Appendix P - August 2016 SWRP Post Closure Groundwater Monitoring Report

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August 31, 2016

By Federal Express (Tracking Number: 777082386232)

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RE: Submission of the Semi Annual Resource Conservation and Recovery Act Post-Closure Monitoring Report
Stormwater Retention Pond, Permit No. 000396549
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma

Dear Mr. Hensch:

On behalf of Wynnewood Refining Company (WRC), please find enclosed the Semi Annual Resource Conservation and Recovery Act (RCRA) Post-Closure Monitoring Report detailing post-closure monitoring activities for the closed Storm Water Retention Pond (SWRP) at the Wynnewood Refinery in Wynnewood, Oklahoma. WRC will continue post-closure detection monitoring as detailed in the RCRA Operations and Post-Closure Permit No. 000396549. The next sampling event is scheduled for December 2016 with a monitoring report submittal date of March 1, 2017.

If you have any questions, please do not hesitate to contact me at the number listed above.

Sincerely,

Sam A. McCormick
Project Manager

SAM:cew
K:\Coffeyville Resources\WRC\Reporting\RCRA Semi-Annual Reports\September 2016\WRC_083115_RCRA SArpt cover letter.doc

Enclosure

cc/encl: Evan Hilburn – Wynnewood Refining Company, LLC
Jerome McSorley – CVR Energy, Inc.
Christine Warford – WSP | Parsons Brinckerhoff

SEMI-ANNUAL

POST-CLOSURE MONITORING REPORT

Stormwater Retention Pond
RCRA Permit No. 000396549

WYNNEWOOD REFINING COMPANY, LLC

WYNNEWOOD, OKLAHOMA

Prepared by CVR Energy, Inc. and

WSP | Parsons Brinckerhoff

August 31, 2016

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SEMI-ANNUAL
POST-CLOSURE MONITORING REPORT
STORMWATER RETENTION POND
RCRA PERMIT NO. 000396549

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WYNNEWOOD REFINERY
WYNNEWOOD, OKLAHOMA

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August 31, 2016

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08/31/2016

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Sam. A. McCormick
CVR Energy, Inc.

Report Distribution:

Donald Hensch – ODEQ
Evan Hilburn – WRC

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Acronyms

BTEX	benzene, toluene, ethylbenzene, and xylenes
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
ft/day	feet per day
ft/ft	foot per foot
ft/mile	feet per mile
ft/year	feet per year
GRO	gasoline range organics
LOQ	limit of quantification
MCL	Maximum Contaminant Level
µg/l	micrograms per liter
mg/l	milligrams per liter
ODEQ	Oklahoma Department of Environmental Quality
PHC	principal hazardous constituents
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SWRP	storm water retention pond
TPH	total petroleum hydrocarbons
WRC	Wynnewood Refining Company, LLC

1 Introduction and Site History

1.1 INTRODUCTION

Wynnewood Refining Company, LLC (WRC) owns and operates a petroleum refinery in Wynnewood, Oklahoma (Figure 1). The Refinery operates in accordance with Resource Conservation and Recovery Act (RCRA) Operations and Post-Closure Permit No. 000396549, issued by the Oklahoma Department of Environmental Quality (ODEQ) on May 30, 2007. On January 1, 2012, WRC converted from a corporation to a limited liability company. Although there was no change in the ownership or operational control of the Refinery at that time, the conversion reflects WRC's status as a wholly owned subsidiary of CVR Energy, Inc., effective December 15, 2011. A Class I permit modification reflecting this conversion was approved by ODEQ on May 18, 2012.

1.2 SITE LOCATION AND HISTORY

The closed Storm Water Retention Pond (SWRP) is located in the southern part of the WRC property, along the east side of the BNSF railroad tracks, approximately 0.50 mile south of Wynnewood, Oklahoma. Figure 1A is a United States Geological Survey 7.5-minute quadrangle topographic map showing the location of the Refinery and the closed SWRP. Figure 1B is a topographic site map that includes aerial photography. The closed SWRP is located in the south half of Section 23, Township 2 North, Range 1 East, in Garvin County, Oklahoma. Garvin County is located in south-central Oklahoma in the Washita River Valley. Bedrock in this area is the Upper Pennsylvania Stillwater Formation of the Pontotoc Group.

The closed SWRP was originally a 0.52-acre surface impoundment used to receive refinery storm water. During heavy rain events, some refinery primary sludge may have been carried into the SWRP. When primary sludge was listed as a hazardous waste on May 2, 1991, the SWRP subsequently became a hazardous waste management unit. The SWRP was then closed following a U.S. Environmental Protection Agency (EPA) approved closure plan. The closure method included stabilization of sludge and affected soils (an estimated 860 cubic yards) followed by disposal (at the same location as the original SWRP) into a landfill cell engineered to meet applicable RCRA regulations.

