FOURTH QUARTER 2019 GROUNDWATER ASSESSMENT MONITORING REPORT
NOVEMBER 2019 MONITORING EVENT

FORMER ENVIRONMENTAL WASTE SOLUTIONS (EWS)
CAMDEN CLASS II LANDFILL

TDSWM PERMIT NUMBER IDL 03-0212 (TERMINATED)
200 OMAR CIRCLE
CAMDEN, TN 38320

Prepared for:
THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

FORMER ENVIRONMENTAL WASTE SOLUTIONS
CAMDEN CLASS II LANDFILL

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EXECUTIVE SUMMARY

This report documents the fourth quarter 2019 assessment-monitoring event, which was performed at the former Environmental Waste Solutions, LLC (EWS) Camden Class II Landfill on November 20, 2019.

The former EWS Camden Class II Landfill is located in Benton County at 200 Omar Circle, Camden, Tennessee (latitude 36°03'16" N/longitude -88°05'16" W), and was formerly registered with the Tennessee Division of Solid Waste Management (DSWM) with permit number IDL 03-0212 and previously received secondary aluminum smelter waste for disposal including aluminum dross, salt cakes, and other industrial wastes. The IDL 03-0212 permit was terminated in July 2017.

Beginning in 2008, the site entered into the Groundwater Detection-Monitoring Program, and groundwater samples were collected from site monitoring wells on a semi-annual basis. EWS entered the Assessment Monitoring Program because of chloride concentrations reported above the 250 mg/l EPA secondary drinking water standard (2DWS) at monitoring well MW-3 during the November 2015 semi-annual detection-monitoring event. As a result, additional groundwater quality assessment activities were completed which included the installation of a new permanent groundwater monitoring well (MW-5), the installation of three (3) temporary monitoring wells (TMW-1, TMW-2, TMW-3), and completion of a private water-use survey. In addition, the semi-annual detection monitoring frequency was increased from semi-annual to quarterly assessment monitoring. The observed chloride concentration at MW-3 during this November 2019 event (19.3 mg/l) was well below the 2DWS.

Quarterly assessment monitoring activities have been performed since the November 2015 monitoring event in general accordance with the site's Groundwater Quality Assessment Plan (GWQAP) dated March 14, 2016. During the second quarter 2017 assessment-monitoring event, total cadmium was detected above the maximum contaminant level (MCL) at MW-3, which was the first MCL exceedance for total cadmium concentrations at any well location on site. As a result, enhancements have been made to the sampling and analytical program for the site.

The 4th Quarter 2019 sampling event at the facility included the following sampling activities:

Groundwater samples were collected by CEC on November 20, 2019 from MW-1, MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3. A leachate sample was also collected by CEC on November 20, 2019 from the "Aluminum Processing Waste Cell (APWC)" location. However, CEC was unable to collect a leachate sample from the "Industrial Waste Cell (IWC)" during this event. The amount of leachate produced from the IWC has been minimal since the landfill was capped, and the leachate being pumped from the IWC has been intermittent.

Pace Analytical (Pace), formerly ESC Lab Sciences, was the laboratory sub-contracted to perform the chemical analyses. Laboratory reports for the 4th quarter 2019 groundwater analyses were prepared by Pace and reported to CEC on December 9, 2019.

The reported concentrations of chemicals detected in the groundwater monitoring wells and temporary monitoring wells were reviewed and compared against their respective U.S. EPA Maximum Contaminant Levels (MCLs) and U.S. National Secondary Drinking Water Standards (2DWS). Where primary or secondary standards weren't available (i.e. cobalt), concentrations were reviewed and compared against their EPA Regional Screening Levels (RSLs). Statistical analysis methods were used to identify whether there were any statistically significant increases (SSIs) in any site monitoring wells over background concentrations for the analyzed water quality parameters. The results of the analyses during this assessment monitoring event are summarized in the following paragraphs.

Total cadmium was detected below the MCL (0.005 mg/l) at MW-3 during the November 20, 2019 monitoring event (total cadmium at MW-3 = 0.00157 mg/l) and was significantly lower than the previous September 5, 2019 event (0.0088 mg/l). In addition, total cadmium was **not** above the MCL in the duplicate sample collected at MW-3 during the November 20, 2019 monitoring event (total cadmium at MW-3 duplicate sample = 0.00155 mg/l). The cadmium detections at MW-3 during this event were the only cadmium detections above the Practical Quantification Limit (PQL) at any of the groundwater monitoring locations. The statistical trend analysis for total cadmium at MW-3 does confirm an increasing trend having statistical significance when considering all current and past data for cadmium at MW-3. However, based on the Mann-Kendall trend test, no distinct statistically significant trend was identified for total cadmium concentrations at MW-3 when considering data from the past 10 sampling events since June 2017. Total cadmium was first detected above the MCL at MW-3 during the June 8, 2017 event (total cadmium at MW-3 = 0.0286 mg/l).

Although there have been elevated concentrations of total cadmium in MW-3, the cadmium levels observed in MW-3 have improved significantly since closure activities have been completed. The cadmium concentration reported at MW-3 during this event was lower than the previous 14 sampling events since May 9, 2016.

Eight SSIs were identified over background during this event. SSIs included chloride (MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3), fluoride (MW-3), and sulfate (MW-3). No SSIs were identified for the total cadmium and zinc concentrations at MW-3 during this event. The chloride, fluoride, zinc, and sulfate detections observed in the site monitoring wells were all below their associated MCLs or 2DWS.

Glossary of Terms

Appendix I	Refers to the required regulatory sample list of groundwater parameters
CEC	Civil & Environmental Consultants, Inc.
Class I Landfill	Municipal Solid Waste Landfill
Class II Landfill	Industrial Waste Landfill
Class IV Landfill	Construction/Demolition Waste Landfill
Class III/IV Landfill	Landscaping and Construction/Demolition Waste Landfill
DML	Construction Demolition Landfill
US EPA	United States Environmental Protection Agency
Pace	Pace Analytical
EWS	Environmental Waste Solutions
GW	Groundwater
HDPE	High Density Polyethylene
HI	Hydrogeologic Investigation
MCL	Maximum Contaminant Level
microomhos•cm-1	micro-Siemens per centimeter
mg/l	milligrams per Liter
MW	Monitor Well
NPPL	Non-parametric prediction limit analysis
ORP	Oxidation Reduction Potential
POTW	Publically Owned Treatment Works
ppm	parts per million*
PQL	Practical Quantitation Limit
QC	Quality Control
2DWS	Secondary Drinking Water Standard (EPA)
SESD	Science and Ecosystem Support Division
SNL	Sanitary Landfill
SSI	Statistically Significant Increase
TDEC	Tennessee Department of Environment and Conservation
TDOG	Tennessee Division of Geology
TDSWM	Tennessee Division of Solid Waste Management
TOC	Top of Casing
VOC	Volatile Organic Compound

* ppm – parts per million* is equivalent to mg/l – milligrams per Liter for water samples

1.0 INTRODUCTION

1.1 SITE LOCATION

The former Camden Class II landfill is located just off Highway US 70 at 200 Omar Circle, Camden, Tennessee. The site is located on the Camden, Tennessee USGS quadrangle at north latitude 36° 03' 16" and west longitude -88° 05' 16" at an average elevation of 400 feet above mean sea level datum (MSL). The location of the facility is shown in Appendix A – Figure 1 – Site Location Map. The landfill footprint can be viewed in Appendix A – Figure 2 – Potentiometric Surface Map.

1.2 CURRENT ACTIVITIES

The former EWS Camden Class II landfill is not currently operating (i.e., the permit has been terminated, and TDEC is in the process of achieving certified final closure of the site) and substantial landfill cap construction activities have been completed. Continued post-closure activities being implemented at the facility are intended to protect the environment and human health and include leachate pre-treatment, leachate hauling and disposal, storm water management activities, and groundwater monitoring activities.

2.0 AQUIFER CHARACTERISTICS

2.1 GEOLOGIC AND AQUIFER CHARACTERISTICS

The extensive reworking of the site because of the excavation of chert for local road and fill projects has impacted the original site geology. Based upon a review of the Tennessee Division of Geology (TDOG) Geologic Map and site observations, it appears that the site is within the Camden and Harriman Formations. It is reported by the TDOG that the Camden and Harriman Formations are lithologically identical and not enough fossils are present to form a convenient basis for subdivision.

2.1.1 Camden and Harriman Formations

The Camden and Harriman Formations are described as follows: chert, gray with specks and mottling's of very light-gray and yellowish-gray (surfaces stained pale to dark yellowish-orange), bedded and blocky (beds 2 to 8 inches thick), dense, conchoidal fracture, contains pods of white to light gray tripolitic clay, locally stained yellow and brown, and fossiliferous. Locally, especially near the top, fragments of chert are cemented into large masses and beds of breccia by dark-brown to moderate-red limonite.

Groundwater potentiometric data collected from the uppermost water-bearing zone across the entire landfill site footprint during the 1999 and 2006 hydrogeological investigations indicated that groundwater flow in the uppermost aquifer is generally to the south. Comparisons of the water bearing zone elevations to static groundwater elevations indicate an unconfined aquifer.

2.2 MONITOR WELL INTEGRITY & STATIC WATER LEVELS

The groundwater-monitoring network for the former EWS Class II Landfill currently consists of monitoring wells MW-1, MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3. Due to insufficient groundwater volumes for sampling, MW-2 has been removed from the regular sampling network and replaced by MW-4. MW-2 is still intact and is used for potentiometric surface measurements and field parameter testing. Monitoring well MW-1 serves as an up-gradient monitoring point, while monitoring wells MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3 serve as down-gradient monitoring points. The temporary wells (TMW-1, TMW-2, and TMW-3) were installed with the purpose of delineating the areal extent of groundwater contamination and providing additional potentiometric interpretation. The installation of these temporary wells were in response to elevated chloride concentrations at MW-3, which were first detected during the November 2015 sampling event. In addition to providing potentiometric information for the site, these temporary wells yield groundwater samples for water-quality analyses.

The following table presents the wells that were used to develop this report.

Up-gradient Monitoring Points	Down-gradient Monitoring Points
MW-1	MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3

Before purging and sampling activities began, depth to water (DTW) measurements were collected at each of the above-referenced monitoring wells using an electronic water level indicator such as the Solinst® model #122 electronic water-level indicator. DTW measurements were also collected from MW-2 for potentiometric interpretation. DTW measurements were collected in the following order from first to last: MW-1, MW-5, TMW-1, TMW-2, TMW-3, MW-4, MW-2, and finally MW-3.

The integrity of each monitoring well was checked during each sampling event prior to groundwater collection. The physical condition of each wellhead was observed and noted along with the condition of all locking mechanisms for each monitoring well. Once the watertight seal was removed from the top of each monitoring well's casing, the well was allowed to equilibrate to atmospheric conditions. The water-level indicator was decontaminated in accordance with the United States Environmental Protection Agency-Science and Ecosystem Support Division (USEPA SESD) procedures for field water-level measurements in between wells and a new pair of clean nitrile gloves were donned at each monitoring location while collecting DTW measurements. The decontaminated electronic water-level indicator was slowly lowered into the well to establish the distance between the top of casing and the elevation of free groundwater. The electronic probe was capable of determining this distance to within one-hundredth of one foot (0.01 foot). The distance was written in the site-specific field book or field data sheet as DTW. Upon collection of these data, the electronic water-level indicator was removed from the monitoring well and decontaminated.

The following equation is used to determine the elevation of groundwater at each well:

Established Top of Casing Elevation – Depth to Water = Groundwater Elevation

Top of casing elevation has been determined by a licensed land surveyor and is referenced to the current Tennessee State Plane Coordinate System. The top of casing elevations for all site-monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3) were updated by a licensed land surveyor on May 12, 2016. Groundwater elevations are listed in Appendix A – Table 1 – Field Parameters & Potentiometric Data and reflect the most recent survey.

2.3 GROUNDWATER FLOW DIRECTION

Groundwater at the landfill appears to generally flow in a southern direction towards Charlie Creek and Cane Creek. Groundwater flow in the vicinity of the former EWS Class II Landfill generally flows from a topographic high north of the landfill towards monitoring wells MW-2, MW-3, MW-4, and MW-5 and temporary monitoring wells TMW-1, TMW-2, and TMW-3, which are all down-gradient of the waste cells.

2.4 POTENTIOMETRIC GRADIENT

The potentiometric surface of the unconfined aquifer occurring beneath the former EWS Class II Landfill occurs at approximately 22.51 feet below the top of casing at the up-gradient monitor well MW-1 to approximately 11.29 feet below the top of casing at monitor well MW-4. The potentiometric gradient calculated from groundwater elevation data collected on November 20, 2019 is approximately 1.25%.

The potentiometric gradient is calculated according to the following formula:

$$\frac{\text{Highest GW. Elev. (MW-1) } \_ \text{ – Lowest GW. Elev. (MW-4)}}{\text{Horizontal Distance between the Wells}} * 100 = \text{Pot. Grad.}$$

$$\frac{(393.96') - (370.18)}{1{,}910'} * 100 = 1.25\%$$

The above calculation assumes a perpendicular gradient between the potentiometric elevations from MW-1 and MW-4. These assumptions may provide an artificially higher potentiometric gradient than is likely occurring at the site.

2.5 HYDRAULIC CONDUCTIVITY

Hydraulic conductivity estimations within the uppermost aquifer occurring beneath the landfill have not been determined at this time.

3.0 GROUNDWATER SAMPLING PROCEDURES

3.1 INSTRUMENTATION

Before purging and sampling activities began, DTW measurements were collected at each of the monitoring wells. A YSI Professional Plus® multi-parameter instrument (YSI) was used to record pH, conductivity, temperature, dissolved oxygen (DO), and oxidation-reduction potential (ORP) during groundwater sampling events at the landfill. A Hach® model 2100Q turbidity meter was used to collect turbidity readings. Each instrument was either checked against known standards or calibrated per manufacturers' specifications prior to the commencement of sampling activities.

3.2 GROUNDWATER PURGING AND COLLECTION OF FIELD PARAMETER VALUES

On November 29, 2017, dedicated submersible bladder pumps (low-flow bladder pumps) were installed in each of the groundwater monitoring wells (MW-1, MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3). During the December 11, 2017 sampling event, monitoring personnel for the former EWS Class II Landfill began utilizing low-flow protocols as described within the USEPA's Issue Paper EPA/540/S-95/504: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, April 1996. The low-flow protocols have continued to be utilized by monitoring personnel during each quarterly groundwater assessment-monitoring event since December 11, 2017. Additionally, groundwater-sampling activities were completed during this sampling event in accordance with the USEPA SESD sampling procedure -SESDPROC-301-R4 titled "Groundwater Sampling", effective April 26, 2017.

Each dedicated submersible bladder pump is of stainless steel construction, and each is equipped with a Teflon™ bladder and dedicated Teflon™-lined bonded twin polyethylene tubing (airline and water discharge line). The low-flow bladder pumps were operated by using a special control box, which controls the pressure and frequency of the pumping action and was used to adjust the flow rate of the water. The flow rate used was adjusted to minimize stress (drawdown), prevent damage to monitoring well components, and to minimize the risk of introducing sediments into the monitoring well through the well's gravel pack. Water pumped was withdrawn directly from the formation with little mixing of casing water or disturbance to the sampling zone. The initial amount of purged groundwater was collected in a clean, high-density polyethylene (HDPE) flow-through cell while measuring temperature, pH, conductivity, DO, and ORP. A turbidity meter was used to collect turbidity readings during low-flow purging activities.

The start time of purging, the parameter measurements at intervals during purging, estimated pumped volumes, depths to water for low-flow sampling, and any notes of unusual conditions were recorded during purging activities. Field parameter measurements (temperature, pH, conductivity, DO, ORP, and turbidity) were collected periodically until proper field stabilization goals had been met, which are defined by the USEPA SESD as: "for at least three consecutive measurements, the pH remains constant within 0.1 Standard Unit (SU), conductivity varies no more than 5 percent, and the turbidity has either stabilized or is below 10 Nephelometric Turbidity

Units (NTUs)". Other parameters such as DO were also measured as a purge-adequacy parameter. Normal goals for DO are 0.2 mg/l or 10% saturation, whichever is greater. Temperature and ORP were measured during purging to obtain measurements of record for these parameters for each sampling event.

During the November 20, 2019 monitoring event, a peristaltic pump was utilized during purging activities in the temporary monitoring wells (TMW-1, TMW-2, and TMW-3). According to the USEPA SESD groundwater sampling procedures, peristaltic pumps can be utilized as an alternative and acceptable method for low-flow or multiple volume purging and sampling activities.

Peristaltic pumps require three separate pieces of tubing in order to function: (1) a section of Teflon® tubing, which is lowered into the well, (2) a small section of flexible Masterflex® silicone tubing, which is installed into the peristaltic pump head, and (3) a small section of Teflon® tubing, which connects the pump head to the flow-through cell. The first section of tubing was deployed to the approximate mid-screen within the well (approximately 4 feet above the bottom of the well casing) and cut above the ground surface. The free end of the first section of tubing was connected to the flexible Masterflex® silicone tubing situated in the peristaltic pump head. Finally, the third section of tubing (second section of Teflon® tubing) connected the Masterflex® silicone tubing at the pump head to the flow-through cell for collection of field chemistry parameter measurements. In order to prevent the transfer of residuals between sampling locations, all three sections of tubing were replaced between each well. After replacement of all sections of tubing, the peristaltic pump was turned on, and a suitable (slow) pumping rate was achieved to maintain a minimal and stable drawdown level. Field parameters were collected from the initial amount of water that was purged and measurements were collected periodically until the parameters had stabilized as described above.

With respect to groundwater chemistry, an adequate purge is achieved when the pH and conductivity have stabilized and the turbidity either has stabilized or is below 10 NTUs. If the field parameters were not stable, the purging procedures continued until one of the following adequate purge conditions were met:

1. Field stabilization occurred.
2. Well was purged dry. For wells with slow recovery, attempts were made to avoid purging to dryness by slowing the purge rate. In some situations, even with slow purge rates, the well may be pumped dry. This situation generally indicates that an adequate purge had been achieved and the well was sampled following sufficient recovery (enough volume to allow filling of all sample containers).
3. A minimum of three well volumes were purged.

Field chemistry parameters were collected periodically at the temporary wells until field parameter measurements had stabilized, and at least three well volumes were removed from each temporary monitoring well. The purge water from down-gradient monitoring wells MW-3, MW-4, MW-5,

TMW-1, TMW-2, and TMW-3 were containerized and discarded into the on-site leachate collection system storage tank.

Field parameter values for each well are presented in Table 1 – Field Parameters and Potentiometric Data in Appendix A. A detailed account of each purge and sample procedure conducted at each monitoring well is presented in Appendix D – CEC Standard Operating Procedures.

3.3 GROUNDWATER SAMPLE COLLECTION & PRESERVATION

Groundwater samples were collected from monitoring wells when field parameter data indicated that stagnant water had been purged from the well and replaced by groundwater from the adjacent formation that is representative of actual aquifer conditions. Groundwater was placed in the laboratory supplied sample vessels in the following order: Appendix I organics – three (3) forty (40) mL amber glass containers preserved with hydrochloric acid (HCl); Appendix I organics EDB and DBCP– three (3) forty (40) mL clear glass containers preserved with sodium thiosulfate ($Na_2S_2O_3$); total metals (Appendix I metals, Al, Ca, Fe, K, Mg, Mn, Na, and Boron) – one (1) two-hundred fifty (250) ml HDPE container preserved with nitric acid (HNO_3); alkalinity – one (1) one-hundred (100) ml unpreserved amber glass container; bromide, chloride, nitrate, and sulfate – one (1) two-hundred fifty (250) ml unpreserved HDPE container; COD & ammonia – one (1) two-hundred fifty (250) ml HDPE jar preserved with sulfuric acid (H_2SO_4).

As described in the previous section, a peristaltic pump was used to purge temporary monitoring wells TMW-1, TMW-2, and TMW-3. Samples for organic analysis cannot be exposed to the flexible peristaltic pump-head tubing, due to the risk of contaminant sorption and/or the risk of the dissolution of organic compounds to the sample.

3.4 LEACHATE SAMPLING PROCEDURES

A leachate sample was also collected by CEC on November 20, 2019 from the "Aluminum Processing Waste Cell (APWC)" location. However, a leachate sample was unable to be collected from the "Industrial Waste Cell (IWC)" during this event due to the lack of available leachate. The amount of leachate produced from the IWC has been minimal since the landfill was capped, and the leachate being pumped from the IWC has been intermittent. The APWC leachate sample was collected from the leachate collection system associated with the aluminum processing waste cell and was collected directly from the associated leachate collection hose before the leachate entered the APWC leachate collection tanks. Laboratory reports from the leachate analyses were prepared by Pace and reported to CEC on December 9, 2019. The approximate APWC and IWC leachate sample locations are shown on Figure 2 – Potentiometric Surface Map located in Appendix A.

3.5 QUALITY ASSURANCE AND QUALITY CONTROL

3.5.1 Field Quality Assurance and Quality Control

Field Quality Assurance and Quality Control (QA/QC) samples were collected as part of the groundwater-sampling program. Quality assurance (with internal laboratory quality controls) addresses the accuracy and repeatability of analytical results after analysis in the laboratory. Quality control addresses methods to preserve the integrity of samples in the field and during shipping to the laboratory. Quality control may be accomplished by incorporating trip blanks, field blanks, field duplicates, and equipment (rinsate) blanks into the analytical program.

A field blank and a duplicate sample were collected during this groundwater-monitoring event. CEC collected a field blank next to monitoring well MW-4 and a duplicate sample was collected from MW-3. The field blank was collected by pouring deionized water into a set of sample bottles provided by the laboratory, thereby allowing any airborne contaminants a chance to enter the field blank sample. The duplicate sample was collected by taking separate samples from within MW-3 at the same time. In addition, a laboratory supplied trip blank for VOC analysis was prepared and placed in a cooler, which was present during groundwater sampling activities. Upon the collection of the final groundwater sample, the trip blank was placed in a sample cooler and delivered to Pace for VOC analysis. No VOCs were detected above the laboratory PQL in the trip blank sample.

Pace reported the groundwater laboratory analytical results to CEC on December 9, 2019. Laboratory analytical testing of the field blank presented in the analytical report showed no indications of any constituents above the laboratory PQL. The results for the duplicate sample collected from MW-3 were similar to the original MW-3 sample results.

3.5.2 Laboratory Quality Assurance and Quality Control

In order to demonstrate that a laboratory is producing data of adequate precision, accuracy and sensitivity, it is necessary to assess all laboratory procedures at all stages from sampling to reporting. The laboratory completed specific control and assessment procedures designed to monitor, quantitatively, the accuracy and precision of specific assays. Laboratory Internal Quality Assurance (IQA) refers to the full range of practices employed to ensure that laboratory results are reliable. Internal Laboratory Quality Control (IQC) consists of the operational techniques used by the laboratory staff for continuous assessment of the quality of the results of individual analytical procedures. The specific quality-control procedures utilized by the analytical laboratory are summarized in the following table:

Quality Criteria Category	Quality Control Laboratory Methods
Precision	Laboratory duplicates at a frequency of one per matrix spike, one per laboratory control sample, and one per method blank.
Bias	Matrix spikes, laboratory control samples, method blanks at a frequency of one sample per standard batch.
Representative and Comparable Data	Adherence to standard analytical procedures, analytical methods, units of measurement, and detection limits.

The groundwater analytical report from the November 2019 event indicated that the same analyte was found in the associated laboratory blank for the detected concentrations of total Hardness (MW5, TMW-1, TMW-2, TMW-3, and APWC Leachate), Chromium (MW-5), and Copper (MW-5) as laboratory qualifier "B". Since the same constituent concentrations were found in the method blank, the reported concentrations (indicated as laboratory qualifier "B") may be falsely higher than the actual concentrations. The associated batch quality control was outside the established quality control range for Acetone (MW-1, MW-3, MW-4, MW-5, TMW-1, TMW-2 TMW-3, and Field Blank) as laboratory qualifier "J4". The sample matrix interfered with the ability to make any accurate determination for Hardness (MW-3) as laboratory qualifier "J6". The relative percentage difference value was not applicable for sample concentrations less than 5 times reporting limit for Ammonia Nitrogen (MW-1) as laboratory qualifier "P1". The internal laboratory IQA and IQC results are included in the laboratory analytical reports located in Appendix C – Laboratory Analytical Reports & Field Information Logs.

3.6 SAMPLE CHAIN-OF-CUSTODY

A sample Chain-of-Custody (COC) traveled with the sample kit from Pace to the former EWS Class II Landfill site and back to Pace for the November 2019 sampling event. The CEC SOP 07-01-01 for maintaining sample Chain of Custody is presented in Appendix D – CEC Standard Operating Procedures.

4.0 LABORATORY ANALYTICAL PROCEDURES

4.1 ANALYTICAL METHODS

All laboratory analyses for the fourth quarter 2019 groundwater assessment-monitoring event were completed by Pace Analytical. The analytical methods chosen for these monitoring events were in full compliance with the procedures required by the DSWM and the USEPA's publication SW-846, entitled Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (3rd Edition).

The SW-846 methods used for the analysis of **groundwater and leachate samples** were as follows:

Method 6010b	Inductively Coupled Plasma (ICP) – Atomic Emission Spectrometry (Boron only)
Method 6020	ICP – Mass Spectrometry (metals)
Method 2320 B-2011	Alkalinity
Method 7470A	Mercury in Liquid Waste – Manual Cold Vapor Technique
Method 8011	1,2-dibromoethane & 1,2 dibromo-3-chloropropane by Micro-extraction and Gas Chromatography
Method 8260B	Volatile Organic Compounds by Gas Chromatograph/Mass Spectrometry
Method 9056A	Determination of Inorganic Anions by Ion Chromatography (Bromide, Chloride, Fluoride, Nitrate, and Sulfate)
Method 130.1	Hardness (colorimetric) as $CaCO_3$
Method 350.1	Ammonia Nitrogen
Method 410.4	Chemical Oxygen Demand (COD)

4.2 LABORATORY ANALYTICAL RESULTS

Fourth quarter groundwater samples were collected by CEC on November 20, 2019. Pace performed the groundwater analysis and reported the results on December 9, 2019. A fourth quarter leachate sample was collected by CEC on November 5, 2019 from the "Aluminum Processing Waste Cell (APWC)", but no sample was collected from the "Industrial Waste Processing Cell (IWC)" since the amount of leachate produced from the IWC has been minimal since the landfill was capped, and the leachate being pumped from the IWC has been intermittent. Pace performed the leachate analysis and reported the results on December 9, 2019.

Constituent values from all inorganic laboratory analyses for groundwater and leachate samples, along with applicable MCLs or 2DWSs, are presented in Table 2a – Groundwater and Leachate Analytical Data in Appendix A. Copies of the laboratory reports are located in Appendix C – Laboratory Analytical Report & Field Information Logs.

4.2.1 EWS Groundwater Quality Relative to the EPA Primary Drinking Water Standards

Total Arsenic was detected above the MCL (0.01 mg/l) at up-gradient MW-1 (0.0176 mg/l) during this 4th Quarter 2019 event, which was equal to the arsenic concentration reported at MW-1 during the previous 3rd Quarter 2019 event. Arsenic has consistently been detected at similar concentrations that exceed the MCL only at up-gradient MW-1. The lower limit for the 95% confidence interval about the mean for arsenic at up-gradient MW-1 (incorporating the arsenic concentrations for the last 10 events, using distribution fitting with the lognormal distribution as the best fit) is 0.0168 mg/l. This is above the MCL for arsenic. During the previous 2nd Quarter 2019 event, arsenic was also detected above the MCL in MW-1 (0.0194 mg/l). Arsenic was not detected above the laboratory PQL (<0.002 mg/l) in any of the down-gradient monitoring wells during this event, which is consistent with previous sampling events. For this site, the presence of arsenic in the local groundwater is considered to be naturally occurring, originating from deposits in the soil overburden, since there is no immediate development up-gradient of MW-1.

Total Cadmium was **not** detected above the MCL (0.005 mg/l) at MW-3 during the November 20, 2019 monitoring event (total cadmium at MW-3 = 0.00157 mg/l). In addition, total cadmium was detected below the MCL in the duplicate sample collected from MW-3 during the November 20, 2019 monitoring event (total cadmium at duplicate MW-3 = 0.00155 mg/l). A summary of cadmium concentrations (total cadmium and dissolved cadmium) and turbidity values observed at MW-3 during each sampling event since May 9, 2016 is referenced in the table below:

MW-3
Summary of Cadmium Concentrations and Turbidity Measurements

Date	Total Cadmium (mg/l)	Cadmium, Dissolved (mg/l)	Turbidity (NTU)
11/20/2019	**0.00157**	**NA**	**2.11**
9/6/2019	**0.0088**	**NA**	**2.98**
6/4/2019	**0.0292**	**0.0297**	**2.98**
3/5/2019	**0.0117**	**0.0133**	**6.27**
12/4/2018	**0.144**	**0.139**	**4.77**
9/27/2018	**0.204**	**0.204**	**1.05**
9/12/2018	**0.297**	**0.320**	**1.12**
6/19/2018	**0.0312**	**0.0292**	**4.90**
3/22/2018	**0.00671**	**0.00637**	**24.3**
12/14/2017	**0.00659**	**0.00733**	**23.0**
9/28/2017	**0.00926**	**0.0102**	**18.9**
8/8/2017	**0.0113**	NA	**16.6**
6/8/2017	**0.0286**	NA	**34.8**
11/10/2016	**0.00177**	NA	**64.5**
5/9/2016	<0.001	NA	**8.39**

NA-Not Analyzed

As demonstrated in the summary table above, the total cadmium concentration at MW-3 during this November 20, 2019 was lower than the previous September 6, 2019 monitoring event. The cadmium concentrations at MW-3 decreased during every sampling event from September 12, 2018 to March 5, 2019. During the November 20, 2019 sample event, the observed cadmium concentration was at the lowest recorded level since May 9, 2016. In addition, the turbidity result for MW-3 on November 20, 2019 (2.11 NTUs) was within the recommended goal of 10 NTUs and is consistent with recent monitoring events.

Total cadmium was first detected at a level above the laboratory PQL, but at a level below the MCL (<0.005 mg/l), in MW-3 during the 4th quarter 2016 sampling event completed on November 10, 2016. Total cadmium was first detected above the MCL of 0.005 mg/l at MW-3 during the June 8, 2017 event. Although there have been elevated detections of total cadmium in MW-3, there have been no detections, as of this date, from groundwater samples extracted from any other monitoring wells at the site including monitoring wells TMW-1, TMW-2, and TMW-3, which are down-gradient from MW-3.

Total Cobalt was detected in up-gradient well MW-1 (0.0329 mg/l) and down-gradient wells MW-5 (0.00261 mg/l) during this November 2019 event. Cobalt does not have an MCL; however, the TDEC-DSWM uses the EPA regional screening level (RSL) of 0.006 mg/l as the groundwater protection standard for this constituent. The reported cobalt detection at upgradient well MW-1 was above the RSL for cobalt during this November 2019 event. However, the reported cobalt concentration in down-gradient MW-5 was below the RSL for cobalt concentrations during this November 2019 event. Cobalt has historically been detected at concentrations that exceed the RSL at MW-1 prior to the disposal of waste in the landfill, and total cobalt was detected in MW-1 at similar concentrations during previous events. For this site, the presence of cobalt in the local groundwater is considered to be naturally occurring, originating from deposits in the soil overburden, since there is no immediate development up-gradient of MW-1.

Total Chromium was detected in MW-5 (0.00219 mg/l); however, it did have a "B" qualifier showing that the same analyte is found in the associated blank. This value was not above the MCL of 0.1 mg/l for chromium.

Total Mercury was detected in up-gradient well MW-1 (total mercury = 0.00121 mg/l) during this November 2019 monitoring event, which was below the MCL of 0.002 mg/l for mercury concentrations, but higher in concentration than the previous September 2019 event (total mercury = 0.00108 mg/l) at MW-1. Total mercury was not detected above the laboratory PQL (0.000200 mg/l) at any of the down-gradient wells during this November 2019 event. During the June 2018 event, total mercury was detected above the MCL at MW-1 (total mercury=0.00319 mg/l), which was the first and only time the total mercury concentration has exceeded the MCL at MW-1. The lower limit for the 95% confidence interval about the mean for mercury at MW-1 (incorporating the mercury concentrations for the previous 10 events before the November 2019 event, using Regression on Order Statistics with 3 non-detects) was 0.0003 mg/L. This was well below the MCL for mercury. Total mercury has historically been detected above the laboratory PQL (0.0002

mg/l) at up-gradient well MW-1 at concentrations ranging from 0.00024 mg/l (February 2011) to 0.00319 mg/l (June 2018). Although total mercury has been previously detected above the PQL at up-gradient MW-1, total mercury has not been detected above the laboratory PQL in any of the down-gradient monitoring wells since monitoring began at the site in 2008. The presence of mercury in the local groundwater near up-gradient monitoring well MW-1 may be attributable to naturally occurring deposits in the soil overburden, since there is no immediate development up-gradient of MW-1. The observed concentrations of mercury at MW-1 will continue to be monitored in future monitoring events.

4.2.2 EWS Groundwater Quality Relative to the National Secondary Drinking Water Standards

Laboratory analytical results for the groundwater samples collected in November of 2019 from the former EWS Class II Landfill groundwater monitoring well network indicated that three of the site-specific groundwater-monitoring list of compounds were detected at concentrations that exceeded the National Secondary Drinking Water Standards (2DWS). Those parameters include **aluminum** in down-gradient wells TMW-2 and TMW-3, **iron** in up-gradient well MW-1 and down-gradient wells MW-4 and TMW-3, and **manganese** in up-gradient well MW-1 and down-gradient well MW-5. Chloride, sulfate, and nickel detections were below the 2DWS during this event. The observed concentrations for the constituents given below are discussed relative to the 2DWS.

Total Aluminum concentrations observed in TMW-2 (0.456 mg/l) and TMW-3 (0.233 mg/l) during the November 2019 sampling event were above the 2DWS (0.2 mg/l). Aluminum concentrations were lower than the previous September 2019 sampling event at TMW-2(1.02 mg/l) and TMW-3 (1.51 mg/l). Aluminum was not detected above the PQL (<0.1 mg/l) at MW-1, MW-3, or MW-4 during this November 2019 event.

The **Chloride** concentrations reported at MW-1 (2.52 mg/l), MW-3 (19.3 mg/l), MW-4 (8.76 mg/l), MW-5 (83.5 mg/l), TMW-1 (18.6 mg/l), TMW-2 (22.7 mg/l), and TMW-3 (61.1 mg/l) during this November 2019 event were below the 2DWS for chloride concentrations (250 mg/l). The chloride concentrations reported during this event are slightly lower compared to the September 2019 event at wells MW-1 (2.84 mg/l), MW-4 (8.85 mg/l), MW-5 (88.9 mg/l), and TMW-2 (22.9 mg/l). The current chloride concentrations for the November 2019 event is slightly higher than the June 2019 event at wells MW-3 (19.3 mg/l), and TMW-1 (18.6 mg/l). However, the chloride concentration at MW-3 during this event continues to be significantly lower in concentration compared to the previous December 2018 event (65 mg/l), September 2018 event (222 mg/l), November 2015 (458 mg/l) event, and the supplemental re-sampling event (360 mg/l) in December 2015. Chloride concentrations at MW-3 have remained below the 250 mg/l 2DWS for chloride during the March 2019, June 2019, September 2019, and November events. In addition, the chloride concentration at MW-3 during this event was lower than the twenty-two monitoring events from July 16, 2010 to December 4, 2018. Although the chloride concentrations reported at MW-5 have remained below the 2DWS for chloride concentrations, the chloride concentrations at MW-5 appear to be increasing slightly since November 2016, based on the time-

series graphs. The observed slight decrease in the chloride concentration at MW-5 during this event is noted, and chloride concentrations at MW-3 and MW-5 will continue to be evaluated.

Fluoride was not detected above the MCL (4.0 mg/l) or the 2DWS (2.0 mg/l) at MW-3 during the November 20, 2019 monitoring event (fluoride at MW-3 = 0.00197 mg/l). In addition, fluoride was detected below the MCL or 2DWS in the duplicate sample collected from MW-3 during the November 20, 2019 monitoring event (fluoride at duplicate MW-3 = 0.00178 mg/l).

Total Iron was detected above the 2DWS (0.3 mg/l) in up-gradient well MW-1 (13.1 mg/l) and down-gradient wells MW-4 (0.607 mg/l), and TMW-3 (0.533 mg/l) during the November 2019 monitoring event. The reported total iron concentrations at each of the groundwater monitoring wells were less than the highest concentrations observed prior to placement of waste and do not exhibit a trend via time-series graphs. The presence of iron in the local groundwater is considered to be naturally occurring, originating from deposits in the soil overburden, and iron has consistently been detected above the 2DWS in up-gradient well MW-1.

Total Manganese has been consistently detected at concentrations above the 2DWS (0.05 mg/l) in up-gradient well MW-1. Manganese detections were observed above the 2DWS (0.05 mg/l) in up-gradient MW-1 (0.651 mg/l) and down-gradient well MW-5 (0.231 mg/l) during the November 2019 monitoring event. The presence of total manganese in the local groundwater is considered to be naturally occurring, originating from deposits in the soil overburden.

Total Nickel was detected in up-gradient well MW-1 (0.00468 mg/l) and down-gradient wells MW-3 (0.00237 mg/l), and MW-5 (0.00862 mg/l) during the November 2019 sampling event, and these values were not above the MCL value obtained from the Tennessee Division of Water Resources (TN DWR) Public Water Systems chapter rule 0400-45-01-.06 (0.10 mg/l). Total nickel has been detected at concentrations above the TN DWR Public Water Systems MCL (0.1 mg/l) in up-gradient well MW-1 during previous events on April 9, 2009 (total nickel at MW-1= 0.2 mg/l) and May 19, 2009 (total nickel at MW-1=0.17 mg/l). Therefore, the presence of total nickel in the local groundwater is considered to be naturally occurring, originating from deposits in the soil overburden. The observed total nickel concentration at MW-3 during this event was lower in concentration compared to the September 2019 event (0.00799 mg/l) and June 2019 event (0.0397 mg/l).

The **Sulfate** concentration reported at MW-3 (111 mg/l) during this sampling event was below the 2DWS for sulfate (250 mg/l). Also, the sulfate concentration at MW-3 during this event was lower in concentration than the previous September 2019 event (154 mg/l), the June 2019 event (219 mg/l), the December 2018 event (324 mg/l), and the September 2018 event (484 mg/l). The September 2018 event was the first time the sulfate concentration at MW-3 was above the 2DWS. Prior to September 2018, the sulfate concentration at MW-3 had remained below the 2DWS during previous events in June 2018 (30.1 mg/l), December 2017 (46.2 mg/l), September 2017 (46.2 mg/l), and June 2017 (93.7 mg/) monitoring events. For further comparisons, the detected sulfate concentration at MW-3 was 34 mg/l in November 2016, 95.7 mg/l in August 2016, and 105 mg/l

in March 2017. Prior to August 2016, the reported sulfate concentrations at MW-3 ranged from <5 mg/l to 29.1 mg/l.

Sulfate was also detected in MW-5 (8.5 mg/l), which was just above the laboratory PQL of 5.00 mg/l during this November 2019 event. Sulfate was not detected above the PQL of 5.00 mg/l in any of the other monitoring wells across the site.

Total Magnesium does not currently have an established MCL, 2DWS, EPA RSL, or an approved alternate groundwater protection standard (GWPS). The total magnesium concentration at MW-3 during this November 2019 event was 10.3 mg/l, which was lower than the previous September 2019 event concentration (13 mg/l), June 2019 event concentration (20.8 mg/l), December 2018 event concentration (36.4 mg/l), and September 2018 event concentration (64 mg/l). However, the magnesium concentration at MW-3 during this sampling event was higher than the March 2019 event concentration (7.83 mg/l). Before the September 2018 event, the highest total magnesium concentration observed at MW-3 was 31.9 mg/l during the November 2015 monitoring event, and total magnesium concentrations have remained below 31.9 mg/l at MW-3 in recent groundwater events from December 2018 to November 2019.

4.3 QUALITY CONTROL QUALIFIER CODES

The EPA Contract Laboratory Program states that sample and result qualifiers should be utilized as part of a total quality-control process. Pace complies with this directive and reports all qualifiers along with explanations of QC qualifier codes. Ten QC qualifier codes (B, E, J, J3, J4, J6, P, P1, Q, and V) were indicated during the laboratory analysis of samples collected in November 2019. Ten qualifier codes (B, E, J, J3, J4, J6, P, P1, Q and V) were indicated during the laboratory analysis of groundwater samples. Six QC qualifier codes (B, E, J, J6, P, and P1) were indicated during the laboratory analysis of the APWC leachate sample. Specific information concerning each laboratory QC qualifier code can be found in the Laboratory Analytical Reports in Appendix C (Page 58 of 61 in the Groundwater Analytical Report, Page 28 of 30 in the IWC Leachate Analytical Report, and Page 24 of 26 in the APWC Leachate Analytical Report).

5.0 STATISTICAL ANALYSIS

5.1 APPLICABLE METHODS

The Rules of the Tennessee Department of Environment and Conservation, Division of Solid Waste Management Chapter 1200-1-7-.04 state, in part, that each landfill must conduct and report statistical analyses as part of the evaluation of groundwater monitoring data. Statistical analyses of the sampling data was performed on monitoring wells MW-1, MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3.

The solid waste rules require groundwater sample results and associated statistical methods used to determine the statistical background of a groundwater detection/assessment monitoring program be “protective of human health and the environment”. Furthermore, the rules require that the results

be “representative” of the background groundwater quality of the geologic formation(s) being monitored. Various influences may affect the representativeness of sample results, which include possible errors in sampling. As previously discussed, reported total metals concentrations are likely affected by elevated turbidity values and would not be representative of the natural groundwater conditions. Before statistical evaluations were completed, the turbidity values which were collected during historical groundwater sampling events were evaluated for elevated turbidity values (>150 NTU). If the turbidity value at the time of sample collection at any given location was greater than 150 NTUs, the total metals concentrations for each sample location would not be representative of natural groundwater conditions. As a result, the corresponding data were removed from the background data set.

After the non-representative background sample data were removed, the distribution of the data was evaluated for normality. The test for normality was conducted using the Shapiro-Wilks method if N <50 or Shapiro-Francia method if N>50. The normality test was performed for both raw and log-transformed data, with replacement of non-detects to half of the corresponding laboratory PQL. Data determined to be normally distributed were evaluated using parametric prediction limit (PPL) analysis. Inter-well and intra-well (intra-well utilized for upgradient MW-1) statistical methods were appropriately utilized to determine statistically significant increases in constituent concentrations.

Intra-well analyses was utilized only at MW-1 to compare the concentrations observed during the current groundwater-sampling event to the established background data set for MW-1 concentrations. Intra-well PPL and non-parametric statistical methods were appropriately utilized to determine statistically significant changes in background water quality data in up-gradient monitoring well MW-1. The arsenic, cobalt, and chloride data at MW-1 were normally distributed using the Shapiro-Wilks test for normality. Therefore, intra-well PPL analysis was performed for the arsenic, cobalt, and chloride data sets that passed normality testing. However, all other data sets (barium, nickel, and mercury data) for MW-1 were not normally distributed and were evaluated using intra-well non-parametric statistical methods.

Inter-well analyses compared the concentrations observed at the down-gradient monitoring locations (MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3) to the concentrations observed at the up-gradient monitoring location (MW-1) during this monitoring event. Chloride data distribution tests from all up-gradient and down-gradient monitoring wells indicated normality when the data were log-transformed and non-detects were replaced by half of the corresponding PQL. Therefore, the chloride data at MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3 were evaluated using PPL inter-well analysis. All other data sets (aluminum, barium, total cadmium, chromium, cobalt, copper, fluoride, lead, nickel, zinc, and sulfate data) at all up-gradient and down-gradient monitoring wells were not normally distributed and were evaluated using non-parametric statistical methods.

The percentage of inter-well non-detects for each parameter determined the primary statistical method utilized. If the percentage of non-detects in the samples was less than 50%, Shewart-

CUSUM control charts were utilized. If at least 50% non-detects existed for the given parameter, non-parametric inter-well prediction limit analysis was conducted on the data. For this site, the total % non-detects for aluminum (38.33% non-detects) and barium (0% non-detects) were less than 50%, and Shewart-CUSUM control charts were utilized for aluminum and barium analysis. Based on the high amount of left-censored data (>/=50% of non-detects) for total cadmium, chromium, cobalt, copper, lead, fluoride, nickel, zinc, and sulfate, non-parametric inter-well prediction limit analysis was conducted for the background data from up-gradient well MW-1 compared to down-gradient monitoring wells (MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3). Additional statistical procedures performed included Mann-Kendall trend analyses and the non-parametric Wilcoxon Rank Sum group comparisons (with non-detects set to the highest reporting limit for the given constituent analyzed). The Wilcoxon Rank Sum non-parametric inter-well analysis was conducted as a confirmation test for any parameter that failed the above-mentioned statistical analysis methods for final determination of a statistical increase.

The computer program ChemStat v.6.4 was used for all statistical computations. Worksheets for inter-well and intra-well statistical analysis and time versus concentration charts are given in Appendix B – Statistical Evaluations and Time Series Plots.

5.2 STATISTICAL RESULTS

No statistically significant increases (SSIs) were identified in up-gradient well MW-1 during this event.

SSIs over background identified for the current monitoring event include chloride at MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3, fluoride at MW-3, and sulfate at MW-3. It should be noted that **no** SSIs were identified for total cadmium or zinc concentrations at MW-3 during this event. Trend analyses revealed a statistically significant upward trend in total cadmium, chloride, fluoride, sulfate, and zinc concentrations reported at MW-3. In addition, trend analyses revealed a statistically significant upward trend in total barium, chloride, chromium, lead, and sulfate at MW-5. A statistically significant upward trend in total barium was also reported at TMW-3. A statistically significant upward trend in chloride concentrations was reported at TMW-1, TMW-2, and TMW-3. There were no distinct statistically significant trends in total aluminum at MW-5, TMW-1, and TMW-2; barium concentrations reported at MW-3, TMW-1, and TMW-2; chloride concentrations reported at MW-4; cobalt concentrations at MW-5; nickel concentrations reported at MW-5; or zinc concentrations reported at MW-4 and MW-5. In addition, trend analysis revealed a downward trend in total nickel concentrations at MW-3, barium concentrations at MW-4, and in total aluminum concentrations at TMW-2.

The total cadmium concentration observed at MW-3 (0.00157 mg/l) was just above the laboratory PQL, was less than the MCL (0.005 mg/l), and did not produce a SSI in reported concentrations during this event. This was the first time total cadmium was not indicated as an SSI since November 10, 2016. The statistical trend analysis for total cadmium at MW-3 does confirm an increasing trend having statistical significance when considering all current and past data for cadmium at MW-3. However, no distinct statistically significant trend was identified by Mann-

Kendall for total cadmium concentrations at MW-3 when considering data from the past 10 sampling events since 12/14/2017. The total cadmium concentrations reported at MW-3 during this sampling event on November 20, 2019 (0.00157 mg/l and 0.00155 mg/l in duplicate sample) were significantly lower in concentration than recent events since 2016. For instance, the total cadmium concentrations during this November 2019 event was significantly lower than the previous September 5, 2019 event (0.0088 mg/l and 0.00822 mg/l in duplicate sample), June 4, 2019 event (0.0292 mg/l and 0.0288 mg/l in duplicate sample) and March 5, 2019 event (0.0117 mg/l and 0.0113 mg/l in duplicate sample).

The chloride concentrations observed at MW-3 (19.3 mg/l), MW-4 (8.76 mg/l), MW-5 (83.5 mg/l), TMW-1 (18.6 mg/l), TMW-2 (22.7 mg/l), and TMW-3 (61.1 mg/l) produced a SSI over background during this event. The chloride detections at MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3 are consistent with previous data and are below the 2DWS for chloride concentrations (250 mg/l). When considering all chloride data to date from MW-4, the data do not show an upward or downward trend in chloride concentrations using the Mann-Kendall trend analysis at the 95% confidence level. However, the chloride concentrations observed at MW-3, MW-5, TMW-1, TMW-2, and TMW-3 indicated an upward trend in chloride concentrations using the Mann-Kendall trend analyses at the 95% confidence level.

The chromium concentration observed at MW-5 (0.00219 mg/l) was less than the MCL (0.1 mg/l), and did not produce a SSI in reported concentrations during this event. When considering all chromium data to date from MW-5, the data indicated an upward trend in chromium concentrations using the Mann-Kendall trend analysis at the 95% confidence level. However, the same analyte (chromium) was found in the associated laboratory blank. Therefore, the chromium concentration reported during this event may have been artificially elevated.

The cobalt concentration observed at MW-5 (0.00261 mg/l) was less than the GWPS value referenced from the EPA Regional Screening Levels for cobalt (0.006 mg/l), and did not produce a SSI in reported concentrations during this event.

The fluoride concentration at MW-3 (0.197 mg/l) was less than the MCL (4.0 mg/l) during this event, and was significantly lower than the previous September 2019 event (0.306 mg/l). When considering all data accumulated from MW-3 since January 21, 2009, a statistically significant upward trend in fluoride concentrations at MW-3 was indicated using the Mann-Kendall trend analysis at the 95% confidence level. The fluoride detection at MW-3 in September 2018 was higher than the previous ten sampling events.

