

FIRST ANNUAL CCR GROUNDWATER MONITORING and CORRECTIVE ACTION REPORT 2017

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

January 30, 2018

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Table of Contents

Acronyms ii
1.0 Introduction..... 1
1.1 Regulatory Background..... 1
1.2 Facility Location and Operational History 1
1.3 CCR Unit Description 1
1.4 Physical Setting and Geology..... 2
2.0 Groundwater Monitoring and Corrective Action Process Overview 3
3.0 Groundwater Activities in 2017 4
3.1 Monitoring Well Installation, Development, and Testing 4
3.2 Groundwater Monitoring Activities 5
4.0 Monitoring System Evaluation..... 6
5.0 Groundwater Sampling and Analysis 7
6.0 Statistical Analysis 8
7.0 Anticipated Future Activities 9
8.0 References 10

Certifications

Statistical Methods Certification
Groundwater Monitoring System Certification

Tables

Table 1 Monitoring Well Construction Summary
Table 2 Borehole Lithology Summary
Table 3 Analytical Results Summary

Figures

Figure 1 Site Location Map
Figure 2 Monitoring Well Network
Figure 3 Groundwater Surface Contour Map, Event #1, July 19, 2017
Figure 4 Groundwater Surface Contour Map, Event #2, July 24, 2017
Figure 5 Groundwater Surface Contour Map, Event #3, August 23, 2017
Figure 6 Groundwater Surface Contour Map, Event #4, August 29, 2017
Figure 7 Groundwater Surface Contour Map, Event #5, September 6, 2017
Figure 8 Groundwater Surface Contour Map, Event #6, September 14, 2017

Figure 9 Groundwater Surface Contour Map, Event #7, September 28, 2017
Figure 10 Groundwater Surface Contour Map, Event # 8, October 5, 2017

Appendices

Appendix A Boring Logs/Well Construction Diagrams
Appendix B Analytical Laboratory Reports
Appendix C Statistical Analysis
Appendix D Slug Testing Report
Appendix E *Holding Pond Annual Inspection Report, AECOM, January 12, 2017*

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 pre-preserved 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. Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities, 15 p.
- Gair, J.E., and Thaden, R.E., 1968, Geology of the Marquette and Sands quadrangles, Marquette County, Michigan: U.S. Geological Survey, Professional Paper 397, scale 1:24,000.
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- Tri-Media Consultants, 2000. Feasibility Study and Corrective Action Plan For The Leaking Underground Storage Tank Project At The Swanson Tire Center, Marquette, Michigan. September 28, 2000.
- Twin Port Testing (TPT), 1994. Narrative Excerpt from Phase I Hydrogeological Study. July 1994.
- United States Environmental Protection Agency (USEPA) 1996. Low Stress (Low Flow) Purging and Sampling Procedure, United States Environmental Protection Agency, July 30, 1996.
- United States Environmental Protection Agency (USEPA), 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance. EPA 530/R-09-007, 884 p.

Certifications

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**HOLDING POND
SHIRAS STEAM PLANT
MARQUETTE, MICHIGAN**

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

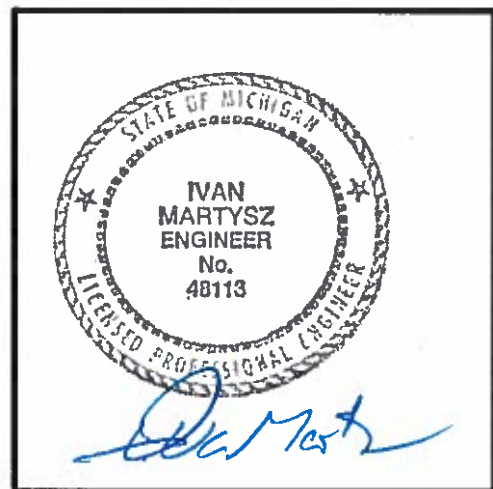
I, Ivan Martysz, being a Registered Professional Engineer in good standing in the State of Michigan do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification is prepared in accordance with the accepted practice of engineering. I certify, 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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**HOLDING POND
SHIRAS STEAM PLANT
MARQUETTE, MICHIGAN**

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

**COAL COMBUSTION RESIDUALS RULE
STATISTICAL METHODS CERTIFICATION
MARQUETTE BOARD OF LIGHT AND POWER (MBLP)**

**HOLDING POND
SHIRAS STEAM PLANT
MARQUETTE, MICHIGAN**

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

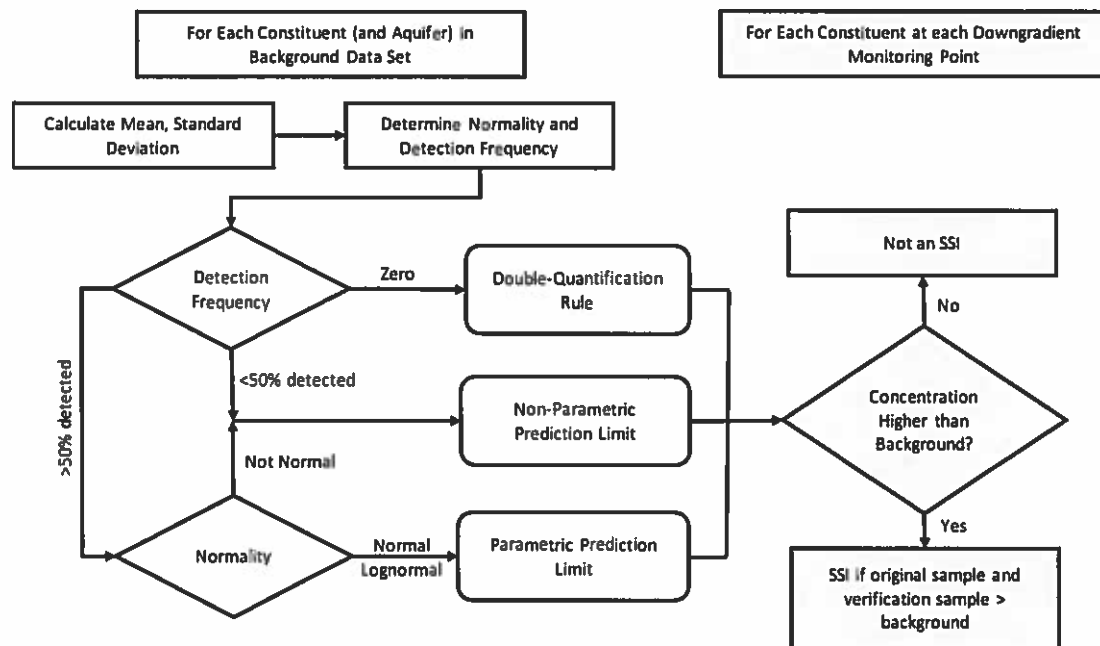


Figure 1. Flow chart for Detection Monitoring statistical evaluation (from EPRI, 2015).

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_0 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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STATISTICAL METHODS CERTIFICATION
MARQUETTE BOARD OF LIGHT AND POWER (MBLP)**

**HOLDING POND
SHIRAS STEAM PLANT
MARQUETTE, MICHIGAN**

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 , and an appropriate value is identified as the one-sided, upper prediction limit, P_u , 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 data is continuous and is the same in both 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

**COAL COMBUSTION RESIDUALS RULE
STATISTICAL METHODS CERTIFICATION
MARQUETTE BOARD OF LIGHT AND POWER (MBLP)**

**HOLDING POND
SHIRAS STEAM PLANT
MARQUETTE, MICHIGAN**

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 2nd-to-largest, or the 3rd-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 j^{th} 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 two-sided, 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

**COAL COMBUSTION RESIDUALS RULE
STATISTICAL METHODS CERTIFICATION
MARQUETTE BOARD OF LIGHT AND POWER (MBLP)**

**HOLDING POND
SHIRAS STEAM PLANT
MARQUETTE, MICHIGAN**

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

**COAL COMBUSTION RESIDUALS RULE
STATISTICAL METHODS CERTIFICATION
MARQUETTE BOARD OF LIGHT AND POWER (MBLP)**

**HOLDING POND
SHIRAS STEAM PLANT
MARQUETTE, MICHIGAN**

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

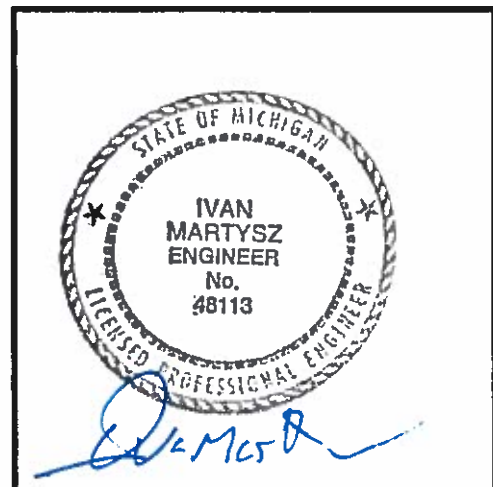
I, Ivan Martysz, being a Registered Professional Engineer in good standing in the State of Michigan, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification is prepared in accordance with the accepted practice of engineering. I certify, 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 1
Monitoring Well Construction Summary
Marquette Board of Light and Power
Shiras 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		8-inch steel casing	2-inch stainless steel	Downgradient	Detection
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				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				Downgradient	
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		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 Geologic Material Monitored Total Depth (feet bgs) Water Bearing Zone (feet bgs) Screened Interval (feet bgs)	MW-1		MW-2		MW-3		MW-4		MW-5	
	Unconsolidated		Unconsolidated		Unconsolidated		Unconsolidated		Unconsolidated	
	20		22		21		47		45	
	Drilled in lake sediment		Drilled in lake sediment		Drilled in lake sediment		Upland Well		Upland Well	
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			

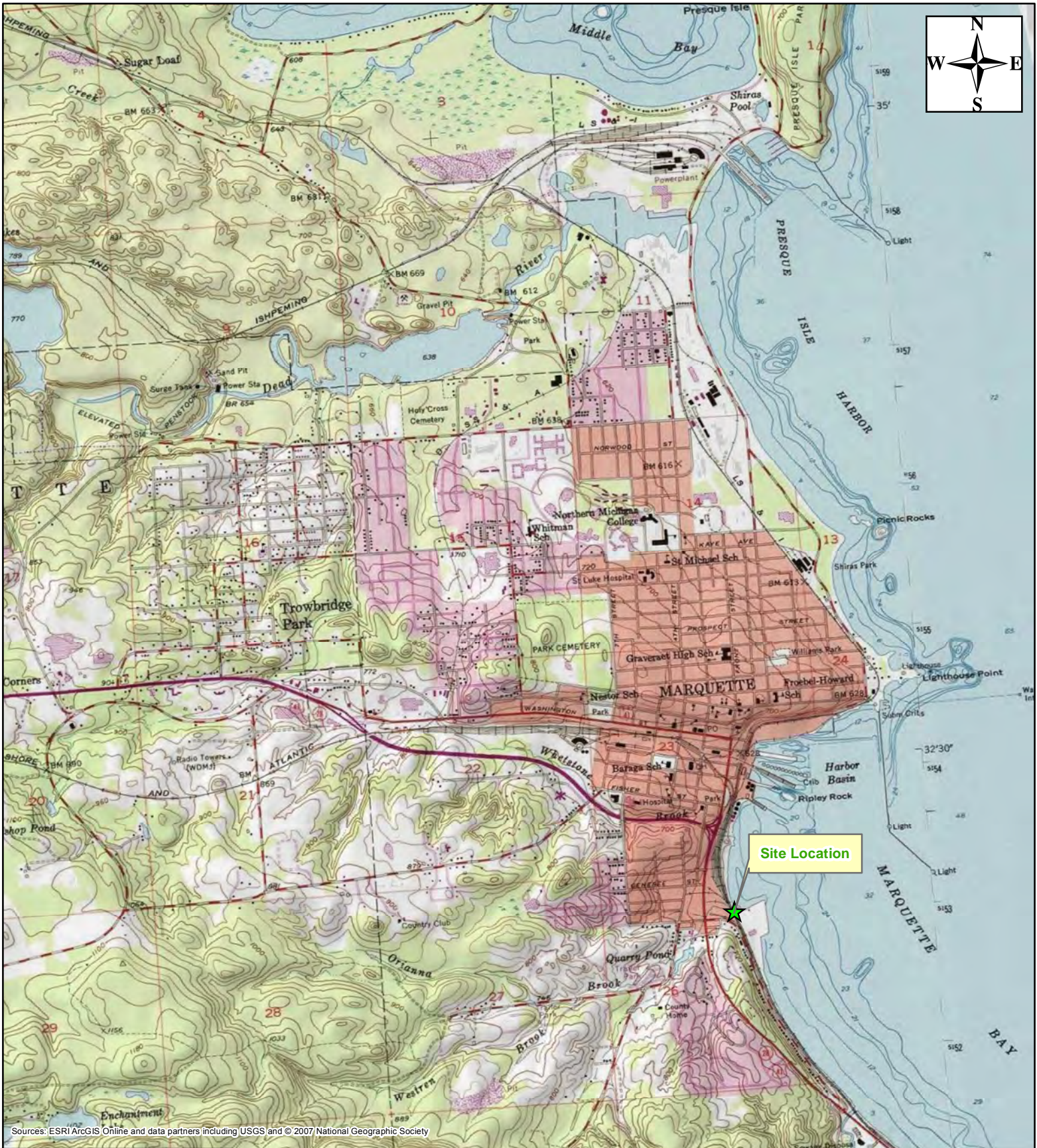
Notes:
bgs = below ground surface
(CL)/(ML)/(SW) = Unified Soil Classification System Code for primary grain size
All wells constructed with 10-foot length screens

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

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

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 Analyzed

Figures



Sources: ESRI ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

★ Site Location

Scale: 1:36,000

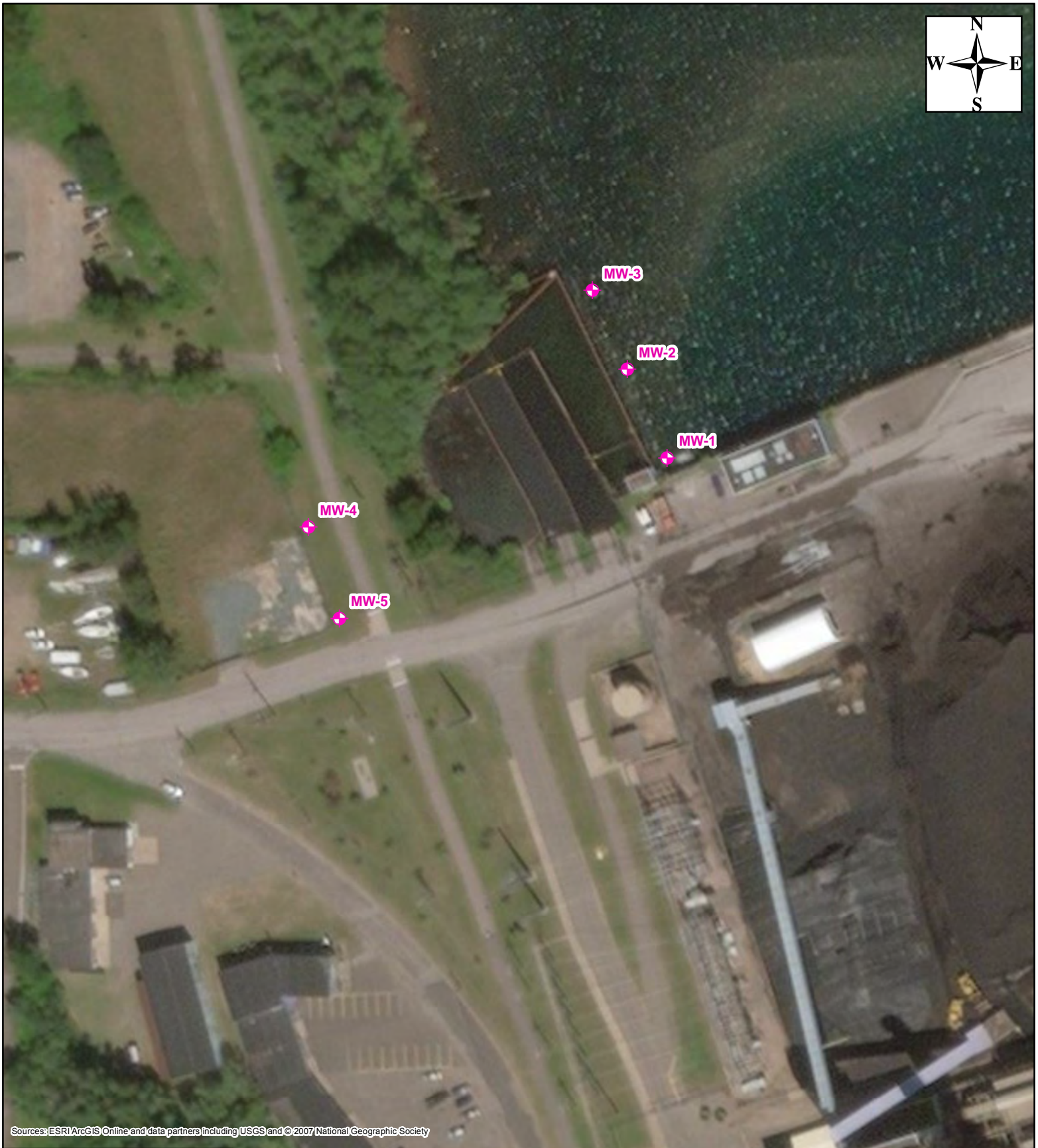
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Site Location Map

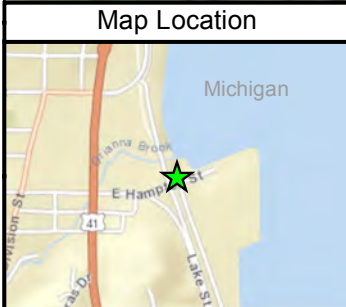
AECOM

January 2018

Figure 1



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

Monitoring Well

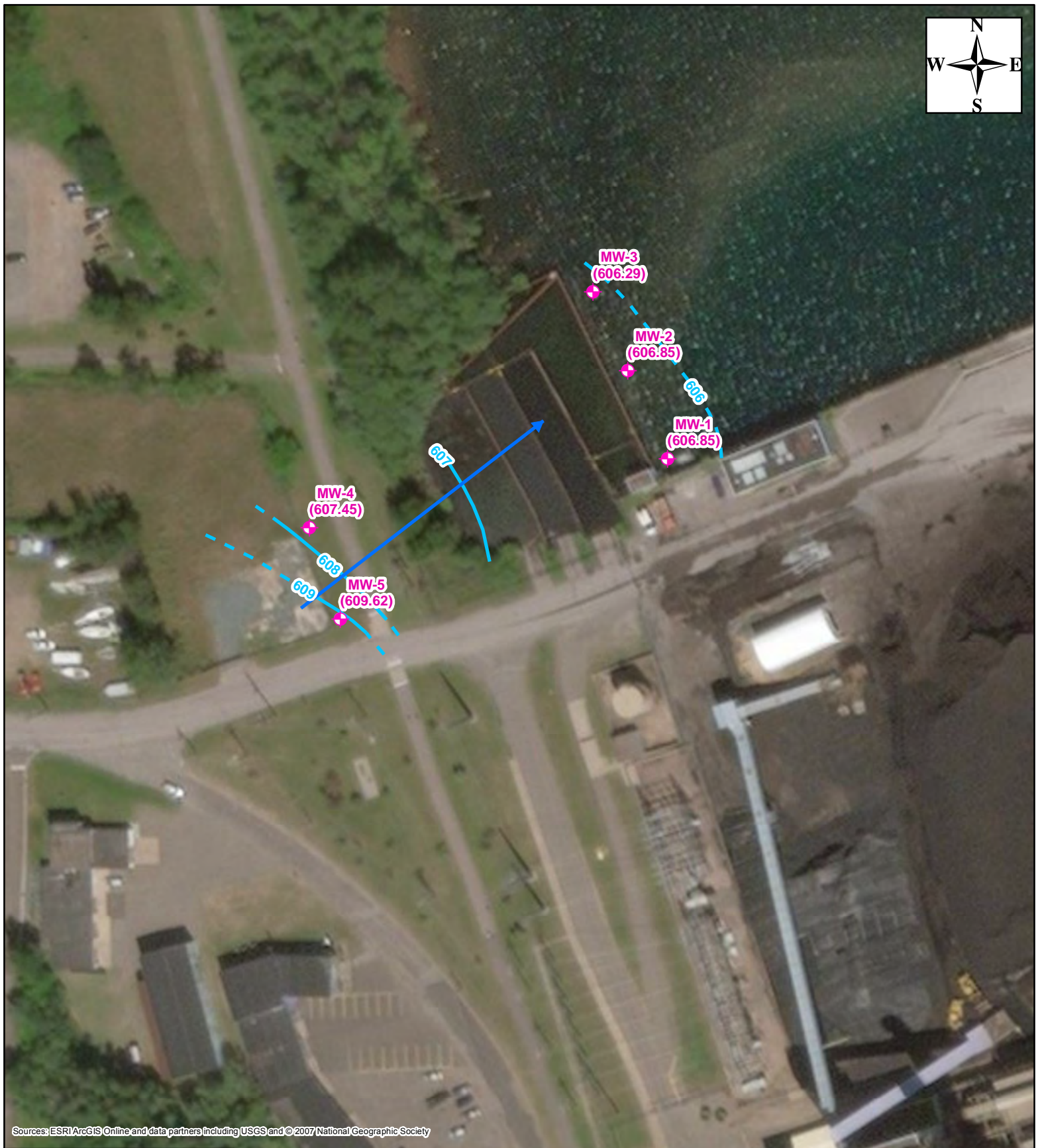
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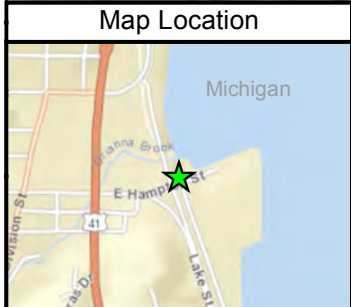
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January 2018

Figure 2



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

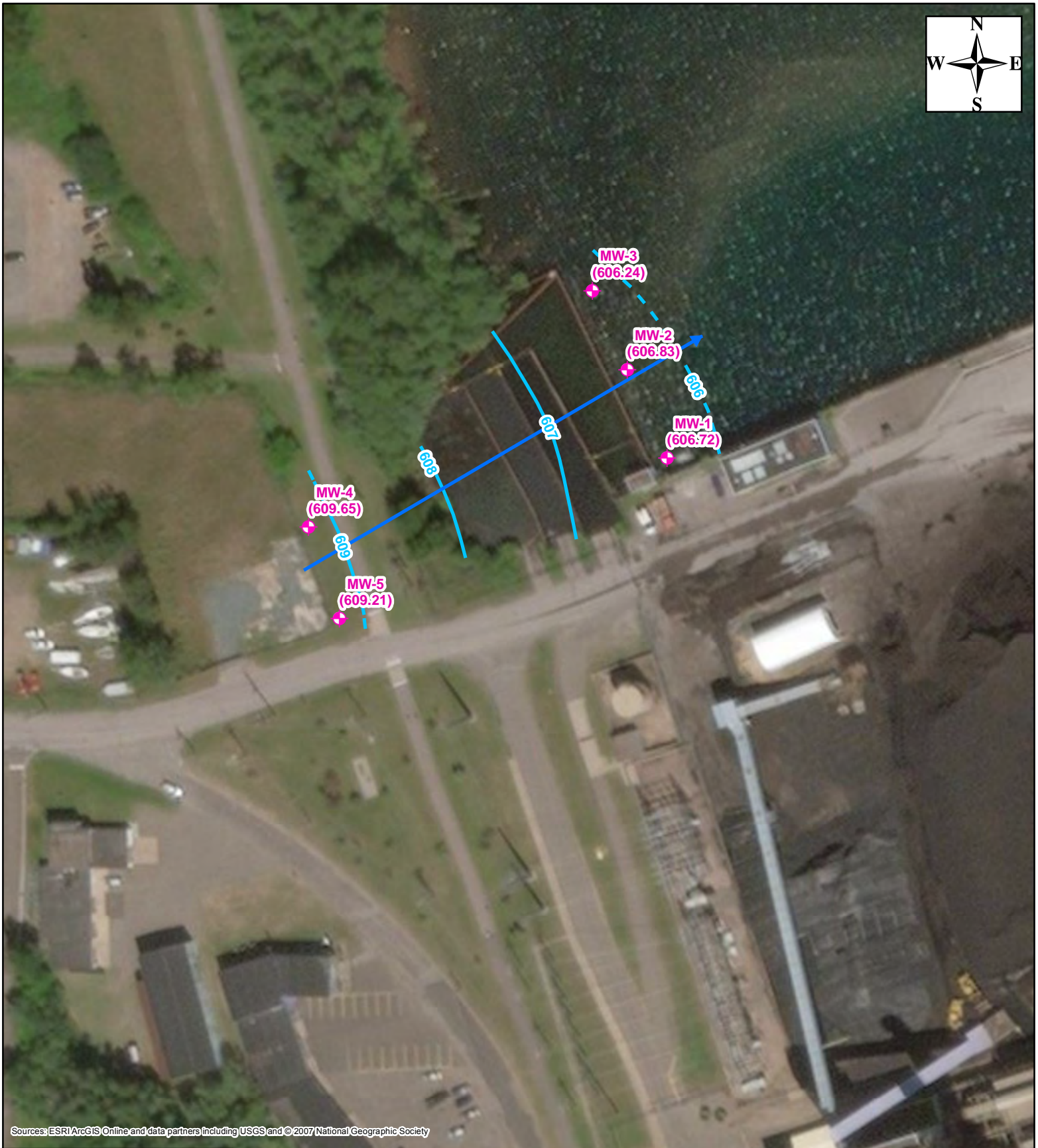
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- Piezometric Surface Contour (1-foot, July 19, 2017)
- Groundwater Flow Direction

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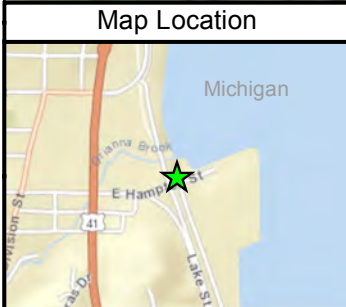
January 2018

Groundwater Surface Contour Map, Event #1, July 19, 2017

Figure 3



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

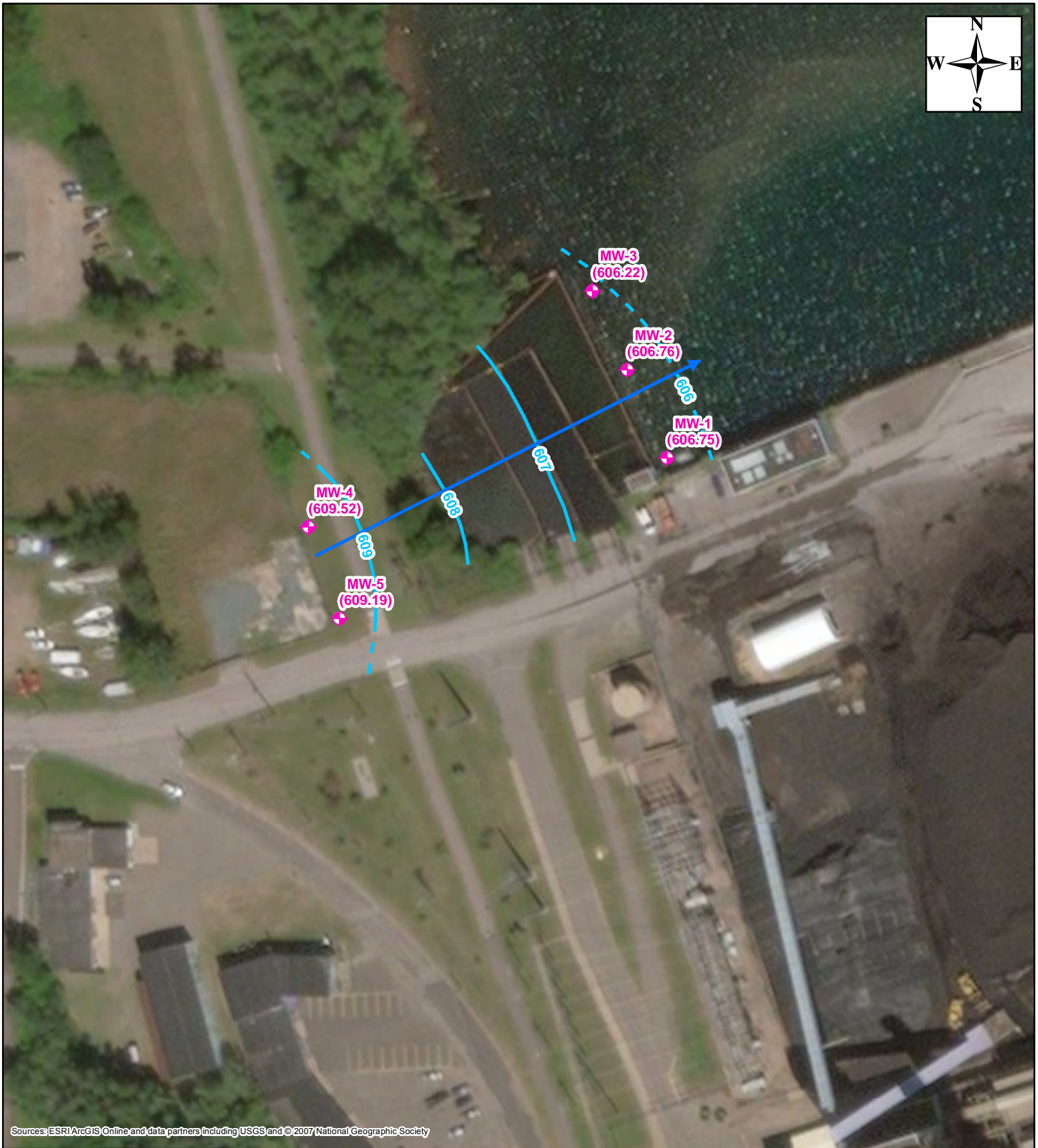
- Monitoring Well With Measured Groundwater Elevation
- Piezometric Surface Contour (1-foot, July 24, 2017)
- Groundwater Flow Direction

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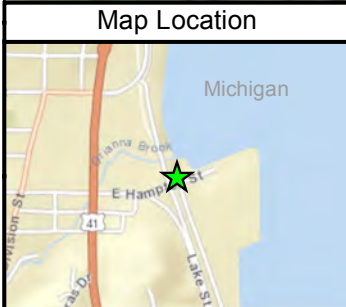
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Groundwater Surface Contour Map, Event #2, July 24, 2017

Figure 4



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

- Monitoring Well With Measured Groundwater Elevation
- Piezometric Surface Contour (1-foot, August 23, 2017)
- Groundwater Flow Direction

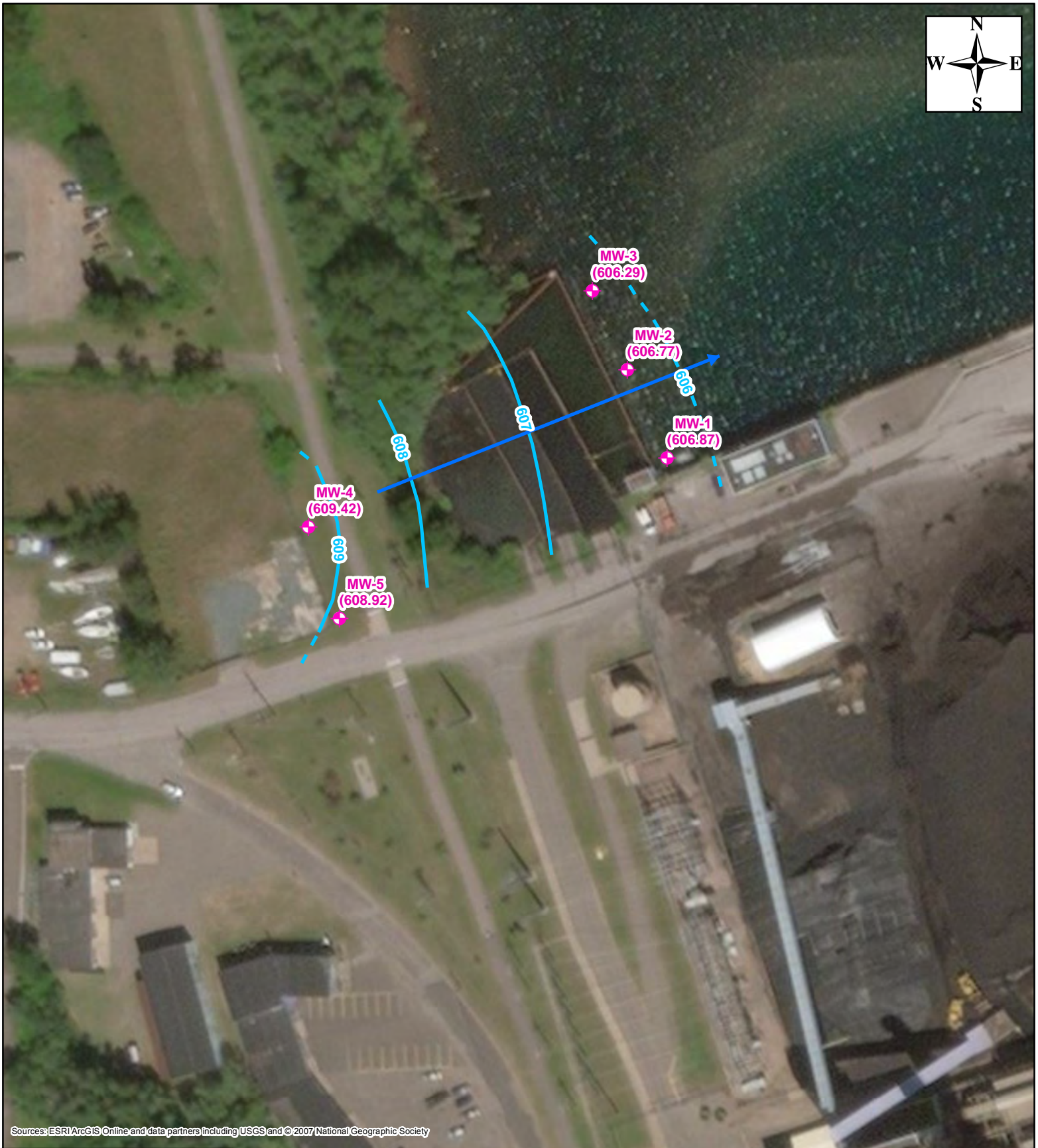
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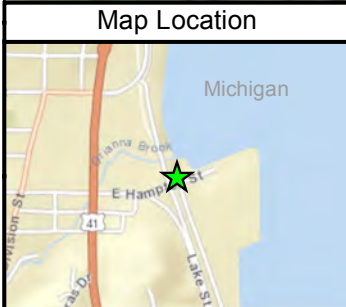
Groundwater Surface Contour Map, Event #3, August 23, 2017

AECOM

Figure 5



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

- Monitoring Well With Measured Groundwater Elevation
- Piezometric Surface Contour (1-foot, August 29, 2017)
- Groundwater Flow Direction

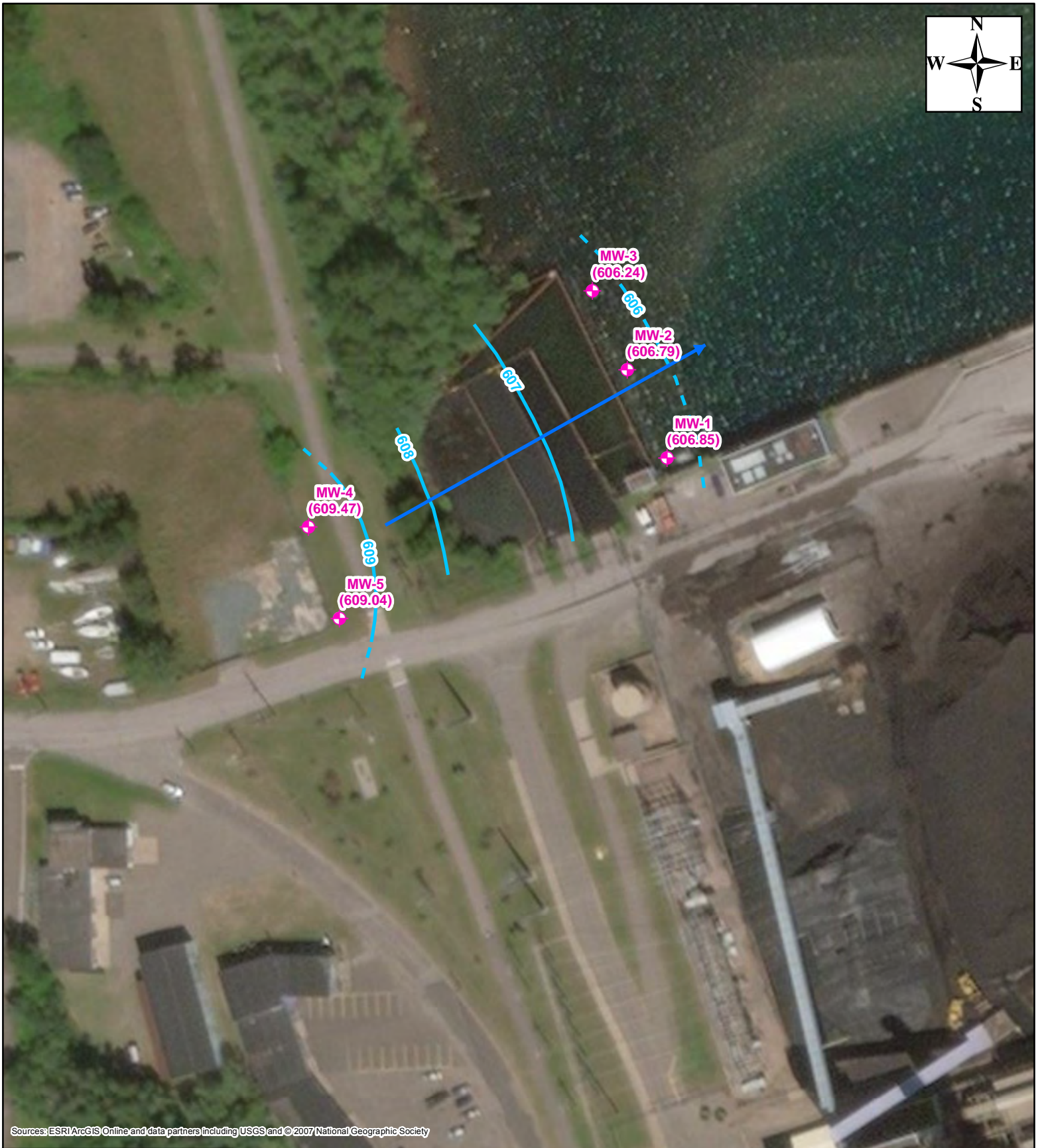
Scale: 1:1,200 0 100 200 Feet

January 2018

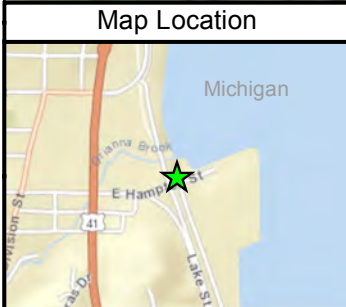
Groundwater Surface Contour Map, Event #4, August 29, 2017

AECOM

Figure 6



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

- Monitoring Well With Measured Groundwater Elevation
- Piezometric Surface Contour (1-foot, September 6, 2017)
- Groundwater Flow Direction

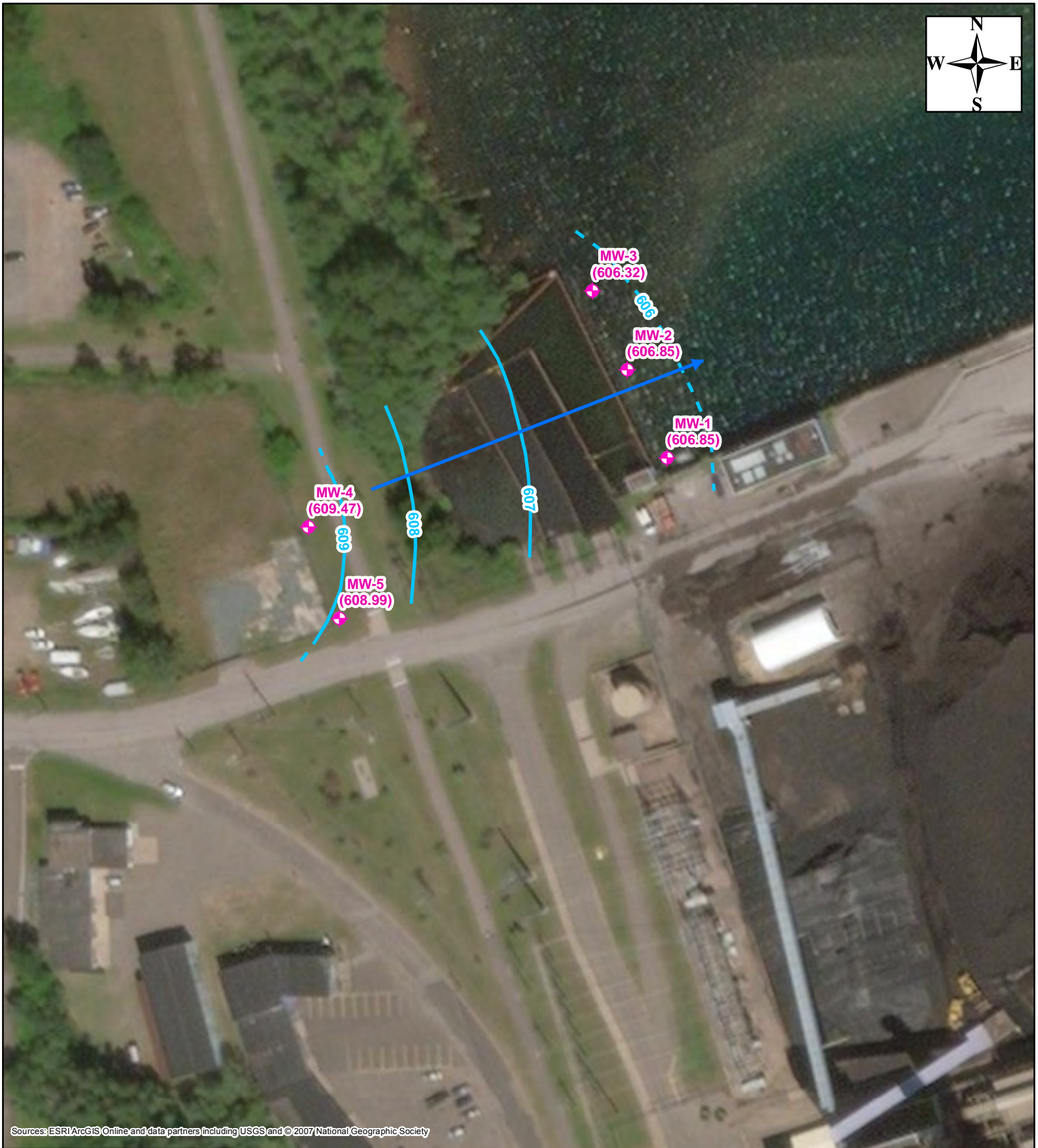
January 2018

Scale: 1:1,200 0 100 200 Feet

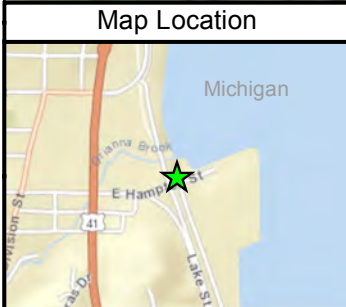
Groundwater Surface Contour Map, Event #5, September 6, 2017

AECOM

Figure 7



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

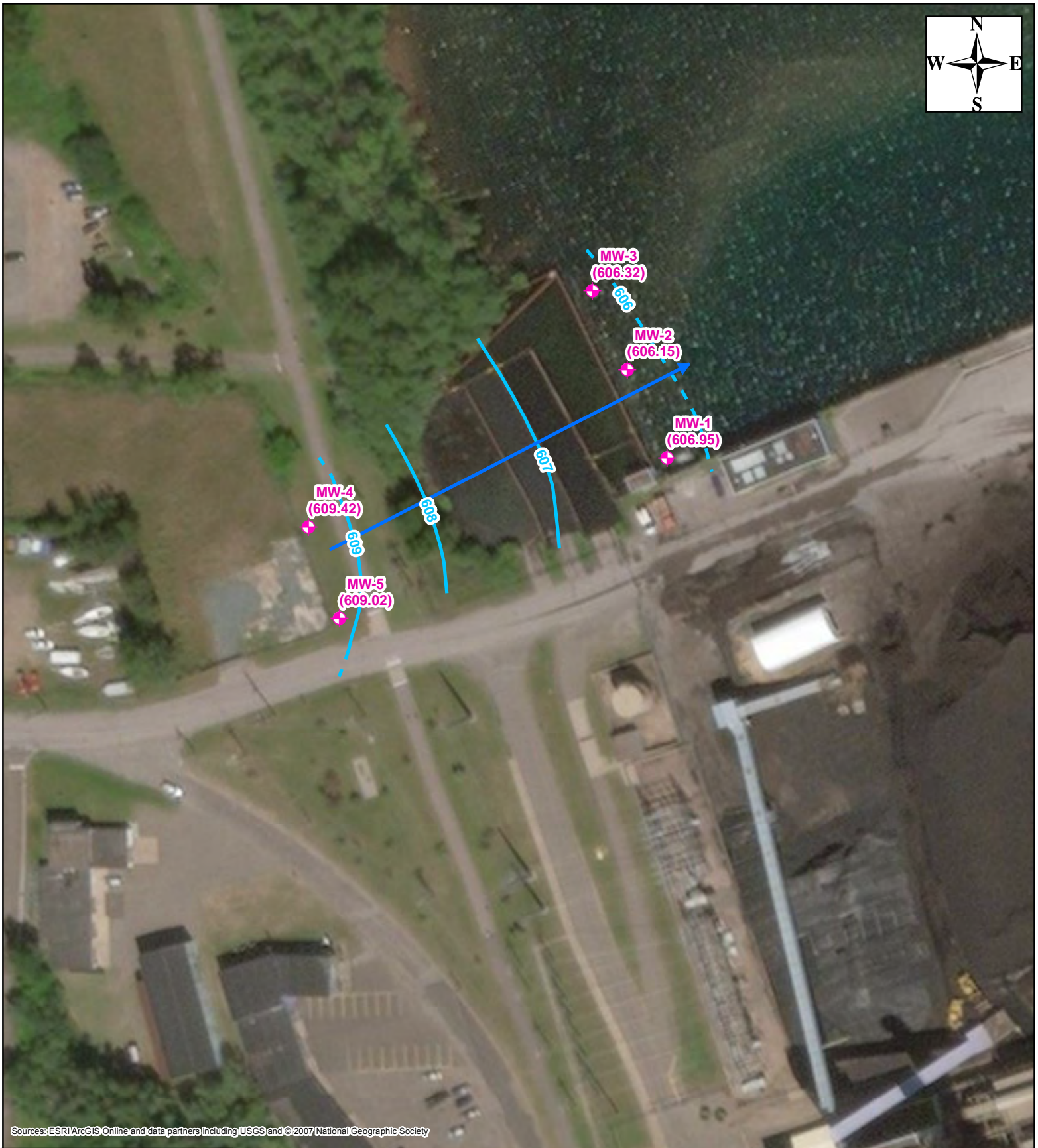
- Monitoring Well With Measured Groundwater Elevation
- Piezometric Surface Contour (1-foot, September 14, 2017)
- Groundwater Flow Direction

Scale: 1:1,200 0 100 200 Feet

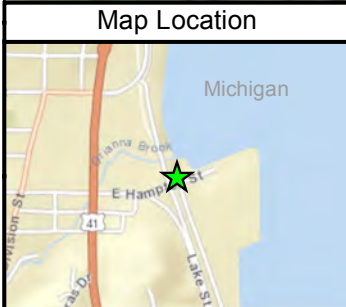
January 2018

Groundwater Surface Contour Map, Event #6, September 14, 2017

Figure 8



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

- Monitoring Well With Measured Groundwater Elevation
- Piezometric Surface Contour (1-foot, September 28, 2017)
- Groundwater Flow Direction

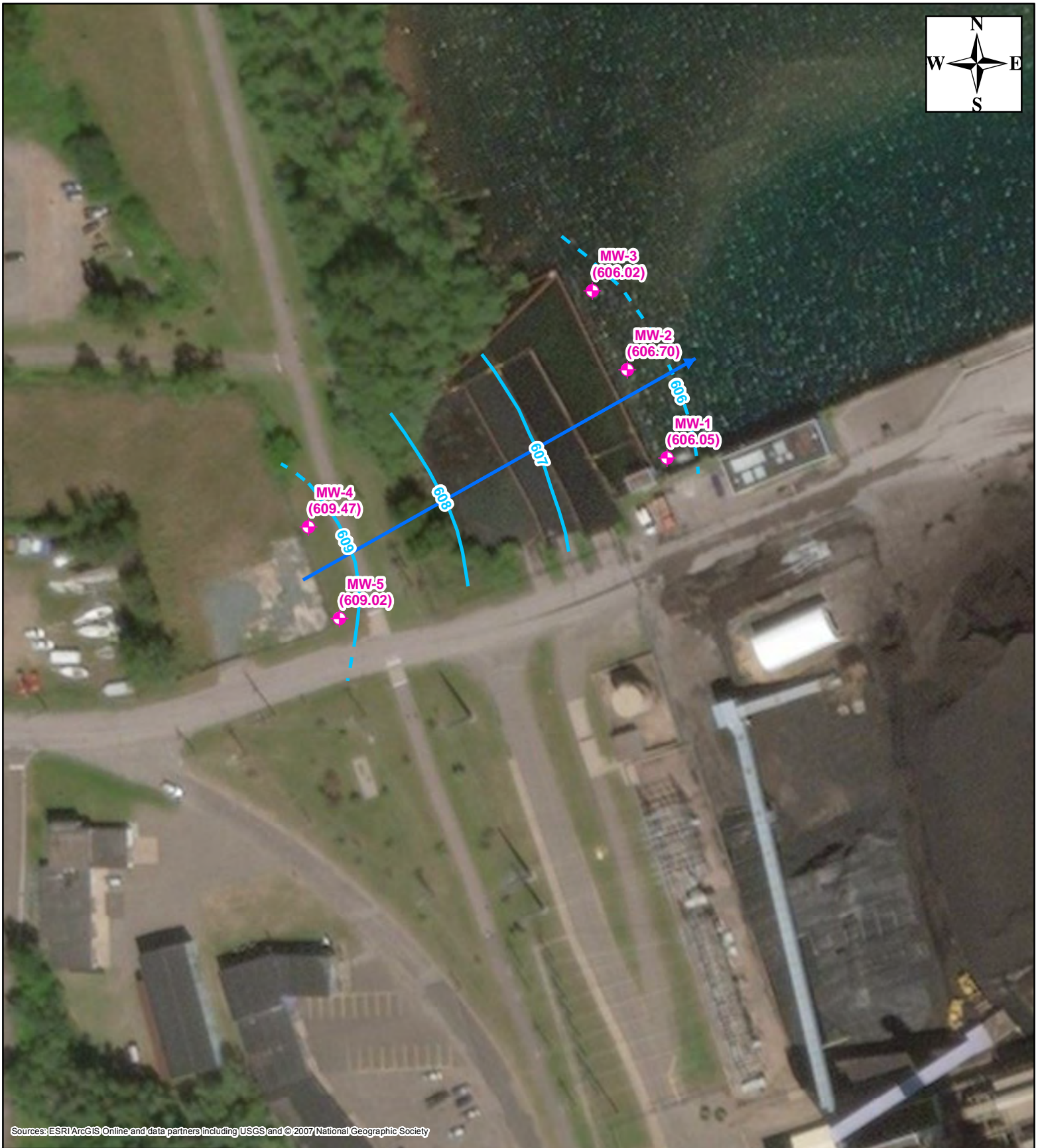
Scale: 1:1,200 0 100 200 Feet

January 2018

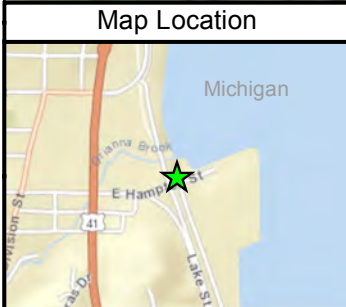
Groundwater Surface Contour Map, Event #7, September 28, 2017

AECOM

Figure 9



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Marquette Board of Light and Power – Shiras Steam Plant, Marquette, Michigan

LEGEND

- Monitoring Well With Measured Groundwater Elevation
- Piezometric Surface Contour (1-foot, October 5, 2017)
- Groundwater Flow Direction

Scale: 1:1,200 0 100 200 Feet

January 2018

Groundwater Surface Contour Map, Event #8, October 5, 2017

AECOM

Figure 10

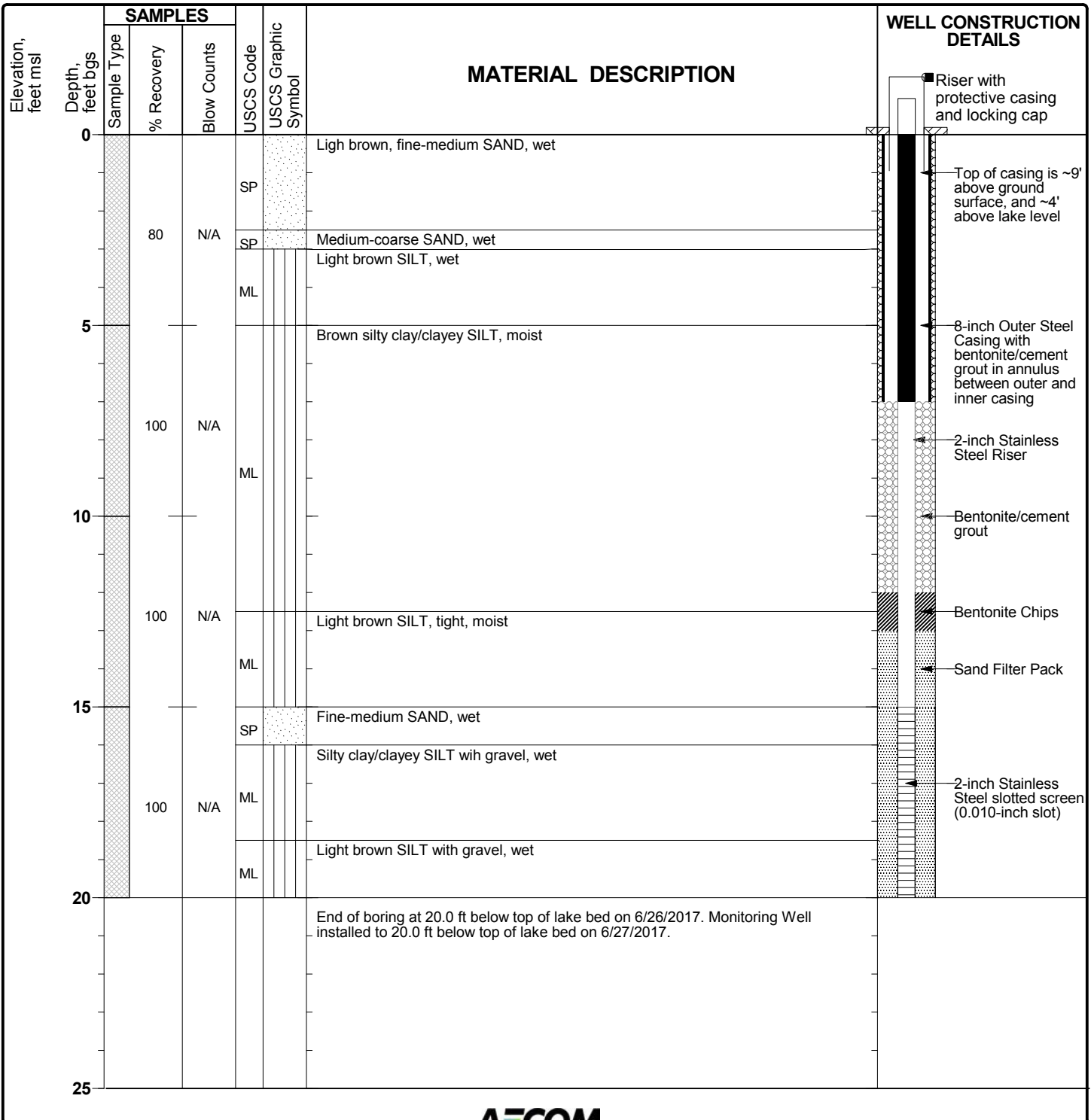
Appendices

Appendix A
Boring Logs

Client: Marquette Board of Light and Power
Project: MBLP Shiras CCR Groundwater
Project Location: Shiras Steam Plant
Project Number: 60546383

Log of MW-1
 Sheet 1 of 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 Plane)	637979.85 ft
Seal or Backfill	Grout	Easting (State Plane)	26147788.78 ft	Comments	
		Drilled with Geoprobe 7822DT, Depths measured from top of lake bed			

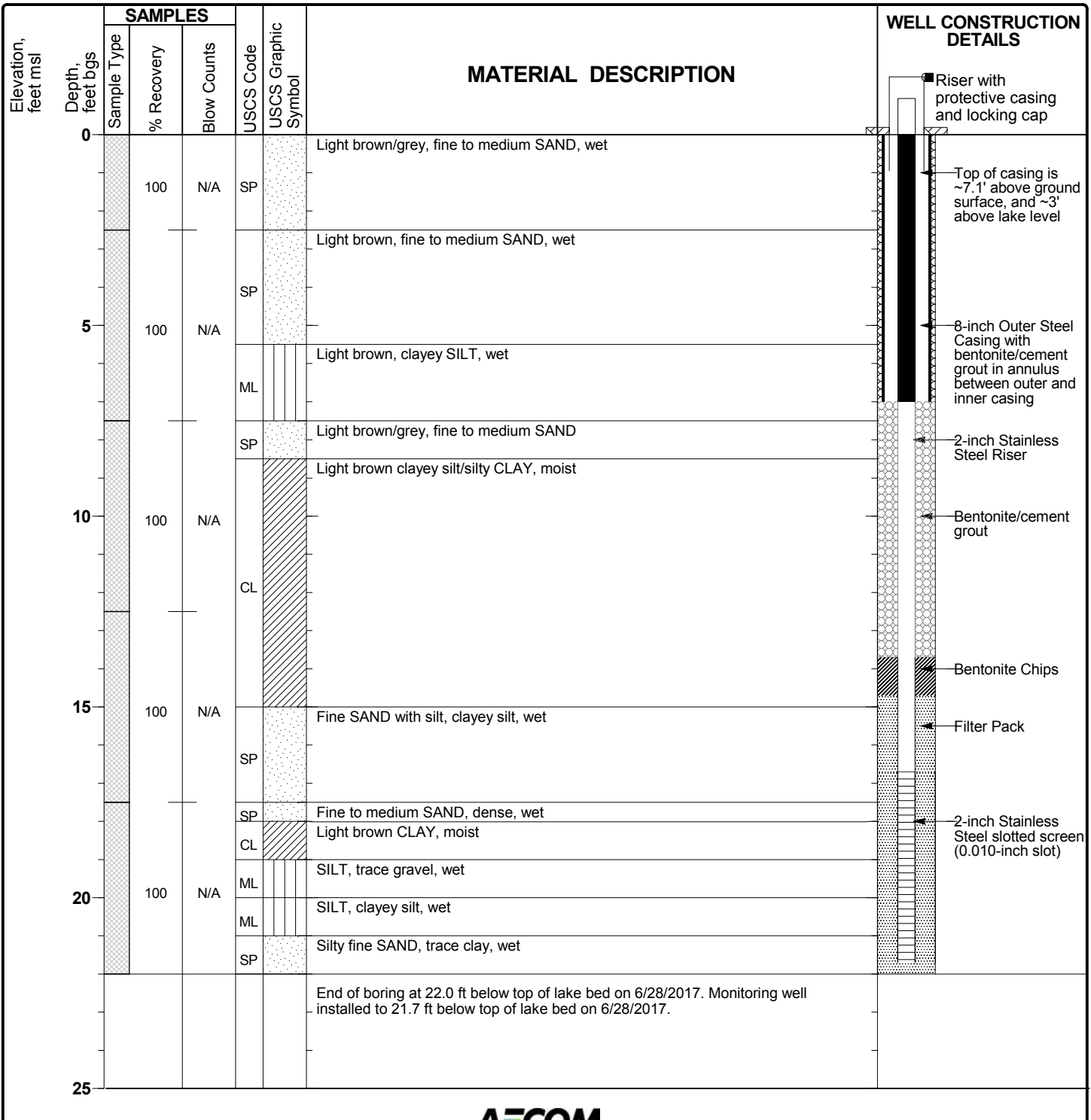


MARQUETTE MBLP CCR MBLP SHIRAS CCR.GPJ 1/10/18

Client: Marquette Board of Light and Power
Project: MBLP Shiras CCR Groundwater
Project Location: Shiras Steam Plant
Project Number: 60546383

Log of MW-2
 Sheet 1 of 1

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 Plane)	638049.08 ft
Seal or Backfill	Grout	Easting (State Plane)	26147757.22 ft	Comments	
		Drilled with Geoprobe 7822DT, Depths measured from top of lake bed			

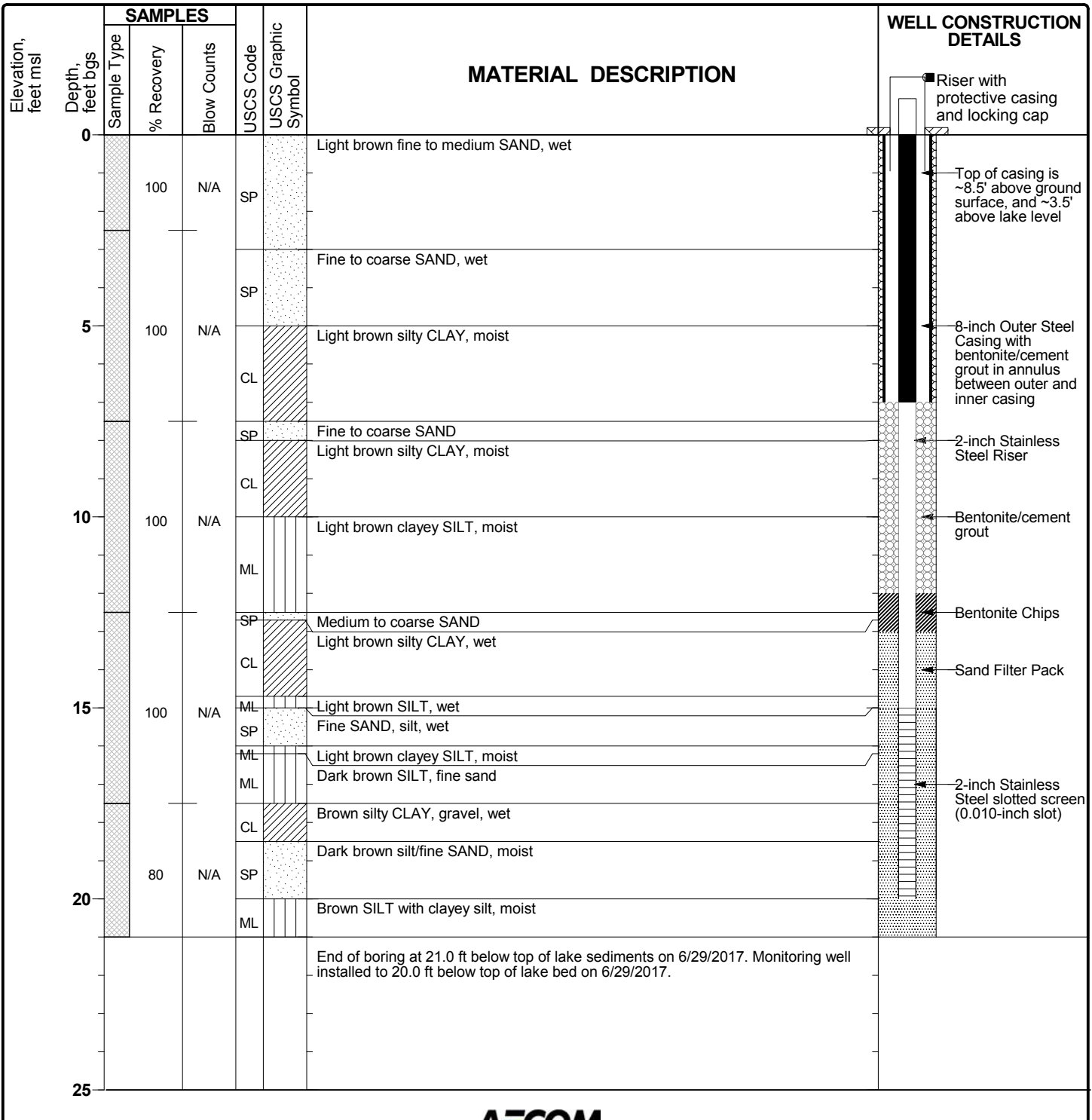


MARQUETTE MBLP CCR MBLP SHIRAS CCR.GPJ 1/10/18

Client: Marquette Board of Light and Power
Project: MBLP Shiras CCR Groundwater
Project Location: Shiras Steam Plant
Project Number: 60546383

Log of MW-3
 Sheet 1 of 1

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 Plane)	638111.37 ft
Seal or Backfill	Grout	Easting (State Plane)	26147729.99 ft	Comments: Drilled with Geoprobe 7822DT, Depths measured from top of lake bed	



MARQUETTE MBLP CCR MBLP SHIRAS CCR.GPJ 1/10/18

Client: Marquette Board of Light and Power
 Project: MBLP Shiras CCR Groundwater
 Project Location: Shiras Steam Plant
 Project Number: 60546383

Log of MW-4

Sheet 1 of 2

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 Plane)	637925.68 ft
Seal or Backfill	Grout	Comments	Drilled with Geoprobe 7822DT		

Elevation, feet msl	SAMPLES				USCS Code	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	Depth, feet bgs	Sample Type	% Recovery	Blow Counts				
0							Flush-mounted casing with locking cap	
620			50	N/A	SP	Fine to medium SAND	2 X 2 X 1 Concrete Pad Concrete	
5					SP	Black SAND, slight odor	Bentonite/cement grout	
615			50	N/A	SP	Brown, fine to medium SAND		
10					SP	Light brown, fine to medium SAND	2-inch Polyvinyl Chloride (PVC) Riser	
610			40	N/A	SP	Ligh brown, medium to coarse SAND		
15					CL	Light brown silty clay, medium to coarse SAND		
605			60	N/A	SP	Light brown, fine to medium SAND, wet		
20					SP	Tan/black, fine to medium SAND, wet, odor		
600			20	N/A	SP	Tan/black, fine to medium SAND, wet		
25								

MARQUETTE MBLP CCR MBLP SHIRAS CCR.GPJ 1/10/18

Client: Marquette Board of Light and Power
 Project: MBLP Shiras CCR Groundwater
 Project Location: Shiras Steam Plant
 Project Number: 60546383

Log of MW-4
 Sheet 2 of 2

Elevation, feet msl	SAMPLES				USCS Code	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	Depth, feet bgs	Sample Type	% Recovery	Blow Counts				
25						Light brown, fine to medium SAND		
595			100	N/A	CL	Light brown silty CLAY, moist		
					ML	Light brown SILT, moist		
					SP	Light brown, fine to medium SAND, wet		
30					SP	Tan, fine to medium SAND, wet	Bentonite/cement grout	
590			100	N/A	CL	Light brown silty CLAY, moist		
35					SP	Tan/grey, fine to medium SAND, wet	2-inch Polyvinyl Chloride (PVC) Riser	
585			100	N/A	SP		Bentonite Chips	
40					SP	Tan/grey, fine to medium SAND, wet	Sand Filter Pack	
580			100	N/A	ML	Light brown clayey SILT, wet		
45		NR		N/A		No Recovery from 45.0 - 47.0 feet bgs	2-inch Polyvinyl Chloride (PVC) slotted screen (0.010-inch slot)	
575						End of boring at 47.0 ft below top of lake sediment on 7/5/2017. Monitoring well installed to 46.6 ft below top of lake sediment on 7/6/2017.		
50								
570								

MARQUETTE MBLP CCR MBLP SHIRAS CCR.GPJ 1/10/18

Client: Marquette Board of Light and Power
 Project: MBLP Shiras CCR Groundwater
 Project Location: Shiras Steam Plant
 Project Number: 60546383

Log of MW-5

Sheet 1 of 2

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 Plane)	637853.84 ft
Seal or Backfill	Grout	Comments	Drilled with Geoprobe 7822DT		

Elevation, feet msl	SAMPLES				USCS Code	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	Depth, feet bgs	Sample Type	% Recovery	Blow Counts				
0						Fine to medium SAND, coal and brick (FILL)	Flush-mounted casing with locking cap	
620			60	N/A	SP		2 X 2 X 1 Concrete Pad	
							Concrete	
							Bentonite/cement grout	
615			100	N/A	SP	Light brown, fine to medium SAND		
					SP	Gravel, black fine to medium SAND		
					SP	Light brown, fine to medium SAND		
610			100	N/A	SP	Brown silty SAND		
						Light brown, fine to medium SAND		
605			100	N/A	SP	Light brown, fine to medium SAND, odor		
						Grey fine to medium SAND, wet, odor		
					SP	Black sand, gravel, Clay, wet		
600			100	N/A	SP	Black SAND, gravel, wet		
						Light brown, fine to medium SAND, wet		
25								

MARQUETTE MBLP CCR MBLP SHIRAS CCR.GPJ 1/10/18

Client: Marquette Board of Light and Power
 Project: MBLP Shiras CCR Groundwater
 Project Location: Shiras Steam Plant
 Project Number: 60546383

Log of MW-5

Sheet 2 of 2

Elevation, feet msl	Depth, feet bgs	SAMPLES			USCS Code	USCS Graphic Symbol	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
		Sample Type	% Recovery	Blow Counts				
25						Light brown, fine to medium SAND		
595			100	N/A	SP			
30							Bentonite/cement grout	
590			60	N/A	SP	Light brown, fine to medium SAND, wet		
					SP	Grey/black, fine to medium SAND, wet		
35					SP	Grey/black, fine to medium SAND, wet		
585			100	N/A		Light brown SILT with gravel, wet	Bentonite Chips Filter Sand	
40						No recovery from 40.0 - 45.0 feet bgs		
580			NR	N/A	ML		2-inch Polyvinyl Chloride (PVC) slotted screen (0.010-inch slot)	
45						End of boring at 45.0 ft below top of lake bed on 7/6/2017. Monitoring well installed to 44.8 ft below top of lake bed on 7/7/2017.		
575								
50								
570								

MARQUETTE MBLP CCR MBLP SHIRAS CCR.GPJ 1/10/18

Appendix B
Analytical Laboratory Reports



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project	
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies	
Work Order:	T17G390	
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: 9/1/2017

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	MS/MSD for Hg MS for Radium 226&228 Lab Dup for TDS	07/19/17	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
- ✗ Laboratory blanks and equipment blanks
- ✗ 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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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.

Analyte	Units	Sample Result	Field Duplicate 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.

Table 1 - Data Validation Summary of Qualified Data

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	B	eb
MW-5	Radium-228	pCi/L	1.51 ± 0.65	B	eb
MW-1	TDS	mg/L	700	J	ld
MW-2	TDS	mg/L	220	J	ld

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

Reason Codes	Description
eb	Equipment blank contamination
ld	Laboratory duplicate
ms	Matrix spike

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673



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,

A handwritten signature in black ink, appearing to read "Jon Mink".

Jon Mink
Senior Project Manager
Enclosures



NJDEP Accreditation No. MI008

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Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673



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

SAMPLE SUMMARY

Trace Project ID: T17G390
Client Project ID: 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

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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
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: T070773-DUP1

Analysis: SM 2540 C-11

Total Dissolved Solids Note 623 : The relative percent difference between the sample and sample duplicate is out of control. The sample result should be considered estimated.

Trace ID: T070773-DUP2

Analysis: SM 2540 C-11

Total Dissolved Solids Note 623 : The relative percent difference between the sample and sample duplicate is out of control. The sample result should be considered estimated.

Trace ID: T17G390-01

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: T17G390-02

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: T17G390-03

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: T17G390-04

Analysis: SM 4500-H+ B-11

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www.trace-labs.com

pH 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

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

Trace ID: T17G390-07

Analysis: SM 4500-H+ B-11

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

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ANALYTICAL RESULTS

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

Trace ID: T17G390-01 Date Collected: 07/19/17 12:45 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 07/21/17 10:40

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		
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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	N	

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	N	
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: T17G390
 Client Project ID: MBLP CCR 60546383

Trace ID: T17G390-01 Date Collected: 07/19/17 12:45 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 07/21/17 10:40

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 Date Collected: 07/19/17 11:55 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070738

Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
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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	N	

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	N	
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

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

Trace ID: T17G390-02 Date Collected: 07/19/17 11:55 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	220 mg/L	40	4	07/26/17	arm	07/28/17	arm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T070364

pH	8.41 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: T17G390-03 Date Collected: 07/19/17 10:55 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070738

Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
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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	N	

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	N	
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: T17G390
 Client Project ID: MBLP CCR 60546383

Trace ID: T17G390-03 Date Collected: 07/19/17 10:55 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	360 mg/L	40	4	07/26/17	arm	07/28/17	arm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T070364

pH	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

Trace ID: T17G390-04 Date Collected: 07/19/17 15:20 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070738

Mercury	<0.00020	mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
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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	N	

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	N	
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		

Analysis Method: SM 2540 C-11
 Batch: T070773

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ANALYTICAL RESULTS

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

Trace ID: T17G390-04 Date Collected: 07/19/17 15:20 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 07/21/17 10:40

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	7.92 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

Trace ID: T17G390-05 Date Collected: 07/19/17 14:10 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070738

Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
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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	N	

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	N	
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	200 mg/L	25	50	07/21/17	nm	07/24/17	nm		
Sulfate as SO4	25 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: T17G390
 Client Project ID: MBLP CCR 60546383

Trace ID: T17G390-05 Date Collected: 07/19/17 14:10 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	640 mg/L	40	4	07/26/17	arm	07/28/17	arm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T070364

pH	7.36 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: T17G390-06 Date Collected: 07/19/17 Matrix: Ground Water
 Sample ID: Dup_071917 Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070738

Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
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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	N	

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	N	
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	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

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 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	530 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: T17G390-07 Date Collected: 07/20/17 14:30 Matrix: Ground Water
 Sample ID: Equipment Blank Date Received: 07/21/17 10:40

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070738

Mercury	<0.00020 mg/L	0.00020	1	07/25/17	kbc	07/27/17	nws		
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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	N	

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	N	
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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Muskegon, MI 49444-2673



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www.trace-labs.com

ANALYTICAL RESULTS

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

Trace ID: T17G390-07 Date Collected: 07/20/17 14:30 Matrix: Ground Water
Sample ID: Equipment Blank Date Received: 07/21/17 10:40

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 <i>Batch: T070364</i>									
pH	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	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T070738-BS1

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	

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

QC Batch: T070741	Analysis Description: Calcium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	Analysis Method: EPA 6010B

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

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

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

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

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QC Batch: T070699

Analysis Description: Sulfate

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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LABORATORY CONTROL SAMPLE: T070773-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	501	471	94	80-120	

SAMPLE DUPLICATE: T070773-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: T070773-DUP2 Original: T17G390-02

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	220	196	12	10	623

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

QC Batch: T070364	Analysis Description: pH, SM 4500
QC Batch Method: *** DEFAULT PREP ***	Analysis Method: SM 4500-H+ B-11

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www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

TRACE ID NO. T17G390

Report Results To:
Client Name: Aecom
Contact Person: Tom Flaminio
Mailing Address: 1230 W. Lynn
City, State, Zip Code: Marquette MI 49855
Phone: _____ Fax: _____
Email Address: Tom.Flaminio@acem.com
Cell #: _____ Sampled by: TJR
Project Name & #: MGP CR 60546383

Bill To:
Billing Address (if different) 1
City, State, Zip Code _____
Phone: _____ PO #: _____

Request for Analytical Services

TRACE NO.	DATE TAKEN	TIME TAKEN	METALS FIELD FILTERED	CLIENT SAMPLE ID	MATRIX	NUMBER OF CONTAINERS
01	7-8-17	12:45		MU-1		X
02	7-8-17	11:55		MU-2		X
03	7-8-17	1:55		MU-3		X
04	7-8-17	1:52		MU-4		X
05	7-8-17	1:46		MU-5		X
06	7-8-17			DUP 021912		X
07	7-20-17	14:30		Equipment Blank		X

Please Sign

Item #	RELEASED BY	RECEIVED BY	DATE	TIME	Item #	RELEASED BY	RECEIVED BY	DATE	TIME
1)	<u>Tom Flaminio</u>	<u>Food Corp</u>			3)	<u>Food Corp</u>	<u>Alvin Jones</u>	7/21/17	10:40
2)					4)				

TRACE USE ONLY

Logged By: TJR Checked By: Alvin Jones

Received on Ice: Yes No Preservative Checked: Yes No N/A

Soil Volatiles Preserved: MeOH Low Level Lab Sampling Time: _____

ANALYSIS REQUESTED

Regulatory Requirements	Turnaround Requirements	Matrix Key
MERA TMDLs <input type="checkbox"/>	Standard <input type="checkbox"/>	S = Soil
Drinking Water <input type="checkbox"/>	3-4 Day (RUSH)* <input type="checkbox"/>	W = Water
NPDES <input type="checkbox"/>	24-48 Hour (RUSH)* <input type="checkbox"/>	SE = Sediment
USACE <input type="checkbox"/>	* Requires prior approval	OI = Oil
Special <input type="checkbox"/>		SO = Solid Waste
		WI = Wipes
		LW = Liquid Waste
		A = Air
		D = Drinking Water
		SL = Sludge

Barium, Calcium Chloride, Fluoride, Sulfate, TDS, Radium, 226 & 228, Metals Attached

REMARKS: PHS Attached

Possible Health Hazard

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SAMPLE LOG IN CHECKLIST

Trace ID #: 7176390 Date: 7/21/17 Package Description: Cooler Temperature: 1.4
Client Name: AECOM Time: 10:50 Logged in by: [Signature]

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 #: 77969679 10las
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
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 N/A

Cooler Temperature
Correction Factors: •Digital Stick Thermometer CF = -0.6°C
•IR Thermometer CF = -0.4°C
Representative Sample Temperature: 3.2 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
Melt Water: 1.4 °C (Use Digital Stick Thermometer)

	General			Comments
	Yes	No	NA	
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Notes: Equipment Blank

*EMD pH Test Strips Used:
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
Lot: HC563733 verified 6/21/16 AY
Lot: HC574761 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17G390 Date: 7/21/17 Package Description: Cooler Temperature: 1.6
 Client Name: AECOM Time: 10:50 Logged in by: G. Ixx

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 Yes Client custody seal # (if applicable): _____

Coolant and Temperature

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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 3.0 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: 1.6 °C (Use Digital Stick Thermometer)

	General			Comments
	Yes	No	NA	
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Notes: _____

*EMD pH Test Strips Used:
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive style with a large initial "J" and "M".

Jon Mink
Senior Project Manager

Enclosures



NJDEP Accreditation No. MI008

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CHAIN-OF-CUSTODY RECORD

Page 1 of 1

TRACE ID NO. T17G390

Report Results To:

Client Name: Aecm
 Contact Person: Tom Flaminio
 Mailing Address: 1230 Wilson
 City, State, Zip Code: Marquette MI 49855
 Phone: _____ Fax: _____
 Email Address: Tom.Flaminio@aecm.com
 Cell #: _____ Sampled by: TVP

Bill To:

Billing Address (if different): /
 City, State, Zip Code: _____
 Attn: _____ Phone: _____ PO #: _____

TRACE USE ONLY

Regulatory Requirements: MERA TMDLs Drinking Water NPDES USACE Special

Turnaround Requirements: Standard 3-4 Day (RUSH)* 24-48 Hour (RUSH)* * Requires prior approval

Matrix Key: S = Soil, W = Water, SE = Sediment, OI = Oil, SO = Solid Waste

WI = Wipes, LW = Liquid Waste, A = Air, D = Drinking Water, SL = Sludge

Logged By: [Signature] Checked By: [Signature]
 Received on ice: Yes No Preservative Checked: Yes No
 Soil Volatiles Preserved: MeOH Low Level Lab Sampling Time: _____

Request for Analytical Services				METALS FIELD FILTERED		CLIENT SAMPLE ID		MATRIX		NUMBER OF CONTAINERS	
TRACE NO.	DATE TAKEN	TIME TAKEN									
01	2-18-17	1245		MW-1							
02		1155		MW-2							
03		1355		MW-3							
04		1520		MW-4							
05		1416		MW-5							
06	2-19-17			DUP 021917							
07	2-20-17	1430		Equipment Blank							

Please Sign

Item #	RELEASED BY	RECEIVED BY	DATE	TIME	Item #	RELEASED BY	RECEIVED BY	DATE	TIME
1)	<u>[Signature]</u>	<u>[Signature]</u>			3)	<u>[Signature]</u>	<u>[Signature]</u>	7/21/17	1040
2)					4)				

ANALYSIS REQUESTED

Barium, Calcium Chloride, Fluoride, Sulfate, TDS, Radium, 226 & 228, Metals Attached

REMARKS: PHS Attached

Possible Health Hazard

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SAMPLE LOG IN CHECKLIST

Trace ID #: 716390 Date: 7/21/17 Package Description: Cooler Temperature: 1.4
 Client Name: AECOM Time: 10:50 Logged in by: [Signature]

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 #: 77969679 10las

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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 3.2 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: 1.4 °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Notes: Equipment Blank

*EMD pH Test Strips Used:
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17G390 Date: 7/21/17 Package Description: Cooler Temperature: 1.6
 Client Name: AECOM Time: 10:50 Logged in by: G. Wex

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 Yes Client custody seal # (if applicable): _____

Coolant and Temperature

<p>Type of Coolant Used</p> <p>Slurry w/ crushed, cubed, or chip ice? <input checked="" type="checkbox"/></p> <p>Multiple bags of ice around samples? <input type="checkbox"/></p> <p>Ice Packs/ Blue Ice : <input type="checkbox"/></p> <p>No Coolant Present: <input type="checkbox"/></p> <p>Ice still present upon receipt (circle one): <input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A</p>	<p>Cooler Temperature</p> <p><u>Correction Factors:</u> •Digital Stick Thermometer CF = -0.6°C •IR Thermometer CF = -0.4°C</p> <p>Representative Sample Temperature: <u>3.0</u> °C (check one below) <input checked="" type="checkbox"/> Temp Blank (Stick Thermometer) <input type="checkbox"/> Client Sample (IR Thermometer)</p> <p>Melt Water: <u>1.6</u> °C (Use Digital Stick Thermometer)</p>
--	--

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



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

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

Order No.: 17071376

Dear Jon Mink:

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,

A handwritten signature in black ink that reads 'Holly Florea'. The signature is written in a cursive style.

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



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Case Narrative

WO#: 17071376
Date: 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.

Original



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

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



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Analytical Report

(consolidated)

WO#: 17071376

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G390
Lab ID: 17071376-001
Client Sample ID T17G390-01

Collection Date: 7/19/2017 12:45:00 PM

Matrix: AQUEOUS

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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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)				E903.0	E903-904	Analyst: BRD	
Radium-226	ND	1.00		pCi/L	± 0.18	1	8/17/2017 8:34:00 AM
Yield	1.00					1	8/17/2017 8:34:00 AM
RADIUM-228 (EPA 904.0)				E904.0	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071376

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G390
Lab ID: 17071376-003
Client Sample ID T17G390-03

Collection Date: 7/19/2017 10:55:00 AM

Matrix: AQUEOUS

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		pCi/L	± 0.15	1	8/17/2017 8:34:00 AM
Yield	1.00					1	8/17/2017 8:34:00 AM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.39	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071376

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G390
Lab ID: 17071376-004
Client Sample ID T17G390-04

Collection Date: 7/19/2017 3:20:00 PM

Matrix: AQUEOUS

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		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)					E904.0	E903-904	Analyst: BRD
Radium-228	1.07	1.00		pCi/L	± 0.49	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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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)				E903.0	E903-904	Analyst: BRD	
Radium-226	ND	1.00		pCi/L	± 0.24	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	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071376

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G390
Lab ID: 17071376-006
Client Sample ID T17G390-06

Collection Date: 7/19/2017

Matrix: AQUEOUS

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		pCi/L	± 0.16	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		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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071376

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G390
Lab ID: 17071376-007
Client Sample ID T17G390-07

Collection Date: 7/20/2017 2:30:00 PM

Matrix: AQUEOUS

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		pCi/L	± 0.13	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	1.24	1.00		pCi/L	± 0.63	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



Summit Environmental Technologies, Inc.
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QC SUMMARY REPORT

WO#: 17071376
 17-Aug-17

Client: Trace Analytical Laboratories, Inc.
Project: T17G390

BatchID: 28306

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						
Yield	1.00			0	0						

Sample ID	lcs-28306	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	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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original



Summit Environmental Technologies, Inc.
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QC SUMMARY REPORT

WO#: 17071376
 17-Aug-17

Client: Trace Analytical Laboratories, Inc.
Project: T17G390

BatchID: 28306

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		ND	1.00									
Yield		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	17071190-001aMS	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	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original

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

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.

