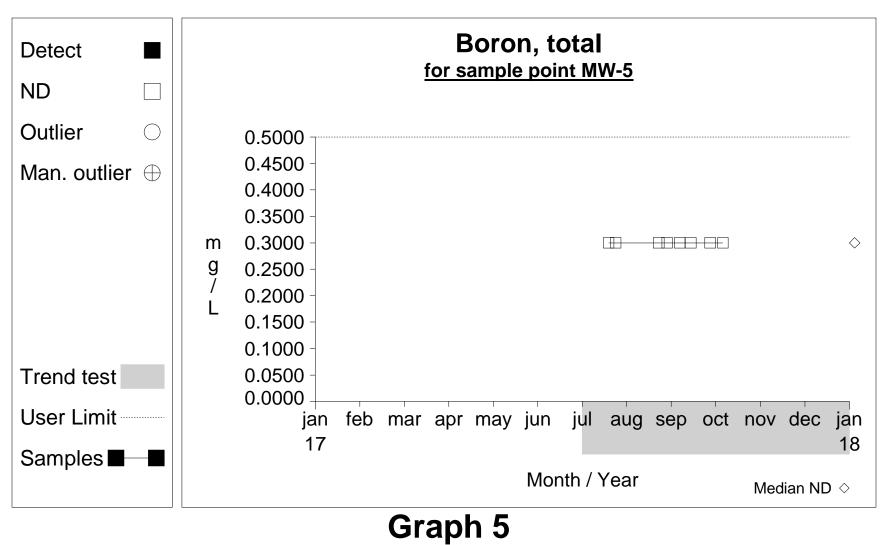


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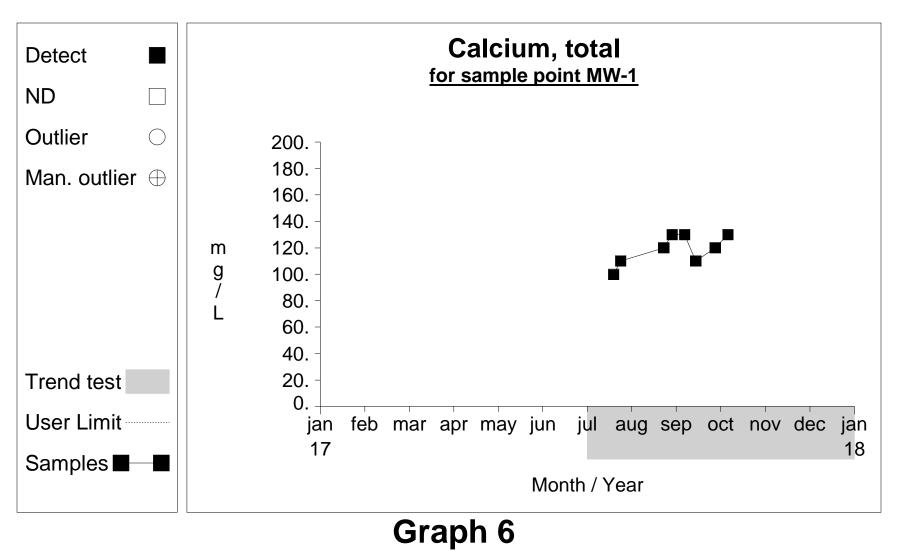
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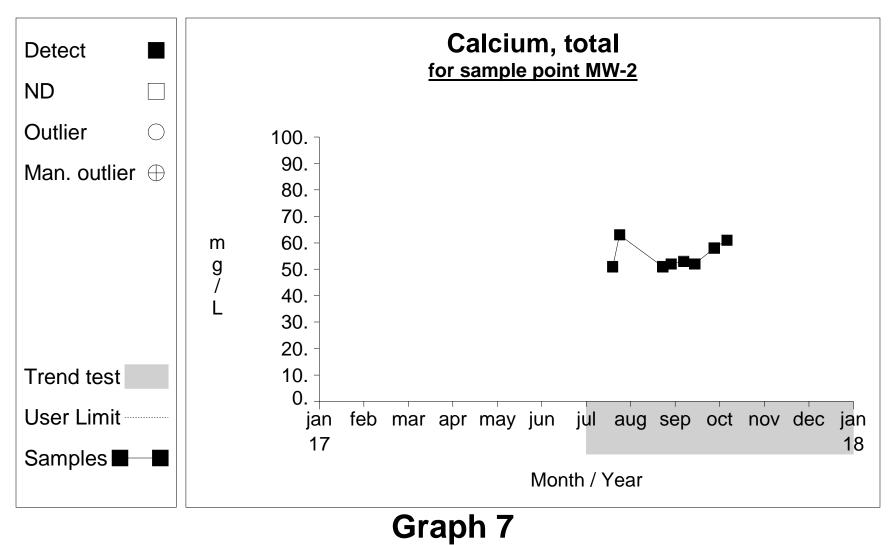


Analysis prepared on: 1/4/2018

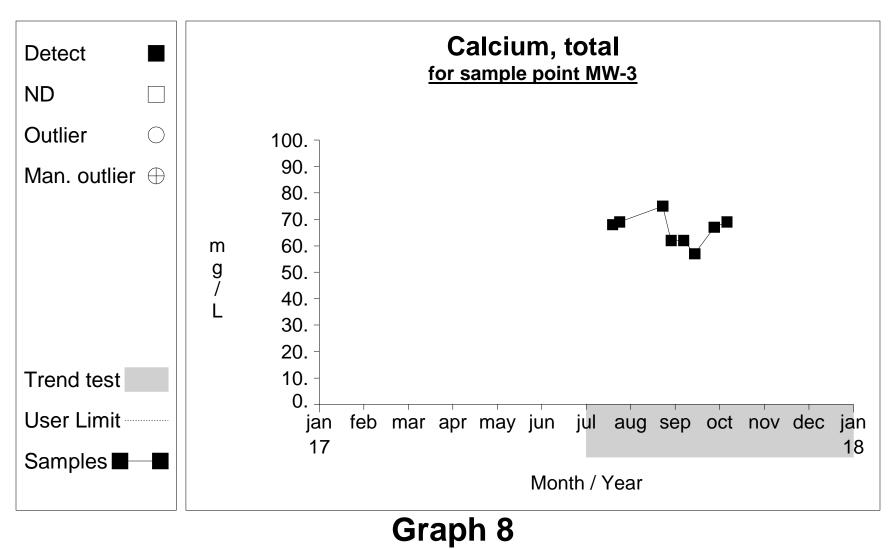


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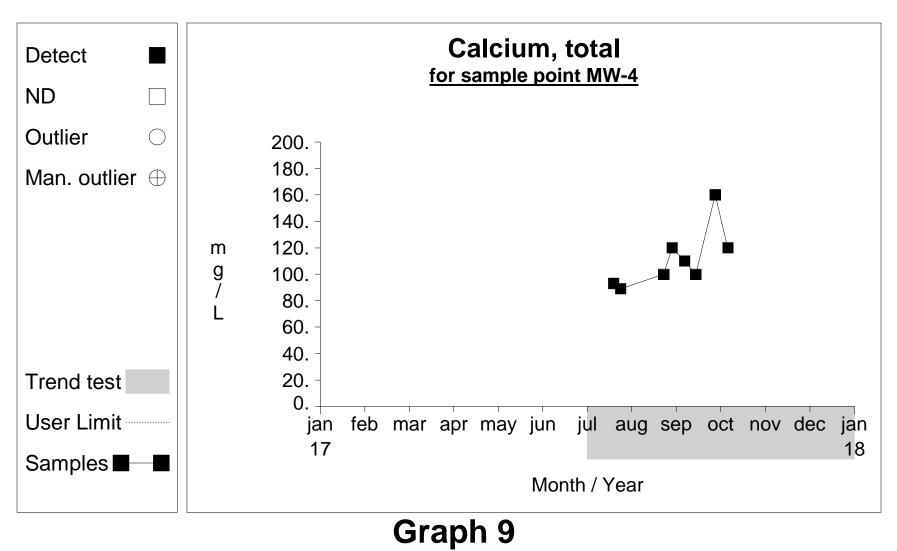
Time Series



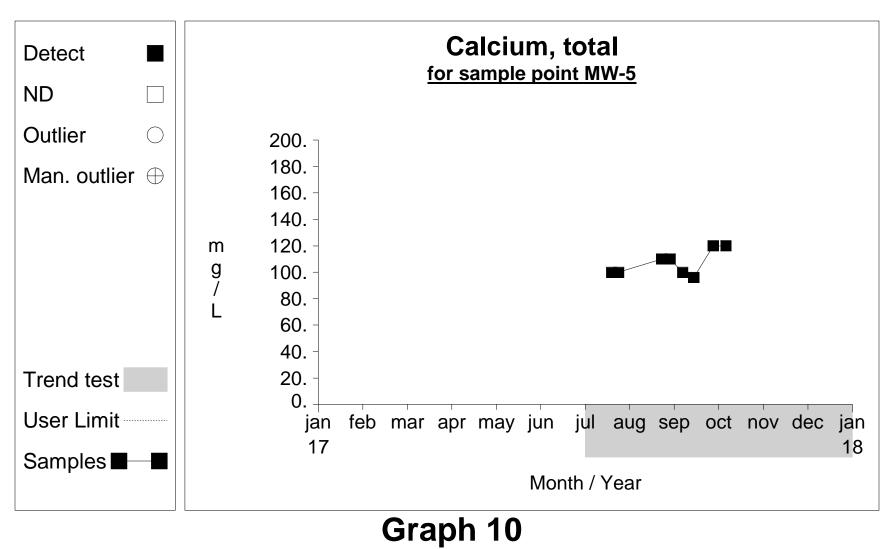
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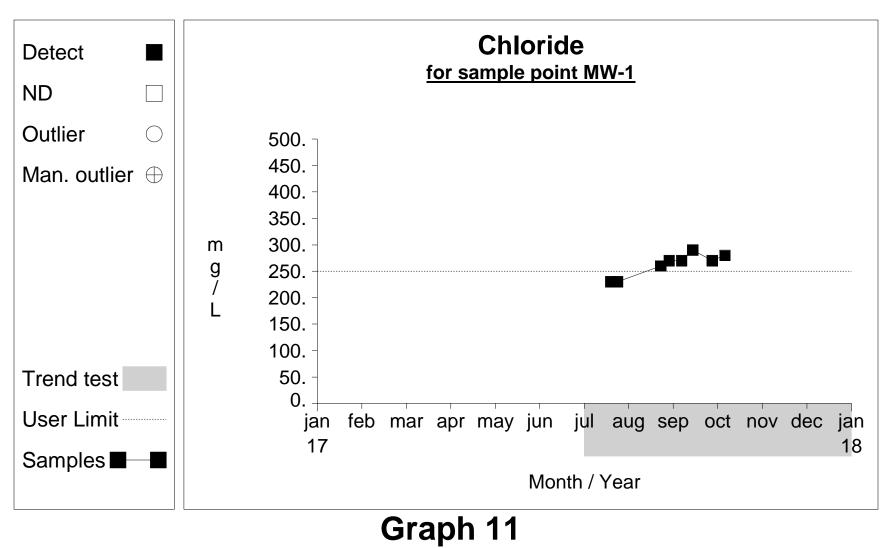
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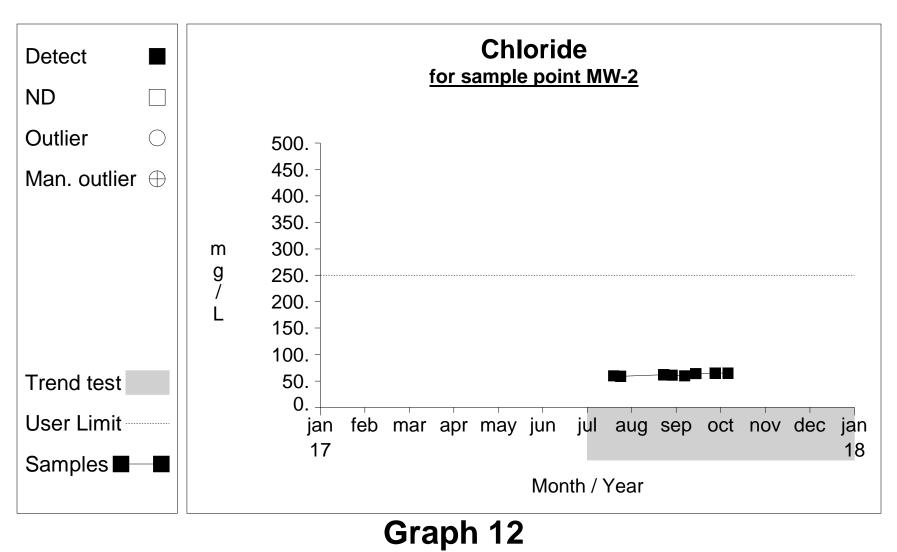
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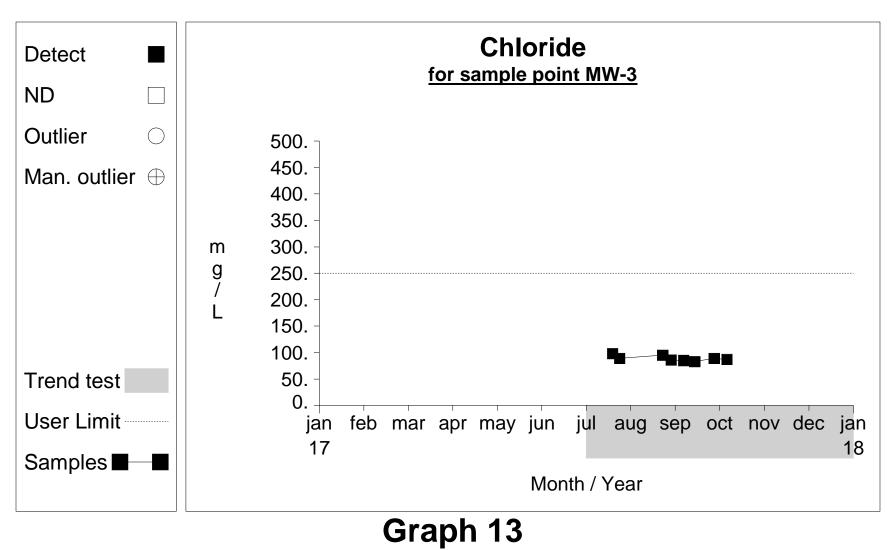
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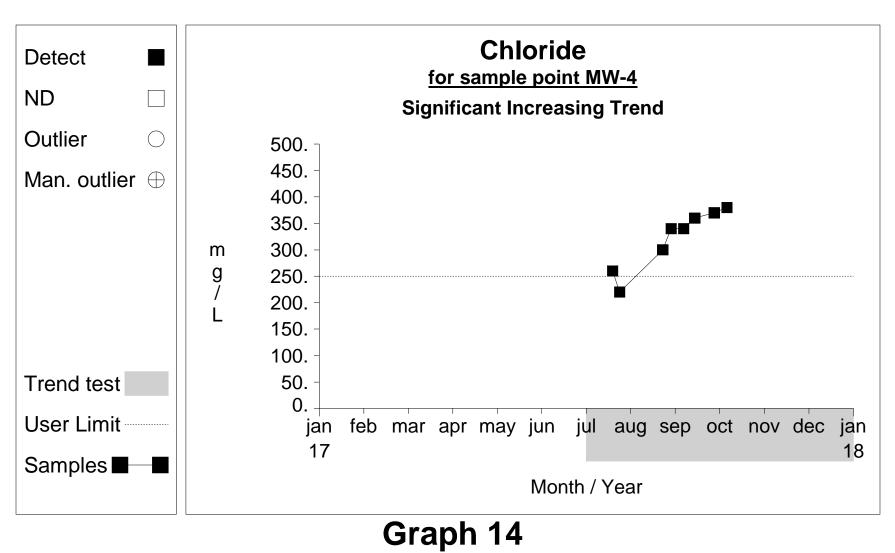
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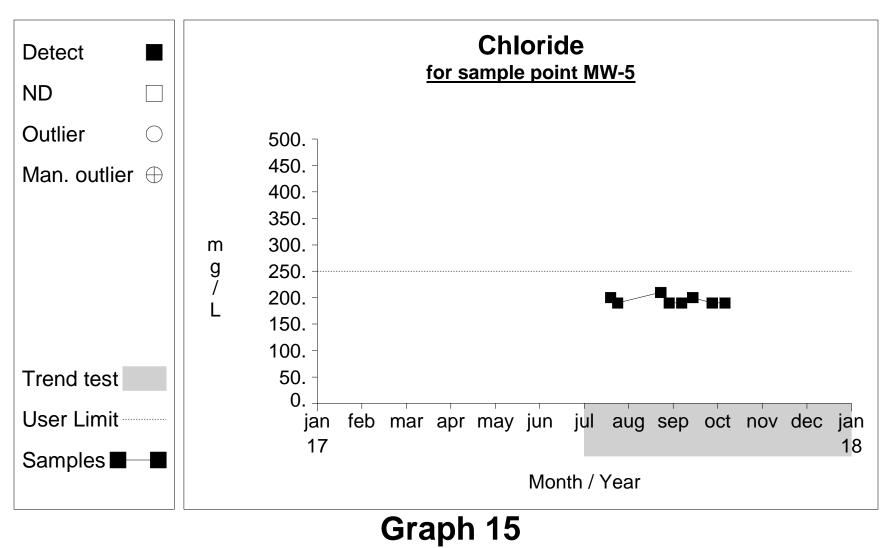
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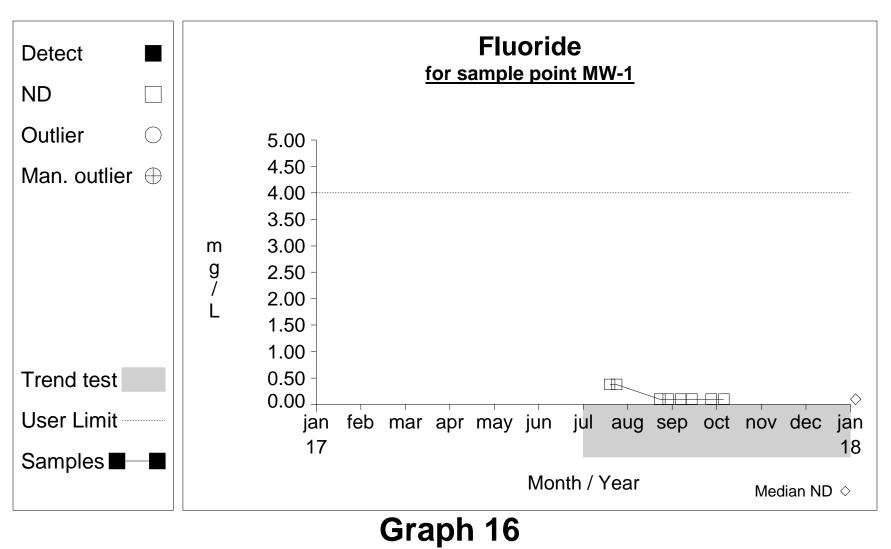


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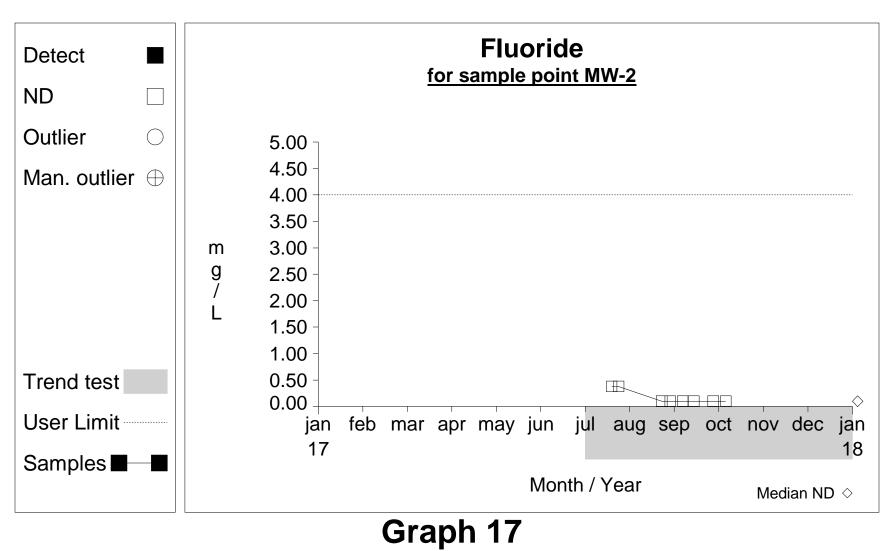


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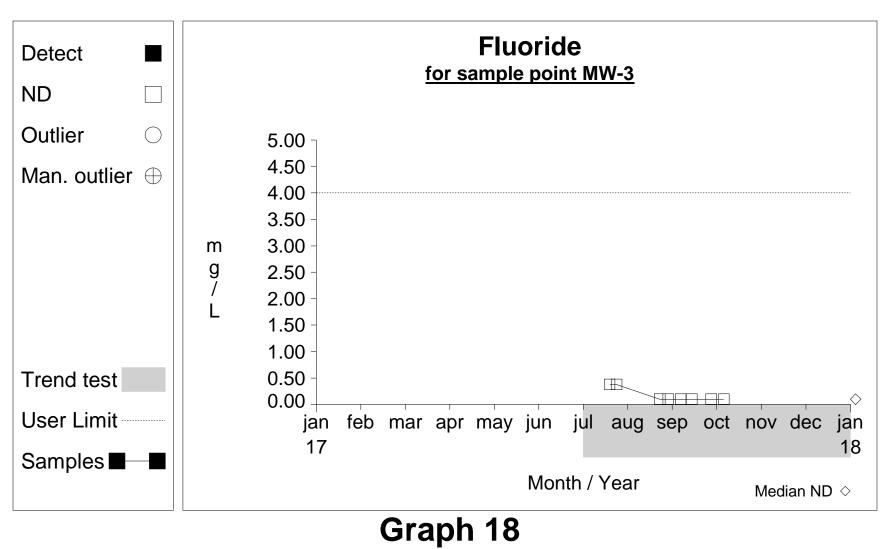




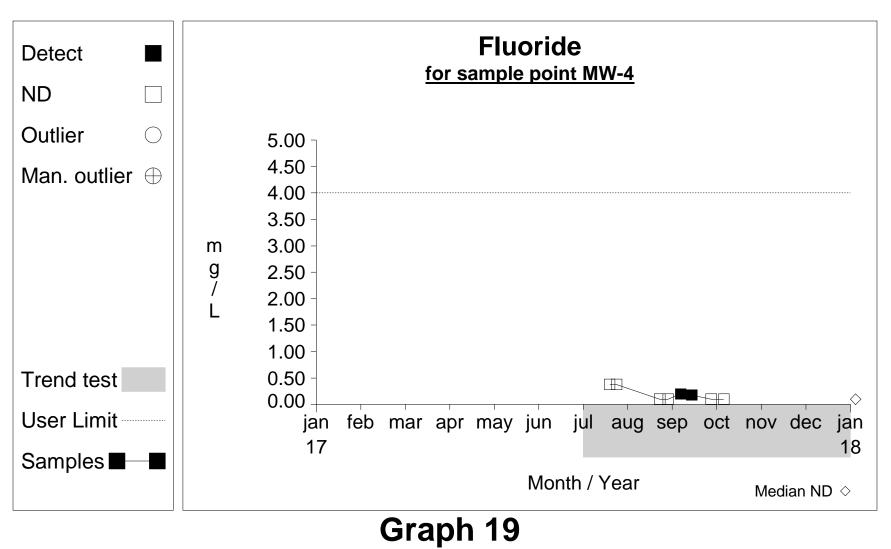
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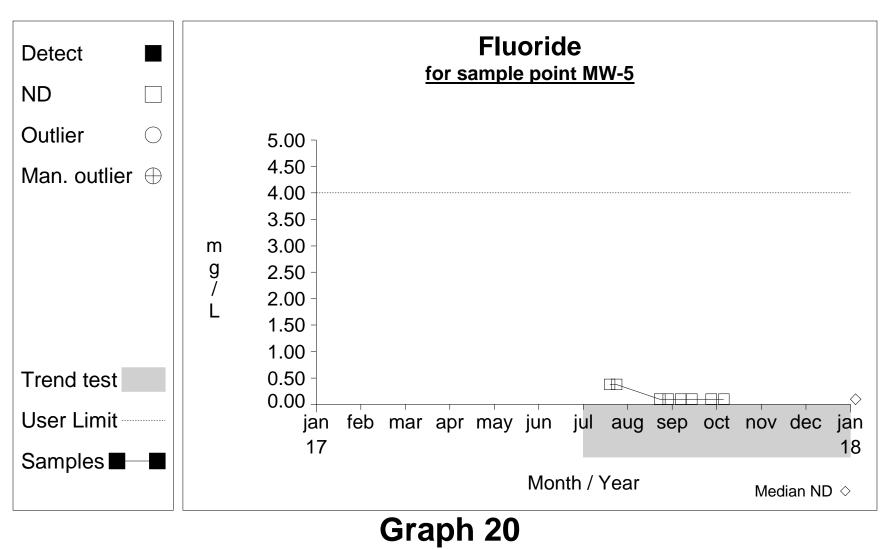


Time Series



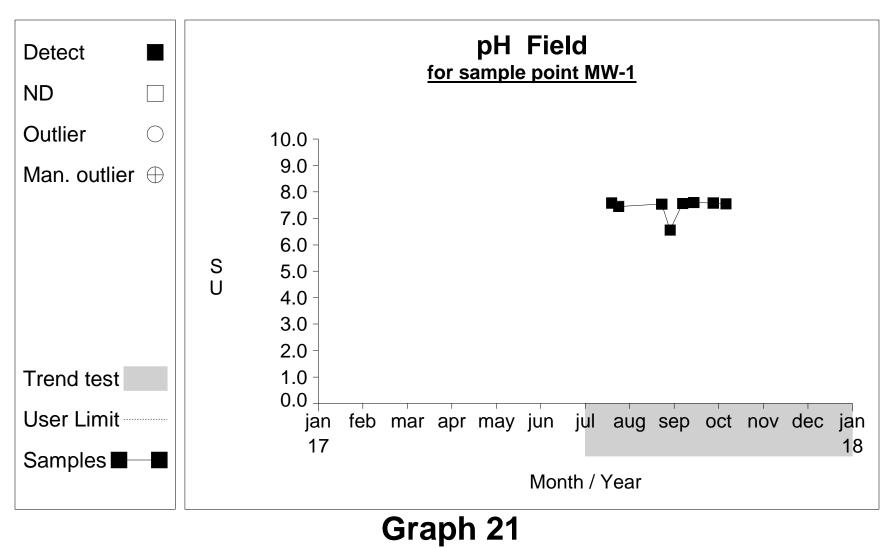
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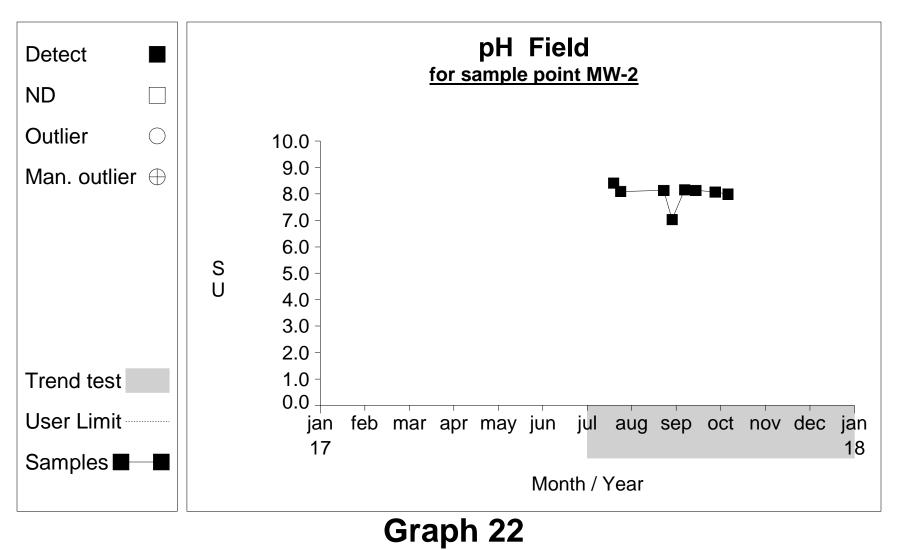


Analysis prepared on: 1/4/2018

Time Series

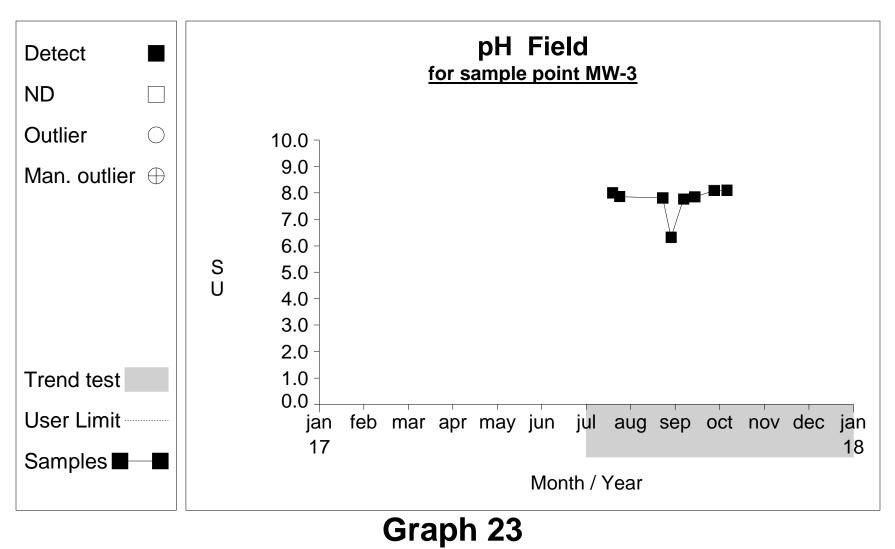


Analysis prepared on: 1/4/2018



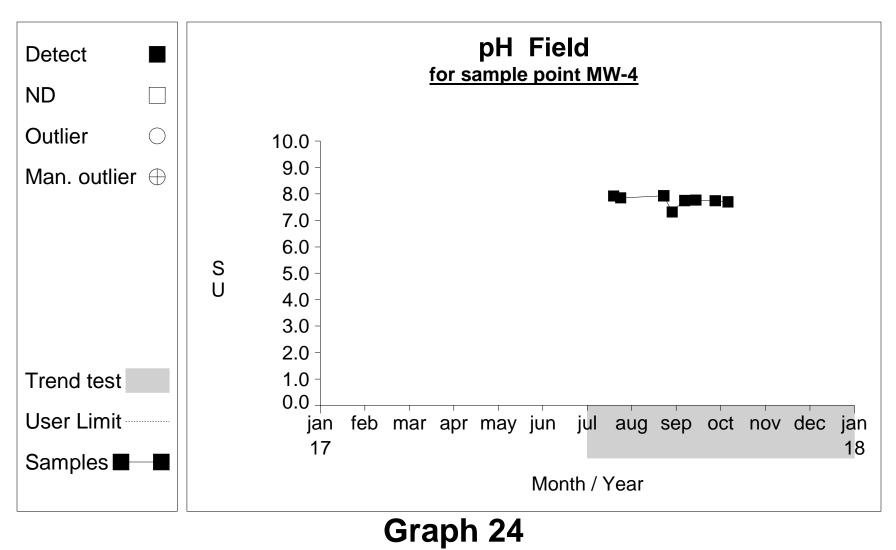
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Time Series