A SSI in reported sulfate concentrations at MW-3 was identified during this sampling event. In addition, when considering all data accumulated from MW-3 since May 19, 2009, a statistically significant upward trend in sulfate concentrations at MW-3 was indicated using the Mann-Kendall trend analysis at the 95% confidence level. The sulfate concentration reported during this sampling event (111 mg/l) was lower than the previous September 2019 event (154 mg/l), June 2019 event (219 mg/l) but higher than the March 2019 event (85.8 mg/l). Regardless, the concentration

remains below the 2DWS of 250 mg/l. Also, the observed sulfate concentration during this event is lower than the previous December 2018 event (324 mg/l) and the previous September 2018 event (484 mg/l). The sulfate concentrations observed at MW-3 had remained below the 2DWS during all previous monitoring events prior to September 2018. Sulfate was also detected in MW-5 (8.50 mg/l) during this November 2019 event, which was well below the 2DWS of 250 mg/l. Sulfate was not detected above the PQL in any of the other monitoring wells across the site. While there was an upward trend in sulfate concentrations identified in MW-5 during this event, there was no reported SSI.

The zinc concentration observed at MW-3 (0.0251 mg/l) was just above the laboratory PQL, was less than the MCL value obtained from the EPA 2DWS (5 mg/l), and did not produce a SSI in reported concentrations during this event. During the previous September 2019 event, an SSI in reported total zinc concentrations at MW-3 was identified, and the statistical trend analysis for total zinc at MW-3 previously confirmed an increasing trend having statistical significance. However, the zinc concentration at MW-3 during this event was lower than the previous September event (0.0324 mg/l), June 2019 event (0.197 mg/l), March 2019 event (0.0994 mg/l), December 2018 event (1.34 mg/l), initial September 12, 2018 event (1.68 mg/l), and the subsequent re-sample event on September 27, 2018 (1.58 mg/l). The September 12, 2018 event was the highest zinc concentration reported at MW-3 since April 19, 2008. Total zinc was first detected above the laboratory PQL (<0.025 mg/l) at MW-3 during the June 2017 groundwater event (0.0769 mg/l) and was detected at MW-3 during the September 2017 event (0.0439 mg/l), December 2017 event (0.159 mg/l), and March 2018 event (0.0499 mg/l). Before June 2017, zinc had remained below the current laboratory PQL of 0.025 mg/l since July of 2010. Although zinc levels at MW-3 are above the PQL, the levels appear to be decreasing in concentration since September 2018 and are still below the 2DWS of 5 mg/l.

A summary of intra-well and inter-well statistical analysis is presented in Table 3 – Intra-Well and Inter-Well Statistical Summary in Appendix A.

6.0 CONCLUSIONS

The results of the fourth quarter assessment-monitoring event of 2019 are summarized as follows:

- SSIs over background identified for the current monitoring event include chloride at MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3, fluoride at MW-3, and sulfate at MW-3. Trend analyses revealed a statistically significant upward trend, using all concentrations detected since the beginning of the monitoring program, in total cadmium, chloride, fluoride, sulfate, and zinc concentrations reported at MW-3. In addition, trend analyses revealed a statistically significant upward trend in total barium, chloride, chromium, lead, and sulfate at MW-5; a statistically significant upward trend in total barium was also reported at TMW-3; and a statistically significant upward trend in chloride concentrations was reported at TMW-1, TMW-2, and TMW-3.
- The total cadmium concentration at MW-3 during this event was below the MCL and did not indicate a SSI over background total cadmium concentrations. Based on current data, the cadmium levels observed in MW-3 have improved significantly since closure activities have been completed. In addition, there have been no cadmium detections from groundwater samples obtained from temporary monitoring wells TMW-2 and TMW-3 that are immediately down-gradient of MW-3. The cadmium concentration reported at MW-3 during this event was lower than the previous 14 sampling events since May 9, 2016, when total cadmium concentrations were below the laboratory PQL (<0.001 mg/l).
- Total Arsenic was detected above the MCL (0.01 mg/l) at background well MW-1 (0.0176 mg/l) during this 4th Quarter 2019 event, which was equal to the arsenic detection in MW-1 during the previous 3rd Quarter 2019 event. In addition, total arsenic was detected above the PQL (0.002 mg/l) in TMW-3 (0.00387 mg/l). During the previous 2nd Quarter 2019 event, arsenic was also detected above the MCL in MW-1 (0.0194 mg/l), but was not detected above the PQL in TMW-3. Arsenic was not detected above the MCL in any of the monitoring locations during the 1st Quarter 2019 event. The lower limit for the 95% confidence interval about the mean for arsenic at MW-1 (incorporating the arsenic concentrations for the last 10 events, using distribution fitting with the lognormal distribution as the best fit) is 0.0168 mg/L. This is above the MCL for arsenic.
- A SSI was identified for the reported sulfate concentration at MW-3, and the sulfate concentrations at MW-3 exhibited a statistically significant increasing trend. During the September 2018 and December 2018 events, the observed sulfate concentrations at MW-3 had been above the 2DWS for sulfate (250 mg/l). However, the sulfate concentrations reported at MW-3 during the March 2019 sampling event (85.8 mg/l), June 2019 sampling event (219 mg/l), September 2019 sampling event (154 mg/l), and this November 2019 sampling event (111 mg/l) have all been below the 2DWS for sulfate and appear to be decreasing in concentration. Sulfate was also detected in MW-5 (8.50 mg/l) during this November 2019 event, which was well below the 2DWS.

Sulfate has not consistently been detected above the PQL (5 mg/l) at any of the other permanent monitoring wells or temporary monitoring wells across the site.

- Based on the review of the time-series graphs, it appears that the concentrations of total aluminum, cadmium, calcium, fluoride, magnesium, manganese, nickel, potassium, zinc, chloride, and sulfate at MW-3 decreased in concentration during this fourth quarter monitoring event compared to the previous third quarter 2019 monitoring event. This general decrease in constituent concentration followed a period of increase in concentration during the second quarter 2019 monitoring event compared to the first quarter 2019 event. However, a decrease in constituent concentrations was also noted during the first quarter 2019 monitoring event compared to the previous fourth quarter and third quarter 2018 monitoring events. During the third quarter 2018 event, the same above-referenced constituents at MW-3 increased in concentration compared to previous groundwater events. Specifically, the observed cadmium, calcium, fluoride, magnesium, manganese, nickel, and zinc concentrations reported at MW-3 during the September 2018 event were the highest reported concentrations of these constituents since April 19, 2008, when monitoring began at MW-3. In addition, the conductivity measured in uS/cm observed at MW-3 during the previous third quarter 2018 monitoring event was higher than previous monitoring events since the April 2016 monitoring event. However, the conductivity measurements during recent events are lower than the conductivity measurement during the third quarter 2018 monitoring event.
- The chloride concentrations at MW-1, MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3 are still well below the 250 mg/l 2DWS.
- There were no distinct statistically significant trends in total barium concentrations at MW-3 (because sulfates are elevated and controlling/limiting the dissolved barium concentrations), and aluminum, chromium, and cobalt were not detected above the laboratory PQL at MW-3 during this event. When considering all chloride data to date from MW-4, the data do not show an upward or downward trend in chloride concentrations using the Mann-Kendall trend analysis at the 95% confidence level. In addition, trend analysis revealed a downward trend in total nickel concentrations at MW-3, downward trend in barium concentrations at MW-4, and a downward trend in total aluminum concentrations at TMW-2. No other statistically significant upward or downward trends in data were identified for this event.
- No VOCs were detected above their respective laboratory PQL in any of the groundwater monitoring wells during the monitoring event.

The first quarter 2020 assessment-monitoring event is tentatively scheduled for February 2020 and will consist of collecting groundwater samples from up-gradient well MW-1 and down-gradient wells MW-3, MW-4, MW-5, TMW-1, TMW-2, and TMW-3. Leachate samples will be collected from the APWC and IWC.

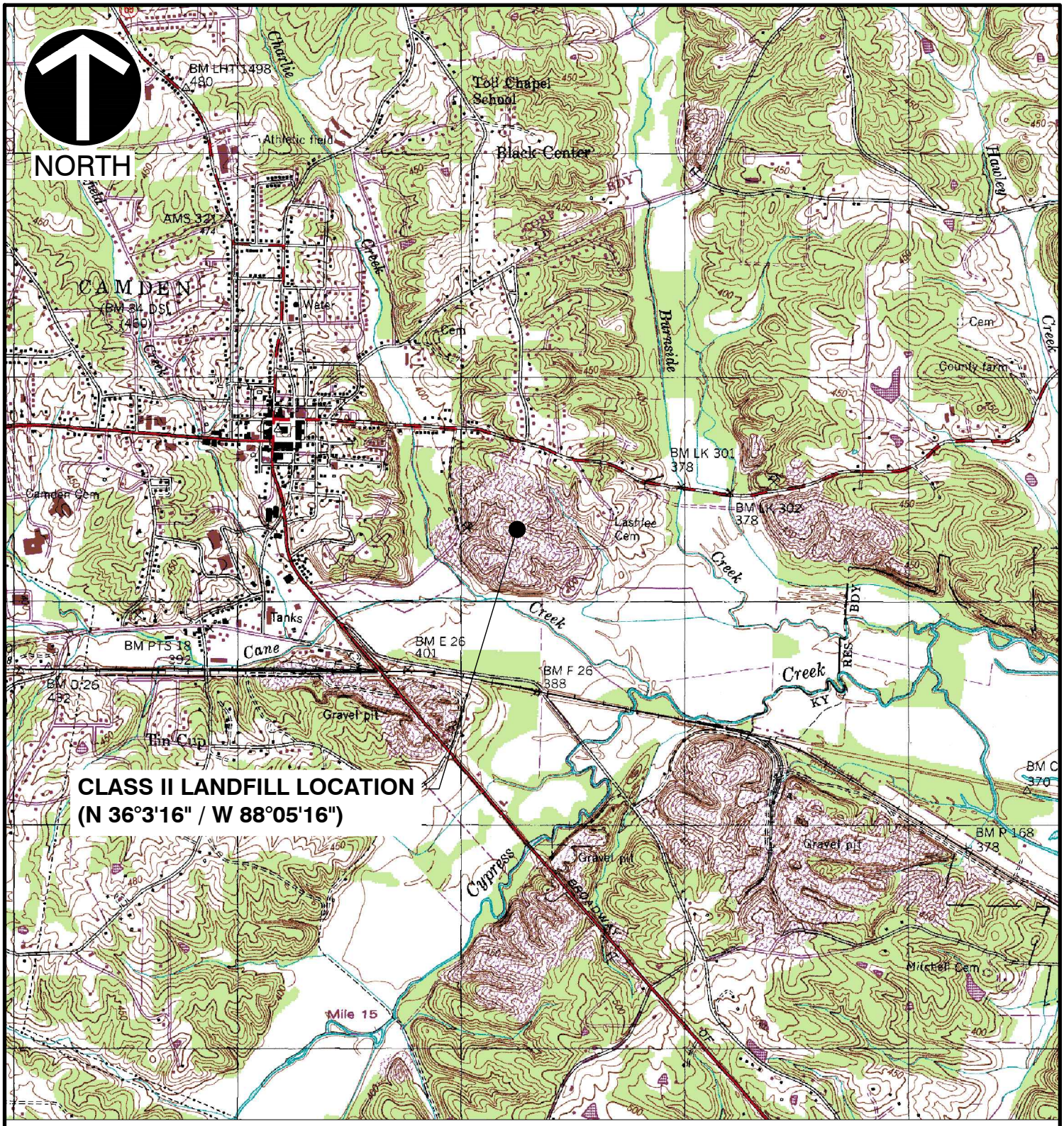
Since the former EWS Class II Landfill site remains in assessment monitoring, a private water use survey update is required annually. The previous annual water use survey for the former EWS Class II Landfill site was completed in December 2018, and no new wells or springs were identified within the approved search radius for the site during the December 2018 update. Therefore, an updated water use survey was completed in November 2019. The 2019 annual water use survey update will be documented and submitted in a separate report.

7.0 RECOMMENDATIONS

The following recommendations are presented in an effort to ensure the continuance of securing representative groundwater samples and to obtain analytical results with a high-degree of accuracy and precision (i.e., repeatability).

1. It is recommended that all permanent monitoring wells on the site continue to be monitored quarterly. In addition, quarterly groundwater samples will continue to be collected from temporary monitoring wells down-gradient from MW-3.
2. It is recommended that the chosen analytical laboratory (Pace) continue to analyze for total metal constituents using methods that will produce the lowest reporting limit. Additional sampling analysis for dissolved metals will not be necessary if sample turbidities are low, considering recent analytical data has shown that total and dissolved metals concentrations have been similar when samples have low turbidities, and sampling for dissolved metals analysis (in addition to total metals) is not standard protocol when sample turbidities are low. If certain groundwater samples have turbidities that are elevated (observed primarily in temporary monitoring wells TMW-1, TMW-2, and TMW-3), samples may be collected for dissolved metals analysis (in addition to total metals analysis).
3. It is recommended that total metals sample data will continue to be removed from the background data set for statistical evaluations if elevated turbidity values are observed during sample collection.

APPENDIX A
MAPS & TABLES



REFERENCE

1. U.S.G.S. 7.5' TOPOGRAPHIC MAP, CAMDEN QUADRANGLE, TENN. DATED: 1950, PHOTOREVISED: 1984.

* HAND SIGNATURE ON FILE

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CLASS II CAMDEN LANDFILL
CAMDEN, TENNESSEE

SITE LOCATION MAP

DRAWN BY:	KLU	CHECKED BY:	PC	APPROVED BY:	KBW*	FIGURE NO.:	1
DATE:	JANUARY 2020	DWG SCALE:	1"=2000'	PROJECT NO:	181-364		

P:\2018\181-364\-CADD\Dwg\181-364_ SITE LOCATION MAP.dwg{LAYOUT1} LS:(1/16/2020 - pcampbell) - LP: 1/16/2020 6:42 PM

NORTH

LEGEND

MW1 393.96	GROUND WATER MONITORING WELL GROUND WATER ELEVATION (FMSL)
TMW-1 374.87	TEMPORARY GROUND WATER MONITORING WELL GROUND WATER ELEVATION (FMSL)
390	POTENTIOMETRIC SURFACE CONTOUR (FMSL)
	GROUND WATER FLOW DIRECTION
MH1	MANHOLE
	APPROXIMATE FILL LIMITS
FM	LEACHATE FORCE MAIN

NOTE:

Hydraulic gradient calculation between MW–1 and MW–4 locations.

$$i = \frac{393.96' \text{ (MW–1)} - 370.18' \text{ (MW–4)}}{1{,}910'} = 0.0125 \text{ ft/ft}$$

GROUNDWATER CONDITIONS

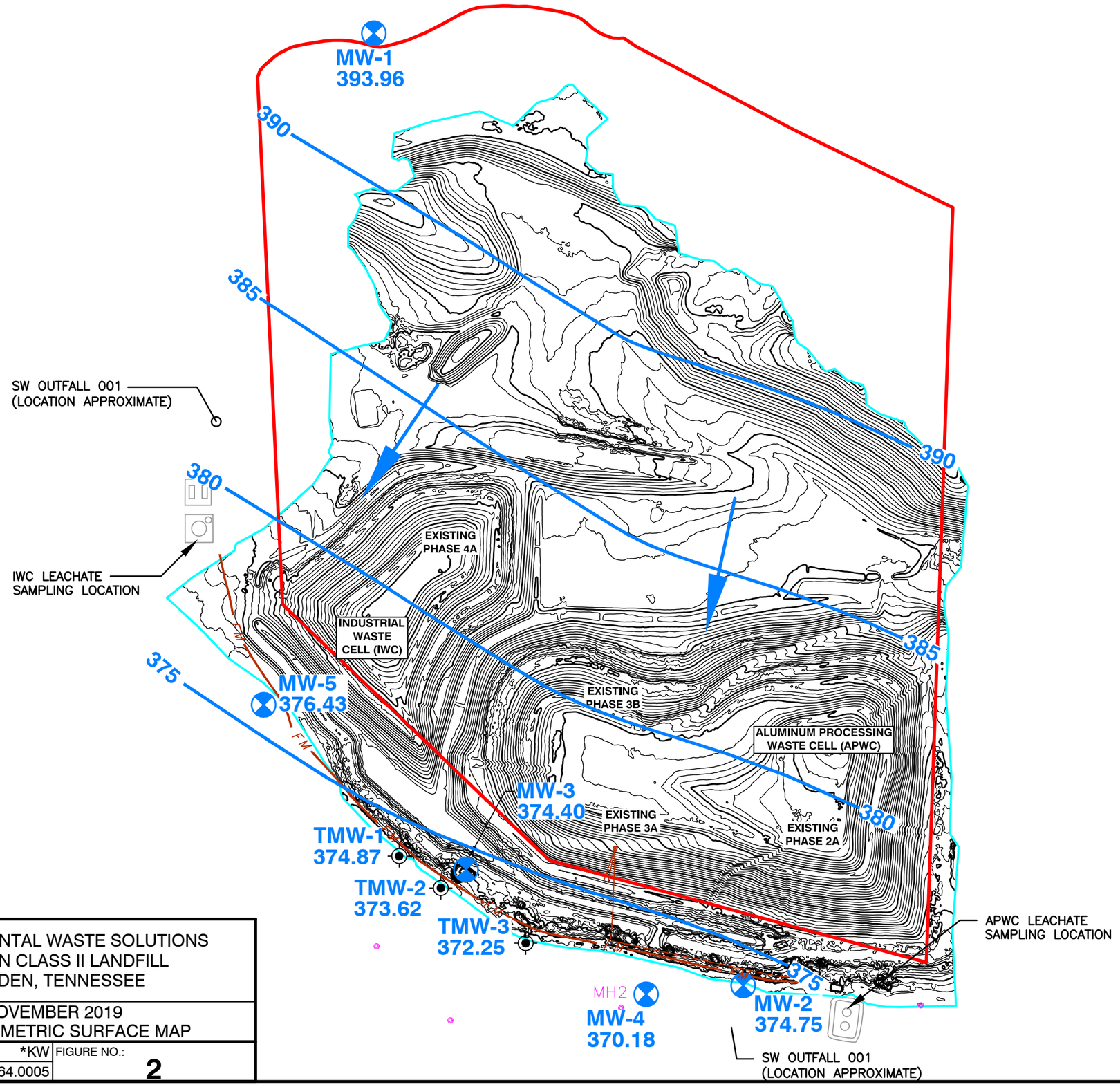
THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.

POTENTIOMETRIC CONTOURS GENERATED FROM THESE DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOWN STATIC WATER LEVEL ELEVATIONS AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. ACTUAL STATIC WATER LEVELS AT LOCATIONS BETWEEN THE MONITORING POINTS MAY DIFFER FROM THOSE DEPICTED.

SCALE IN FEET

0 200 400

*HAND SIGNATURE ON FILE



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ENVIRONMENTAL WASTE SOLUTIONS
CAMDEN CLASS II LANDFILL
CAMDEN, TENNESSEE

NOVEMBER 2019
POTENTIOMETRIC SURFACE MAP

DRAWN BY:	CDS	CHECKED BY:	PC	APPROVED BY:	*KW	FIGURE NO.:	2
DATE:	JANUARY 2020	DWG SCALE:	1"=200'	PROJECT NO:	181-364.0005		

P:\2018\181-364\-CADD\DWG\181-364_ GROUNDWATER MAP DECEMBER 2019.DWG\FIG 2 (2)\LS:(PCAMPBELL - 1/16/2020) - LP: 1/16/2020_6:40:40_PM

Table 1

Former Environmental Waste Solutions Camden Class II Landfill

Field Parameters and Potentiometric Data - November 2019

Monitoring Well/ Sample Location	Date	Sample Time	Top of Casing Elevation[1] (Feet MSL)	Bottom of Well Elevation (Feet)	Well Diameter (Feet)	Well Volume Gallons	Depth to Water (Feet)[2]	Potentiometric Surface (Feet MSL)	Temp. (˚C)	Conductivity (micromhos/cm)	Specific Conductivity (micromhos/cm)	pH (SU)	Dissolved Oxygen (mg/l)	Oxidation Reduction Potential (Millivolts)	Turbidity (NTU)
MW-1	11/20/2019	11:25	416.47	385.97	0.17	1.4	22.51	393.96	16.1	86.8	104.7	5.48	0.68	84.1	6.53
MW-2*	11/20/2019	14:50	380.35	367.70	0.17	1.2	5.60	374.75	15.9	306.9	370.7	5.97	3.40	187.8	10.3
MW-3	11/20/2019	14:10	392.90	365.10	0.17	1.6	18.50	374.40	17.8	304.0	350.4	5.40	2.50	186.0	2.11
MW-4	11/20/2019	13:10	381.47	358.37	0.17	2.0	11.29	370.18	17.6	70.1	81.7	5.49	2.96	186.4	6.94
MW-5	11/20/2019	12:20	385.25	351.40	0.17	4.2	8.82	376.43	17.3	335.3	393.2	5.11	0.95	196.2	16.0
TMW-1	11/20/2019	11:30	381.19	348.99	0.085	1.1	6.32	374.87	16.7	96.6	114.8	5.40	4.08	316.4	14.5
TMW-2	11/20/2019	13:20	384.27	356.77	0.085	0.7	10.65	373.62	17.0	102.0	120.1	5.37	5.25	367.4	21.6
TMW-3	11/20/2019	15:10	381.37	353.37	0.085	0.8	9.12	372.25	17.1	243.0	286.8	5.03	1.32	376.3	42.3
**Leachate (IWC-L)	11/20/2019	10:50	NA	NA	NA	NA	NA	NA	NS	NS	NS	NS	NS	NS	NS
Leachate (APWC-L)	11/20/2019	15:10	NA	NA	NA	NA	NA	NA	25.6	43,211	42,906	9.12	4.70	124.6	18.4

[1] Top of Casing Elevations from survey by Civil & Environmental Consultants, Inc. on May 12, 2016.

[2] Depth to water measurements collected by Civil & Environmental Consultants, Inc. on November 20, 2019.

*MW-2 has been removed from monitoring network. Only water level and field parameters collected at MW-2.

**Leachate (IWC-L) was not producing enough liquid to be sampled at time of event.

NS= Not Sampled

NA= Not Applicable.

Table 2
Former EWS Camden Class II Landfill IDL 03-0212 (Terminated)
Groundwater and Leachate Analytical Data - November 2019

		MW-1	Qualifier	MW-3	Qualifier	Duplicate (MW-3)	Qualifier	MW-4	Qualifier	MW-5	Qualifier	TMW-1	Qualifier	TMW-2	Qualifier	TMW-3	Qualifier	Field Blank	Qualifier	Leachate-APWC-L	Qualifier
		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019	
Parameter	**MCL/GWPS (mg/l)**	**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**	
Hardness	-	<30.0		**121**	B, J6	**128**		<30.0		**102**	B	**34.8**	B	**36.7**	B	**79**	B	<30.0		**60.5**	B
Alkalinity	-	**49.3**		<20.0		<20.0		**21.9**	B	<20.0		<20.0		<20.0		<20.0		<20.0		**724**	
Ammonia Nitrogen	-	<0.100	P1	<0.100		<0.100		<0.100		<0.100		<0.100		<0.100		<0.100		<0.100		**516**	
COD	-	<10.0		<10.0		<10.0		**23.8**		<10.0		<10.0		**36.4**		<10.0		<10.0		**731**	
Boron	-	<0.200		<0.200		<0.200		<0.200		<0.200		<0.200		<0.200		<0.200		<0.200		**1.41**	
Bromide	-	<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<20.0	
Chloride	250 [2]	**2.52**		**19.3**		**19.2**		**8.76**		**83.5**		**18.6**		**22.7**		**61.1**		<1.00		**14,600**	
Fluoride	2 [2]	<0.100		**0.197**		**0.178**		<0.100		<0.100		<0.100		<0.100		<0.100		<0.100		**4.65**	
Nitrate	10 [1]	<0.100		**1.29**		**1.75**	Q	**0.832**		**1.51**		**1.84**		**0.759**		**4.76**		<0.100		**22.7**	
Sulfate	250 [2]	<5.00		**111**		**98.1**		<5.00		**8.50**		<5.00		<5.00		<5.00		<5.00		**191**	
Aluminum	0.2 [2]	<0.100		<0.100		<0.100		<0.100		**0.146**		**0.174**		**0.456**		**0.233**		<0.100		<1.00	
Antimony	0.006	<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	
Arsenic	0.01	**0.0176**		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	
Barium	2	**0.0194**		**0.0450**		**0.0403**		**0.00828**		**0.0570**		**0.0129**		**0.0309**		**0.0458**		<0.00500		**0.139**	
Beryllium	0.004	<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	
Cadmium	0.005	<0.00100		**0.00157**		**0.00155**		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.0100	
Calcium	-	**3.11**		**32.5**		**32.3**		**5.56**		**18.5**		**9.87**		**9.27**		**20.3**		<1.00		**19.8**	
Chromium	0.1	<0.00200		<0.00200		<0.00200		<0.00200		**0.00219**	B	<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	
Cobalt	0.006 [3]	**0.0329**		<0.00200		<0.00200		<0.00200		**0.00261**		<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	
Copper	1.3	<0.00500		<0.00500		<0.00500		<0.00500		**0.00553**	B	<0.00500		<0.00500		<0.00500		<0.00500		**6.64**	
Iron	0.3 [2]	**13.1**		<0.100		<0.100		**0.607**		**0.391**		**0.282**		**0.47**		**0.533**		<0.100		<1.00	
Lead	0.015	<0.00200		<0.00200		<0.00200		<0.00200		**0.00517**		<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	

Table 2
Former EWS Camden Class II Landfill IDL 03-0212 (Terminated)
Groundwater and Leachate Analytical Data - November 2019

		MW-1	Qualifier	MW-3	Qualifier	Duplicate (MW-3)	Qualifier	MW-4	Qualifier	MW-5	Qualifier	TMW-1	Qualifier	TMW-2	Qualifier	TMW-3	Qualifier	Field Blank	Qualifier	Leachate-APWC-L	Qualifier
		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019	
Parameter	**MCL/GWPS (mg/l)**	**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**		**Value (mg/l)**	
Magnesium	-	**2.37**		**10.3**		**10.1**		**2.81**		**12.8**		**2.78**		**3.53**		**6.72**		<1.00		<10.0	
Manganese	0.05 [2]	**0.651**		**0.0205**		**0.0221**		**0.0481**		**0.231**		**0.0145**		**0.00775**		**0.0131**		<0.00500		**0.0848**	
Nickel	0.10 [1]	**0.00468**		**0.00237**		**0.00295**		<0.00200		**0.00862**		<0.00200		<0.00200		<0.00200		<0.00200		**0.0522**	
Potassium	-	**1.25**		**4.67**		**4.58**		<1.00		**1.5**		<1.00		**1.02**		**1.71**		<1.00		**3,920**	
Selenium	0.05	<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		**0.0245**	
Silver	0.10 [2]	<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	
Sodium	-	**3.09**		**6.69**		**6.53**		**3.62**		**20**		**3.45**		**3.99**		**12.5**		<1.00		**6,750**	
Thallium	0.002	<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.00200		<0.0200	
Vanadium	-	<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.0500	
Zinc	5 [2]	<0.0250		**0.0251**		**0.0276**		**0.0579**		**0.247**		<0.0250		<0.0250		<0.0250		<0.0250		**0.286**	
Mercury	0.002	**0.00121**		<0.000200		<0.000200		<0.000200		<0.000200		<0.000200		<0.000200		<0.000200		<0.000200		<0.000200	
Acetone	-	<0.0500	J4	<0.0500	J4	<0.0500	J4	<0.0500	J4	<0.0500	J4	<0.0500	J4	<0.0500	J4	<0.0500	J4	<0.0500	J4	**0.079**	
Carbon Disulfide	-	<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100	
Chlorobenzene	0.1	<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		**0.00523**	
Chloroform	0.08	<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500		<0.00500	
2-Butanone (MEK)	-	<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100	
Toluene	1.0	<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100		<0.00100	
4-Methyl-2-Pentanone (MIBK)	-	<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		<0.0100		**0.0859**	
Ethylene Dibromide	0.00005	<0.0000100		<0.0000101		<0.0000100		<0.0000101		<0.0000101		<0.0000100		<0.0000100		<0.0000100		<0.0000102		<0.0000100	

Notes:

MCL: Maximum Contaminant Level Enforceable National Primary Drinking Water Standards

GWPS: Groundwater Protection Standard

[1] - MCL value obtained from TN Division of Water Supply rule 1200-5-.06(1)(b)11

[2] - MCL value obtained from TN Division of Water Supply rule 1200-5-1-.12(1)(n). (EPA Secondary Drinking Water Standard)

[3] - GWPS value is referenced from EPA Regional Screening Level for Cobalt

NS- Not Sampled for analysis.

NA-Not Analyzed by the Laboratory.

Bold text indicates laboratory analytical detections above the practical quantitation level

Dark gray shaded text indicates detection above respective MCL/GWPS

Light gray shaded text indicates detection above respective Non-Enforceable National Secondary Drinking Water Standard.

B-The same analyte is found in the associated blank.

P1- RPD value not applicable for sample concentrations less than 5 times the reporting limit.

J4 - The associated batch QC was outside the established quality control range for accuracy.

J6 - The sample matrix interfered with the ability to make any accurate determination; spike value is low.

Q - Sample was prepared and/or analyzed past holding time as defined in the method. Concentrations should be considered minimum values.

Table 3
Intra-Well and Inter-Well Statistical Summary
Environmental Waste Solutions Camden Class II Landfill IDL 03-0212 (Terminated)
Inorganic Analytical Data - November 2019

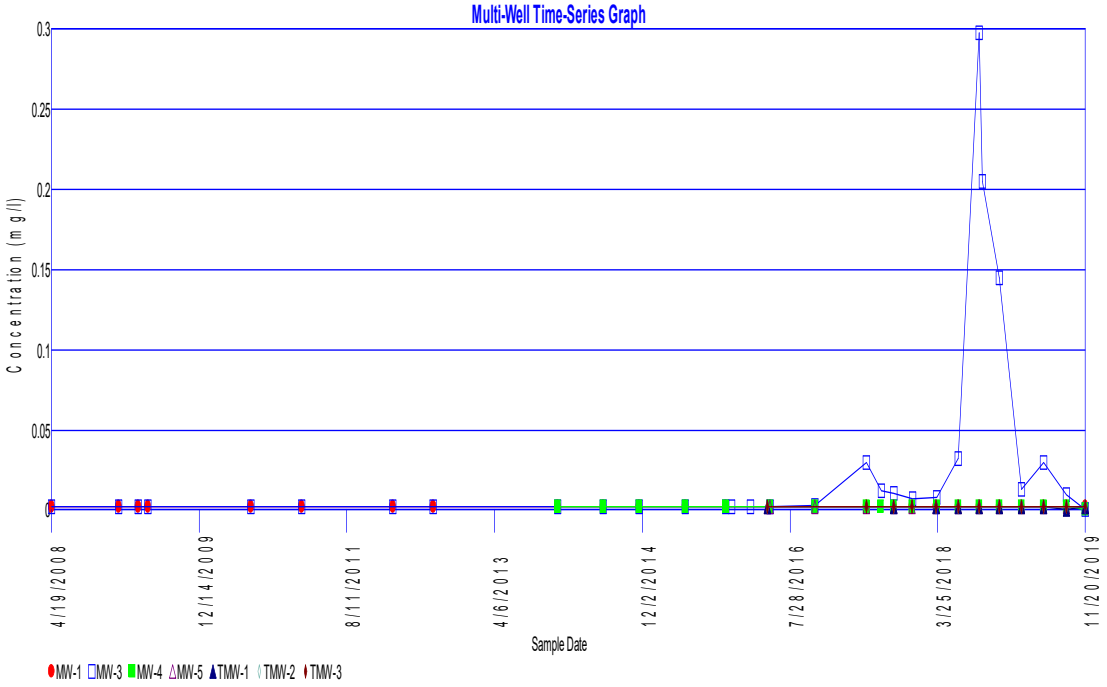
Intra-Well Statistical Summary (Upgradient Background Well MW-1)								
Constituent	Well	% Non Detects	Normality	Intra-well NPPL	Intra-well PPL	Shewhart-Cusum	Wilcoxon Rank Sum	SSI
Arsenic	MW-1	0.00	parametric	--	Pass	--	--	No
Barium	MW-1	0.00	non-parametric	Pass	--	Pass	--	No
Chloride	MW-1	0.00	log-normal	--	Pass	--	--	No
Cobalt	MW-1	0.00	log-normal	--	Pass	--	--	No
Nickel	MW-1	40.74	non-parametric	Pass	--	Pass	--	No
Mercury	MW-1	34.61	non-parametric	Pass	--	Pass	--	No

Inter-Well Statistical Summary (Downgradient Compliance Wells)									
Constituent	Well	Total % Non Detects	Normality	Inter-well NPPL	Inter-well PPL	Shewhart-Cusum	Wilcoxon Rank Sum	SSI	Mann-Kendall Trend Analysis
Aluminum	MW-5	38.33	non-parametric	--	--	Pass	--	No	No Trend
	TMW-1		non-parametric	--	--	Pass	--	No	No Trend
	TMW-2		non-parametric	--	--	Pass	--	No	**Downward Trend**
	TMW-3		non-parametric	--	--	Pass	--	No	No Trend
Barium	MW-3	0.00	non-parametric	--	--	Pass	--	No	No Trend
	MW-4		non-parametric	--	--	Pass	--	No	**Downward Trend**
	MW-5		non-parametric	--	--	Pass	--	No	**Upward Trend**
	TMW-1		non-parametric	--	--	Pass	--	No	No Trend
	TMW-2		non-parametric	--	--	Pass	--	No	No Trend
	TMW-3		non-parametric	--	--	Pass	--	No	**Upward Trend**
Total Cadmium	MW-3	88.43	non-parametric	Pass	--	--	--	No	**Upward Trend**
Chloride	MW-3	0.00	log-normal	--	**Fail**	--	--	**Yes**	**Upward Trend**
	MW-4		log-normal	--	**Fail**	--	--	**Yes**	No Trend
	MW-5		log-normal	--	**Fail**	--	--	**Yes**	**Upward Trend**
	TMW-1		log-normal	--	**Fail**	--	--	**Yes**	**Upward Trend**
	TMW-2		log-normal	--	**Fail**	--	--	**Yes**	**Upward Trend**
	TMW-3		log-normal	--	**Fail**	--	--	**Yes**	**Upward Trend**
Chromium*	MW-5	74.17	non-parametric	Pass	--	--	--	No	**Upward Trend**
Cobalt	MW-5	58.33	non-parametric	Pass	--	--	--	No	No Trend
Copper*	MW-5	84.03	non-parametric	Pass	--	--	--	No	No Trend
Lead	MW-5	90.00	non-parametric	Pass	--	--	--	No	**Upward Trend**
Fluoride	MW-3	85.71	non-parametric	**Fail**	--	--	**Fail**	**Yes**	**Upward Trend**
Nickel	MW-3	60.66	non-parametric	Pass	--	--	--	No	**Downward Trend**
	MW-5		non-parametric	Pass	--	--	--	No	No Trend
Zinc	MW-3	64.75	non-parametric	Pass	--	--	--	No	**Upward Trend**
	MW-4		non-parametric	**Fail**	--	--	Pass	No	No Trend
	MW-5		non-parametric	**Fail**	--	--	Pass	No	No Trend
Sulfate	MW-3	63.93	non-parametric	**Fail**	--	--	**Fail**	**Yes**	**Upward Trend**
	MW-5		non-parametric	Pass	--	--	--	No	**Upward Trend**

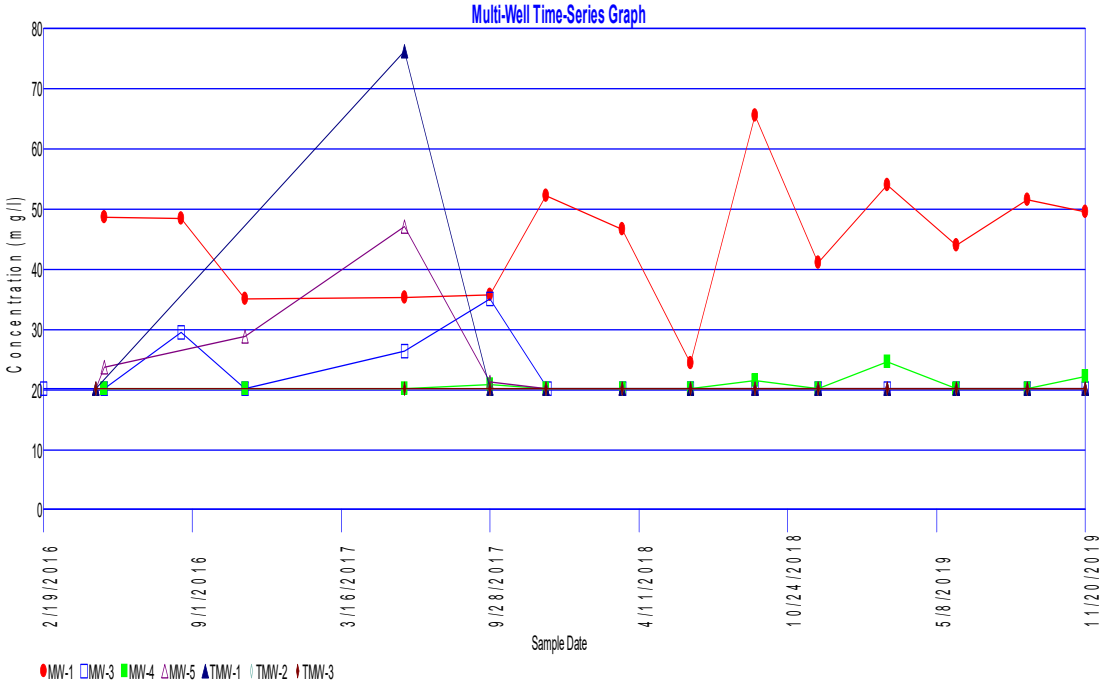
*-The same analyte is found in the associated blank. Therefore, the constituent concentration reported may be elevated.

APPENDIX B
STATISTICAL EVALUATIONS & TIME SERIES PLOTS

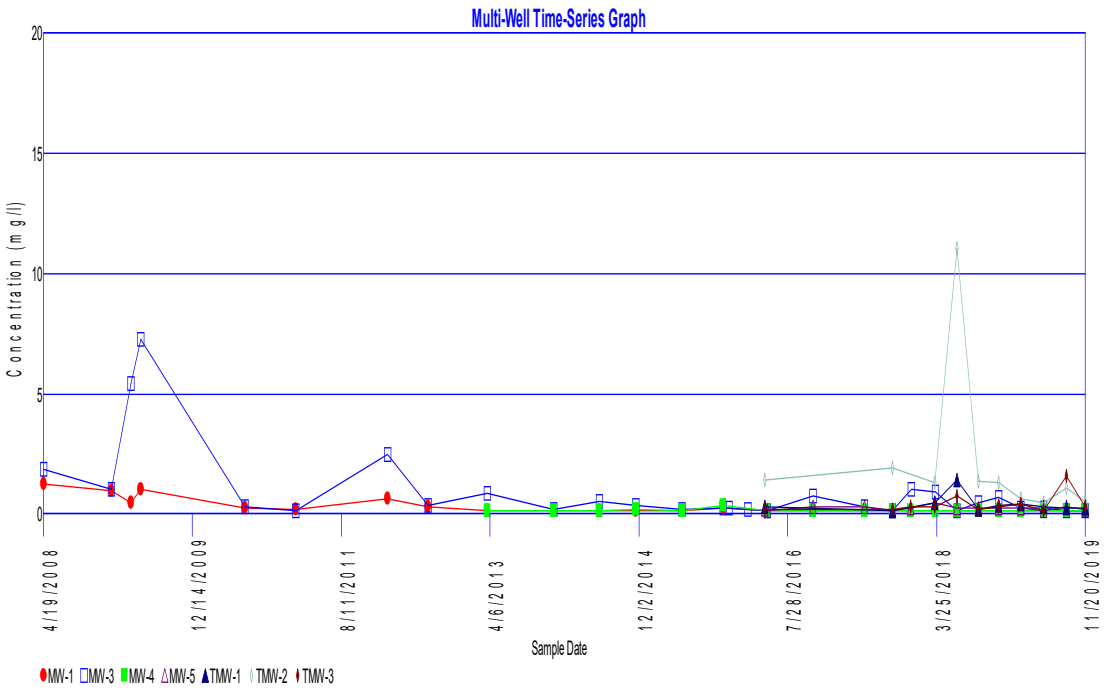
Total Cadmium



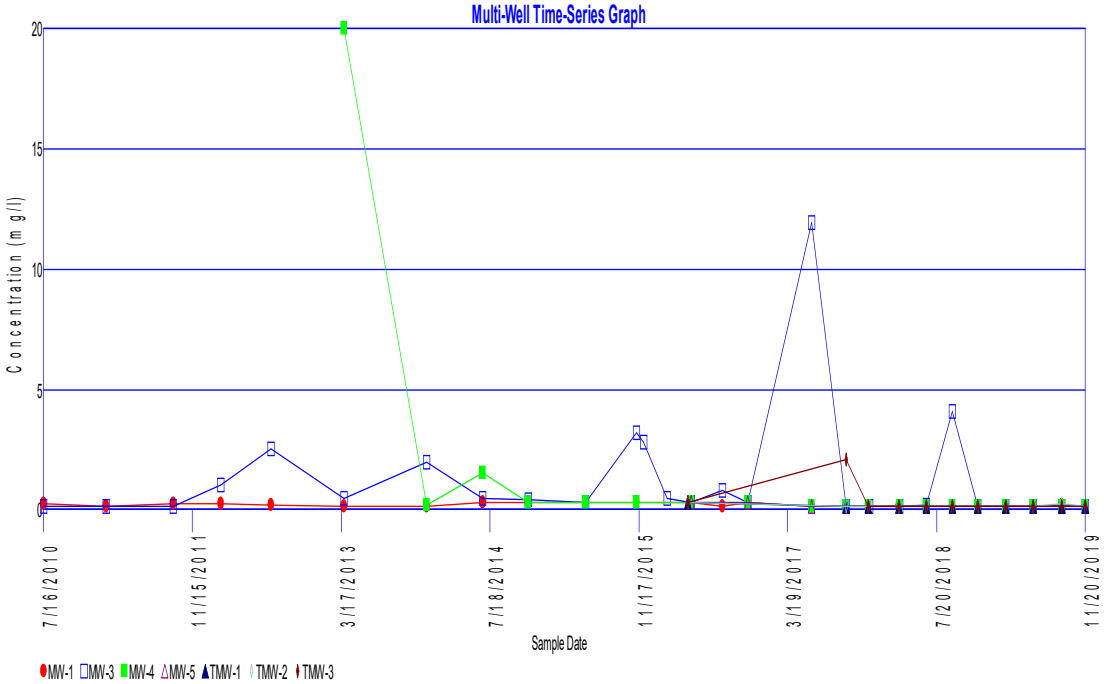
Alkalinity

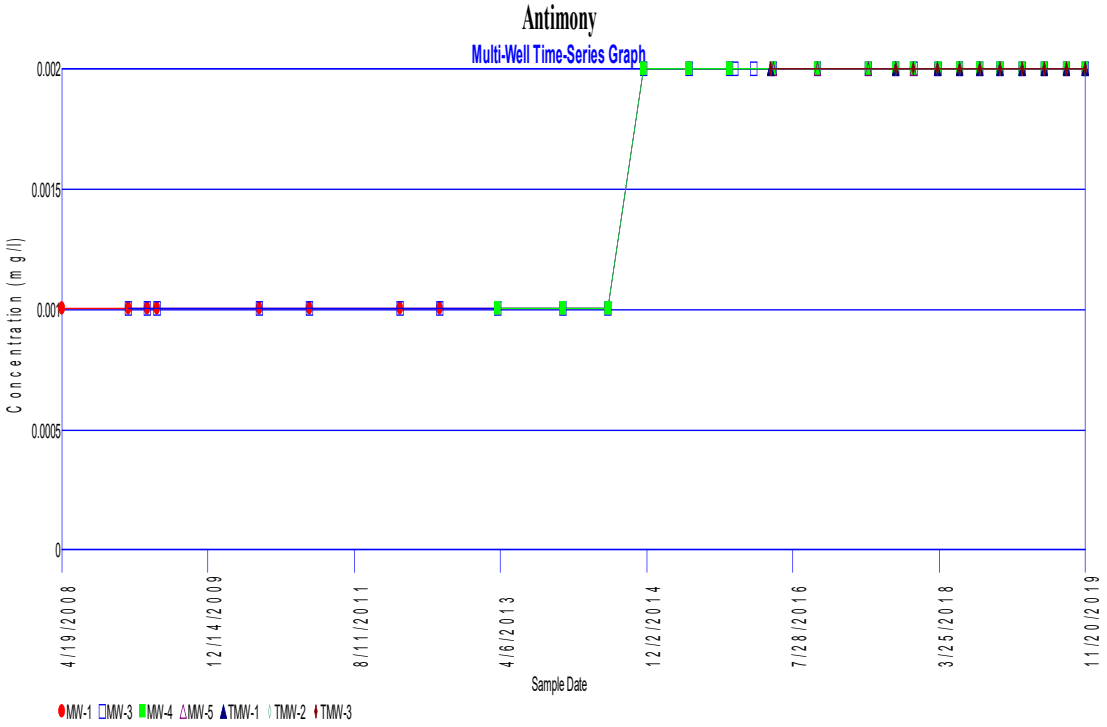


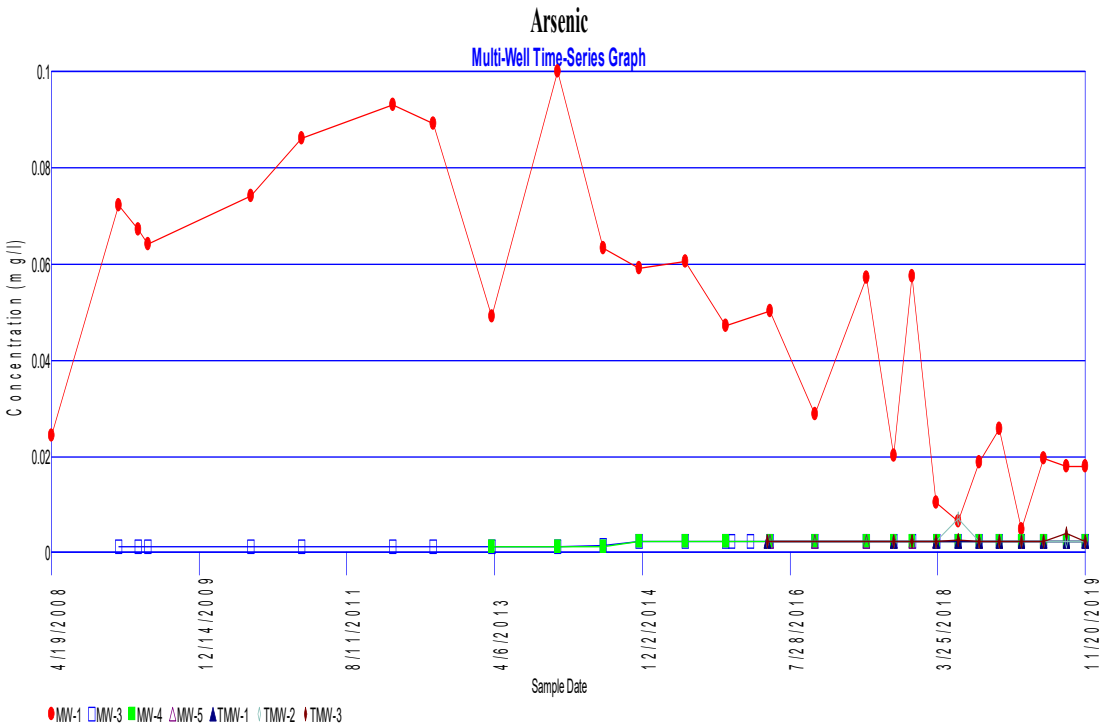
Aluminum



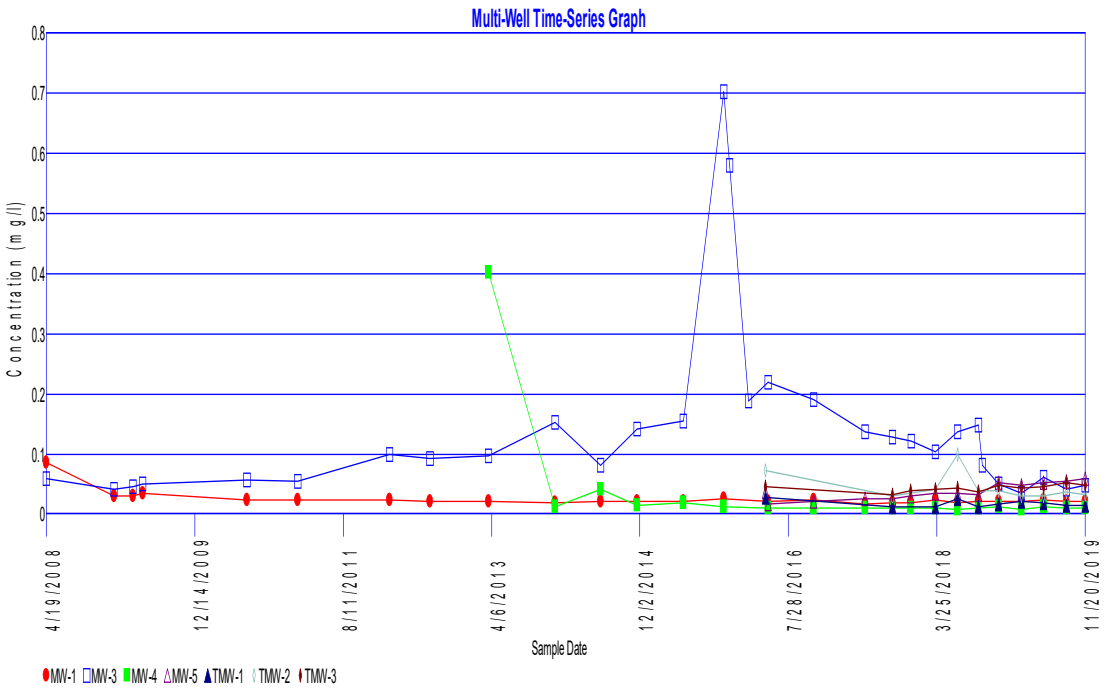
Ammonia Nitrogen



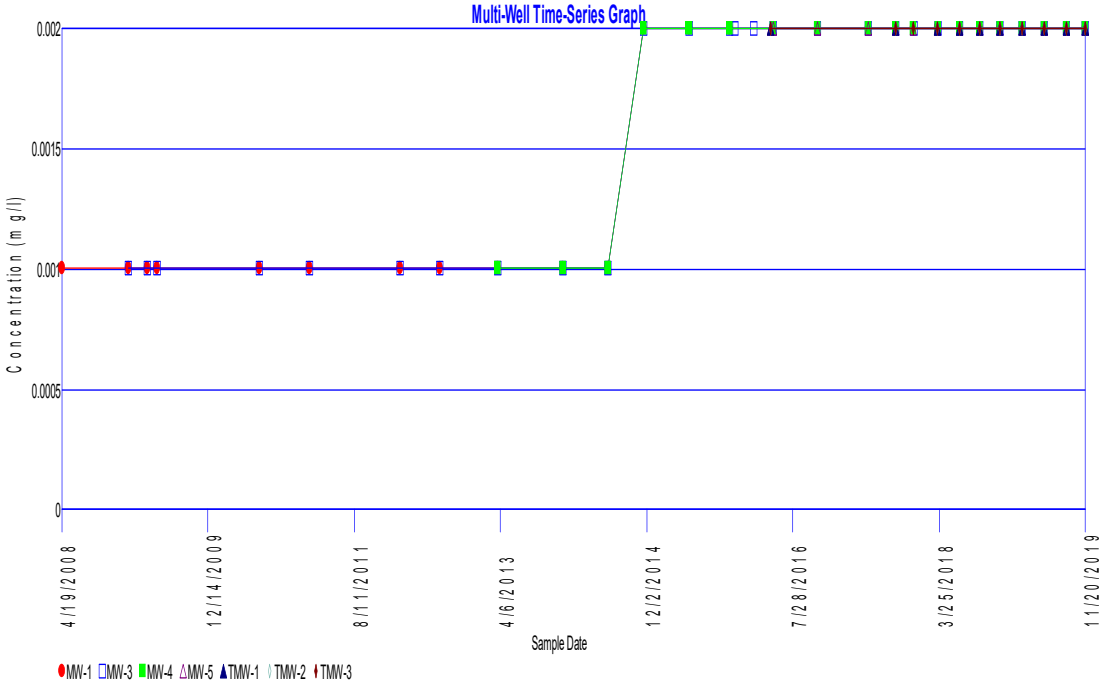

Antimony
Multi-Well Time-Series Graph
0.002
0.0015
0.001
0.0005
0
Concentration (mg/l)
4/19/2008
12/14/2009
8/11/2011
4/6/2013
12/2/2014
7/28/2016
3/25/2018
11/20/2019
Sample Date
MW-1 MW-3 MW-4 MW-5 TMW-1 TMW-2 TMW-3