SUBCONTRACT ORDER
Trace Analytical Laboratories, Inc.
T17G390

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

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, OH 44223
Phone: (330) 253-8211
Fax: (330) 253-4489

PO # 07212017AY1

Accounting Code: _____

17071376-001-001

Sample ID: T17G390-01 **Aqueous** **Sampled: 07/19/17 12:45**

Subcontracted Work 07/28/17 15:00 07/19/18 12:45

Containers Supplied:

Radium 226/228

Sample ID: T17G390-02 **Aqueous** **Sampled: 07/19/17 11:55**

Subcontracted Work 07/28/17 15:00 07/19/18 11:55

Containers Supplied:

Radium 226/228

Sample ID: T17G390-03 **Aqueous** **Sampled: 07/19/17 10:55**

Subcontracted Work 07/28/17 15:00 07/19/18 10:55

Containers Supplied:

Radium 226/228

Sample ID: T17G390-04 **Aqueous** **Sampled: 07/19/17 15:20**

Subcontracted Work 07/28/17 15:00 07/19/18 15:20

Containers Supplied:

Radium 226/228

Sample ID: T17G390-05 **Aqueous** **Sampled: 07/19/17 14:10**

Subcontracted Work 07/28/17 15:00 07/19/18 14:10

Containers Supplied:

Radium 226/228

Sample ID: T17G390-06 **Aqueous** **Sampled: 07/19/17 00:00**

Subcontracted Work 07/28/17 15:00 07/19/18 00:00

Containers Supplied:

Radium 226/228

Released By 

Date 7-24-17

Received By SU Campion

Date 7-25-17

Released By _____ Date _____ Received By _____ Date _____

SUBCONTRACT ORDER
Trace Analytical Laboratories, Inc.
T17G390

Sample ID: T17G390-07 Aqueous Sampled: 07/20/17 14:30
Subcontracted Work 07/28/17 15:00 07/20/18 14:30
Containers Supplied:

Radium 226/228

-160-
1500-252110R

Released By _____ Date _____ Received By SN Carphue Date _____
Released By _____ Date _____ Received By _____ Date _____

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

Figure 1 – Summit Environmental Technologies, Inc.
 Cooler Receipt Form, Page 1

Client: Trace Initials of person inspecting cooler and samples: Sc
 Order Number: 17071576

Date Received: 7-25-17 Time Received: 1025 Date cooler(s) opened and samples inspected: 7-25-17
 Number of Coolers/Boxes: 1 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: N N/A

Custody Seals intact Y N N/A

C-O-C in plastic N N/A

Ice Blue Ice present absent melted N/A

Cooler Temperature IR Gun #19020459 CF 0.0°C Temp: 16.7°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

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 Y N N/A

Samples received within holding time N N/A

Do any 40 mL vials contain bubbles** Y N N/A

**Samples with bubbles 55mm are acceptable. Indicate bubble size if >5mm. _____

Was client contacted about samples Y N

Will client send new samples Y N

Client contact: _____

Date/Time: _____

Logged in by: _____

Comments: _____

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	MPD	2		20	
2	↓	2		18	
3		2		21	
4		2		26	
5		2		24	
6		2		20	
7		2		24	

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



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
- ✗ 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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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	Units	Sample Result	Field Duplicate Result	RPD	RPD Limit
MW-4/Dup 72117:					
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	Definition
J	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,

A handwritten signature in black ink, appearing to read "Jon Mink".

Jon Mink
Senior Project Manager
Enclosures



NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: T17G439
Client Project ID: 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
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: T070841-MSD2

Analysis: EPA 6010B

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.
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Trace ID: T17G439-01

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: T17G439-02

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: T17G439-03

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: T17G439-04

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: T17G439-05

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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: T17G439-06

Analysis: SM 4500-H+ B-11

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

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ANALYTICAL RESULTS

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

Trace ID: T17G439-01 Date Collected: 07/24/17 07:50 Matrix: Water
 Sample ID: MW-5 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070834

Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
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METALS, TOTAL

Analysis Method: 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	N	

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	N	
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

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ANALYTICAL RESULTS

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

Trace ID: T17G439-01 Date Collected: 07/24/17 07:50 Matrix: Water
 Sample ID: MW-5 Date Received: 07/25/17 13:10

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									
pH	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: T17G439-02 Date Collected: 07/24/17 09:00 Matrix: Water
 Sample ID: MW-4 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070834

Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
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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	N	

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	N	
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	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 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: T17G439-02 Date Collected: 07/24/17 09:00 Matrix: Water
 Sample ID: MW-4 Date Received: 07/25/17 13:10

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									
pH	7.86 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: T17G439-03 Date Collected: 07/24/17 11:30 Matrix: Water
 Sample ID: MW-1 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070834

Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
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METALS, TOTAL

Analysis Method: EPA 6010B
 Batch: T070841

Barium	0.15 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	110 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	N	

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	N	
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	20 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 ID: T17G439
 Client Project ID: MBLP CCR 60546383

Trace ID: T17G439-03 Date Collected: 07/24/17 11:30 Matrix: Water
 Sample ID: MW-1 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	800	mg/L	40	4	07/28/17	kj	07/28/17	kj		
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Analysis Method: SM 4500-H+ B-11
 Batch: T070364

pH	7.45	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: T17G439-04 Date Collected: 07/24/17 12:30 Matrix: Water
 Sample ID: MW-2 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070834

Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
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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	N	

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	N	
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

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ANALYTICAL RESULTS

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

Trace ID: T17G439-04 Date Collected: 07/24/17 12:30 Matrix: Water
 Sample ID: MW-2 Date Received: 07/25/17 13:10

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									
pH	8.09 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: T17G439-05 Date Collected: 07/24/17 13:05 Matrix: Water
 Sample ID: MW-3 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070834

Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
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METALS, TOTAL

Analysis Method: EPA 6010B
 Batch: T070841

Barium	0.23 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	69 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	N	

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	N	
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	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		

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 Date Collected: 07/24/17 13:05 Matrix: Water
 Sample ID: MW-3 Date Received: 07/25/17 13:10

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									
pH	7.86 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: T17G439-06 Date Collected: 07/24/17 14:30 Matrix: Water
 Sample ID: Equipment Blank 22417 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070834

Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
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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	N	

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	N	
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 ID: T17G439
 Client Project ID: MBLP CCR 60546383

Trace ID: T17G439-06 Date Collected: 07/24/17 14:30 Matrix: Water
 Sample ID: Equipment Blank 22417 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	<10 mg/L	10	1	07/28/17	kj	07/28/17	kj		
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Analysis Method: SM 4500-H+ B-11
 Batch: T070364

pH	7.94 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: T17G439-07 Date Collected: 07/24/17 Matrix: Water
 Sample ID: Dup 72117 Date Received: 07/25/17 13:10

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T070834

Mercury	<0.00020 mg/L	0.00020	1	07/28/17	kbc	07/31/17	nws		
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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	N	

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	N	
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

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

Trace ID:	T17G439-07	Date Collected:	07/24/17	Matrix:	Water
Sample ID:	Dup 72117	Date Received:	07/25/17 13:10		

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	710 mg/L	40	4	07/28/17	kj	07/28/17	kj		
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QUALITY CONTROL RESULTS

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

QC Batch: T070834	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T070834-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T070834-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00190	95	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T070834-MSD1

Original: T17G439-01

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	0.00185	0.00204	92	102	76-123	10	20	

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

QC Batch: T070841	Analysis Description: Barium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	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 DUPLICATE: T070841-MSD2

Original: **T17G439-01**

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

Analysis Description: Antimony, Total

QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids

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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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T070841-MSD2

Original: **T17G439-01**

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	

Trace Project ID: T17G439

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: T17G439

Client Project ID: MBLP CCR 60546383

QC Batch: T070745

QC Batch Method: IC Prep W

Analysis Description: Sulfate

Analysis Method: EPA 300.0 Rev. 2.1

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 SPIKE DUPLICATE: T070745-MSD1

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	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T070745-MSD2

Original: T17G439-01

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 Project ID: T17G439

Client Project ID: MBLP CCR 60546383

QC Batch: T070862

QC Batch Method: SM 2540 C-11

Analysis Description: Total Dissolved Solids

Analysis Method: SM 2540 C-11

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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Muskegon, MI 49444-2673



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

SAMPLE DUPLICATE: T070862-DUP1

Original: **T17G439-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	728	708	3	10	

Trace Project ID: T17G439

Client Project ID: MBLP CCR 60546383

QC Batch: T070364

Analysis Description: pH, SM 4500

QC Batch Method: *** DEFAULT PREP ***

Analysis Method: SM 4500-H+ B-11

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 ANALYTICAL LABORATORIES, INC.

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CHAIN-OF-CUSTODY RECORD

2 coolers

Page 1 of 1

Report Results To:

Bill To:

Trace Use:

Company Name: Acorn - unavette PO #: 60516383
 Report To: Tom Flaminio Contact Name: same
 Mailing Address: Tom Flaminio & Associates Billing Address (if different):
 City, State, Zip Code: _____ City, State, Zip Code: _____
 Office Phone: 906 222 4929 Cell Phone: _____ Phone Number: _____
 Email Address: _____ Billing Email Address: _____

Logged By: JS
 Checked By: GL
 Soil Volatiles Preserved (circle if applicable):
 MeOH Low Level Lab
 Sampling Time: _____

Turnaround Requirements:
 Standard 48 Hour
 4 Day 24 Hour
 3 Day * Requires Prior Approval

Matrix Key:
 S = Soil / Solid W = Water L = Liquid Waste
 A = Air SL = Sludge
 OI = Oil D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By:	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation						Analysis Requested	Remarks	Possible Health Hazards?
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other			
1	7-24	0750	MU-5	TVE												
2	7-24	0750	MU-5													
3	7-24	0900	MU-4													
4	7-24	1130	MU-1													
5	7-24	1230	MU-2													
6	7-24	1305	MU-3													
7	7-24	1430	30014 BLANK 772417													
8	7-24		DUP 72117													
Please Sign				Released By:	Received By:	Date:	Time:	Released By:	Received By:	Date:	Time:					
				<u>JS</u>	<u>GL</u>			<u>JS</u>	<u>GL</u>							

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.

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17G439 Date: 7/25/17 Package Description: Coder #1 Temperature: 0.1
 Client Name: AECOM Time: 13:10 Logged in by: JS

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 #: 7797 1970 3064

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

<p>Type of Coolant Used</p> <p>Slurry w/ crushed, cubed, or chip ice? <input checked="" type="checkbox"/></p> <p>Multiple bags of ice around samples? <input type="checkbox"/></p> <p>Ice Packs/ Blue Ice : <input type="checkbox"/></p> <p>No Coolant Present: <input type="checkbox"/></p> <p>Ice still present upon receipt (circle one): <input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A</p>	<p>Cooler Temperature</p> <p>Correction Factors: •Digital Stick Thermometer CF = -0.6°C •IR Thermometer CF = -0.4°C</p> <p>Representative Sample Temperature: <u>1.8</u> °C (check one below) <input checked="" type="checkbox"/> Temp Blank (Stick Thermometer) <input type="checkbox"/> Client Sample (IR Thermometer)</p> <p>Melt Water: <u>none</u> °C (Use Digital Stick Thermometer)</p>
--	--

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: mw-5, mw-4, Dup-1

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328

Other: _____

Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17G439 Date: 7/25/17 Package Description: Cooler #2 Temperature: -0.5
 Client Name: AECOM Time: 13:10 Logged in by: JK

Cooler Receipt

Cooler/samples delivered by: Trace courier Hand delivered Commercial courier Name of delivery person: _____
 UPS FED EX US Mail

Tracking Number: Not Applicable
 Tracking #: 7797 1170 3502

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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 1.9 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: mw-1, mw-2, mw-3, EB

*EMD pH Test Strips Used:
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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Muskegon, MI 49444-2673



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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 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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive, flowing style.

Jon Mink
Senior Project Manager

Enclosures



NJDEP Accreditation No. MI008

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TRACE

ANALYTICAL LABORATORIES, INC.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

Phone 231.773.5998
Fax 888.979.4469
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CHAIN-OF-CUSTODY RECORD

2 coolers

Page 1 of 1

Report Results To:

Bill To:

Trace Use:

Company Name: Acorn - Marquette PO #: 60546383
 Report To: Tom Flavin Contact Name: same
 Mailing Address: Tom Flavin's Cell Phone Billing Address (if different):
 City, State, Zip Code: _____ City, State, Zip Code: _____
 Office Phone: 906 225 4929 Cell Phone: _____ Phone Number: _____
 Email Address: _____ Billing Email Address: _____

Logged By: JS
 Checked By: GL
 Soil Volatiles Preserved (circle if applicable):
 MeOH Low Level Lab
 Sampling Time: _____

Turnaround Requirements:
 Standard 48 Hour
 4 Day 24 Hour
 3 Day
 * Requires Prior Approval

Matrix Key:
 S = Soil / Solid W = Water LW = Liquid Waste
 A = Air
 D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By:	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation							Analysis Requested	Remarks	Possible Health Hazards?														
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other																		
1	7-24	0750	MW-5	TVE		MW-5	4	X	X	X	X	X	X	X																	
2	7-24	0750	MW-5			MW-5	4	X	X	X	X	X	X	X																	
3	7-24	0900	MW-4			MW-4	4	X	X	X	X	X	X	X																	
4	7-24	1130	MW-1			MW-1	4	X	X	X	X	X	X	X																	
5	7-24	1230	MW-2			MW-2	4	X	X	X	X	X	X	X																	
6	7-24	1305	MW-3			MW-3	4	X	X	X	X	X	X	X																	
7	7-24	1430	SOUP BLANK 72417				4	X	X	X	X	X	X	X																	
8	7-24	1511	DUP 72417				4	X	X	X	X	X	X	X																	
<p>Please Sign</p> <table border="1"> <thead> <tr> <th>Released By</th> <th>Received By</th> <th>Date</th> <th>Time</th> <th>Released By</th> <th>Received By</th> <th>Date</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td><u>[Signature]</u></td> <td><u>[Signature]</u></td> <td></td> <td></td> <td><u>[Signature]</u></td> <td><u>[Signature]</u></td> <td>7/24</td> <td>13:10</td> </tr> </tbody> </table>																Released By	Received By	Date	Time	Released By	Received By	Date	Time	<u>[Signature]</u>	<u>[Signature]</u>			<u>[Signature]</u>	<u>[Signature]</u>	7/24	13:10
Released By	Received By	Date	Time	Released By	Received By	Date	Time																								
<u>[Signature]</u>	<u>[Signature]</u>			<u>[Signature]</u>	<u>[Signature]</u>	7/24	13:10																								

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.

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17G439 Date: 7/25/17 Package Description: Coder #1 Temperature: 0.1
 Client Name: AECOM Time: 13:10 Logged in by: JS

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 #: 7797 1970 3064
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 1.8 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

	General			Comments
	Yes	No	NA	
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: mw-5, mw-4, Dup-1

*EMD pH Test Strips Used:
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17G439 Date: 7/25/17 Package Description: Cooler #2 Temperature: -0.5
 Client Name: AECOM Time: 13:10 Logged in by: JE

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 #: 7197 1170 3502
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 1.9 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

	General			Comments
	Yes	No	NA	
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: mw-1, mw-2, mw-3, EB

*EMD pH Test Strips Used:
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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

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

Order No.: 17071537

Dear Jon Mink:

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,

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: <http://www.settek.com>

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.

Original



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

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.



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

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



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Analytical Report

(consolidated)

WO#: 17071537

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G439
Lab ID: 17071537-001
Client Sample ID T17G439-01

Collection Date: 7/24/2017 7:50:00 AM

Matrix: WATER

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	± 0.17	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071537

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G439
Lab ID: 17071537-002
Client Sample ID T17G439-02

Collection Date: 7/24/2017 9:00:00 AM

Matrix: WATER

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	± 0.11	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071537

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc. **Collection Date:** 7/24/2017 11:30:00 AM
Project: T17G439
Lab ID: 17071537-003 **Matrix:** WATER
Client Sample ID T17G439-03

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	± 0.11	1	8/17/2017 10:13:00 AM
Yield	1.00					1	8/17/2017 10:13:00 AM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	1.43	1.00		pCi/L	± 0.69	1	8/16/2017 5:08:00 PM
Yield	1.00					1	8/16/2017 5:08:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071537

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G439
Lab ID: 17071537-004
Client Sample ID T17G439-04

Collection Date: 7/24/2017 12:30:00 PM

Matrix: WATER

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17071537**

Date Reported: **8/17/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G439
Lab ID: 17071537-005
Client Sample ID T17G439-05

Collection Date: 7/24/2017 1:05:00 PM

Matrix: WATER

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17071537

Date Reported: 8/17/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G439
Lab ID: 17071537-006
Client Sample ID T17G439-06

Collection Date: 7/24/2017 2:30:00 PM

Matrix: WATER

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17071537**

Date Reported: **8/17/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17G439
Lab ID: 17071537-007
Client Sample ID T17G439-07

Collection Date: 7/24/2017

Matrix: WATER

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 AM
Yield	1.00					1	8/17/2017 10:14:00 AM
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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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QC SUMMARY REPORT

WO#: 17071537
 17-Aug-17

Client: Trace Analytical Laboratories, Inc.
Project: T17G439

BatchID: 28306

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	lcs-28306	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	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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original



Summit Environmental Technologies, Inc.
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 Website: <http://www.settek.com>

QC SUMMARY REPORT

WO#: 17071537
 17-Aug-17

Client: Trace Analytical Laboratories, Inc.
Project: T17G439

BatchID: 28306

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		ND	1.00									U
Yield		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	17071190-001aMS	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	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original

SUBCONTRACT ORDER
Trace Analytical Laboratories, Inc.
T17G439

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

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc.
3310 Wm Street
Cuyahoga Falls, OH 44223
Phone: (330) 253-8211
Fax: (330) 253-4489

PO # _____

17071537-001
DBE
CSL

Accounting Code: _____

Sample ID: T17G439-01 **Aqueous** **Sampled: 07/24/17 07:50**
Subcontracted Work 08/01/17 15:00 07/24/18 07:50 Radium 226/228

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

Sample ID: T17G439-02 **Aqueous** **Sampled: 07/24/17 09:00**
Subcontracted Work 08/01/17 15:00 07/24/18 09:00 Radium 226/228

Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17G439-03 **Aqueous** **Sampled: 07/24/17 11:30**
Subcontracted Work 08/01/17 15:00 07/24/18 11:30 Radium 226/228

Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17G439-04 **Aqueous** **Sampled: 07/24/17 12:30**
Subcontracted Work 08/01/17 15:00 07/24/18 12:30 Radium 226/228

Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17G439-05 **Aqueous** **Sampled: 07/24/17 13:05**
Subcontracted Work 08/01/17 15:00 07/24/18 13:05 Radium 226/228

Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17G439-06 **Aqueous** **Sampled: 07/24/17 14:30**
Subcontracted Work 08/01/17 15:00 07/24/18 14:30 Radium 226/228

Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Released By: *Tracy* Date: *7/27/17* Received By: *CSL* Date: *10/8/17*

SUBCONTRACT ORDER
Trace Analytical Laboratories, Inc.
T17G439

Sample ID: T17G439-07 Aqueous Sampled: 07/24/17 00:00
Subcontracted Work 08/01/17 15:00 07/24/18 00:00 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO

Handwritten: 140-7321600
K23

Released By: *Trace Analytical* Date: 7/24/17 @ 16:13 Received By: Date: Received By: Date:

Released By: _____ Date: _____ Received By: _____ Date: _____ Received By: _____ Date: _____
Page 2 of 2

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

Figure 1 – Summit Environmental Technologies, Inc.
 Cooler Receipt Form, Page 1

Client: Tau Initials of person inspecting cooler and samples: CSL
 Date Received: 7/27 Time Received: 10:30 Date cooler(s) opened and samples inspected: 7/27
 Number of Coolers/Boxes: N/A Order Number: 1701537

Shipper: Fed Ex DHL Airborne US Postal Walk-in Pickup Other: _____

Packaging: Peanut Bubble Wrap Paper Foam None Other: _____

Tape on cooler/box: N N/A

Custody Seals Intact Y N N/A

C-O-C in plastic N N/A

Ice: Blue ice present absent melted N/A

Cooler Temperature IR Gun #169204589 CF 22.0 Temp: 14.0 °C N/A

Radiological Testing Instrument serial #35127 N N/A (see page 2 for scan results)

Use 1 ensc 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
 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 N/A
 **Samples with bubbles 50mm are acceptable. Indicate bubble size if > 50mm: _____
 Was client contacted about samples Y N
 Will client send new samples Y N
 Client contact: _____
 Date/Time: _____
 Logged in by: _____
 Comments: _____

16-01-720

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	726/725	2		1619	21
2		2		17	
3		2		18	
4		2		17	
5		2		19	
6		2		24	
7		2		24	

P = Permanganate Interference
 504, 1, 508, 515, 1, 525, 2, 547, 548, 1, 549, 1, 531, 2, 1613 methods checked for Total Chlorine
 552, 2 checked for Free Chlorine
 531, 2 pH is checked for -3.8 (SET# OES-01-0149)
 524, 2 = pH and Chlorine checked by lab analyst



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project	
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies	
Work Order:	T17H507	
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 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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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.

Analyte	Units	Sample Result	Field Duplicate 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.

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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,

A handwritten signature in black ink, appearing to read "Jon Mink".

Jon Mink
Senior Project Manager
Enclosures



NJDEP Accreditation No. MI008

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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

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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
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: T17H507-01

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: T17H507-02

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: T17H507-03

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: T17H507-04

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: T17H507-05

Analysis: SM 4500-H+ B-11

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

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ANALYTICAL RESULTS

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

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	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071505

Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws		
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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	N	

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	N	
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

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	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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ANALYTICAL RESULTS

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

Trace ID: T17H507-02 Date Collected: 08/23/17 10:15 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 08/24/17 09:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071505

Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws		
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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	51 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	N	

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	0.24 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	N	
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	62 mg/L	10	25	08/24/17	jek	08/26/17	jek		
Sulfate as SO4	26 mg/L	5.0	25	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: T17H507-02 Date Collected: 08/23/17 10:15 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 08/24/17 09:34

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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ANALYTICAL RESULTS

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

Trace ID: T17H507-03 Date Collected: 08/23/17 11:05 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 08/24/17 09:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071505

Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws		
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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	75 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	N	

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	N	
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	95 mg/L	10	100	08/24/17	jek	08/26/17	jek		
Sulfate as SO4	44 mg/L	20	100	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: T17H507-03 Date Collected: 08/23/17 11:05 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 08/24/17 09:34

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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ANALYTICAL RESULTS

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

Trace ID: T17H507-04 Date Collected: 08/23/17 13:40 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 08/24/17 09:34

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071505

Mercury	<0.00020	mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws		
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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	N	

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	N	
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	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

Trace ID: T17H507-04 Date Collected: 08/23/17 13:40 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 08/24/17 09:34

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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ANALYTICAL RESULTS

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

Trace ID: T17H507-05 Date Collected: 08/23/17 14:55 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 08/24/17 09:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071505

Mercury	<0.00020 mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws		
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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	N	

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	N	
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 Date Collected: 08/23/17 14:55 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 08/24/17 09:34

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 Project ID: T17H507
 Client Project ID: MBLP CCR Investigation

Trace ID: T17H507-06 Date Collected: 08/23/17 Matrix: Ground Water
 Sample ID: Dup_082317 Date Received: 08/24/17 09:34

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071505

Mercury	<0.00020	mg/L	0.00020	1	08/29/17	kbc	08/29/17	nws		
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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	N	

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	N	
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	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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 www.trace-labs.com

ANALYTICAL RESULTS

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

Trace ID: T17H507-06 Date Collected: 08/23/17 Matrix: Ground Water
 Sample ID: Dup_082317 Date Received: 08/24/17 09:34

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	620	mg/L	20	2	08/24/17	nm	08/25/17	nm		
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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 CONTROL SAMPLE: T071505-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00204	102	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071505-MSD1

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 Investigation

QC Batch: T071450	Analysis Description: Lithium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	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 SPIKE DUPLICATE: T071450-MSD1

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

Analysis Description: Selenium, Total

QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids

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	

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071450-MSD1

Original: **T17H507-05**

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	

Trace Project ID: T17H507

Client Project ID: MBLP CCR Investigation

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	

Trace Project ID: T17H507

Client Project ID: MBLP CCR Investigation

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 SAMPLE: T071409-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
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LABORATORY CONTROL SAMPLE: T071409-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	526	506	96	80-120	

SAMPLE DUPLICATE: T071409-DUP1 Original: T17H507-05

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	830	780	6	10	

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

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

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CHAIN-OF-CUSTODY RECORD

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Page 1 of 1

Report Results To:

Bill To:

Trace Use:

Company Name: Arcem PO #: 6054 6054/6383
 Report To: Tom Plawins Contact Name: Same
 Mailing Address: 1230 Wilson Billing Address (if different):
 City, State, Zip Code: Wolverine MI 49855 City, State, Zip Code:
 Office Phone: 906-226-1879 Cell Phone: Billing Email Address:
 Email Address: Tom.Plawins@arcem.com

Logged By: ES
 Checked By: AT
 Soil Volatiles Preserved (circle if applicable):
 MeOH Low Level Lab
 Sampling Time:

Turnaround Requirements:
 Standard 48 Hour
 4 Day 24 Hour
 3 Day*
 * Requires Prior Approval

Matrix Key:
 S = Soil / Solid W = Water LW = Liquid Waste
 SL = Sludge A = Air
 O = Oil D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By:	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation						Analysis Requested	Remarks	Possible Health Hazards?		
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other					
1	8-23	0835	MLW-1	TUF	NW	Y	4											
2	10/15		MLW-2															
3	11/05		MLW-3															
4	12/46		MLW-5															
5	1/45		MLW-4															
5	1/45		MLW-4															
6			DUP-082317															

Please Sign

Released By: <u>Tom Plawins</u>	Received By: <u>ES</u>	Date: _____	Time: _____	Released By: <u>ES</u>	Received By: <u>AT</u>	Date: <u>8/24/17</u>	Time: <u>9:34</u>
---------------------------------	------------------------	-------------	-------------	------------------------	------------------------	----------------------	-------------------

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SAMPLE LOG IN CHECKLIST

#2

Trace ID #: T17H507 Date: 8-24-17 Package Description: Cooler Temperature: 0.9
 Client Name: AECOM Time: 9:34 Logged in by: GH

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 #: 787488429158
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 3.0 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

Trace ID #: TF7 H507 Date: 8-24-17 Package Description: COOLER Temperature: -0.8
 Client Name: AECOM Time: 7:34 Logged in by: GAJ

Cooler Receipt

Cooler/samples delivered by: Trace courier Hand delivered Commercial courier Name of delivery person: _____
 UPS FED EX US Mail
 Tracking Number: Not Applicable Tracking #: 787488403309
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 26 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: None °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive style with a large initial "J" and "M".

Jon Mink
Senior Project Manager

Enclosures



NJDEP Accreditation No. MI008

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Trace ID No.
T1H507

CHAIN-OF-CUSTODY RECORD

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Report Results To:

Bill To:

Trace Use:

Company Name:	Aecom	PO #:	6054 6054/6383
Report To:	Tom Flavinis	Contact Name:	Same
Mailing Address:	1230 Wilson	Billing Address (if different):	
City, State, Zip Code:	Muskegon MI 49855	City, State, Zip Code:	
Office Phone:	906-226-1879	Cell Phone:	
Email Address:	Tom.Flavinis@aecom.com	Phone Number:	
		Billing Email Address:	

Logged By:	JS
Checked By:	AK
Soil Volatiles Preserved (circle if applicable):	
MeOH	Low Level
Lab	
Sampling Time:	

Turnaround Requirements:

Standard 48 Hour*
 4 Day* 24 Hour*
 3 Day*

* Requires Prior Approval

Matrix Key:

S = Soil / Solid W = Wipes
 W = Water LW = Liquid Waste
 SL = Sludge A = Air
 OI = Oil D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By:	Metals Field Filtered (Y / N)	Matrix	Number of Containers	Preservation							Analysis Requested	Remarks	Possible Health Hazards?
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other				
1	8/23	0935	MW-1	TUF			1										
2	10/5		MW-2				1										
3	10/5		MW-3				1										
4	10/5		MW-5				1										
5	10/5		MW-4				1										
5	10/5		MW-4				1										
6			DUP-082317				1										

Please Sign

Released By	Received By	Date	Time	Released By	Date	Time
1) Tom Flavinis	Field			2) Field	8/24/17	9:39
3)				4)		

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SAMPLE LOG IN CHECKLIST

#1

Trace ID #: T17H507 Date: 8-24-17 Package Description: Cooler Temperature: 0.9
 Client Name: AECom Time: 9:34 Logged in by: CF

Cooler Receipt

Cooler/samples delivered by: Trace courier Hand delivered Commercial courier Name of delivery person: _____
 UPS FED EX US Mail
 Tracking Number: Not Applicable Tracking #: 787488429158
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 3.0 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

CERTIFICATE OF ANALYSIS

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SAMPLE LOG IN CHECKLIST

Trace ID #: TF7 H507 Date: 8-24-17 Package Description: COOLER Temperature: -0.8
 Client Name: AECOM Time: 7:34 Logged in by: GH

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 #: 787488403309
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 26 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: None °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328

Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

CERTIFICATE OF ANALYSIS

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

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,

A handwritten signature in black ink that reads "Holly Florea". The signature is written in a cursive, flowing style.

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



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Case Narrative

WO#: 17081538
Date: 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 groundwater.



Summit Environmental Technologies, Inc.
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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



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Analytical Report

(consolidated)

WO#: **17081538**

Date Reported: **9/26/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17H507
Lab ID: 17081538-001
Client Sample ID T17H507-01

Collection Date: 8/23/2017 9:35:00 AM

Matrix: GROUNDWATER

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	± 0.45	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17081538**

Date Reported: **9/26/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17H507
Lab ID: 17081538-002
Client Sample ID T17H507-02

Collection Date: 8/23/2017 10:15:00 AM

Matrix: GROUNDWATER

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	± 0.16	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17081538**

Date Reported: **9/26/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17H507
Lab ID: 17081538-003
Client Sample ID T17H507-03

Collection Date: 8/23/2017 11:05:00 AM

Matrix: GROUNDWATER

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	± 0.14	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17081538**

Date Reported: **9/26/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17H507
Lab ID: 17081538-004
Client Sample ID T17H507-04

Collection Date: 8/23/2017 1:40:00 PM

Matrix: GROUNDWATER

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	± 0.26	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17081538**

Date Reported: **9/26/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17H507
Lab ID: 17081538-005
Client Sample ID T17H507-05

Collection Date: 8/23/2017 2:55:00 PM

Matrix: GROUNDWATER

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	± 0.12	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17081538**

Date Reported: **9/26/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17H507
Lab ID: 17081538-006
Client Sample ID T17H507-06

Collection Date: 8/23/2017

Matrix: GROUNDWATER

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	± 0.38	1	9/14/2017 10:41:00 AM
Yield	1.00					1	9/14/2017 10:41:00 AM
RADIUM-228 (904.0)					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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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QC SUMMARY REPORT

WO#: 17081538
 27-Sep-17

Client: Trace Analytical Laboratories, Inc.
Project: T17H507

BatchID: 28705

Sample ID	mb-28705	SampType: MBLK	TestCode: Radium-228_ Units: pCi/L			Prep Date: 9/8/2017	RunNo: 74700					
Client ID:	PBW	Batch ID: 28705	TestNo: E904.0		E903-904	Analysis Date: 9/13/2017	SeqNo: 1260875					
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		0.830			0	0						

Sample ID	LCS-28705	SampType: LCS	TestCode: Radium-228_ Units: pCi/L			Prep Date: 9/8/2017	RunNo: 74700					
Client ID:	LCSW	Batch ID: 28705	TestNo: E904.0		E903-904	Analysis Date: 9/13/2017	SeqNo: 1260877					
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.46	1.00	5.000	0	89.2	70	130				
Yield		0.870			0	0						

Sample ID	17081417-001aMS	SampType: MS	TestCode: Radium-228_ Units: pCi/L			Prep Date: 9/8/2017	RunNo: 74700					
Client ID:	BatchQC	Batch ID: 28705	TestNo: E904.0		E903-904	Analysis Date: 9/13/2017	SeqNo: 1260880					
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		7.32	1.00	5.000	0	146	70	130				S
Yield		1.00			0.8900	0						

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Revision v1



Summit Environmental Technologies, Inc.
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QC SUMMARY REPORT

WO#: 17081538
 27-Sep-17

Client: Trace Analytical Laboratories, Inc.
Project: T17H507

BatchID: 28705

Sample ID	17081539-001adup	SampType:	DUP	TestCode:	Radium-228_	Units:	pCi/L	Prep Date:	9/8/2017	RunNo:	74700											
Client ID:	BatchQC	Batch ID:	28705	TestNo:	E904.0		E903-904	Analysis Date:	9/13/2017	SeqNo:	1260893											
Analyte		Result		PQL		SPK value		SPK Ref Val		%REC		LowLimit		HighLimit		RPD Ref Val		%RPD		RPDLimit		Qual
Radium-228		ND		1.00				0		0						0		0		20		R
Yield		0.700						0		0						0.7200		2.82				

Sample ID	17081539-002adup	SampType:	DUP	TestCode:	Radium-228_	Units:	pCi/L	Prep Date:	9/8/2017	RunNo:	74700											
Client ID:	BatchQC	Batch ID:	28705	TestNo:	E904.0		E903-904	Analysis Date:	9/13/2017	SeqNo:	1260895											
Analyte		Result		PQL		SPK value		SPK Ref Val		%REC		LowLimit		HighLimit		RPD Ref Val		%RPD		RPDLimit		Qual
Radium-228		ND		1.00				0		0						0		0		20		R
Yield		1.00						0		0						1.000		0				

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Revision v1



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QC SUMMARY REPORT

WO#: 17081538
 27-Sep-17

Client: Trace Analytical Laboratories, Inc.
Project: T17H507

BatchID: 28705

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		ND		1.00										
Yield		1.00												

Sample ID	17081417-001aMS	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	17081539-001adup	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		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



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QC SUMMARY REPORT

WO#: 17081538
 27-Sep-17

Client: Trace Analytical Laboratories, Inc.
Project: T17H507

BatchID: 28705

Sample ID	17081539-002adup	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: 1261055			
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	

Sample ID	lcs-28705	SampType: LCS	TestCode: Radium-226_ Units: pCi/L				Prep Date: 9/8/2017			RunNo: 74705		
Client ID:	LCSSW	Batch ID: 28705	TestNo: E903.0		E903-904	Analysis Date: 9/14/2017			SeqNo: 1261061			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226		3.76	1.00	5.000	0	75.2	70	130				

Sample ID	lcsd-28705	SampType: LCSSD	TestCode: Radium-226_ Units: pCi/L				Prep Date: 9/8/2017			RunNo: 74705		
Client ID:	LCSS02	Batch ID: 28705	TestNo: E903.0		E903-904	Analysis Date: 9/14/2017			SeqNo: 1261062			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226		3.78	1.00	5.000	0	75.6	70	130	3.760	0.531	20	

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Revision v1

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

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.

Tetra Analytical Laboratories, Inc.
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www.tetra-labs.com

SUBCONTRACT ORDER

117H507

SENDING LABORATORY:

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Madison, MI 48444
Phone: 231.773.5998
Fax: 231.773.6337
Project Manager: Jon Mink

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc.
1310 Wain Street
Cuyahoga Falls, OH 44223
Phone: (330) 253-8211
Fax: (330) 253-4489

PO # 0824 207 151

~~1081832-02408664~~

17081538-01 00154

Accounting Code:

Sample ID: 117H507-01 Aqueous Sample: 082307 09:35
Subcontracted Work 08/31/17 15:00 08/23/18 09:35 Radium 226/228

Customer Supplied
Sample ID: 117H507-02 Aqueous Sample: 082307 10:15
1-PL1000 pH <2 w/ HNO 08/31/17 15:00 08/23/18 10:15 Radium 226/228

Customer Supplied
Sample ID: 117H507-03 Aqueous Sample: 082307 11:05
Subcontracted Work 08/31/17 15:00 08/23/18 11:05 Radium 226/228

Customer Supplied
Sample ID: 117H507-04 Aqueous Sample: 082307 13:40
Subcontracted Work 08/31/17 15:00 08/23/18 13:40 Radium 226/228

Customer Supplied
Sample ID: 117H507-05 Aqueous Sample: 082307 14:55
Subcontracted Work 08/31/17 15:00 08/23/18 14:55 Radium 226/228

Customer Supplied
Sample ID: 117H507-06 Aqueous Sample: 082307 16:55
Subcontracted Work 08/31/17 15:00 08/23/18 16:55 Radium 226/228

Received By: [Signature] Date: 8-28-17 10x

Retained By: _____ Date: _____ Received By: _____ Date: _____

Trace Analytical Laboratories, Inc.
204 S. Dixie Street, Room 100
Mesa, AZ 85204-2973

TRACE
ANALYTICAL LABORATORIES, INC.

231 773 Mesa Plaza
Mesa, AZ 85204-4418 P.O. Box
www.trace-labs.com

SUBCONTRACT ORDER
117H507

Sample ID: 117H507-06 Aliquot Sampled: 08/23/17 00:00 Radium 226-228
Subcontracted Work 08/21/17 15:00 08/23/18 00:00

Container Supplied
1-PL1000 pH-C2 w/ HNO 1-PL1000 pH-C2 w/ HNO

08/23/18 15:00
08/23/18 15:00
08/23/18 15:00

Received By: [Signature] Date: 08/17/18 16:00
Received By: _____ Date: _____
Received By: _____ Date: _____
Received By: _____ Date: _____

Figure 1 - Summit Environmental Technologies, Inc.
 Cooler Receipt Form, Page 1

Client: TWICE Labels of person inspecting cooler and sample: AMR
 Date Received: 8-28-17 Time Received: 1:00 Order Number: 17081536
Date printed: 17081536
 Number of Coolers/Bboxes: 1 Data center(s) opened and samples inspected: 8-28-17
 Shipper: Fed Ex DHL Airborne US Postal Western Pickup Other _____
 Packaging: Pallet Bubble Wrap Paper Foam None Other _____
 Tape on cooler/bbox: Y N N/A
 Custom Seal Label: Y N N/A
 C-O-C in plastic: Y N N/A
 Ice: _____ Blue Ice _____ present absent melted N/A
 Cooler Temperature: IR Gun #1502048 CP 23°C 23°C N/A (see page 2 for scan results)
 Radiological Testing Instrument serial #33127 Y N N/A
 Use 1 sheet per sample. If sample is > 100 gms, the Radiological Safety Officer must be notified immediately.
 C-O-C Read out properly: Y N N/A
 Samples in separate bags: Y N N/A
 Samples contained intact: Y N N/A
 #, no, list broken sample(s): MSMSD Valve for OS Defmt coils

Sample label(s) complete (ID, date, etc.)	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
Label(s) agree with C-O-C	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
Correct containers used	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
Sufficient sample received	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
Sufficient sample for DC	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
Samples received within holding time	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
Do any 40 mL vials contain bubbles?	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N	<input type="checkbox"/> N/A
---Samples with bubbles often are acceptable, indicate bubble size if above---			
Vials dated contained about samples	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N	<input type="checkbox"/> N/A
Vial closed and new samples	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N	<input type="checkbox"/> N/A
Client contact: <u>8-29-17</u> <u>Jon Mark</u>			
Date/Time: <u>10/26/17</u>			
Logged in by: <u>Chris</u>			

Comments: Receiving MSMSD Valve. Not matching by color
Reg Sample Clear, MSMSD Valve Blue, Conducted Holly
Regarding Issue on 8/29/17 on 9/19/17 client has requested
for MSMSD and report Page 10 or 12 please extract.

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 (P-14)F: WC-DS-1174	pH Strip (24-48) SETF: OES-01-0250
Total DPD packet SETF: OES-02-0230	Free DPD packet SETF: OES-01-0290
Disp. Pipers SETF:	

Sample ID	Test Method	pH	Chlorine (r or f)	CPM	Comments
MW-1	✓	2		23	
MW-2		2		28	
MW-3	✓	2		23	
MW-4	✓	2		21	
MW-4 _{HD}	✓	2		21	
MW-5		2		26	
0825T MW		2		26	

F: Fluorimetric Instrument
 S04: 1, 50M; S15: 1, 625; S2: 507; S48: 1, 548; S1: 531; S2: 1813 methods checked for ZONE chloro
 S04: 2 checked for ZONE chloro
 S04: 1, 50M; S15: 1, 625; S2: 507; S48: 1, 548; S1: 531; S2: 1813 methods checked for ZONE chloro
 S24: 2 pH and Chlorine checked by lab myself



AECOM
1555 N. RiverCenter Drive, Suite 214
Milwaukee, WI 53212

414.944.6080 tel
414.944.6081 fax

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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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.

^aThe 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.

Analyte	Units	Sample Result	Field Duplicate 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.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
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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 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,

A handwritten signature in black ink, appearing to read "Jon Mink".

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	tvf	08/29/17	08/31/17 10:22

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
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: 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

pH	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

pH	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

pH	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

pH	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

pH

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

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ANALYTICAL RESULTS

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

Trace ID: T17H658-01 Date Collected: 08/29/17 10:00 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 08/31/17 10:22

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	N	

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	N	
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 Date Collected: 08/29/17 10:00 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 08/31/17 10:22

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	
----	---------------	--	---	----------	----	----------	----	-----------	--

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

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

Trace ID: T17H658-02 Date Collected: 08/29/17 11:15 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 08/31/17 10:22

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	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	N	

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	N	
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		

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 Date Collected: 08/29/17 11:15 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 08/31/17 10:22

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 Project ID: T17H658
 Client Project ID: MBLP CCR Investigation

Trace ID: T17H658-03 Date Collected: 08/29/17 12:20 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 08/31/17 10:22

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071591

Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
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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	N	

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	N	
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 Date Collected: 08/29/17 12:20 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 08/31/17 10:22

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 Project ID: T17H658
 Client Project ID: MBLP CCR Investigation

Trace ID: T17H658-04 Date Collected: 08/29/17 14:05 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 08/31/17 10:22

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071591

Mercury	<0.00020	mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
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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	N	

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	N	
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 SO ₄	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 Date Collected: 08/29/17 14:05 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 08/31/17 10:22

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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ANALYTICAL RESULTS

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

Trace ID: T17H658-05 Date Collected: 08/29/17 15:25 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 08/31/17 10:22

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071591

Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
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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	N	

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	N	
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	340 mg/L	10	100	09/05/17	nm	09/06/17	nm		
Sulfate as SO4	47 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: T17H658-05 Date Collected: 08/29/17 15:25 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 08/31/17 10:22

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	1000 mg/L	20	2	09/05/17	nm	09/06/17	nm		
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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 Date Collected: 08/29/17 16:30 Matrix: Ground Water
 Sample ID: Equipment Blank 082917 Date Received: 08/31/17 10:22

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071591

Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
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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	N	

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	N	
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 ID: T17H658
Client Project ID: MBLP CCR Investigation

Trace ID: T17H658-06 Date Collected: 08/29/17 16:30 Matrix: Ground Water
Sample ID: Equipment Blank 082917 Date Received: 08/31/17 10:22

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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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 Project ID: T17H658
 Client Project ID: MBLP CCR Investigation

Trace ID: T17H658-07 Date Collected: 08/29/17 Matrix: Ground Water
 Sample ID: Dup 082917 Date Received: 08/31/17 10:22

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071591

Mercury	<0.00020 mg/L	0.00020	1	08/31/17	nws	08/31/17	nws		
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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	N	

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	N	
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		

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:	T17H658-07	Date Collected:	08/29/17	Matrix:	Ground Water
Sample ID:	Dup 082917	Date Received:	08/31/17 10:22		

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	320	mg/L	10	1	09/05/17	nm	09/06/17	nm		
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QUALITY CONTROL RESULTS

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

QC Batch: T071591	Analysis Description: Mercury, Total, EPA 7470/7471
QC Batch Method: EPA 7470A Prep	Analysis Method: EPA 7470A

METHOD BLANK: T071591-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T071591-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00206	103	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071591-MSD1

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	

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

QC Batch: T071646	Analysis Description: Barium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	Analysis Method: EPA 6010B

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-MSD1

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

Analysis Description: Antimony, Total

QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids

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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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071646-MSD1

Original: **T17H658-01**

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	

Trace Project ID: T17H658

Client Project ID: MBLP CCR Investigation

QC Batch: T069765

Analysis Description: Metals Digestion

QC Batch Method: EPA 200.2

Analysis Method: EPA 200.2

Trace Project ID: T17H658

Client Project ID: MBLP CCR Investigation

QC Batch: T071662

Analysis Description: Sulfate

QC Batch Method: IC Prep W

Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T071662-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: 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	

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

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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2241 Black Creek Road
Muskegon, MI 49444-2673



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

QC Batch: T070922

Analysis Description: pH, SM 4500

QC Batch Method: *** DEFAULT PREP ***

Analysis Method: SM 4500-H+ B-11

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www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

2 cobblers

Page 1 of 1

Trace ID No.
T17H658

Report Results To:

Company Name: Aercom
 Report To: Tom Flaws
 Mailing Address:
 City, State, Zip Code:
 Office Phone: Cell Phone:
 Email Address: Tom.Flaws@Aercom.com Billing Email Address:

Bill To:
 PO #: 60546383
 Contact Name:
 Billing Address (if different):
 City, State, Zip Code:
 Phone Number:
 Billing Email Address:

Turnaround Requirements:
 Standard 48 Hour*
 4 Day* 24 Hour*
 3 Day*
 * Requires Prior Approval

Matrix Key:
 S = Soil / Solid W = Wipes
 W = Water LW = Liquid Waste
 SL = Sludge A = Air
 OI = Oil D = Drinking Water

Project Name: MPLD CCL Investigation
Sampled By: TVR

Trace No.	Date Collected	Time Collected	Client Sample ID	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation							
							Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other		
1	8-28-17	1600	MLW-1	Y		4								
2		1115	MLW-2											
3		1228	MLW-3											
4		1405	MLW-S											
5		1525	MLW-4											
6		1600	MLW-1 MS WSD											
7		1630	Equipment Rentals 082917											
8														
9														

Analysis Requested

<input checked="" type="checkbox"/>	Barium
<input checked="" type="checkbox"/>	Calcium
<input checked="" type="checkbox"/>	Chloride
<input checked="" type="checkbox"/>	Fluoride
<input checked="" type="checkbox"/>	Sulfate
<input checked="" type="checkbox"/>	TDS
<input checked="" type="checkbox"/>	Radium 226/228
<input checked="" type="checkbox"/>	Metals (Attached)
<input type="checkbox"/>	Other

Remarks: Possible Health Hazards?

Please Sign

Released By	Received By	Date	Time
<u>Tom Flaws</u>	<u>Fed Ex</u>		
<u> </u>	<u>Fed Ex</u>		
<u> </u>	<u> </u>		
<u> </u>	<u> </u>		

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17H658 Date: 8/31/17 Package Description: Cooler #1 Temperature: -0.5
 Client Name: AECOM Time: 10:27 Logged in by: JS

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 #: 7701 4852 1196
 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
 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 N/A

Cooler Temperature
Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 1.0 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: Dup 082912, mw-3, mw-4, ymw-2

***EMD pH Test Strips Used:**
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17H658 Date: 8/31/17 Package Description: Code #2 Temperature: -1.8
 Client Name: AECOM Time: 10:26 Logged in by: JB

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 #: 7701 4852 1605

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

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 N/A

Cooler Temperature

Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C

Representative Sample Temperature: 0.6 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)

Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: MW-S, Equip Blank, MW-1

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328

Other: _____

Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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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 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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive, flowing style.

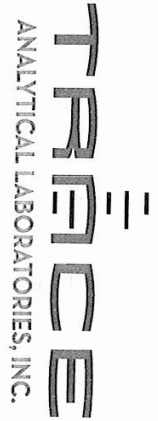
Jon Mink
Senior Project Manager

Enclosures



NJDEP Accreditation No. MI008

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CHAIN-OF-CUSTODY RECORD

Z Cobblers

Page 1 of 1

Report Results To:

Company Name: Arcem
 Report To: Tom Flavinis
 Mailing Address: _____
 City, State, Zip Code: _____
 Office Phone: _____ Cell Phone: _____
 Email Address: Tom Flavinis @ arcem.com
 Billing Address: _____ Billing Email Address: _____

Bill To:

PO #: 60546383
 Contact Name: _____
 Billing Address (if different): _____
 City, State, Zip Code: _____
 Phone Number: _____

Trace Use:

Logged By: BF
 Checked By: BF
 Soil Volatiles Preserved (circle if applicable):
 MeOH Low Level Lab
 Sampling Time: _____

Trace ID No.
T17H658

- Turnaround Requirements:**
- Standard
 - 4 Day*
 - 3 Day*
 - 48 Hour*
 - 24 Hour*

- Matrix Key:**
- S = Soil / Solid
 - W = Water
 - SL = Sludge
 - OI = Oil
 - WI = Wipes
 - LW = Liquid Waste
 - A = Air
 - D = Drinking Water

Project Name: MFLD CCR Investigation
 Sampled By: TVE

Trace No.	Date Collected	Time Collected	Client Sample ID	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation							Analysis Requested	Remarks	Possible Health Hazards?		
							Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other						
1	8-28-17	1600	MFLD-1	N	U	4												
2		1115	MFLD-2															
3		1229	MFLD-3															
4		1405	MFLD-5															
5		1525	MFLD-4															
16		1600	MFLD-1 MFLD-2															
16		1630	Equipment Blank 082917															
17																		
18																		

Please Sign		Released By	Received By	Date	Time	Released By	Received By	Date	Time
1)	<u>Tom Flavinis</u>	<u>Fed E</u>	<u>Fed E</u>			2)	<u>Fed E</u>	<u>CPJ</u>	
3)						4)			

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17H658 Date: 8/31/17 Package Description: Cooler #1 Temperature: -0.5
 Client Name: AECOM Time: 10:27 Logged in by: JS

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 #: 7701 4852 1196
 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
 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 N/A

Cooler Temperature
Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 1.0 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: Dup 082912, MW-3, MW-4, MW-2

***EMD pH Test Strips Used:**
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17H658 Date: 8/31/17 Package Description: Code #2 Temperature: -1.8
 Client Name: AECOM Time: 10:26 Logged in by: JB

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 #: 7701 4852 1605
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 0.6 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes: MW-S, Equip Blank, MW-1

*EMD pH Test Strips Used:

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328

Other: _____

Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



Summit Environmental Technologies, Inc.
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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,

A handwritten signature in black ink that reads 'Holly Florea'. The signature is written in a cursive, slightly slanted style.

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



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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.



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

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.



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Workorder
Sample Summary
WO#: **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

(consolidated)

WO#: **17090138**

Date Reported: **9/22/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 8/29/2017 10:00:00 AM

Project: T17H658

Lab ID: 17090138-001

Matrix: AQUEOUS

Client Sample ID T17H658-01

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	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	ND	1.00	U	pCi/L	± 0.41	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090138**

Date Reported: **9/22/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 8/29/2017 11:15:00 AM

Project: T17H658

Lab ID: 17090138-002

Matrix: AQUEOUS

Client Sample ID T17H658-02

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	± 0.14	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	2.00	1.00		pCi/L	± 0.68	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090138**

Date Reported: **9/22/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 8/29/2017 12:20:00 PM

Project: T17H658

Lab ID: 17090138-003

Matrix: AQUEOUS

Client Sample ID T17H658-03

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	± 0.17	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	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090138**

Date Reported: **9/22/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 8/29/2017 2:05:00 PM

Project: T17H658

Lab ID: 17090138-004

Matrix: AQUEOUS

Client Sample ID T17H658-04

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	± 0.16	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	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090138**

Date Reported: **9/22/2017**

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 (EPA 903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	U	pCi/L	± 0.18	1	9/20/2017 2:11:00 PM
Yield	1.00					1	9/20/2017 2:11:00 PM
RADIUM-228 (EPA 904.0)					E904.0	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090138**

Date Reported: **9/22/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 8/29/2017 4:30:00 PM

Project: T17H658

Lab ID: 17090138-006

Matrix: AQUEOUS

Client Sample ID T17H658-06

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	± 0.16	1	9/20/2017 2:11:00 PM
Yield	1.00					1	9/20/2017 2:11:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00	U	pCi/L	± 0.33	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090138**

Date Reported: **9/22/2017**

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 (EPA 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
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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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QC SUMMARY REPORT

WO#: 17090138
 22-Sep-17

Client: Trace Analytical Laboratories, Inc.
Project: T17H658

BatchID: 28784

Sample ID: mb-28784	SampType: MBLK	TestCode: Radium-228_	Units: pCi/L	Prep Date: 9/13/2017	RunNo: 74966						
Client ID: PBW	Batch ID: 28784	TestNo: E904.0	E903-904	Analysis Date: 9/19/2017	SeqNo: 1267569						
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-28784	SampType: LCS	TestCode: Radium-228_	Units: pCi/L	Prep Date: 9/13/2017	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	5.35	1.00	5.000	0	107	70	130				
Yield	1.00			0	0						

Sample ID: 17090211-001aMS	SampType: MS	TestCode: Radium-228_	Units: pCi/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	5.71	1.00	5.000	0	114	70	130				
Yield	1.00			1.000	0						

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original



Summit Environmental Technologies, Inc.
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 Website: <http://www.settek.com>

QC SUMMARY REPORT

WO#: 17090138
 22-Sep-17

Client: Trace Analytical Laboratories, Inc.
Project: T17H658

BatchID: 28784

Sample ID: mb-28784	SampType: MBLK	TestCode: Radium-226_	Units: pCi/L	Prep Date: 9/13/2017	RunNo: 74971						
Client ID: PBW	Batch ID: 28784	TestNo: E903.0	E903-904	Analysis Date: 9/20/2017	SeqNo: 1267727						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	0.990										

Sample ID: lcs-28784	SampType: LCS	TestCode: Radium-226_	Units: pCi/L	Prep 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	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.78	1.00	5.000	0	95.6	70	130				

Sample ID: lcsd-28784	SampType: LCS D	TestCode: Radium-226_	Units: pCi/L	Prep 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	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.33	1.00	5.000	0	107	70	130	4.780	10.9	20	

Sample ID: 17090211-001aMS	SampType: MS	TestCode: Radium-226_	Units: pCi/L	Prep 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	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original



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QC SUMMARY REPORT

WO#: 17090138
 22-Sep-17

Client: Trace Analytical Laboratories, Inc.

Project: T17H658

BatchID: 28784

Sample ID: 17090211-001aMS	SampType: MS	TestCode: Radium-226_	Units: pCi/L	Prep 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	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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
	H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
	MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
	P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original

SUBCONTRACT ORDER

T17H658

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

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, OH 44223
Phone : (330) 253-8211
Fax: (330) 253-4489

PO # 08312017 JS2

Accounting Code: _____

17090138-
001-007 sc

Sample ID: T17H658-01 Aqueous Sampled: 08/29/17 10:00

Subcontracted Work 09/08/17 15:00 08/29/18 10:00

Radium 226/228

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

Sample ID: T17H658-02 Aqueous Sampled: 08/29/17 11:15

Subcontracted Work 09/08/17 15:00 08/29/18 11:15

Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17H658-03 Aqueous Sampled: 08/29/17 12:20

Subcontracted Work 09/08/17 15:00 08/29/18 12:20

Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17H658-04 Aqueous Sampled: 08/29/17 14:05

Subcontracted Work 09/08/17 15:00 08/29/18 14:05

Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17H658-05 Aqueous Sampled: 08/29/17 15:25

Subcontracted Work 09/08/17 15:00 08/29/18 15:25

Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Released By (Trace) J Spring

Date 8/31/17 @ 16:00

Received By SNU Campher

Date 9-5-17

Released By

Date

Received By

Date

SUBCONTRACT ORDER

T17H658

Sample ID: T17H658-06 Aqueous Sampled: 08/29/17 16:30

Subcontracted Work 09/08/17 15:00 08/29/18 16:30 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T17H658-07 Aqueous Sampled: 08/29/17 00:00

Subcontracted Work 09/08/17 15:00 08/29/18 00:00 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

821000
001-00128

(Trace) *[Signature]*

8/31/17 @ 16:00

[Signature]

Released By

Date

Received By

Date

Released By

Date

Received By

Date

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

Figure 1 - Summit Environmental Technologies, Inc.
 Cooler Receipt Form, Page 1

Client: Trace Initials of person inspecting cooler and samples: SC
 Order Number: 17090138
 Date Received: 9-5-17 Time Received: 1000 Date cooler(s) opened and samples inspected: 9-5-17
 Number of Coolers/Boxes: 1 N/A

Shipper: Fed Ex DHL Airborne US Postal Walk-in Pickup Other: _____
 Packaging: Peanuts Bubble Paper Foam None Other: _____

Tape on cooler/box: N N/A
 Custody Seals intact: N N/A
 C-O-C in plastic: N N/A
 Ice _____ Blue ice _____ present absent _____ melted _____ N/A
 Cooler Temperature IR Gun #16020459 CR °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
 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 N/A
 **Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm: _____
 Was client contacted about samples: Y N
 Will client send new samples: Y N

Client contact: _____
 Date/Time: _____
 Logged in by: _____

Comments: extra volume for QC for sample # 1 only.

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	RAD	2		29	
2	↓	2		24	
3		2		13	
4		2		17	
5		2		23	
6		2		14	
7		2		20	

P = Permanganate interference
 504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1813 methods checked for Total chlorine
 552.2 checked for Free chlorine
 531.2 pH is checked for ~3.8 (SET# OES-01-0149)
 524.2 = pH and Chlorine checked by lab analyst



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project	
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies	
Work Order:	T171125	
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 6, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1		6-Sep-17	T171125-01
MW-2		6-Sep-17	T171125-02
MW-3		6-Sep-17	T171125-03
MW-4	MS for Radium 226 and 228	6-Sep-17	T171125-05
MW-5	MS/MSD for Metals and Method 300.0; Lab Dup for TDS	6-Sep-17	T171125-04
DUP090617	FD of MW-5	6-Sep-17	T171125-06
Equipment Blank 090617	Laboratory Duplicate for Radium 226 and 228	6-Sep-17	T171125-07

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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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.

Analyte	Units	Sample Result	Field Duplicate 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 T171125
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,

A handwritten signature in black ink, appearing to read "Jon Mink".

Jon Mink
Senior Project Manager
Enclosures



NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: T171125
Client Project ID: MBLP CCR 60546383

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T171125-01	MW-1	Ground Water	Client	09/06/17 09:50	09/08/17 10:12
T171125-02	MW-2	Ground Water	Client	09/06/17 10:35	09/08/17 10:12
T171125-03	MW-3	Ground Water	Client	09/06/17 11:20	09/08/17 10:12
T171125-04	MW-5	Ground Water	Client	09/06/17 13:45	09/08/17 10:12
T171125-05	MW-4	Ground Water	Client	09/06/17 15:10	09/08/17 10:12
T171125-06	DUP090617	Ground Water	Client	09/06/17	09/08/17 10:12
T171125-07	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
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: 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.
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Trace ID: T171125-01

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: T171125-02

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: T171125-03

Analysis: SM 4500-H+ B-11

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

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Trace ID: T171125-04

Analysis: SM 4500-H+ B-11

pH	Note Client : The analysis was performed on site at the time of sampling by the client.
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Trace ID: T171125-05

Analysis: SM 4500-H+ B-11

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

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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-01 Date Collected: 09/06/17 09:50 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071904

Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
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METALS, TOTAL

Analysis Method: EPA 6010B
 Batch: T071846

Barium	0.13 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	130 mg/L	5.0	10	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

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	N	
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	270 mg/L	10	100	09/08/17	nm	09/12/17	jek		
Sulfate as SO4	21 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: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-01 Date Collected: 09/06/17 09:50 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	930	mg/L	20	2	09/12/17	nm	09/13/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	7.56	pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-02 Date Collected: 09/06/17 10:35 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071904

Mercury	<0.00020	mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
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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	N	

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	N	
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		

Analysis Method: SM 2540 C-11
 Batch: T071857

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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-02 Date Collected: 09/06/17 10:35 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	310	mg/L	20	2	09/12/17	nm	09/13/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	8.15	pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-03 Date Collected: 09/06/17 11:20 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071904

Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
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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	N	

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	N	
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		

Analysis Method: SM 2540 C-11
 Batch: T071857

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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-03 Date Collected: 09/06/17 11:20 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	380 mg/L	20	2	09/12/17	nm	09/13/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	7.77 pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-04 Date Collected: 09/06/17 13:45 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071904

Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
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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	N	

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	N	
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

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-04 Date Collected: 09/06/17 13:45 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	660	mg/L	20	2	09/12/17	nm	09/13/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	7.43	pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-05 Date Collected: 09/06/17 15:10 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071904

Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
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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	N	

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	N	
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: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-05 Date Collected: 09/06/17 15:10 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	1000	mg/L	20	2	09/12/17	nm	09/13/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	7.75	pH Units		1	09/06/17	jm	09/06/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-06 Date Collected: 09/06/17 Matrix: Ground Water
 Sample ID: DUP090617 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071904

Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
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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	N	

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	N	
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

Trace Project ID: T171125
Client Project ID: MBLP CCR 60546383

Trace ID: T171125-06	Date Collected: 09/06/17	Matrix: Ground Water
Sample ID: DUP090617	Date Received: 09/08/17 10:12	

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	730	mg/L	20	2	09/12/17	nm	09/13/17	nm		
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ANALYTICAL RESULTS

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-07 Date Collected: 09/06/17 16:30 Matrix: Ground Water
 Sample ID: Equipment Blank 090617 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T071904

Mercury	<0.00020 mg/L	0.00020	1	09/14/17	nws	09/15/17	nws		
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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	N	

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	N	
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 ID: T171125
 Client Project ID: MBLP CCR 60546383

Trace ID: T171125-07 Date Collected: 09/06/17 16:30 Matrix: Ground Water
 Sample ID: Equipment Blank 090617 Date Received: 09/08/17 10:12

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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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: T171125
 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 CONTROL SAMPLE: T071904-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00187	94	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071904-MSD1 Original: T171125-04

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	0.00175	0.00184	88	92	76-123	5	20	

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

QC Batch: T071846	Analysis Description: Barium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	Analysis Method: EPA 6010B

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	

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071846-MSD1

Original: T171125-04

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

Trace Project ID: T171125

Client Project ID: MBLP CCR 60546383

QC Batch: T071846

Analysis Description: Antimony, Total

QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids

Analysis Method: EPA 6020

METHOD BLANK: T071846-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: 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	

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071846-MSD1

Original: T171125-04

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	

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

QC Batch: T071726
 QC Batch Method: EPA 200.2

Analysis Description: Metals Digestion
 Analysis Method: EPA 200.2

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

QC Batch: T071781
 QC Batch Method: IC Prep W

Analysis Description: Sulfate
 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	

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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 DUPLICATE: T071781-MSD1

Original: T171125-04

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 Project ID: T171125

Client Project ID: MBLP CCR 60546383

QC Batch: T071857

Analysis Description: Total Dissolved Solids

QC Batch Method: SM 2540 C-11

Analysis Method: SM 2540 C-11

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Trace Analytical Laboratories, Inc.
 2241 Black Creek Road
 Muskegon, MI 49444-2673



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

METHOD BLANK: T071857-BLK1

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

LABORATORY CONTROL SAMPLE: 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: T071857-DUP1

Original: T171125-04

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	662	682	3	10	

Trace Project ID: T171125
 Client Project ID: MBLP CCR 60546383

QC Batch: T071632	Analysis Description: pH, SM 4500
QC Batch Method: *** DEFAULT PREP ***	Analysis Method: SM 4500-H+ B-11

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CHAIN-OF-CUSTODY RECORD

2 cos 105 Page 1 of 1

Trace-#D No.
 T172L125

Report Results To:

Bill To:

Company Name:	Aelsum	PO #:	60546383
Report To:	Lance Lindberg	Contact Name:	
Mailing Address:		Billing Address (if different):	
City, State, Zip Code:		City, State, Zip Code:	
Office Phone:		Phone Number:	
Email Address:	lance.lindberg@aelsum.com	Billing Email Address:	

Turnaround Requirements:

Standard
 48 Hour*
 4 Day*
 24 Hour*
 3 Day*

Matrix Key:

S = Soil / Solid
 W = Water
 SL = Sludge
 OI = Oil
 WI = Wipes
 LW = Liquid Waste
 A = Air
 D = Drinking Water

Project Name:

Sampled By:

Trace No.	Date Collected	Time Collected	Client Sample ID	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation							Remarks		
							Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other	Analysis Requested			
1	9-6-17	0958	MW-1	N		4									Boron, Calcium Chloride, Fluoride Sulfate, TDS Radium 226/228 Metals (attached)	
2		035	MW-2			4										
3		1120	MW-3			4										
4		1345	MW-S			5										
5		1345	MW-S			5										
6		1510	MW-4			4										
7			DUP 090617			4										
8		1630	Equipment Blank 090617			4										
9	9-8-17															

Please Sign

Released By:	Date:	Time:	Received By:	Date:	Time:
<i>[Signature]</i>	9-2-17		<i>[Signature]</i>	9-8-17	16:17

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.

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17125 Date: 9-8-17 Package Description: cooler Temperature: 0.9
 Client Name: AECOM Time: 10:12 Logged in by: [Signature]

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 #: 77020581 2097

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

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 N/A

Cooler Temperature

Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 0-6 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
Lot: HC563733 verified 6/21/16 AY
 Lot: HC54761 verified 04/03/17 JS

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Muskegon, MI 49444-2673



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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: T171125

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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive style with a large initial "J" and "M".

Jon Mink
Senior Project Manager

Enclosures



NJDEP Accreditation No. MI008

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 www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

2 copies
 Page 1 of 1

Trace ID No.
 T171125

Report Results To:

Bill To:

Company Name: <u>Acersm</u>	PO #: <u>60546383</u>
Report To: <u>Lance Lindberg</u>	Contact Name:
Mailing Address:	Billing Address (if different):
City, State, Zip Code:	City, State, Zip Code:
Office Phone:	Phone Number:
Email Address: <u>Lance.Lindberg@acersm.com</u>	Billing Email Address:

Trace Use:

Logged By: AK

Checked By: AK

Soil Volatiles Preserved (circle if applicable):
 MeOH Low Level Lab

Sampling Time:

Turnaround Requirements:

Standard 48 Hour*

4 Day* 24 Hour*

3 Day*

* Requires Prior Approval

Matrix Key:

S = Soil / Solid WI = Wipes

W = Water LW = Liquid Waste

SL = Sludge A = Air

OI = Oil D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation					Remarks																				
							Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH		Other																			
1	9-6-11	0850	MW-1	N		4																										
2		035	MW-2			4																										
3		1120	MW-3			4																										
4		1345	MW-5			4																										
4S		1345	MW-S WSI, WSD			5																										
56		1510	MW-4			4																										
67			DUP090617			4																										
78		1630	Equipment Mark 090617			4																										
		SW 9-8-11																														

Analysis Requested

Boron, Calcium
 Chloride, Fluoride
 Sulfate, TDS
 Radium 226/228
 Metals (attached)

Please Sign

Released By	Date	Time	Released By	Date	Time
<u>[Signature]</u>	9-7-11		<u>[Signature]</u>	9-8-11	10:17
<u>[Signature]</u>			<u>[Signature]</u>		

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.

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17125 Date: 9-8-17 Package Description: cooler Temperature: 0.9
 Client Name: AECOM Time: 10:12 Logged in by: [Signature]

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 #: 77020581 2097

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
 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 N/A

Cooler Temperature
Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 0.6 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

*EMD pH Test Strips Used:
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC54761 verified 04/03/17 JS

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TEL: (330) 253-8211 FAX: (330) 253-4489
Website: <http://www.settek.com>

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,

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



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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



Summit Environmental Technologies, Inc.
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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	TH17I125-06		9/6/2017	9/12/2017 10:15:00 AM	Aqueous
17090596-007	TH17I125-07		9/6/2017 4:30:00 PM	9/12/2017 10:15:00 AM	Aqueous



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Analytical Report

(consolidated)

WO#: **17090596**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I125
Lab ID: 17090596-001
Client Sample ID TH17I125-01

Collection Date: 9/6/2017 9:50:00 AM

Matrix: AQUEOUS

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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090596**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I125
Lab ID: 17090596-002
Client Sample ID TH17I125-02

Collection Date: 9/6/2017 10:35:00 AM

Matrix: AQUEOUS

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	± 0.18	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	± 0.54	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090596**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I125
Lab ID: 17090596-003
Client Sample ID TH17I125-03

Collection Date: 9/6/2017 11:20:00 AM

Matrix: AQUEOUS

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	± 0.17	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090596**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I125
Lab ID: 17090596-004
Client Sample ID TH17I125-04

Collection Date: 9/6/2017 1:45:00 PM

Matrix: AQUEOUS

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 8:17:00 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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17090596**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I125
Lab ID: 17090596-005
Client Sample ID TH17I125-05

Collection Date: 9/6/2017 3:10:00 PM

Matrix: AQUEOUS

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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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 Cuyahoga Falls, Ohio 44223
 TEL: (330) 253-8211 FAX: (330) 253-4489
 Website: <http://www.settek.com>

Analytical Report

(consolidated)

WO#: **17090596**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I125
Lab ID: 17090596-006
Client Sample ID TH171125-06

Collection Date: 9/6/2017

Matrix: AQUEOUS

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	± 0.14	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	± 0.72	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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

Analytical Report

(consolidated)

WO#: **17090596**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I125
Lab ID: 17090596-007
Client Sample ID TH171125-07

Collection Date: 9/6/2017 4:30:00 PM

Matrix: AQUEOUS

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 8:19:00 AM
Yield	1.00					1	9/26/2017 8:19:00 AM
RADIUM-228 (904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.79	1	9/25/2017 3:19:00 PM
Yield	1.00					1	9/25/2017 3:19:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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QC SUMMARY REPORT

WO#: 17090596
 13-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T17I125

BatchID: 28872

Sample ID	mb-28872	SampType: MBLK	TestCode: Radium-228_ Units: pCi/L			Prep Date: 9/21/2017			RunNo: 75166			
Client ID:	PBW	Batch ID: 28872	TestNo: E904.0		E903-904	Analysis Date: 9/25/2017			SeqNo: 1272160			
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	lcs-28872	SampType: LCS	TestCode: Radium-228_ Units: pCi/L			Prep Date: 9/21/2017			RunNo: 75166			
Client ID:	LCSW	Batch ID: 28872	TestNo: E904.0		E903-904	Analysis Date: 9/25/2017			SeqNo: 1272161			
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	lcsd-28872	SampType: LCSD	TestCode: Radium-228_ Units: pCi/L			Prep Date: 9/21/2017			RunNo: 75166			
Client ID:	LCSS02	Batch ID: 28872	TestNo: E904.0		E903-904	Analysis Date: 9/25/2017			SeqNo: 1272162			
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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits



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QC SUMMARY REPORT

WO#: 17090596
 13-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T17I125

BatchID: 28872

Sample ID	17090596-004aMS	SampType:	MS	TestCode:	Radium-228_	Units:	pCi/L	Prep Date:	9/21/2017	RunNo:	75166											
Client ID:	TH171125-04	Batch ID:	28872	TestNo:	E904.0		E903-904	Analysis Date:	9/25/2017	SeqNo:	1272166											
Analyte		Result		PQL		SPK value		SPK Ref Val		%REC		LowLimit		HighLimit		RPD Ref Val		%RPD		RPDLimit		Qual
Radium-228		4.93		1.00		5.000		0		98.6		70		130								
Yield		1.00						1.000		0												

Sample ID	17090596-007adup	SampType:	DUP	TestCode:	Radium-228_	Units:	pCi/L	Prep Date:	9/21/2017	RunNo:	75166											
Client ID:	TH171125-07	Batch ID:	28872	TestNo:	E904.0		E903-904	Analysis Date:	9/25/2017	SeqNo:	1272184											
Analyte		Result		PQL		SPK value		SPK Ref Val		%REC		LowLimit		HighLimit		RPD Ref Val		%RPD		RPDLimit		Qual
Radium-228		ND		1.00				0		0						0		0		20		
Yield		1.00						0		0						1.000		0				

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits



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QC SUMMARY REPORT

WO#: 17090596
 13-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T171125

BatchID: 28872

Sample ID	mb-28872	SampType:	MBLK	TestCode:	Radium-226_	Units:	pCi/L	Prep Date:	9/21/2017	RunNo:	75177			
Client ID:	PBW	Batch ID:	28872	TestNo:	E903.0		E903-904	Analysis Date:	9/26/2017	SeqNo:	1272431			
Analyte		Result		PQL	SPK value	SPK Ref Val		%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226		ND		1.00										
Yield		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		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:	TH171125-04	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		4.60		1.00	5.000	0		92.0	70	130				

Sample ID	17090596-007adup	SampType:	DUP	TestCode:	Radium-226_	Units:	pCi/L	Prep Date:	9/21/2017	RunNo:	75177			
Client ID:	TH171125-07	Batch ID:	28872	TestNo:	E903.0		E903-904	Analysis Date:	9/26/2017	SeqNo:	1272445			
Analyte		Result		PQL	SPK value	SPK Ref Val		%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits



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QC SUMMARY REPORT

WO#: 17090596
 13-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T17I125

BatchID: 28872

Sample ID	17090596-007adup	SampType:	DUP	TestCode:	Radium-226_	Units:	pCi/L	Prep Date:	9/21/2017	RunNo:	75177			
Client ID:	TH171125-07	Batch ID:	28872	TestNo:	E903.0		E903-904	Analysis Date:	9/26/2017	SeqNo:	1272445			
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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
	H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
	MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
	P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

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

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49844-2673



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SUBCONTRACT ORDER

1171125

SENDING LABORATORY:

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49844
Phone: 231.773.5998
Fax: 231.773.6537
Project Manager: Jon Mink

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, OH 44223
Phone: (330) 253-8211
Fax: (330) 253-4489

PO # 070820170257

17690594-001 007

EST

Accounting Code:

Sample ID: T171125-01 Aqueous Sampled: 09/06/17 09:50

Subcontracted Work 09/15/17 15:00 09/06/18 09:50 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T171125-02 Aqueous Sampled: 09/06/17 10:35

Subcontracted Work 09/15/17 15:00 09/06/18 10:35 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T171125-03 Aqueous Sampled: 09/06/17 11:20

Subcontracted Work 09/15/17 15:00 09/06/18 11:20 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T171125-04 Aqueous Sampled: 09/06/17 13:45

Subcontracted Work 09/15/17 15:00 09/06/18 13:45 Radium 226/228

MJ/MJD

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

Sample ID: T171125-05 Aqueous Sampled: 09/06/17 15:10

Subcontracted Work 09/15/17 15:00 09/06/18 15:10 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Released By  Date 9-8-17

Received By  Date

Released By _____ Date _____

Received By  Date 9-12-17

1016





Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673



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SUBCONTRACT ORDER
T171125

Sample ID: T171125-06	Aqueous	Sampled: 09/06/17 00:00	
Subcontracted Work	69/15/17 15:00	09/06/18 00:00	Radium 226/228
<i>Containers Supplied:</i>			
1-PL1000 pH <2 w/ HNO. 1-PL1000 pH <2 w/ HNO.			
Sample ID: T171125-07	Aqueous	Sampled: 09/06/17 16:30	
Subcontracted Work	69/15/17 15:00	09/06/18 16:30	Radium 226/228
<i>Containers Supplied:</i>			
1-PL1000 pH <2 w/ HNO. 1-PL1000 pH <2 w/ HNO.			

Received By		Date	9/8/17	Received By		Date	9-12-17
Released By		Date		Received By		Date	12/16

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

Figure 1 – Summit Environmental Technologies, Inc.
 Cooler Receipt Form, Page 1

Client: Trace Initials of person inspecting cooler and samples: AMB
 Date Received: 9-12-17 Time Received: 1015 Date cooler(s) opened and samples inspected: 9-12-17
 Number of Coolers/Boxes: 1 N/A Order Number: 1090596

Shipper: Fed Ex (UPS) DHL Airborne US Postal Walk-in Pickup Other: _____
 Packaging: Peanuts Bubble Wrap Paper Foam (None) Other: _____
 Tape on cooler/box: (Y) N N/A
 Custody Seals Intact Y N (N/A)
 C-O-C in plastic Y (N) N/A
 Ice: Blue Ice present absent melted (N/A) N/A
 Cooler Temperature IR Gun #16020458 CFDO-C Temp: 18.6 °C N/A
 Radiological Testing Instrument serial #36127 (Y) 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 (Y) N N/A
 Samples in separate bags (Y) N N/A
 Sample containers intact* Y N (N/A)
 *if no, list broken sample(s): _____

Sample label(s) complete (ID, date, etc.)	<u>(Y)</u>	N	N/A
Label(s) agrees with C-O-C	<u>(Y)</u>	N	N/A
Correct containers used	<u>(Y)</u>	N	N/A
Sufficient sample received	<u>(Y)</u>	N	N/A
Sufficient sample for QC	<u>(Y)</u>	N	N/A
Samples received within holding time	<u>(Y)</u>	N	N/A
Do any 40 mL vials contain bubbles**	<u>(Y)</u>	N	N/A
**Samples with bubbles stream are acceptable. Indicate bubble size if seen:	<u>(N/A)</u>	N	N/A
Was client contacted about samples	<u>(Y)</u>	N	N/A
Will client send new samples	<u>(Y)</u>	N	N/A

Client contact: _____
 Date/Time: _____
 Logged in by: _____
 Comments: _____

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		17	
2		2		21	
3		2		34	
4		2		25	
5		2		23	
6		2		24	
7		2		28	

B = Permeability Interference
 504.1, 508, 515.1, 523.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total Chlorine**
 532.2 checked for **Free Chlorine**
 531.2 pH is checked for ~3.8 (SET# OES-01-0149)
 534.2 = pH and Chlorine checked by lab analyst



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project	
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies	
Work Order:	T171272	
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	T171272-01
MW-2	MS for Radium 228	14-Sep-17	T171272-02
MW-3		14-Sep-17	T171272-03
MW-4		14-Sep-17	T171272-04
MW-5	MS/MSD for Metals and Method 300.0; MS for Radium 226; Lab Dup for TDS	14-Sep-17	T171272-05
Dup-091417	FD of MW-3	14-Sep-17	T171272-06
Equipment Blank		14-Sep-17	T171272-07

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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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 than 4 times the spike concentration and results were acceptable without qualification.
Chloride	718/702	80-120	2	20	

^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	Units	Sample Result	Field Duplicate Result	RPD	RPD Limit
MW-3/Dup-091417:					
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.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
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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 Project T171272
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,

A handwritten signature in black ink, appearing to read "Jon Mink".

Jon Mink
Senior Project Manager
Enclosures



NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: T171272
Client Project ID: MBLP CCR INVEST 60546383

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T171272-01	MW-1	Ground Water	adj/ll	09/14/17 10:15	09/15/17 11:34
T171272-02	MW-2	Ground Water	adj/ll	09/14/17 10:50	09/15/17 11:34
T171272-03	MW-3	Ground Water	adj/ll	09/14/17 11:30	09/15/17 11:34
T171272-04	MW-4	Ground Water	adj/ll	09/14/17 13:55	09/15/17 11:34
T171272-05	MW-5	Ground Water	adj/ll	09/14/17 13:00	09/15/17 11:34
T171272-06	Dup-091417	Ground Water	adj/ll	09/14/17	09/15/17 11:34
T171272-07	Equipment Blank	Aqueous	adj/ll	09/14/17 14:00	09/15/17 11:34

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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
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.
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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.
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Trace ID: T171272-01

Analysis: SM 4500-H+ B-11

pH	Note Client : The analysis was performed on site at the time of sampling by the client.
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Trace ID: T171272-02

Analysis: SM 4500-H+ B-11

pH	Note Client : The analysis was performed on site at the time of sampling by the client.
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Trace ID: T171272-03

Analysis: SM 4500-H+ B-11

pH	Note Client : The analysis was performed on site at the time of sampling by the client.
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Trace ID: T171272-04

Analysis: SM 4500-H+ B-11

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pH

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

Trace ID: T171272-05

Analysis: SM 4500-H+ B-11

pH

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

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ANALYTICAL RESULTS

Trace Project ID: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-01 Date Collected: 09/14/17 10:15 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072052

Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
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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	N	

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	N	
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		

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: T17I272-01 Date Collected: 09/14/17 10:15 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	980 mg/L	40	4	09/21/17	nm	09/22/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	7.60 pH Units		1	09/14/17	jm	09/14/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-02 Date Collected: 09/14/17 10:50 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072052

Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
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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	N	

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	N	
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		

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: T17I272-02 Date Collected: 09/14/17 10:50 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	300	mg/L	40	4	09/21/17	nm	09/22/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	8.13	pH Units		1	09/14/17	jm	09/14/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-03 Date Collected: 09/14/17 11:30 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072052

Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
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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	N	

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	N	
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

Trace Project ID: T17I272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T17I272-03 Date Collected: 09/14/17 11:30 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	380	mg/L	40	4	09/21/17	nm	09/22/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T071632

pH	7.85	pH Units		1	09/14/17	jm	09/14/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-04 Date Collected: 09/14/17 13:55 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072052

Mercury	<0.00020	mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
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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	N	

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	N	
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

Trace Project ID: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-04 Date Collected: 09/14/17 13:55 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 09/15/17 11:34

PARAMETERS	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									
pH	7.77 pH Units		1	09/14/17	jm	09/14/17	jm	Client, N	

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ANALYTICAL RESULTS

Trace Project ID: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-05 Date Collected: 09/14/17 13:00 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072052

Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
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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	N	

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	N	
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 ID: T17I272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T17I272-05 Date Collected: 09/14/17 13:00 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Total Dissolved Solids	720 mg/L	40	4	09/21/17	nm	09/22/17	nm		
Analysis Method: SM 4500-H+ B-11 Batch: T071632									
pH	7.51 pH Units		1	09/14/17	jm	09/14/17	jm	Client, N	

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ANALYTICAL RESULTS

Trace Project ID: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-06 Date Collected: 09/14/17 Matrix: Ground Water
 Sample ID: Dup-091417 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072052

Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
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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	N	

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	N	
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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 Muskegon, MI 49444-2673



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 www.trace-labs.com

ANALYTICAL RESULTS

Trace Project ID: T17I272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T17I272-06 Date Collected: 09/14/17 Matrix: Ground Water
 Sample ID: Dup-091417 Date Received: 09/15/17 11:34

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

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: T171272
 Client Project ID: MBLP CCR INVEST 60546383

Trace ID: T171272-07 Date Collected: 09/14/17 14:00 Matrix: Aqueous
 Sample ID: Equipment Blank Date Received: 09/15/17 11:34

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072052

Mercury	<0.00020 mg/L	0.00020	1	09/20/17	nws	09/20/17	dtm		
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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	N	

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	N	
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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888-979-4469 Fax
www.trace-labs.com

ANALYTICAL RESULTS

Trace Project ID: T17I272
Client Project ID: MBLP CCR INVEST 60546383

Trace ID:	T17I272-07	Date Collected:	09/14/17 14:00	Matrix:	Aqueous
Sample ID:	Equipment Blank	Date Received:	09/15/17 11:34		

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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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: T171272
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 CONTROL SAMPLE: T072052-BS1

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: T171272-05

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: T171272
Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T071980	Analysis Description: Barium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	Analysis Method: EPA 6010B

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: T171272-05

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: T171272

Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T071980

Analysis Description: Antimony, Total

QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids

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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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071980-MSD1

Original: T171272-05

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	

Trace Project ID: T171272

Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T071726

Analysis Description: Metals Digestion

QC Batch Method: EPA 200.2

Analysis Method: EPA 200.2

Trace Project ID: T171272

Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T071952

Analysis Description: Sulfate

QC Batch Method: IC Prep W

Analysis Method: EPA 300.0 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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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071952-MSD1

Original: T171272-05

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	

Trace Project ID: T171272

Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T071985

Analysis Description: Chloride

QC Batch Method: IC Prep W

Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T071985-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T071985-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	94	90-110	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T071985-MSD1

Original: T171272-05

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Chloride	mg/L	200	200	405	408	103	104	80-120	2	20	

Trace Project ID: T171272

Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T072093

Analysis Description: Total Dissolved Solids

QC Batch Method: SM 2540 C-11

Analysis Method: SM 2540 C-11

METHOD BLANK: T072093-BLK1

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

LABORATORY CONTROL SAMPLE: T072093-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	538	537	100	80-120	

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SAMPLE DUPLICATE: T072093-DUP1

Original: **T171272-05**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	724	780	7	10	

Trace Project ID: T171272

Client Project ID: MBLP CCR INVEST 60546383

QC Batch: T071632

Analysis Description: pH, SM 4500

QC Batch Method: *** DEFAULT PREP ***

Analysis Method: SM 4500-H+ B-11

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 Muskegon, MI 49444-2673

Phone 231.773.5998
 Fax 888.979.4469
 www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Trace ID No.
T17272

Report Results To:

Company Name: RECON

PO #: 60546383

Report To: LANCE WILSON BRC

Contact Name:

Mailing Address: 1230 WILSON ST

Billing Address (if different):

City, State, Zip Code: MARQUETTE, MI, 49855

City, State, Zip Code:

Office Phone: 906-326-4580

Call Phone: 906-869-0619

Phone Number:

Email Address: lance.lindberg@recon.com

Billing Email Address:

Turnaround Requirements:

- Standard 48 Hour*
 4 Day* 24 Hour*
 3 Day* 24 Hour*

Matrix Key:

- S = Soil / Solid W1 = Wipes
 W = Water LW = Liquid Waste
 SL = Sludge A = Air
 OI = Oil D = Drinking Water

Analysis Requested

BORON / CALCIUM
CHLORIDE / FLUORIDE
SULFATE / TDS
RADIUM 226/228
METALS (ATTACHED)

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By:	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation						Remarks				
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other					
1	9/14/12	1015	MW-1	ADD/LL			3											
2		1050	MW-2				3											
3		1130	MW-3				3											
4		1355	MW-4				3											
5		1350	MW-5				3											
5		1350	MW-5				3											
6			MW-5				3											
6			MW-5				3											
7		1400	EQUIPMENT BLANK				3											

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
<u>[Signature]</u>	<u>FELIX</u>	9/14/12	1700	<u>[Signature]</u>	<u>FELIX</u>	9/15/12	11:34

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 received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

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SAMPLE LOG IN CHECKLIST

Trace ID #: T171272 Date: 9-15-17 Package Description: cooler Temperature: 0.4
 Client Name: AECOM Time: 11:34 Logged in by: GTJ

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

<p>Type of Coolant Used</p> <p>Slurry w/ crushed, cubed, or chip ice? <input checked="" type="checkbox"/> Multiple bags of ice around samples? <input type="checkbox"/> Ice Packs/ Blue Ice: <input type="checkbox"/> No Coolant Present: <input type="checkbox"/> Ice still present upon receipt (circle one): <input checked="" type="radio"/> Yes No N/A</p>	<p>Cooler Temperature</p> <p>Correction Factors: • Digital Stick Thermometer CF = -0.6°C • IR Thermometer CF = -0.4°C Representative Sample Temperature: <u>4.4</u> °C (check one below) <input type="checkbox"/> Temp Blank (Stick Thermometer) <input checked="" type="checkbox"/> Client Sample (IR Thermometer) Melt Water: <u>none</u> °C (Use Digital Stick Thermometer)</p>
---	--

General			Comments	
Yes	No	NA		
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**
 pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____
 Lot: HC563733 verified 6/21/16 AY
 Lot: HC574761 verified 04/03/17 JS

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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: T171272

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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive, flowing style.

Jon Mink
Senior Project Manager

Enclosures



NJDEP Accreditation No. MI008

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Page 1 of 1

Trace ID No.

T17272

CHAIN-OF-CUSTODY RECORD

Report Results To:
Company Name: RECOM
Report To: LANCE LINDBERG
Mailing Address: 1330 WILSON ST
City, State, Zip Code: MUSKEGON, MI 49855
Office Phone: 906-326-4580 Cell Phone: 906-869-0649
Email Address: lance.lindberg@recom.com
Billing Email Address: _____

Bill To:
PO # 60546383
Billing Address (if different): _____
City, State, Zip Code: _____
Phone Number: _____

Company Name: RECOM
Contact Name: _____

Trace Use:
Logged By: ES
Checked By: CPH
Soil Volatiles Preserved (circle if applicable):
MeOH _____ Low Level _____ Lab _____
Sampling Time: _____

Turnaround Requirements:
 Standard
 4 Day*
 3 Day*
 48 Hour*
 24 Hour*
*Requires Prior Approval

Matrix Key:
S = Soil / Solid
W = Water
SL = Sludge
OI = Oil
WI = Wipes
LW = Liquid Waste
A = Air
D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By:	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation						Analysis Requested	Remarks			
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other					
1	9/14/17	16:15	MM-1	ADDJ/LC		MM	43										BORON/CALCIUM	
2		18:50	MM-2			MM	3										CHLORIDE/FLUORIDE	
3		11:30	MM-3			MM	3										SULFATE / TDS	
4		13:55	MM-4			MM	3										RADIUM 226/228	
5		13:52	MM-5			MM	3										METALS (ATTACHED)	
5		13:52	MM-5															
6		~	DUP-091417			MM	3											
7		14:00	EQUIPMENT BLANK			MM	3											
Please Sign																		
Released By: _____				Received By: _____				Date: 9/14/17				Time: 17:00			Released By: _____			
1) _____				2) _____				3) _____				4) _____			Received By: _____			
_____				_____				_____				_____			Date: 9/15/17			
_____				_____				_____				_____			Time: 11:34			

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.