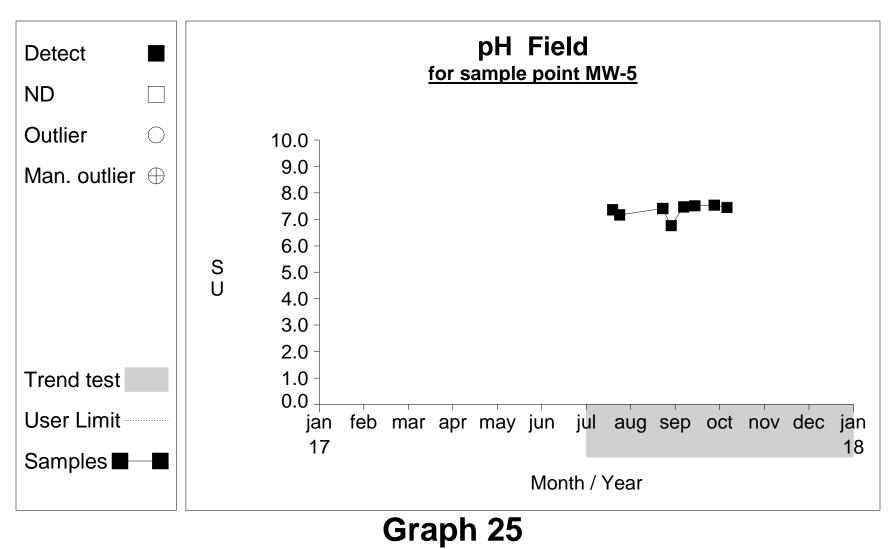
Analysis prepared on: 1/4/2018

Time Series



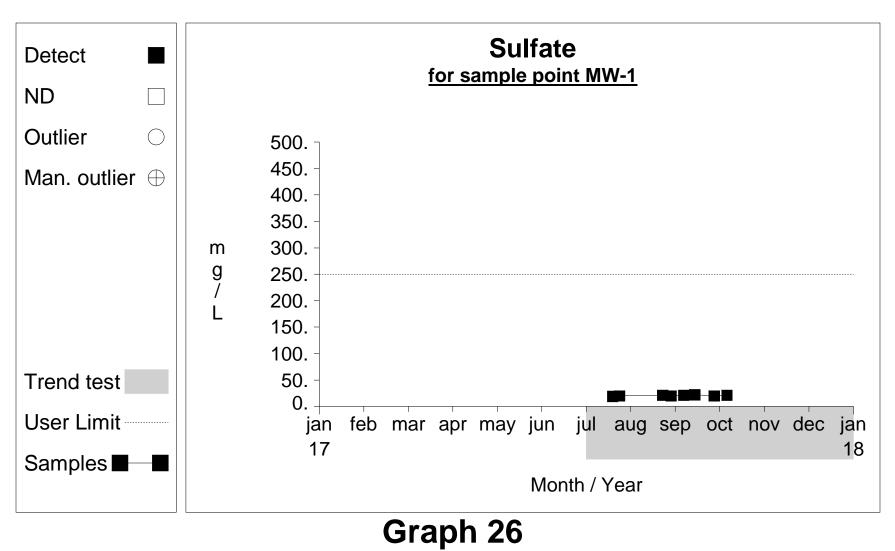
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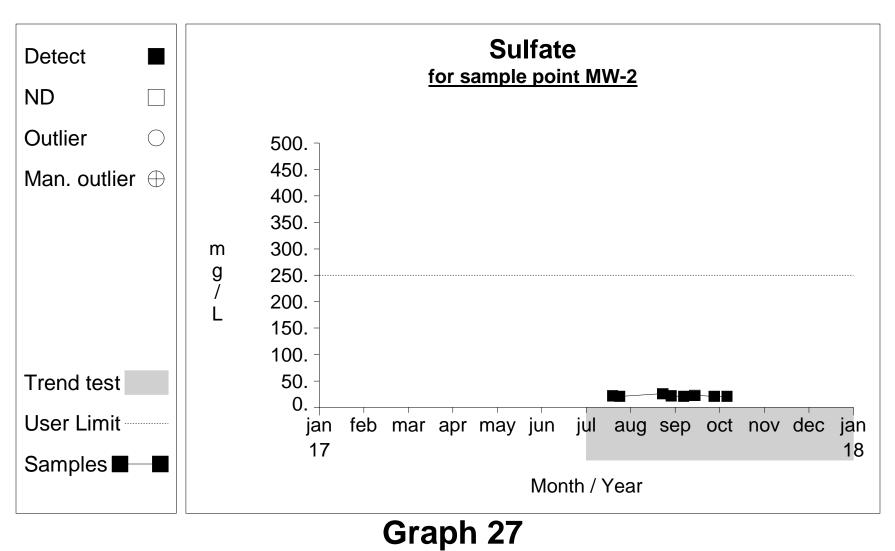
Time Series



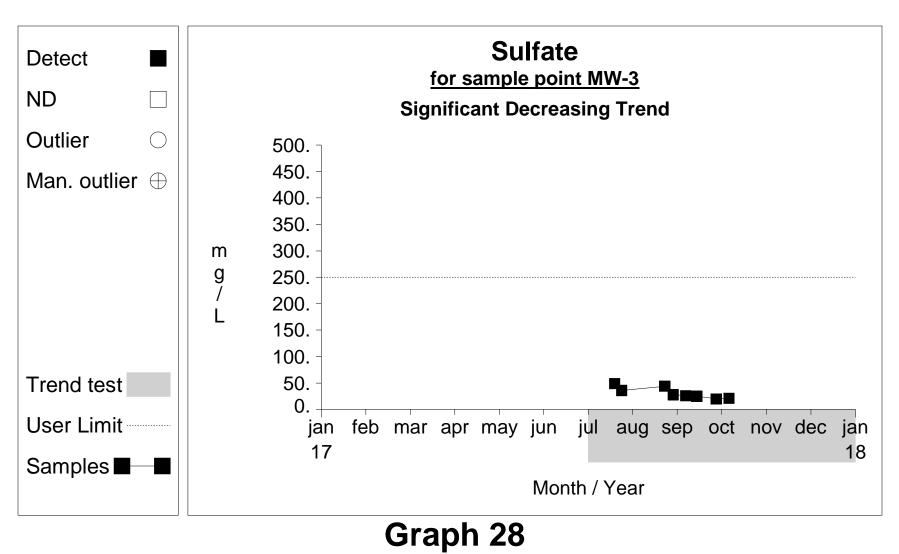
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Time Series

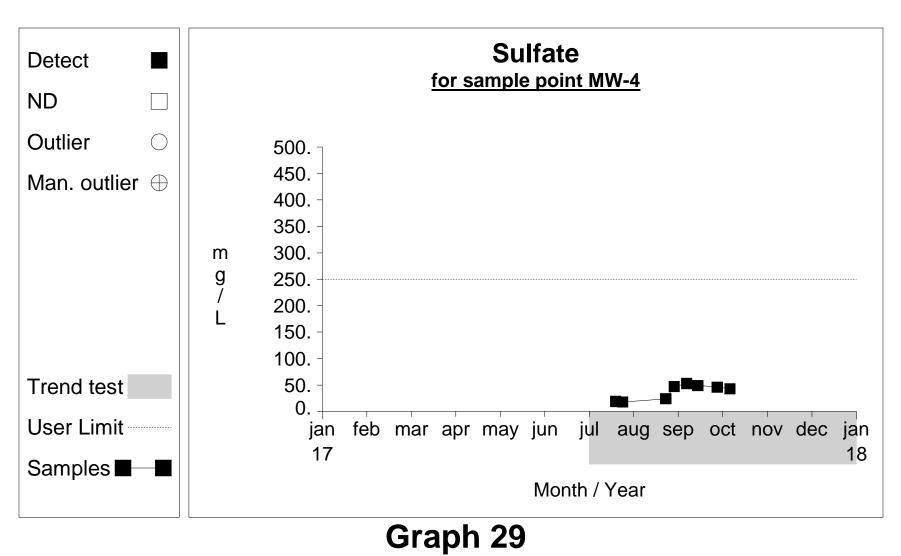




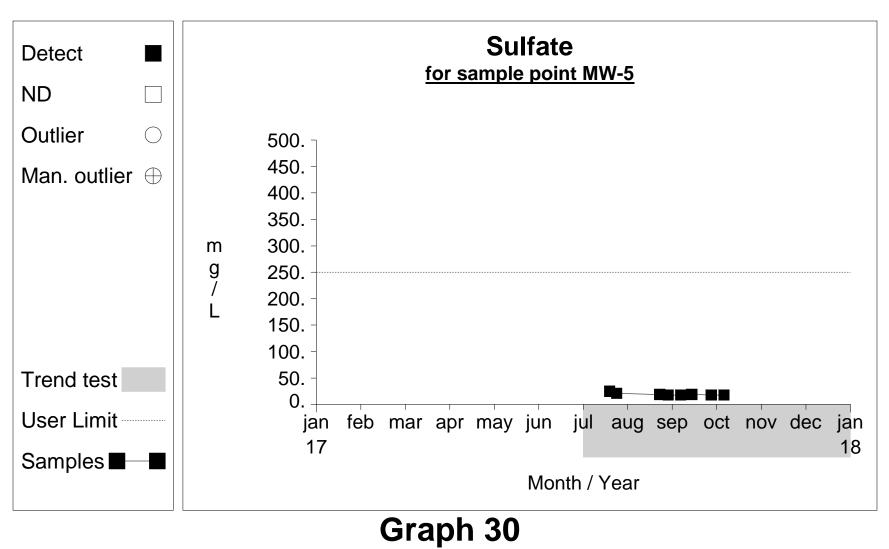
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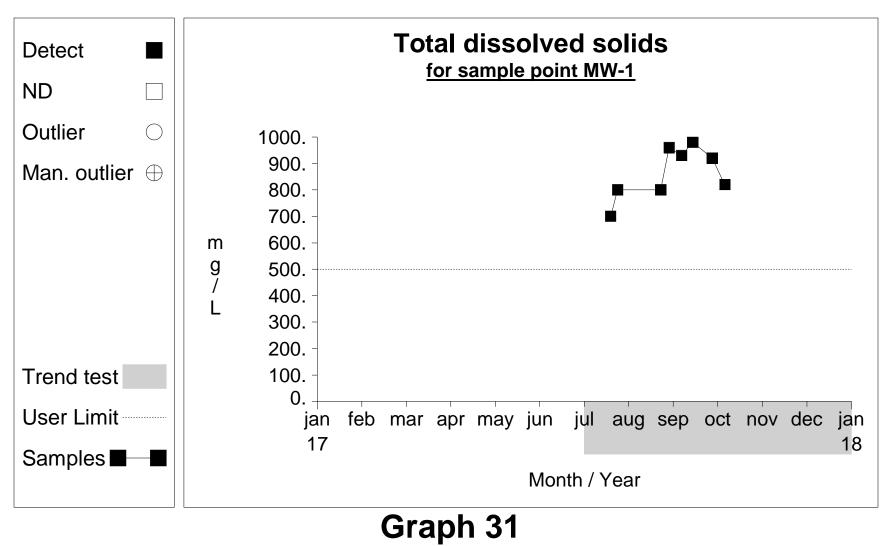
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Time Series

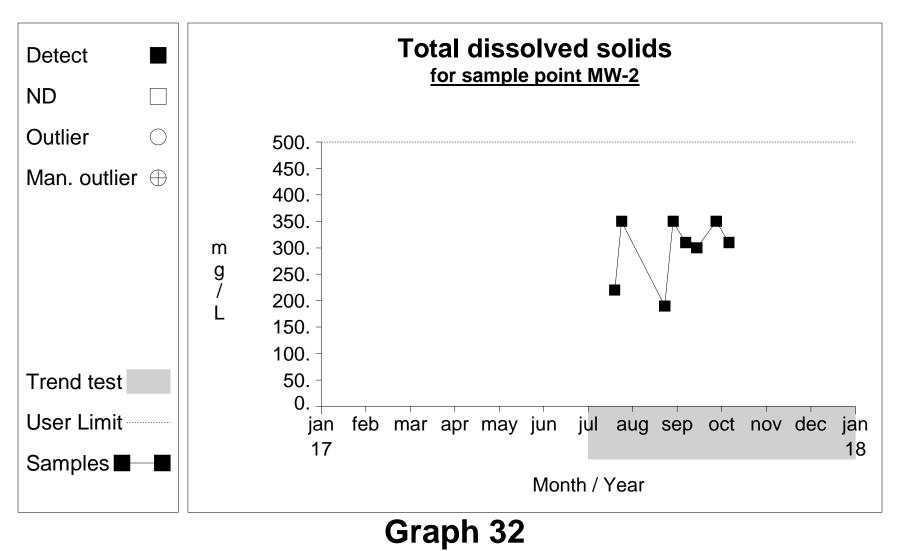


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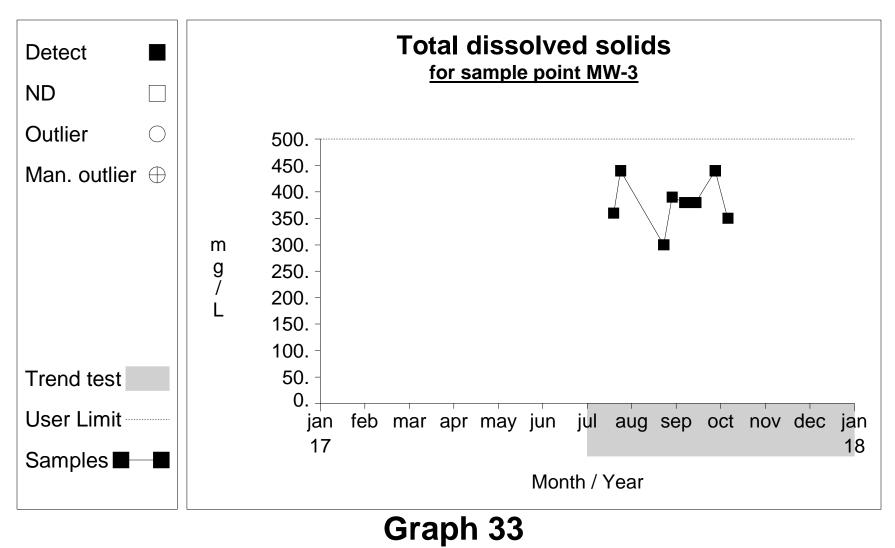


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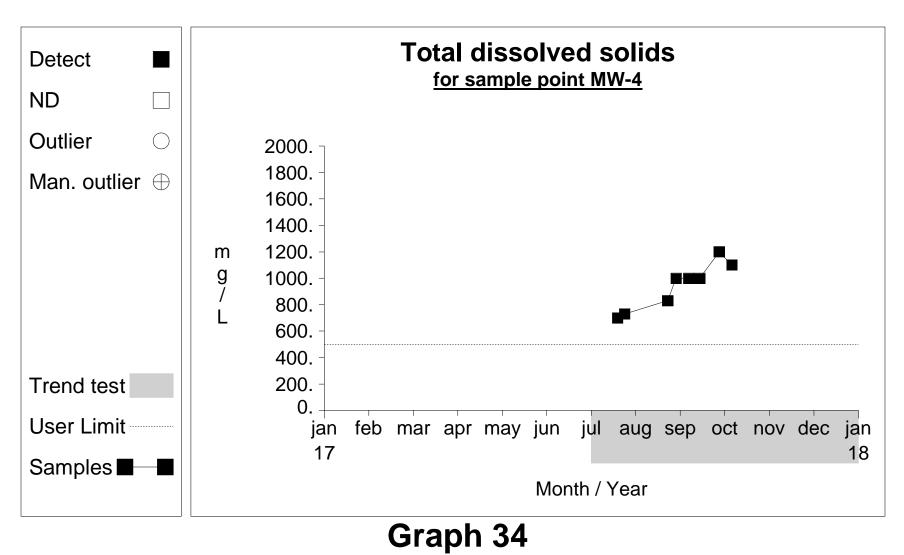
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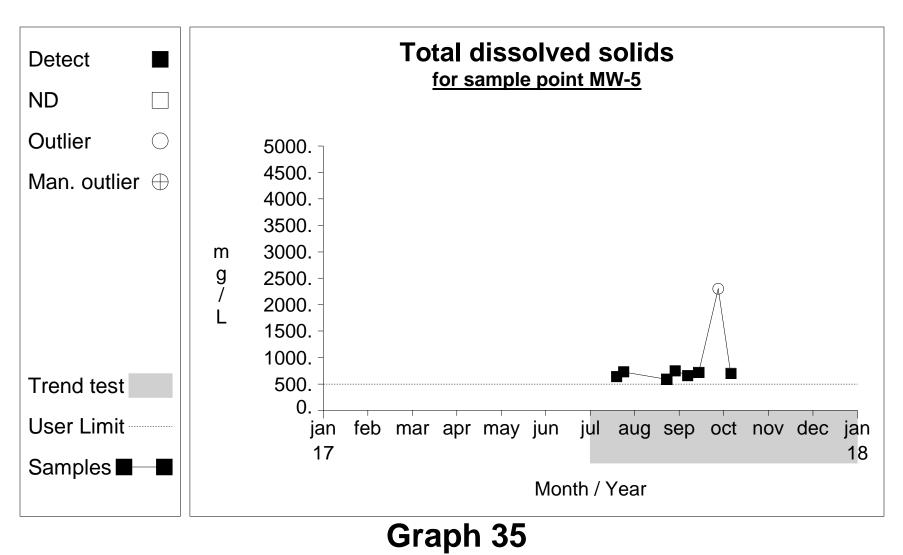
Analysis prepared on: 1/4/2018



Analysis prepared on: 1/4/2018



Analysis prepared on: 1/4/2018



Analytical Data Summary for Antimony, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0020	<.0020	<.0020	<.0020	<.0020
7/24/2017	<.0020	<.0020	<.0020	<.0020	<.0020
8/23/2017	<.0020	<.0020	<.0020	<.0020	<.0020
8/29/2017	<.0020	<.0020	<.0020	<.0020	<.0020
9/06/2017	<.0020	<.0020	<.0020	<.0020	<.0020
9/14/2017	<.0020	<.0020	<.0020	<.0020	<.0020
9/28/2017	<.0020	<.0020	<.0020	<.0020	<.0020
10/05/2017	<.0020	<.0020	<.0020	<.0020	<.0020

Analytical Data Summary for Arsenic, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	.0066	<.0050	<.0050	<.0050	<.0050
7/24/2017	<.0050	<.0050	<.0050	<.0050	<.0050
8/23/2017	<.0050	<.0050	<.0050	<.0050	<.0050
8/29/2017	<.0050	<.0050	<.0050	<.0050	<.0050
9/06/2017	<.0050	<.0050	<.0050	<.0050	<.0050
9/14/2017	<.0050	<.0050	<.0050	<.0050	<.0050
9/28/2017	<.0050	<.0050	<.0050	<.0050	<.0050
10/05/2017	<.0050	<.0050	<.0050	<.0050	<.0050

Analytical Data Summary for Barium, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	.2100	<.1000	.1100	<.1000	.1700
7/24/2017	.1500	<.1000	.2300	<.1000	.1600
8/23/2017	.1400	<.1000	<.1000	<.1000	.1300
8/29/2017	.1300	<.1000	<.1000	<.1000	.1200
9/06/2017	.1300	<.1000	<.1000	<.1000	.1100
9/14/2017	.1300	<.1000	<.1000	<.1000	.1100
9/28/2017	.1300	<.1000	<.1000	.1200	.1100
10/05/2017	.1300	<.1000	<.1000	.1000	.1200

			•			•
C	Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/	/19/2017	<.0010	<.0010	<.0010	<.0010	<.0010
7/	/24/2017	<.0010	<.0010	<.0010	<.0010	<.0010
8/	/23/2017	<.0010	<.0010	<.0010	<.0010	<.0010
8/	/29/2017	<.0010	<.0010	<.0010	<.0010	<.0010
9/	/06/2017	<.0010	<.0010	<.0010	<.0010	<.0010
9/	/14/2017	<.0010	<.0010	<.0010	<.0010	<.0010
9/	/28/2017	<.0010	<.0010	<.0010	<.0010	<.0010
10/	/05/2017	<.0010	<.0010	<.0010	<.0010	<.0010

Analytical Data Summary for Beryllium, total (mg/L)

Analytical Data Summary for Boron, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.3000	<.3000	<.3000	<.3000	<.3000
7/24/2017	<.3000	<.3000	<.3000	<.3000	<.3000
8/23/2017	<.3000	<.3000	<.3000	<.3000	<.3000
8/29/2017	<.3000	<.3000	<.3000	<.3000	<.3000
9/06/2017	<.3000	<.3000	<.3000	<.3000	<.3000
9/14/2017	<.3000	<.3000	<.3000	<.3000	<.3000
9/28/2017	.5300	<.3000	<.3000	<.3000	<.3000
10/05/2017	<.3000	<.3000	<.3000	<.3000	<.3000

Analytical Data Summary for Cadmium, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0010	<.0010	<.0010	<.0010	<.0010
7/24/2017	<.0010	<.0010	<.0010	<.0010	<.0010
8/23/2017	<.0010	<.0010	<.0010	<.0010	<.0010
8/29/2017	<.0010	<.0010	<.0010	<.0010	<.0010
9/06/2017	<.0010	<.0010	<.0010	<.0010	<.0010
9/14/2017	<.0010	<.0010	<.0010	<.0010	<.0010
9/28/2017	<.0010	<.0010	<.0010	<.0010	<.0010
10/05/2017	<.0010	<.0010	<.0010	<.0010	<.0010

Analytical Data Summary for Calcium, total (mg/L)

ſ	Dates	MW-1	MW-2	MW-3	MW-4	MW-5
	7/19/2017	100.0000	51.0000	68.0000	93.0000	100.0000
	7/24/2017	110.0000	63.0000	69.0000	89.0000	100.0000
	8/23/2017	120.0000	51.0000	75.0000	100.0000	110.0000
	8/29/2017	130.0000	52.0000	62.0000	120.0000	110.0000
	9/06/2017	130.0000	53.0000	62.0000	110.0000	100.0000
	9/14/2017	110.0000	52.0000	57.0000	100.0000	96.0000
	9/28/2017	120.0000	58.0000	67.0000	160.0000	120.0000
	10/05/2017	130.0000	61.0000	69.0000	120.0000	120.0000

	Dates	MW-1	MW-2	MW-3	MW-4	MW-5
	7/19/2017	230.0000	60.0000	98.0000	260.0000	200.0000
	7/24/2017	230.0000	59.0000	89.0000	220.0000	190.0000
	8/23/2017	260.0000	62.0000	95.0000	300.0000	210.0000
	8/29/2017	270.0000	61.0000	86.0000	340.0000	190.0000
	9/06/2017	270.0000	60.0000	85.0000	340.0000	190.0000
	9/14/2017	290.0000	64.0000	83.0000	360.0000	200.0000
	9/28/2017	270.0000	65.0000	89.0000	370.0000	190.0000
1	0/05/2017	280.0000	65.0000	87.0000	380.0000	190.0000

Analytical Data Summary for Chloride (mg/L)

Analytical Data Summary for Chromium, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0100	<.0100	<.0100	<.0100	<.0100
7/24/2017	<.0100	<.0100	<.0100	<.0100	<.0100
8/23/2017	<.0100	<.0100	<.0100	<.0100	<.0100
8/29/2017	.0180	<.0100	<.0100	<.0100	<.0100
9/06/2017	<.0100	<.0100	<.0100	<.0100	<.0100
9/14/2017	<.0100	<.0100	<.0100	<.0100	<.0100
9/28/2017	<.0100	<.0100	<.0100	<.0100	<.0100
10/05/2017	<.0100	<.0100	<.0100	<.0100	<.0100

Analytical Data Summary for Cobalt, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0200	<.0200	<.0200	<.0200	<.0200
7/24/2017	<.0200	<.0200	<.0200	<.0200	<.0200
8/23/2017	<.0200	<.0200	<.0200	<.0200	<.0200
8/29/2017	<.0200	<.0200	<.0200	<.0200	<.0200
9/06/2017	<.0200	<.0200	<.0200	<.0200	<.0200
9/14/2017	<.0200	<.0200	<.0200	<.0200	<.0200
9/28/2017	<.0200	<.0200	<.0200	<.0200	<.0200
10/05/2017	<.0200	<.0200	<.0200	<.0200	<.0200

Analytical Data Summary for Fluoride (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.3800	<.3800	<.3800	<.3800	<.3800
7/24/2017	<.3800	<.3800	<.3800	<.3800	<.3800
8/23/2017	<.1000	<.1000	<.1000	<.1000	<.1000
8/29/2017	<.1000	<.1000	<.1000	<.1000	<.1000
9/06/2017	<.1000	<.1000	<.1000	.2000	<.1000
9/14/2017	<.1000	<.1000	<.1000	.1800	<.1000
9/28/2017	<.1000	<.1000	<.1000	<.1000	<.1000
10/05/2017	<.1000	<.1000	<.1000	<.1000	<.1000

Analytical Data Summary for Lead, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	.0170	<.0030	<.0030	<.0030	<.0030
7/24/2017	<.0030	<.0030	<.0030	<.0030	<.0030
8/23/2017	<.0030	.2400	<.0030	<.0030	<.0030
8/29/2017	<.0030	<.0030	<.0030	<.0030	<.0030
9/06/2017	<.0030	<.0030	<.0030	<.0030	<.0030
9/14/2017	<.0030	<.0030	<.0030	<.0030	<.0030
9/28/2017	<.0030	<.0030	<.0030	.0031	<.0030
10/05/2017	<.0030	<.0030	<.0030	<.0030	<.0030

Analytical Data Summary for Lithium, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0100	<.0100	<.0100	<.0100	<.0100
7/24/2017	<.0100	<.0100	<.0100	<.0100	<.0100
8/23/2017	<.0100	<.0100	<.0100	<.0100	<.0100
8/29/2017	<.0100	<.0100	<.0100	<.0100	<.0100
9/06/2017	<.0100	<.0100	<.0100	<.0100	<.0100
9/14/2017	<.0100	<.0100	<.0100	<.0100	<.0100
9/28/2017	<.0100	<.0100	<.0100	.0130	<.0100
10/05/2017	<.0100	<.0100	<.0100	.0110	.0130

Analytical Data Summary for Mercury, total (mg/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0002	<.0002	<.0002	<.0002	<.0002
7/24/2017	<.0002	<.0002	<.0002	<.0002	<.0002
8/23/2017	<.0002	<.0002	<.0002	<.0002	<.0002
8/29/2017	<.0002	<.0002	<.0002	<.0002	<.0002
9/06/2017	<.0002	<.0002	<.0002	<.0002	<.0002
9/14/2017	<.0002	<.0002	<.0002	<.0002	<.0002
9/28/2017	<.0002	<.0002	<.0002	<.0002	<.0002
10/05/2017	<.0002	<.0002	<.0002	<.0002	<.0002

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	Dates	MW-1	MW-2	MW-3	MW-4	MW-5
	7/19/2017	<.0500	<.0500	<.0500	<.0500	<.0500
	7/24/2017	<.0500	<.0500	<.0500	<.0500	<.0500
	8/23/2017	<.0500	<.0500	<.0500	<.0500	<.0500
	8/29/2017	<.0500	<.0500	<.0500	<.0500	<.0500
	9/06/2017	<.0500	<.0500	<.0500	<.0500	<.0500
	9/14/2017	<.0500	<.0500	<.0500	<.0500	<.0500
	9/28/2017	<.0500	<.0500	<.0500	<.0500	<.0500
	10/05/2017	<.0500	<.0500	<.0500	<.0500	<.0500

Analytical Data Summary for Molybdenum, total (mg/L)

Analytical Data Summary for pH Field (SU)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	7.5800	8.4100	8.0000	7.9200	7.3600
7/24/2017	7.4500	8.0900	7.8600	7.8500	7.1700
8/23/2017	7.5400	8.1300	7.8100	7.9300	7.4100
8/29/2017	6.5600	7.0300	6.3200	7.3200	6.7600
9/06/2017	7.5600	8.1500	7.7700	7.7500	7.4700
9/14/2017	7.6000	8.1300	7.8500	7.7700	7.5100
9/28/2017	7.5800	8.0700	8.0900	7.7400	7.5400
10/05/2017	7.5500	7.9900	8.1000	7.7000	7.4500

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for Radium-226 (pCi/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
7/24/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
8/23/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
8/29/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
9/06/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
9/14/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
9/28/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
10/05/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000

Analytical Data Summary for Radium-228 (pCi/L)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	2.3300	<1.0000	<1.0000	1.0700	1.5100
7/24/2017	1.4300	1.5600	<1.0000	<1.0000	<1.0000
8/23/2017	<1.0000	<1.0000	<1.0000	<1.0000	1.4400
8/29/2017	<1.0000	2.0000	<1.0000	<1.0000	<1.0000
9/06/2017	<1.0000	<1.0000	1.0500	<1.0000	<1.0000
9/14/2017	<1.0000	<1.0000	1.1700	<1.0000	<1.0000
9/28/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
10/05/2017	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0050	<.0050	<.0050	<.0050	<.0050
7/24/2017	<.0050	<.0050	<.0050	<.0050	<.0050
8/23/2017	<.0050	<.0050	<.0050	<.0050	<.0050
8/29/2017	<.0050	<.0050	<.0050	<.0050	<.0050
9/06/2017	<.0050	<.0050	<.0050	<.0050	<.0050
9/14/2017	<.0050	<.0050	<.0050	<.0050	<.0050
9/28/2017	<.0050	<.0050	<.0050	<.0050	<.0050
10/05/2017	<.0050	<.0050	<.0050	<.0050	<.0050

Analytical Data Summary for Selenium, total (mg/L)

Analytical Data Summary for Specific conductance (µmhos/cm)

ſ	Dates	MW-1	MW-2	MW-3	MW-4	MW-5
	7/19/2017	1185.0000	421.0000	697.0000	1265.0000	1097.0000
	7/24/2017	1228.0000	463.0000	655.0000	1171.0000	1106.0000
	8/23/2017	1363.0000	456.0000	630.0000	1366.0000	1104.0000
	8/29/2017	1261.0000	369.0000	480.0000	1235.0000	834.0000
	9/06/2017	1360.0000	476.0000	599.0000	1586.0000	1108.0000
	9/14/2017	1366.0000	480.0000	590.0000	1639.0000	1121.0000
	9/28/2017	1366.0000	487.0000	648.0000	1678.0000	1122.0000
	10/05/2017	1377.0000	492.5000	644.0000	1727.0000	1138.0000

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Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	19.0000	22.0000	49.0000	19.0000	25.0000
7/24/2017	20.0000	21.0000	36.0000	18.0000	21.0000
8/23/2017	21.0000	26.0000	44.0000	24.0000	19.0000
8/29/2017	20.0000	22.0000	28.0000	47.0000	18.0000
9/06/2017	21.0000	21.0000	26.0000	53.0000	18.0000
9/14/2017	22.0000	23.0000	25.0000	49.0000	19.0000
9/28/2017	20.0000	21.0000	20.0000	46.0000	18.0000
10/05/2017	21.0000	21.0000	21.0000	43.0000	18.0000

Analytical Data Summary for Sulfate (mg/L)

Analytical Data Summary for Thallium, total (mg/L)

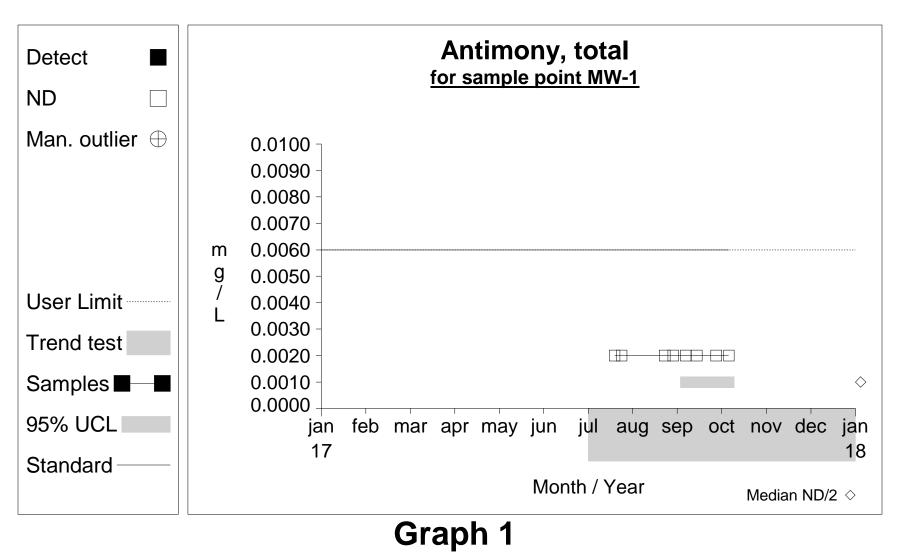
Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	<.0020	<.0020	<.0020	<.0020	<.0020
7/24/2017	<.0020	<.0020	<.0020	<.0020	<.0020
8/23/2017	<.0020	<.0020	<.0020	<.0020	<.0020
8/29/2017	<.0020	<.0020	<.0020	<.0020	<.0020
9/06/2017	<.0020	<.0020	<.0020	<.0020	<.0020
9/14/2017	<.0020	<.0020	<.0020	<.0020	<.0020
9/28/2017	<.0020	<.0020	<.0020	<.0020	<.0020
10/05/2017	<.0020	<.0020	<.0020	<.0020	<.0020