WRC is currently conducting groundwater monitoring and reporting activities in accordance with the RCRA Operations and Post-Closure Permit and the ODEQ state RCRA program. This report summarizes the RCRA groundwater sampling results and evaluation activities conducted during the six-month period from January 1 to June 30, 2016. This report is the 43rd Post-Closure Groundwater Monitoring report since the surface impoundment was officially closed on June 21, 1994.

1.3 NATURE AND EVOLUTION OF GROUNDWATER MONITORING NETWORK

The SWRP monitoring well network consists of four nested well locations (8 total wells). The four SWRP nested monitoring well locations include one upgradient nested pair (SMW-5/5D) and three downgradient nested pairs (SMW-9/9D, SMW-11/11D, and SMW-21/21D). Each nested well pair consists of one monitoring well placed in the shallow alluvial material and one monitoring well placed in the deep alluvial/terrace material. The deeper well is designated by the "D". Pursuant to RCRA regulations in Title 40 of the Code of Federal Regulations Chapter 264 Subpart F, WRC determined the number, hydraulic position, and depth of monitoring wells was sufficient to monitor groundwater conditions beneath the SWRP. The locations of the eight monitoring wells at the SWRP are shown on Figure 2.

Groundwater monitoring initially included an expanded list of principal hazardous constituents (PHCs). After three years and the approval of the ODEQ, the expanded list of PHCs was reduced because some constituents were not detected at significant concentrations. The post-closure permit includes the requirement to test for total petroleum hydrocarbons (TPH) as gasoline range organics (GRO) and diesel range organics (DRO), benzene, toluene, ethylbenzene, total xylenes (BTEX), and total metals (arsenic, barium, chromium, lead, selenium, and vanadium). Under the permit, the wells are sampled semi-annually in the second quarter (June) and the fourth quarter (December) of each year during the post-closure monitoring period.

Initially, the groundwater monitoring data were evaluated to detect statistically significant differences between upgradient and downgradient data sets using statistical procedures approved by ODEQ. Subsequently, the permit was amended to replace the initial statistical procedures with a control chart statistical method, using the Mann-Kendall Trend evaluation when appropriate, for purposes of determining a statistically significant evidence of a release. The Mann-Kendall Trend evaluation is also used for determining statistically significant increases in monitoring parameter concentrations.

1.4 OPERATION AND MAINTENANCE ACTIVITIES

No changes were made to the SWRP monitoring well system from January 1 to June 30, 2016.

2 Sampling and Analysis Procedures

WRC's RCRA permit includes a Groundwater Sampling and Analysis Plan (SAP) for the monitoring well network at the SWRP (Attachment 12 of RCRA Permit No. 000396549). The SAP describes protocols for collecting groundwater samples from the SWRP. On May 10, 2012, an update to the SAP was submitted to ODEQ to include low-flow sampling procedures as a method to sample the monitoring wells (approved by ODEQ on May 30, 2012).

The four SWRP nested monitoring well locations are currently sampled with dedicated pumps using the low-flow sampling techniques (described in the SAP update) semi-annually in June and December for TPH as GRO, TPH as DRO, BTEX, and six metals. The laboratory analytical methods, regulatory screening levels, and analytical results for the June 2016 SWRP sampling events are discussed in Section 4.

3 Groundwater Flow Evaluation

In March and June 2016, groundwater elevations and flow direction at the closed SWRP remained essentially the same as in the previous reporting period. Heavy rainfall preceding and during the reporting period has altered the prevailing groundwater gradient. This temporary perturbation is discussed more fully in Section 3.2. Details of the data evaluation are provided in the following sections.

3.1 GROUNDWATER ELEVATION MEASUREMENTS

Groundwater elevation measurements were collected from the eight SWRP monitoring wells on March 14, 2016, and prior to the groundwater sampling event on June 6, 2016. The measurements of depth to groundwater and calculated groundwater elevation are shown in Table 1. Groundwater elevation contour maps of the closed SWRP area for March and June are included as Figure 3A and Figure 3B, respectively. The static groundwater elevations from the monitoring events over the past nine years (2007 through 2016) are also provided in Table 1. Monitoring well hydrographs, shown on Figure 4, for the same period show a general decreasing trend in groundwater elevation was present from 2007 to 2012. Since 2013, an increasing groundwater elevation trend has been observed. Groundwater elevations increased slightly, an average 0.15 feet, from December 2015 to March 2016 and decreased an average of 0.56 feet from March 2016 to June 2016. Groundwater elevations in June 2016 were approximately the same as elevations measured the previous year (June 2015).