CERTIFICATE OF ANALYSIS

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SAMPLE LOG IN CHECKLIST

Trace ID #: T11272 Date: 9-15-17 Package Description: cooler Temperature: 0.4
 Client Name: AECOM Time: 11:34 Logged in by: GTJ

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

<p>Type of Coolant Used</p> <p>Slurry w/ crushed, cubed, or chip ice? <input checked="" type="checkbox"/> Multiple bags of ice around samples? <input type="checkbox"/> Ice Packs/ Blue Ice : <input type="checkbox"/> No Coolant Present: <input type="checkbox"/> Ice still present upon receipt (circle one): <input checked="" type="radio"/> Yes No N/A</p>	<p>Cooler Temperature</p> <p><u>Correction Factors:</u> • Digital Stick Thermometer CF = -0.6°C • IR Thermometer CF = -0.4°C Representative Sample Temperature: <u>4.4</u> °C (check one below) <input type="checkbox"/> Temp Blank (Stick Thermometer) <input checked="" type="checkbox"/> Client Sample (IR Thermometer) Melt Water: <u>none</u> °C (Use Digital Stick Thermometer)</p>
--	---

General	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____

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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Summit Environmental Technologies, Inc.
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Website: <http://www.settek.com>

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,

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



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Case Narrative

WO#: 17091007
Date: 10/9/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T171272

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.

Original



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

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.



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Workorder
Sample Summary
WO#: **17091007**
09-Oct-17

CLIENT: Trace Analytical Laboratories, Inc.
Project: T171272

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17091007-001	T171272-01		9/14/2017 10:15:00 AM	9/19/2017 10:20:00 AM	Aqueous
17091007-002	T171272-02		9/14/2017 10:50:00 AM	9/19/2017 10:20:00 AM	Aqueous
17091007-003	T171272-03		9/14/2017 11:30:00 AM	9/19/2017 10:20:00 AM	Aqueous
17091007-004	T171272-04		9/14/2017 1:55:00 PM	9/19/2017 10:20:00 AM	Aqueous
17091007-005	T171272-05		9/14/2017 1:00:00 PM	9/19/2017 10:20:00 AM	Aqueous
17091007-006	T171272-06		9/14/2017	9/19/2017 10:20:00 AM	Aqueous
17091007-007	T171272-07		9/14/2017 2:00:00 PM	9/19/2017 10:20:00 AM	Aqueous



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Analytical Report

(consolidated)

WO#: **17091007**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 9/14/2017 10:15:00 AM

Project: T17I272

Lab ID: 17091007-001

Matrix: AQUEOUS

Client Sample ID: T17I272-01

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RADIUM-226 (903.0)				E903.0	E903-904	Analyst: BRD	
Radium-226	ND	1.00	U	pCi/L	± 0.12	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	U	pCi/L	± 0.42	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17091007**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 9/14/2017 10:50:00 AM

Project: T17I272

Lab ID: 17091007-002

Matrix: AQUEOUS

Client Sample ID: T17I272-02

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17091007**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 9/14/2017 11:30:00 AM

Project: T17I272

Lab ID: 17091007-003

Matrix: AQUEOUS

Client Sample ID: T17I272-03

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17091007**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 9/14/2017 1:55:00 PM

Project: T17I272

Lab ID: 17091007-004

Matrix: AQUEOUS

Client Sample ID: T17I272-04

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17091007**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 9/14/2017 1:00:00 PM

Project: T17I272

Lab ID: 17091007-005

Matrix: AQUEOUS

Client Sample ID: T17I272-05

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RADIUM-226 (903.0)					E903.0	E903-904	Analyst: BRD
Radium-226	ND	1.00	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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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
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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17091007**

Date Reported: **10/9/2017**

CLIENT: Trace Analytical Laboratories, Inc.

Collection Date: 9/14/2017 2:00:00 PM

Project: T17I272

Lab ID: 17091007-007

Matrix: AQUEOUS

Client Sample ID: T17I272-07

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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QC SUMMARY REPORT

WO#: 17091007
 09-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T171272

BatchID: 29079

Sample ID: mb-29079	SampType: MBLK	TestCode: Radium-228_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75737						
Client ID: PBW	Batch ID: 29079	TestNo: E904.0	E903-904	Analysis Date: 10/6/2017	SeqNo: 1286301						
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	TestCode: Radium-228_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75737						
Client ID: LCSW	Batch ID: 29079	TestNo: E904.0	E903-904	Analysis Date: 10/6/2017	SeqNo: 1286303						
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: 17091007-005aMS	SampType: MS	TestCode: Radium-228_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75737						
Client ID: T171272-05	Batch ID: 29079	TestNo: E904.0	E903-904	Analysis Date: 10/6/2017	SeqNo: 1286306						
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:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original



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 Website: <http://www.settek.com>

QC SUMMARY REPORT

WO#: 17091007
 09-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T171272

BatchID: 29079

Sample ID: mb-29079	SampType: MBLK	TestCode: Radium-228_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75670						
Client ID: PBW	Batch ID: 29079	TestNo: E904.0	E903-904	Analysis Date: 10/6/2017	SeqNo: 1284827						
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	TestCode: Radium-228_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75670						
Client ID: LCSW	Batch ID: 29079	TestNo: E904.0	E903-904	Analysis Date: 10/6/2017	SeqNo: 1284829						
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:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original



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QC SUMMARY REPORT

WO#: **17091007**
09-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T171272

BatchID: 29079

Sample ID: mb-29079	SampType: MBLK	TestCode: Radium-226_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75751						
Client ID: PBW	Batch ID: 29079	TestNo: E903.0	E903-904	Analysis Date: 10/7/2017	SeqNo: 1286503						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID: lcs-29079	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: lcsd-29079	SampType: LCSD	TestCode: Radium-226_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75751						
Client ID: LCSS02	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: 17091007-005aMS	SampType: MS	TestCode: Radium-226_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75751						
Client ID: T171272-05	Batch ID: 29079	TestNo: E903.0	E903-904	Analysis Date: 10/7/2017	SeqNo: 1286508						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	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#: 17091007
 09-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T171272

BatchID: 29079

Sample ID: 17091007-005aMS	SampType: MS	TestCode: Radium-226_	Units: pCi/L	Prep Date: 10/4/2017	RunNo: 75751						
Client ID: T171272-05	Batch ID: 29079	TestNo: E903.0	E903-904	Analysis Date: 10/7/2017	SeqNo: 1286508						
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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original

SUBCONTRACT ORDER
T171272

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

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc.
 3310 Win Street
 Cuyahoga Falls, OH 44223
 Phone : (330) 253-8211
 Fax: (330) 253-4489

PO # 09182017-JS1
Accounting Code: _____

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
<i>Containers Supplied:</i>			
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO			
Sample ID: T171272-02	Aqueous	Sampled: 09/14/17 10:50	
Subcontracted Work	09/22/17 15:00	09/14/18 10:50	Radium 226/228
<i>Containers Supplied:</i>			
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <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
<i>Containers Supplied:</i>			
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <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
<i>Containers Supplied:</i>			
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO			
Sample ID: T171272-05	Aqueous	Sampled: 09/14/17 13:00	
Subcontracted Work	09/22/17 15:00	09/14/18 13:00	Radium 226/228
<i>Containers Supplied:</i>			
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			

extra volume for QC

17091007-001 007 CSL

Released By (T.M.) [Signature] Date 9/18/17 @ 12:00 Received By [Signature] Date 9-19-17 1020

Released By _____ Date _____ Received By _____ Date _____

SUBCONTRACT ORDER

T17I272

Sample ID: T17I272-06	Aqueous	Sampled: 09/14/17 00:00	
Subcontracted Work	09/22/17 15:00	09/14/18 00:00	Radium 226/228
<i>Containers Supplied:</i> 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO			
Sample ID: T17I272-07	Aqueous	Sampled: 09/14/17 14:00	
Subcontracted Work	09/22/17 15:00	09/14/18 14:00	Radium 226/228
<i>Containers Supplied:</i> 1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO			

223 700 100-500 / 9051

Released By [Signature] Date 9/18/17 @ 12:00 Received By _____ Date _____
Released By _____ Date _____ Received By _____ Date _____

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

Figure 1 - Summit Environmental Technologies, Inc.
Cooler Receipt Form, Page 1

Client: Trace Initials of person inspecting cooler and samples: AMP
 Order Number: 17091007
 Date Received: 2-19-17 Time Received: 1020 Date cooler(s) opened and samples inspected: 2-19-17
 Number of Coolers/Boxes: 1 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: Y N N/A
 Custody Seals intact: Y N N/A
 C-O-C in plastic: Y N N/A
 Ice _____ Blue ice _____ present absent melted N/A
 Cooler Temperature IR Gun #10020458 CFDO C F Temp: 21.9°C N/A
 Radiological Testing Instrument serial #935127 Y 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: Y N N/A
 Samples in separate bags: Y N N/A
 Sample containers intact*: Y N N/A
 *If no, list broken sample(s): _____

Sample label(s) complete (ID, date, etc.)	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> N/A
Label(s) agree with C-O-C	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> N/A
Correct containers used	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> N/A
Sufficient sample received	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> N/A
Sufficient sample for QC	<input type="radio"/> Y	<input checked="" type="radio"/> N	<input type="radio"/> N/A
Samples received within holding time	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> N/A
Do any 40 mL vials contain bubbles**	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> N/A
**Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm: _____			
Was client contacted about samples	<input type="radio"/> Y	<input type="radio"/> N	
Will client send new samples	<input type="radio"/> Y	<input type="radio"/> N	

Client contact: _____
 Date/Time: _____
 Logged in by: _____
 Comments: _____

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		35	
2		2		25	
3		2		19	
4		2		32	
5		2		18	
6		2		21	
7		2		19	

P = Permanganate Interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1813 methods checked for Total chlorine
552.2 checked for Free chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0149)
524.2 = pH and Chlorine checked by lab analyst



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project	
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies	
Work Order:	T171537	
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 28, 2017.

Sample ID	QC Samples	Sample Date/Time	Laboratory ID
MW-1		28-Sep-17	T171537-01
MW-2	MS/MSD; Lab Dup for TDS	28-Sep-17	T171537-02
MW-3		28-Sep-17	T171537-03
MW-4		28-Sep-17	T171537-04
MW-5		28-Sep-17	T171537-05
Dup-092817	FD of MW-1	28-Sep-17	T171537-06
Equipment Blank		28-Sep-17	T171537-07

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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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 than 4 times the spike concentration and results were acceptable without qualification.
Chloride	194/185	80-120	5	20	
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 ± 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.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673



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 Project T171537
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,

A handwritten signature in black ink, appearing to read "Jon Mink".

Jon Mink
Senior Project Manager
Enclosures



NJDEP Accreditation No. MI008

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Muskegon, MI 49444-2673



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SAMPLE SUMMARY

Trace Project ID: T171537
Client Project ID: MBLP CCR 60546383

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T171537-01	MW-1	Aqueous	ll/djl	09/28/17 10:30	09/29/17 15:03
T171537-02	MW-2	Aqueous	ll/djl	09/28/17 11:25	09/29/17 15:03
T171537-03	MW-3	Aqueous	ll/djl	09/28/17 12:25	09/29/17 15:03
T171537-04	MW-4	Aqueous	ll/djl	09/28/17 13:38	09/29/17 15:03
T171537-05	MW-5	Aqueous	ll/djl	09/28/17 12:55	09/29/17 15:03
T171537-06	Dup-092817	Aqueous	ll/djl	09/28/17	09/29/17 15:03
T171537-07	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
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: 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: T171537-01

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: T171537-02

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: T171537-03

CERTIFICATE OF ANALYSIS

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Muskegon, MI 49444-2673



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www.trace-labs.com

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: T171537-04

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: T171537-05

Analysis: SM 4500-H+ B-11

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

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ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-01 Date Collected: 09/28/17 10:30 Matrix: Aqueous
 Sample ID: MW-1 Date Received: 09/29/17 15:03

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	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	<0.0030 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	N	
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

CERTIFICATE OF ANALYSIS

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 www.trace-labs.com

ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-01 Date Collected: 09/28/17 10:30 Matrix: Aqueous
 Sample ID: MW-1 Date Received: 09/29/17 15:03

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

pH	7.58	pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	
----	------	----------	--	---	----------	----	----------	----	-----------	--

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-02 Date Collected: 09/28/17 11:25 Matrix: Aqueous
 Sample ID: MW-2 Date Received: 09/29/17 15:03

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	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	<0.0030 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	N	
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: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-02 Date Collected: 09/28/17 11:25 Matrix: Aqueous
 Sample ID: MW-2 Date Received: 09/29/17 15:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	350 mg/L	40	4	10/04/17	nm	10/05/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T072307

pH	8.07 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-03 Date Collected: 09/28/17 12:25 Matrix: Aqueous
 Sample ID: MW-3 Date Received: 09/29/17 15:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072302

Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
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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	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: 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	N	
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	89 mg/L	10	50	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: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-03 Date Collected: 09/28/17 12:25 Matrix: Aqueous
 Sample ID: MW-3 Date Received: 09/29/17 15:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	440 mg/L	40	4	10/04/17	nm	10/05/17	nm		
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Analysis Method: SM 4500-H+ B-11
 Batch: T072307

pH	8.09 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	
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ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-04 Date Collected: 09/28/17 13:38 Matrix: Aqueous
 Sample ID: MW-4 Date Received: 09/29/17 15:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072302

Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
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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	N	
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: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-04 Date Collected: 09/28/17 13:38 Matrix: Aqueous
 Sample ID: MW-4 Date Received: 09/29/17 15:03

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									
pH	7.74 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	

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ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-05 Date Collected: 09/28/17 12:55 Matrix: Aqueous
 Sample ID: MW-5 Date Received: 09/29/17 15:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072302

Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
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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	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	<0.0030 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	N	
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: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-05 Date Collected: 09/28/17 12:55 Matrix: Aqueous
 Sample ID: MW-5 Date Received: 09/29/17 15:03

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									
pH	7.54 pH Units		1	09/28/17	jm	09/28/17	jm	Client, N	

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ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-06 Date Collected: 09/28/17 Matrix: Aqueous
 Sample ID: Dup-092817 Date Received: 09/29/17 15:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072302

Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
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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	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	<0.0030 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	N	
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

Trace Project ID: T171537
Client Project ID: MBLP CCR 60546383

Trace ID: T171537-06	Date Collected: 09/28/17	Matrix: Aqueous
Sample ID: Dup-092817	Date Received: 09/29/17 15:03	

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	990 mg/L	40	4	10/04/17	nm	10/05/17	nm		
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ANALYTICAL RESULTS

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

Trace ID: T171537-07 Date Collected: 09/28/17 14:00 Matrix: Aqueous
 Sample ID: Equip Blank Date Received: 09/29/17 15:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072302

Mercury	<0.00020 mg/L	0.00020	1	10/02/17	nws	10/02/17	dtm		
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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	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	<0.0030 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	N	
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

Trace Project ID: T171537
Client Project ID: MBLP CCR 60546383

Trace ID:	T171537-07	Date Collected:	09/28/17 14:00	Matrix:	Aqueous
Sample ID:	Equip Blank	Date Received:	09/29/17 15:03		

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	10	mg/L	10	1	10/04/17	nm	10/05/17	nm		
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QUALITY CONTROL RESULTS

Trace Project ID: T171537
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 Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T072302-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00196	98	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T072302-MSD1

Original: T171537-02

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	0.00195	0.00199	97	100	76-123	2	20	

Trace Project ID: T171537
Client Project ID: MBLP CCR 60546383

QC Batch: T072306	Analysis Description: Barium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	Analysis Method: EPA 6010B

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-MSD1

Original: T171537-02

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: T171537

Client Project ID: MBLP CCR 60546383

QC Batch: T072306

Analysis Description: Antimony, Total

QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids

Analysis Method: EPA 6020

METHOD BLANK: T072306-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: 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: T171537-02

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	

Trace Project ID: T171537

Client Project ID: MBLP CCR 60546383

QC Batch: T071726

Analysis Description: Metals Digestion

QC Batch Method: EPA 200.2

Analysis Method: EPA 200.2

Trace Project ID: T171537

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-MSD1

Original: T171537-02

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 DUPLICATE: T072325-MSD2

Original: T171537-02

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	

Trace Project ID: T171537

Client Project ID: MBLP CCR 60546383

QC Batch: T072383

Analysis Description: Total Dissolved Solids

QC Batch Method: SM 2540 C-11

Analysis Method: SM 2540 C-11

METHOD BLANK: T072383-BLK1

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

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 Muskegon, MI 49444-2673



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

LABORATORY CONTROL SAMPLE: T072383-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	524	533	102	80-120	

SAMPLE DUPLICATE: T072383-DUP1

Original: T171537-02

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	352	380	8	10	

Trace Project ID: T171537
 Client Project ID: MBLP CCR 60546383

QC Batch: T072307

Analysis Description: pH, SM 4500

QC Batch Method: *** DEFAULT PREP ***

Analysis Method: SM 4500-H+ B-11

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Page 1 of 1
 Trace ID No. T171537

Report Results To:

Bill To:

Trace Use:

Company Name: RECOY PO #:
 Report To: LANCE LINDBERG Contact Name:
 Mailing Address: 1230 WILSON ST Billing Address (if different):
 City, State, Zip Code: MUSKEGON MI 49858 City, State, Zip Code:
 Office Phone: 231-336-4980 Cell Phone: 231-819-0618 Phone Number:
 Email Address: lance.lindberg@recoy.com Billing Email Address:

Logged By: IS
 Checked By: CLP
 Soil Vials Preserved (circle if applicable):
 MeOH Low Level Lab
 Sampling Time:

Turnaround Requirements:
 Standard
 4 Day*
 3 Day*
 48 Hour*
 24 Hour*
 * Requires Prior Approval

Matrix Key:
 S = Soil / Solid
 W = Water
 SL = Sludge
 OI = Oil
 WI = Wipes
 LW = Liquid Waste
 A = Air
 D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation						Analysis Requested	Remarks					
							Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other							
1	9/25/12	1030	MW-1		MW	43													
2		1135	MW-2		MW	13													
3		1205	MW-3		MW	13													
4		1338	MW-4		MW	3													
5		1255	MW-5		MW	3													
2		1125	MW-2 HS/HSD		MW	54													
6		---	DIP - 092817		MW	43													
7		1700	EAUIP BLANK		MW	3													

Please Sign

Released By: [Signature] Received By: Fed Ex Date: 9/25/12 Time: 1200 Released By: Fed Ex Received By: [Signature] Date: 9/25/12 Time: 15:03

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 received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

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SAMPLE LOG IN CHECKLIST

#1

Trace ID #: T11E537 Date: 9-24-17 Package Description: Cooler Temperature: 04
 Client Name: AECOM Time: 15:03 Logged in by: GH

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 #: 770874337685
 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
 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 N/A

Cooler Temperature
 Correction Factors: • Digital Stick Thermometer CF = -0.6°C
 • IR Thermometer CF = -0.4°C GH 9-24-17
 Representative Sample Temperature: 08.08 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____

Lot: HC563733 verified 6/21/16 AY
 Lot: HC547461 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

#2

Trace ID #: T171537 Date: 9-24-17 Package Description: Cooler Temperature: -0.6
 Client Name: AFCOM Time: 15:03 Logged in by: GH

Cooler Receipt

Cooler/samples delivered by: Trace courier Hand delivered Commercial courier Name of delivery person: _____
 UPS FED EX US Mail
 Tracking Number: Not Applicable Tracking #: 770774337614
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 1.2 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328

Other: _____

Lot: HC563733 verified 6/21/16 AY
 Lot: HC547461 verified 04/03/17 JS

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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 ID: T171537

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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive, slightly slanted style.

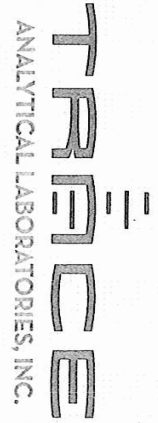
Jon Mink
Senior Project Manager

Enclosures



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Trace ID No.
117537

Report Results To:

Bill To:

Company Name: **RECOY** PO #:
Report To: **LANCE LINDERS** Contact Name:
Mailing Address: **1330 WILSON ST** Billing Address (if different):
City, State, Zip Code: **MUSKEGON MI 49858** City, State, Zip Code:
Office Phone: **206-226-4980** Cell Phone: **906-819-0618** Phone Number:
Email Address: **lance.lindberg@recoy.com** Billing Email Address:

Trace Use:
Logged By: **ES**
Checked By: **ES**
Soil Volatiles Preserved (circle if applicable):
MeOH Low Level Lab
Sampling Time:

Turnaround Requirements:
 Standard 48 Hour*
 4 Day* 24 Hour*
 3 Day*
* Requires Prior Approval

Matrix Key:
S = Soil / Solid W = Wipes
W = Water LW = Liquid Waste
SL = Sludge A = Air
OI = Oil D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By: LL/DJL	Metals Field Filtered (Y / N)	Matrix	Number of Containers	Preservation							Analysis Requested	Remarks			
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other	BORON/CALCIUM			CHLORIDE/FLUORIDE	SULFATE/TDS	RADIUM 226/228
1	9/25/12	1030	MW-1		N	M	43	1											
2	1/25	MW-2					3	1											
3	1/25	MW-3					3	1											
4	1/38	MW-4					3	1											
5	1/25	MW-5					3	1											
6	1/25	MW-2 HS/MSD					54	1											
7	1/25	DUP-092817					43	1											
8	1/26	EQUIP BLANK					3	1											
Please Sign																			
Released By: [Signature]					Received By: Fed Ex					Date: 9/28/12					Time: 1200				
Released By: [Signature]					Received By: Fed Ex					Date: 9/28/12					Time: 1200				

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SAMPLE LOG IN CHECKLIST

#1

Trace ID #: T171537 Date: 9-24-17 Package Description: Cooler Temperature: 0A
 Client Name: AECOM Time: 15:03 Logged in by: G/J

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 #: 770874337685
 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
 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 N/A

Cooler Temperature
Correction Factors: • Digital Stick Thermometer CF = -0.6°C
 • IR Thermometer CF = -0.4°C G/J 9-24-17
 Representative Sample Temperature: 28.08 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____

Lot: HC563733 verified 6/21/16 AY
 Lot: HC547328 verified 04/03/17 JS

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SAMPLE LOG IN CHECKLIST

#2

Trace ID #: T171537 Date: 9-24-17 Package Description: Cooler Temperature: -0.6
 Client Name: AFCOM Time: 15:03 Logged in by: GA

Cooler Receipt

Cooler/samples delivered by: Trace courier Hand delivered Commercial courier Name of delivery person: _____
 UPS FED EX US Mail
 Tracking Number: Not Applicable Tracking #: 770774337614
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.6°C
 •IR Thermometer CF = -0.4°C
 Representative Sample Temperature: 1.2 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC563733 pH 11.0-13.0 Lot: HC547328
 Other: _____

Lot: HC563733 verified 6/21/16 AY
 Lot: HC547461 verified 04/03/17 JS

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



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

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,

A handwritten signature in black ink that reads "Holly Florea". The signature is written in a cursive style.

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



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Case Narrative

WO#: 17100130
Date: 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.

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>

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



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Analytical Report

(consolidated)

WO#: **17100130**

Date Reported: **10/24/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I537
Lab ID: 17100130-001
Client Sample ID T17I537-01

Collection Date: 9/28/2017 10:30:00 AM

Matrix: AQUEOUS

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 10:26:00 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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17100130

Date Reported: 10/24/2017

CLIENT: Trace Analytical Laboratories, Inc. **Collection Date:** 9/28/2017 11:25:00 AM
Project: T17I537
Lab ID: 17100130-002 **Matrix:** AQUEOUS
Client Sample ID T17I537-02

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 10:26:00 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 PM
Yield	1.00					1	10/23/2017 3:46:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17100130**

Date Reported: **10/24/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I537
Lab ID: 17100130-003
Client Sample ID T17I537-03

Collection Date: 9/28/2017 12:25:00 PM
Matrix: AQUEOUS

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	± 0.14	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	± 0.37	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17100130**

Date Reported: **10/24/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I537
Lab ID: 17100130-004
Client Sample ID T17I537-04

Collection Date: 9/28/2017 1:38:00 PM

Matrix: AQUEOUS

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	± 0.15	1	10/24/2017 10:26:00 AM
Yield	1.00					1	10/24/2017 10:26:00 AM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.44	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17100130

Date Reported: 10/24/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I537
Lab ID: 17100130-005
Client Sample ID T17I537-05

Collection Date: 9/28/2017 12:55:00 PM
Matrix: AQUEOUS

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	± 0.11	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17100130**

Date Reported: **10/24/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I537
Lab ID: 17100130-006
Client Sample ID T17I537-06

Collection Date: 9/28/2017

Matrix: AQUEOUS

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	± 0.08	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	1.16	1.00		pCi/L	± 0.4	1	10/23/2017 3:44:00 PM
Yield	1.00					1	10/23/2017 3:44:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17100130**

Date Reported: **10/24/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17I537
Lab ID: 17100130-007
Client Sample ID T17I537-07

Collection Date: 9/28/2017 2:00:00 PM

Matrix: AQUEOUS

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 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



Summit Environmental Technologies, Inc.
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QC SUMMARY REPORT

WO#: 17100130
 24-Oct-17

Client: Trace Analytical Laboratories, Inc.
Project: T17I537

BatchID: 29323

Sample ID	Ics-29323	SampType: LCS	TestCode: Radium-228_ Units: pCi/L				Prep Date: 10/20/2017		RunNo: 76386			
Client ID:	LCSW	Batch ID: 29323	TestNo: E904.0		E903-904	Analysis Date: 10/23/2017		SeqNo: 1301295				
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		3.57	1.00	5.000	0	71.4	70	130				
Yield		0.720			0	0						

Sample ID	17100130-002aMS	SampType: MS	TestCode: Radium-228_ Units: pCi/L				Prep Date: 10/20/2017		RunNo: 76386			
Client ID:	T17I537-02	Batch ID: 29323	TestNo: E904.0		E903-904	Analysis Date: 10/23/2017		SeqNo: 1301299				
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.19	1.00	5.000	0	83.7	70	130				
Yield		1.00			1.000	0						

Sample ID	MB-29323	SampType: MBLK	TestCode: Radium-228_ Units: pCi/L				Prep Date: 10/20/2017		RunNo: 76386			
Client ID:	PBW	Batch ID: 29323	TestNo: E904.0		E903-904	Analysis Date: 10/23/2017		SeqNo: 1301319				
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						

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	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 Analytical Laboratories, Inc.
Project: T17I537

BatchID: 29323

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	ND	1.00									U
Yield	1.00										

Sample ID lcs-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 17100130-002aMS	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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

Original

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

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673



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

SUBCONTRACT ORDER
T171537

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

RECEIVING LABORATORY:
Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, OH 44223
Phone: (330) 253-8211
Fax: (330) 253-4489

PO # 09292017552
Accounting Code: _____

Sample ID: T171537-01 **Aqueous** **Sampled: 09/28/17 10:30**
Subcontracted Work 10/06/17 15:00 09/28/18 10:30 Radium 226/228
Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T171537-02 **Aqueous** **Sampled: 09/28/17 11:25**
Subcontracted Work 10/06/17 15:00 09/28/18 11:25 Radium 226/228
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

Sample ID: T171537-03 **Aqueous** **Sampled: 09/28/17 12:25**
Subcontracted Work 10/06/17 15:00 09/28/18 12:25 Radium 226/228
Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T171537-04 **Aqueous** **Sampled: 09/28/17 13:38**
Subcontracted Work 10/06/17 15:00 09/28/18 13:38 Radium 226/228
Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T171537-05 **Aqueous** **Sampled: 09/28/17 12:55**
Subcontracted Work 10/06/17 15:00 09/28/18 12:55 Radium 226/228
Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

7100130-001-0075

Released By Trace King **Date** 9/29/17 @ 16:00 **Received By** [Signature] **Date** 10-3-17/10:00

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2873



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

SUBCONTRACT ORDER

T171537

Sample ID: T171537-06 Aqueous Sampled: 09/28/17 00:00

Subcontracted Work 10/06/17 15:00 09/28/18 00:00

Radium 226/228

Containers Supplied:
1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Sample ID: T171537-07 Aqueous Sampled: 09/28/17 14:00

Subcontracted Work 10/06/17 15:00 09/28/18 14:00

Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Trace
7500-160-08100151
9/29/17 @ 16:00

Released By

Date

Received By

Date

Released By

Date

Received By

Date

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

Figure 1 – Summit Environmental Technologies, Inc.
 Cooler Receipt Form, Page 1

Client: Trace Initials of person inspecting cooler and samples: AMPB
 Date Received: 10-3-17 Time Received: 1250 Order Number: 171080
 Number of Coolers/Boxes: 1 Date cooler(s) opened and samples inspected: 10-3-17
 N/A

Shipper: Fed Ex (DPS) DHL Airborne US Postal Walk-in Pickup Other: _____
 Packaging: Peanuts Bubble Wrap Paper Foam None Other: _____
 Tape on cooler/box: (Y) N N/A

Custody Seals intact Y N N (N/A)
 C-O-C in plastic (Y) N N/A

Ice Blue ice _____ present absent melted (N/A)
 Cooler Temperature IR Gun #16020459 CF 2.0 C Temp 6.3 °C N/A

Radiological Testing Instrument serial #35127 (Y) 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 (Y) N N/A
 Samples in separate bags Y N (N) N/A
 Sample containers intact* (Y) N N/A
 *If no, list broken sample(s): _____

Sample label(s) complete (ID, date, etc.)	<u>(Y)</u>	N	N/A
Label(s) agree with C-O-C	<u>(Y)</u>	N	N/A
Correct containers used	<u>(Y)</u>	N	N/A
Sufficient sample received	<u>(Y)</u>	N	N/A
Sufficient sample for QC	<u>(Y)</u>	N	N/A
Samples received within holding time	<u>(Y)</u>	N	N/A
Do any 40 mL vials contain bubbles**	<u>Y</u>	N	<u>(N/A)</u>
**Samples with bubbles 56mm are acceptable. Indicate bubble size if >6mm:			
Was client contacted about samples	<u>Y</u>	N	
Will client send new samples	<u>Y</u>	N	
Client contact: _____			

Date/Time: _____
 Logged in by: _____
 Comments: _____

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		30	
2		2		9	
3		2		8	
4		2		16	
5		2		21	
6		2		24	
7		2		16	
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

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



Data Validation Report

Project:	Marquette Board of Light and Power (MBLP) Project	
Laboratory:	Trace Analytical Laboratories and Summit Environmental Technologies	
Work Order:	T17J162	
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: 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; Lab Dup for TDS	5-Oct-17	T17J162-01
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 (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (X) 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.

Analyte	Units	Sample Result	Field Duplicate 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,

A handwritten signature in black ink, appearing to read "Jon Mink".

Jon Mink
Senior Project Manager
Enclosures



NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: T17J162
Client Project ID: 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
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: T072457-MSD1

Analysis: EPA 6010B

Calcium 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.

Analysis: EPA 6020

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

pH 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

pH 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

pH 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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pH

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

Trace ID: T17J162-05

Analysis: SM 4500-H+ B-11

pH

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

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ANALYTICAL RESULTS

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-01 Date Collected: 10/05/17 09:30 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072526

Mercury	<0.00020	mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
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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	N	

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	N	
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 Date Collected: 10/05/17 09:30 Matrix: Ground Water
 Sample ID: MW-1 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	820	mg/L	40	4	10/06/17	nm	10/09/17	nm		
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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 Date Collected: 10/05/17 11:30 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 10/06/17 11:31

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		
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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	N	

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	N	
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 Date Collected: 10/05/17 11:30 Matrix: Ground Water
 Sample ID: MW-2 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	310	mg/L	40	4	10/06/17	nm	10/09/17	nm		
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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 Date Collected: 10/05/17 12:15 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072526

Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
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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	N	

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	N	
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 Date Collected: 10/05/17 12:15 Matrix: Ground Water
 Sample ID: MW-3 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	350 mg/L	40	4	10/06/17	nm	10/09/17	nm		
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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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ANALYTICAL RESULTS

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-04 Date Collected: 10/05/17 14:00 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072526

Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
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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	N	

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	N	
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 Date Collected: 10/05/17 14:00 Matrix: Ground Water
 Sample ID: MW-4 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	1100 mg/L	40	4	10/06/17	nm	10/09/17	nm		
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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 Date Collected: 10/05/17 14:40 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072526

Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
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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	N	

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	N	
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 Date Collected: 10/05/17 14:40 Matrix: Ground Water
 Sample ID: MW-5 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	700 mg/L	40	4	10/06/17	nm	10/09/17	nm		
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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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ANALYTICAL RESULTS

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-06 Date Collected: 10/05/17 Matrix: Ground Water
 Sample ID: Dup-100517 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072526

Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
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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	N	

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	N	
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

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-06 Date Collected: 10/05/17 Matrix: Ground Water
 Sample ID: Dup-100517 Date Received: 10/06/17 11:31

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	880	mg/L	40	4	10/06/17	nm	10/09/17	nm		
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ANALYTICAL RESULTS

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

Trace ID: T17J162-07 Date Collected: 10/05/17 14:00 Matrix: Aqueous
 Sample ID: Equipment Blank Date Received: 10/06/17 11:31

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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METALS, TOTAL

Analysis Method: EPA 7470A
 Batch: T072526

Mercury	<0.00020 mg/L	0.00020	1	10/11/17	nws	10/12/17	nws		
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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	N	

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	N	
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

Trace Project ID: T17J162
Client Project ID: MBLP CCR 60546383

Trace ID:	T17J162-07	Date Collected:	10/05/17 14:00	Matrix:	Aqueous
Sample ID:	Equipment Blank	Date Received:	10/06/17 11:31		

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
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WET CHEMISTRY

Total Dissolved Solids	18 mg/L	10	1	10/11/17	nm	10/12/17	nm		
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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 CONTROL SAMPLE: T072526-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00204	102	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T072526-MSD1

Original: T17J162-01

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	Analysis Description: Barium, Total
QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids	Analysis Method: EPA 6010B

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 DUPLICATE: T072457-MSD1

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

Analysis Description: Antimony, Total

QC Batch Method: EPA 3015 Microwave Assisted Digestions for Liquids

Analysis Method: EPA 6020

METHOD BLANK: T072457-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: 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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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T072457-MSD1

Original: T17J162-01

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	0.0569	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	
Lead	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	
Thallium	mg/L	0	0.0556	0.0563	0.0551	101	99	75-125	2	20	

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

QC Batch: T071726
 QC Batch Method: EPA 200.2

Analysis Description: Metals Digestion
 Analysis Method: EPA 200.2

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

QC Batch: T072469
 QC Batch Method: IC Prep W

Analysis Description: Sulfate
 Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T072469-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: T072469-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % 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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MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T072469-MSD1

Original: T17J162-01

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	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 SPIKE DUPLICATE: T072469-MSD2

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	

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

QC Batch: T072491	Analysis Description: Fluoride
QC Batch Method: IC Prep W	Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T072491-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: T072491-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	1.00	<10	94	90-110	
Fluoride	mg/L	0.500	0.461	92	90-110	
Sulfate as SO4	mg/L	2.50	2.41	96	90-110	

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

QC Batch: T072440	Analysis Description: Total Dissolved Solids
QC Batch Method: SM 2540 C-11	Analysis Method: SM 2540 C-11

METHOD BLANK: T072440-BLK1

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

LABORATORY CONTROL SAMPLE: T072440-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
-----------	-------	-------------	------------	-----------	-------------	-------

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 Muskegon, MI 49444-2673



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

LABORATORY CONTROL SAMPLE: T072440-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	515	507	98	80-120	

SAMPLE DUPLICATE: T072440-DUP1

Original: T17J162-01

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	816	892	9	10	

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

QC Batch: T072544

Analysis Description: Total Dissolved Solids

QC Batch Method: SM 2540 C-11

Analysis Method: SM 2540 C-11

METHOD BLANK: T072544-BLK1

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

LABORATORY CONTROL SAMPLE: T072544-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	527	556	106	80-120	

Trace Project ID: T17J162
 Client Project ID: MBLP CCR 60546383

QC Batch: T072307

Analysis Description: pH, SM 4500

QC Batch Method: *** DEFAULT PREP ***

Analysis Method: SM 4500-H+ B-11

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Page 1 of 1

Trace ID No.
 T17J162

Report Results To:

Company Name: **AECOM**

Report To: **LANCE LIMBERG**

Mailing Address: **1830 WILSON ST**

City, State, Zip Code: **MUSKEGON MI 49865**

Office Phone: _____ Cell Phone: _____

Email Address: _____

Bill To:

PO # **60546383**

Contact Name: _____

Billing Address (if different): _____

City, State, Zip Code: _____

Phone Number: _____

Billing Email Address: _____

Trace Use:

Logged By: **ES**

Checked By: **EL**

Soil Volatiles Preserved (circle if applicable):

MeOH Low Level Lab

Sampling Time: _____

Turnaround Requirements:

- Standard
- 48 Hour*
- 4 Day*
- 24 Hour*
- 3 Day*

- Matrix Key:
- S = Soil / Solid
 - W = Water
 - SL = Sludge
 - OI = Oil
 - WI = Wipes
 - LW = Liquid Waste
 - A = Air
 - D = Drinking Water

* Requires Prior Approval

Trace No.	Date Collected	Time Collected	Client Sample ID	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation							Analysis Requested	Remarks	Possible Health Hazards?				
							Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other								
1	10/5/17	6:30	MW-1			1	W	4	3	1										
2	11/30	11:30	MW-2			1	W	4	3	1										
3	12/5	12:15	MW-3			1	W	4	3	1										
4	1/40	14:00	MW-4			1	W	4	3	1										
5	1/40	14:40	MW-5			1	W	4	3	1										
1	1	08:30	MW-1 MS/MSD			1	W	4	3	1										
6	1	-	DUP-100517			1	W	4	3	1										
		14:00	EQUIPMENT BLACK			1	W	4	3	1										

Please Sign

Released By: <i>[Signature]</i>	Received By: <i>[Signature]</i>	Date: 10/5/17	Time: 17:00	Released By: <i>[Signature]</i>	Received By: <i>[Signature]</i>	Date: 10/6/17	Time: 11:31
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TRACE

ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Trace Analytical Laboratories, Inc.
 2241 Black Creek Road
 Muskegon, MI 49444-2673

Phone 231.773.5998
 Fax 888.979.4469
 www.trace-labs.com

Report Results To:

Bill To: PO # 60546383

Trace Use:

Logged By: IK

Checked By: G11

Soil Vials Preserved (circle if applicable):

Mech Low Level Lab

Sampling Time:

Company Name: **MECON**
 Report To: **LANCE LIMBERS**
 Mailing Address: **1820 WILSON ST**
 City, State, Zip Code: **MARQUETTE, MI 49855**
 Office Phone: Cell Phone: Billing Email Address:
 Email Address:

Turnaround Requirements:
 Standard 48 Hour
 4 Day* 24 Hour
 3 Day*
 *Requires Prior Approval

Matrix Key:
 S = Soil / Solid
 W = Water
 LW = Liquid Waste
 A = Air
 D = Drinking Water
 Sl = Sludge
 OI = Oil

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation							Analysis Requested	Remarks	Possible Health Hazards?
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other				
	10/5/17	0930	MW-1	LL/MS			1										
		1130	MW-2				1										
		1215	MW-3				1										
		1400	MW-4				1										
		1440	MW-5				1										
		0930	MW-1 MS/MSB				1										
		-	DUP-10AS12				1										
7	1400		EQUIPMENT BLANK				1										

Please Sign
 Released By: [Signature] Received By: Fed Ex Date: 10/5/17 Time: 1700
 Released By: [Signature] Received By: Fed Ex Date: 10/11/17 Time: 16:36

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 received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17J162 Date: 10/6/17 Package Description: Coden Temperature: -0.9
 Client Name: AECOM Time: 11:31 Logged in by: JS

Cooler Receipt

Cooler/samples delivered by: Trace courier Hand delivered Commercial courier Name of delivery person: _____
 UPS FED EX US Mail

Tracking Number: Not Applicable
 Tracking #: 7704 3138 9855

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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.2°C
 •IR Thermometer CF = -0.5°C
 Representative Sample Temperature: 1.4 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC573059 pH 11.0-13.0 Lot: HC547328
 Other: _____

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17J162 Date: 10/10/17 Package Description: Cooler Temperature: -0.9
 Client Name: AECOM Time: 10:36 Logged in by: JS

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 #: 7704 5225 9126
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.2°C
 •IR Thermometer CF = -0.5°C
 Representative Sample Temperature: 2.3 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC573059 pH 11.0-13.0 Lot: HC547328
 Other: _____

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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,

A handwritten signature in black ink that reads "Jon Mink". The signature is written in a cursive style with a large initial "J" and "M".

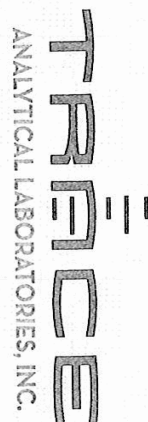
Jon Mink
Senior Project Manager

Enclosures



NJDEP Accreditation No. MI008

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 Muskegon, MI 49444-2673

Phone 231.773.5998
 Fax 888.979.4469
 www.trace-labs.com

Trace ID No.
117J162

Report Results To:

Company Name: **RECOM**

Report To: **LANCE LINDBERG**

Mailing Address: **1330 WILSON ST**

City, State, Zip Code: **MARQUETTE, MI 49866**

Office Phone:

Email Address:

Bill To: PO #: **60546383**

Contact Name:

Billing Address (if different):

City, State, Zip Code:

Phone Number:

Billing Email Address:

Trace Use:

Logged By: **SE**

Checked By: **EP**

Soil Volatiles Preserved (circle if applicable):

MeOH Low Level Lab

Sampling Time:

Turnaround Requirements:

- Standard
- 48 Hour
- 4 Day
- 24 Hour
- 3 Day
- * Requires Prior Approval

Matrix Key:

- S = Soil / Solid
- W = Water
- SL = Sludge
- OI = Oil
- WI = Wipes
- LW = Liquid Waste
- A = Air
- D = Drinking Water

Trace No.	Date Collected	Time Collected	Client Sample ID	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation						Analysis Requested	Remarks	Possible Health Hazards?			
							Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other						
1	10/5/17	0930	MW-1		W	4												
2		1130	MW-2		W	4												
3		1215	MW-3		W	4												
4		1400	MW-4		W	4												
5		1440	MW-5		W	4												
6		0830	MW-1 MS/MSD		W	5												
		-	DUP-100512		W	4												
		1400	EQUIPMENT BLANK		W	4												

Please Sign

Released By: *[Signature]*

Received By: *[Signature]*

Date: 10/5/17 Time: 1700

Released By: *[Signature]*

Received By: *[Signature]*

Date: 10/6/17 Time: 11:31

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TRACE

ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Trace Analytical Laboratories, Inc.
 2241 Black Creek Road
 Muskegon, MI 49444-2673

Phone 231.773.5998
 Fax 888.979.4469
 www.trace-labs.com

Report Results To:

Bill To:

Company Name: **RECON**

PO #: **60546383**

Report To: **LANCE LINDERS**

Contact Name:

Mailing Address: **1820 WILSON ST**

Billing Address (if different):

City, State, Zip Code: **MARQUETTE, MI 49866**

City, State, Zip Code:

Office Phone:

Phone Number:

Email Address:

Billing Email Address:

Turnaround Requirements:

- Standard 48 Hour
 4 Day* 24 Hour
 3 Day* 3 Day*

Matrix Key:

- S = Soil / Solid W = Wipes
 W = Water LW = Liquid Waste
 SL = Sludge A = Air
 OI = Oil D = Drinking Water

Analysis Requested

Logged By: **JK**
 Checked By: **GJL**
 Soil Volatiles Preserved (circle if applicable):
 MeOH Low Level Lab
 Sampling Time:

Trace ID No. **1171162**

Page 1 of 1

Trace No.	Date Collected	Time Collected	Client Sample ID	Sampled By	Metals Field Filtered (Y/N)	Matrix	Number of Containers	Preservation							Remarks	Possible Health Hazards?	
								Cool	HCl	HNO ₃	H ₂ SO ₄	NaOH	Other				
	10/5/17	0930	MW-1			W	4										
		1130	MW-2			W	4										
		1215	MW-3			W	4										
		1400	MW-4			W	4										
		1440	MW-5			W	4										
		0930	MW-1 MS/MSD			W	5										
		-	DUP-100517			W	4										
		1400	EQUIPMENT BLANK			W	4										

Please Sign

Released By: <i>[Signature]</i>	Received By: <i>[Signature]</i>	Date: 10/5/17	Time: 1700	Released By: <i>[Signature]</i>	Date: 10/10/17	Time: 16:36
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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.

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17J162 Date: 10/6/17 Package Description: Coder Temperature: -0.9
 Client Name: AECOM Time: 11:31 Logged in by: JS

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 #: 7704 3138 9855
 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

<p>Type of Coolant Used</p> <p>Slurry w/ crushed, cubed, or chip ice? <input checked="" type="checkbox"/></p> <p>Multiple bags of ice around samples? <input type="checkbox"/></p> <p>Ice Packs/ Blue Ice : <input type="checkbox"/></p> <p>No Coolant Present: <input type="checkbox"/></p> <p>Ice still present upon receipt (circle one): <input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A</p>	<p>Cooler Temperature</p> <p>Correction Factors: •Digital Stick Thermometer CF = -0.2°C •IR Thermometer CF = -0.5°C</p> <p>Representative Sample Temperature: <u>1.4</u> °C (check one below) <input checked="" type="checkbox"/> Temp Blank (Stick Thermometer) <input type="checkbox"/> Client Sample (IR Thermometer)</p> <p>Melt Water: <u>none</u> °C (Use Digital Stick Thermometer)</p>
--	--

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC573059 pH 11.0-13.0 Lot: HC547328
 Other: _____

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SAMPLE LOG IN CHECKLIST

Trace ID #: T17J162 Date: 10/10/17 Package Description: Cooler Temperature: -0.9
 Client Name: AECOM Time: 10:36 Logged in by: JS

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 #: 7704 5225 9126
 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
 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 N/A

Cooler Temperature
 Correction Factors: •Digital Stick Thermometer CF = -0.2°C
 •IR Thermometer CF = -0.5°C
 Representative Sample Temperature: 2.3 °C (check one below)
 Temp Blank (Stick Thermometer)
 Client Sample (IR Thermometer)
 Melt Water: none °C (Use Digital Stick Thermometer)

General

	Yes	No	NA	Comments
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Each sample point is in a sealed plastic bag?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See Below*
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Notes:

***EMD pH Test Strips Used:**

pH 0-2.5 Lot: HC573059 pH 11.0-13.0 Lot: HC547328
 Other: _____

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

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,

A handwritten signature in black ink that reads 'Holly Florea'. The signature is written in a cursive style with a large 'H' and 'F'.

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



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Website: <http://www.settek.com>

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.



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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



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Analytical Report

(consolidated)

WO#: 17100766

Date Reported: 11/10/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17J162
Lab ID: 17100766-001
Client Sample ID T17J162-01

Collection Date: 10/5/2017 9:30:00 AM

Matrix: AQUEOUS

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	± 0.11	1	11/2/2017 4:25:00 PM
Yield	1.00					1	11/2/2017 4:25:00 PM
RADIUM-228 (EPA 904.0)					E904.0	E903-904	Analyst: BRD
Radium-228	ND	1.00		pCi/L	± 0.68	1	11/1/2017 3:44:00 PM
Yield	0.950					1	11/1/2017 3:44:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17100766

Date Reported: 11/10/2017

CLIENT: Trace Analytical Laboratories, Inc. **Collection Date:** 10/5/2017 11:30:00 AM
Project: T17J162
Lab ID: 17100766-002 **Matrix:** AQUEOUS
Client Sample ID T17J162-02

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	± 0.15	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		pCi/L	± 0.64	1	11/8/2017 3:39:00 PM
Yield	1.00					1	11/8/2017 3:39:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17100766

Date Reported: 11/10/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17J162
Lab ID: 17100766-003
Client Sample ID T17J162-03

Collection Date: 10/5/2017 12:15:00 PM
Matrix: AQUEOUS

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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17100766

Date Reported: 11/10/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17J162
Lab ID: 17100766-004
Client Sample ID T17J162-04

Collection Date: 10/5/2017 2:00:00 PM

Matrix: AQUEOUS

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	± 0.15	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17100766

Date Reported: 11/10/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17J162
Lab ID: 17100766-005
Client Sample ID T17J162-05

Collection Date: 10/5/2017 2:40:00 PM

Matrix: AQUEOUS

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	± 0.17	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: 17100766

Date Reported: 11/10/2017

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17J162
Lab ID: 17100766-006
Client Sample ID T17J162-06

Collection Date: 10/5/2017

Matrix: AQUEOUS

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	± 0.23	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	± 0.74	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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Analytical Report

(consolidated)

WO#: **17100766**

Date Reported: **11/10/2017**

CLIENT: Trace Analytical Laboratories, Inc.
Project: T17J162
Lab ID: 17100766-007
Client Sample ID T17J162-07

Collection Date: 10/5/2017 2:00:00 PM

Matrix: AQUEOUS

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	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.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit



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QC SUMMARY REPORT

WO#: 17100766
 10-Nov-17

Client: Trace Analytical Laboratories, Inc.

Project: T17J162

BatchID: 29465

Sample ID	lcs-29465	SampType: LCS	TestCode: Radium-228_ Units: pCi/L				Prep Date: 10/27/2017			RunNo: 76915		
Client ID:	LCSW	Batch ID: 29465	TestNo: E904.0		E903-904	Analysis Date: 11/1/2017			SeqNo: 1314132			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		3.63	1.00	5.000	0	72.7	70	130				
Yield		0.790			0	0						

Sample ID	lcsd-29465	SampType: LCSD	TestCode: Radium-228_ Units: pCi/L				Prep Date: 10/27/2017			RunNo: 76915		
Client ID:	LCSS02	Batch ID: 29465	TestNo: E904.0		E903-904	Analysis Date: 11/1/2017			SeqNo: 1314133			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.15	1.00	5.000	0	82.9	70	130	3.633	13.2	20	
Yield		0.700			0	0			0.7900	12.1		

Sample ID	17100766-001aMS	SampType: MS	TestCode: Radium-228_ Units: pCi/L				Prep Date: 10/27/2017			RunNo: 76915		
Client ID:	T17J162-01	Batch ID: 29465	TestNo: E904.0		E903-904	Analysis Date: 11/1/2017			SeqNo: 1314136			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228		4.97	1.00	5.000	0.8501	82.4	70	130				
Yield		1.00			0.9500	0						

Qualifiers:

* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits



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QC SUMMARY REPORT

WO#: 17100766
 10-Nov-17

Client: Trace Analytical Laboratories, Inc.
Project: T17J162

BatchID: 29465

Sample ID	MB-29465	SampType:	MBLK	TestCode:	Radium-228_	Units:	pCi/L	Prep Date:	10/27/2017	RunNo:	76915												
Client ID:	PBW	Batch ID:	29465	TestNo:	E904.0		E903-904	Analysis Date:	11/1/2017	SeqNo:	1314144												
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													

Qualifiers:	* Value exceeds Maximum Contaminant Level.	B Analyte detected in the associated Method Blank	E Value above quantitation range
	H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
	MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
	P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits



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QC SUMMARY REPORT

WO#: **17100766**
10-Nov-17

Client: Trace Analytical Laboratories, Inc.
Project: T17J162

BatchID: 29465

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		ND		1.00										U
Yield		1.00												

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	17100766-001aMS	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.	B Analyte detected in the associated Method Blank	E Value above quantitation range
H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits	M Manual Integration used to determine
MC Value is below Minimum Compound Limit.	ND Not Detected	O RSD is greater than RSDlimit
P Second column confirmation exceeds	PL Permit Limit	R RPD outside accepted recovery limits

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

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	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
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	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	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

Acronyms

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	Tentatively Identified Compound
CCB	Continuing Calibration Blank	RT	Retention Time
RLC	Reporting Limit Check	CF	Calibration Factor
DF	Dilution Factor	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.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673



231-773-5998 Phone
888-979-4489 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

RECEIVING LABORATORY:

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, OH 44223
Phone : (330) 253-8211
Fax: (330) 253-4489

PO # 10102017 JS1

Accounting Code: _____

17100766-001-0075

Sample ID: T17J162-01 Aqueous Sampled: 10/05/17 09:30

Subcontracted Work 10/13/17 15:00 10/05/18 09:30 Radium 226/228

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

Sample ID: T17J162-02 Aqueous Sampled: 10/05/17 11:30

Subcontracted Work 10/13/17 15:00 10/05/18 11:30 Radium 226/228

Containers Supplied:

1-PL1000 pH <2 w/ HNO 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/ HNO 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/ HNO 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:

1-PL1000 pH <2 w/ HNO 1-PL1000 pH <2 w/ HNO

Released By (Trace) JS1 Date 10/10/17 @ 16:00 Received By [Signature] Date 10/10/17 1010

Released By _____ Date _____ Received By _____ Date _____

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673



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/ HNO 1-PL1000 pH <2 w/ HNO

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/ HNO 1-PL1000 pH <2 w/ HNO

(Trace) [Signature] 10/10/17 @ 16:00

Released By Date Received By Date

Released By Date Received By Date

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

**Figure 1 – Summit Environmental Technologies, Inc.
 Cooler Receipt Form, Page 1**

Client: Trace Initials of person inspecting cooler and samples: ANB
 Order Number: 1710766

Date Received: 10-12-17 Time Received: 1010 Date cooler(s) opened and samples inspected: 10-12-17

Number of Coolers/Boxes: 1 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: Y N N/A

Custody Seals intact: Y N N/A

C-O-C in plastic: Y N N/A

Ice _____ Blue ice _____ present absent melted N/A

Cooler Temperature IR Gun #16020459 CF₂O °C Temp: 17.6°C N/A

Radiological Testing Instrument serial #35127 Y 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: Y N N/A

Samples in separate bags: Y N N/A

Sample containers intact*: Y N N/A

*If no, list broken sample(s): _____

Sample label(s) complete (ID, date, etc.): Y N N/A

Label(s) agree with C-O-C: Y N N/A

Correct containers used: Y N N/A

Sufficient sample received: Y N N/A

Sufficient sample for QC: Y N N/A

Samples received within holding time: Y N N/A

Do any 40 mL vials contain bubbles**: Y N N/A

**Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm: _____

Was client contacted about samples: Y N

Will client send new samples: Y N

Client contact: _____

Date/Time: _____

Logged in by: _____

Comments: _____

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	

P = Permanganate interference
 504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for Total chlorine
 552.2 checked for Free 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
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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
 - For detection frequency $\geq 50\%$, and data Lognormal in distribution, compute a Lognormal prediction limit
 - For detection frequency $\geq 50\%$, 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
 - 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 µg/L which exceeds the EPA GWPS of 15 µg/L. After the initial sampling event, all Total Lead results in MW-1 were nondetect. MW-2 had a Total Lead result of 240 µg/L for third sampling event which exceeds the EPA GWPS of 15 µg/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 µg/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

Parameter	Detection 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%
pH	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 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
Antimony	n	8	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

Parameter	N (detects)	Detection Frequency	G raw	G log	Critical 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 $G < \text{critical value}$

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

Parameter	Units	Model Type	n	Detect	\bar{x}	s	Prediction 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

Parameter	Units	Well	Date	Qualifier	Result	Prediction Limit	SSI
Boron, Total	mg/L	MW-1	7/19/2017	ND	0.300	0.300	
Boron, Total	mg/L	MW-1	7/24/2017	ND	0.300	0.300	
Boron, Total	mg/L	MW-1	8/23/2017	ND	0.300	0.300	
Boron, Total	mg/L	MW-1	8/29/2017	ND	0.300	0.300	
Boron, Total	mg/L	MW-1	9/6/2017	ND	0.300	0.300	
Boron, Total	mg/L	MW-1	9/14/2017	ND	0.300	0.300	
Boron, Total	mg/L	MW-1	9/28/2017		0.530	0.300	> PL
Boron, Total	mg/L	MW-1	10/5/2017	ND	0.300	0.300	
pH, Field	SU	MW-2	7/19/2017		8.41	6.76 - 7.93	> PL
pH, Field	SU	MW-2	7/24/2017		8.09	6.76 - 7.93	> PL
pH, Field	SU	MW-2	8/23/2017		8.13	6.76 - 7.93	> PL
pH, Field	SU	MW-2	8/29/2017		7.03	6.76 - 7.93	
pH, Field	SU	MW-2	9/6/2017		8.15	6.76 - 7.93	> PL
pH, Field	SU	MW-2	9/14/2017		8.13	6.76 - 7.93	> PL
pH, Field	SU	MW-2	9/28/2017		8.07	6.76 - 7.93	> PL
pH, Field	SU	MW-2	10/5/2017		7.99	6.76 - 7.93	> PL
pH, Field	SU	MW-3	7/19/2017		8.00	6.76 - 7.93	> PL
pH, Field	SU	MW-3	7/24/2017		7.86	6.76 - 7.93	
pH, Field	SU	MW-3	8/23/2017		7.81	6.76 - 7.93	
pH, Field	SU	MW-3	8/29/2017		6.32	6.76 - 7.93	
pH, Field	SU	MW-3	9/6/2017		7.77	6.76 - 7.93	
pH, Field	SU	MW-3	9/14/2017		7.85	6.76 - 7.93	
pH, Field	SU	MW-3	9/28/2017		8.09	6.76 - 7.93	> PL
pH, Field	SU	MW-3	10/5/2017		8.10	6.76 - 7.93	> PL

Notes:

>PL - results exceeds prediction limit; significantly increased over background

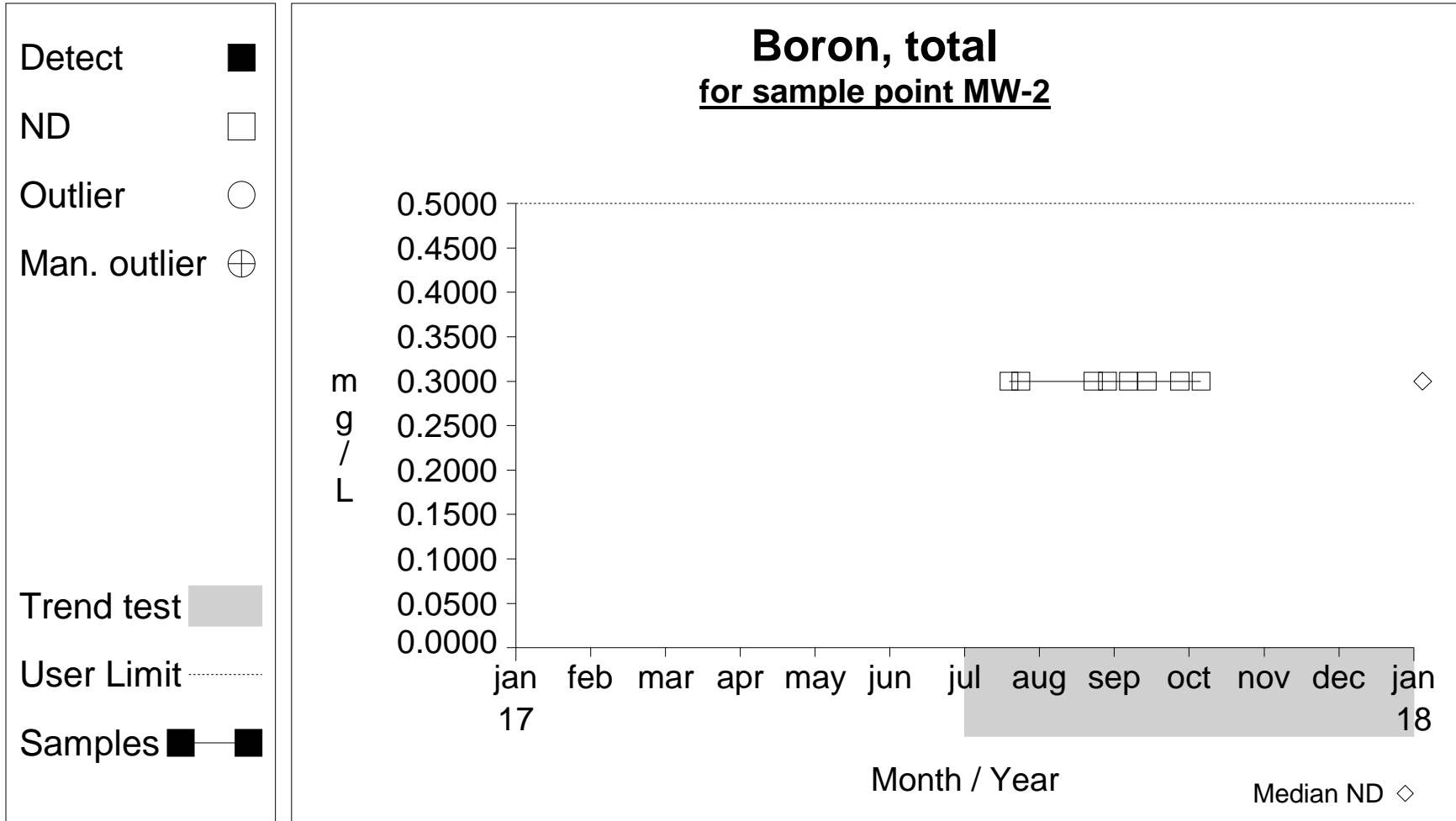
ND = not detected, result = detection limit