Arsenic
Multi-Well Time-Series Graph
0.1
0.08
0.06
0.04
0.02
0
Concentration (mg/l)
4/19/2008
12/14/2009
8/11/2011
4/6/2013
12/2/2014
7/28/2016
3/25/2018
11/20/2019
Sample Date
MW-1 MW-3 MW-4 MW-5 TMW-1 TMW-2 TMW-3

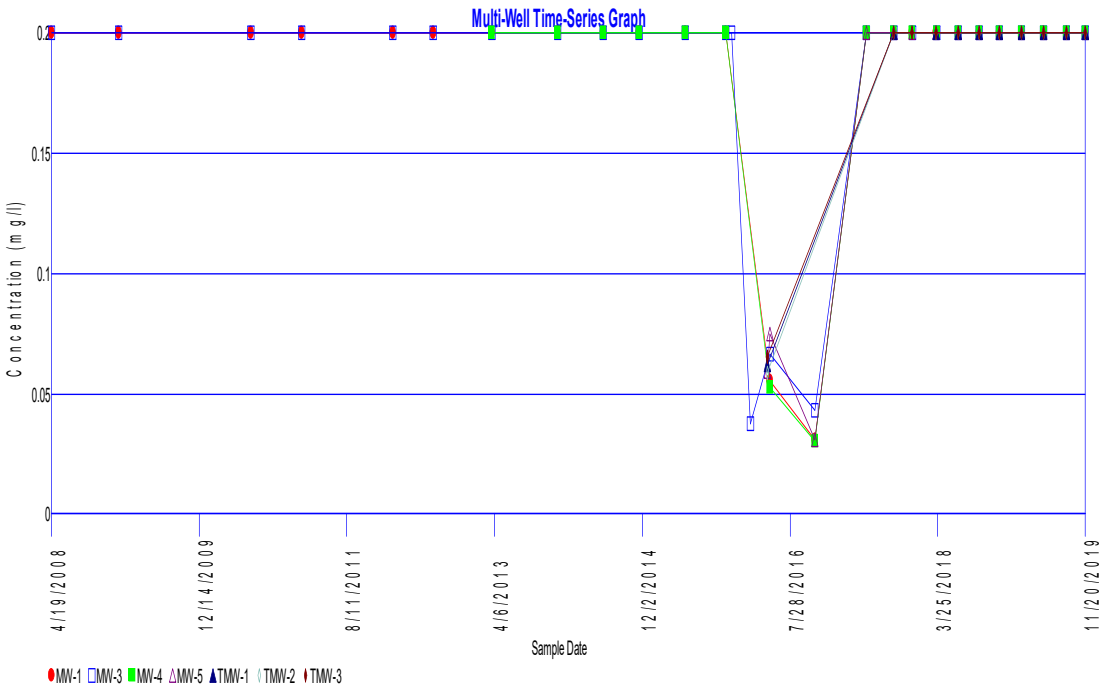
Barium



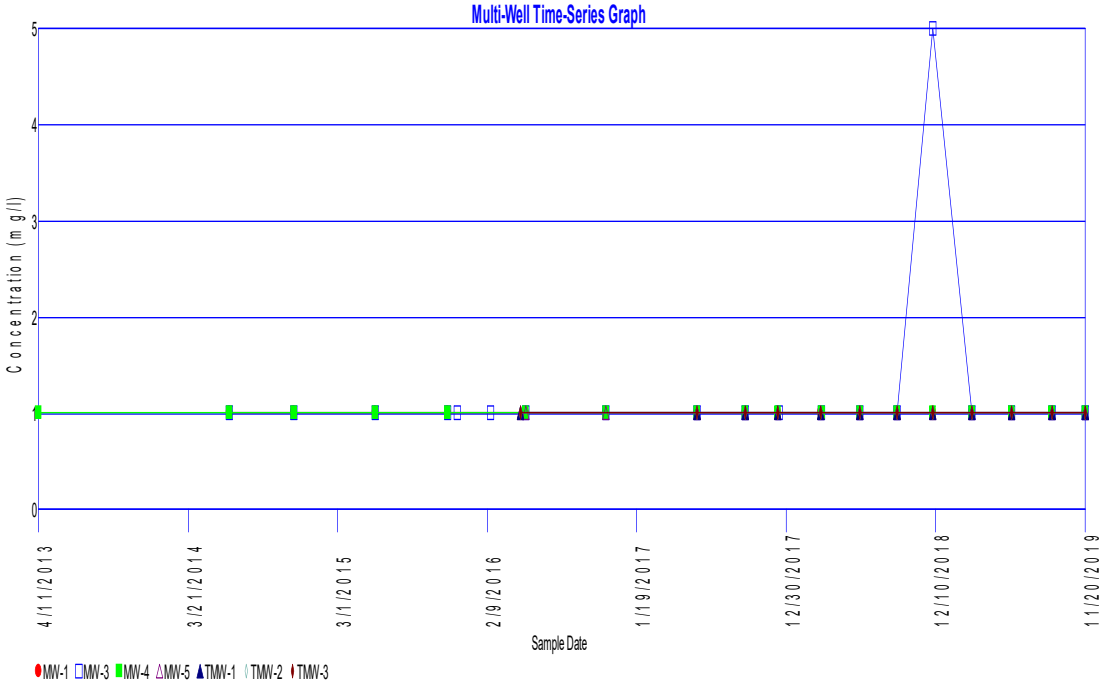
Beryllium



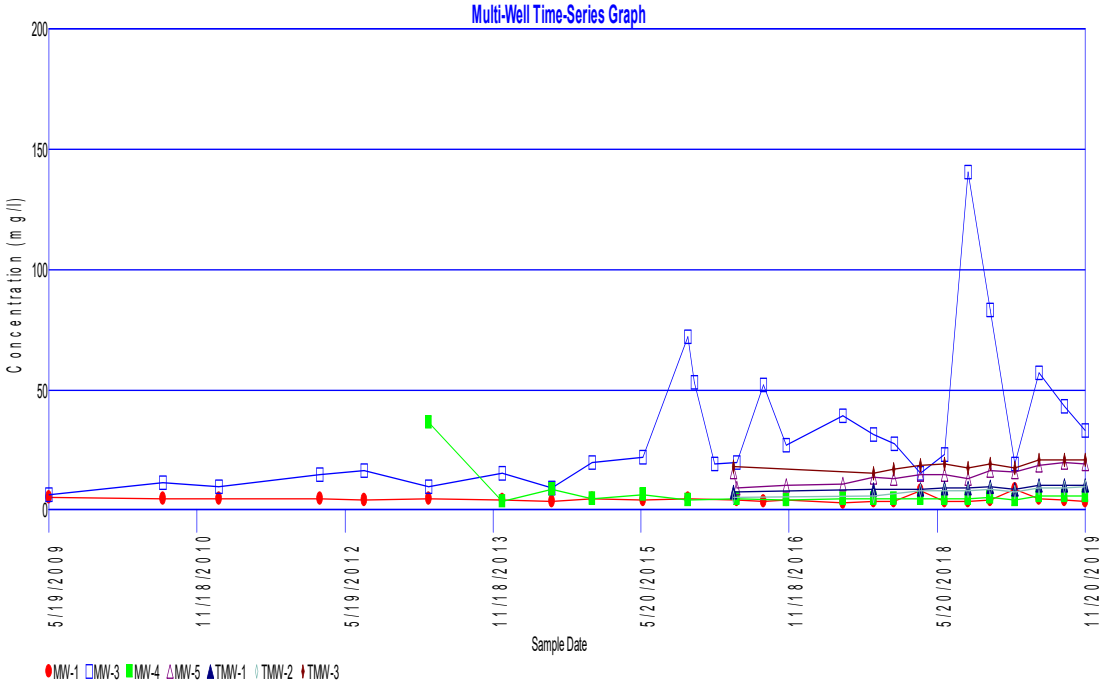
Boron



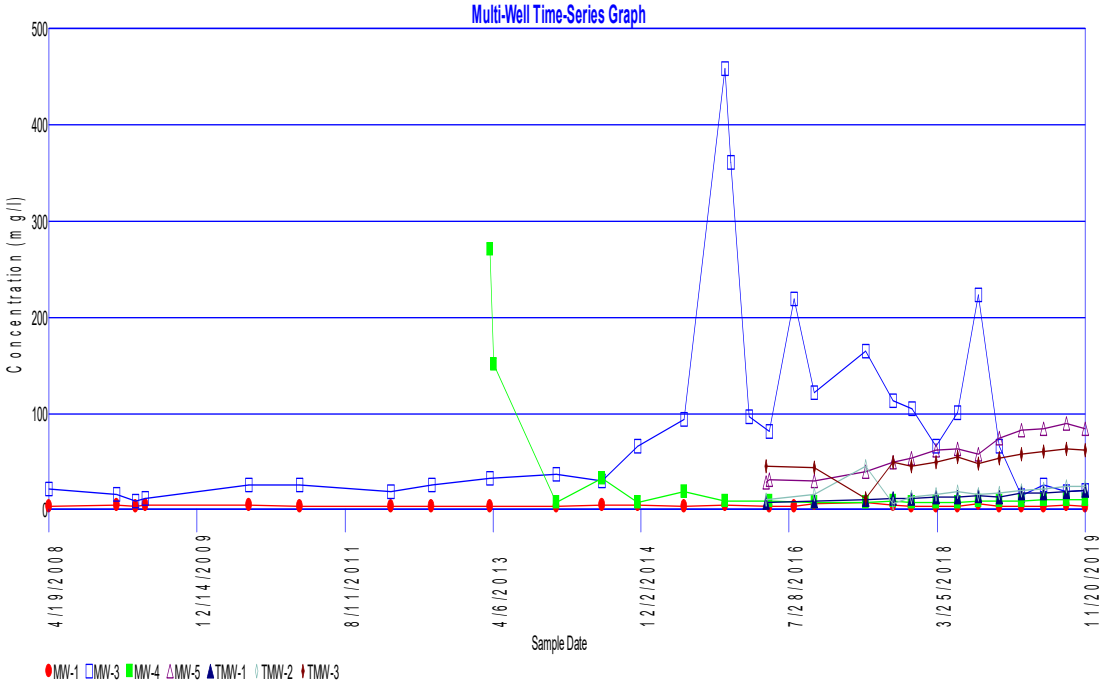
Bromide



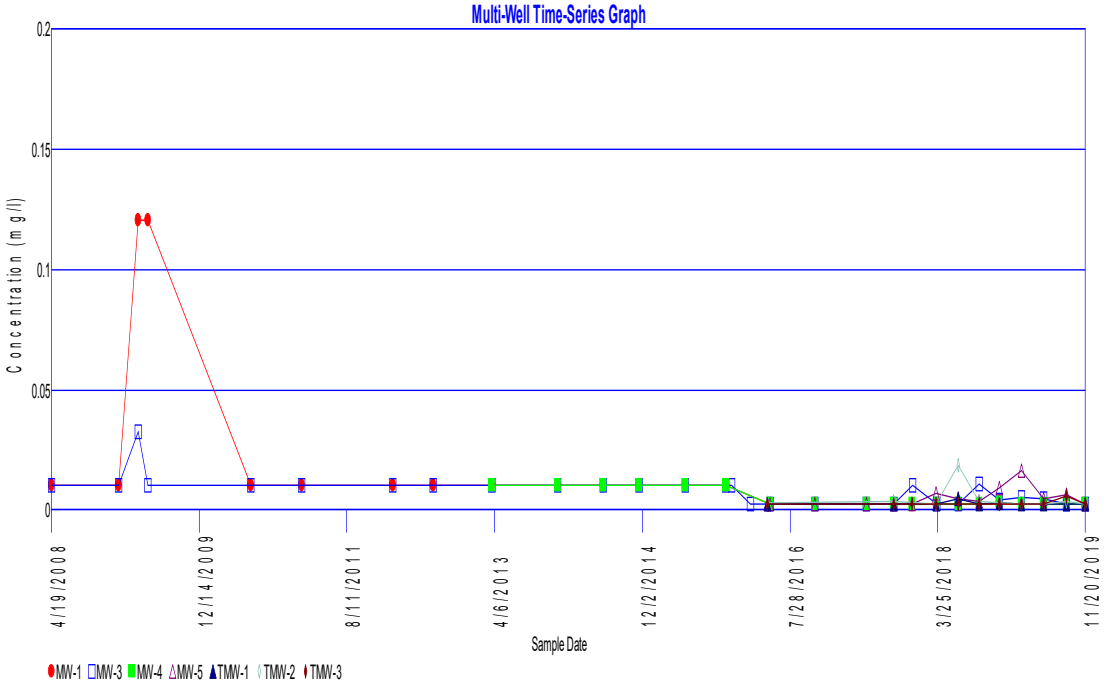
Calcium



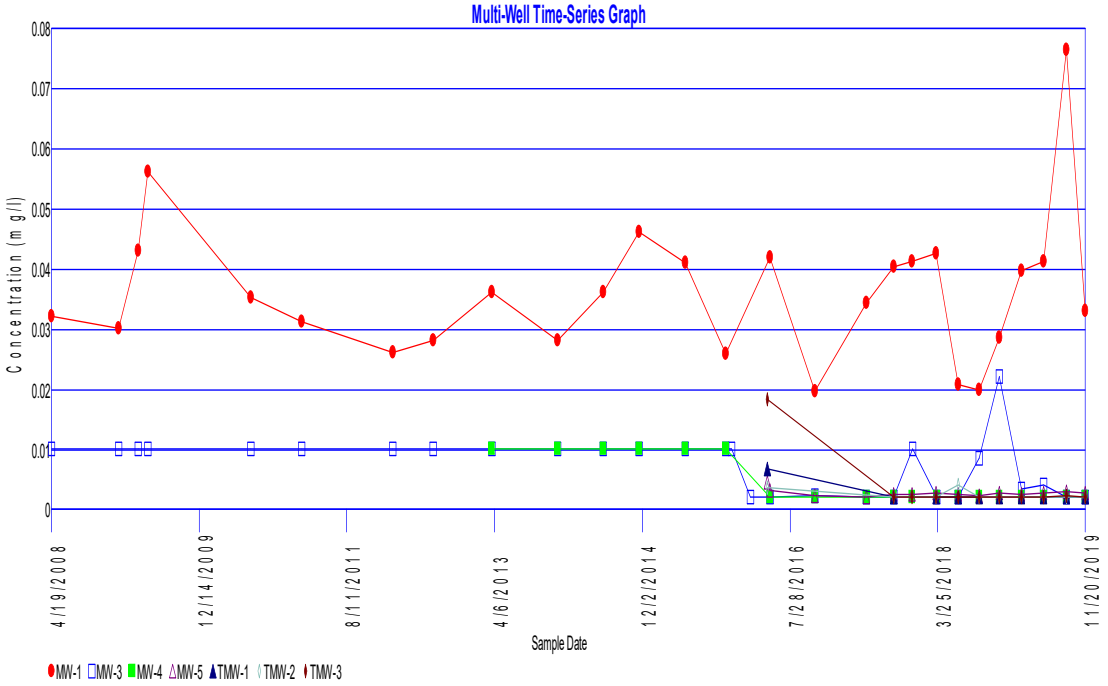
Chloride



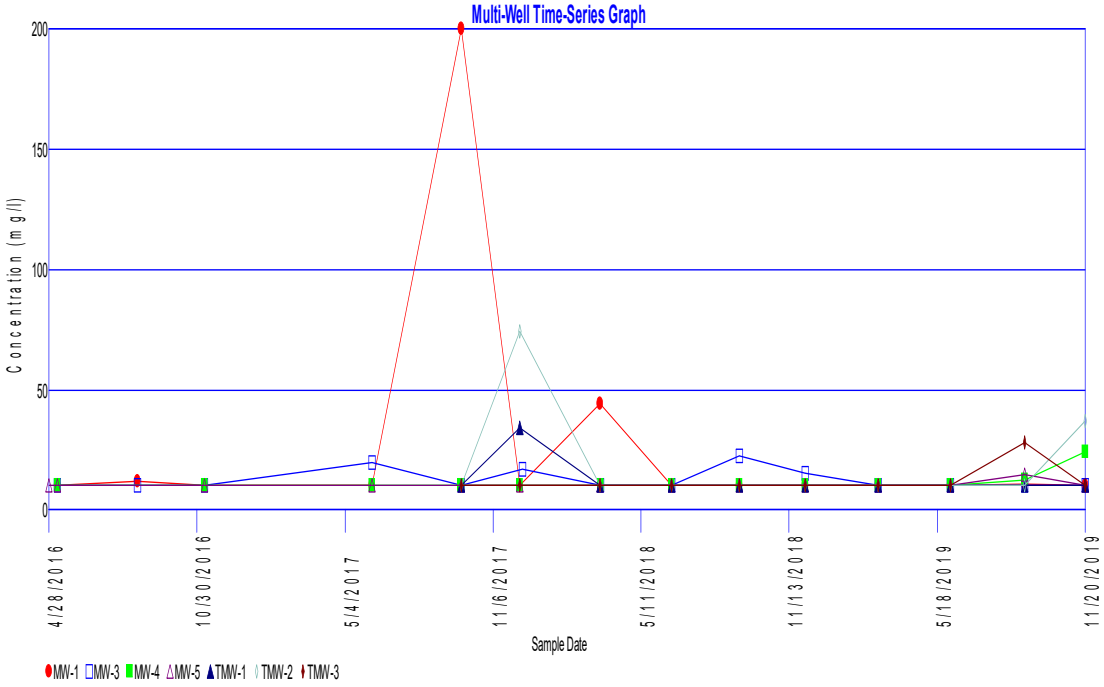
Chromium



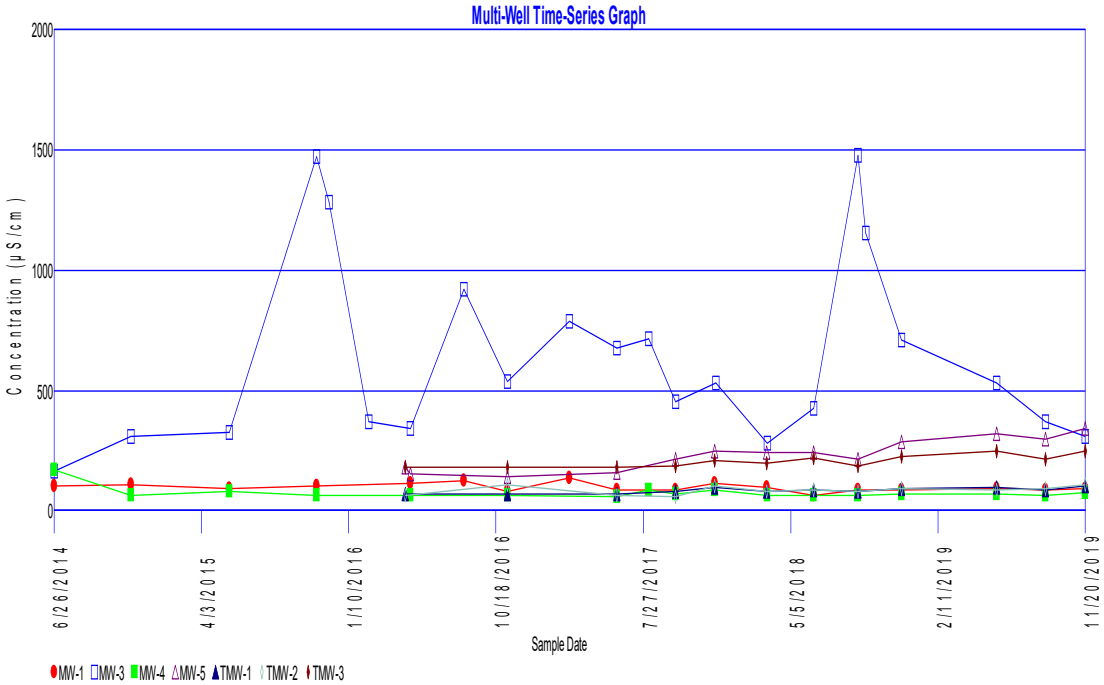
Cobalt



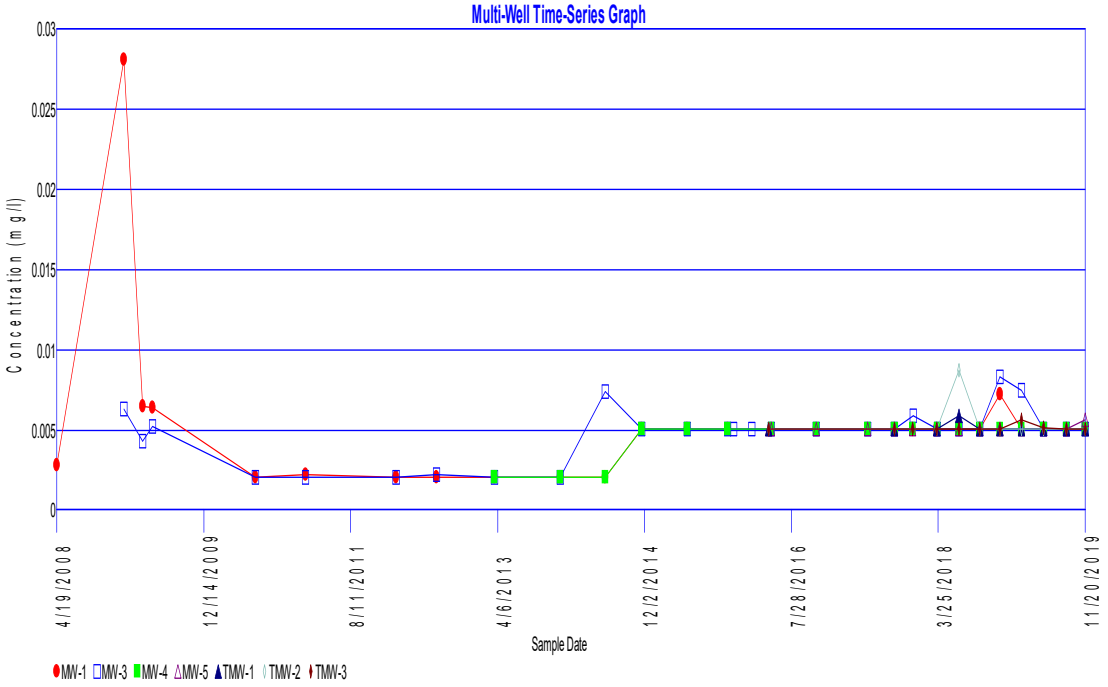
COD



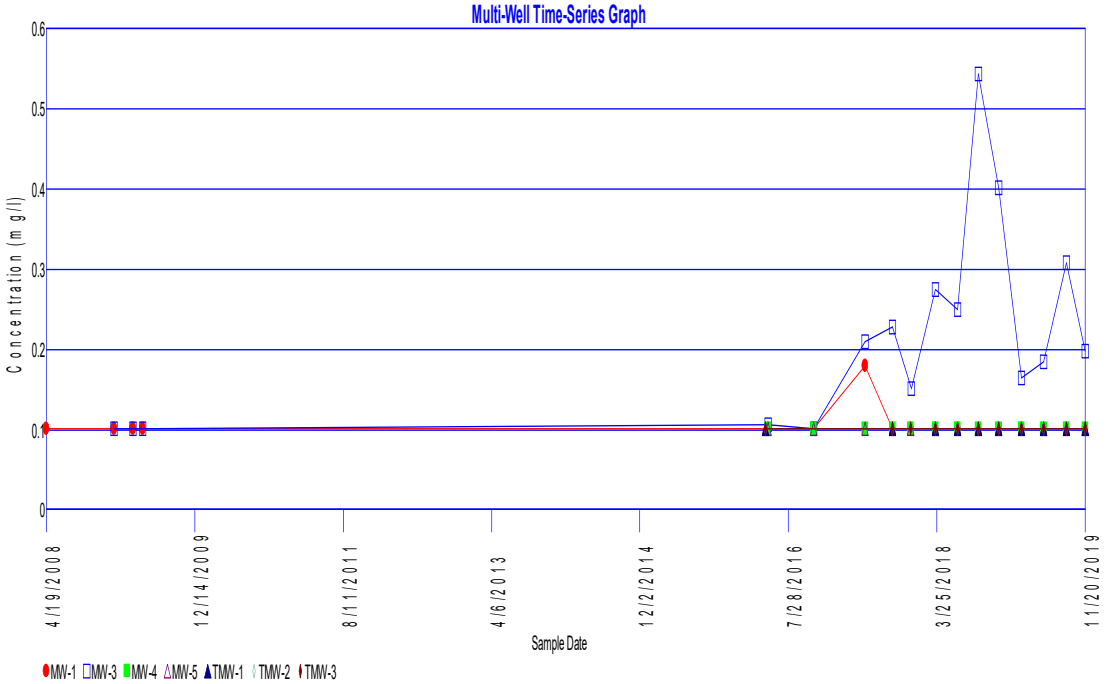
Conductivity



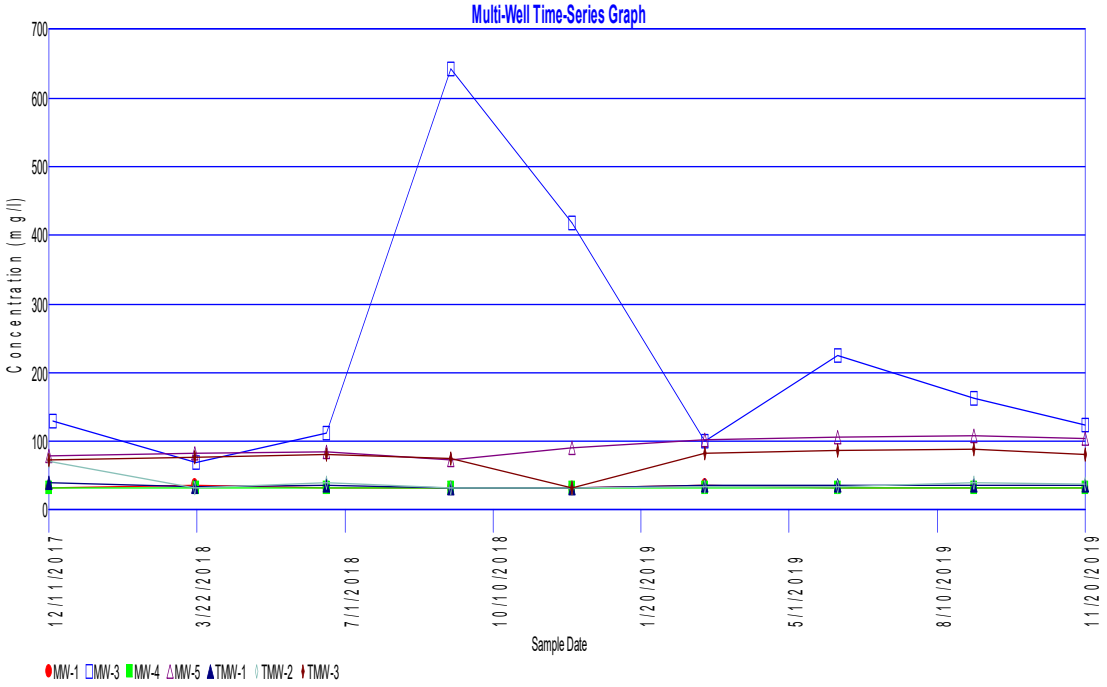
Copper



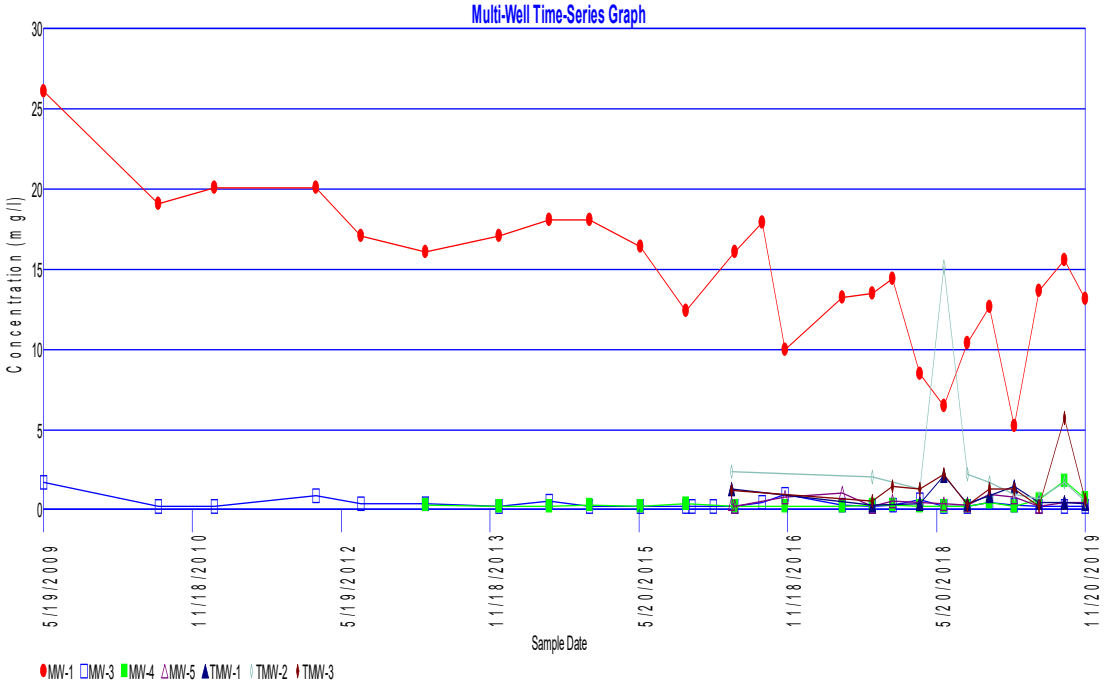
Fluoride



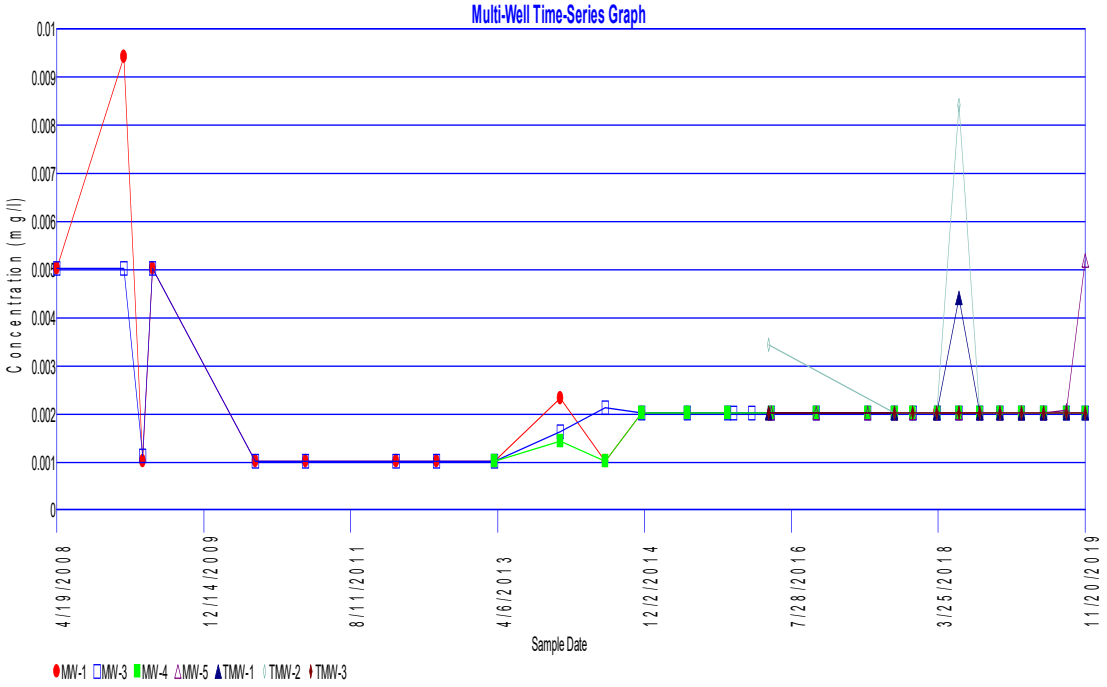
Hardness



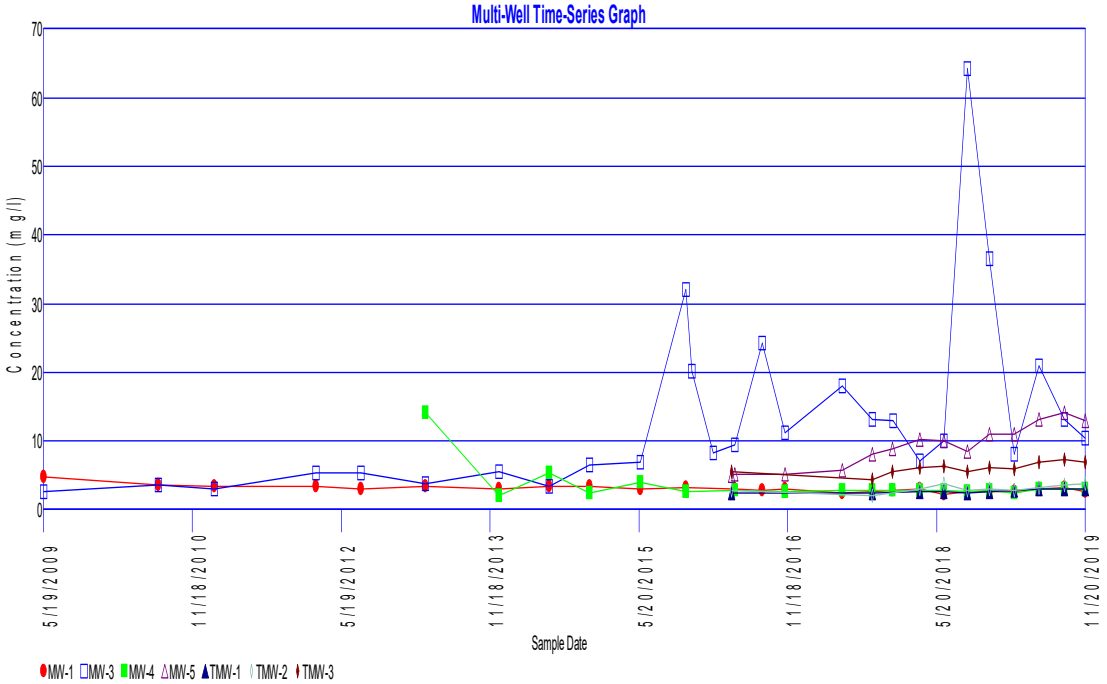
Iron



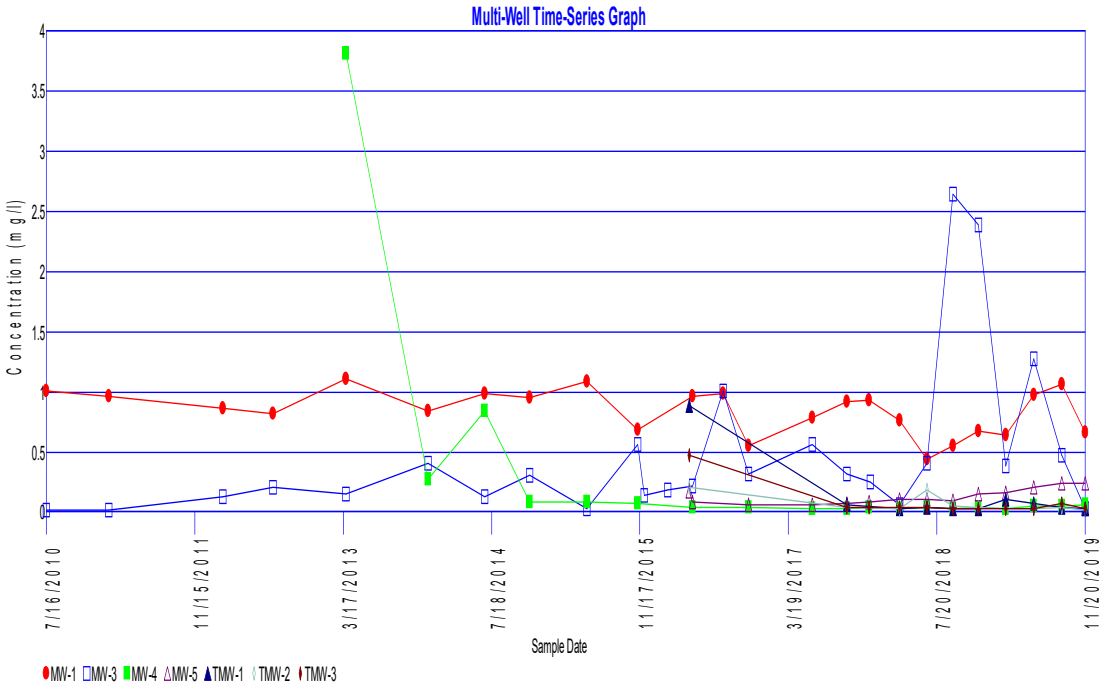
Lead



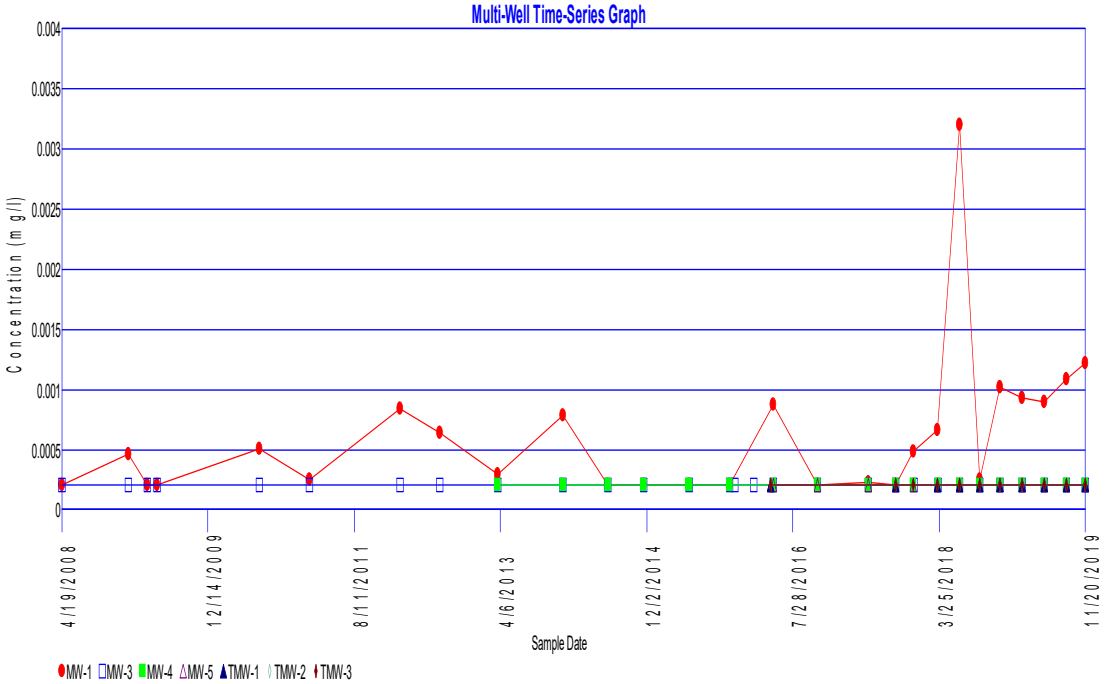
Magnesium



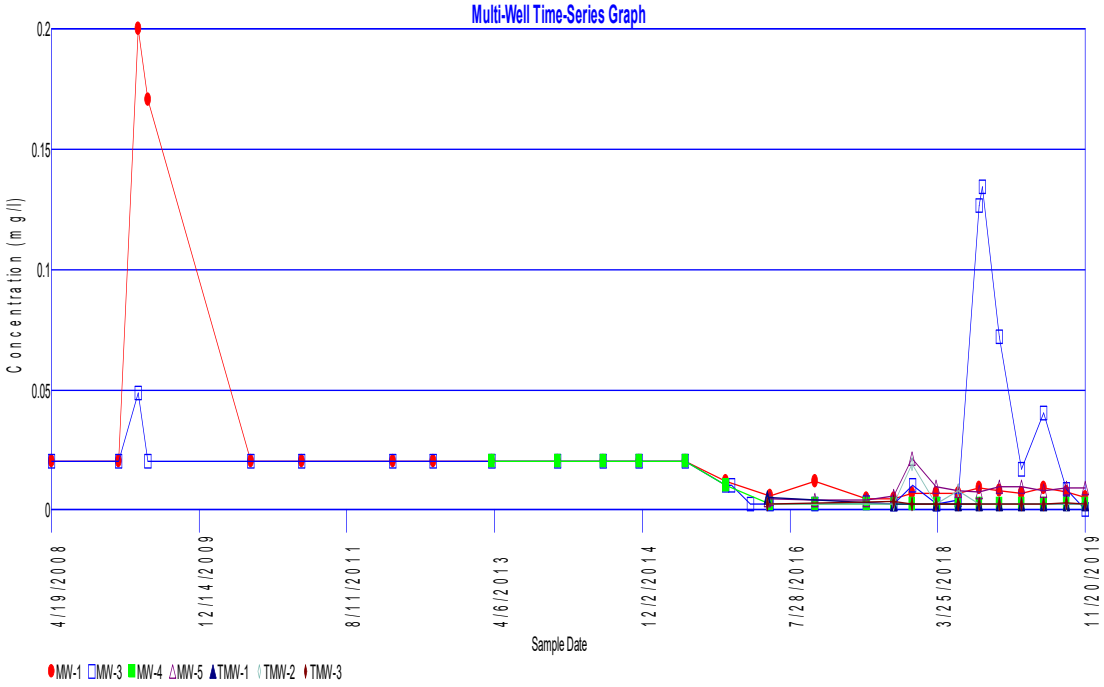
Manganese



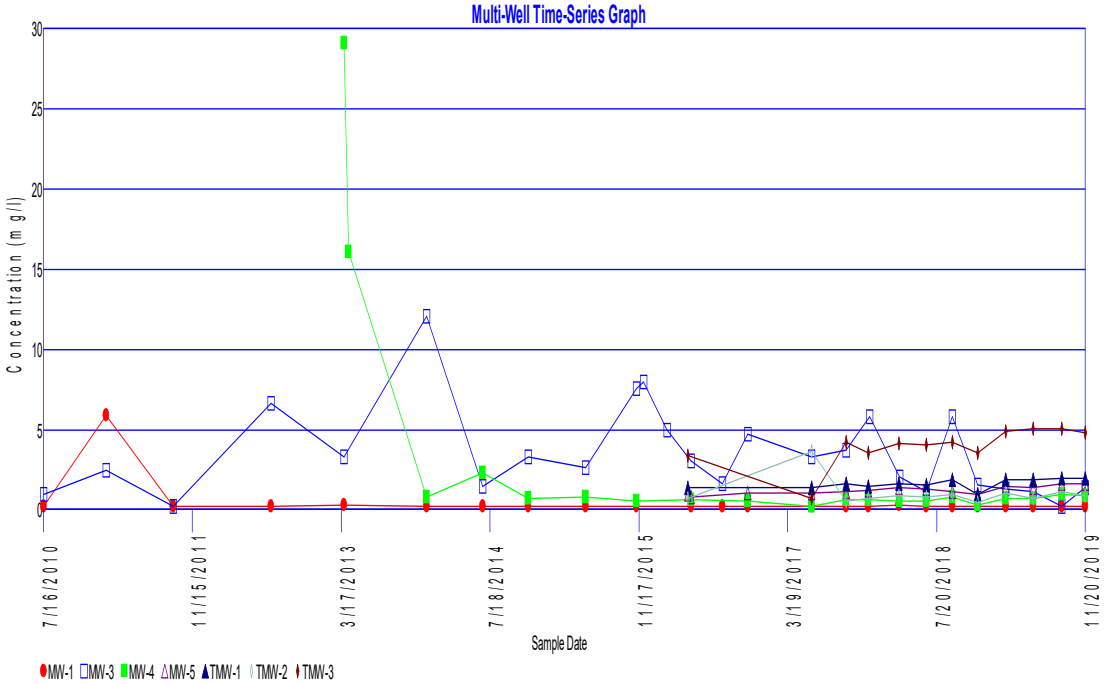
Mercury



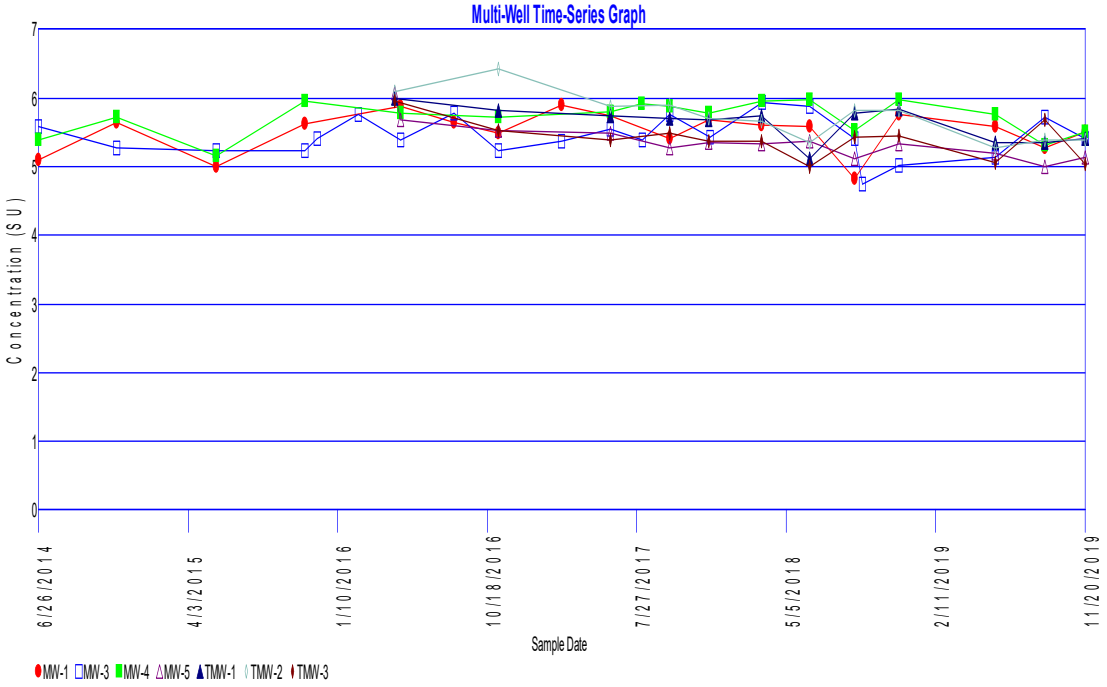
Nickel



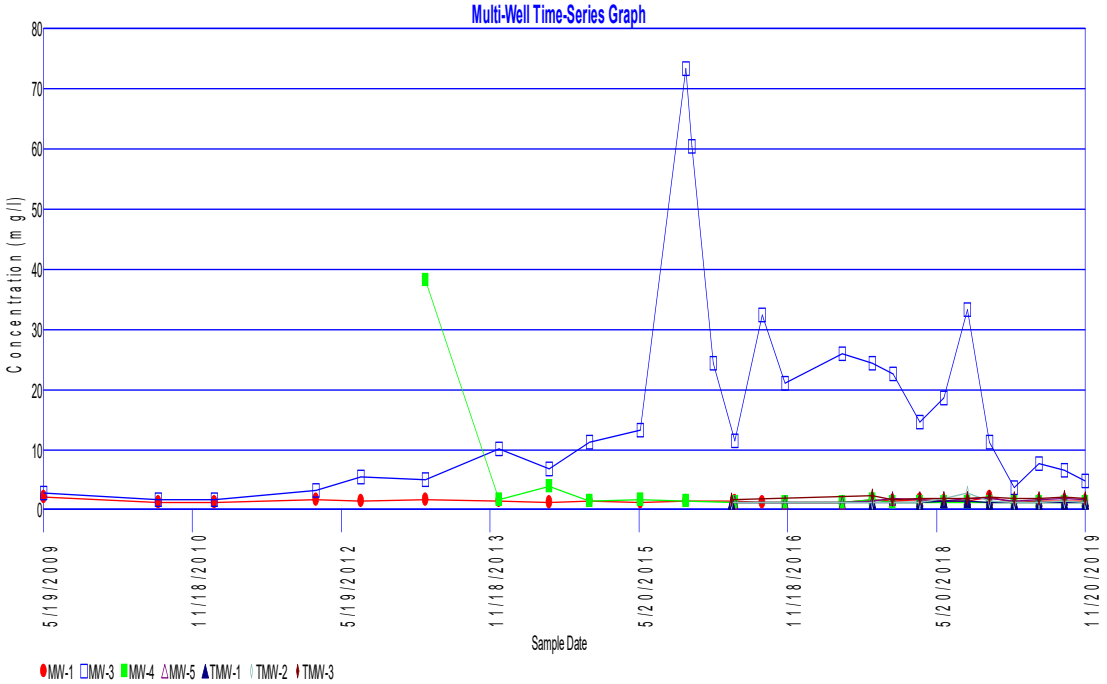
Nitrate

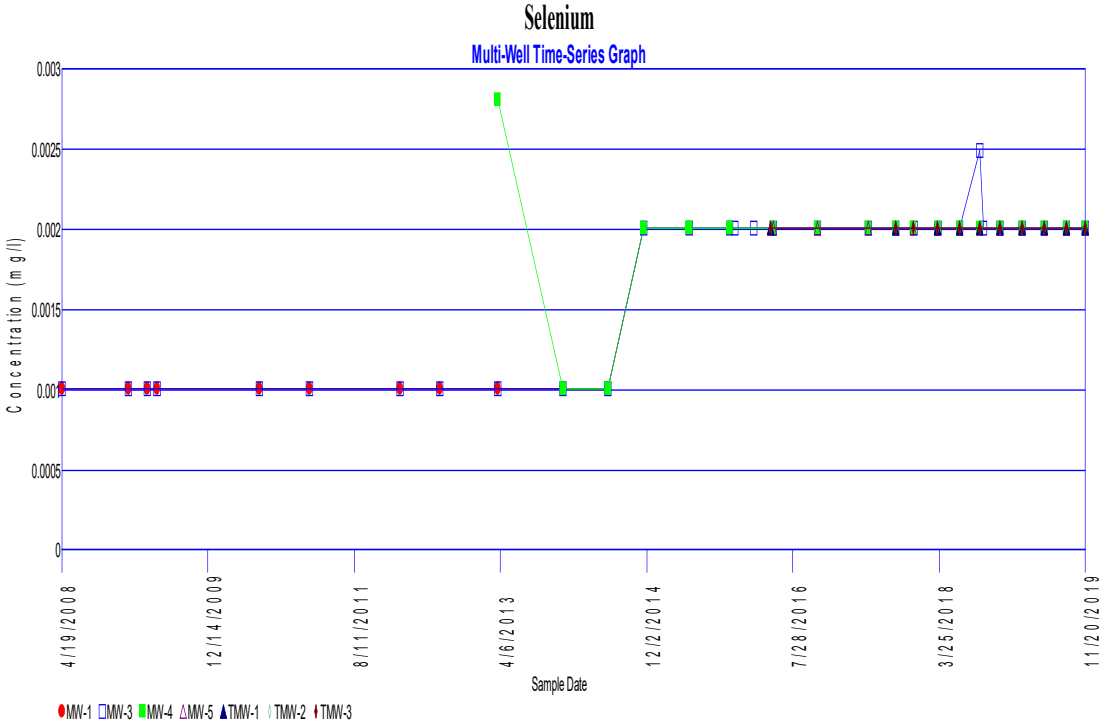


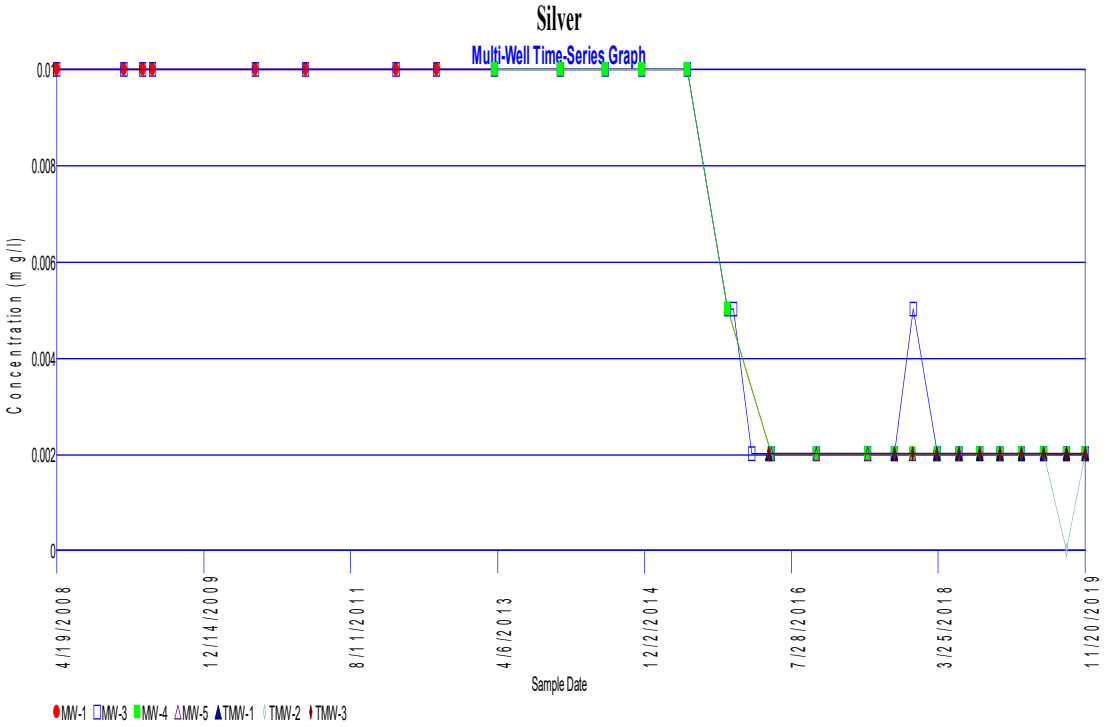
pH



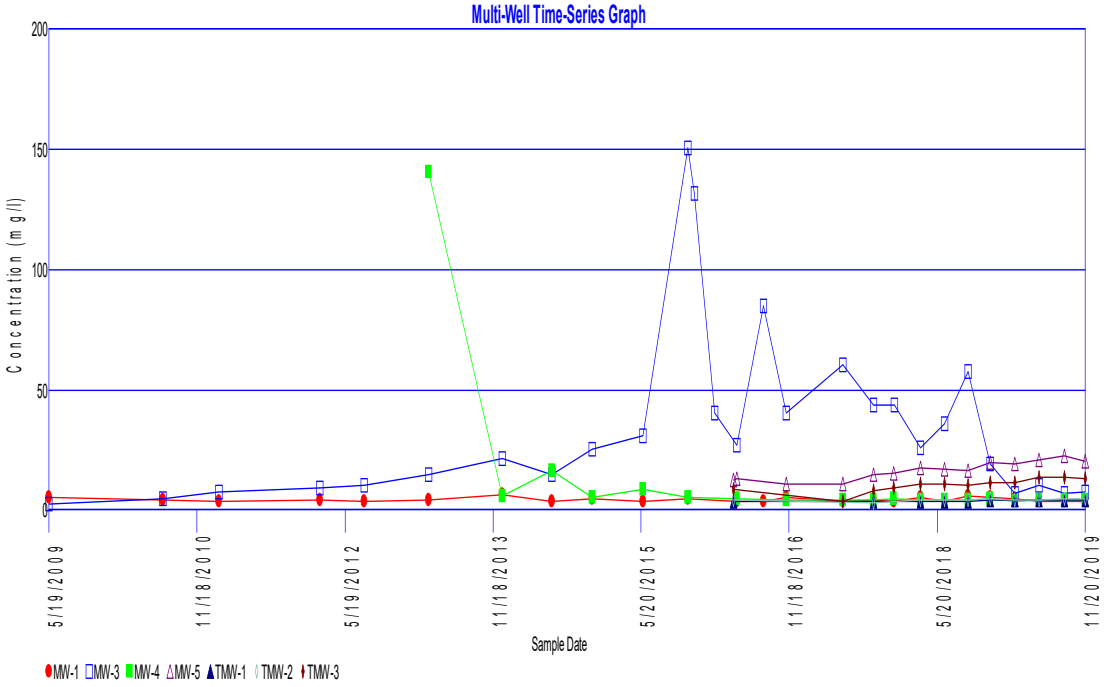
Potassium



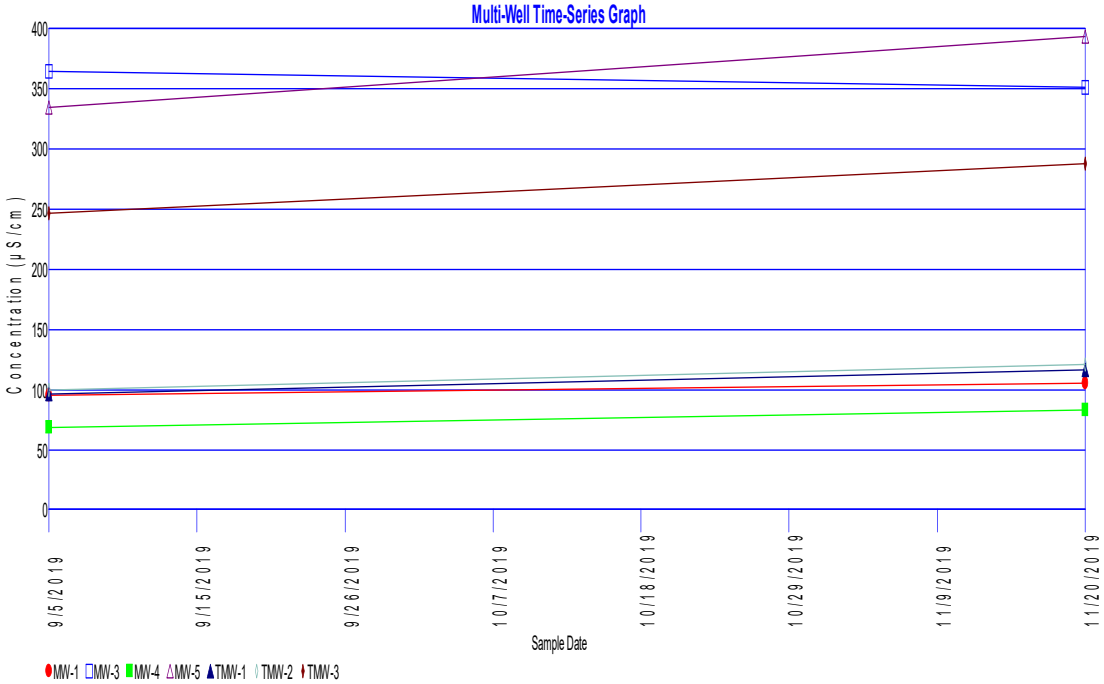

Selenium
Multi-Well Time-Series Graph
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Concentration (mg/l)
4/19/2008
12/14/2009
8/11/2011
4/6/2013
12/2/2014
7/28/2016
3/25/2018
11/20/2019
Sample Date
MW-1 MW-3 MW-4 MW-5 TMW-1 TMW-2 TMW-3


Silver
Multi-Well Time-Series Graph
0.01
0.008
0.006
0.004
0.002
0
Concentration (mg/l)
4/19/2008
12/14/2009
8/11/2011
4/6/2013
12/2/2014
7/28/2016
3/25/2018
11/20/2019
Sample Date
MW-1 MW-3 MW-4 MW-5 TMW-1 TMW-2 TMW-3

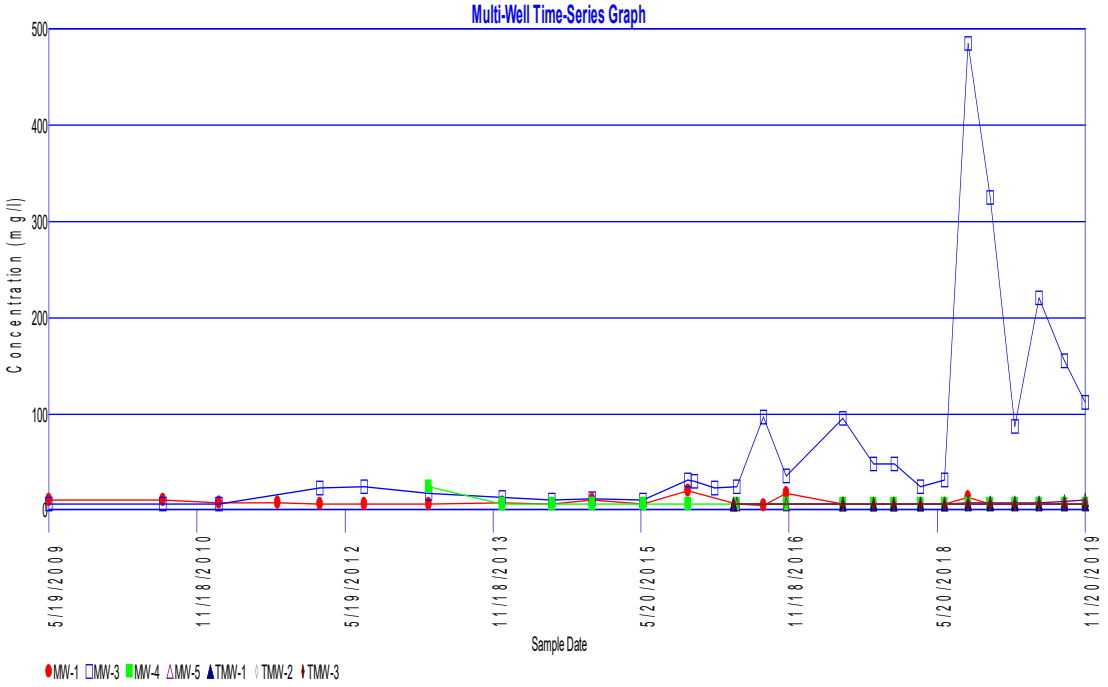
Sodium



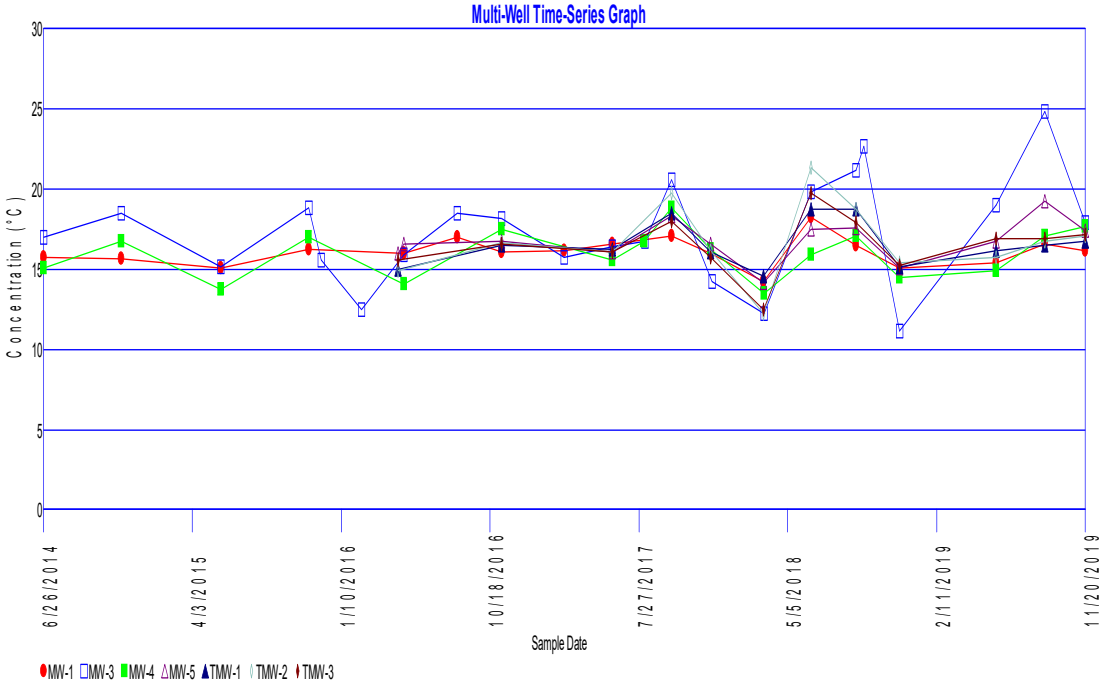
Specific Conductivity

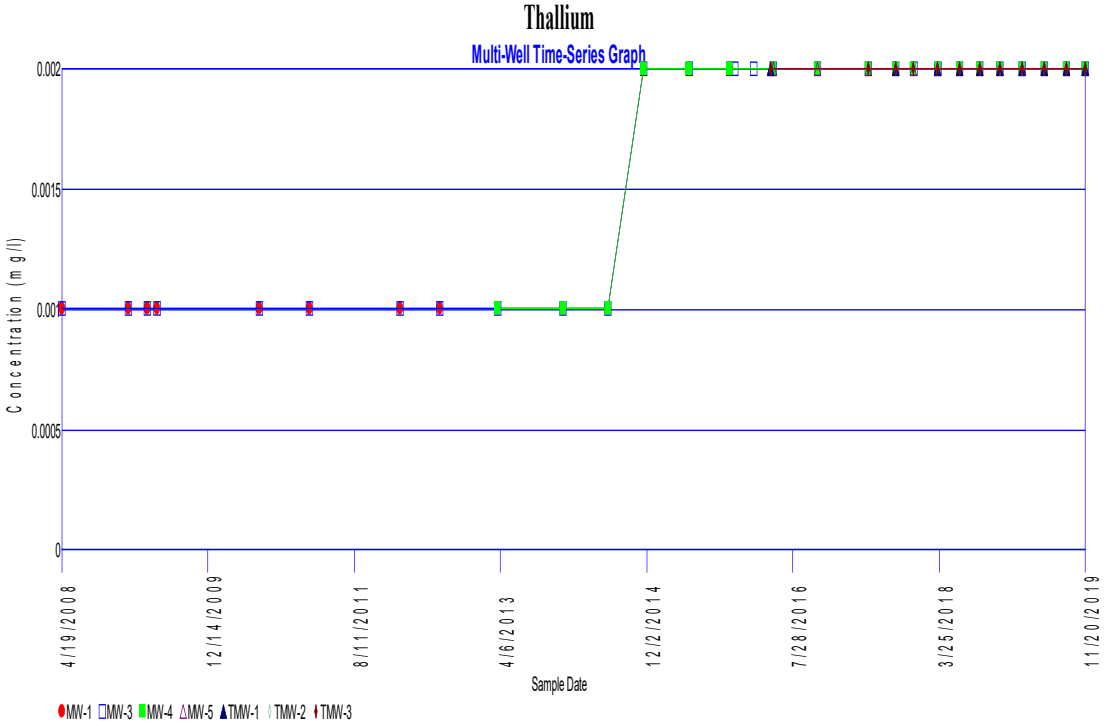


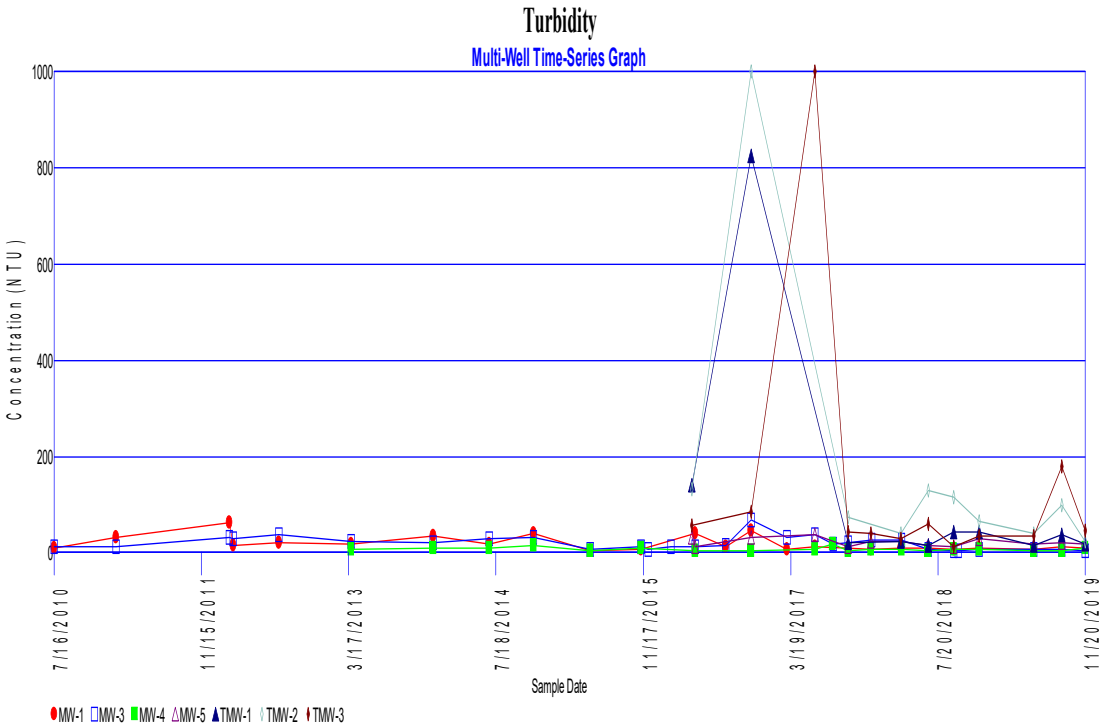
Sulfate



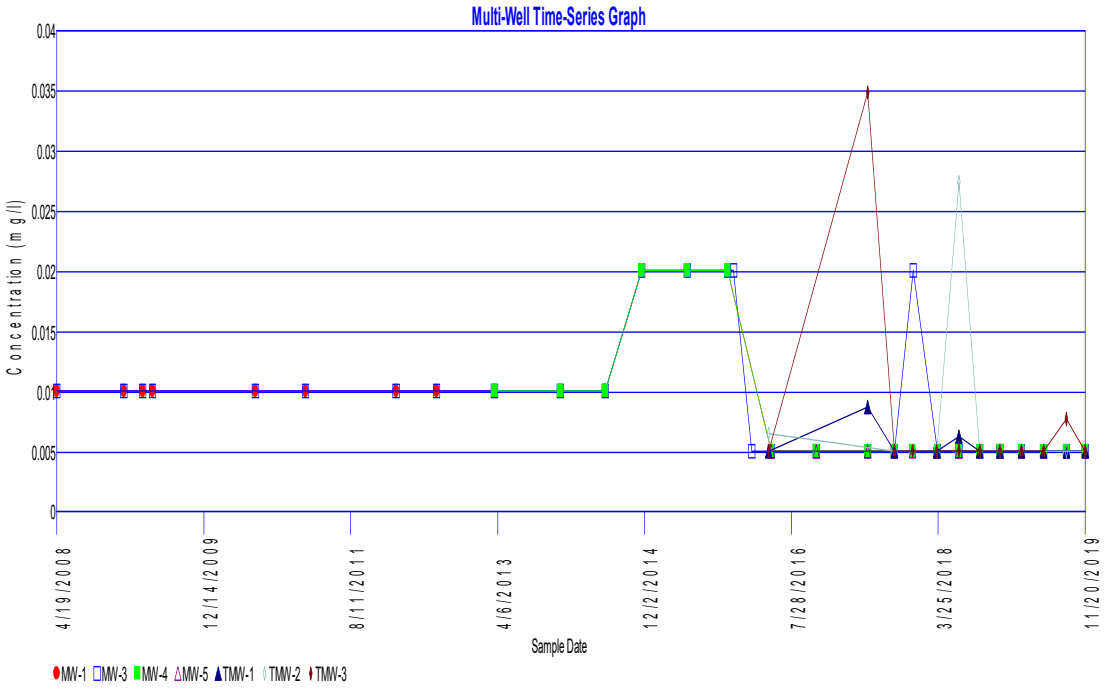
Temperature



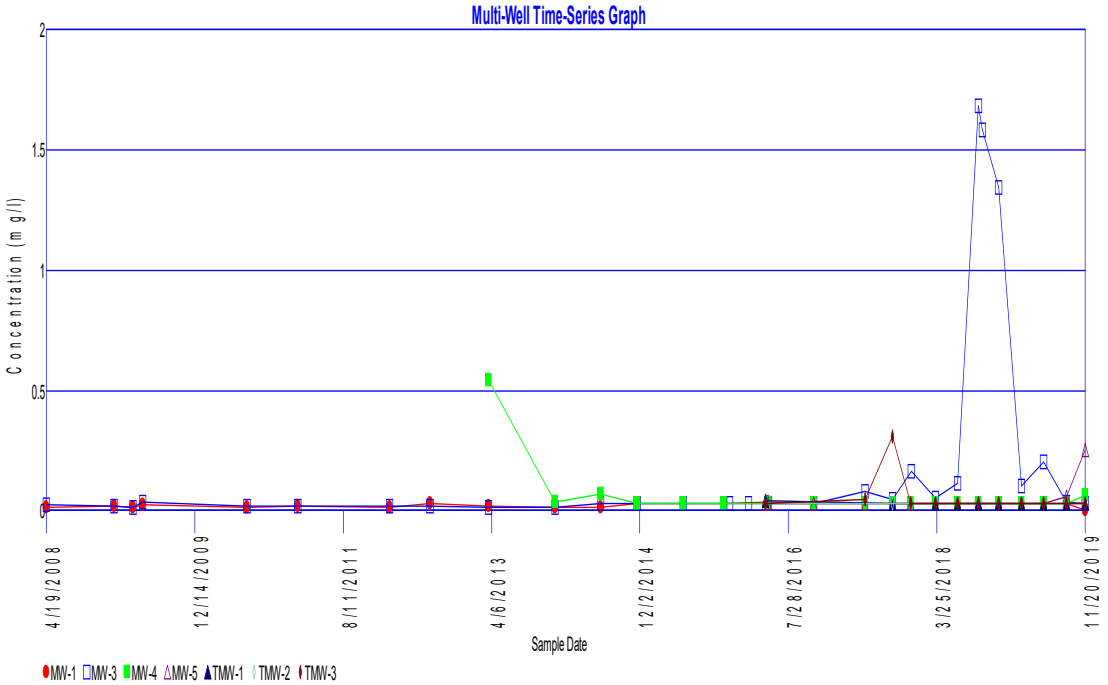

Thallium
Multi-Well Time-Series Graph
0.002
0.0015
0.001
0.0005
0
Concentration (mg/l)
4/19/2008
12/14/2009
8/11/2011
4/6/2013
12/2/2014
7/28/2016
3/25/2018
11/20/2019
Sample Date
MW-1 MW-3 MW-4 MW-5 TMW-1 TMW-2 TMW-3


Turbidity
Multi-Well Time-Series Graph
1000
800
600
400
200
0
Concentration (NTU)
7/16/2010
11/15/2011
3/17/2013
7/18/2014
11/17/2015
3/19/2017
7/20/2018
11/20/2019
Sample Date
MW-1 MW-3 MW-4 MW-5 TMW-1 TMW-2 TMW-3

Vanadium



Zinc



Shapiro-Wilks Test of Normality

Parameter: Arsenic
Location: MW-1
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
K = 13 for 27 measurements

Sum of b values = 0.141084
Sample Standard Deviation = 0.0285898
W Statistic = 0.936616

5% Critical value of 0.923 is less than 0.936616
Data is normally distributed at 95% level of significance

1% Critical value of 0.894 is less than 0.936616
Data is normally distributed at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Barium
Location: MW-1
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
K = 13 for 27 measurements

Sum of b values = 0.0436993
Sample Standard Deviation = 0.01284
W Statistic = 0.4455

5% Critical value of 0.923 exceeds 0.4455
Evidence of non-normality at 95% level of significance

1% Critical value of 0.894 exceeds 0.4455
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Chloride
Location: MW-1
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
K = 14 for 28 measurements

Sum of b values = 5.02163
Sample Standard Deviation = 1.05258
W Statistic = 0.84298

5% Critical value of 0.924 exceeds 0.84298
Evidence of non-normality at 95% level of significance

1% Critical value of 0.896 exceeds 0.84298
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Cobalt
Location: MW-1
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
K = 13 for 27 measurements

Sum of b values = 0.0564647
Sample Standard Deviation = 0.0117782
W Statistic = 0.883947

5% Critical value of 0.923 exceeds 0.883947
Evidence of non-normality at 95% level of significance

1% Critical value of 0.894 exceeds 0.883947
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Mercury
Location: MW-1
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
K = 13 for 27 measurements

Sum of b values = 0.0025262
Sample Standard Deviation = 0.000614189
W Statistic = 0.650664

5% Critical value of 0.923 exceeds 0.650664
Evidence of non-normality at 95% level of significance

1% Critical value of 0.894 exceeds 0.650664
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Nickel
Location: MW-1
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
K = 13 for 27 measurements

Sum of b values = 0.15384
Sample Standard Deviation = 0.0466219
W Statistic = 0.418779

5% Critical value of 0.923 exceeds 0.418779
Evidence of non-normality at 95% level of significance

1% Critical value of 0.894 exceeds 0.418779
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Barium
Location: MW-1
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 13 for 27 measurements

Sum of b values = 1.37134
Sample Standard Deviation = 0.325523
W Statistic = 0.682577

5% Critical value of 0.923 exceeds 0.682577
Evidence of non-normality at 95% level of significance

1% Critical value of 0.894 exceeds 0.682577
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Chloride
Location: MW-1
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 14 for 28 measurements

Sum of b values = 1.69352
Sample Standard Deviation = 0.338448
W Statistic = 0.927327

5% Critical value of 0.924 is less than 0.927327
Data is normally distributed at 95% level of significance

1% Critical value of 0.896 is less than 0.927327
Data is normally distributed at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Cobalt
Location: MW-1
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 13 for 27 measurements

Sum of b values = 1.53124
Sample Standard Deviation = 0.306149
W Statistic = 0.962158

5% Critical value of 0.923 is less than 0.962158
Data is normally distributed at 95% level of significance

1% Critical value of 0.894 is less than 0.962158
Data is normally distributed at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Mercury
Location: MW-1
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 13 for 27 measurements

Sum of b values = 5.00049
Sample Standard Deviation = 1.04606
W Statistic = 0.878892

5% Critical value of 0.923 exceeds 0.878892
Evidence of non-normality at 95% level of significance

1% Critical value of 0.894 exceeds 0.878892
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Nickel
Location: MW-1
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 13 for 27 measurements

Sum of b values = 3.5064
Sample Standard Deviation = 0.888096
W Statistic = 0.599556

5% Critical value of 0.923 exceeds 0.599556
Evidence of non-normality at 95% level of significance

1% Critical value of 0.894 exceeds 0.599556
Evidence of non-normality at 99% level of significance

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-1

Parameter: Chloride

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	4/19/2008	0.693147
	1/21/2009	1.06471
	4/9/2009	0.641854
	5/19/2009	1.02962
