SECOND 2014 SEMI-ANNUAL
GROUNDWATER MONITORING REPORT

ENVIRONMENTAL WASTE SOLUTIONS
CAMDEN CLASS II LANDFILL
TDSWM PERMIT NUMBER IDL 03-0212
CAMDEN, TENNESSEE

Prepared For:

ENVIRONMENTAL WASTE SOLUTIONS CLASS II LANDFILL
200 OMAR CIRCLE
CAMDEN, TN 38320

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
NASHVILLE, TN

CEC Project 142-059

NOVEMBER 2014

Civil & Environmental Consultants, Inc.

Nashville 325 Seaboard Lane, Suite 170 | Franklin, TN 37067 | p: 615-333-7797 f: 615-333-7751 | www.cecinc.com

SEMI-ANNUAL GROUNDWATER MONITORING REPORT
NOVEMBER 2014

Environmental Waste Solutions Camden Class II Landfill
TDSWM Permit Number IDL 03-0212
Camden, Tennessee

Prepared for:
Environmental Waste Solutions Camden Class II Landfill
200 Omar Circle
Camden, TN 38320

Prepared by:
Civil & Environmental Consultants, Inc.
325 Seaboard Lane, Suite 170
Franklin, Tennessee 37067
CEC Project No. 142-059
January 5, 2015

Michael Johnson, P.G.
Project Manager II

Ed Hood, P.G.
Principal

TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

This report documents the second semi-annual monitoring event of 2014 for the Environmental Waste Solutions, LLC (EWS) Class II Landfill. The Class II landfill is registered with the Tennessee Division of Solid Waste Management (TDSWM) with permit number IDL 03-0212. The 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).

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

Upgradient Monitoring Points	Downgradient Monitoring Points
MW-1	MW-3, MW-4

Groundwater samples were collected by Civil & Environmental Consultants, Inc. (CEC) on November 21, 2014. ESC Lab Sciences performed the analysis and reported the results on December 4, 2014. All monitoring wells were sampled during the event, with the exception of MW-2, which was recently replaced by MW-4. MW-2 has subsequently been removed from the Appendix I monitoring network because the well routinely yielded insufficient volumes of water for sampling purposes. MW-2 remains in place, and will continue to be monitored for field parameters and water level data. The collected groundwater samples were analyzed for Appendix I organics, Appendix I inorganics, Bromide, Chloride, Nitrate, Sulfate, Ammonia (NH_3), and a short list of ions.

Since additional waste streams have been approved for disposal in the EWS Class II Landfill, the TDSWM requested that EWS add the volatile organic compounds (VOCs) included in the Appendix I *Constituents For Groundwater Monitoring* presented in Rule 0400-11-01-.04 (9.) d of the Rules and Regulations Governing Solid Waste Disposal in Tennessee to the existing list of groundwater monitoring constituents.

Inter-well prediction interval analysis was used to identify statistically significant increases (SSIs) over background concentrations for the analyzed water quality parameters. The

percentage of inter-well background non-detects for each parameter determines the primary statistical method utilized for each parameter. First, the distribution of the data was evaluated for normality. The test of 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 detection limit. Data determined to be normally distributed were evaluated using parametric prediction interval analysis. Data that was not normally distributed were evaluated using non-parametric statistical methods. If the percentage of non-detects in the background samples is less than 50%, Shewart-CUSUM control charts are utilized. If more than 50% background non-detects exist for the given parameter, non-parametric inter-well prediction limit analysis is conducted on the data. Only parameters reported above the detection limits (practical quantitation limits) of the laboratory were evaluated. The results of the analysis are summarized as follows:

SSIs over background identified for the current monitoring event include barium at MW-3 and chloride at MW-3 and MW-4. The chloride concentrations are consistent with historical data and remain well below the secondary drinking water standard for chloride concentrations (250 mg/L). The barium concentration at MW-3 was 0.14 mg/L, well below the maximum contaminant level (MCL) primary drinking water standard of 2 mg/L.

The next semi-annual monitoring event is tentatively scheduled for May, 2015.

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 accepts household waste
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
EPA	Environmental Protection Agency
ESC	ESC Lab Sciences
EWS	Environmental Waste Solutions
GW	Groundwater
HDPE	High Density Polyethylene
HI	Hydrogeologic Investigation
MCL	Maximum Contaminant Level
µS•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 Operated Treatment Works
Ppm	parts per million*
PQL	Practical Quantitation Limit
QC	Quality Control
SNL	Sanitary Landfill
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

1.0 INTRODUCTION

1.1 SITE LOCATION

Environmental Waste Solutions, LLC (EWS) manages the Camden Class II landfill located just off highway US 70 at 200 Omar Circle, Camden, Tennessee. The site can be located on the Camden, Tennessee USGS quadrangle at north latitude 36° 3' 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 indicated in Figure 1- Site Location Map. The landfill footprint can be viewed in Figure 2 - Potentiometric Surface Map.

1.2 CURRENT ACTIVITIES

The EWS Camden Class II Landfill currently receives secondary aluminum smelter waste for disposal including aluminum dross and salt cakes and other industrial wastes approved by the TDSWM.

2.0 AQUIFER CHARACTERISTICS

2.1 GEOLOGIC AND AQUIFER CHARACTERISTICS

The extensive reworking of the site as a result of the excavation of chert for local road and fill projects has significantly 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 mottlings 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, 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 proposed waste area footprint during the 1999 and 2006 hydrogeological investigations indicate that the uppermost aquifer is sloped to the southwest. Comparisons of the water bearing zone elevations to static groundwater elevations for both indicate an unconfined aquifer.

2.2 MONITOR WELL INTEGRITY & STATIC WATER LEVELS

The groundwater monitoring network for the Class II Landfill consists of monitor wells MW-1, MW-3, and MW-4. Monitor well MW-1 serves as an up-gradient monitoring point while monitor wells MW-3 and MW-4 serve as down-gradient monitoring points.

The integrity of each monitor well is checked during each sampling event prior to groundwater collection. The physical condition of each wellhead is observed and noted along with the condition and ability of any and all locking mechanisms for each monitor well. Once the watertight seal is removed from the top of each monitor well's casing, the well is allowed to de-pressurize. A decontaminated electronic probe is slowly lowered into the monitor well to establish the distance between the established top of casing and the elevation of free groundwater. The distance is then re-checked to ensure that the measurement is of actual static water level and the groundwater is not rising or falling in the monitor well. The electronic probe is capable of determining this distance to within one-hundredth of one foot (0.01 foot). This distance is written in the site-specific field book as depth-to-water. Upon collection of this data, the electronic water level probe is removed from the monitor well and decontaminated from contact with the well casing / screen and groundwater.

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 Mean Sea Level Datum of the World Geodetic Survey of 1984. Groundwater elevations are listed in Table 1 – Field Parameters & Potentiometric Data, Appendix A.

2.3 GROUNDWATER FLOW DIRECTION

Groundwater flow at the landfill appears to flow in a southwesterly direction towards Charlie Creek. Groundwater flow in the vicinity of the Class II Landfill generally flows from a topographic high north of the landfill south towards monitor wells MW-3 and MW-4. Monitoring wells MW-3 and MW-4 are positioned to intercept any possible groundwater contaminants leaching from the landfill.

2.4 POTENTIOMETRIC GRADIENT

The Potentiometric surface of the first aquifer occurring beneath the Class II Landfill occurs at approximately twenty-three (23) feet below ground surface at the up-gradient monitor well MW-

1 to approximately eleven (11) feet below ground surface at monitor well MW-4. The groundwater potentiometric data interpreted from the 1999 and 2006 hydrogeological investigations conducted at the site for the uppermost aquifer indicate that the uppermost water bearing zone generally moves in a Southwest direction. Comparisons of water bearing zone elevations to static groundwater elevations for both investigations indicate an unconfined aquifer. The potentiometric gradient calculated from groundwater elevation data collected on November 21, 2014 is approximately 1.43 %.

The potentiometric gradient is calculated according to the following formula:

$$\frac{\text{Highest GW. Contour Elev. – Lowest GW. Contour Elev.}}{\text{Horizontal Distance between the Potentiometric Contours}} * 100 = \text{Pot. Grad.}$$

$$\frac{(390') - (370')}{1{,}400'} * 100 = 1.43\%$$

The above calculation assumes a perpendicular gradient between the potentiometric contours drawn between 370' and 390'. 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 first aquifer occurring beneath the landfill have not been determined at this time.

3.0 GROUNDWATER SAMPLING PROCEDURES

3.1 INSTRUMENTATION

Depth to groundwater measurements are collected using a Solinst® electronic water level indicator, model # 122. A YSI 556 Multi-parameter probe was used to record pH, specific conductance, temperature, dissolved oxygen and ORP during groundwater sampling events at the landfill. A LaMotte model 2020 turbidity meter or equivalent was used to collect turbidity readings. Each instrument was either checked against known standards or calibrated as per manufacturers' specifications prior to the commencement of sampling activities.

3.2 PURGING AND COLLECTION OF FIELD PARAMETER VALUES

Groundwater was purged using either a decontaminated down-well pump using new tubing or using new tubing connected to a peristaltic pump or in the case of a pump malfunction, a new disposable bailer. The total volume of groundwater residing in each monitor well was calculated by subtracting the depth to water from the total depth of each well. This linear distance was next multiplied by 0.163 gallons per foot in a 2 inch (I.D.) monitor well. When purging using a disposable polyethylene bailer, the bailer with sufficient nylon twine was slowly lowered into the water column. The bailer was allowed to completely submerse into the water column prior to extracting the bailer from the monitor well. The initial amount of purged groundwater was collected in a clean, high-density polyethylene (HDPE) reservoir where it is observed for Temperature, pH, specific conductance, dissolved oxygen, oxidation-reduction potential (ORP) and turbidity. These values are noted in the site specific field book as V_0 and then the collected groundwater is discarded onto the ground, away from the monitor well.

Bailers and tubing used for purging activities were constructed of either polyethylene or Teflon. Bailers were factory decontaminated and sealed as to allow no environmental contaminants to interact with the bailer. New nylon twine was fixed to each bailer via a tied knot.

The collected groundwater was decanted into a flow-through cell where it was be observed for pH, specific conductance, temperature, and turbidity. These values were noted in the site specific

field book as V_0 and then the collected groundwater was poured onto the ground, down-gradient from the monitor well.

Groundwater was purged from the monitor well for a specific period of time that allowed for a new volume of water to have passed into the flow-through cell. Once this volume of water was purged, the field chemistry parameters were again observed and recorded in the field book as V_1. This procedure for purging groundwater continued for an additional well volume, if sufficient groundwater was available. After the second purged well volume was observed for field parameter values, the values were checked against values for V_1. If the pH and specific conductance values for each volume purged varied no more than 10% from V_1 to V_2 and the temperature stabilized to within one degree Celsius, preparations were made to collect a groundwater sample for submittal to an analytical laboratory. If the field parameters were not stable, the purging procedures continued until either one of the following conditions were met:

1. Field stabilization occurred,
2. Well was purged dry, or
3. Three well volumes were purged.

If the monitor well was purged dry, then the recharging groundwater was collected within twenty-four hours.

Field parameter values are presented in Table 1 – Groundwater Field Data, Appendix A. A detailed account of each purge and sample procedure conducted at each monitor well is presented in Appendix D – Standard Operating Procedures.

3.3 SAMPLE COLLECTION & PRESERVATION

Groundwater samples were collected from monitor wells when field parameter data indicated that stagnant water has been purged from the well and replaced by groundwater from the adjacent formation that is representative of actual aquifer conditions. Groundwater is placed in laboratory supplied sample vessels in the following order if analyzed: Appendix I Organics-three(3), forty (40) mL preserved with Hydrochloric Acid (HCl), Appendix I inorganics – one

(1), five-hundred (500) ml preserved with nitric acid (HNO_3); Chloride, Nitrate, Sulfate – one (1), two-hundred fifty (250) ml unpreserved HDPE jar; Ammonia – one (1), two-hundred fifty (250) ml HDPE jar preserved with sulfuric (H_2SO_4) acid; Dissolved Inorganics- one (1), five-hundred (500) ml preserved with nitric acid (HNO_3), field filtered with 0.45 micron filter.

3.4 QUALITY ASSURANCE & QUALITY CONTROL

Field blanks and trip blanks were collected for each sample collection event performed to date at the EWS Class II Landfill. CEC collected a field blank next to monitoring well MW-3. The field blanks were collected by pouring deionized water into a duplicate set of sample bottles. Thereby, allowing any airborne contaminants a chance to enter the field blank sample. A laboratory supplied VOC trip blank was transported into the field and handled in the same manner as the water samples collected for volatile organic compounds analysis. Laboratory analytical testing of the field blanks and trip blank did not reveal the presence of any of the EWS Class II Landfill site specific target compounds.

Additionally, a field duplicate sample was collected from MW-4 for laboratory quality control purposes. The reported values for the duplicate sample are similar to the original MW-4 sample.

3.5 SAMPLE CHAIN-OF-CUSTODY

A sample Chain-of-Custody (COC) traveled along with each sample kit from ESC to EWS and finally back to ESC for the sampling events. The CEC SOP 07-01-01 for maintaining sample Chain of Custody may be found in Appendix D – CEC Standard Operating Procedures.

4.0 LABORATORY ANALYTICAL PROCEDURES

4.1 ANALYTICAL METHODS

All laboratory analyses for November 2014 monitoring event were completed by Environmental Science Corporation in Mt. Juliet, Tennessee. The analytical methods chosen for this monitoring event are the most appropriate procedures as directed by the Tennessee Division of Solid Waste Management (TN-DSWM) and the United States Environmental Protection Agency'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 (if necessary) were as follows:

Method 6010b	Inductively Coupled Plasma (ICP) – Atomic Emission Spectrometry
Method 6020	ICP – Mass Spectrometry
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 9056	Determination of Inorganic Anions by Ion Chromatography (Fluoride)
Method 350.1	Ammonia Nitrogen

4.2 LABORATORY ANALYTICAL RESULTS

Laboratory reports from the analysis of groundwater samples collected from the EWS Camden Class II Landfill during the semi-annual monitoring event were prepared by ESC and reported to CEC on December 4, 2014. Copies of the laboratory reports are located in Appendix C – Laboratory Analytical Reports. Constituent values from all laboratory analysis along with applicable maximum contaminant levels (MCLs) are presented in Table 2 – Analytical Results, Appendix A.

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. ESC complies with this directive and reports all qualifiers along with explanations of QC qualifier codes. One QC qualifier code was indicated during the laboratory analysis of groundwater samples during this monitoring event and can be viewed along with the Laboratory Analytical Reports, in Appendix C.

5.0 STATISTICAL ANALYSIS

5.1 APPLICABLE METHODS

The Rules of Tennessee Department of Environment and Conservation, Division of Solid Waste Management Chapter 1200-1-7-.04 states, in part, that each landfill must conduct and report statistical analysis as part of the evaluation of groundwater monitoring data. Several methods may be employed for this endeavor. EWS Camden Class II Landfill has chosen to use Inter-well and intra-well non-parametric prediction limit analysis (NPPL) at this time.

First, the distribution of the data was evaluated for normality. The test of 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 detection limit. Data determined to be normally distributed were evaluated using parametric prediction interval analysis. Data that was not normally distributed were evaluated using non-parametric statistical methods. Inter-well and intra-well parametric and non-parametric prediction limit analyses (NPPL) were deemed appropriate for this data set. Inter-well analyses compared the concentrations observed at the down-gradient monitoring locations to the concentrations observed at the up-gradient monitoring location during this monitoring event. For the Class II Landfill, monitor well MW-1 was considered as background. Intra-well analysis was utilized only at MW-1 to compare the concentrations observed during the current groundwater sampling event to the established background data set.

The percentage of inter-well background non-detects for each parameter determines the primary statistical method utilized for each parameter. If the percentage of non-detects in the background samples is less than 50%, Shewart-CUSUM control charts are utilized. If more than 50% background non-detects exist for the given parameter, non-parametric inter-well prediction limit analysis is conducted on the data.

The computer program ChemStat was used for all statistical computations. Worksheets indicating inter-well and intra-well statistical analysis sheets and time versus concentration charts may be viewed in Appendix B, Statistical and Trend Analysis.

5.2 RESULTS

Review of the statistical analysis performed on the available data indicated that there were two statistically significant increases (SSI's) over background data. The SSI's over background data were limited to Barium (MW-3), and Chloride (MW-3 and MW-4). The Barium and Chloride detections observed at MW-3 and MW-4 are well below their associated MCL's.

Trend analysis utilizing the limited data available from the monitoring events showed no distinct trends for the site monitoring wells.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Representative groundwater samples were collected from monitor wells MW-1, MW-3 and MW-4. The groundwater samples were analyzed for Appendix I list of parameters, chloride, nitrate, sulfate, ammonia (NH_3), and a short list of ions.

6.1 EWS GROUNDWATER QUALITY RELATIVE TO THE EPA PRIMARY DRINKING WATER STANDARDS

Laboratory analytical results for the groundwater samples collected from the facility monitoring wells for the EWS Class II Landfill indicated that one compound was detected at concentrations that exceeded the EPA MCL; specifically, the concentration of Arsenic in MW-1.

Arsenic was detected in MW-1 at a concentration of 0.059 mg/l. The MCL for arsenic is 0.01 mg/l. Arsenic has been detected at concentrations exceeding the primary drinking water MCL prior to the disposal of waste in the landfill. More specifically, laboratory analytical testing of groundwater samples taken from MW-1 during background testing of the groundwater prior to waste placement in the landfill revealed concentrations of arsenic ranging from 0.024 mg/L to 0.072 mg/L. The presence of arsenic in the local groundwater is considered attributable to naturally occurring deposits in the soil overburden since there is no immediate development up-gradient of the well.

6.2 EWS GROUNDWATER QUALITY RELATIVE TO THE TENNESSEE SECONDARY DRINKING WATER STANDARDS

Laboratory analytical results for the groundwater samples collected in November of 2014 from the EWS Class II Landfill groundwater monitor well network indicated that three of the site specific groundwater monitor list of compounds was detected at concentrations which exceeded the Tennessee Public Water Supply Secondary Drinking Water Standards (2DW). Those parameters included Iron and Manganese in upgradient well MW-1, Aluminum and Manganese in MW-3, and Manganese in MW-4.

Aluminum was detected at a concentration of 1.2 mg/L in MW-1 and 1.8 mg/L in MW-3 prior to the placement of waste. Therefore the concentration in the groundwater samples taken during the November 2014 sample event of 0.3 mg/L in MW-3 is not considered the result of a new offsite source.

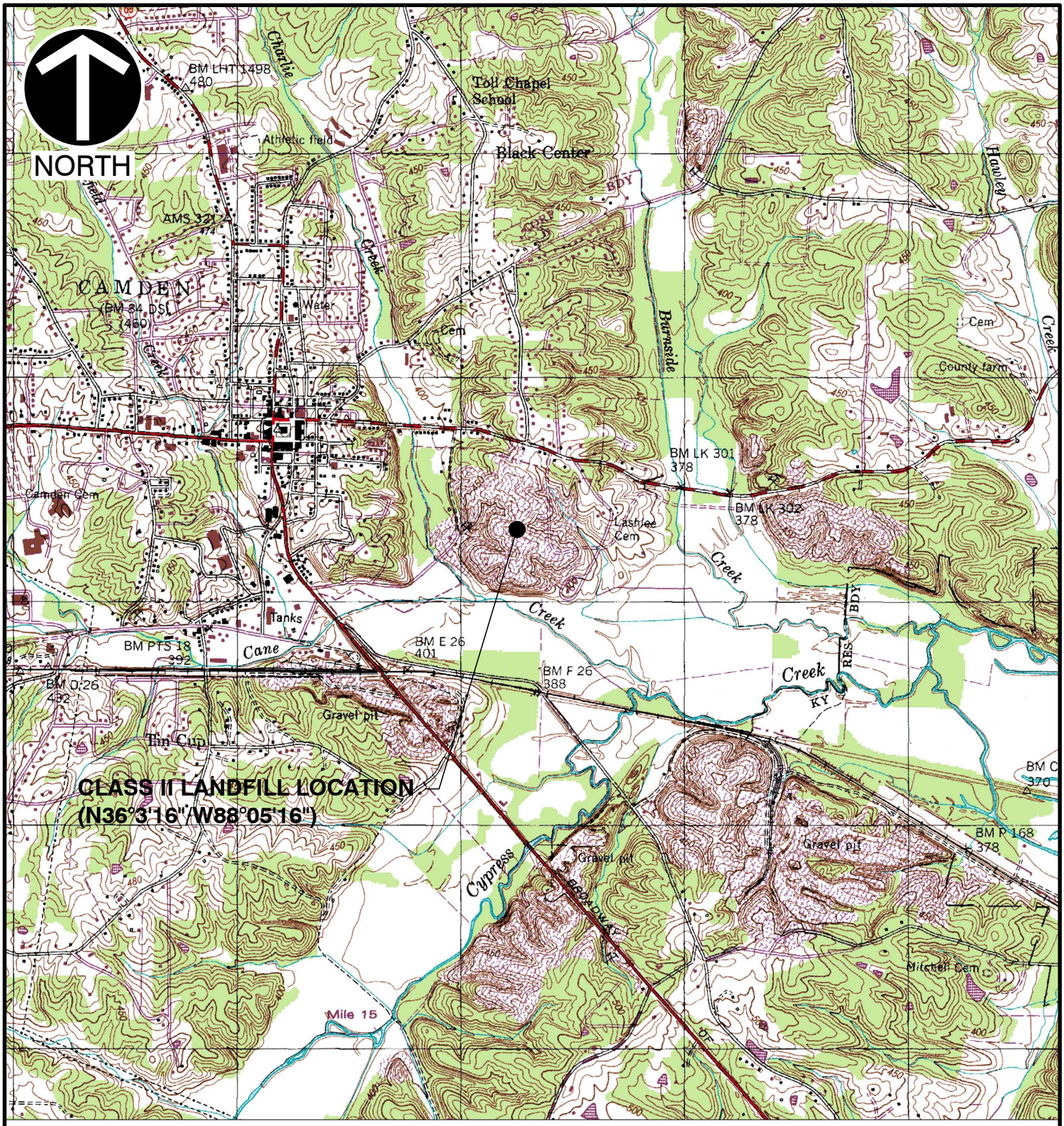
Iron was detected at a concentration of 26 mg/L in MW-1 and 1.6 mg/L in MW-3 prior to the placement of waste. Therefore, the concentration in the groundwater samples taken during the November 2014 sample event of 18 mg/L in MW-1 is not considered the result of a new offsite source.

Manganese has been consistently detected in upgradient well MW-1 and has the highest reported concentration observed during the current monitoring event of 0.94 mg/L. The manganese detections observed in site monitoring wells MW-3 (0.29 mg/L) and MW-4 (.074 mg/L) are considered a natural variation in local groundwater.

The next semi-annual monitoring event is tentatively scheduled for May 2015.

APPENDIX A

MAPS AND TABLES



REFERENCE

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

* HAND SIGNATURE ON FILE

Civil & Environmental Consultants, Inc.
325 Seaboard Lane, Suite 170 - Franklin, TN 37067
615-333-7797 · 800-763-2326
www.cecinc.com

ENVIRONMENTAL WASTE SOLUTIONS
CLASS II CAMDEN LANDFILL
CAMDEN, TENNESSEE

SITE LOCATION MAP

DRAWN BY:	KLU	CHECKED BY:	PC	APPROVED BY:	*EH	FIGURE NO.:	1
DATE:	AUGUST 14, 2014	DWG SCALE:	1"=2000'	PROJECT NO:	142-059		

P:\2014\142-059\-CADD\Dwg\142-059 SITE LOCATION MAP.dwg{LAYOUT1} LS:(8/14/2014 - kunderwood) - LP: 8/14/2014 1:43 PM

LEGEND

- MW1 392.62 — GROUND WATER MONITORING WELL / GROUND WATER ELEVATION (FMSL)
- 390 — POTENTIOMETRIC SURFACE CONTOUR (FMSL)
- GROUND WATER FLOW DIRECTION
- MH1 — MANHOLE
- APPROXIMATE FILL LIMITS

NOTE:

Hydraulic gradient calculation between contour lines 370' and 390'

$$i = \frac{390' - 370'}{1{,}400'} = 0.0143 \text{ ft/ft}$$

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 THIS 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

0 300' 600'

Civil & Environmental Consultants, Inc.
405 Duke Drive, Suite 270 - Franklin, TN 37067
615-333-7797 · 800-763-2326
www.cecinc.com

ENVIRONMENTAL WASTE SOLUTIONS
CAMDEN CLASS II LANDFILL
CAMDEN, TENNESSEE

NOVEMBER 2014
POTENTIOMETRIC SURFACE MAP

DRAWN BY:	PC	CHECKED BY:	MJ	APPROVED BY:	EH
DATE:	NOVEMBER 2014	DWG SCALE:	1"=300'	PROJECT NO:	142-059

FIGURE NO.: 2

P:\2014\142-059\-DRAFT DOCUMENTS\DECEMBER 2014 GW REPORT\142-059 GROUNDWATER MAP DECEMBER 2014.DWG{LAYOUT1}LS:(PCAMPBELL - 12/23/2014) - LP: 12/23/2014_12:02:52_PM

Table 1

Environmental Waste Solutions Camden Class II Landfill IDL 03-0212

Field Parameters and Potentiometric Data - November 21, 2014

Monitoring Well/ Piezometric Well	Date	Sample Time	Top of Casing Elevation Feet MSL	Sample Method	Bottom of Well Elevation Feet	Well Diameter Feet	Well Volume Gallons	Depth to Water Feet	Potentiometric Surface Feet MSL	Temperature Degrees C	Conductivity micromhos/cm	pH SU	Dissolved Oxygen mg/l	Oxidation Reduction Potential Millivolts	Turbidity NTU
MW-1	11/21/2014	13:00	415.36	Bailer	382.26	0.17	1.8	22.74	392.62	15.6	102.7	5.62	4.12	22.4	38
MW-2	11/21/2014	NS	380.15	NS	367.70	0.17	0.8	7.90	372.25	17.0	223.2	5.4	4.91	140.3	NS
MW-3	11/21/2014	14:00	392.49	Bailer	369.66	0.17	0.6	19.55	372.94	18.4	305.3	5.26	3.56	128.6	28.6
MW-4	11/21/2014	13:25	381.50	Bailer	369.39	0.17	0.1	11.55	369.95	16.7	61.2	5.71	2.82	126.4	12.2

NS= Not Sampled, Only water level and field parameters collected at MW-2. MW-2 removed from monitoring network

Table 2
Environmental Waste Solutions Camden Class II Landfill IDL 03-0212
Analytical Data - November 21, 2014

		MW-1		MW-3		MW-4	
		11/21/2014		11/21/2014		11/21/2014	
Parameter	MCL (mg/l)	Value (mg/l)	Qual	Value (mg/l)	Qual	Value (mg/l)	Qual
Bromide	-	<1.0		<1.0		<1.0	
Chloride	250 [2]	**3.9**		**65.0**		**6.7**	
Nitrate	10	<0.10		**3.2**		**0.65**	
Sulfate	250 [2]	**9.1**		**11.0**		<5.0	
Ammonia Nitrogen	-	<0.25		**0.4**		<0.25	
Antimony	0.006	<0.0020		<0.0020		<0.0020	
Arsenic	0.01	**0.059**		<0.0020		<0.0020	
Beryllium	0.004	<0.0020		<0.0020		<0.0020	
Cadmium	0.005	<0.00050		<0.00050		<0.00050	
Copper	1.3	<0.0020		**0.0073**		<0.0020	
Lead	0.015	<0.0020		<0.0020		<0.0020	
Selenium	0.05	<0.0020		<0.0020		<0.0020	
Thallium	0.002	<0.0020		<0.0020		<0.0020	
Zinc	5 [2]	<0.025		<0.025		<0.025	
Mercury	0.002	<0.00020		<0.00020		<0.00020	
Aluminum	0.2 [2]	<0.10		**0.3**		**0.14**	
Aluminum (Dissolved)	-	<0.10		**0.13**		<0.10	
Barium	2	**0.02**		**0.14**		**0.013**	
Boron	-	<0.20		<0.20		<0.20	
Boron (Dissolved)	-	<0.20		<0.20		<0.20	
Calcium	-	**4.0**		**19.0**		**4.0**	
Chromium	0.1	<0.010		<0.010		<0.010	
Cobalt	-	**0.046**		<0.010		<0.010	
Iron	0.3 [2]	**18.0**	**V**	**0.15**		**0.21**	
Magnesium	-	**3.2**		**6.4**		**2.3**	
Magnesium (Dissolved)	-	**3.3**		**6.0**		**2.2**	
Manganese	0.05 [2]	**0.94**		**0.29**		**0.074**	
Manganese (Dissolved)	-	**0.94**		**0.26**		**0.12**	
Nickel	-	<0.020		<0.020		<0.020	
Potassium	-	**1.2**		**11.0**		**1.2**	
Potassium (Dissolved)	-	**1.2**		**10.0**		**1.1**	
Silver	0.10 [2]	<0.010		<0.010		<0.010	
Sodium	-	**4.0**		**25.0**		**5.0**	
Sodium (Dissolved)	-	**4.2**		**25.0**		**4.7**	
Vanadium	-	<0.010		<0.010		<0.010	