3.2 EVALUATION OF HORIZONTAL DIRECTION OF FLOW AND GRADIENT

The horizontal groundwater flow through the alluvial aquifer underneath the SWRP was toward the south-southeast. This contrasts with the historical data, which indicates that groundwater flow is toward the south-southwest. This adjustment in the groundwater flow direction was first noted in June 2015, following heavy (well above average) spring and early summer precipitation. WRC believes the change in groundwater flow direction is a temporary phenomenon and the groundwater flow direction will return to its historical direction when the groundwater elevations return to their historical normal range.

In March 2016, the average horizontal groundwater gradient across the SWRP (between SMW-5 and SMW-9) was approximately 0.004 foot per foot (ft/ft) (21 feet per mile [ft/mile]). In June 2016, the average horizontal groundwater gradient across the SWRP was approximately 0.005 ft/ft (25 ft/mile). The horizontal gradients in March and December data were above the average horizontal gradient from June 2011 to December 2014 of 0.0014 ft/ft (8 ft/mile), but consistent with groundwater gradients in 2015 when groundwater elevations were higher due to near-record rainfall. A copy of the spreadsheet used to calculate the horizontal gradients is included in Table A.1 of Appendix A.

3.3 EVALUATION OF VERTICAL GRADIENT

In March 2016, there was a positive vertical gradient, indicating upward groundwater flow, in well pair SMW-5/5D (0.002 ft/ft) and a negative vertical gradient, indicating downward groundwater flow, in well pairs SMW-9/9D (-0.002 ft/ft), SMW-11/11D (-0.006 ft/ft), and SMW-21/21D (-0.011 ft/ft). In June 2016, there was a positive vertical gradient in well pair SMW-5/5D (0.001 ft/ft) and a negative vertical gradient in well pairs SMW-9/9D (-0.002 ft/ft), SMW-11/11D (-0.009 ft/ft), and SMW-21/21D (-0.001 ft/ft). The vertical gradients in these well clusters over the last four years have typically been negative or slightly positive, indicating that vertical groundwater flow is generally neutral or downward. Groundwater elevations and results of the vertical gradient calculations are provided in Table A.2 of Appendix A.

3.4 VELOCITY OF HORIZONTAL FLOW

Based on historical aquifer testing data, the average hydraulic conductivity (geometric mean) measured in the vicinity of the SWRP is approximately 62 feet per day (ft/day). Assuming an effective porosity of 20 percent for the alluvial aquifer (from historical testing data) and using the average horizontal gradient calculated in Section 3.2, the average rate of groundwater movement across the SWRP was approximately 1.2 ft/day (442 feet per year [ft/year]) in March 2016 and approximately 1.5 ft/day (544 ft/year) in June 2016. The groundwater flow velocities were higher than the average calculated from data collected from June 2011 to December 2014 (163 ft/year), but consistent with 2015 data. The higher than average flow velocities in March and June 2016 are attributed to the higher horizontal gradients, discussed in Section 3.2.

4 Discussion of Analytical Results

Groundwater samples were collected from the eight SWRP monitoring wells from June 9 to 10, 2016. The laboratory analytical reports are included in Appendix B and the results are summarized in Table 2. The distribution of select analytes is illustrated on Figures 5 through 7.

4.1 CONCENTRATION OF CONSTITUENTS

TPH as GRO was detected in SMW-9 at 36 micrograms per liter (µg/l) and in SMW-11 at 32 µg/l. TPH as DRO was detected in all SWRP monitoring wells, at concentrations ranging from 280 µg/l (SMW-21D) to 1,600 µg/l (SMW-11). Consistent with past reporting periods, the concentration of TPH as DRO was highest at SMW-11 in June 2016.

Benzene, toluene, and ethylbenzene were not detected in any sample above the limit of quantification (LOQ) in June 2016. In the sample collected from SMW-9, o-xylene was detected above the LOQ at a concentration of 1.9 µg/l. The remaining analytical results for xylene were at or below the LOQ. Any compounds potentially identified below the LOQ are reported as estimates.

Arsenic, barium, and selenium were detected above the LOQ in several samples. Arsenic was detected above the LOQ in all groundwater samples, except SMW-5, at concentrations ranging from 0.0052 milligrams per liter (mg/l) (SMW-9) to 0.0208 mg/l (SMW-21). Barium was detected above the LOQ in all groundwater samples at concentrations ranging from 0.0984 mg/l (SMW-9) to 0.304 mg/l (SMW-11). Selenium was detected above the LOQ at SMW-5 (0.0102 mg/l) and SMW-9 (0.0063 mg/l).