	7/16/2010	1.02962
	2/8/2011	0.955511
	2/17/2012	0.741937
	7/31/2012	0.788457
	3/27/2013	0.587787
	12/23/2013	0.405465
	6/26/2014	1.06471
	11/21/2014	1.36098
	5/28/2015	0.698135
	11/11/2015	1.37877
	5/9/2016	0.751416
	8/18/2016	0.875469
	11/10/2016	1.52388
	6/8/2017	1.73695
	9/28/2017	1.41342
	12/11/2017	0.837248
	3/21/2018	0.741937
	6/19/2018	0.806476
	9/12/2018	1.59737
	12/4/2018	0.512824
	3/5/2019	0.746688
	6/4/2019	0.765468
	9/5/2019	1.0438

From 27 baseline samples
Baseline mean = 0.95532
Baseline std Dev = 0.344844

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.01/1) = 99 %
t is Percentile of Student's T-Test (0.99/1) = 0.99
Degrees of Freedom = 27 (background observations) - 1
t(0.99, 26) = 2.47863

Date	Samples	Mean	Interval	Significant
11/20/2019	1	0.924259	[0, 1.82574]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-1

Parameter: Cobalt

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	4/19/2008	-3.44202
	1/21/2009	-3.50656
	4/9/2009	-3.14656
	5/19/2009	-2.8824
	7/16/2010	-3.35241
	2/8/2011	-3.47377
	2/17/2012	-3.64966
	7/31/2012	-3.57555
	3/27/2013	-3.32424
	12/23/2013	-3.57555
	6/26/2014	-3.32424
	11/21/2014	-3.07911
	5/28/2015	-3.19418
	11/11/2015	-3.66126
	5/9/2016	-3.17725
	11/10/2016	-3.93223
	6/8/2017	-3.37553
	9/28/2017	-3.2114
	12/11/2017	-3.19175
	3/21/2018	-3.15825
	6/19/2018	-3.88246
	9/12/2018	-3.92207
	12/4/2018	-3.56137
	3/5/2019	-3.23145
	6/4/2019	-3.19175
	9/5/2019	-2.57308

From 26 baseline samples
Baseline mean = -3.36908
Baseline std Dev = 0.312086

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.01/1) = 99 %
t is Percentile of Student's T-Test (0.99/1) = 0.99
Degrees of Freedom = 26 (background observations) - 1
t(0.99, 25) = 2.4851

Date	Samples	Mean	Interval	Significant
11/20/2019	1	-3.41428	[0, -2.57874]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-1

Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	4/19/2008	0.024
	1/21/2009	0.072
	4/9/2009	0.067
	5/19/2009	0.064
	7/16/2010	0.074
	2/8/2011	0.086
	2/17/2012	0.093
	7/31/2012	0.089
	3/27/2013	0.049
	12/23/2013	0.1
	6/26/2014	0.063
	11/21/2014	0.059
	5/28/2015	0.0604
	11/11/2015	0.0469
	5/9/2016	0.05
	11/10/2016	0.0286
	6/8/2017	0.0571
	9/28/2017	0.0199
	12/11/2017	0.0573
	3/21/2018	0.0101
	6/19/2018	0.0063
	9/12/2018	0.0184
	12/4/2018	0.0254
	3/5/2019	0.00449
	6/4/2019	0.0194
	9/5/2019	0.0176

From 26 baseline samples
Baseline mean = 0.0485342
Baseline std Dev = 0.0285169

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 26 (background observations) - 1
t(0.95, 26) = 1.70814

Date	Samples	Mean	Interval	Significant
11/20/2019	1	0.0176	[0, 0.0981729]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Barium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 26
Maximum Baseline Concentration = 0.084
Confidence Level = 96.3%
False Positive Rate = 3.7%

Baseline Measurem	Date	Value
	4/19/2008	0.084
	1/21/2009	0.028
	4/9/2009	0.028
	5/19/2009	0.033
	7/16/2010	0.021
	2/8/2011	0.021
	2/17/2012	0.022
	7/31/2012	0.019
	3/27/2013	0.018
	12/23/2013	0.017
	6/26/2014	0.018
	11/21/2014	0.02
	5/28/2015	0.0188
	11/11/2015	0.0237
	5/9/2016	0.02
	11/10/2016	0.0207
	6/8/2017	0.0146
	9/28/2017	0.0175
	12/11/2017	0.0166
	3/21/2018	0.0212
	6/19/2018	0.0163
	9/12/2018	0.0186
	12/4/2018	0.0199
	3/5/2019	0.0184
	6/4/2019	0.0219
	9/5/2019	0.0199

Date	Count	Mean	Significant
11/20/2019	1	0.0194	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Mercury

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 34.6154%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 26
Maximum Baseline Concentration = 0.00319
Confidence Level = 96.3%
False Positive Rate = 3.7%

Baseline Measurem	Date	Value
	4/19/2008	ND<0.0002
	1/21/2009	0.00045
	4/9/2009	ND<0.0002
	5/19/2009	ND<0.0002
	7/16/2010	0.0005
	2/8/2011	0.00024
	2/17/2012	0.00083
	7/31/2012	0.00063
	3/27/2013	0.00028
	12/23/2013	0.00077
	6/26/2014	ND<0.0002
	11/21/2014	ND<0.0002
	5/28/2015	ND<0.0002
	11/11/2015	ND<0.0002
	5/9/2016	0.000858
	11/10/2016	ND<0.0002
	6/8/2017	0.000222
	9/28/2017	ND<0.0002
	12/11/2017	0.000473
	3/21/2018	0.000651
	6/19/2018	0.00319
	9/12/2018	0.000244
	12/4/2018	0.00101
	3/5/2019	0.000922
	6/4/2019	0.000889
	9/5/2019	0.00108

Date	Count	Mean	Significant
11/20/2019	1	0.00121	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Nickel

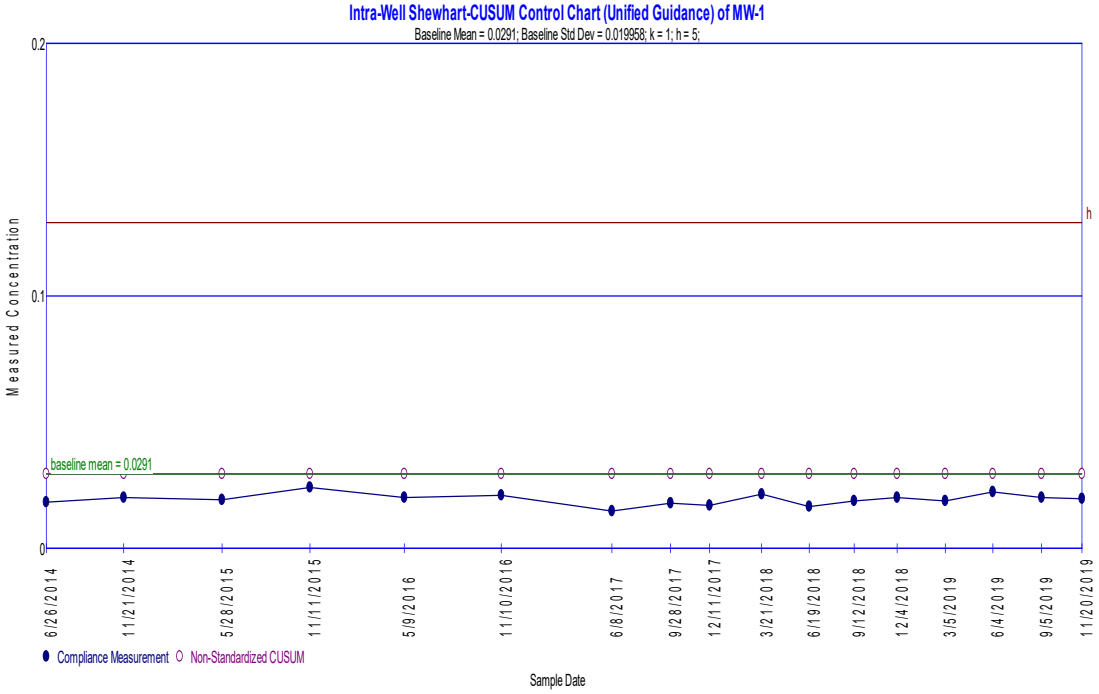
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 42.3077%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 26
Maximum Baseline Concentration = 0.2
Confidence Level = 96.3%
False Positive Rate = 3.7%

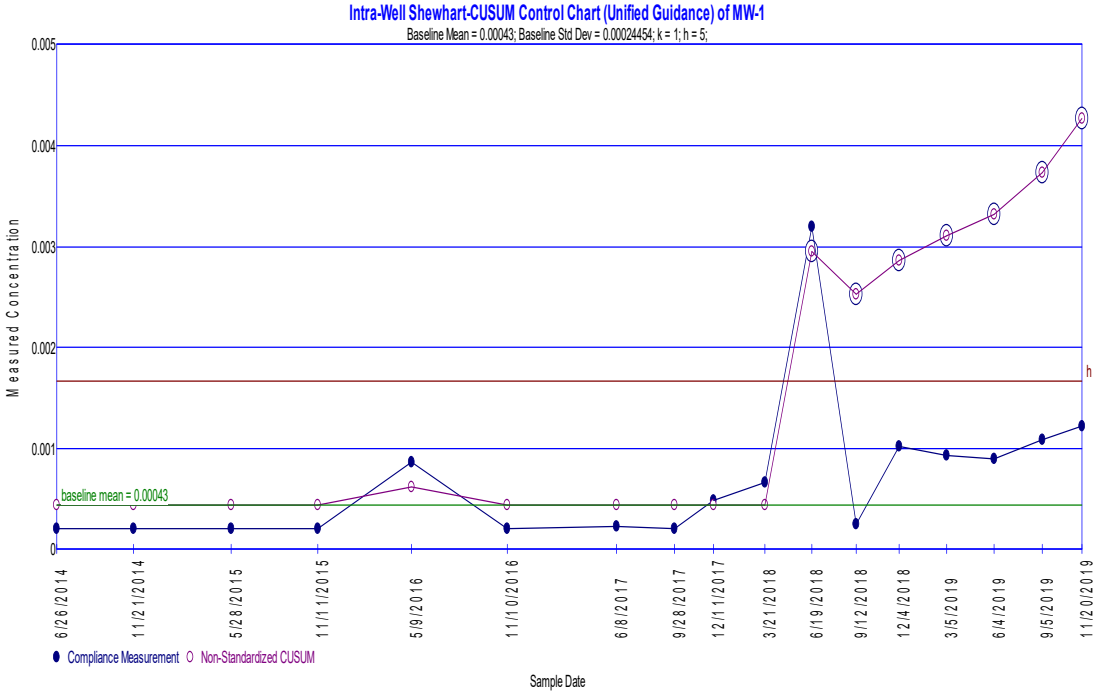
Baseline Measurem	Date	Value
	4/19/2008	ND<0.02
	1/21/2009	ND<0.02
	4/9/2009	0.2
	5/19/2009	0.17
	7/16/2010	ND<0.02
	2/8/2011	ND<0.02
	2/17/2012	ND<0.02
	7/31/2012	ND<0.02
	3/27/2013	ND<0.02
	12/23/2013	ND<0.02
	6/26/2014	ND<0.02
	11/21/2014	ND<0.02
	5/28/2015	ND<0.02
	11/11/2015	0.0112
	5/9/2016	0.00512
	11/10/2016	0.0112
	6/8/2017	0.00418
	9/28/2017	0.00445
	12/11/2017	0.00652
	3/21/2018	0.00658
	6/19/2018	0.00637
	9/12/2018	0.00839
	12/4/2018	0.00744
	3/5/2019	0.00638
	6/4/2019	0.0088
	9/5/2019	0.00686

Date	Count	Mean	Significant
11/20/2019	1	0.00468	FALSE

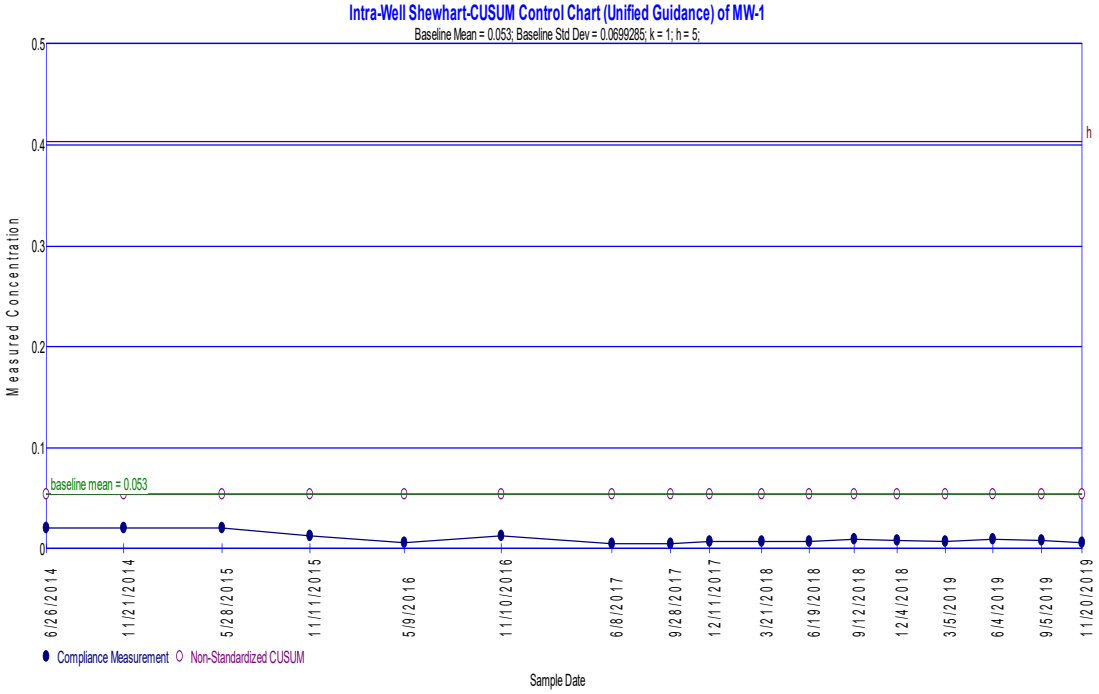
Barium



Mercury



Nickel


Intra-Well Shewhart-CUSUM Control Chart (Unified Guidance) of MW-1
Baseline Mean = 0.053; Baseline Std Dev = 0.0699285; k = 1; h = 5;
Measured Concentration
0.5
0.4
0.3
0.2
0.1
0
h
baseline mean = 0.053
6/26/2014
11/21/2014
5/28/2015
11/11/2015
5/9/2016
11/10/2016
6/8/2017
9/28/2017
12/11/2017
3/21/2018
6/19/2018
9/12/2018
12/4/2018
3/5/2019
6/4/2019
9/5/2019
11/20/2019
Compliance Measurement
Non-Standardized CUSUM
Sample Date

Shapiro-Francia Test of Normality

Parameter: Aluminum

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 120

Data Set Standard Deviation = 1.30741
Numerator = 7393.31
Denominator = 22919.4
W Statistic = 0.322579 = 7393.31 / 22919.4

5% Critical value of 0.976 exceeds 0.322579
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.322579
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Barium

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 121

Data Set Standard Deviation = 0.0930256
Numerator = 52.5893
Denominator = 118.065
W Statistic = 0.445428 = 52.5893 / 118.065

5% Critical value of 0.976 exceeds 0.445428
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.445428
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Total Cadmium

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 121

Data Set Standard Deviation = 0.0350247
Numerator = 2.75523
Denominator = 16.7365
W Statistic = 0.164625 = 2.75523 / 16.7365

5% Critical value of 0.976 exceeds 0.164625
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.164625
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Chloride

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 131

Data Set Standard Deviation = 64.7236
Numerator = 3.70709e+007
Denominator = 6.73572e+007
W Statistic = 0.550362 = 3.70709e+007 / 6.73572e+007

5% Critical value of 0.976 exceeds 0.550362
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.550362
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Cobalt

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 120

Data Set Standard Deviation = 0.0147305
Numerator = 2.03101
Denominator = 2.90948
W Statistic = 0.698068 = 2.03101 / 2.90948