Notes:

MCL: Maximum Contaminant Level Enforceable National Primary Drinking Water Standards

2: Non-Enforceable National Secondary Drinking Water Standard

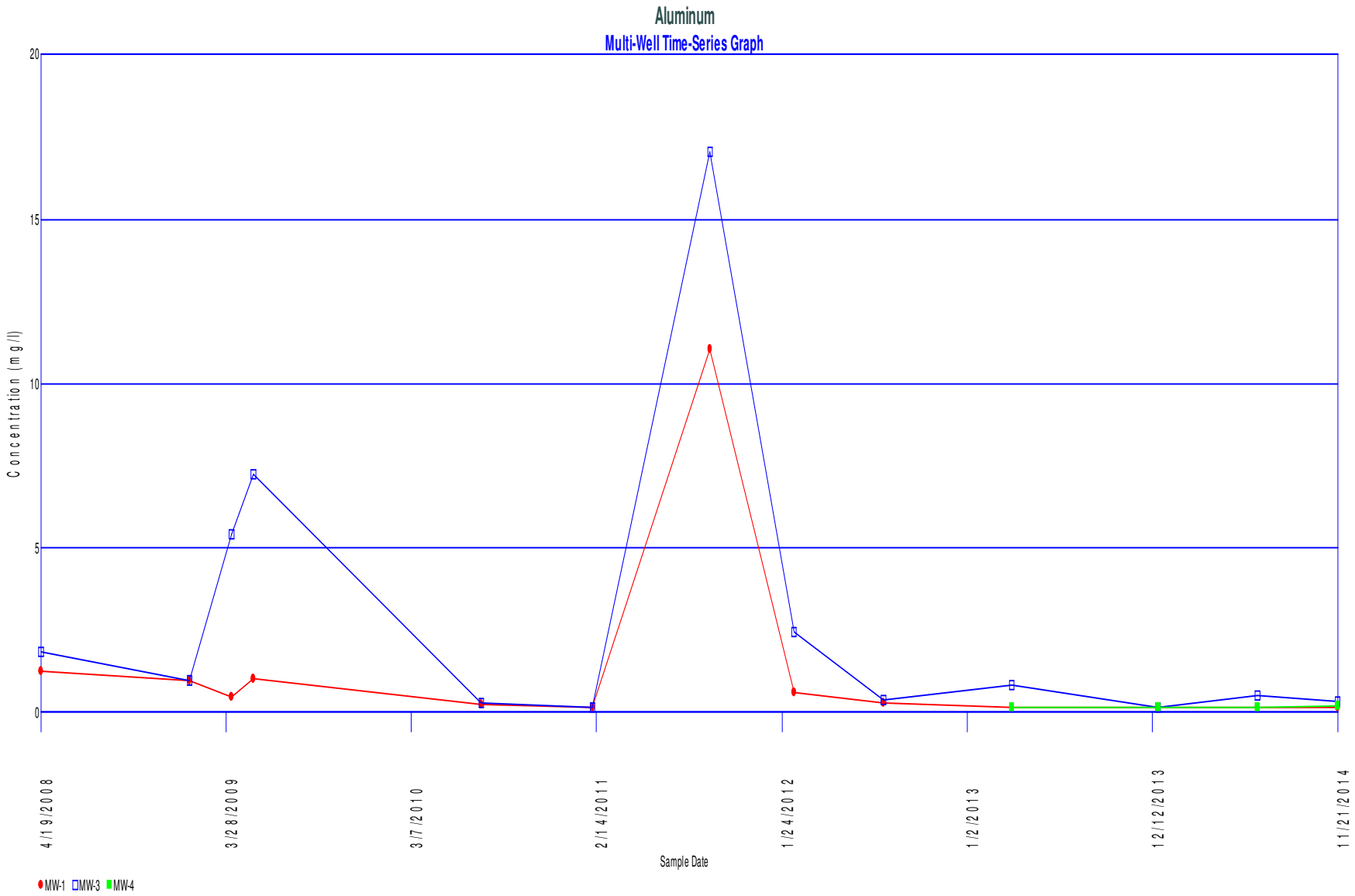
Bold text indicates laboratory analytical detections above the practical quantitation level

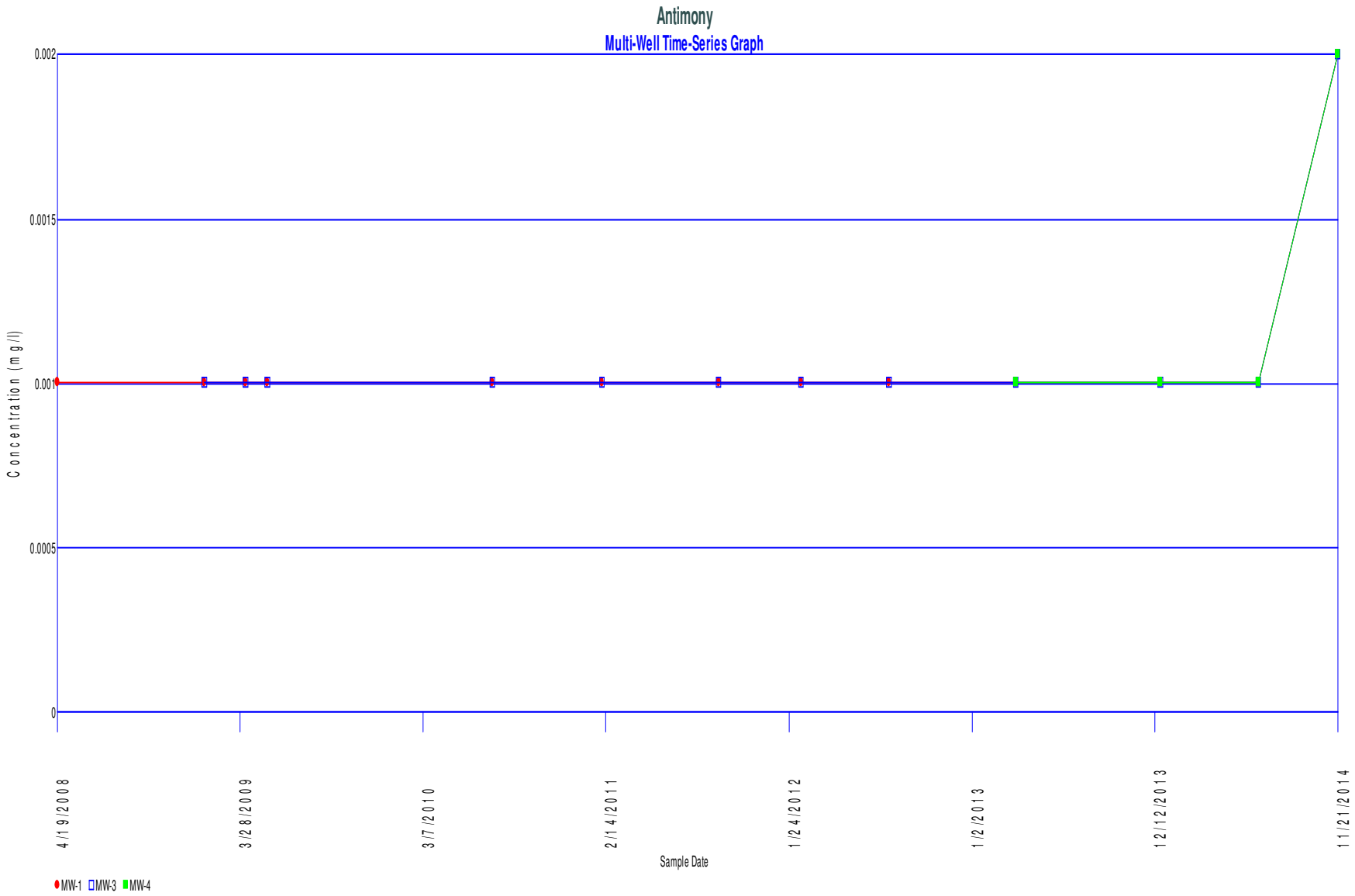
Greyed text indicates detection above respective MCL

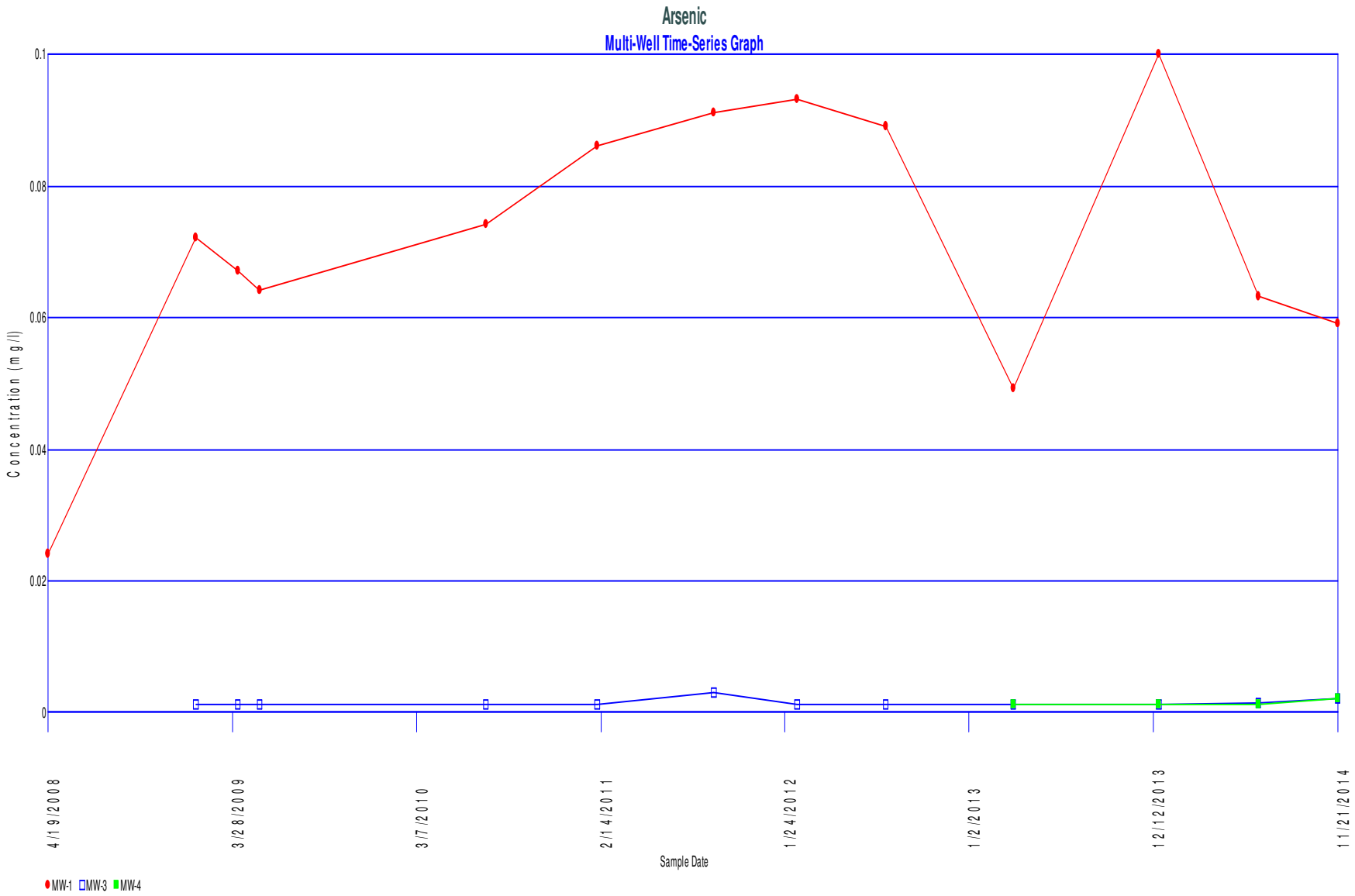
V: (ESC)- Additional QC Info: The sample concentration is too high to evaluate accurate spike recoveries.

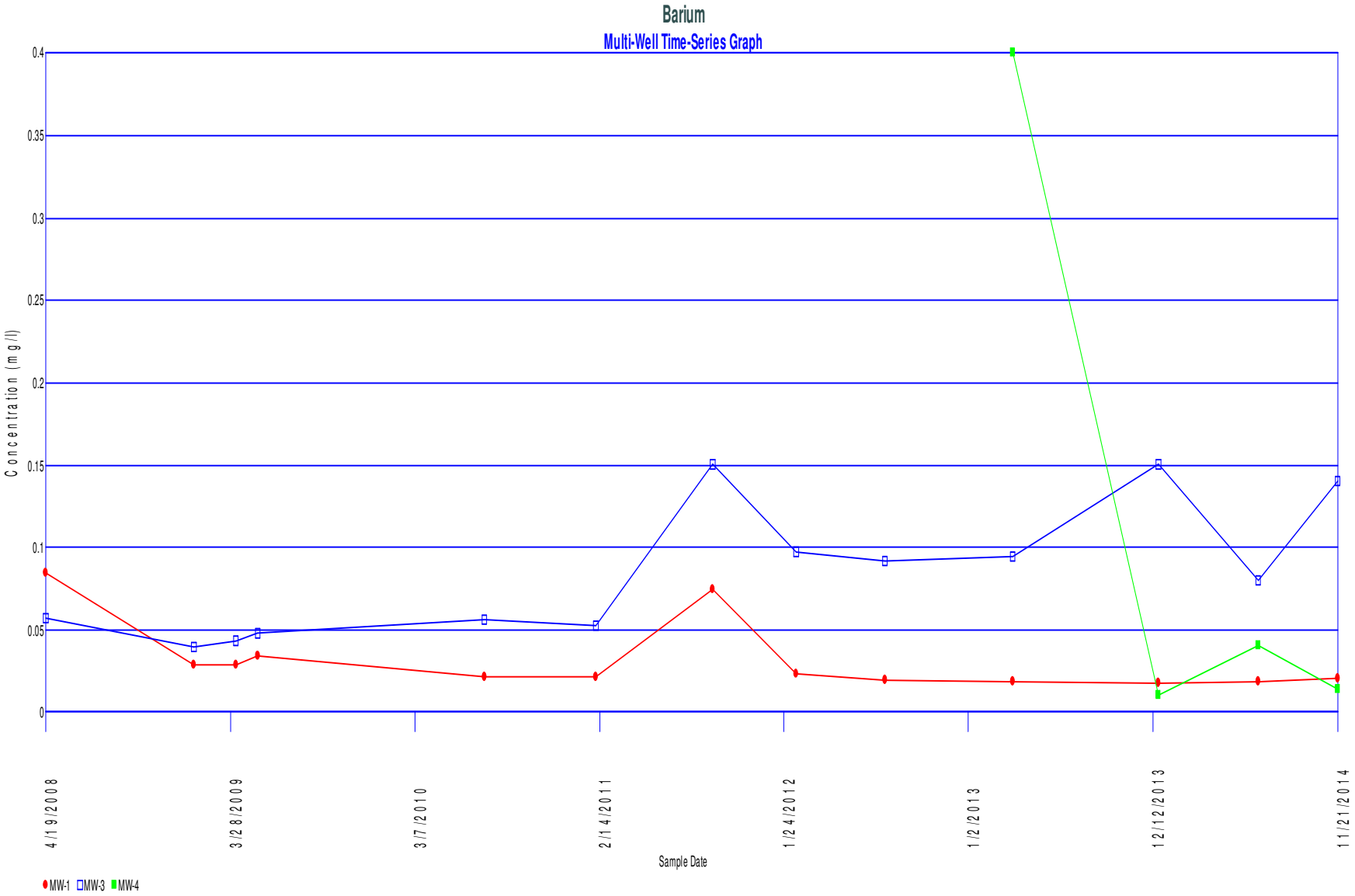
APPENDIX B

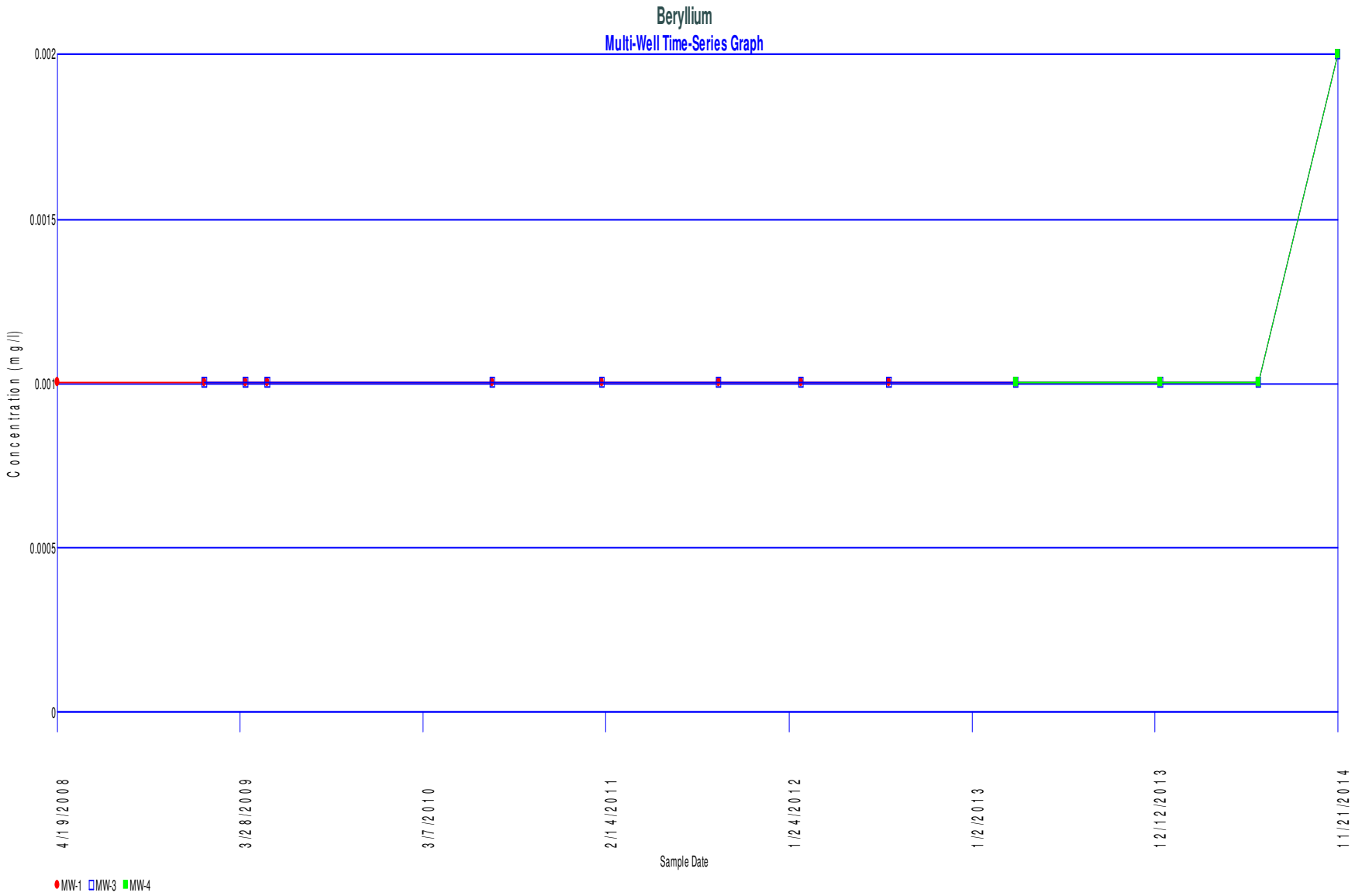
STATISTICAL EVALUATIONS & TIME SERIES PLOTS

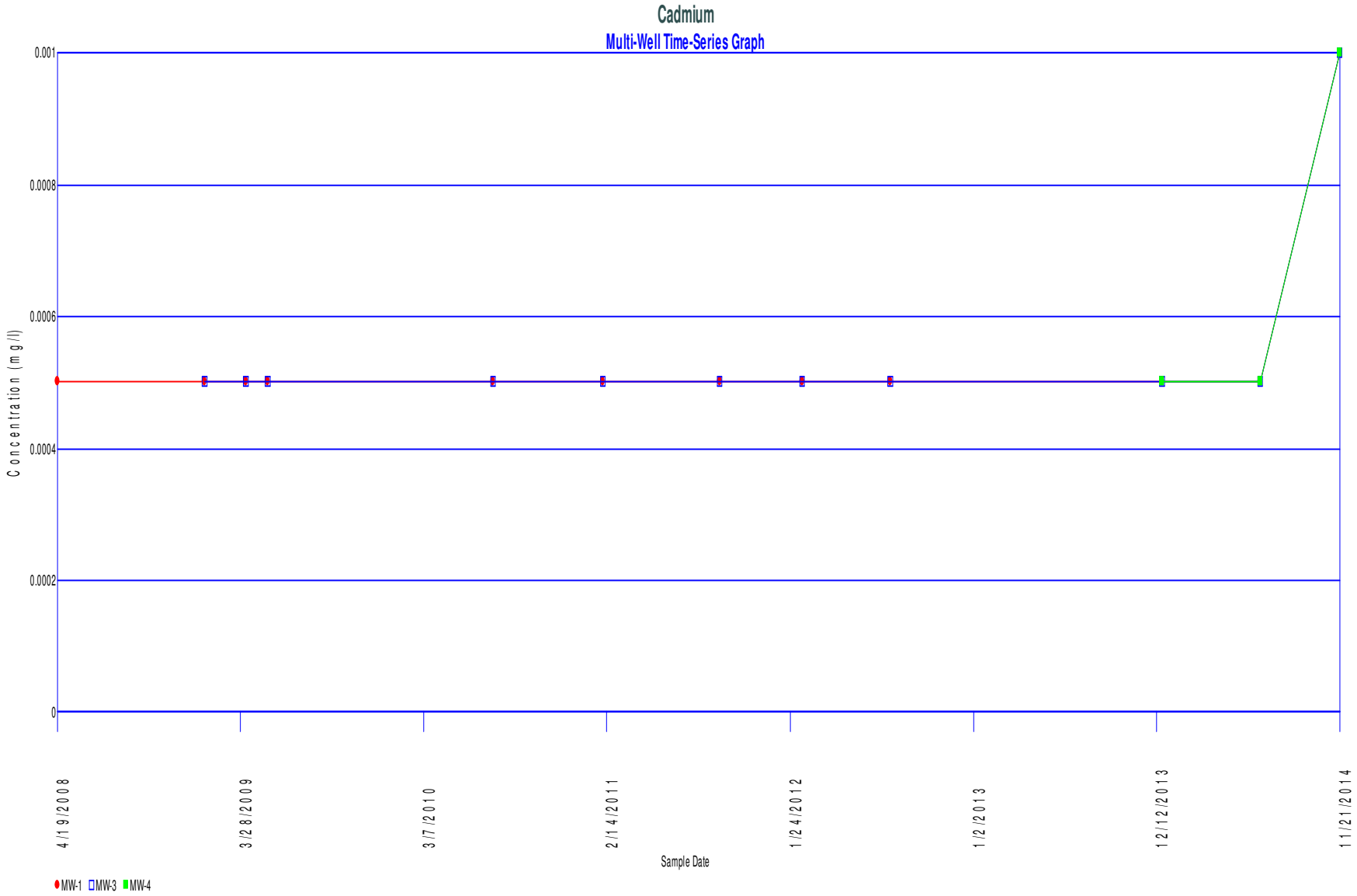

Aluminum
Multi-Well Time-Series Graph
20
15
10
5
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

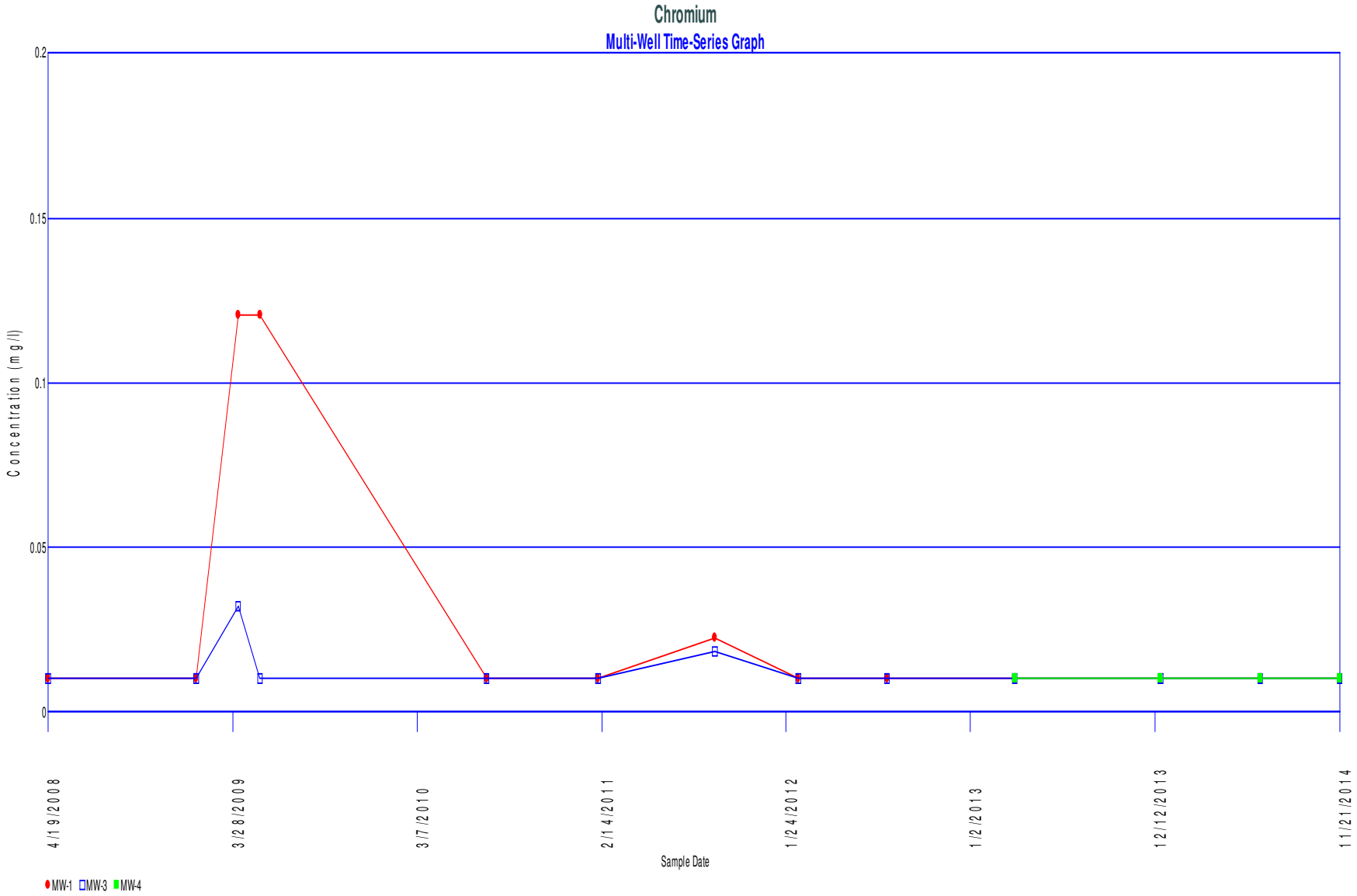

Antimony
Multi-Well Time-Series Graph
0.002
0.0015
0.001
0.0005
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