Time Series



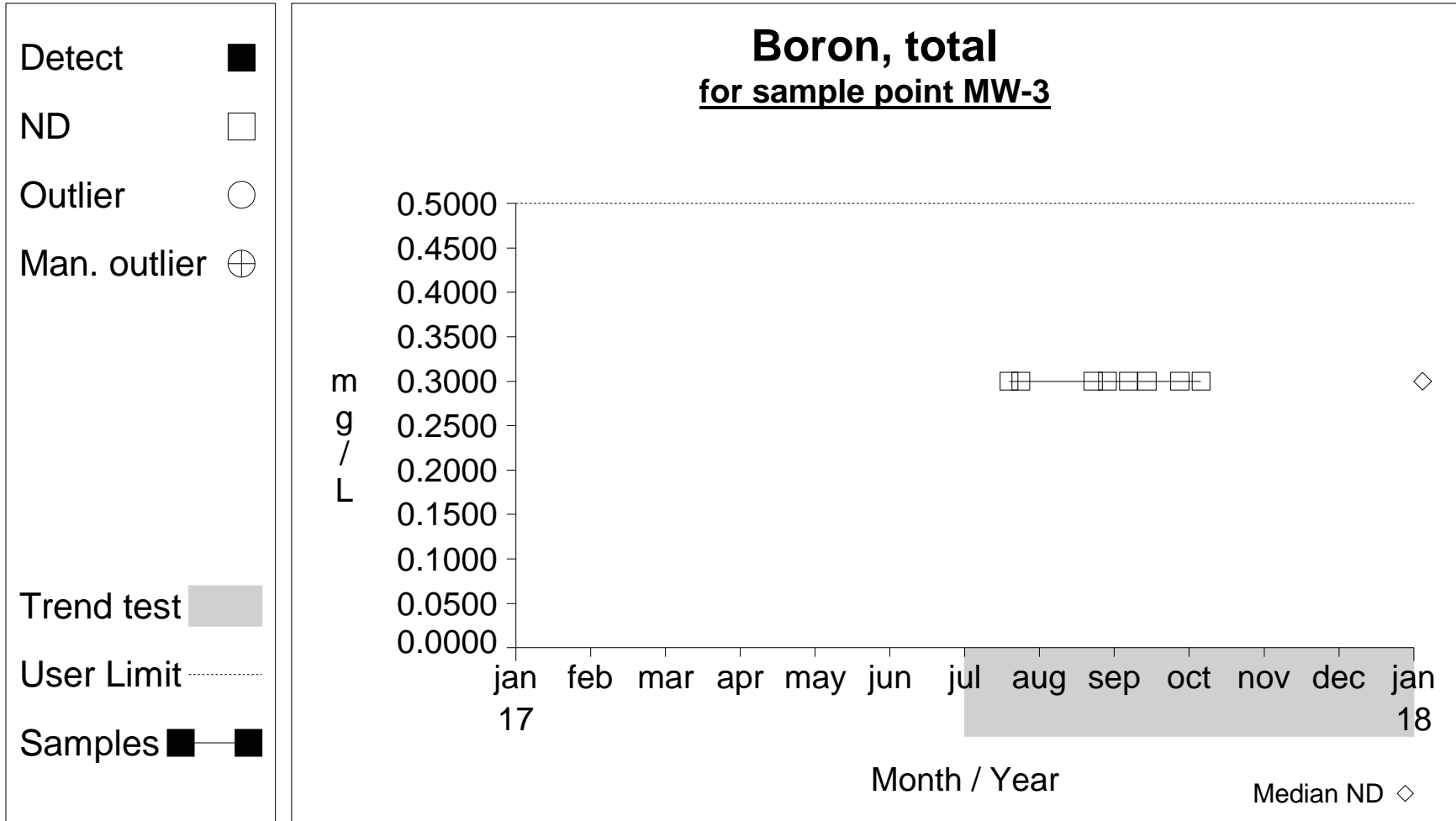
Graph 1

Time Series



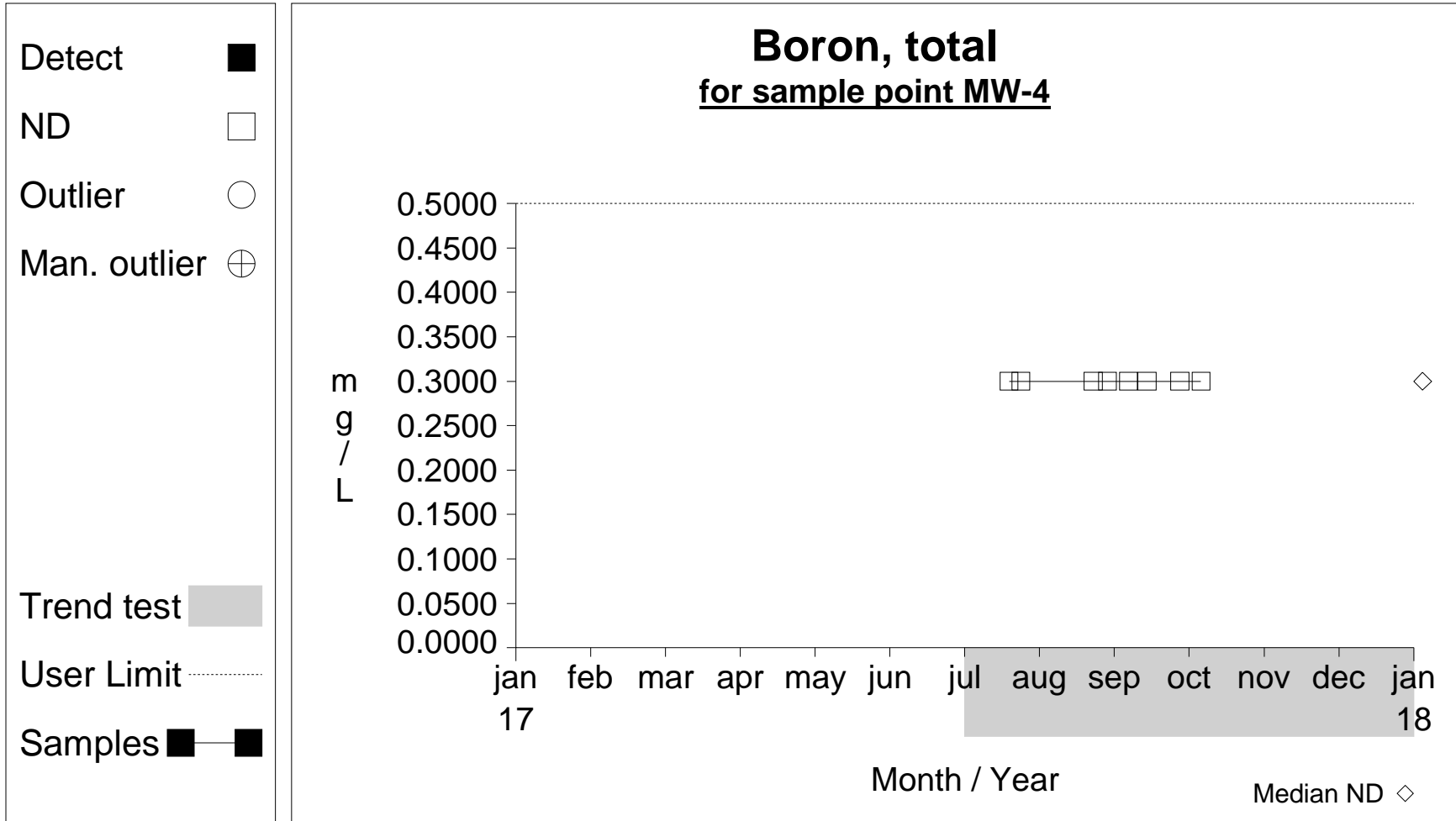
Graph 2

Time Series



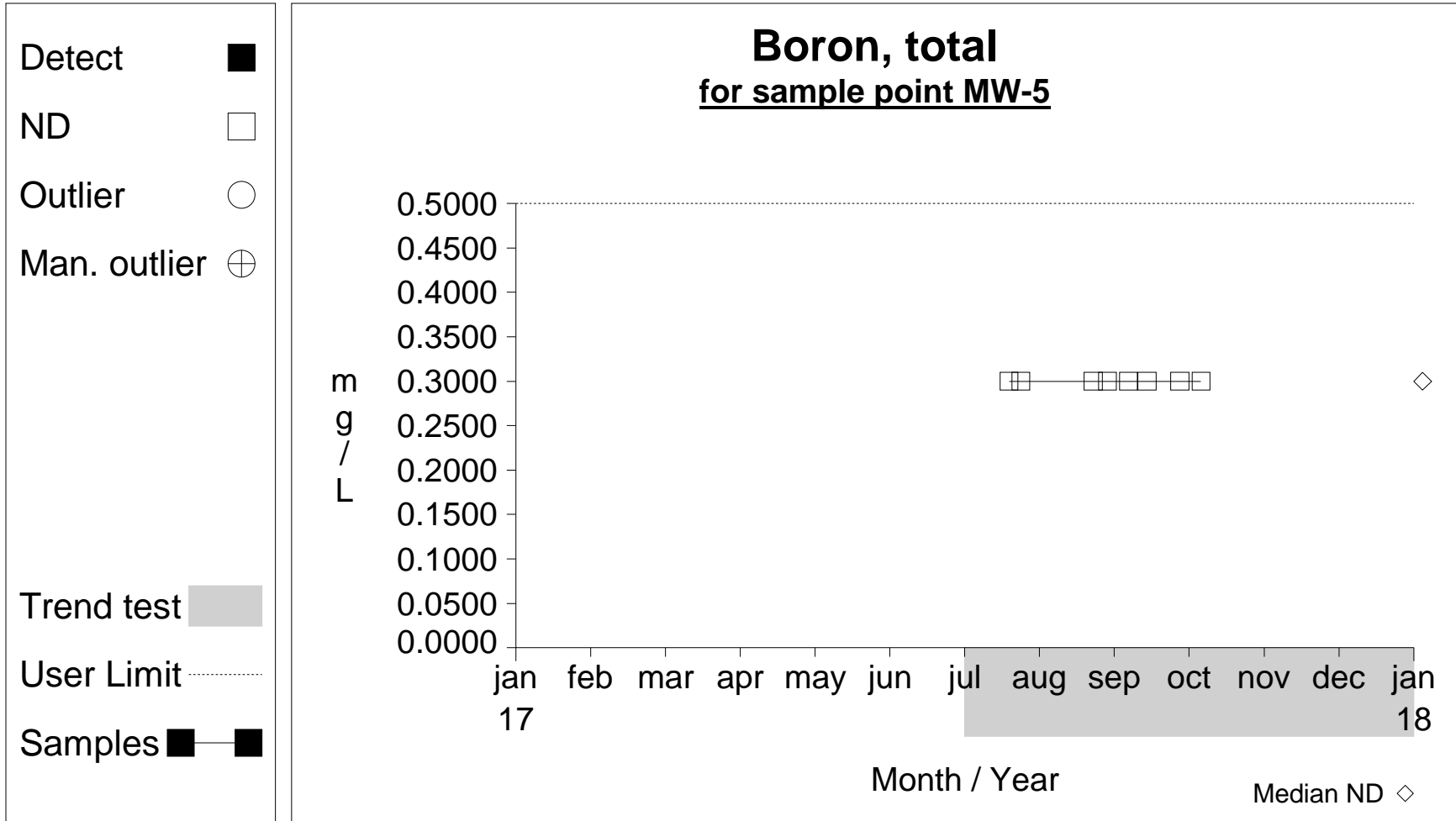
Graph 3

Time Series



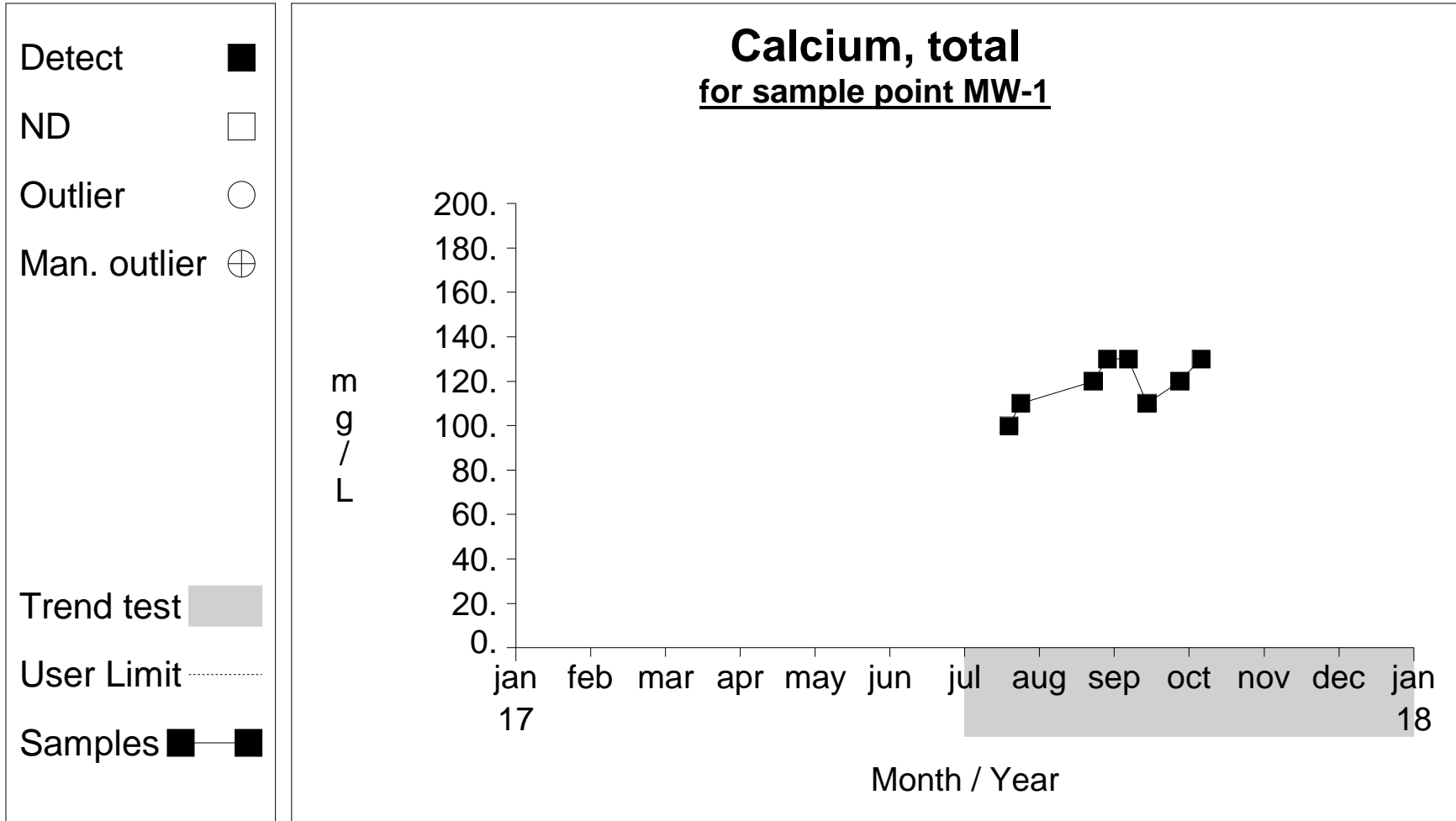
Graph 4

Time Series



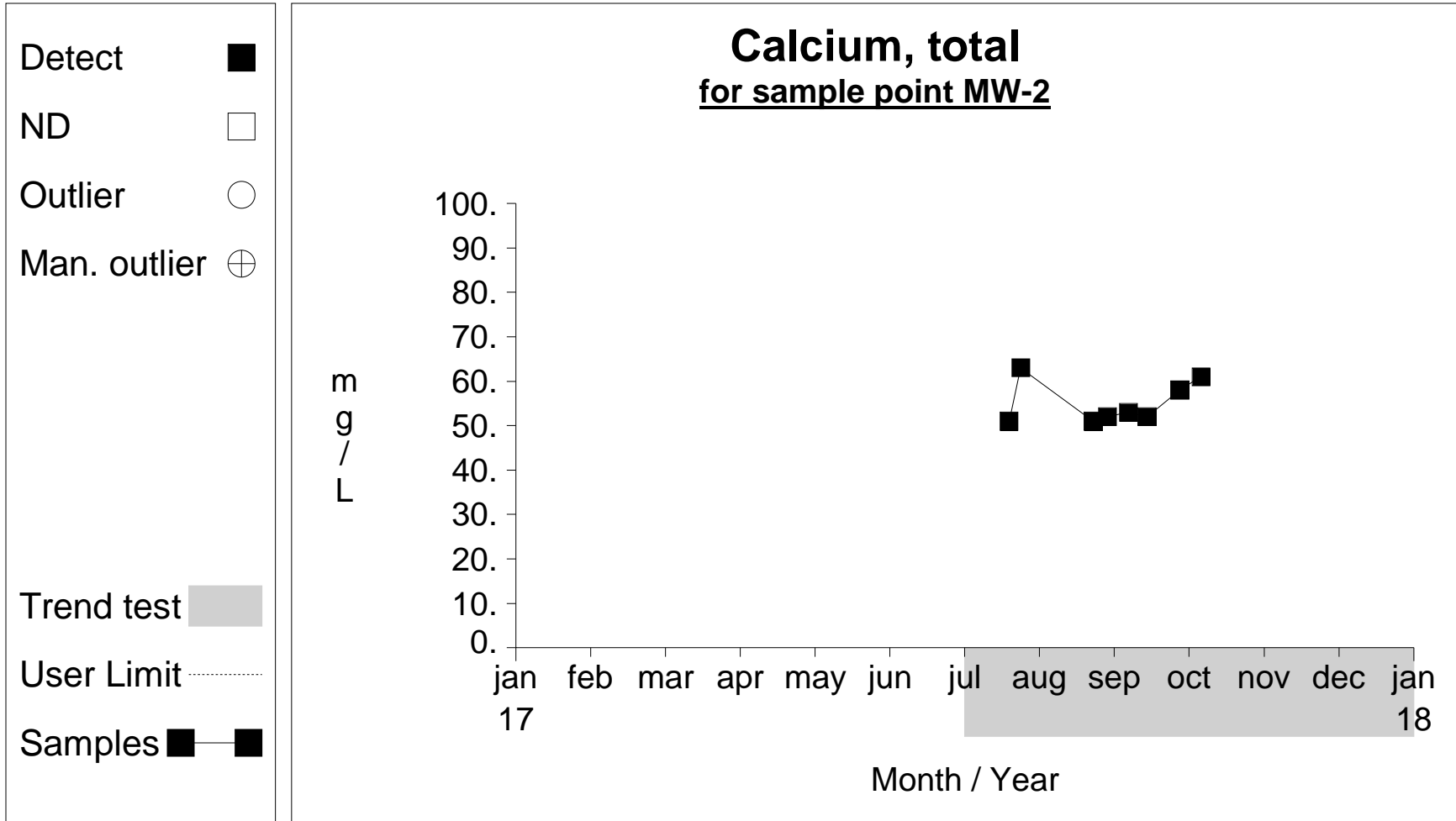
Graph 5

Time Series



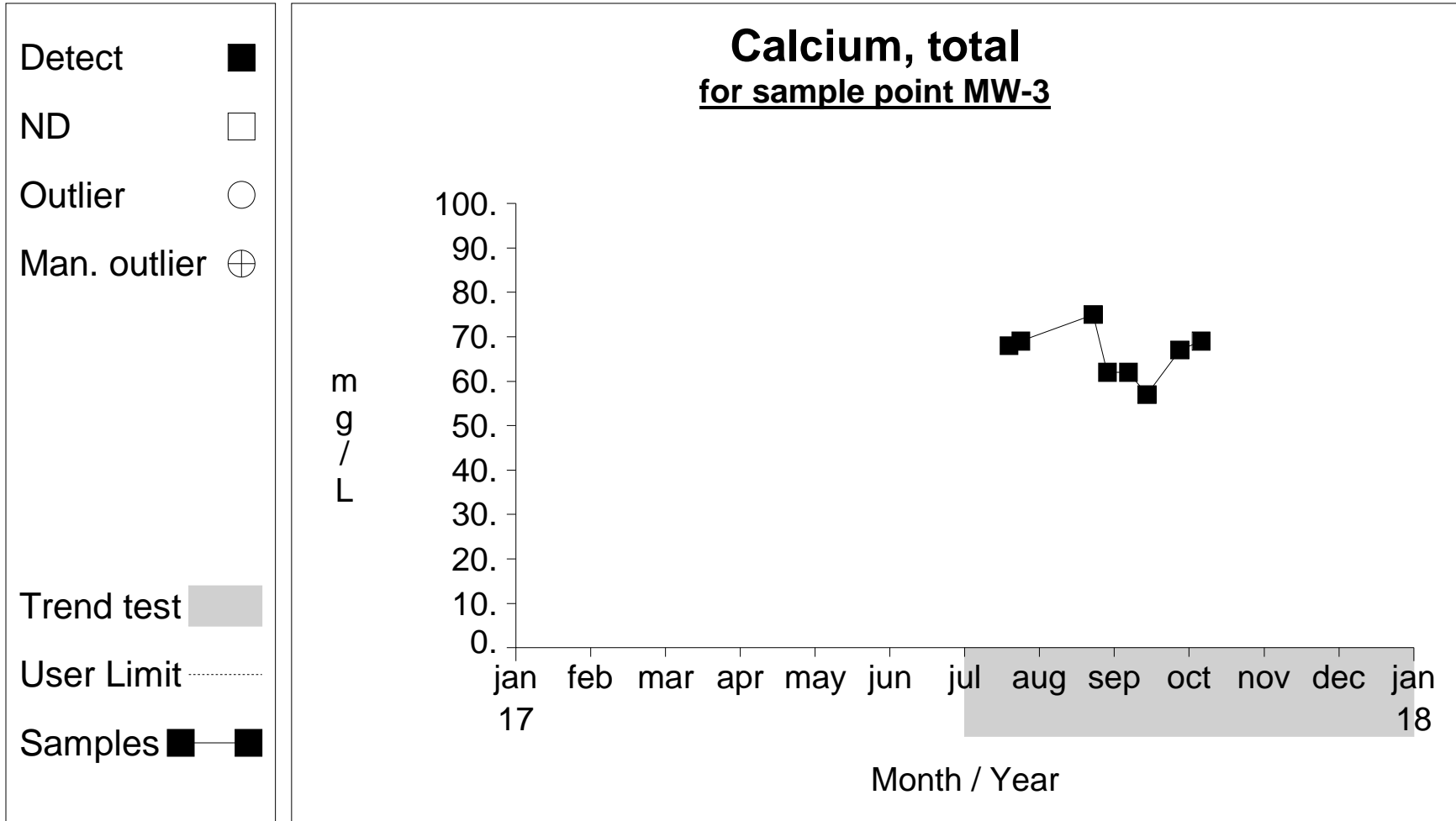
Graph 6

Time Series



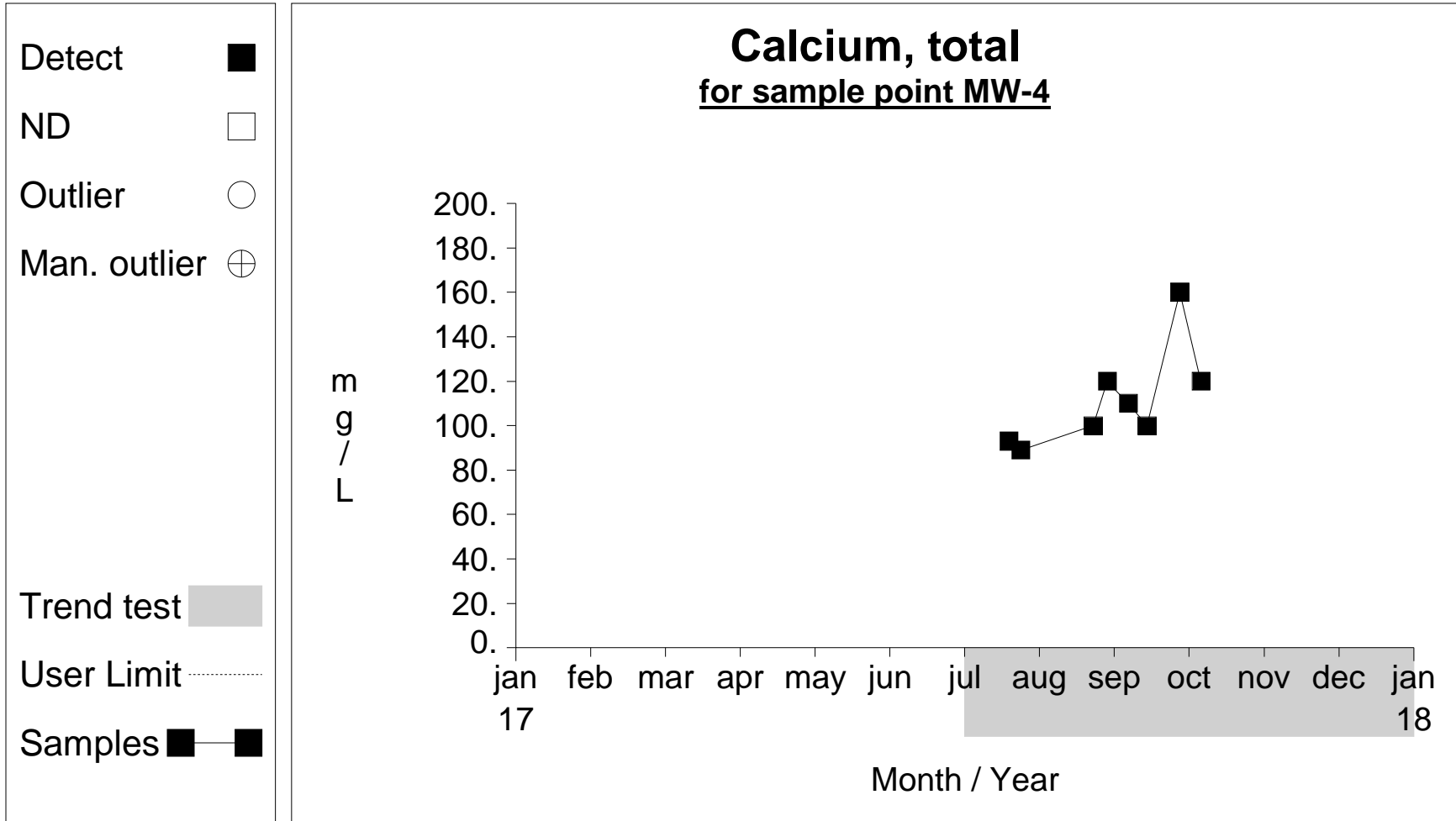
Graph 7

Time Series



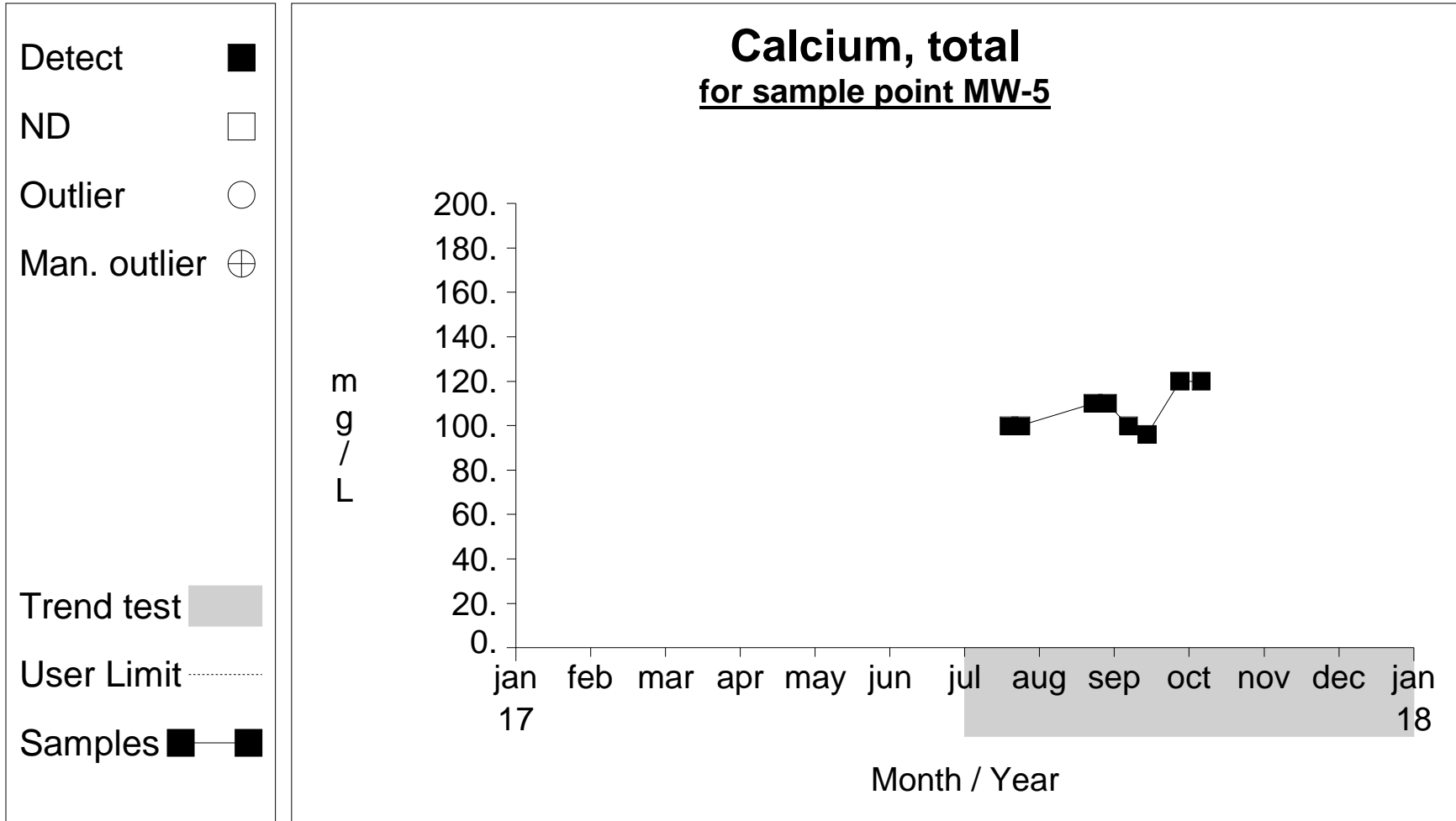
Graph 8

Time Series



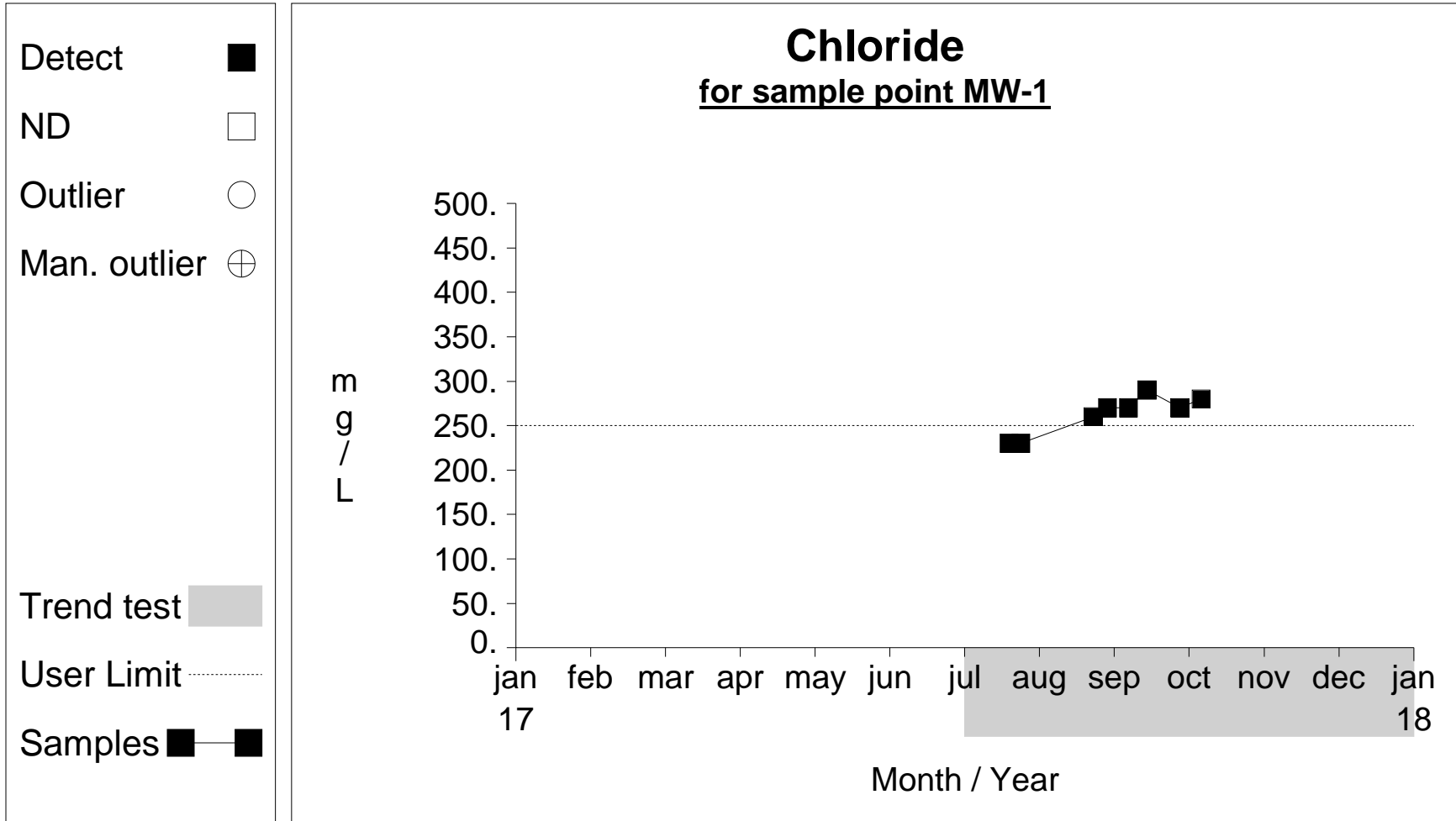
Graph 9

Time Series



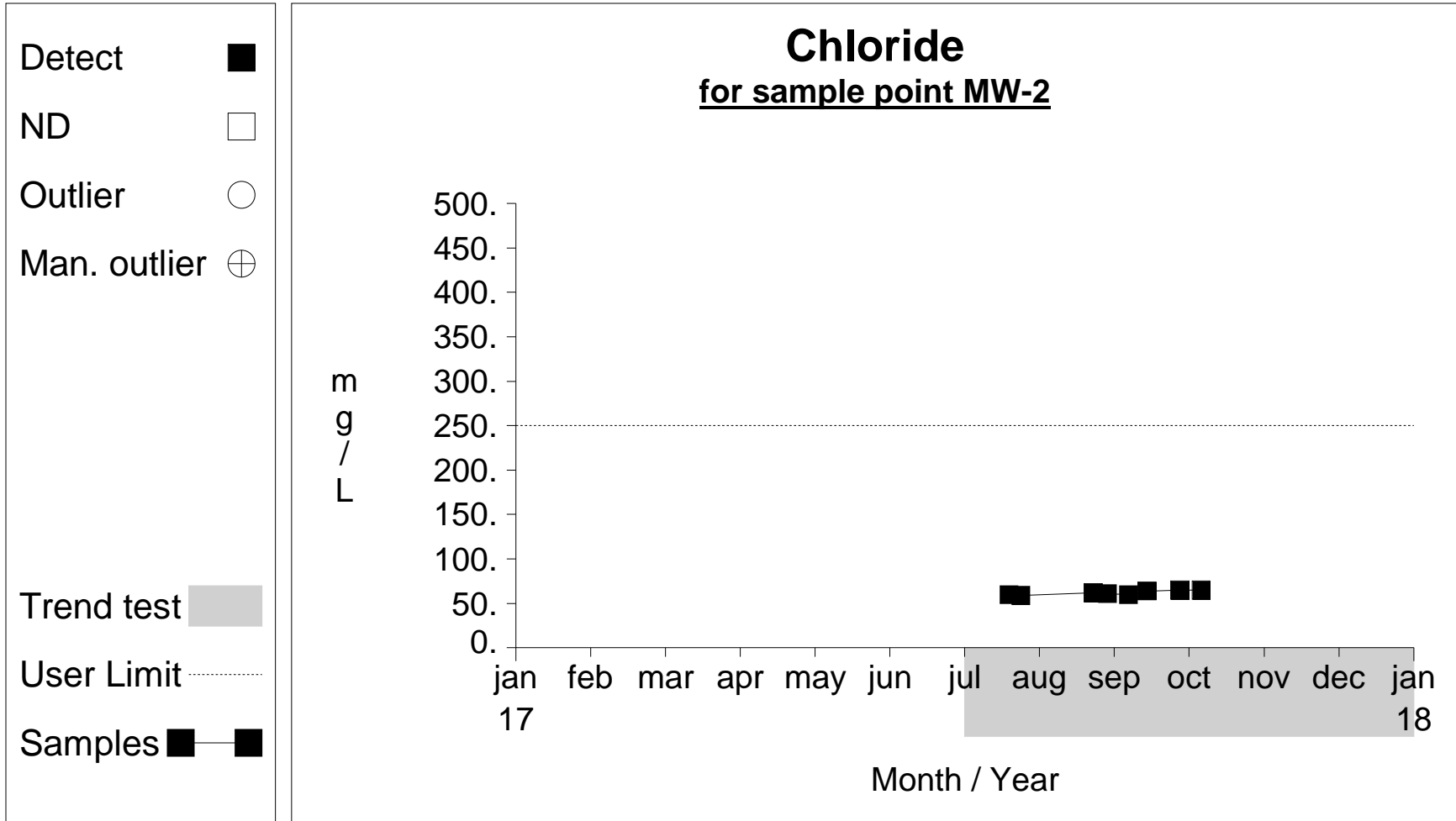
Graph 10

Time Series



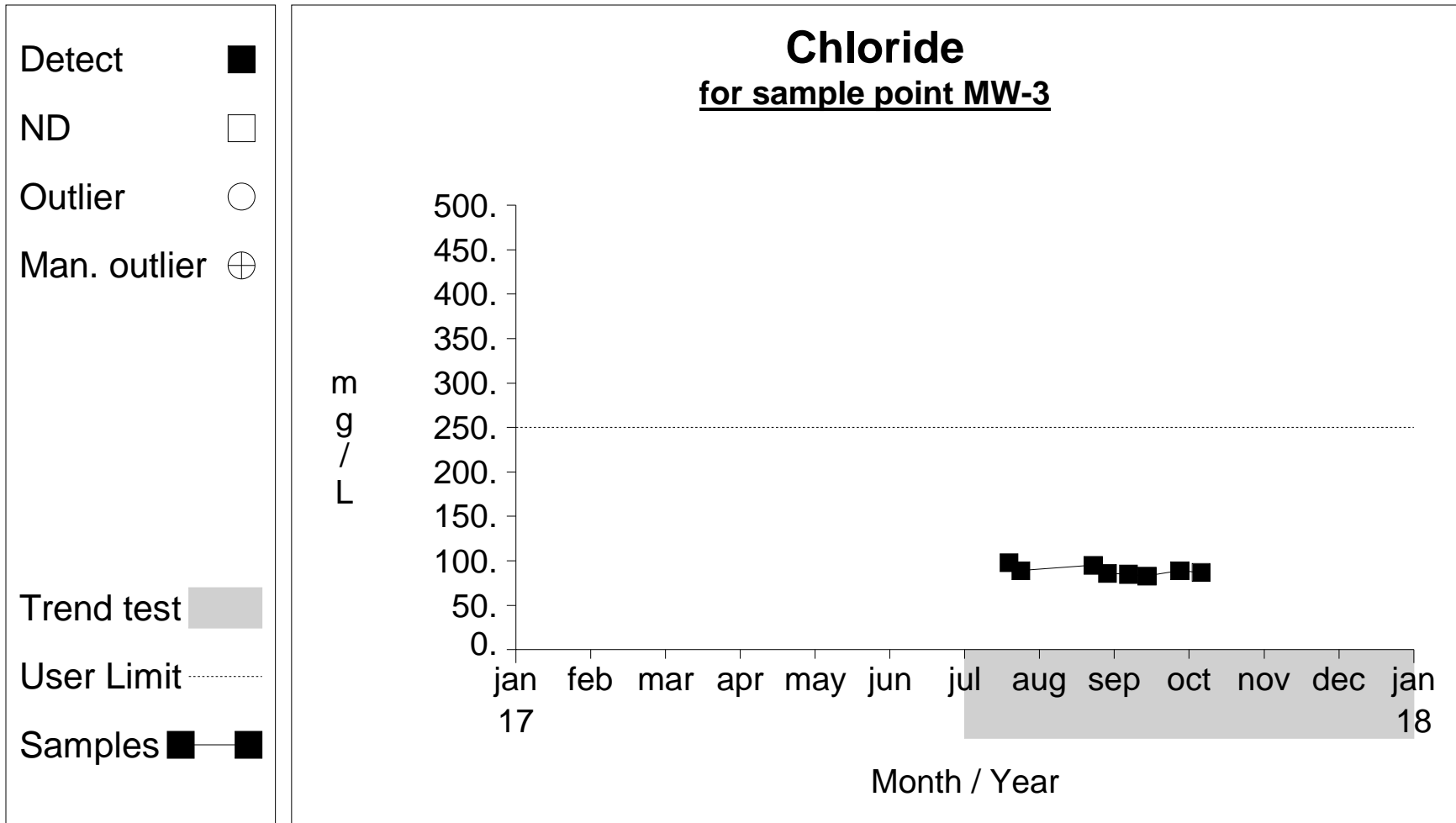
Graph 11

Time Series



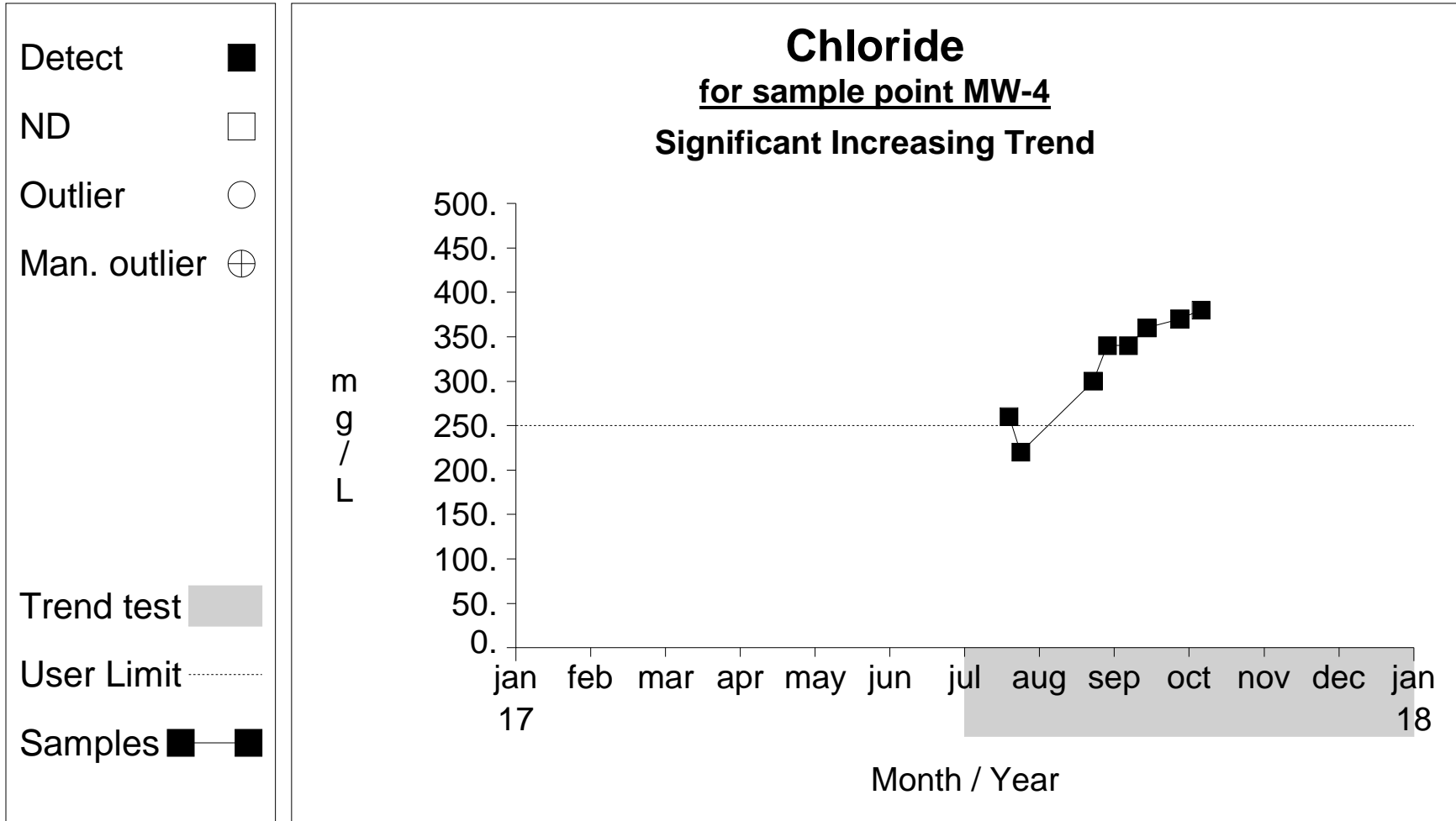
Graph 12

Time Series



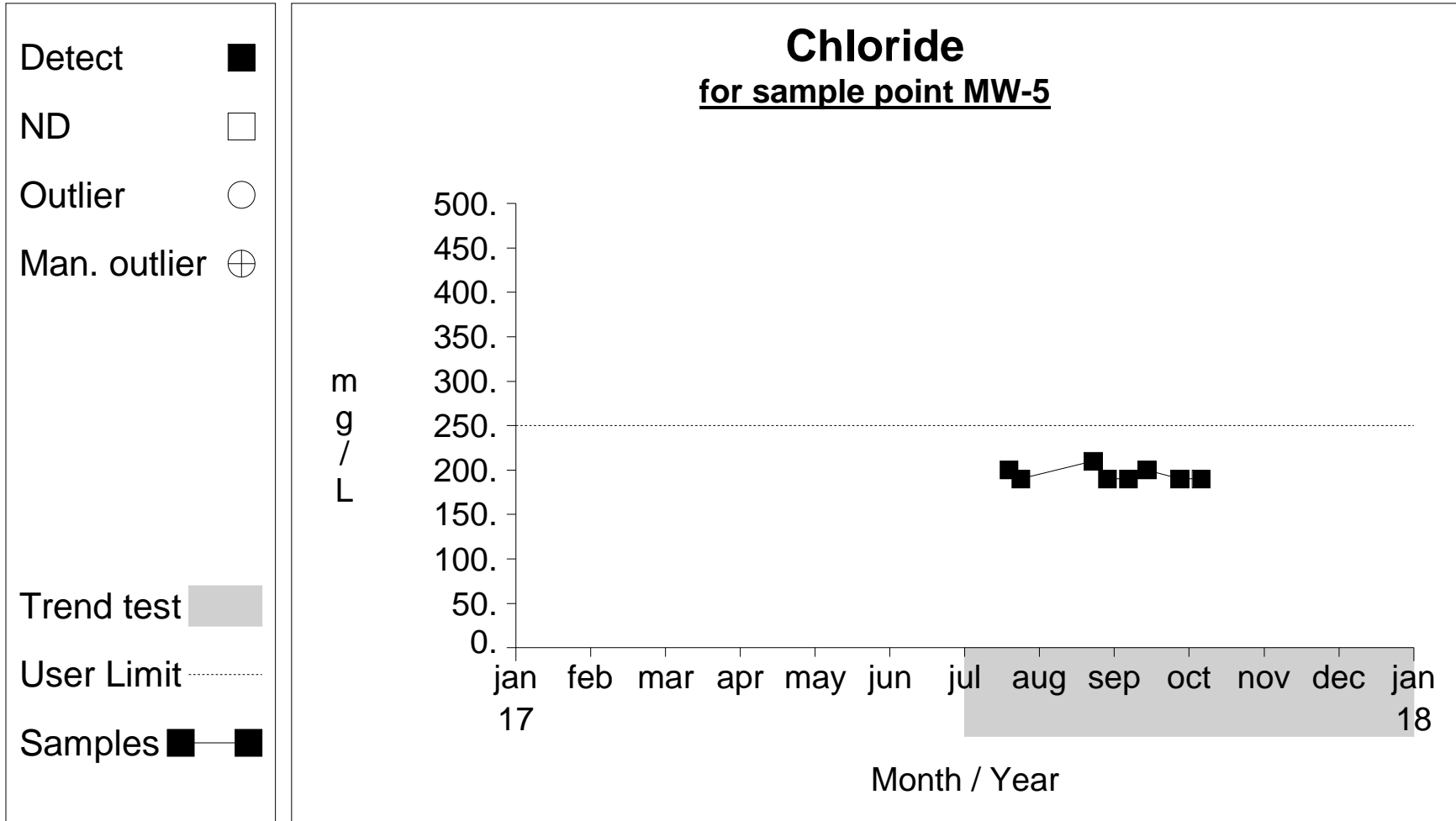
Graph 13

Time Series



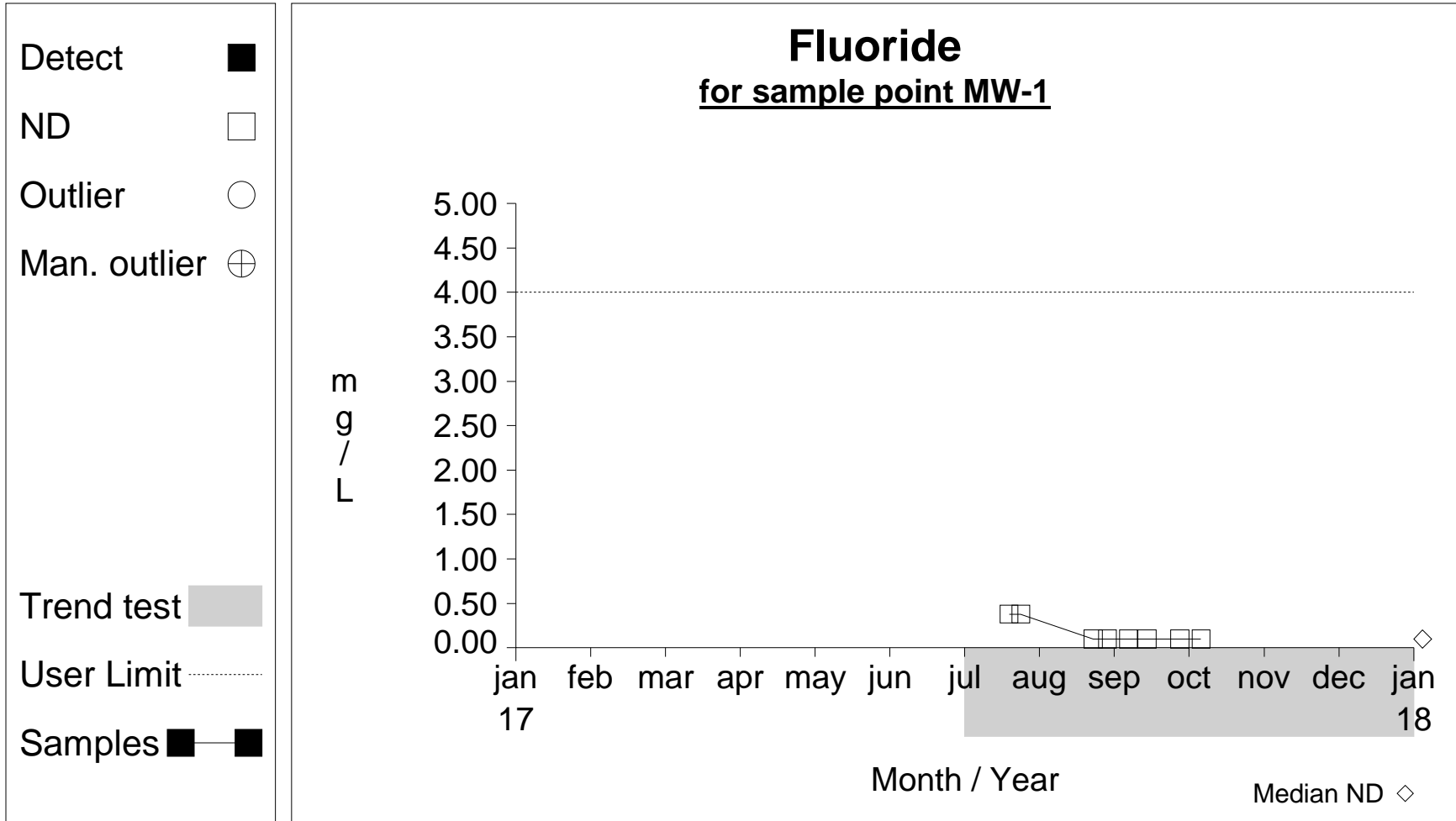
Graph 14

Time Series



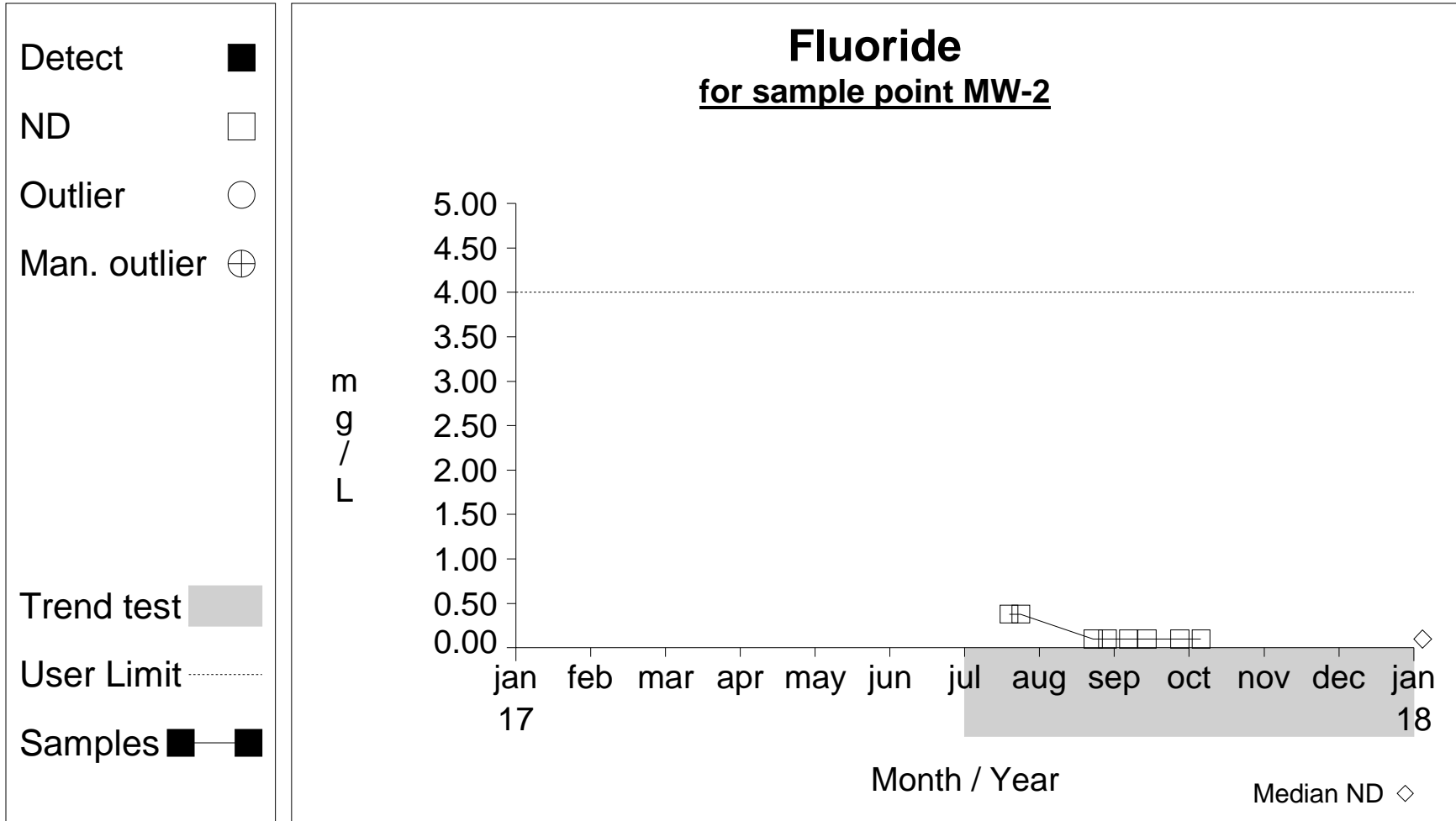
Graph 15

Time Series



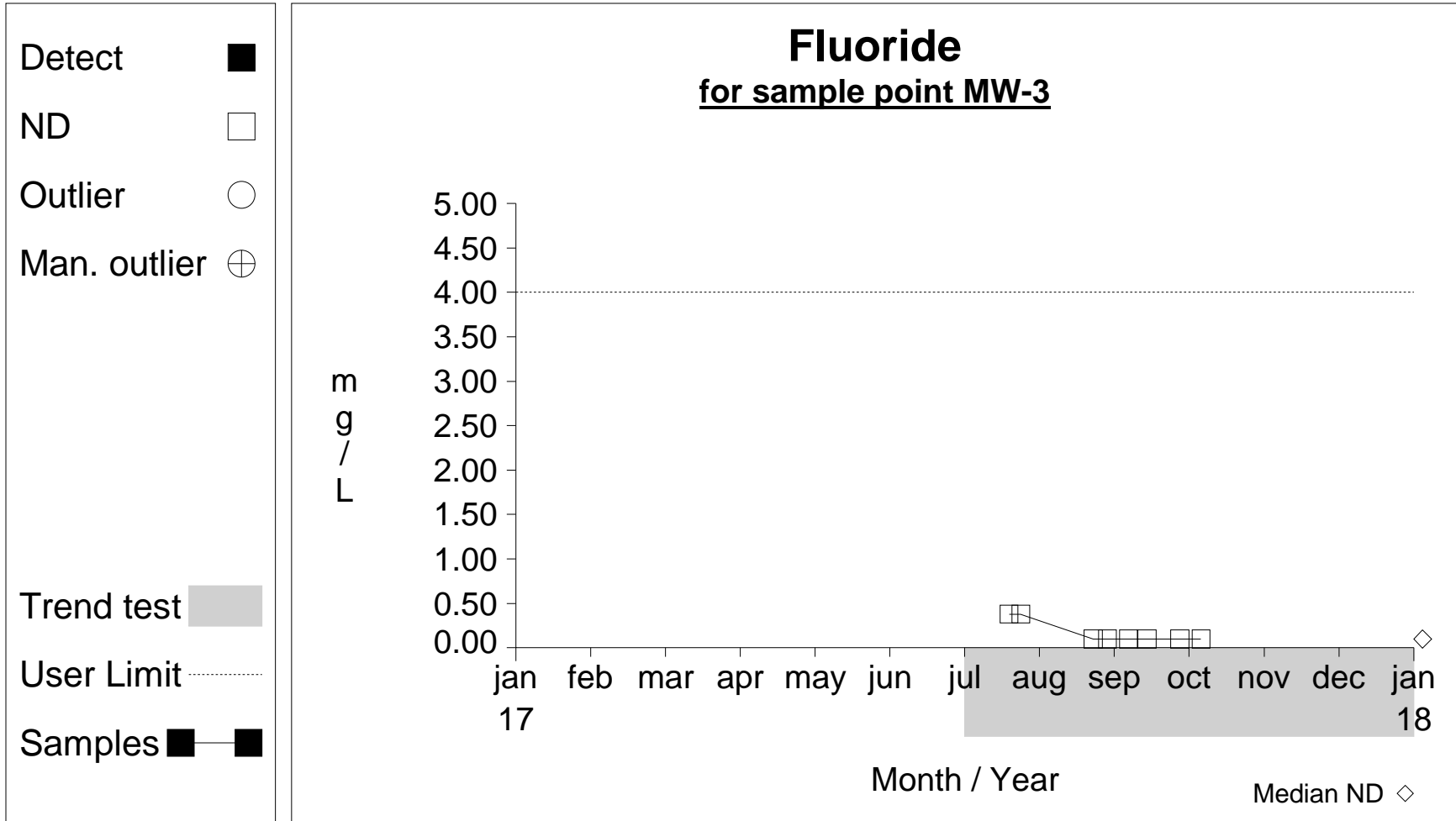
Graph 16

Time Series



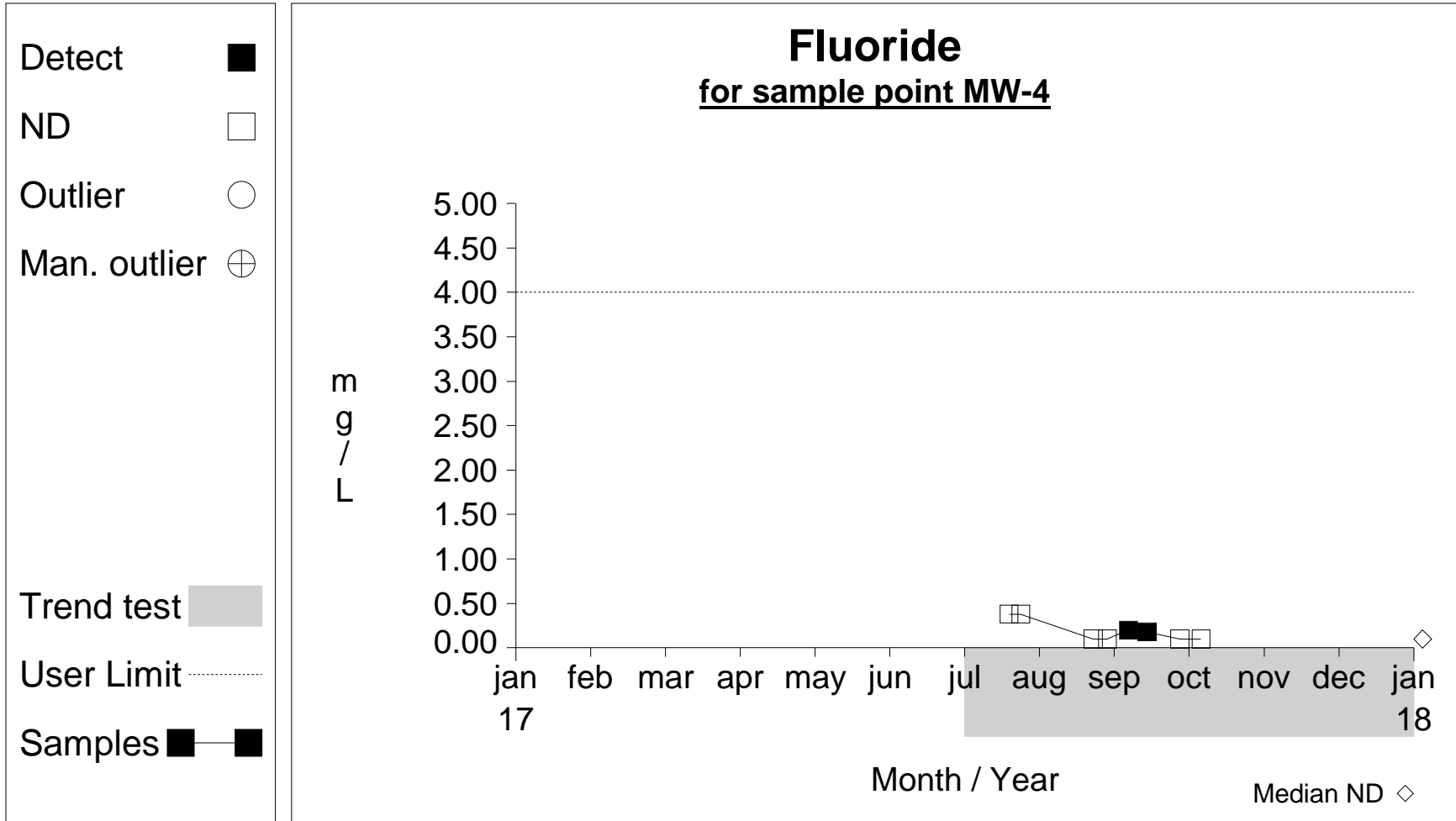
Graph 17

Time Series



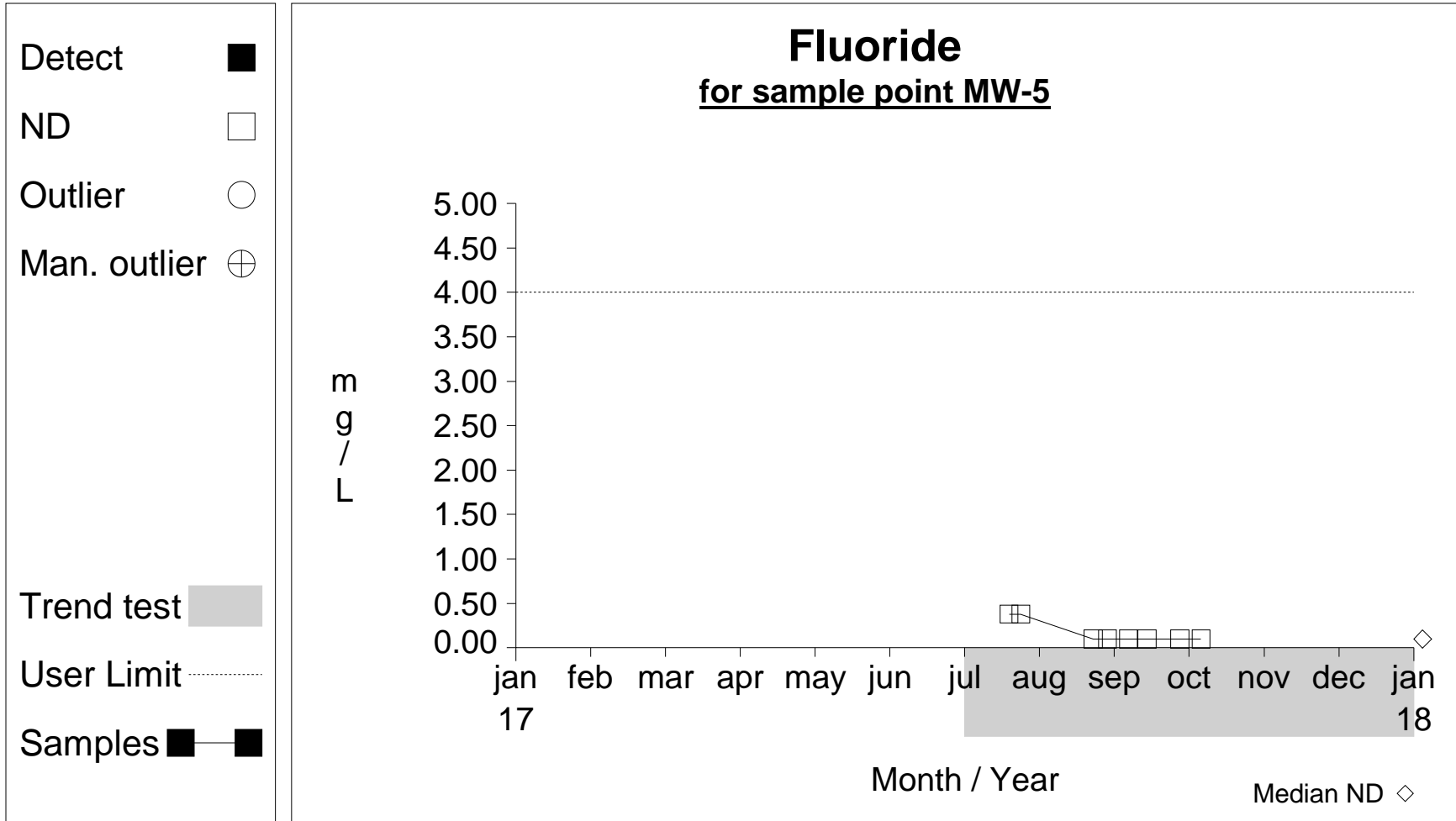
Graph 18

Time Series



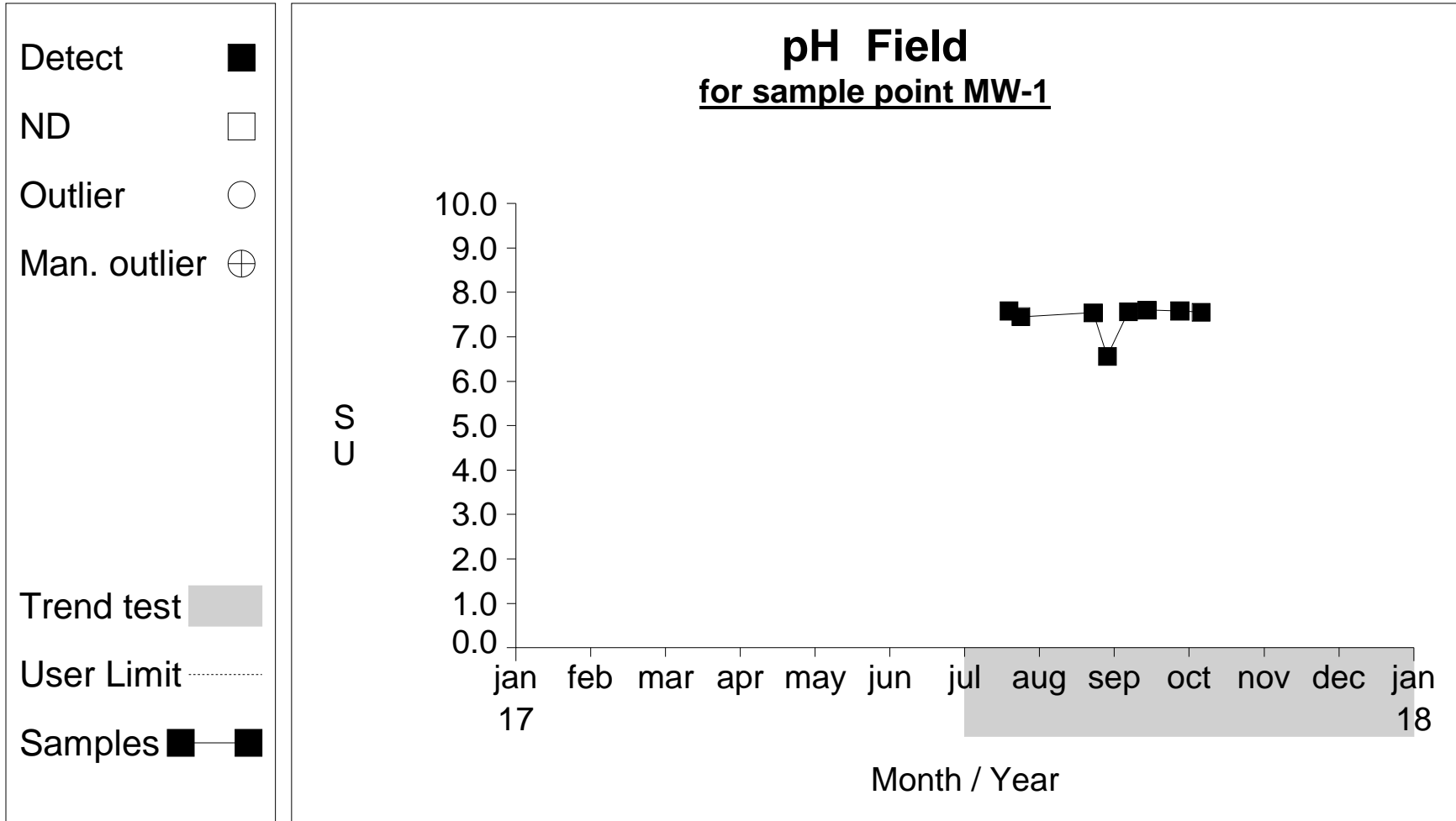
Graph 19

Time Series



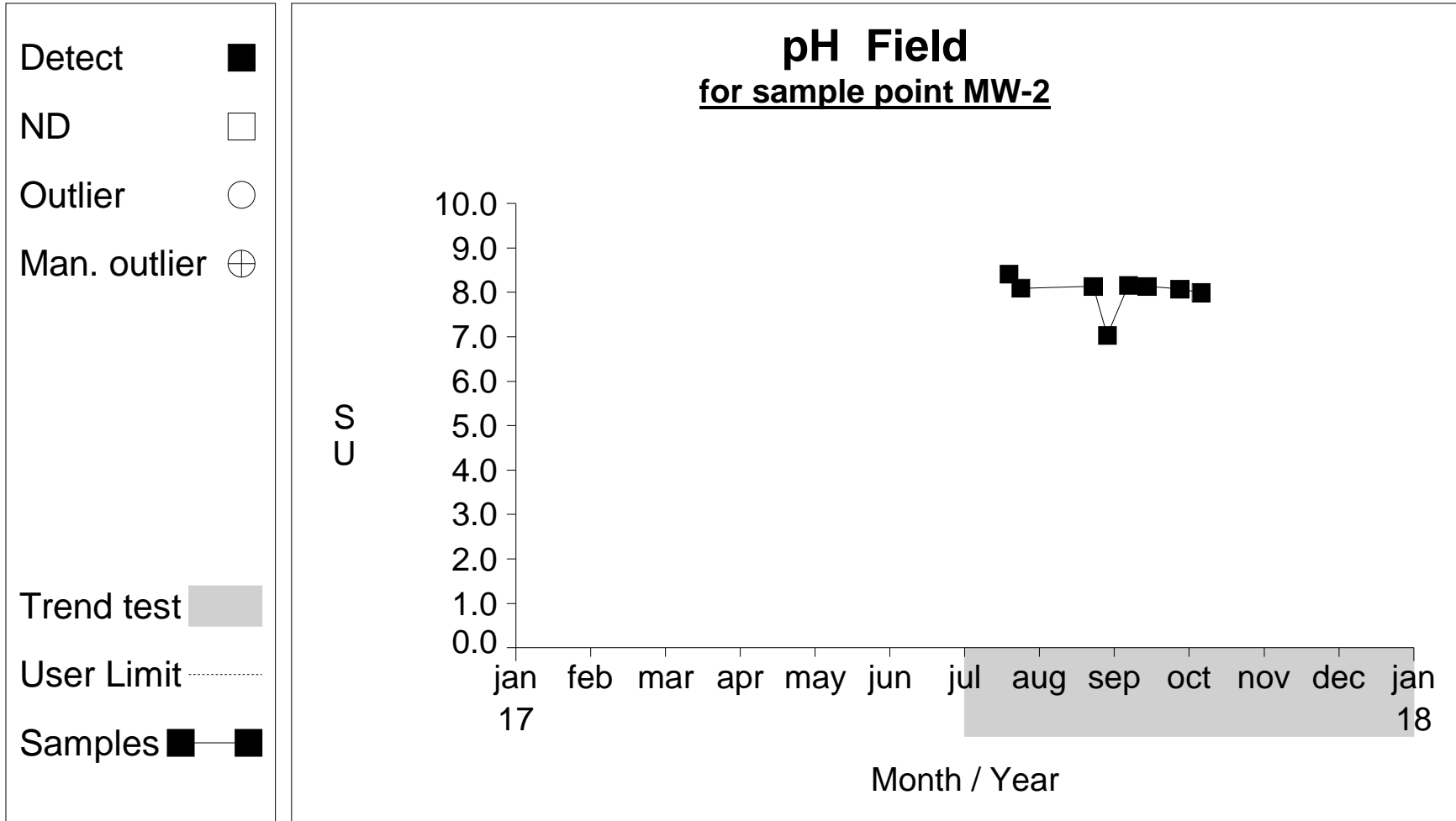
Graph 20

Time Series



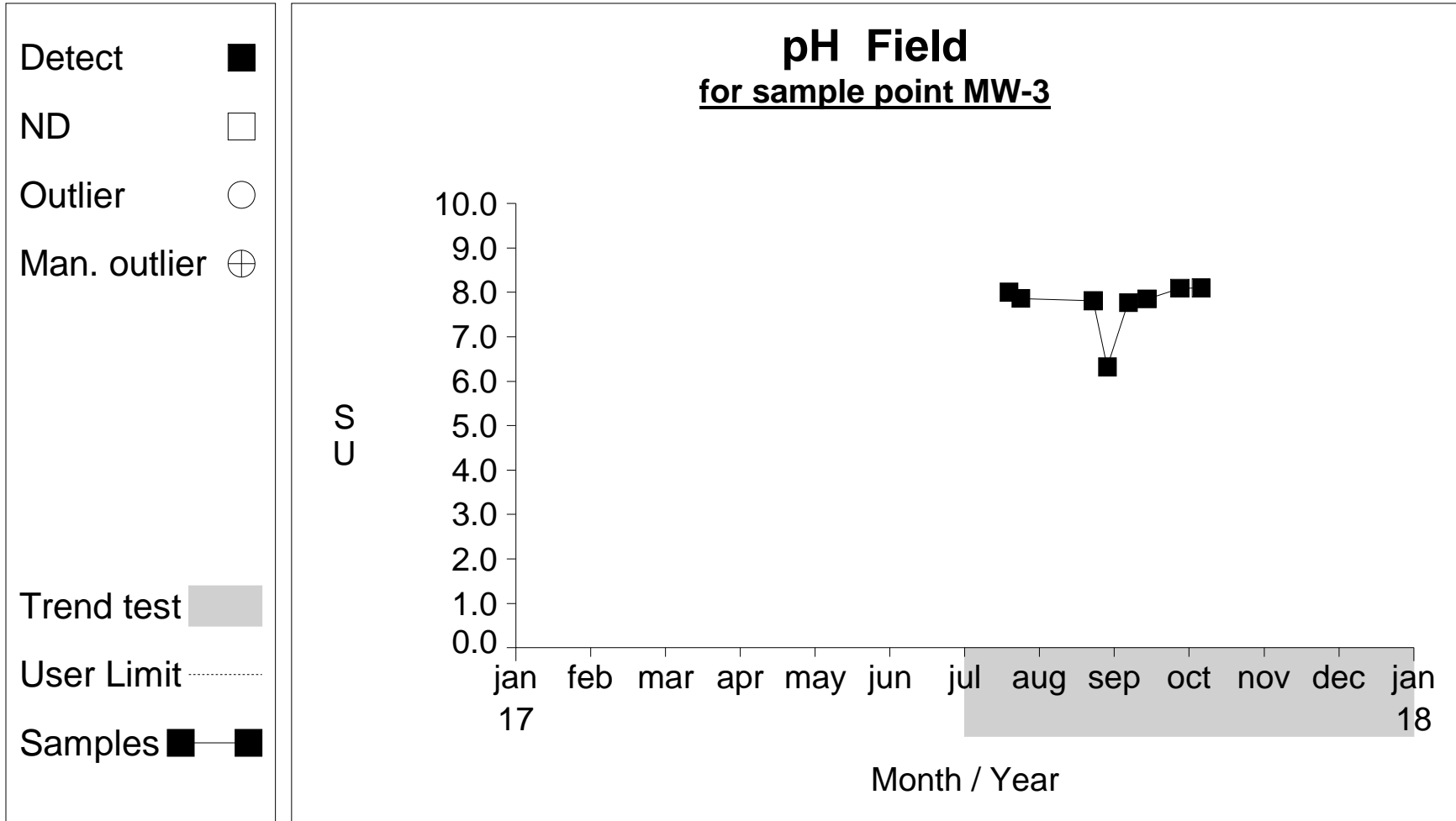
Graph 21

Time Series



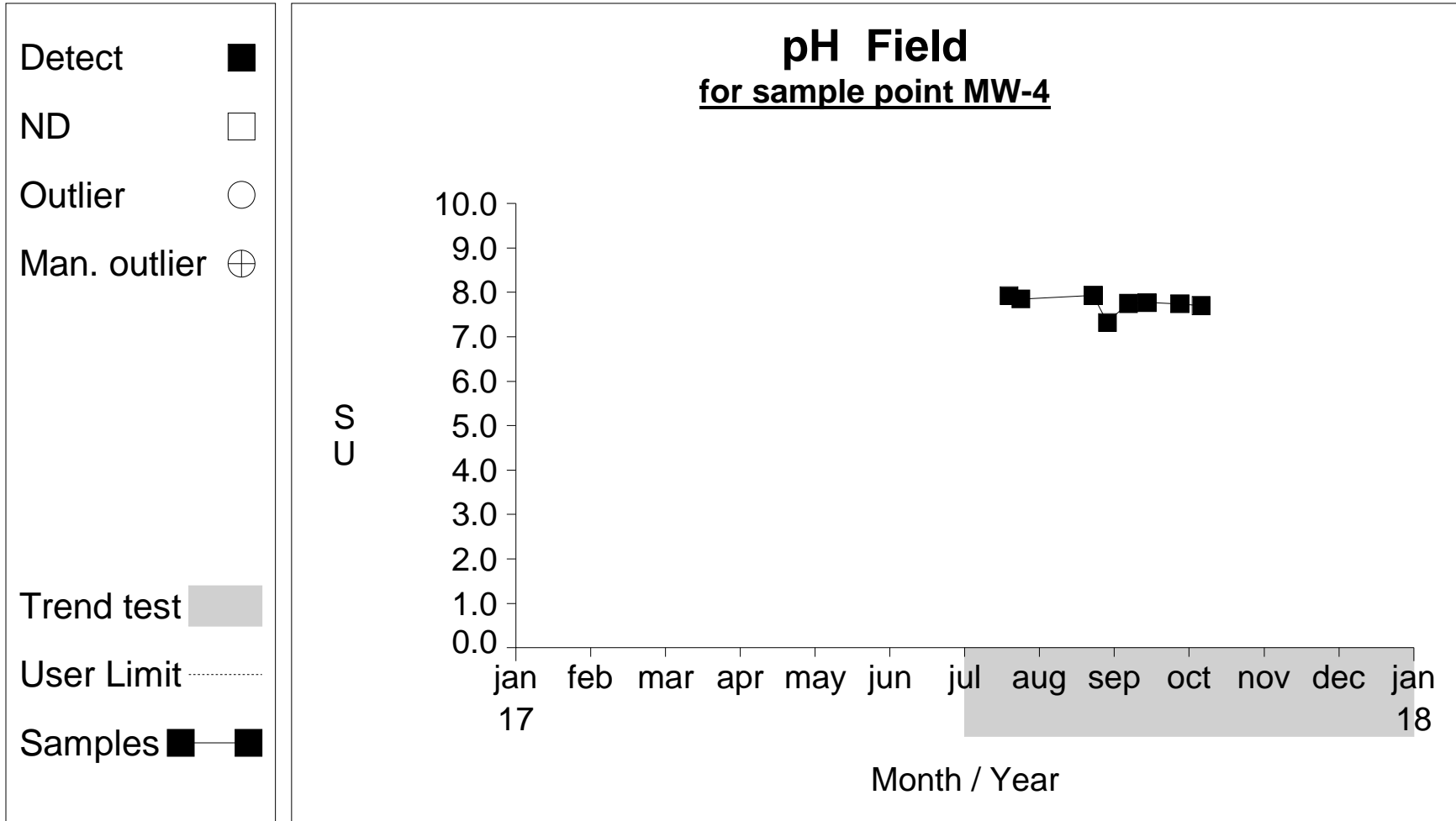
Graph 22

Time Series



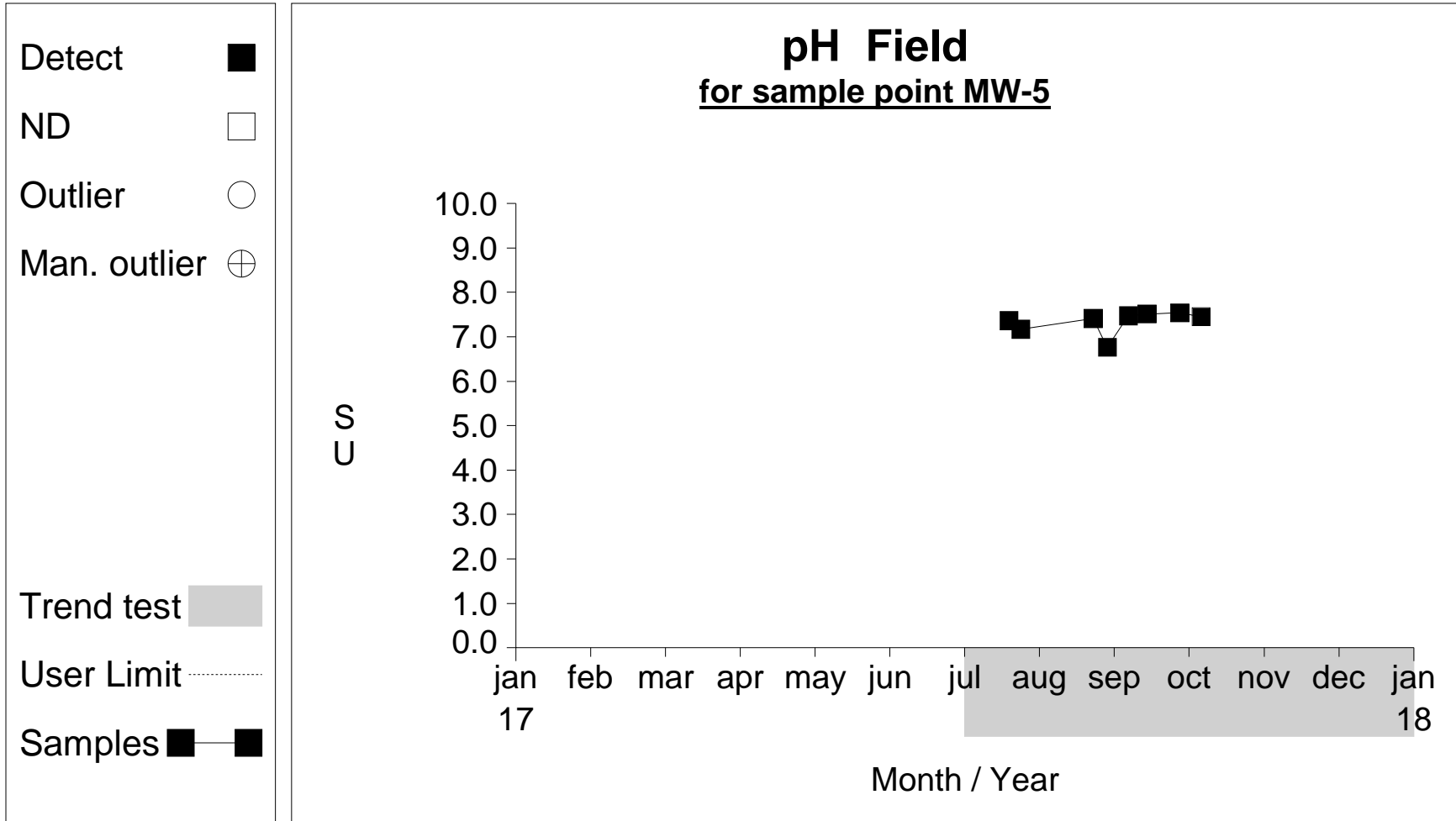
Graph 23

Time Series



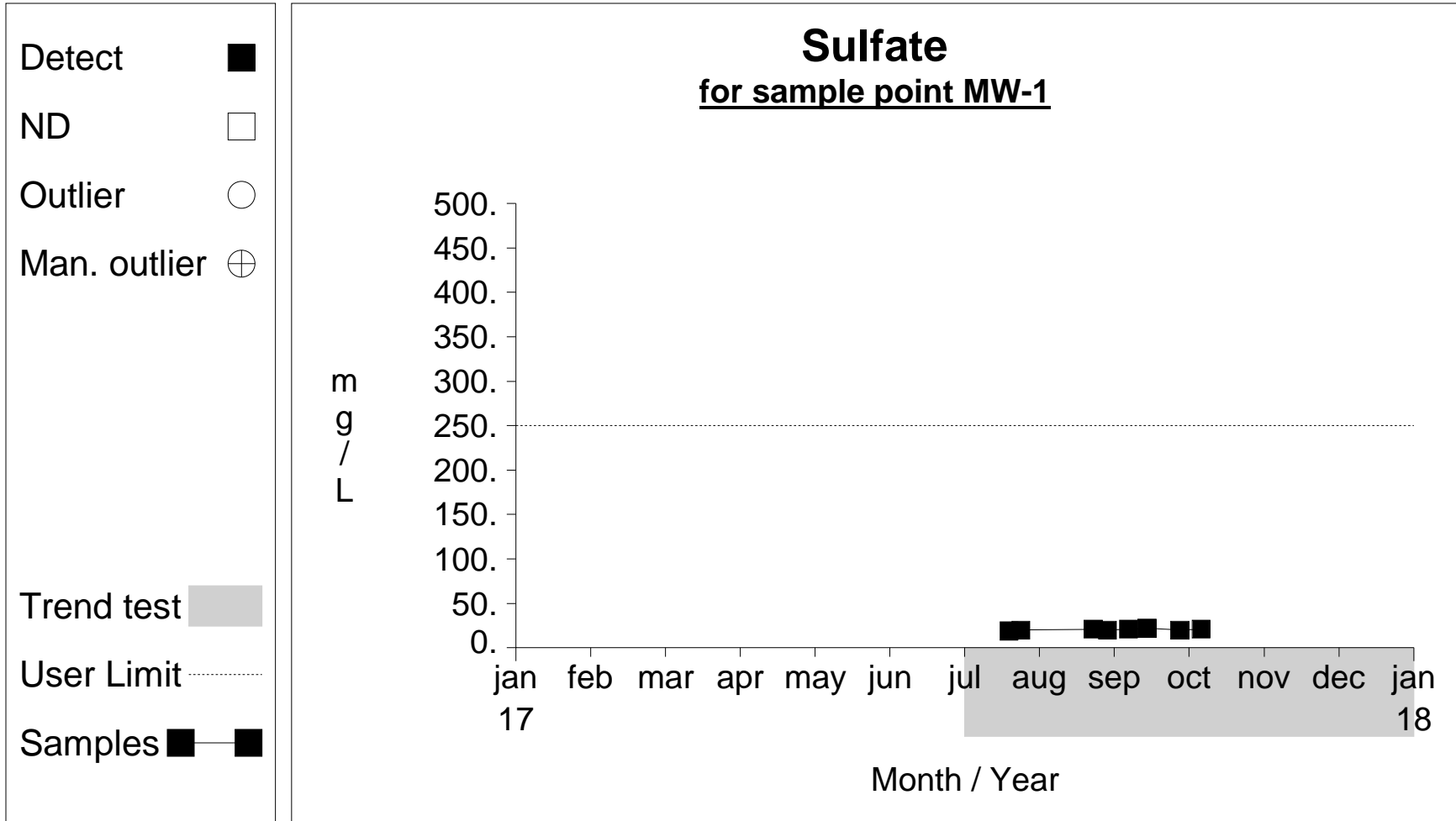
Graph 24

Time Series



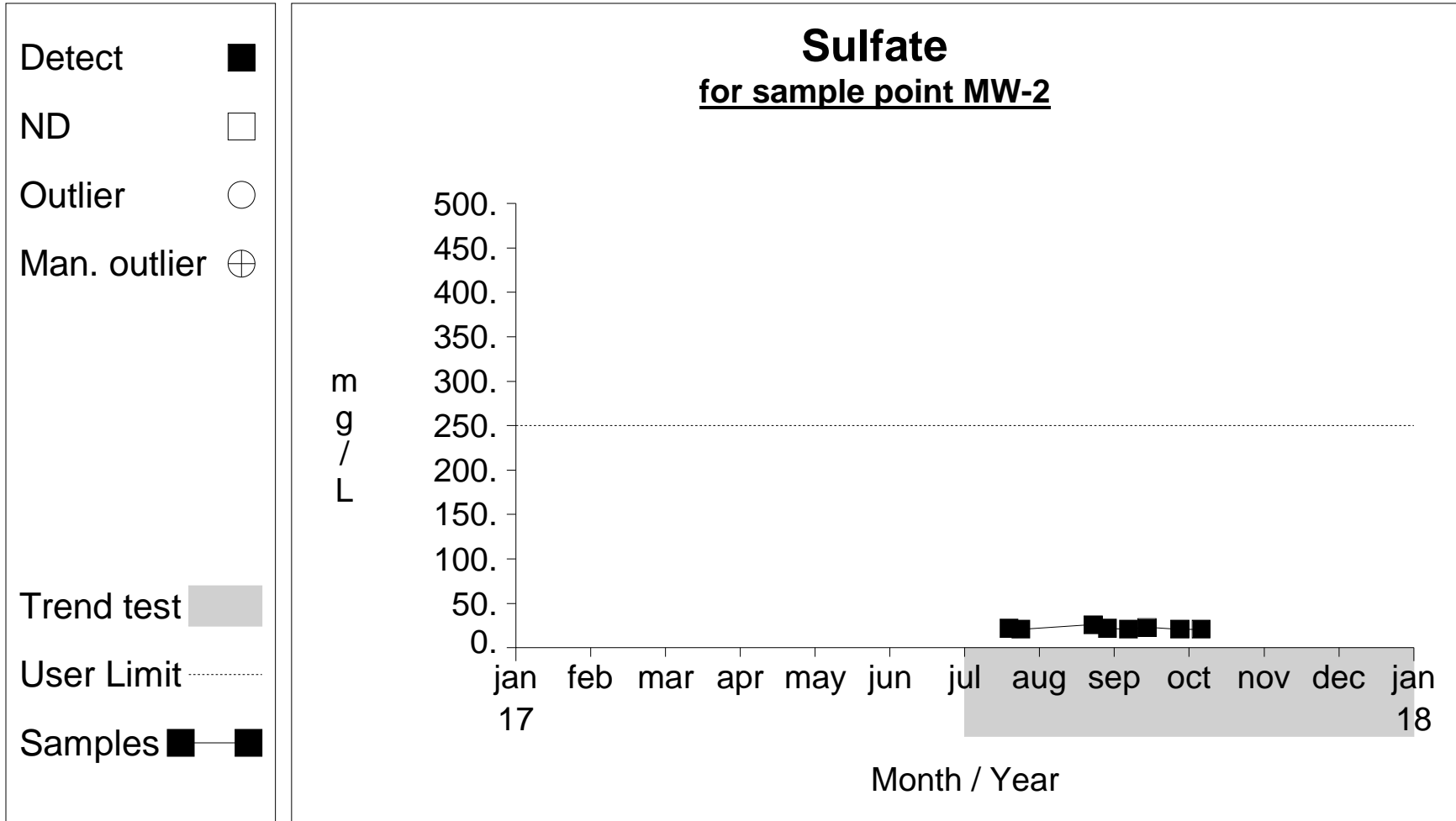
Graph 25

Time Series



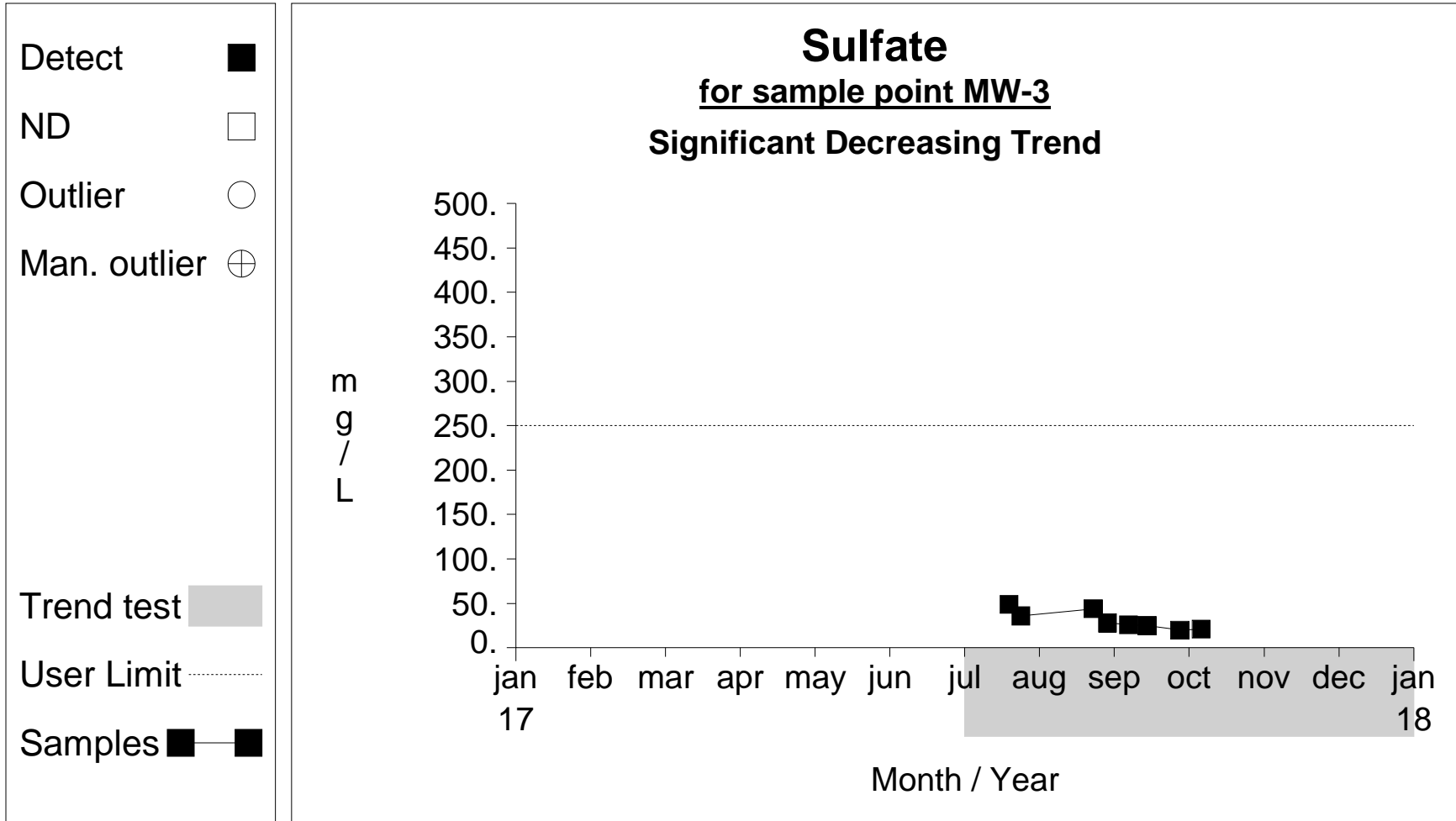
Graph 26

Time Series



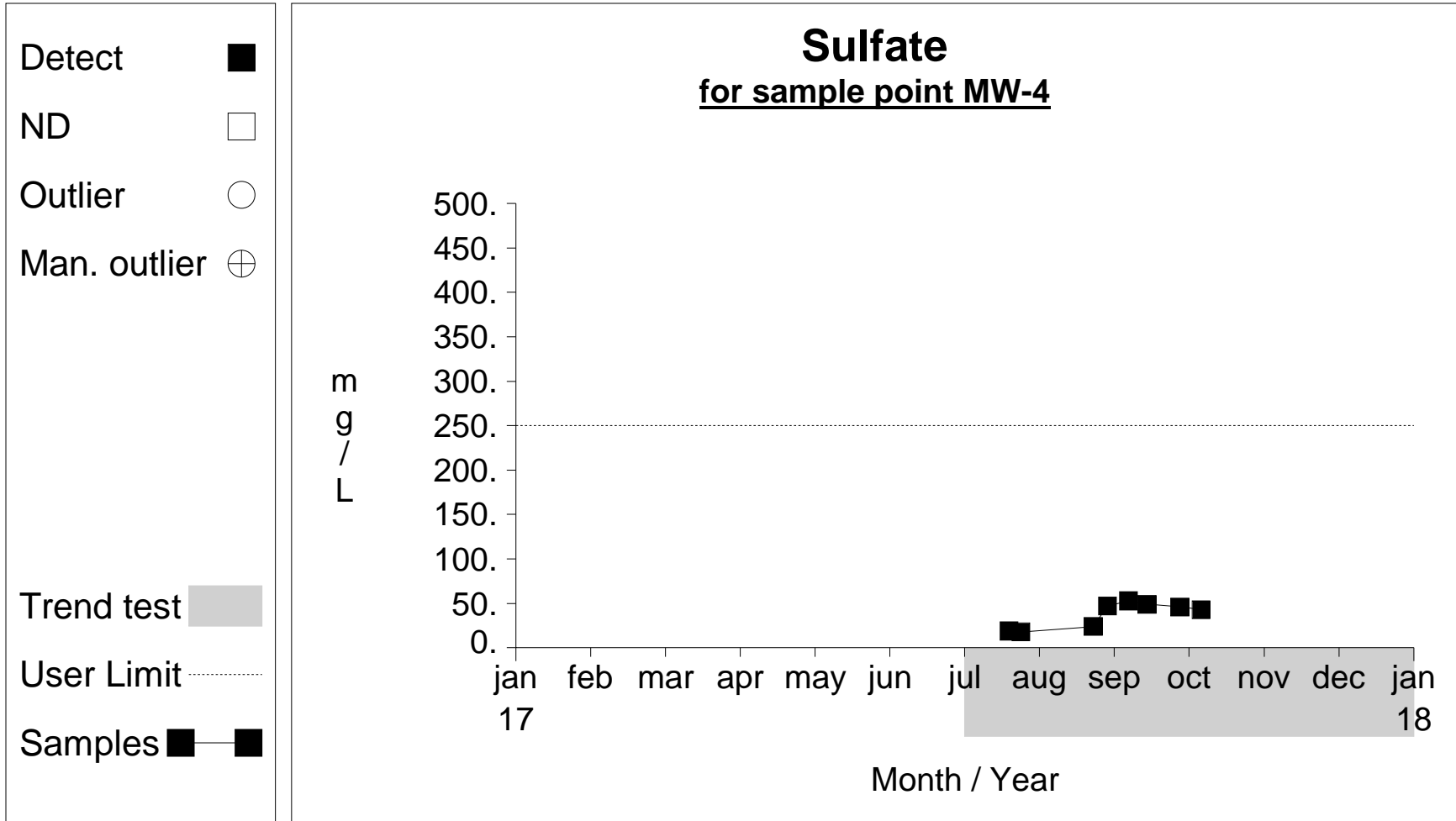
Graph 27

Time Series



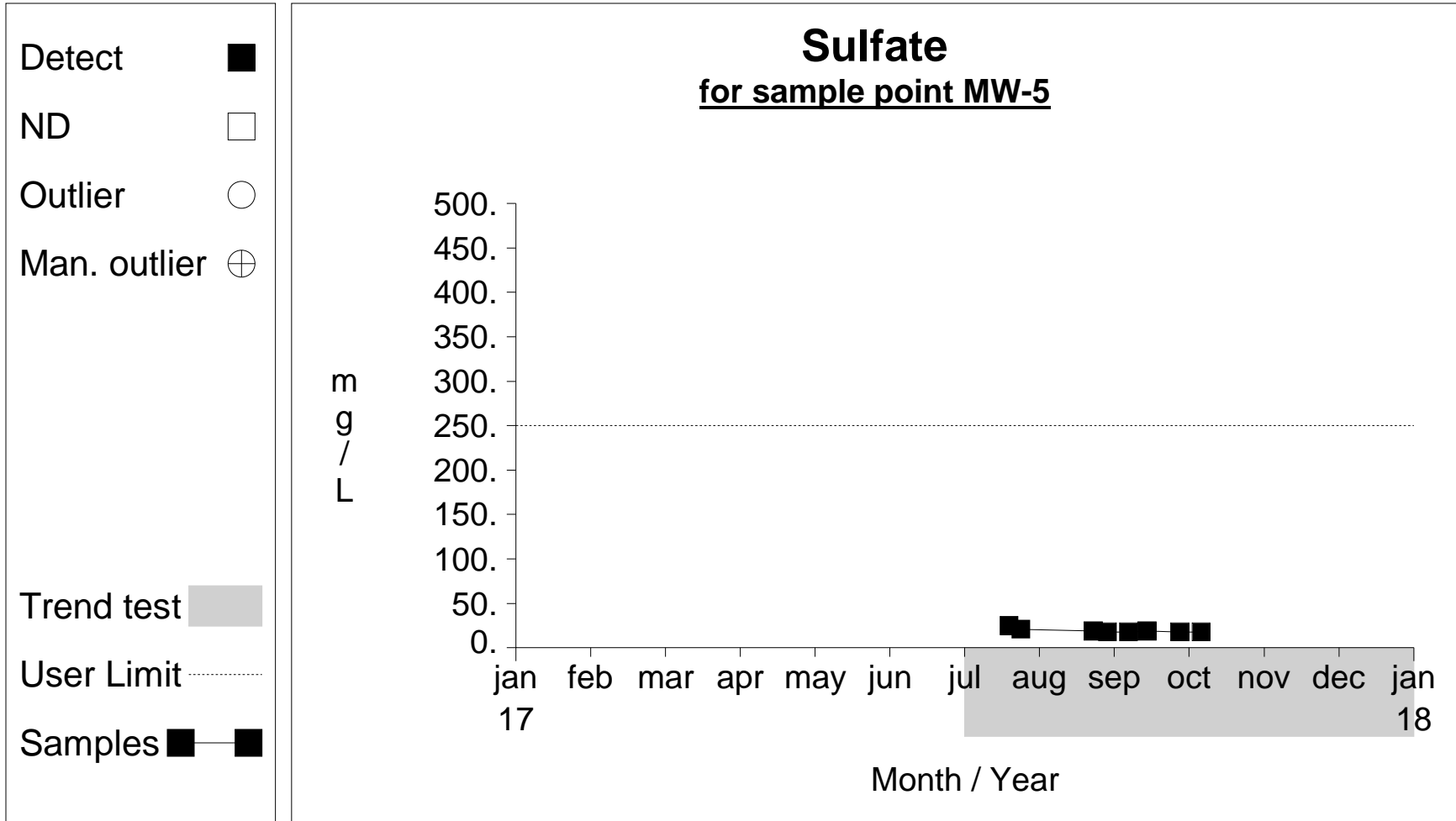
Graph 28

Time Series



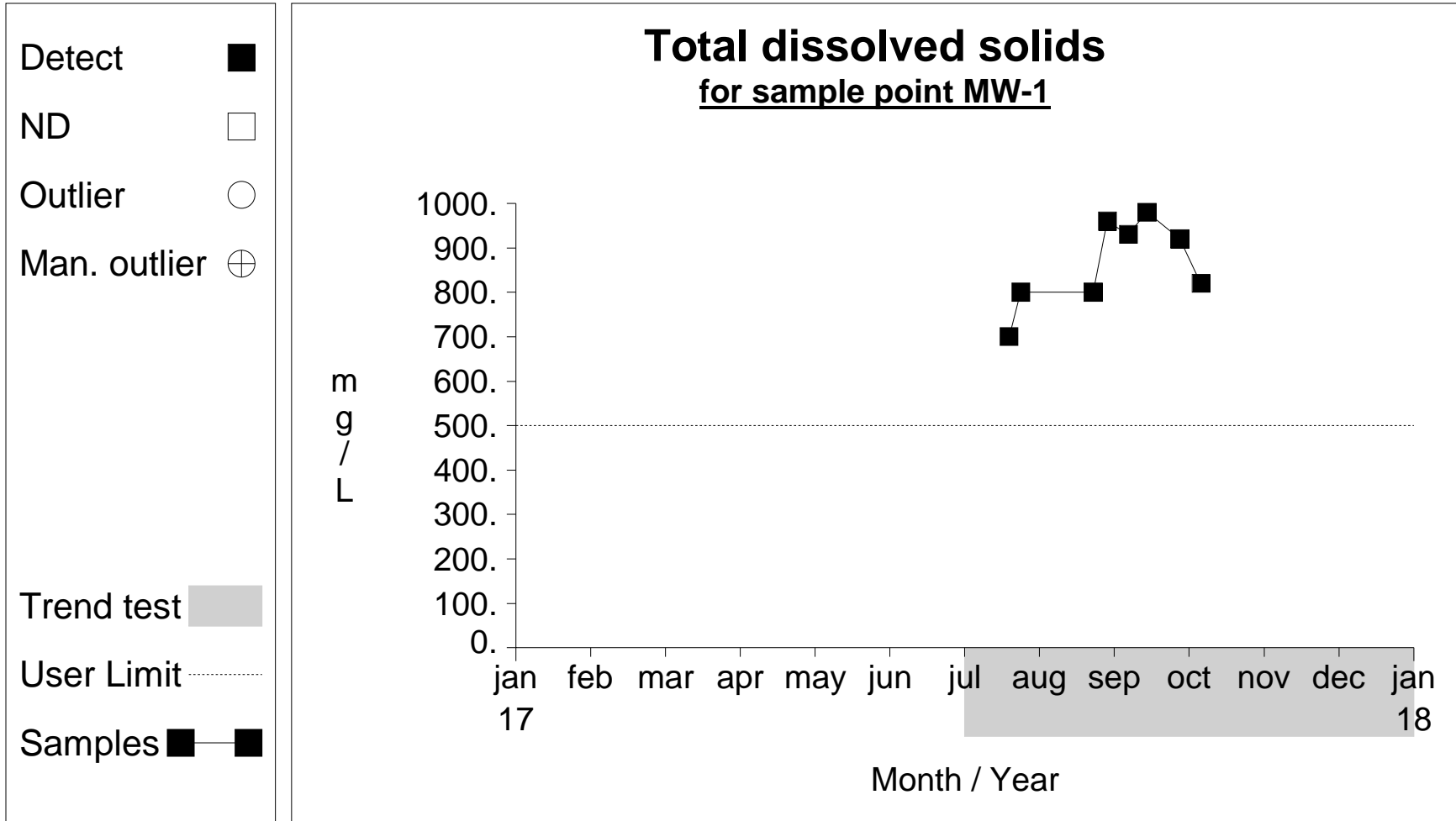
Graph 29

Time Series



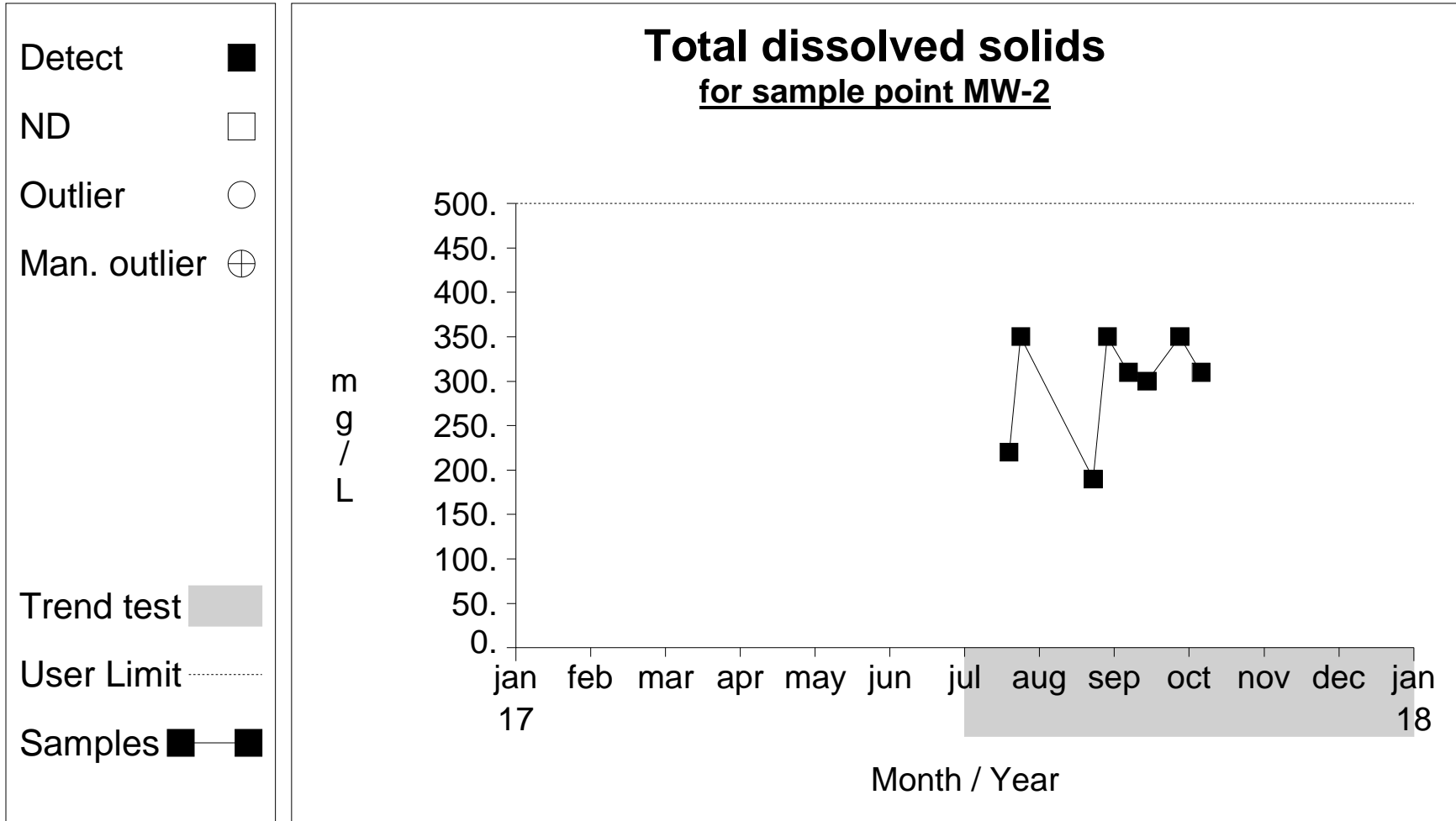
Graph 30

Time Series



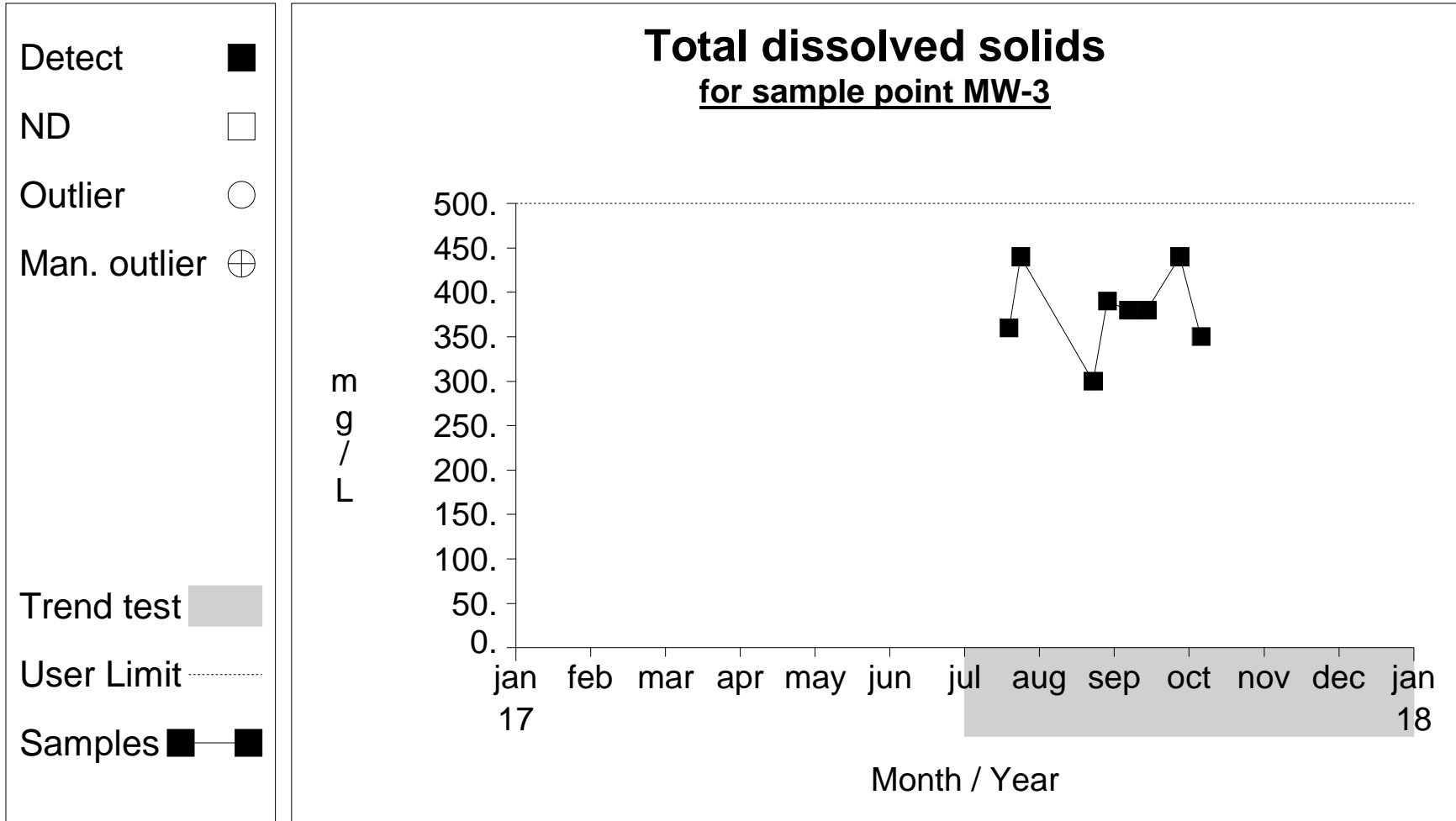
Graph 31

Time Series



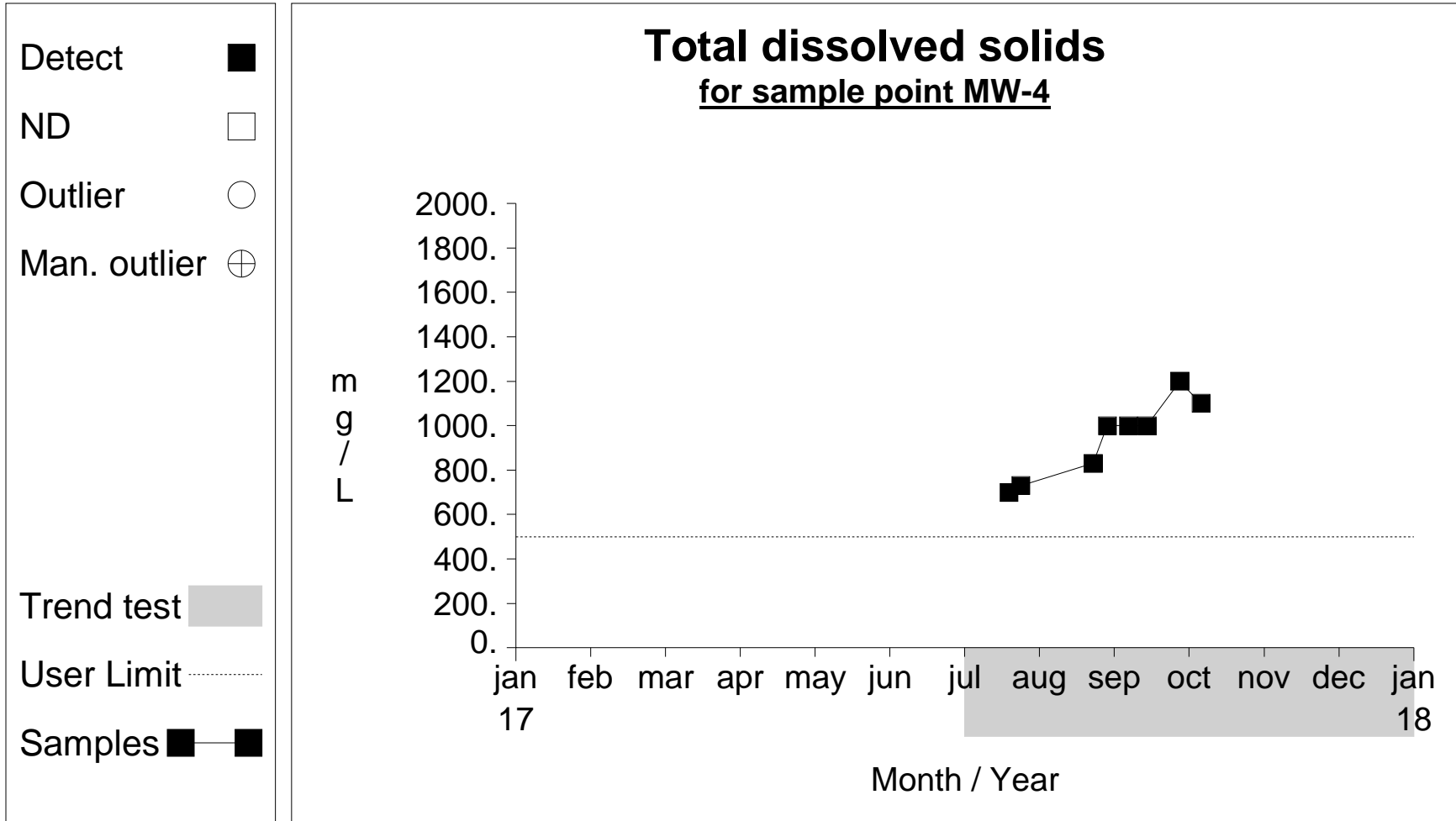
Graph 32

Time Series



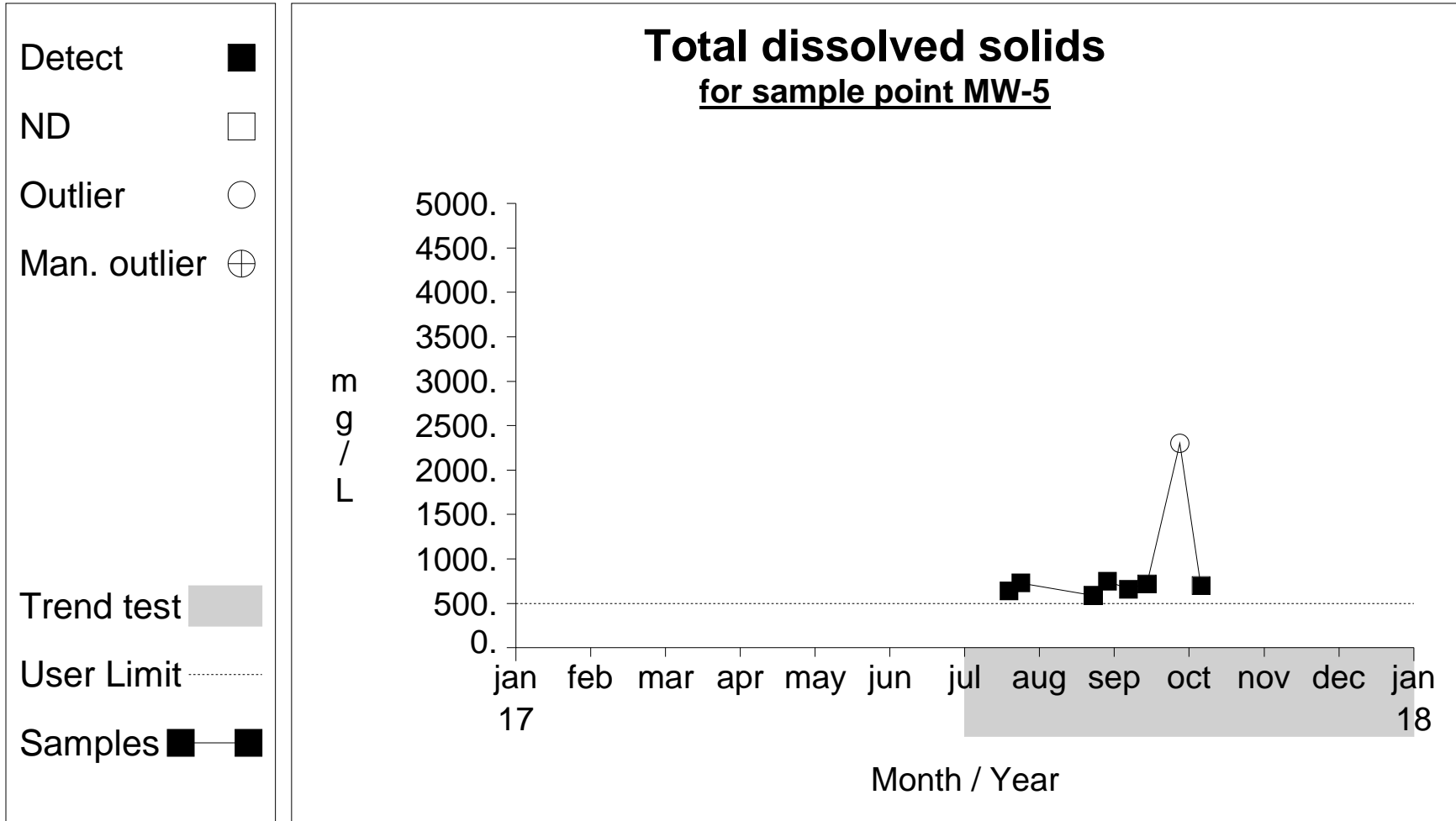
Graph 33

Time Series



Graph 34

Time Series



Graph 35

Table 15**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 16**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 17