5% Critical value of 0.976 exceeds 0.698068
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.698068
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Chromium

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 120

Data Set Standard Deviation = 0.0154563
Numerator = 0.846612
Denominator = 3.20322
W Statistic = 0.2643 = 0.846612 / 3.20322

5% Critical value of 0.976 exceeds 0.2643
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.2643
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Copper

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 119

Data Set Standard Deviation = 0.00247666
Numerator = 0.0286138
Denominator = 0.080734
W Statistic = 0.354421 = 0.0286138 / 0.080734

5% Critical value of 0.976 exceeds 0.354421
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.354421
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Fluoride

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 91

Data Set Standard Deviation = 0.0665284
Numerator = 11.3972
Denominator = 33.534
W Statistic = 0.33987 = 11.3972 / 33.534

5% Critical value of 0.973 exceeds 0.33987
Evidence of non-normality at 95% level of significance

1% Critical value of 0.962 exceeds 0.33987
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Lead

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 120

Data Set Standard Deviation = 0.00119626
Numerator = 0.00876948
Denominator = 0.0191881
W Statistic = 0.457027 = 0.00876948 / 0.0191881

5% Critical value of 0.976 exceeds 0.457027
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.457027
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Nickel

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 122

Data Set Standard Deviation = 0.0288889
Numerator = 4.60275
Denominator = 11.5684
W Statistic = 0.397873 = 4.60275 / 11.5684

5% Critical value of 0.976 exceeds 0.397873
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.397873
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Zinc

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 122

Data Set Standard Deviation = 0.241442
Numerator = 172.371
Denominator = 808.045
W Statistic = 0.213319 = 172.371 / 808.045

5% Critical value of 0.976 exceeds 0.213319
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.213319
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Sulfate

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Number of Measurements = 122

Data Set Standard Deviation = 58.3375
Numerator = 1.27907e+007
Denominator = 4.71743e+007
W Statistic = 0.271137 = 1.27907e+007 / 4.71743e+007

5% Critical value of 0.976 exceeds 0.271137
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.271137
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Aluminum

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 120

Data Set Standard Deviation = 1.28583
Numerator = 19683.4
Denominator = 22168.9
W Statistic = 0.887883 = 19683.4 / 22168.9

5% Critical value of 0.976 exceeds 0.887883
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.887883
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Barium

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 121

Data Set Standard Deviation = 0.954045
Numerator = 11965.9
Denominator = 12418
W Statistic = 0.963591 = 11965.9 / 12418

5% Critical value of 0.976 exceeds 0.963591
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.963591
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Total Cadmium

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 121

Data Set Standard Deviation = 1.68657
Numerator = 15235.5
Denominator = 38808
W Statistic = 0.392587 = 15235.5 / 38808

5% Critical value of 0.976 exceeds 0.392587
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.392587
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Chloride

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 131

Data Set Standard Deviation = 1.34892
Numerator = 28730
Denominator = 29257.1
W Statistic = 0.981986 = 28730 / 29257.1

5% Critical value of 0.976 is less than 0.981986
Data is normally distributed at 95% level of significance

1% Critical value of 0.967 is less than 0.981986
Data is normally distributed at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Chromium

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 120

Data Set Standard Deviation = 0.979526
Numerator = 9943.58
Denominator = 12865
W Statistic = 0.772917 = 9943.58 / 12865

5% Critical value of 0.976 exceeds 0.772917
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.772917
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Cobalt

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 120

Data Set Standard Deviation = 1.39075
Numerator = 21798.9
Denominator = 25934.5
W Statistic = 0.840539 = 21798.9 / 25934.5

5% Critical value of 0.976 exceeds 0.840539
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.840539
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Copper

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 119

Data Set Standard Deviation = 0.508555
Numerator = 2342.44
Denominator = 3404.09
W Statistic = 0.688125 = 2342.44 / 3404.09

5% Critical value of 0.976 exceeds 0.688125
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.688125
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Fluoride

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 91

Data Set Standard Deviation = 0.549861
Numerator = 992.536
Denominator = 2290.75
W Statistic = 0.43328 = 992.536 / 2290.75

5% Critical value of 0.973 exceeds 0.43328
Evidence of non-normality at 95% level of significance

1% Critical value of 0.962 exceeds 0.43328
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Lead

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 120

Data Set Standard Deviation = 0.485111
Numerator = 1932.81
Denominator = 3155.44
W Statistic = 0.612533 = 1932.81 / 3155.44

5% Critical value of 0.976 exceeds 0.612533
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.612533
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Nickel

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 122

Data Set Standard Deviation = 1.36869
Numerator = 21937.2
Denominator = 25967
W Statistic = 0.844811 = 21937.2 / 25967

5% Critical value of 0.976 exceeds 0.844811
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.844811
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Zinc

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 122

Data Set Standard Deviation = 1.10534
Numerator = 10308.5
Denominator = 16935.6
W Statistic = 0.608686 = 10308.5 / 16935.6

5% Critical value of 0.976 exceeds 0.608686
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.608686
Evidence of non-normality at 99% level of significance

Shapiro-Francia Test of Normality

Parameter: Sulfate

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
Total Number of Measurements = 122

Data Set Standard Deviation = 1.22862
Numerator = 14022.2
Denominator = 20924
W Statistic = 0.670151 = 14022.2 / 20924

5% Critical value of 0.976 exceeds 0.670151
Evidence of non-normality at 95% level of significance

1% Critical value of 0.967 exceeds 0.670151
Evidence of non-normality at 99% level of significance

Parametric Prediction Interval Analysis

Inter-Well Comparison

Parameter: Chloride

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Inter-Well Unified Guid. Formula 95% One-Sided Comparison

Background Samples = 28
Background Mean = 0.954211
Background Std Dev = 0.338448

Number of comparisons = 6
Future Samples (k) = 6
Actual confidence level is 1.0 - (0.05/6) = 99.1667 %
t is Percentile of Student's T-Test (0.95/6) = 0.991667
Degrees of Freedom = 28 (background observations) - 1
t(0.991667, 28) = 2.572

Well MW-3

Date	Samples	Mean	Interval	Significant
11/20/2019	1	2.96011	[0, 1.84011]	TRUE

Well MW-4

Date	Samples	Mean	Interval	Significant
11/20/2019	1	2.1702	[0, 1.84011]	TRUE

Well MW-5

Date	Samples	Mean	Interval	Significant
11/20/2019	1	4.42485	[0, 1.84011]	TRUE

Well TMW-1

Date	Samples	Mean	Interval	Significant
11/20/2019	1	2.92316	[0, 1.84011]	TRUE

Well TMW-2

Date	Samples	Mean	Interval	Significant
11/20/2019	1	3.12236	[0, 1.84011]	TRUE

Well TMW-3

Date	Samples	Mean	Interval	Significant
11/20/2019	1	4.11251	[0, 1.84011]	TRUE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Total Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 89.2562%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 26
Maximum Background Value = 0.001
Confidence Level = 81.3%
False Positive Rate = 18.7%

Location	Date	Count	Mean	Significant
MW-3	11/20/2019	1	0	FALSE
MW-4	11/20/2019	1	0	FALSE
MW-5	11/20/2019	1	0.001	FALSE
TMW-1	11/20/2019	1	0.001	FALSE
TMW-2	11/20/2019	1	0.001	FALSE
TMW-3	11/20/2019	1	0.001	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Chromium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 74.1667%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 27
Maximum Background Value = 0.12
Confidence Level = 81.8%
False Positive Rate = 18.2%

Location	Date	Count	Mean	Significant
MW-3	11/20/2019	1	0.002	FALSE
MW-4	11/20/2019	1	0.002	FALSE
MW-5	11/20/2019	1	0.00219	FALSE
TMW-1	11/20/2019	1	0.002	FALSE
TMW-2	11/20/2019	1	0.002	FALSE
TMW-3	11/20/2019	1	0.002	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Cobalt

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 58.3333%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 27
Maximum Background Value = 0.0763
Confidence Level = 81.8%
False Positive Rate = 18.2%

Location	Date	Count	Mean	Significant
MW-3	11/20/2019	1	0.002	FALSE
MW-4	11/20/2019	1	0.002	FALSE
MW-5	11/20/2019	1	0.00261	FALSE
TMW-1	11/20/2019	1	0.002	FALSE
TMW-2	11/20/2019	1	0.002	FALSE
TMW-3	11/20/2019	1	0.002	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Copper

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 84.0336%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 27
Maximum Background Value = 0.028
Confidence Level = 81.8%
False Positive Rate = 18.2%

Location	Date	Count	Mean	Significant
MW-3	11/20/2019	1	0.005	FALSE
MW-4	11/20/2019	1	0.005	FALSE
MW-5	11/20/2019	1	0.00553	FALSE
TMW-1	11/20/2019	1	0.005	FALSE
TMW-2	11/20/2019	1	0.005	FALSE
TMW-3	11/20/2019	1	0.005	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Fluoride

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 85.7143%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 17
Maximum Background Value = 0.178
Confidence Level = 73.9%
False Positive Rate = 26.1%

Location	Date	Count	Mean	Significant
MW-3	**11/20/2019**	**1**	**0.197**	**TRUE**
MW-4	11/20/2019	1	0.1	FALSE
MW-5	11/20/2019	1	0.1	FALSE
TMW-1	11/20/2019	1	0.1	FALSE
TMW-2	11/20/2019	1	0.1	FALSE
TMW-3	11/20/2019	1	0.1	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 90%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 27
Maximum Background Value = 0.0094
Confidence Level = 81.8%
False Positive Rate = 18.2%

Location	Date	Count	Mean	Significant
MW-3	11/20/2019	1	0.002	FALSE
MW-4	11/20/2019	1	0.002	FALSE
MW-5	11/20/2019	1	0.00517	FALSE
TMW-1	11/20/2019	1	0.002	FALSE
TMW-2	11/20/2019	1	0.002	FALSE
TMW-3	11/20/2019	1	0.002	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Nickel

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 60.6557%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 27
Maximum Background Value = 0.2
Confidence Level = 81.8%
False Positive Rate = 18.2%

Location	Date	Count	Mean	Significant
MW-3	11/20/2019	1	0.00237	FALSE
MW-4	11/20/2019	1	0.002	FALSE
MW-5	11/20/2019	1	0.00862	FALSE
TMW-1	11/20/2019	1	0.002	FALSE
TMW-2	11/20/2019	1	0.002	FALSE
TMW-3	11/20/2019	1	0.002	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Sulfate

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 63.9344%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 26
Maximum Background Value = 18.8
Confidence Level = 81.3%
False Positive Rate = 18.7%

Location	Date	Count	Mean	Significant
MW-3	**11/20/2019**	**1**	**111**	**TRUE**
MW-4	11/20/2019	1	5	FALSE
MW-5	11/20/2019	1	8.5	FALSE
TMW-1	11/20/2019	1	5	FALSE
TMW-2	11/20/2019	1	5	FALSE
TMW-3	11/20/2019	1	5	FALSE

Non-Parametric Prediction Interval

Inter-Well Comparison

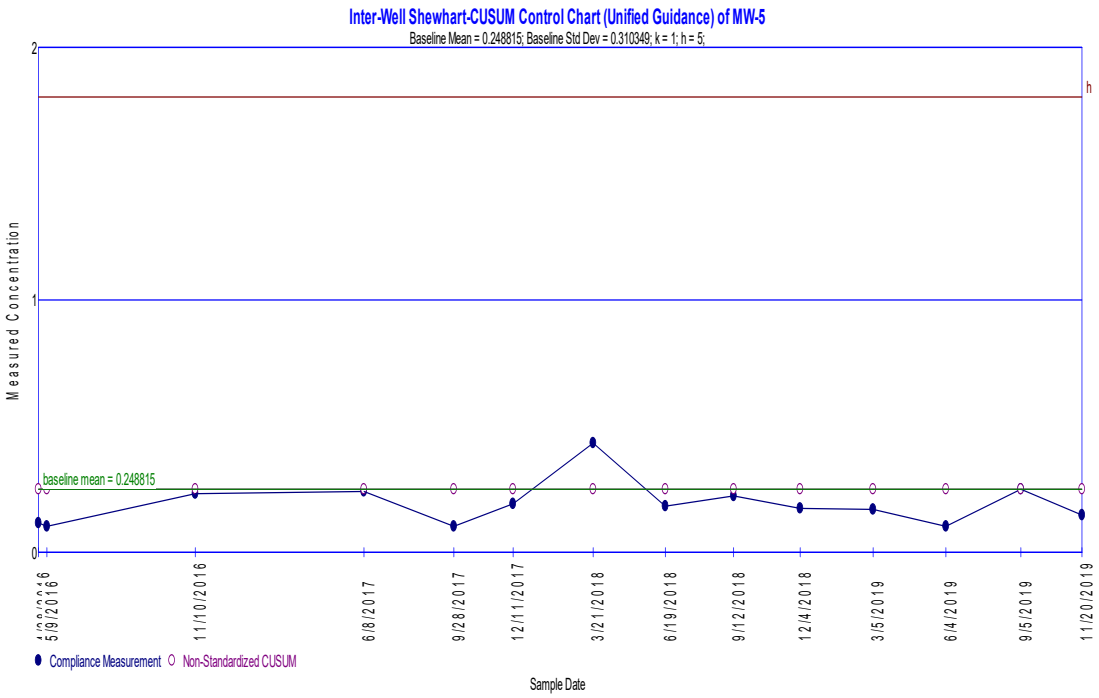
Parameter: Zinc

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

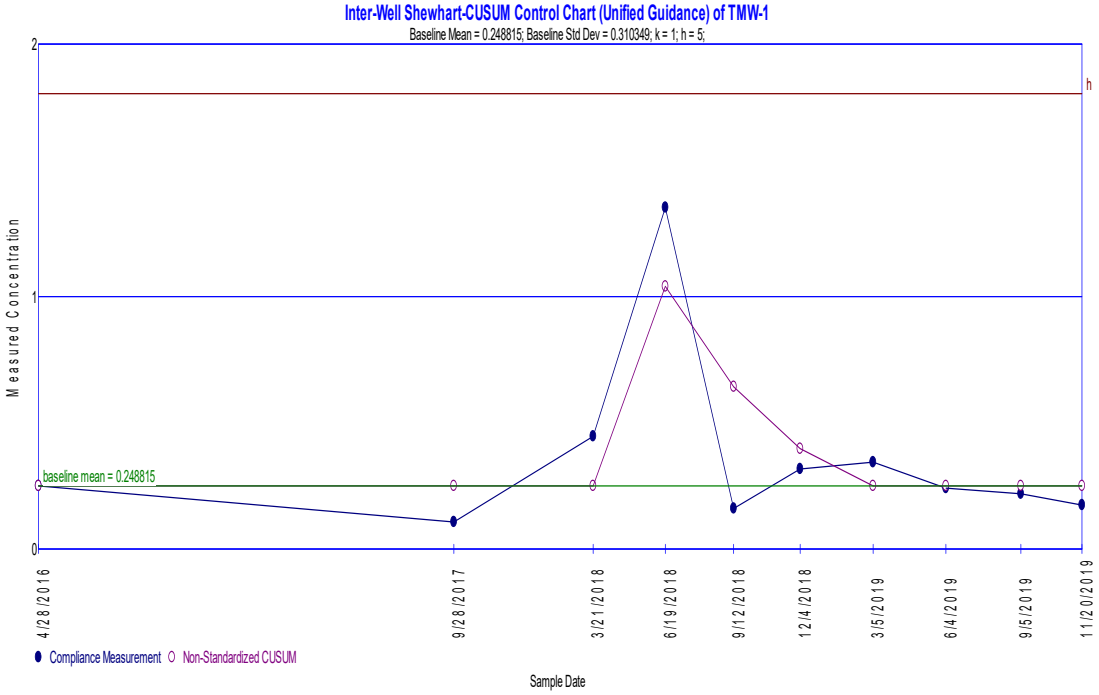
Total Percent Non-Detects = 64.7541%
Number of comparisons = 6
Future Samples (k) = 6
Recent Dates = 1
Background Measurements (n) = 27
Maximum Background Value = 0.0281
Confidence Level = 81.8%
False Positive Rate = 18.2%

Location	Date	Count	Mean	Significant
MW-3	11/20/2019	1	0.0251	FALSE
MW-4	**11/20/2019**	**1**	**0.0579**	**TRUE**
MW-5	**11/20/2019**	**1**	**0.247**	**TRUE**
TMW-1	11/20/2019	1	0.025	FALSE
TMW-2	11/20/2019	1	0.025	FALSE
TMW-3	11/20/2019	1	0.025	FALSE

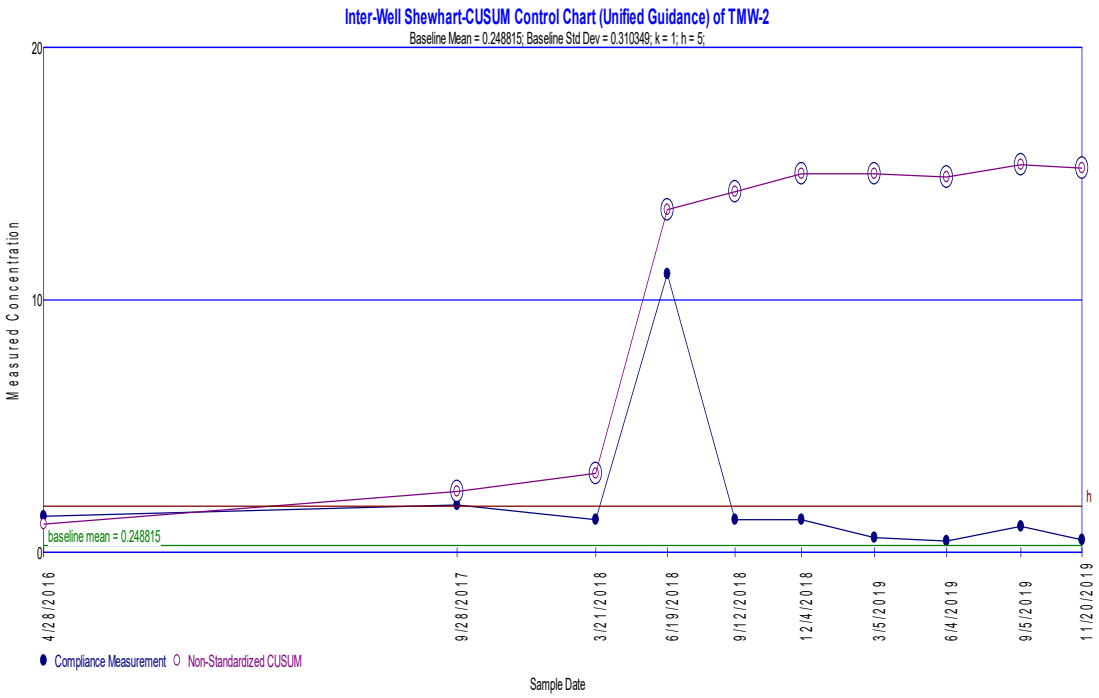
Aluminum



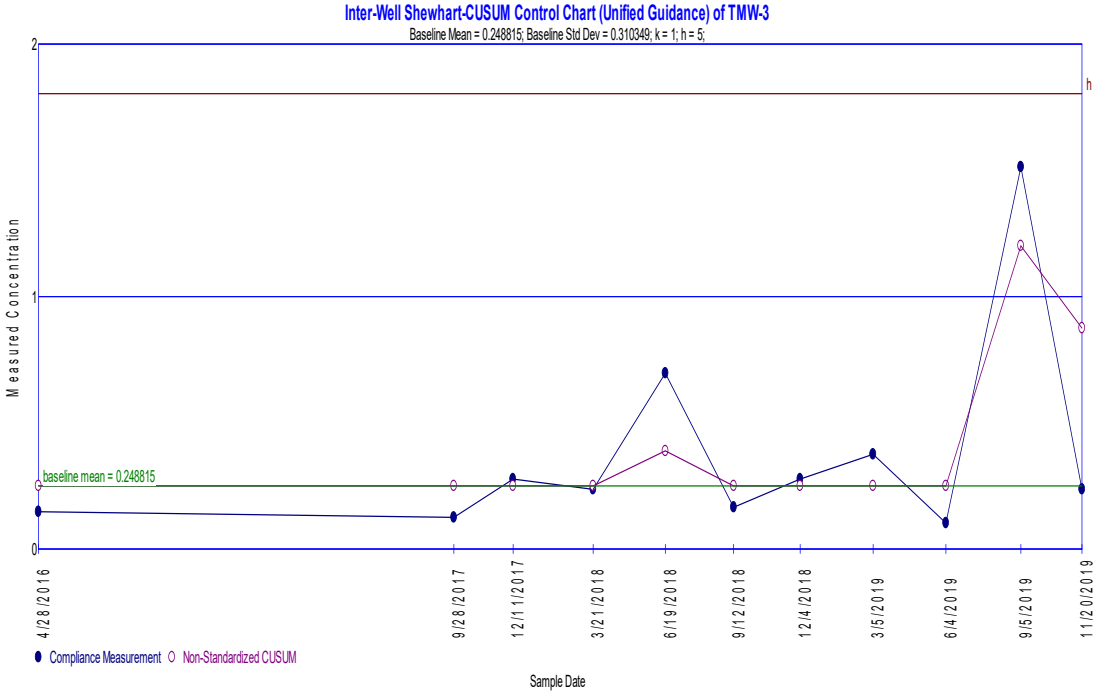
Aluminum



Aluminum



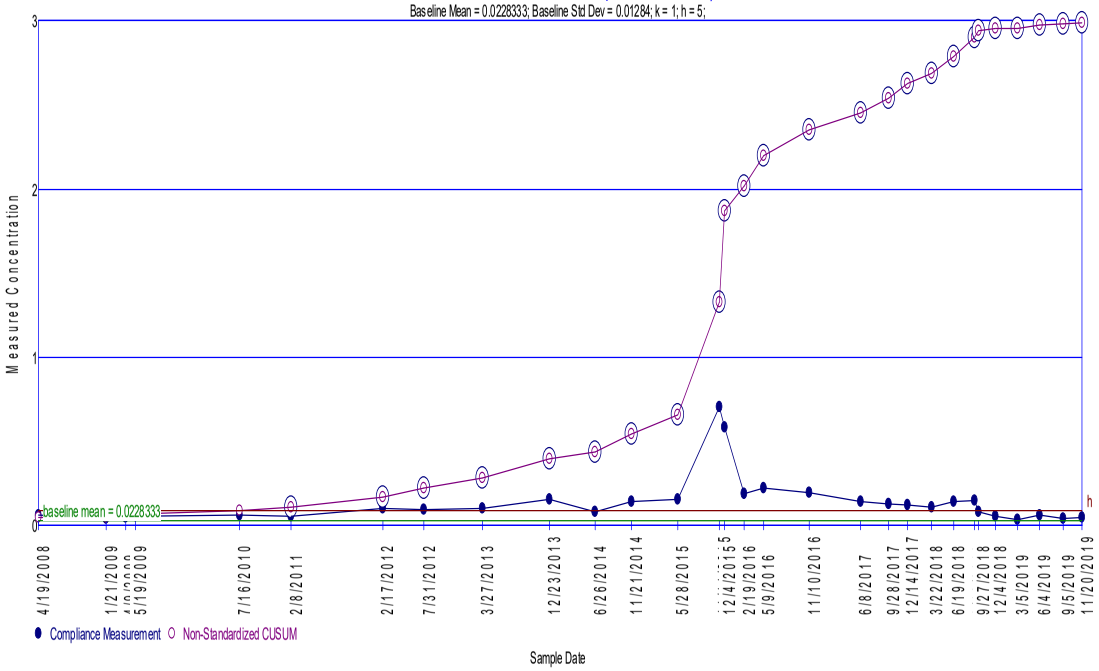
Aluminum



Barium

Inter-Well Shewhart-CUSUM Control Chart (Unified Guidance) of MW-3

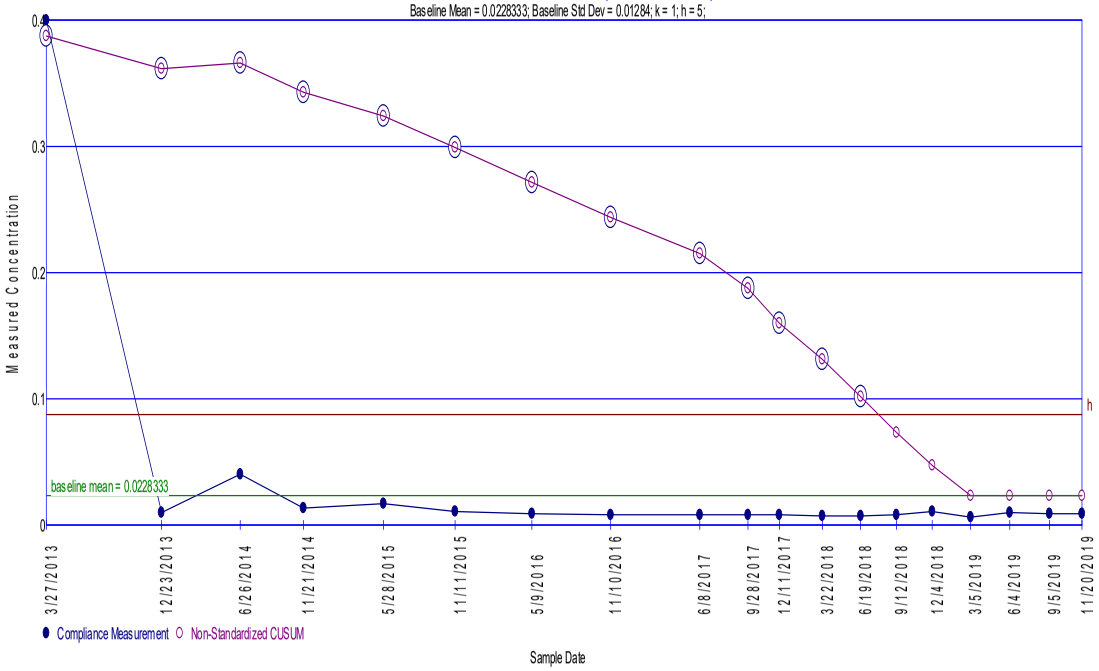
Baseline Mean = 0.0228333; Baseline Std Dev = 0.01284; k = 1; h = 5;



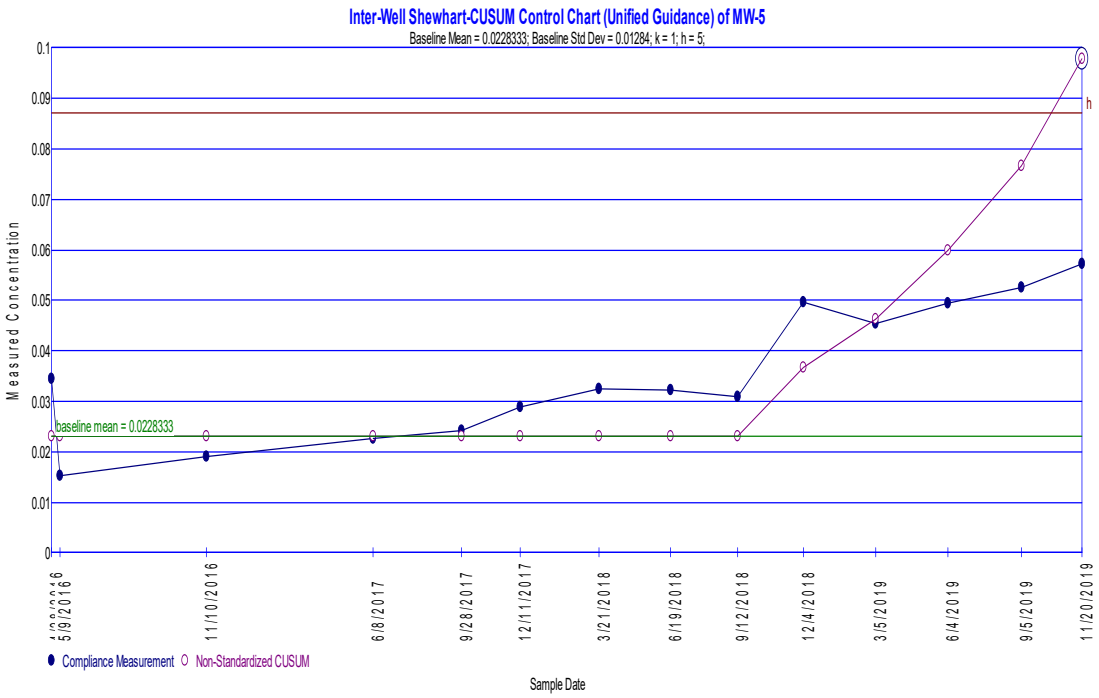
Barium

Inter-Well Shewhart-CUSUM Control Chart (Unified Guidance) of MW-4

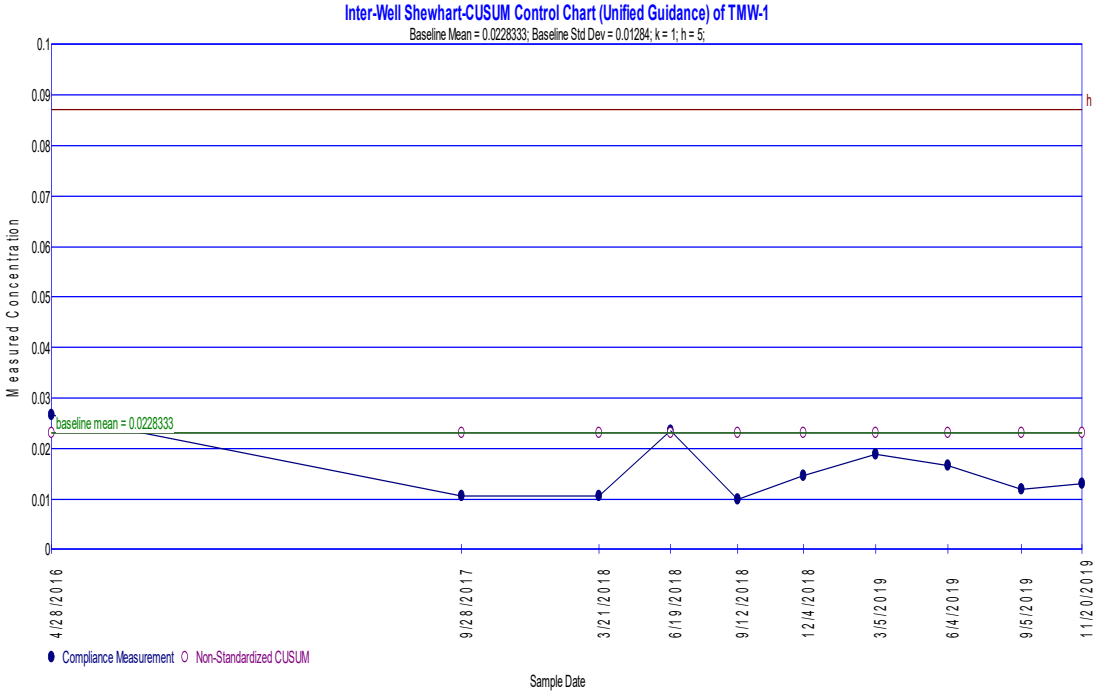
Baseline Mean = 0.0228333; Baseline Std Dev = 0.01284; k = 1; h = 5;



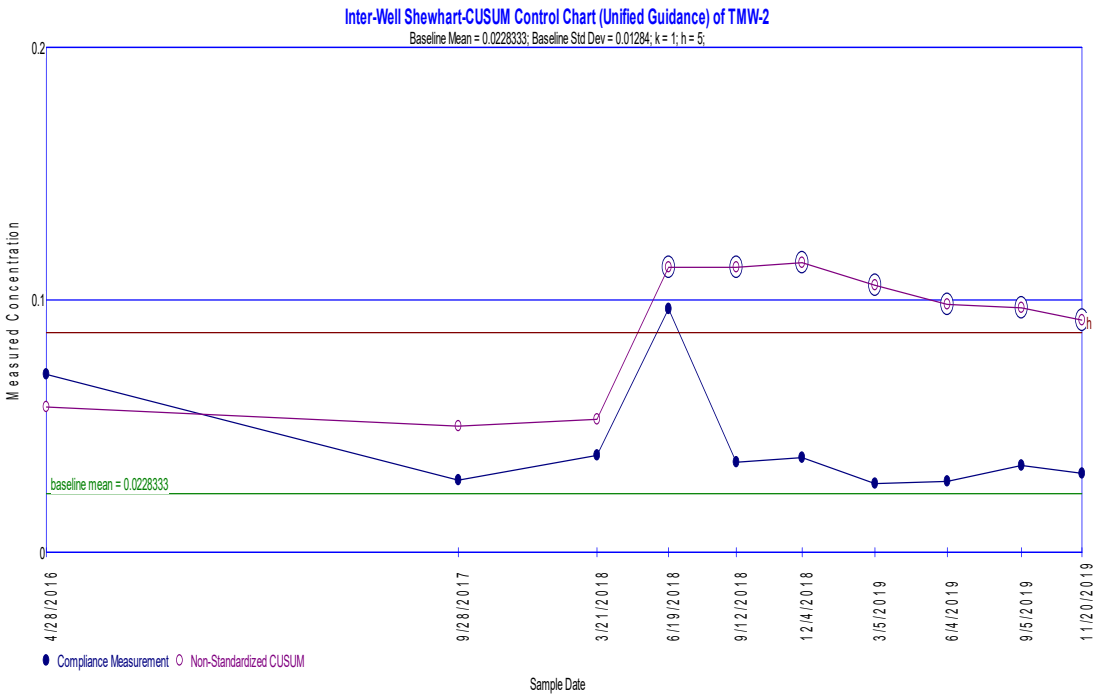
Barium



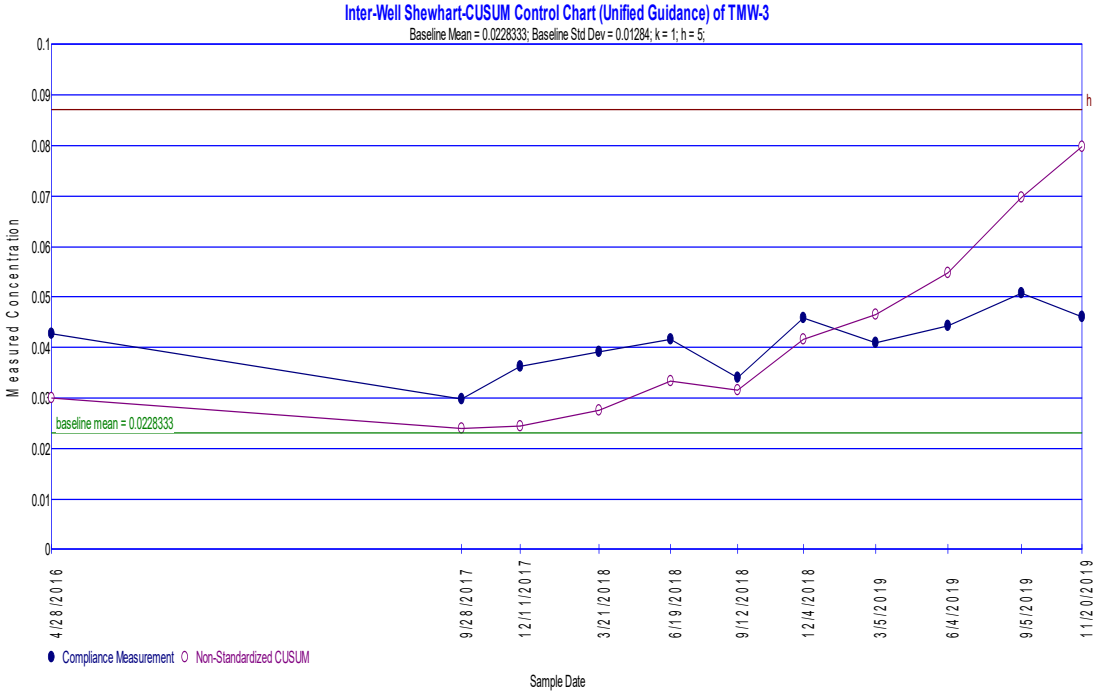
Barium



Barium



Barium



Wilcoxon Non-Parametric Analysis (Inter-Well)

Parameter: Zinc

Location: MW-4

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total non detects is 32
Non detect rank is 16.5

Wilcoxon Ranks

Location	Date	Conc.	Rank
MW-1	4/19/2008	0.011	33
	1/21/2009	0.015	37
	4/9/2009	0.011	34
	5/19/2009	0.021	39
	7/16/2010	0.011	35
	2/8/2011	0.016	38
	2/17/2012	ND<0.01	16.5
	7/31/2012	0.023	40
	3/27/2013	0.012	36
	12/23/2013	ND<0.01	16.5
	6/26/2014	ND<0.01	16.5
	11/21/2014	ND<0.025	16.5
	5/28/2015	ND<0.025	16.5
	11/11/2015	ND<0.025	16.5
	5/9/2016	0.0281	41
	11/10/2016	ND<0.025	16.5
	6/8/2017	ND<0.025	16.5
	9/28/2017	ND<0.025	16.5
	12/11/2017	ND<0.025	16.5
	3/21/2018	ND<0.025	16.5
	6/19/2018	ND<0.025	16.5
	9/12/2018	ND<0.025	16.5
	12/4/2018	ND<0.025	16.5
	3/5/2019	ND<0.025	16.5
	6/4/2019	ND<0.025	16.5
	9/5/2019	ND<0.025	16.5
MW-4	3/27/2013	0.54	45
	12/23/2013	0.031	42
	6/26/2014	0.062	44
	11/21/2014	ND<0.025	16.5
	5/28/2015	ND<0.025	16.5
	11/11/2015	ND<0.025	16.5
	5/9/2016	ND<0.025	16.5
	11/10/2016	ND<0.025	16.5
	6/8/2017	ND<0.025	16.5
	9/28/2017	ND<0.025	16.5
	12/11/2017	ND<0.025	16.5
	3/22/2018	ND<0.025	16.5
	6/19/2018	ND<0.025	16.5
	9/12/2018	ND<0.025	16.5
	12/4/2018	ND<0.025	16.5
	3/5/2019	ND<0.025	16.5
	6/4/2019	ND<0.025	16.5
	9/5/2019	ND<0.025	16.5
	11/20/2019	0.0579	43

The Wilcoxon Statistic is 231.5
The Expected value is is 247
The Standard Deviation is 43.5163
The Z Score is -0.367678
The Standard Deviation adjusted for ties is 34.8288
The Z Score adjusted for ties is -0.45939
-0.367678 < 2.326 indicating no statistical significance at 1% level
-0.45939 < 2.326 indicating no statistical significance at 1% level when adjusted for ties

Wilcoxon Non-Parametric Analysis (Inter-Well)

Parameter: Zinc

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total non detects is 28
Non detect rank is 14.5

Wilcoxon Ranks

Location	Date	Conc.	Rank
MW-1	4/19/2008	0.011	29
	1/21/2009	0.015	33
	4/9/2009	0.011	30
	5/19/2009	0.021	35
	7/16/2010	0.011	31
	2/8/2011	0.016	34
	2/17/2012	ND<0.01	14.5
	7/31/2012	0.023	36
	3/27/2013	0.012	32
	12/23/2013	ND<0.01	14.5
	6/26/2014	ND<0.01	14.5
	11/21/2014	ND<0.025	14.5
	5/28/2015	ND<0.025	14.5
	11/11/2015	ND<0.025	14.5
	5/9/2016	0.0281	38
	11/10/2016	ND<0.025	14.5
	6/8/2017	ND<0.025	14.5
	9/28/2017	ND<0.025	14.5
	12/11/2017	ND<0.025	14.5
	3/21/2018	ND<0.025	14.5
	6/19/2018	ND<0.025	14.5
	9/12/2018	ND<0.025	14.5
	12/4/2018	ND<0.025	14.5
	3/5/2019	ND<0.025	14.5
	6/4/2019	ND<0.025	14.5
	9/5/2019	ND<0.025	14.5
MW-5	4/28/2016	0.027	37
	5/9/2016	ND<0.025	14.5
	11/10/2016	ND<0.025	14.5
	6/8/2017	ND<0.025	14.5
	9/28/2017	ND<0.025	14.5
	12/11/2017	ND<0.025	14.5
	3/21/2018	ND<0.025	14.5
	6/19/2018	ND<0.025	14.5
	9/12/2018	ND<0.025	14.5
	12/4/2018	ND<0.025	14.5
	3/5/2019	ND<0.025	14.5
	6/4/2019	ND<0.025	14.5
	9/5/2019	0.0513	39
	11/20/2019	0.247	40

The Wilcoxon Statistic is 170.5
The Expected value is is 182
The Standard Deviation is 35.2657

The Z Score is -0.340274
The Standard Deviation adjusted for ties is 28.5896
The Z Score adjusted for ties is -0.419733
-0.340274 < 2.326 indicating no statistical significance at 1% level
-0.419733 < 2.326 indicating no statistical significance at 1% level when adjusted for ties

Wilcoxon Non-Parametric Analysis (Inter-Well)

Parameter: Fluoride

Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total non detects is 20
Non detect rank is 10.5

Wilcoxon Ranks

Location	Date	Conc.	Rank
MW-1	4/19/2008	ND<0.1	10.5
	1/21/2009	ND<0.1	10.5
	4/9/2009	ND<0.1	10.5
	5/19/2009	ND<0.1	10.5
	5/9/2016	ND<0.1	10.5
	11/10/2016	ND<0.1	10.5
	6/8/2017	0.178	24
	9/28/2017	ND<0.1	10.5
	12/11/2017	ND<0.1	10.5
	3/21/2018	ND<0.1	10.5
	6/19/2018	ND<0.1	10.5
	9/12/2018	ND<0.1	10.5
	12/4/2018	ND<0.1	10.5
	3/5/2019	ND<0.1	10.5
	6/4/2019	ND<0.1	10.5
	9/5/2019	ND<0.1	10.5
	11/20/2019	ND<0.1	10.5
MW-3	1/21/2009	ND<0.1	10.5
	4/9/2009	ND<0.1	10.5
	5/19/2009	ND<0.1	10.5
	5/9/2016	0.105	21
	11/10/2016	ND<0.1	10.5
	6/8/2017	0.208	27
	9/28/2017	0.226	28
	12/14/2017	0.149	22
	3/22/2018	0.274	30
	6/19/2018	0.248	29
	9/12/2018	0.543	33
	12/4/2018	0.4	32
	3/5/2019	0.163	23
	6/4/2019	0.183	25
	9/5/2019	0.306	31
	11/20/2019	0.197	26

The Wilcoxon Statistic is 233
The Expected value is is 136
The Standard Deviation is 27.7609
The Z Score is 3.47611
The Standard Deviation adjusted for ties is 24.4822
The Z Score adjusted for ties is 3.94164
3.47611 > 2.326 indicating statistical significance at 1% level
3.94164 > 2.326 indicating statistical significance at 1% level when adjusted for ties

Wilcoxon Non-Parametric Analysis (Inter-Well)

Parameter: Sulfate

Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total non detects is 17
Non detect rank is 9

Wilcoxon Ranks

Location	Date	Conc.	Rank
MW-1	5/19/2009	8.9	24
	7/16/2010	9.4	27
	2/8/2011	5.8	21
	9/14/2011	6.6	23
	2/17/2012	ND<5	9
	7/31/2012	ND<5	9
	3/27/2013	5.1	19
	12/23/2013	6.1	22
	6/26/2014	ND<5	9
	11/21/2014	9.1	26
	5/28/2015	ND<5	9
	11/11/2015	18.8	34
	5/9/2016	ND<5	9
	8/18/2016	3.51	18
	11/10/2016	16.5	33
	6/8/2017	ND<5	9
	9/28/2017	ND<5	9
	12/11/2017	ND<5	9
	3/21/2018	ND<5	9
	6/19/2018	ND<5	9
	9/12/2018	12.3	31
	12/4/2018	ND<5	9
	3/5/2019	ND<5	9
	6/4/2019	ND<5	9
	9/5/2019	ND<5	9
	11/20/2019	ND<5	9
MW-3	5/19/2009	ND<5	9
	7/16/2010	5.1	20
	2/8/2011	ND<5	9
	2/17/2012	22	35
	7/31/2012	23	39
	3/27/2013	16	32
	12/23/2013	12	30
	6/26/2014	9.7	28
	11/21/2014	11	29
	5/28/2015	9.09	25
	11/11/2015	29.3	41
	12/4/2015	29.1	40
	2/19/2016	22.2	36
	5/9/2016	22.3	37
	8/18/2016	95.7	48
	11/10/2016	34	43
	6/8/2017	93.7	47
	9/28/2017	46.2	44
	12/14/2017	46.2	45

3/22/2018	22.3	38
6/19/2018	30.1	42
9/12/2018	484	53
12/4/2018	324	52
3/5/2019	85.8	46
6/4/2019	219	51
9/5/2019	154	50
11/20/2019	111	49

The Wilcoxon Statistic is 640
The Expected value is is 351
The Standard Deviation is 56.205
The Z Score is 5.133
The Standard Deviation adjusted for ties is 55.2727
The Z Score adjusted for ties is 5.21957
5.133 > 2.326 indicating statistical significance at 1% level
5.21957 > 2.326 indicating statistical significance at 1% level when adjusted for ties

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 43 - 45 = -2

Tied GrouValue	Members
1 0.1	3

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 66
B = 0
C = 6
D = 0
E = 6
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 330
Z-Score = -0.0550482
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|-0.0550482| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: TMW-1

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 19 - 26 = -7
Comparing at 1.0 - (0.05 / 2) = 97.5% confidence level (two-tailed)
Probability of obtaining S >= |-7| is 0.6
0.6 >= 0.025 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: TMW-2

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 8 - 37 = -29
Comparing at 95% confidence level (downward trend)
Probability of obtaining S >= 29 is 0.0046
S < 0 and 0.0046 < 0.05 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: TMW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 34 - 21 = 13

Tied GrouValue	Members

Time Period	Observations
4/28/2016	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 2970
b = 8910
c = 220
Group Variance = 165
Z-Score = 0.934199
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|0.934199| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Barium

Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 225 - 210 = 15

Tied GrouValue	Members

Time Period	Observations
4/19/2008	1
1/21/2009	1
4/9/2009	1
5/19/2009	1
7/16/2010	1
2/8/2011	1
2/17/2012	1
7/31/2012	1
3/27/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
12/4/2015	1
2/19/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/14/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
9/27/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 56550
b = 219240
c = 1740
Group Variance = 3141.67
Z-Score = 0.249774
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|0.249774| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Barium

Location: MW-4

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 48 - 123 = -75

Tied GrouValue	Members

Time Period	Observations
3/27/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 14706
b = 52326
c = 684
Group Variance = 817
Z-Score = -2.58893
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-2.58893 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Barium

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 78 - 13 = 65

Tied GrouValue	Members

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 333.667
Z-Score = 3.50367
Comparison Level at 95% confidence level = 1.65463 (upward trend)
3.50367 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Barium
Location: TMW-1

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 21 - 24 = -3
Comparing at 1.0 - (0.05 / 2) = 97.5% confidence level (two-tailed)
Probability of obtaining S >= |-3| is 0.862
0.862 >= 0.025 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Barium
Location: TMW-2

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 14 - 31 = -17
Comparing at 1.0 - (0.05 / 2) = 97.5% confidence level (two-tailed)
Probability of obtaining S >= |-17| is 0.156
0.156 >= 0.025 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Barium
Location: TMW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 42 - 13 = 29

Tied GrouValue	Members

Time Period	Observations
4/28/2016	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 2970
b = 8910
c = 220
Group Variance = 165
Z-Score = 2.1798
Comparison Level at 95% confidence level = 1.65463 (upward trend)
2.1798 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Total Cadmium
Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 256 - 59 = 197

Tied GrouValue		Members
1	0.001	16

Time Period	Observations
4/19/2008	1
1/21/2009	1
4/9/2009	1
5/19/2009	1
7/16/2010	1
2/8/2011	1
2/17/2012	1
7/31/2012	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
12/4/2015	1
2/19/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
8/8/2017	1
9/28/2017	1
12/14/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
9/27/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 8880
B = 0
C = 3360
D = 0
E = 240
F = 0
a = 56550
b = 219240
c = 1740
Group Variance = 2648.33
Z-Score = 3.80864

Comparison Level at 95% confidence level = 1.65463 (upward trend)
3.80864 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Chloride

Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 271 - 160 = 111

Tied GrouValue		Members
1	25	3
2	65	2

Time Period	Observations
4/19/2008	1
1/21/2009	1
4/9/2009	1
5/19/2009	1
7/16/2010	1
2/8/2011	1
2/17/2012	1
8/1/2012	1
3/27/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
12/4/2015	1
2/19/2016	1
5/9/2016	1
8/18/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/14/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 84
B = 0
C = 6
D = 0
E = 8
F = 0
a = 56550
b = 219240
c = 1740
Group Variance = 3137

Z-Score = 1.96397
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.96397 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Chloride

Location: MW-4

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 94 - 96 = -2

Tied GrouValue	Members

Time Period	Observations
3/27/2013	1
4/11/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 17100
b = 61560
c = 760
Group Variance = 950
Z-Score = -0.0324443
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|-0.0324443| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Chloride
Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 86 - 4 = 82

Tied GrouValue		Members
1	83.5	2

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 18
B = 0
C = 0
D = 0
E = 2
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 332.667
Z-Score = 4.441
Comparison Level at 95% confidence level = 1.65463 (upward trend)
4.441 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Chloride
Location: TMW-1