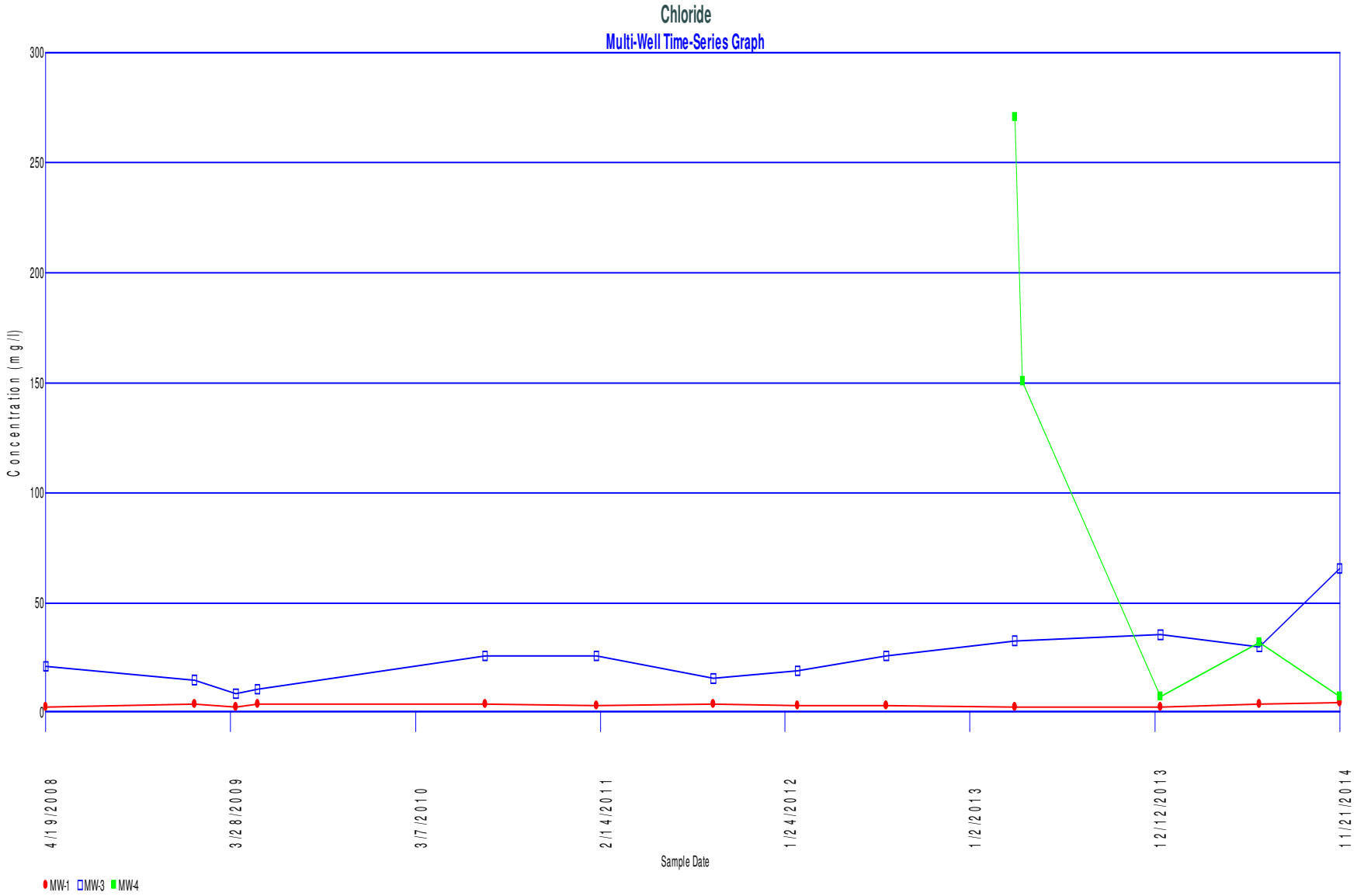

Arsenic
Multi-Well Time-Series Graph
0.1
0.08
0.06
0.04
0.02
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

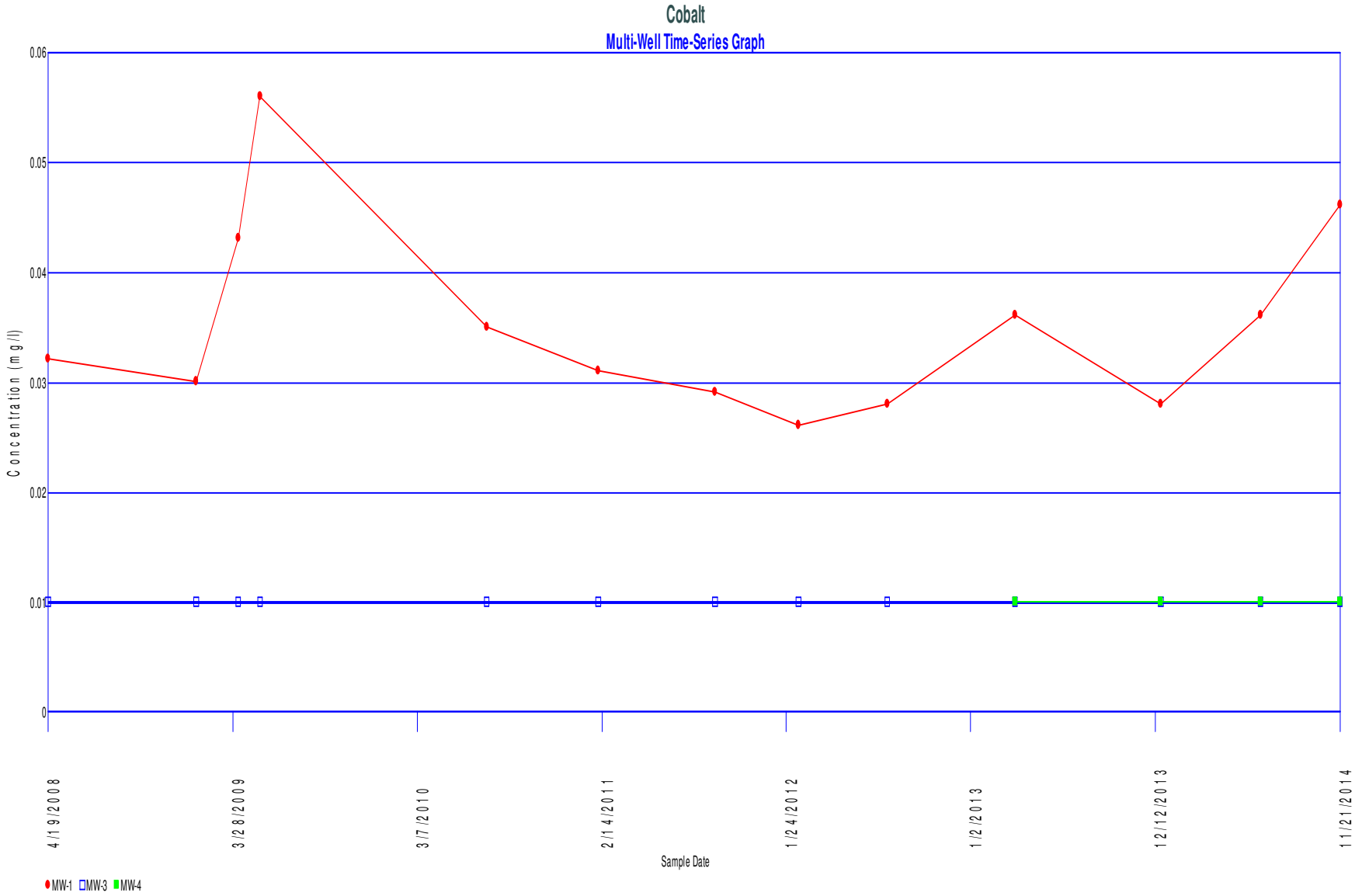

Barium
Multi-Well Time-Series Graph
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

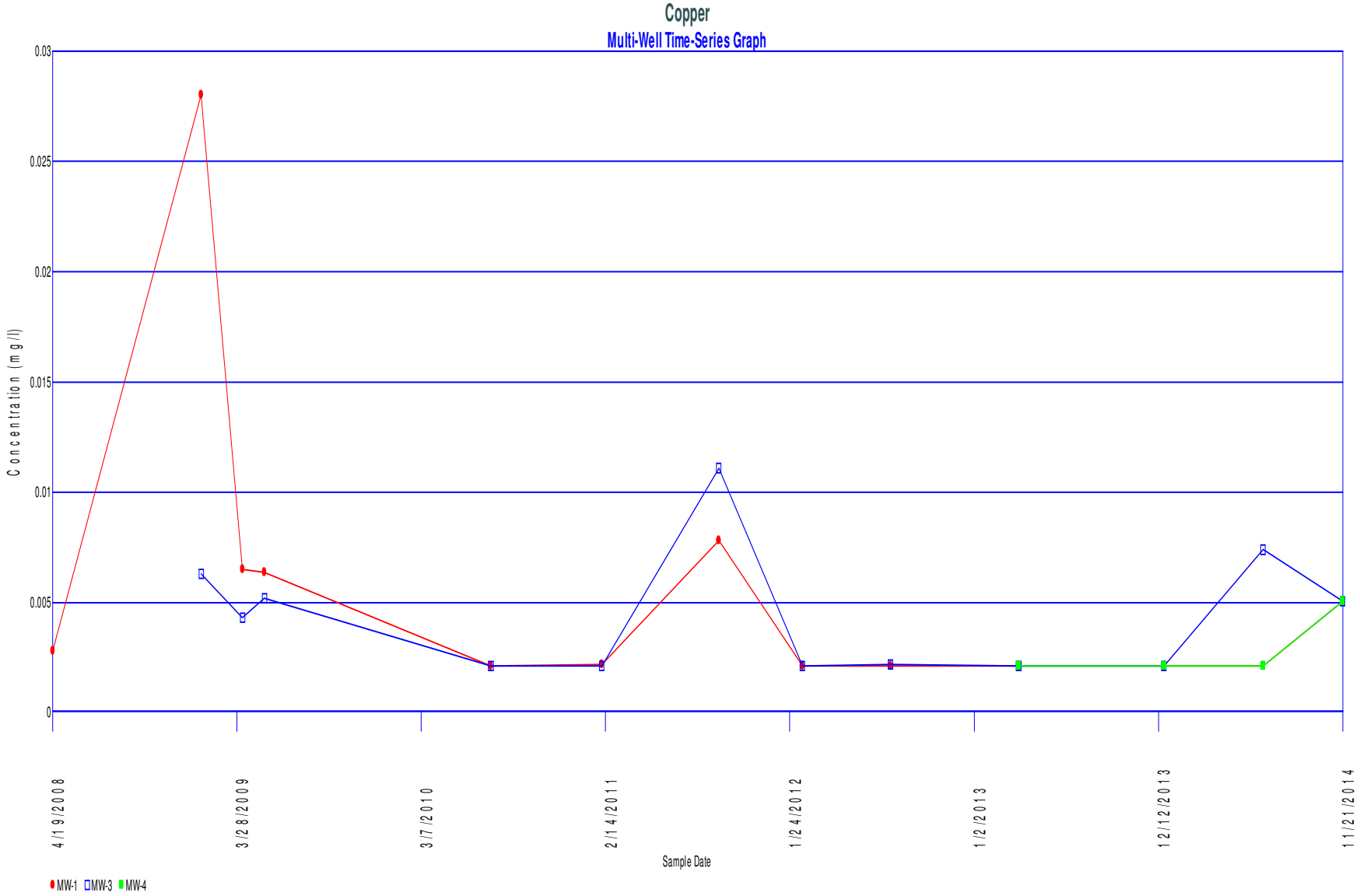

Beryllium
Multi-Well Time-Series Graph
0.002
0.0015
0.001
0.0005
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

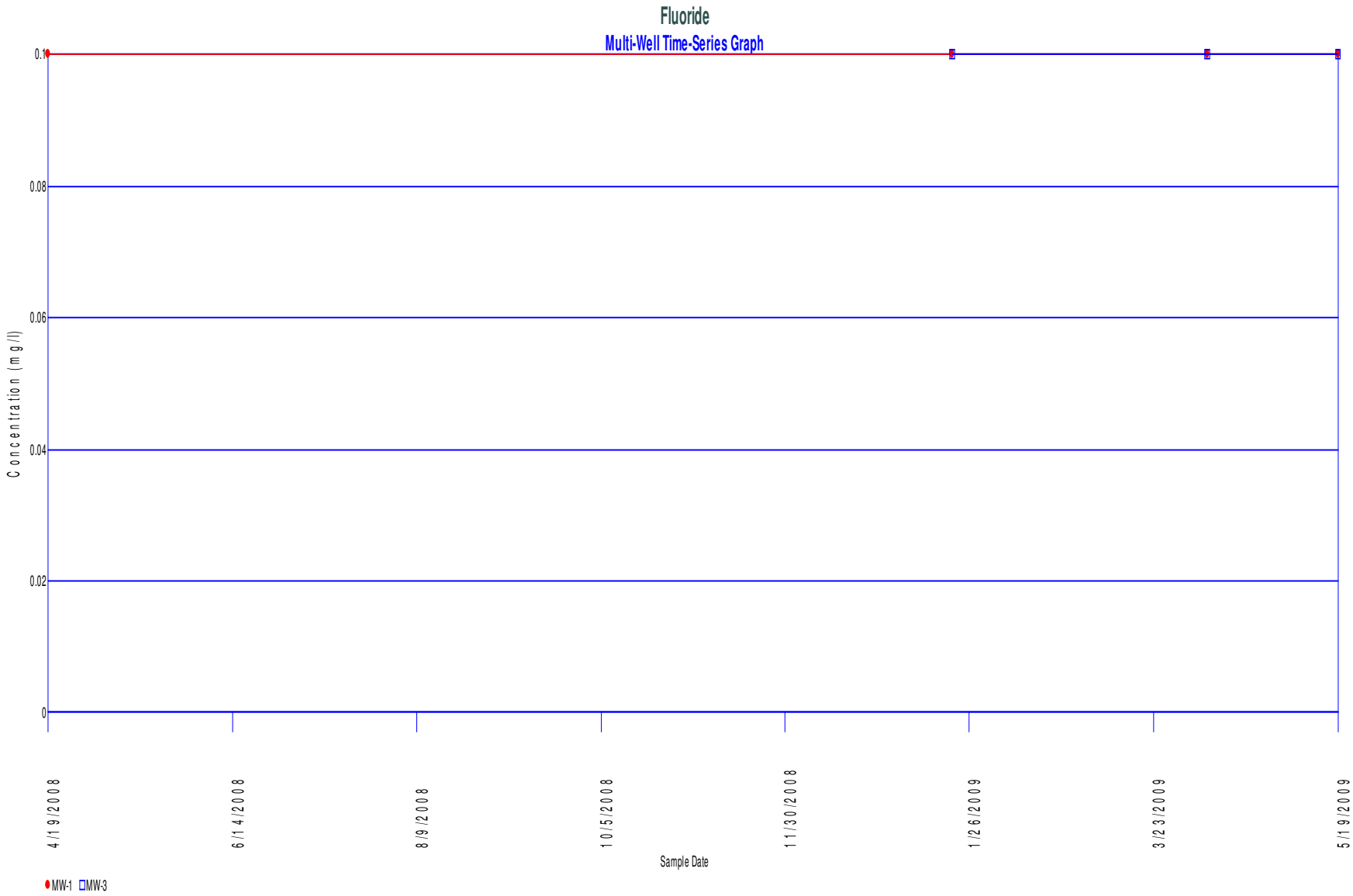

Cadmium
Multi-Well Time-Series Graph
0.001
0.0008
0.0006
0.0004
0.0002
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1 MW-3 MW-4

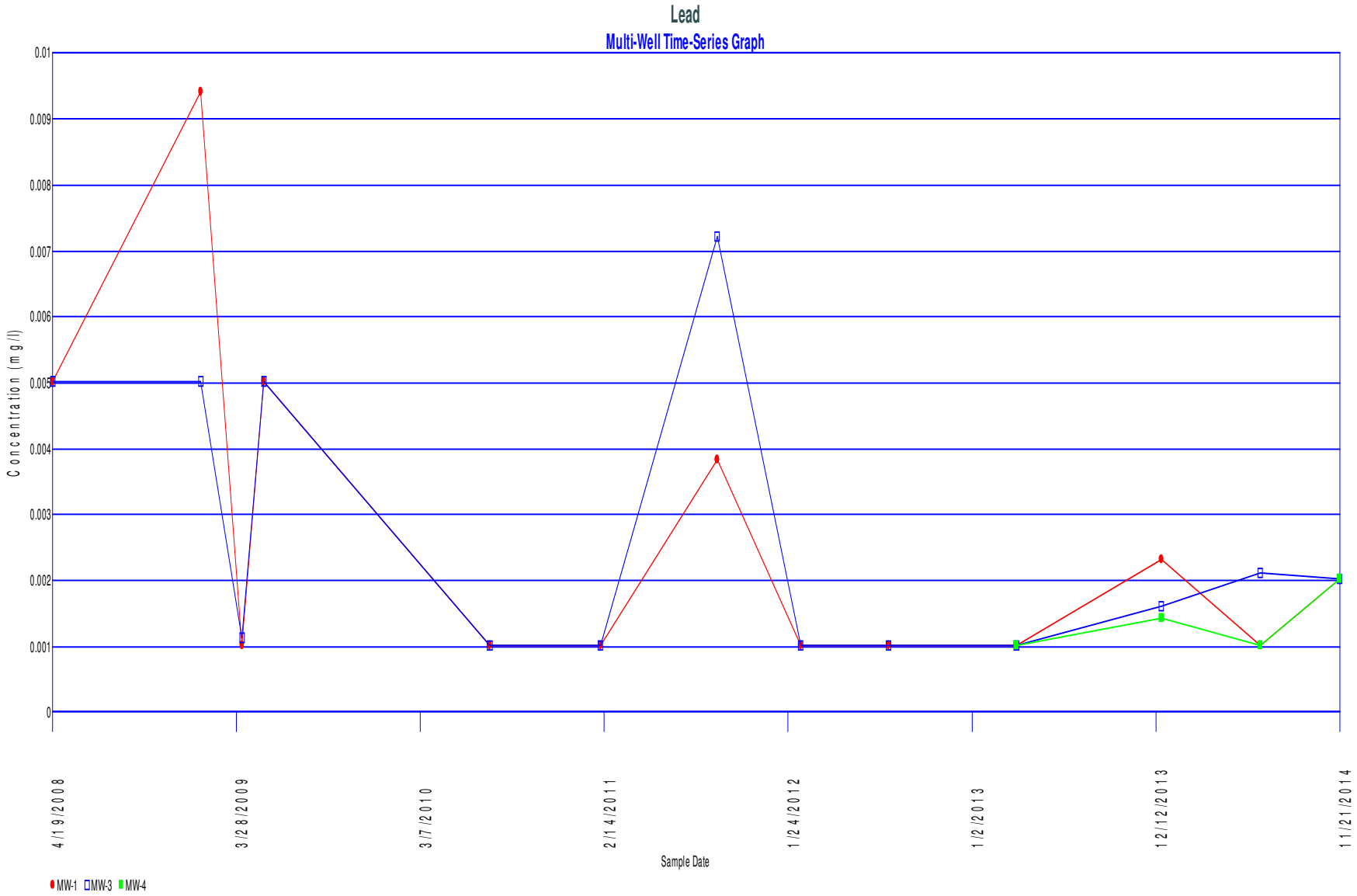

Chromium
Multi-Well Time-Series Graph
0.2
0.15
0.1
0.05
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

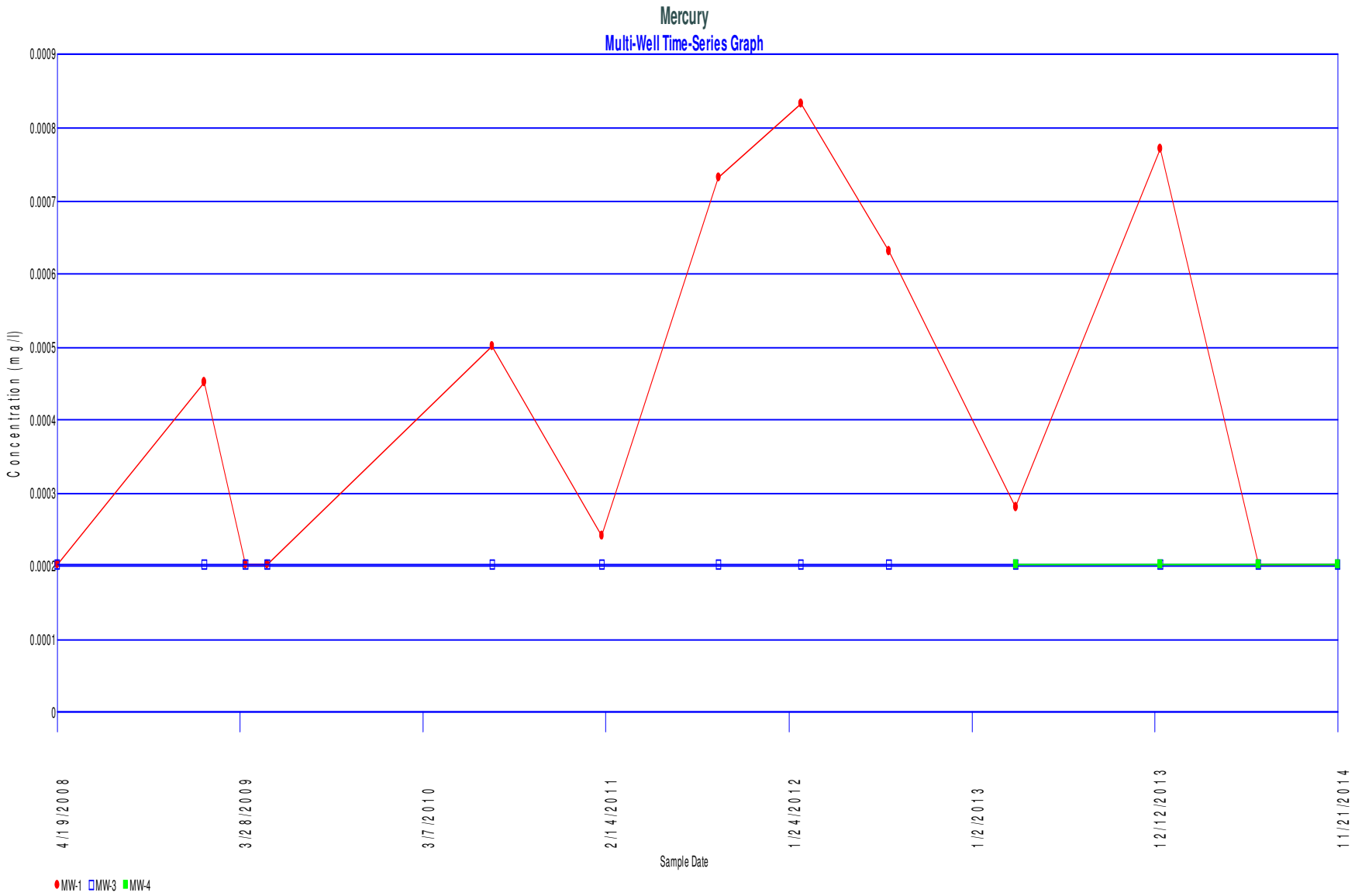

Chloride
Multi-Well Time-Series Graph
300
250
200
150
100
50
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

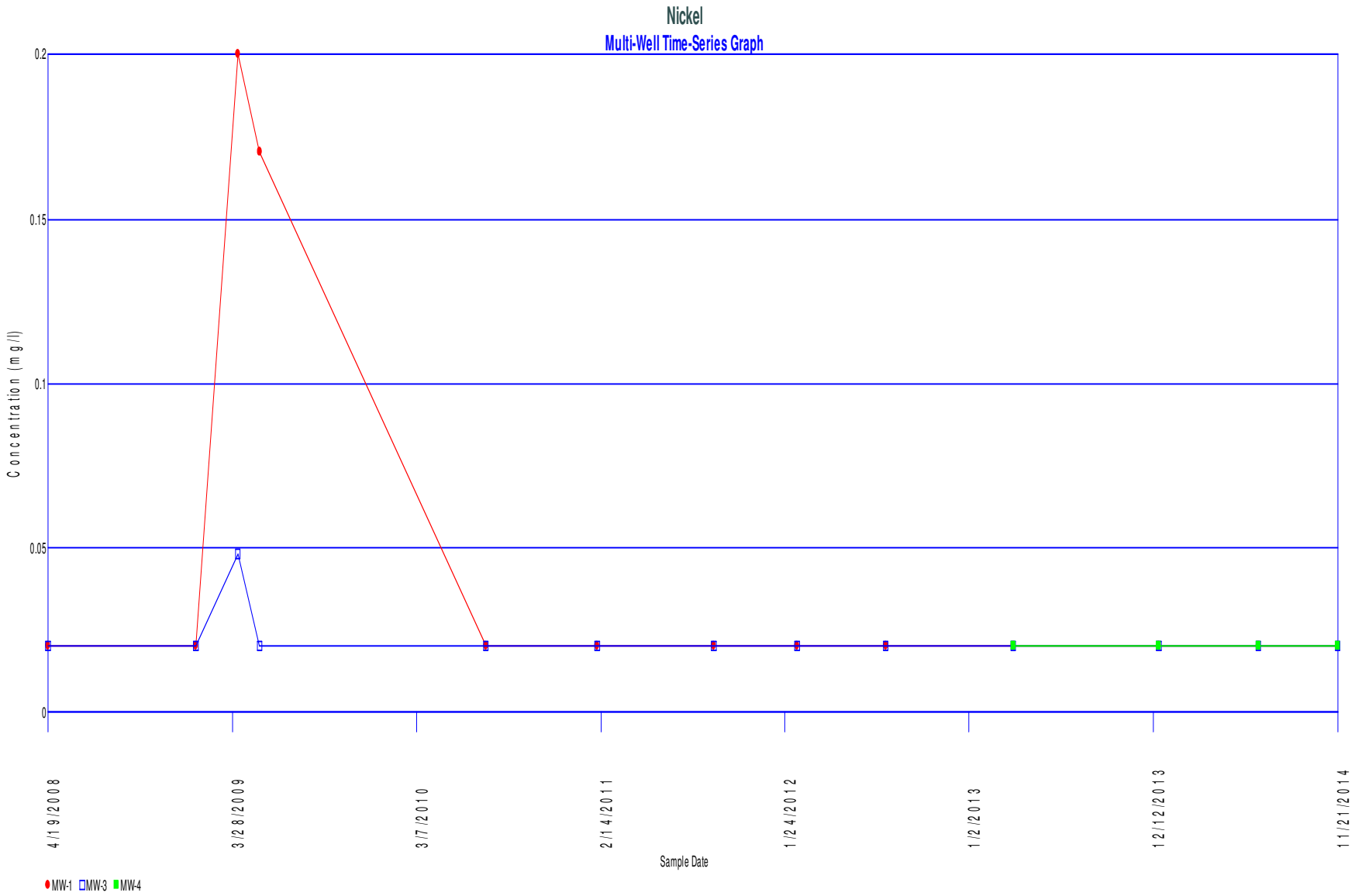

Cobalt
Multi-Well Time-Series Graph
0.06
0.05
0.04
0.03
0.02
0.01
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

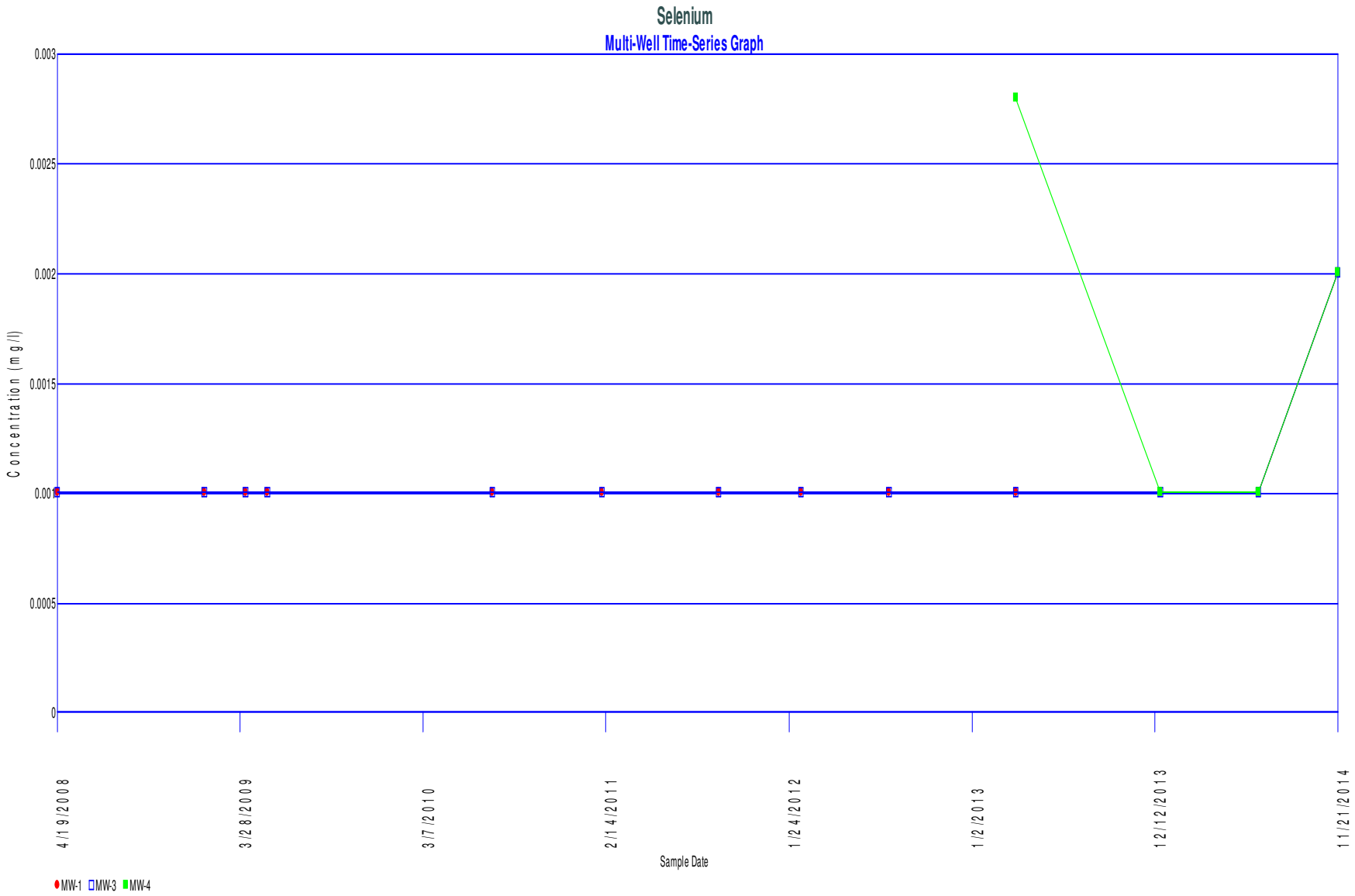

Copper
Multi-Well Time-Series Graph
0.03
0.025
0.02
0.015
0.01
0.005
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