A duplicate sample (WRCDUP) was collected from monitoring well SMW-21D. An equipment blank [WRCEB(061016)] and field blank were also collected. There were no quality assurance/quality control (QA/QC) issues related to field activities or sample shipping. Details of laboratory QA/QC are included in the laboratory analytical report (Appendix B).

4.2 COMPARISON TO WATER QUALITY OR RISK-BASED EVALUATION CRITERIA

The groundwater analytical results were compared to three regulatory screening criteria: EPA primary drinking water Maximum Contaminant Levels (MCLs), EPA Regional Screening Levels for Tap Water (RSLs), and ODEQ cleanup levels for TPH as GRO and TPH as DRO. These regulatory screening criteria are included in Table 2.

The concentration of arsenic exceeded the MCL of 0.010 mg/l in SMW-5D, SMW-9D, SMW-11, SMW-21, and SMW-21D. All eight of the wells sampled exceeded the RSL for arsenic (0.000052 mg/l). The concentration of TPH as DRO exceeded the ODEQ cleanup level of 1,000 µg/l in SMW-9 and SMW-11. Selenium was slightly over the RSL (0.01 mg/l) at SMW-5. No other analyte exceeded any evaluation criteria.

4.3 RATE OF CONSTITUENT MIGRATION

The rate of constituent migration across the SWRP has been estimated using the groundwater gradient (during sampling events), the average hydraulic conductivity and estimated aquifer porosity, and the solubility of the compound in water (Fetter, 1994).

The average hydraulic conductivity for the alluvial aquifer across the SWRP is 62.09 ft/day. As discussed in Section 3.4, the groundwater velocity of groundwater in the vicinity of the SWRP was approximately

442 ft/year in March and 544 ft/year in June 2016. These flow rates are higher than the average calculated from data collected from 2011 to 2014, but consistent with 2015 data.

Based on partitioning coefficients (Fetter, 1994), benzene, toluene, and xylene are characterized as being highly to moderately mobile in groundwater. Ethylbenzene is characterized as having moderate to low mobility in groundwater. As shown on Figure 5 and in Table 2, only low estimated concentrations of benzene, ethylbenzene, toluene, and/or total xylenes were identified in June 2016. With the exception of o-xylene at SMW-9, all of the estimated results were at or below the LOQ.

TPH as GRO and TPH as DRO do not migrate in groundwater as quickly as volatile compounds (Fetter, 1994). The distribution of TPH as GRO and TPH as DRO in June 2016 is shown on Figure 6.

Metals are considered relatively immobile in groundwater (Fetter, 1994). The distribution of arsenic in June 2016 is shown on Figure 7.

5 Statistical Evaluation of Data

5.1 STATISTICAL EVALUATION OF GROUNDWATER MONITORING RESULTS

A detailed statistical evaluation of June 2016 groundwater monitoring results was conducted by GeoStat Environmental, LLC (GeoStat). The evaluation included Sen's Slope (Mann-Kendall) trend analysis, tolerance limit analysis, time series plots, and box & whisker plots. The analyses were completed for measured constituents utilizing all available data from 2006 through 2016. A copy of the GeoStat report, including a summary and trend evaluation charts, is included as Appendix C.

5.1.1 Groundwater Constituent Trend Graphs

Groundwater constituent trend graphs for BTEX, TPH (as GRO and DRO), arsenic, and other inorganics are included in Appendix D. Since the end of 2008, BTEX trends in six SWRP monitoring wells (all but SMW-5D and SMW-9) have exhibited a decreasing or stable trend. SMW-5D exhibited a slight increase in BTEX concentrations in June 2012, but has been stable or slightly decreasing since that measurement. SMW-9 had slightly elevated xylene detections (four orders of magnitude below the MCL) in December 2015 and June 2016. BTEX constituents have not been detected above the LOQ (1.0 µg/l) in any of the SWRP monitoring wells, except for slightly elevated xylenes at SMW-5D and SMW-9, since June 2009.

TPH (as GRO and DRO) exhibited a general increasing trend in SWRP monitoring wells from 2005 until 2010. SWRP monitoring wells SMW-5, SMW-5D, and SMW-9 exhibited a decreasing trend in TPH (as GRO and DRO) from December 2010 until June 2015, but have since exhibited an increasing trend in the last year (June 2015 to June 2016). The remaining five SWRP monitoring wells (SMW-9D, SMW-11, SMW-11D, SMW-21, and SMW-21D) have shown decreasing trends since 2011.