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 76 - 2 = 74

Tied GrouValue	Members

Time Period	Observations
4/28/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 4836
b = 15444
c = 312
Group Variance = 268.667
Z-Score = 4.45365
Comparison Level at 95% confidence level = 1.65463 (upward trend)
4.45365 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Chloride
Location: TMW-2

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 60 - 18 = 42

Tied GrouValue	Members

Time Period	Observations
4/28/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 4836
b = 15444
c = 312
Group Variance = 268.667
Z-Score = 2.50136
Comparison Level at 95% confidence level = 1.65463 (upward trend)
2.50136 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Chloride
Location: TMW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 68 - 10 = 58

Tied GrouValue	Members

Time Period	Observations
4/28/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 4836
b = 15444
c = 312
Group Variance = 268.667
Z-Score = 3.47751
Comparison Level at 95% confidence level = 1.65463 (upward trend)
3.47751 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Chromium

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 59 - 17 = 42

Tied GrouValue		Members
1	0.002	6

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 510
B = 0
C = 120
D = 0
E = 30
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 305.333
Z-Score = 2.34637
Comparison Level at 95% confidence level = 1.65463 (upward trend)
2.34637 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Cobalt

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 50 - 40 = 10

Tied GrouValue		Members
1	0.00264	2

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 18
B = 0
C = 0
D = 0
E = 2
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 332.667
Z-Score = 0.493444
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|0.493444| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Copper

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 13 - 0 = 13

Tied GrouValue		Members
1	0.005	13

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 4836
B = 0
C = 1716
D = 0
E = 156
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 65
Z-Score = 1.48842
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|1.48842| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Lead

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 25 - 0 = 25

Tied GrouValue		Members
1	0.002	12

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 3828
B = 0
C = 1320
D = 0
E = 132
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 121
Z-Score = 2.18182
Comparison Level at 95% confidence level = 1.65463 (upward trend)
2.18182 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Fluoride

Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 88 - 26 = 62

Tied GrouValue		Members
1	0.1	4

Time Period	Observations
1/21/2009	1
4/9/2009	1
5/19/2009	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/14/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 156
B = 0
C = 24
D = 0
E = 12
F = 0
a = 8880
b = 30240
c = 480
Group Variance = 484.667
Z-Score = 2.77082
Comparison Level at 95% confidence level = 1.65463 (upward trend)
2.77082 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Nickel

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 63 - 28 = 35

Tied GrouValue	Members

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 333.667
Z-Score = 1.86133
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|1.86133| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Zinc

Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 336 - 76 = 260

Tied GrouValue		Members
1	0.015	2
2	0.01	2
3	0.025	7

Time Period	Observations
4/19/2008	1
1/21/2009	1
4/9/2009	1
5/19/2009	1
7/16/2010	1
2/8/2011	1
2/17/2012	1
7/31/2012	1
3/27/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
12/4/2015	1
2/19/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/14/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
9/27/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 834
B = 0
C = 210
D = 0
E = 46
F = 0
a = 56550
b = 219240
c = 1740

Group Variance = 3095.33
Z-Score = 4.65528
Comparison Level at 95% confidence level = 1.65463 (upward trend)
4.65528 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Nickel

Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 133 - 227 = -94

Tied Grou	Value	Members
1	0.02	12
2	0.01	3
3	0.002	4

Time Period	Observations
4/19/2008	1
1/21/2009	1
4/9/2009	1
5/19/2009	1
7/16/2010	1
2/8/2011	1
2/17/2012	1
7/31/2012	1
3/27/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
12/4/2015	1
2/19/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/14/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
9/27/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 4050
B = 0
C = 1350
D = 0
E = 150
F = 0
a = 56550
b = 219240
c = 1740

Group Variance = 2916.67
Z-Score = -1.72203
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.72203 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Zinc
Location: MW-4

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 17 - 49 = -32

Tied GrouValue		Members
1	0.025	15

Time Period	Observations
3/27/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 7350
B = 0
C = 2730
D = 0
E = 210
F = 0
a = 14706
b = 52326
c = 684
Group Variance = 408.667
Z-Score = -1.53348
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|-1.53348| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Zinc
Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 25 - 11 = 14

Tied GrouValue		Members
1	0.025	11

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 2970
B = 0
C = 990
D = 0
E = 110
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 168.667
Z-Score = 1.00099
Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)
|1.00099| <= 1.97737 indicating no evidence of a trend

Mann-Kendall Trend Analysis

Parameter: Sulfate
Location: MW-3

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 288 - 60 = 228

Tied GrouValue		Members
1	5	2
2	22.3	2
3	46.2	2

Time Period	Observations
5/19/2009	1
7/16/2010	1
2/8/2011	1
2/17/2012	1
7/31/2012	1
3/27/2013	1
12/23/2013	1
6/26/2014	1
11/21/2014	1
5/28/2015	1
11/11/2015	1
12/4/2015	1
2/19/2016	1
5/9/2016	1
8/18/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/14/2017	1
3/22/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 54
B = 0
C = 0
D = 0
E = 6
F = 0
a = 41418
b = 157950
c = 1404
Group Variance = 2298
Z-Score = 4.73534
Comparison Level at 95% confidence level = 1.65463 (upward trend)

4.73534 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: MW-5

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

95% Confidence Level

S Statistic = 69 - 1 = 68

Tied Grou	Value	Members
1	5	7

Time Period	Observations
4/28/2016	1
5/9/2016	1
11/10/2016	1
6/8/2017	1
9/28/2017	1
12/11/2017	1
3/21/2018	1
6/19/2018	1
9/12/2018	1
12/4/2018	1
3/5/2019	1
6/4/2019	1
9/5/2019	1
11/20/2019	1

There are 0 time periods with multiple data

A = 798
B = 0
C = 210
D = 0
E = 42
F = 0
a = 6006
b = 19656
c = 364
Group Variance = 289.333
Z-Score = 3.93891
Comparison Level at 95% confidence level = 1.65463 (upward trend)
3.93891 > 1.65463 indicating an upward trend

APPENDIX C
LABORATORY ANALYTICAL REPORTS & FIELD INFORMATION LOGS

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

December 09, 2019

Civil & Environmental Consultants - TN

Sample Delivery Group:	L1163520
Samples Received:	11/21/2019
Project Number:	181-364
Description:	Former EWS Camden Class 2 Landfill
Site:	CAMDEN, TN
Report To:	Philip Campbell 117 Seaboard Ln. Suite E100 Franklin, TN 37067

Entire Report Reviewed By:

Chris McCord
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

TABLE OF CONTENTS

MW-1 L1163520-01 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 11:25 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:36	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 14:45	11/29/19 14:45	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:36	12/06/19 19:36	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:57	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1384700	1	11/22/19 06:52	11/22/19 06:52	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 15:48	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385228	1	11/26/19 10:38	11/26/19 16:12	EL	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:10	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 11:42	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 20:14	11/25/19 20:14	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1	11/23/19 09:55	11/24/19 17:50	LEL	Mt. Juliet, TN

MW-3 L1163520-02 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 14:10 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:37	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 14:52	11/29/19 14:52	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:39	12/06/19 19:39	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:57	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1384700	1	11/22/19 07:20	11/22/19 07:20	ELN	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1384700	5	11/22/19 10:29	11/22/19 10:29	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 15:50	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385228	1	11/26/19 10:38	11/26/19 16:15	EL	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:14	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 11:46	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 20:41	11/25/19 20:41	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1.01	11/23/19 09:55	11/24/19 18:02	LEL	Mt. Juliet, TN

MW-4 L1163520-03 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 13:10 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:39	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 14:58	11/29/19 14:58	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:44	12/06/19 19:44	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:57	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1384700	1	11/22/19 07:35	11/22/19 07:35	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 15:52	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385228	1	11/26/19 10:38	11/26/19 16:18	EL	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:30	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 11:49	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 21:08	11/25/19 21:08	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1.01	11/23/19 09:55	11/24/19 18:13	LEL	Mt. Juliet, TN

MW-5 L1163520-04 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 12:20 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:42	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 15:16	11/29/19 15:16	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:45	12/06/19 19:45	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:57	BAM	Mt. Juliet, TN

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

MW-5 L1163520-04 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 12:20 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9056A	WG1384700	1	11/22/19 08:18	11/22/19 08:18	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 15:54	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385228	1	11/26/19 10:38	11/26/19 16:20	EL	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:33	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 11:52	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 21:35	11/25/19 21:35	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1.01	11/23/19 09:55	11/24/19 18:24	LEL	Mt. Juliet, TN

TMW-1 L1163520-05 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 11:30 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:43	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 15:22	11/29/19 15:22	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:52	12/06/19 19:52	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:57	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1384700	1	11/22/19 08:32	11/22/19 08:32	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 15:56	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385230	1	11/26/19 16:14	11/29/19 13:11	CCE	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:37	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 11:56	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 22:02	11/25/19 22:02	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1	11/23/19 09:55	11/24/19 18:35	LEL	Mt. Juliet, TN

TMW-2 L1163520-06 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 13:20 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:44	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 15:30	11/29/19 15:30	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:53	12/06/19 19:53	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:57	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1385274	1	11/22/19 10:33	11/22/19 10:33	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 16:02	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385230	1	11/26/19 16:14	11/29/19 13:14	CCE	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:41	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 11:59	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 22:29	11/25/19 22:29	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1	11/23/19 09:55	11/24/19 18:46	LEL	Mt. Juliet, TN

TMW-3 L1163520-07 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 15:10 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:45	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 15:37	11/29/19 15:37	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:55	12/06/19 19:55	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:58	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1385274	1	11/22/19 10:49	11/22/19 10:49	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 16:04	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385230	1	11/26/19 16:14	11/29/19 13:17	CCE	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:45	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 12:03	TM	Mt. Juliet, TN

TMW-3 L1163520-07 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 15:10 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 22:56	11/25/19 22:56	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1	11/23/19 09:55	11/24/19 18:57	LEL	Mt. Juliet, TN

DUPLICATE L1163520-08 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 00:00 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:46	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 15:44	11/29/19 15:44	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:57	12/06/19 19:57	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:58	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1389065	1	12/01/19 01:02	12/01/19 01:02	MCG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1389065	5	12/01/19 01:13	12/01/19 01:13	MCG	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 16:05	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385230	1	11/26/19 16:14	11/27/19 22:37	CCE	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 09:52	RDS	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 12:06	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 23:23	11/25/19 23:23	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1	11/23/19 09:55	11/24/19 19:08	LEL	Mt. Juliet, TN

FIELD BLANK L1163520-09 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 13:25 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385296	1	11/26/19 07:07	11/27/19 16:47	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 15:50	11/29/19 15:50	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	1	12/06/19 19:58	12/06/19 19:58	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	1	11/27/19 15:00	11/27/19 18:58	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1385274	1	11/22/19 11:05	11/22/19 11:05	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 16:07	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385230	1	11/26/19 16:14	11/27/19 22:40	CCE	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 10:48	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	1	11/26/19 11:24	11/27/19 12:10	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 19:20	11/25/19 19:20	JSD	Sacramento, CA
EDB / DBCP by Method 8011	WG1385648	1.02	11/23/19 09:55	11/24/19 19:19	LEL	Mt. Juliet, TN

TRIP BLANK L1163520-10 GW

Collected by: Brandon Solonka | Collected date/time: 11/20/19 00:00 | Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1386101	1	11/25/19 19:47	11/25/19 19:47	JSD	Sacramento, CA

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord
Project Manager

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	ND		30.0	1	11/27/2019 16:36	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	49.3		20.0	1	11/29/2019 14:45	WG1388427

Sample Narrative:
L1163520-01 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND	P1	0.100	1	12/06/2019 19:36	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		10.0	1	11/27/2019 18:57	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	11/22/2019 06:52	WG1384700
Chloride	2.52		1.00	1	11/22/2019 06:52	WG1384700
Fluoride	ND		0.100	1	11/22/2019 06:52	WG1384700
Nitrate	ND		0.100	1	11/22/2019 06:52	WG1384700
Sulfate	ND		5.00	1	11/22/2019 06:52	WG1384700

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	0.00121		0.000200	1	11/25/2019 15:48	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/26/2019 16:12	WG1385228

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	ND		0.100	1	11/27/2019 10:10	WG1385251
Antimony	ND		0.00200	1	11/27/2019 11:42	WG1385251
Arsenic	0.0176		0.00200	1	11/27/2019 10:10	WG1385251
Barium	0.0194		0.00500	1	11/27/2019 10:10	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:10	WG1385251
Cadmium	ND		0.00100	1	11/27/2019 10:10	WG1385251
Calcium	3.11		1.00	1	11/27/2019 10:10	WG1385251
Chromium	ND		0.00200	1	11/27/2019 10:10	WG1385251
Cobalt	0.0329		0.00200	1	11/27/2019 10:10	WG1385251
Copper	ND		0.00500	1	11/27/2019 10:10	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	13.1		0.100	1	11/27/2019 10:10	WG1385251
Lead	ND		0.00200	1	11/27/2019 10:10	WG1385251
Magnesium	2.37		1.00	1	11/27/2019 10:10	WG1385251
Manganese	0.651		0.00500	1	11/27/2019 10:10	WG1385251
Nickel	0.00468		0.00200	1	11/27/2019 10:10	WG1385251
Potassium	1.25		1.00	1	11/27/2019 10:10	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:10	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:10	WG1385251
Sodium	3.09		1.00	1	11/27/2019 10:10	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:10	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:10	WG1385251
Zinc	ND		0.0250	1	11/27/2019 10:10	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 20:14	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 20:14	WG1386101
Benzene	ND		0.00100	1	11/25/2019 20:14	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 20:14	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 20:14	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 20:14	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 20:14	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 20:14	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 20:14	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 20:14	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 20:14	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 20:14	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 20:14	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 20:14	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 20:14	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 20:14	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 20:14	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 20:14	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 20:14	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 20:14	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 20:14	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 20:14	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 20:14	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 20:14	WG1386101
Styrene	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 20:14	WG1386101
Toluene	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 20:14	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 20:14	WG1386101

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 20:14	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 20:14	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 20:14	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 20:14	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 20:14	WG1386101
(S) Toluene-d8	*96.8*		*80.0-120*		*11/25/2019 20:14*	WG1386101
(S) 4-Bromofluorobenzene	*98.9*		*75.0-120*		*11/25/2019 20:14*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.9*		*80.0-125*		*11/25/2019 20:14*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000100	1	11/24/2019 17:50	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000200	1	11/24/2019 17:50	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	121	B J6	30.0	1	11/27/2019 16:37	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	ND		20.0	1	11/29/2019 14:52	WG1388427

Sample Narrative:
L1163520-02 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:39	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		10.0	1	11/27/2019 18:57	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	11/22/2019 07:20	WG1384700
Chloride	19.3		1.00	1	11/22/2019 07:20	WG1384700
Fluoride	0.197		0.100	1	11/22/2019 07:20	WG1384700
Nitrate	1.29		0.100	1	11/22/2019 07:20	WG1384700
Sulfate	111		25.0	5	11/22/2019 10:29	WG1384700

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	11/25/2019 15:50	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/26/2019 16:15	WG1385228

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	ND		0.100	1	11/27/2019 10:14	WG1385251
Antimony	ND		0.00200	1	11/27/2019 11:46	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 10:14	WG1385251
Barium	0.0450		0.00500	1	11/27/2019 10:14	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:14	WG1385251
Cadmium	0.00157		0.00100	1	11/27/2019 10:14	WG1385251
Calcium	32.5		1.00	1	11/27/2019 10:14	WG1385251
Chromium	ND		0.00200	1	11/27/2019 10:14	WG1385251
Cobalt	ND		0.00200	1	11/27/2019 10:14	WG1385251
Copper	ND		0.00500	1	11/27/2019 10:14	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	ND		0.100	1	11/27/2019 10:14	WG1385251
Lead	ND		0.00200	1	11/27/2019 10:14	WG1385251
Magnesium	10.3		1.00	1	11/27/2019 10:14	WG1385251
Manganese	0.0205		0.00500	1	11/27/2019 10:14	WG1385251
Nickel	0.00237		0.00200	1	11/27/2019 10:14	WG1385251
Potassium	4.67		1.00	1	11/27/2019 10:14	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:14	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:14	WG1385251
Sodium	6.69		1.00	1	11/27/2019 10:14	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:14	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:14	WG1385251
Zinc	0.0251		0.0250	1	11/27/2019 10:14	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 20:41	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 20:41	WG1386101
Benzene	ND		0.00100	1	11/25/2019 20:41	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 20:41	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 20:41	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 20:41	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 20:41	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 20:41	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 20:41	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 20:41	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 20:41	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 20:41	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 20:41	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 20:41	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 20:41	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 20:41	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 20:41	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 20:41	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 20:41	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 20:41	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 20:41	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 20:41	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 20:41	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 20:41	WG1386101
Styrene	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 20:41	WG1386101
Toluene	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 20:41	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 20:41	WG1386101

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 20:41	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 20:41	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 20:41	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 20:41	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 20:41	WG1386101
(S) Toluene-d8	*101*		*80.0-120*		*11/25/2019 20:41*	WG1386101
(S) 4-Bromofluorobenzene	*97.3*		*75.0-120*		*11/25/2019 20:41*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.1*		*80.0-125*		*11/25/2019 20:41*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000101	1.01	11/24/2019 18:02	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000202	1.01	11/24/2019 18:02	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	ND		30.0	1	11/27/2019 16:39	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	21.9	B	20.0	1	11/29/2019 14:58	WG1388427

Sample Narrative:
L1163520-03 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:44	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	23.8		10.0	1	11/27/2019 18:57	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	11/22/2019 07:35	WG1384700
Chloride	8.76		1.00	1	11/22/2019 07:35	WG1384700
Fluoride	ND		0.100	1	11/22/2019 07:35	WG1384700
Nitrate	0.832		0.100	1	11/22/2019 07:35	WG1384700
Sulfate	ND		5.00	1	11/22/2019 07:35	WG1384700

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	11/25/2019 15:52	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/26/2019 16:18	WG1385228

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	ND		0.100	1	11/27/2019 10:30	WG1385251
Antimony	ND		0.00200	1	11/27/2019 11:49	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 10:30	WG1385251
Barium	0.00828		0.00500	1	11/27/2019 10:30	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:30	WG1385251
Cadmium	ND		0.00100	1	11/27/2019 10:30	WG1385251
Calcium	5.56		1.00	1	11/27/2019 10:30	WG1385251
Chromium	ND		0.00200	1	11/27/2019 10:30	WG1385251
Cobalt	ND		0.00200	1	11/27/2019 10:30	WG1385251
Copper	ND		0.00500	1	11/27/2019 10:30	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	0.607		0.100	1	11/27/2019 10:30	WG1385251
Lead	ND		0.00200	1	11/27/2019 10:30	WG1385251
Magnesium	2.81		1.00	1	11/27/2019 10:30	WG1385251
Manganese	0.0481		0.00500	1	11/27/2019 10:30	WG1385251
Nickel	ND		0.00200	1	11/27/2019 10:30	WG1385251
Potassium	ND		1.00	1	11/27/2019 10:30	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:30	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:30	WG1385251
Sodium	3.62		1.00	1	11/27/2019 10:30	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:30	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:30	WG1385251
Zinc	0.0579		0.0250	1	11/27/2019 10:30	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 21:08	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 21:08	WG1386101
Benzene	ND		0.00100	1	11/25/2019 21:08	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 21:08	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 21:08	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 21:08	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 21:08	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 21:08	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 21:08	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 21:08	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 21:08	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 21:08	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 21:08	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 21:08	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 21:08	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 21:08	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 21:08	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 21:08	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 21:08	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 21:08	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 21:08	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 21:08	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 21:08	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 21:08	WG1386101
Styrene	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 21:08	WG1386101
Toluene	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 21:08	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 21:08	WG1386101

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 21:08	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 21:08	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 21:08	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 21:08	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 21:08	WG1386101
(S) Toluene-d8	*102*		*80.0-120*		*11/25/2019 21:08*	WG1386101
(S) 4-Bromofluorobenzene	*99.8*		*75.0-120*		*11/25/2019 21:08*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.4*		*80.0-125*		*11/25/2019 21:08*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000101	1.01	11/24/2019 18:13	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000202	1.01	11/24/2019 18:13	WG1385648

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	102	B	30.0	1	11/27/2019 16:42	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	ND		20.0	1	11/29/2019 15:16	WG1388427

Sample Narrative:
L1163520-04 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:45	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		10.0	1	11/27/2019 18:57	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	11/22/2019 08:18	WG1384700
Chloride	83.5		1.00	1	11/22/2019 08:18	WG1384700
Fluoride	ND		0.100	1	11/22/2019 08:18	WG1384700
Nitrate	1.51		0.100	1	11/22/2019 08:18	WG1384700
Sulfate	8.50		5.00	1	11/22/2019 08:18	WG1384700

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	11/25/2019 15:54	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/26/2019 16:20	WG1385228

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	0.146		0.100	1	11/27/2019 10:33	WG1385251
Antimony	ND		0.00200	1	11/27/2019 11:52	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 10:33	WG1385251
Barium	0.0570		0.00500	1	11/27/2019 10:33	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:33	WG1385251
Cadmium	ND		0.00100	1	11/27/2019 10:33	WG1385251
Calcium	18.5		1.00	1	11/27/2019 10:33	WG1385251
Chromium	0.00219	B	0.00200	1	11/27/2019 10:33	WG1385251
Cobalt	0.00261		0.00200	1	11/27/2019 10:33	WG1385251
Copper	0.00553	B	0.00500	1	11/27/2019 10:33	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	0.391		0.100	1	11/27/2019 10:33	WG1385251
Lead	0.00517		0.00200	1	11/27/2019 10:33	WG1385251
Magnesium	12.8		1.00	1	11/27/2019 10:33	WG1385251
Manganese	0.231		0.00500	1	11/27/2019 10:33	WG1385251
Nickel	0.00862		0.00200	1	11/27/2019 10:33	WG1385251
Potassium	1.50		1.00	1	11/27/2019 10:33	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:33	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:33	WG1385251
Sodium	20.0		1.00	1	11/27/2019 10:33	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:33	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:33	WG1385251
Zinc	0.247		0.0250	1	11/27/2019 10:33	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 21:35	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 21:35	WG1386101
Benzene	ND		0.00100	1	11/25/2019 21:35	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 21:35	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 21:35	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 21:35	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 21:35	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 21:35	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 21:35	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 21:35	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 21:35	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 21:35	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 21:35	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 21:35	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 21:35	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 21:35	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 21:35	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 21:35	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 21:35	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 21:35	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 21:35	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 21:35	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 21:35	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 21:35	WG1386101
Styrene	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 21:35	WG1386101
Toluene	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 21:35	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 21:35	WG1386101

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 21:35	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 21:35	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 21:35	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 21:35	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 21:35	WG1386101
(S) Toluene-d8	*102*		*80.0-120*		*11/25/2019 21:35*	WG1386101
(S) 4-Bromofluorobenzene	*98.1*		*75.0-120*		*11/25/2019 21:35*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.7*		*80.0-125*		*11/25/2019 21:35*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000101	1.01	11/24/2019 18:24	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000202	1.01	11/24/2019 18:24	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	34.8	B	30.0	1	11/27/2019 16:43	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	ND		20.0	1	11/29/2019 15:22	WG1388427

Sample Narrative:
L1163520-05 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:52	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		10.0	1	11/27/2019 18:57	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	11/22/2019 08:32	WG1384700
Chloride	18.6		1.00	1	11/22/2019 08:32	WG1384700
Fluoride	ND		0.100	1	11/22/2019 08:32	WG1384700
Nitrate	1.84		0.100	1	11/22/2019 08:32	WG1384700
Sulfate	ND		5.00	1	11/22/2019 08:32	WG1384700

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	11/25/2019 15:56	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/29/2019 13:11	WG1385230

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	0.174		0.100	1	11/27/2019 10:37	WG1385251
Antimony	ND		0.00200	1	11/27/2019 11:56	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 10:37	WG1385251
Barium	0.0129		0.00500	1	11/27/2019 10:37	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:37	WG1385251
Cadmium	ND		0.00100	1	11/27/2019 10:37	WG1385251
Calcium	9.87		1.00	1	11/27/2019 10:37	WG1385251
Chromium	ND		0.00200	1	11/27/2019 10:37	WG1385251
Cobalt	ND		0.00200	1	11/27/2019 10:37	WG1385251
Copper	ND		0.00500	1	11/27/2019 10:37	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	0.282		0.100	1	11/27/2019 10:37	WG1385251
Lead	ND		0.00200	1	11/27/2019 10:37	WG1385251
Magnesium	2.78		1.00	1	11/27/2019 10:37	WG1385251
Manganese	0.0145		0.00500	1	11/27/2019 10:37	WG1385251
Nickel	ND		0.00200	1	11/27/2019 10:37	WG1385251
Potassium	ND		1.00	1	11/27/2019 10:37	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:37	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:37	WG1385251
Sodium	3.45		1.00	1	11/27/2019 10:37	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:37	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:37	WG1385251
Zinc	ND		0.0250	1	11/27/2019 10:37	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 22:02	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 22:02	WG1386101
Benzene	ND		0.00100	1	11/25/2019 22:02	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 22:02	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 22:02	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 22:02	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 22:02	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 22:02	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 22:02	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 22:02	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 22:02	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 22:02	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 22:02	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 22:02	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 22:02	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 22:02	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 22:02	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 22:02	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 22:02	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 22:02	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 22:02	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 22:02	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 22:02	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 22:02	WG1386101
Styrene	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 22:02	WG1386101
Toluene	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 22:02	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 22:02	WG1386101

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 22:02	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 22:02	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 22:02	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 22:02	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 22:02	WG1386101
(S) Toluene-d8	*102*		*80.0-120*		*11/25/2019 22:02*	WG1386101
(S) 4-Bromofluorobenzene	*97.7*		*75.0-120*		*11/25/2019 22:02*	WG1386101
(S) 1,2-Dichloroethane-d4	*97.0*		*80.0-125*		*11/25/2019 22:02*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000100	1	11/24/2019 18:35	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000200	1	11/24/2019 18:35	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	36.7	B	30.0	1	11/27/2019 16:44	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	ND		20.0	1	11/29/2019 15:30	WG1388427

Sample Narrative:
L1163520-06 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:53	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	36.4		10.0	1	11/27/2019 18:57	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	11/22/2019 10:33	WG1385274
Chloride	22.7		1.00	1	11/22/2019 10:33	WG1385274
Fluoride	ND		0.100	1	11/22/2019 10:33	WG1385274
Nitrate	0.759		0.100	1	11/22/2019 10:33	WG1385274
Sulfate	ND		5.00	1	11/22/2019 10:33	WG1385274

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	11/25/2019 16:02	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/29/2019 13:14	WG1385230

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	0.456		0.100	1	11/27/2019 10:41	WG1385251
Antimony	ND		0.00200	1	11/27/2019 11:59	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 10:41	WG1385251
Barium	0.0309		0.00500	1	11/27/2019 10:41	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:41	WG1385251
Cadmium	ND		0.00100	1	11/27/2019 10:41	WG1385251
Calcium	9.27		1.00	1	11/27/2019 10:41	WG1385251
Chromium	ND		0.00200	1	11/27/2019 10:41	WG1385251
Cobalt	ND		0.00200	1	11/27/2019 10:41	WG1385251
Copper	ND		0.00500	1	11/27/2019 10:41	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	0.470		0.100	1	11/27/2019 10:41	WG1385251
Lead	ND		0.00200	1	11/27/2019 10:41	WG1385251
Magnesium	3.53		1.00	1	11/27/2019 10:41	WG1385251
Manganese	0.00775		0.00500	1	11/27/2019 10:41	WG1385251
Nickel	ND		0.00200	1	11/27/2019 10:41	WG1385251
Potassium	1.02		1.00	1	11/27/2019 10:41	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:41	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:41	WG1385251
Sodium	3.99		1.00	1	11/27/2019 10:41	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:41	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:41	WG1385251
Zinc	ND		0.0250	1	11/27/2019 10:41	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 22:29	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 22:29	WG1386101
Benzene	ND		0.00100	1	11/25/2019 22:29	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 22:29	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 22:29	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 22:29	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 22:29	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 22:29	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 22:29	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 22:29	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 22:29	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 22:29	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 22:29	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 22:29	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 22:29	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 22:29	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 22:29	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 22:29	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 22:29	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 22:29	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 22:29	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 22:29	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 22:29	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 22:29	WG1386101
Styrene	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 22:29	WG1386101
Toluene	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 22:29	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 22:29	WG1386101

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 22:29	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 22:29	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 22:29	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 22:29	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 22:29	WG1386101
(S) Toluene-d8	*101*		*80.0-120*		*11/25/2019 22:29*	WG1386101
(S) 4-Bromofluorobenzene	*98.1*		*75.0-120*		*11/25/2019 22:29*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.7*		*80.0-125*		*11/25/2019 22:29*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000100	1	11/24/2019 18:46	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000200	1	11/24/2019 18:46	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	79.0	B	30.0	1	11/27/2019 16:45	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	ND		20.0	1	11/29/2019 15:37	WG1388427

Sample Narrative:
L1163520-07 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:55	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		10.0	1	11/27/2019 18:58	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	11/22/2019 10:49	WG1385274
Chloride	61.1		1.00	1	11/22/2019 10:49	WG1385274
Fluoride	ND		0.100	1	11/22/2019 10:49	WG1385274
Nitrate	4.76		0.100	1	11/22/2019 10:49	WG1385274
Sulfate	ND		5.00	1	11/22/2019 10:49	WG1385274

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	11/25/2019 16:04	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/29/2019 13:17	WG1385230

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	0.233		0.100	1	11/27/2019 10:45	WG1385251
Antimony	ND		0.00200	1	11/27/2019 12:03	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 10:45	WG1385251
Barium	0.0458		0.00500	1	11/27/2019 10:45	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:45	WG1385251
Cadmium	ND		0.00100	1	11/27/2019 10:45	WG1385251
Calcium	20.3		1.00	1	11/27/2019 10:45	WG1385251
Chromium	ND		0.00200	1	11/27/2019 10:45	WG1385251
Cobalt	ND		0.00200	1	11/27/2019 10:45	WG1385251
Copper	ND		0.00500	1	11/27/2019 10:45	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	0.533		0.100	1	11/27/2019 10:45	WG1385251
Lead	ND		0.00200	1	11/27/2019 10:45	WG1385251
Magnesium	6.72		1.00	1	11/27/2019 10:45	WG1385251
Manganese	0.0131		0.00500	1	11/27/2019 10:45	WG1385251
Nickel	ND		0.00200	1	11/27/2019 10:45	WG1385251
Potassium	1.71		1.00	1	11/27/2019 10:45	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:45	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:45	WG1385251
Sodium	12.5		1.00	1	11/27/2019 10:45	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:45	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:45	WG1385251
Zinc	ND		0.0250	1	11/27/2019 10:45	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 22:56	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 22:56	WG1386101
Benzene	ND		0.00100	1	11/25/2019 22:56	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 22:56	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 22:56	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 22:56	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 22:56	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 22:56	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 22:56	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 22:56	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 22:56	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 22:56	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 22:56	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 22:56	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 22:56	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 22:56	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 22:56	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 22:56	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 22:56	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 22:56	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 22:56	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 22:56	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 22:56	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 22:56	WG1386101
Styrene	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 22:56	WG1386101
Toluene	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 22:56	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 22:56	WG1386101

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 22:56	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 22:56	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 22:56	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 22:56	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 22:56	WG1386101
(S) Toluene-d8	*102*		*80.0-120*		*11/25/2019 22:56*	WG1386101
(S) 4-Bromofluorobenzene	*99.3*		*75.0-120*		*11/25/2019 22:56*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.9*		*80.0-125*		*11/25/2019 22:56*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000100	1	11/24/2019 18:57	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000200	1	11/24/2019 18:57	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Wet Chemistry by Method 130.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Hardness (colorimetric) as CaCO3	128		30.0	1	11/27/2019 16:46	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Alkalinity	ND		20.0	1	11/29/2019 15:44	WG1388427

Sample Narrative:
L1163520-08 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:57	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
COD	ND		10.0	1	11/27/2019 18:58	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Bromide	ND		1.00	1	12/01/2019 01:02	WG1389065
Chloride	19.2		1.00	1	12/01/2019 01:02	WG1389065
Fluoride	0.178		0.100	1	12/01/2019 01:02	WG1389065
Nitrate	1.75	Q	0.100	1	12/01/2019 01:02	WG1389065
Sulfate	98.1		25.0	5	12/01/2019 01:13	WG1389065

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	11/25/2019 16:05	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Boron	ND		0.200	1	11/27/2019 22:37	WG1385230

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Aluminum	ND		0.100	1	11/27/2019 09:52	WG1385251
Antimony	ND		0.00200	1	11/27/2019 12:06	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 09:52	WG1385251
Barium	0.0403		0.00500	1	11/27/2019 09:52	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 09:52	WG1385251
Cadmium	0.00155		0.00100	1	11/27/2019 09:52	WG1385251
Calcium	32.3		1.00	1	11/27/2019 09:52	WG1385251
Chromium	ND		0.00200	1	11/27/2019 09:52	WG1385251
Cobalt	ND		0.00200	1	11/27/2019 09:52	WG1385251
Copper	ND		0.00500	1	11/27/2019 09:52	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	ND		0.100	1	11/27/2019 09:52	WG1385251
Lead	ND		0.00200	1	11/27/2019 09:52	WG1385251
Magnesium	10.1		1.00	1	11/27/2019 09:52	WG1385251
Manganese	0.0221		0.00500	1	11/27/2019 09:52	WG1385251
Nickel	0.00295		0.00200	1	11/27/2019 09:52	WG1385251
Potassium	4.58		1.00	1	11/27/2019 09:52	WG1385251
Selenium	ND		0.00200	1	11/27/2019 09:52	WG1385251
Silver	ND		0.00200	1	11/27/2019 09:52	WG1385251
Sodium	6.53		1.00	1	11/27/2019 09:52	WG1385251
Thallium	ND		0.00200	1	11/27/2019 09:52	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 09:52	WG1385251
Zinc	0.0276		0.0250	1	11/27/2019 09:52	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 23:23	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 23:23	WG1386101
Benzene	ND		0.00100	1	11/25/2019 23:23	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 23:23	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 23:23	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 23:23	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 23:23	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 23:23	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 23:23	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 23:23	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 23:23	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 23:23	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 23:23	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 23:23	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 23:23	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 23:23	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 23:23	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 23:23	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 23:23	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 23:23	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 23:23	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 23:23	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 23:23	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 23:23	WG1386101
Styrene	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 23:23	WG1386101
Toluene	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 23:23	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 23:23	WG1386101

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 23:23	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 23:23	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 23:23	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 23:23	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 23:23	WG1386101
(S) Toluene-d8	*101*		*80.0-120*		*11/25/2019 23:23*	WG1386101
(S) 4-Bromofluorobenzene	*98.5*		*75.0-120*		*11/25/2019 23:23*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.3*		*80.0-125*		*11/25/2019 23:23*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000100	1	11/24/2019 19:08	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000200	1	11/24/2019 19:08	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Wet Chemistry by Method 130.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Hardness (colorimetric) as CaCO3	ND		30.0	1	11/27/2019 16:47	WG1385296

Wet Chemistry by Method 2320 B-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Alkalinity	ND		20.0	1	11/29/2019 15:50	WG1388427

Sample Narrative:

L1163520-09 WG1388427: Endpoint pH 4.5

Wet Chemistry by Method 350.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ammonia Nitrogen	ND		0.100	1	12/06/2019 19:58	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
COD	ND		10.0	1	11/27/2019 18:58	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Bromide	ND		1.00	1	11/22/2019 11:05	WG1385274
Chloride	ND		1.00	1	11/22/2019 11:05	WG1385274
Fluoride	ND		0.100	1	11/22/2019 11:05	WG1385274
Nitrate	ND		0.100	1	11/22/2019 11:05	WG1385274
Sulfate	ND		5.00	1	11/22/2019 11:05	WG1385274

Mercury by Method 7470A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Mercury	ND		0.000200	1	11/25/2019 16:07	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	11/27/2019 22:40	WG1385230

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Aluminum	ND		0.100	1	11/27/2019 10:48	WG1385251
Antimony	ND		0.00200	1	11/27/2019 12:10	WG1385251
Arsenic	ND		0.00200	1	11/27/2019 10:48	WG1385251
Barium	ND		0.00500	1	11/27/2019 10:48	WG1385251
Beryllium	ND		0.00200	1	11/27/2019 10:48	WG1385251
Cadmium	ND		0.00100	1	11/27/2019 10:48	WG1385251
Calcium	ND		1.00	1	11/27/2019 10:48	WG1385251
Chromium	ND		0.00200	1	11/27/2019 10:48	WG1385251
Cobalt	ND		0.00200	1	11/27/2019 10:48	WG1385251
Copper	ND		0.00500	1	11/27/2019 10:48	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	ND		0.100	1	11/27/2019 10:48	WG1385251
Lead	ND		0.00200	1	11/27/2019 10:48	WG1385251
Magnesium	ND		1.00	1	11/27/2019 10:48	WG1385251
Manganese	ND		0.00500	1	11/27/2019 10:48	WG1385251
Nickel	ND		0.00200	1	11/27/2019 10:48	WG1385251
Potassium	ND		1.00	1	11/27/2019 10:48	WG1385251
Selenium	ND		0.00200	1	11/27/2019 10:48	WG1385251
Silver	ND		0.00200	1	11/27/2019 10:48	WG1385251
Sodium	ND		1.00	1	11/27/2019 10:48	WG1385251
Thallium	ND		0.00200	1	11/27/2019 10:48	WG1385251
Vanadium	ND		0.00500	1	11/27/2019 10:48	WG1385251
Zinc	ND		0.0250	1	11/27/2019 10:48	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 19:20	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 19:20	WG1386101
Benzene	ND		0.00100	1	11/25/2019 19:20	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 19:20	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 19:20	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 19:20	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 19:20	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 19:20	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 19:20	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 19:20	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 19:20	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 19:20	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 19:20	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 19:20	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 19:20	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 19:20	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 19:20	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 19:20	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 19:20	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 19:20	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 19:20	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 19:20	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 19:20	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 19:20	WG1386101
Styrene	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 19:20	WG1386101
Toluene	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 19:20	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 19:20	WG1386101

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 19:20	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 19:20	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 19:20	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 19:20	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 19:20	WG1386101
(S) Toluene-d8	*101*		*80.0-120*		*11/25/2019 19:20*	WG1386101
(S) 4-Bromofluorobenzene	*99.6*		*75.0-120*		*11/25/2019 19:20*	WG1386101
(S) 1,2-Dichloroethane-d4	*95.5*		*80.0-125*		*11/25/2019 19:20*	WG1386101

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000102	1.02	11/24/2019 19:19	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000204	1.02	11/24/2019 19:19	WG1385648

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	0.0500	1	11/25/2019 19:47	WG1386101
Acrylonitrile	ND		0.0100	1	11/25/2019 19:47	WG1386101
Benzene	ND		0.00100	1	11/25/2019 19:47	WG1386101
Bromochloromethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
Bromodichloromethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
Bromoform	ND		0.00100	1	11/25/2019 19:47	WG1386101
Bromomethane	ND		0.00500	1	11/25/2019 19:47	WG1386101
Carbon disulfide	ND		0.00100	1	11/25/2019 19:47	WG1386101
Carbon tetrachloride	ND		0.00100	1	11/25/2019 19:47	WG1386101
Chlorobenzene	ND		0.00100	1	11/25/2019 19:47	WG1386101
Chlorodibromomethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
Chloroethane	ND		0.00500	1	11/25/2019 19:47	WG1386101
Chloroform	ND		0.00500	1	11/25/2019 19:47	WG1386101
Chloromethane	ND		0.00250	1	11/25/2019 19:47	WG1386101
Dibromomethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,2-Dichlorobenzene	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,4-Dichlorobenzene	ND		0.00100	1	11/25/2019 19:47	WG1386101
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/25/2019 19:47	WG1386101
1,1-Dichloroethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,2-Dichloroethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,1-Dichloroethene	ND		0.00100	1	11/25/2019 19:47	WG1386101
cis-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 19:47	WG1386101
trans-1,2-Dichloroethene	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,2-Dichloropropane	ND		0.00100	1	11/25/2019 19:47	WG1386101
cis-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 19:47	WG1386101
trans-1,3-Dichloropropene	ND		0.00100	1	11/25/2019 19:47	WG1386101
Ethylbenzene	ND		0.00100	1	11/25/2019 19:47	WG1386101
2-Hexanone	ND		0.0100	1	11/25/2019 19:47	WG1386101
Iodomethane	ND		0.0100	1	11/25/2019 19:47	WG1386101
2-Butanone (MEK)	ND		0.0100	1	11/25/2019 19:47	WG1386101
Methylene Chloride	ND		0.00500	1	11/25/2019 19:47	WG1386101
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	11/25/2019 19:47	WG1386101
Styrene	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
Tetrachloroethene	ND		0.00100	1	11/25/2019 19:47	WG1386101
Toluene	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,1,1-Trichloroethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
1,1,2-Trichloroethane	ND		0.00100	1	11/25/2019 19:47	WG1386101
Trichloroethene	ND		0.00100	1	11/25/2019 19:47	WG1386101
Trichlorofluoromethane	ND		0.00500	1	11/25/2019 19:47	WG1386101
1,2,3-Trichloropropane	ND		0.00250	1	11/25/2019 19:47	WG1386101
Vinyl acetate	ND		0.0100	1	11/25/2019 19:47	WG1386101
Vinyl chloride	ND		0.00100	1	11/25/2019 19:47	WG1386101
Xylenes, Total	ND		0.00300	1	11/25/2019 19:47	WG1386101
(S) Toluene-d8	*101*		*80.0-120*		*11/25/2019 19:47*	WG1386101
(S) 4-Bromofluorobenzene	*98.3*		*75.0-120*		*11/25/2019 19:47*	WG1386101
(S) 1,2-Dichloroethane-d4	*96.0*		*80.0-125*		*11/25/2019 19:47*	WG1386101

Method Blank (MB)

(MB) R3477113-1 11/27/19 16:32

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Hardness (colorimetric) as CaCO3	12.6	J	1.43	30.0

L1162222-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1162222-03 11/27/19 16:34 • (DUP) R3477113-3 11/27/19 16:35

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hardness (colorimetric) as CaCO3	50.1	45.1	1	10.5		20

L1163520-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1163520-04 11/27/19 16:42 • (DUP) R3477113-6 11/27/19 16:43

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hardness (colorimetric) as CaCO3	102	97.7	1	4.31		20

Laboratory Control Sample (LCS)

(LCS) R3477113-2 11/27/19 16:32

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Hardness (colorimetric) as CaCO3	100	93.3	93.3	85.0-115	

L1163520-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163520-02 11/27/19 16:37 • (MS) R3477113-4 11/27/19 16:37 • (MSD) R3477113-5 11/27/19 16:38

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Hardness (colorimetric) as CaCO3	100	121	198	201	77.0	80.0	1	80.0-120	J6	E	1.50	20

Method Blank (MB)

(MB) R3477543-1 11/29/19 13:34

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Alkalinity	3.48	J	2.71	20.0

Sample Narrative:

BLANK: Endpoint pH 4.5

L1163315-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163315-01 11/29/19 13:57 • (DUP) R3477543-2 11/29/19 14:05

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Alkalinity	304	306	1	0.571		20

Sample Narrative:

OS: Endpoint pH 4.5 HEADSPACE

DUP: Endpoint pH 4.5

L1163588-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1163588-03 11/29/19 16:18 • (DUP) R3477543-4 11/29/19 16:37

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Alkalinity	61.0	61.2	1	0.361		20

Sample Narrative:

OS: Endpoint pH 4.5 HEADSPACE

DUP: Endpoint pH 4.5

Laboratory Control Sample (LCS)

(LCS) R3477543-3 11/29/19 15:05

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Alkalinity	100	93.0	93.0	85.0-115	

Sample Narrative:

LCS: Endpoint pH 4.5

Method Blank (MB)

(MB) R3479975-1 12/06/19 19:31

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Ammonia Nitrogen	U		0.0317	0.100

L1163520-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163520-01 12/06/19 19:36 • (DUP) R3479975-3 12/06/19 19:37

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Ammonia Nitrogen	ND	0.0440	1	29.1	J P1	10

Laboratory Control Sample (LCS)

(LCS) R3479975-2 12/06/19 19:33

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Ammonia Nitrogen	7.50	7.48	99.8	90.0-110	

L1163520-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163520-02 12/06/19 19:39 • (MS) R3479975-4 12/06/19 19:41 • (MSD) R3479975-5 12/06/19 19:42

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Ammonia Nitrogen	5.00	ND	5.09	5.03	102	101	1	90.0-110			1.11	10

Method Blank (MB)

(MB) R3477123-1 11/27/19 18:56

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
COD	U		3.00	10.0

L1163492-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163492-01 11/27/19 18:56 • (DUP) R3477123-3 11/27/19 18:56

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
COD	45.8	45.1	1	1.62		20

L1164814-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1164814-03 11/27/19 19:00 • (DUP) R3477123-6 11/27/19 19:00

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
COD	162	161	1	0.223		20

Laboratory Control Sample (LCS)

(LCS) R3477123-2 11/27/19 18:56

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
COD	222	223	100	90.0-110	

L1163520-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163520-07 11/27/19 18:58 • (MS) R3477123-4 11/27/19 18:58 • (MSD) R3477123-5 11/27/19 18:58

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
COD	400	ND	435	433	108	107	1	80.0-120			0.426	20

Method Blank (MB)

(MB) R3475093-1 11/21/19 22:41

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Bromide	U		0.0790	1.00
Chloride	U		0.0519	1.00
Fluoride	U		0.00990	0.100
Nitrate	U		0.0227	0.100
Sulfate	0.354	J	0.0774	5.00

L1163203-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1163203-04 11/22/19 09:46 • (DUP) R3475093-3 11/22/19 00:51

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	U	0.000	1	0.000		15
Chloride	1.95	2.15	1	10.0		15
Fluoride	0.0294	0.0239	1	20.6	J P1	15
Nitrate	0.536	0.528	1	1.56		15
Sulfate	0.504	0.451	1	11.0	J	15

L1163520-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1163520-05 11/22/19 08:32 • (DUP) R3475093-6 11/22/19 08:47

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	ND	0.000	1	0.000		15
Chloride	18.6	18.4	1	0.784		15
Fluoride	ND	0.000	1	0.000		15
Nitrate	1.84	1.88	1	1.81		15
Sulfate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3475093-2 11/21/19 22:56

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Bromide	40.0	39.5	98.9	80.0-120	
Chloride	40.0	39.2	97.9	80.0-120	
Fluoride	8.00	7.94	99.2	80.0-120	
Nitrate	8.00	8.24	103	80.0-120	

Laboratory Control Sample (LCS)

(LCS) R3475093-2 11/21/19 22:56

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Sulfate	40.0	40.3	101	80.0-120	

L1163203-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163203-04 11/22/19 09:46 • (MS) R3475093-4 11/22/19 01:06 • (MSD) R3475093-5 11/22/19 01:20

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Bromide	50.0	U	46.1	48.0	92.2	96.0	1	80.0-120			4.04	15
Chloride	50.0	1.95	51.5	51.6	99.2	99.3	1	80.0-120			0.153	15
Fluoride	5.00	0.0294	5.00	5.02	99.4	99.8	1	80.0-120			0.427	15
Nitrate	5.00	0.536	5.35	5.59	96.4	101	1	80.0-120			4.24	15
Sulfate	50.0	0.504	50.9	51.1	101	101	1	80.0-120			0.369	15

L1163520-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1163520-05 11/22/19 08:32 • (MS) R3475093-7 11/22/19 09:01

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Bromide	50.0	ND	48.9	97.8	1	80.0-120	
Chloride	50.0	18.6	68.0	98.9	1	80.0-120	
Fluoride	5.00	ND	5.06	101	1	80.0-120	
Nitrate	5.00	1.84	6.73	97.7	1	80.0-120	
Sulfate	50.0	ND	51.7	103	1	80.0-120	

Method Blank (MB)

(MB) R3475310-1 11/22/19 09:32

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Bromide	U		0.0790	1.00
Chloride	U		0.0519	1.00
Fluoride	U		0.00990	0.100
Nitrate	U		0.0227	0.100
Sulfate	U		0.0774	5.00

L1163690-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163690-01 11/22/19 15:12 • (DUP) R3475310-3 11/22/19 15:27

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	ND	0.830	1	0.000		15
Chloride	99.7	102	1	2.20	E	15
Fluoride	ND	0.000	1	0.000		15
Nitrate	ND	0.000	1	0.000		15
Sulfate	15.2	14.7	1	3.59		15

L1163732-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1163732-03 11/22/19 19:26 • (DUP) R3475310-7 11/22/19 19:42

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	2.02	1.97	1	2.43		15
Fluoride	0.582	0.582	1	0.0515		15
Nitrate	0.271	0.269	1	0.851		15

L1163732-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1163732-03 11/22/19 20:14 • (DUP) R3475310-9 11/22/19 20:29

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	312	308	10	1.45		15
Sulfate	163	161	10	0.850		15

Laboratory Control Sample (LCS)

(LCS) R3475310-2 11/22/19 09:48

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Bromide	40.0	38.3	95.8	80.0-120	
Chloride	40.0	38.4	96.1	80.0-120	
Fluoride	8.00	7.97	99.6	80.0-120	
Nitrate	8.00	7.92	99.0	80.0-120	
Sulfate	40.0	38.5	96.3	80.0-120	