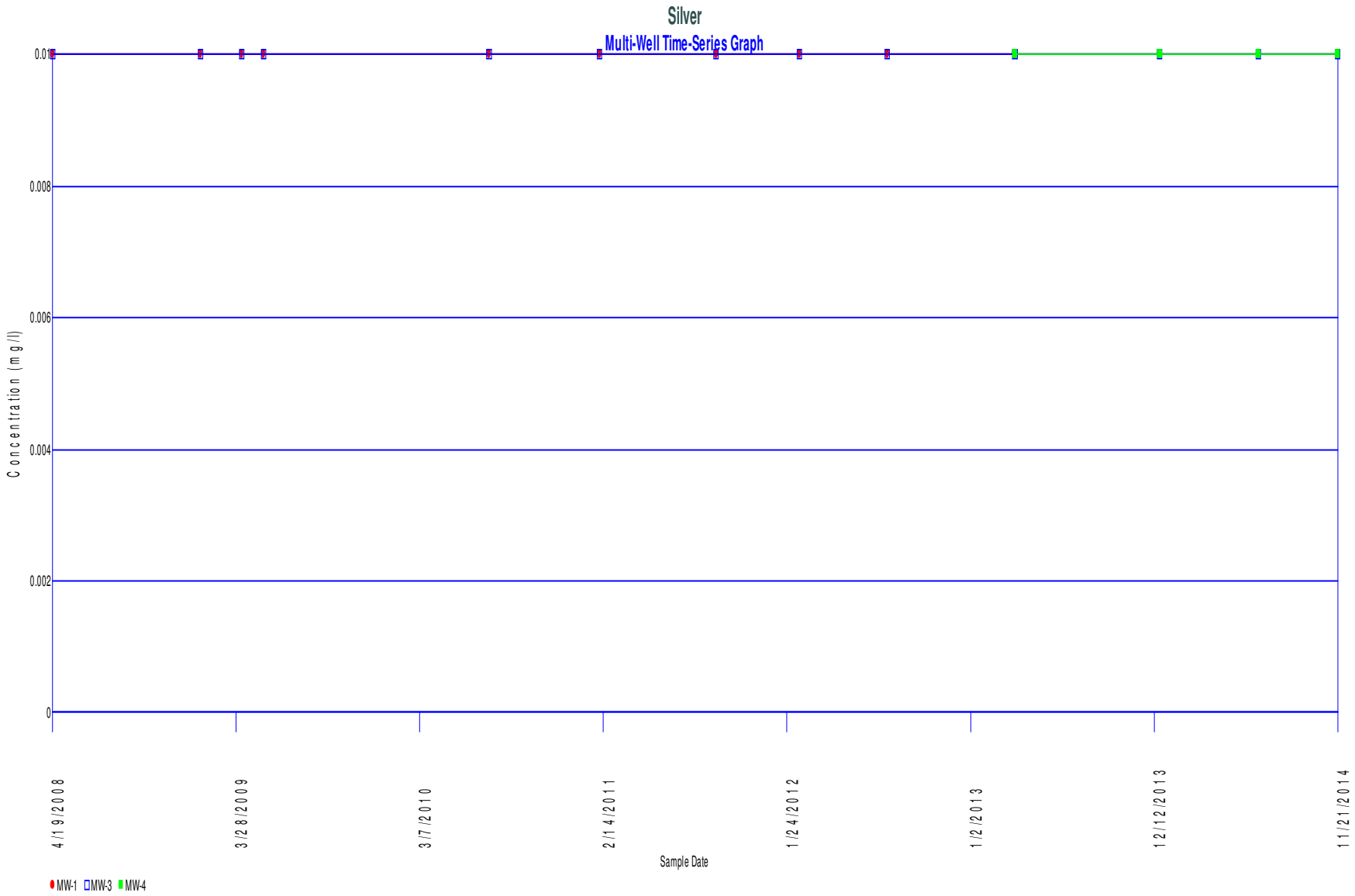

Fluoride
Multi-Well Time-Series Graph
0.1
0.08
0.06
0.04
0.02
0
Concentration (mg/l)
4/19/2008
6/14/2008
8/9/2008
10/5/2008
11/30/2008
1/26/2009
3/23/2009
5/19/2009
Sample Date
MW-1
MW-3

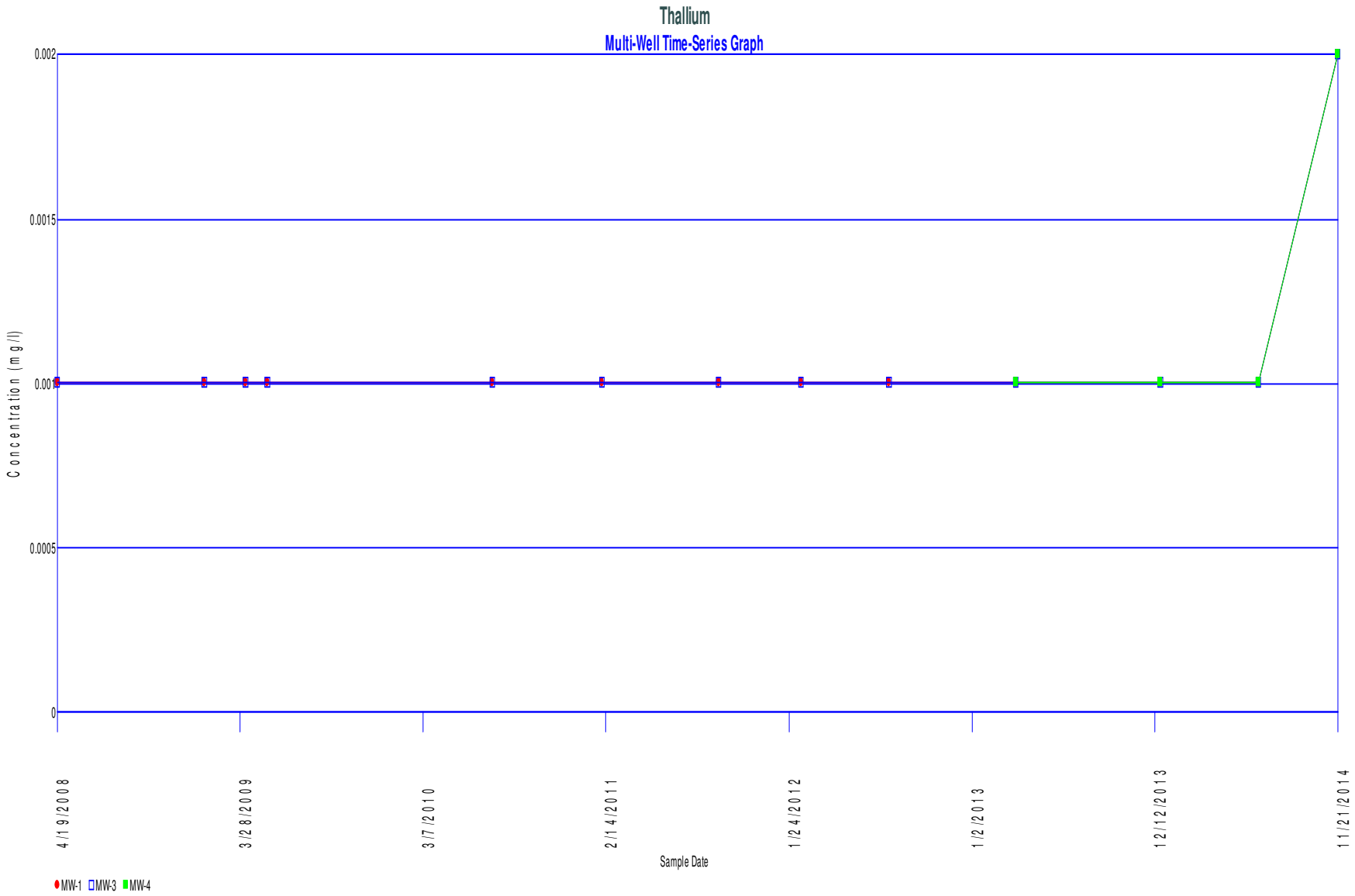

Lead
Multi-Well Time-Series Graph
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

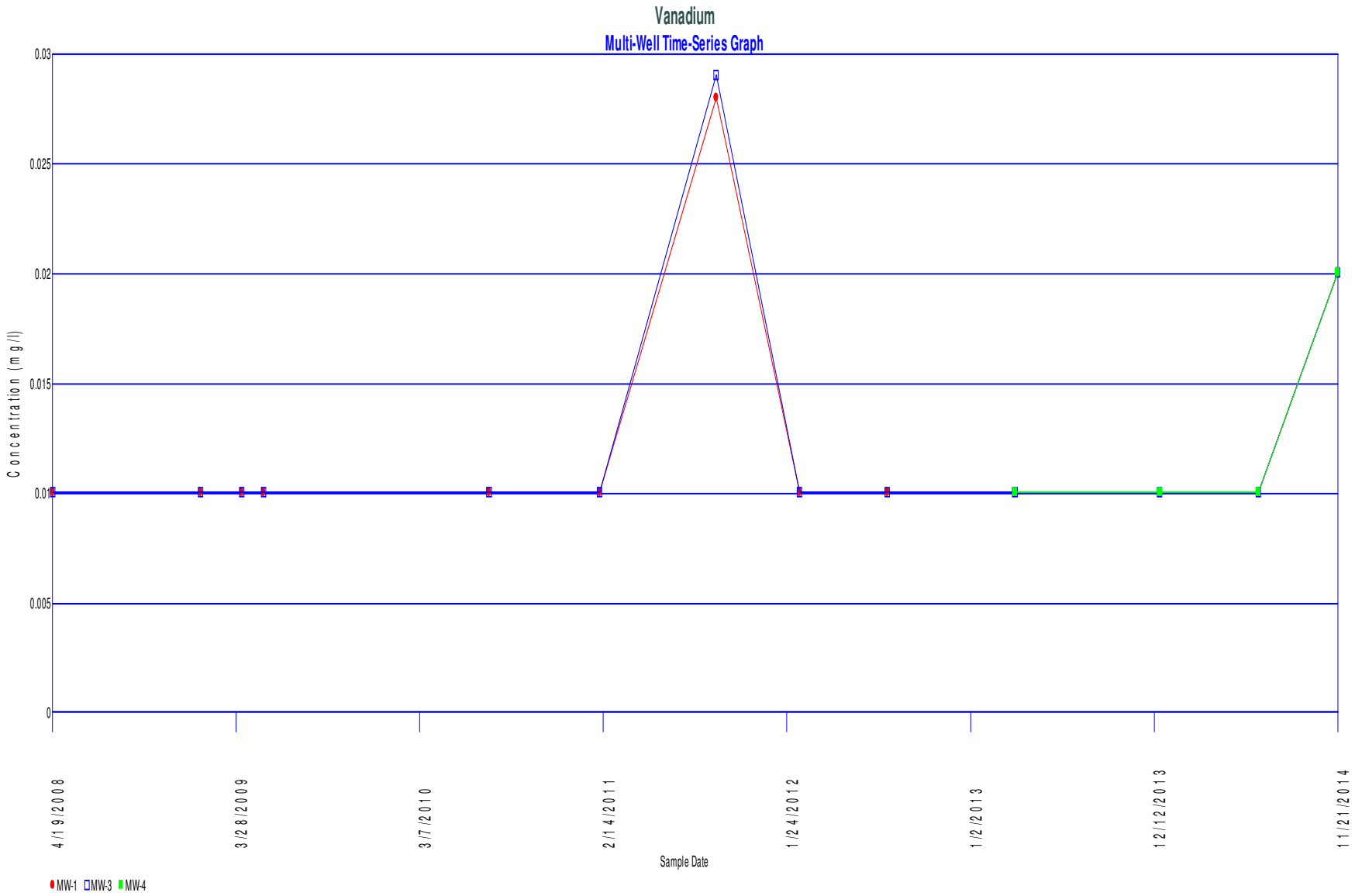

Mercury
Multi-Well Time-Series Graph
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

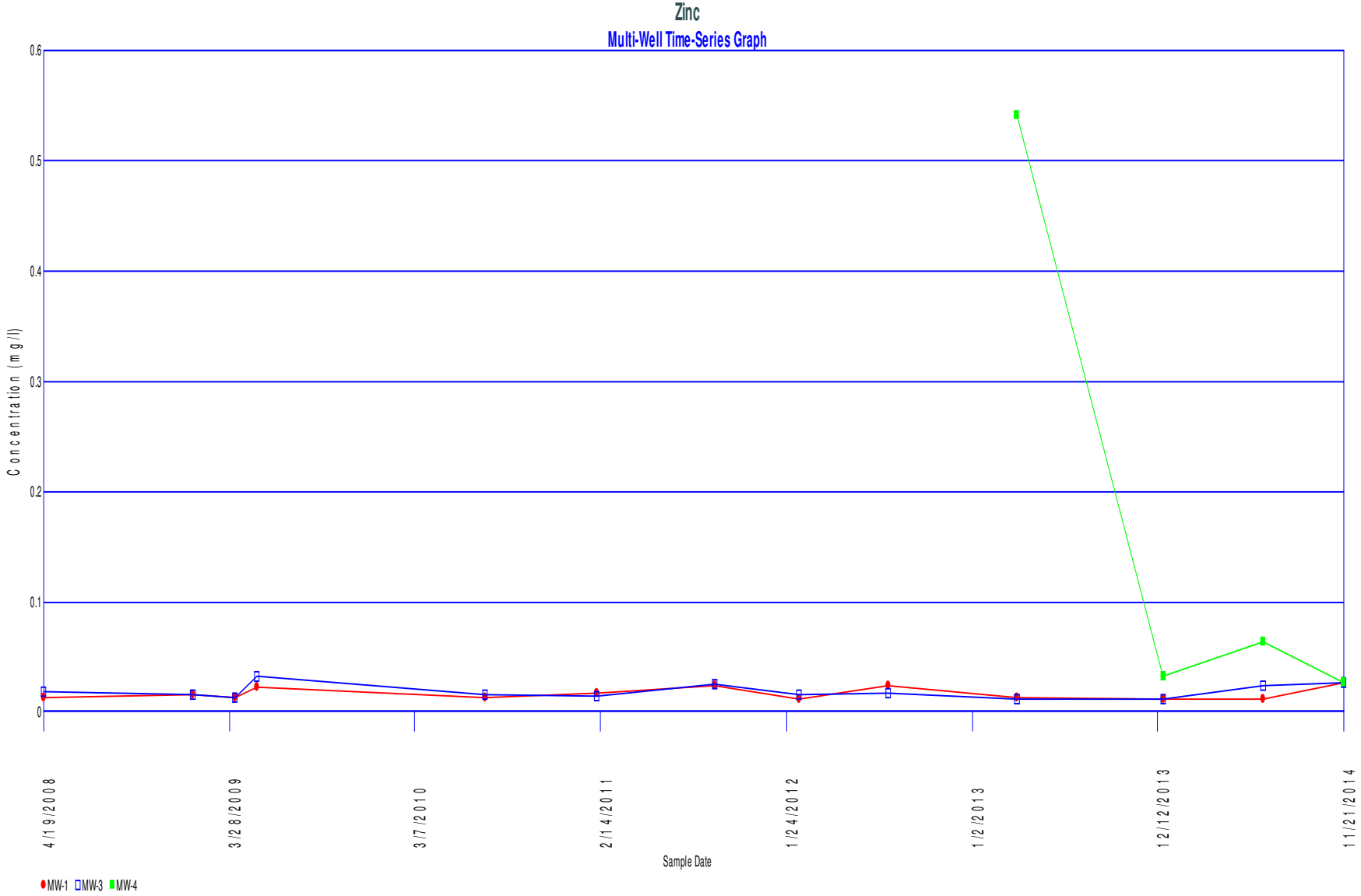

Nickel
Multi-Well Time-Series Graph
0.2
0.15
0.1
0.05
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4


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
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1 MW-3 MW-4


Silver
Multi-Well Time-Series Graph
0.01
0.008
0.006
0.004
0.002
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4


Thallium
Multi-Well Time-Series Graph
0.002
0.0015
0.001
0.0005
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4


Vanadium
Multi-Well Time-Series Graph
0.03
0.025
0.02
0.015
0.01
0.005
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4


Zinc
Multi-Well Time-Series Graph
0.6
0.5
0.4
0.3
0.2
0.1
0
Concentration (mg/l)
4/19/2008
3/28/2009
3/7/2010
2/14/2011
1/24/2012
1/2/2013
12/12/2013
11/21/2014
Sample Date
MW-1
MW-3
MW-4

Shapiro-Wilks Test of Normality

Parameter: Aluminum

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 15 for 30 measurements

Sum of b values = 14.5135
Sample Standard Deviation = 3.75963
W Statistic = 0.513877

5% Critical value of 0.927 exceeds 0.513877
Evidence of non-normality at 95% level of significance

1% Critical value of 0.9 exceeds 0.513877
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Arsenic

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 14 for 29 measurements

Sum of b values = 0.17485
Sample Standard Deviation = 0.0381548
W Statistic = 0.750022

5% Critical value of 0.926 exceeds 0.750022
Evidence of non-normality at 95% level of significance

1% Critical value of 0.898 exceeds 0.750022
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Barium

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 15 for 30 measurements

Sum of b values = 0.325237
Sample Standard Deviation = 0.0752134
W Statistic = 0.644779

5% Critical value of 0.927 exceeds 0.644779
Evidence of non-normality at 95% level of significance

1% Critical value of 0.9 exceeds 0.644779
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Chloride

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 15 for 31 measurements

Sum of b values = 203.403
Sample Standard Deviation = 53.3733
W Statistic = 0.484108

5% Critical value of 0.929 exceeds 0.484108
Evidence of non-normality at 95% level of significance

1% Critical value of 0.902 exceeds 0.484108
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Cobalt

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 15 for 30 measurements

Sum of b values = 0.0651092
Sample Standard Deviation = 0.0138034
W Statistic = 0.767213

5% Critical value of 0.927 exceeds 0.767213
Evidence of non-normality at 95% level of significance

1% Critical value of 0.9 exceeds 0.767213
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Aluminum

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

Non-Detects Replaced with 1/2 DL

K = 15 for 30 measurements

Sum of b values = 9.03907
Sample Standard Deviation = 1.75508
W Statistic = 0.914646

5% Critical value of 0.927 exceeds 0.914646
Evidence of non-normality at 95% level of significance

1% Critical value of 0.9 is less than 0.914646
Data is normally distributed at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Arsenic

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

Non-Detects Replaced with 1/2 DL

K = 14 for 29 measurements

Sum of b values = 10.7831
Sample Standard Deviation = 2.37902
W Statistic = 0.733724

5% Critical value of 0.926 exceeds 0.733724
Evidence of non-normality at 95% level of significance

1% Critical value of 0.898 exceeds 0.733724
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Barium

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

Non-Detects Replaced with 1/2 DL

K = 15 for 30 measurements

Sum of b values = 4.59623
Sample Standard Deviation = 0.867875
W Statistic = 0.967143

5% Critical value of 0.927 is less than 0.967143
Data is normally distributed at 95% level of significance

1% Critical value of 0.9 is less than 0.967143
Data is normally distributed at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Chloride

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

Non-Detects Replaced with 1/2 DL

K = 15 for 31 measurements

Sum of b values = 7.29351
Sample Standard Deviation = 1.38915
W Statistic = 0.918872

5% Critical value of 0.929 exceeds 0.918872
Evidence of non-normality at 95% level of significance

1% Critical value of 0.902 is less than 0.918872
Data is normally distributed at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Cobalt

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

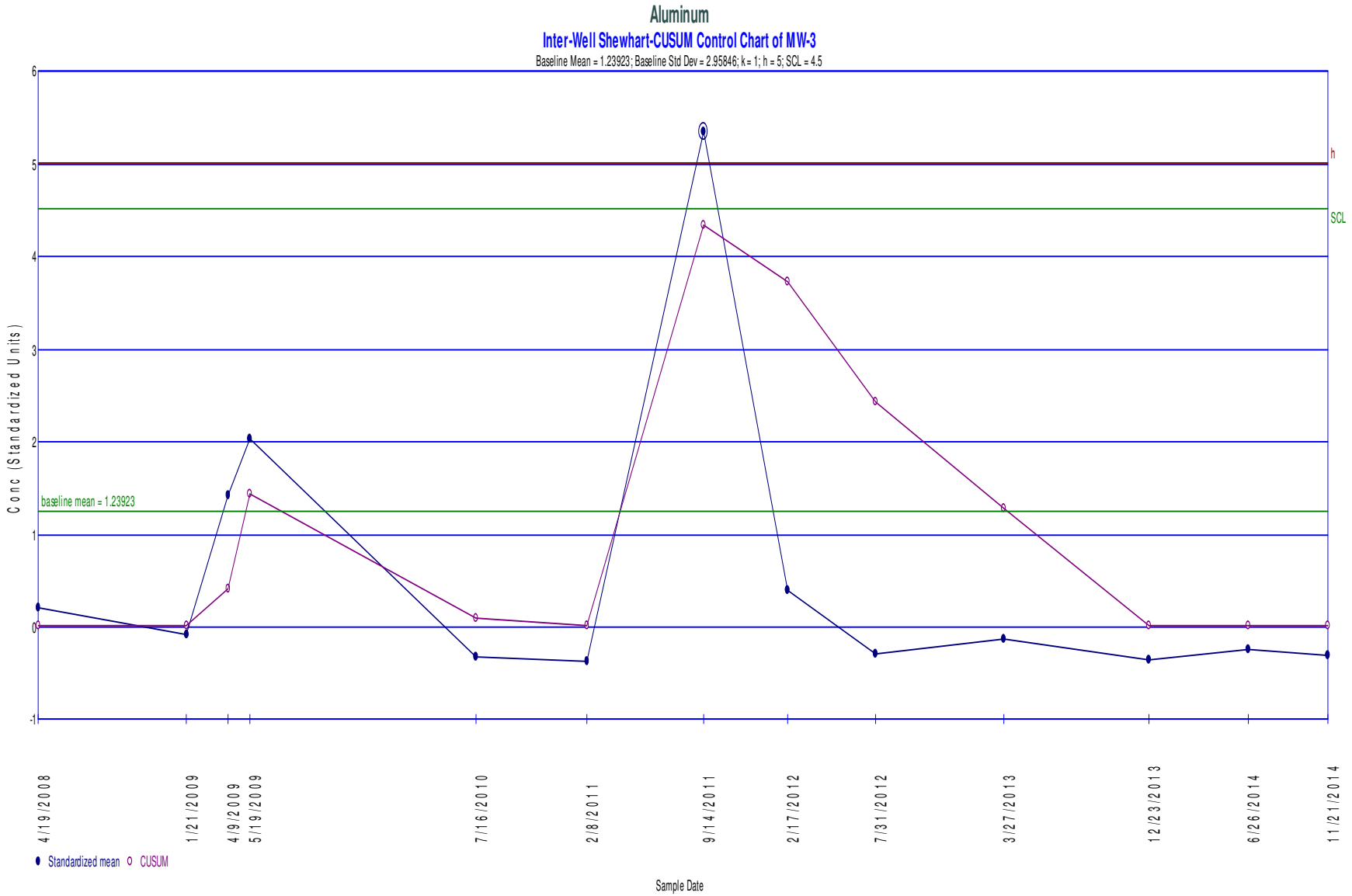
Non-Detects Replaced with 1/2 DL

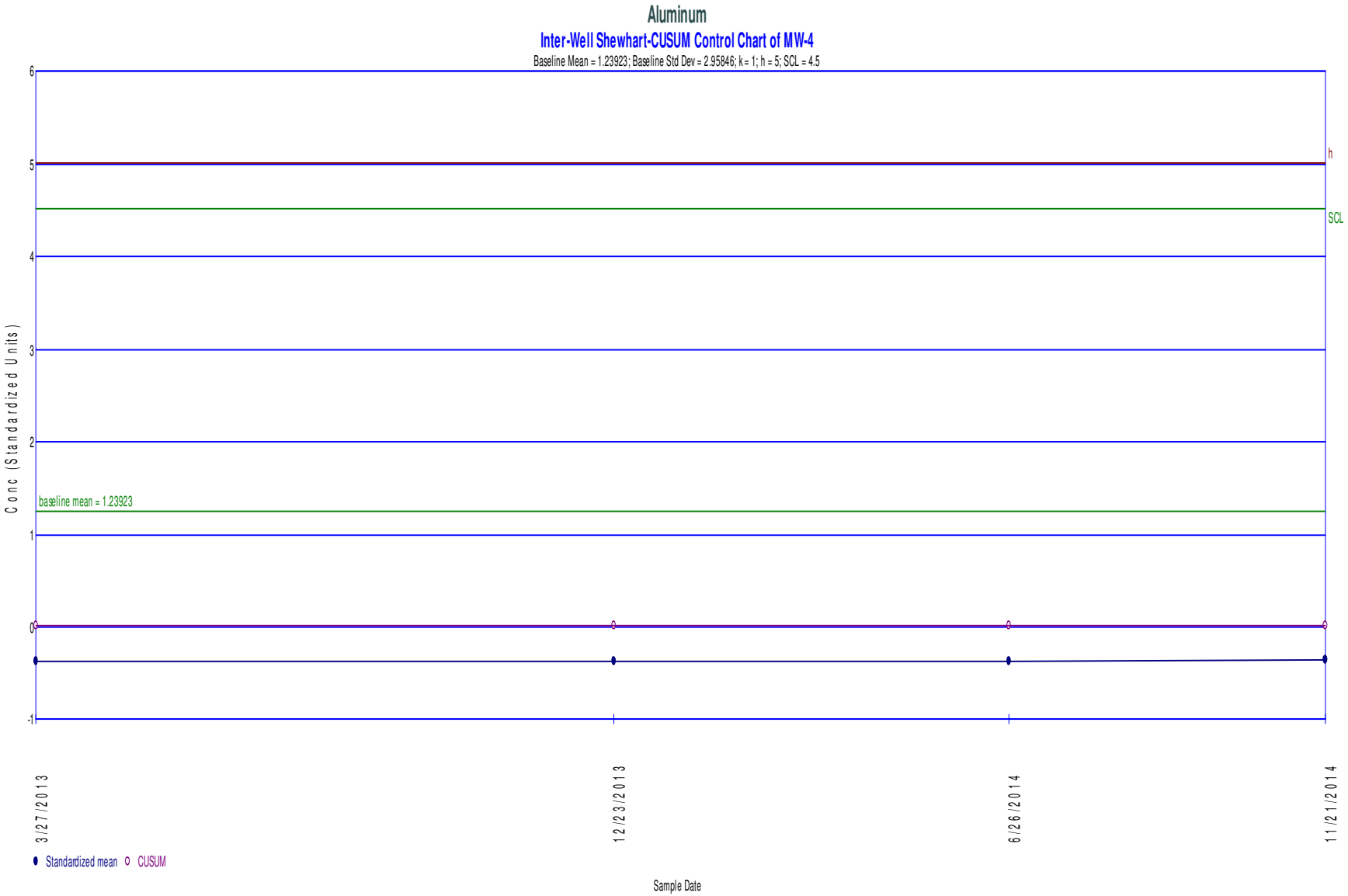
K = 15 for 30 measurements

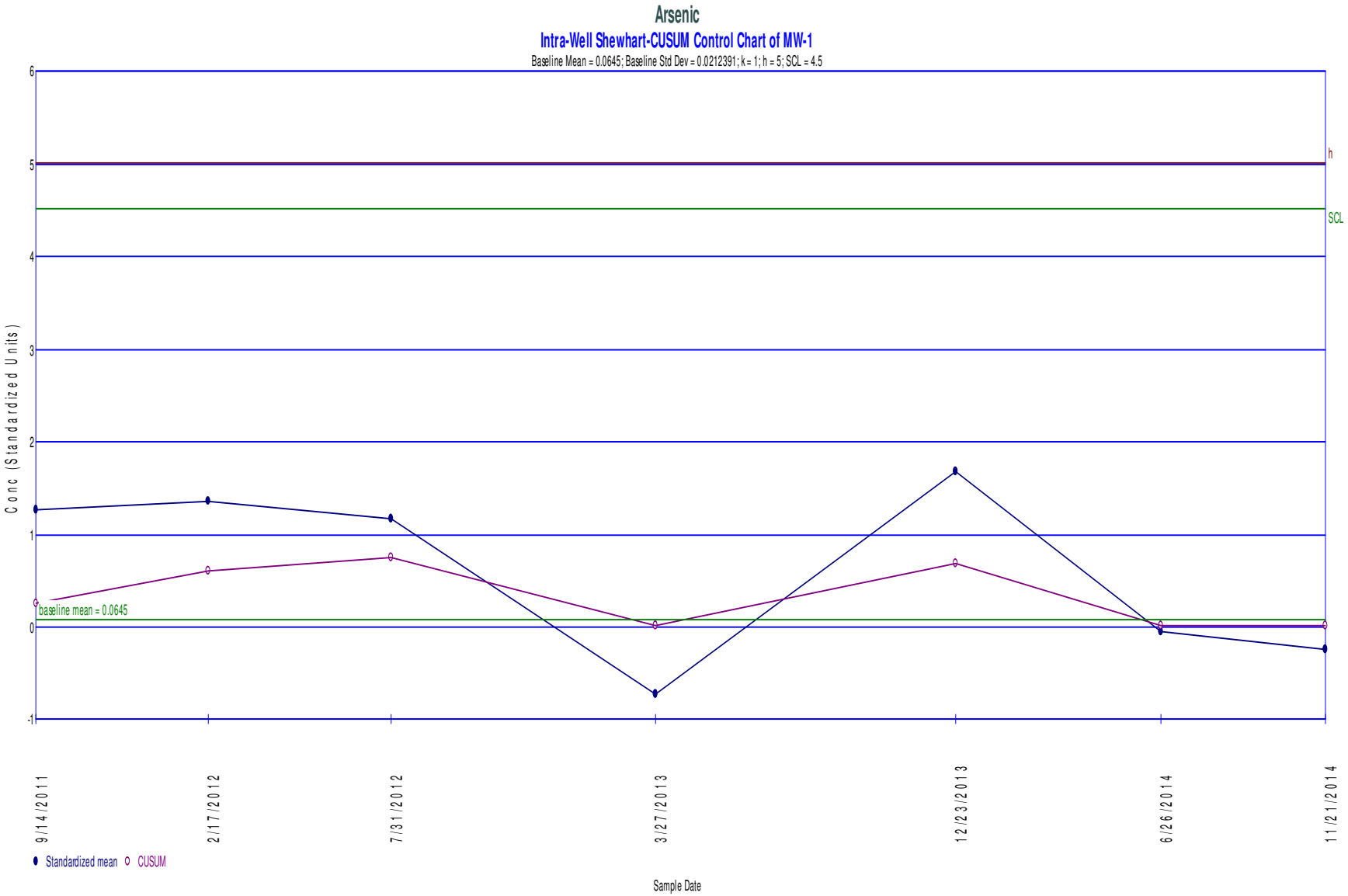
Sum of b values = 4.42421
Sample Standard Deviation = 0.980124
W Statistic = 0.702605