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 18**Analytical Data Summary for Beryllium, 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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 19

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 20**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 21**Analytical Data Summary for Calcium, total (mg/L)**

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 22**Analytical Data Summary for Chloride (mg/L)**

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
10/05/2017	280.0000	65.0000	87.0000	380.0000	190.0000

* - The displayed value is the arithmetic mean of multiple database matches.

Table 23**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 24**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 25

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 26**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 27

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 28**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 29**Analytical Data Summary for Molybdenum, total (mg/L)**

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 30**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.

Table 31**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 32

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 33**Analytical Data Summary for Selenium, total (mg/L)**

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 34

Analytical Data Summary for Specific conductance (µmhos/cm)

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 35**Analytical Data Summary for Sulfate (mg/L)**

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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 36**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

* - The displayed value is the arithmetic mean of multiple database matches.

Table 37**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	800.0000	350.0000	440.0000	730.0000	730.0000
8/23/2017	800.0000	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

* - The displayed value is the arithmetic mean of multiple database matches.

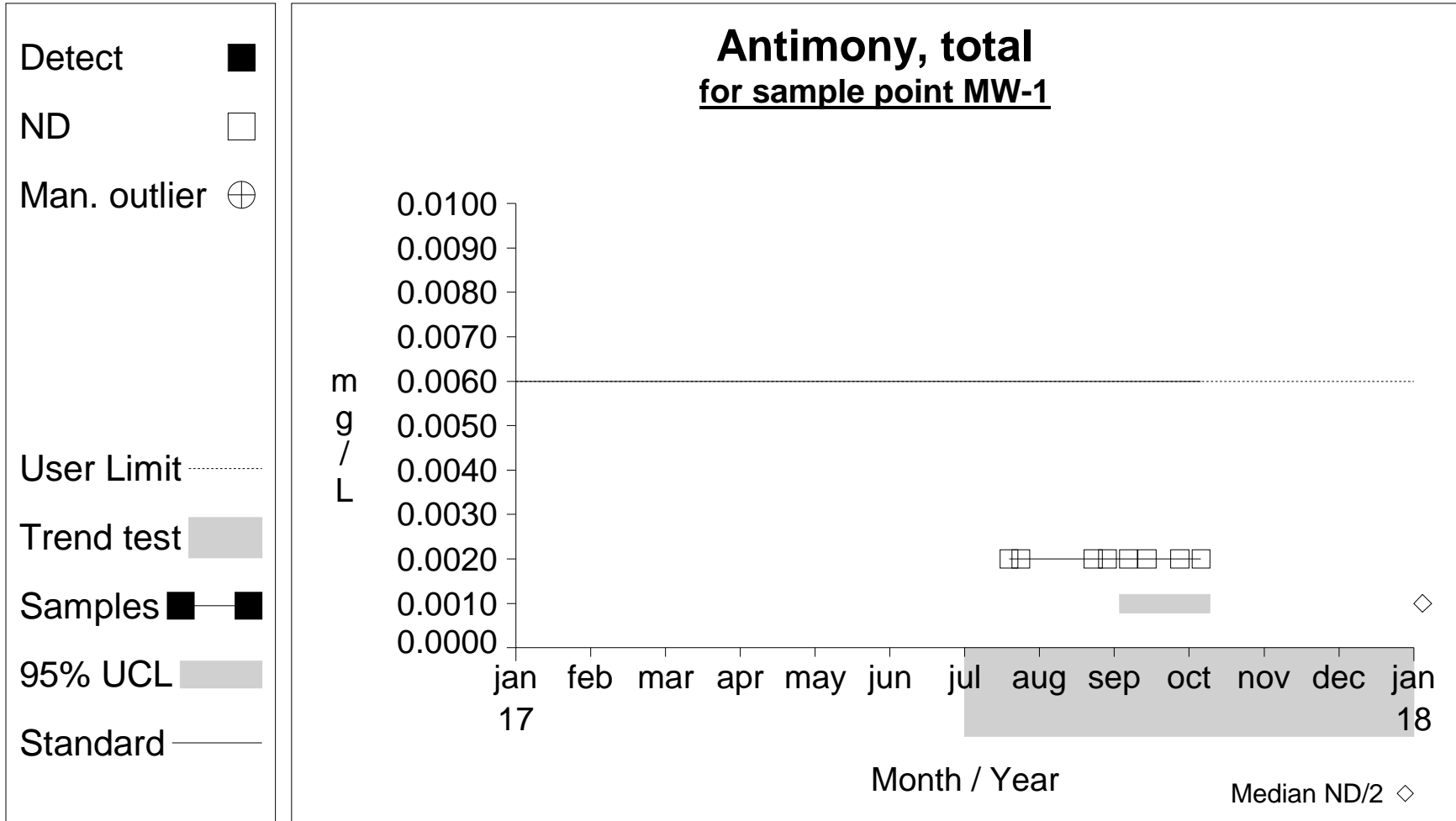
Table 38

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

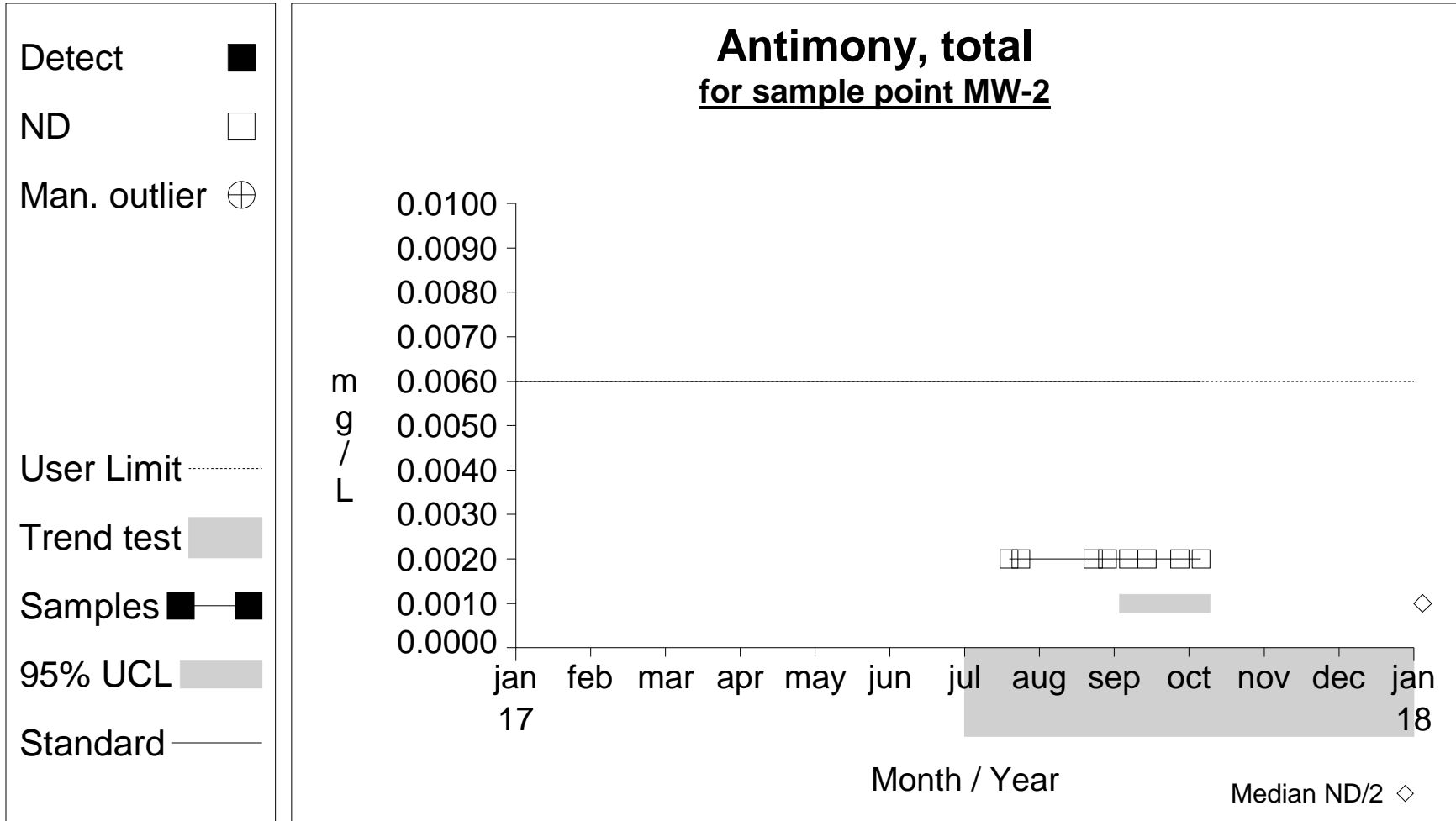
* - The displayed value is the arithmetic mean of multiple database matches.

Confidence Limits (Assessment)



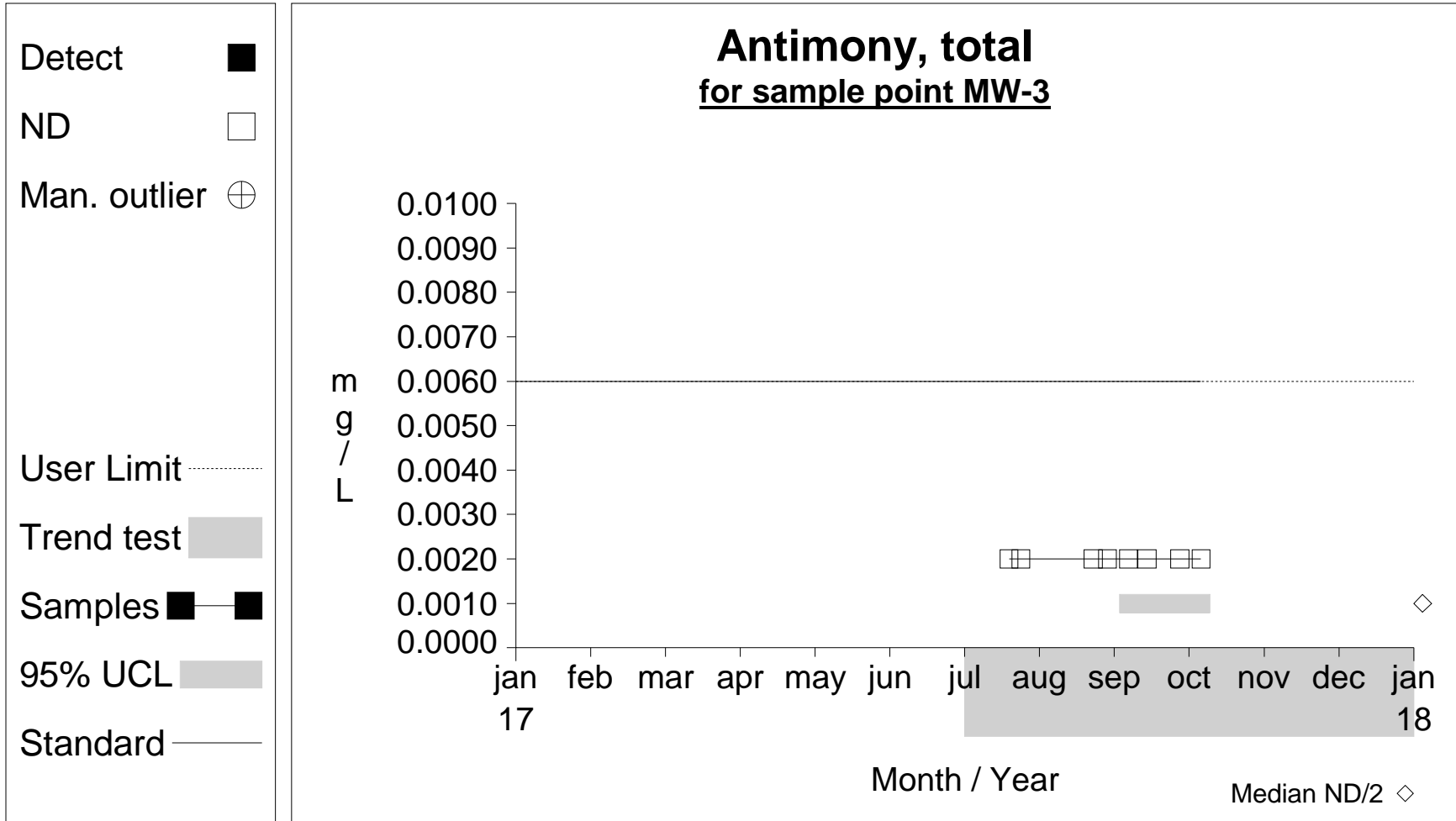
Graph 1

Confidence Limits (Assessment)



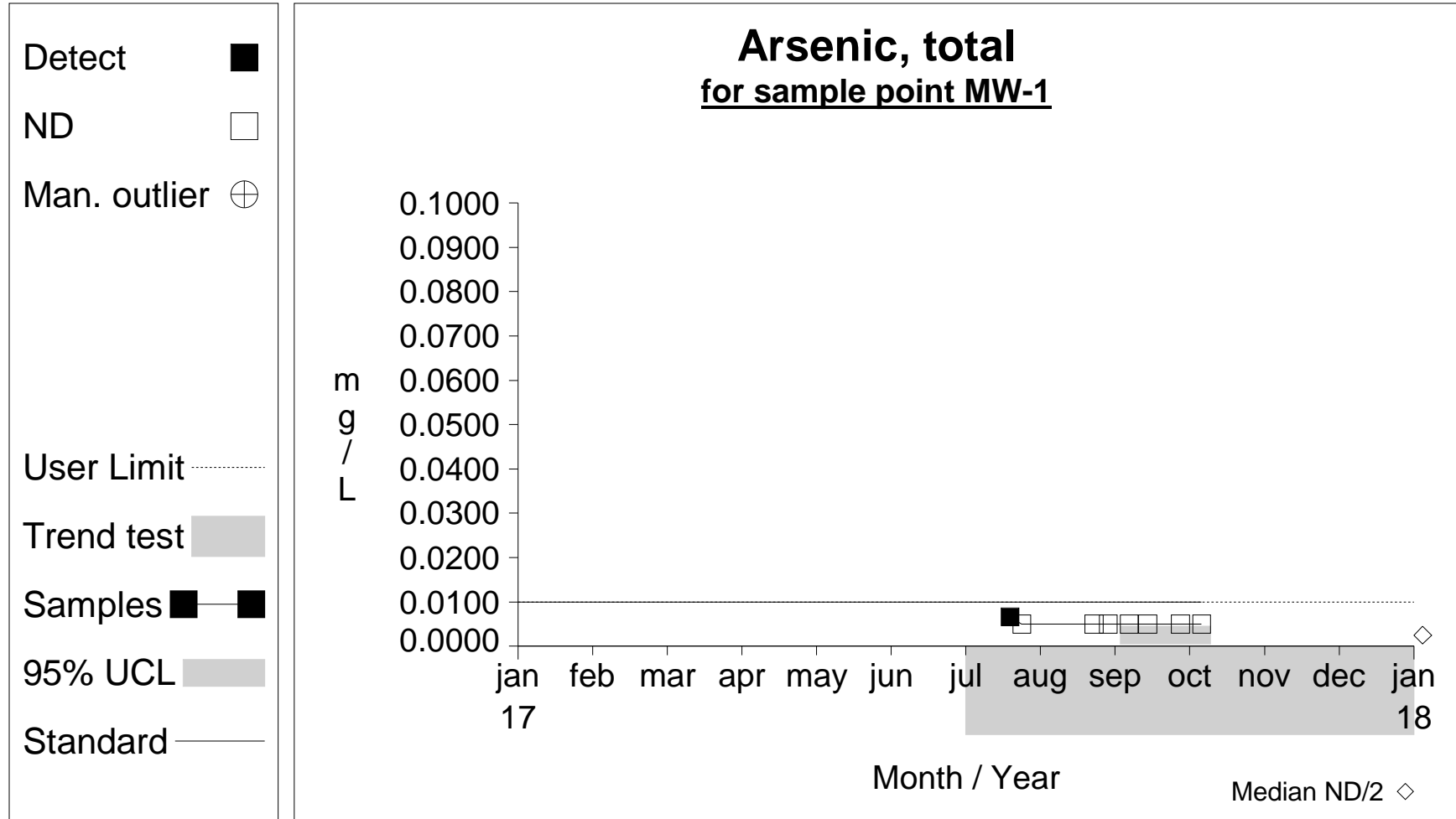
Graph 2

Confidence Limits (Assessment)



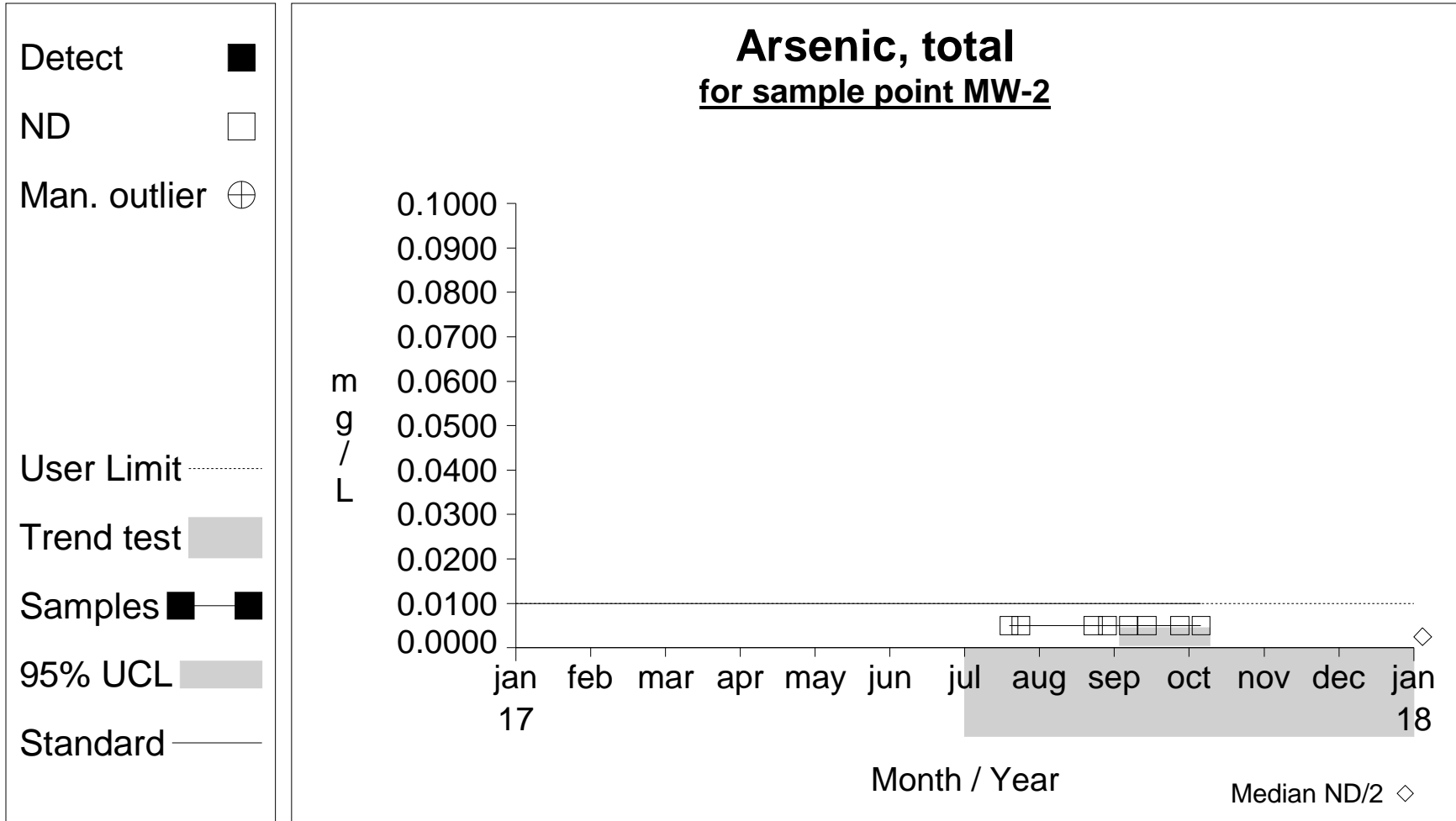
Graph 3

Confidence Limits (Assessment)



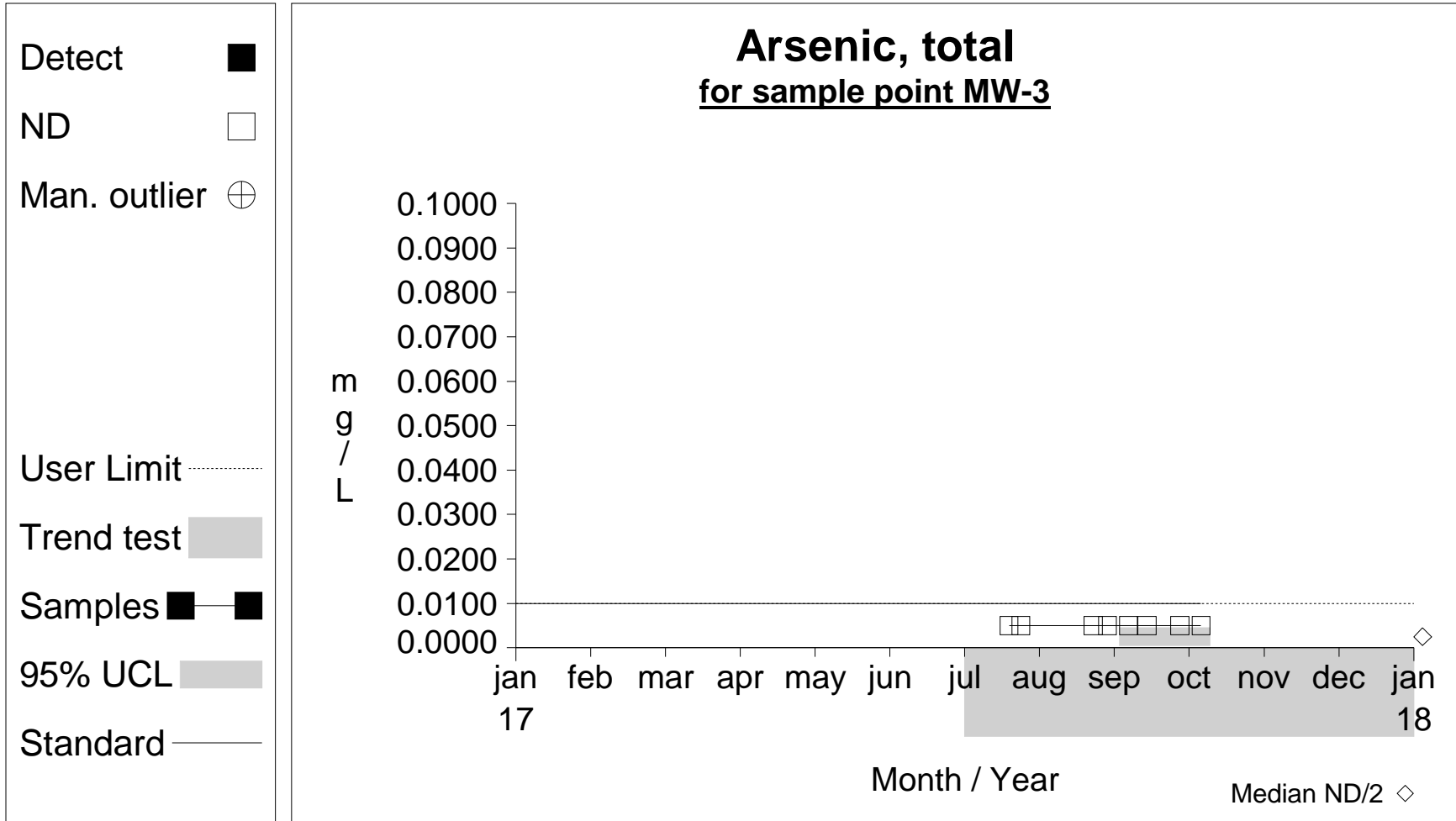
Graph 4

Confidence Limits (Assessment)



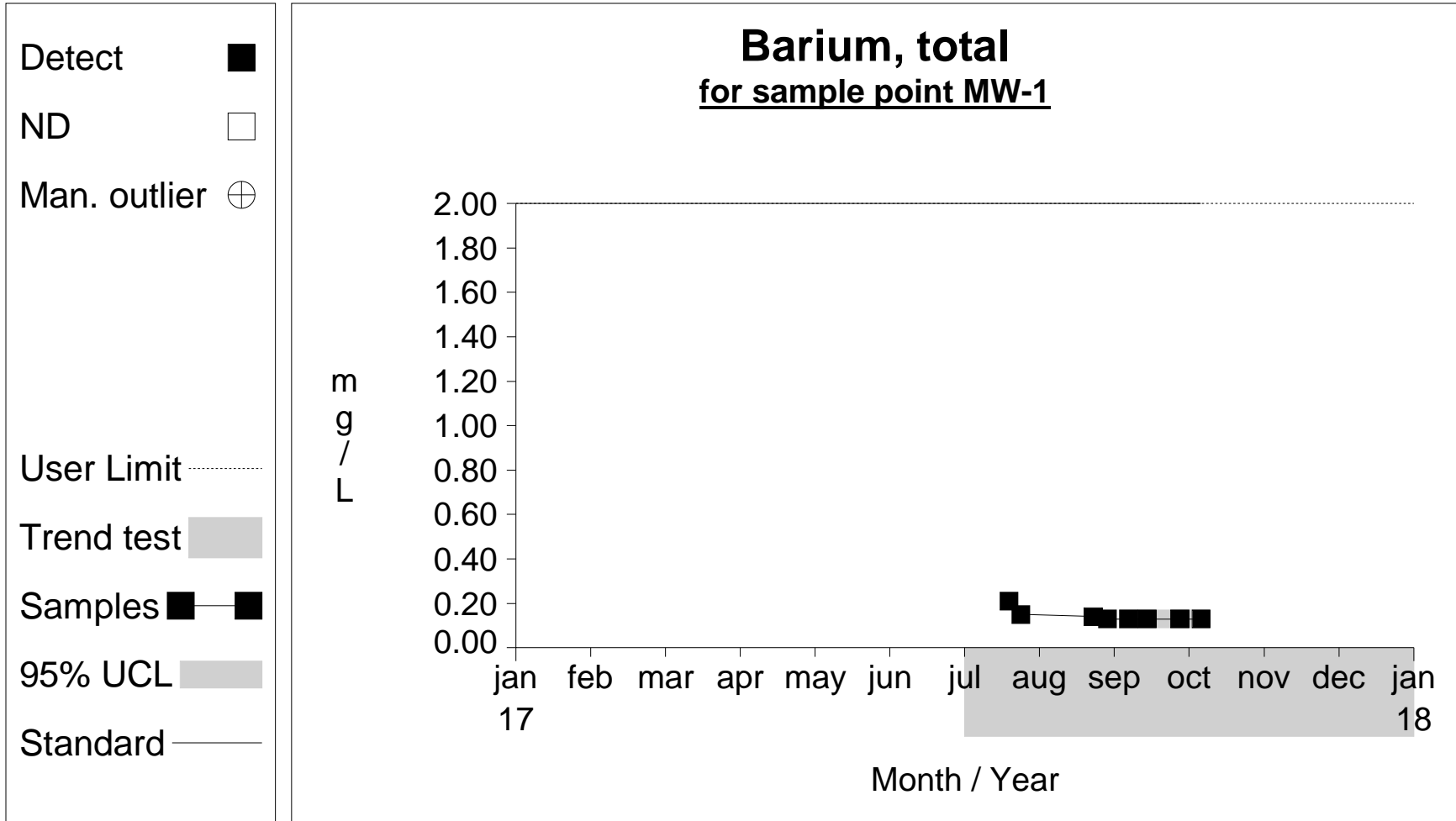
Graph 5

Confidence Limits (Assessment)



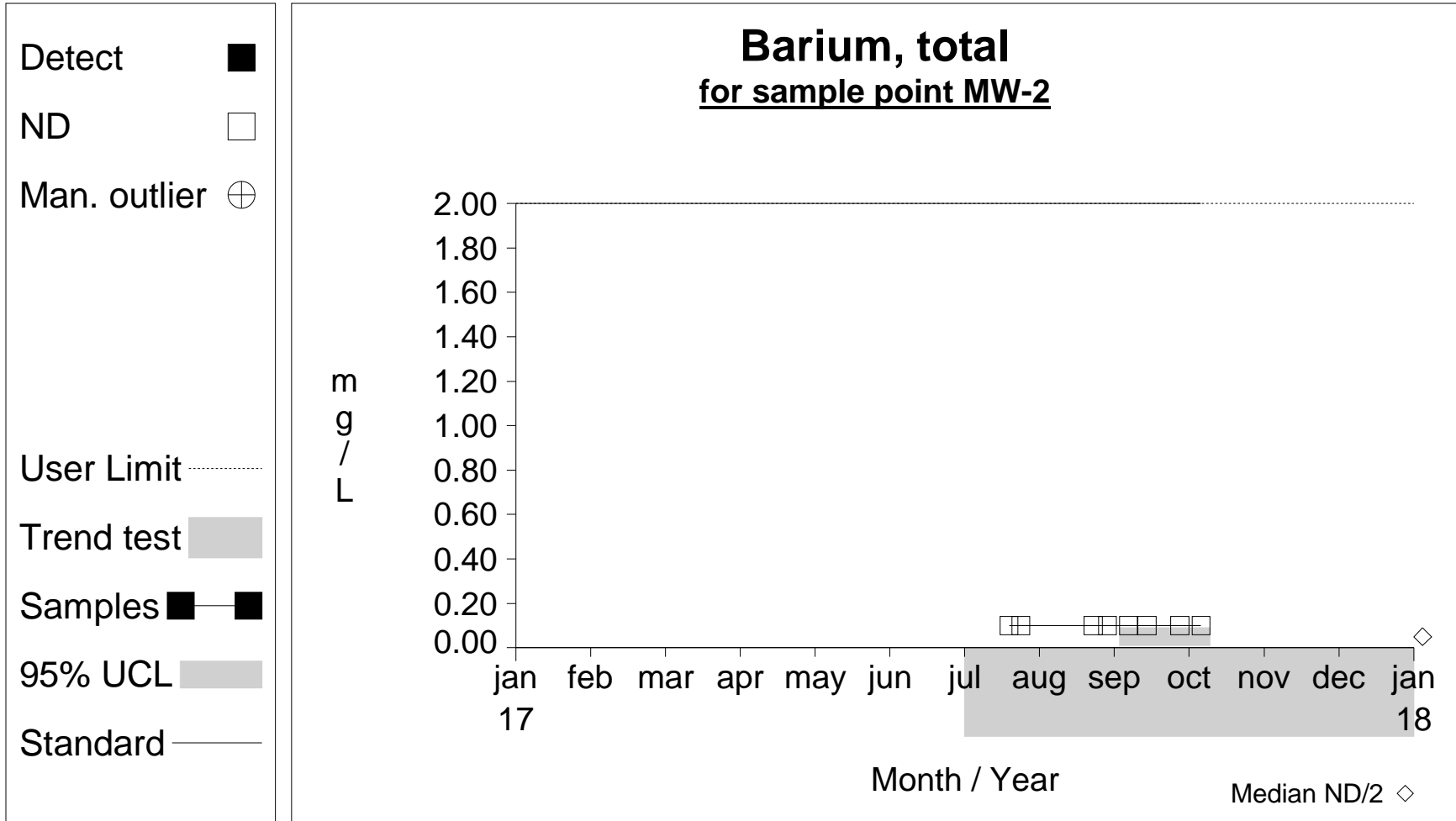
Graph 6

Confidence Limits (Assessment)



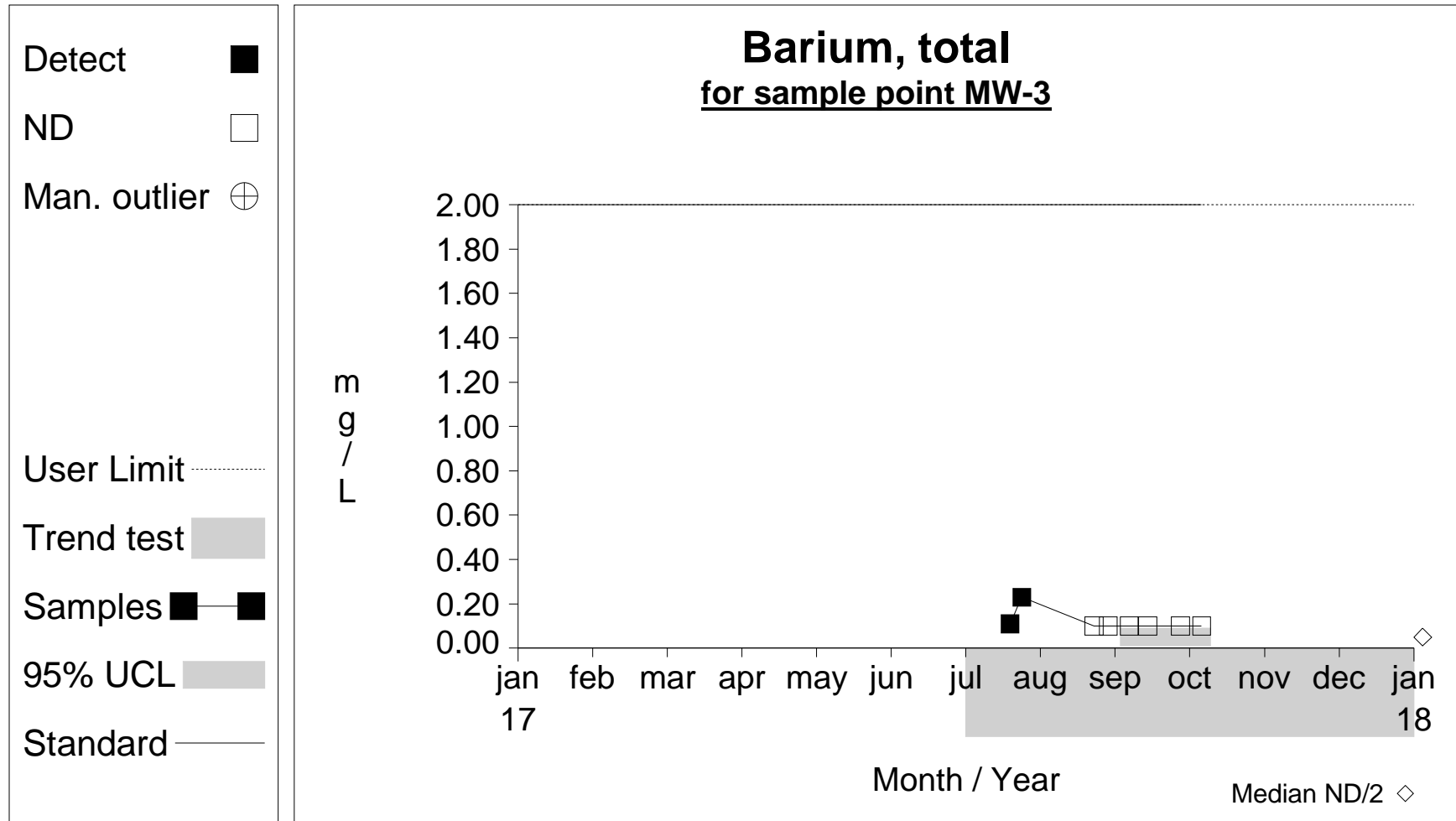
Graph 7

Confidence Limits (Assessment)



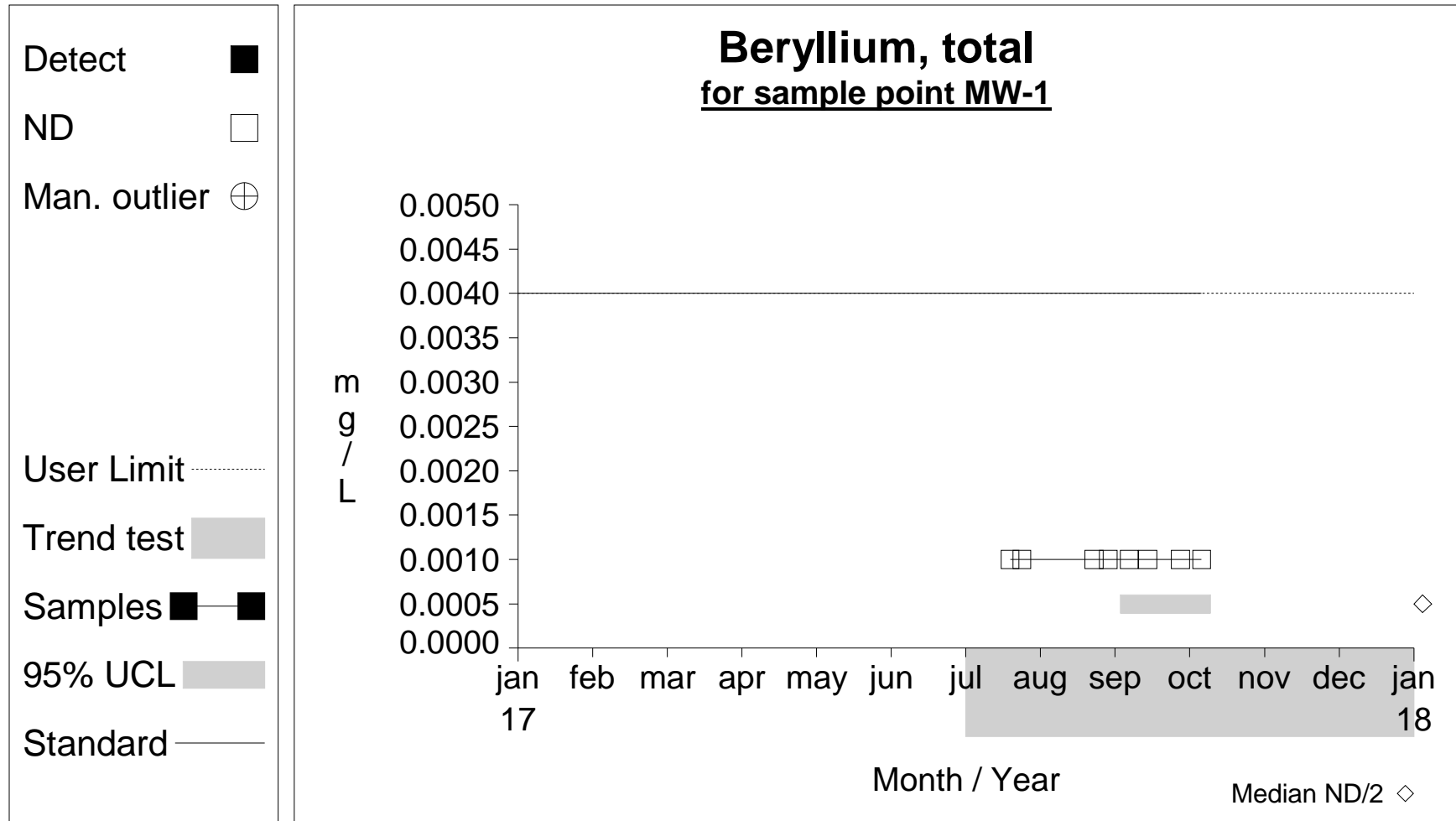
Graph 8

Confidence Limits (Assessment)



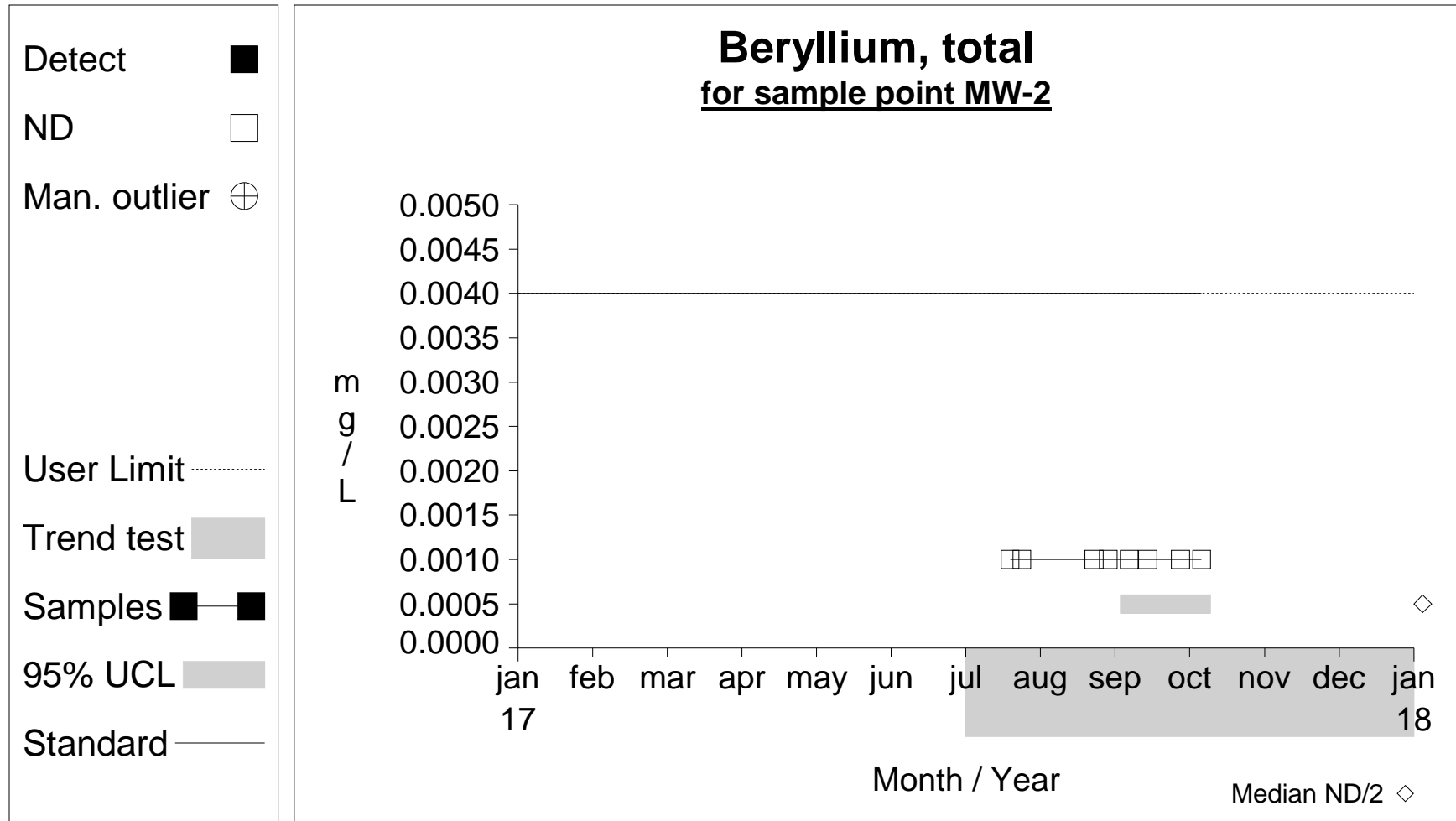
Graph 9

Confidence Limits (Assessment)



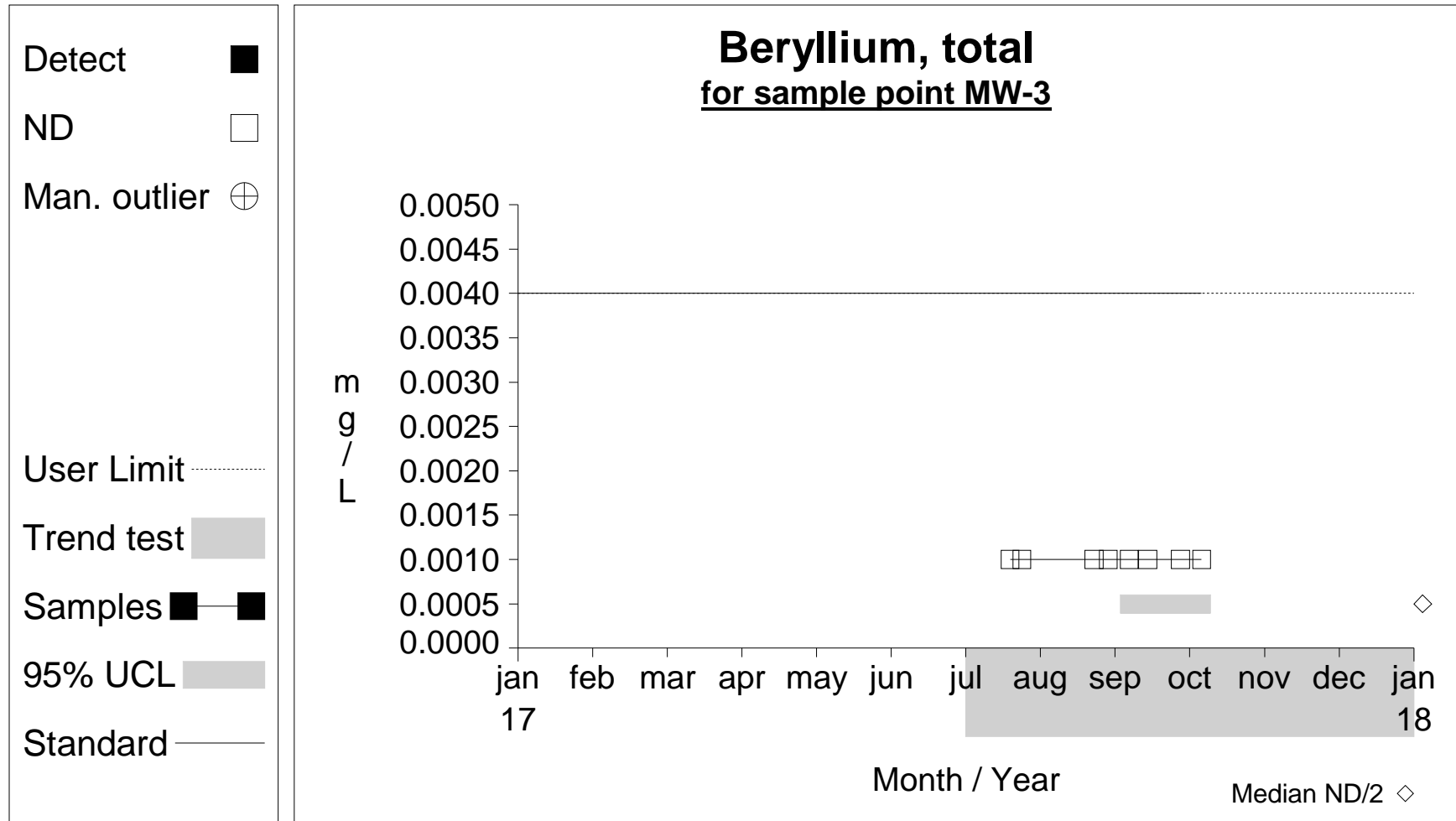
Graph 10

Confidence Limits (Assessment)



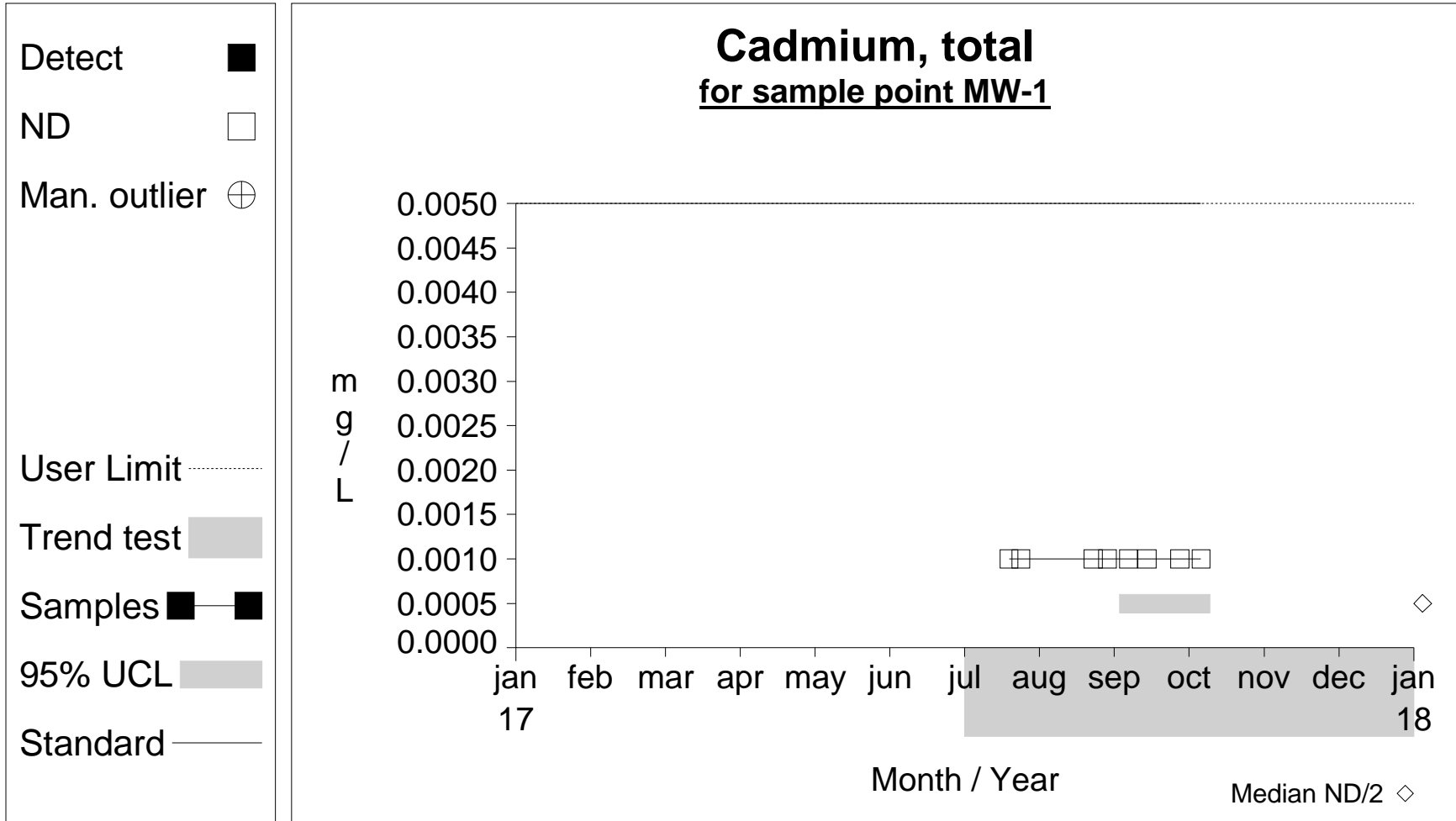
Graph 11

Confidence Limits (Assessment)



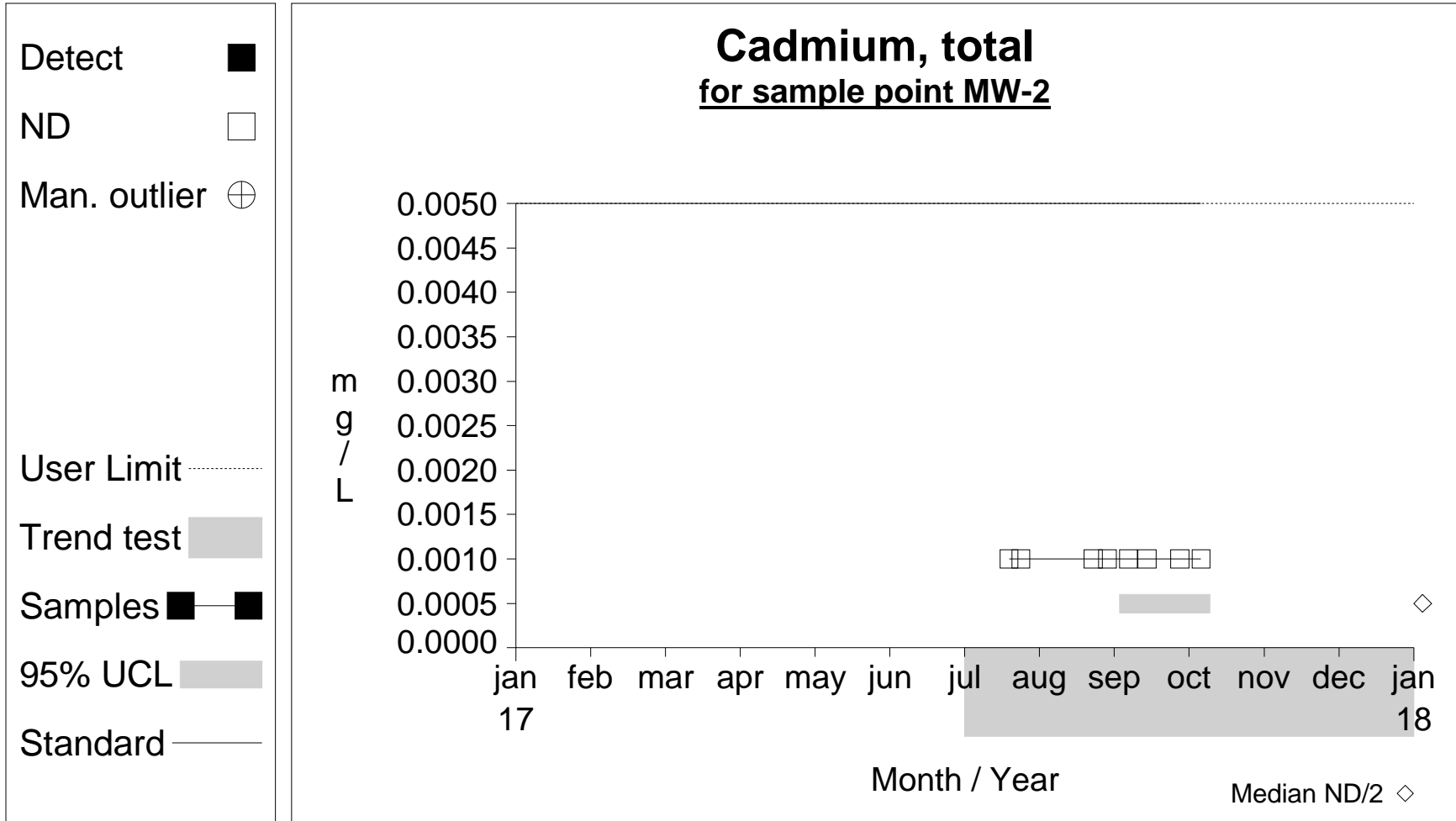
Graph 12

Confidence Limits (Assessment)



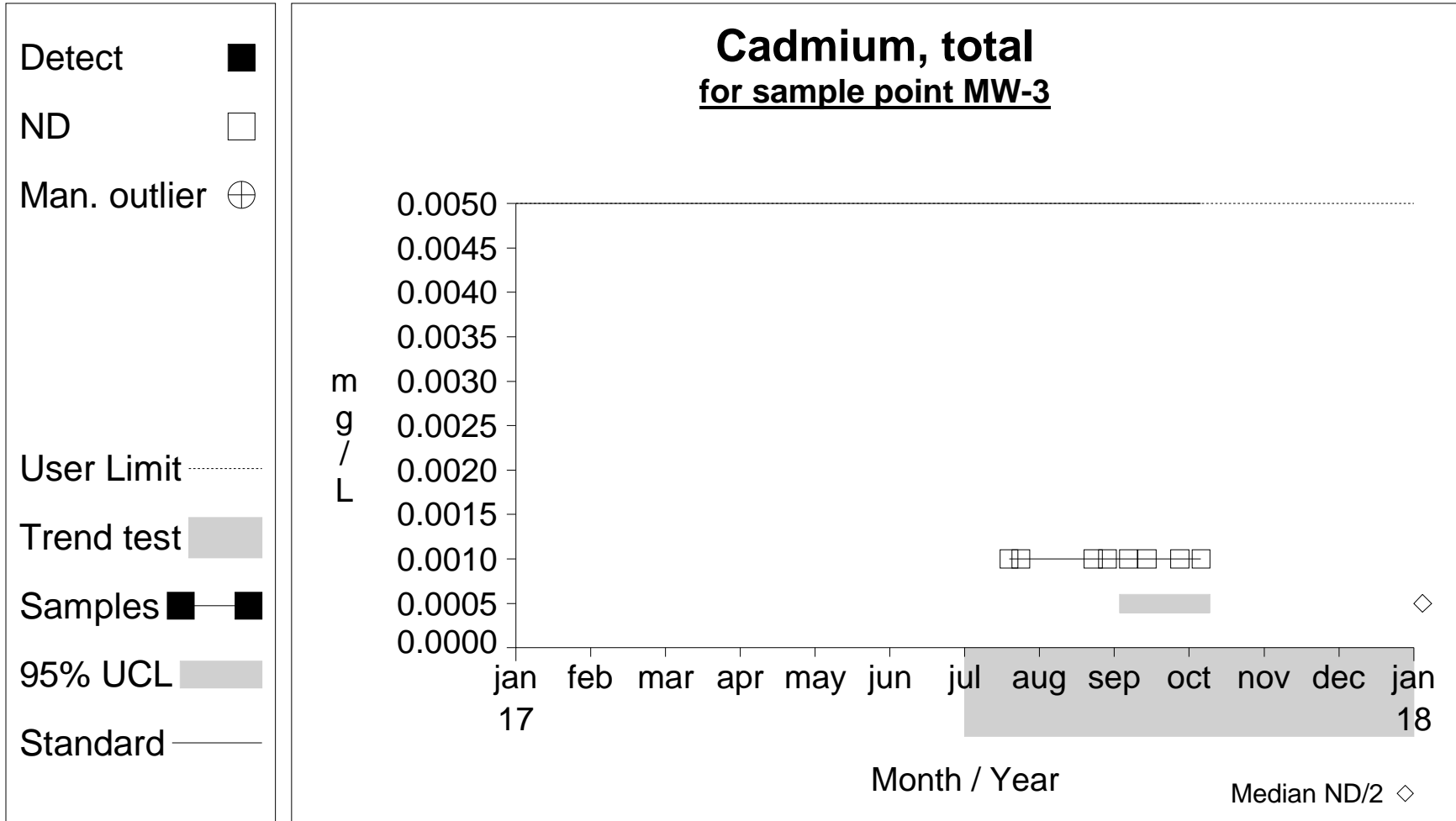
Graph 13

Confidence Limits (Assessment)



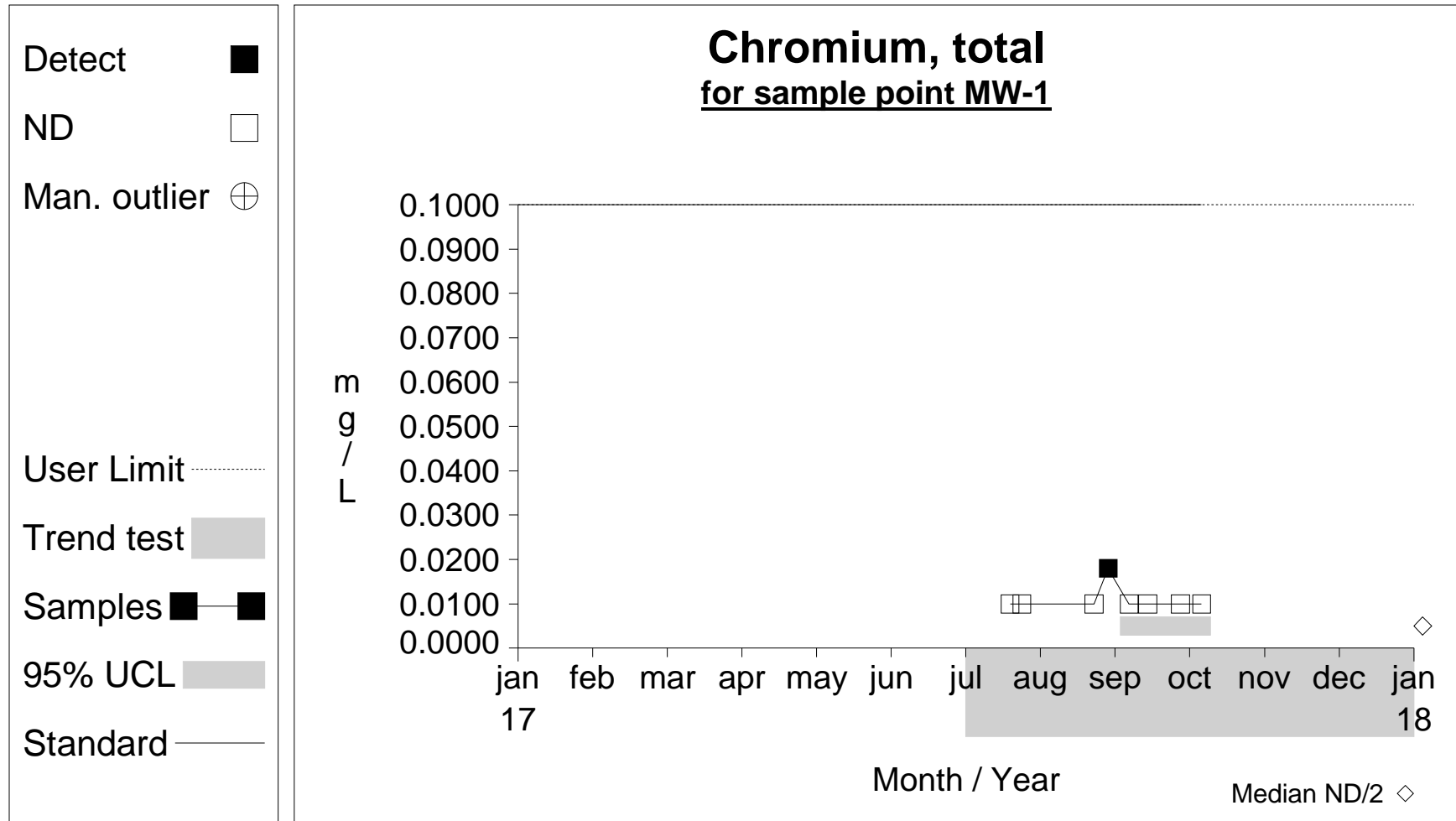
Graph 14

Confidence Limits (Assessment)



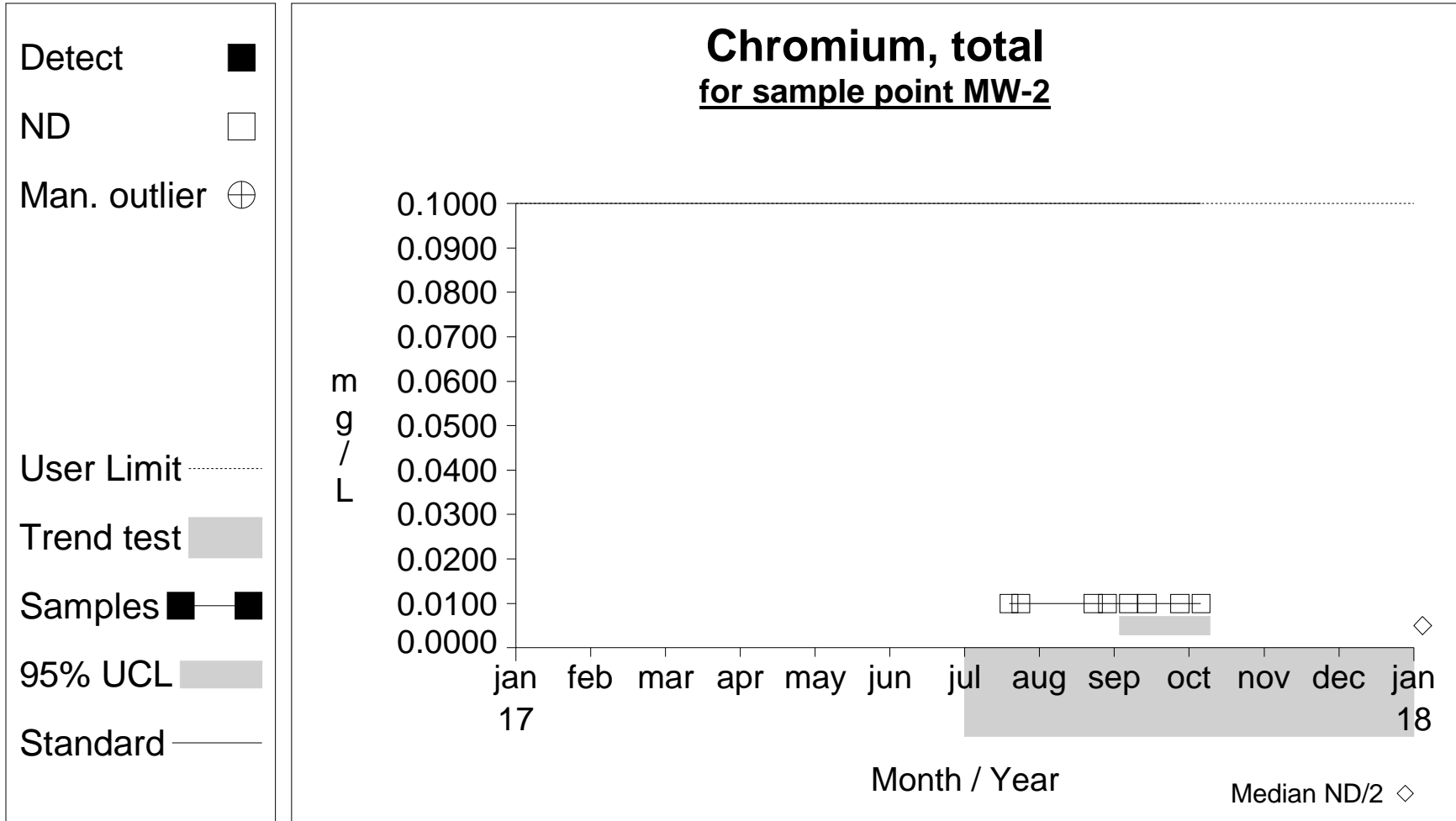
Graph 15

Confidence Limits (Assessment)



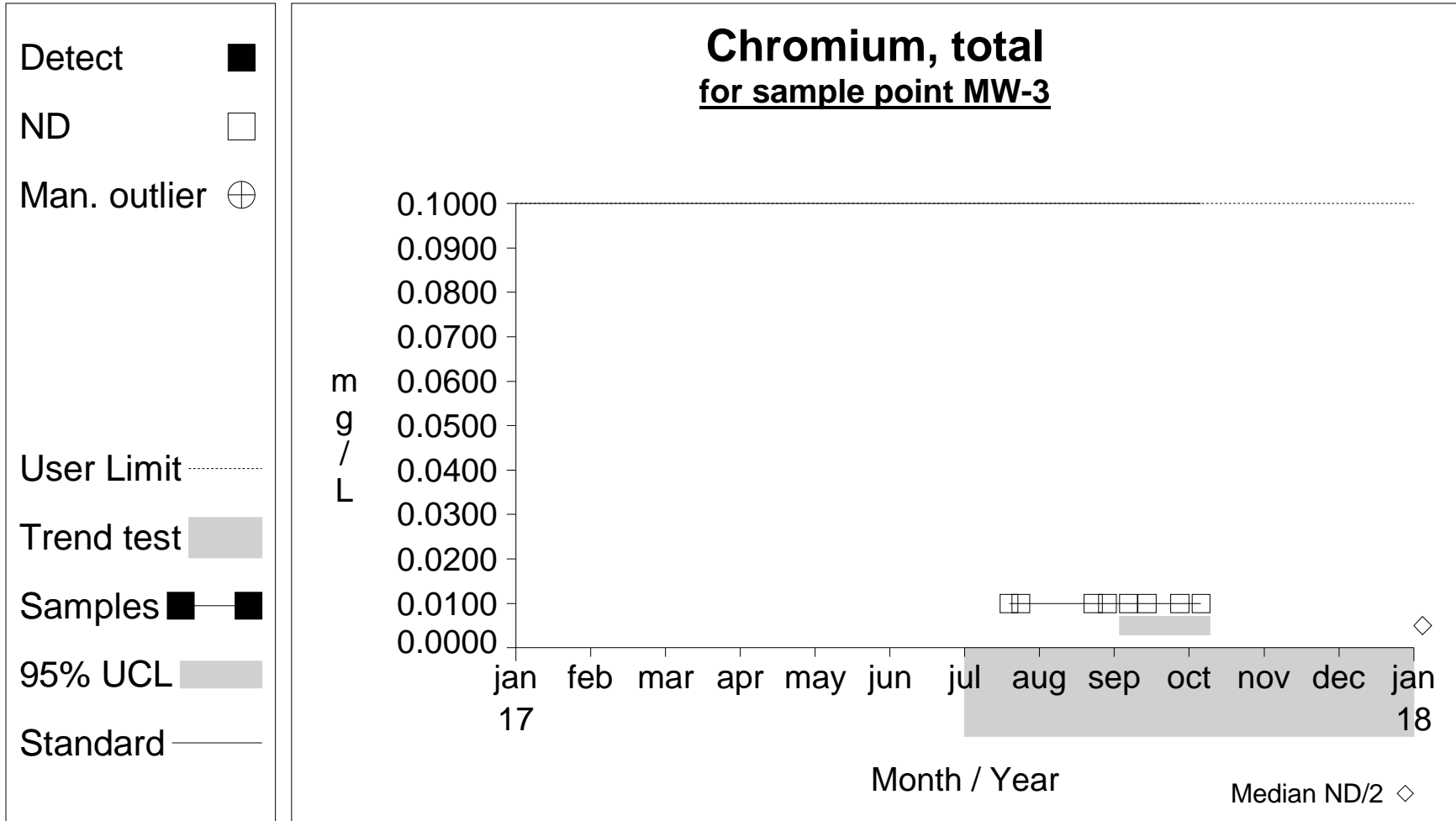
Graph 16

Confidence Limits (Assessment)



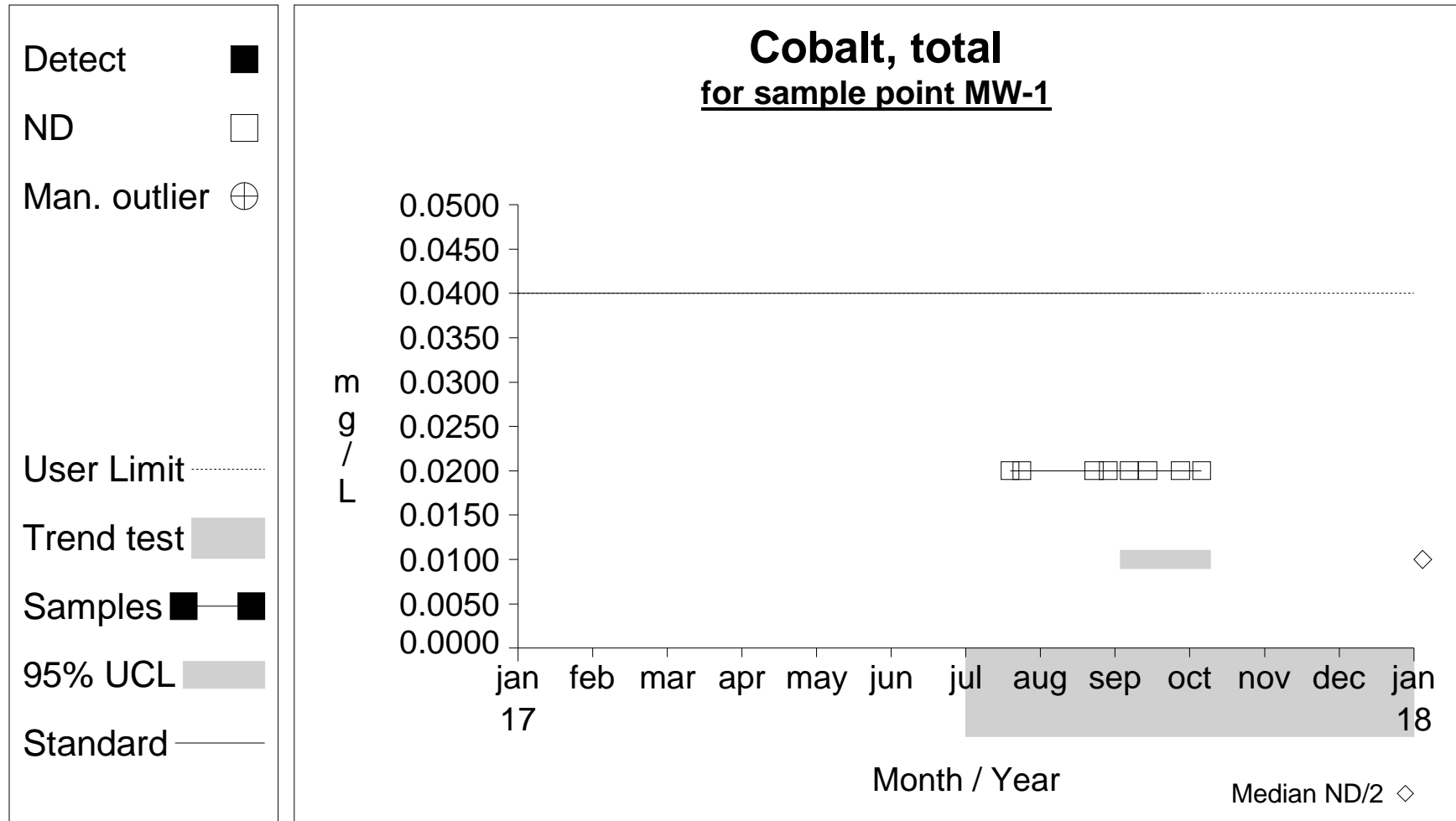
Graph 17

Confidence Limits (Assessment)