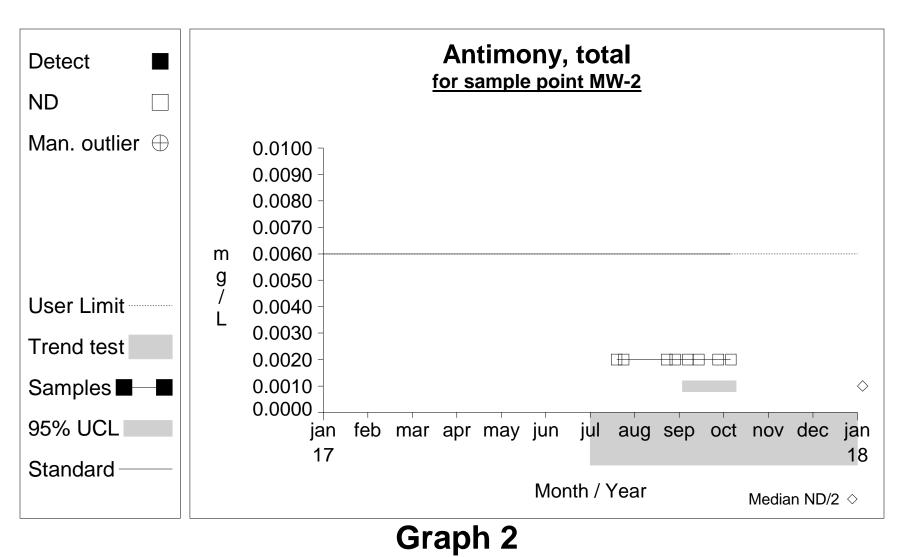
Analytical Data Summary for Total dissolved solids (mg/L)

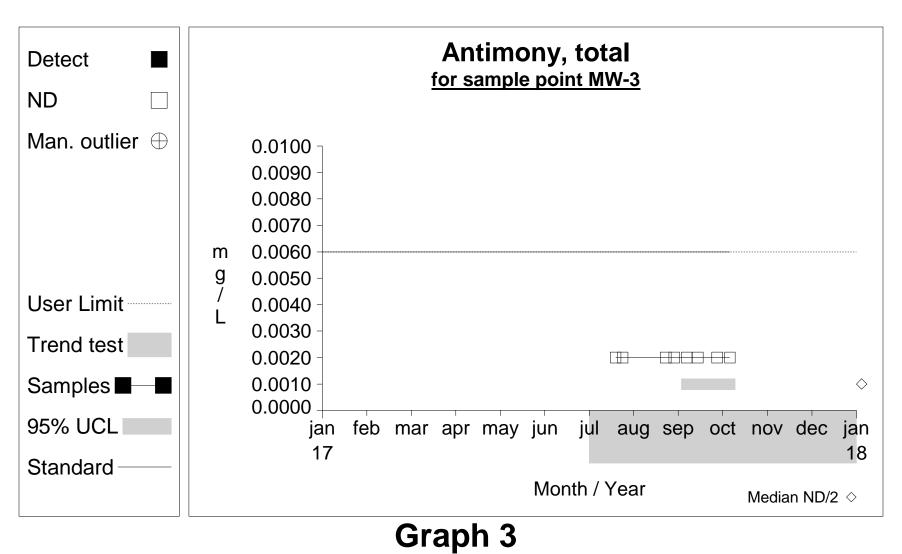
Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	700.0000	220.0000	360.0000	700.0000	640.0000
7/24/2017	800.000	350.0000	440.0000	730.0000	730.0000
8/23/2017	800.000	190.0000	300.0000	830.0000	590.0000
8/29/2017	960.0000	350.0000	390.0000	1000.0000	750.0000
9/06/2017	930.0000	310.0000	380.0000	1000.0000	660.0000
9/14/2017	980.0000	300.0000	380.0000	1000.0000	720.0000
9/28/2017	920.0000	350.0000	440.0000	1200.0000	2300.0000
10/05/2017	820.0000	310.0000	350.0000	1100.0000	700.0000

Analytical Data Summary for Turbidity, field (NTU)

Dates	MW-1	MW-2	MW-3	MW-4	MW-5
7/19/2017	14.8000	20.1000	28.0000	5.8800	6.7000
7/24/2017	20.9000	16.1000	17.2000	8.7000	3.7000
8/23/2017	22.4000	5.2000	5.9000	24.9000	4.5000
8/29/2017	11.0200	10.2800	9.8700	7.9200	6.7100
9/06/2017	3.5000	3.3000	4.5000	4.1000	2.6000
9/14/2017	5.1000	7.2000	15.6000	9.1000	3.4000
9/28/2017	5.5000	5.3000	4.9000	19.4000	4.5000
10/05/2017	2.7000	4.5000	2.8000	13.4000	4.3000





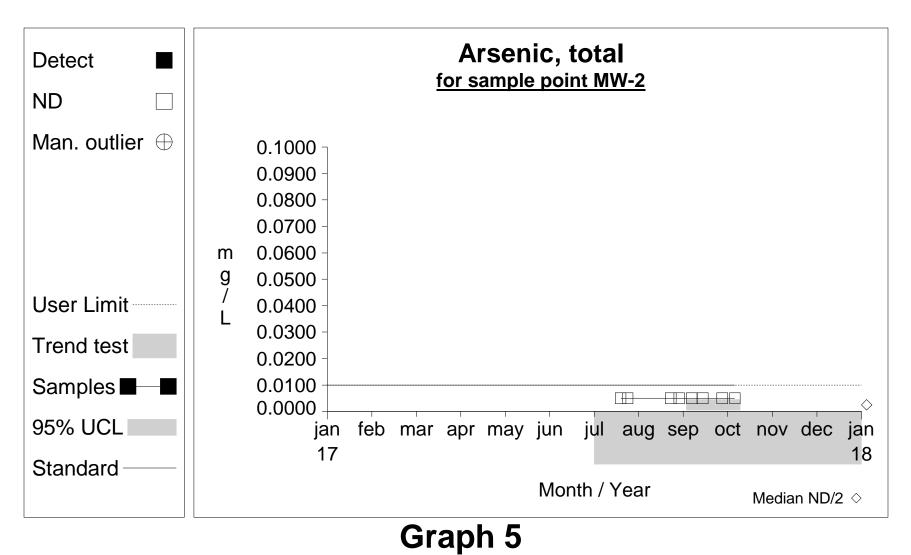


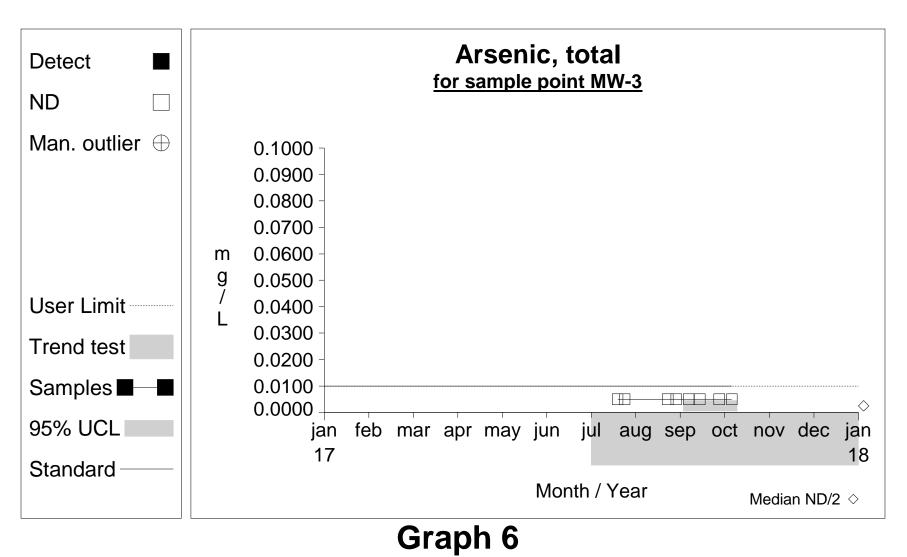
Analysis prepared on: 1/4/2018

Arsenic, total Detect for sample point MW-1 ND Man. outlier \oplus 0.1000 0.0900 0.0800 0.0700 0.0600 m g 0.0500 / User Limit 0.0400 0.0300 Trend test 0.0200 Samples 0.0100 0.0000 \Diamond 95% UCL feb mar apr may jun jan jul aug sep oct nov dec jan 17 18 Standard Month / Year Median ND/2 \diamond

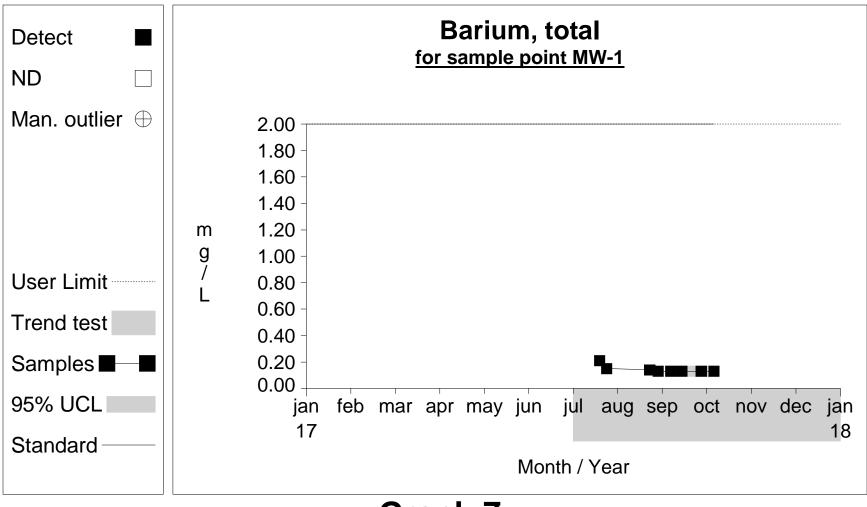
Graph 4

Analysis prepared on: 1/4/2018



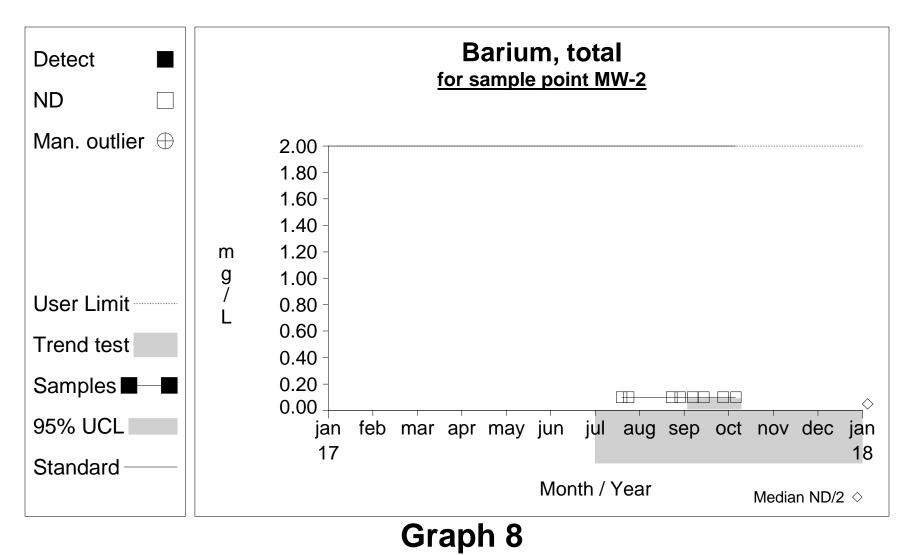


Analysis prepared on: 1/4/2018

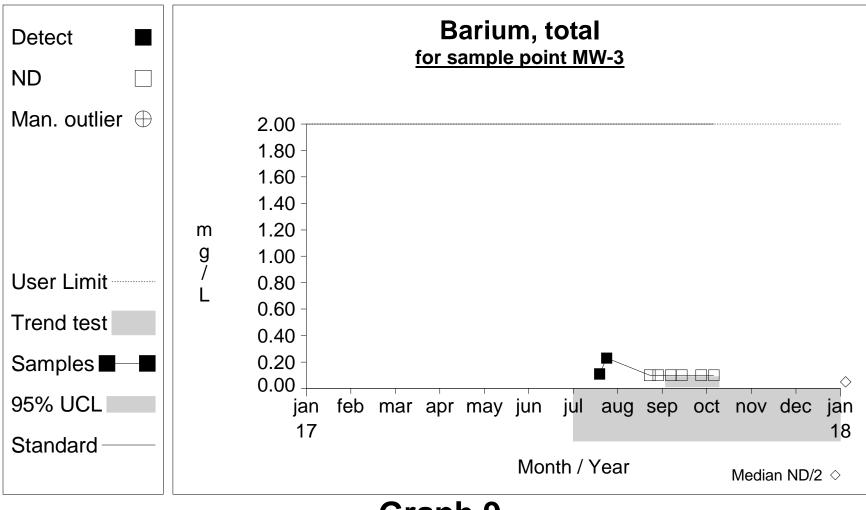


Graph 7

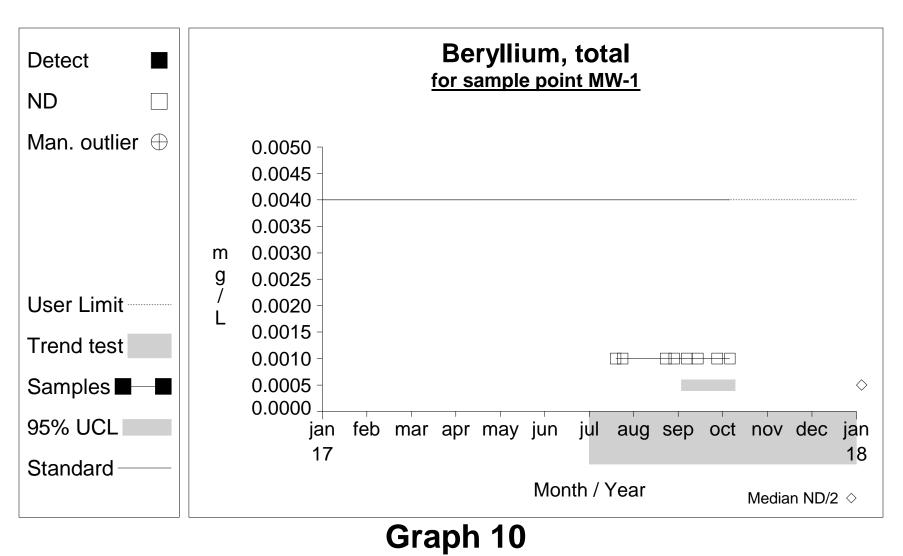
Analysis prepared on: 1/4/2018



Analysis prepared on: 1/4/2018

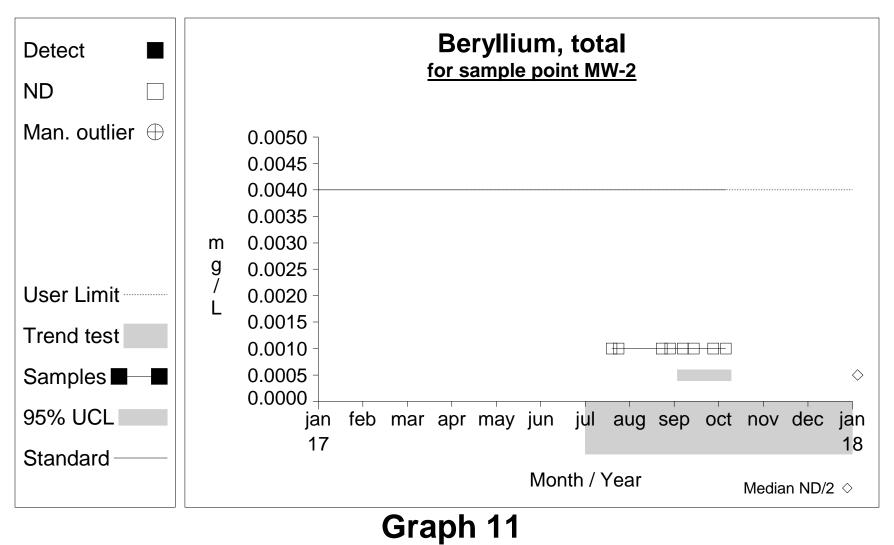


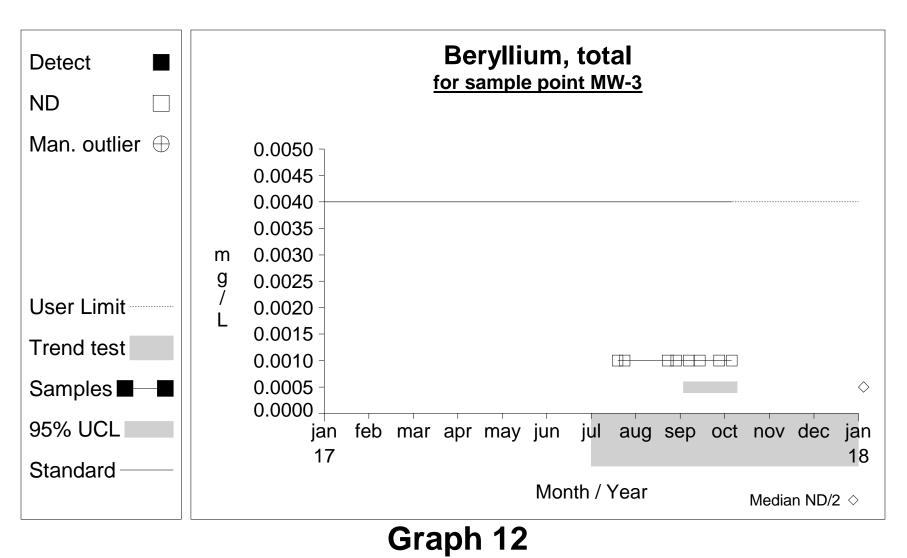
Graph 9



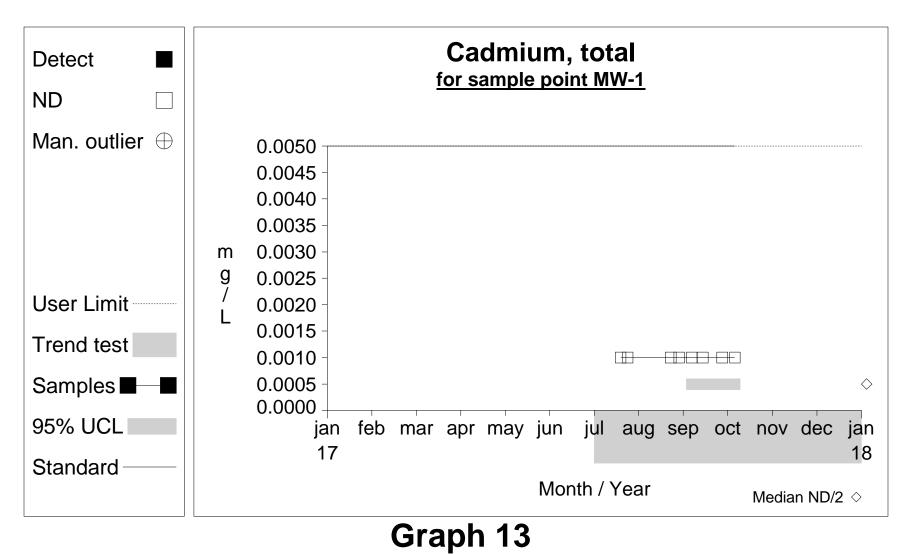
Analysis prepared on: 1/4/2018

Confidence Limits (Assessment)

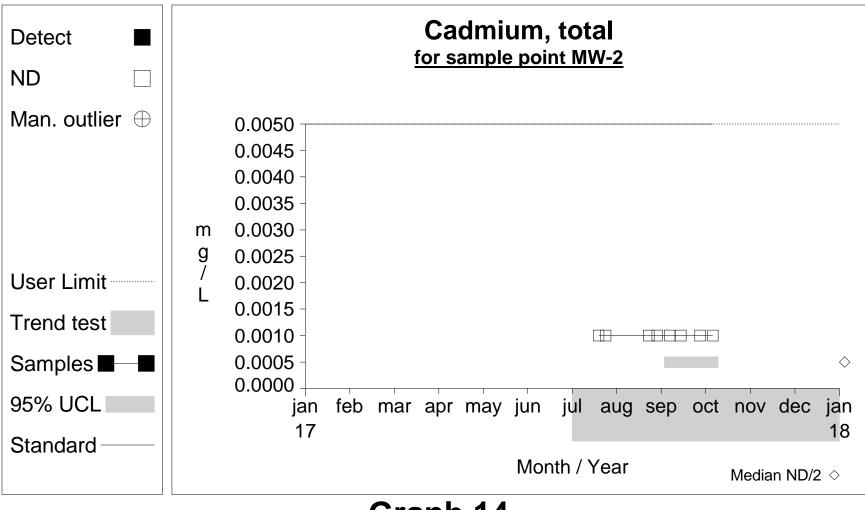




Analysis prepared on: 1/4/2018



Analysis prepared on: 1/4/2018

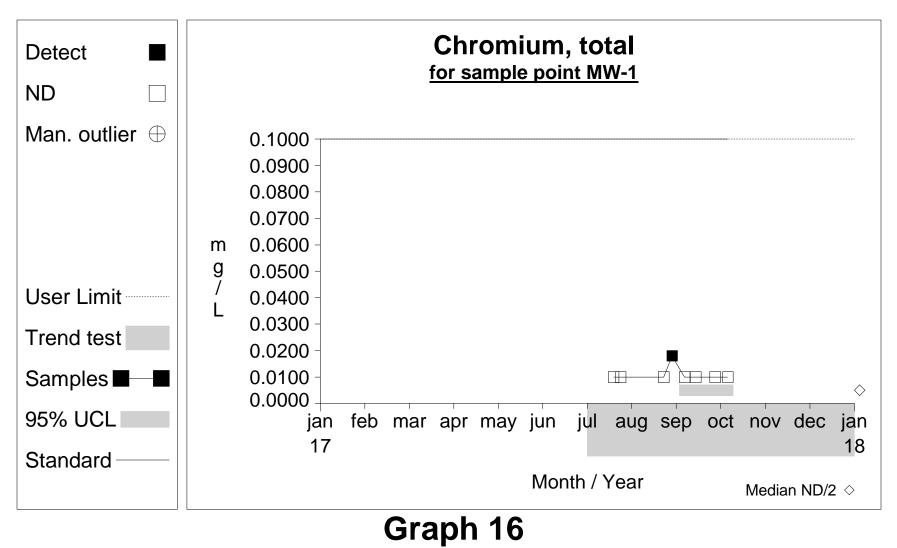


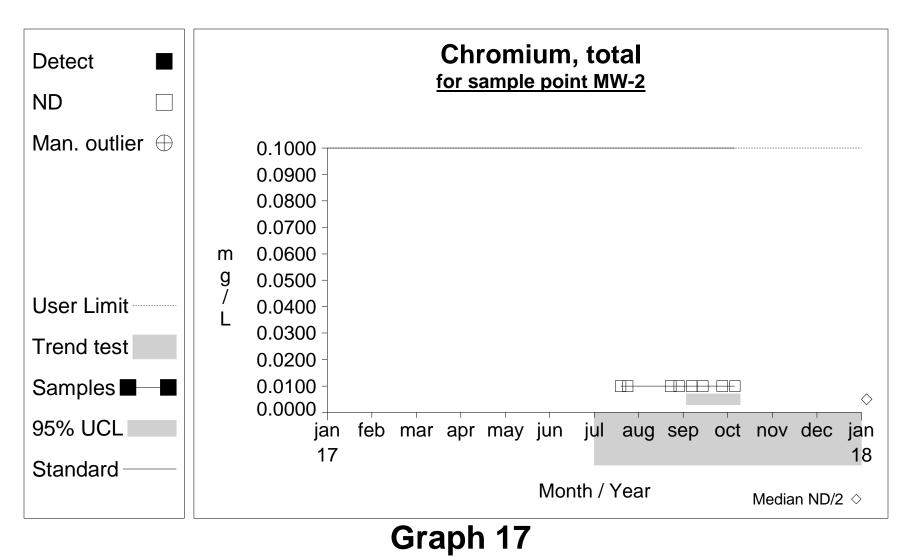
Graph 14

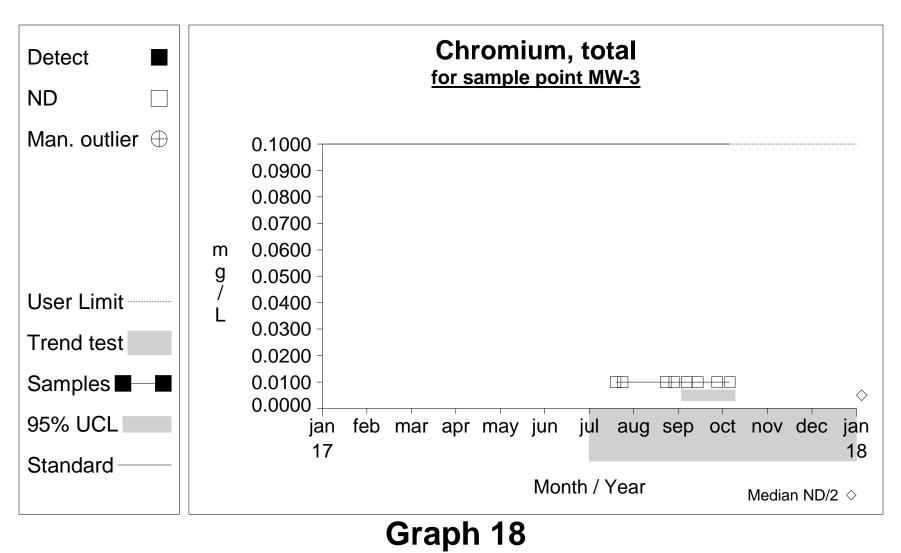
Cadmium, total Detect for sample point MW-3 ND Man. outlier \oplus 0.0050 0.0045 0.0040 0.0035 0.0030 m g 0.0025 / User Limit 0.0020 0.0015 Trend test 0.0010 Samples 0.0005 \Diamond 0.0000 95% UCL feb mar apr may jun jul aug sep oct nov dec jan jan 17 18 Standard Month / Year Median ND/2 \diamond Graph 15

Analysis prepared on: 1/4/2018

Confidence Limits (Assessment)

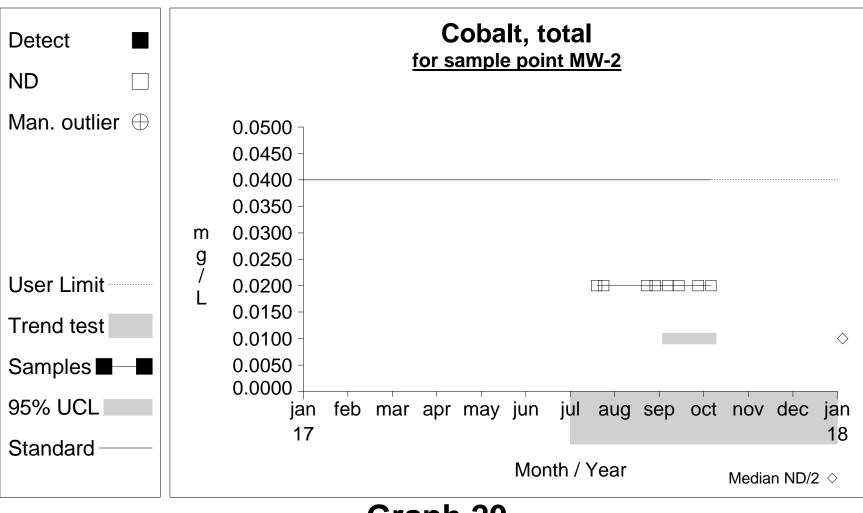




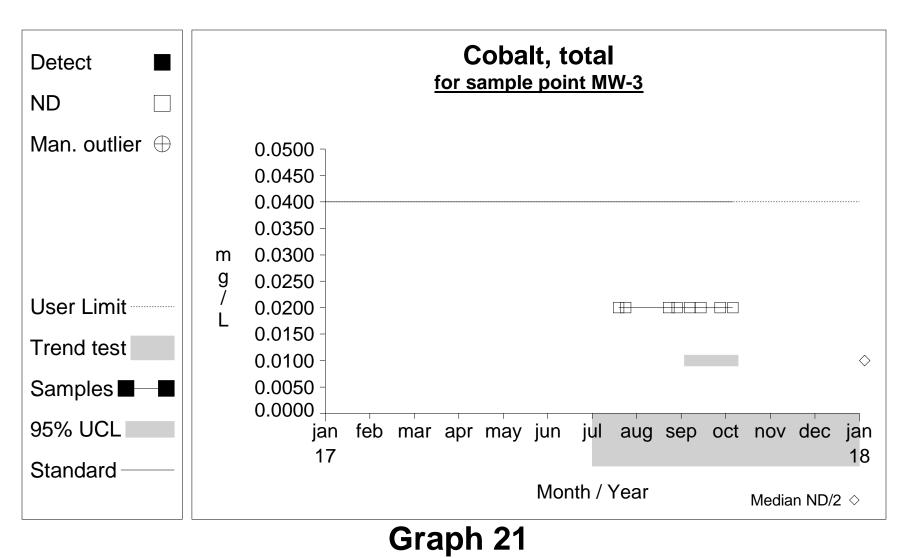


Cobalt, total Detect for sample point MW-1 ND Man. outlier \oplus 0.0500 0.0450 0.0400 0.0350 0.0300 m g 0.0250 / User Limit 0.0200 0.0150 Trend test 0.0100 \diamond Samples 0.0050 0.0000 95% UCL feb mar apr may jun jul aug sep oct nov dec jan jan 17 18 Standard Month / Year Median ND/2 \diamond