5% Critical value of 0.927 exceeds 0.702605
Evidence of non-normality at 95% level of significance

1% Critical value of 0.9 exceeds 0.702605
Evidence of non-normality at 99% level of significance

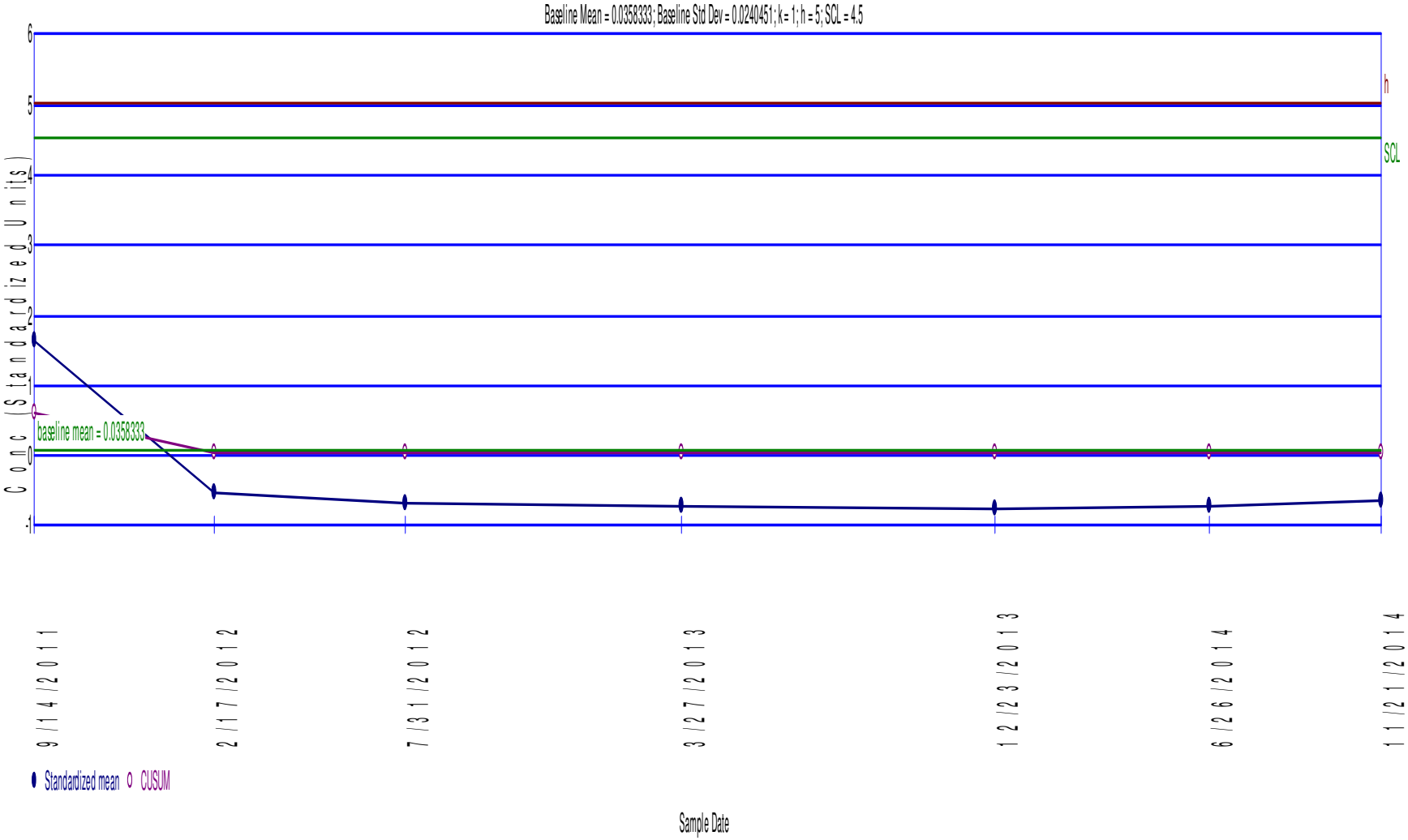

Aluminum
Inter-Well Shewhart-CUSUM Control Chart of MW-3
Baseline Mean = 1.23923; Baseline Std Dev = 2.95846; k = 1; h = 5; SCL = 4.5
Conc (Standardized Units)
6
5
4
3
2
1
0
-1
h
SCL
baseline mean = 1.23923
4/19/2008
1/21/2009
4/9/2009
5/19/2009
7/16/2010
2/8/2011
9/14/2011
2/17/2012
7/31/2012
3/27/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date

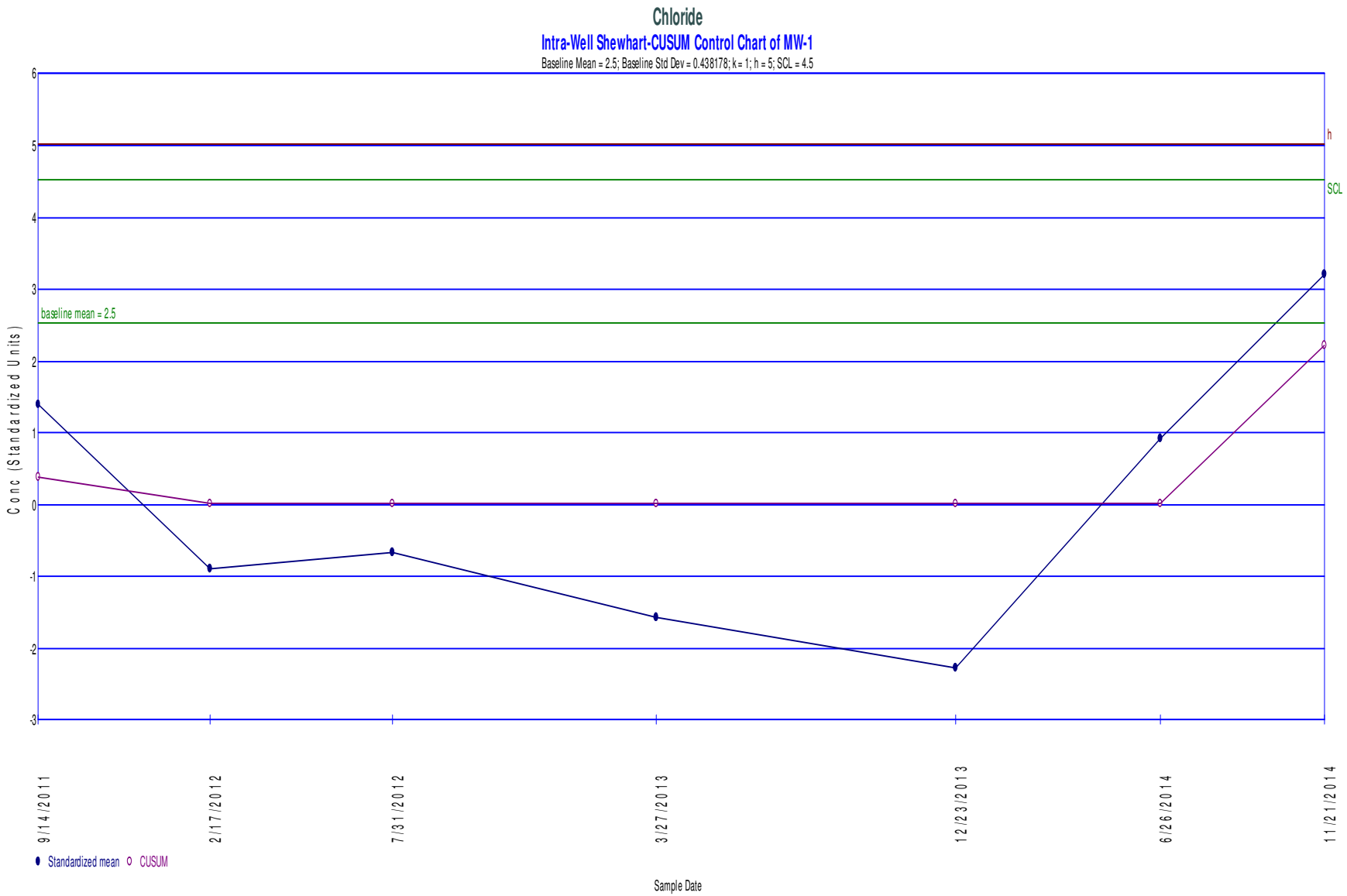

Aluminum
Inter-Well Shewhart-CUSUM Control Chart of MW-4
Baseline Mean = 1.23923; Baseline Std Dev = 2.95846; k = 1; h = 5; SCL = 4.5
6
5
4
3
2
1
0
-1
h
SCL
baseline mean = 1.23923
Conc (Standardized Units)
3/27/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date

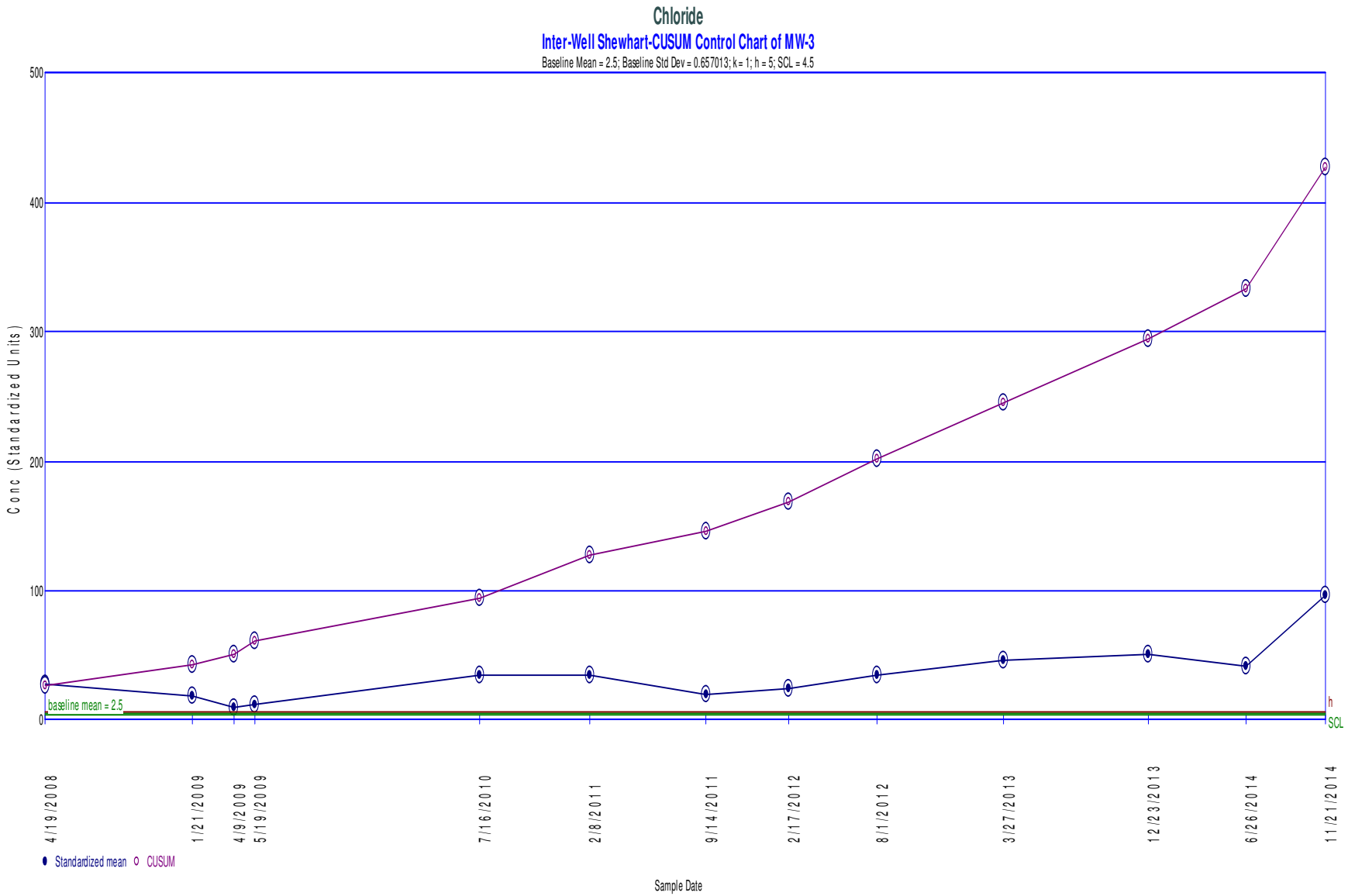

Arsenic
Intra-Well Shewhart-CUSUM Control Chart of MW-1
Baseline Mean = 0.0645; Baseline Std Dev = 0.0212391; k = 1; h = 5; SCL = 4.5
h
SCL
baseline mean = 0.0645
Conc (Standardized Units)
6
5
4
3
2
1
0
-1
9/14/2011
2/17/2012
7/31/2012
3/27/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date

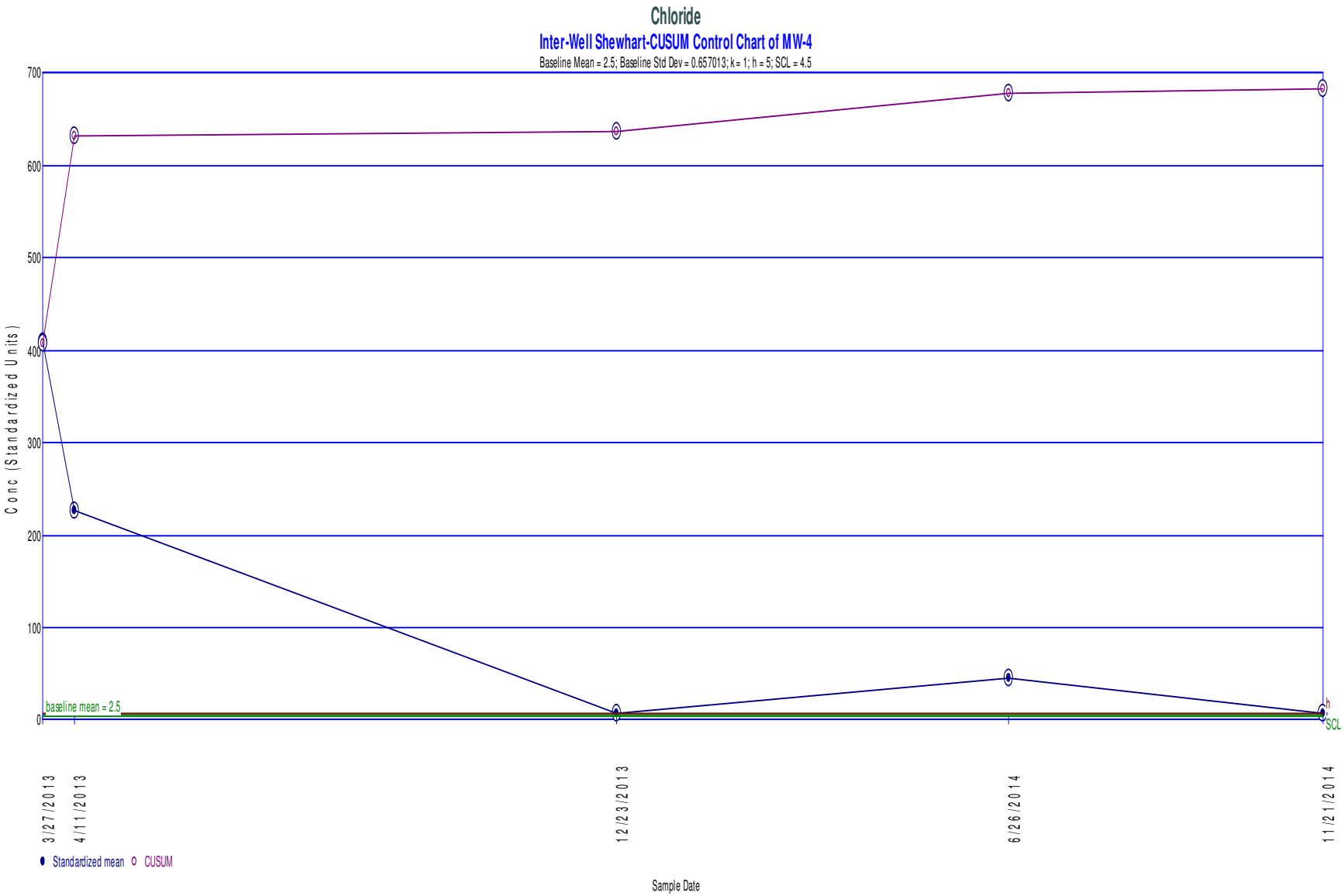
Barium

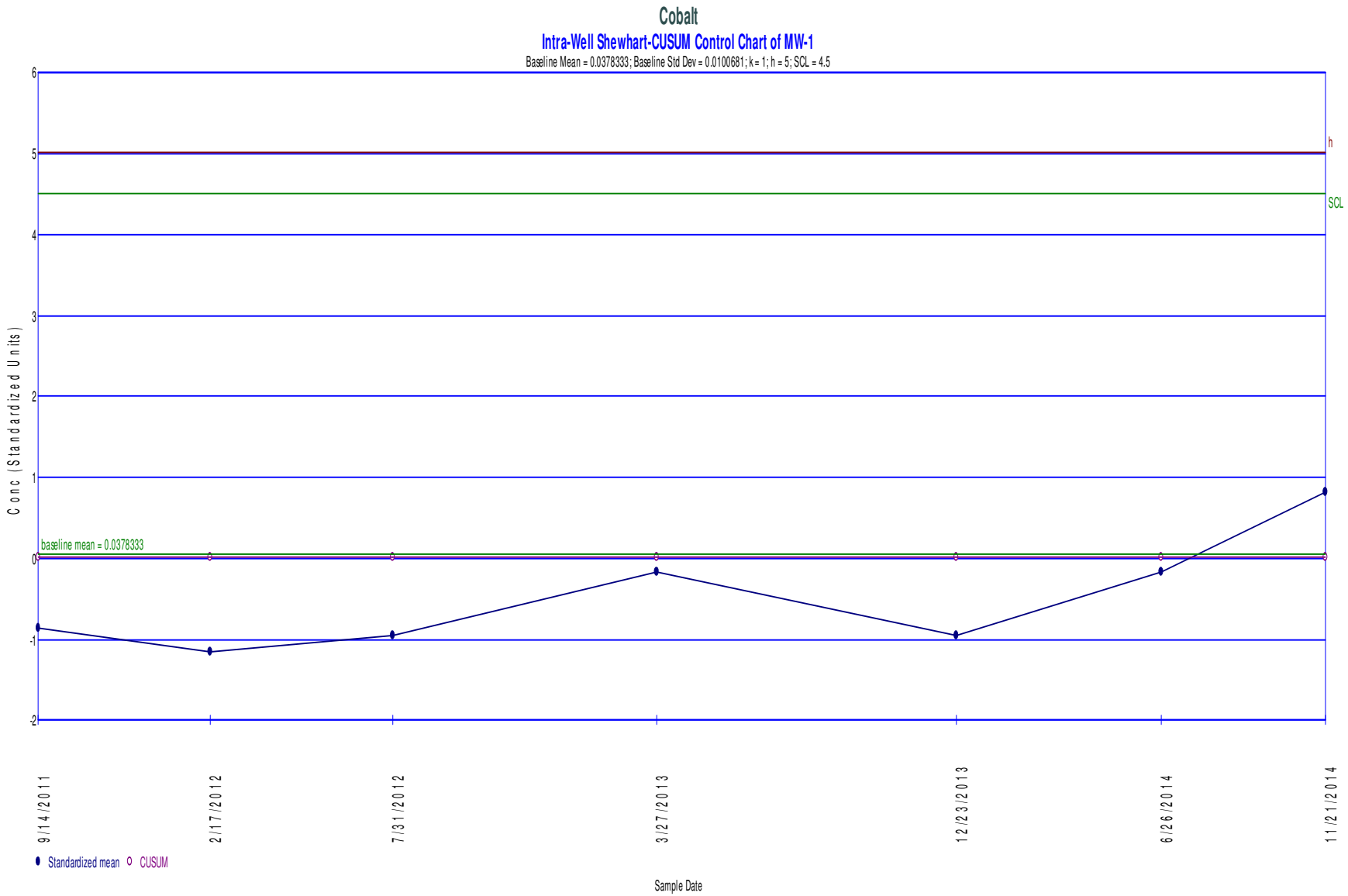
Intra-Well Shewhart-CUSUM Control Chart of MW-1

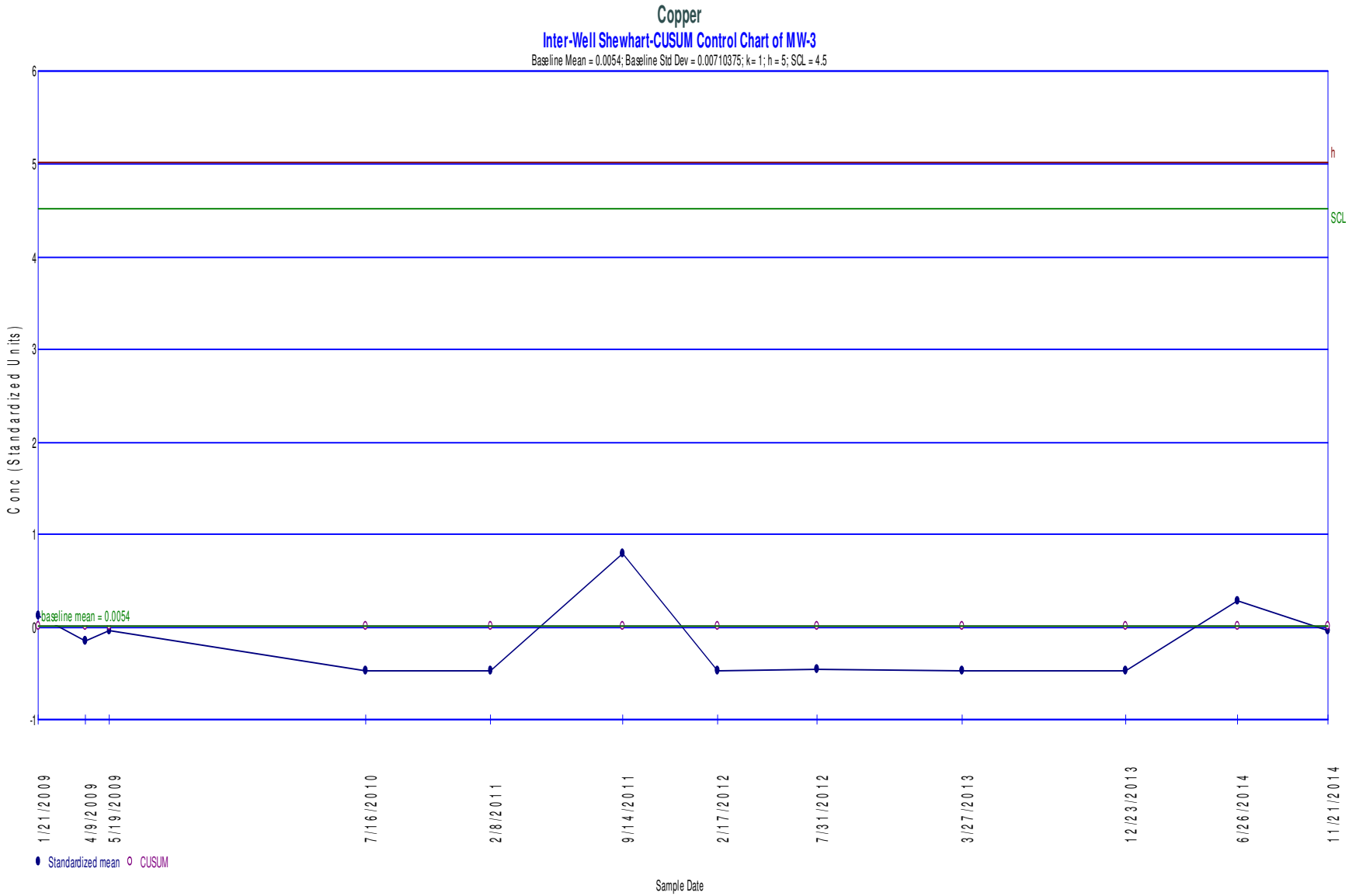



Chloride
Intra-Well Shewhart-CUSUM Control Chart of MW-1
Baseline Mean = 2.5; Baseline Std Dev = 0.438178; k = 1; h = 5; SCL = 4.5
h
SCL
baseline mean = 2.5
Conc (Standardized Units)
6
5
4
3
2
1
0
-1
-2
-3
9/14/2011
2/17/2012
7/31/2012
3/27/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date


Chloride
Inter-Well Shewhart-CUSUM Control Chart of MW-3
Baseline Mean = 2.5; Baseline Std Dev = 0.657013; k = 1; h = 5; SCL = 4.5
Conc (Standardized Units)
500
400
300
200
100
0
baseline mean = 2.5
h
SCL
4/19/2008
1/21/2009
4/9/2009
5/19/2009
7/16/2010
2/8/2011
9/14/2011
2/17/2012
8/1/2012
3/27/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date


Chloride
Inter-Well Shewhart-CUSUM Control Chart of MW-4
Baseline Mean = 2.5; Baseline Std Dev = 0.657013; k = 1; h = 5; SCL = 4.5
Conc (Standardized Units)
700
600
500
400
300
200
100
0
baseline mean = 2.5
h
SCL
3/27/2013
4/11/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date


Cobalt
Intra-Well Shewhart-CUSUM Control Chart of MW-1
Baseline Mean = 0.0378333; Baseline Std Dev = 0.0100681; k = 1; h = 5; SCL = 4.5
Conc (Standardized Units)
6
5
4
3
2
1
0
-1
-2
h
SCL
baseline mean = 0.0378333
9/14/2011
2/17/2012
7/31/2012
3/27/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date


Copper
Inter-Well Shewhart-CUSUM Control Chart of MW-3
Baseline Mean = 0.0054; Baseline Std Dev = 0.00710375; k= 1; h = 5; SCL = 4.5
Conc (Standardized Units)
6
5
4
3
2
1
0
-1
h
SCL
baseline mean = 0.0054
1/21/2009
4/9/2009
5/19/2009
7/16/2010
2/8/2011
9/14/2011
2/17/2012
7/31/2012
3/27/2013
12/23/2013
6/26/2014
11/21/2014
Standardized mean
CUSUM
Sample Date

Parametric Prediction Interval Analysis

Inter-Well Comparison

Parameter: Barium

Natural Logarithm Transformation

Non-Detects Replaced with 1/2 DL

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

Background Samples = 13
Background Mean = -3.62852
Background Std Dev = 0.521908

Number of comparisons = 2
Future Samples (k) = 2
Actual confidence level is 1.0 - (0.05/2) = 97.5 %
t is Percentile of Student's T-Test (0.95/2) = 0.975
Degrees of Freedom = 13 (background observations) - 1
t(0.975, 13) = 2.17881