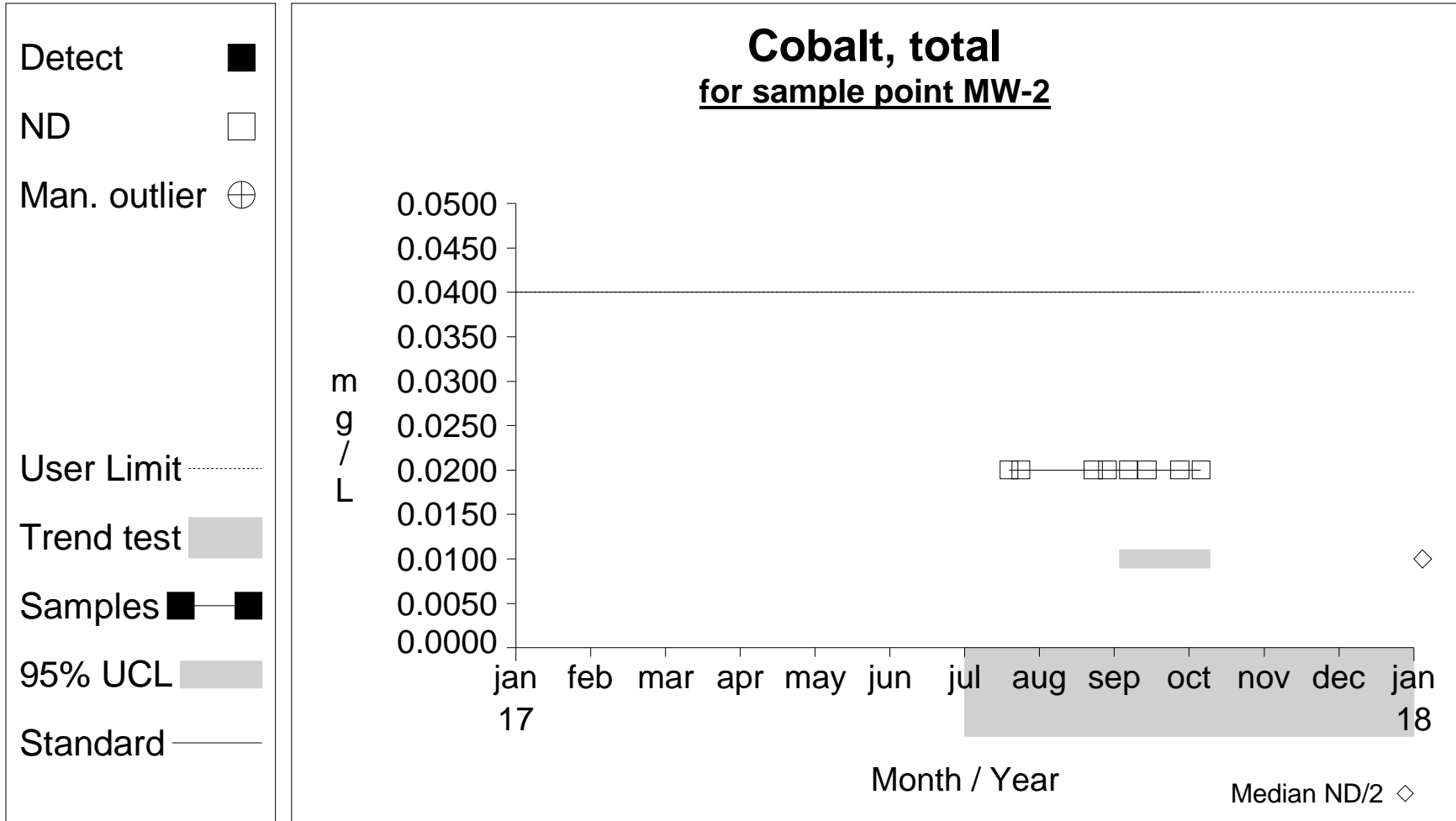
Graph 18

Confidence Limits (Assessment)



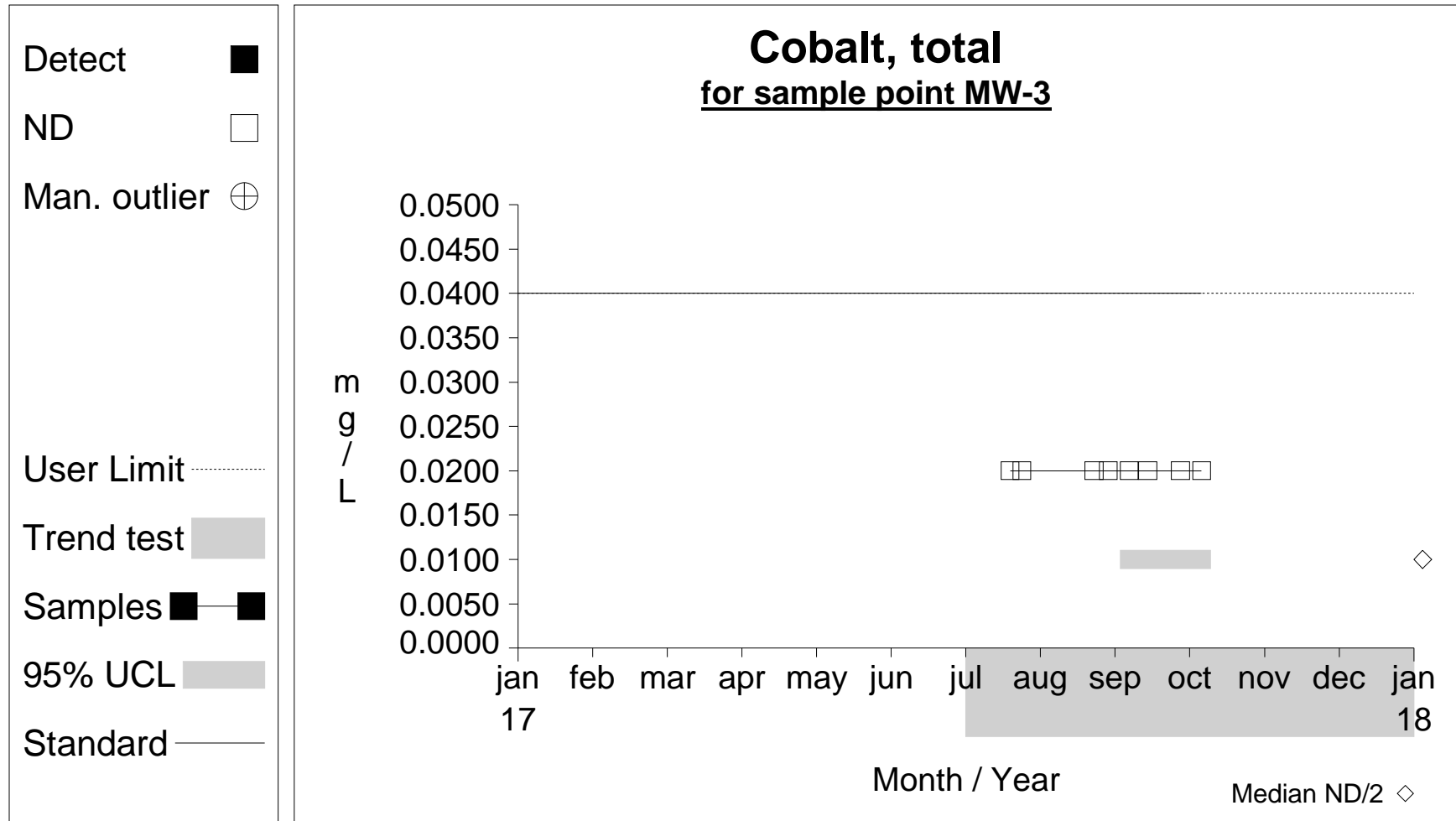
Graph 19

Confidence Limits (Assessment)



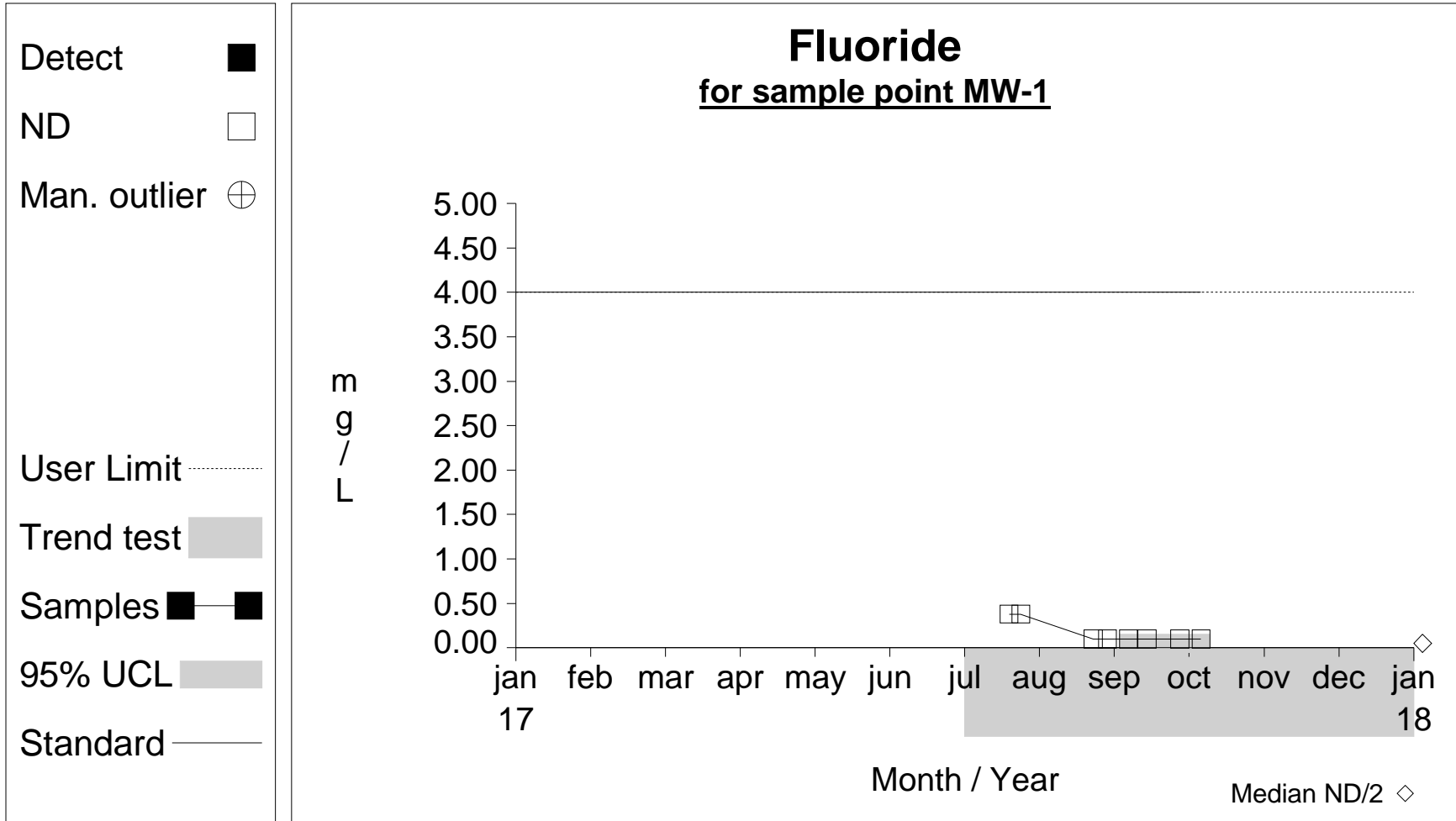
Graph 20

Confidence Limits (Assessment)



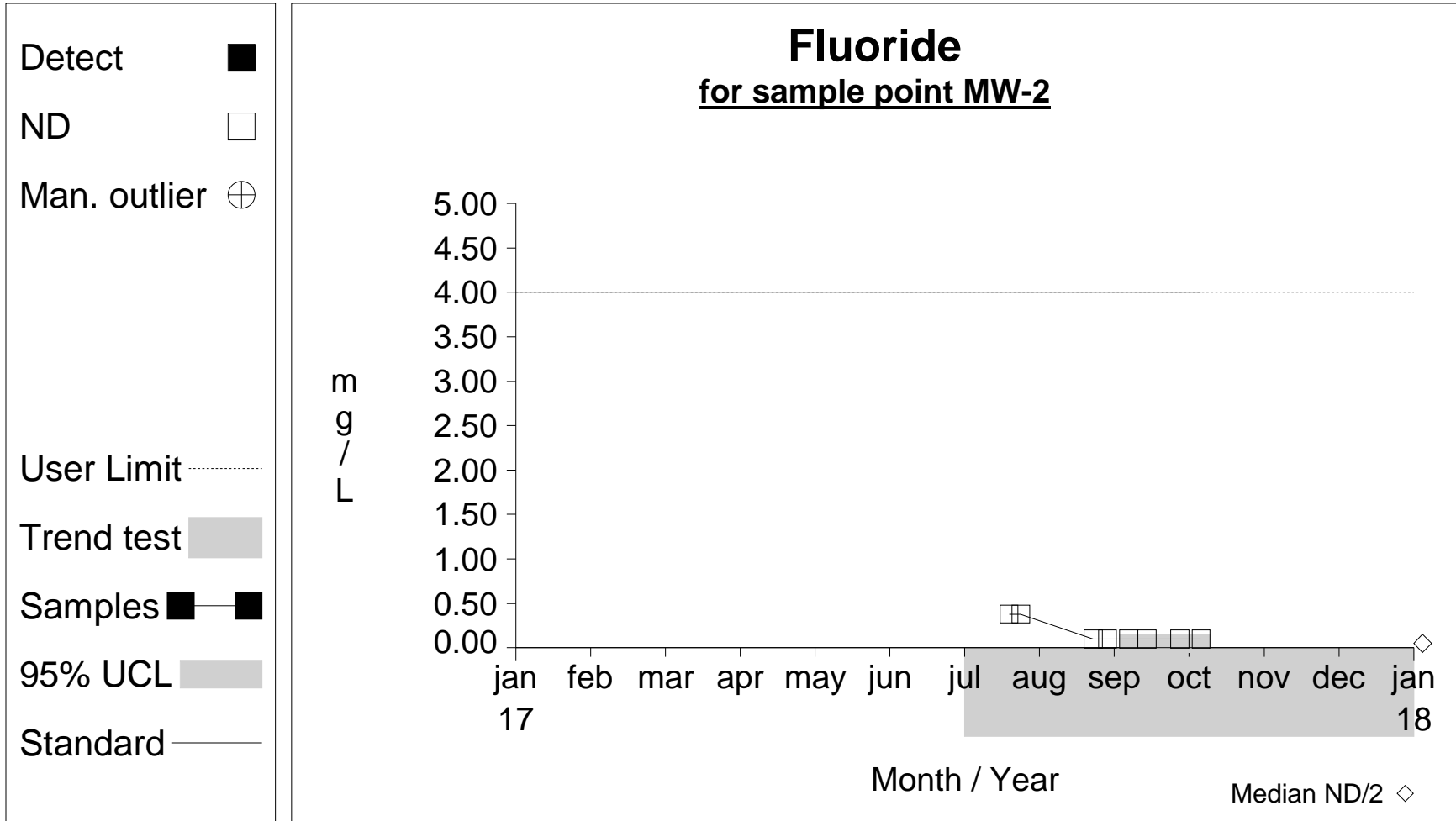
Graph 21

Confidence Limits (Assessment)



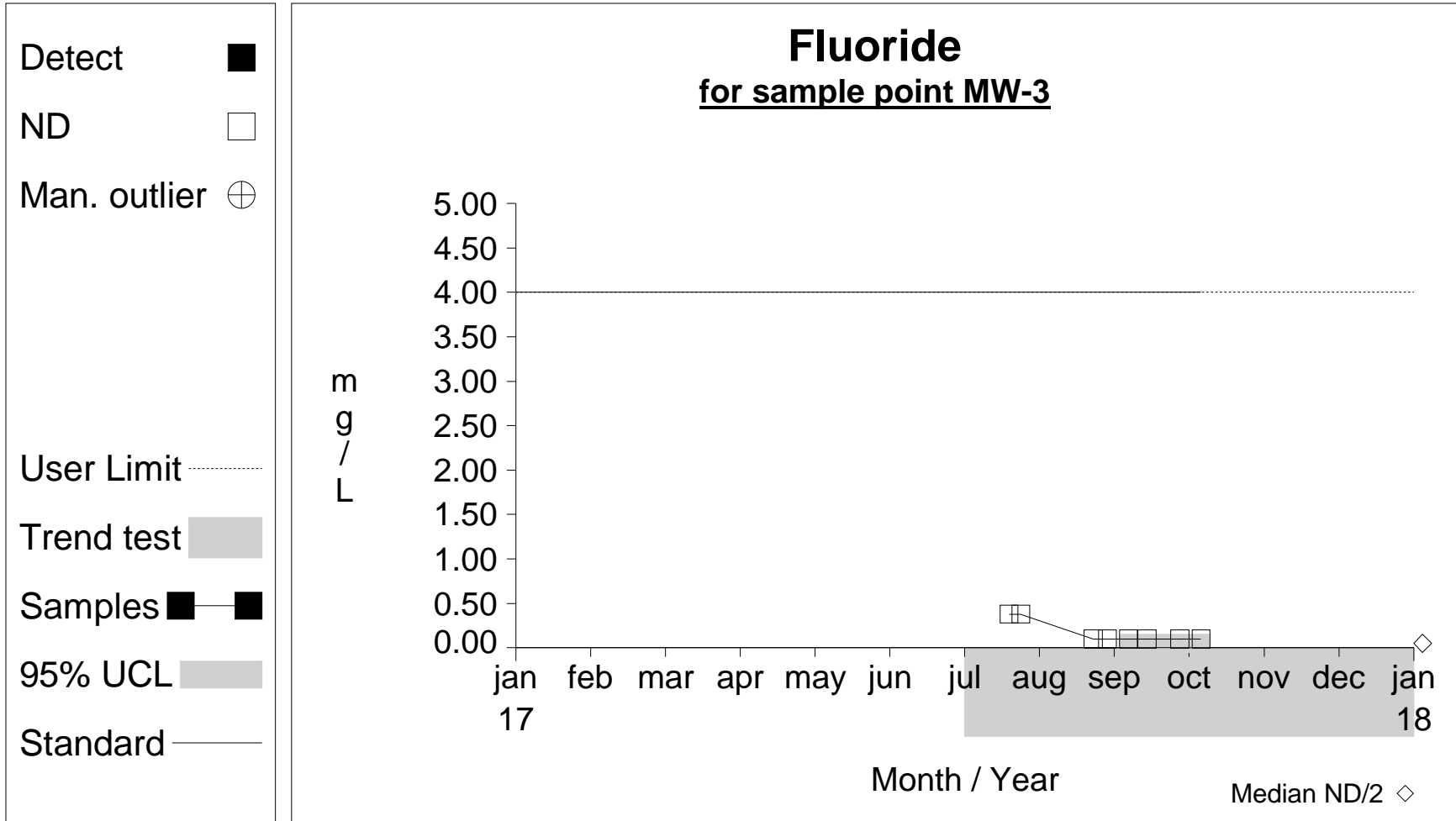
Graph 22

Confidence Limits (Assessment)



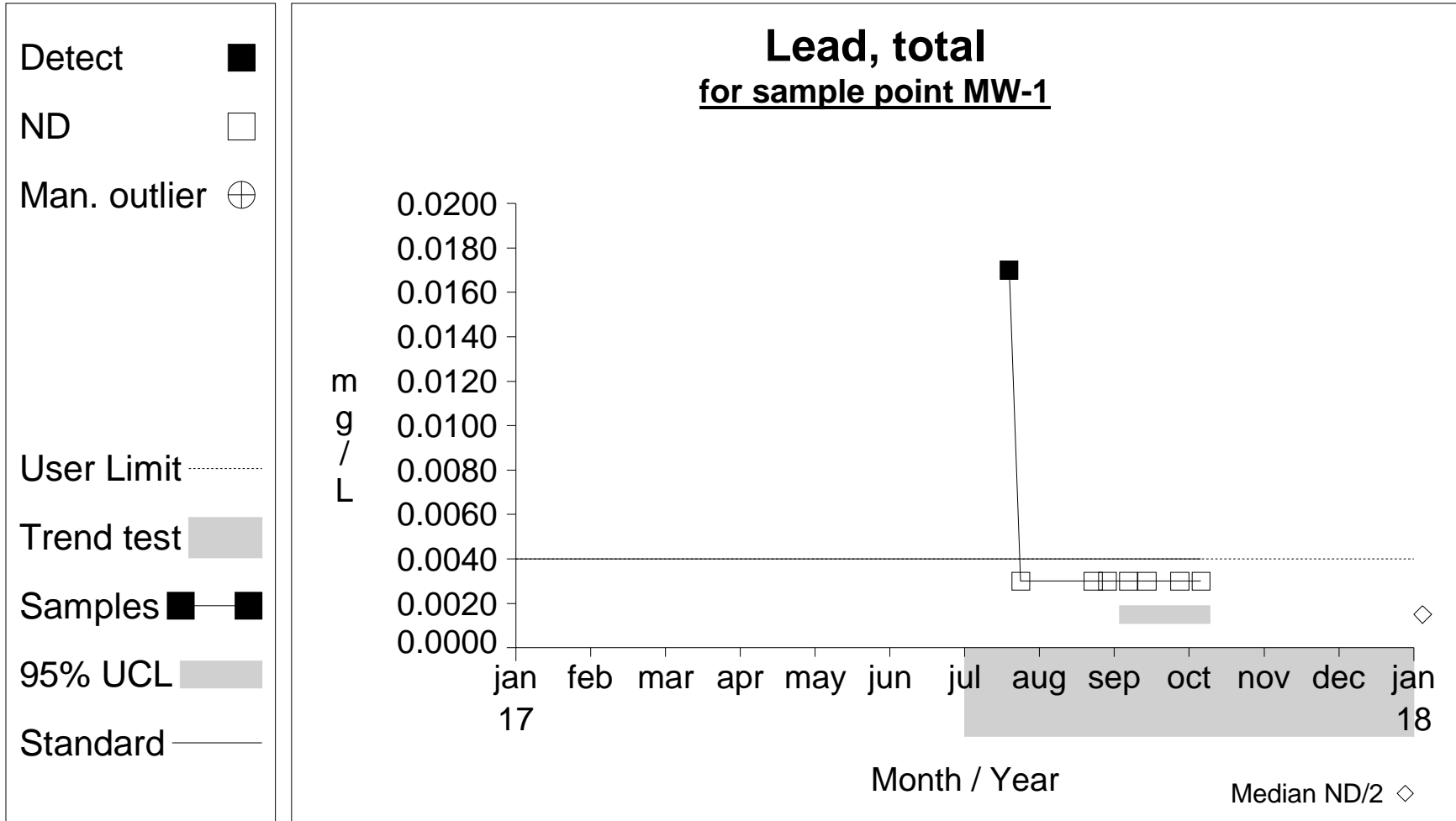
Graph 23

Confidence Limits (Assessment)



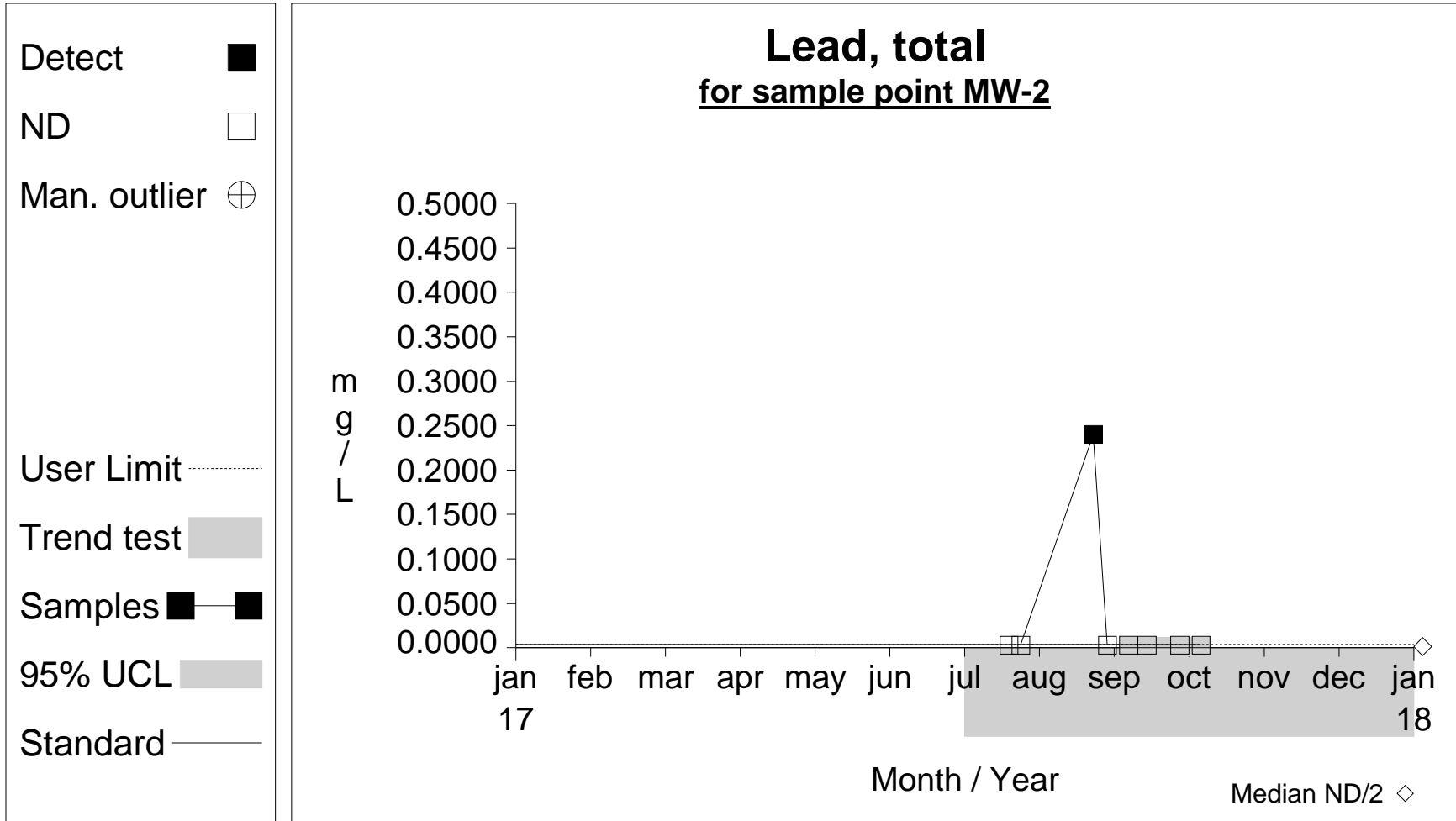
Graph 24

Confidence Limits (Assessment)



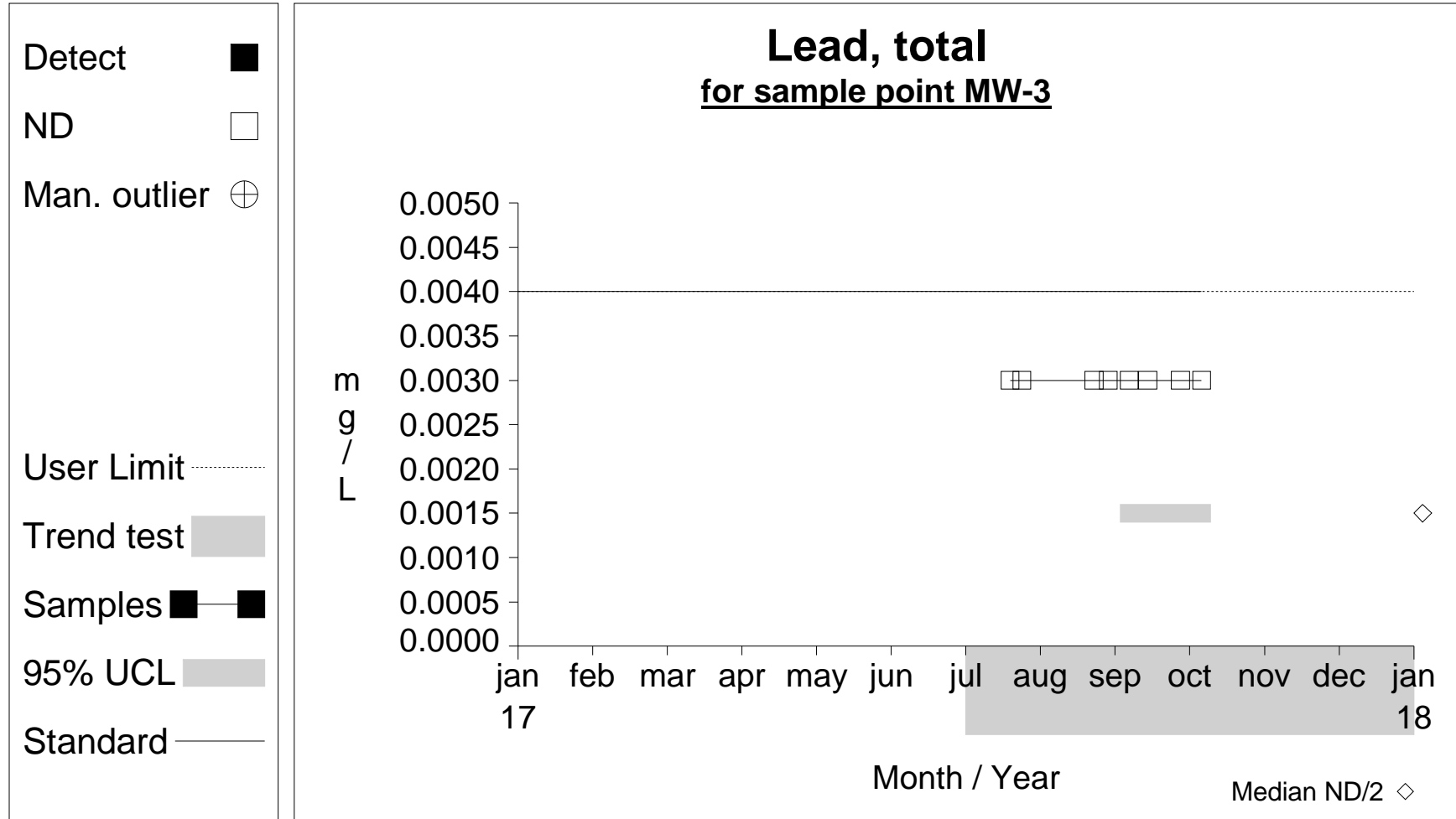
Graph 25

Confidence Limits (Assessment)



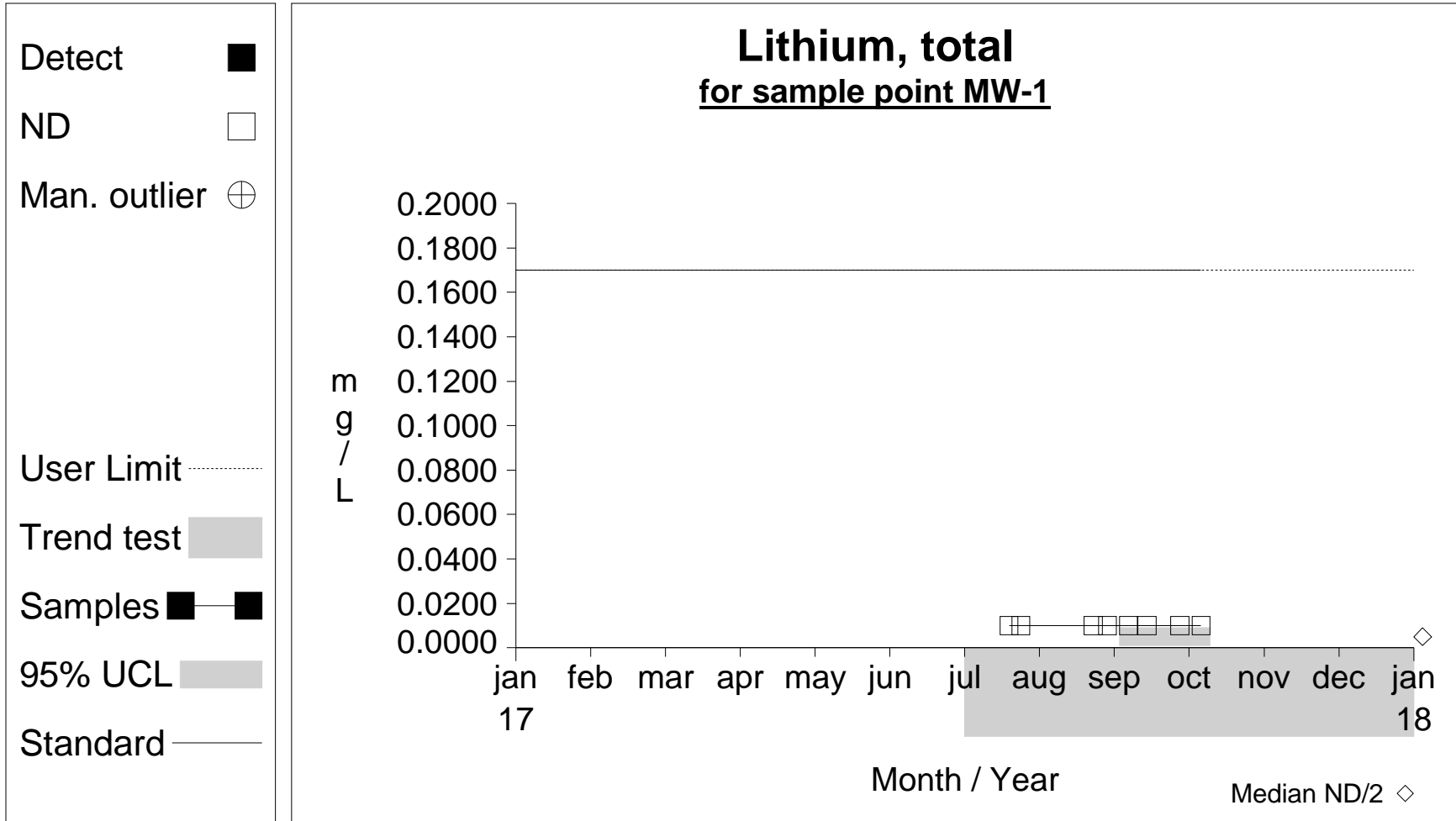
Graph 26

Confidence Limits (Assessment)



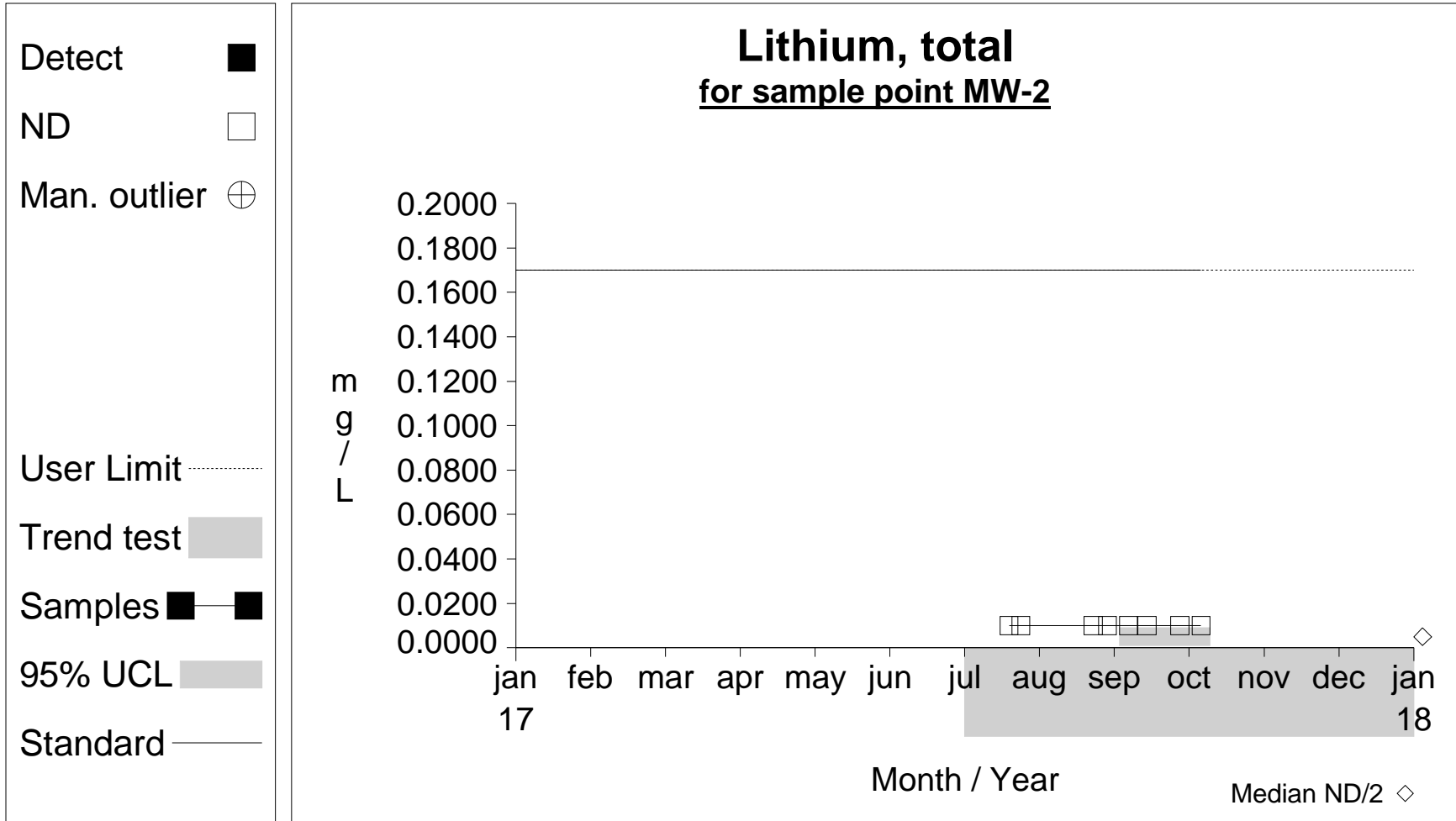
Graph 27

Confidence Limits (Assessment)



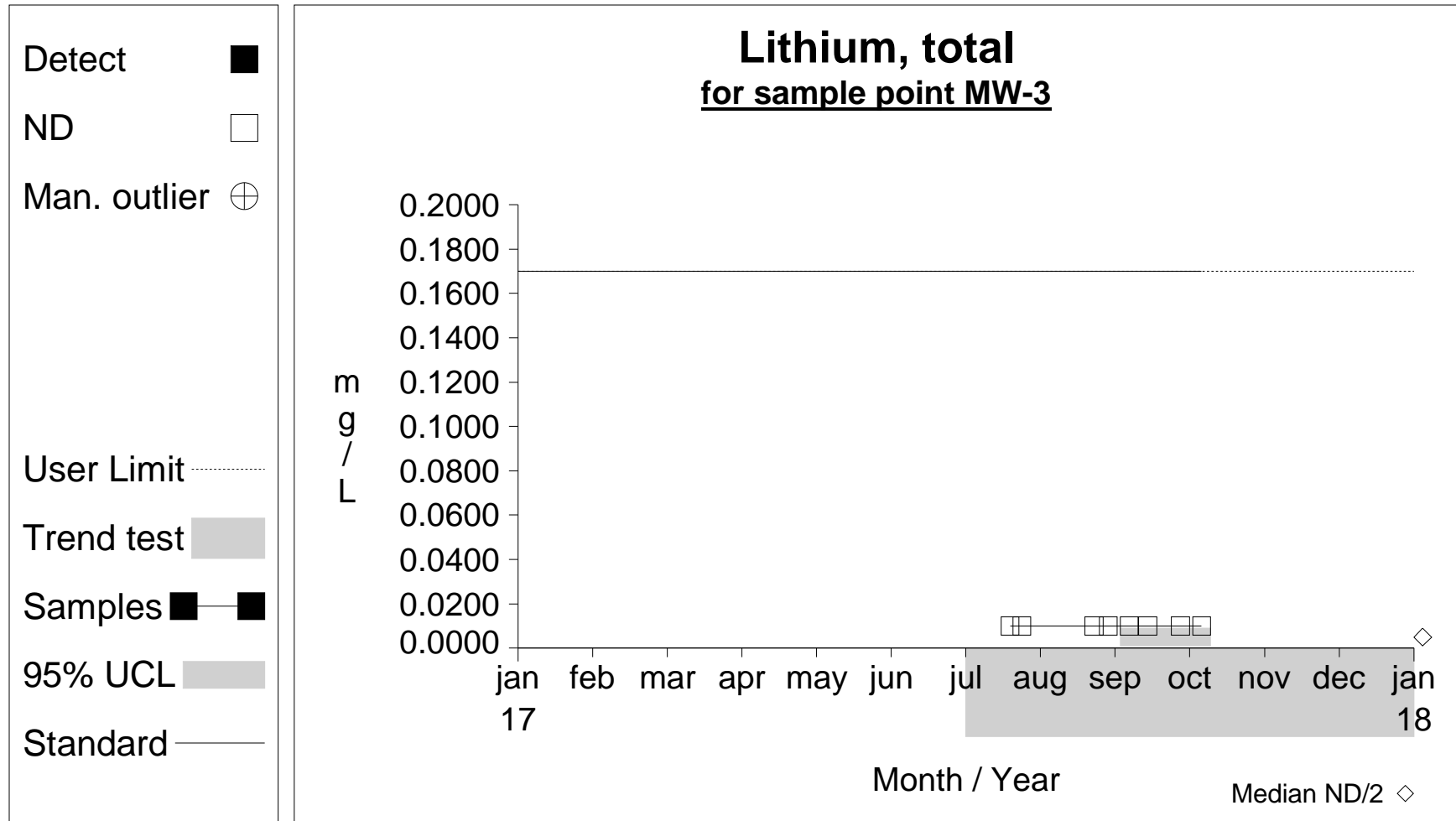
Graph 28

Confidence Limits (Assessment)



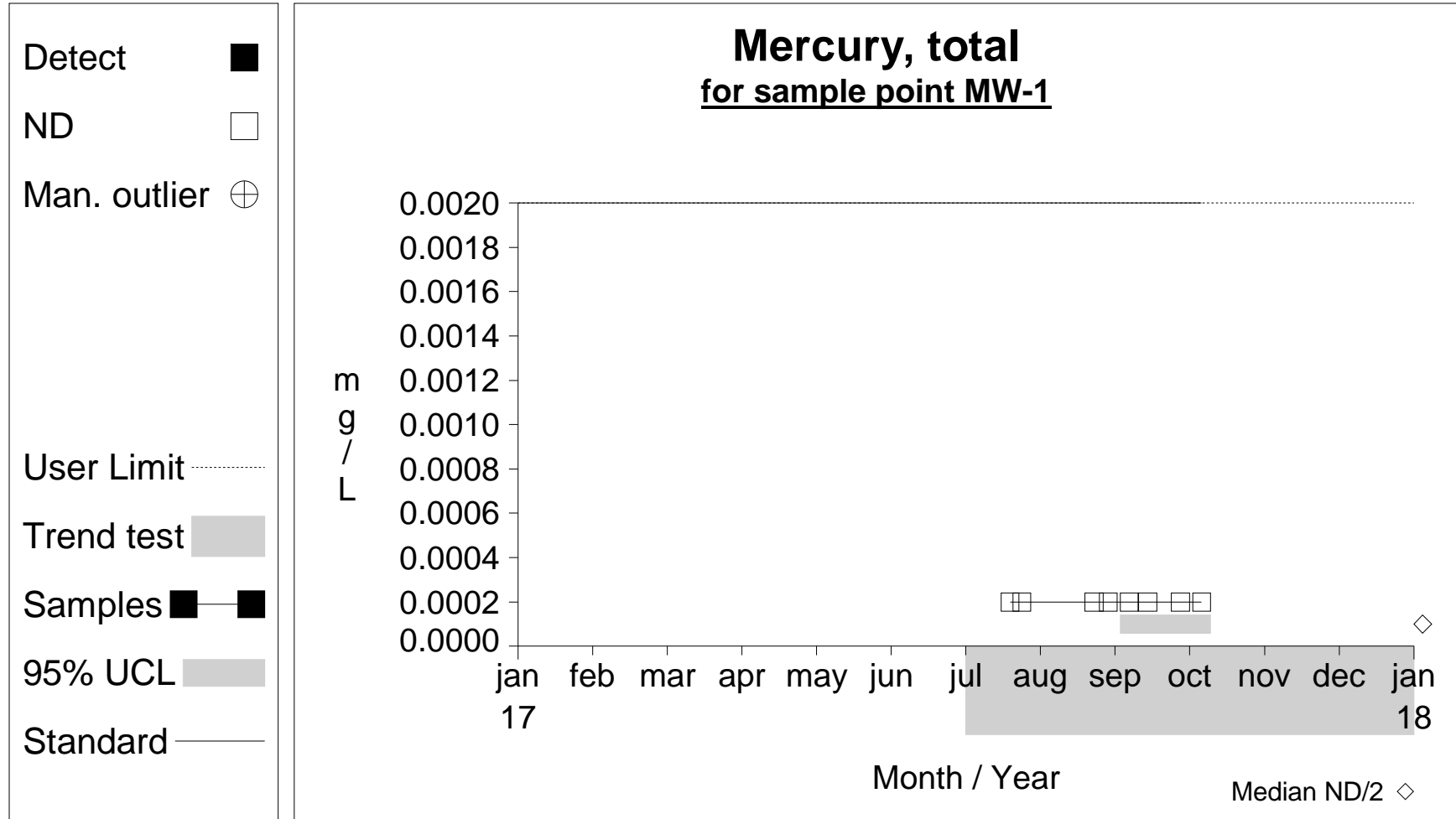
Graph 29

Confidence Limits (Assessment)



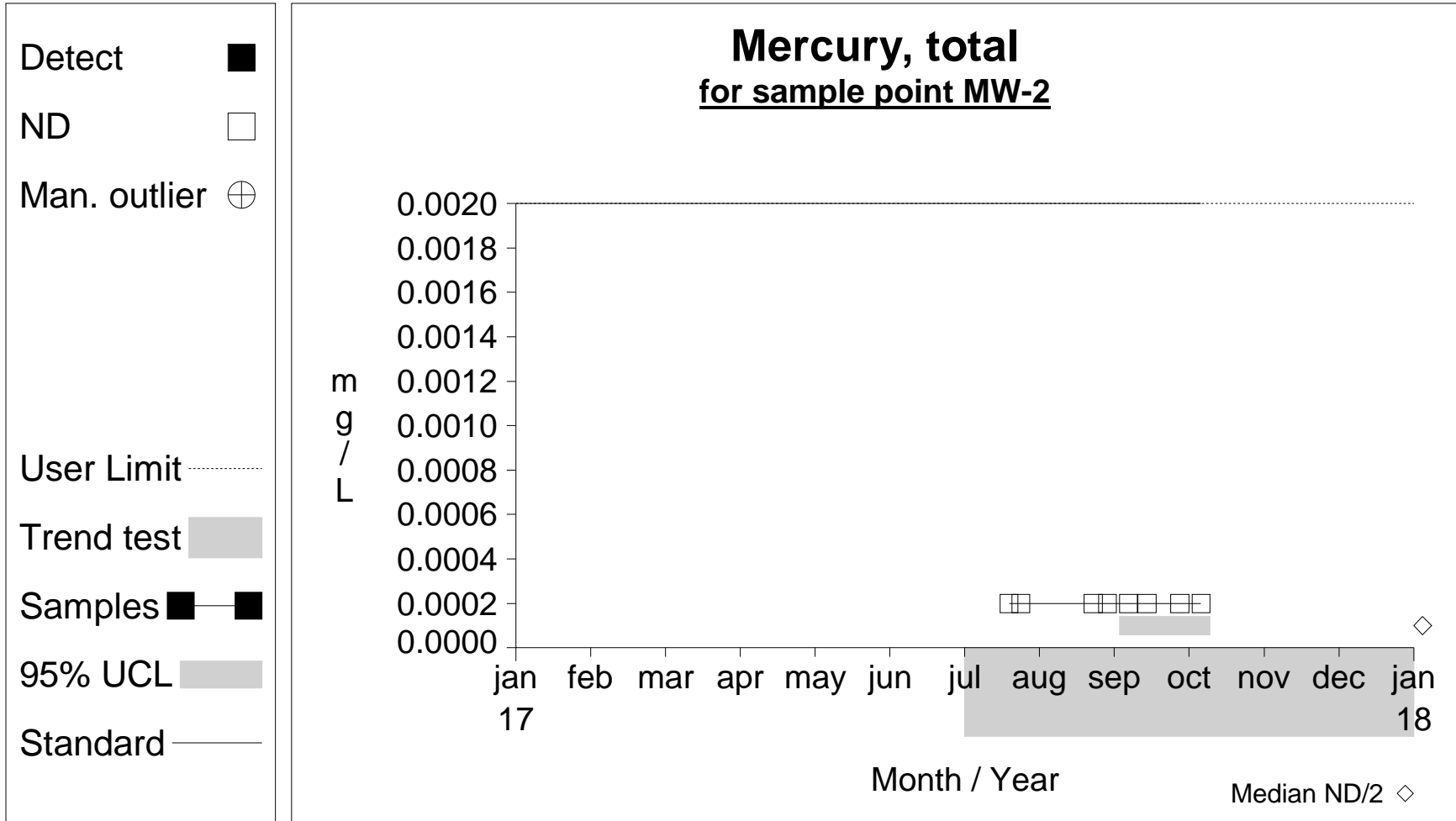
Graph 30

Confidence Limits (Assessment)



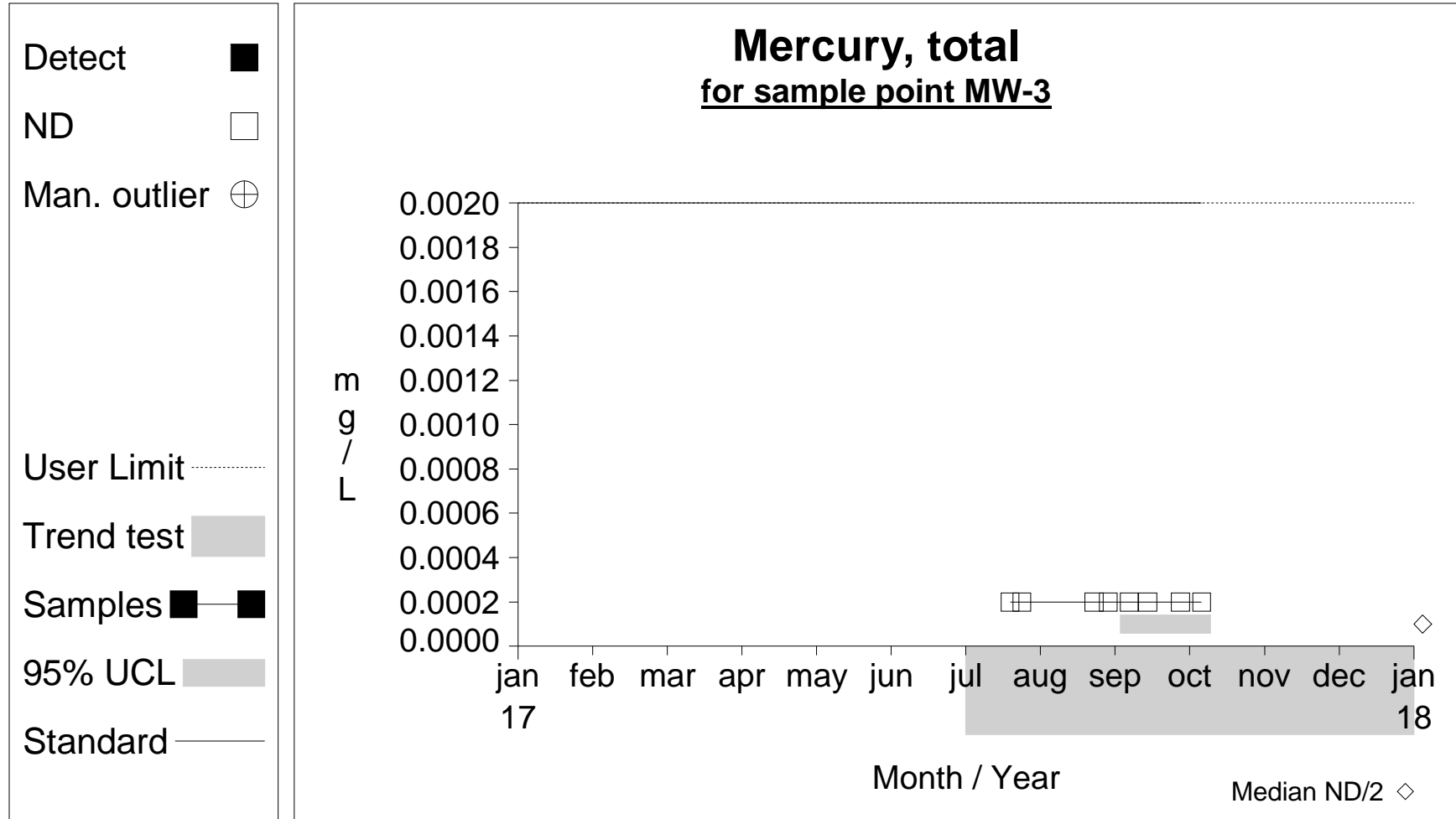
Graph 31

Confidence Limits (Assessment)



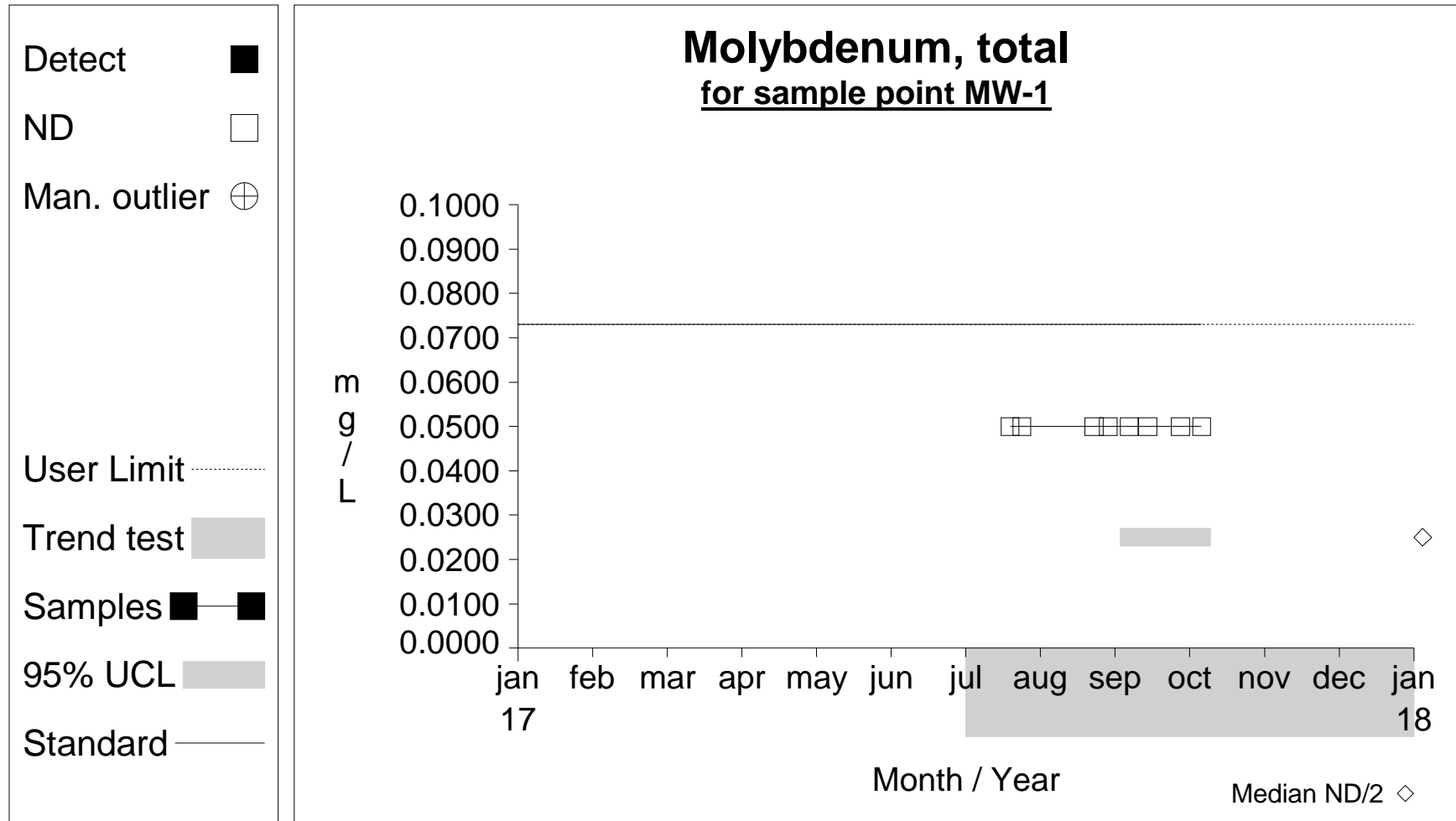
Graph 32

Confidence Limits (Assessment)



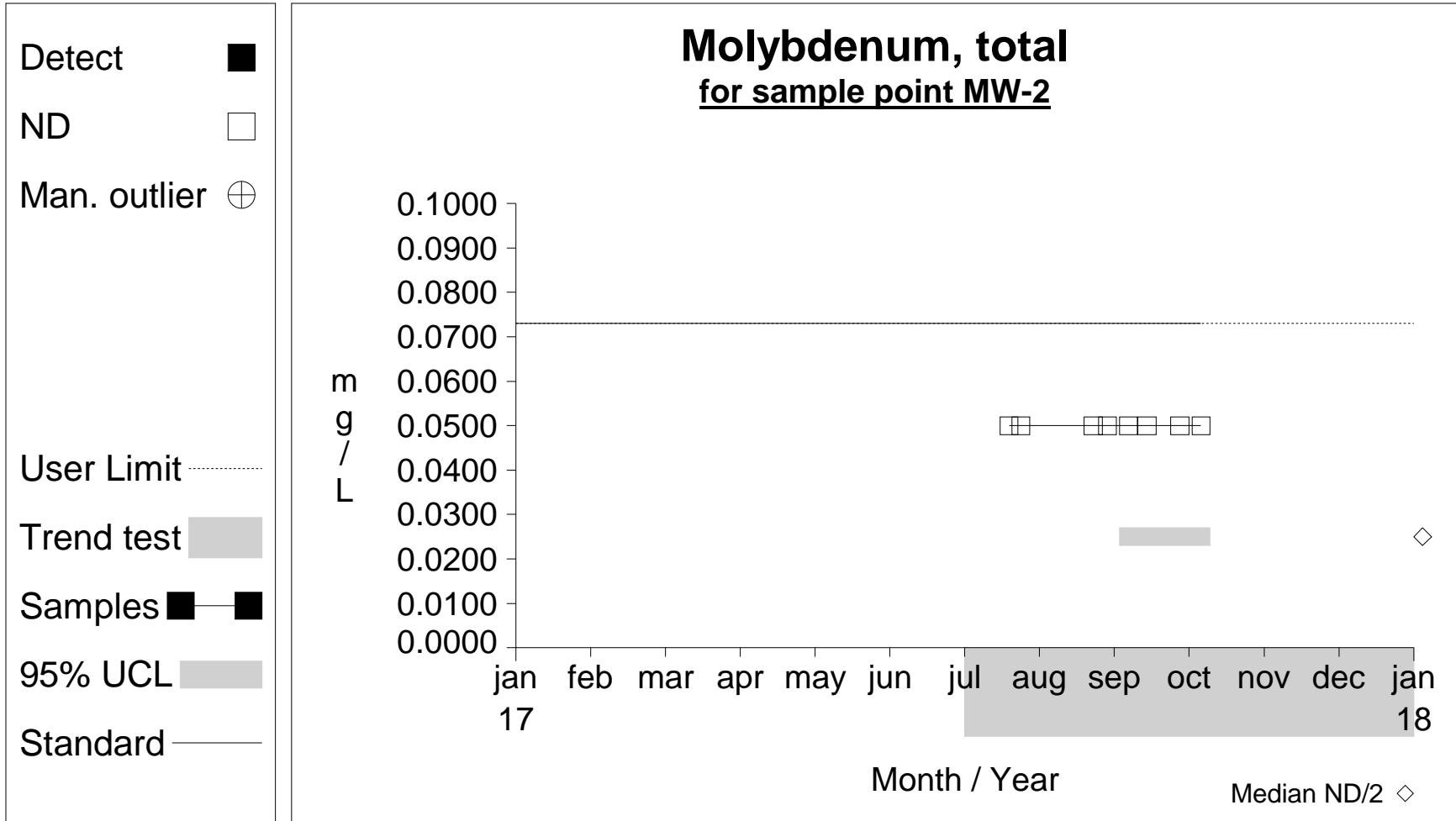
Graph 33

Confidence Limits (Assessment)



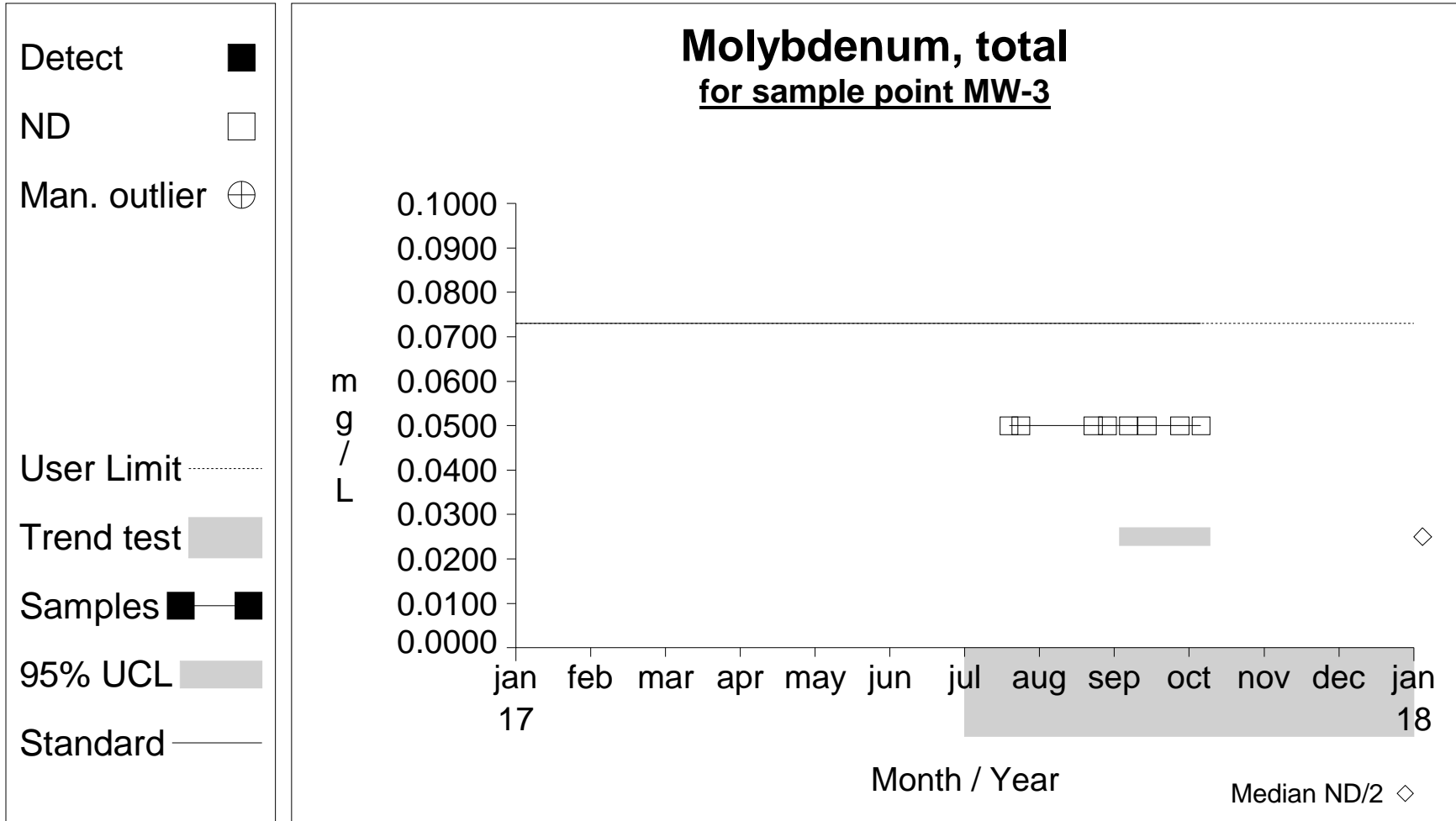
Graph 34

Confidence Limits (Assessment)



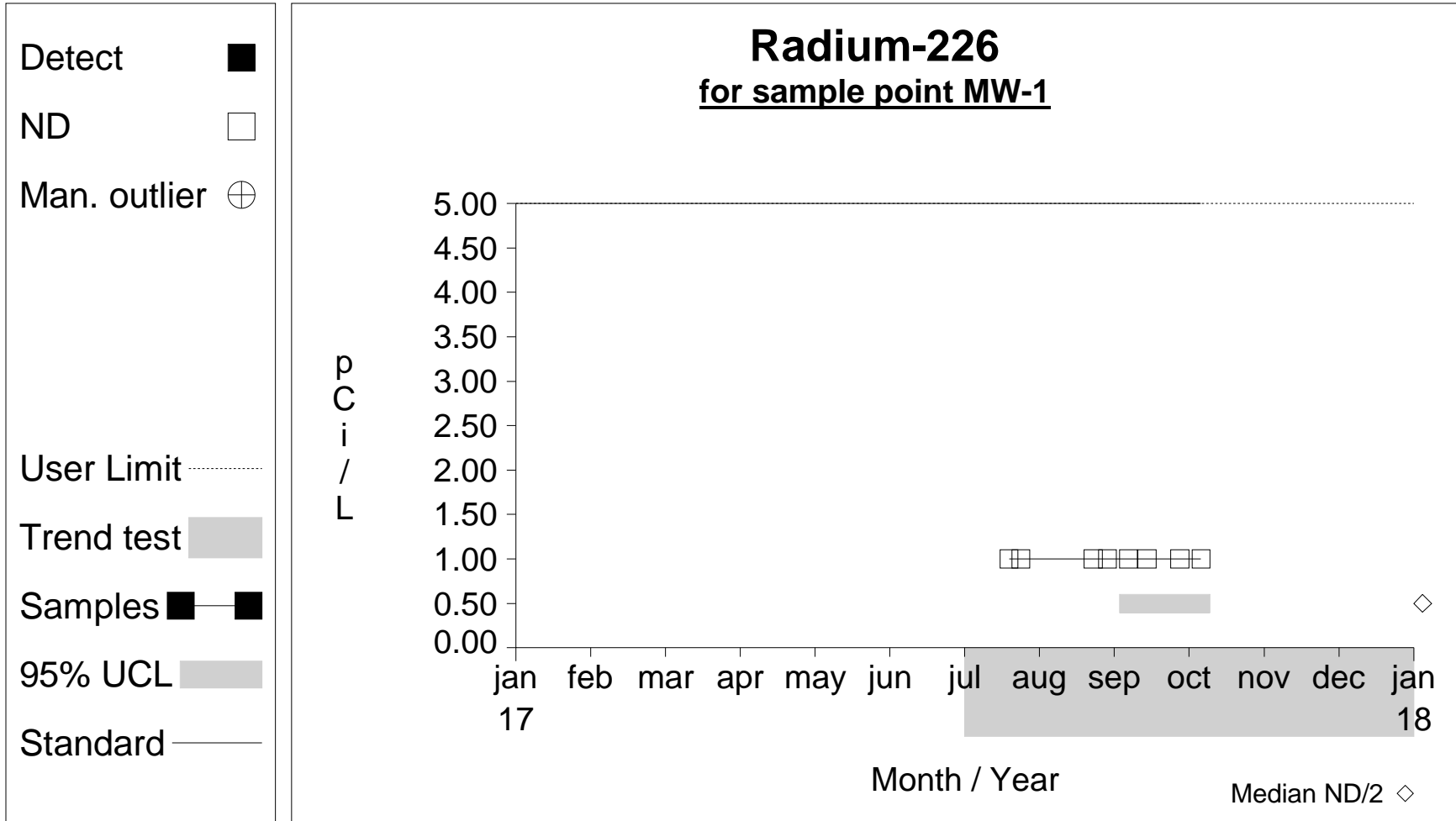
Graph 35

Confidence Limits (Assessment)



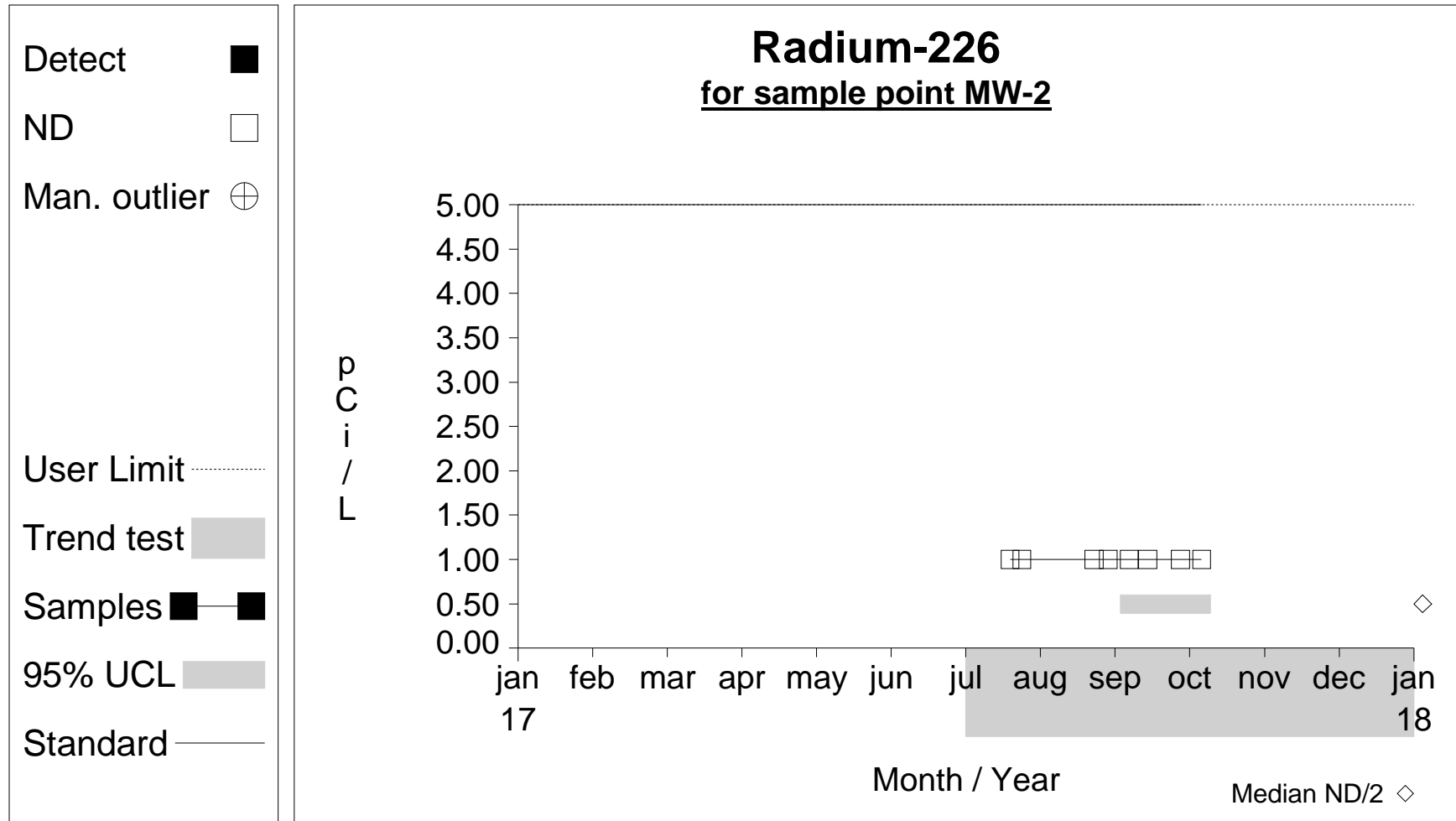
Graph 36

Confidence Limits (Assessment)



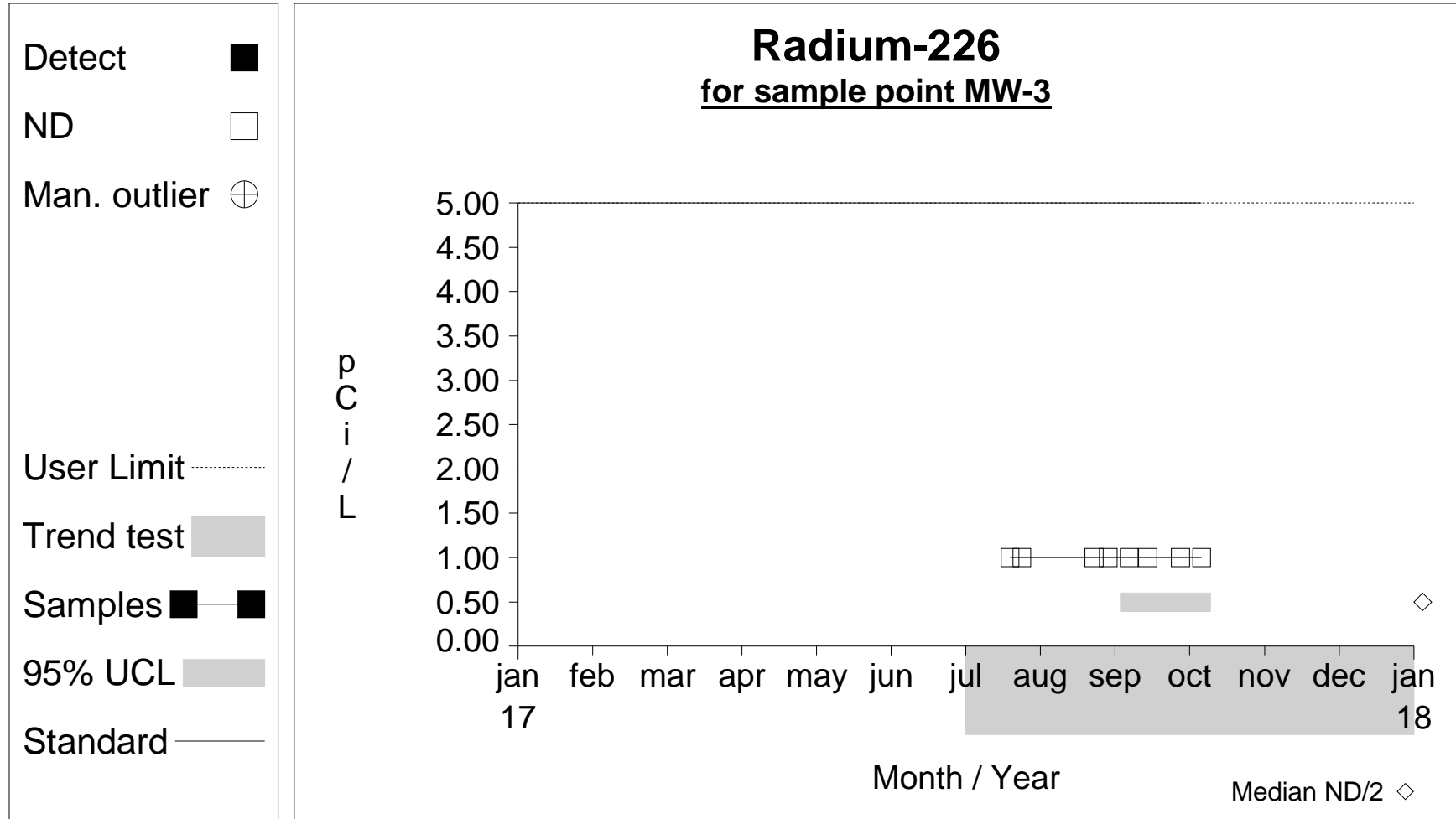
Graph 37

Confidence Limits (Assessment)



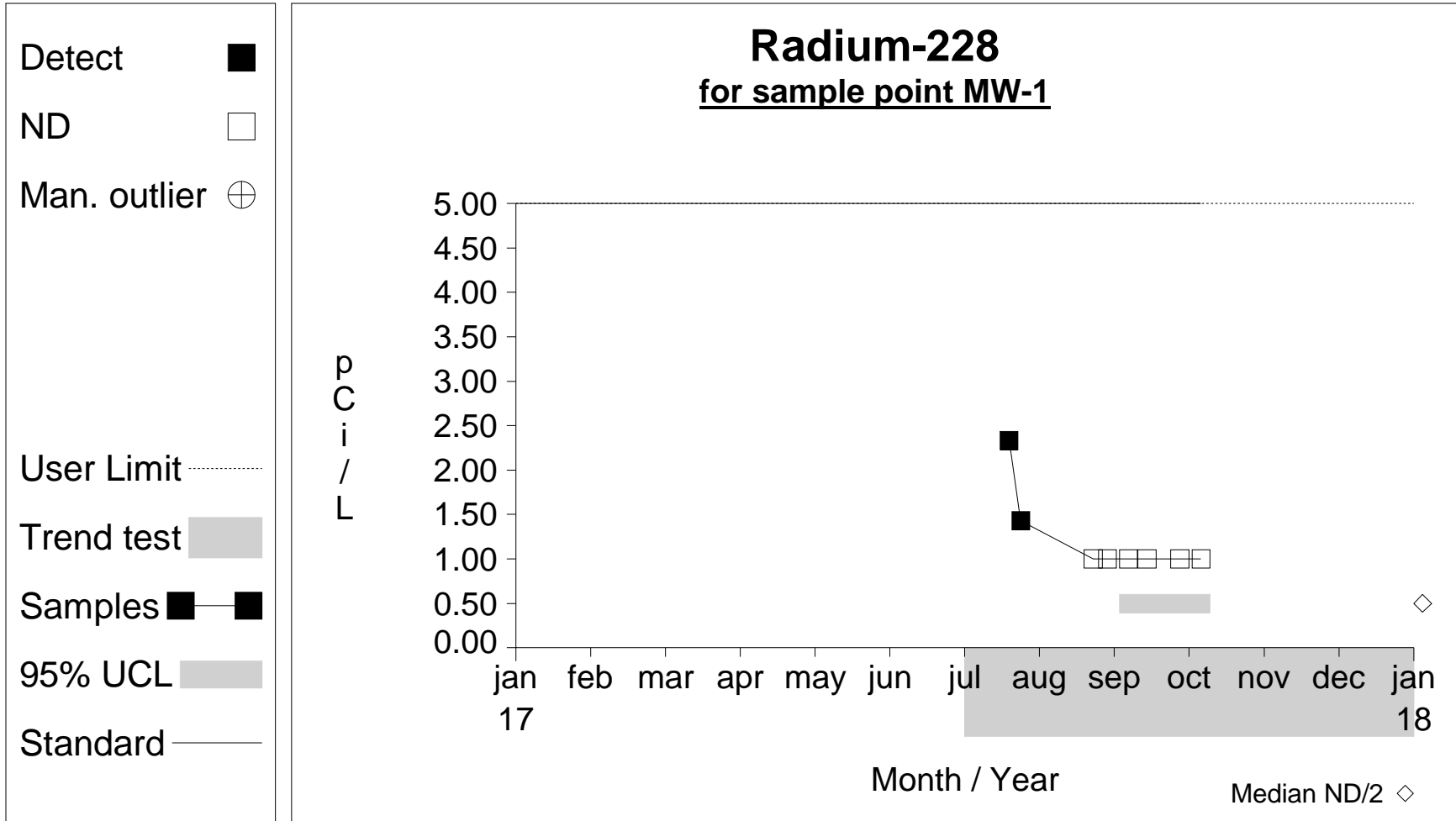
Graph 38

Confidence Limits (Assessment)



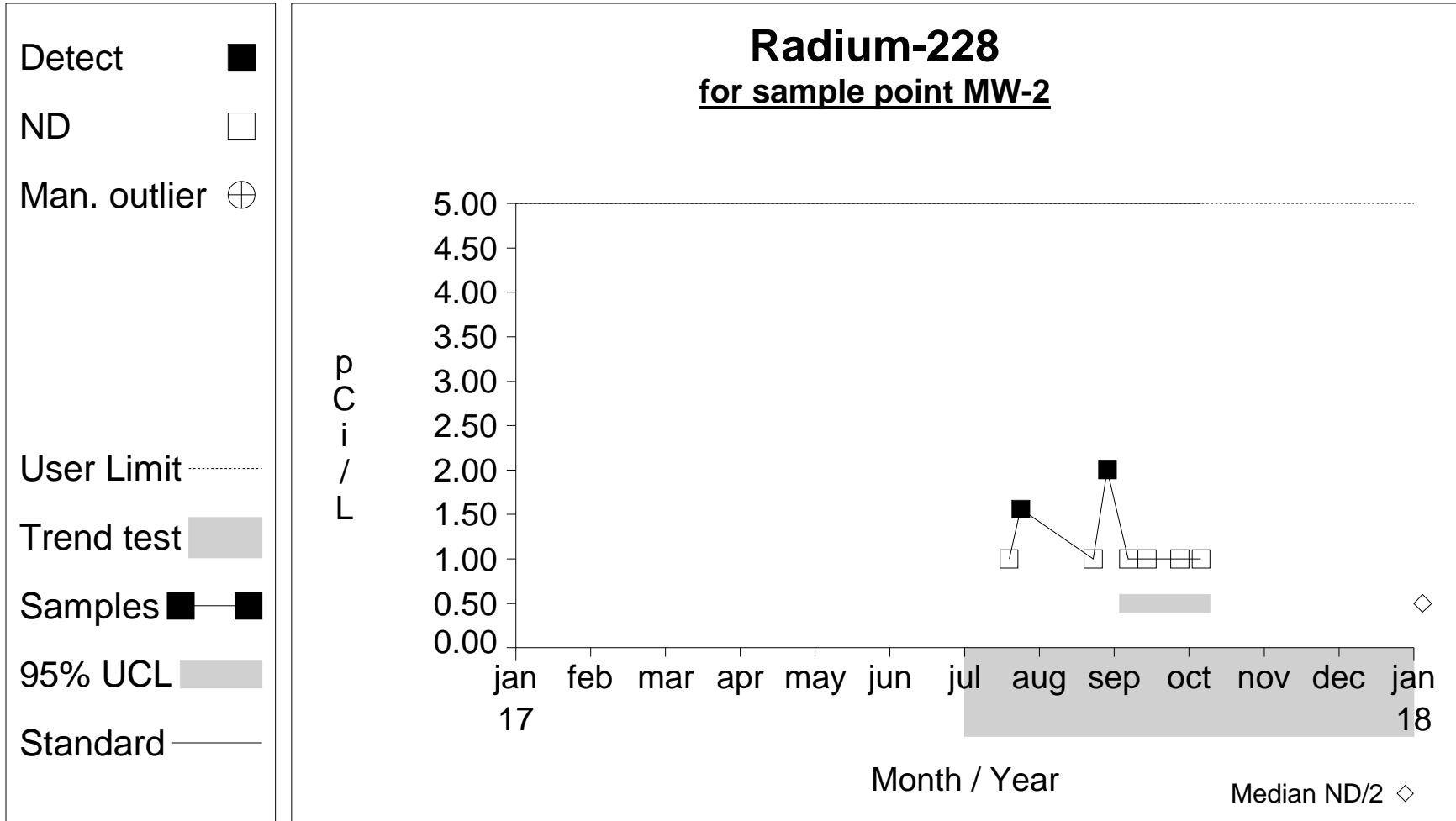
Graph 39

Confidence Limits (Assessment)



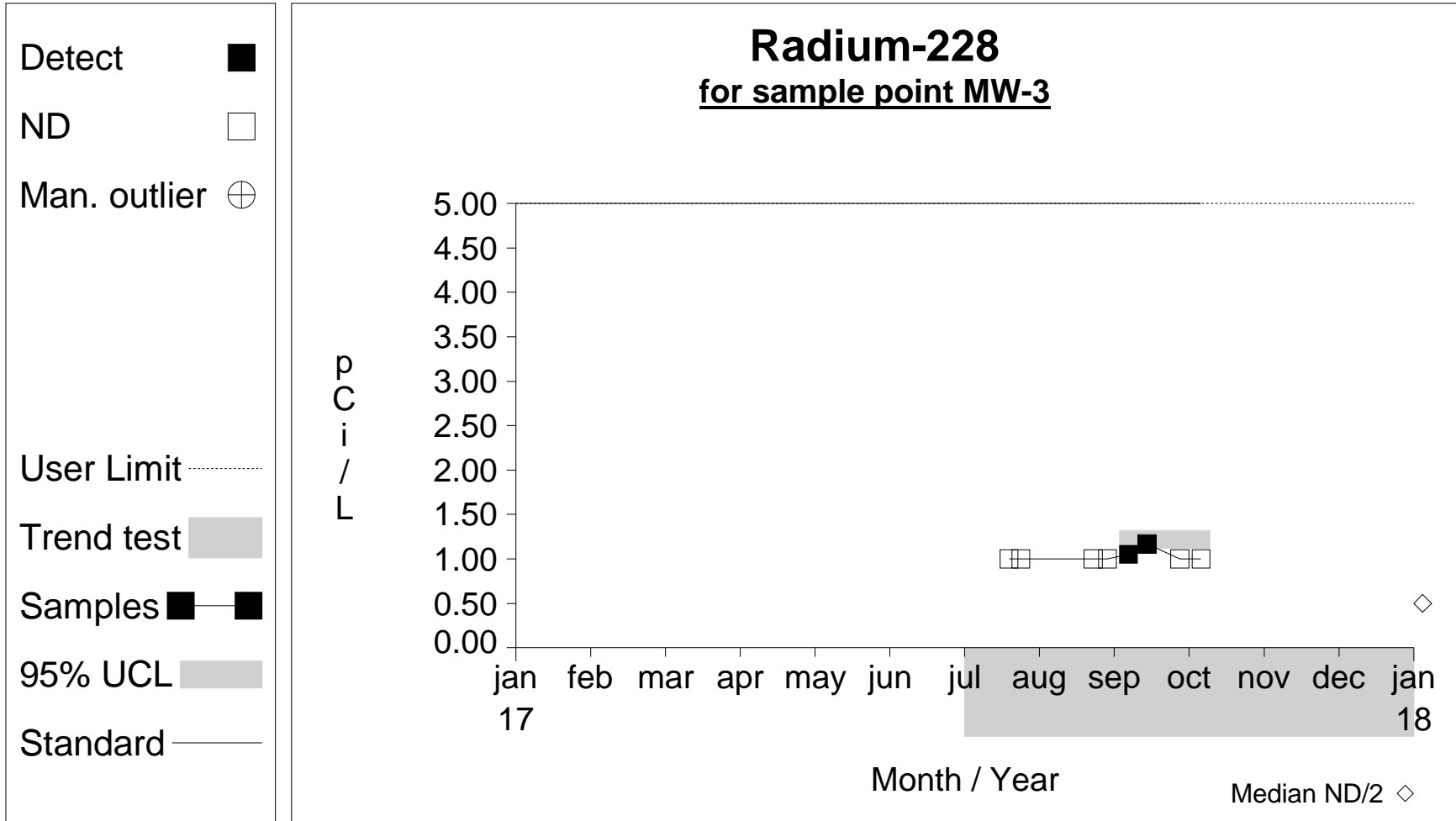
Graph 40

Confidence Limits (Assessment)