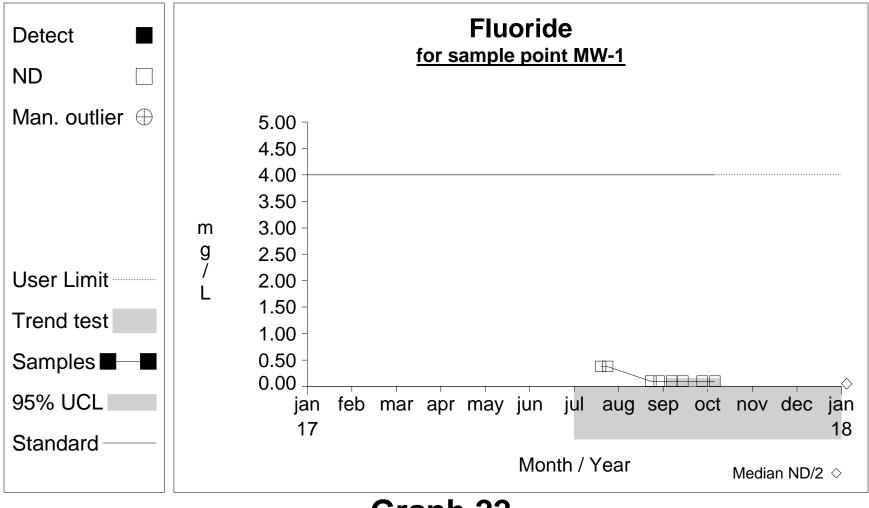
Graph 19



Graph 20

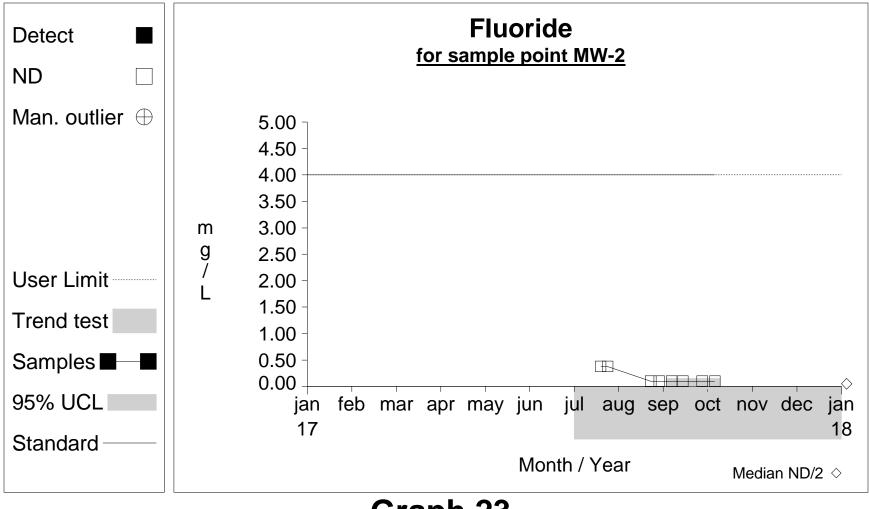






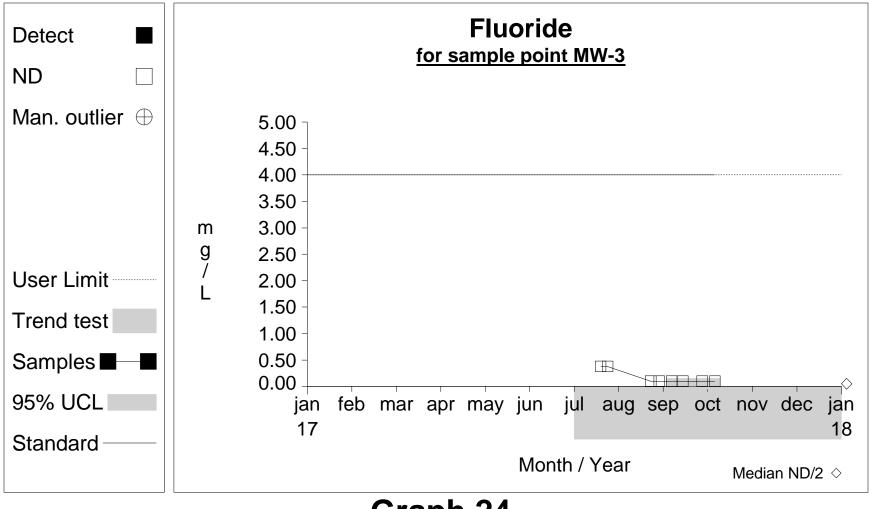
Graph 22





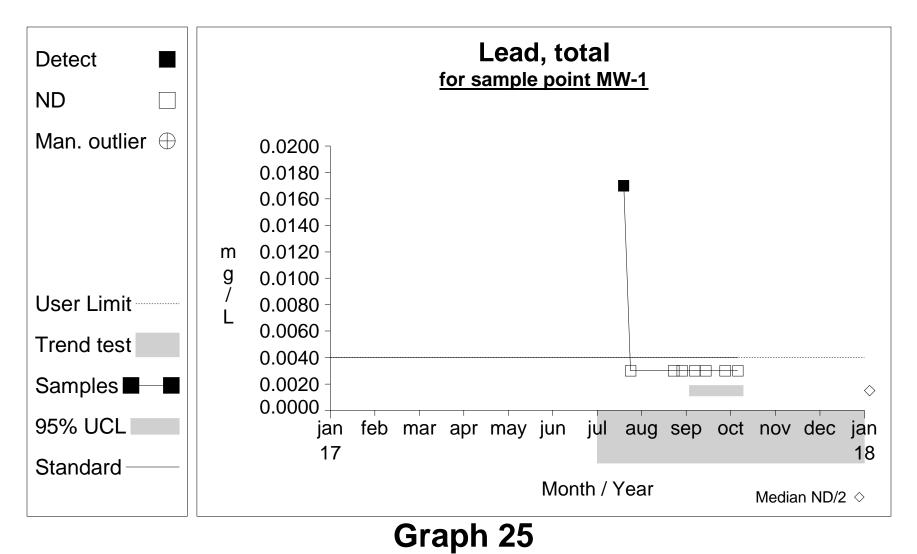
Graph 23



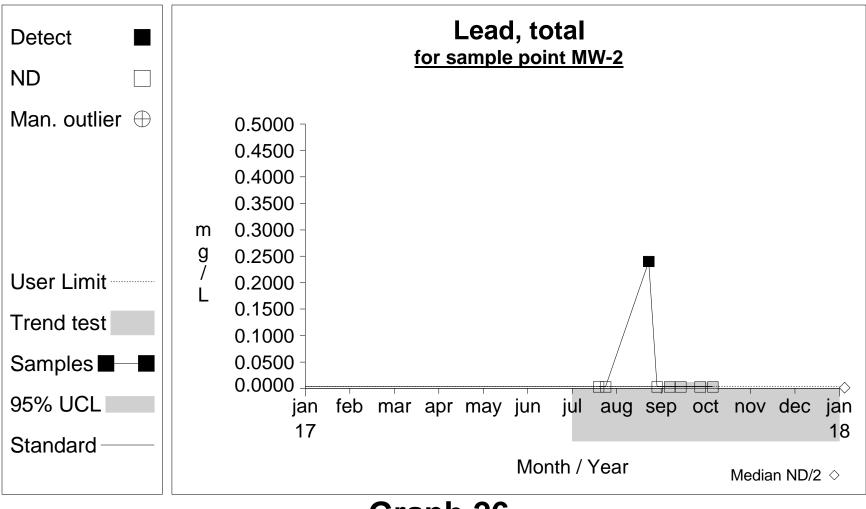


Graph 24



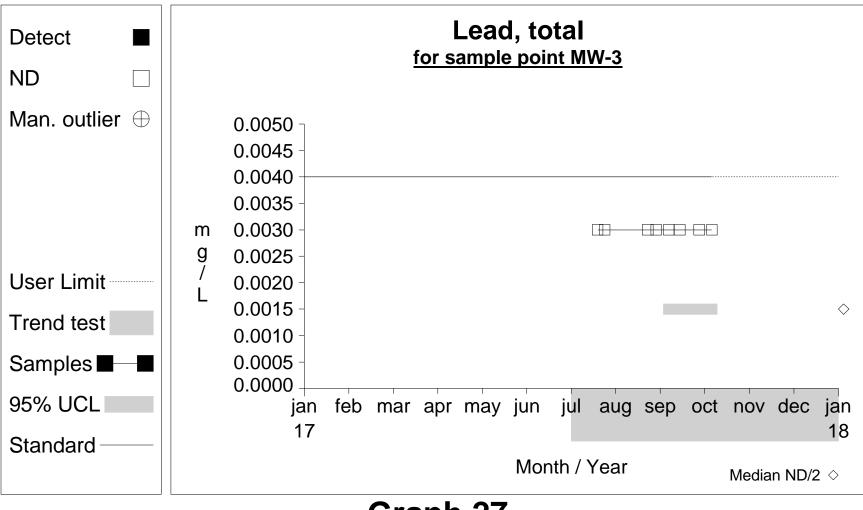


Analysis prepared on: 1/4/2018



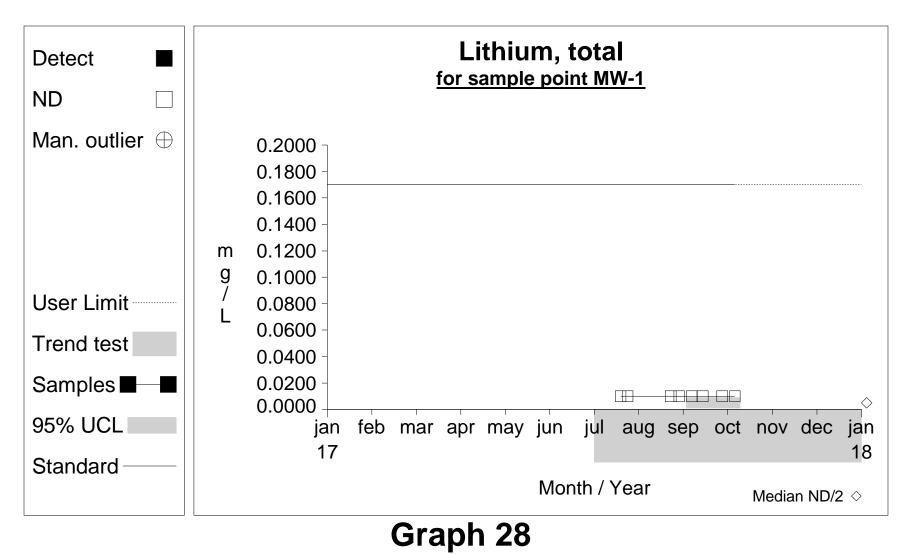
Graph 26

Analysis prepared on: 1/4/2018

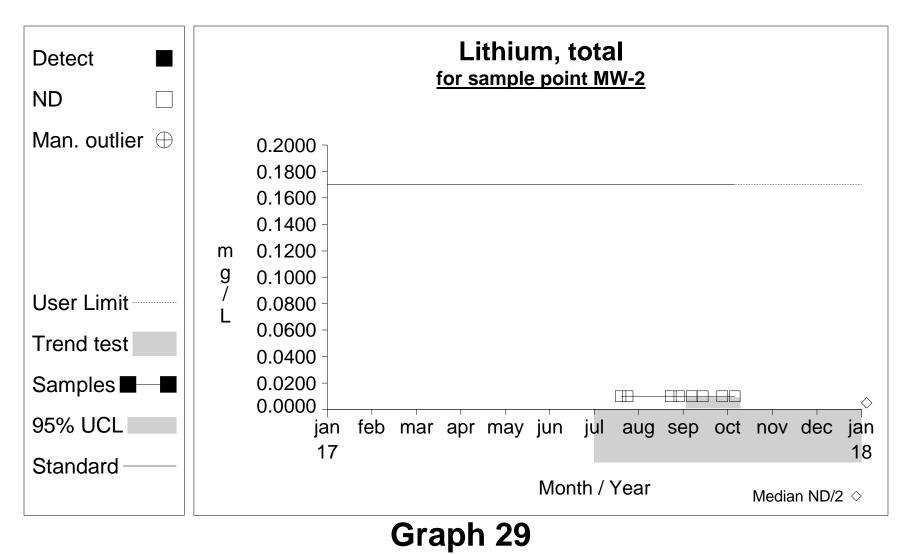


Graph 27

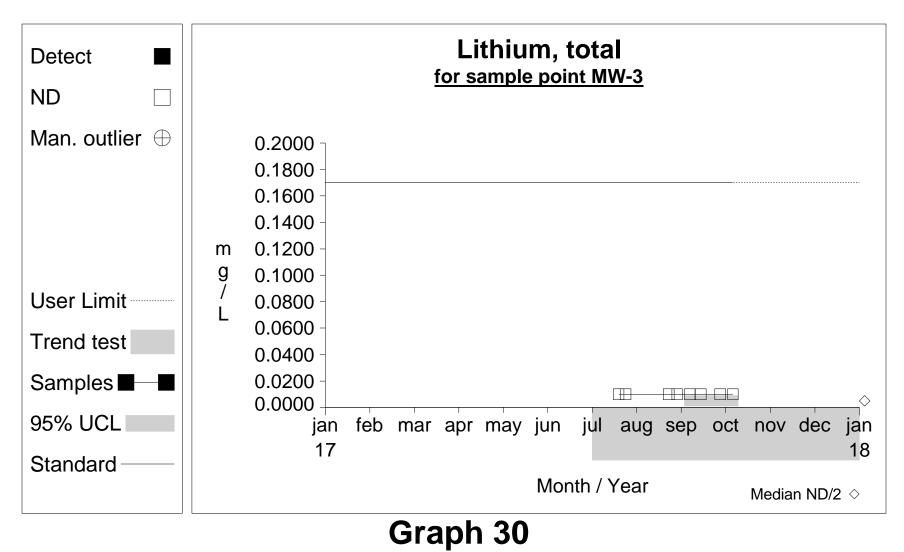
Analysis prepared on: 1/4/2018

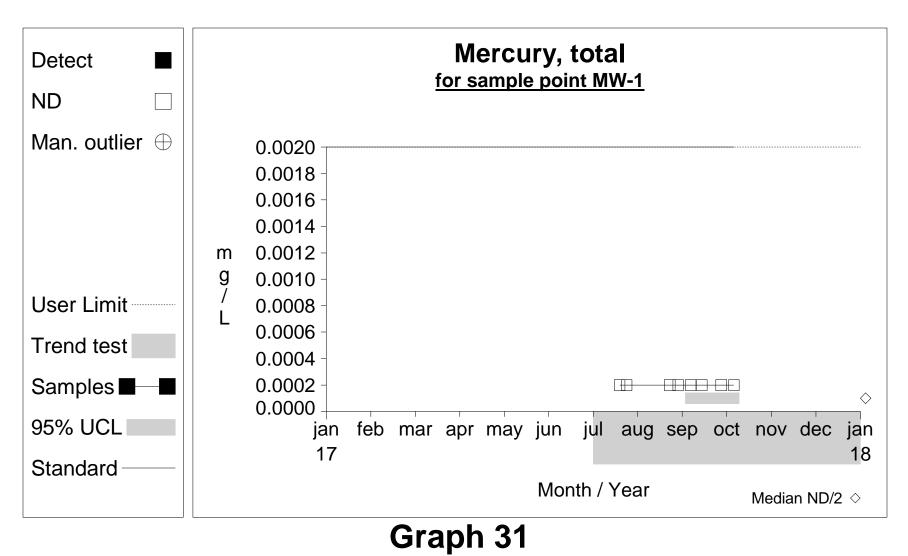


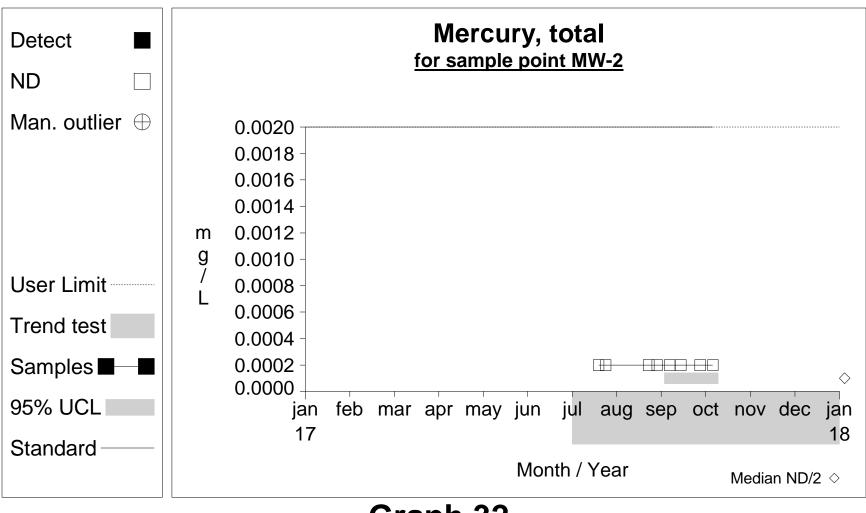
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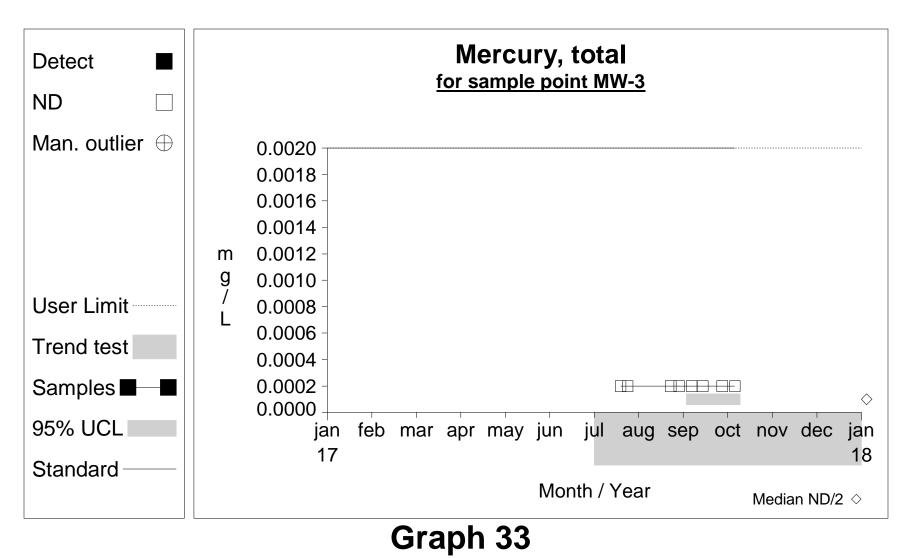
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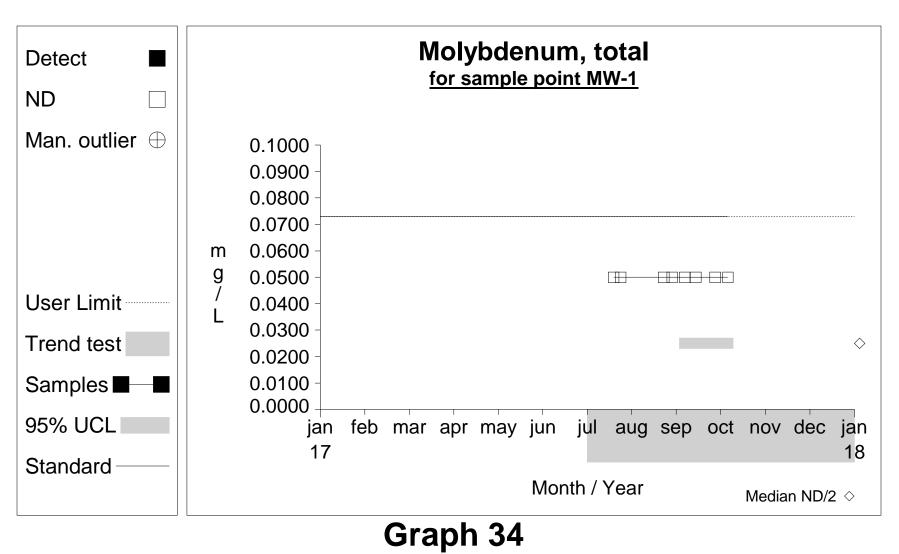