Well MW-3

Date	Samples	Mean	Interval	Significant
11/21/2014	1	-1.96611	[0, -2.44846]	TRUE

Well MW-4

Date	Samples	Mean	Interval	Significant
11/21/2014	1	-4.34281	[0, -2.44846]	FALSE

Wilcoxon Non-Parametric Analysis (Inter-Well)

Parameter: Barium

Location: MW-3

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total non detects is 0
Non detect rank is 0

Wilcoxon Ranks

Location	Date	Conc.	Rank
MW-1	4/19/2008	0.084	20
	1/21/2009	0.028	9
	4/9/2009	0.028	10
	5/19/2009	0.033	11
	7/16/2010	0.021	6
	2/8/2011	0.021	7
	9/14/2011	0.074	18
	2/17/2012	0.022	8
	7/31/2012	0.019	4
	3/27/2013	0.018	2
	12/23/2013	0.017	1
	6/26/2014	0.018	3
	11/21/2014	0.02	5
MW-3	4/19/2008	0.056	17
	1/21/2009	0.039	12
	4/9/2009	0.043	13
	5/19/2009	0.047	14
	7/16/2010	0.055	16
	2/8/2011	0.052	15
	9/14/2011	0.15	25
	2/17/2012	0.097	23
	7/31/2012	0.091	21
	3/27/2013	0.094	22
	12/23/2013	0.15	26
	6/26/2014	0.079	19
	11/21/2014	0.14	24

The Wilcoxon Statistic is 156
The Expected value is is 84.5
The Standard Deviation is 19.5
The Z Score is 3.64103
The Standard Deviation adjusted for ties is 19.5
The Z Score adjusted for ties is 3.64103

3.64103 > 2.326 indicating statistical significance at 1% level

3.64103 > 2.326 indicating statistical significance at 1% level when adjusted for ties

Wilcoxon Non-Parametric Analysis (Inter-Well)

Parameter: Chloride

Location: MW-3

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total non detects is 0
Non detect rank is 0

Wilcoxon Ranks

Location	Date	Conc.	Rank
MW-1	4/19/2008	2	4
	1/21/2009	2.9	10
	4/9/2009	1.9	3
	5/19/2009	2.8	8
	7/16/2010	2.8	9
	2/8/2011	2.6	7
	9/14/2011	3.1	12
	2/17/2012	2.1	5
	7/31/2012	2.2	6
	3/27/2013	1.8	2
	12/23/2013	1.5	1
	6/26/2014	2.9	11
	11/21/2014	3.9	13
MW-3	4/19/2008	20	19
	1/21/2009	14	16
	4/9/2009	8.2	14
	5/19/2009	10	15
	7/16/2010	25	20
	2/8/2011	25	21
	9/14/2011	15	17
	2/17/2012	18	18
	8/1/2012	25	22
	3/27/2013	32	24
	12/23/2013	35	25
	6/26/2014	29	23
	11/21/2014	65	26

The Wilcoxon Statistic is 169
The Expected value is is 84.5
The Standard Deviation is 19.5
The Z Score is 4.30769
The Standard Deviation adjusted for ties is 19.5
The Z Score adjusted for ties is 4.30769
4.30769 > 2.326 indicating statistical significance at 1% level
4.30769 > 2.326 indicating statistical significance at 1% level when adjusted for ties

Wilcoxon Non-Parametric Analysis (Inter-Well)

Parameter: Chloride

Location: MW-4

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total non detects is 0
Non detect rank is 0

Wilcoxon Ranks

Location	Date	Conc.	Rank
MW-1	4/19/2008	2	4
	1/21/2009	2.9	10
	4/9/2009	1.9	3
	5/19/2009	2.8	8
	7/16/2010	2.8	9
	2/8/2011	2.6	7
	9/14/2011	3.1	12
	2/17/2012	2.1	5
	7/31/2012	2.2	6
	3/27/2013	1.8	2
	12/23/2013	1.5	1
	6/26/2014	2.9	11
	11/21/2014	3.9	13
MW-4	3/27/2013	270	18
	4/11/2013	150	17
	12/23/2013	6.4	14
	6/26/2014	31	16
	11/21/2014	6.7	15

The Wilcoxon Statistic is 65
The Expected value is is 32.5
The Standard Deviation is 10.1448
The Z Score is 3.15433
The Standard Deviation adjusted for ties is 10.1448
The Z Score adjusted for ties is 3.15433

3.15433 > 2.326 indicating statistical significance at 1% level

3.15433 > 2.326 indicating statistical significance at 1% level when adjusted for ties

APPENDIX C

LABORATORY ANALYTICAL REPORT, FIELD INFORMATION LOGS

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Mike Johnson
Civil & Environmental Consultants - TN
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Report Summary

Friday December 19, 2014

Report Number: L735200
Samples Received: 11/21/14
Client Project: 101-301

Description: EWS - Camden

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: Jimmy Hunt

Jimmy Hunt , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364, EPA - TN002

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-01

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-1

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 13:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Bromide	BDL	1.0	mg/l	9056MOD	11/22/14 1156	NJM	1
Chloride	3.9	1.0	mg/l	9056MOD	11/22/14 1156	NJM	1
Nitrate	BDL	0.10	mg/l	9056MOD	11/22/14 1156	NJM	1
Sulfate	9.1	5.0	mg/l	9056MOD	11/22/14 1156	NJM	1
Ammonia Nitrogen	BDL	0.25	mg/l	350.1	11/25/14 1954	JAL	1
Antimony	BDL	0.0020	mg/l	6020	11/28/14 2036	ST	1
Arsenic	0.059	0.0020	mg/l	6020	11/28/14 2036	ST	1
Beryllium	BDL	0.0020	mg/l	6020	11/28/14 2036	ST	1
Cadmium	BDL	0.0010	mg/l	6020	11/28/14 2036	ST	1
Copper	BDL	0.0050	mg/l	6020	11/28/14 2036	ST	1
Lead	BDL	0.0020	mg/l	6020	11/28/14 2036	ST	1
Selenium	BDL	0.0020	mg/l	6020	11/28/14 2036	ST	1
Thallium	BDL	0.0020	mg/l	6020	11/28/14 2036	ST	1
Zinc	BDL	0.025	mg/l	6020	11/30/14 2033	VSS	1
Mercury	BDL	0.00020	mg/l	7470A	11/24/14 1330	CCS	1
Aluminum	BDL	0.10	mg/l	6010B	11/28/14 1224	WBD	1
Aluminum,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1706	RDS	1
Barium	0.020	0.0050	mg/l	6010B	11/28/14 1224	WBD	1
Boron	BDL	0.20	mg/l	6010B	11/28/14 1224	WBD	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	11/25/14 1706	RDS	1
Calcium	4.0	1.0	mg/l	6010B	11/28/14 1224	WBD	1
Calcium,Dissolved	3.9	1.0	mg/l	6010B	11/25/14 1706	RDS	1
Chromium	BDL	0.010	mg/l	6010B	11/28/14 1224	WBD	1
Cobalt	0.046	0.010	mg/l	6010B	11/28/14 1224	WBD	1
Iron	18.	0.10	mg/l	6010B	11/28/14 1224	WBD	1
Iron,Dissolved	16.	0.10	mg/l	6010B	11/25/14 1706	RDS	1
Magnesium	3.2	1.0	mg/l	6010B	11/28/14 1224	WBD	1
Magnesium,Dissolved	3.3	1.0	mg/l	6010B	11/25/14 1706	RDS	1
Manganese	0.94	0.010	mg/l	6010B	11/28/14 1224	WBD	1
Manganese,Dissolved	0.94	0.010	mg/l	6010B	11/25/14 1706	RDS	1
Nickel	BDL	0.020	mg/l	6010B	11/28/14 1224	WBD	1
Potassium	1.2	1.0	mg/l	6010B	11/28/14 1224	WBD	1
Potassium,Dissolved	1.2	1.0	mg/l	6010B	11/25/14 1706	RDS	1
Silver	BDL	0.010	mg/l	6010B	11/28/14 1224	WBD	1
Sodium	4.0	1.0	mg/l	6010B	11/28/14 1224	WBD	1
Sodium,Dissolved	4.2	1.0	mg/l	6010B	11/25/14 1706	RDS	1
Vanadium	BDL	0.020	mg/l	6010B	11/28/14 1224	WBD	1
Volatile Organics							
Acetone	BDL	0.050	mg/l	8260B	11/26/14 0231	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-01

Site ID :

Project # : 101-301

Date Received : November 21, 2014
Description : EWS - Camden

Sample ID : MW-1

Collected By : Philip Campbell
Collection Date : 11/21/14 13:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Acrylonitrile	BDL	0.010	mg/l	8260B	11/26/14 0231	JC	1
Benzene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Bromochloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Bromoform	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Bromomethane	BDL	0.0050	mg/l	8260B	11/26/14 0231	JC	1
Carbon disulfide	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Chloroethane	BDL	0.0050	mg/l	8260B	11/26/14 0231	JC	1
Chloroform	BDL	0.0050	mg/l	8260B	11/26/14 0231	JC	1
Chloromethane	BDL	0.0025	mg/l	8260B	11/26/14 0231	JC	1
Dibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
trans-1,4-Dichloro-2-butene	BDL	0.0025	mg/l	8260B	11/26/14 0231	JC	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
2-Hexanone	BDL	0.010	mg/l	8260B	11/26/14 0231	JC	1
Iodomethane	BDL	0.010	mg/l	8260B	11/26/14 0231	JC	1
2-Butanone (MEK)	BDL	0.010	mg/l	8260B	11/26/14 0231	JC	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	11/26/14 0231	JC	1
4-Methyl-2-pentanone (MIBK)	BDL	0.010	mg/l	8260B	11/26/14 0231	JC	1
Styrene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Toluene	BDL	0.0050	mg/l	8260B	11/26/14 0231	JC	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Trichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Trichlorofluoromethane	BDL	0.0050	mg/l	8260B	11/26/14 0231	JC	1
1,2,3-Trichloropropane	BDL	0.0025	mg/l	8260B	11/26/14 0231	JC	1
Vinyl acetate	BDL	0.010	mg/l	8260B	11/26/14 0231	JC	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	11/26/14 0231	JC	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	11/26/14 0231	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-01

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-1

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 13:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Surrogate Recovery							
Toluene-d8	100.		% Rec.	8260B	11/26/14 0231	JC	1
Dibromofluoromethane	101.		% Rec.	8260B	11/26/14 0231	JC	1
a,a,a-Trifluorotoluene	99.5		% Rec.	8260B	11/26/14 0231	JC	1
4-Bromofluorobenzene	104.		% Rec.	8260B	11/26/14 0231	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

All samples analyzed in accordance with 40 CFR, Part 136.3
Reported: 12/19/14 09:01 Printed: 12/19/14 09:01

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-02

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-4

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 13:25

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Bromide	BDL	1.0	mg/l	9056MOD	11/22/14 1210	NJM	1
Chloride	6.7	1.0	mg/l	9056MOD	11/22/14 1210	NJM	1
Nitrate	0.65	0.10	mg/l	9056MOD	11/22/14 1210	NJM	1
Sulfate	BDL	5.0	mg/l	9056MOD	11/22/14 1210	NJM	1
Ammonia Nitrogen	BDL	0.25	mg/l	350.1	11/25/14 1957	JAL	1
Antimony	BDL	0.0020	mg/l	6020	11/28/14 2049	ST	1
Arsenic	BDL	0.0020	mg/l	6020	11/28/14 2049	ST	1
Beryllium	BDL	0.0020	mg/l	6020	11/28/14 2049	ST	1
Cadmium	BDL	0.0010	mg/l	6020	11/28/14 2049	ST	1
Copper	BDL	0.0050	mg/l	6020	11/28/14 2049	ST	1
Lead	BDL	0.0020	mg/l	6020	11/28/14 2049	ST	1
Selenium	BDL	0.0020	mg/l	6020	11/28/14 2049	ST	1
Thallium	BDL	0.0020	mg/l	6020	11/28/14 2049	ST	1
Zinc	BDL	0.025	mg/l	6020	11/30/14 2103	VSS	1
Mercury	BDL	0.00020	mg/l	7470A	11/24/14 1332	CCS	1
Aluminum	0.14	0.10	mg/l	6010B	11/28/14 1245	WBD	1
Aluminum,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1711	RDS	1
Barium	0.013	0.0050	mg/l	6010B	11/28/14 1245	WBD	1
Boron	BDL	0.20	mg/l	6010B	11/28/14 1245	WBD	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	11/25/14 1711	RDS	1
Calcium	4.0	1.0	mg/l	6010B	11/28/14 1245	WBD	1
Calcium,Dissolved	3.2	1.0	mg/l	6010B	11/25/14 1711	RDS	1
Chromium	BDL	0.010	mg/l	6010B	11/28/14 1245	WBD	1
Cobalt	BDL	0.010	mg/l	6010B	11/28/14 1245	WBD	1
Iron	0.21	0.10	mg/l	6010B	11/28/14 1245	WBD	1
Iron,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1711	RDS	1
Magnesium	2.3	1.0	mg/l	6010B	11/28/14 1245	WBD	1
Magnesium,Dissolved	2.2	1.0	mg/l	6010B	11/25/14 1711	RDS	1
Manganese	0.074	0.010	mg/l	6010B	11/28/14 1245	WBD	1
Manganese,Dissolved	0.12	0.010	mg/l	6010B	11/25/14 1711	RDS	1
Nickel	BDL	0.020	mg/l	6010B	11/28/14 1245	WBD	1
Potassium	1.2	1.0	mg/l	6010B	11/28/14 1245	WBD	1
Potassium,Dissolved	1.1	1.0	mg/l	6010B	11/25/14 1711	RDS	1
Silver	BDL	0.010	mg/l	6010B	11/28/14 1245	WBD	1
Sodium	5.0	1.0	mg/l	6010B	11/28/14 1245	WBD	1
Sodium,Dissolved	4.7	1.0	mg/l	6010B	11/25/14 1711	RDS	1
Vanadium	BDL	0.020	mg/l	6010B	11/28/14 1245	WBD	1
Volatile Organics							
Acetone	BDL	0.050	mg/l	8260B	11/26/14 0253	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-02

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-4

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 13:25

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Acrylonitrile	BDL	0.010	mg/l	8260B	11/26/14 0253	JC	1
Benzene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Bromochloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Bromoform	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Bromomethane	BDL	0.0050	mg/l	8260B	11/26/14 0253	JC	1
Carbon disulfide	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Chloroethane	BDL	0.0050	mg/l	8260B	11/26/14 0253	JC	1
Chloroform	BDL	0.0050	mg/l	8260B	11/26/14 0253	JC	1
Chloromethane	BDL	0.0025	mg/l	8260B	11/26/14 0253	JC	1
Dibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
trans-1,4-Dichloro-2-butene	BDL	0.0025	mg/l	8260B	11/26/14 0253	JC	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
2-Hexanone	BDL	0.010	mg/l	8260B	11/26/14 0253	JC	1
Iodomethane	BDL	0.010	mg/l	8260B	11/26/14 0253	JC	1
2-Butanone (MEK)	BDL	0.010	mg/l	8260B	11/26/14 0253	JC	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	11/26/14 0253	JC	1
4-Methyl-2-pentanone (MIBK)	BDL	0.010	mg/l	8260B	11/26/14 0253	JC	1
Styrene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Toluene	BDL	0.0050	mg/l	8260B	11/26/14 0253	JC	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Trichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Trichlorofluoromethane	BDL	0.0050	mg/l	8260B	11/26/14 0253	JC	1
1,2,3-Trichloropropane	BDL	0.0025	mg/l	8260B	11/26/14 0253	JC	1
Vinyl acetate	BDL	0.010	mg/l	8260B	11/26/14 0253	JC	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	11/26/14 0253	JC	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	11/26/14 0253	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-02

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-4

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 13:25

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Surrogate Recovery							
Toluene-d8	101.		% Rec.	8260B	11/26/14 0253	JC	1
Dibromofluoromethane	101.		% Rec.	8260B	11/26/14 0253	JC	1
a,a,a-Trifluorotoluene	99.4		% Rec.	8260B	11/26/14 0253	JC	1
4-Bromofluorobenzene	102.		% Rec.	8260B	11/26/14 0253	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

All samples analyzed in accordance with 40 CFR, Part 136.3
Reported: 12/19/14 09:01 Printed: 12/19/14 09:01

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-03

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-3

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 14:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Bromide	BDL	1.0	mg/l	9056MOD	11/22/14 1224	NJM	1
Chloride	65.	1.0	mg/l	9056MOD	11/22/14 1224	NJM	1
Nitrate	3.2	0.10	mg/l	9056MOD	11/22/14 1224	NJM	1
Sulfate	11.	5.0	mg/l	9056MOD	11/22/14 1224	NJM	1
Ammonia Nitrogen	0.35	0.25	mg/l	350.1	11/25/14 1959	JAL	1
Antimony	BDL	0.0020	mg/l	6020	11/28/14 2052	ST	1
Arsenic	BDL	0.0020	mg/l	6020	11/28/14 2052	ST	1
Beryllium	BDL	0.0020	mg/l	6020	11/28/14 2052	ST	1
Cadmium	BDL	0.0010	mg/l	6020	11/28/14 2052	ST	1
Copper	BDL	0.0050	mg/l	6020	11/28/14 2052	ST	1
Lead	BDL	0.0020	mg/l	6020	11/28/14 2052	ST	1
Selenium	BDL	0.0020	mg/l	6020	11/28/14 2052	ST	1
Thallium	BDL	0.0020	mg/l	6020	11/28/14 2052	ST	1
Zinc	BDL	0.025	mg/l	6020	11/30/14 2106	VSS	1
Mercury	BDL	0.00020	mg/l	7470A	11/24/14 1335	CCS	1
Aluminum	0.30	0.10	mg/l	6010B	11/28/14 1249	WBD	1
Aluminum,Dissolved	0.13	0.10	mg/l	6010B	11/25/14 1716	RDS	1
Barium	0.14	0.0050	mg/l	6010B	11/28/14 1249	WBD	1
Boron	BDL	0.20	mg/l	6010B	11/28/14 1249	WBD	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	11/25/14 1716	RDS	1
Calcium	19.	1.0	mg/l	6010B	11/28/14 1249	WBD	1
Calcium,Dissolved	17.	1.0	mg/l	6010B	11/25/14 1716	RDS	1
Chromium	BDL	0.010	mg/l	6010B	11/28/14 1249	WBD	1
Cobalt	BDL	0.010	mg/l	6010B	11/28/14 1249	WBD	1
Iron	0.15	0.10	mg/l	6010B	11/28/14 1249	WBD	1
Iron,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1716	RDS	1
Magnesium	6.4	1.0	mg/l	6010B	11/28/14 1249	WBD	1
Magnesium,Dissolved	6.0	1.0	mg/l	6010B	11/25/14 1716	RDS	1
Manganese	0.29	0.010	mg/l	6010B	11/28/14 1249	WBD	1
Manganese,Dissolved	0.26	0.010	mg/l	6010B	11/25/14 1716	RDS	1
Nickel	BDL	0.020	mg/l	6010B	11/28/14 1249	WBD	1
Potassium	11.	1.0	mg/l	6010B	11/28/14 1249	WBD	1
Potassium,Dissolved	10.	1.0	mg/l	6010B	11/25/14 1716	RDS	1
Silver	BDL	0.010	mg/l	6010B	11/28/14 1249	WBD	1
Sodium	25.	1.0	mg/l	6010B	11/28/14 1249	WBD	1
Sodium,Dissolved	25.	1.0	mg/l	6010B	11/25/14 1716	RDS	1
Vanadium	BDL	0.020	mg/l	6010B	11/28/14 1249	WBD	1
Volatile Organics							
Acetone	BDL	0.050	mg/l	8260B	11/26/14 0315	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-03

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-3

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 14:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Acrylonitrile	BDL	0.010	mg/l	8260B	11/26/14 0315	JC	1
Benzene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Bromochloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Bromoform	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Bromomethane	BDL	0.0050	mg/l	8260B	11/26/14 0315	JC	1
Carbon disulfide	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Chloroethane	BDL	0.0050	mg/l	8260B	11/26/14 0315	JC	1
Chloroform	BDL	0.0050	mg/l	8260B	11/26/14 0315	JC	1
Chloromethane	BDL	0.0025	mg/l	8260B	11/26/14 0315	JC	1
Dibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
trans-1,4-Dichloro-2-butene	BDL	0.0025	mg/l	8260B	11/26/14 0315	JC	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
2-Hexanone	BDL	0.010	mg/l	8260B	11/26/14 0315	JC	1
Iodomethane	BDL	0.010	mg/l	8260B	11/26/14 0315	JC	1
2-Butanone (MEK)	BDL	0.010	mg/l	8260B	11/26/14 0315	JC	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	11/26/14 0315	JC	1
4-Methyl-2-pentanone (MIBK)	BDL	0.010	mg/l	8260B	11/26/14 0315	JC	1
Styrene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Toluene	BDL	0.0050	mg/l	8260B	11/26/14 0315	JC	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Trichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Trichlorofluoromethane	BDL	0.0050	mg/l	8260B	11/26/14 0315	JC	1
1,2,3-Trichloropropane	BDL	0.0025	mg/l	8260B	11/26/14 0315	JC	1
Vinyl acetate	BDL	0.010	mg/l	8260B	11/26/14 0315	JC	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	11/26/14 0315	JC	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	11/26/14 0315	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-03

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : MW-3

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 14:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Surrogate Recovery							
Toluene-d8	101.		% Rec.	8260B	11/26/14 0315	JC	1
Dibromofluoromethane	99.6		% Rec.	8260B	11/26/14 0315	JC	1
a,a,a-Trifluorotoluene	100.		% Rec.	8260B	11/26/14 0315	JC	1
4-Bromofluorobenzene	104.		% Rec.	8260B	11/26/14 0315	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

All samples analyzed in accordance with 40 CFR, Part 136.3
Reported: 12/19/14 09:01 Printed: 12/19/14 09:01

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-04

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : DUPLICATE

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 00:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Bromide	BDL	1.0	mg/l	9056MOD	11/22/14 1306	NJM	1
Chloride	6.7	1.0	mg/l	9056MOD	11/22/14 1306	NJM	1
Nitrate	0.67	0.10	mg/l	9056MOD	11/22/14 1306	NJM	1
Sulfate	BDL	5.0	mg/l	9056MOD	11/22/14 1306	NJM	1
Ammonia Nitrogen	BDL	0.25	mg/l	350.1	11/25/14 2002	JAL	1
Antimony	BDL	0.0020	mg/l	6020	11/28/14 2055	ST	1
Arsenic	BDL	0.0020	mg/l	6020	11/28/14 2055	ST	1
Beryllium	BDL	0.0020	mg/l	6020	11/28/14 2055	ST	1
Cadmium	BDL	0.0010	mg/l	6020	11/28/14 2055	ST	1
Copper	BDL	0.0050	mg/l	6020	11/28/14 2055	ST	1
Lead	BDL	0.0020	mg/l	6020	11/28/14 2055	ST	1
Selenium	BDL	0.0020	mg/l	6020	11/28/14 2055	ST	1
Thallium	BDL	0.0020	mg/l	6020	11/28/14 2055	ST	1
Zinc	BDL	0.025	mg/l	6020	11/30/14 2109	VSS	1
Mercury	BDL	0.00020	mg/l	7470A	11/24/14 1337	CCS	1
Aluminum	0.14	0.10	mg/l	6010B	11/28/14 1314	WBD	1
Aluminum,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1720	RDS	1
Barium	0.012	0.0050	mg/l	6010B	11/28/14 1314	WBD	1
Boron	BDL	0.20	mg/l	6010B	11/28/14 1314	WBD	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	11/25/14 1720	RDS	1
Calcium	3.6	1.0	mg/l	6010B	11/28/14 1314	WBD	1
Calcium,Dissolved	3.2	1.0	mg/l	6010B	11/25/14 1720	RDS	1
Chromium	BDL	0.010	mg/l	6010B	11/28/14 1314	WBD	1
Cobalt	BDL	0.010	mg/l	6010B	11/28/14 1314	WBD	1
Iron	0.25	0.10	mg/l	6010B	11/28/14 1314	WBD	1
Iron,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1720	RDS	1
Magnesium	2.3	1.0	mg/l	6010B	11/28/14 1314	WBD	1
Magnesium,Dissolved	2.2	1.0	mg/l	6010B	11/25/14 1720	RDS	1
Manganese	0.075	0.010	mg/l	6010B	11/28/14 1314	WBD	1
Manganese,Dissolved	0.11	0.010	mg/l	6010B	11/25/14 1720	RDS	1
Nickel	BDL	0.020	mg/l	6010B	11/28/14 1314	WBD	1
Potassium	1.3	1.0	mg/l	6010B	11/28/14 1314	WBD	1
Potassium,Dissolved	1.2	1.0	mg/l	6010B	11/25/14 1720	RDS	1
Silver	BDL	0.010	mg/l	6010B	11/28/14 1314	WBD	1
Sodium	5.0	1.0	mg/l	6010B	11/28/14 1314	WBD	1
Sodium,Dissolved	4.7	1.0	mg/l	6010B	11/25/14 1720	RDS	1
Vanadium	BDL	0.020	mg/l	6010B	11/28/14 1314	WBD	1
Volatile Organics							
Acetone	BDL	0.050	mg/l	8260B	11/26/14 0337	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-04

Site ID :

Project # : 101-301

Date Received : November 21, 2014
Description : EWS - Camden

Sample ID : DUPLICATE

Collected By : Philip Campbell
Collection Date : 11/21/14 00:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Acrylonitrile	BDL	0.010	mg/l	8260B	11/26/14 0337	JC	1
Benzene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Bromochloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Bromoform	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Bromomethane	BDL	0.0050	mg/l	8260B	11/26/14 0337	JC	1
Carbon disulfide	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Chloroethane	BDL	0.0050	mg/l	8260B	11/26/14 0337	JC	1
Chloroform	BDL	0.0050	mg/l	8260B	11/26/14 0337	JC	1
Chloromethane	BDL	0.0025	mg/l	8260B	11/26/14 0337	JC	1
Dibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
trans-1,4-Dichloro-2-butene	BDL	0.0025	mg/l	8260B	11/26/14 0337	JC	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
2-Hexanone	BDL	0.010	mg/l	8260B	11/26/14 0337	JC	1
Iodomethane	BDL	0.010	mg/l	8260B	11/26/14 0337	JC	1
2-Butanone (MEK)	BDL	0.010	mg/l	8260B	11/26/14 0337	JC	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	11/26/14 0337	JC	1
4-Methyl-2-pentanone (MIBK)	BDL	0.010	mg/l	8260B	11/26/14 0337	JC	1
Styrene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Toluene	BDL	0.0050	mg/l	8260B	11/26/14 0337	JC	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Trichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Trichlorofluoromethane	BDL	0.0050	mg/l	8260B	11/26/14 0337	JC	1
1,2,3-Trichloropropane	BDL	0.0025	mg/l	8260B	11/26/14 0337	JC	1
Vinyl acetate	BDL	0.010	mg/l	8260B	11/26/14 0337	JC	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	11/26/14 0337	JC	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	11/26/14 0337	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19,2014

ESC Sample # : L735200-04

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : DUPLICATE

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 00:00

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Surrogate Recovery							
Toluene-d8	102.		% Rec.	8260B	11/26/14 0337	JC	1
Dibromofluoromethane	98.3		% Rec.	8260B	11/26/14 0337	JC	1
a,a,a-Trifluorotoluene	99.1		% Rec.	8260B	11/26/14 0337	JC	1
4-Bromofluorobenzene	101.		% Rec.	8260B	11/26/14 0337	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

All samples analyzed in accordance with 40 CFR, Part 136.3
Reported: 12/19/14 09:01 Printed: 12/19/14 09:01