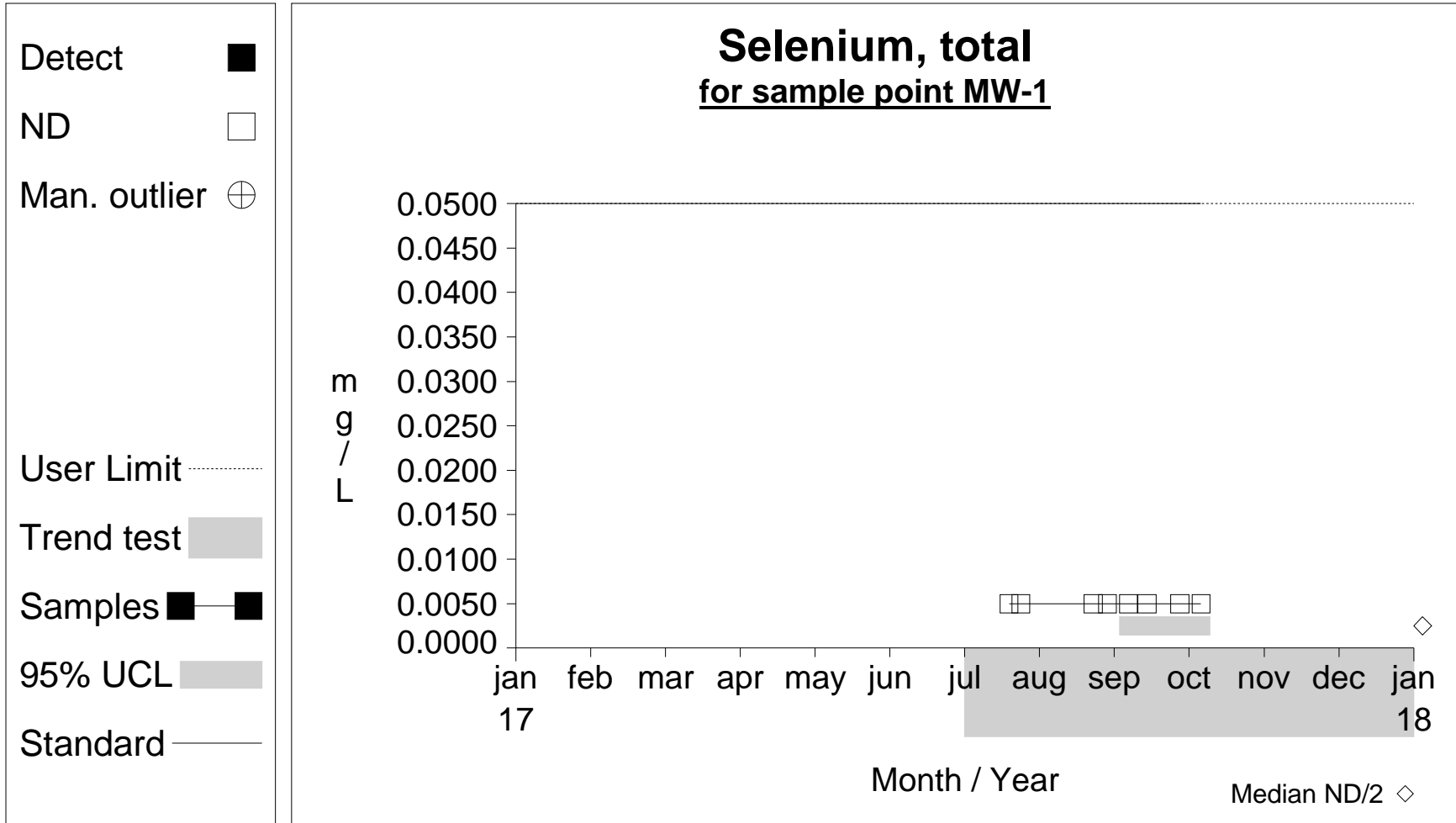
Graph 41

Confidence Limits (Assessment)



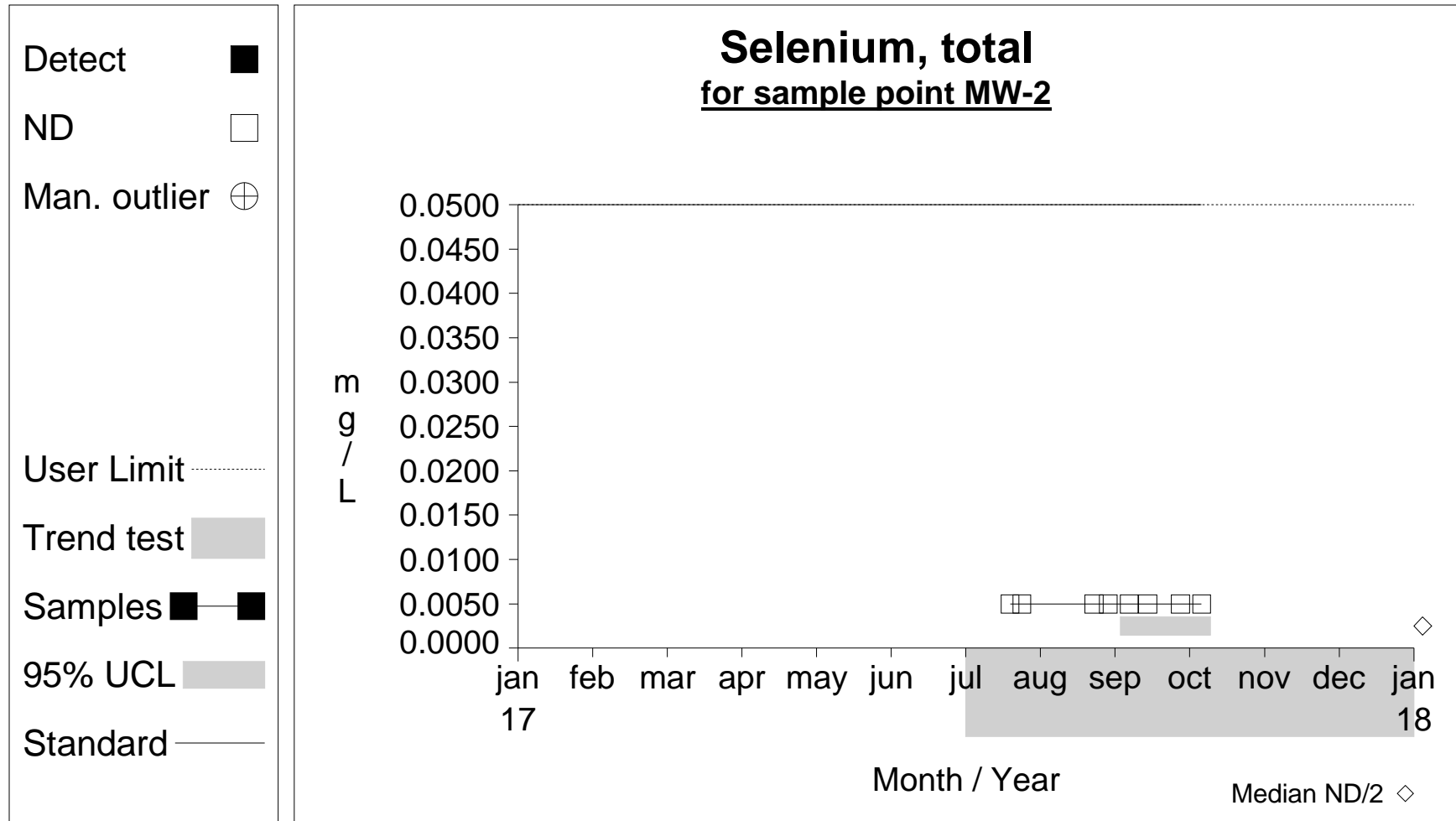
Graph 42

Confidence Limits (Assessment)



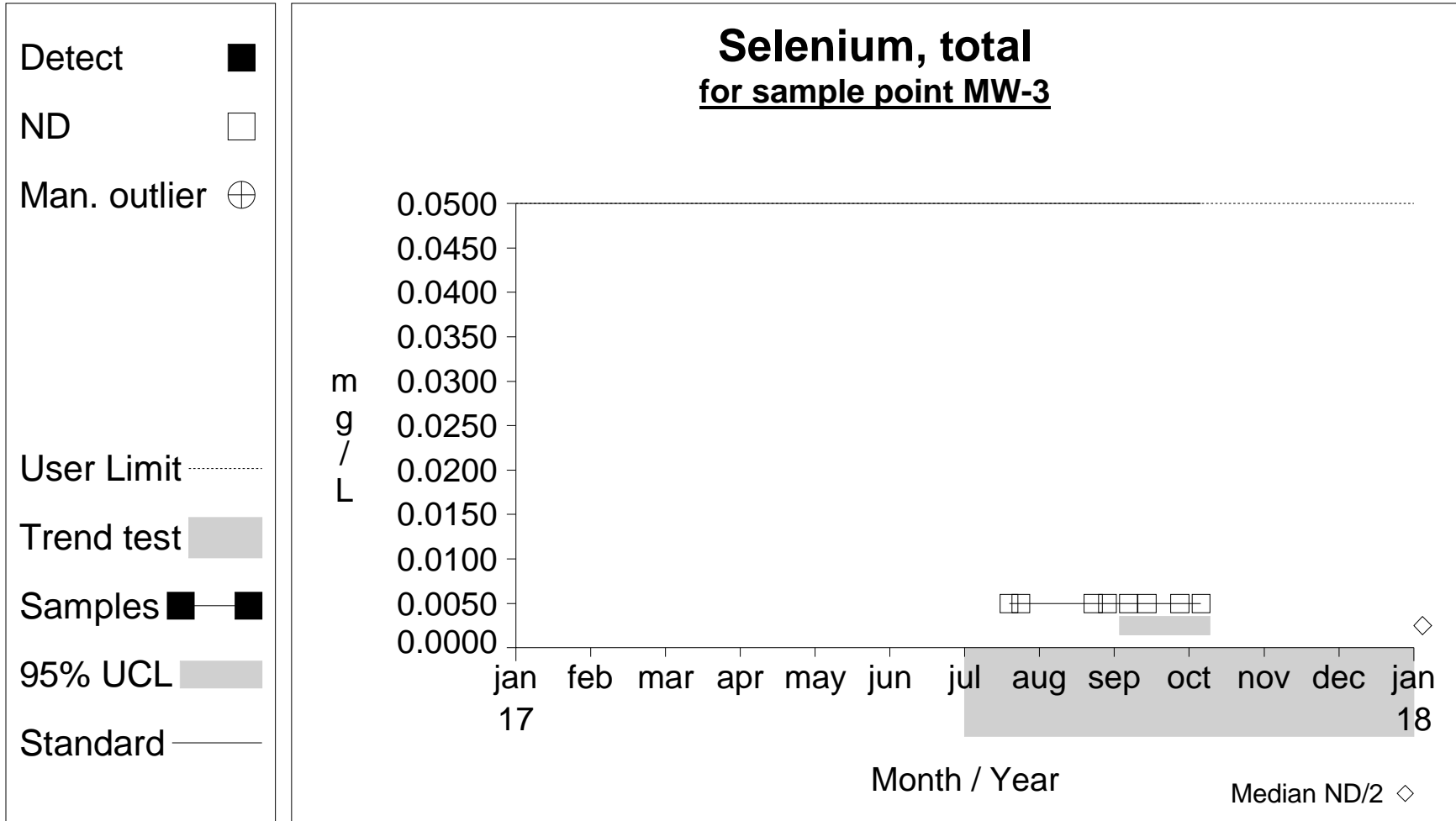
Graph 43

Confidence Limits (Assessment)



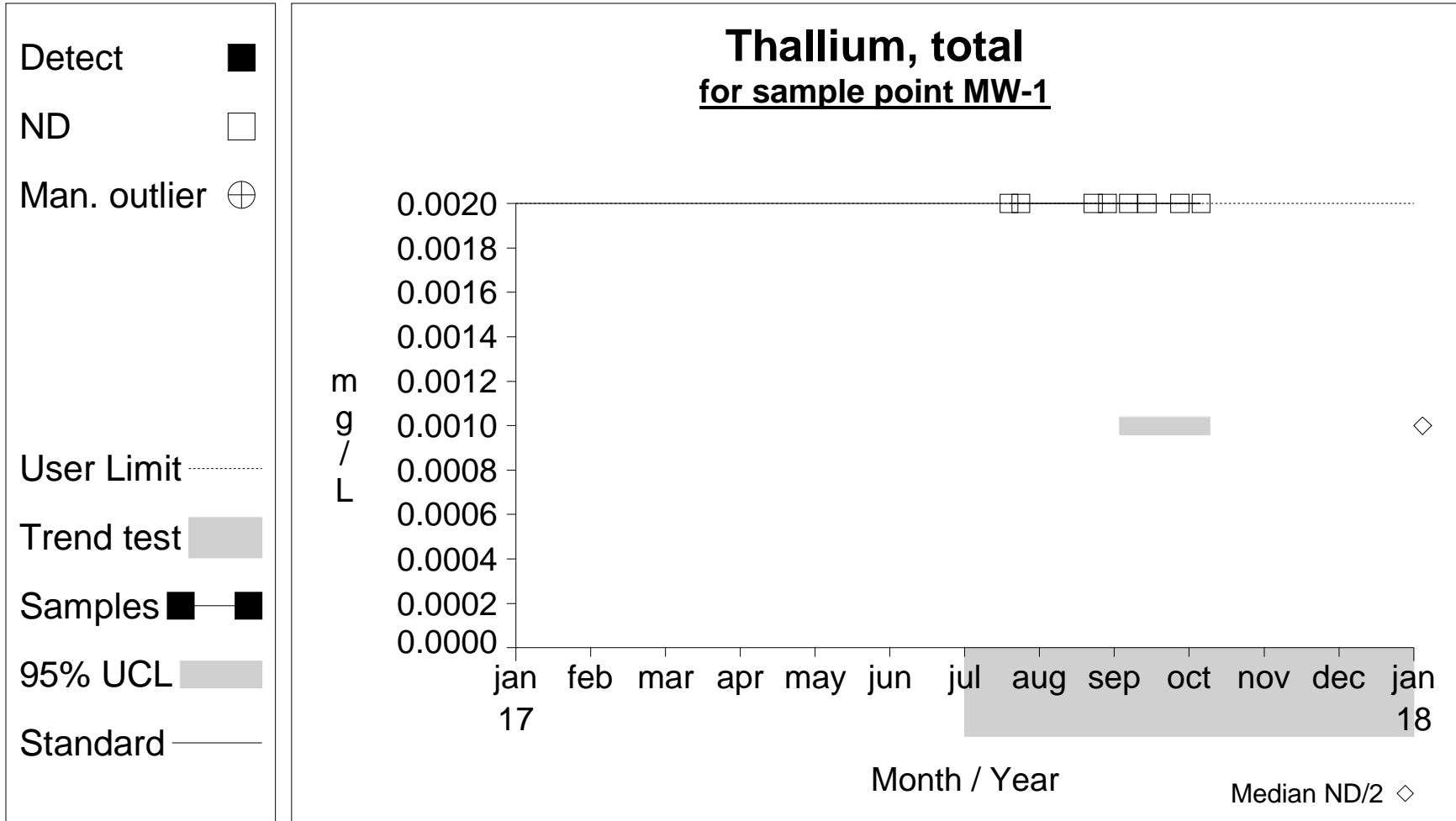
Graph 44

Confidence Limits (Assessment)



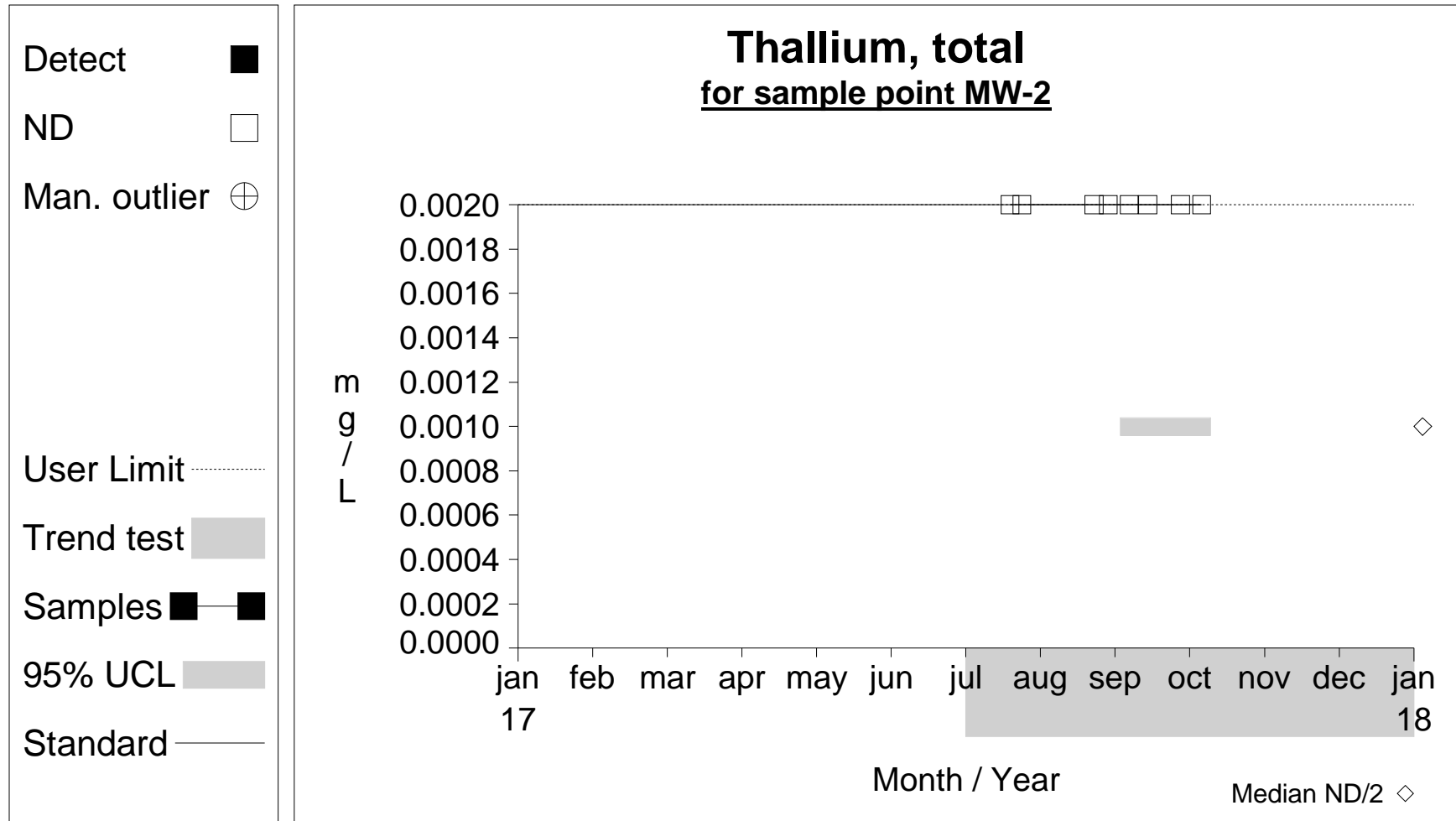
Graph 45

Confidence Limits (Assessment)



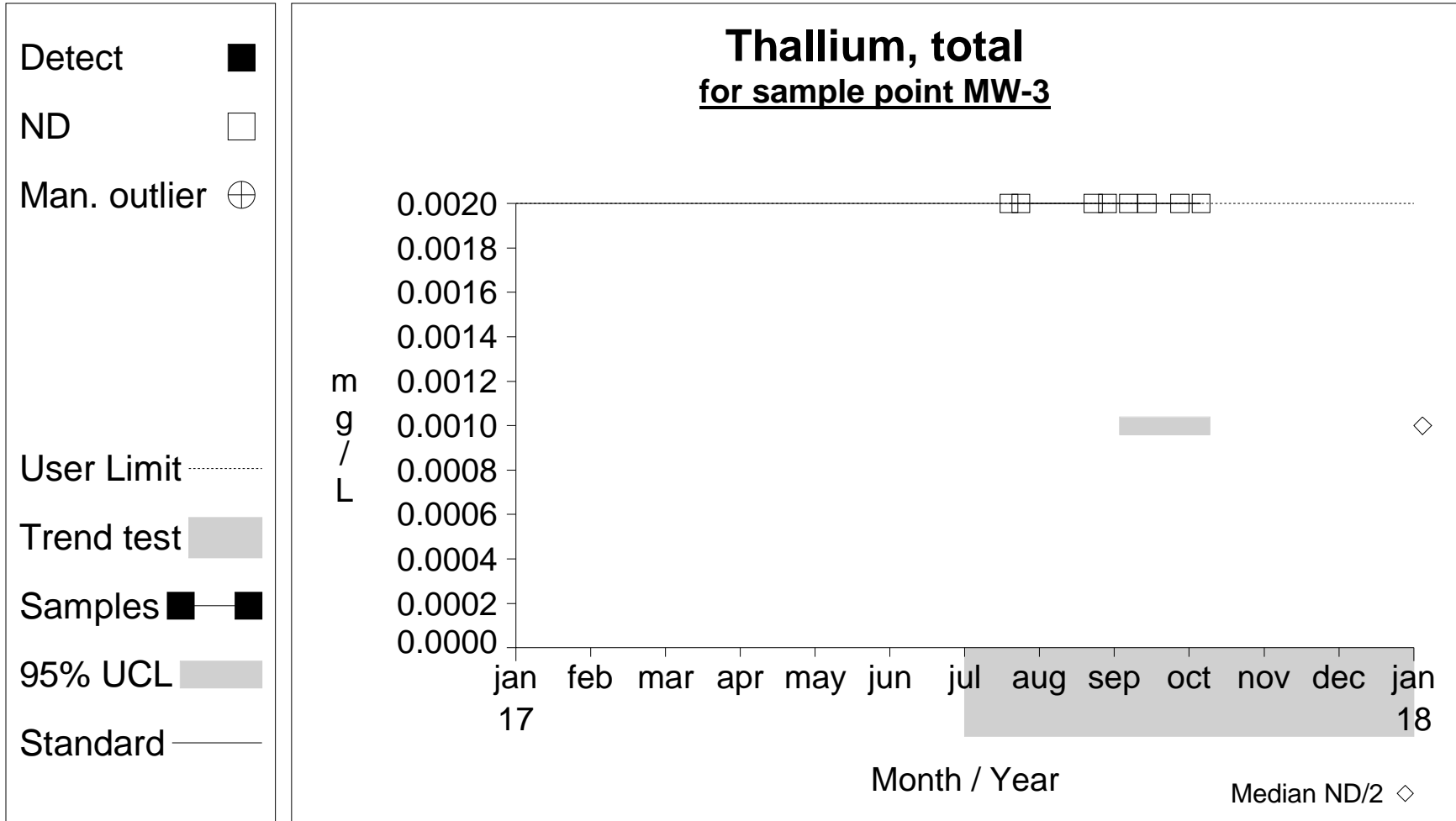
Graph 46

Confidence Limits (Assessment)



Graph 47

Confidence Limits (Assessment)



Graph 48

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	N	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	N	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	N	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.004 / 4$ $= 0.001$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.001 - 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.001 + 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Antimony, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.004 / 4$ $= 0.001$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.001 - 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.001 + 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Antimony, total (mg/L) at MW-3

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.004 / 4$ $= 0.001$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.001 - 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.001 + 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Arsenic, total (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.01 / 4$ $= 0.003$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 7.24 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.003 - 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.003 + 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.003$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Arsenic, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.01 / 4$ $= 0.003$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 7.24 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.003 - 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.003 + 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.003$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.01 / 4$ $= 0.003$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 7.24 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.003 - 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.003 + 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.003$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.52 / 4$ $= 0.13$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.068 - 0.27/4) / (4-1))^{1/2}$ $= 9.46 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.13 - 2.353 * 9.46 \times 10^{-10} / 4^{1/2}$ $= 0.13$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.13 + 2.353 * 9.46 \times 10^{-10} / 4^{1/2}$ $= 0.13$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = -0.004$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $-0.016 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Barium, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.2 / 4$ $= 0.05$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.01 - 0.04/4) / (4-1))^{1/2}$ $= 5.27 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.05 - 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.05 + 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Barium, total (mg/L) at MW-3

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.2 / 4$ $= 0.05$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.01 - 0.04/4) / (4-1))^{1/2}$ $= 5.27 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.05 - 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.05 + 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $-0.03 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Beryllium, total (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.002 / 4$ $= 5.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-6} - 4.00 \times 10^{-6}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 5.00 \times 10^{-4} - 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 5.00 \times 10^{-4} + 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.002 / 4$ $= 5.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-6} - 4.00 \times 10^{-6}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 5.00 \times 10^{-4} - 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 5.00 \times 10^{-4} + 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.002 / 4$ $= 5.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-6} - 4.00 \times 10^{-6}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 5.00 \times 10^{-4} - 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 5.00 \times 10^{-4} + 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.002 / 4$ $= 5.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-6} - 4.00 \times 10^{-6}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 5.00 \times 10^{-4} - 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 5.00 \times 10^{-4} + 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.002 / 4$ $= 5.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-6} - 4.00 \times 10^{-6}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 5.00 \times 10^{-4} - 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 5.00 \times 10^{-4} + 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.002 / 4$ $= 5.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-6} - 4.00 \times 10^{-6}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 5.00 \times 10^{-4} - 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 5.00 \times 10^{-4} + 2.353 * 0.0/4^{1/2}$ $= 5.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.02 / 4$ $= 0.005$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 1.45 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.005 - 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.005 + 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Chromium, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.02 / 4$ $= 0.005$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 1.45 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.005 - 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.005 + 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Chromium, total (mg/L) at MW-3

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.02 / 4$ $= 0.005$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 1.45 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.005 - 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.005 + 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Cobalt, total (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.04 / 4$ $= 0.01$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-4} - 0.002/4) / (4-1))^{1/2}$ $= 2.90 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.01 - 2.353 * 2.90 \times 10^{-11} / 4^{1/2}$ $= 0.01$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.01 + 2.353 * 2.90 \times 10^{-11} / 4^{1/2}$ $= 0.01$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Cobalt, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.04 / 4$ $= 0.01$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-4} - 0.002/4) / (4-1))^{1/2}$ $= 2.90 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.01 - 2.353 * 2.90 \times 10^{-11} / 4^{1/2}$ $= 0.01$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.01 + 2.353 * 2.90 \times 10^{-11} / 4^{1/2}$ $= 0.01$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.04 / 4$ $= 0.01$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-4} - 0.002/4) / (4-1))^{1/2}$ $= 2.90 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.01 - 2.353 * 2.90 \times 10^{-11} / 4^{1/2}$ $= 0.01$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.01 + 2.353 * 2.90 \times 10^{-11} / 4^{1/2}$ $= 0.01$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Fluoride (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.2 / 4$ $= 0.05$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.01 - 0.04/4) / (4-1))^{1/2}$ $= 5.27 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.05 - 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.05 + 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Fluoride (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.2 / 4$ $= 0.05$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.01 - 0.04/4) / (4-1))^{1/2}$ $= 5.27 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.05 - 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.05 + 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Fluoride (mg/L) at MW-3

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.2 / 4$ $= 0.05$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.01 - 0.04/4) / (4-1))^{1/2}$ $= 5.27 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.05 - 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.05 + 2.353 * 5.27 \times 10^{-10} / 4^{1/2}$ $= 0.05$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Lead, total (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.006 / 4$ $= 0.002$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((9.00 \times 10^{-6} - 3.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.002 - 2.353 * 0.0/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.002 + 2.353 * 0.0/4^{1/2}$ $= 0.002$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.006 / 4$ $= 0.002$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((9.00 \times 10^{-6} - 3.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.002 - 2.353 * 0.0/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.002 + 2.353 * 0.0/4^{1/2}$ $= 0.002$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.006 / 4$ $= 0.002$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((9.00 \times 10^{-6} - 3.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.002 - 2.353 * 0.0/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.002 + 2.353 * 0.0/4^{1/2}$ $= 0.002$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.02 / 4$ $= 0.005$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 1.45 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.005 - 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.005 + 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Lithium, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.02 / 4$ $= 0.005$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 1.45 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.005 - 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.005 + 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Lithium, total (mg/L) at MW-3

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.02 / 4$ $= 0.005$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.00 \times 10^{-4} - 4.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 1.45 \times 10^{-11}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.005 - 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.005 + 2.353 * 1.45 \times 10^{-11} / 4^{1/2}$ $= 0.005$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Mercury, total (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 4.00 \times 10^{-4} / 4$ $= 1.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-8} - 1.60 \times 10^{-7}/4) / (4-1))^{1/2}$ $= 1.10 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 1.00 \times 10^{-4} - 2.353 * 1.10 \times 10^{-12}/4^{1/2}$ $= 10.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 1.00 \times 10^{-4} + 2.353 * 1.10 \times 10^{-12}/4^{1/2}$ $= 1.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 4.00 \times 10^{-4} / 4$ $= 1.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-8} - 1.60 \times 10^{-7}/4) / (4-1))^{1/2}$ $= 1.10 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 1.00 \times 10^{-4} - 2.353 * 1.10 \times 10^{-12}/4^{1/2}$ $= 10.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 1.00 \times 10^{-4} + 2.353 * 1.10 \times 10^{-12}/4^{1/2}$ $= 1.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 4.00 \times 10^{-4} / 4$ $= 1.00 \times 10^{-4}$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-8} - 1.60 \times 10^{-7}/4) / (4-1))^{1/2}$ $= 1.10 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 1.00 \times 10^{-4} - 2.353 * 1.10 \times 10^{-12}/4^{1/2}$ $= 10.00 \times 10^{-4}$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 1.00 \times 10^{-4} + 2.353 * 1.10 \times 10^{-12}/4^{1/2}$ $= 1.00 \times 10^{-4}$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.1 / 4$ $= 0.025$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.003 - 0.01/4) / (4-1))^{1/2}$ $= 2.63 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.025 - 2.353 * 2.63 \times 10^{-10} / 4^{1/2}$ $= 0.025$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.025 + 2.353 * 2.63 \times 10^{-10} / 4^{1/2}$ $= 0.025$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.1 / 4$ $= 0.025$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.003 - 0.01/4) / (4-1))^{1/2}$ $= 2.63 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.025 - 2.353 * 2.63 \times 10^{-10} / 4^{1/2}$ $= 0.025$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.025 + 2.353 * 2.63 \times 10^{-10} / 4^{1/2}$ $= 0.025$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.1 / 4$ $= 0.025$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((0.003 - 0.01/4) / (4-1))^{1/2}$ $= 2.63 \times 10^{-10}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.025 - 2.353 * 2.63 \times 10^{-10} / 4^{1/2}$ $= 0.025$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.025 + 2.353 * 2.63 \times 10^{-10} / 4^{1/2}$ $= 0.025$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 2.0 / 4$ $= 0.5$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.0 - 4.0/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.5 - 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.5 + 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Radium-226 (pCi/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 2.0 / 4$ $= 0.5$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.0 - 4.0/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.5 - 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.5 + 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Radium-226 (pCi/L) at MW-3

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 2.0 / 4$ $= 0.5$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.0 - 4.0/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.5 - 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.5 + 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Radium-228 (pCi/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 2.0 / 4$ $= 0.5$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.0 - 4.0/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.5 - 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.5 + 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $-0.438 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Radium-228 (pCi/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 2.0 / 4$ $= 0.5$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.0 - 4.0/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.5 - 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.5 + 2.353 * 0.0/4^{1/2}$ $= 0.5$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $-0.334 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Radium-228 (pCi/L) at MW-3

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 3.22 / 4$ $= 0.805$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((2.971 - 10.368/4) / (4-1))^{1/2}$ $= 0.356$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.805 - 2.353 * 0.356/4^{1/2}$ $= 0.387$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.805 + 2.353 * 0.356/4^{1/2}$ $= 1.223$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.137$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Selenium, total (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.01 / 4$ $= 0.003$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 7.24 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.003 - 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.003 + 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.003$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Selenium, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.01 / 4$ $= 0.003$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 7.24 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.003 - 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.003 + 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.003$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.01 / 4$ $= 0.003$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((2.50 \times 10^{-5} - 1.00 \times 10^{-4}/4) / (4-1))^{1/2}$ $= 7.24 \times 10^{-12}$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.003 - 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.002$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.003 + 2.353 * 7.24 \times 10^{-12}/4^{1/2}$ $= 0.003$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Thallium, total (mg/L) at MW-1

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.004 / 4$ $= 0.001$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.001 - 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.001 + 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

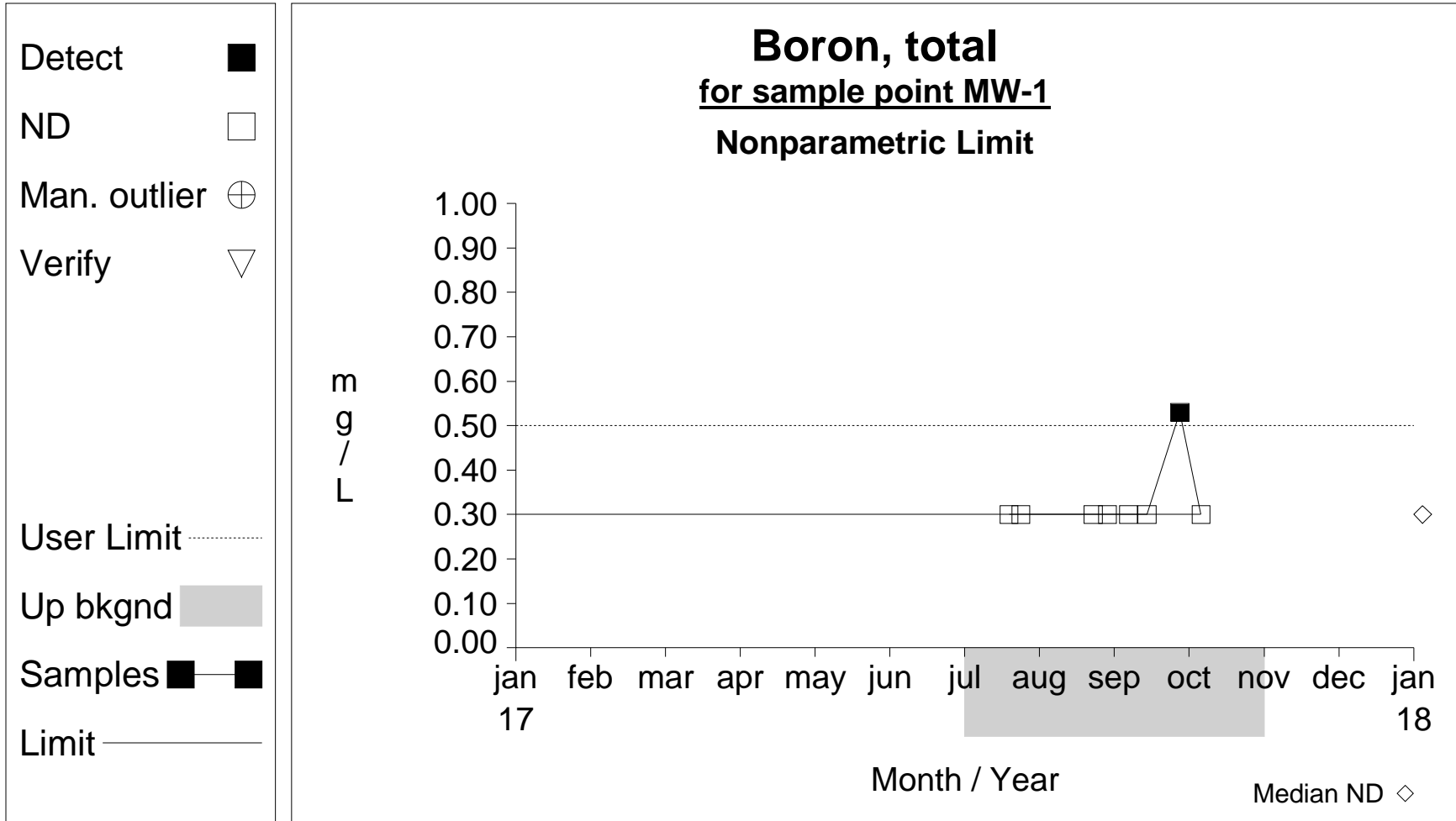
Worksheet 6 - Assessment Monitoring
Thallium, total (mg/L) at MW-2

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.004 / 4$ $= 0.001$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.001 - 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.001 + 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Worksheet 6 - Assessment Monitoring
Thallium, total (mg/L) at MW-3

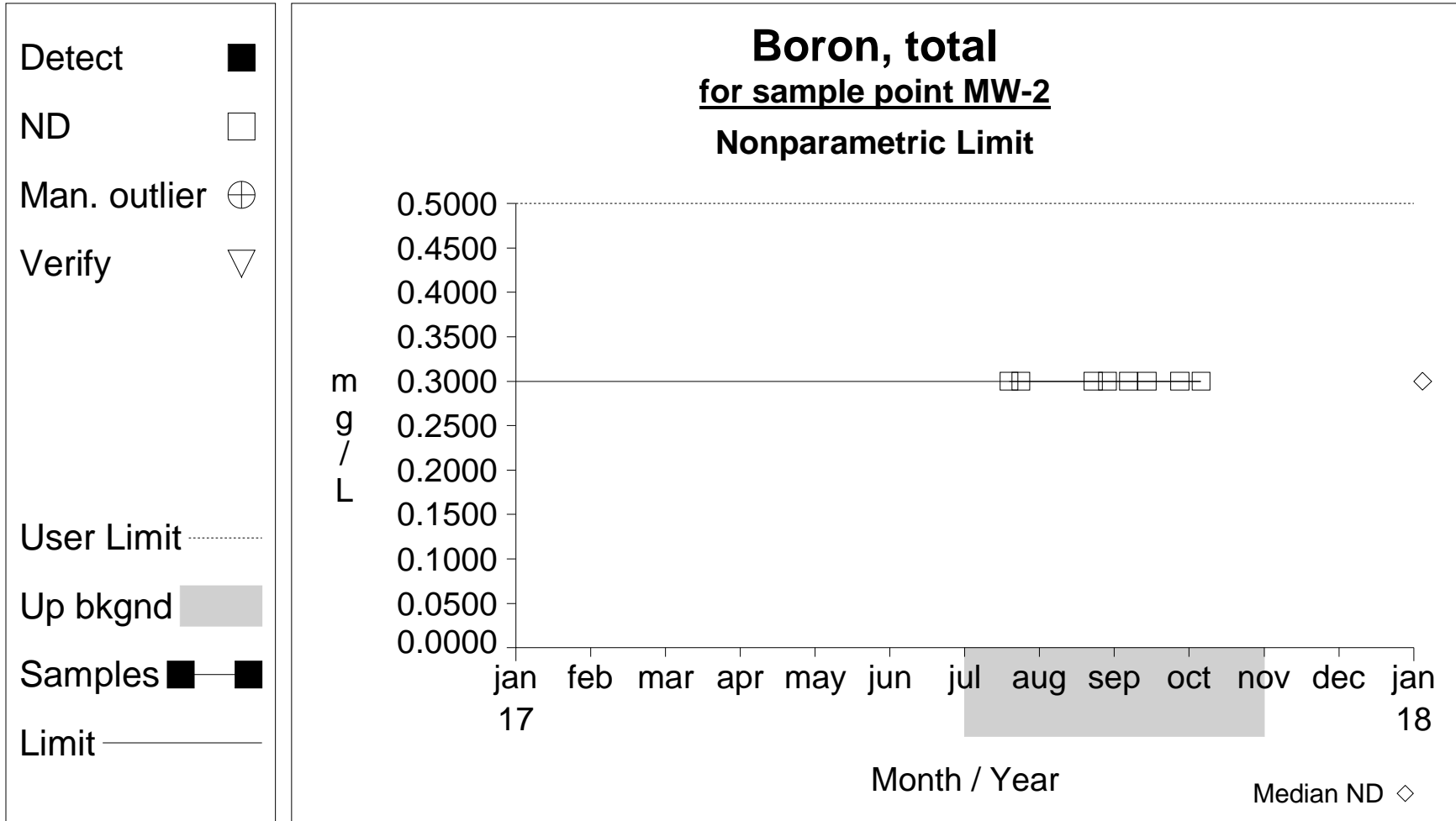
<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / 4$ $= 0.004 / 4$ $= 0.001$	Compute the mean of the last 4 measurements.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((4.00 \times 10^{-6} - 1.60 \times 10^{-5}/4) / (4-1))^{1/2}$ $= 0.0$	Compute sd of the last 4 measurements.
3	$\text{LCL} = \bar{X} - tS/N^{1/2}$ $= 0.001 - 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute lower confidence limit for the mean of the last 4 measurements.
4	$\text{UCL} = \bar{X} + tS/N^{1/2}$ $= 0.001 + 2.353 * 0.0/4^{1/2}$ $= 0.001$	Compute upper confidence limit for the mean of the last 4 measurements.
5	$S = 0.0$	Sens slope estimate.
6	$\text{LCL}(S) - \text{UCL}(S)$ $0.0 - 0.0$	Two-sided confidence interval for slope. The trend is not significant.