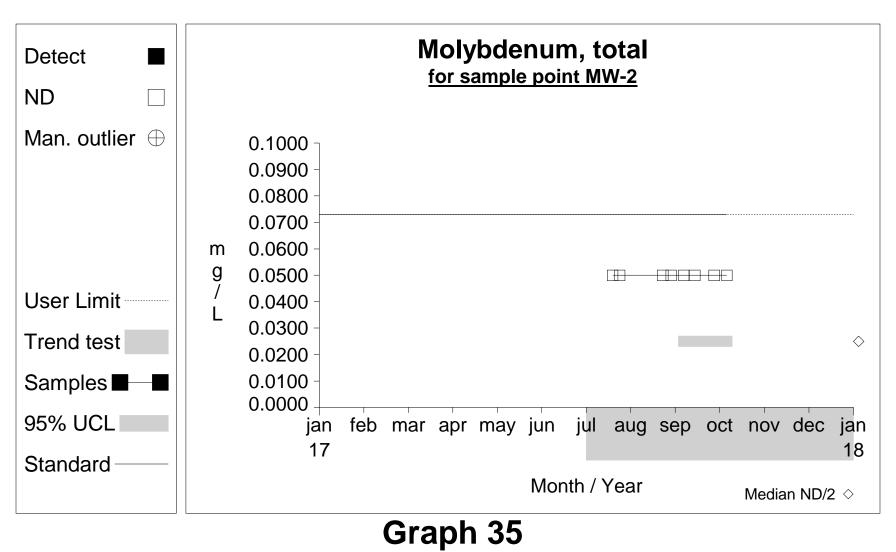


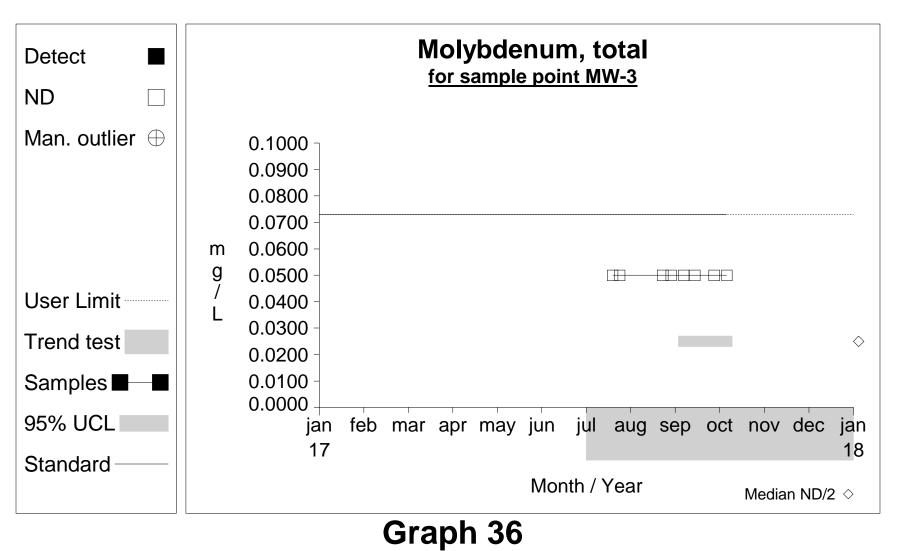


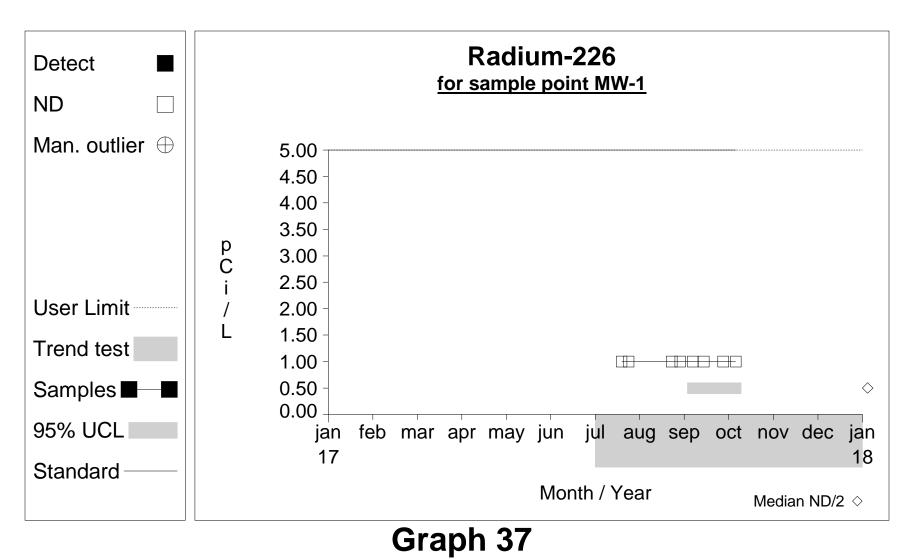
Graph 32

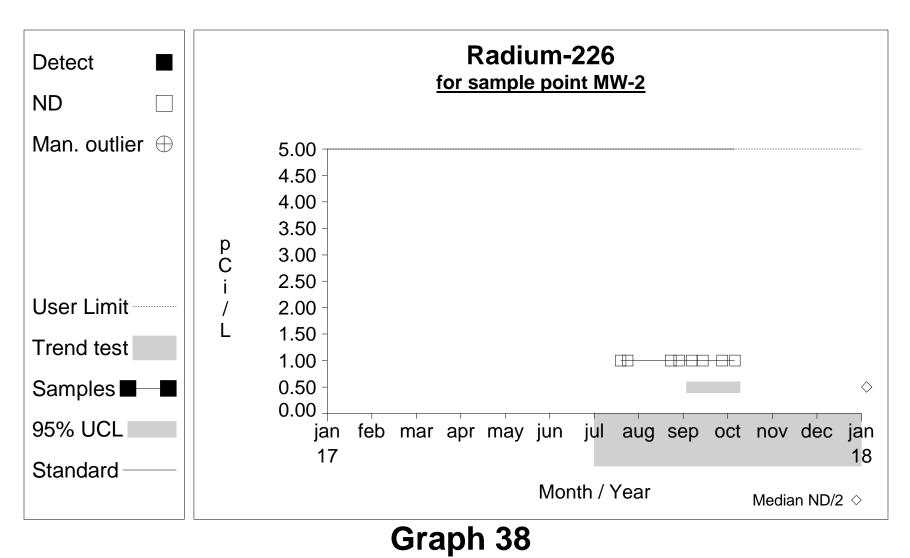


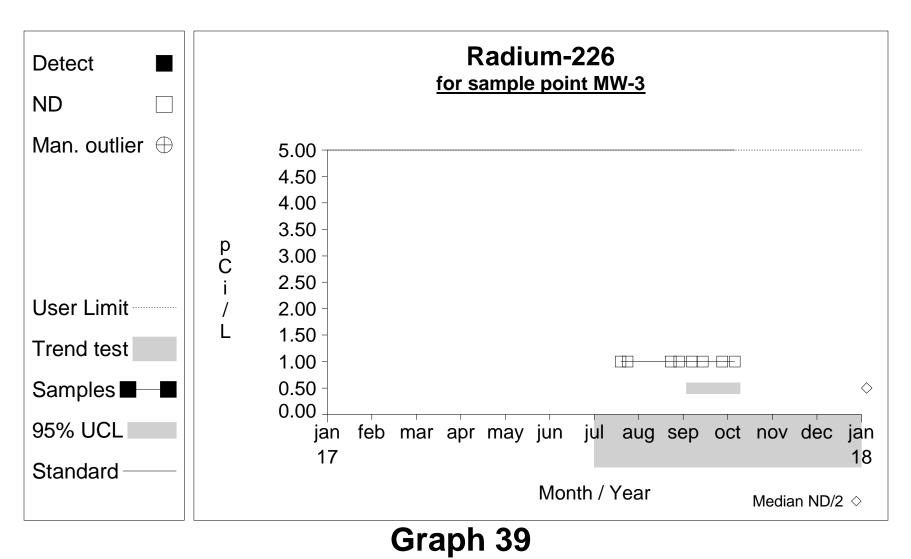


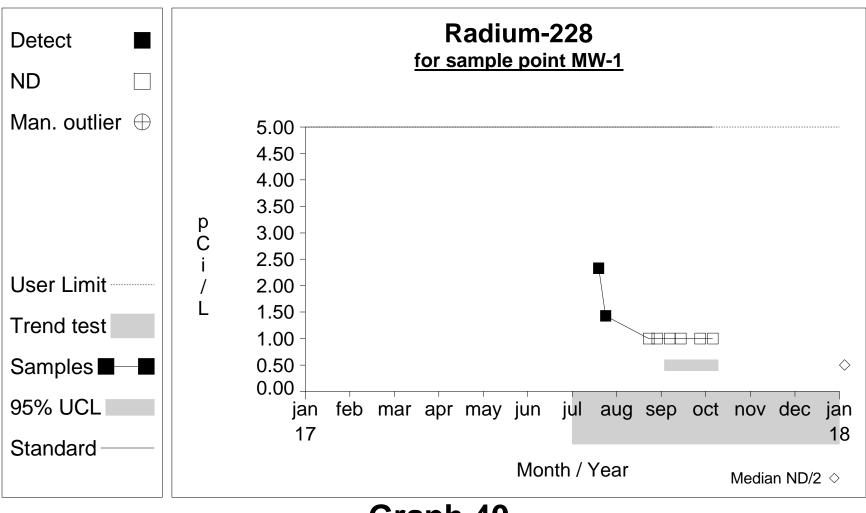






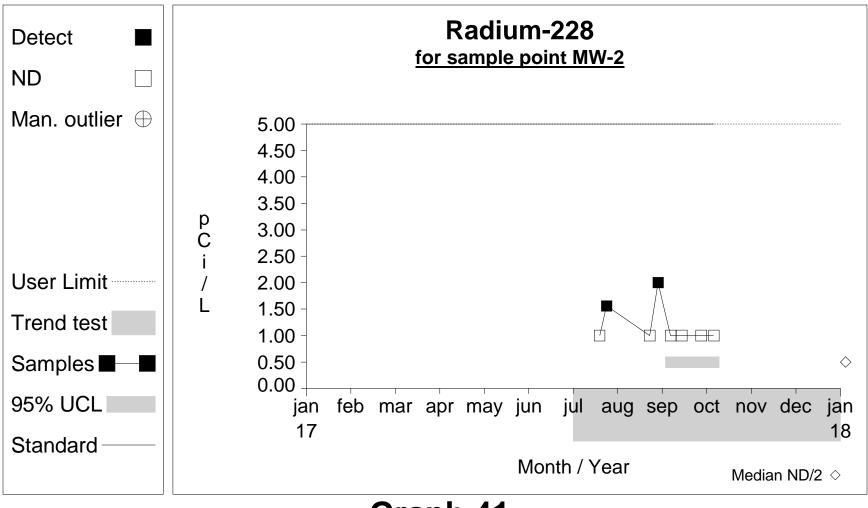




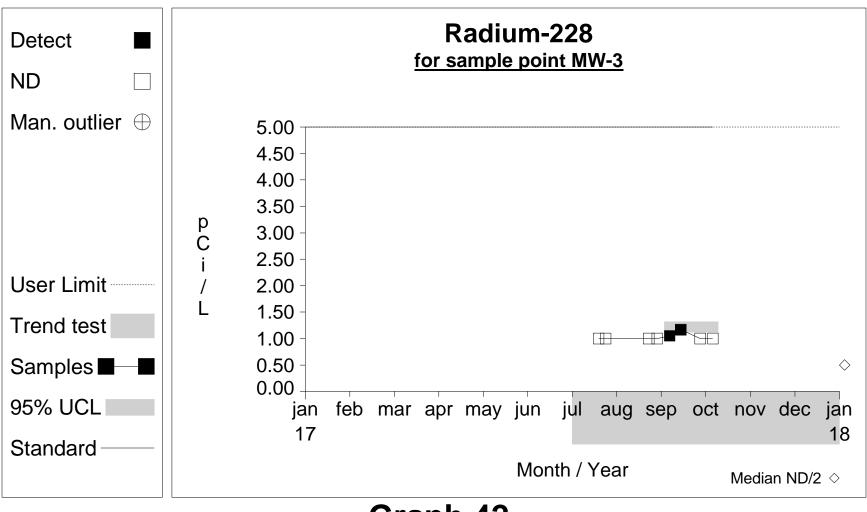


Graph 40

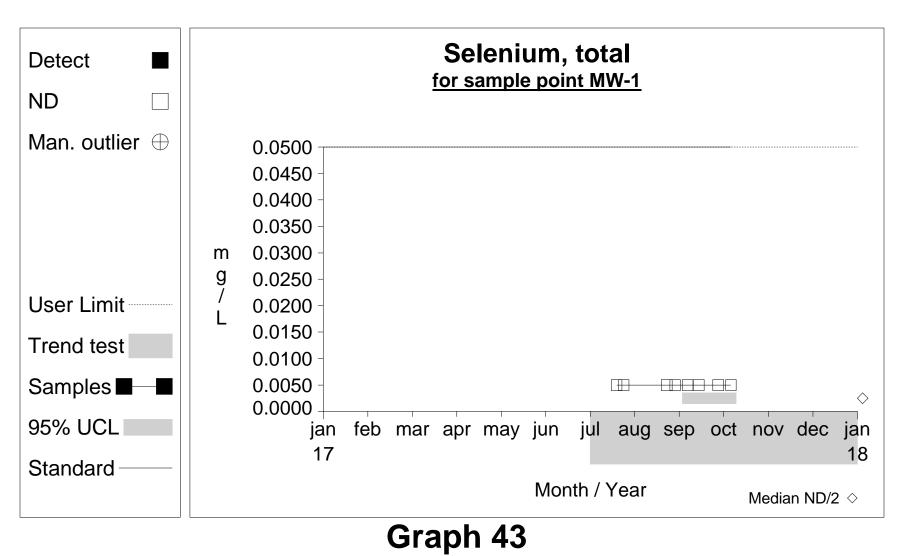
Analysis prepared on: 1/4/2018

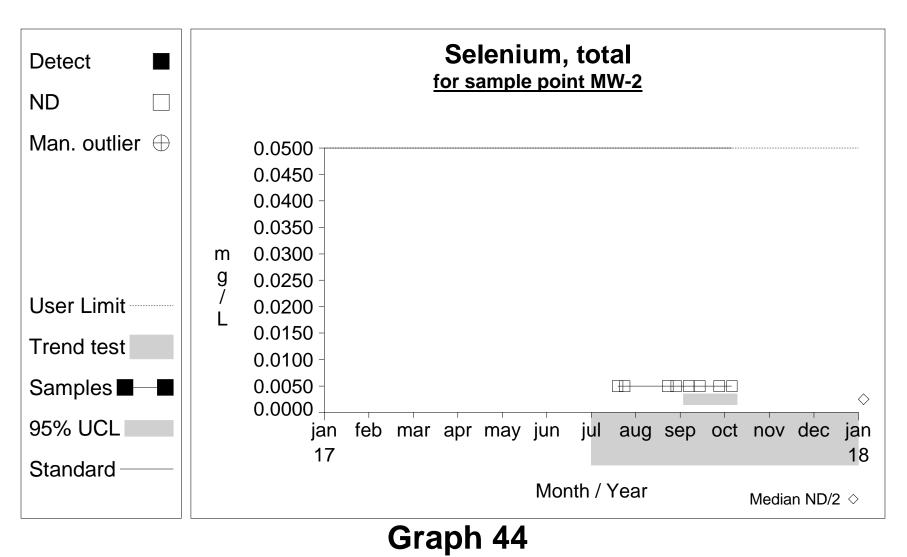


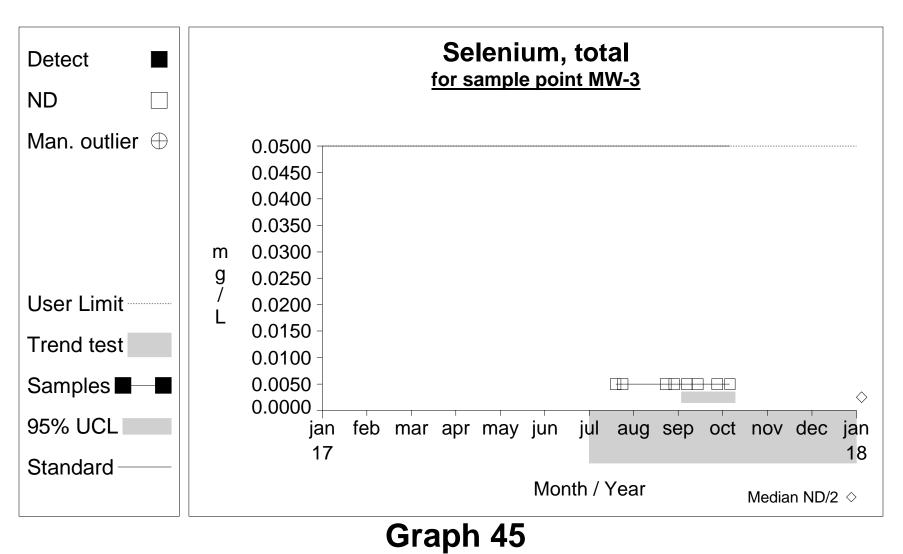
Graph 41

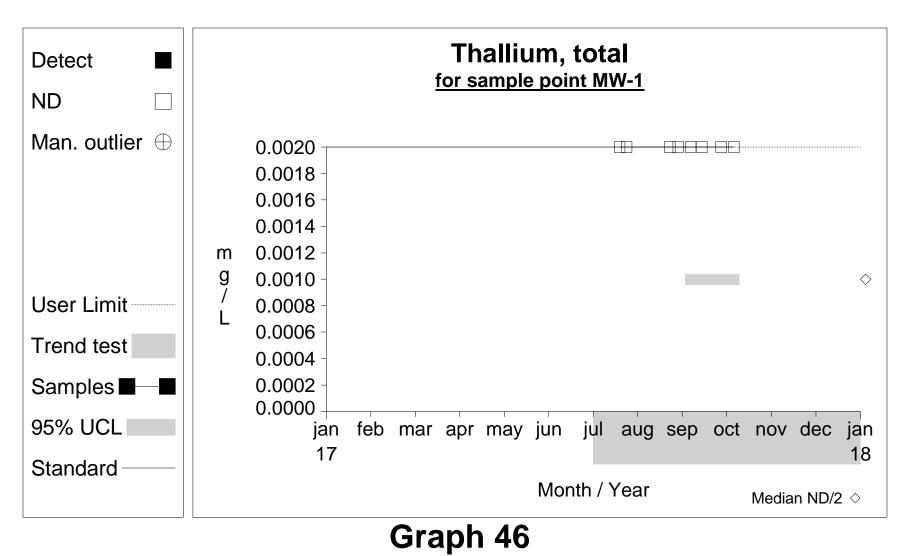


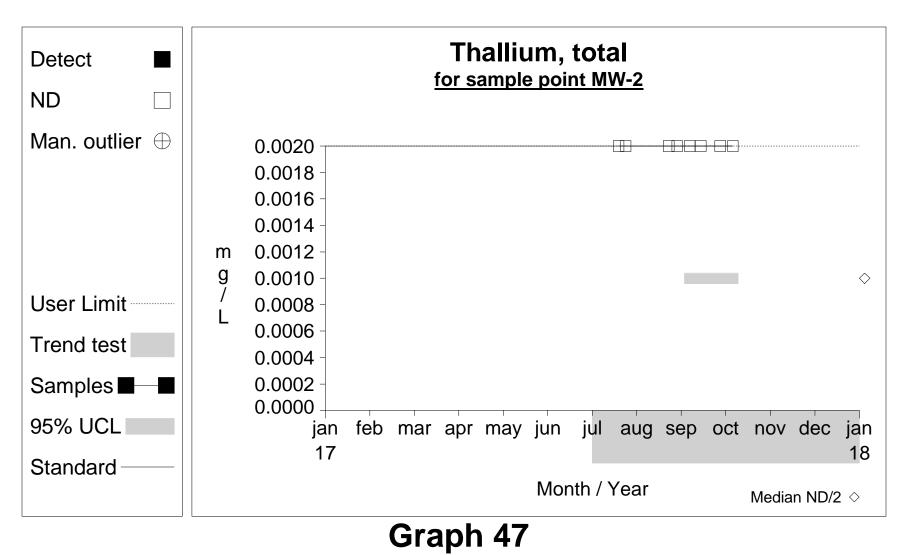
Graph 42











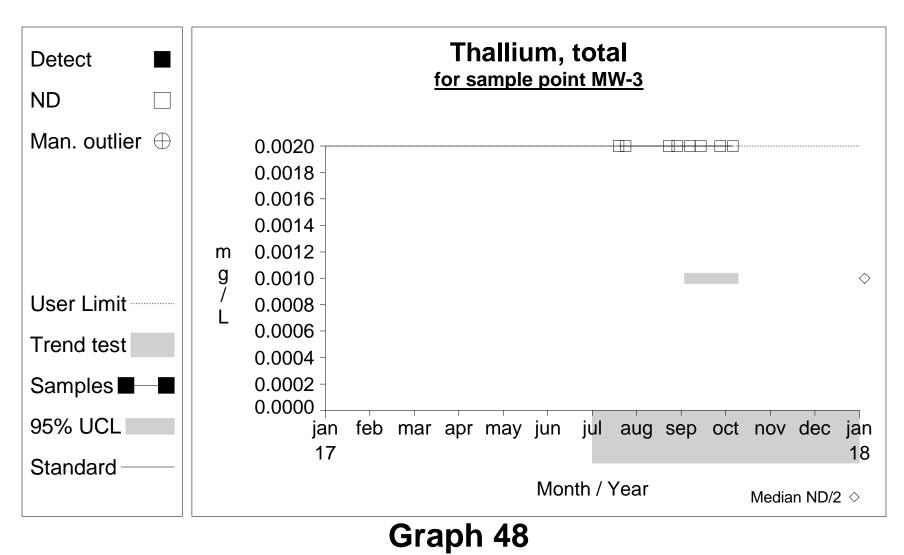


Table 12

Confidence Intervals for Comparing the Mean of the Last 4 Measurements to an Assessment Monitoring Standard Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Ν	Mean	SD	Factor	95% LCL	95% UCL	Standard
Antimony, total	mg/L	MW-1	4	0.001	0.000	1.176	0.001	0.001	0.006
Antimony, total	mg/L	MW-2	4	0.001	0.000	1.176	0.001	0.001	0.006
Antimony, total	mg/L	MW-3	4	0.001	0.000	1.176	0.001	0.001	0.006
Arsenic, total	mg/L	MW-1	4	0.003	0.000	1.176	0.002	0.003	0.010
Arsenic, total	mg/L	MW-2	4	0.003	0.000	1.176	0.002	0.003	0.010
Arsenic, total	mg/L	MW-3	4	0.003	0.000	1.176	0.002	0.003	0.010
Barium, total	mg/L	MW-1	4	0.130	0.000	1.176	0.130	0.130	2.000
Barium, total	mg/L	MW-2	4	0.050	0.000	1.176	0.050	0.050	2.000
Barium, total	mg/L	MW-3	4	0.050	0.000	1.176	0.050	0.050	2.000
Beryllium, total	mg/L	MW-1	4	0.001	0.000	1.176	0.001	0.001	0.004
Beryllium, total	mg/L	MW-2	4	0.001	0.000	1.176	0.001	0.001	0.004
Beryllium, total	mg/L	MW-3	4	0.001	0.000	1.176	0.001	0.001	0.004
Cadmium, total	mg/L	MW-1	4	0.001	0.000	1.176	0.001	0.001	0.005
Cadmium, total	mg/L	MW-2	4	0.001	0.000	1.176	0.001	0.001	0.005
Cadmium, total	mg/L	MW-3	4	0.001	0.000	1.176	0.001	0.001	0.005
Chromium, total	mg/L	MW-1	4	0.005	0.000	1.176	0.005	0.005	0.100
Chromium, total	mg/L	MW-2	4	0.005	0.000	1.176	0.005	0.005	0.100
Chromium, total	mg/L	MW-3	4	0.005	0.000	1.176	0.005	0.005	0.100
Cobalt, total	mg/L	MW-1	4	0.010	0.000	1.176	0.010	0.010	0.040
Cobalt, total	mg/L	MW-2	4	0.010	0.000	1.176	0.010	0.010	0.040
Cobalt, total	mg/L	MW-3	4	0.010	0.000	1.176	0.010	0.010	0.040

* - Insufficient Data

** - Significant Exceedance

LCL = Lower Confidence Limit

UCL = Upper Confidence Limit

Table 12

Confidence Intervals for Comparing the Mean of the Last 4 Measurements to an Assessment Monitoring Standard Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Ν	Mean	SD	Factor	95% LCL	95% UCL	Standard
Fluoride	mg/L	MW-1	4	0.050	0.000	1.176	0.050	0.050	4.000
Fluoride	mg/L	MW-2	4	0.050	0.000	1.176	0.050	0.050	4.000
Fluoride	mg/L	MW-3	4	0.050	0.000	1.176	0.050	0.050	4.000
Lead, total	mg/L	MW-1	4	0.002	0.000	1.176	0.002	0.002	0.004
Lead, total	mg/L	MW-2	4	0.002	0.000	1.176	0.002	0.002	0.004
Lead, total	mg/L	MW-3	4	0.002	0.000	1.176	0.002	0.002	0.004
Lithium, total	mg/L	MW-1	4	0.005	0.000	1.176	0.005	0.005	0.170
Lithium, total	mg/L	MW-2	4	0.005	0.000	1.176	0.005	0.005	0.170
Lithium, total	mg/L	MW-3	4	0.005	0.000	1.176	0.005	0.005	0.170
Mercury, total	mg/L	MW-1	4	0.000	0.000	1.176	0.000	0.000	0.002
Mercury, total	mg/L	MW-2	4	0.000	0.000	1.176	0.000	0.000	0.002
Mercury, total	mg/L	MW-3	4	0.000	0.000	1.176	0.000	0.000	0.002
Molybdenum, total	mg/L	MW-1	4	0.025	0.000	1.176	0.025	0.025	0.073
Molybdenum, total	mg/L	MW-2	4	0.025	0.000	1.176	0.025	0.025	0.073
Molybdenum, total	mg/L	MW-3	4	0.025	0.000	1.176	0.025	0.025	0.073
Radium-226	pCi/L	MW-1	4	0.500	0.000	1.176	0.500	0.500	5.000
Radium-226	pCi/L	MW-2	4	0.500	0.000	1.176	0.500	0.500	5.000
Radium-226	pCi/L	MW-3	4	0.500	0.000	1.176	0.500	0.500	5.000
Radium-228	pCi/L	MW-1	4	0.500	0.000	1.176	0.500	0.500	5.000
Radium-228	pCi/L	MW-2	4	0.500	0.000	1.176	0.500	0.500	5.000
Radium-228	pCi/L	MW-3	4	0.805	0.356	1.176	0.387	1.223	5.000

* - Insufficient Data

** - Significant Exceedance

LCL = Lower Confidence Limit

UCL = Upper Confidence Limit

Table 12

Confidence Intervals for Comparing the Mean of the Last 4 Measurements to an Assessment Monitoring Standard Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Ν	Mean	SD	Factor	95% LCL	95% UCL	Standard
Selenium, total	mg/L	MW-1	4	0.003	0.000	1.176	0.002	0.003	0.050
Selenium, total	mg/L	MW-2	4	0.003	0.000	1.176	0.002	0.003	0.050
Selenium, total	mg/L	MW-3	4	0.003	0.000	1.176	0.002	0.003	0.050
Thallium, total	mg/L	MW-1	4	0.001	0.000	1.176	0.001	0.001	0.002
Thallium, total	mg/L	MW-2	4	0.001	0.000	1.176	0.001	0.001	0.002
Thallium, total	mg/L	MW-3	4	0.001	0.000	1.176	0.001	0.001	0.002

* - Insufficient Data

** - Significant Exceedance

LCL = Lower Confidence Limit

UCL = Upper Confidence Limit

Worksheet 6 - Assessment Monitoring Antimony, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ = 0.004 / 4	Compute the mean of the last 4 measurements.
	= 0.001	
2	S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((4.00×10 ⁻⁶ - 1.60×10 ⁻⁵ /4) / (4-1)) ^{1/2}	Compute sd of the last 4 measurements.
	= 0.0	
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.001 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.001	
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 0.001 + 2.353 * 0.0/4 ^{1/2} = 0.001	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Antimony, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 0.004 / 4	Compute the mean of the last 4 measurements.
	= 0.001	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{\frac{1}{2}}$	Compute sd of the last 4 measurements.
	= 0.0	
3	LCL = \overline{X} - tS/N ^{1/2} = 0.001 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.001 UCL = \overline{X} + tS/N ^{1/2} = 0.001 + 2.353 * 0.0/4 ^{1/2} = 0.001	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Antimony, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	X̄ = sum[X] / 4 = 0.004 / 4	Compute the mean of the last 4 measurements.
	= 0.001	
2	S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{$\frac{1}{2}$} = ((4.00×10 ⁻⁶ - 1.60×10 ⁻⁵ /4) / (4-1)) ^{$\frac{1}{2}$}	Compute sd of the last 4 measurements.
	= 0.0	
3	LCL = \overline{X} - tS/N ^{1/2} = 0.001 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.001	
4	UCL = \overline{X} + tS/N ^{1/2} = 0.001 + 2.353 * 0.0/4 ^{1/2} = 0.001	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Arsenic, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.01 / 4$	Compute the mean of the last 4 measurements.
	= 0.003	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 7.24×10^{-12}	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.003 - 2.353 * 7.24×10 ⁻¹² /4 ^{1/2} = 0.002	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.003 + 2.353 * 7.24×10 ⁻¹² /4 ^{1/2} = 0.003	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Arsenic, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	X̄ = sum[X] / 4 = 0.01 / 4	Compute the mean of the last 4 measurements.
	= 0.003	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 7.24×10 ⁻¹²	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.003 - 2.353 * 7.24×10 ⁻¹² /4 ^{1/2} = 0.002	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{$\frac{1}{2}$} = 0.003 + 2.353 * 7.24×10 ⁻¹² /4 ^{$\frac{1}{2}$} = 0.003	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Arsenic, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	X̄ = sum[X] / 4 = 0.01 / 4	Compute the mean of the last 4 measurements.
	= 0.003	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 7.24×10 ⁻¹²	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.003 - 2.353 * 7.24×10 ⁻¹² /4 ^{1/2} = 0.002	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{$\frac{1}{2}$} = 0.003 + 2.353 * 7.24×10 ⁻¹² /4 ^{$\frac{1}{2}$} = 0.003	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Barium, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.52 / 4$	Compute the mean of the last 4 measurements.
	= 0.13	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((0.068 - 0.27/4) / (4-1))^{\frac{1}{2}}$ = 9.46×10^{-10}	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.13 - 2.353 * 9.46x10 ⁻¹⁰ /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.13	
4	UCL = \overline{X} + tS/N ^{1/2} = 0.13 + 2.353 * 9.46×10 ⁻¹⁰ /4 ^{1/2} = 0.13	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = -0.004	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	-0.016 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Barium, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.2 / 4$	Compute the mean of the last 4 measurements.
	= 0.05	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((0.01 - 0.04/4) / (4-1))^{\frac{1}{2}}$ = 5.27×10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.05 - 2.353 * 5.27×10 ⁻¹⁰ /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.05	
4	UCL = \overline{X} + tS/N ^{$\frac{1}{2}$} = 0.05 + 2.353 * 5.27×10 ⁻¹⁰ /4 ^{$\frac{1}{2}$} = 0.05	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Barium, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.2 / 4$	Compute the mean of the last 4 measurements.
	= 0.05	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((0.01 - 0.04/4) / (4-1))^{\frac{1}{2}}$ = 5.27×10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.05 - 2.353 * 5.27×10 ⁻¹⁰ /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.05	
4	UCL = \overline{X} + tS/N ^{$\frac{1}{2}$} = 0.05 + 2.353 * 5.27×10 ⁻¹⁰ /4 ^{$\frac{1}{2}$} = 0.05	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	-0.03 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Beryllium, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{\mathbf{X}} = \mathbf{sum}[\mathbf{X}] / 4$ $= 0.002 / 4$	Compute the mean of the last 4 measurements.
2	= 5.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.00x10 ⁻⁶ - 4.00x10 ⁻⁶ /4) / (4-1)) ^{1/2} = 0.0	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 5.00×10 ⁻⁴ - 2.353 * 0.0/4 ^{1/2} = 5.00×10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 5.00x10 ⁻⁴ + 2.353 * 0.0/4 ^{\frac{1}{2}} = 5.00x10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Beryllium, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{\mathbf{X}} = \mathbf{sum}[\mathbf{X}] / 4$ $= 0.002 / 4$	Compute the mean of the last 4 measurements.
2	= 5.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.00x10 ⁻⁶ - 4.00x10 ⁻⁶ /4) / (4-1)) ^{1/2} = 0.0	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 5.00×10 ⁻⁴ - 2.353 * 0.0/4 ^{1/2} = 5.00×10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 5.00x10 ⁻⁴ + 2.353 * 0.0/4 ^{\frac{1}{2}} = 5.00x10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Beryllium, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{\mathbf{X}} = \mathbf{sum}[\mathbf{X}] / 4$ $= 0.002 / 4$	Compute the mean of the last 4 measurements.
2	= 5.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.00x10 ⁻⁶ - 4.00x10 ⁻⁶ /4) / (4-1)) ^{1/2} = 0.0	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 5.00×10 ⁻⁴ - 2.353 * 0.0/4 ^{1/2} = 5.00×10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 5.00x10 ⁻⁴ + 2.353 * 0.0/4 ^{\frac{1}{2}} = 5.00x10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Cadmium, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{\mathbf{X}} = \mathbf{sum}[\mathbf{X}] / 4$ $= 0.002 / 4$	Compute the mean of the last 4 measurements.
2	= 5.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.00x10 ⁻⁶ - 4.00x10 ⁻⁶ /4) / (4-1)) ^{1/2} = 0.0	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 5.00×10 ⁻⁴ - 2.353 * 0.0/4 ^{1/2} = 5.00×10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 5.00x10 ⁻⁴ + 2.353 * 0.0/4 ^{\frac{1}{2}} = 5.00x10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Cadmium, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{\mathbf{X}} = \mathbf{sum}[\mathbf{X}] / 4$ $= 0.002 / 4$	Compute the mean of the last 4 measurements.
2	= 5.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.00x10 ⁻⁶ - 4.00x10 ⁻⁶ /4) / (4-1)) ^{1/2} = 0.0	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 5.00×10 ⁻⁴ - 2.353 * 0.0/4 ^{1/2} = 5.00×10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 5.00x10 ⁻⁴ + 2.353 * 0.0/4 ^{\frac{1}{2}} = 5.00x10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Cadmium, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{\mathbf{X}} = \mathbf{sum}[\mathbf{X}] / 4$ $= 0.002 / 4$	Compute the mean of the last 4 measurements.
2	= 5.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.00x10 ⁻⁶ - 4.00x10 ⁻⁶ /4) / (4-1)) ^{1/2} = 0.0	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 5.00×10 ⁻⁴ - 2.353 * 0.0/4 ^{1/2} = 5.00×10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 5.00x10 ⁻⁴ + 2.353 * 0.0/4 ^{\frac{1}{2}} = 5.00x10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Chromium, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.02 / 4$	Compute the mean of the last 4 measurements.
	= 0.005	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 1.45×10^{-11}	Compute sd of the last 4 measurements.
3	LCL = X - tS/N ^{1/2} = 0.005 - 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.005 UCL = \overline{X} + tS/N ^{1/2} = 0.005 + 2.353 * 1.45×10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Chromium, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ = 0.02 / 4	Compute the mean of the last 4 measurements.
	= 0.005	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 1.45×10^{-11}	Compute sd of the last 4 measurements.
3	LCL = X - tS/N ^{1/2} = 0.005 - 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.005 + 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Chromium, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ = 0.02 / 4	Compute the mean of the last 4 measurements.
	= 0.005	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 1.45×10^{-11}	Compute sd of the last 4 measurements.
3	LCL = X - tS/N ^{1/2} = 0.005 - 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.005 + 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Cobalt, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.04 / 4$	Compute the mean of the last 4 measurements.
	= 0.01	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00 \times 10^{-4} - 0.002/4) / (4-1))^{\frac{1}{2}}$ = 2.90×10 ⁻¹¹	Compute sd of the last 4 measurements.
	= 2.90×10	
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.01 - 2.353 * 2.90×10 ⁻¹¹ /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.01 = 2.333 = 2.30×10 = 74	
4	UCL = \overline{X} + tS/N ^{1/2} = 0.01 + 2.353 * 2.90x10 ⁻¹¹ /4 ^{1/2}	Compute upper confidence limit for the mean of the last 4 measurements.
	= 0.01	
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Cobalt, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.04 / 4$	Compute the mean of the last 4 measurements.
	= 0.01	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00 \times 10^{-4} - 0.002/4) / (4-1))^{\frac{1}{2}}$ = 2.90×10 ⁻¹¹	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.01 - 2.353 * 2.90×10 ⁻¹¹ /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.01 UCL = \overline{X} + tS/N ^{1/2} = 0.01 + 2.353 * 2.90×10 ⁻¹¹ /4 ^{1/2} = 0.01	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Cobalt, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.04 / 4$	Compute the mean of the last 4 measurements.
	= 0.01	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00 \times 10^{-4} - 0.002/4) / (4-1))^{\frac{1}{2}}$ = 2.90×10 ⁻¹¹	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.01 - 2.353 * 2.90×10 ⁻¹¹ /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.01 UCL = \overline{X} + tS/N ^{1/2} = 0.01 + 2.353 * 2.90×10 ⁻¹¹ /4 ^{1/2} = 0.01	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Fluoride (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.2 / 4$	Compute the mean of the last 4 measurements.
	= 0.05	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((0.01 - 0.04/4) / (4-1))^{\frac{1}{2}}$ = 5.27×10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.05 - 2.353 * 5.27×10 ⁻¹⁰ /4 ^{1/2} = 0.05	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.05 + 2.353 * 5.27x10 ⁻¹⁰ /4 ^{1/2} = 0.05	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Fluoride (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.2 / 4$	Compute the mean of the last 4 measurements.
	= 0.05	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((0.01 - 0.04/4) / (4-1))^{\frac{1}{2}}$ = 5.27×10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.05 - 2.353 * 5.27×10 ⁻¹⁰ /4 ^{1/2} = 0.05	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.05 + 2.353 * 5.27x10 ⁻¹⁰ /4 ^{1/2} = 0.05	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Fluoride (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.2 / 4$	Compute the mean of the last 4 measurements.
	= 0.05	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((0.01 - 0.04/4) / (4-1))^{\frac{1}{2}}$ = 5.27×10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.05 - 2.353 * 5.27×10 ⁻¹⁰ /4 ^{1/2} = 0.05	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.05 + 2.353 * 5.27x10 ⁻¹⁰ /4 ^{1/2} = 0.05	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Lead, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 0.006 / 4	Compute the mean of the last 4 measurements.
2	= 0.002 S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((9.00×10 ⁻⁶ - 3.60×10 ⁻⁵ /4) / (4-1)) ^{1/2}	Compute sd of the last 4 measurements.
3	= 0.0 LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.002 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.002 UCL = \overline{X} + tS/N ^{1/2} = 0.002 + 2.353 * 0.0/4 ^{1/2} = 0.002	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Lead, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 0.006 / 4	Compute the mean of the last 4 measurements.
2	= 0.002 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((9.00 \times 10^{-6} - 3.60 \times 10^{-5}/4) / (4-1))^{\frac{1}{2}}$ = 0.0	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.002 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.002 UCL = \overline{X} + tS/N ^{1/2} = 0.002 + 2.353 * 0.0/4 ^{1/2} = 0.002	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Lead, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 0.006 / 4	Compute the mean of the last 4 measurements.
2	= 0.002 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((9.00 \times 10^{-6} - 3.60 \times 10^{-5}/4) / (4-1))^{\frac{1}{2}}$	Compute sd of the last 4 measurements.
3	= 0.0 LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.002 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.002 UCL = \overline{X} + tS/N ^{1/2} = 0.002 + 2.353 * 0.0/4 ^{1/2} = 0.002	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Lithium, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.02 / 4$	Compute the mean of the last 4 measurements.
	= 0.005	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 1.45×10^{-11}	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.005 - 2.353 * 1.45×10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.005 + 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Lithium, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.02 / 4$	Compute the mean of the last 4 measurements.
	= 0.005	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 1.45×10^{-11}	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.005 - 2.353 * 1.45×10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.005 + 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Lithium, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.02 / 4$	Compute the mean of the last 4 measurements.
	= 0.005	
2	S = $((sum[X2] - sum[X]2/N) / (N-1))^{\frac{1}{2}}$ = $((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 1.45×10^{-11}	Compute sd of the last 4 measurements.
3	LCL = \overline{X} - tS/N ^{1/2} = 0.005 - 2.353 * 1.45×10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.005 + 2.353 * 1.45x10 ⁻¹¹ /4 ^{1/2} = 0.005	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Mercury, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 4.00 \times 10^{-4} / 4$	Compute the mean of the last 4 measurements.
2	= 1.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((4.00x10 ⁻⁸ - 1.60x10 ⁻⁷ /4) / (4-1)) ^{1/2} = 1.10x10 ⁻¹²	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 1.00×10 ⁻⁴ - 2.353 * 1.10×10 ⁻¹² /4 ^{1/2} = 10.00×10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 1.00x10 ⁻⁴ + 2.353 * 1.10x10 ⁻¹² /4 ^{1/2} = 1.00x10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Mercury, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ = 4.00×10 ⁻⁴ / 4	Compute the mean of the last 4 measurements.
2	= 1.00x10 ⁻⁴ S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((4.00x10 ⁻⁸ - 1.60x10 ⁻⁷ /4) / (4-1)) ^{1/2} = 1.10x10 ⁻¹²	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 1.00x10 ⁻⁴ - 2.353 * 1.10x10 ⁻¹² /4 ^{1/2} = 10.00x10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 1.00×10 ⁻⁴ + 2.353 * 1.10×10 ⁻¹² /4 ^{1/2} = 1.00×10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Mercury, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ = 4.00×10 ⁻⁴ / 4 = 1.00×10 ⁻⁴	Compute the mean of the last 4 measurements.
2	= 1.00x10 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00x10^{-8} - 1.60x10^{-7}/4) / (4-1))^{\frac{1}{2}}$ = 1.10x10^{-12}	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 1.00x10 ⁻⁴ - 2.353 * 1.10x10 ⁻¹² /4 ^{1/2} = 10.00x10 ⁻⁴	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 1.00×10 ⁻⁴ + 2.353 * 1.10×10 ⁻¹² /4 ^{1/2} = 1.00×10 ⁻⁴	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Molybdenum, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.1 / 4$	Compute the mean of the last 4 measurements.
2	= 0.025 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((0.003 - 0.01/4) / (4-1))^{\frac{1}{2}}$ = 2.63x10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.025 - 2.353 * 2.63×10 ⁻¹⁰ /4 ^{1/2} = 0.025	Compute lower confidence limit for the mean of the last 4 measurements.
4	$= 0.025$ $UCL = \overline{X} + tS/N^{\frac{1}{2}}$ $= 0.025 + 2.353 * 2.63 \times 10^{-10}/4^{\frac{1}{2}}$ $= 0.025$	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Molybdenum, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.1 / 4$	Compute the mean of the last 4 measurements.
2	= 0.025 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((0.003 - 0.01/4) / (4-1))^{\frac{1}{2}}$ = 2.63x10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.025 - 2.353 * 2.63×10 ⁻¹⁰ /4 ^{1/2} = 0.025	Compute lower confidence limit for the mean of the last 4 measurements.
4	$= 0.025$ $UCL = \overline{X} + tS/N^{\frac{1}{2}}$ $= 0.025 + 2.353 * 2.63 \times 10^{-10}/4^{\frac{1}{2}}$ $= 0.025$	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Molybdenum, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 0.1 / 4$	Compute the mean of the last 4 measurements.
2	= 0.025 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((0.003 - 0.01/4) / (4-1))^{\frac{1}{2}}$ = 2.63x10 ⁻¹⁰	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.025 - 2.353 * 2.63×10 ⁻¹⁰ /4 ^{1/2} = 0.025	Compute lower confidence limit for the mean of the last 4 measurements.
4	$= 0.025$ $UCL = \overline{X} + tS/N^{\frac{1}{2}}$ $= 0.025 + 2.353 * 2.63 \times 10^{-10}/4^{\frac{1}{2}}$ $= 0.025$	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Radium-226 (pCi/L) at MW-1

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 2.0 / 4	Compute the mean of the last 4 measurements.
	= 0.5	
2	S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.0 - 4.0/4) / (4-1)) ^{1/2}	Compute sd of the last 4 measurements.
	= 0.0	
3	LCL = \overline{X} - tS/N ^{1/2} = 0.5 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.5	
4	UCL = \overline{X} + tS/N ^{1/2} = 0.5 + 2.353 * 0.0/4 ^{1/2} = 0.5	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Radium-226 (pCi/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 2.0 / 4$	Compute the mean of the last 4 measurements.
	= 0.5	
2	S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.0 - 4.0/4) / (4-1)) ^{1/2}	Compute sd of the last 4 measurements.
	= 0.0	
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 0.5 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.5 - 2.353 ^ 0.0/4 = 0.5	
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 0.5 + 2.353 * 0.0/4 ^{\frac{1}{2}}	Compute upper confidence limit for the mean of the last 4 measurements.
	= 0.5	
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Radium-226 (pCi/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 2.0 / 4$	Compute the mean of the last 4 measurements.
	= 0.5	
2	S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.0 - 4.0/4) / (4-1)) ^{1/2}	Compute sd of the last 4 measurements.
	= 0.0	
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 0.5 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.5 - 2.353 ^ 0.0/4 = 0.5	
4	$UCL = \overline{X} + tS/N^{\frac{1}{2}}$ = 0.5 + 2.353 * 0.0/4 ^{\frac{1}{2}}	Compute upper confidence limit for the mean of the last 4 measurements.
	= 0.5	
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Radium-228 (pCi/L) at MW-1

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 2.0 / 4	Compute the mean of the last 4 measurements.
2	= 0.5 S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2}	Compute sd of the last 4 measurements.
	$= ((1.0 - 4.0/4) / (4-1))^{\frac{1}{2}}$ $= 0.0$	
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ = 0.5 - 2.353 * 0.0/4 ^{1/2} = 0.5	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.5 + 2.353 * 0.0/4 ^{1/2} = 0.5	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	-0.438 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Radium-228 (pCi/L) at MW-2

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ $= 2.0 / 4$	Compute the mean of the last 4 measurements.
	= 0.5	
2	S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{1/2} = ((1.0 - 4.0/4) / (4-1)) ^{1/2} = 0.0	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ $= 0.5 - 2.353 * 0.0/4^{\frac{1}{2}}$	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.5	
4	UCL = \overline{X} + tS/N ^{1/2} = 0.5 + 2.353 * 0.0/4 ^{1/2}	Compute upper confidence limit for the mean of the last 4 measurements.
	= 0.5	
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	-0.334 - 0.0	The trend is not significant.

Analysis prepared on: 1/4/2018

Worksheet 6 - Assessment Monitoring Radium-228 (pCi/L) at MW-3

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 3.22 / 4	Compute the mean of the last 4 measurements.
	= 0.805	
2	S = ((sum[X ²] - sum[X] ² /N) / (N-1)) ^{$\frac{1}{2}$} = ((2.971 - 10.368/4) / (4-1)) ^{$\frac{1}{2}$} = 0.356	Compute sd of the last 4 measurements.
3	$LCL = \overline{X} - tS/N^{\frac{1}{2}}$ $= 0.805 - 2.353 * 0.356/4^{\frac{1}{2}}$	Compute lower confidence limit for the mean of the last 4 measurements.
	= 0.387	
4	UCL = \overline{X} + tS/N ^{1/2} = 0.805 + 2.353 * 0.356/4 ^{1/2}	Compute upper confidence limit for the mean of the last 4 measurements.
	= 1.223	
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.137	The trend is not significant.