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19, 2014

ESC Sample # : L735200-05

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : FIELD BLANK

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 12:30

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Bromide	BDL	1.0	mg/l	9056MOD	11/22/14 1320	NJM	1
Chloride	BDL	1.0	mg/l	9056MOD	11/22/14 1320	NJM	1
Nitrate	BDL	0.10	mg/l	9056MOD	11/22/14 1320	NJM	1
Sulfate	BDL	5.0	mg/l	9056MOD	11/22/14 1320	NJM	1
Ammonia Nitrogen	BDL	0.25	mg/l	350.1	11/25/14 2004	JAL	1
Antimony	BDL	0.0020	mg/l	6020	11/28/14 2058	ST	1
Arsenic	BDL	0.0020	mg/l	6020	11/28/14 2058	ST	1
Beryllium	BDL	0.0020	mg/l	6020	11/28/14 2058	ST	1
Cadmium	BDL	0.0010	mg/l	6020	11/28/14 2058	ST	1
Copper	BDL	0.0050	mg/l	6020	11/28/14 2058	ST	1
Lead	BDL	0.0020	mg/l	6020	11/28/14 2058	ST	1
Selenium	BDL	0.0020	mg/l	6020	11/28/14 2058	ST	1
Thallium	BDL	0.0020	mg/l	6020	11/28/14 2058	ST	1
Zinc	BDL	0.025	mg/l	6020	11/30/14 2112	VSS	1
Mercury	BDL	0.00020	mg/l	7470A	11/24/14 1340	CCS	1
Aluminum	BDL	0.10	mg/l	6010B	11/28/14 1318	WBD	1
Aluminum,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1725	RDS	1
Barium	BDL	0.0050	mg/l	6010B	11/28/14 1318	WBD	1
Boron	BDL	0.20	mg/l	6010B	11/28/14 1318	WBD	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	11/25/14 1725	RDS	1
Calcium	BDL	1.0	mg/l	6010B	11/28/14 1318	WBD	1
Calcium,Dissolved	BDL	1.0	mg/l	6010B	11/25/14 1725	RDS	1
Chromium	BDL	0.010	mg/l	6010B	11/28/14 1318	WBD	1
Cobalt	BDL	0.010	mg/l	6010B	11/28/14 1318	WBD	1
Iron	BDL	0.10	mg/l	6010B	11/28/14 1318	WBD	1
Iron,Dissolved	BDL	0.10	mg/l	6010B	11/25/14 1725	RDS	1
Magnesium	BDL	1.0	mg/l	6010B	11/28/14 1318	WBD	1
Magnesium,Dissolved	BDL	1.0	mg/l	6010B	11/25/14 1725	RDS	1
Manganese	BDL	0.010	mg/l	6010B	11/28/14 1318	WBD	1
Manganese,Dissolved	BDL	0.010	mg/l	6010B	11/25/14 1725	RDS	1
Nickel	BDL	0.020	mg/l	6010B	11/28/14 1318	WBD	1
Potassium	BDL	1.0	mg/l	6010B	11/28/14 1318	WBD	1
Potassium,Dissolved	BDL	1.0	mg/l	6010B	11/25/14 1725	RDS	1
Silver	BDL	0.010	mg/l	6010B	11/28/14 1318	WBD	1
Sodium	BDL	1.0	mg/l	6010B	11/28/14 1318	WBD	1
Sodium,Dissolved	BDL	1.0	mg/l	6010B	11/25/14 1725	RDS	1
Vanadium	BDL	0.020	mg/l	6010B	11/28/14 1318	WBD	1
Volatile Organics							
Acetone	BDL	0.050	mg/l	8260B	11/26/14 0103	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19, 2014

ESC Sample # : L735200-05

Site ID :

Project # : 101-301

Date Received : November 21, 2014
Description : EWS - Camden

Sample ID : FIELD BLANK

Collected By : Philip Campbell
Collection Date : 11/21/14 12:30

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Acrylonitrile	BDL	0.010	mg/l	8260B	11/26/14 0103	JC	1
Benzene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Bromochloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Bromoform	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Bromomethane	BDL	0.0050	mg/l	8260B	11/26/14 0103	JC	1
Carbon disulfide	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Chloroethane	BDL	0.0050	mg/l	8260B	11/26/14 0103	JC	1
Chloroform	BDL	0.0050	mg/l	8260B	11/26/14 0103	JC	1
Chloromethane	BDL	0.0025	mg/l	8260B	11/26/14 0103	JC	1
Dibromomethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
trans-1,4-Dichloro-2-butene	BDL	0.0025	mg/l	8260B	11/26/14 0103	JC	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
2-Hexanone	BDL	0.010	mg/l	8260B	11/26/14 0103	JC	1
Iodomethane	BDL	0.010	mg/l	8260B	11/26/14 0103	JC	1
2-Butanone (MEK)	BDL	0.010	mg/l	8260B	11/26/14 0103	JC	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	11/26/14 0103	JC	1
4-Methyl-2-pentanone (MIBK)	BDL	0.010	mg/l	8260B	11/26/14 0103	JC	1
Styrene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Toluene	BDL	0.0050	mg/l	8260B	11/26/14 0103	JC	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Trichloroethene	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Trichlorofluoromethane	BDL	0.0050	mg/l	8260B	11/26/14 0103	JC	1
1,2,3-Trichloropropane	BDL	0.0025	mg/l	8260B	11/26/14 0103	JC	1
Vinyl acetate	BDL	0.010	mg/l	8260B	11/26/14 0103	JC	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	11/26/14 0103	JC	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	11/26/14 0103	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19, 2014

ESC Sample # : L735200-05

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : FIELD BLANK

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 12:30

Parameter	Result	Det. Limit	Units	Method	Date/Time	Analyst	Dil.
Surrogate Recovery							
Toluene-d8	101.		% Rec.	8260B	11/26/14 0103	JC	1
Dibromofluoromethane	96.2		% Rec.	8260B	11/26/14 0103	JC	1
a,a,a-Trifluorotoluene	100.		% Rec.	8260B	11/26/14 0103	JC	1
4-Bromofluorobenzene	102.		% Rec.	8260B	11/26/14 0103	JC	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Notes:
The reported analytical results relate only to the sample submitted

All samples analyzed in accordance with 40 CFR, Part 136.3
Reported: 12/19/14 09:01 Printed: 12/19/14 09:01

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19, 2014

ESC Sample # : L735200-06

Date Received : November 21, 2014
Description : EWS - Camden

Site ID :

Sample ID : TRIP BLANK

Project # : 101-301

Collected By : Philip Campbell
Collection Date : 11/21/14 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	11/26/14	1
Acrylonitrile	BDL	0.010	mg/l	8260B	11/26/14	1
Benzene	BDL	0.0010	mg/l	8260B	11/26/14	1
Bromochloromethane	BDL	0.0010	mg/l	8260B	11/26/14	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	11/26/14	1
Bromoform	BDL	0.0010	mg/l	8260B	11/26/14	1
Bromomethane	BDL	0.0050	mg/l	8260B	11/26/14	1
Carbon disulfide	BDL	0.0010	mg/l	8260B	11/26/14	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	11/26/14	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	11/26/14	1
Chloroethane	BDL	0.0050	mg/l	8260B	11/26/14	1
Chloroform	BDL	0.0050	mg/l	8260B	11/26/14	1
Chloromethane	BDL	0.0025	mg/l	8260B	11/26/14	1
Dibromomethane	BDL	0.0010	mg/l	8260B	11/26/14	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	11/26/14	1
trans-1,4-Dichloro-2-butene	BDL	0.0025	mg/l	8260B	11/26/14	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	11/26/14	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	11/26/14	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	11/26/14	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	11/26/14	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	11/26/14	1
2-Hexanone	BDL	0.010	mg/l	8260B	11/26/14	1
Iodomethane	BDL	0.010	mg/l	8260B	11/26/14	1
2-Butanone (MEK)	BDL	0.010	mg/l	8260B	11/26/14	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	11/26/14	1
4-Methyl-2-pentanone (MIBK)	BDL	0.010	mg/l	8260B	11/26/14	1
Styrene	BDL	0.0010	mg/l	8260B	11/26/14	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	11/26/14	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	11/26/14	1
Toluene	BDL	0.0050	mg/l	8260B	11/26/14	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	11/26/14	1
Trichloroethene	BDL	0.0010	mg/l	8260B	11/26/14	1
Trichlorofluoromethane	BDL	0.0050	mg/l	8260B	11/26/14	1
1,2,3-Trichloropropane	BDL	0.0025	mg/l	8260B	11/26/14	1
Vinyl acetate	BDL	0.010	mg/l	8260B	11/26/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mike Johnson
Civil & Environmental Consultants -
325 Seaboard Lane, Suite 170
Franklin, TN 37067

December 19, 2014

ESC Sample # : L735200-06

Site ID :

Project # : 101-301

Date Received : November 21, 2014
Description : EWS - Camden

Sample ID : TRIP BLANK

Collected By : Philip Campbell
Collection Date : 11/21/14 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Vinyl chloride	BDL	0.0010	mg/l	8260B	11/26/14	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	11/26/14	1
Surrogate Recovery						
Toluene-d8	102.		% Rec.	8260B	11/26/14	1
Dibromofluoromethane	98.5		% Rec.	8260B	11/26/14	1
a,a,a-Trifluorotoluene	99.9		% Rec.	8260B	11/26/14	1
4-Bromofluorobenzene	103.		% Rec.	8260B	11/26/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 12/19/14 09:01 Printed: 12/19/14 09:01

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L735200-01	WG756626	SAMP	Bromomethane	R3007042	J4J5
	WG756908	SAMP	Iron	R3007100	V
L735200-02	WG756626	SAMP	Bromomethane	R3007042	J4
L735200-03	WG756626	SAMP	Bromomethane	R3007042	J4
L735200-04	WG756626	SAMP	Bromomethane	R3007042	J4
L735200-05	WG756626	SAMP	Bromomethane	R3007042	J4
L735200-06	WG756626	SAMP	Bromomethane	R3007042	J4

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high
V	(ESC) - Additional QC Info: The sample concentration is too high to evaluate accurate spike recoveries.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
12/19/14 at 09:01:49

TSR Signing Reports: 350
R5 - Desired TAT

Use CDG, SBG, ASG, not CDICP, SBICP, or ASICP on GW; Charge $6 for additional metals when metals list is run. Need analyst's initials on all reports.

Sample: L735200-01 Account: CEC Received: 11/21/14 17:13 Due Date: 12/18/14 00:00 RPT Date: 12/19/14 09:01
Dissolved metals have been field filtered and preserved. uni 798566 & Bromide added dor 12/17/14.
Sample: L735200-02 Account: CEC Received: 11/21/14 17:13 Due Date: 12/18/14 00:00 RPT Date: 12/19/14 09:01
Dissolved metals have been field filtered and preserved. uni 798566 & Bromide added dor 12/17/14.
Sample: L735200-03 Account: CEC Received: 11/21/14 17:13 Due Date: 12/18/14 00:00 RPT Date: 12/19/14 09:01
Dissolved metals have been field filtered and preserved. uni 798566 & Bromide added dor 12/17/14.
Sample: L735200-04 Account: CEC Received: 11/21/14 17:13 Due Date: 12/18/14 00:00 RPT Date: 12/19/14 09:01
uni 798566 & Bromide added dor 12/17/14.
Sample: L735200-05 Account: CEC Received: 11/21/14 17:13 Due Date: 12/18/14 00:00 RPT Date: 12/19/14 09:01
uni 798566 & Bromide added dor 12/17/14.
Sample: L735200-06 Account: CEC Received: 11/21/14 17:13 Due Date: 12/18/14 00:00 RPT Date: 12/19/14 09:01

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Bromide	< 1	mg/l			WG756208	11/22/14 08:24
Chloride	< 1	mg/l			WG756208	11/22/14 08:24
Nitrate	< .1	mg/l			WG756208	11/22/14 08:24
Sulfate	< 5	mg/l			WG756208	11/22/14 08:24
Mercury	< .0002	mg/l			WG756319	11/24/14 12:30
Aluminum,Dissolved	< .1	mg/l			WG756478	11/25/14 15:23
Boron,Dissolved	< .2	mg/l			WG756478	11/25/14 15:23
Calcium,Dissolved	< 1	mg/l			WG756478	11/25/14 15:23
Iron,Dissolved	< .1	mg/l			WG756478	11/25/14 15:23
Magnesium,Dissolved	< 1	mg/l			WG756478	11/25/14 15:23
Manganese,Dissolved	< .01	mg/l			WG756478	11/25/14 15:23
Potassium,Dissolved	< 1	mg/l			WG756478	11/25/14 15:23
Sodium,Dissolved	< 1	mg/l			WG756478	11/25/14 15:23
Ammonia Nitrogen	< .25	mg/l			WG756259	11/25/14 18:59
1,1,1,2-Tetrachloroethane	< .001	mg/l			WG756626	11/26/14 00:10
1,1,1-Trichloroethane	< .001	mg/l			WG756626	11/26/14 00:10
1,1,2,2-Tetrachloroethane	< .001	mg/l			WG756626	11/26/14 00:10
1,1,2-Trichloroethane	< .001	mg/l			WG756626	11/26/14 00:10
1,1-Dichloroethane	< .001	mg/l			WG756626	11/26/14 00:10
1,1-Dichloroethene	< .001	mg/l			WG756626	11/26/14 00:10
1,2,3-Trichloropropane	< .001	mg/l			WG756626	11/26/14 00:10
1,2-Dichlorobenzene	< .001	mg/l			WG756626	11/26/14 00:10
1,2-Dichloroethane	< .001	mg/l			WG756626	11/26/14 00:10
1,2-Dichloropropane	< .001	mg/l			WG756626	11/26/14 00:10
1,4-Dichlorobenzene	< .001	mg/l			WG756626	11/26/14 00:10
2-Butanone (MEK)	< .01	mg/l			WG756626	11/26/14 00:10
2-Hexanone	< .01	mg/l			WG756626	11/26/14 00:10
4-Methyl-2-pentanone (MIBK)	< .01	mg/l			WG756626	11/26/14 00:10
Acetone	< .05	mg/l			WG756626	11/26/14 00:10
Acrylonitrile	< .01	mg/l			WG756626	11/26/14 00:10
Benzene	< .001	mg/l			WG756626	11/26/14 00:10
Bromochloromethane	< .001	mg/l			WG756626	11/26/14 00:10
Bromodichloromethane	< .001	mg/l			WG756626	11/26/14 00:10
Bromoform	< .001	mg/l			WG756626	11/26/14 00:10
Bromomethane	< .005	mg/l			WG756626	11/26/14 00:10
Carbon disulfide	< .001	mg/l			WG756626	11/26/14 00:10
Carbon tetrachloride	< .001	mg/l			WG756626	11/26/14 00:10
Chlorobenzene	< .001	mg/l			WG756626	11/26/14 00:10
Chlorodibromomethane	< .001	mg/l			WG756626	11/26/14 00:10
Chloroethane	< .005	mg/l			WG756626	11/26/14 00:10
Chloroform	< .005	mg/l			WG756626	11/26/14 00:10
Chloromethane	< .0025	mg/l			WG756626	11/26/14 00:10
cis-1,2-Dichloroethene	< .001	mg/l			WG756626	11/26/14 00:10
cis-1,3-Dichloropropene	< .001	mg/l			WG756626	11/26/14 00:10
Dibromomethane	< .001	mg/l			WG756626	11/26/14 00:10
Ethylbenzene	< .001	mg/l			WG756626	11/26/14 00:10
Iodomethane	< .01	mg/l			WG756626	11/26/14 00:10
Methylene Chloride	< .005	mg/l			WG756626	11/26/14 00:10
Styrene	< .001	mg/l			WG756626	11/26/14 00:10
Tetrachloroethene	< .001	mg/l			WG756626	11/26/14 00:10
Toluene	< .005	mg/l			WG756626	11/26/14 00:10

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
trans-1,2-Dichloroethene	< .001	mg/l			WG756626	11/26/14 00:10
trans-1,3-Dichloropropene	< .001	mg/l			WG756626	11/26/14 00:10
trans-1,4-Dichloro-2-butene	< .0025	mg/l			WG756626	11/26/14 00:10
Trichloroethene	< .001	mg/l			WG756626	11/26/14 00:10
Trichlorofluoromethane	< .005	mg/l			WG756626	11/26/14 00:10
Vinyl acetate	< .01	mg/l			WG756626	11/26/14 00:10
Vinyl chloride	< .001	mg/l			WG756626	11/26/14 00:10
Xylenes, Total	< .003	mg/l			WG756626	11/26/14 00:10
4-Bromofluorobenzene		% Rec.	102.0	71-126	WG756626	11/26/14 00:10
Dibromofluoromethane		% Rec.	98.20	78.3-121	WG756626	11/26/14 00:10
Toluene-d8		% Rec.	99.90	88.5-111	WG756626	11/26/14 00:10
a,a,a-Trifluorotoluene		% Rec.	99.10	85-114	WG756626	11/26/14 00:10
Aluminum	< .1	mg/l			WG756908	11/28/14 12:12
Barium	< .005	mg/l			WG756908	11/28/14 12:12
Boron	< .2	mg/l			WG756908	11/28/14 12:12
Calcium	< 1	mg/l			WG756908	11/28/14 12:12
Chromium	< .01	mg/l			WG756908	11/28/14 12:12
Cobalt	< .01	mg/l			WG756908	11/28/14 12:12
Iron	< .1	mg/l			WG756908	11/28/14 12:12
Magnesium	< 1	mg/l			WG756908	11/28/14 12:12
Manganese	< .01	mg/l			WG756908	11/28/14 12:12
Nickel	< .02	mg/l			WG756908	11/28/14 12:12
Potassium	< 1	mg/l			WG756908	11/28/14 12:12
Silver	< .01	mg/l			WG756908	11/28/14 12:12
Sodium	< 1	mg/l			WG756908	11/28/14 12:12
Vanadium	< .02	mg/l			WG756908	11/28/14 12:12
Antimony	< .001	mg/l			WG757119	11/28/14 20:27
Arsenic	< .001	mg/l			WG757119	11/28/14 20:27
Beryllium	< .001	mg/l			WG757119	11/28/14 20:27
Cadmium	< .0005	mg/l			WG757119	11/28/14 20:27
Copper	< .002	mg/l			WG757119	11/28/14 20:27
Lead	< .001	mg/l			WG757119	11/28/14 20:27
Selenium	< .001	mg/l			WG757119	11/28/14 20:27
Thallium	< .001	mg/l			WG757119	11/28/14 20:27
Zinc	< .01	mg/l			WG757119	11/30/14 20:24

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Chloride	mg/l	46.0	46.5	1.00	20	L735098-01	WG756208
Nitrate	mg/l	0.0	0.0	0.0	20	L735098-01	WG756208
Sulfate	mg/l	64.0	64.4	1.00	20	L735098-01	WG756208
Nitrate	mg/l	0.0	0.0	0.0	20	L735243-02	WG756208
Ammonia Nitrogen	mg/l	0.0	0.0	0.0	20	L735200-05	WG756259
Ammonia Nitrogen	mg/l	4.20	4.10	2.41	20	L734899-02	WG756259

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Bromide	mg/l	40	40.5	101.	90-110	WG756208
Chloride	mg/l	40	39.0	98.0	90-110	WG756208
Nitrate	mg/l	8	8.29	104.	90-110	WG756208
Sulfate	mg/l	40	39.9	100.	90-110	WG756208

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Mercury	mg/l	.003	0.00319	106.	85-115	WG756319
Aluminum,Dissolved	mg/l	1	1.09	109.	80-120	WG756478
Boron,Dissolved	mg/l	1	0.999	100.	80-120	WG756478
Calcium,Dissolved	mg/l	10	9.41	94.0	80-120	WG756478
Iron,Dissolved	mg/l	1	0.945	94.0	80-120	WG756478
Magnesium,Dissolved	mg/l	10	9.93	99.0	80-120	WG756478
Manganese,Dissolved	mg/l	1	0.971	97.0	80-120	WG756478
Potassium,Dissolved	mg/l	10	9.78	98.0	80-120	WG756478
Sodium,Dissolved	mg/l	10	9.86	99.0	80-120	WG756478
Ammonia Nitrogen	mg/l	7.5	7.37	98.3	90-110	WG756259
1,1,1,2-Tetrachloroethane	mg/l	.025	0.0244	97.6	74.2-124	WG756626
1,1,1-Trichloroethane	mg/l	.025	0.0247	98.8	73.2-123	WG756626
1,1,2,2-Tetrachloroethane	mg/l	.025	0.0245	97.9	70.7-122	WG756626
1,1,2-Trichloroethane	mg/l	.025	0.0240	96.0	77.7-118	WG756626
1,1-Dichloroethane	mg/l	.025	0.0242	96.8	70.7-126	WG756626
1,1-Dichloroethene	mg/l	.025	0.0224	89.7	67.8-129	WG756626
1,2,3-Trichloropropane	mg/l	.025	0.0243	97.1	71.8-121	WG756626
1,2-Dichlorobenzene	mg/l	.025	0.0245	97.9	78.4-117	WG756626
1,2-Dichloroethane	mg/l	.025	0.0261	104.	68.8-124	WG756626
1,2-Dichloropropane	mg/l	.025	0.0251	100.	76.5-119	WG756626
1,4-Dichlorobenzene	mg/l	.025	0.0242	96.9	78.8-115	WG756626
2-Butanone (MEK)	mg/l	.125	0.124	99.3	55-149	WG756626
2-Hexanone	mg/l	.125	0.128	103.	65.6-144	WG756626
4-Methyl-2-pentanone (MIBK)	mg/l	.125	0.130	104.	70.5-133	WG756626
Acetone	mg/l	.125	0.109	87.2	35.6-163	WG756626
Acrylonitrile	mg/l	.125	0.126	101.	55.2-130	WG756626
Benzene	mg/l	.025	0.0252	101.	74.8-121	WG756626
Bromochloromethane	mg/l	.025	0.0254	102.	77.6-119	WG756626
Bromodichloromethane	mg/l	.025	0.0259	103.	75.1-116	WG756626
Bromoform	mg/l	.025	0.0244	97.6	67.5-130	WG756626
Bromomethane	mg/l	.025	0.0391	156.	49.9-162	WG756626
Carbon disulfide	mg/l	.025	0.0235	93.8	64.6-140	WG756626
Carbon tetrachloride	mg/l	.025	0.0247	98.8	70.2-123	WG756626
Chlorobenzene	mg/l	.025	0.0256	102.	78.1-119	WG756626
Chlorodibromomethane	mg/l	.025	0.0250	99.8	74-121	WG756626
Chloroethane	mg/l	.025	0.0293	117.	61.7-135	WG756626
Chloroform	mg/l	.025	0.0247	98.9	76-121	WG756626
Chloromethane	mg/l	.025	0.0244	97.8	61.5-129	WG756626
cis-1,2-Dichloroethene	mg/l	.025	0.0241	96.3	76-119	WG756626
cis-1,3-Dichloropropene	mg/l	.025	0.0258	103.	78.2-120	WG756626
Dibromomethane	mg/l	.025	0.0250	100.	79.5-118	WG756626
Ethylbenzene	mg/l	.025	0.0247	98.7	78.8-122	WG756626
Iodomethane	mg/l	.125	0.142	113.	61-130	WG756626
Methylene Chloride	mg/l	.025	0.0230	92.0	70.3-120	WG756626
Styrene	mg/l	.025	0.0264	106.	80.4-126	WG756626
Tetrachloroethene	mg/l	.025	0.0248	99.3	72.6-126	WG756626
Toluene	mg/l	.025	0.0235	94.0	79.7-116	WG756626
trans-1,2-Dichloroethene	mg/l	.025	0.0236	94.3	72.6-121	WG756626
trans-1,3-Dichloropropene	mg/l	.025	0.0265	106.	74.3-123	WG756626
trans-1,4-Dichloro-2-butene	mg/l	.025	0.0246	98.3	65.1-123	WG756626
Trichloroethene	mg/l	.025	0.0243	97.1	77.7-118	WG756626
Trichlorofluoromethane	mg/l	.025	0.0233	93.2	63.5-135	WG756626
Vinyl acetate	mg/l	.125	0.146	117.	65-138	WG756626

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Vinyl chloride	mg/l	.025	0.0233	93.4	65.9-128	WG756626
Xylenes, Total	mg/l	.075	0.0747	99.5	78.7-121	WG756626
4-Bromofluorobenzene				99.80	71-126	WG756626
Dibromofluoromethane				95.60	78.3-121	WG756626
Toluene-d8				102.0	88.5-111	WG756626
a,a,a-Trifluorotoluene				101.0	85-114	WG756626
Aluminum	mg/l	1	1.08	108.	80-120	WG756908
Barium	mg/l	1	1.05	105.	80-120	WG756908
Boron	mg/l	1	1.01	101.	80-120	WG756908
Calcium	mg/l	10	10.4	104.	80-120	WG756908
Chromium	mg/l	1	1.03	103.	80-120	WG756908
Cobalt	mg/l	1	1.07	107.	80-120	WG756908
Iron	mg/l	1	1.06	106.	80-120	WG756908
Magnesium	mg/l	10	10.6	106.	80-120	WG756908
Manganese	mg/l	1	1.04	104.	80-120	WG756908
Nickel	mg/l	1	0.992	99.0	80-120	WG756908
Potassium	mg/l	10	10.5	105.	80-120	WG756908
Silver	mg/l	1	1.00	100.	80-120	WG756908
Sodium	mg/l	10	10.2	102.	80-120	WG756908
Vanadium	mg/l	1	1.04	104.	80-120	WG756908
Antimony	mg/l	.05	0.0555	111.	85-115	WG757119
Arsenic	mg/l	.05	0.0527	105.	85-115	WG757119
Beryllium	mg/l	.05	0.0553	111.	85-115	WG757119
Cadmium	mg/l	.05	0.0542	108.	85-115	WG757119
Copper	mg/l	.05	0.0524	105.	85-115	WG757119
Lead	mg/l	.05	0.0539	108.	85-115	WG757119
Selenium	mg/l	.05	0.0544	109.	85-115	WG757119
Thallium	mg/l	.05	0.0548	110.	85-115	WG757119
Zinc	mg/l	.05	0.0470	94.0	85-115	WG757119

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
Bromide	mg/l	40.5	40.5	101.	90-110	0.0	20	WG756208
Chloride	mg/l	39.0	39.0	98.0	90-110	0.0	20	WG756208
Nitrate	mg/l	8.29	8.29	104.	90-110	0.0	20	WG756208
Sulfate	mg/l	39.8	39.9	100.	90-110	0.0	20	WG756208
Mercury	mg/l	0.00326	0.00319	109.	85-115	2.00	20	WG756319
Aluminum,Dissolved	mg/l	1.04	1.09	104.	80-120	4.00	20	WG756478
Boron,Dissolved	mg/l	1.00	0.999	100.	80-120	0.0	20	WG756478
Calcium,Dissolved	mg/l	9.56	9.41	96.0	80-120	2.00	20	WG756478
Iron,Dissolved	mg/l	0.959	0.945	96.0	80-120	1.00	20	WG756478
Magnesium,Dissolved	mg/l	10.1	9.93	101.	80-120	2.00	20	WG756478
Manganese,Dissolved	mg/l	0.967	0.971	97.0	80-120	0.0	20	WG756478
Potassium,Dissolved	mg/l	10.0	9.78	100.	80-120	2.00	20	WG756478
Sodium,Dissolved	mg/l	9.99	9.86	100.	80-120	1.00	20	WG756478
Ammonia Nitrogen	mg/l	7.05	7.37	94.0	90-110	4.44	20	WG756259

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Analyte	Units	Laboratory Control Sample Result	Ref	%Rec	Limit	Duplicate RPD	Limit	Batch
1,1,1,2-Tetrachloroethane	mg/l	0.0246	0.0244	98.0	74.2-124	0.900	20	WG756626
1,1,1-Trichloroethane	mg/l	0.0241	0.0247	96.0	73.2-123	2.47	20	WG756626
1,1,2,2-Tetrachloroethane	mg/l	0.0246	0.0245	98.0	70.7-122	0.540	20	WG756626
1,1,2-Trichloroethane	mg/l	0.0246	0.0240	98.0	77.7-118	2.29	20	WG756626
1,1-Dichloroethane	mg/l	0.0243	0.0242	97.0	70.7-126	0.250	20	WG756626
1,1-Dichloroethene	mg/l	0.0235	0.0224	94.0	67.8-129	4.93	20	WG756626
1,2,3-Trichloropropane	mg/l	0.0257	0.0243	103.	71.8-121	5.83	20	WG756626
1,2-Dichlorobenzene	mg/l	0.0253	0.0245	101.	78.4-117	3.46	20	WG756626
1,2-Dichloroethane	mg/l	0.0259	0.0261	104.	68.8-124	0.570	20	WG756626
1,2-Dichloropropane	mg/l	0.0252	0.0251	101.	76.5-119	0.300	20	WG756626
1,4-Dichlorobenzene	mg/l	0.0246	0.0242	98.0	78.8-115	1.49	20	WG756626
2-Butanone (MEK)	mg/l	0.127	0.124	101.	55-149	2.03	20	WG756626
2-Hexanone	mg/l	0.129	0.128	103.	65.6-144	0.250	20	WG756626
4-Methyl-2-pentanone (MIBK)	mg/l	0.128	0.130	102.	70.5-133	2.07	20	WG756626
Acetone	mg/l	0.113	0.109	90.0	35.6-163	3.55	23.9	WG756626
Acrylonitrile	mg/l	0.128	0.126	102.	55.2-130	1.58	20	WG756626
Benzene	mg/l	0.0253	0.0252	101.	74.8-121	0.230	20	WG756626
Bromochloromethane	mg/l	0.0251	0.0254	100.	77.6-119	1.14	20	WG756626
Bromodichloromethane	mg/l	0.0260	0.0259	104.	75.1-116	0.520	20	WG756626
Bromoform	mg/l	0.0247	0.0244	99.0	67.5-130	1.10	20	WG756626
Bromomethane	mg/l	0.0409	0.0391	164*	49.9-162	4.71	20	WG756626
Carbon disulfide	mg/l	0.0242	0.0235	97.0	64.6-140	2.99	20	WG756626
Carbon tetrachloride	mg/l	0.0242	0.0247	97.0	70.2-123	1.85	20	WG756626
Chlorobenzene	mg/l	0.0252	0.0256	101.	78.1-119	1.64	20	WG756626
Chlorodibromomethane	mg/l	0.0253	0.0250	101.	74-121	1.24	20	WG756626
Chloroethane	mg/l	0.0305	0.0293	122.	61.7-135	3.80	20	WG756626
Chloroform	mg/l	0.0248	0.0247	99.0	76-121	0.280	20	WG756626
Chloromethane	mg/l	0.0261	0.0244	104.	61.5-129	6.47	20	WG756626
cis-1,2-Dichloroethene	mg/l	0.0238	0.0241	95.0	76-119	1.03	20	WG756626
cis-1,3-Dichloropropene	mg/l	0.0252	0.0258	101.	78.2-120	2.07	20	WG756626
Dibromomethane	mg/l	0.0252	0.0250	101.	79.5-118	0.880	20	WG756626
Ethylbenzene	mg/l	0.0240	0.0247	96.0	78.8-122	2.91	20	WG756626
Iodomethane	mg/l	0.145	0.142	116.	61-130	2.45	20	WG756626
Methylene Chloride	mg/l	0.0240	0.0230	96.0	70.3-120	4.23	20	WG756626
Styrene	mg/l	0.0259	0.0264	104.	80.4-126	1.79	20	WG756626
Tetrachloroethene	mg/l	0.0250	0.0248	100.	72.6-126	0.520	20	WG756626
Toluene	mg/l	0.0233	0.0235	93.0	79.7-116	0.990	20	WG756626
trans-1,2-Dichloroethene	mg/l	0.0241	0.0236	96.0	72.6-121	2.14	20	WG756626
trans-1,3-Dichloropropene	mg/l	0.0254	0.0265	102.	74.3-123	4.33	20	WG756626
trans-1,4-Dichloro-2-butene	mg/l	0.0256	0.0246	102.	65.1-123	4.21	20	WG756626
Trichloroethene	mg/l	0.0248	0.0243	99.0	77.7-118	2.04	20	WG756626
Trichlorofluoromethane	mg/l	0.0243	0.0233	97.0	63.5-135	4.16	20	WG756626
Vinyl acetate	mg/l	0.146	0.146	116.	65-138	0.390	20	WG756626
Vinyl chloride	mg/l	0.0246	0.0233	98.0	65.9-128	5.20	20	WG756626
Xylenes, Total	mg/l	0.0735	0.0747	98.0	78.7-121	1.50	20	WG756626
4-Bromofluorobenzene				95.80	71-126			WG756626
Dibromofluoromethane				94.20	78.3-121			WG756626
Toluene-d8				100.0	88.5-111			WG756626
a,a,a-Trifluorotoluene				101.0	85-114			WG756626
Aluminum	mg/l	1.08	1.08	108.	80-120	0.0	20	WG756908
Barium	mg/l	1.04	1.05	104.	80-120	1.00	20	WG756908
Boron	mg/l	1.01	1.01	101.	80-120	0.0	20	WG756908
Calcium	mg/l	10.3	10.4	103.	80-120	1.00	20	WG756908
Chromium	mg/l	1.02	1.03	102.	80-120	0.0	20	WG756908
Cobalt	mg/l	1.06	1.07	106.	80-120	1.00	20	WG756908
Iron	mg/l	1.05	1.06	105.	80-120	1.00	20	WG756908
Magnesium	mg/l	10.5	10.6	104.	80-120	1.00	20	WG756908