L1163690-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163690-01 11/22/19 15:12 • (MS) R3475310-4 11/22/19 15:43 • (MSD) R3475310-5 11/22/19 15:59

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Bromide	50.0	ND	46.0	45.8	90.6	90.2	1	80.0-120			0.363	15
Chloride	50.0	99.7	149	149	99.1	99.2	1	80.0-120	E	E	0.0543	15
Fluoride	5.00	ND	2.00	2.02	40.0	40.5	1	80.0-120	J6	J6	1.23	15
Nitrate	5.00	ND	4.03	4.00	80.6	80.0	1	80.0-120			0.707	15
Sulfate	50.0	15.2	64.6	64.8	98.7	99.1	1	80.0-120			0.310	15

L1163732-03 Original Sample (OS) • Matrix Spike (MS)

(OS) L1163732-03 11/22/19 19:26 • (MS) R3475310-8 11/22/19 19:58

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Bromide	50.0	2.02	45.4	86.7	1	80.0-120	
Chloride	50.0	320	354	68.6	1	80.0-120	E V
Fluoride	5.00	0.582	5.62	101	1	80.0-120	
Nitrate	5.00	0.271	5.18	98.2	1	80.0-120	
Sulfate	50.0	182	228	92.5	1	80.0-120	E

Method Blank (MB)

(MB) R3477731-1 11/30/19 08:42

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Bromide	U		0.0790	1.00
Chloride	0.347	J	0.0519	1.00
Fluoride	U		0.00990	0.100
Nitrate	U		0.0227	0.100
Sulfate	0.671	J	0.0774	5.00

L1163204-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163204-01 11/30/19 18:41 • (DUP) R3477731-3 11/30/19 18:52

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	0.909	0.848	1	6.90	J	15
Chloride	33.0	33.5	1	1.55		15
Fluoride	0.139	0.143	1	3.19		15
Nitrate	U	0.000	1	0.000		15
Sulfate	48.1	48.9	1	1.67		15

L1163452-09 Original Sample (OS) • Duplicate (DUP)

(OS) L1163452-09 11/30/19 23:57 • (DUP) R3477731-6 12/01/19 00:08

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	U	0.000	1	0.000		15
Chloride	18.3	19.2	1	4.71		15
Fluoride	0.113	0.113	1	0.709		15
Nitrate	0.137	0.000	1	200	P1	15
Sulfate	36.2	36.7	1	1.33		15

Laboratory Control Sample (LCS)

(LCS) R3477731-2 11/30/19 08:53

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Bromide	40.0	39.4	98.4	80.0-120	
Chloride	40.0	39.1	97.8	80.0-120	
Fluoride	8.00	8.09	101	80.0-120	
Nitrate	8.00	7.75	96.9	80.0-120	

Laboratory Control Sample (LCS)

(LCS) R3477731-2 11/30/19 08:53

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Sulfate	40.0	39.3	98.1	80.0-120	

L1163204-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163204-01 11/30/19 18:41 • (MS) R3477731-4 11/30/19 19:03 • (MSD) R3477731-5 11/30/19 19:14

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Bromide	50.0	0.909	48.5	51.6	95.2	101	1	80.0-120			6.25	15
Chloride	50.0	33.0	83.6	84.3	101	103	1	80.0-120			0.775	15
Fluoride	5.00	0.139	5.42	5.41	106	105	1	80.0-120			0.338	15
Nitrate	5.00	U	4.59	5.41	91.7	108	1	80.0-120		J3	16.5	15
Sulfate	50.0	48.1	98.0	102	99.8	108	1	80.0-120		E	3.95	15

L1163452-09 Original Sample (OS) • Matrix Spike (MS)

(OS) L1163452-09 11/30/19 23:57 • (MS) R3477731-7 12/01/19 00:19

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Bromide	50.0	U	47.1	94.1	1	80.0-120	
Chloride	50.0	18.3	68.1	99.6	1	80.0-120	
Fluoride	5.00	0.113	4.63	90.4	1	80.0-120	
Nitrate	5.00	0.137	5.00	97.3	1	80.0-120	
Sulfate	50.0	36.2	84.9	97.4	1	80.0-120	

Method Blank (MB)

(MB) R3476075-1 11/25/19 15:16

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Mercury	U		0.0000490	0.000200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476075-2 11/25/19 15:18 • (LCSD) R3476075-3 11/25/19 15:20

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
Mercury	0.00300	0.00337	0.00347	112	116	80.0-120			2.97	20

Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) • (MS) R3476075-4 11/25/19 15:24 • (MSD) R3476075-5 11/25/19 15:26

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l		mg/l	mg/l	%	%		%			%	%
Mercury	0.00300		0.00351	0.00334	117	111	1	75.0-125			5.02	20

Method Blank (MB)

(MB) R3476716-1 11/26/19 15:02

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Boron	U		0.0126	0.200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476716-2 11/26/19 15:05 • (LCSD) R3476716-3 11/26/19 15:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Boron	1.00	0.985	0.973	98.5	97.3	80.0-120			1.22	20

L1163452-10 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163452-10 11/26/19 15:10 • (MS) R3476716-5 11/26/19 15:15 • (MSD) R3476716-6 11/26/19 15:17

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Boron	1.00	0.226	1.17	1.19	94.6	96.5	1	75.0-125			1.61	20

Method Blank (MB)

(MB) R3477536-1 11/29/19 12:52

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Boron	U		0.0126	0.200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3477536-2 11/29/19 12:55 • (LCSD) R3477536-3 11/29/19 12:57

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Boron	1.00	0.984	0.966	98.4	96.6	80.0-120			1.79	20

L1163535-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163535-01 11/29/19 13:00 • (MS) R3477536-5 11/29/19 13:06 • (MSD) R3477536-6 11/29/19 13:08

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Boron	1.00	0.0939	1.09	1.08	99.1	98.4	1	75.0-125			0.721	20

Method Blank (MB)

(MB) R3476857-1 11/27/19 09:40

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Aluminum	U		0.00515	0.100
Antimony	U		0.000754	0.00200
Arsenic	U		0.000250	0.00200
Barium	U		0.000360	0.00500
Beryllium	U		0.000120	0.00200
Cadmium	U		0.000160	0.00100
Calcium	U		0.0460	1.00
Chromium	0.000565	J	0.000540	0.00200
Copper	0.000651	J	0.000520	0.00500
Cobalt	U		0.000260	0.00200
Iron	U		0.0150	0.100
Lead	0.000271	J	0.000240	0.00200
Magnesium	U		0.100	1.00
Manganese	0.000629	J	0.000250	0.00500
Nickel	U		0.000350	0.00200
Potassium	0.0514	J	0.0370	1.00
Selenium	U		0.000380	0.00200
Silver	U		0.000310	0.00200
Sodium	U		0.110	1.00
Thallium	U		0.000190	0.00200
Vanadium	U		0.000180	0.00500
Zinc	U		0.00256	0.0250

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476857-2 11/27/19 09:44 • (LCSD) R3476857-3 11/27/19 09:48

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Aluminum	5.00	4.75	4.70	95.1	94.0	80.0-120			1.10	20
Antimony	0.0500	0.0478	0.0477	95.6	95.5	80.0-120			0.0903	20
Arsenic	0.0500	0.0489	0.0469	97.8	93.8	80.0-120			4.15	20
Barium	0.0500	0.0471	0.0470	94.2	94.1	80.0-120			0.187	20
Beryllium	0.0500	0.0474	0.0474	94.8	94.8	80.0-120			0.0165	20
Cadmium	0.0500	0.0491	0.0479	98.1	95.7	80.0-120			2.47	20
Calcium	5.00	4.81	4.67	96.1	93.3	80.0-120			2.93	20
Chromium	0.0500	0.0487	0.0462	97.5	92.4	80.0-120			5.34	20
Copper	0.0500	0.0452	0.0488	90.4	97.6	80.0-120			7.57	20
Cobalt	0.0500	0.0496	0.0477	99.2	95.5	80.0-120			3.84	20
Iron	5.00	4.91	4.71	98.3	94.2	80.0-120			4.16	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476857-2 11/27/19 09:44 • (LCSD) R3476857-3 11/27/19 09:48

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Lead	0.0500	0.0464	0.0464	92.7	92.9	80.0-120			0.138	20
Magnesium	5.00	4.80	4.75	96.0	95.0	80.0-120			1.06	20
Manganese	0.0500	0.0492	0.0470	98.4	94.0	80.0-120			4.56	20
Nickel	0.0500	0.0491	0.0484	98.2	96.9	80.0-120			1.41	20
Potassium	5.00	4.73	4.64	94.6	92.7	80.0-120			2.02	20
Selenium	0.0500	0.0556	0.0523	111	105	80.0-120			6.07	20
Silver	0.0500	0.0481	0.0475	96.1	95.0	80.0-120			1.13	20
Sodium	5.00	4.83	4.78	96.5	95.5	80.0-120			1.02	20
Thallium	0.0500	0.0485	0.0474	96.9	94.9	80.0-120			2.12	20
Vanadium	0.0500	0.0492	0.0468	98.3	93.6	80.0-120			4.90	20
Zinc	0.0500	0.0507	0.0495	101	99.0	80.0-120			2.43	20

L1163520-08 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163520-08 11/27/19 09:52 • (MS) R3476857-5 11/27/19 09:59 • (MSD) R3476857-6 11/27/19 10:03

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Aluminum	5.00	ND	4.99	5.01	98.7	99.1	1	75.0-125			0.453	20
Antimony	0.0500	ND	0.0518	0.0495	104	99.0	1	75.0-125			4.47	20
Arsenic	0.0500	ND	0.0508	0.0519	102	104	1	75.0-125			2.30	20
Barium	0.0500	0.0403	0.0916	0.0904	103	100	1	75.0-125			1.30	20
Beryllium	0.0500	ND	0.0493	0.0491	98.5	98.2	1	75.0-125			0.395	20
Cadmium	0.0500	0.00155	0.0526	0.0518	102	100	1	75.0-125			1.62	20
Calcium	5.00	32.3	37.1	37.2	95.8	96.6	1	75.0-125			0.104	20
Chromium	0.0500	ND	0.0509	0.0527	102	105	1	75.0-125			3.46	20
Copper	0.0500	ND	0.0464	0.0467	89.3	89.9	1	75.0-125			0.576	20
Cobalt	0.0500	ND	0.0517	0.0526	103	105	1	75.0-125			1.71	20
Potassium	5.00	4.58	9.51	9.47	98.5	97.7	1	75.0-125			0.445	20
Iron	5.00	ND	5.13	5.24	102	104	1	75.0-125			2.19	20
Lead	0.0500	ND	0.0491	0.0495	96.9	97.7	1	75.0-125			0.836	20
Magnesium	5.00	10.1	15.3	15.2	103	101	1	75.0-125			0.616	20
Manganese	0.0500	0.0221	0.0721	0.0735	100	103	1	75.0-125			1.82	20
Nickel	0.0500	0.00295	0.0547	0.0554	104	105	1	75.0-125			1.26	20
Selenium	0.0500	ND	0.0574	0.0571	115	114	1	75.0-125			0.529	20
Silver	0.0500	ND	0.0519	0.0513	103	102	1	75.0-125			1.26	20
Sodium	5.00	6.53	11.5	11.5	100	99.6	1	75.0-125			0.242	20
Thallium	0.0500	ND	0.0501	0.0500	100	100	1	75.0-125			0.300	20
Vanadium	0.0500	ND	0.0515	0.0520	103	103	1	75.0-125			0.915	20
Zinc	0.0500	0.0276	0.0768	0.0814	98.5	108	1	75.0-125			5.83	20

Method Blank (MB)

(MB) R3476641-2 11/25/19 18:53

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1,1,2-Tetrachloroethane	U		0.000385	0.00100
1,1,1-Trichloroethane	U		0.000319	0.00100
1,1,2,2-Tetrachloroethane	U		0.000130	0.00100
1,1,2-Trichloroethane	U		0.000383	0.00100
1,1-Dichloroethane	U		0.000259	0.00100
1,1-Dichloroethene	U		0.000398	0.00100
1,2,3-Trichloropropane	U		0.000807	0.00250
1,2-Dichlorobenzene	U		0.000349	0.00100
1,2-Dichloroethane	U		0.000361	0.00100
1,2-Dichloropropane	U		0.000306	0.00100
1,4-Dichlorobenzene	U		0.000274	0.00100
2-Butanone (MEK)	U		0.00393	0.0100
2-Hexanone	U		0.00382	0.0100
4-Methyl-2-pentanone (MIBK)	U		0.00214	0.0100
Acetone	U		0.0100	0.0500
Acrylonitrile	U		0.00187	0.0100
Benzene	U		0.000331	0.00100
Bromochloromethane	U		0.000520	0.00100
Bromodichloromethane	U		0.000380	0.00100
Bromoform	U		0.000469	0.00100
Bromomethane	U		0.000866	0.00500
Carbon Disulfide	U		0.000275	0.00100
Carbon Tetrachloride	U		0.000379	0.00100
Chlorobenzene	U		0.000348	0.00100
Chloroethane	U		0.000453	0.00500
Chloroform	U		0.000324	0.00500
Chloromethane	U		0.000276	0.00250
Cis-1,2-Dichloroethene	U		0.000260	0.00100
Cis-1,3-Dichloropropene	U		0.000418	0.00100
Chlorodibromomethane	U		0.000327	0.00100
Dibromomethane	U		0.000346	0.00100
Ethylbenzene	U		0.000384	0.00100
Methylene Chloride	U		0.00100	0.00500
Styrene	U		0.000307	0.00100
Tetrachloroethene	U		0.000372	0.00100
Toluene	U	J	0.000412	0.00100
trans-1,2-Dichloroethene	U		0.000396	0.00100
trans-1,3-Dichloropropene	U		0.000419	0.00100
trans-1,4-Dichloro-2-butene	U		0.000866	0.00250
Trichloroethene	U		0.000398	0.00100

Method Blank (MB)

(MB) R3476641-2 11/25/19 18:53

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Trichlorofluoromethane	U		0.00120	0.00500
Vinyl Acetate	U		0.00163	0.0100
Vinyl Chloride	U		0.000259	0.00100
Xylenes, Total	U		0.00106	0.00300
Iodomethane	U		0.00171	0.0100
(S) 1,2-Dichloroethane-d4	*95.3*			*80.0-125*
(S) 4-Bromofluorobenzene	*99.2*			*75.0-120*
(S) Toluene-d8	*102*			*80.0-120*

Laboratory Control Sample (LCS)

(LCS) R3476641-1 11/25/19 16:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
1,1,1,2-Tetrachloroethane	0.0400	0.0454	114	80.0-120	
1,1,1-Trichloroethane	0.0400	0.0445	111	80.0-125	
1,1,2,2-Tetrachloroethane	0.0400	0.0362	90.5	79.0-121	
1,1,2-Trichloroethane	0.0400	0.0372	93.0	78.0-121	
1,1-Dichloroethane	0.0400	0.0415	104	78.0-124	
1,1-Dichloroethene	0.0400	0.0402	101	78.0-121	
1,2,3-Trichloropropane	0.0400	0.0320	80.0	77.0-120	
1,2-Dichlorobenzene	0.0400	0.0406	102	80.0-120	
1,2-Dichloroethane	0.0400	0.0350	87.5	72.0-126	
1,2-Dichloropropane	0.0400	0.0413	103	79.0-123	
1,4-Dichlorobenzene	0.0400	0.0397	99.3	80.0-120	
2-Butanone (MEK)	0.200	0.221	111	64.0-142	
2-Hexanone	0.200	0.223	112	66.0-140	
4-Methyl-2-pentanone (MIBK)	0.200	0.176	88.0	68.0-137	
Acetone	0.200	0.345	173	56.0-140	J4
Acrylonitrile	0.400	0.310	77.5	65.0-137	
Benzene	0.0400	0.0405	101	79.0-120	
Bromochloromethane	0.0400	0.0384	96.0	78.0-120	
Bromodichloromethane	0.0400	0.0456	114	80.0-125	
Bromoform	0.0400	0.0453	113	74.0-129	
Bromomethane	0.0400	0.0254	63.5	25.0-160	
Carbon Disulfide	0.0400	0.0473	118	74.0-123	
Carbon Tetrachloride	0.0400	0.0519	130	78.0-131	
Chlorobenzene	0.0400	0.0391	97.8	80.0-120	
Chloroethane	0.0400	0.0472	118	55.0-143	

Laboratory Control Sample (LCS)

(LCS) R3476641-1 11/25/19 16:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Chloroform	0.0400	0.0381	95.3	80.0-122	
Chloromethane	0.0400	0.0445	111	57.0-130	
Cis-1,2-Dichloroethene	0.0400	0.0387	96.8	80.0-120	
Cis-1,3-Dichloropropene	0.0400	0.0413	103	80.0-123	
Chlorodibromomethane	0.0400	0.0449	112	80.0-123	
Dibromomethane	0.0400	0.0373	93.3	77.0-122	
Ethylbenzene	0.0400	0.0394	98.5	80.0-120	
Methylene Chloride	0.0400	0.0434	109	78.0-120	
Styrene	0.0400	0.0403	101	80.0-123	
Tetrachloroethene	0.0400	0.0391	97.8	78.0-122	
Toluene	0.0400	0.0409	102	80.0-121	
trans-1,2-Dichloroethene	0.0400	0.0408	102	80.0-121	
trans-1,3-Dichloropropene	0.0400	0.0414	104	78.0-125	
trans-1,4-Dichloro-2-butene	0.100	0.0814	81.4	57.0-153	
Trichloroethene	0.0400	0.0383	95.8	78.0-121	
Trichlorofluoromethane	0.0400	0.0394	98.5	65.0-135	
Vinyl Acetate	0.0400	0.0427	107	71.0-139	
Vinyl Chloride	0.0400	0.0461	115	72.0-124	
Xylenes, Total	0.120	0.119	99.2	80.0-121	
Iodomethane	0.0400	0.0423	106	70.0-130	
(S) 1,2-Dichloroethane-d4			*92.7*	*80.0-125*	
(S) 4-Bromofluorobenzene			*101*	*75.0-120*	
(S) Toluene-d8			*104*	*80.0-120*	

Method Blank (MB)

(MB) R3476058-1 11/24/19 14:54

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Ethylene Dibromide	U		0.00000240	0.0000100
1,2-Dibromo-3-Chloropropane	U		0.00000430	0.0000200

L1163066-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1163066-11 11/24/19 15:16 • (DUP) R3476058-2 11/24/19 15:05

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Ethylene Dibromide	ND	0.000	1.02	0.000		20
1,2-Dibromo-3-Chloropropane	ND	0.000	1.02	0.000		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476058-4 11/24/19 17:28 • (LCSD) R3476058-5 11/24/19 19:42

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Ethylene Dibromide	0.000250	0.000228	0.000236	91.2	94.4	60.0-140			3.45	20
1,2-Dibromo-3-Chloropropane	0.000250	0.000244	0.000264	97.6	106	60.0-140			7.87	20

L1163066-12 Original Sample (OS) • Matrix Spike (MS)

(OS) L1163066-12 11/24/19 15:38 • (MS) R3476058-3 11/24/19 15:27

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Ethylene Dibromide	0.000101	ND	0.0000987	97.7	1.01	64.0-159	
1,2-Dibromo-3-Chloropropane	0.000101	ND	0.0000728	72.1	1.01	72.0-148	P

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
P	RPD between the primary and confirmatory analysis exceeded 40%.
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.
Q	Sample was prepared and/or analyzed past holding time as defined in the method. Concentrations should be considered minimum values.
V	The sample concentration is too high to evaluate accurate spike recoveries.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.

Civil & Environmental Consultants - TN

117 Seaboard Ln.

Billing Information:
Dr. Kevin Wolfe
117 Seaboard Ln.
Suite E100
Franklin, TN 37067

Pres Chk

Report to: Philip Campbell

Email To: pcampbell@cecinc.com

Project Description: Former EWS Camden Class 2 La

City/State Collected:

Please Circle: PT MT CT ET

Phone: 615-333-7797
Fax: 615-333-7751

Client Project # 181-364

Lab Project # CEC-181364

Collected by (print): BRANDON SCLCNHA

Site/Facility ID # CAMDEN, TN

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ___

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Date Results Needed

Quote #

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace Analytical® National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

SDG # 163570

F177

Acctnum: CEC
Template: T133579
Prelogin: P741255
PM: 526 - Chris McCord
PB: JB 11-18-19
Shipped Via: Courier

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**WetChem** 250mlHDPE-NoPres	ALK 100ml Amb-NoPres	COD,NH3 250mlHDPE-H2SO4	Diss. Metals-FF 250mlHDPE-HNO3	SV8011 40mlClr-NaThio	Total Metals,HARD 250mlHDPE-HNO3	V8260AP1 40mlAmb-HCl	V8260AP1-Trip Blank 40mlAmb-HCl-Blk	Remarks	Sample # (lab only)
MW-1	Grab	GW		11-20-19	1125	10 11	X	X	X	X	X	X	X			01
MW-3	Grab	GW		11-20-19	1410	10 11	X	X	X	X	X	X	X			02
MW-4	Grab	GW		11-20-19	1310	10 11	X	X	X	X	X	X	X			03
MW-5	Grab	GW		11-20-19	1220	10 11	X	X	X	X	X	X	X			04
TMW-1	Grab	GW		11-20-19	1130	10 11	X	X	X	X	X	X	X			05
TMW-2	Grab	GW		11-20-19	~~1301320~~	10 11	X	X	X	X	X	X	X		Time is 1320	06
TMW-3	Grab	GW		11-20-19	1510	10 11	X	X	X	X	X	X	X			07
DUPLICATE	Grab	GW		11-20-19	—	10 11	X	X	X	X	X	X	X			08
FIELD BLANK	Grab	GW		11-20-19	1325	10	X	X	X		X	X	X			09
~~EQUIPMENT BLANK~~		GW				10	X	X	X		X	X	X			

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:**WetChem** = *NITRATE*,CHLORIDE,BROMIDE,SULFATE,FLUORIDE,ALK Tot/Diss Metals=M6020AP1+Al,Ca,Fe,K,Mg,Mn,Na,B(6010/7470).

pH _____ Temp _____

Flow _____ Other _____

Sample Receipt Checklist

COC Seal Present/Intact:	NP	Y N
COC Signed/Accurate:		Y N
Bottles arrive intact:		Y N
Correct bottles used:		Y N
Sufficient volume sent:		Y N
If Applicable		
VOA Zero Headspace:		Y N
Preservation Correct/Checked:		Y N
RAD Screen <0.5 mR/hr:		Y N

Samples returned via: __UPS __FedEx __Courier _____

Tracking #

	Date:	Time:	
Relinquished by : (Signature)	11-21-19	1027	Received by: (Signature)
Relinquished by : (Signature)	11-21-19	13:55	Received by: (Signature)
Relinquished by : (Signature)			Received for lab by: (Signature)

Trip Blank Received: Yes / No (HCL / MeoH) TBR

Temp: A3 °C Bottles Received: 90

1.2+.5=1.7

Date: 11/21/19 Time: 830

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

1355 MM

Chain of Custody Page ___ of ___

Pace Analytical®
National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

Civil & Environmental Consultants - TN

117 Seaboard Ln.

Billing Information:
Dr. Kevin Wolfe
117 Seaboard Ln.
Suite E100
Franklin, TN 37067

Email To: pcampbell@cecinc.com

Report to: Philip Campbell

Project Description: Former EWS Camden Class 2 La

City/State Collected:

Please Circle: PT MT CT ET

Phone: 615-333-7797
Fax: 615-333-7751

Client Project # 181-364

Lab Project # CEC-181364

Collected by (print): BRANDON SOLOMA

Site/Facility ID # CAMDEN, TN

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

SDG # 1169570

Table #

Acctnum: CEC

Template: T133579

Prelogin: P741255

PM: 526 - Chris McCord

PB: JB 11-18-19

Shipped Via: Courier

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**WetChem** 250mlHDPE-NoPres	ALK 100ml Amb-NoPres	COD,NH3 250mlHDPE-H2SO4	Diss. Metals-FF 250mlHDPE-HNO3	SV8011 40mlClr-NaThio	Total Metals,HARD 250mlHDPE-HNO3	V8260AP1 40mlAmb-HCl	V8260AP1-Trip Blank 40mlAmb-HCl-Blk	Remarks	Sample # (lab only)
TRIP BLANK	—	GW	—	—	—	1								X		10

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks: **WetChem** = *NITRATE*,CHLORIDE,BROMIDE,SULFATE,FLUORIDE,ALK
Tot/Diss Metals=M6020AP1+Al,Ca,Fe,K,Mg,Mn,Na,B(6010/7470).

pH _____ Temp _____

Flow _____ Other _____

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N
RAD Screen <0.5 mR/hr: Y N

Samples returned via: __ UPS __ FedEx __ Courier

Tracking #

Trip Blank Received: Yes / No (HCL / MeoH) TBR
1

Temp: A3 °C Bottles Received: 10
1.2+.5=1.7

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

	Date:	Time:	
Relinquished by: (Signature)	11-21-19	10:27	Received by: (Signature)
Relinquished by: (Signature)	11-21-19	13:55	Received by: (Signature)
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) Date: 11/21/19 Time: 1355

Matt Shacklock

Login #:1163520	Client: CEC	Date:11/21	Evaluated by:Matt S

Non-Conformance (check applicable items)

	Sample Integrity		Chain of Custody Clarification		
	Parameter(s) past holding time	x	Login Clarification Needed		**If Broken Container:**
	Temperature not in range		Chain of custody is incomplete		Insufficient packing material around container
	Improper container type		Please specify Metals requested.		Insufficient packing material inside cooler
	pH not in range.		Please specify TCLP requested.		Improper handling by carrier (FedEx / UPS / Couri
	Insufficient sample volume.		Received additional samples not listed on coc.		Sample was frozen
	Sample is biphasic.		Sample ids on containers do not match ids on coc		Container lid not intact
	Vials received with headspace.		Trip Blank not received.		**If no Chain of Custody:**
	Broken container		Client did not "X" analysis.		Received by:
	Broken container:		Chain of Custody is missing		Date/Time:
	Sufficient sample remains				Temp./Cont. Rec./pH:
					Carrier:
					Tracking#

Login Comments: Client has dissolved metals on TMW-1, but didn't receive a bottle

Client informed by:		Call	x	Email		Voice Mail		Date: 11/22/19	Time: 11:12
TSR Initials: CM	Client Contact: Philip Campbell								

Login Instructions:

Dissolved metals not needed.

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

December 09, 2019

Civil & Environmental Consultants - TN

Sample Delivery Group:	L1163515
Samples Received:	11/21/2019
Project Number:	181-364
Description:	EWS Camden Class 2 Landfill
Site:	CAMDEN, TN
Report To:	Philip Campbell 117 Seaboard Ln. Suite E100 Franklin, TN 37067

Entire Report Reviewed By:

Chris McCord
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

TABLE OF CONTENTS

APWC-L L1163515-01 GW

Collected by: Brandon S.
Collected date/time: 11/20/19 15:10
Received date/time: 11/21/19 13:55

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 130.1	WG1385295	1	11/25/19 09:36	11/25/19 19:46	JER	Mt. Juliet, TN
Wet Chemistry by Method 2320 B-2011	WG1388427	1	11/29/19 14:35	11/29/19 14:35	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1387666	100	12/06/19 20:23	12/06/19 20:23	AJC	Mt. Juliet, TN
Wet Chemistry by Method 410.4	WG1387950	10	11/27/19 15:00	11/27/19 18:57	BAM	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1384700	1000	11/22/19 06:37	11/22/19 06:37	ELN	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1384700	20	11/22/19 10:15	11/22/19 10:15	ELN	Mt. Juliet, TN
Mercury by Method 7470A	WG1385083	1	11/24/19 13:00	11/25/19 15:46	ABL	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385228	1	11/26/19 10:38	11/26/19 16:10	EL	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	10	11/26/19 11:24	11/27/19 12:53	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	10	11/26/19 11:24	11/27/19 13:15	TM	Mt. Juliet, TN
Metals (ICPMS) by Method 6020A	WG1385251	50	11/26/19 11:24	11/27/19 13:19	TM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1388578	1	11/29/19 01:23	11/29/19 01:23	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1388893	1	11/30/19 07:08	11/30/19 07:08	HJF	Mt. Juliet, TN
EDB / DBCP by Method 8011	WG1385648	1	11/23/19 09:55	11/24/19 17:39	LEL	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord
Project Manager

Wet Chemistry by Method 130.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Hardness (colorimetric) as CaCO3	60.5	B	30.0	1	11/25/2019 19:46	WG1385295

Wet Chemistry by Method 2320 B-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Alkalinity	724		20.0	1	11/29/2019 14:35	WG1388427

Sample Narrative:
L1163515-01 WG1388427: Endpoint pH 4.5 HEADSPACE

Wet Chemistry by Method 350.1

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ammonia Nitrogen	516		10.0	100	12/06/2019 20:23	WG1387666

Wet Chemistry by Method 410.4

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
COD	731		100	10	11/27/2019 18:57	WG1387950

Wet Chemistry by Method 9056A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Bromide	ND		20.0	20	11/22/2019 10:15	WG1384700
Chloride	14600		1000	1000	11/22/2019 06:37	WG1384700
Fluoride	4.65		2.00	20	11/22/2019 10:15	WG1384700
Nitrate	22.7		2.00	20	11/22/2019 10:15	WG1384700
Sulfate	191		100	20	11/22/2019 10:15	WG1384700

Mercury by Method 7470A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Mercury	ND		0.000200	1	11/25/2019 15:46	WG1385083

Metals (ICP) by Method 6010B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Boron	1.41		0.200	1	11/26/2019 16:10	WG1385228

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Aluminum	ND		1.00	10	11/27/2019 13:15	WG1385251
Antimony	ND		0.0200	10	11/27/2019 12:53	WG1385251
Arsenic	ND		0.0200	10	11/27/2019 13:15	WG1385251
Barium	0.139		0.0500	10	11/27/2019 13:15	WG1385251
Beryllium	ND		0.0200	10	11/27/2019 13:15	WG1385251
Cadmium	ND		0.0100	10	11/27/2019 13:15	WG1385251
Calcium	19.8		10.0	10	11/27/2019 13:15	WG1385251
Chromium	ND		0.0200	10	11/27/2019 12:53	WG1385251
Cobalt	ND		0.0200	10	11/27/2019 13:15	WG1385251
Copper	6.64		0.250	50	11/27/2019 13:19	WG1385251

Metals (ICPMS) by Method 6020A

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Iron	ND		1.00	10	11/27/2019 13:15	WG1385251
Lead	ND		0.0200	10	11/27/2019 13:15	WG1385251
Magnesium	ND		10.0	10	11/27/2019 13:15	WG1385251
Manganese	0.0848		0.0500	10	11/27/2019 13:15	WG1385251
Nickel	0.0522		0.0200	10	11/27/2019 13:15	WG1385251
Potassium	3920		10.0	10	11/27/2019 13:15	WG1385251
Selenium	0.0245		0.0200	10	11/27/2019 13:15	WG1385251
Silver	ND		0.0200	10	11/27/2019 13:15	WG1385251
Sodium	6750		50.0	50	11/27/2019 13:19	WG1385251
Thallium	ND		0.0200	10	11/27/2019 13:15	WG1385251
Vanadium	ND		0.0500	10	11/27/2019 13:15	WG1385251
Zinc	0.286		0.250	10	11/27/2019 13:15	WG1385251

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	0.0790		0.0500	1	11/29/2019 01:23	WG1388578
Acrylonitrile	ND		0.0100	1	11/29/2019 01:23	WG1388578
Benzene	ND		0.00100	1	11/29/2019 01:23	WG1388578
Bromochloromethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
Bromodichloromethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
Bromoform	ND		0.00100	1	11/29/2019 01:23	WG1388578
Bromomethane	ND		0.00500	1	11/29/2019 01:23	WG1388578
Carbon disulfide	ND		0.00100	1	11/29/2019 01:23	WG1388578
Carbon tetrachloride	ND		0.00100	1	11/29/2019 01:23	WG1388578
Chlorobenzene	0.00523		0.00100	1	11/29/2019 01:23	WG1388578
Chlorodibromomethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
Chloroethane	ND		0.00500	1	11/29/2019 01:23	WG1388578
Chloroform	ND		0.00500	1	11/29/2019 01:23	WG1388578
Chloromethane	ND		0.00250	1	11/29/2019 01:23	WG1388578
Dibromomethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,2-Dibromo-3-Chloropropane	ND		0.00500	1	11/29/2019 01:23	WG1388578
1,2-Dibromoethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,2-Dichlorobenzene	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,4-Dichlorobenzene	ND		0.00100	1	11/29/2019 01:23	WG1388578
trans-1,4-Dichloro-2-butene	ND		0.00250	1	11/29/2019 01:23	WG1388578
1,1-Dichloroethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,2-Dichloroethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,1-Dichloroethene	ND		0.00100	1	11/29/2019 01:23	WG1388578
cis-1,2-Dichloroethene	ND		0.00100	1	11/30/2019 07:08	WG1388893
trans-1,2-Dichloroethene	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,2-Dichloropropane	ND		0.00100	1	11/29/2019 01:23	WG1388578
cis-1,3-Dichloropropene	ND		0.00100	1	11/29/2019 01:23	WG1388578
trans-1,3-Dichloropropene	ND		0.00100	1	11/29/2019 01:23	WG1388578
Ethylbenzene	ND		0.00100	1	11/29/2019 01:23	WG1388578
2-Hexanone	ND		0.0100	1	11/29/2019 01:23	WG1388578
Iodomethane	ND		0.0100	1	11/29/2019 01:23	WG1388578
2-Butanone (MEK)	ND		0.0100	1	11/29/2019 01:23	WG1388578
Methylene Chloride	ND		0.00500	1	11/29/2019 01:23	WG1388578
4-Methyl-2-pentanone (MIBK)	0.0859		0.0100	1	11/29/2019 01:23	WG1388578
Styrene	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,1,1,2-Tetrachloroethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,1,2,2-Tetrachloroethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
Tetrachloroethene	ND		0.00100	1	11/29/2019 01:23	WG1388578
Toluene	ND		0.00100	1	11/29/2019 01:23	WG1388578
1,1,1-Trichloroethane	ND		0.00100	1	11/29/2019 01:23	WG1388578

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,1,2-Trichloroethane	ND		0.00100	1	11/29/2019 01:23	WG1388578
Trichloroethene	ND		0.00100	1	11/29/2019 01:23	WG1388578
Trichlorofluoromethane	ND		0.00500	1	11/29/2019 01:23	WG1388578
1,2,3-Trichloropropane	ND		0.00250	1	11/29/2019 01:23	WG1388578
Vinyl acetate	ND		0.0100	1	11/29/2019 01:23	WG1388578
Vinyl chloride	ND		0.00100	1	11/30/2019 07:08	WG1388893
Xylenes, Total	ND		0.00300	1	11/29/2019 01:23	WG1388578
(S) Toluene-d8	*99.3*		*80.0-120*		*11/29/2019 01:23*	WG1388578
(S) Toluene-d8	*99.4*		*80.0-120*		*11/30/2019 07:08*	WG1388893
(S) 4-Bromofluorobenzene	*100*		*77.0-126*		*11/29/2019 01:23*	WG1388578
(S) 4-Bromofluorobenzene	*105*		*77.0-126*		*11/30/2019 07:08*	WG1388893
(S) 1,2-Dichloroethane-d4	*99.5*		*70.0-130*		*11/29/2019 01:23*	WG1388578
(S) 1,2-Dichloroethane-d4	*85.0*		*70.0-130*		*11/30/2019 07:08*	WG1388893

EDB / DBCP by Method 8011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0000100	1	11/24/2019 17:39	WG1385648
1,2-Dibromo-3-Chloropropane	ND		0.0000200	1	11/24/2019 17:39	WG1385648

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3476148-1 11/25/19 18:58

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Hardness (colorimetric) as CaCO3	12.8	J	1.43	30.0

L1162347-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1162347-02 11/25/19 19:09 • (DUP) R3476148-5 11/25/19 19:10

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hardness (colorimetric) as CaCO3	136	123	1	10.0		20

L1163311-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163311-01 11/25/19 19:44 • (DUP) R3476148-6 11/25/19 19:45

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hardness (colorimetric) as CaCO3	694	720	10	3.68		20

Laboratory Control Sample (LCS)

(LCS) R3476148-2 11/25/19 18:59

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Hardness (colorimetric) as CaCO3	100	93.3	93.3	85.0-115	

L1162240-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1162240-01 11/25/19 19:00 • (MS) R3476148-3 11/25/19 19:01 • (MSD) R3476148-4 11/25/19 19:02

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Hardness (colorimetric) as CaCO3	100	227	257	258	30.0	31.0	1	80.0-120	E J6	E J6	0.388	20

Method Blank (MB)

(MB) R3477543-1 11/29/19 13:34

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Alkalinity	3.48	J	2.71	20.0

Sample Narrative:

BLANK: Endpoint pH 4.5

L1163315-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163315-01 11/29/19 13:57 • (DUP) R3477543-2 11/29/19 14:05

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Alkalinity	304	306	1	0.571		20

Sample Narrative:

OS: Endpoint pH 4.5 HEADSPACE

DUP: Endpoint pH 4.5

L1163588-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1163588-03 11/29/19 16:18 • (DUP) R3477543-4 11/29/19 16:37

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Alkalinity	61.0	61.2	1	0.361		20

Sample Narrative:

OS: Endpoint pH 4.5 HEADSPACE

DUP: Endpoint pH 4.5

Laboratory Control Sample (LCS)

(LCS) R3477543-3 11/29/19 15:05

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Alkalinity	100	93.0	93.0	85.0-115	

Sample Narrative:

LCS: Endpoint pH 4.5

Method Blank (MB)

(MB) R3479975-1 12/06/19 19:31

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Ammonia Nitrogen	U		0.0317	0.100

L1163520-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163520-01 12/06/19 19:36 • (DUP) R3479975-3 12/06/19 19:37

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Ammonia Nitrogen	ND	0.0440	1	29.1	J P1	10

Laboratory Control Sample (LCS)

(LCS) R3479975-2 12/06/19 19:33

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Ammonia Nitrogen	7.50	7.48	99.8	90.0-110	

L1163520-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163520-02 12/06/19 19:39 • (MS) R3479975-4 12/06/19 19:41 • (MSD) R3479975-5 12/06/19 19:42

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Ammonia Nitrogen	5.00	ND	5.09	5.03	102	101	1	90.0-110			1.11	10

Method Blank (MB)

(MB) R3477123-1 11/27/19 18:56

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
COD	U		3.00	10.0

L1163492-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163492-01 11/27/19 18:56 • (DUP) R3477123-3 11/27/19 18:56

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
COD	45.8	45.1	1	1.62		20

L1164814-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1164814-03 11/27/19 19:00 • (DUP) R3477123-6 11/27/19 19:00

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
COD	162	161	1	0.223		20

Laboratory Control Sample (LCS)

(LCS) R3477123-2 11/27/19 18:56

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
COD	222	223	100	90.0-110	

L1163520-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163520-07 11/27/19 18:58 • (MS) R3477123-4 11/27/19 18:58 • (MSD) R3477123-5 11/27/19 18:58

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
COD	400	ND	435	433	108	107	1	80.0-120			0.426	20

Method Blank (MB)

(MB) R3475093-1 11/21/19 22:41

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Bromide	U		0.0790	1.00
Chloride	U		0.0519	1.00
Fluoride	U		0.00990	0.100
Nitrate	U		0.0227	0.100
Sulfate	0.354	J	0.0774	5.00

L1163203-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1163203-04 11/22/19 09:46 • (DUP) R3475093-3 11/22/19 00:51

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	U	0.000	1	0.000		15
Chloride	1.95	2.15	1	10.0		15
Fluoride	0.0294	0.0239	1	20.6	J P1	15
Nitrate	0.536	0.528	1	1.56		15
Sulfate	0.504	0.451	1	11.0	J	15

L1163520-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1163520-05 11/22/19 08:32 • (DUP) R3475093-6 11/22/19 08:47

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Bromide	ND	0.000	1	0.000		15
Chloride	18.6	18.4	1	0.784		15
Fluoride	ND	0.000	1	0.000		15
Nitrate	1.84	1.88	1	1.81		15
Sulfate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3475093-2 11/21/19 22:56

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Bromide	40.0	39.5	98.9	80.0-120	
Chloride	40.0	39.2	97.9	80.0-120	
Fluoride	8.00	7.94	99.2	80.0-120	
Nitrate	8.00	8.24	103	80.0-120	

Laboratory Control Sample (LCS)

(LCS) R3475093-2 11/21/19 22:56

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Sulfate	40.0	40.3	101	80.0-120	

L1163203-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163203-04 11/22/19 09:46 • (MS) R3475093-4 11/22/19 01:06 • (MSD) R3475093-5 11/22/19 01:20

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Bromide	50.0	U	46.1	48.0	92.2	96.0	1	80.0-120			4.04	15
Chloride	50.0	1.95	51.5	51.6	99.2	99.3	1	80.0-120			0.153	15
Fluoride	5.00	0.0294	5.00	5.02	99.4	99.8	1	80.0-120			0.427	15
Nitrate	5.00	0.536	5.35	5.59	96.4	101	1	80.0-120			4.24	15
Sulfate	50.0	0.504	50.9	51.1	101	101	1	80.0-120			0.369	15

L1163520-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1163520-05 11/22/19 08:32 • (MS) R3475093-7 11/22/19 09:01

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Bromide	50.0	ND	48.9	97.8	1	80.0-120	
Chloride	50.0	18.6	68.0	98.9	1	80.0-120	
Fluoride	5.00	ND	5.06	101	1	80.0-120	
Nitrate	5.00	1.84	6.73	97.7	1	80.0-120	
Sulfate	50.0	ND	51.7	103	1	80.0-120	

Method Blank (MB)

(MB) R3476075-1 11/25/19 15:16

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Mercury	U		0.0000490	0.000200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476075-2 11/25/19 15:18 • (LCSD) R3476075-3 11/25/19 15:20

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Mercury	0.00300	0.00337	0.00347	112	116	80.0-120			2.97	20

Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) • (MS) R3476075-4 11/25/19 15:24 • (MSD) R3476075-5 11/25/19 15:26

Analyte	Spike Amount mg/l	Original Result	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Mercury	0.00300		0.00351	0.00334	117	111	1	75.0-125			5.02	20

Method Blank (MB)

(MB) R3476716-1 11/26/19 15:02

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Boron	U		0.0126	0.200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476716-2 11/26/19 15:05 • (LCSD) R3476716-3 11/26/19 15:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Boron	1.00	0.985	0.973	98.5	97.3	80.0-120			1.22	20

L1163452-10 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163452-10 11/26/19 15:10 • (MS) R3476716-5 11/26/19 15:15 • (MSD) R3476716-6 11/26/19 15:17

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Boron	1.00	0.226	1.17	1.19	94.6	96.5	1	75.0-125			1.61	20

Method Blank (MB)

(MB) R3476857-1 11/27/19 09:40

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Aluminum	U		0.00515	0.100
Antimony	U		0.000754	0.00200
Arsenic	U		0.000250	0.00200
Barium	U		0.000360	0.00500
Beryllium	U		0.000120	0.00200
Cadmium	U		0.000160	0.00100
Calcium	U		0.0460	1.00
Chromium	0.000565	J	0.000540	0.00200
Copper	0.000651	J	0.000520	0.00500
Cobalt	U		0.000260	0.00200
Iron	U		0.0150	0.100
Lead	0.000271	J	0.000240	0.00200
Magnesium	U		0.100	1.00
Manganese	0.000629	J	0.000250	0.00500
Nickel	U		0.000350	0.00200
Potassium	0.0514	J	0.0370	1.00
Selenium	U		0.000380	0.00200
Silver	U		0.000310	0.00200
Sodium	U		0.110	1.00
Thallium	U		0.000190	0.00200
Vanadium	U		0.000180	0.00500
Zinc	U		0.00256	0.0250

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476857-2 11/27/19 09:44 • (LCSD) R3476857-3 11/27/19 09:48

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Aluminum	5.00	4.75	4.70	95.1	94.0	80.0-120			1.10	20
Antimony	0.0500	0.0478	0.0477	95.6	95.5	80.0-120			0.0903	20
Arsenic	0.0500	0.0489	0.0469	97.8	93.8	80.0-120			4.15	20
Barium	0.0500	0.0471	0.0470	94.2	94.1	80.0-120			0.187	20
Beryllium	0.0500	0.0474	0.0474	94.8	94.8	80.0-120			0.0165	20
Cadmium	0.0500	0.0491	0.0479	98.1	95.7	80.0-120			2.47	20
Calcium	5.00	4.81	4.67	96.1	93.3	80.0-120			2.93	20
Chromium	0.0500	0.0487	0.0462	97.5	92.4	80.0-120			5.34	20
Copper	0.0500	0.0452	0.0488	90.4	97.6	80.0-120			7.57	20
Cobalt	0.0500	0.0496	0.0477	99.2	95.5	80.0-120			3.84	20
Iron	5.00	4.91	4.71	98.3	94.2	80.0-120			4.16	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476857-2 11/27/19 09:44 • (LCSD) R3476857-3 11/27/19 09:48

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Lead	0.0500	0.0464	0.0464	92.7	92.9	80.0-120			0.138	20
Magnesium	5.00	4.80	4.75	96.0	95.0	80.0-120			1.06	20
Manganese	0.0500	0.0492	0.0470	98.4	94.0	80.0-120			4.56	20
Nickel	0.0500	0.0491	0.0484	98.2	96.9	80.0-120			1.41	20
Potassium	5.00	4.73	4.64	94.6	92.7	80.0-120			2.02	20
Selenium	0.0500	0.0556	0.0523	111	105	80.0-120			6.07	20
Silver	0.0500	0.0481	0.0475	96.1	95.0	80.0-120			1.13	20
Sodium	5.00	4.83	4.78	96.5	95.5	80.0-120			1.02	20
Thallium	0.0500	0.0485	0.0474	96.9	94.9	80.0-120			2.12	20
Vanadium	0.0500	0.0492	0.0468	98.3	93.6	80.0-120			4.90	20
Zinc	0.0500	0.0507	0.0495	101	99.0	80.0-120			2.43	20

L1163520-08 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163520-08 11/27/19 09:52 • (MS) R3476857-5 11/27/19 09:59 • (MSD) R3476857-6 11/27/19 10:03

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Aluminum	5.00	ND	4.99	5.01	98.7	99.1	1	75.0-125			0.453	20
Antimony	0.0500	ND	0.0518	0.0495	104	99.0	1	75.0-125			4.47	20
Arsenic	0.0500	ND	0.0508	0.0519	102	104	1	75.0-125			2.30	20
Barium	0.0500	0.0403	0.0916	0.0904	103	100	1	75.0-125			1.30	20
Beryllium	0.0500	ND	0.0493	0.0491	98.5	98.2	1	75.0-125			0.395	20
Cadmium	0.0500	0.00155	0.0526	0.0518	102	100	1	75.0-125			1.62	20
Calcium	5.00	32.3	37.1	37.2	95.8	96.6	1	75.0-125			0.104	20
Chromium	0.0500	ND	0.0509	0.0527	102	105	1	75.0-125			3.46	20
Copper	0.0500	ND	0.0464	0.0467	89.3	89.9	1	75.0-125			0.576	20
Cobalt	0.0500	ND	0.0517	0.0526	103	105	1	75.0-125			1.71	20
Potassium	5.00	4.58	9.51	9.47	98.5	97.7	1	75.0-125			0.445	20
Iron	5.00	ND	5.13	5.24	102	104	1	75.0-125			2.19	20
Lead	0.0500	ND	0.0491	0.0495	96.9	97.7	1	75.0-125			0.836	20
Magnesium	5.00	10.1	15.3	15.2	103	101	1	75.0-125			0.616	20
Manganese	0.0500	0.0221	0.0721	0.0735	100	103	1	75.0-125			1.82	20
Nickel	0.0500	0.00295	0.0547	0.0554	104	105	1	75.0-125			1.26	20
Selenium	0.0500	ND	0.0574	0.0571	115	114	1	75.0-125			0.529	20
Silver	0.0500	ND	0.0519	0.0513	103	102	1	75.0-125			1.26	20
Sodium	5.00	6.53	11.5	11.5	100	99.6	1	75.0-125			0.242	20
Thallium	0.0500	ND	0.0501	0.0500	100	100	1	75.0-125			0.300	20
Vanadium	0.0500	ND	0.0515	0.0520	103	103	1	75.0-125			0.915	20
Zinc	0.0500	0.0276	0.0768	0.0814	98.5	108	1	75.0-125			5.83	20

Method Blank (MB)