Worksheet 6 - Assessment Monitoring Selenium, total (mg/L) at MW-1

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ = 0.01 / 4	Compute the mean of the last 4 measurements.
	= 0.003	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 7.24×10^{-12}	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.003 - 2.353 * 7.24×10 ⁻¹² /4 ^{1/2} = 0.002	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.003 + 2.353 * 7.24x10 ⁻¹² /4 ^{1/2} = 0.003	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Selenium, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	X̄ = sum[X] / 4 = 0.01 / 4	Compute the mean of the last 4 measurements.
	= 0.003	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 7.24×10^{-12}	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.003 - 2.353 * 7.24×10 ⁻¹² /4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.002 UCL = \overline{X} + tS/N ^{1/2} = 0.003 + 2.353 * 7.24×10 ⁻¹² /4 ^{1/2} = 0.003	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Selenium, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	$\overline{X} = sum[X] / 4$ = 0.01 / 4	Compute the mean of the last 4 measurements.
	= 0.003	
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{\frac{1}{2}}$ = 7.24×10^{-12}	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.003 - 2.353 * 7.24×10 ⁻¹² /4 ^{1/2} = 0.002	Compute lower confidence limit for the mean of the last 4 measurements.
4	UCL = \overline{X} + tS/N ^{1/2} = 0.003 + 2.353 * 7.24x10 ⁻¹² /4 ^{1/2} = 0.003	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S)	Two-sided confidence interval for slope.
	0.0 - 0.0	The trend is not significant.

Worksheet 6 - Assessment Monitoring Thallium, total (mg/L) at MW-1

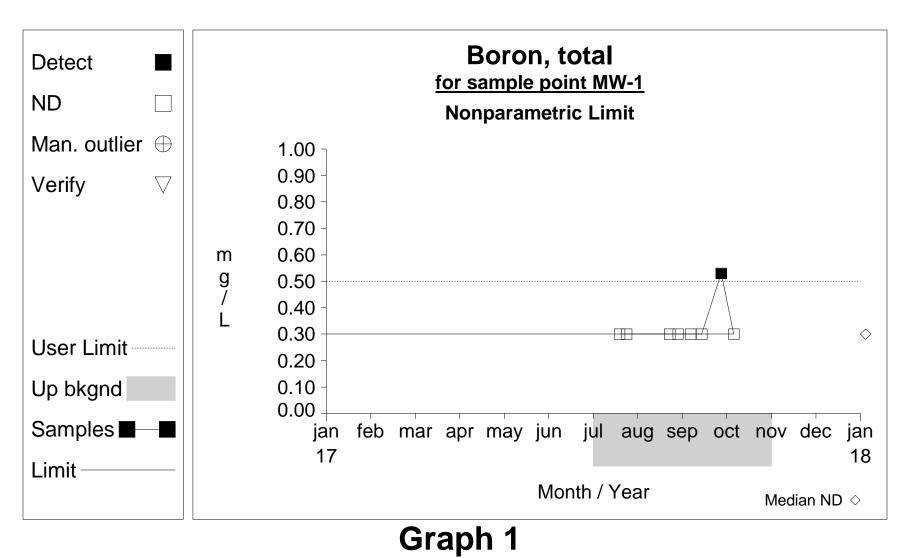
<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 0.004 / 4	Compute the mean of the last 4 measurements.
2	= 0.001 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{\frac{1}{2}}$ = 0.0	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.001 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.001 UCL = \overline{X} + tS/N ^{1/2} = 0.001 + 2.353 * 0.0/4 ^{1/2} = 0.001	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring Thallium, total (mg/L) at MW-2

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 0.004 / 4	Compute the mean of the last 4 measurements.
2	= 0.001 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{\frac{1}{2}}$ = 0.0	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.001 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.001 UCL = \overline{X} + tS/N ^{1/2} = 0.001 + 2.353 * 0.0/4 ^{1/2} = 0.001	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.

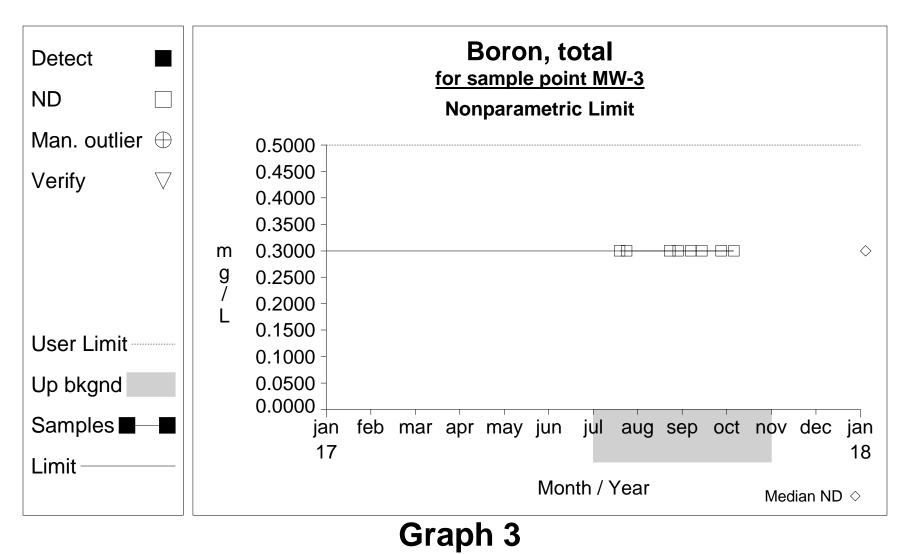
Worksheet 6 - Assessment Monitoring Thallium, total (mg/L) at MW-3

<u>Step</u>	Equation	Description
1	X = sum[X] / 4 = 0.004 / 4	Compute the mean of the last 4 measurements.
2	= 0.001 S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{\frac{1}{2}}$ = 0.0	Compute sd of the last 4 measurements.
3	LCL = $\overline{X} - tS/N^{\frac{1}{2}}$ = 0.001 - 2.353 * 0.0/4 ^{1/2}	Compute lower confidence limit for the mean of the last 4 measurements.
4	= 0.001 UCL = \overline{X} + tS/N ^{1/2} = 0.001 + 2.353 * 0.0/4 ^{1/2} = 0.001	Compute upper confidence limit for the mean of the last 4 measurements.
5	S = 0.0	Sens slope estimate.
6	LCL(S) - UCL(S) 0.0 - 0.0	Two-sided confidence interval for slope. The trend is not significant.



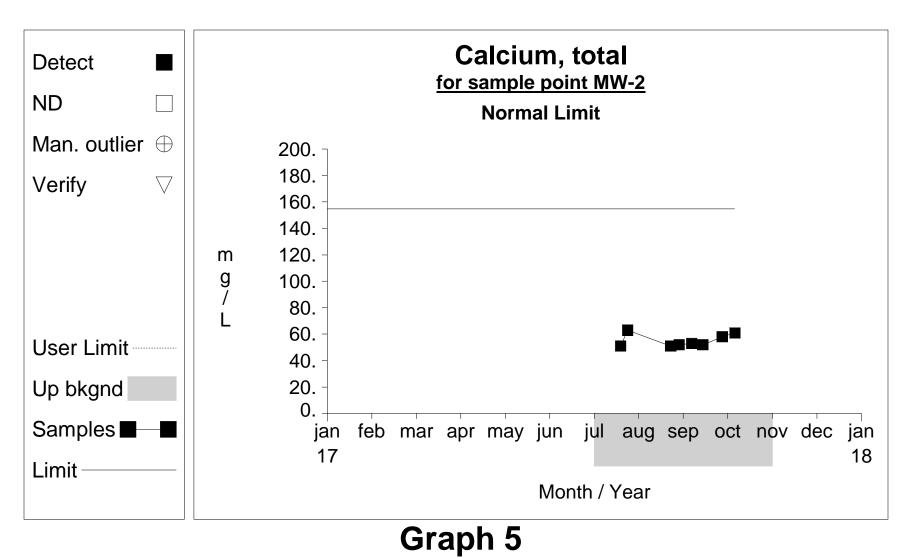
Boron, total Detect for sample point MW-2 ND Nonparametric Limit Man. outlier \oplus 0.5000 0.4500 Verify \bigtriangledown 0.4000 0.3500 0.3000 \diamond m - III g 0.2500 / 0.2000 0.1500 User Limit 0.1000 Up bkgnd 0.0500 0.0000 Samples feb mar apr may jun jul aug sep oct nov dec jan jan 17 18 Limit Month / Year Median ND \diamond

Graph 2



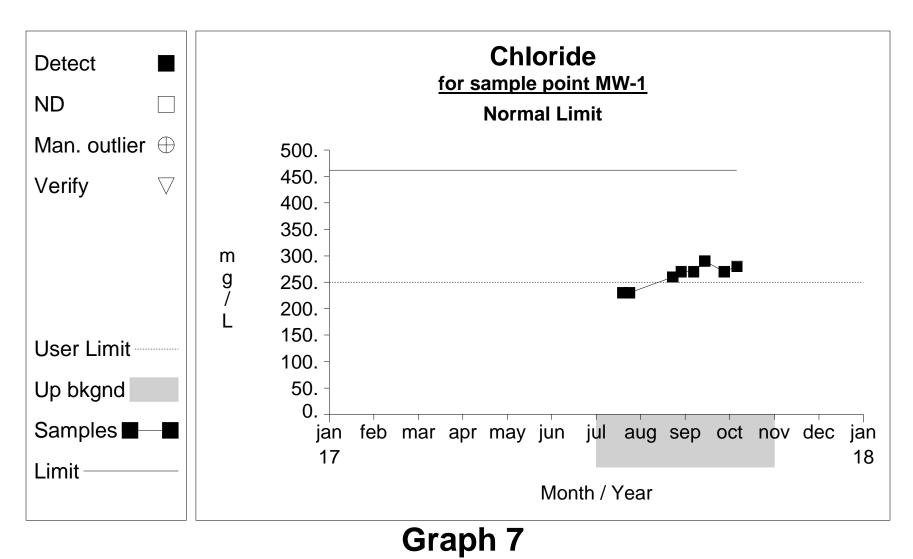
Calcium, total Detect for sample point MW-1 ND **Normal Limit** Man. outlier \oplus 200. 180. Verify \bigtriangledown 160. 140. 120. m g 100. / 80. 60. User Limit 40. Up bkgnd 20. 0. Samples feb mar apr may jun jul aug sep oct nov dec jan jan 17 18 Limit Month / Year

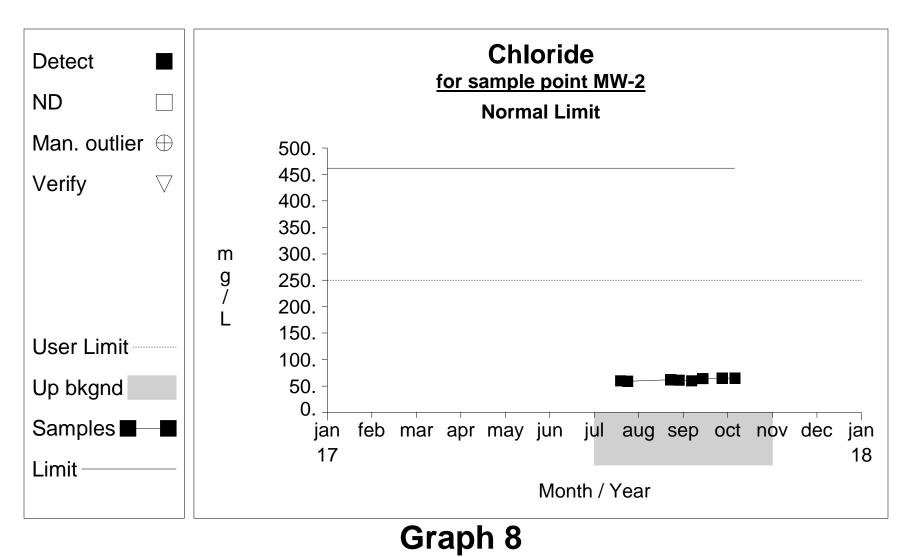
Graph 4

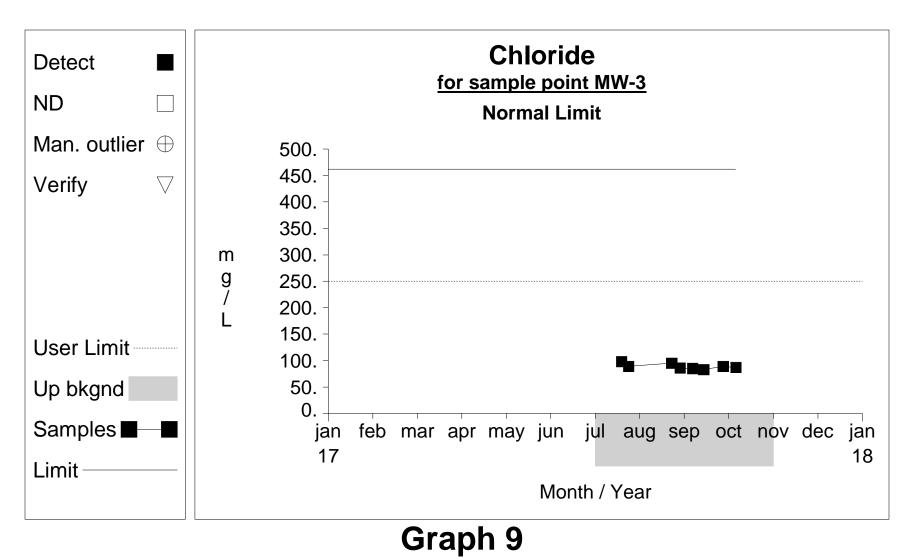


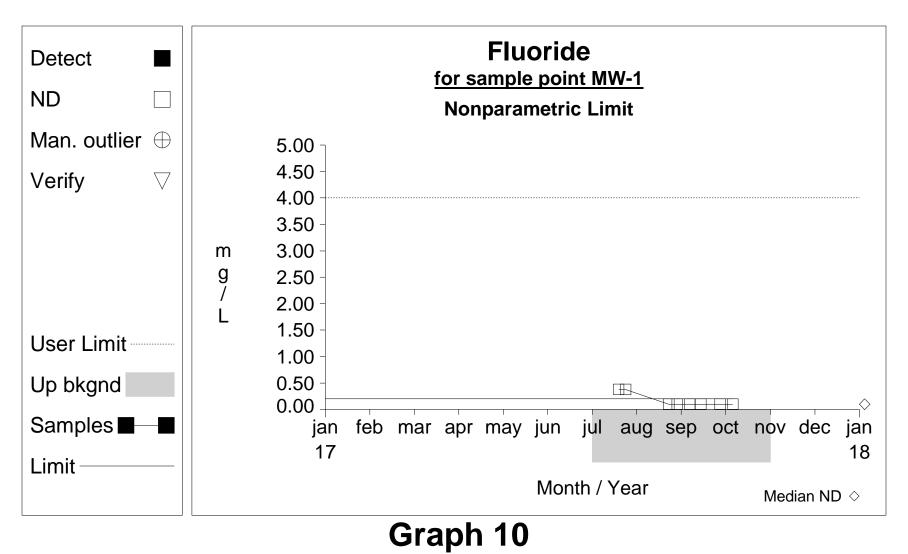
Calcium, total Detect for sample point MW-3 ND **Normal Limit** Man. outlier \oplus 200. 180. Verify \bigtriangledown 160. 140. 120. m g 100. / 80. 60. User Limit 40. Up bkgnd 20. 0. Samples feb mar apr may jun jul aug sep oct nov dec jan jan 17 18 Limit Month / Year

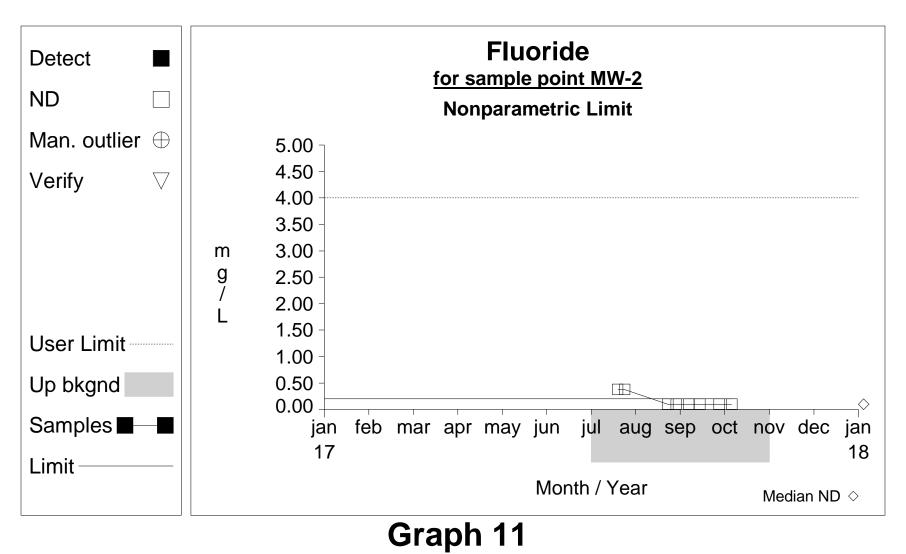
Graph 6

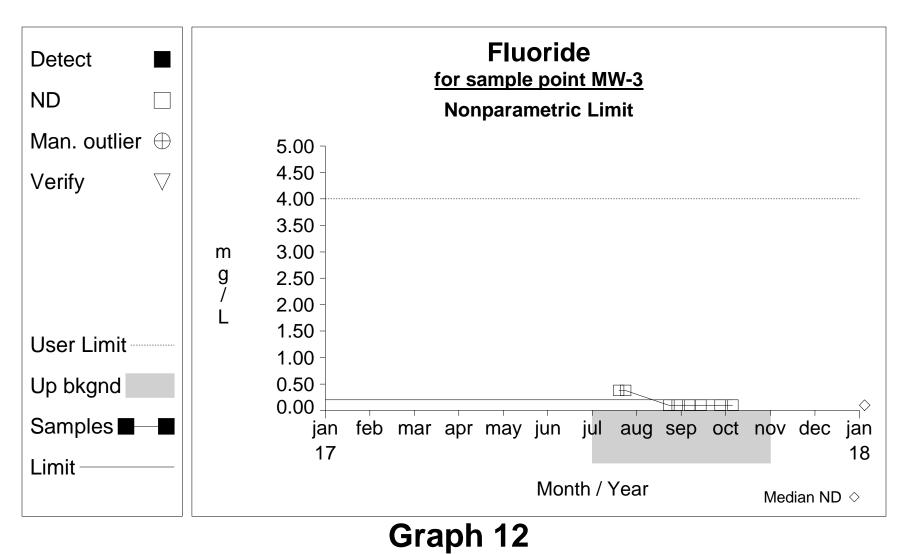


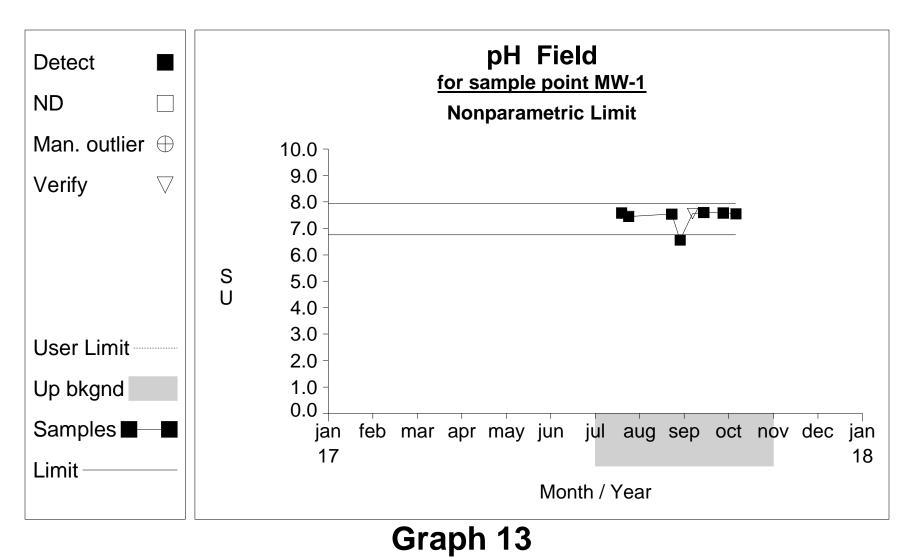


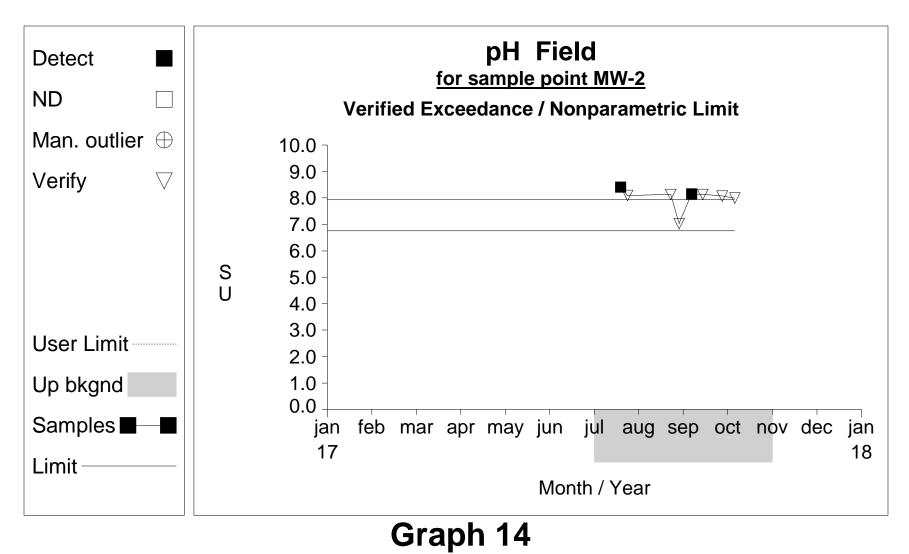


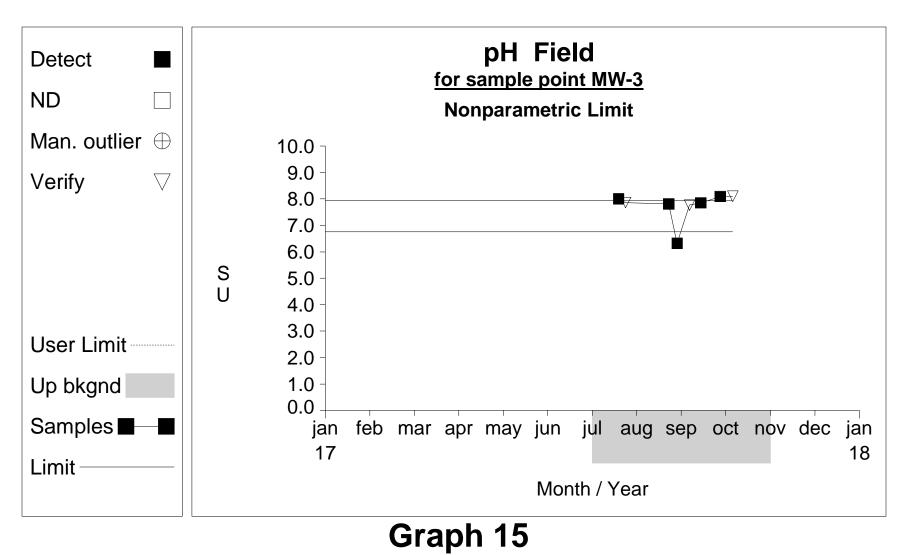


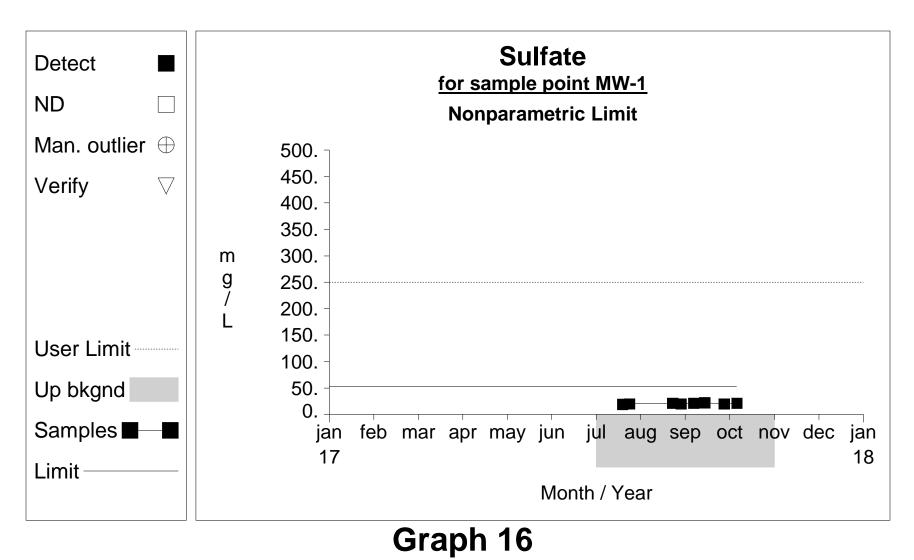


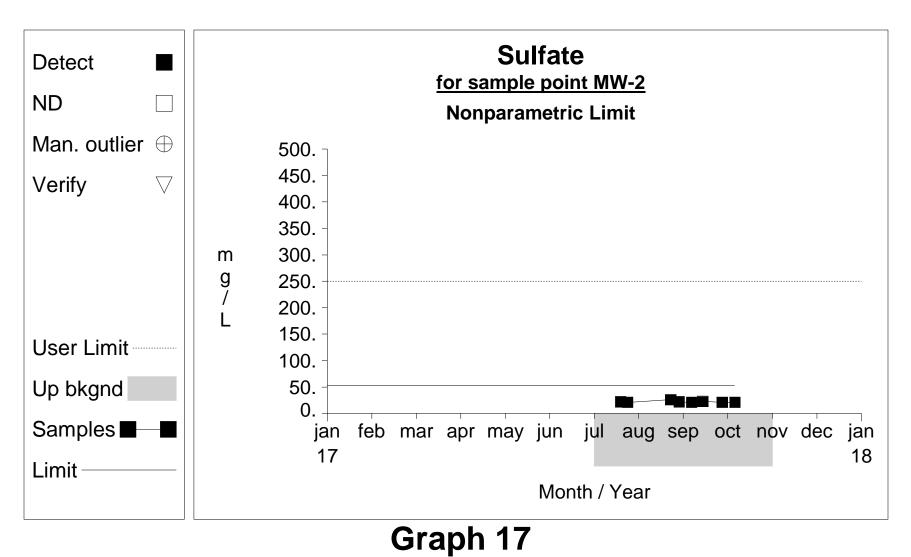


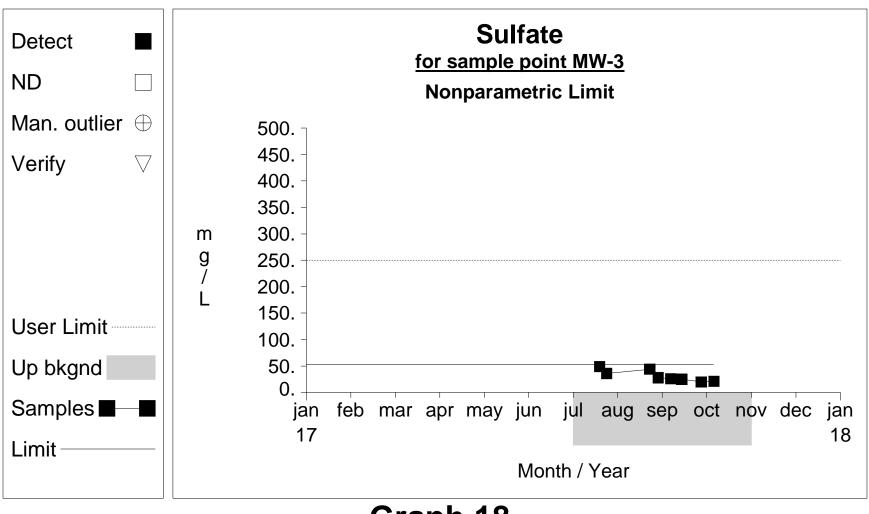




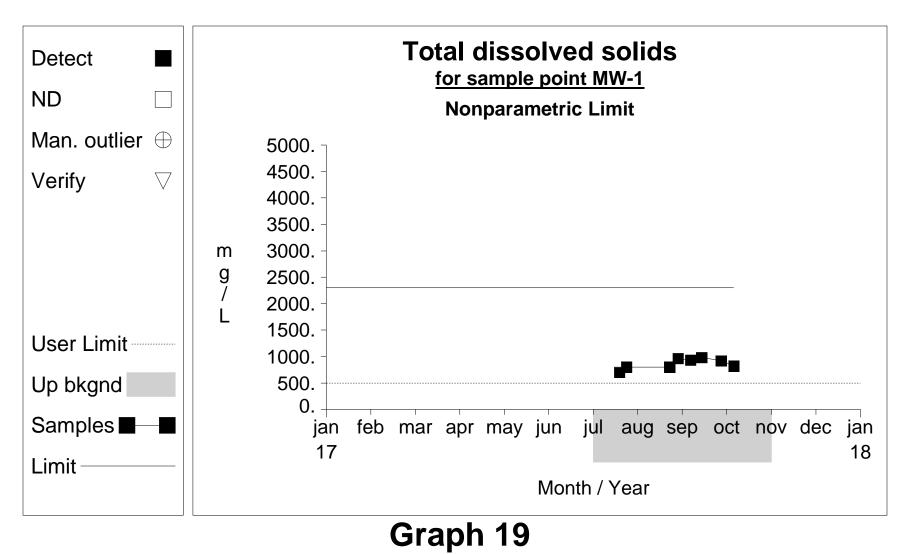


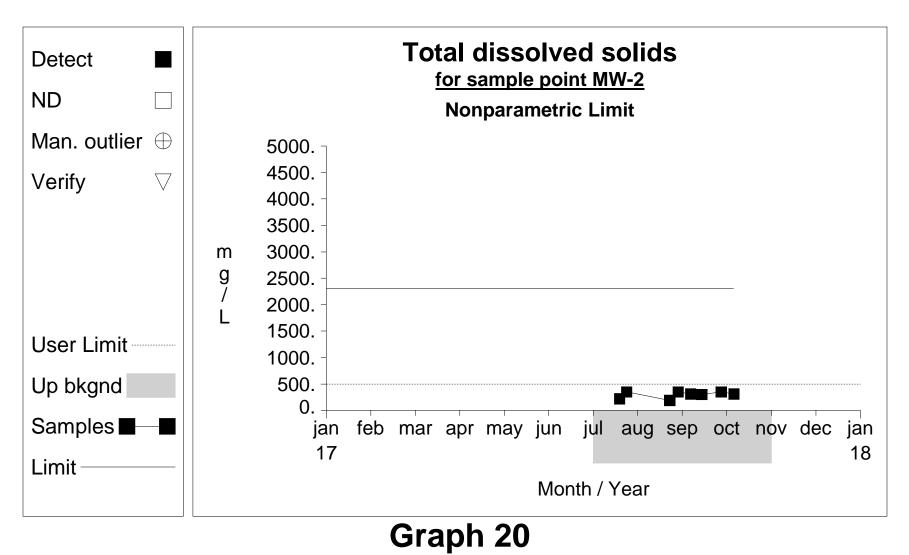


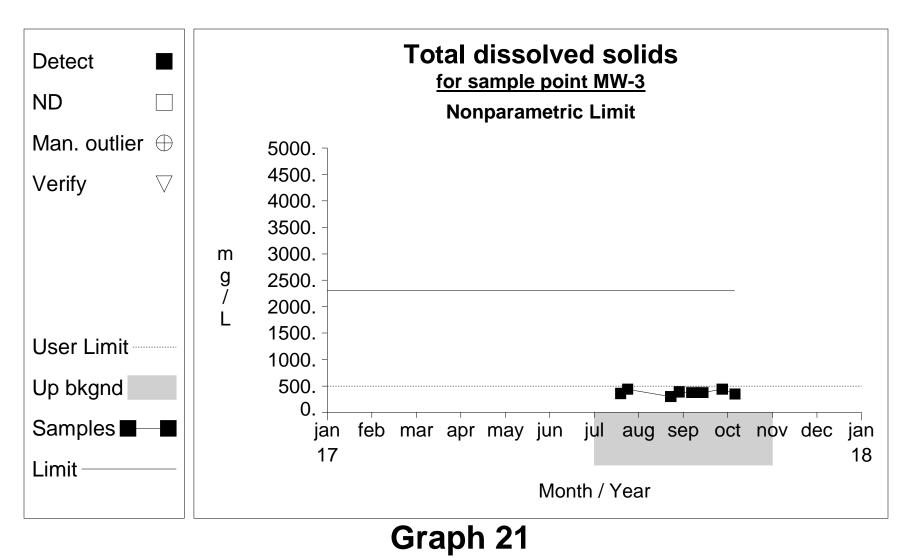


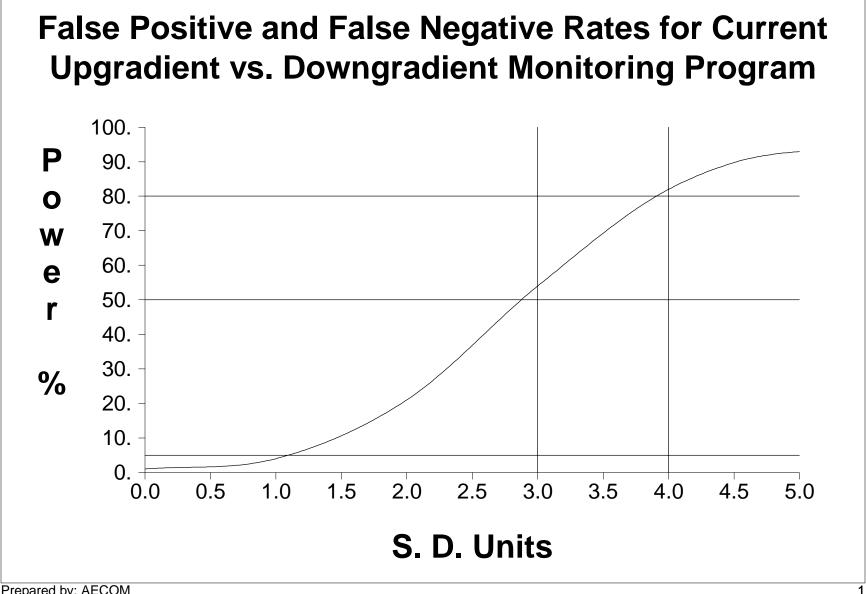


Graph 18









<u>Worksheet 1 - Upgradient vs. Downgradient Comparisons</u> <u>Boron, total (mg/L)</u> <u>Nonparametric Prediction Limit</u>

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= 0.3	
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons Calcium, total (mg/L) Normal Prediction Limit

<u>Step</u>	Equation	Description
1	X = sum[X] / N = 1748.0 / 16 = 109.25	Compute upgradient mean.
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((195286.0 - 3.06 \times 10^6/16) / (16-1))^{\frac{1}{2}}$ = 16.965	Compute upgradient sd.
3	alpha = min[$(195^{1/K})^{1/3}$ or .01] = min[$(195^{1/21})^{1/3}$ or .01] = 0.01	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
4	PL = \overline{X} + tS(1+1/N) ^{1/2} = 109.25 + (2.6*16.965)(1+1/16) ^{1/2} = 154.722	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons Chloride (mg/L) Normal Prediction Limit

<u>Step</u>	Equation	Description
1	X = sum[X] / N = 4130.0 / 16 = 258.125	Compute upgradient mean.
2	S = $((sum[X^2] - sum[X]^2/N) / (N-1))^{\frac{1}{2}}$ = $((1.15 \times 10^6 - 1.71 \times 10^7/16) / (16-1))^{\frac{1}{2}}$ = 76.002	Compute upgradient sd.
3	alpha = min[$(195^{1/K})^{1/3}$ or .01] = min[$(195^{1/21})^{1/3}$ or .01] = 0.01	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
4	PL = \overline{X} + tS(1+1/N) ^{1/2} = 258.125 + (2.6*76.002)(1+1/16) ^{1/2} = 461.84	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

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Worksheet 1 - Upgradient vs. Downgradient Comparisons Fluoride (mg/L) Nonparametric Prediction Limit

<u>Step</u>	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= 0.2	
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons pH Field (SU) Nonparametric Prediction Limit

<u>Step</u>	Equation	Description
1	PL _(low) = min(X) = 6.76	Compute nonparametric prediction interval as minimum and maximum measurements.
	PL _(high) = max(X)	
	= 7.93	
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Prepared by: AECOM

Marquette BLP

<u>Worksheet 1 - Upgradient vs. Downgradient Comparisons</u> <u>Sulfate (mg/L)</u> <u>Nonparametric Prediction Limit</u>

<u>Step</u>	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= 53.0	
	- 55.6	
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).
2		Confidence levens based on N, N and resampling strategy (see Clobon's 1994).