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Analyte	Units	Laboratory Control Sample Result	Ref	%Rec	Limit	RPD	Limit	Batch
Manganese	mg/l	1.03	1.04	103.	80-120	1.00	20	WG756908
Nickel	mg/l	0.993	0.992	99.0	80-120	0.0	20	WG756908
Potassium	mg/l	10.6	10.5	106.	80-120	1.00	20	WG756908
Silver	mg/l	0.995	1.00	99.0	80-120	1.00	20	WG756908
Sodium	mg/l	10.3	10.2	103.	80-120	1.00	20	WG756908
Vanadium	mg/l	1.04	1.04	104.	80-120	1.00	20	WG756908
Antimony	mg/l	0.0557	0.0555	111.	85-115	0.0	20	WG757119
Arsenic	mg/l	0.0547	0.0527	109.	85-115	4.00	20	WG757119
Beryllium	mg/l	0.0556	0.0553	111.	85-115	1.00	20	WG757119
Cadmium	mg/l	0.0555	0.0542	111.	85-115	2.00	20	WG757119
Copper	mg/l	0.0535	0.0524	107.	85-115	2.00	20	WG757119
Lead	mg/l	0.0544	0.0539	109.	85-115	1.00	20	WG757119
Selenium	mg/l	0.0542	0.0544	108.	85-115	0.0	20	WG757119
Thallium	mg/l	0.0556	0.0548	111.	85-115	1.00	20	WG757119
Zinc	mg/l	0.0468	0.0470	94.0	85-115	0.0	20	WG757119

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Chloride	mg/l	56.7	7.81	50	98.0	80-120	L735098-02	WG756208
Nitrate	mg/l	4.68	0.0	5	94.0	80-120	L735098-02	WG756208
Sulfate	mg/l	50.6	2.24	50	97.0	80-120	L735098-02	WG756208
Mercury	mg/l	0.00335	0.0000253	.003	110.	80-120	L735095-09	WG756319
Calcium,Dissolved	mg/l	64.6	54.2	10	100.	75-125	L734659-21	WG756478
Iron,Dissolved	mg/l	0.961	0.00395	1	96.0	75-125	L734659-21	WG756478
Magnesium,Dissolved	mg/l	48.9	38.8	10	100.	75-125	L734659-21	WG756478
Manganese,Dissolved	mg/l	0.959	-0.00109	1	96.0	75-125	L734659-21	WG756478
Potassium,Dissolved	mg/l	12.5	2.44	10	100.	75-125	L734659-21	WG756478
Sodium,Dissolved	mg/l	63.1	53.0	10	100.	75-125	L734659-21	WG756478
Ammonia Nitrogen	mg/l	14.4	4.60	10	98.0	90-110	L734909-01	WG756259
1,1,1,2-Tetrachloroethane	mg/l	0.0246	0.0	.025	98.0	64-128	L735200-01	WG756626
1,1,1-Trichloroethane	mg/l	0.0243	0.0	.025	97.0	58.7-134	L735200-01	WG756626
1,1,2,2-Tetrachloroethane	mg/l	0.0273	0.0	.025	110.	56-132	L735200-01	WG756626
1,1,2-Trichloroethane	mg/l	0.0258	0.0	.025	100.	66.3-125	L735200-01	WG756626
1,1-Dichloroethane	mg/l	0.0247	0.0	.025	99.0	58.5-132	L735200-01	WG756626
1,1-Dichloroethene	mg/l	0.0242	0.0	.025	97.0	51.1-140	L735200-01	WG756626
1,2,3-Trichloropropane	mg/l	0.0275	0.0	.025	110.	61.4-128	L735200-01	WG756626
1,2-Dichlorobenzene	mg/l	0.0255	0.0	.025	100.	68.2-123	L735200-01	WG756626
1,2-Dichloroethane	mg/l	0.0271	0.0	.025	110.	60-126	L735200-01	WG756626
1,2-Dichloropropane	mg/l	0.0256	0.0	.025	100.	64.2-123	L735200-01	WG756626
1,4-Dichlorobenzene	mg/l	0.0256	0.0	.025	100.	68.6-123	L735200-01	WG756626
2-Butanone (MEK)	mg/l	0.137	0.0	.125	110.	22.4-138	L735200-01	WG756626
2-Hexanone	mg/l	0.144	0.0	.125	120.	43.3-137	L735200-01	WG756626
4-Methyl-2-pentanone (MIBK)	mg/l	0.142	0.0	.125	110.	60.8-140	L735200-01	WG756626
Acetone	mg/l	0.121	0.00234	.125	95.0	10-130	L735200-01	WG756626
Acrylonitrile	mg/l	0.145	0.0	.125	120.	49.4-133	L735200-01	WG756626
Benzene	mg/l	0.0254	0.0	.025	100.	54.3-133	L735200-01	WG756626
Bromochloromethane	mg/l	0.0261	0.0	.025	100.	66.5-122	L735200-01	WG756626
Bromodichloromethane	mg/l	0.0267	0.0	.025	110.	63.9-121	L735200-01	WG756626

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Bromoform	mg/l	0.0258	0.0	.025	100.	59.5-134	L735200-01	WG756626
Bromomethane	mg/l	0.0426	0.0	.025	170.*	41.7-155	L735200-01	WG756626
Carbon disulfide	mg/l	0.0249	0.0	.025	99.0	43.3-149	L735200-01	WG756626
Carbon tetrachloride	mg/l	0.0249	0.0	.025	100.	55.7-134	L735200-01	WG756626
Chlorobenzene	mg/l	0.0254	0.0	.025	100.	67-125	L735200-01	WG756626
Chlorodibromomethane	mg/l	0.0261	0.0	.025	100.	64.3-125	L735200-01	WG756626
Chloroethane	mg/l	0.0320	0.0	.025	130.	51.5-136	L735200-01	WG756626
Chloroform	mg/l	0.0254	0.0	.025	100.	63-129	L735200-01	WG756626
Chloromethane	mg/l	0.0278	0.0	.025	110.	42.4-135	L735200-01	WG756626
cis-1,2-Dichloroethene	mg/l	0.0244	0.0	.025	98.0	59.2-129	L735200-01	WG756626
cis-1,3-Dichloropropene	mg/l	0.0255	0.0	.025	100.	66.4-125	L735200-01	WG756626
Dibromomethane	mg/l	0.0262	0.0	.025	100.	68.2-124	L735200-01	WG756626
Ethylbenzene	mg/l	0.0247	0.0	.025	99.0	61.4-133	L735200-01	WG756626
Iodomethane	mg/l	0.150	0.0	.125	120.	49.7-132	L735200-01	WG756626
Methylene Chloride	mg/l	0.0241	0.000333	.025	95.0	58.1-122	L735200-01	WG756626
Styrene	mg/l	0.0259	0.0	.025	100.	66.8-133	L735200-01	WG756626
Tetrachloroethene	mg/l	0.0247	0.0	.025	99.0	53-139	L735200-01	WG756626
Toluene	mg/l	0.0232	0.0	.025	93.0	61.4-130	L735200-01	WG756626
trans-1,2-Dichloroethene	mg/l	0.0246	0.0	.025	98.0	56.5-129	L735200-01	WG756626
trans-1,3-Dichloropropene	mg/l	0.0254	0.0	.025	100.	64.1-128	L735200-01	WG756626
trans-1,4-Dichloro-2-butene	mg/l	0.0287	0.0	.025	120.	57.1-130	L735200-01	WG756626
Trichloroethene	mg/l	0.0242	0.0	.025	97.0	44.1-149	L735200-01	WG756626
Trichlorofluoromethane	mg/l	0.0255	0.0	.025	100.	49.6-145	L735200-01	WG756626
Vinyl acetate	mg/l	0.169	0.0	.125	140.	56.1-149	L735200-01	WG756626
Vinyl chloride	mg/l	0.0257	0.0	.025	100.	47.8-137	L735200-01	WG756626
Xylenes, Total	mg/l	0.0751	0.0	.075	100.	63.3-131	L735200-01	WG756626
4-Bromofluorobenzene					96.60	71-126		WG756626
Dibromofluoromethane					95.40	78.3-121		WG756626
Toluene-d8					98.60	88.5-111		WG756626
a,a,a-Trifluorotoluene					99.70	85-114		WG756626
Aluminum	mg/l	1.09	0.0432	1	100.	75-125	L735200-01	WG756908
Barium	mg/l	1.05	0.0197	1	100.	75-125	L735200-01	WG756908
Boron	mg/l	1.05	0.0545	1	99.0	75-125	L735200-01	WG756908
Calcium	mg/l	14.1	4.03	10	100.	75-125	L735200-01	WG756908
Chromium	mg/l	1.01	0.00142	1	100.	75-125	L735200-01	WG756908
Cobalt	mg/l	1.09	0.0459	1	100.	75-125	L735200-01	WG756908
Iron	mg/l	18.4	17.9	1	54.0*	75-125	L735200-01	WG756908
Magnesium	mg/l	13.4	3.22	10	100.	75-125	L735200-01	WG756908
Manganese	mg/l	1.91	0.937	1	98.0	75-125	L735200-01	WG756908
Nickel	mg/l	0.987	0.0111	1	98.0	75-125	L735200-01	WG756908
Potassium	mg/l	11.5	1.19	10	100.	75-125	L735200-01	WG756908
Silver	mg/l	0.986	0.000420	1	99.0	75-125	L735200-01	WG756908
Sodium	mg/l	13.9	4.05	10	99.0	75-125	L735200-01	WG756908
Vanadium	mg/l	1.02	-0.000187	1	100.	75-125	L735200-01	WG756908
Antimony	mg/l	0.0545	0.000370	.05	110.	75-125	L735200-01	WG757119
Arsenic	mg/l	0.113	0.0594	.05	110.	75-125	L735200-01	WG757119
Beryllium	mg/l	0.0523	0.0000800	.05	100.	75-125	L735200-01	WG757119
Cadmium	mg/l	0.0534	0.000140	.05	110.	75-125	L735200-01	WG757119
Copper	mg/l	0.0490	0.000180	.05	98.0	75-125	L735200-01	WG757119
Lead	mg/l	0.0540	0.0000700	.05	110.	75-125	L735200-01	WG757119
Selenium	mg/l	0.0523	0.000200	.05	100.	75-125	L735200-01	WG757119
Thallium	mg/l	0.0543	-0.000010	.05	110.	75-125	L735200-01	WG757119
Zinc	mg/l	0.0517	0.0106	.05	82.0	75-125	L735200-01	WG757119

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Chloride	mg/l	56.8	56.7	97.9	80-120	0.0	20	L735098-02	WG756208
Nitrate	mg/l	4.70	4.68	94.0	80-120	1.00	20	L735098-02	WG756208
Sulfate	mg/l	50.9	50.6	97.2	80-120	1.00	20	L735098-02	WG756208
Mercury	mg/l	0.00336	0.00335	111.	80-120	0.0	20	L735095-09	WG756319
Calcium,Dissolved	mg/l	64.3	64.6	101.	75-125	0.0	20	L734659-21	WG756478
Iron,Dissolved	mg/l	0.933	0.961	92.9	75-125	3.00	20	L734659-21	WG756478
Magnesium,Dissolved	mg/l	48.6	48.9	98.2	75-125	1.00	20	L734659-21	WG756478
Manganese,Dissolved	mg/l	0.946	0.959	94.7	75-125	1.00	20	L734659-21	WG756478
Potassium,Dissolved	mg/l	12.2	12.5	98.0	75-125	2.00	20	L734659-21	WG756478
Sodium,Dissolved	mg/l	62.7	63.1	96.8	75-125	1.00	20	L734659-21	WG756478
Ammonia Nitrogen	mg/l	13.9	14.4	93.0	90-110	3.53	20	L734909-01	WG756259
1,1,1,2-Tetrachloroethane	mg/l	0.0251	0.0246	100.	64-128	2.23	20	L735200-01	WG756626
1,1,1-Trichloroethane	mg/l	0.0255	0.0243	102.	58.7-134	4.55	20	L735200-01	WG756626
1,1,2,2-Tetrachloroethane	mg/l	0.0275	0.0273	110.	56-132	0.690	22.2	L735200-01	WG756626
1,1,2-Trichloroethane	mg/l	0.0261	0.0258	104.	66.3-125	1.41	20	L735200-01	WG756626
1,1-Dichloroethane	mg/l	0.0253	0.0247	101.	58.5-132	2.53	20	L735200-01	WG756626
1,1-Dichloroethene	mg/l	0.0250	0.0242	100.	51.1-140	3.19	20.2	L735200-01	WG756626
1,2,3-Trichloropropane	mg/l	0.0285	0.0275	114.	61.4-128	3.53	22.4	L735200-01	WG756626
1,2-Dichlorobenzene	mg/l	0.0261	0.0255	104.	68.2-123	2.24	20	L735200-01	WG756626
1,2-Dichloroethane	mg/l	0.0277	0.0271	111.	60-126	2.22	20	L735200-01	WG756626
1,2-Dichloropropane	mg/l	0.0260	0.0256	104.	64.2-123	1.68	20	L735200-01	WG756626
1,4-Dichlorobenzene	mg/l	0.0261	0.0256	104.	68.6-123	1.93	20	L735200-01	WG756626
2-Butanone (MEK)	mg/l	0.139	0.137	111.	22.4-138	1.38	27	L735200-01	WG756626
2-Hexanone	mg/l	0.143	0.144	114.	43.3-137	0.820	25.5	L735200-01	WG756626
4-Methyl-2-pentanone (MIBK)	mg/l	0.142	0.142	113.	60.8-140	0.0900	25.1	L735200-01	WG756626
Acetone	mg/l	0.122	0.121	95.5	10-130	0.940	27.9	L735200-01	WG756626
Acrylonitrile	mg/l	0.146	0.145	117.	49.4-133	0.720	25.3	L735200-01	WG756626
Benzene	mg/l	0.0265	0.0254	106.	54.3-133	4.23	20	L735200-01	WG756626
Bromochloromethane	mg/l	0.0263	0.0261	105.	66.5-122	0.910	20.8	L735200-01	WG756626
Bromodichloromethane	mg/l	0.0271	0.0267	108.	63.9-121	1.45	20	L735200-01	WG756626
Bromoform	mg/l	0.0263	0.0258	105.	59.5-134	1.65	20.5	L735200-01	WG756626
Bromomethane	mg/l	0.0441	0.0426	176.*	41.7-155	3.47	21.9	L735200-01	WG756626
Carbon disulfide	mg/l	0.0258	0.0249	103.	43.3-149	3.81	20.3	L735200-01	WG756626
Carbon tetrachloride	mg/l	0.0254	0.0249	101.	55.7-134	1.68	20	L735200-01	WG756626
Chlorobenzene	mg/l	0.0262	0.0254	105.	67-125	3.26	20	L735200-01	WG756626
Chlorodibromomethane	mg/l	0.0263	0.0261	105.	64.3-125	0.710	20.8	L735200-01	WG756626
Chloroethane	mg/l	0.0319	0.0320	128.	51.5-136	0.390	40	L735200-01	WG756626
Chloroform	mg/l	0.0259	0.0254	103.	63-129	1.89	20	L735200-01	WG756626
Chloromethane	mg/l	0.0267	0.0278	107.	42.4-135	4.15	20	L735200-01	WG756626
cis-1,2-Dichloroethene	mg/l	0.0247	0.0244	98.8	59.2-129	1.08	20	L735200-01	WG756626
cis-1,3-Dichloropropene	mg/l	0.0260	0.0255	104.	66.4-125	1.60	20	L735200-01	WG756626
Dibromomethane	mg/l	0.0268	0.0262	107.	68.2-124	2.27	20	L735200-01	WG756626
Ethylbenzene	mg/l	0.0254	0.0247	102.	61.4-133	2.96	20	L735200-01	WG756626
Iodomethane	mg/l	0.155	0.150	124.	49.7-132	3.27	20	L735200-01	WG756626
Methylene Chloride	mg/l	0.0249	0.0241	98.2	58.1-122	3.12	20	L735200-01	WG756626
Styrene	mg/l	0.0267	0.0259	107.	66.8-133	2.96	20	L735200-01	WG756626
Tetrachloroethene	mg/l	0.0254	0.0247	102.	53-139	2.72	20	L735200-01	WG756626
Toluene	mg/l	0.0239	0.0232	95.6	61.4-130	2.92	20	L735200-01	WG756626
trans-1,2-Dichloroethene	mg/l	0.0254	0.0246	101.	56.5-129	3.15	20	L735200-01	WG756626
trans-1,3-Dichloropropene	mg/l	0.0267	0.0254	107.	64.1-128	5.11	20	L735200-01	WG756626
trans-1,4-Dichloro-2-butene	mg/l	0.0285	0.0287	114.	57.1-130	0.520	23.9	L735200-01	WG756626
Trichloroethene	mg/l	0.0253	0.0242	101.	44.1-149	4.44	20	L735200-01	WG756626

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Trichlorofluoromethane	mg/l	0.0262	0.0255	105.	49.6-145	2.74	21.2	L735200-01	WG756626
Vinyl acetate	mg/l	0.170	0.169	136.	56.1-149	0.330	22.7	L735200-01	WG756626
Vinyl chloride	mg/l	0.0265	0.0257	106.	47.8-137	2.88	20	L735200-01	WG756626
Xylenes, Total	mg/l	0.0769	0.0751	102.	63.3-131	2.46	20	L735200-01	WG756626
4-Bromofluorobenzene				96.70	71-126				WG756626
Dibromofluoromethane				95.70	78.3-121				WG756626
Toluene-d8				98.50	88.5-111				WG756626
a,a,a-Trifluorotoluene				100.0	85-114				WG756626
Aluminum	mg/l	1.07	1.09	103.	75-125	2.00	20	L735200-01	WG756908
Barium	mg/l	1.04	1.05	102.	75-125	1.00	20	L735200-01	WG756908
Boron	mg/l	1.04	1.05	98.5	75-125	1.00	20	L735200-01	WG756908
Calcium	mg/l	13.9	14.1	98.9	75-125	1.00	20	L735200-01	WG756908
Chromium	mg/l	0.996	1.01	99.4	75-125	2.00	20	L735200-01	WG756908
Cobalt	mg/l	1.08	1.09	103.	75-125	1.00	20	L735200-01	WG756908
Iron	mg/l	18.3	18.4	40.3*	75-125	1.00	20	L735200-01	WG756908
Magnesium	mg/l	13.2	13.4	99.9	75-125	1.00	20	L735200-01	WG756908
Manganese	mg/l	1.89	1.91	95.5	75-125	1.00	20	L735200-01	WG756908
Nickel	mg/l	0.977	0.987	96.6	75-125	1.00	20	L735200-01	WG756908
Potassium	mg/l	11.4	11.5	102.	75-125	0.0	20	L735200-01	WG756908
Silver	mg/l	0.971	0.986	97.0	75-125	2.00	20	L735200-01	WG756908
Sodium	mg/l	14.0	13.9	99.5	75-125	0.0	20	L735200-01	WG756908
Vanadium	mg/l	1.01	1.02	101.	75-125	1.00	20	L735200-01	WG756908
Antimony	mg/l	0.0596	0.0545	118.	75-125	9.00	20	L735200-01	WG757119
Arsenic	mg/l	0.119	0.113	118.	75-125	5.00	20	L735200-01	WG757119
Beryllium	mg/l	0.0570	0.0523	114.	75-125	9.00	20	L735200-01	WG757119
Cadmium	mg/l	0.0581	0.0534	116.	75-125	9.00	20	L735200-01	WG757119
Copper	mg/l	0.0528	0.0490	105.	75-125	8.00	20	L735200-01	WG757119
Lead	mg/l	0.0576	0.0540	115.	75-125	6.00	20	L735200-01	WG757119
Selenium	mg/l	0.0543	0.0523	108.	75-125	4.00	20	L735200-01	WG757119
Thallium	mg/l	0.0580	0.0543	116.	75-125	7.00	20	L735200-01	WG757119
Zinc	mg/l	0.0552	0.0517	89.1	75-125	7.00	20	L735200-01	WG757119

Serial Dilution

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

Serial Dilution

Batch number /Run number / Sample number cross reference

WG756208: R3006040: L735200-01 02 03 04 05
WG756319: R3006276: L735200-01 02 03 04 05
WG756478: R3006649 R3006735: L735200-01 02 03 04 05
WG756259: R3006688: L735200-01 02 03 04 05
WG756626: R3007042: L735200-01 02 03 04 05 06
WG756908: R3007100: L735200-01 02 03 04 05
WG757119: R3007147 R3007247: L735200-01 02 03 04 05

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Civil & Environmental Consultants - TN
Mike Johnson
325 Seaboard Lane, Suite 170
Franklin, TN 37067

Quality Assurance Report
Level II

L735200

December 19, 2014

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

Civil & Environmental Consultants - TN
405 Duke Drive, Suite 270
Franklin, TN 37067

Billing information:
Dr. Kevin Wolfe
405 Duke Drive, Suite 270
Franklin, TN 37067

Chain of Custody
Page 1 of 1

ESC LABS
12065 Lebanon Road
Mt. Juliet, TN 37122
Phone: (800) 767-5859
Phone: (615) 758-5858
Fax: (615) 758-5859
A153

Report to: Mr. Michael Johnson / Philip Campbell
Email: mjohnson@cecinc.com
Project Description: EWS - Camden
City/State Collected:
Phone: (615) 333-7797
FAX: (615) 333-7751
Client Project #: 101-301
Lab Project #: CEC-CUSTOM TIRE
Collected by (print): Philip Campbell
Site/Facility ID#:
P.O.#:
Collected by (signature): Philip Campbell
Immediately Packed on Ice N ___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day.....100%
___ Two Day.....50%
___ Three Day.....25%

Date Results Needed
Email? __No X Yes
FAX? __No __Yes

Acctnum: CEC (lab use only)
Template/Prelogin: T76821 / P419592
Cooler #: 1-30
Shipped Via: Courier L735280

Analysis/Container/Preservative

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	Cl, Nitrate, SO4 125mlHDPE-NoPres	Dissolved Metals 500mlHDPE-NoPres (HNO3) Field Filtered * Hold	NH3 250mlHDPE-H2SO4 <2	Total Metals 500mlHDPE-HNO3 <2	App IV no lat, les-HCl			Remarks/Contaminant	Sample # (lab only)
MW-1	Grab	GW	—	11-21-14	1300	7	X	X	X	X	X				-01
~~MW-4~~ MW-4	Grab	GW	—	11-21-14	1325	7	X	X	X	X	X				-02
MW-3	Grab	GW	—	11-21-14	1400	7	X	X	X	X	X				-03
DUPLICATE	Grab	GW	—	11-21-14	—	7	X	X	X	X	X				-04
FIELD BLANK	Grab	GW	—	11-21-14	1230	7	X	X	X	X	X				-05
~~EQUIPMENT BLANK~~		GW				4	X	X	X	X					
Trip Blank	—	W	—	—	—	1					X				-06

*Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other _____

pH _____ Temp _____

Remarks: Total & Dissolved metals = AP1 + Al, B, Ca, Fe, K, Mg, Mn, Na

Flow _____ Other _____

* Hold Dissolved Metals. Field Filtered w/ 0.45 micron filter. HNO3 pres.

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
Philip Campbell	11-21-14	1710	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☒ CLT
Temp: 3.2 Bottles Received:
Date: 11/21/14 Time: 17:13

Condition: on ice (lab use only) OK
COC Seal Intact: ___ Y ___ N ___ NA
pH Checked: NCF:

11-21-14 EWS cloudy, 40s PC

8:00 - Arrive, check-in, C.

10:10 - meet TD Eng - Michael David.

10:30 - Cal. Hach YSI & Turbidimeter. pH 4,7,10.

Well	DTW	TD	WC	1 Vol	3 Vol
MW-2	7.90	10.60			
MW-4	11.55	23.10	11.55	≈2	5.8
MW-3	19.55	27.01	7.45	1.21	3.66
MW-1	22.74	30.50	7.76	1.3	3.85

30.50 23.10 27.01
22.74 11.55 19.55
7.76 11.55 7.45

MW-1, use clean poly tubing & peristaltic for purge.

Time	Temp	pH	Cond	DO	ORP	Turb	Gal
1055	15.9	6.18	68.4	6.26	+1.3	OR	0 - V_0
1100	16.6	5.89	84.7	6.83	+48	1390	1.5 - V_1
1105	16.1	5.86	99.8	6.78	12.0	375	2.5

1110 - Going dry @ 2.6, very turbid. Turn off pump for recharge.

11:15 - Resample purging

11:20	15.6	5.62	102.5	4.02	22.4	183	4.0 - V_3
11:							

NTU = 1380 @ sample

4 gallons purged, water clearing up. Turn off pump, come back to sample.

1300 - sample via clean bailer

Well	Current Condition
MW-1	Good, accessible, all caps & locks appear well, pad good
MW-2	Good, pad good, locking cap good
MW-3	Good, easily accessible, locks well, pad good
MW-4	Good, pad good, cap locks, no issues

11-21-14 EWS - Camden Cloudy, 40's PC

MW-4 - purge using peristaltic pump & tubing

Time	Temp	pH	Cond	DO	ORP	Turb	Gal
1142	16.5	5.81	64.3	4.77	57.1	OR	0
1140	16.6	5.67	62.0	3.49	81.3	129	2
1147	16.7	5.69	61.4	3.07	102.4	33.6	4
1153	16.7	5.71	61.2	2.82	126.4	8.51	6

Total Gal purged = 6.5 NTU = 12.1 @ samp

* Sample via bailer 1325 12

MW-3 TD = 27.00 19.55 = DTW WC = No

Time	Temp	pH	Cond	DO	ORP	Turb	Gal
1209	18.6	5.48	311.9	4.97	133.7	200	0
1213	18.9	5.57	332.5	3.00	76.5	344	1.2
1223	18.5	5.34	312.4	4.12	126.4	767	2.4
1226	Let sit 5 min, going dry						
1245	18.4	5.26	305.3	3.56	125.6	885	3.4

NTU = 28.6 @ sample Dry

1230 - FB sample Taken @ MW-3

1400 - Sample via bailer, purged via peristaltic pump

MW-2 parameters

Temp	pH	Cond	DO	ORP	Turb
17.0	5.40	233.2	4.91	140.3	NA

samples

	Time
FB -	1230
MW-1	1300
MW-4	1325 =
MW-3	1400
Duplicate =	MW-4

1710 - Delivered to lab

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.