Up vs. Down Prediction Limits



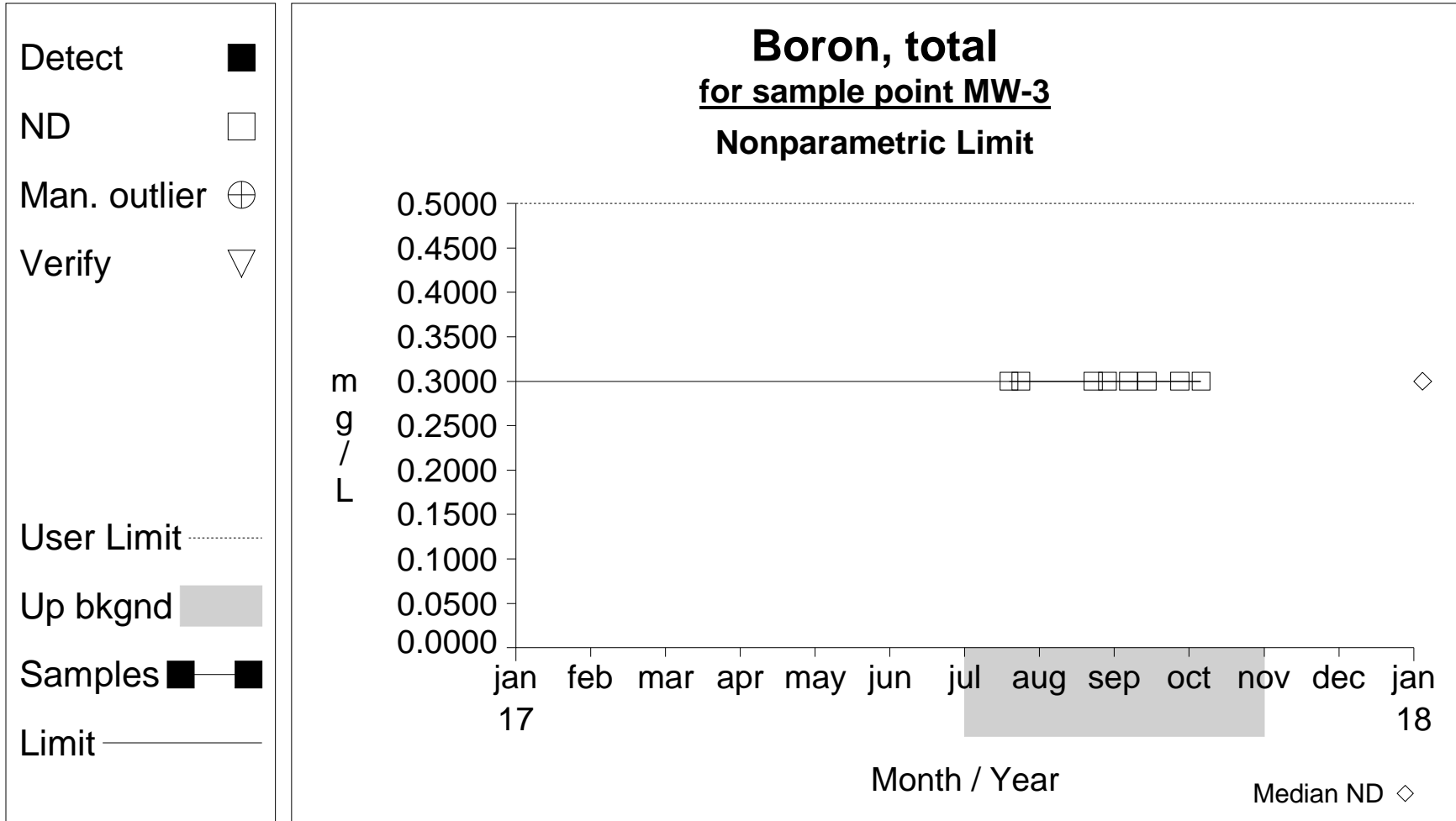
Graph 1

Up vs. Down Prediction Limits



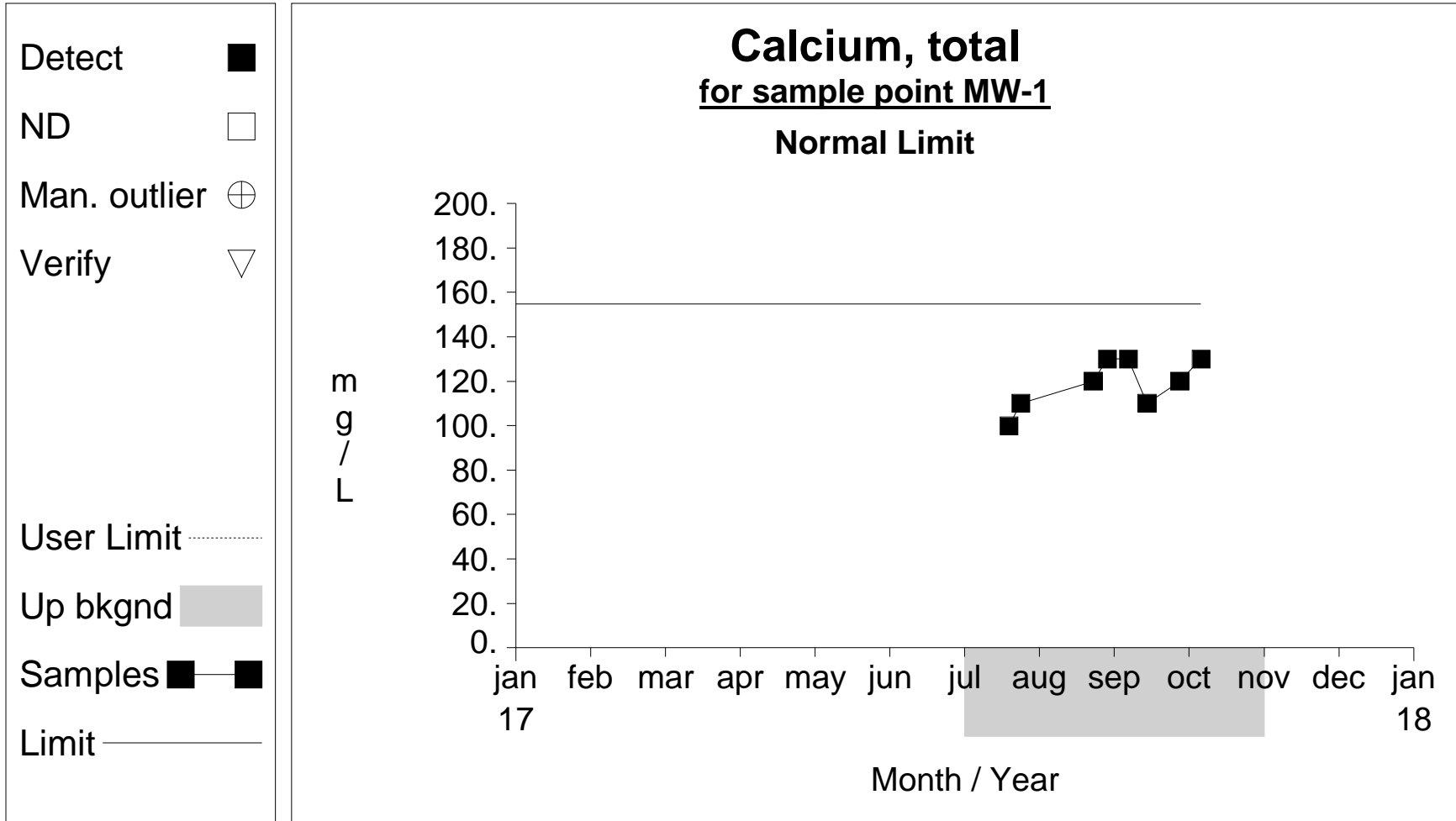
Graph 2

Up vs. Down Prediction Limits



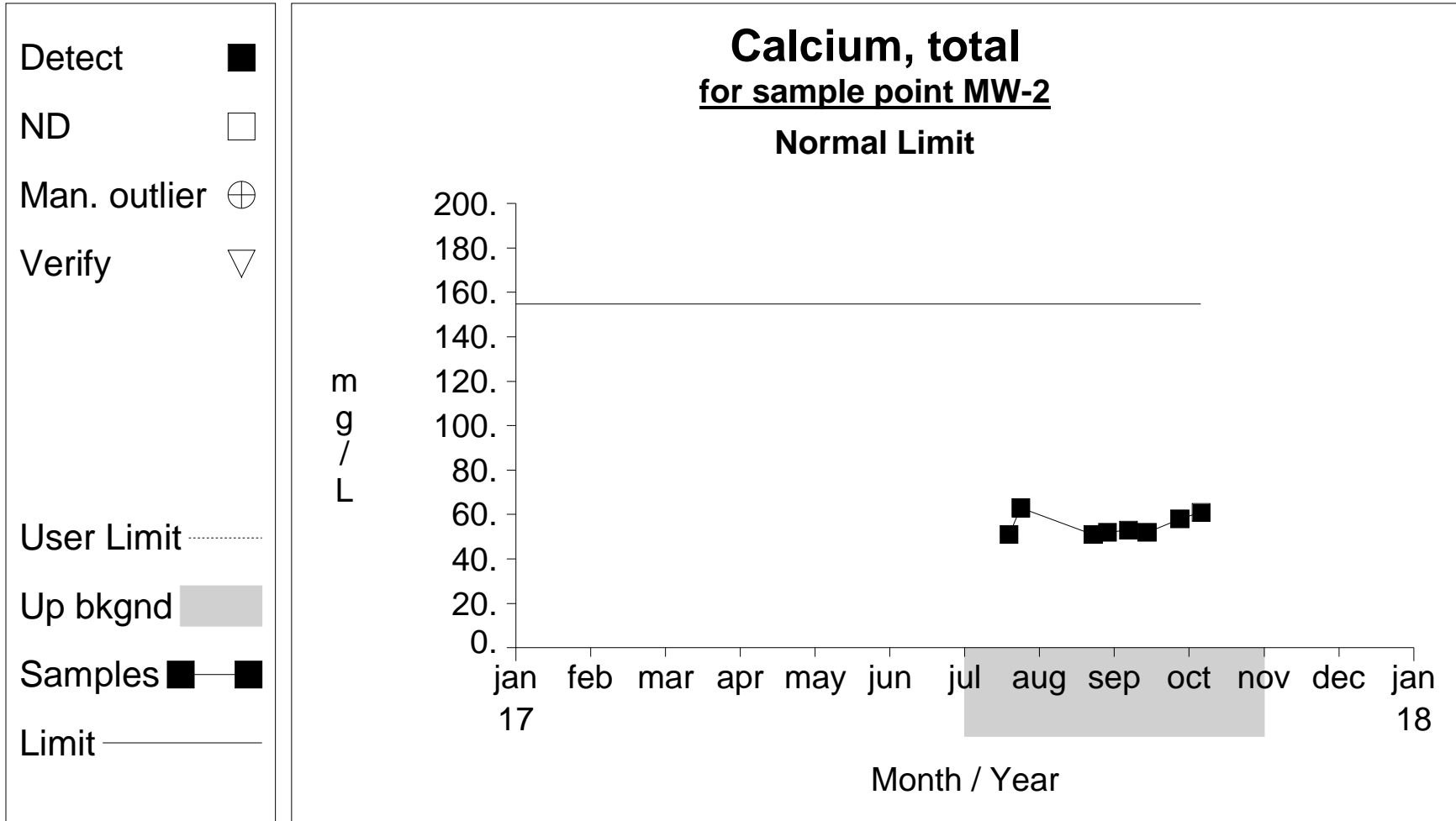
Graph 3

Up vs. Down Prediction Limits



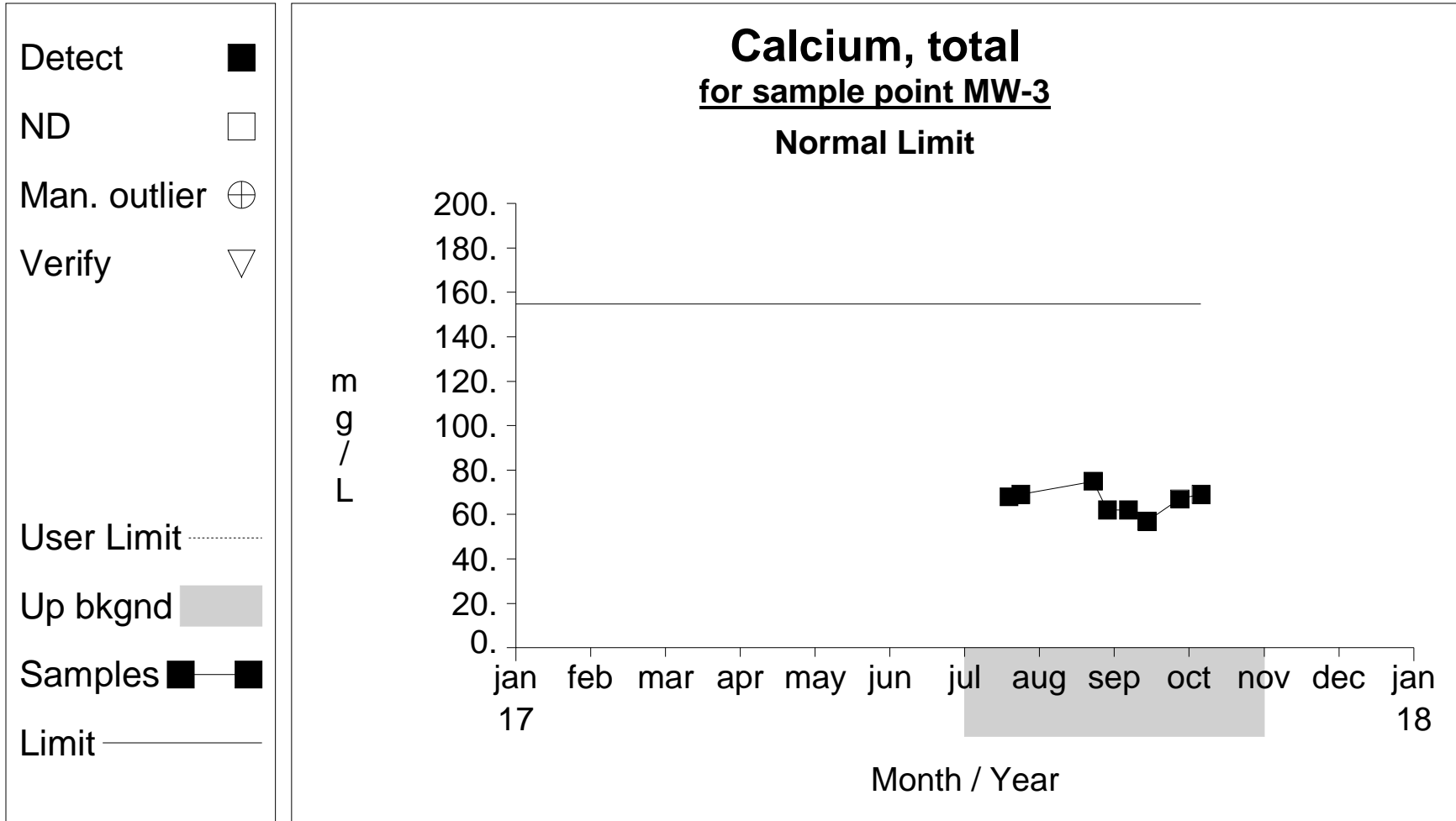
Graph 4

Up vs. Down Prediction Limits



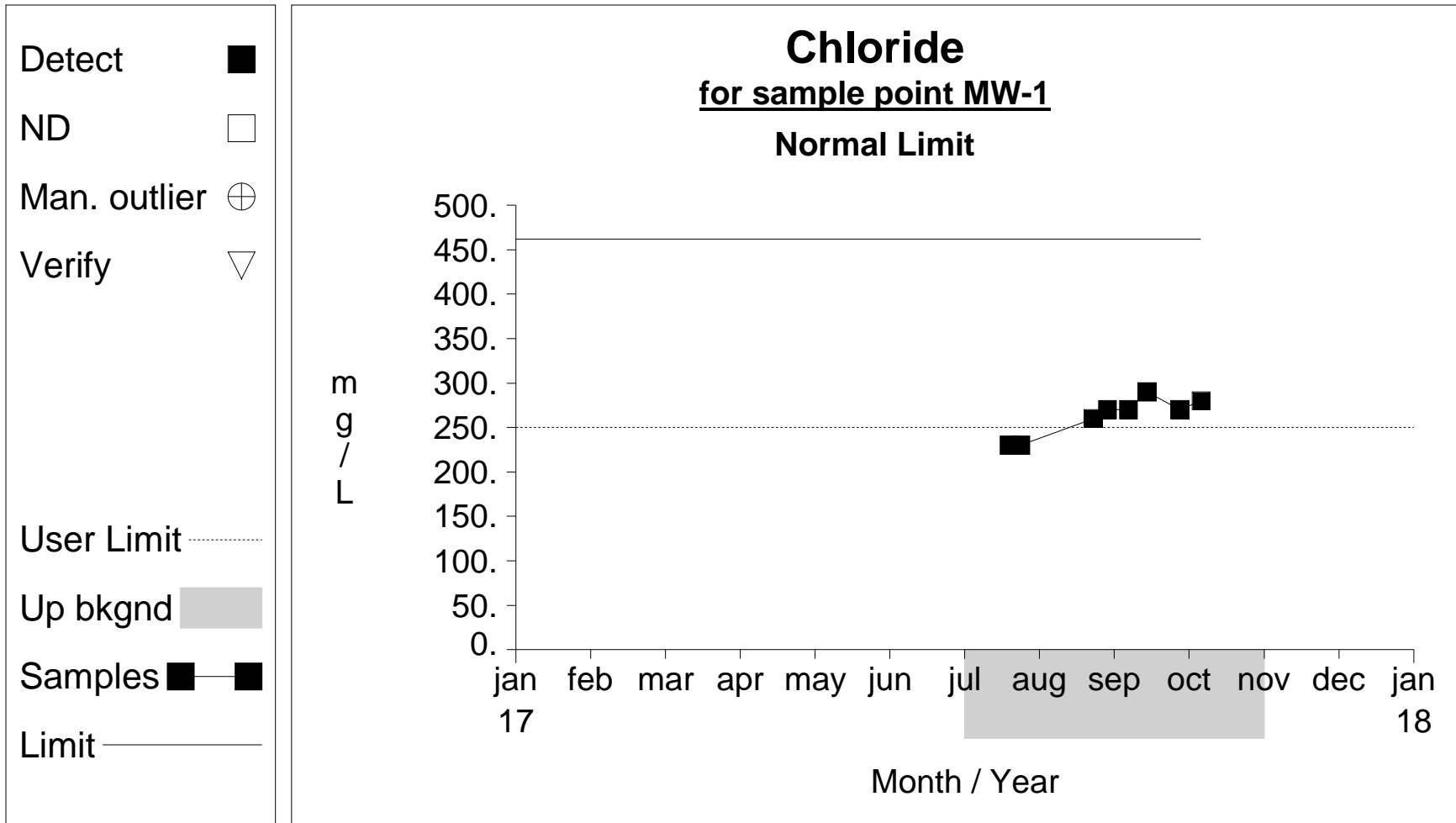
Graph 5

Up vs. Down Prediction Limits



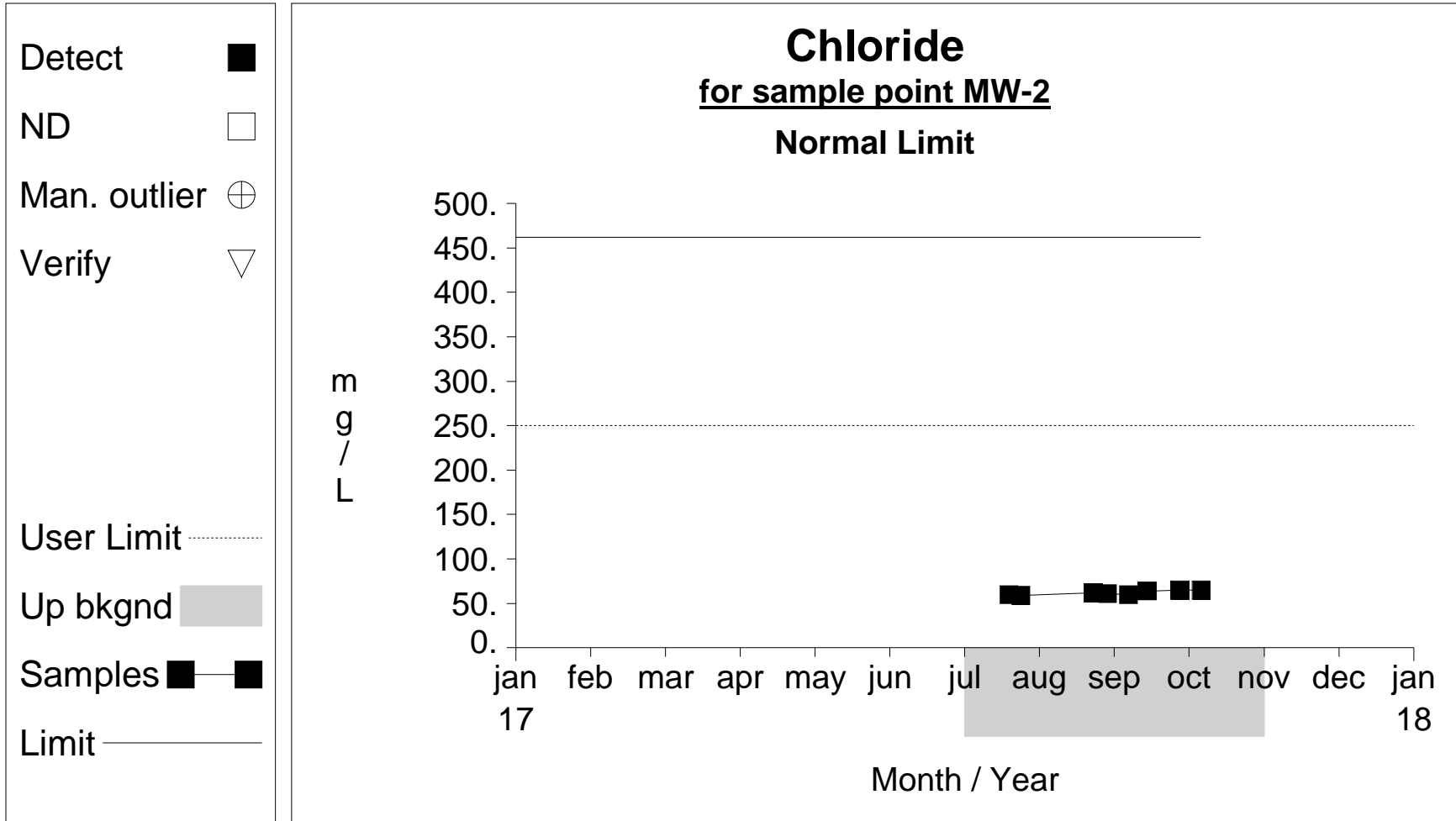
Graph 6

Up vs. Down Prediction Limits



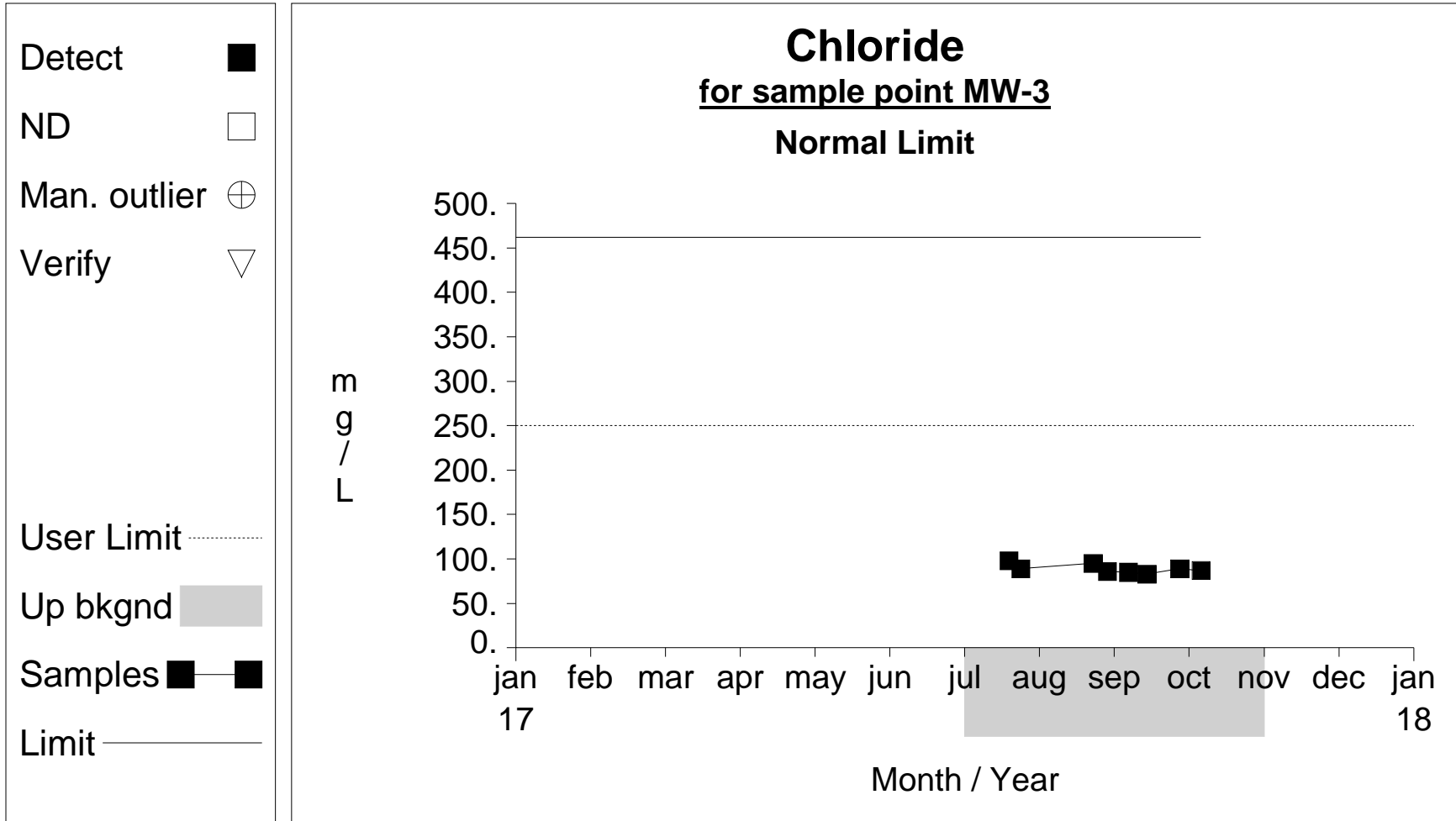
Graph 7

Up vs. Down Prediction Limits



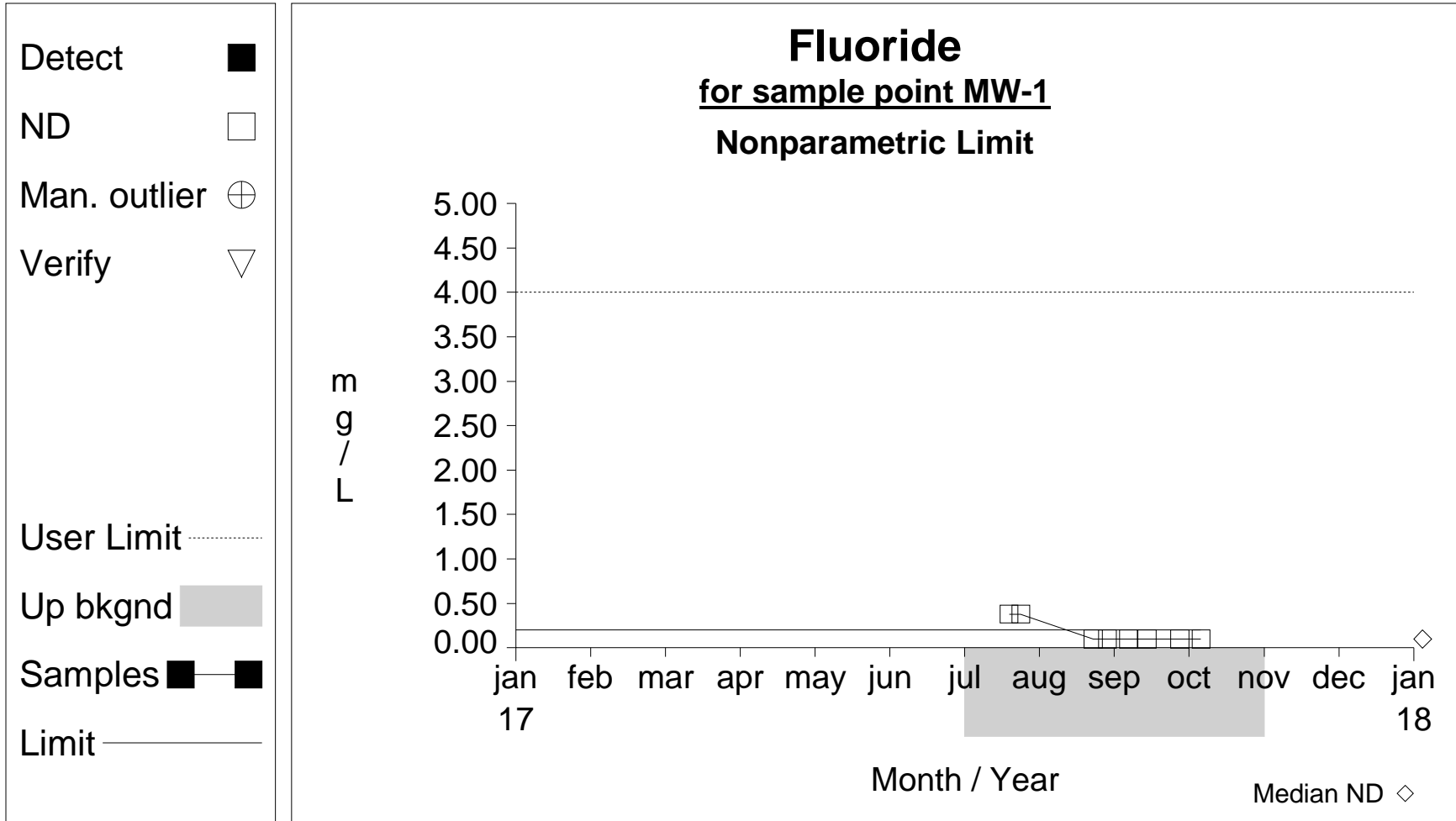
Graph 8

Up vs. Down Prediction Limits



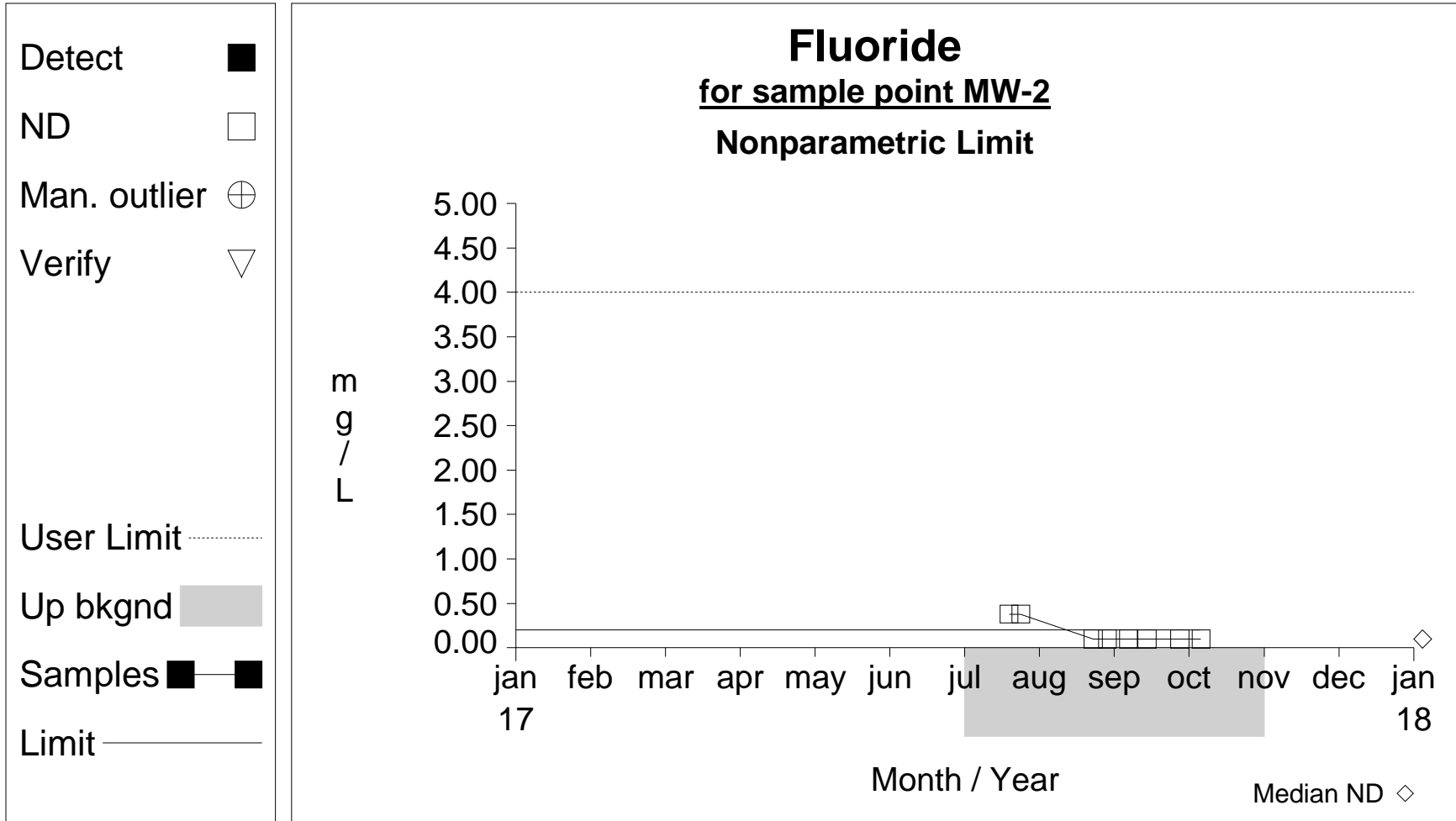
Graph 9

Up vs. Down Prediction Limits



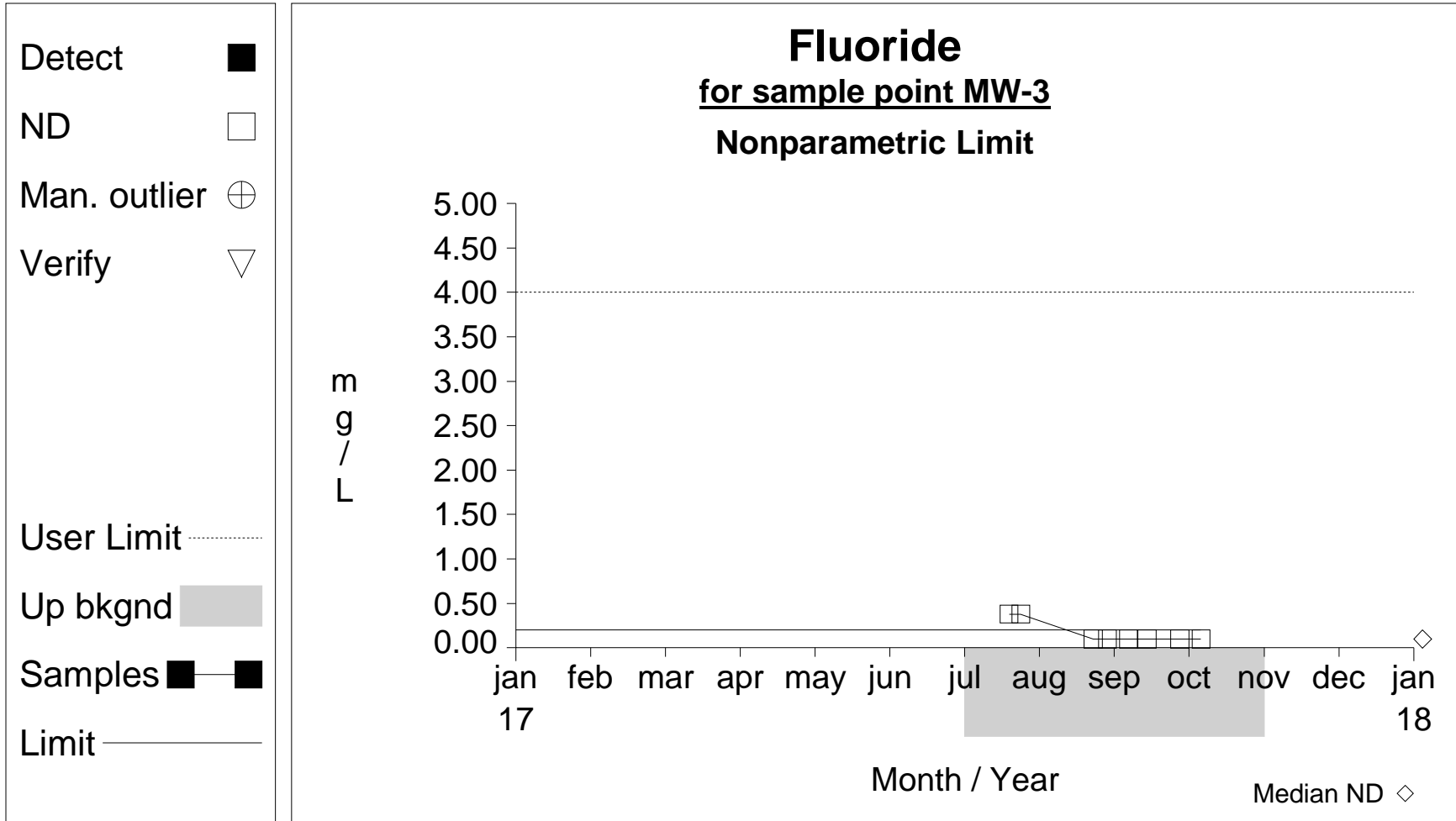
Graph 10

Up vs. Down Prediction Limits



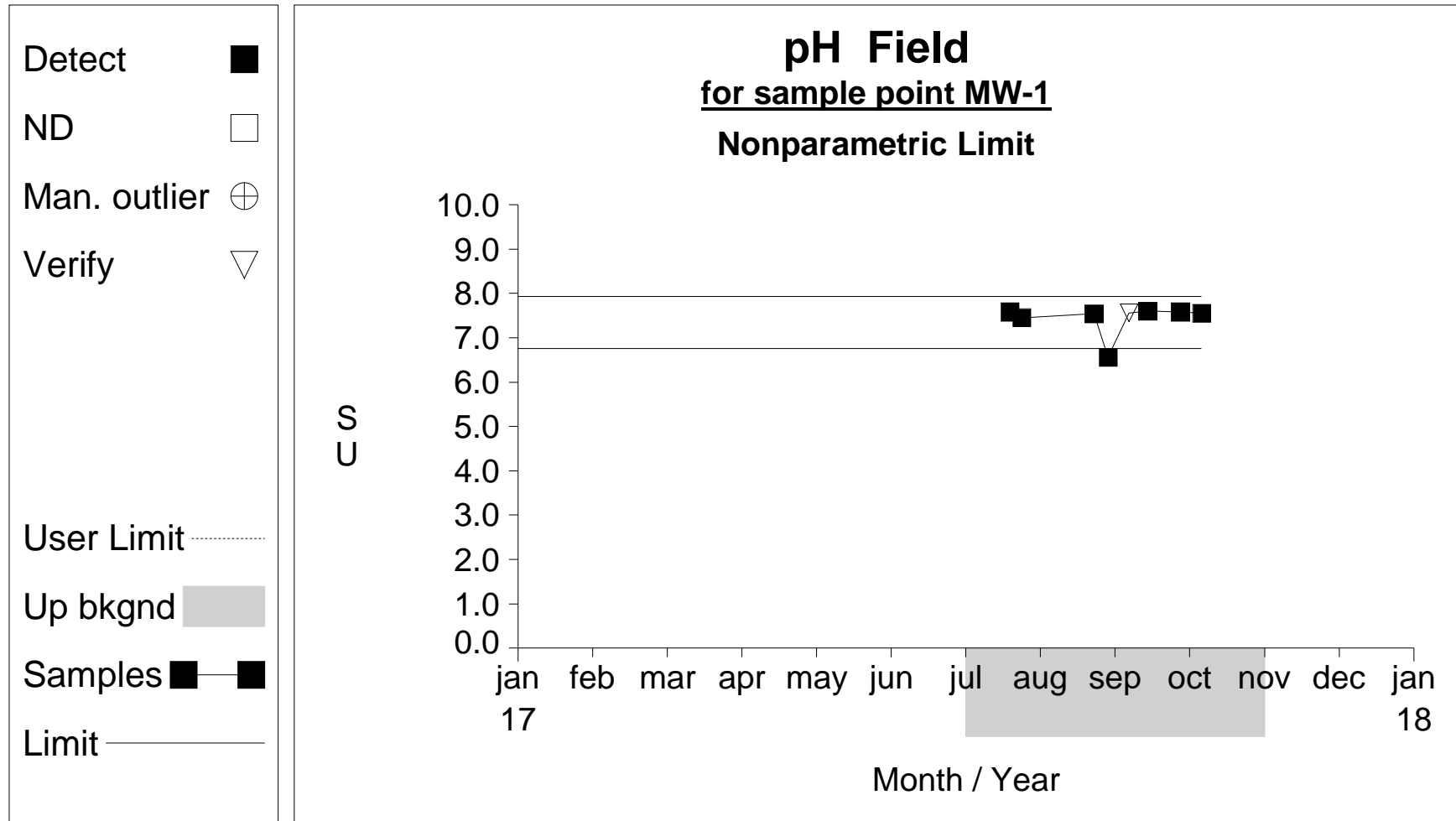
Graph 11

Up vs. Down Prediction Limits



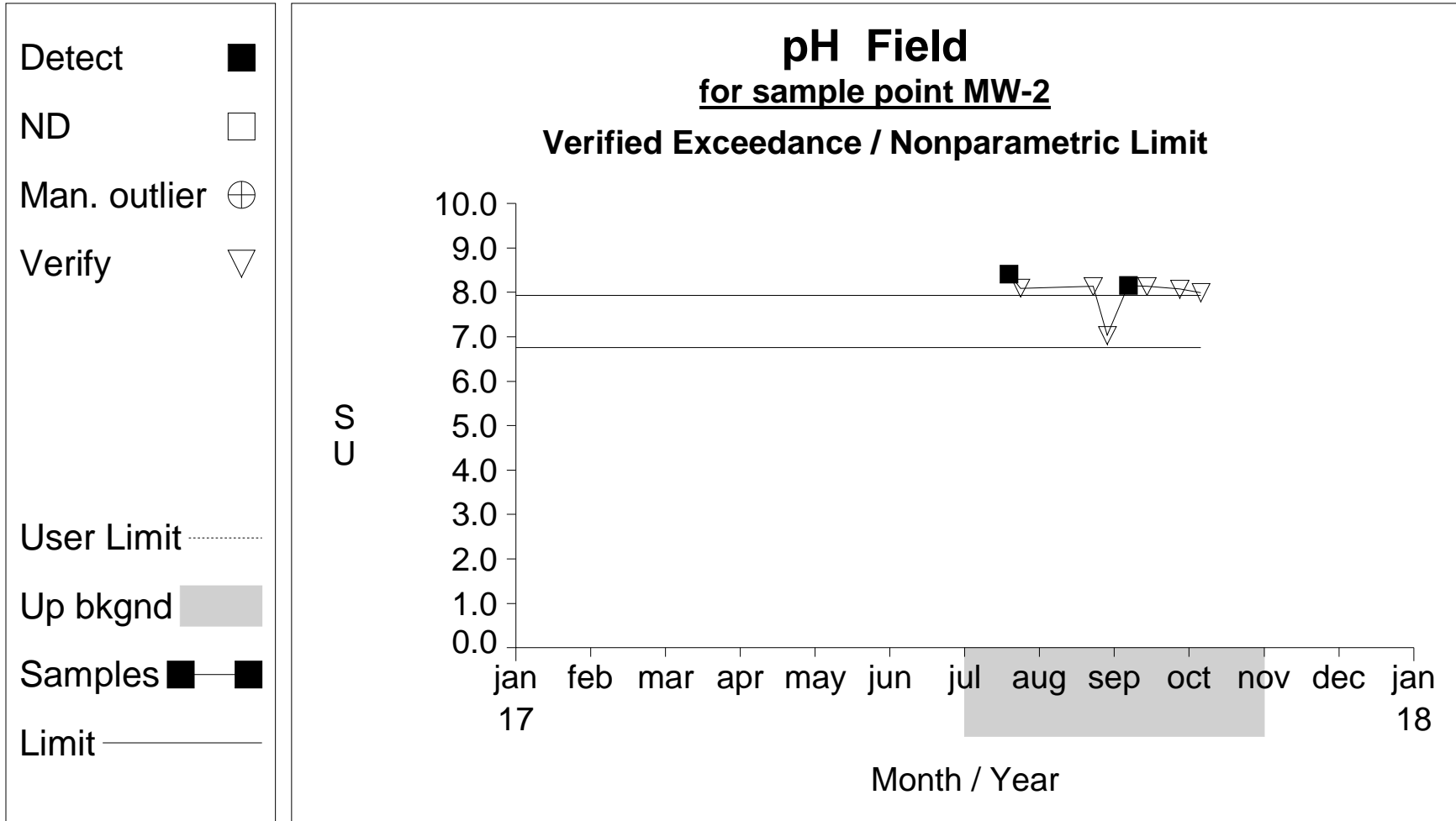
Graph 12

Up vs. Down Prediction Limits



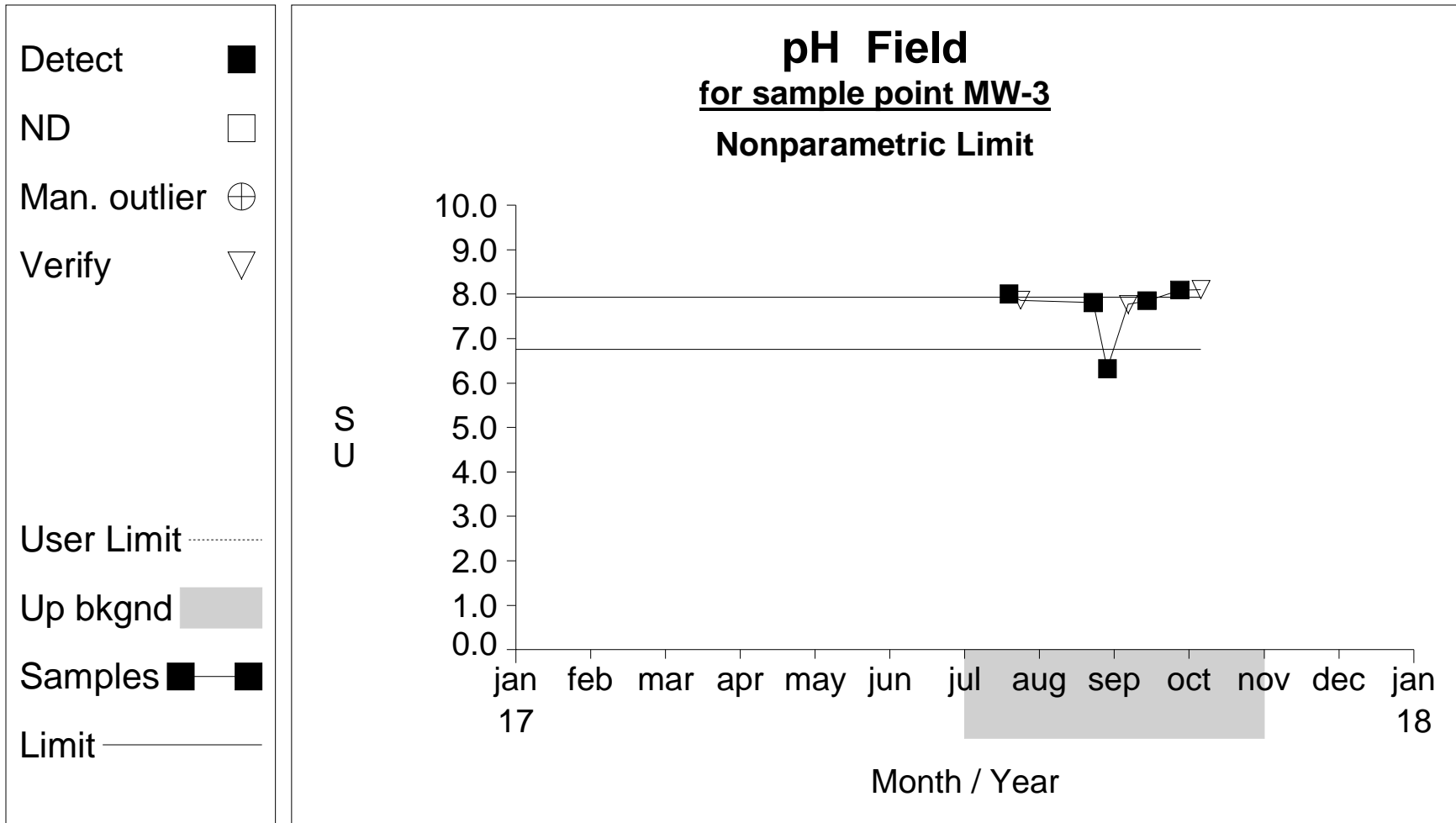
Graph 13

Up vs. Down Prediction Limits



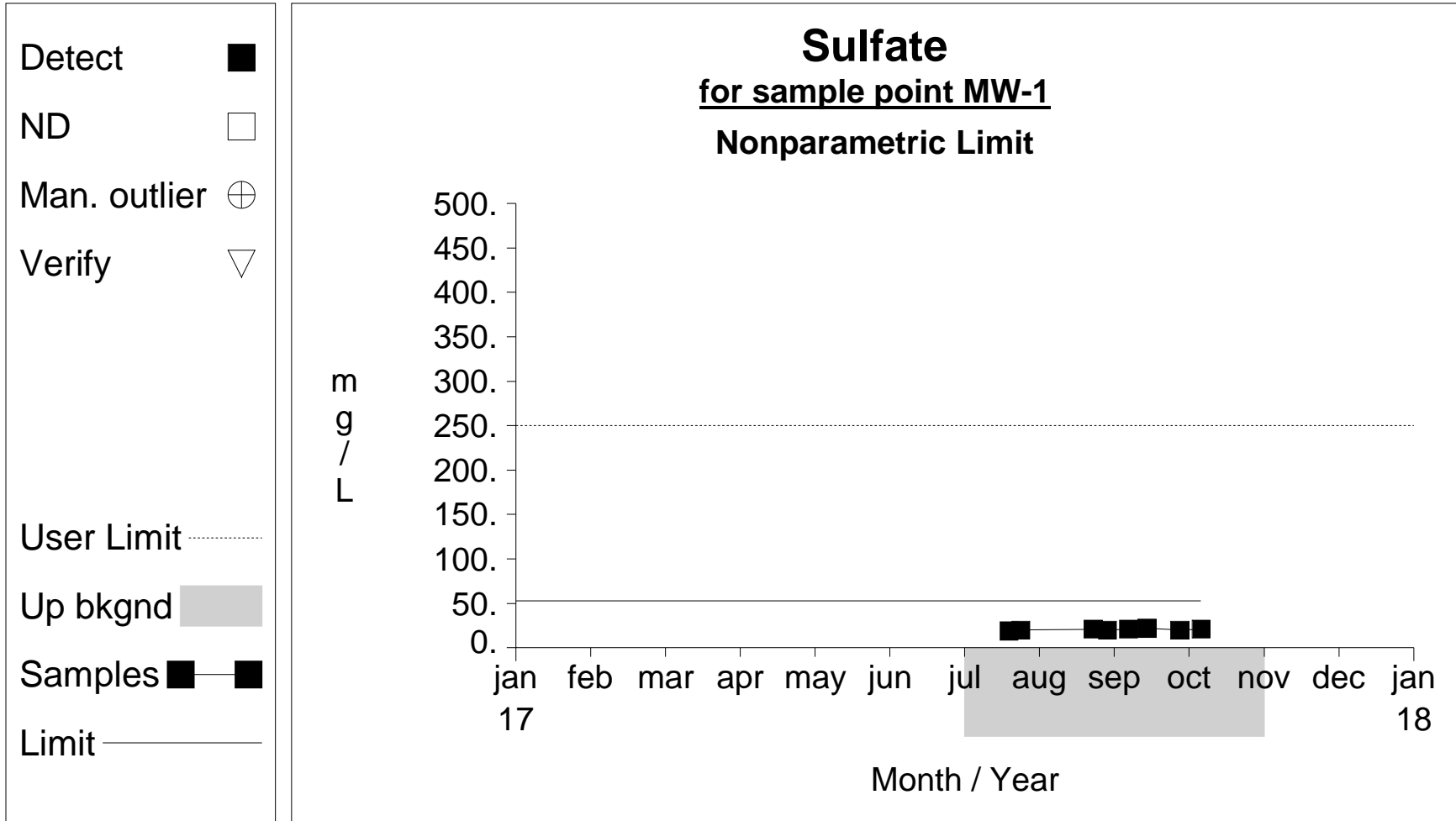
Graph 14

Up vs. Down Prediction Limits



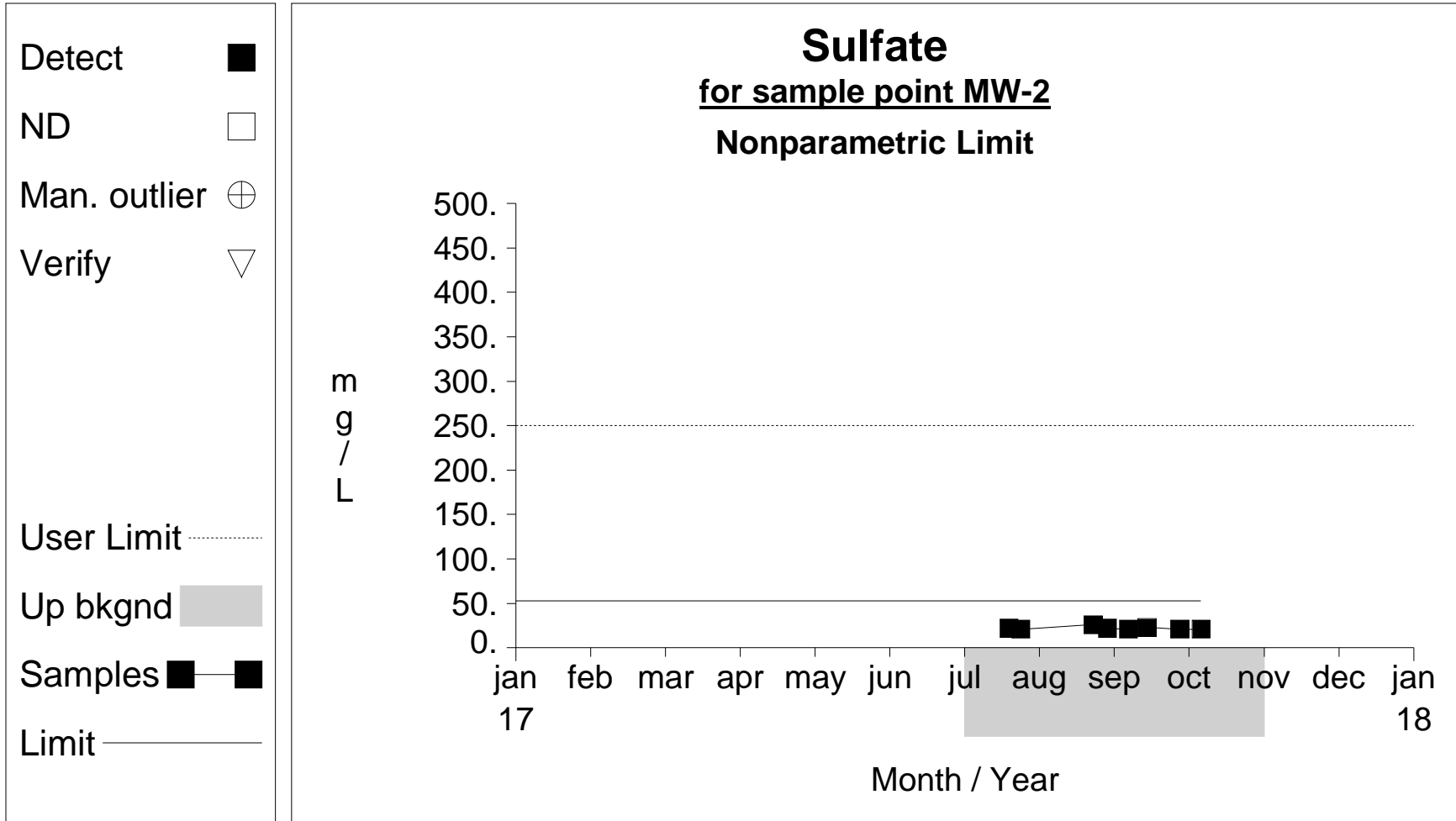
Graph 15

Up vs. Down Prediction Limits



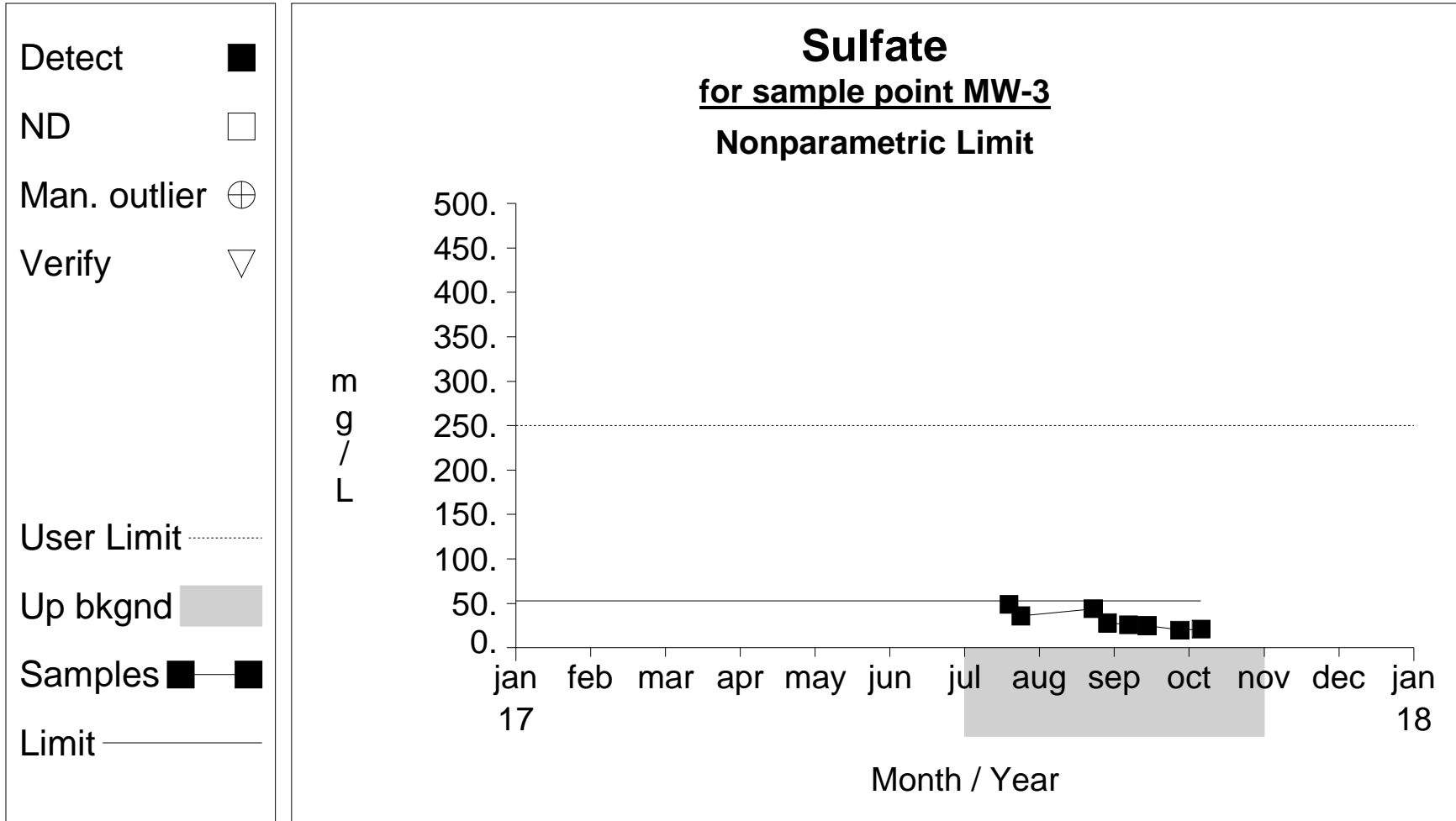
Graph 16

Up vs. Down Prediction Limits



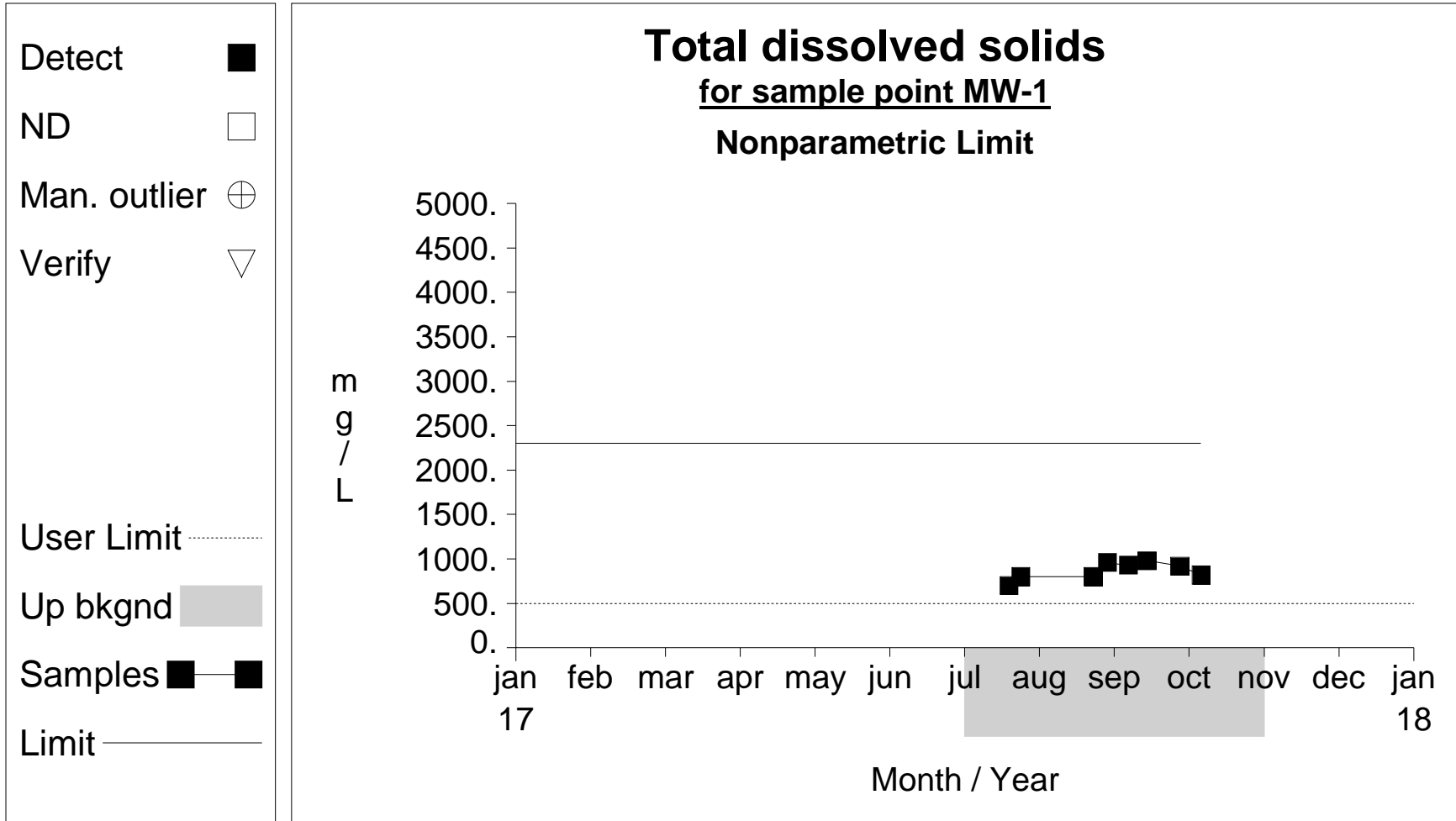
Graph 17

Up vs. Down Prediction Limits



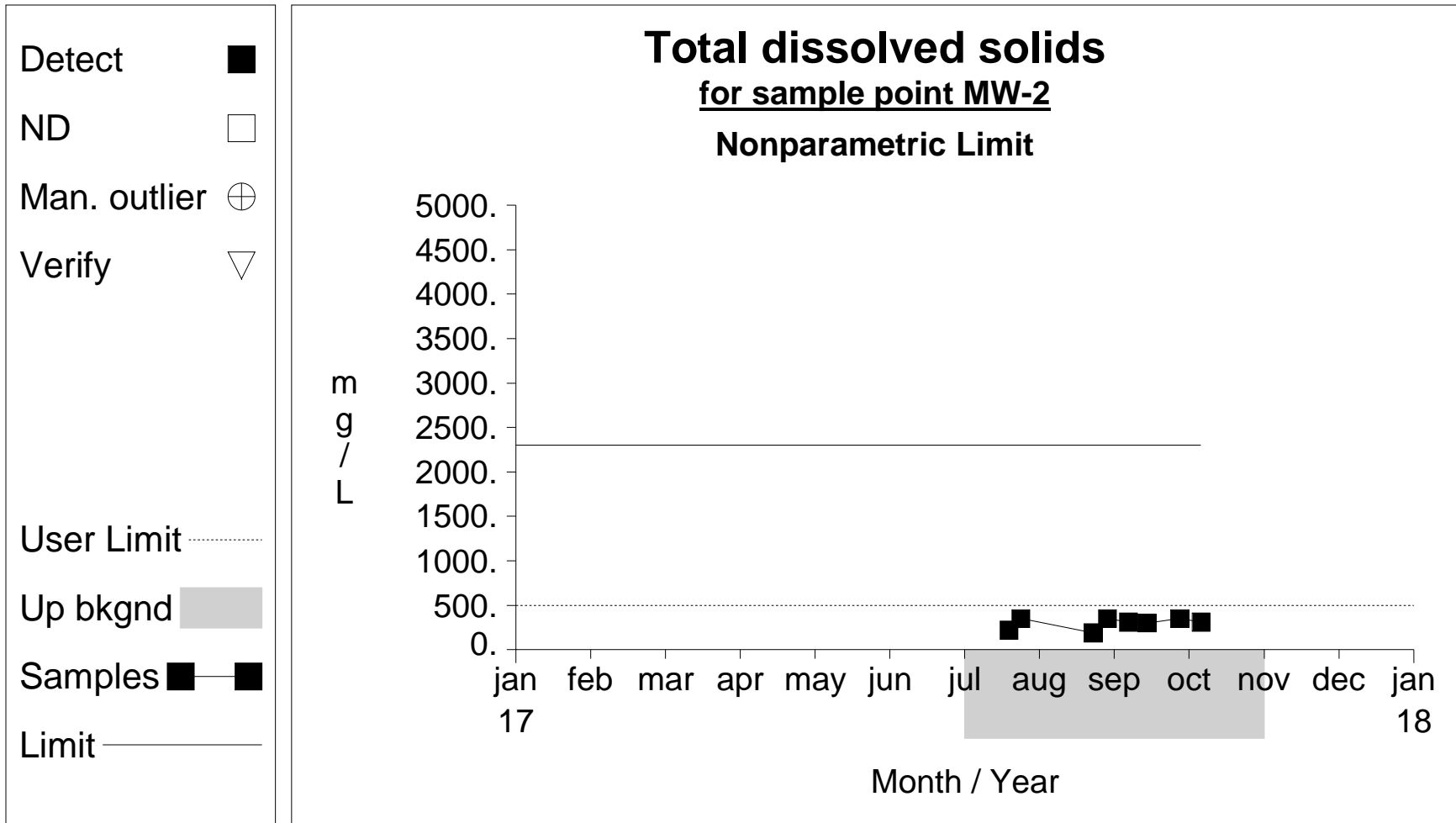
Graph 18

Up vs. Down Prediction Limits



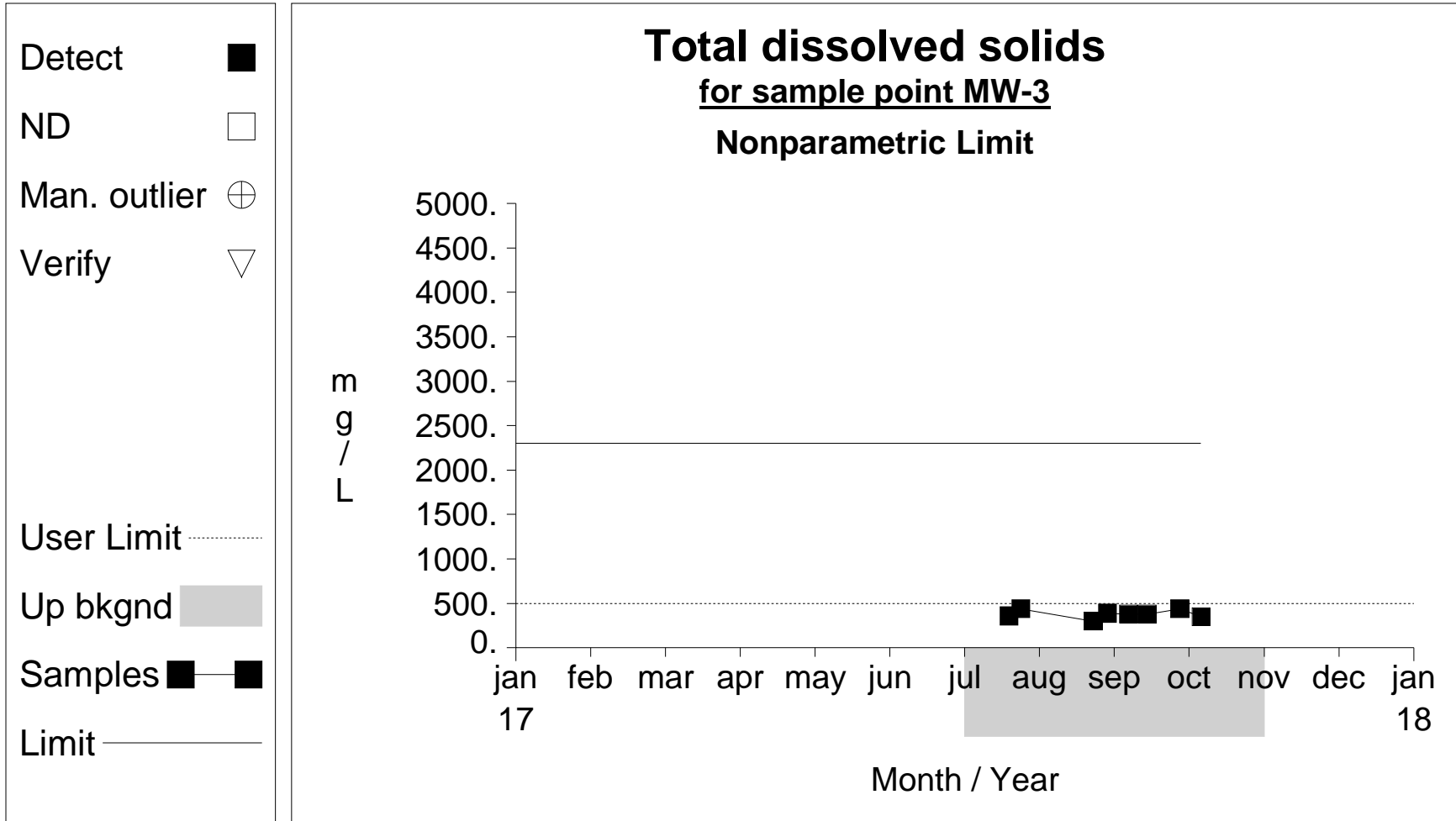
Graph 19

Up vs. Down Prediction Limits



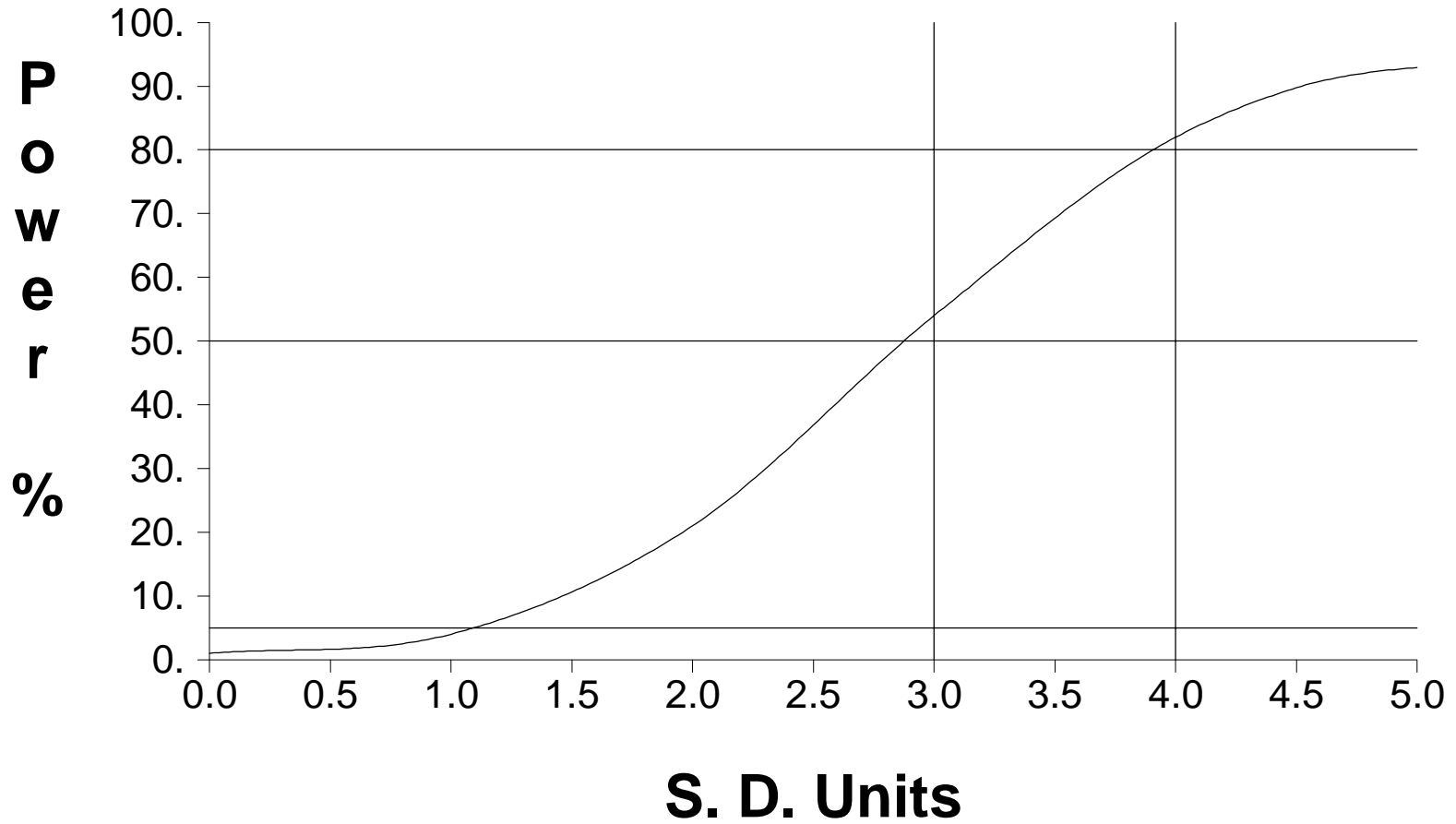
Graph 20

Up vs. Down Prediction Limits



Graph 21

False Positive and False Negative Rates for Current Upgradient vs. Downgradient Monitoring Program



Worksheet 1 - Upgradient vs. Downgradient Comparisons**Boron, total (mg/L)****Nonparametric Prediction Limit**

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	PL = median(X) = 0.3	Compute nonparametric prediction limit as median reporting limit in background.
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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / N$ $= 1748.0 / 16$ $= 109.25$	Compute upgradient mean.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((195286.0 - 3.06 \times 10^6 / 16) / (16-1))^{1/2}$ $= 16.965$	Compute upgradient sd.
3	$\alpha = \min[(1-.95^{1/K})^{1/3} \text{ or } .01]$ $= \min[(1-.95^{1/21})^{1/3} \text{ or } .01]$ $= 0.01$	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
4	$PL = \bar{X} + tS(1+1/N)^{1/2}$ $= 109.25 + (2.6 * 16.965)(1+1/16)^{1/2}$ $= 154.722$	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>	<u>Equation</u>	<u>Description</u>
1	$\bar{X} = \text{sum}[X] / N$ $= 4130.0 / 16$ $= 258.125$	Compute upgradient mean.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((1.15 \times 10^6 - 1.71 \times 10^7 / 16) / (16-1))^{1/2}$ $= 76.002$	Compute upgradient sd.
3	$\alpha = \min[(1-.95^{1/K})^{1/3} \text{ or } .01]$ $= \min[(1-.95^{1/21})^{1/3} \text{ or } .01]$ $= 0.01$	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
4	$PL = \bar{X} + tS(1+1/N)^{1/2}$ $= 258.125 + (2.6 * 76.002)(1+1/16)^{1/2}$ $= 461.84$	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Fluoride (mg/L)
Nonparametric Prediction Limit

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	PL = max(X) = 0.2	Compute nonparametric prediction limit as largest background measurement.
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>	<u>Equation</u>	<u>Description</u>
1	$PL_{(low)} = \min(X)$ $= 6.76$ $PL_{(high)} = \max(X)$ $= 7.93$	Compute nonparametric prediction interval as minimum and maximum measurements.
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Sulfate (mg/L)
Nonparametric Prediction Limit

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	PL = max(X) = 53.0	Compute nonparametric prediction limit as largest background measurement.
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons**Total dissolved solids (mg/L)****Nonparametric Prediction Limit**

<u>Step</u>	<u>Equation</u>	<u>Description</u>
1	PL = max(X) = 2300.0	Compute nonparametric prediction limit as largest background measurement.
2	Confidence = 0.99	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Table 1
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.
ND = Not detected, result = detection limit.

Table 1
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.
ND = Not detected, result = detection limit.

Table 1
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.
 ND = Not detected, result = detection limit.

Table 1
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.
 ND = Not detected, result = detection limit.

Table 1
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.

ND = Not detected, result = detection limit.

Table 2
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.

ND = Not Detected, result = detection limit.

Table 2

**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.
- ND = Not Detected, result = detection limit.

Table 3

**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.

Table 4

**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 $G < \text{critical value}$.

If detection frequency is $< 50\%$ nonparametric or Poisson limit is used

Table 5

**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	SU	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.

Table 6

**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.
ND = Not Detected, result = detection limit.

Table 6

**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
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.
 ND = Not Detected, result = detection limit.

Appendix D
Slug Test Report

CCR IMPOUNDMENT GROUNDWATER INVESTIGATION

PROJECT NUMBER: 60546383

SLUG TEST ANALYSIS

TECHNICAL MEMORANDUM

DATE: December 26, 2017

TO: 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 In-situ 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 3.0×10^{-5} cm/s to 9.6×10^{-4} cm/s. Representative values from literature (Freeze and Cherry, 1979; Domenico and Schwartz, 1990) of hydraulic conductivities for silty fine sands range from 2.0×10^{-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 hydrostratigraphic 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. Physical and Chemical Hydrogeology. John Wiley and Sons, New York.

Freeze and Cherry, 1979. Groundwater. Prentice Hall, Englewood Cliffs, New Jersey.

HYDROSOLVE, 1996. AQTESOLV, Reston, Virginia.

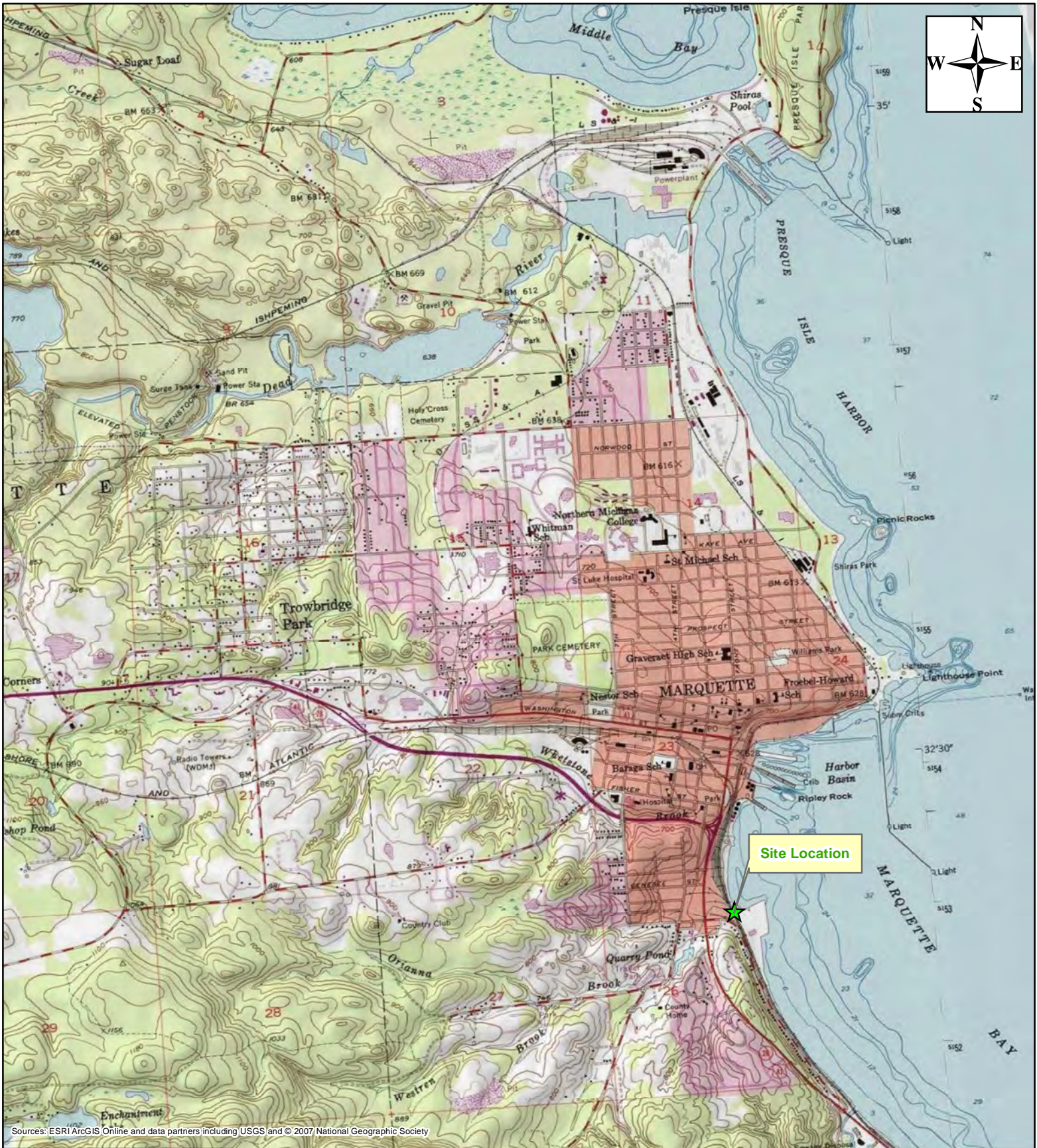
HYDROSOLVE, 2007. AQTESOLV, Reston, Virginia.

TABLE

TABLE 1
IN-SITU HYDRAULIC CONDUCTIVITY 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
	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		
<p>NOTE:</p> <p>Screened formation represents the material with the highest potential for hydraulic conductivity.</p>					

FIGURE

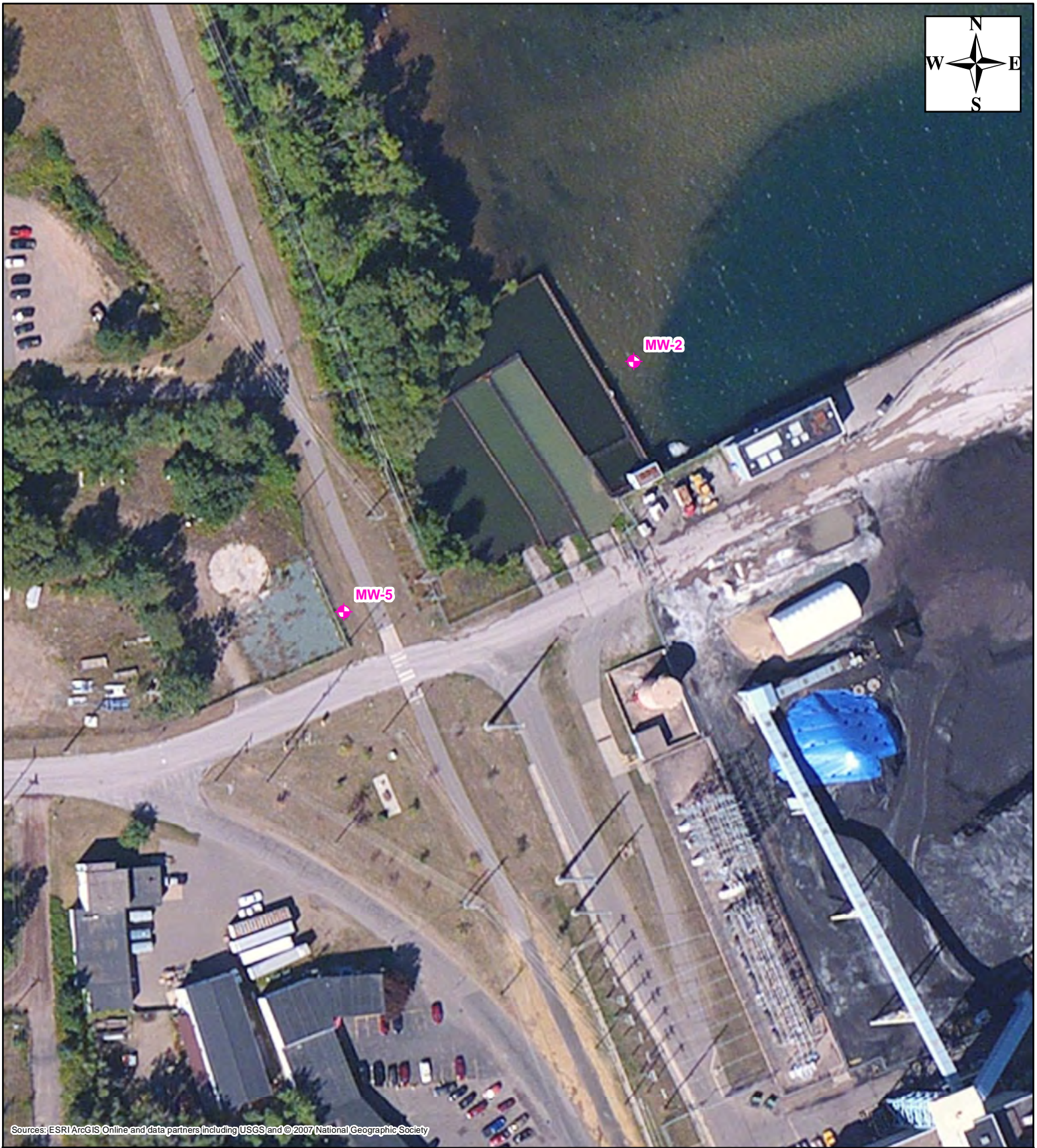


Sources: ESRI ArcGIS Online and data partners including USGS and © 2007 National Geographic Society

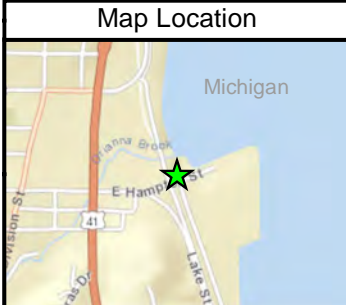


<h3>Site Location Map</h3> <p>CCR Impoundment Site Marquette, Michigan</p>		
<p>Scale: 1:36,000</p>		<p>0 3,000 6,000 Feet</p>

<p>2985 South Ridge Road, Suite B Green Bay, WI 54304</p>
<p>December 2017</p>
<p>Figure 1</p>



Sources: ESRI/ArcGIS Online and data partners including USGS and © 2007 National Geographic Society



Well Location Map
CCR Impoundment Site
Marquette, Michigan

Monitoring Well (Slug Tested)

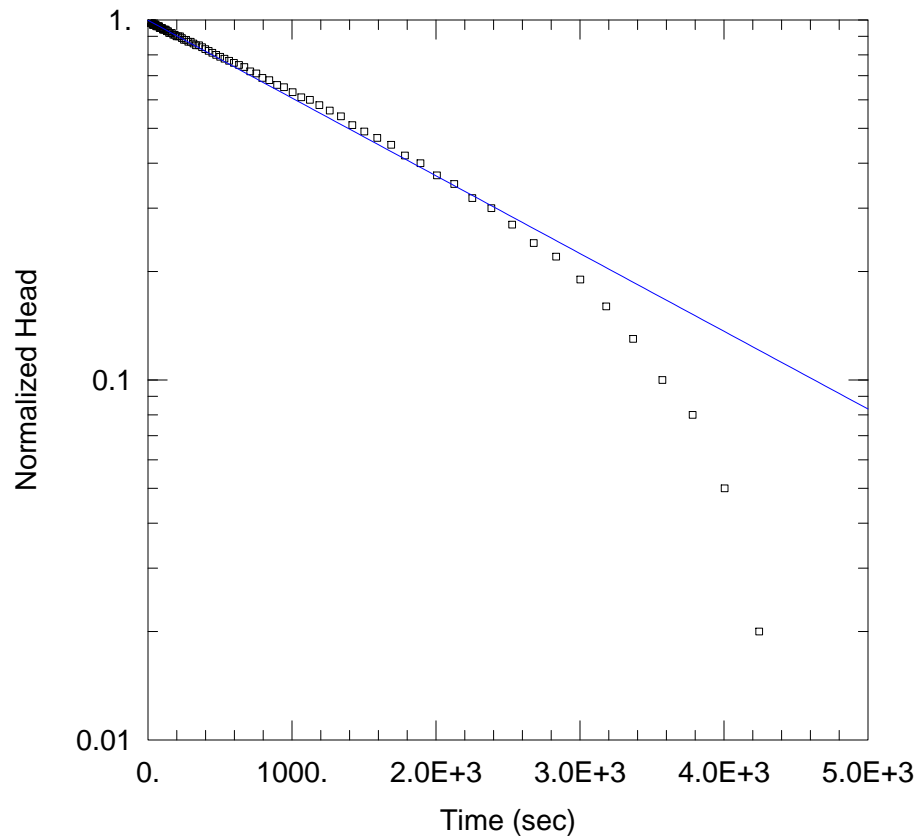
Scale: 1:1,200 0 100 200 Feet

AECOM
2985 South Ridge Road, Suite B
Green Bay, WI 54304

December 2017

Figure 2

SLUG TEST ANALYSIS



MW-2 RISING TEST 1

PROJECT INFORMATION

Company: AECOM
 Client: Power Plant
 Location: Marquette, Michigan
 Test Well: MW-2
 Test Date: 10/12/17

SOLUTION

Aquifer Model: Unconfined
 Solution Method: Bouwer-Rice
 $K = 3.034E-5$ cm/sec
 $y_0 = 0.9976$ ft

AQUIFER DATA

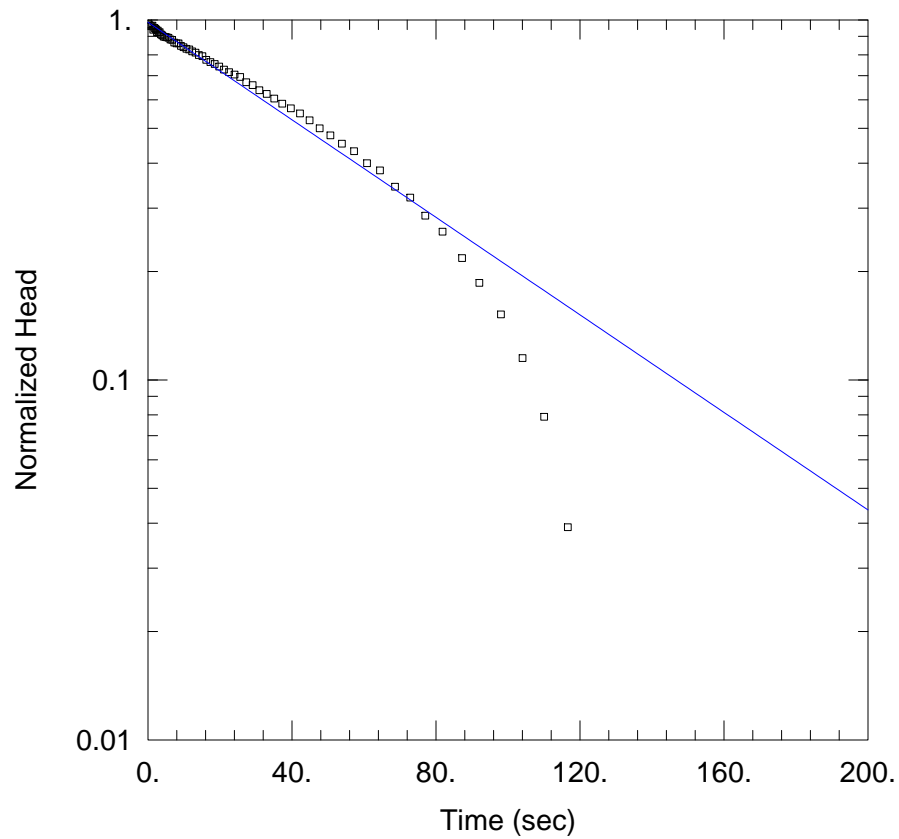
Saturated Thickness: 28.7 ft

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW-2)

Initial Displacement: 1. ft
 Total Well Penetration Depth: 28.7 ft
 Casing Radius: 0.0833 ft

Static Water Column Height: 28.7 ft
 Screen Length: 5. ft
 Well Radius: 0.333 ft



MW-5 RISING TEST 1

PROJECT INFORMATION

Company: AECOM
 Client: Power Plant
 Location: Marquette, Michigan
 Test Well: MW-5
 Test Date: 10/12/17

SOLUTION

Aquifer Model: Unconfined
 Solution Method: Bouwer-Rice
 $K = 0.0009583$ cm/sec
 $y_0 = 0.9853$ ft

AQUIFER DATA

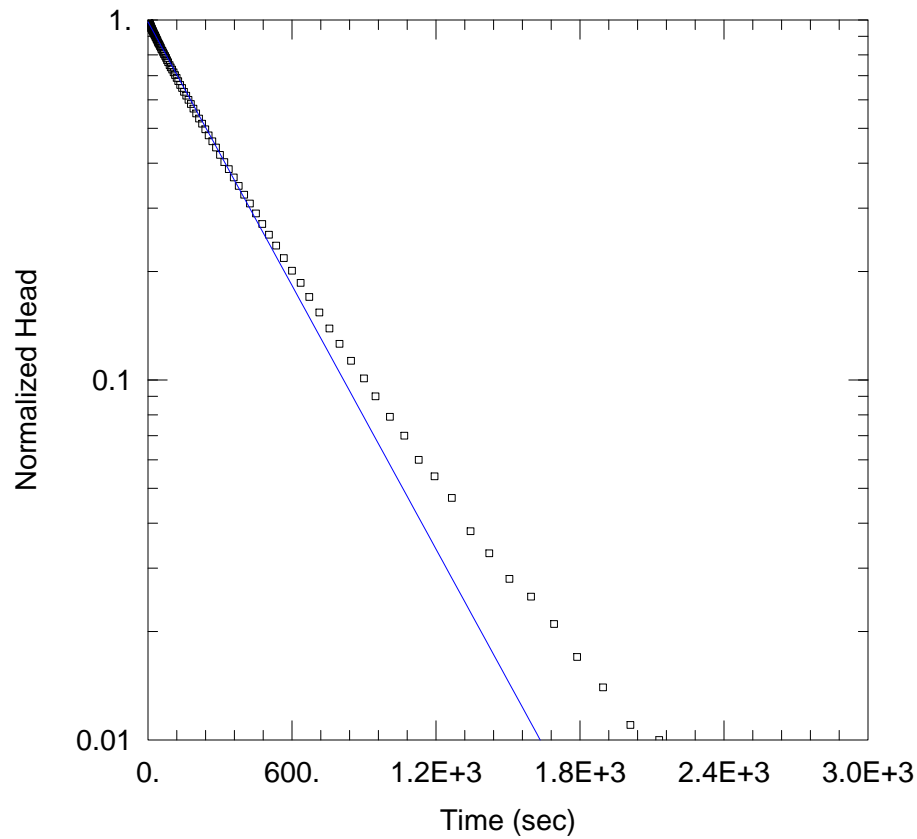
Saturated Thickness: 30.01 ft

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW-5)

Initial Displacement: 1. ft
 Total Well Penetration Depth: 30.01 ft
 Casing Radius: 0.0833 ft

Static Water Column Height: 30.01 ft
 Screen Length: 5. ft
 Well Radius: 0.333 ft



MW-5 RISING TEST 2

PROJECT INFORMATION

Company: AECOM
 Client: Power Plant
 Location: Marquette, Michigan
 Test Well: MW-5
 Test Date: 10/12/17

SOLUTION

Aquifer Model: Unconfined
 Solution Method: Bouwer-Rice
 $K = 0.0001726$ cm/sec
 $y_0 = 0.9872$ ft

AQUIFER DATA

Saturated Thickness: 30.01 ft

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW-5)

Initial Displacement: 1. ft
 Total Well Penetration Depth: 30.01 ft
 Casing Radius: 0.0833 ft

Static Water Column Height: 30.01 ft
 Screen Length: 5. ft
 Well Radius: 0.333 ft

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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Table of Contents

1.	Introduction	4
2.	Annual Inspection	5
2.1	Holding Pond Configuration.....	5
2.2	Instrumentation	5
2.3	Water and CCR Ash Elevations.....	5
2.4	Storage Capacity	6
2.5	Current Volume of Impounded Water and CCR	6
2.6	Structural Field Evaluation.....	6
3.	Conclusion	8
	Appendix A Report Drawings	9
	Appendix B Volume Calculations	10
	Appendix C Photo Log	11

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 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

**MARQUETTE BOARD OF LIGHT AND POWER
CCR COMPLIANCE
SHEET PILE MONITORING
SHIRAS COAL PLANT**

DATE OF SURVEY: NOVEMBER 22, 2016
ELEVATION DATUM IS NAVD88 AND ESTABLISHED BY DIFFERENTIAL LEVEL LOOP FROM NGS DISK LSC7863 (RK0415) WHICH HAS A PUBLISHED ELEVATION OF 615.610'.
REFLECTIVE TARGET COORDINATES AND ELEVATIONS ESTABLISHED BY TURNING 2 SETS OF ANGLES FROM CONTROL POINTS 1 AND 2.
TARGET BENCHMARK ELEVATIONS ESTABLISHED BY DIFFERENTIAL LEVELING. SOME TARGET BENCHMARKS WERE INACCESSIBLE TO A LEVEL ROD AND HAD TO BE MEASURED DOWN TO FROM ABOVE.

Ash Pond CCR Compliance Movement Monitoring						
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
1	5000.000	5000.000	5000.000	5000.000	0.000	0.000
2	5053.395	4885.493	5053.395	4885.493	0.000	0.000
3	5032.562	4987.579	5032.562	4987.578	0.000	-0.001
4	5076.237	4960.903	5076.220	4960.876	-0.017	-0.027
5	5124.911	4931.078	5124.911	4931.083	0.000	0.005
6	5049.868	5011.443	5049.865	5011.409	-0.033	-0.034
7	5089.939	4987.426	5089.900	4987.363	-0.039	-0.063
8	5138.743	4957.869	5138.738	4957.866	-0.005	-0.003
9	5135.519	4922.879	5135.518	4922.877	-0.001	-0.002
10	5157.940	4943.954	5157.940	4943.955	0.000	0.001
11	5182.039	4966.800	5182.039	4966.799	-0.001	-0.001
12	5202.844	4986.818	5202.842	4986.813	-0.002	-0.006
13	5212.675	5003.027	5212.663	5003.041	-0.012	0.014
14	5181.111	5020.604	5181.105	5020.619	-0.006	0.015
15	5151.909	5036.356	5151.908	5036.367	-0.001	0.011
16	5126.503	5050.227	5126.501	5050.237	-0.002	0.010
17	5099.988	5064.660	5099.985	5064.666	-0.003	0.006
18	5080.634	5075.118	5080.635	5075.124	0.001	0.006
19	5048.539	5048.415	5048.536	5048.413	-0.003	-0.002
20	5104.828	5013.673	5104.835	5013.695	0.007	0.022
21	5153.524	4983.690	5153.518	4983.701	-0.007	0.011

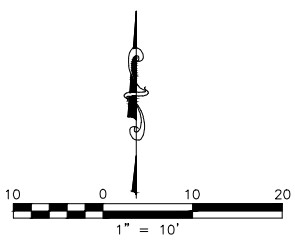
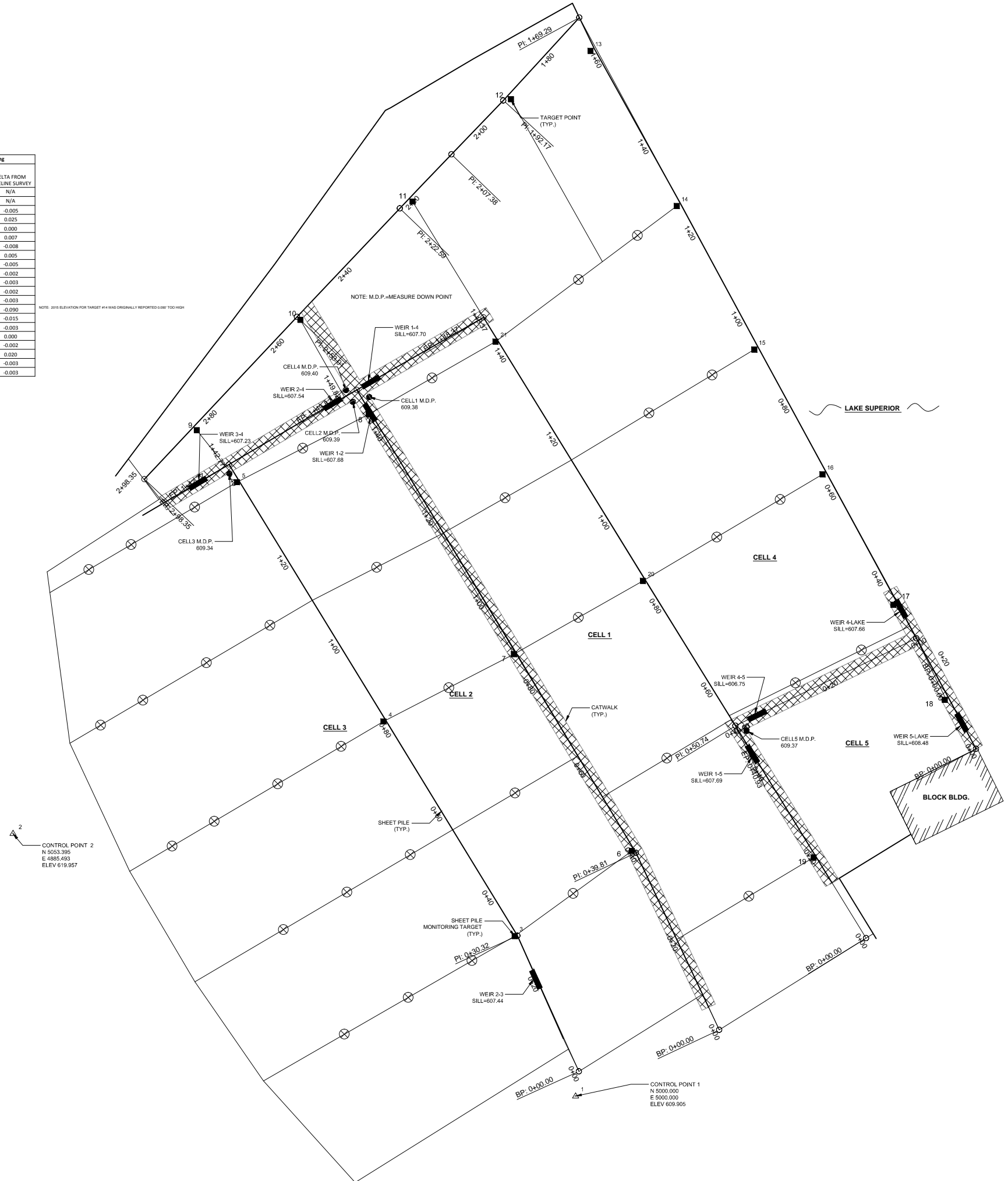
CCR Compliance Ash Pond Monitoring			
POINT	10/15/2015 ELEVATION	11/22/2016 ELEVATION	DELTA FROM BASELINE SURVEY
1	609.905	609.905	N/A
2	616.957	616.957	N/A
3	608.825	608.820	-0.005
4	608.815	608.840	0.025
5	608.865	608.865	0.000
6	608.843	608.850	0.007
7	608.970	608.862	-0.108
8	608.908	608.913	0.005
9	609.835	609.830	-0.005
10	609.857	609.855	-0.002
11	609.730	609.727	-0.003
12	609.752	609.750	-0.002
13	609.695	609.692	-0.003
14	609.720	609.630	-0.090
15	609.670	609.655	-0.015
16	609.730	609.727	-0.003
17	609.735	609.735	0.000
18	609.702	609.700	-0.002
19	608.830	608.850	0.020
20	608.960	608.957	-0.003
21	608.950	608.947	-0.003

NOTE: 2015 ELEVATION FOR TARGET #14 WAS ORIGINALLY REPORTED 0.002 TOO HIGH

TYPICAL TARGET INSTALLATION



TARGET COORDINATE AND ELEVATION
BENCHMARK ELEVATION



Rev	Date	Description
R-1	BDP 12/15/2016	2016 ANNUAL INSPECTION

Designed: CLC 10/19/2015
Drawn: CLC 10/19/2015
Checked: CHI XX/XX/2008
Approved: JKL XX/XX/2008

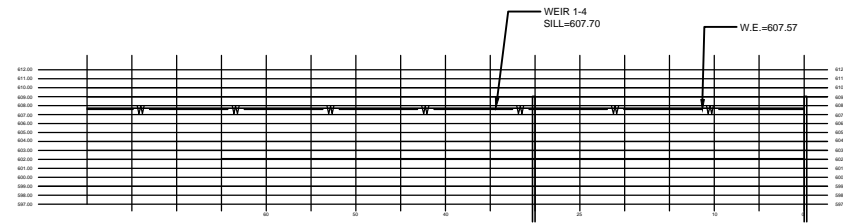
PROJECT NUMBER
60445171

SHEET REFERENCE NUMBER
1

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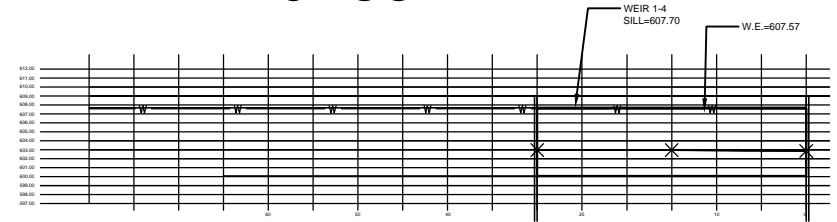
CELL 1

0+00



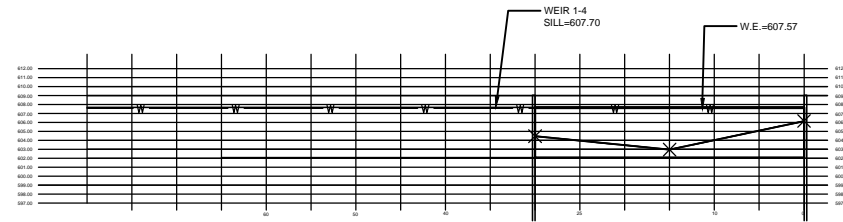
MATERIAL AREA = 0.0 SFT
 MEASURED ADDITIONAL AREA= 0.0 SFT
 TOTAL AREA = 0.0 SFT

0+85



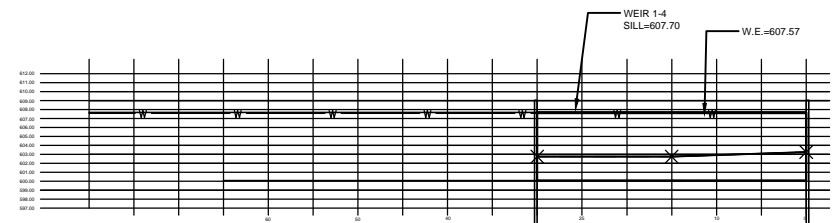
MATERIAL AREA = 86.0 SFT
 MEASURED ADDITIONAL AREA= 142.6 SFT
 TOTAL AREA = 228.6 SFT

0+20



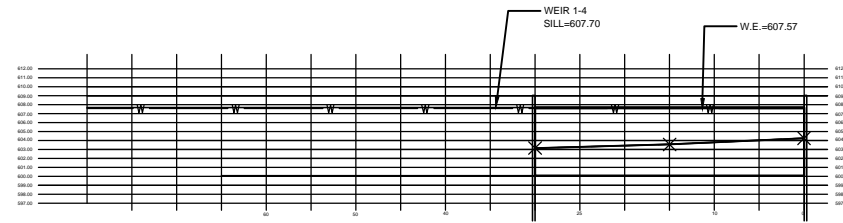
MATERIAL AREA = 62.0 SFT
 MEASURED ADDITIONAL AREA= 106.6 SFT
 TOTAL AREA = 168.6 SFT

1+15



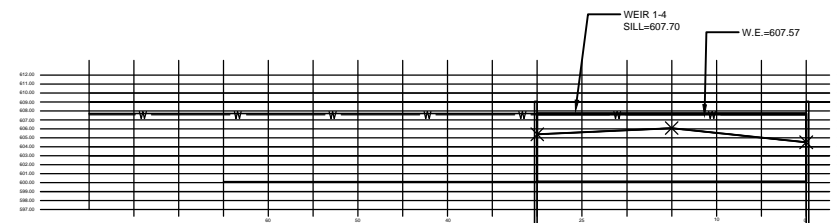
MATERIAL AREA = 84.5 SFT
 MEASURED ADDITIONAL AREA= 144.1 SFT
 TOTAL AREA = 228.6 SFT

0+52



MATERIAL AREA = 107.0 SFT
 MEASURED ADDITIONAL AREA= 121.6 SFT
 TOTAL AREA = 228.6 SFT

1+43



MATERIAL AREA = 176.6 SFT
 MEASURED ADDITIONAL AREA= 52.0 SFT
 TOTAL AREA = 228.6 SFT

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Rev	Date	Description

R-1 BDP 12/15/16
 2016 ANNUAL INSPECTION

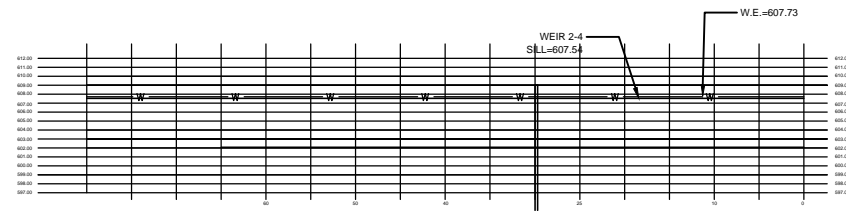
Designed: CLC 10/19/2015
 Drawn: CLC 10/19/2015
 Checked: GHI XX/XX/2008
 Approved: JKL XX/XX/2008

PROJECT NUMBER
 60445171

SHEET REFERENCE NUMBER

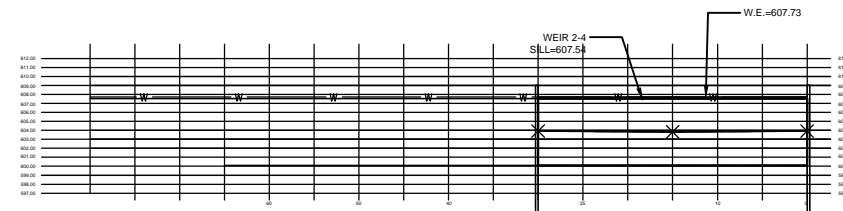
CELL 2

0+08



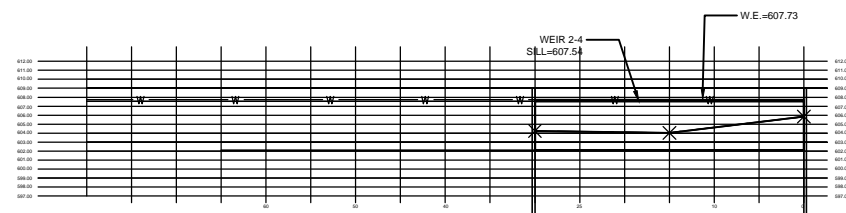
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MEASURED ADDITIONAL AREA= 0.0 SFT
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0+87



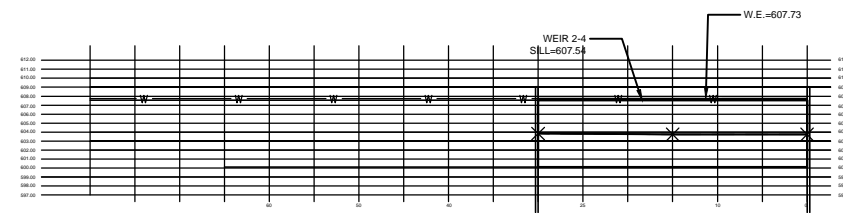
MATERIAL AREA = 114.0 SFT
MEASURED ADDITIONAL AREA= 109.8 SFT
TOTAL AREA = 223.8 SFT

0+40



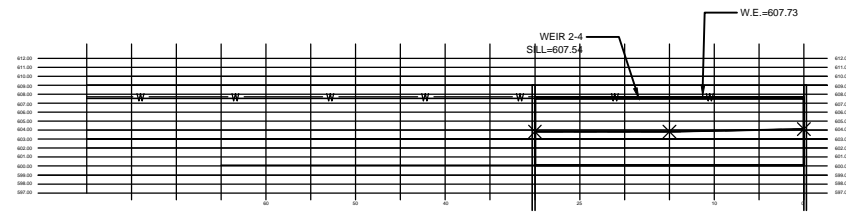
MATERIAL AREA = 73.5 SFT
MEASURED ADDITIONAL AREA= 90.3 SFT
TOTAL AREA = 163.8 SFT

1+16



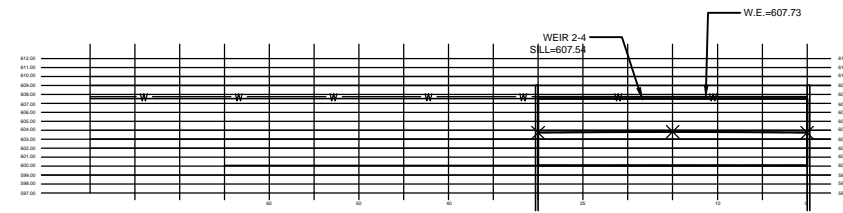
MATERIAL AREA = 110.3 SFT
MEASURED ADDITIONAL AREA= 113.5 SFT
TOTAL AREA = 223.8 SFT

0+63



MATERIAL AREA = 114.8 SFT
MEASURED ADDITIONAL AREA= 120.6 SFT
TOTAL AREA = 235.4 SFT

1+45



MATERIAL AREA = 111.0 SFT
MEASURED ADDITIONAL AREA= 112.8 SFT
TOTAL AREA = 223.8 SFT

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Issued

Rev	Date	Description

R-1 BDP 12/15/2016
2016 ANNUAL INSPECTION

Designed: CLC 10/19/2015
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Approved: JKL XX/XX/2008

PROJECT NUMBER
60445171

SHEET REFERENCE NUMBER

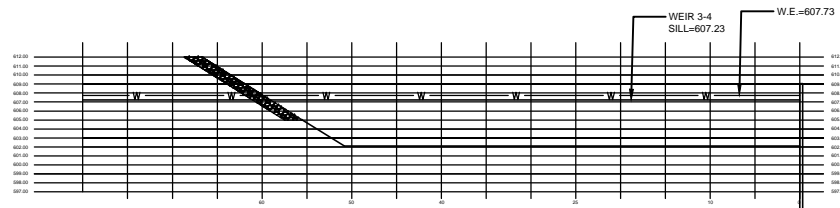
3

SHEET 03 OF 06

CELL 3

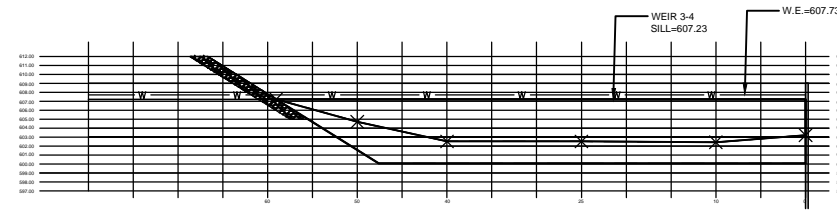
MARQUETTE BOARD OF LIGHT AND POWER
CCR COMPLIANCE
SHEET PILE MONITORING
SHIRAS COAL PLANT

0+10



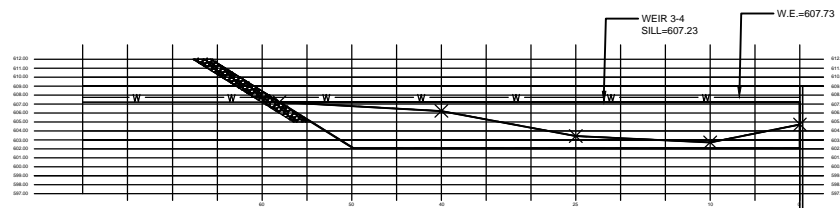
MATERIAL AREA = 0.0 SFT
MEASURED ADDITIONAL AREA= 0.0 SFT
TOTAL AREA = 0.0 SFT

0+81



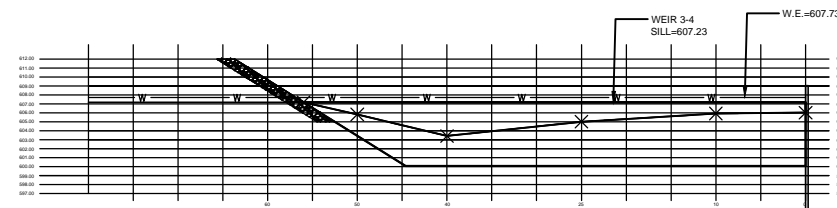
MATERIAL AREA = 148.3
MEASURED ADDITIONAL AREA= 233.1
TOTAL AREA = 381.4 SFT

0+30



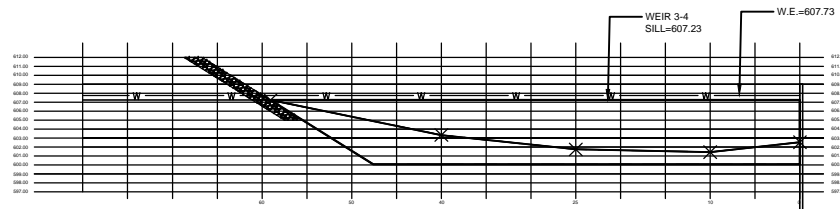
MATERIAL AREA = 135.5 SFT
MEASURED ADDITIONAL AREA= 142.3 SFT
TOTAL AREA = 277.8 SFT

1+10



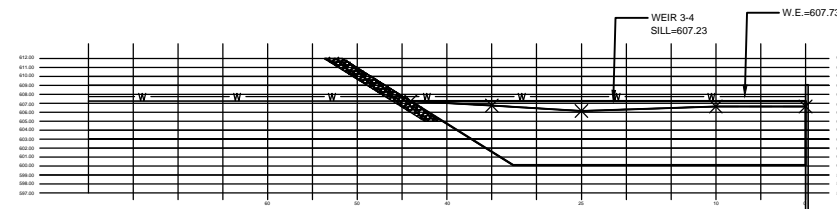
MATERIAL AREA = 245.9 SFT
MEASURED ADDITIONAL AREA= 112.3 SFT
TOTAL AREA = 358.2 SFT

0+55



MATERIAL AREA = 136.4 SFT
MEASURED ADDITIONAL AREA= 245.0 SFT
TOTAL AREA = 381.4 SFT

1+39



MATERIAL AREA = 245.1 SFT
MEASURED ADDITIONAL AREA= 29.0 SFT
TOTAL AREA = 274.1 SFT

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Rev	Date	Description

R-1 BDP 12/15/2016
2016 ANNUAL INSPECTION

Designed: CLC 10/19/2015
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Approved: JKL XX/XX/2008

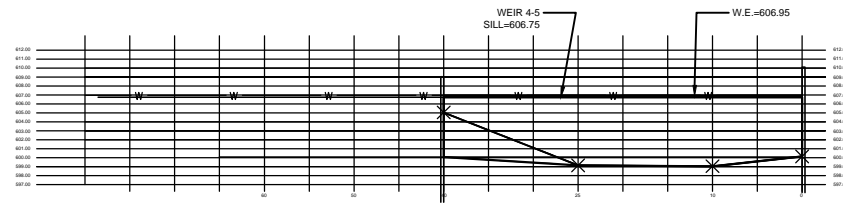
PROJECT NUMBER
60445171

SHEET REFERENCE NUMBER

CELL 4

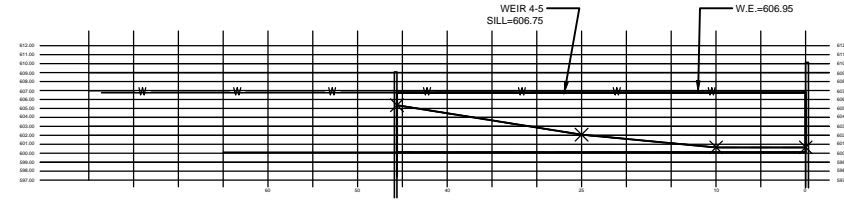
NOTE: CELL 4 BOTTOM HAS BEEN EXCAVATED BELOW 1990 SCA, CINDER POND IMPROVEMENT PROJECT, AT SOME LOCATIONS

0+28



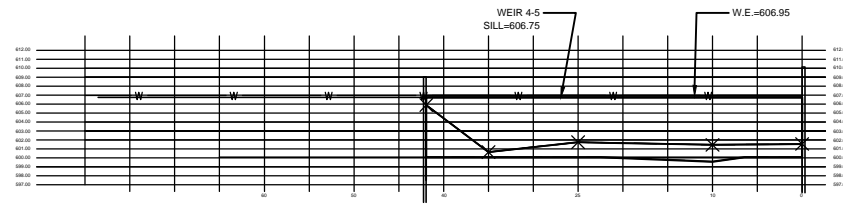
MATERIAL AREA = 37.3 SFT
MEASURED ADDITIONAL AREA= 256.0 SFT
TOTAL AREA = 293.3 SFT

1+26



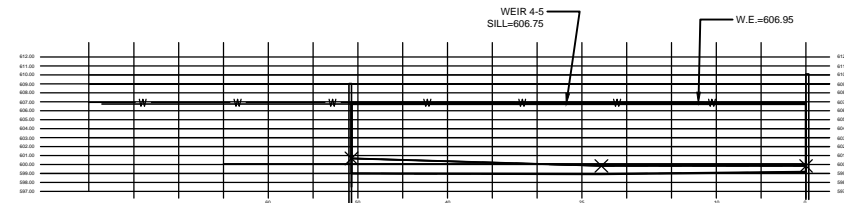
MATERIAL AREA = 99.3 SFT
MEASURED ADDITIONAL AREA= 204.9 SFT
TOTAL AREA = 304.2 SFT

0+64



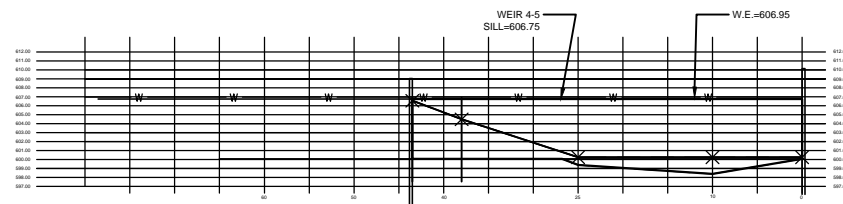
MATERIAL AREA = 74.4 SFT
MEASURED ADDITIONAL AREA= 209.4 SFT
TOTAL AREA = 283.8 SFT

1+69



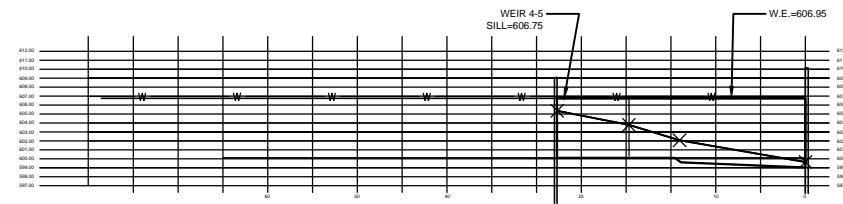
MATERIAL AREA = 53.9 SFT
MEASURED ADDITIONAL AREA= 338.2 SFT
TOTAL AREA = 392.1 SFT

0+93



MATERIAL AREA = 91.0 SFT
MEASURED ADDITIONAL AREA= 226.3 SFT
TOTAL AREA = 317.3 SFT

2+19



MATERIAL AREA = 46.3 SFT
MEASURED ADDITIONAL AREA= 149.5 SFT
TOTAL AREA = 195.8 SFT

MARQUETTE BOARD OF LIGHT AND POWER
CCR COMPLIANCE
SHEET PILE MONITORING
SHIRAS COAL PLANT

Rev	Date	Description

R-1 BDP 12/15/16
2016 ANNUAL INSPECTION

Designed: CLC 10/19/2015
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Approved: JKL XX/XX/2008

PROJECT NUMBER
60445171

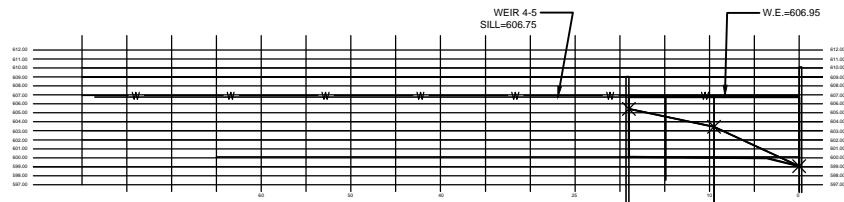
SHEET REFERENCE NUMBER

5

CELL 4 (Cont.)

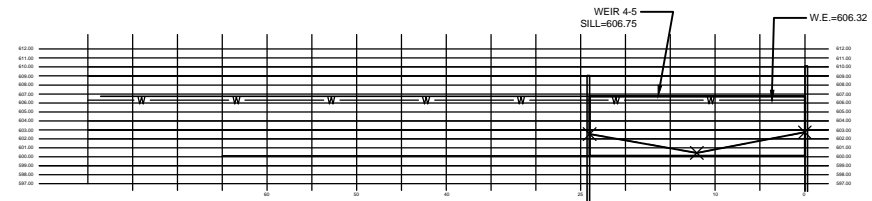
CELL 5

2+52



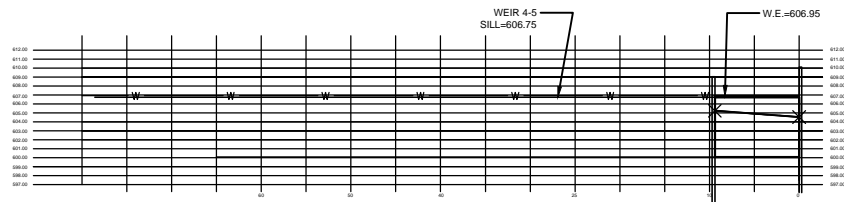
MATERIAL AREA = 55.8 SFT
MEASURED ADDITIONAL AREA= 74.1 SFT
TOTAL AREA = 129.9 SFT

0+00



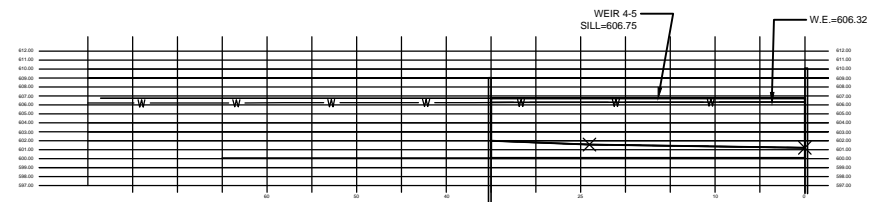
MATERIAL AREA = 34.6 SFT
MEASURED ADDITIONAL AREA= 125.5 SFT
TOTAL AREA = 160.1 SFT

2+83



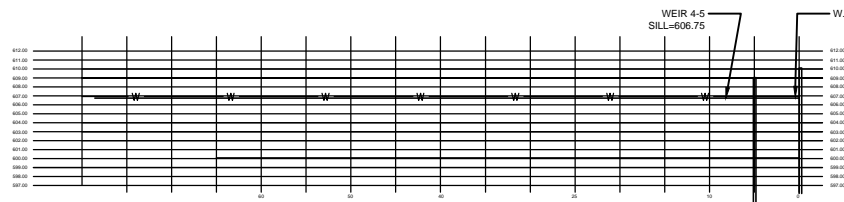
MATERIAL AREA = 40.9 SFT
MEASURED ADDITIONAL AREA= 21.8 SFT
TOTAL AREA = 62.7 SFT

0+20



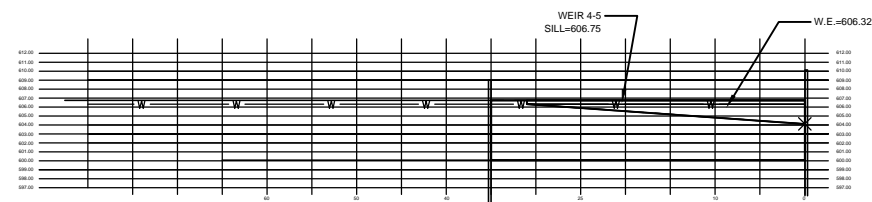
MATERIAL AREA = 50.6 SFT
MEASURED ADDITIONAL AREA= 182.9 SFT
TOTAL AREA = 233.5 SFT

2+98



MATERIAL AREA = 0.0 SFT
MEASURED ADDITIONAL AREA= 0.0 SFT
TOTAL AREA = 0.0 SFT

0+40



MATERIAL AREA = 186.0 SFT
MEASURED ADDITIONAL AREA= 47.5 SFT
TOTAL AREA = 233.5 SFT

MARQUETTE BOARD OF LIGHT AND POWER
CCR COMPLIANCE
SHEET PILE MONITORING
SHIRAS COAL PLANT

Rev	Date	Description

R-1 BDP 12/15/16
2016 ANNUAL INSPECTION

Designed: CLC 10/19/2015
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Checked: GHI XX/XX/2008
Approved: JKL XX/XX/2008

PROJECT NUMBER
60445171

SHEET REFERENCE NUMBER

Appendix B Volume Calculations

Client: Marquette Board of Light and Power
Project No.: 60445171
Project : CCR Compliance : Ash Cell Volumes



Date: 12/15/2016

CELL 1				
Station	Length (FT)	Occupied Area		Unoccupied
		(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
Occupied Volume =	11462.5	424.5
Unoccupied Volume =	14866.7	550.6
Total Cell 1 Volume =	26329.2	975.2

CELL 2				
Station	Length (FT)	Occupied Area		Unoccupied
		(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
Occupied Volume =	13669.8	506.3
Unoccupied Volume =	13998.1	518.4
Total Cell 2 Volume =	27667.8	1024.7

CELL 3

Station	Length (FT)	Occupied Area		Total Area (SFT)
		(SFT)	Unoccupied 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
Occupied Volume =	21290.3	788.5
Unoccupied Volume =	19530.0	723.3
Total Cell 3 Volume =	40820.2	1511.9

CELL 4

Station	Length (FT)	Occupied Area		Total Area (SFT)
		(SFT)	Unoccupied 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
Occupied Volume =	14886.2	551.3
Unoccupied Volume =	38270.7	1417.4
Total Cell 4 Volume =	53156.9	1968.8

CELL 5

Station	Length (FT)	Occupied Area (SFT)	Unoccupied 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