Marquette BLP

<u>Worksheet 1 - Upgradient vs. Downgradient Comparisons</u> <u>Total dissolved solids (mg/L)</u> <u>Nonparametric Prediction Limit</u>

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= 2300.0	
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Upgradient Data Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date		Result	
Boron, total	mg/L	MW-4	07/19/2017	ND	0.3000	
Boron, total	mg/L	MW-4	07/24/2017	ND	0.3000	
Boron, total	mg/L	MW-4	08/23/2017	ND	0.3000	
Boron, total	mg/L	MW-4	08/29/2017	ND	0.3000	
Boron, total	mg/L	MW-4	09/06/2017	ND	0.3000	
Boron, total	mg/L	MW-4	09/14/2017	ND	0.3000	
Boron, total	mg/L	MW-4	09/28/2017	ND	0.3000	
Boron, total	mg/L	MW-4	10/05/2017	ND	0.3000	
Boron, total	mg/L	MW-5	07/19/2017	ND	0.3000	
Boron, total	mg/L	MW-5	07/24/2017	ND	0.3000	
Boron, total	mg/L	MW-5	08/23/2017	ND	0.3000	
Boron, total	mg/L	MW-5	08/29/2017	ND	0.3000	
Boron, total	mg/L	MW-5	09/06/2017	ND	0.3000	
Boron, total	mg/L	MW-5	09/14/2017	ND	0.3000	
Boron, total	mg/L	MW-5	09/28/2017	ND	0.3000	
Boron, total	mg/L	MW-5	10/05/2017	ND	0.3000	
Calcium, total	mg/L	MW-4	07/19/2017		93.0000	
Calcium, total	mg/L	MW-4	07/24/2017		89.0000	
Calcium, total	mg/L	MW-4	08/23/2017		100.0000	
Calcium, total	mg/L	MW-4	08/29/2017		120.0000	
Calcium, total	mg/L	MW-4	09/06/2017		110.0000	
Calcium, total	mg/L	MW-4	09/14/2017		100.0000	
Calcium, total	mg/L	MW-4	09/28/2017		160.0000	
Calcium, total	mg/L	MW-4	10/05/2017		120.0000	

* - Outlier for that well and constituent.

Upgradient Data Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date	Result
Calcium, total	mg/L	MW-5	07/19/2017	100.0000
Calcium, total	mg/L	MW-5	07/24/2017	100.0000
Calcium, total	mg/L	MW-5	08/23/2017	110.0000
Calcium, total	mg/L	MW-5	08/29/2017	110.0000
Calcium, total	mg/L	MW-5	09/06/2017	100.0000
Calcium, total	mg/L	MW-5	09/14/2017	96.0000
Calcium, total	mg/L	MW-5	09/28/2017	120.0000
Calcium, total	mg/L	MW-5	10/05/2017	120.0000
Chloride	mg/L	MW-4	07/19/2017	260.0000
Chloride	mg/L	MW-4	07/24/2017	220.0000
Chloride	mg/L	MW-4	08/23/2017	300.0000
Chloride	mg/L	MW-4	08/29/2017	340.0000
Chloride	mg/L	MW-4	09/06/2017	340.0000
Chloride	mg/L	MW-4	09/14/2017	360.0000
Chloride	mg/L	MW-4	09/28/2017	370.0000
Chloride	mg/L	MW-4	10/05/2017	380.0000
Chloride	mg/L	MW-5	07/19/2017	200.0000
Chloride	mg/L	MW-5	07/24/2017	190.0000
Chloride	mg/L	MW-5	08/23/2017	210.0000
Chloride	mg/L	MW-5	08/29/2017	190.0000
Chloride	mg/L	MW-5	09/06/2017	190.0000
Chloride	mg/L	MW-5	09/14/2017	200.0000
Chloride	mg/L	MW-5	09/28/2017	190.0000
Chloride	mg/L	MW-5	10/05/2017	190.0000

* - Outlier for that well and constituent.

Upgradient Data Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date		Result	
Fluoride	mg/L	MW-4	07/19/2017	ND	0.3800	
Fluoride	mg/L	MW-4	07/24/2017	ND	0.3800	
Fluoride	mg/L	MW-4	08/23/2017	ND	0.1000	
Fluoride	mg/L	MW-4	08/29/2017	ND	0.1000	
Fluoride	mg/L	MW-4	09/06/2017		0.2000	
Fluoride	mg/L	MW-4	09/14/2017		0.1800	
Fluoride	mg/L	MW-4	09/28/2017	ND	0.1000	
Fluoride	mg/L	MW-4	10/05/2017	ND	0.1000	
Fluoride	mg/L	MW-5	07/19/2017	ND	0.3800	
Fluoride	mg/L	MW-5	07/24/2017	ND	0.3800	
Fluoride	mg/L	MW-5	08/23/2017	ND	0.1000	
Fluoride	mg/L	MW-5	08/29/2017	ND	0.1000	
Fluoride	mg/L	MW-5	09/06/2017	ND	0.1000	
Fluoride	mg/L	MW-5	09/14/2017	ND	0.1000	
Fluoride	mg/L	MW-5	09/28/2017	ND	0.1000	
Fluoride	mg/L	MW-5	10/05/2017	ND	0.1000	
pH Field	SU	MW-4	07/19/2017		7.9200	
pH Field	SU	MW-4	07/24/2017		7.8500	
pH Field	SU	MW-4	08/23/2017		7.9300	
pH Field	SU	MW-4	08/29/2017		7.3200	
pH Field	SU	MW-4	09/06/2017		7.7500	
pH Field	SU	MW-4	09/14/2017		7.7700	
pH Field	SU	MW-4	09/28/2017		7.7400	
pH Field	SU	MW-4	10/05/2017		7.7000	

* - Outlier for that well and constituent.

Upgradient Data Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date	Result
pH Field	SU	MW-5	07/19/2017	7.3600
pH Field	SU	MW-5	07/24/2017	7.1700
pH Field	SU	MW-5	08/23/2017	7.4100
pH Field	SU	MW-5	08/29/2017	6.7600
pH Field	SU	MW-5	09/06/2017	7.4700
pH Field	SU	MW-5	09/14/2017	7.5100
pH Field	SU	MW-5	09/28/2017	7.5400
pH Field	SU	MW-5	10/05/2017	7.4500
Sulfate	mg/L	MW-4	07/19/2017	19.0000
Sulfate	mg/L	MW-4	07/24/2017	18.0000
Sulfate	mg/L	MW-4	08/23/2017	24.0000
Sulfate	mg/L	MW-4	08/29/2017	47.0000
Sulfate	mg/L	MW-4	09/06/2017	53.0000
Sulfate	mg/L	MW-4	09/14/2017	49.0000
Sulfate	mg/L	MW-4	09/28/2017	46.0000
Sulfate	mg/L	MW-4	10/05/2017	43.0000
Sulfate	mg/L	MW-5	07/19/2017	25.0000
Sulfate	mg/L	MW-5	07/24/2017	21.0000
Sulfate	mg/L	MW-5	08/23/2017	19.0000
Sulfate	mg/L	MW-5	08/29/2017	18.0000
Sulfate	mg/L	MW-5	09/06/2017	18.0000
Sulfate	mg/L	MW-5	09/14/2017	19.0000
Sulfate	mg/L	MW-5	09/28/2017	18.0000
Sulfate	mg/L	MW-5	10/05/2017	18.0000

* - Outlier for that well and constituent.

Upgradient Data Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date	Result
Total dissolved solids	mg/L	MW-4	07/19/2017	700.0000
Total dissolved solids	mg/L	MW-4	07/24/2017	730.0000
Total dissolved solids	mg/L	MW-4	08/23/2017	830.0000
Total dissolved solids	mg/L	MW-4	08/29/2017	1000.0000
Total dissolved solids	mg/L	MW-4	09/06/2017	1000.0000
Total dissolved solids	mg/L	MW-4	09/14/2017	1000.0000
Total dissolved solids	mg/L	MW-4	09/28/2017	1200.0000
Total dissolved solids	mg/L	MW-4	10/05/2017	1100.0000
Total dissolved solids	mg/L	MW-5	07/19/2017	640.0000
Total dissolved solids	mg/L	MW-5	07/24/2017	730.0000
Total dissolved solids	mg/L	MW-5	08/23/2017	590.0000
Total dissolved solids	mg/L	MW-5	08/29/2017	750.0000
Total dissolved solids	mg/L	MW-5	09/06/2017	660.0000
Total dissolved solids	mg/L	MW-5	09/14/2017	720.0000
Total dissolved solids	mg/L	MW-5	09/28/2017	2300.0000
Total dissolved solids	mg/L	MW-5	10/05/2017	700.0000

* - Outlier for that well and constituent.

Most Current Downgradient Monitoring Data Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date		Result		Pred. Limit
Boron, total	mg/L	MW-1	10/05/2017	ND	0.3000	**	0.3000
Boron, total	mg/L	MW-2	10/05/2017	ND	0.3000		0.3000
Boron, total	mg/L	MW-3	10/05/2017	ND	0.3000		0.3000
Calcium, total	mg/L	MW-1	10/05/2017		130.0000		154.7222
Calcium, total	mg/L	MW-2	10/05/2017		61.0000		154.7222
Calcium, total	mg/L	MW-3	10/05/2017		69.0000		154.7222
Chloride	mg/L	MW-1	10/05/2017		280.0000		461.8401
Chloride	mg/L	MW-2	10/05/2017		65.0000		461.8401
Chloride	mg/L	MW-3	10/05/2017		87.0000		461.8401
Fluoride	mg/L	MW-1	10/05/2017	ND	0.1000		0.2000
Fluoride	mg/L	MW-2	10/05/2017	ND	0.1000		0.2000
Fluoride	mg/L	MW-3	10/05/2017	ND	0.1000		0.2000
pH Field	SU	MW-1	10/05/2017		7.5500		6.76 - 7.93
pH Field	SU	MW-2	10/05/2017		7.9900	***	6.76 - 7.93
pH Field	SU	MW-3	10/05/2017		8.1000	*	6.76 - 7.93
Sulfate	mg/L	MW-1	10/05/2017		21.0000		53.0000
Sulfate	mg/L	MW-2	10/05/2017		21.0000		53.0000
Sulfate	mg/L	MW-3	10/05/2017		21.0000		53.0000
Total dissolved solids	mg/L	MW-1	10/05/2017		820.0000		2300.0000
Total dissolved solids	mg/L	MW-2	10/05/2017		310.0000		2300.0000

*

 Current value failed - awaiting verification.
 Current value passed - previous exceedance not verified. **

*** - Current value failed - exceedance verified.

**** - Current value passed - awaiting one more verification.

***** - Insufficient background data to compute prediction limit.

Most Current Downgradient Monitoring Data Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date	Result	Pred. Limit
Total dissolved solids	mg/L	MW-3	10/05/2017	350.0000	2300.0000

Current value failed - awaiting verification.
Current value passed - previous exceedance not verified.

*** - Current value failed - exceedance verified.

**** - Current value passed - awaiting one more verification.

***** - Insufficient background data to compute prediction limit.

Detection Frequencies in Upgradient and Downgradient Wells Marquette Board of Light and Power Shiras Steam Plant

Constituent	Detect	Upgradient N	Proportion	Detect	Downgradient N	Proportion
Boron, total	0	16	0.000	1	24	0.042
Calcium, total	16	16	1.000	24	24	1.000
Chloride	16	16	1.000	24	24	1.000
Fluoride	2	16	0.125	0	24	0.000
pH Field	16	16	1.000	24	24	1.000
Sulfate	16	16	1.000	24	24	1.000
Total dissolved solids	16	16	1.000	24	24	1.000

N = Total number of measurements in all wells.Detect = Total number of detections in all wells. Proportion = Detect/N.

Shapiro Wilk Test of Normality for Multiple Groups Marquette Board of Light and Power Shiras Steam Plant

Constituent	N (Detects)	Detect Freq	G raw	G log	Critical Value	Limit Type
Boron, total	0	0.000				nonpar
Calcium, total	16	1.000	1.701	1.133	2.326	normal
Chloride	16	1.000	2.264	2.540	2.326	normal
Fluoride	2	0.125				nonpar
pH Field	16	1.000	2.697	2.812	2.326	nonpar
Sulfate	16	1.000	3.079	3.146	2.326	nonpar
Total dissolved solids	16	1.000	3.566	2.945	2.326	nonpar

Fit to distribution is confirmed if G < critical value.

If detection frequency is < 50% nonparametric or Poisson limit is used

Summary Statistics and Prediction Limits Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Model Type	N	Detect	Mean	SD	Pred Limit	Conf*
Boron, total	mg/L	nonpar	16	0			0.3000	0.99
Calcium, total	mg/L	normal	16	16	109.2500	16.9647	154.7222	
Chloride	mg/L	normal	16	16	258.1250	76.0016	461.8401	
Fluoride	mg/L	nonpar	16	2			0.2000	0.99
pH Field	SŬ	nonpar	16	16			6.76- 7.93	0.99
Sulfate	mg/L	nonpar	16	16			53.0000	0.99
Total dissolved solids	mg/L	nonpar	16	16			2300.0000	0.99

* - Confidence level for passing initial test or one verification resample at all downgradient wells for a single constituent (nonparametric test only).

Model Type refers to type of prediction limit.

For lognormal limit, mean and sd in natural log units and prediction limit in original units.

All sample sizes and statistics are based on outlier free data.

For nonparametric limits, median reporting limits are substituted for extreme reporting limit values.

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date		Result		Pred. Limit
Boron, total	mg/L	MW-1	07/19/2017	ND	0.3000		0.3000
Boron, total	mg/L	MW-1	07/24/2017	ND	0.3000		0.3000
Boron, total	mg/L	MW-1	08/23/2017	ND	0.3000		0.3000
Boron, total	mg/L	MW-1	08/29/2017	ND	0.3000		0.3000
Boron, total	mg/L	MW-1	09/06/2017	ND	0.3000		0.3000
Boron, total	mg/L	MW-1	09/14/2017	ND	0.3000		0.3000
Boron, total	mg/L	MW-1	09/28/2017		0.5300	*	0.3000
Boron, total	mg/L	MW-1	10/05/2017	ND	0.3000		0.3000
pH Field	SU	MW-2	07/19/2017		8.4100	*	6.76 - 7.93
pH Field	SU	MW-2	07/24/2017		8.0900	*	6.76 - 7.93
pH Field	SU	MW-2	08/23/2017		8.1300	*	6.76 - 7.93
pH Field	SU	MW-2	08/29/2017		7.0300		6.76 - 7.93
pH Field	SU	MW-2	09/06/2017		8.1500	*	6.76 - 7.93
pH Field	SU	MW-2	09/14/2017		8.1300	*	6.76 - 7.93
pH Field	SU	MW-2	09/28/2017		8.0700	*	6.76 - 7.93
pH Field	SU	MW-2	10/05/2017		7.9900	*	6.76 - 7.93
pH Field	SU	MW-3	07/19/2017		8.0000	*	6.76 - 7.93
pH Field	SU	MW-3	07/24/2017		7.8600		6.76 - 7.93
pH Field	SU	MW-3	08/23/2017		7.8100		6.76 - 7.93
pH Field	SU	MW-3	08/29/2017		6.3200	*	6.76 - 7.93
pH Field	SU	MW-3	09/06/2017		7.7700		6.76 - 7.93

* - Significantly increased over background.

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode Marquette Board of Light and Power Shiras Steam Plant

Constituent	Units	Well	Date	Result		Pred. L	imit
pH Field	SU	MW-3	09/14/2017	7.8500		6.76 -	7.93
pH Field	SU	MW-3	09/28/2017	8.0900	*	6.76 -	7.93
pH Field	SU	MW-3	10/05/2017	8.1000	*	6.76 -	7.93

* - Significantly increased over background.

Appendix D Slug Test Report

CCR IMPOUNDMENT GROUNDWATER INVESTIGATION

PROJECT NUMBER: 60546383

SLUG TEST ANALYSIS

TECHNICAL MEMORANDUM

DATE:	December 26, 2017
то:	Lance Lindberg - Project Files
FROM:	Robert Weseljak
SUBJECT:	Hydraulic Conductivity Test Procedures, Analysis, and Results CCR Impoundment Site, Marquette, Michigan Project No. 60546383

INTRODUCTION

In-situ hydraulic conductivity tests were performed on 2 wells in the vicinity of the Coal Combustion Residual (CCR) Impoundment in Marquette, Michigan. The tests were performed to determine the hydraulic conductivity of the formation materials in the vicinity of the well screen interval. The tests were performed on October 12, 2017. The field and analytical methods are consistent with procedures as described in Bouwer and Rice, (1976), Freeze and Cherry, (1979), and Domenico and Schwartz, (1990). A brief summary of the conceptual model, the field procedure, analysis, test results, and sensitivities are explained below.

CONCEPTUAL MODEL

The conceptual groundwater flow model in the vicinity of the property is described as a mix of unconsolidated deposits ranging from silts, clays and sands. Wells tested are less than 45 feet deep. Water levels range from ground surface (well tested in lake) to 15 feet below ground surface. Therefore the wells are considered to be unconfined. The wells are screened in the most conductive unconsolidated deposits, the unconfined sands.

FIELD PROCEDURE

In-situ hydraulic conductivity tests at CCR Impoundment were conducted by the baildown method. A 3-foot long stainless steel bailer with rope, an in-situ Level Troll 700 pressure transducer, an Insitu Rugged Reader data logger, an electronic water level indicator, and computer were used to complete the tests. A computer was used to download the data from the data logger and to analyze the data with the use of AQTESOLV for Windows Pro (Version 4.5) an aquifer test analysis software package that performs the analyses (HydroSOLVE 2007).

For the baildown test method, the static water level and the depth to the bottom of the well were

recorded with an electronic water level indicator. Then water was removed from the well with a bailer. After the last bail full of water was removed a transducer was lowered at a preset level in the well to record the water level rise at specific time intervals. Water levels were recorded until the water level had recovered to approximately 90 percent of the initial head change. If time allowed multiple tests were completed on each well.

Decontamination procedures for the slug/baildown test equipment consisted of several distilled water rinses.

SLUG TEST DATA ANALYSIS

Displacement/drawdown (feet) versus time (minutes) data was analyzed following the Bouwer and Rice (1976) method for unconfined aquifers. The Bouwer and Rice analysis were completed using AQTESOLV computer software (HYDROSOLVE, 2007). The AQTESOLV results and plots are attached.

Bouwer and Rice Method

Well and aquifer parameters

Before analyzing the hydraulic conductivity test data, several well and aquifer parameters need to be determined. For the Bouwer and Rice Method the parameters include: radius of borehole (r_w) , radius of well casing (r_c) , aquifer thickness (b), effective well screen length (L), and static height of water in the well (D). The parameters vary based on the hydrogeologic conditions in the vicinity of the well.

Radius of well casing (r_c) is radius of the PVC well screen. Radius of borehole (r_w) varies depending on the hydraulic contrast between the well filter pack and the formation. If the filter pack and the screened formation are hydraulically similar, then r_w is equal to the radius of the well casing (HYDROSOLVE, 1996). If the filter pack and the screened formation are hydraulically dissimilar, then r_w is equal to the radius of the borehole. All wells assumed the filter pack to be hydraulically dissimilar to the formation being screened; therefore, r_w is equal to the radius of the borehole.

The observed initial displacement (H_o) was set at 1 foot because the displacement data are normalized.

Static water column height (H) is the length from the bottom of the well to the water level.

Saturated aquifer thickness (b) is the estimated saturated thickness of the aquifer being tested. Since the wells were unconfined, the saturated aquifer thickness (b) was estimated to be the static water column height.

Vertical-to-horizontal hydraulic conductivity anisotropy ratio (K_v/K_h) is the estimated difference between the vertical and horizontal hydraulic conductivity values within the unconsolidated

deposits.

Depth to top of well screen (d) for the unconfined wells is the difference between the water level and the top of the screen.

For the wells, the well screen length (L) is equal to the length of the well screen. Although, if the water level intersects the well screen at the time of field testing, then L equals the length from the bottom of the well to the water level (ie. L equal H in this instance).

Application

The wells tested by the Bouwer and Rice method and associated deposit are included in the attached table.

The underlying assumptions involved with the Bouwer and Rice method include: 1) Drawdown of the water table around the well is negligible; 2) Flow above the water table (capillary fringe) can be ignored; 3) Well losses are negligible; 4) The aquifer is homogeneous and isotropic. Of these assumptions, Nos. 2 and 3 are typically met. Assumption No. 1 is met if the amount of initial drawdown is small. Assumption No. 4 is more difficult to meet since a geologic formation is rarely homogeneous and isotropic. Freeze and Cherry (1979) note that geologic formations are usually heterogeneous and anisotropic, and the K values should be viewed as "best estimates".

Selection of the segment of the data plot of the natural logarithm of displacement/drawdown versus time to be used for the calculation of hydraulic conductivity is based on the fit of a straight line to the data, (Bouwer and Rice, 1976). The straight line portion of a plot of recovery versus time is the valid data to be used in the analysis.

RESULTS

The calculated hydraulic conductivity values are listed in the attached table. The stratigraphy in the wells tested consisted of unconsolidated deposits. The most conductive of these deposits includes fine sand. The hydraulic conductivities range from 3.0 x 10^{-5} cm/s to 9.6 x 10^{-4} cm/s. Representative values from literature (Freeze and Cherry, 1979; Domenico and Schwartz, 1990) of hydraulic conductivities for silty fine sands range from 2.0 x 10^{-7} cm/s to 1.0×10^{-1} cm/s. The geometric mean for the shallow wells is 1.1×10^{-4} cm/sec.

The calculated hydraulic conductivity values for the corresponding lithologies are within the literature range of values and are representative of the hydrostatigraphic units beneath the site.

REFERENCES

- Bouwer, H., and Rice., 1976. A slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells. Water Resources Research, 12:3, pp. 423-428.
- Domenico and Schwartz, 1990. <u>Physical and Chemical Hydrogeology</u>. John Wiley and Sons, New York.

Freeze and Cherry, 1979. Groundwater. Prentice Hall, Englewood Cliffs, New Jersey.

HYDROSOLVE, 1996. AQTESOLV, Reston, Virginia.

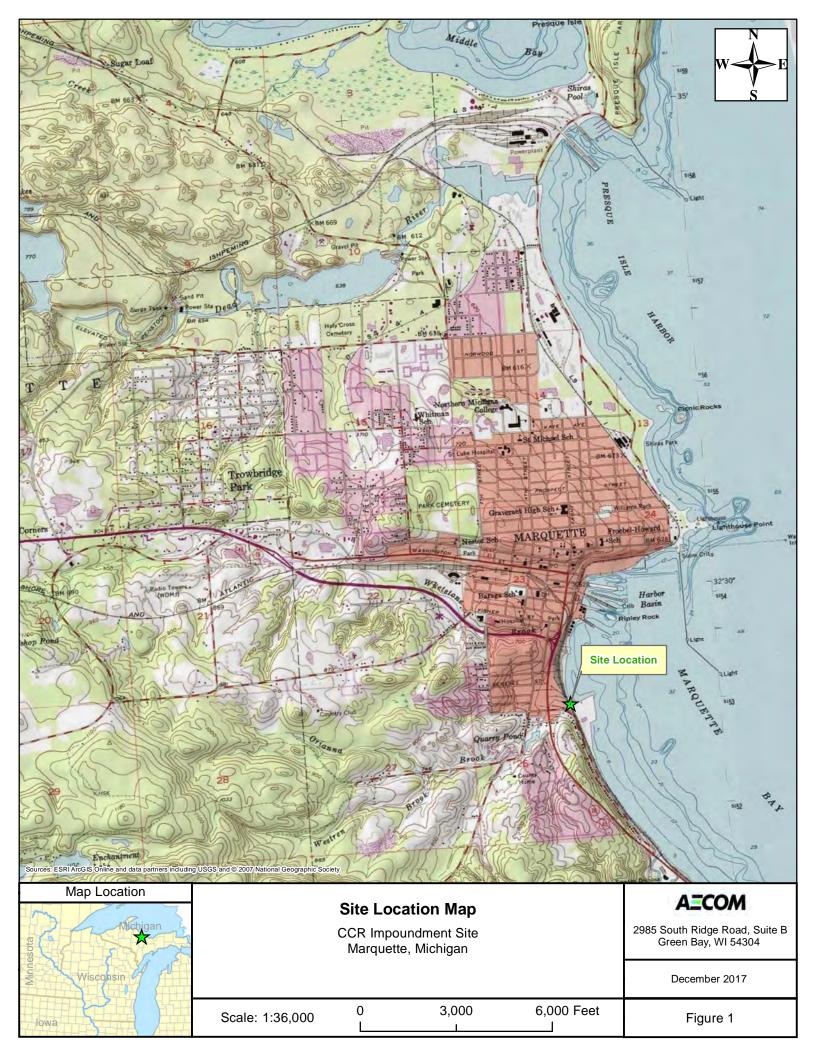
HYDROSOLVE, 2007. AQTESOLV, Reston, Virginia.

TABLE

TABLE 1 IN-SITU HYDRAULIC CONDUCTIVY RESULTS CCR IMPOUNDMENT MARQUETTE, MICHIGAN

Well No.	Field Test Type	Analysis	Hydraulic Conductivity (cm/sec)	Screened Interval Formation	Test No.		
MW-2	Slug (Bailer)	Bouwer and Rice	3.0E-05	Fine Sand	Rising Head Test #1		
MW-5	Slug (Bailer)	Bouwer and Rice	9.6E-04	Fine Sand	Rising Head Test #1		
IVI VV - J	Slug (Bailer)	Bouwer and Rice	1.7E-04	Fine Sand	Rising Head Test #2		
		Geometric Mean (MW-5) =	4.1E-04				
Geometric Mean (Shallow Wells) = 1.1E-04							
NOTE:							
Screened fo	ormation represents	the material with the highest potenit	al for hydraulic conductivit	ty.			