(MB) R3477472-2 11/28/19 18:28

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Acetone	U		0.0100	0.0500
Acrylonitrile	U		0.00187	0.0100
Benzene	U		0.000331	0.00100
Bromodichloromethane	U		0.000380	0.00100
Bromochloromethane	U		0.000520	0.00100
Bromoform	U		0.000469	0.00100
Bromomethane	U		0.000866	0.00500
Carbon disulfide	U		0.000275	0.00100
Carbon tetrachloride	U		0.000379	0.00100
Chlorobenzene	U		0.000348	0.00100
Chlorodibromomethane	U		0.000327	0.00100
Chloroethane	U		0.000453	0.00500
Chloroform	U		0.000324	0.00500
Chloromethane	U		0.000276	0.00250
1,2-Dibromo-3-Chloropropane	U		0.00133	0.00500
1,2-Dibromoethane	U		0.000381	0.00100
Dibromomethane	U		0.000346	0.00100
1,2-Dichlorobenzene	U		0.000349	0.00100
1,4-Dichlorobenzene	U		0.000274	0.00100
trans-1,4-Dichloro-2-butene	U		0.000866	0.00250
1,1-Dichloroethane	U		0.000259	0.00100
1,2-Dichloroethane	U		0.000361	0.00100
1,1-Dichloroethene	U		0.000398	0.00100
trans-1,2-Dichloroethene	U		0.000396	0.00100
1,2-Dichloropropane	U		0.000306	0.00100
cis-1,3-Dichloropropene	U		0.000418	0.00100
trans-1,3-Dichloropropene	U		0.000419	0.00100
Ethylbenzene	U		0.000384	0.00100
2-Hexanone	U		0.00382	0.0100
Iodomethane	U		0.00171	0.0100
2-Butanone (MEK)	U		0.00393	0.0100
Methylene Chloride	U		0.00100	0.00500
4-Methyl-2-pentanone (MIBK)	U		0.00214	0.0100
Styrene	U		0.000307	0.00100
1,1,1,2-Tetrachloroethane	U		0.000385	0.00100
1,1,2,2-Tetrachloroethane	U		0.000130	0.00100
Tetrachloroethene	U		0.000372	0.00100
Toluene	U		0.000412	0.00100
1,1,1-Trichloroethane	U		0.000319	0.00100
1,1,2-Trichloroethane	U		0.000383	0.00100

Method Blank (MB)

(MB) R3477472-2 11/28/19 18:28

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Trichloroethene	U		0.000398	0.00100
Trichlorofluoromethane	U		0.00120	0.00500
1,2,3-Trichloropropane	U		0.000807	0.00250
Vinyl acetate	U		0.00163	0.0100
Xylenes, Total	U		0.00106	0.00300
(S) Toluene-d8	*98.4*			*80.0-120*
(S) 4-Bromofluorobenzene	*99.9*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*104*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3477472-1 11/28/19 17:47

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acetone	0.0250	0.0379	152	19.0-160	
Acrylonitrile	0.0250	0.0333	133	55.0-149	
Benzene	0.00500	0.00559	112	70.0-123	
Bromodichloromethane	0.00500	0.00569	114	75.0-120	
Bromochloromethane	0.00500	0.00571	114	76.0-122	
Bromoform	0.00500	0.00541	108	68.0-132	
Bromomethane	0.00500	0.00565	113	10.0-160	
Carbon disulfide	0.00500	0.00533	107	61.0-128	
Carbon tetrachloride	0.00500	0.00593	119	68.0-126	
Chlorobenzene	0.00500	0.00570	114	80.0-121	
Chlorodibromomethane	0.00500	0.00575	115	77.0-125	
Chloroethane	0.00500	0.00563	113	47.0-150	
Chloroform	0.00500	0.00548	110	73.0-120	
Chloromethane	0.00500	0.00528	106	41.0-142	
1,2-Dibromo-3-Chloropropane	0.00500	0.00571	114	58.0-134	
1,2-Dibromoethane	0.00500	0.00572	114	80.0-122	
Dibromomethane	0.00500	0.00583	117	80.0-120	
1,2-Dichlorobenzene	0.00500	0.00571	114	79.0-121	
1,4-Dichlorobenzene	0.00500	0.00562	112	79.0-120	
trans-1,4-Dichloro-2-butene	0.00500	0.00497	99.4	33.0-144	
1,1-Dichloroethane	0.00500	0.00564	113	70.0-126	
1,2-Dichloroethane	0.00500	0.00534	107	70.0-128	
1,1-Dichloroethene	0.00500	0.00582	116	71.0-124	
trans-1,2-Dichloroethene	0.00500	0.00569	114	73.0-120	
1,2-Dichloropropane	0.00500	0.00568	114	77.0-125	

Laboratory Control Sample (LCS)

(LCS) R3477472-1 11/28/19 17:47

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
cis-1,3-Dichloropropene	0.00500	0.00564	113	80.0-123	
trans-1,3-Dichloropropene	0.00500	0.00543	109	78.0-124	
Ethylbenzene	0.00500	0.00569	114	79.0-123	
2-Hexanone	0.0250	0.0292	117	67.0-149	
Iodomethane	0.0250	0.0286	114	33.0-147	
2-Butanone (MEK)	0.0250	0.0323	129	44.0-160	
Methylene Chloride	0.00500	0.00530	106	67.0-120	
4-Methyl-2-pentanone (MIBK)	0.0250	0.0300	120	68.0-142	
Styrene	0.00500	0.00582	116	73.0-130	
1,1,1,2-Tetrachloroethane	0.00500	0.00553	111	75.0-125	
1,1,2,2-Tetrachloroethane	0.00500	0.00552	110	65.0-130	
Tetrachloroethene	0.00500	0.00610	122	72.0-132	
Toluene	0.00500	0.00571	114	79.0-120	
1,1,1-Trichloroethane	0.00500	0.00597	119	73.0-124	
1,1,2-Trichloroethane	0.00500	0.00580	116	80.0-120	
Trichloroethene	0.00500	0.00604	121	78.0-124	
Trichlorofluoromethane	0.00500	0.00580	116	59.0-147	
1,2,3-Trichloropropane	0.00500	0.00582	116	73.0-130	
Vinyl acetate	0.0250	0.0200	80.0	11.0-160	
Xylenes, Total	0.0150	0.0171	114	79.0-123	
(S) Toluene-d8			*98.1*	*80.0-120*	
(S) 4-Bromofluorobenzene			*99.4*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*106*	*70.0-130*	

Method Blank (MB)

(MB) R3478181-2 11/29/19 23:30

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
cis-1,2-Dichloroethene	U		0.000260	0.00100
Vinyl chloride	U		0.000259	0.00100
(S) Toluene-d8	*101*			*80.0-120*
(S) 4-Bromofluorobenzene	*106*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*79.5*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3478181-1 11/29/19 22:36

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
cis-1,2-Dichloroethene	0.00500	0.00591	118	73.0-120	
Vinyl chloride	0.00500	0.00521	104	67.0-131	
(S) Toluene-d8			*97.8*	*80.0-120*	
(S) 4-Bromofluorobenzene			*103*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*82.6*	*70.0-130*	

Method Blank (MB)

(MB) R3476058-1 11/24/19 14:54

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Ethylene Dibromide	U		0.00000240	0.0000100
1,2-Dibromo-3-Chloropropane	U		0.00000430	0.0000200

L1163066-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1163066-11 11/24/19 15:16 • (DUP) R3476058-2 11/24/19 15:05

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Ethylene Dibromide	ND	0.000	1.02	0.000		20
1,2-Dibromo-3-Chloropropane	ND	0.000	1.02	0.000		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3476058-4 11/24/19 17:28 • (LCSD) R3476058-5 11/24/19 19:42

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Ethylene Dibromide	0.000250	0.000228	0.000236	91.2	94.4	60.0-140			3.45	20
1,2-Dibromo-3-Chloropropane	0.000250	0.000244	0.000264	97.6	106	60.0-140			7.87	20

L1163066-12 Original Sample (OS) • Matrix Spike (MS)

(OS) L1163066-12 11/24/19 15:38 • (MS) R3476058-3 11/24/19 15:27

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Ethylene Dibromide	0.000101	ND	0.0000987	97.7	1.01	64.0-159	
1,2-Dibromo-3-Chloropropane	0.000101	ND	0.0000728	72.1	1.01	72.0-148	P

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
J	The identification of the analyte is acceptable; the reported value is an estimate.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
P	RPD between the primary and confirmatory analysis exceeded 40%.
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.

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* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.

Civil & Environmental Consultants - TN

117 Seaboard Ln.

Billing Information:
Dr. Kevin Wolfe
117 Seaboard Ln.
Suite E100
Franklin, TN 37067

Pres Chk

Report to: Philip Campbell

Email To: pcampbell@cecinc.com

Project Description: EWS Camden Class 2 Landfill

City/State Collected:

Please Circle: PT MT CT ET

Phone: 615-333-7797
Fax: 615-333-7751

Client Project # 181-364

Lab Project # CEC-181364

Collected by (print): BRANDON SOLOMA

Site/Facility ID # CAMDEN, TN

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**WetChem** 250mlHDPE-NoPres	ALK 100ml Amb-NoPres	COD,NH3 250mlHDPE-H2SO4	Diss.Metals 250mlHDPE-NoPres	SV8011 40mlClr-NaThio	Total Metals,HARD 250mlHDPE-HNO3	V8260AP1 40mlAmb-HCl			Remarks	Sample # (lab only)
~~IWC-L~~		~~GW~~				~~11~~	X	X	X	X	X	X	X				
APWC-L	Grab	GW		11-20-19	1510	10 ~~11~~	X	X	X	~~X~~	X	X	X				01

Chain of Custody Page ___ of ___

Pace Analytical® National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

SDG # 116316

F178

Acctnum: CEC
Template: T133582
Prelogin: P741256
PM: 526 - Chris McCord
PB: JB 11-18-19
Shipped Via: Courier

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:**WetChem** = *NITRATE*,CHLORIDE,BROMIDE,SULFATE,FLUORIDE,ALK
Tot/Diss Metals=M6020AP1 + Al,Ca,Fe,K,Mg,Mn,Na,B(6010)

pH _____ Temp _____
Flow _____ Other _____

Samples returned via: __ UPS __ FedEx __ Courier ✗

Tracking # [redacted]

Sample Receipt Checklist

COC Seal Present/Intact:	NP	Y N
COC Signed/Accurate:		Y N
Bottles arrive intact:		Y N
Correct bottles used:		Y N
Sufficient volume sent:		Y N
If Applicable		
VOA Zero Headspace:		Y N
Preservation Correct/Checked:		Y N
RAD Screen <0.5 mR/hr:		Y N

	Date:	Time:	
Relinquished by : (Signature)	11-21-19	1027	Received by: (Signature)
Relinquished by : (Signature)	11-21-19	13:55	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature) Date: 11/21/19 Time: 1355

Trip Blank Received: Yes / No (HCL / MeoH) TBR

Temp: R3 °C 1.2+.5=1.7 Bottles Received: 10

If preservation required by Login: Date/Time

Hold: Condition: NCF / OK

GROUNDWATER MONITORING FIELD INFORMATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste. 170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	MONITORING WELL I.D.	MW-1
LOCATION	Camden, TN	TEMPERATURE & WEATHER	55°F & Sunny
DATE & TIME	11-29-Fl @ 1040	EVENT FREQUENCY	Quarterly
PURGE METHOD	Peristaltic Pump	FIELD REPRESENTATIVE	Brandon Solonka
TOTAL WELL DEPTH (feet)	30.5	SAMPLING EQUIPMENT	Bailer
DEPTH TO WATER (feet)	22.51	IS SAMPLE EQUIPMENT DEDICATED?	No
CASING DIAMETER (inches)	2	DUPLICATE COLLECTED?	NC
WATER COLUMN (feet)	7.99	FIELD BLANK COLLECTED?	NC
PURGE VOLUME (gallons)		EQUIPMENT BLANK COLLECTED?	NC

PURGE INFORMATION

Gallons Purged	Time (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
0	1055	22.75	16.2	5.06	43.0/51.7	2.00	189.4	14.2
1.0	1100	22.80	16.2	5.05	41.7/50.1	1.59	229.2	6.69
1.5	1105	22.66	16.1	5.33	58.0/70.0	1.17	138.2	7.17
1.75	1110	22.66	16.1	5.43	73.2/88.4	0.89	109.2	8.06
2.00	1115	22.66	16.1	5.49	80.8/98.3	0.75	94.2	6.27
2.25	1120	22.66	16.1	5.48	86.2/104.7	0.68	84.1	6.53

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
2.25	1125	22.66	16.1	5.48	86.2/104.7	0.68	84.1	6.53

Sample Charateristics (Odor, Color)		Preservatives Used	See CoC
Number of Containers	10	Sampler Signature	

WELL DATA

Number of Baffles	4	Well Cap Dedicated/In Place?	Yes
Well Clear of Weeds/Accessible?	Yes	Fittings/Well Head Condition	Good
Pad/Casing Quality	Good	Lock Condition	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste. 170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	**MONITORING WELL I.D.**	MW-2
LOCATION	Camden, TN	**TEMPERATURE & WEATHER**	64°F & Sunny
DATE & TIME	11-20-19 @ 1450	**EVENT FREQUENCY**	Quarterly
PURGE METHOD	NA, parameters only	**FIELD REPRESENTATIVE**	Brandon Solonka
TOTAL WELL DEPTH (feet)	10	**SAMPLING EQUIPMENT**	YSI 600 pro plus
DEPTH TO WATER (feet)	5.60	**IS SAMPLE EQUIPMENT DEDICATED?**	No
CASING DIAMETER (inches)	2	**DUPLICATE COLLECTED?**	NO
WATER COLUMN (feet)	4.4	**FIELD BLANK COLLECTED?**	No
PURGE VOLUME (gallons)		**EQUIPMENT BLANK COLLECTED?**	No

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm)	DO (mg/L)	ORP	NTU
6	1450	5.60	15.9	5.97	369/370.7	3.40	187.8	10.3
Sample Charateristics (Odor, Color)	CLEAR/NO ODOR		**Preservatives Used**			—		
Number of Containers	—		**Sampler Signature**					

WELL DATA

Number of Baffles	4	**Well Cap Dedicated/In Place?**	Yes
Well Clear of Weeds/Accessible?	Yes	**Fittings/Well Head Condition**	Good
Pad/Casing Quality	Good	**Lock Condition**	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste. 170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	**MONITORING WELL I.D.**	MW-3
LOCATION	Camden, TN	**TEMPERATURE & WEATHER**	63°F & Sunny
DATE & TIME	11-00-19 G	**EVENT FREQUENCY**	Quarterly
PURGE METHOD	Dedicated bladder pump	**FIELD REPRESENTATIVE**	Brandon Solonka
TOTAL WELL DEPTH (feet)	27	**SAMPLING EQUIPMENT**	Bladder Pump
DEPTH TO WATER (feet)	18.50	**IS SAMPLE EQUIPMENT DEDICATED?**	No
CASING DIAMETER (inches)	2	**DUPLICATE COLLECTED?**	Yes
WATER COLUMN (feet)	8.50	**FIELD BLANK COLLECTED?**	No
PURGE VOLUME (gallons)		**EQUIPMENT BLANK COLLECTED?**	No

PURGE INFORMATION

Gallons Purged	Time (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Sc	DO (mg/L)	ORP	NTU
0	1345	18.60	17.5	5.73	383.2/445.2	5.47	183.5	10.8
0.5	1350	18.65	18.2	5.32	321.2/369.1	2.29	185.4	4.56
1.0	1355	18.65	17.9	5.35	312.3/361.1	2.48	185.9	2.73
1.5	1400	18.65	17.9	5.37	310.7/359.7	2.42	185.7	2.52
2.0	1405	18.65	17.8	5.40	309.0/358.4	2.50	186.0	2.11

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Sc	DO (mg/L)	ORP	NTU
2.0	1410	18.65	17.8	5.40	309.0/358.4	2.50	186.0	2.11

Sample Charateristics (Odor, Color)	Clear / No odor	**Preservatives Used**	See COC
Number of Containers	10	**Sampler Signature**	

WELL DATA

Number of Baffles	4	**Well Cap Dedicated/In Place?**	Yes
Well Clear of Weeds/Accessible?	Yes	**Fittings/Well Head Condition**	Yes
Pad/Casing Quality	Good	**Lock Condition**	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste. 170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	**MONITORING WELL I.D.**	MW-4
LOCATION	Camden, TN	**TEMPERATURE & WEATHER**	61° F & Sunny
DATE & TIME	11-20-19 @ 1237	**EVENT FREQUENCY**	Quarterly
PURGE METHOD	Peristaltic Pump	**FIELD REPRESENTATIVE**	Brandon Solonka
TOTAL WELL DEPTH (feet)	23.1	**SAMPLING EQUIPMENT**	Bailer
DEPTH TO WATER (feet)	11.29	**IS SAMPLE EQUIPMENT DEDICATED?**	No
CASING DIAMETER (inches)	2	**DUPLICATE COLLECTED?**	No
WATER COLUMN (feet)	11.81	**FIELD BLANK COLLECTED?**	Yes @ 1325
PURGE VOLUME (gallons)		**EQUIPMENT BLANK COLLECTED?**	No

PURGE INFORMATION

Gallons Purged	Time (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
0	1245	11.38	17.4	5.60	71.3/ 83.4	3.81	189.0	61.7
0.50	1250	11.38	17.5	5.54	70.3/ 82.0	3.32	186.9	42.5
1.0	1255	11.40	17.6	5.57	70.2/ 81.8	2.96	185.1	19.4
1.5	1300	11.40	17.5	5.54	70.9/ 82.6	3.02	185.6	15.6
1.75	1305	11.40	17.6	5.49	70.1/ 81.7	2.96	186.4	6.94

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
1.76	1310	11.40	17.6	5.49	70.1/ 81.7	2.96	186.4	6.94

Sample Charateristics (Odor, Color)		**Preservatives Used**	See COC
Number of Containers	10	**Sampler Signature**	

WELL DATA

Number of Baffles	0	**Well Cap Dedicated/In Place?**	Yes
Well Clear of Weeds/Accessible?	Yes	**Fittings/Well Head Condition**	Good
Pad/Casing Quality	Good	**Lock Condition**	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

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SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	**MONITORING WELL I.D.**	MW-5
LOCATION	Camden, TN	**TEMPERATURE & WEATHER**	59° F & Sunny
DATE & TIME	11-20-19 @ 1140	**EVENT FREQUENCY**	Quarterly
PURGE METHOD	Peristaltic Pump	**FIELD REPRESENTATIVE**	Brandon Solonka
TOTAL WELL DEPTH (feet)	33.85	**SAMPLING EQUIPMENT**	Bailer
DEPTH TO WATER (feet)	8.82	**IS SAMPLE EQUIPMENT DEDICATED?**	No
CASING DIAMETER (inches)	2	**DUPLICATE COLLECTED?**	NO
WATER COLUMN (feet)	25.03	**FIELD BLANK COLLECTED?**	NO
PURGE VOLUME (gallons)	—	**EQUIPMENT BLANK COLLECTED?**	NO

PURGE INFORMATION

Gallons Purged	Time (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
0	1150	9.30	17.1	5.14	359.6/424.1	2.35	146.1	9.60
0.25	1155	9.51	17.3	5.08	351.3/420.4	0.78	168.0	21.3
0.50	1200	9.61	17.2	5.09	348.2/408.6	0.78	178.2	21.8
0.75	1205	9.65	17.3	5.09	344.8/403.6	0.78	184.7	20.2
1.0	1210	9.71	17.3	5.10	340.8/399.3	0.84	190.1	16.0
1.25	1215	9.81	17.3	5.11	335.3/393.2	0.95	196.2	16.0

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
1.25	1220	9.81	17.3	5.11	335.3/393.2	0.95	196.2	16.0

Sample Charateristics (Odor, Color)		**Preservatives Used**	See COC
Number of Containers	10	**Sampler Signature**	

WELL DATA

Number of Baffles	4	**Well Cap Dedicated/In Place?**	Yes
Well Clear of Weeds/Accessible?	Yes	**Fittings/Well Head Condition**	Good
Pad/Casing Quality	Good	**Lock Condition**	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

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SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	MONITORING WELL I.D.	TMW-1
LOCATION	Camden, TN	TEMPERATURE & WEATHER	Mostly Sunny 55°
DATE & TIME	11.20.19 10:00	EVENT FREQUENCY	Quarterly
PURGE METHOD	Peristaltic Pump	FIELD REPRESENTATIVE	Brandon Solonka
TOTAL WELL DEPTH (feet)	32.5	SAMPLING EQUIPMENT	Bailer
DEPTH TO WATER (feet)	6.32'	IS SAMPLE EQUIPMENT DEDICATED?	No
CASING DIAMETER (inches)	1"	DUPLICATE COLLECTED?	No
WATER COLUMN (feet)	26.18'	FIELD BLANK COLLECTED?	No
PURGE VOLUME (gallons)		EQUIPMENT BLANK COLLECTED?	NC

PURGE INFORMATION

Gallons Purged	Time (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
.5	10:00	8.95	16.2	5.54	95.0/114.2	5.56	281.0	0.2
2	10:15	10.75	16.6	5.47	97.3/116.0	4.27	299.5	0.2
3.5	10:30	11.87	16.6	5.43	97.2/115.6	4.27	304.7	20.3
4.7	10:40	11.58	16.6	5.44	96.6/115.2	4.16	307.0	10.7
5.75	10:50	11.70	16.6	5.43	96.7/115.2	4.16	308.3	49.9
6.3	11:00	11.75	16.6	5.44	97.3/115.1	4.12	313.0	33.0
7.4	11:10	11.85	16.6	5.44	96.6/114.8	4.24	317.3	20.6
8.25	11:20	11.92	16.7	5.42	96.8/115.2	4.11	320.3	13.1
9.3	11:30	11.94	16.7	5.40	96.6/114.8	4.08	316.4	14.5

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
9.3	11:30 AM	11.94'	16.7	5.4	96.6/114.8	4.08	316.4	14.5

Sample Charateristics (Odor, Color)	Clear - No odor	Preservatives Used	See CoC
Number of Containers	10	Sampler Signature	BS

WELL DATA

Number of Baffles	Delrin barrier	Well Cap Dedicated/In Place?	Yes
Well Clear of Weeds/Accessible?	YES	Fittings/Well Head Condition	Good
Pad/Casing Quality	NA	Lock Condition	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste. 170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	**MONITORING WELL I.D.**	TMW-2
LOCATION	Camden, TN	**TEMPERATURE & WEATHER**	Partly Cloudy 59°
DATE & TIME	11.20.19 11:45	**EVENT FREQUENCY**	Quarterly
PURGE METHOD	Peristaltic Pump	**FIELD REPRESENTATIVE**	Brandon Solonka
TOTAL WELL DEPTH (feet)	27.5	**SAMPLING EQUIPMENT**	Bailer
DEPTH TO WATER (feet)	10.65'	**IS SAMPLE EQUIPMENT DEDICATED?**	No
CASING DIAMETER (inches)	1"	**DUPLICATE COLLECTED?**	NC
WATER COLUMN (feet)	16.85'	**FIELD BLANK COLLECTED?**	NC
PURGE VOLUME (gallons)		**EQUIPMENT BLANK COLLECTED?**	NC

PURGE INFORMATION

Gallons Purged	Time (00:00)	Water Level	°C	pH	Conductivity (µs/cm)	DO (mg/L)	ORP	NTU
.25	11:50	15.6'	17.1	5.37	104.0/118.8	5.74	331.4	OR
1.3	12:00	19.27'	17.1	5.44	104.0/123.9	5.41	341.3	OR
2.25	12:10	21.30'	17.0	5.41	102.4/118.3	5.38	343.8	159
3.3	12:20	20.17'	17.0	5.41	101.3/117.8	5.33	344.0	117
4.4	12:30	20.28'	17.0	5.41	99.7/120.9	5.38	347.2	86.0
5.5	12:40	20.24'	17.0	5.40	101.0/117.5	5.33	350.7	47.4
6.5	12:50	20.21'	17.1	5.39	101.8/119.2	5.29	353.9	~~45~~ 33.8
7.6	1300	20.38'	17.1	5.39	101.6/120.2	5.50	359.8	30.7
8.6	1310	20.36'	17.0	5.38	101.8/120.4	5.25	364.2	25.5
9.7	1320	20.37	17.0	5.37	102.0/120.1	5.25	367.4	21.6

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm)	DO (mg/L)	ORP	NTU
9.7	1320	20.37'	17.0	5.37	102.0/120.1	5.25	367.4	21.6

Sample Charateristics (Odor, Color)	CLEAR / NO ODOR	**Preservatives Used**	See CoC
Number of Containers	10	**Sampler Signature**	GB

WELL DATA

Number of Baffles	Jersey Barrier	**Well Cap Dedicated/In Place?**	YES
Well Clear of Weeds/Accessible?	YES	**Fittings/Well Head Condition**	Good
Pad/Casing Quality	NA	**Lock Condition**	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste. 170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	**MONITORING WELL I.D.**	TMW-3
LOCATION	Camden, TN	**TEMPERATURE & WEATHER**	63° Mostly Sunny
DATE & TIME	11.20.19 1:35	**EVENT FREQUENCY**	Quarterly
PURGE METHOD	Peristaltic Pump	**FIELD REPRESENTATIVE**	Brandon Solonka
TOTAL WELL DEPTH (feet)	28	**SAMPLING EQUIPMENT**	Bailer
DEPTH TO WATER (feet)	9.12"	**IS SAMPLE EQUIPMENT DEDICATED?**	No
CASING DIAMETER (inches)	1"	**DUPLICATE COLLECTED?**	No
WATER COLUMN (feet)	18.88	**FIELD BLANK COLLECTED?**	No
PURGE VOLUME (gallons)		**EQUIPMENT BLANK COLLECTED?**	No

PURGE INFORMATION

Gallons Purged	Time (00:00)	Water Level	°C	pH	Conductivity (µs/cm)	DO (mg/L)	ORP	NTU
.25	1340	11.29'	17.1	4.95	250.2/296.9	2.04	381.7	0Z
1.50	1350	12.82'	17.1	5.01	245.3/288.9	1.30	380.8	0
2.25	1400	12.83'	17.1	5.03	244.1/287.6	1.22	375.8	0
3.5	1410	11.90'	17.1	5.02	245.1/287.4	1.25	372.5	167
4.8	1420	11.90	17.1	5.02	244.8/287.8	1.22	373.0	98.2
6.0	1430	11.96	17.1	5.02	244.9/288.0	1.20	374.2	36.1
7.25	1440	11.95	17.1	5.02	242.8/286.5	1.28	374.8	22.4
8.5	1450	11.91	17.1	5.02	243.4/285.9	1.35	376.2	16.4
9.75	1500	11.92	17.1	5.03	243.5/287.8	1.33	375.8	14.8
11.0	1510	11.95	17.1	5.03	243.0/286.8	1.32	376.3	42.3

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm)	DO (mg/L)	ORP	NTU
11.0	1510	11.96	17.1	5.03	243.0/286.8	1.32	376.3	42.3

Sample Charateristics (Odor, Color)	Cloudy - No odor	**Preservatives Used**	See COC
Number of Containers	4 10	**Sampler Signature**	GB

WELL DATA

Number of Baffles	Jersey Barrier	**Well Cap Dedicated/In Place?**	Yes
Well Clear of Weeds/Accessible?	YES	**Fittings/Well Head Condition**	Good
Pad/Casing Quality	NA	**Lock Condition**	Good

GROUNDWATER MONITORING FIELD INFORMATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste. 170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

SITE AND MONITORING WELL DATA

FACILITY NAME	EWS	**MONITORING WELL I.D.**	APWC Leachate
LOCATION	Camden, TN	**TEMPERATURE & WEATHER**	55°F + Sunny
DATE & TIME	11-20-19	**EVENT FREQUENCY**	Quarterly
PURGE METHOD	Grab	**FIELD REPRESENTATIVE**	Brandon Solonka
TOTAL WELL DEPTH (feet)	NA	**SAMPLING EQUIPMENT**	-
DEPTH TO WATER (feet)	NA	**IS SAMPLE EQUIPMENT DEDICATED?**	No
CASING DIAMETER (inches)	NA	**DUPLICATE COLLECTED?**	No
WATER COLUMN (feet)	NA	**FIELD BLANK COLLECTED?**	No
PURGE VOLUME (gallons)	NA	**EQUIPMENT BLANK COLLECTED?**	No

SAMPLE DATA

Gallons Purged	Time Collected (00:00)	Water Level	°C	pH	Conductivity (µs/cm) Spc	DO (mg/L)	ORP	NTU
-	1510	-	25.6	9.12	43211/42906	4.70	124.6	18.4
Sample Charateristics (Odor, Color)			**Preservatives Used**			See CoC		
Number of Containers	10		**Sampler Signature**					

EQUIPMENT CALIBRATION LOG

Civil & Environmental Consultants, Inc. 325 Seaboard Lane, Ste.170 Franklin, Tennessee 37067 - 800-763-2326 - www.cecinc.com

EQUIPMENT CALIBRATION FORM

NAME OF REPRESENTATIVE	B. Solomon
LOCATION	office
DATE AND TIME	11/19/19 @ 1300
Equipment and Model # (ex. YSI Pro Plus 556)	YSI Pro Plus
Equipment Serial #	YSI #1

pH Calibration

pH buffer Calibration Standard	Buffer solution exp. date	Pre-Cal Reading (S.U.)	ph mV Value	Accepted Range mV	Within Range? (Yes or No)	Post-Cal Reading (S.U.)	Calibrated? (yes/no)
4	6/2023	4.07	122.2	160 to 180	NC	4.00	Yes
7	4/2021	7.08	-56.3	+/-50	Na	7.03	Yes
10	6/2020	10.06	-221.5	-160 to -180	Nc	10.04	Yes

Temperature Calibration Check

Cert. Thermometer Value (deg C)	Meter Value (deg C)
22.3	22.2

DO Calibration

Actual Barometric Pressure	Barometric Pressure (mm Hg)	D.O. Value (% Saturated)	Unit reading (%)	% DO accepted?
—	756.6	106.7	100.1	Yes

Specific Conductivity Calibration

Sp. Conductivity Calibration Standard buffer solution	Buffer solution exp. date	Pre Cal Reading (umhos)	Post Cal Reading (umhos)
1583	12/2019	1583	1583

ORP Calibration

ORP Calibration (mV)	Buffer solution exp. date	Pre Cal Reading (mV)	Post Cal Reading (mV)
235.6	5/2020	233.9	235.6

Hach Model 2100P Turbidimeter Calibration

Calibration verification Test performed and passed?	NTU Standard	Within Range? (Yes/No)	Measured Value	Stored?	Final Verification test passed? (Yes/No)
(Yes) / No	20				
	100				
Note: if verification passed, calibration not required	800				

APPENDIX D
CEC STANDARD OPERATING PROCEDURES

APPENDIX D
CEC STANDARD OPERATING PROCEDURES

03-02-01 MONITORING WELLS USING CONVENTIONAL PURGING

I. SCOPE AND APPLICABILITY: This procedure is applicable to the sampling of monitoring wells which do not contain free product using conventional purge methodology.

II. PROJECT-SPECIFIC REQUIREMENTS

A. SAMPLE LOCATIONS AND NUMBERING SYSTEM:

B. ANALYTICAL PARAMETERS AND SAMPLE FREQUENCY:

C. FIELD SCREENING AND ANALYSES: *Reference appropriate SOPs.*

D. QUALITY ASSURANCE SAMPLES: *Number and type of blanks and duplicates. Reference SOPs 04-01-01, 04-01-02, and 04-02-01 as appropriate.*

E. FILTRATION:

F. PURGE CRITERION AND DISPOSAL OF PURGE WATER:

G. WELL KEYS: *Indicate whether wells use CEC's standard key*

H. DEDICATED EQUIPMENT: *Indicate whether dedicated pumps or bailers have been installed.*

I. OTHER REQUIREMENTS:

III. METHODOLOGY: Monitoring wells should be sampled progressing from least contaminated to most contaminated to reduce the chances of cross contamination between samples. If a bailer is employed, use new rope for each well.

A. PURGING: Purging is performed to remove static water standing in the well bore, thereby allowing collection of a sample representative of water in the aquifer. Unless otherwise specified in Section II.F., well development may suffice for the purge, so long as the sample is collected immediately following development.

1. Measure the water level from the top of the riser pipe at the pre-marked reference point (SOP 06-01-01).

2. Calculate the purge volume using the data presented in Exhibit 03-02-01 and the criterion presented in Section II.F.

3. Remove the required volume of water using one of the following methods. If the well goes dry, the purge can be considered complete unless otherwise specified in Section II.F. However, attempts should be made to prevent the well from going dry during purging, drying the well disrupts the flow regime and can result in the loss of volatile compounds. Therefore:

≅ If a well is known to have a low yield, it should be purged by bailing.

≅ If a pump is used for purging, adjust the pumping rate to maintain a water column in the well, if possible.

≅ Do not attempt to purge a well to dryness unless it is infeasible to maintain water in the well at a reasonable purge rate.

METHOD A: If the purge criterion is specified on volume of water to be removed:

a. Remove the required volume of water using a submersible pump or bailer. If a pump is used, a check valve must be installed on the pump to prevent pumped water from returning to the well. Begin purging at the top of the water column. Minimize aeration of the water during purging by pumping at a low rate or lowering the bailer gently into the water.

b. Lower the pump or bailer as necessary to continue purging until the well volume criterion is met.

METHOD B: If the purge criteria are specified on stabilization of field analyses:

a. Measure initial water quality by retrieving a sample from the top of the water column using a bailer. Conduct the field analyses specified in Section II.F. Record these results on the Groundwater Monitoring Data Sheet (SOP 07-02-01).

b. Remove one well volume of water by submersible pump or bailer. If a pump is used, a check valve must be installed to prevent water from returning to the well. Begin purging at the top of the water column. Minimize aeration of the water during purging by pumping at a low rate or lowering the bailer gently into the water.

c. After one well volume has been removed, conduct field analyses on the groundwater being discharged. Record results on the Monitoring Sampling Data Sheet.

d. Repeat steps b and c until the purge criteria have been met.

B. SAMPLE COLLECTION: Groundwater samples should be collected immediately after purging , if the well will yield sufficiently. Some low-yielding wells may require time to recover prior to sampling. If the well will not yield a sample immediately after purging, a maximum of 24 hours between purging and sampling is permitted.

1. Collect water from the well by slowly lowering a decontaminated bailer into the water column.

2. Transfer the samples which do not require filtering directly into sample bottles in the following order:

Volatile Organic Compounds
Semi-Volatile Organic Compounds
Pesticides and PCBs
Cations and Anions
Radionuclides
Bacteria.

3. If indicated in Section II.E., filter the required aliquots (SOP 05-03-02 or 05-03-03) and fill those sample bottles.

4. Preserve the samples immediately in accordance with SOP 07-01-02.

5. Conduct field analyses: pH (SOP 05-04-01 or 05-04-04), temperature, specific conductance (SOP 05-04-02), dissolved oxygen (SOP 05-04-03), Eh (SOP 05-04-08), and any other parameters listed in Section II.C.

6. If a dedicated sample bailer was used, return it to the well head. Otherwise, decontaminate the bailer as specified in SOP 01-01-00.

7. Replace the well cap and lock the protective casing.

8. Collect quality-assurance samples specified in Section II.D in accordance with SOP 04-01-01, 04-01-02, and 04-02-01.

9. Decontaminate samples in accordance with SOP 01-01-00.

10. Pack and ship the samples in accordance with SOP 07-01-03. Samples should be shipped on a daily basis and such that holding time requirements (SOP 07-01-02) can be met.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. When using a bailer, do not allow the rope to drag on the ground. If necessary, lay out plastic sheeting to catch the rope.

B. When using a pump, exercise caution to prevent cross-contaminating samples with the hose. Do not sample from the pump discharge for trace organic compounds. Always use a check valve if not using a dedicated hose. Discard hose if there is a question about whether it can be adequately decontaminated.

C. Check the holding times on the analyses to be conducted. The holding time for some parameters is 24 hours. Plan sampling and shipping of these samples accordingly.

D. Preserve samples immediately after collection, including keeping them cool. Do not let samples sit in a hot vehicle until the end of the day.

V. DOCUMENTATION

A. Record information on a Groundwater Monitoring Data Sheet (SOP 07-02-01).

B. Prepare a Trip Report (SOP 07-02-04) and include:

- ≅ Time, date, and method of sample shipment
- ≅ Preservation methods and sample handling
- ≅ Description of purge and sampling methods
- ≅ The Groundwater Monitoring Data Sheet.

VII. REFERENCES

None

04-01-01 EQUIPMENT BLANKS

I. SCOPE AND APPLICABILITY: Equipment blanks are collected to assess the adequacy of decontamination procedures and to determine whether sampling equipment and methods are contributing contaminants to samples.

II. PROJECT-SPECIFIC REQUIREMENTS:

WATER TYPES TO BE USED FOR BLANKS: *[distilled water, deionized water, HPLC-grade water, etc.]*

III. METHODOLOGY

A. Review the SOP for the medium sampled to establish the frequency for collection of blanks.

B. Assemble a complete set of decontaminated sampling equipment for the subject sampling effort.

C. Rinse the blank water across the sampling equipment, catching it in a decontaminated stainless-steel bucket. Handle the water in the same manner as the samples. For example, if samples for metals analysis are to be filtered with a disposable filter, the blank aliquot for metals analysis should be processed through a new disposable filter. Blanks for soil sampling may be run across the split-spoon sampler, trowel, and bucket.

D. Fill a complete set of sample bottles.

E. Assign the blank a sample number of the same format as the other samples in the series.

F. Store, handle, and ship the blanks in the same manner as the samples.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. The selection of stock solution depends upon the requirements of the project. Analyses for trace contaminants will require a purer blank solution than analyses for major constituents. Stringent analytical requirements will necessitate the use of laboratory-supplied blank water.

B. Include ALL sampling equipment in the rinsing procedure.

V. DOCUMENTATION: Record the following information in the field logbook:

- ≅ Source of blank water
- ≅ Time and sequence within the sampling event when the blanks were prepared
- ≅ Description of the procedure for preparing the blanks
- ≅ Sample numbers assigned to blanks.

Incorporate this information into the Trip Report (SOP 07-02-04).

VI. REFERENCES

EPA, 1986. Test Methods for Evaluating Solid Waste: SW-846; Volume II. Washington, DC.

04-01-02 TRIP BLANKS

I. SCOPE AND APPLICABILITY: Trip blanks are prepared to evaluate whether volatile constituents have migrated into samples from the air on-site, during shipping, or at the laboratory.

II. PROJECT-SPECIFIC REQUIREMENTS:

A. Frequency:

B. Other Criteria:

III. METHODOLOGY

A. When ordering bottles from the laboratory for the sampling event, request that trip blanks be sent also.

B. Keep the supplied blanks with the samples being collected throughout the sampling event. Handle the blanks in the same manner as the filled sample vials.

C. Assign the trip blank a sample number of the format used for the sampling event.

D. Return the trip blanks to the laboratory with the samples. Include the samples on the Chain-of-Custody form (SOP 07-02-02). Analysis is typically performed for volatile organic compounds only.

IV. PRECAUTIONS AND COMMON PROBLEMS: None.

V. DOCUMENTATION: Describe handling on the trip blanks in the Trip Report (SOP 07-02-04). Include the sample numbers assigned.

VI. REFERENCES

EPA, 1986. Test Methods for Evaluating Solid Waste: SW-846; Volume II. Washington, DC.

04-02-01 LIQUID DUPLICATES

I. SCOPE AND APPLICABILITY: Duplicate samples are collected to evaluate the precision involved in the sampling effort. Duplicate samples must be collected to be as similar as possible to the original sample. This procedure is applicable of collection of duplicate samples of all liquids and flowable sludges.

II. PROJECT-SPECIFIC REQUIREMENTS:

NUMBER/FREQUENCY OF DUPLICATE SAMPLING:

DUPLICATE NUMBERING SYSTEM: *[Indicate how sample numbers are to be assigned to duplicates, and whether "blind" numbers should be assigned.]*

III. METHODOLOGY

A. Prepare sample bottles for the target sample and its duplicate.

B. Collect the liquid sample in accordance with the appropriate SOP.

C. When filling sample bottles, fill each type of bottle for the sample and duplicate in sequence. Fill both VOA vials, then both metals bottles, etc. This will assure that the duplicate is as similar to the original sample as possible.

D. Preserve the sample and duplicate identically.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. Failure to fill bottles alternately between the sample and duplicate may result in poor reproducibility between analyses.

B. Samples with free product or multiple phases present special problems. The phase distribution must be the same in both aliquots.

V. DOCUMENTATION: List the sample and duplicate on the Groundwater Monitoring Data Sheet as separate samples, describing the duplicate in the "Comments" column. If a Groundwater Monitoring Data Sheet is not appropriate, incorporate this information into the Trip Report (SOP 07-02-04).

VI. REFERENCES: None.

05-03-05 BAILER

I. EQUIPMENT SPECIFICATION: This procedure is applicable to the use of all bottom-fill bailers.

II. INSPECTION AND CALIBRATION

A. DAILY INSPECTION AND CHECKS: Make sure fittings at both ends of the bailer are secure. Assure that the check valve opens and closes freely.

B. CALIBRATION: There is no calibration applicable to this equipment.

C. ROUTINE MAINTENANCE: There is no maintenance applicable to this equipment. Bailers are typically replaced if damaged.

III. USE

A. Select a rope or cable for suspension of the bailer which is appropriate to project requirements. Typically, small gauge nylon rope is used, although stainless-steel cable may be used when samples will be analyzed to very low detection limits. The rope or cable should be new and clean. Do not use materials which have been used on another project, as this may result in cross contamination.

B. Consult the Project Manager to select a bailer composition which is compatible with the anticipated groundwater quality. For most applications, PVC bailers are adequate. Stainless-steel may be used where very low levels of organic compounds are of interest. Teflon bailers are available and may be requested on some projects.

C. Using a strong, non-slipping knot, such as a bowline, tie the rope or cable to the top of the bailer.

D. Lower the bailer into the well. Do not let the bailer free-fall down the well, as the device may shatter or the ball valve may become dislodged upon striking the water or the bottom of the well.

E. Raise the bailer by pulling the rope with a smooth, uniform motion. A jerky motion may open the check valve, resulting in water loss. Check the knot periodically.

Do not allow the bailer rope to drag on the ground. Place plastic sheeting on the ground to keep the rope clean if conditions are muddy, the ground surface is contaminated, or very low levels of contaminants are of interest.

IV. DECONTAMINATION: The equipment should be decontaminated in accordance with SOP 01-01-00.

Typically, the bailer is washed with a potable water and non-phosphate soap solution. The bailer is then rinsed with distilled water and wrapped in plastic or foil until used.

V. TROUBLESHOOTING

A. If the knot should come undone or the rope breaks, the bailer typically can be recovered using a weighted fishing hook tied to monofilament line.

B. When bailing turbid water, it may be necessary to rinse the ball-valve at the bottom of the bailer with distilled water if it clogs.

06-01-01 WATER-LEVEL MEASUREMENT IN MONITORING WELLS

I. SCOPE AND APPLICABILITY: This procedure is applicable to the measurement of water levels in monitoring wells and open boreholes.

II. PROJECT-SPECIFIC REQUIREMENTS

A. REQUIRED READINGS:

B. APPLICABLE METHODS:

III. METHODOLOGY: Water levels should always be recorded to ±0.01 foot. Measurements should be made from a marked point on the inner casing for monitoring wells, and from the ground surface for open boreholes. Equipment should be decontaminated in accordance with SOP 01-01-00 after each measurement. The following methods may be used:

A. CHALKED-TAPE METHOD

1. Check records for historic water levels in the well, if available.

2. Rub the first five feet of a steel surveyor's chain or fiberglass tape with carpenter's chalk.

3. Lower the tape into the well until the end of the tape enters the water.

4. Record the tape footing at the wellhead to within 0.01 feet.

5. Pull the tape out of the well and read the tape footage of the water mark to within 0.01 feet. The difference between the readings is the water level.

B. SOUNDING

1. Attach a small float or hollow-bottom weight or sounder to the end of a tape measure.

2. Lower the sounder into the well and listen for the sound of the weight hitting the water surface.

3. When this is heard, pull the sounder back a few inches and redrop it by 1/4-inch increments until the sound is heard again.

4. Subsequent smaller increments of lowering the sounder will allow water-level measurements to within 0.01 feet.

5. Measure the length from the zero mark on the tape measure to the bottom of the weight. Add this value to all field measurements made with the sounder.

C. ELECTRIC-WATER LEVEL METER (Solinst)

1. Turn the Solinst on by turning the knob clockwise. This knob is also the volume control. Test the Solinst to see if the battery is dead by pushing the button next to the volume knob.If the battery is charged the Solinst will emit an audible tone and the red indicator light will illuminate.
2. Lower the end of the probe into the well or borehole. The probe will cause the unit to emit the tone and illuminate the light when it contacts water.

3. Pull the probe back a few inches and lower the probe in smaller increments until the water level is measured to within 0.01 feet.

4. The water level is read directly from the Solinst tape, and already includes a correction for the length of the probe on the bottom of the tape.

D. INTERFACE PROBE: This is the only reliable method for wells with floating free product.

1. Push the On/Off button to turn unit on. Lower the probe into the liquid. The horn will sound a steady tone and the yellow light will illuminate when the probe contacts an oil product. Slowly raise probe until sound stops, lower until sound is heard again to refine the oil level.

2. Read the tape marking and note as the surface level of product.

3. Slowly lower the probe through the oil product, searching for the oil-water interface. When the probe reaches water the tone will switch from steady to a beeping tone and the red light will illuminate. Slowly move probe up and down to refine the oil/water interface to within 0.01 feet. Read the water level directly from the tape. The length of the probe is already considered.

NOTE: Auto Shutoff Feature: After approximately five minutes of power on, the unit will auto-shut off. A chirping sound will be heard, warning impending shut off. Press

<POWER ON/RENEW> to continue operation. During five minute interval, short "alive" beep is heard.

IV. PRECAUTIONS AND COMMON PROBLEMS:

1. Be sure to allow sufficient time after development, purging or pumping to allow the well to recover to static conditions.

2. Sounding may be difficult with very deep water levels or in noisy conditions because the sound is hard to hear.

3. Measurement of water levels in pumping wells or wells/boreholes with cascading water can be difficult. Installing a narrow PVC access tube inside the well casing can make obtaining accurate readings easier.

4. Free product floating on the water table depresses the natural water level. If a true water level is required, the product of the oil thickness and the oil specific gravity must be added to the oil/water interface elevation.

5. If there is no measurement mark on the well riser, add one in indelible ink.

V. DOCUMENTATION

1. Record water levels in a field notebook or Groundwater Monitoring Data Sheet (SOP 07-02-01). Be sure to record the date and time of the measurement.

2. Data should be incorporated into the Trip Report (SOP 07-02-04). Method of measurement should be reported.

VI. REFERENCES: None

07-01-01 MAINTAINING SAMPLE CHAIN OF CUSTODY

I. SCOPE AND APPLICABILITY: This procedure is to be employed whenever samples are collected for laboratory analysis, and is designed to ensure that sample integrity is maintained. These procedures are necessary to assure that samples are defensible.

II. PROJECT-SPECIFIC REQUIREMENTS: None.

III. METHODOLOGY

A. SAMPLE CUSTODY: The sampling personnel must maintain custody of the samples until they are delivered to the laboratory, at which time the laboratory takes over the custody record. A sample is considered to be in custody if:

- it is in the investigator's actual possession
- it is in view of the investigator
- it has been placed in a secure area
- a signed custody seal has been placed on the sample container such that the seal would be destroyed if the container was opened.

B. CUSTODY RECORD

1. Complete a Chain-of-Custody Form for each shipping container of samples as described in SOP 07-02-02. Place the white copy of the completed form in the shipping container with the samples, as discussed in SOP 07-01-03.

2. Affix a signed custody seal to secure all samples. Seals may be placed across the lids of individual sample bottles, or on each shipping container of samples. If seals are placed on shipping containers, at least two seals must be used, and they must be placed such that the container cannot be opened without breaking the seals.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. It may be necessary to cover custody seals with clear postal tape to prevent them from falling off.

B. Deliver or fax a copy of the custody form to the Project Manager within 24 hours of shipping the samples so that any errors can be corrected before the laboratory begins processing the samples.

V. DOCUMENTATION

A. The pink copy of the Chain-of-Custody Form should be submitted to the Project Manager as soon as possible after the samples are shipped.

B. The Project Manager or a designee must review the form for completeness and correctness. Any errors should be flagged, and the laboratory should be contacted if errors could affect analysis. The reviewer should initial and date the form, then place it in the Project File.

C. Compliance or problems with custody procedures should be documented in the Trip Report (SOP 07-02-04).

VI. REFERENCES

EPA Region IV; 1991. Environmental Compliance Branch, Standard Operating Procedures and Quality Assurance Manual. Athens, Georgia.

07-02-01 GROUNDWATER MONITORING DATA SHEET

I. SCOPE AND APPLICABILITY: A Groundwater Monitoring Data Sheet is completed each time water samples are collected to document field data and sampling methodology.

II. PROJECT-SPECIFIC REQUIREMENTS: None.

III. METHODOLOGY: Complete the form (Exhibit 07-02-01) as samples are collected, as follows:

a. Self explanatory
b. CEC project number
c. Names or initials of all members of the sampling team
d. Complete well designation
e. Depth to water level, reported to $\pm$0.01 ft. (Check measurement datum at the top of the column.)
f. Date and time well purging is started
g. Volume of water removed, in gallons
h. Check if well was purged to dryness
i. Indicate method of purging, such as submersible pump or bailer
j. Date and time that the actual sample was withdrawn. If sample bottles were filled at multiple, separate times, these should all be indicated.
k. Self explanatory (Check units for temperature.)
l. Unusual odors or other observations
m. Other atypical information, such as special handling of purge water or field problems

IV. PRECAUTIONS AND COMMON PROBLEMS: All information required by the form must be provided.

V. DOCUMENTATION: Attach the form to the Trip Report (SOP 07-02-04).

VI. REFERENCES: None.