FIGURE



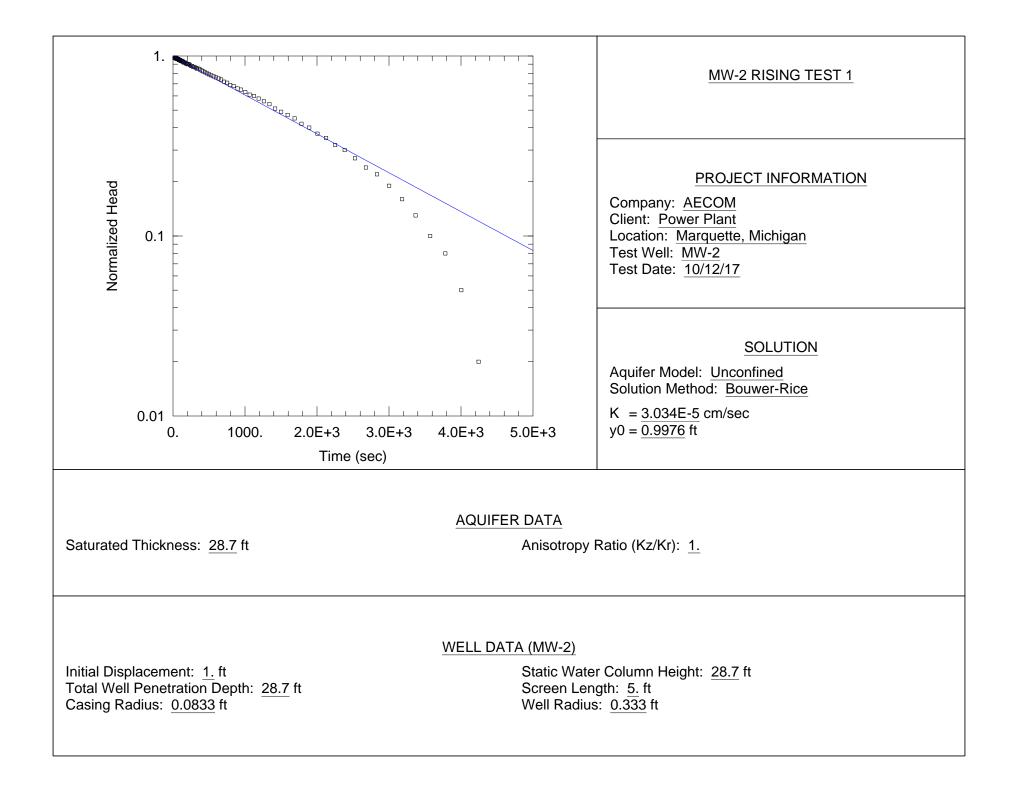


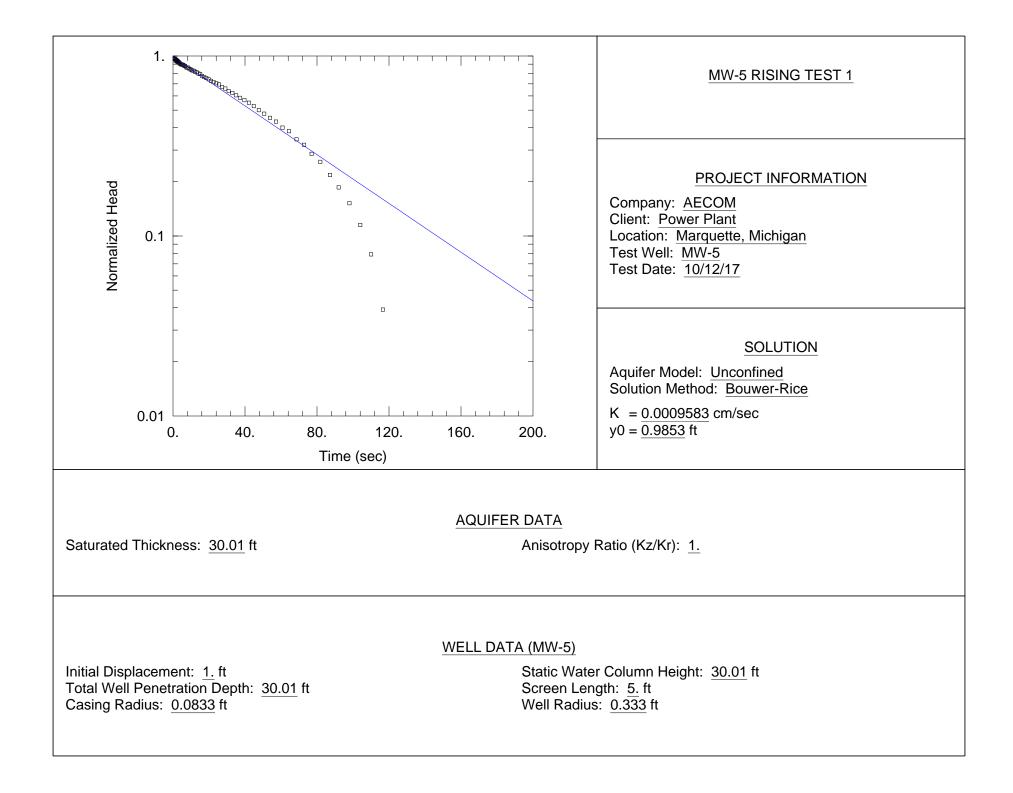
Monitoring Well (Slug Tested)

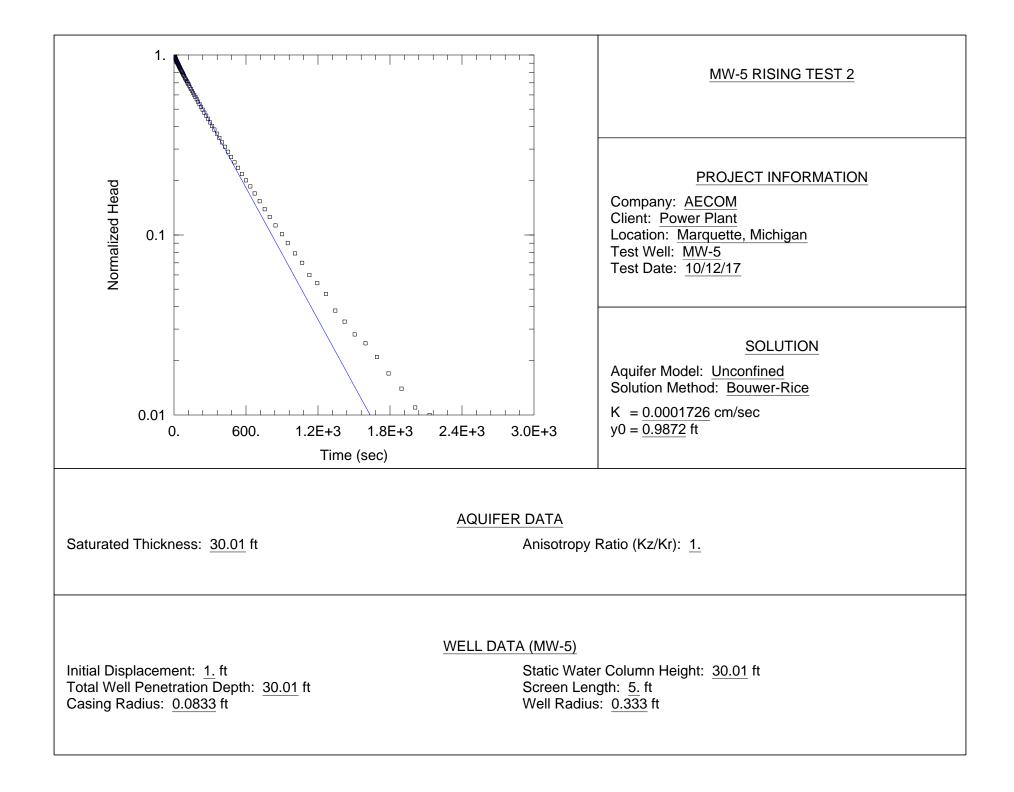
200 Feet 0 100 Scale: 1:1,200 L

Figure 2

SLUG TEST ANALYSIS







Appendix E Holding Pond Inspection Report



Holding Pond Annual Inspection Report

Marquette Board of Light and Power Shiras Steam Plant

Project Number: 60445171

January 12, 2017

Prepared for:

Marquette Board of Light and Power Shiras Steam Plant Marquette, Michigan

Prepared by:

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1. Introduction

The Marquette Board of Light and Power (MBLP) Shiras Steam Plant located in the City of Marquette, Michigan has a holding pond on the north side of the plant property on the shore of Lake Superior. The holding pond (WDS ID# 478988) is classified as a CCR surface water impoundment under the Coal Combustion Residual (CCR) Rule published on April 17, 2015. The rule contains requirements for inspection of CCR surface water impoundments. This report has been prepared to satisfy the 40 CFR 257.83 annual inspection requirements for surface water impoundments. AECOM previously performed the initial annual inspection of this impoundment under the CCR Rule and provided a report dated January 15, 2016.

2. Annual Inspection

2.1 Holding Pond Configuration

The holding pond is composed of 5 cells which are enclosed by steel sheet pile walls. Its overall configuration is shown in Drawing 1 in Appendix A, and an overall view is shown in Photo 1 in Appendix C. It has been expanded and modified a number of times since constructed. The south and west boundaries of the holding pond are formed by the shoreline of the lake. The east and north boundaries of the holding pond are formed by the shoreline of the lake. The east and north boundaries of the holding pond are formed by sheet pile walls which were constructed in 1981. Because of the poor condition of the original north wall, an additional wall was constructed to replace it in 2013. The new wall was placed inside of the original existing north wall, which remains but no longer provides containment (Photo 3 in Appendix C). The walls for the inner cells 1, 2, and 3 were constructed in 1990. There are also some abandoned sheet pile walls in place from previous configurations. The last change to the pond configuration was the addition of the north sheet pile wall in 2013 mentioned above.

The original 1981 construction drawings and 1990 improvement drawings were reviewed as part of this inspection. We also reviewed the report AECOM provided for the structural inspection of the impoundment which we performed in 2013 as well as the report from our initial annual inspection performed in 2015.

There are several ramps on the south shore of the impoundment which allow loaders to enter the cells to remove solids which have settled out of the impounded water. The cells are periodically drained to allow this cleanout operation. The residuals are primarily composed of bottom ash but also contain components from other waste streams including coal pile runoff and storm water. The residuals are removed to an off-site landfill.

2.2 Instrumentation

Water levels in the holding pond cells are monitored by measuring down from points of known elevation on the cell access walkways. The location and elevation of each measure down point (M.D.P.) is shown on Drawing 1 in Appendix A. The elevations were determined by an AECOM survey crew during our initial annual inspection on October 15, 2015.

Movement monitoring targets were also installed during the October 15, 2015 survey work. These reflectorized targets were installed near the top of the sheet pile walls at the locations shown on Drawing 1 in Appendix A. Initial coordinates of each target were determined using a total station laser survey instrument set-up over 2 control points which were established on the south and west shores of the pond. The current coordinates of the targets were checked by an AECOM survey crew on November 22, 2016. No significant lateral movement or settlement of the sheet pile walls was detected. This is a good indication that the sheet pile walls are currently stable.

2.3 Water and CCR Ash Elevations

The water elevation in each of the cells is monitored periodically using the system described in section 2.2 of this report. The following table summarizes the variation in water elevations during the 2016 calendar year:

Cell	Minimum Elevation	Maximum Elevation	Present Elevation
1	604.38	607.88	607.63
2	604.39	607.97	607.72
3	606.59	607.92	607.76
4	606.73	607.90	606.82
5	606.04	607.87	606.45

The elevation of the CCR ash deposit surface varies between cells. The ash surface elevation also varies across each cell and cannot be characterized by a single elevation. Water depth elevations to the top of the ash deposits were measured by AECOM from a boat on December 2, 2016. Cross sections of each cell showing the CCR ash bottom profiles were developed using these measurements and are included in Drawings 2 through 6 in Appendix A.

2.4 Storage Capacity

The storage capacity of the holding pond was calculated using the original design elevation of the pond bottom as the lower limit of the enclosed volume. The upper limit was assumed to be the current elevation of the outlet weir in each cell. The total storage volume was calculated to be 5,799 cubic yards. The calculations are included in Appendix B.

2.5 Current Volume of Impounded Water and CCR

The water depth measurements from our survey were used to calculate the current upper limit of CCR ash in the holding pond. The lower limit of CCR ash was assumed to be the original design elevation of the bottom of the pond. The volume of CCR ash was calculated to be 2,390 cubic yards. The calculations for the CCR ash volume are included in Appendix B.

The volume of impounded water was calculated using the results of our water depth survey for the lower limit of the water. The upper limit was assumed to be the current outlet weir elevation of each cell. The volume of impounded water was calculated to be 3409 cubic yards. The calculations for the impounded water volume are included in Appendix B.

2.6 Structural Field Evaluation

The primary structural component of the holding pond is the exterior sheet pile walls on the east and north sides of the pond. A field evaluation of the outer sheet pile containment wall was performed on December 2, 2016 by AECOM employees, Brian Hintsala, P.E. and Bruce Peterson. The water was at normal elevation in all of the cells during the inspection. A boat was used to inspect the north and east walls, which separate the holding pond from Lake Superior.

Based on our field observations, this sheet pile used for this wall is a hot rolled Z-shaped section with a depth of 12-inches and a 3/8-inch nominal thickness. It appears to be similar to a PZ27 sheet pile section, which is a common type of sheet pile.

The steel surface on the Lake Superior side of the east sheet pile was bare and the majority of the wall appeared to be in good condition (Photo 2 in Appendix C). The north wall is newer and in very good condition. There were a number of spots of localized corrosion which occurred primarily at the joints between the sheets (Photos 4 and 5 in Appendix C). Most of these had an appearance that suggested there may have been seepage through the joint at one time. No seepage was evident during this evaluation.

During our initial annual inspection performed in November of 2015, thickness measurements were taken in order to get an overall view of the condition of the wall. Generally speaking, the readings varied from 0.33-inches to 0.40-inches, indicating little to no loss of the original 3/8-inch steel thickness. There are small areas of more severe localized corrosion (Photo 5 in Appendix C). We would regard this amount of steel loss as non-critical, since they are small 2-inch to 3-inch wide areas and will not materially reduce the structural capacity of the wall. In addition, our structural analysis of the wall performed in 2013 showed that this exterior wall had a large margin of reserve strength and could tolerate over 50% loss of steel thickness due to corrosion.

The remaining sheet pile walls which form the internal boundaries between the cells are constructed of a lighter gage sheet pile. It was not possible to examine these walls closely because the cells were full of water and the walls were mostly submerged. The exposed portions appear to be in poor condition. These internal walls, however, do not affect to the structural ability of the pond to contain CCR ash and are only used as baffles to improve the settlement of ash out of the water.

3. Conclusion

The south and west sides of the holding pond are incised into the ground and pose no threat of failure, resulting in a release of CCR materials. The east steel sheet pile wall of the holding pond is currently in fairly good condition and has a good reserve of structural bending capacity. A new heavy gage sheet pile wall was installed in 2013 to replace the deteriorated north wall of the holding pond and is in very good condition. The north and east sheet pile wall both appear to be stable and have ample structural capacity to contain the impounded water. The interior sheet pile walls are in poor condition, but are not required for containment integrity of the holding pond. The interior walls can continue in this condition to function as separators between the cells to improve the settlement of solids out of the process water.

Appendix A Report Drawings

DATE OF SURVEY: NOVEMBER 22, 2016 ELEVATION DATUM IS NAVDB8 AND ESTABLISHED BY DIFFERENTIAL LEVEL LOOP FROM NGS DISK LSC7683 (RK0415) WHICH HAS A PUBLISHED ELEVATION OF 615.610. REFLECTIVE TARGET COORDINATES AND ELEVATIONS ESTABLISHED BY TURINING 2 SETS OF ANGLES FROM CONTROL POINTS 1 AND 2. TARGET BENCHMARK ELEVATIONS ESTABLISHED BY DIFFERENTIAL LEVELING. SOME TARGET BENCHMARK WERE INACCESSIBLE TO A LEVEL ROD AND HAD TO BE MEASURED DOWN TO FROM ABOVE.

		Ash	Pond CCR Cor	npliance Move	ment Monitoring		1 1				
Point	10/15/2015 NORTHING	10/15/2015 EASTING	11/22/2016 NORTHING	11/22/2016 EASTING	DELTA NORTHING FROM BASELINE SURVEY	DELTA EASTING FROM BASELINE SURVEY		POINT	10/15/2015 ELEVATION	11/22/2016 ELEVATION	DELTA FROM BASELINE SURVEY
1	5000.000	5000.000	5000.000	5000.000	0.000	0.000		1	609.905	609.905	N/A
2	5053.395	4885.493	5053.395	4885.493	0.000	0.000		2	616.957	616.957	N/A
3	5032.562	4987.579	5032.562	4987.578	0.000	-0.001		3	608.825	608.820	-0.005
4	5076.237	4960.903	5076.220	4960.876	-0.017	-0.027		4	608.815	608.840	0.025
5	5124.911	4931.078	5124.911	4931.083	0.000	0.005		5	608.865	608.865	0.000
6	5049.888	5011.443	5049.865	5011.409	-0.023	-0.034		6	608.843	608.850	0.007
7	5089.939	4987.426	5089.900	4987.363	-0.039	-0.063		7	608.870	608.862	-0.008
8	5138.743	4957.869	5138.738	4957.866	-0.005	-0.003		8	608.908	608.913	0.005
9	5135.519	4922.879	5135.518	4922.877	-0.001	-0.002] [9	609.835	609.830	-0.005
10	5157.940	4943.954	5157.940	4943.955	0.000	0.001		10	609.857	609.855	-0.002
11	5182.039	4966.800	5182.039	4966.799	-0.001	-0.001		11	609.730	609.727	-0.003
12	5202.844	4986.818	5202.842	4986.813	-0.002	-0.006		12	609.752	609.750	-0.002
13	5212.675	5003.027	5212.663	5003.041	-0.012	0.014		13	609.695	609.692	-0.003
14	5181.111	5020.604	5181.105	5020.619	-0.006	0.015		14	609.720	609.630	-0.090
15	5151.909	5036.356	5151.908	5036.367	-0.001	0.011		15	609.670	609.655	-0.015
16	5126.503	5050.227	5126.501	5050.237	-0.002	0.010		16	609.730	609.727	-0.003
17	5099.988	5064.660	5099.985	5064.666	-0.003	0.006		17	609.735	609.735	0.000
18	5080.634	5075.118	5080.635	5075.124	0.001	0.006		18	609.702	609.700	-0.002
19	5048.539	5048.415	5048.536	5048.413	-0.003	-0.002		19	608.830	608.850	0.020
20	5104.828	5013.673	5104.835	5013.695	0.007	0.022		20	608.960	608.957	-0.003
21	5153.524	4983.690	5153.518	4983.701	-0.007	0.011		21	608.950	608.947	-0.003

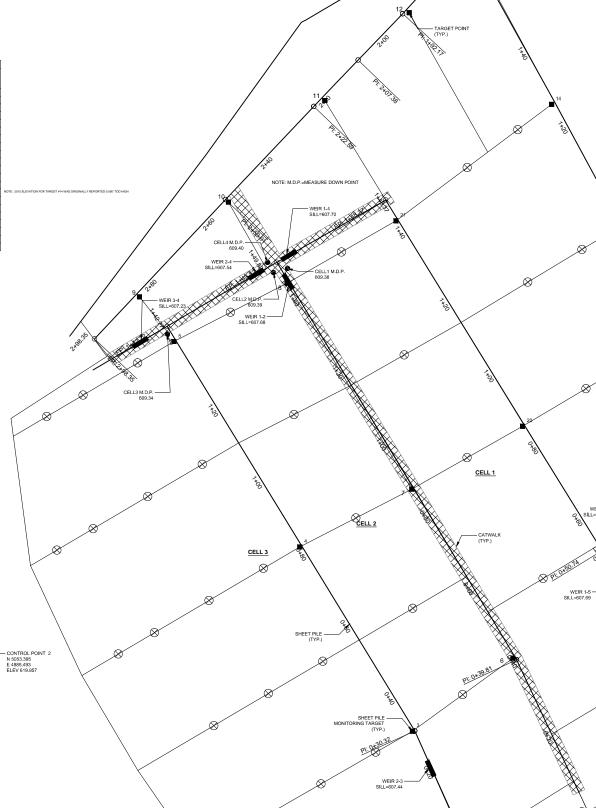
AND ELEVATION

CHMARK ELEVATION

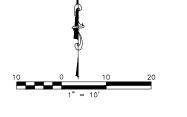
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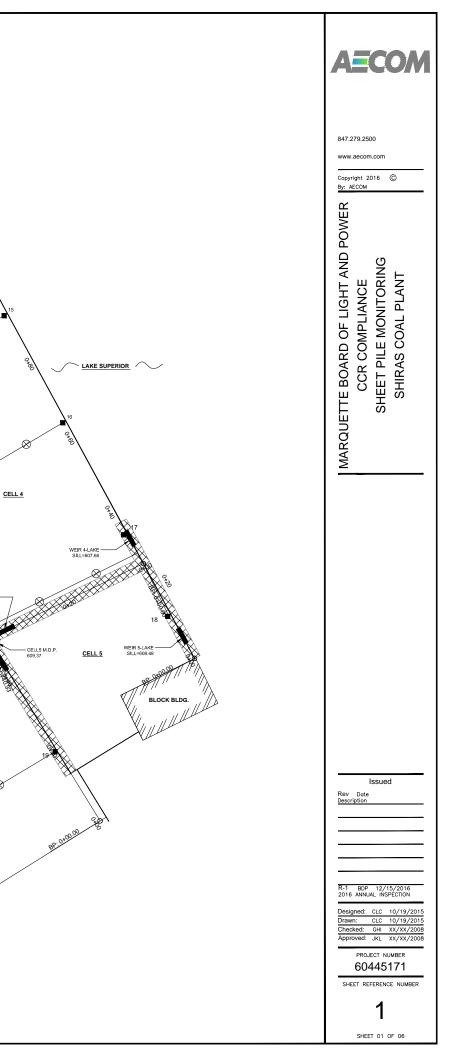
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		CCR Complian	ce Ash Pond Mo	nitoring	
IG FROM URVEY	POINT	10/15/2015 ELEVATION	11/22/2016 ELEVATION	DELTA FROM BASELINE SURVEY	
)	1	609.905	609.905	N/A	1
)	2	616.957	616.957	N/A	1
1	3	608.825	608.820	-0.005	
7	4	608.815	608.840	0.025	
i	5	608.865	608.865	0.000	
1	6	608.843	608.850	0.007	
3	7	608.870	608.862	-0.008	
3	8	608.908	608.913	0.005	1
2	9	609.835	609.830	-0.005	
	10	609.857	609.855	-0.002	
1	11	609.730	609.727	-0.003	
6	12	609.752	609.750	-0.002	
	13	609.695	609.692	-0.003	
	14	609.720	609.630	-0.090	NC
	15	609.670	609.655	-0.015	1
)	16	609.730	609.727	-0.003	
	17	609.735	609.735	0.000	1
	18	609.702	609.700	-0.002	
2	19	608.830	608.850	0.020	
	20	608.960	608.957	-0.003	



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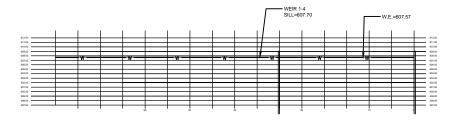
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0+00

0+20

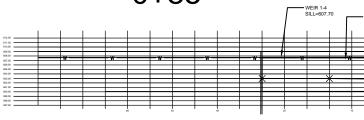


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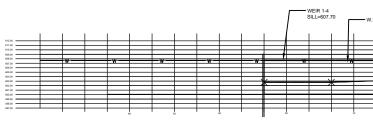
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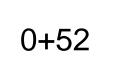
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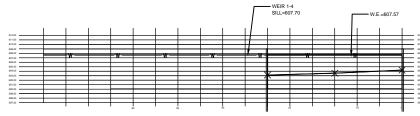




1+15







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MATERIAL AREA = 107.0 SFT MEASURED ADDITIONAL AREA= 121.6 SFT TOTAL AREA = 228.6 SFT

1+43







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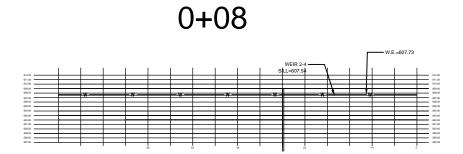


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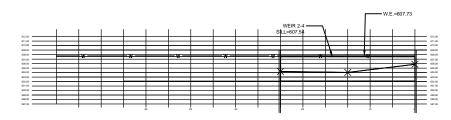
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MARQUETTE BOARD OF LIGHT AND POWER CCR COMPLIANCE SHEET PILE MONITORING SHIRAS COAL PLANT
Issued
Rev Date Description
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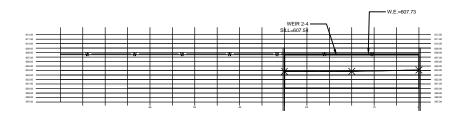
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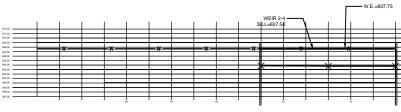
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1+16



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1+45





MATERIAL AREA = 114.0 SFT MEASURED ADDITIONAL AREA= 109.8 SFT TOTAL AREA = 223.8 SFT



- W.E.=607.73

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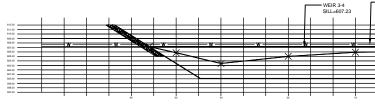
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MARQUETTE BOARD OF LIGHT AND POWER CCR COMPLIANCE SHEET PILE MONITORING SHIRAS COAL PLANT
Issued Rev Date
Description
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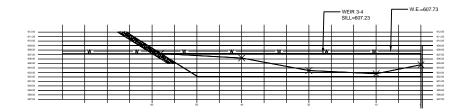
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0+10



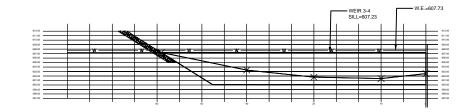
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0+55



MATERIAL AREA = 136.4 SFT MEASURED ADDITIONAL AREA= 245.0 SFT TOTAL AREA = 381.4 SFT

X:ADD_Settings_Autodeskenpidesivi\24x36.dkg 10/23/2008 11:5829 AK AECOMeth





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W.E.=607.73



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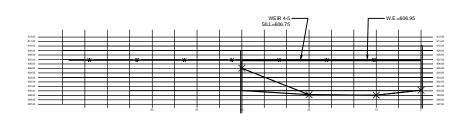


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AARQUETTE BOARD OF LIGHT AND POWER CCR COMPLIANCE SHEET PILE MONITORING SHIRAS COAL PLANT	A		g	OM
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AARQUETTE BOARD OF LIGHT AND POWER CCR COMPLIANCE SHEET PILE MONITORING SHIRAS COAL PLANT	By: A		016	©
<u> </u>	MARQUETTE BOARD OF LIGHT AND POWER	CCR COMPLIANCE	SHEET PILE MONITORING	SHIRAS COAL PLANT
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NOTE: CELL 4 BOTTOM HAS BEEN EXCAVATED BELOW 1990 SCA, CINDER POND IMPROVEMENT PROJECT, AT SOME LOCATIONS

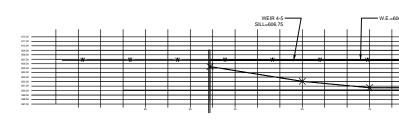




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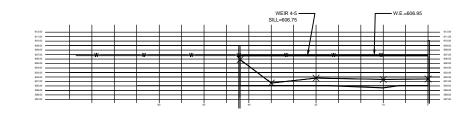
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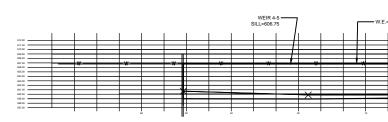


1+26

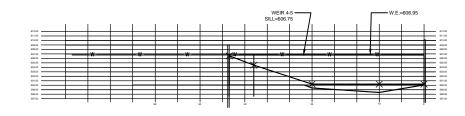




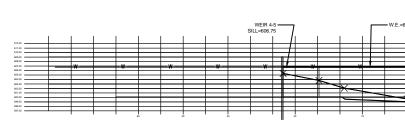
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2+19

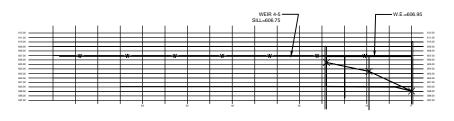
		AECOM
3.95	MATERIAL AREA = 99.3 SFT MEASURED ADDITIONAL AREA= 204.9 SFT TOTAL AREA = 304.2 SFT	MARQUETTE BOARD OF LIGHT AND POWER CCR COMPLIANCE SHEET PILE MONITORING SHIRAS COAL PLANT
	MATERIAL AREA = 53.9 SFT MEASURED ADDITIONAL AREA= 338.2 TOTAL AREA = 392.1 SFT	
	MATERIAL AREA = 46.3 SFT MEASURED ADDITIONAL AREA= 149.5 SFT TOTAL AREA = 195.8 SFT	Issued Rev Dote Description R-1 BDP 12/15/16 2016 ANNUAL INSPECTION Designed: CLC 10/19/2015 Drawn: CLC 10/19/2015 Checked: GHI XX/XX/2008 Approved: JKL XX/XX/XX/XX/XX/XX/XX/XX/XX/XXX/XXX/XXX

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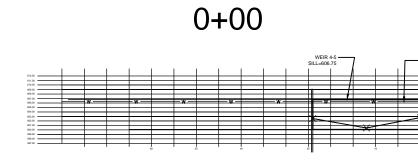
CELL 4 (Cont.)

CELL 5

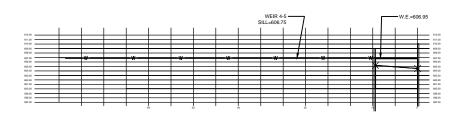
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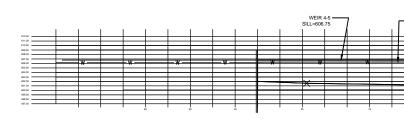
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0+20

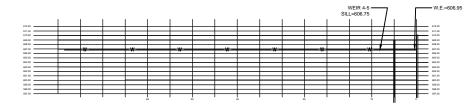


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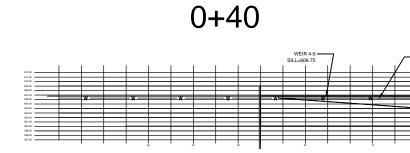


2+98

2+83



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		AECOM
	MATERIAL AREA = 34.6 SFT MEASURED ADDITIONAL AREA= 125.5 SFT TOTAL AREA = 160.1 SFT	MARQUETTE BOARD OF LIGHT AND POWER CCR COMPLIANCE SHEET PILE MONITORING SHIRAS COAL PLANT SHIRAS COAL PLANT
600.32	MATERIAL AREA = 50.6 SFT MEASURED ADDITIONAL AREA= 182.9 SFT TOTAL AREA = 233.5 SFT	
-606.32	MATERIAL AREA = 186.0 SFT MEASURED ADDITIONAL AREA= 47.5 SFT TOTAL AREA = 233.5 SFT	Issued Rev Date Description Rev Date Description Rev Date Description Rev Date Control 12/15/16 2018 ANNULL INSPECTION Rev June Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Approved: JUNE Checked: CHI XX/XX/2008 Checked: CHI XX/XX/2008 Approved: JUNE Checked: /2008 Approved: JUNE CHI XX/XX/XX/2008 Approved: JUNE Approved: JUNE CHI XX/XX/XX/XX/XXX/XXXX/XXXXX/XXXXXXXXXX

Appendix B Volume Calculations

Client:	Marquette Board of Light and Power
Project No.:	60445171
Project :	CCR Compliance : Ash Cell Volumes

AECOM

Date:

12/15/2016

			CELL 1		
		Occupied Area	Unoccupied		
Station	Length (FT)	(SFT)	Area (SFT)	Total Area (SFT)	_
0+00	0	0.0	0.0	0.0	
0+20	20	62.0	106.6	168.6	
0+52	32	107.0	121.6	228.6	
0+85	22	86.0	142.6	228.6	
1+15	30	84.5	144.1	228.6	
1+43	28	162.5	66.1	228.6	
					-
			CFT		CYD
00	cupied Volum	e =	11462.5		424.5
Unc	occupied Volur	ne =	14866.7		550.6
Tot	al Cell 1 Volun	ne =	26329.2		975.2

			CELL 2		
		Occupied Area	Unoccupied		
Station	Length (FT)	(SFT)	Area (SFT)	Total Area (SFT)	_
0+08	0	0.0	0.0	0.0	
0+40	32	73.5	90.3	163.8	
0+63	23	114.8	109.0	223.8	
0+87	24	114.0	109.8	223.8	
1+16	39	110.3	113.5	223.8	
1+45	29	111.0	112.8	223.8	
			CFT		CYD
0	ccupied Volum	ie =	13669.8		506.3
Une	occupied Volur	ne =	13998.1		518.4
Tot	tal Cell 2 Volun	ne =	27667.8		1024.7

			CELL 3		
		Occupied Area	Unoccupied		
Station	Length (FT)	(SFT)	Area (SFT)	Total Area (SFT)	
0+10	0	0.0	0.0	0.0	
0+30	20	135.5	142.0	277.5	
0+55	25	136.4	245.0	381.4	
0+81	26	148.3	233.1	381.4	
1+10	29	245.9	112.3	358.2	
1+39	29	245.1	29.0	274.1	
			CFT		CYD
0	ccupied Volum	1e =	21290.3		788.5
Und	occupied Volu	me =	19530.0		723.3
Tot	al Cell 3 Volun	ne =	40820.2		1511.9

			CELL 4		
		Occupied Area	Unoccupied		
Station	Length (FT)	(SFT)	Area (SFT)	Total Area (SFT)	_
0+28	0	37.3	256.0	293.3	
0+64	36	74.4	209.4	283.8	
0+93	29	91.0	226.3	317.3	
1+26	33	99.3	204.9	304.2	
1+69	43	53.9	338.2	392.1	
2+19	0	73.7	122.0	195.7	
2+52	33	55.8	74.1	129.9	
2+83	31	45.3	17.4	62.7	
2+98	15	0.0	0.0	0.0	
					-
			CFT		CYD
0	ccupied Volum	e =	14886.2		551.3
Und	Unoccupied Volume =		38270.7		1417.4
Tot	tal Cell 4 Volun	ne =	53156.9		1968.8

	CELL 5						
		Occupied Area	Unoccupied				
Station	Length (FT)	(SFT)	Area (SFT)	Total Area (SFT)	_		
0+00	0	34.6	125.5	160.1			
0+20	20	50.6	182.9	233.5			
0+40	20	186.0	47.5	233.5			
			CFT		CYD		
Occupied Volume =			3218.0		119.2		
Unoccupied Volume =			5388.0		199.6		
Total Cell 5 Volume =		8606.0		318.7			

	Total System	
	CFT	CYD
Occupied Volume =	64526.7	2389.9
Unoccupied Volume =	92053.4	3409.4
Total Volume =	156580.1	5799.3

Appendix C Photo Log

Marquette Board of Light and Power, Shiras Steam Plant, Holding Pond



Photo1- Holding Pond



Photo 2 – Overall View of East Wall

Marquette Board of Light and Power, Shiras Steam Plant, Holding Pond



Photo 3 – Recently Constructed North Sheet Pile Wall



Photo 4 – Corrosion at Joints

Marquette Board of Light and Power, Shiras Steam Plant, Holding Pond



Photo 5 – Spot with Localized Corrosion

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