Arsenic concentrations in the SWRP monitoring wells exhibited a significant decrease from 2006 to 2007, a trend that has generally remained stable since 2007. Concentrations increased significantly at SMW-9D and SMW-21 in June 2015, but dropped in December 2015 and June 2016 to the typical historical concentrations in the wells.

Inorganic concentrations of barium, chromium, lead, selenium, and vanadium have exhibited overall stable trends since 2005. Barium concentrations in SMW-9D and SMW-21 increased in June 2015, but dropped to the typical historical concentrations in December 2015 and June 2016. Chromium, lead, selenium, and vanadium have rarely been detected in any of the wells; any apparent variation in the graphs for these metals is most likely attributable to variations in laboratory detection limits over the years.

5.1.2 Mann-Kendall Evaluation

TPH (as GRO and DRO), BTEX, and arsenic levels were evaluated using the Sen's Slope (Mann-Kendall) trend evaluation in accordance with the EPA Practical Methods for Data Analysis, EPA QA/G-9 QA00 Update, July 2000, Section 4.3.4, as outlined in Attachment 13 of the WRC RCRA permit. The trend evaluation compares results from the latest 16 sampling events (8 years) and determines if the measured concentration in the well is increasing, decreasing, or stable/no trend.

The TPH Mann-Kendall trend evaluation tables show TPH (as GRO and DRO) concentrations are stable or trending down in all the downgradient SWRP wells. TPH (as GRO and DRO) concentrations have been generally trending down since 2010. The trend at SMW-5D (upgradient) is slightly increasing.

The arsenic trend evaluation shows an overall downward trend for arsenic in two shallow SWRP wells (SMW-5 and SMW-9), a stable trend in two deep SWRP wells (SMW-9D, SMW-11D), and a slightly

upward trend in two deep SWRP wells (SMW-5D, and SMW-21D). The trend in SMW-21D has been decreasing since June 2011, while the trend at SMW-5D has been increasing during the last two years. The two remaining shallow wells (SMW-11 and SMW-21) exhibit an upward trend. The analysis of other RCRA metals (barium, chromium, lead, selenium, vanadium) indicated the trends were either stable or trending down.

BTEX compounds were not detected above the respective LOQ in monitoring wells in June 2016, with the exception of low levels of xylene in SMW-9. A limited number of BTEX detections near or below the LOQ (J flagged) were noted; therefore, Mann-Kendall analysis was completed. Analysis indicated either a stable trend (sampling data either non-detect or below the applicable LOQ) or a decreasing trend.

Based on the results of the Mann-Kendall evaluation, SMW-11 and SMW-21 displayed an increasing trend for arsenic that is considered statistically significant. It should be noted that the Mann-Kendall evaluation uses the 16 preceding sampling events and that, although statistically significant with respect to the 16 preceding events, the concentration of arsenic at both SMW-11 and SMW-21 has decreased from June 2015 to June 2016 sampling events. No other statistically significant changes were noted in the June 2016 groundwater sampling data that indicate a release of hazardous constituents from the SWRP.

5.1.3 Tolerance Limit Analysis

In addition to the Mann-Kendall evaluation, intra-well tolerance limit analysis was conducted for this reporting period. As shown on the summary table and tolerance limit graphs in Appendix C, no statistical exceedances were noted for the analyzed constituents, with the exception of arsenic in upgradient well SMW-5D.

6 Conclusions and Recommendations

6.1 ADEQUACY OF THE MONITORING WELL SYSTEM

Based on the historical data, the monitoring well network at the closed SWRP is adequate for the intended purpose of monitoring the groundwater beneath the SWRP during the post-closure period. WRC began monitoring the groundwater gradient across the SWRP quarterly in September 2015 (in accordance with the Comprehensive Remediation Plan submitted to ODEQ for compliance with RCRA Consent Order Case No. 15-056). WRC believes that the observed shift in the direction of groundwater flow across the SWRP is a temporary phenomenon related to the near-record rainfall in this area during 2015 and above average rainfall in early 2016. WRC anticipates that groundwater flow will return to its historical direction once groundwater elevations drop back to their normal range.

If the groundwater flow direction in the vicinity of the SWRP wells does not return to its historical condition, WRC will consult with ODEQ and apply for a Class 2 permit modification if an alternative design for the location of upgradient and downgradient wells is needed.

6.2 ASSESSMENT OF POST-CLOSURE MONITORING OBJECTIVES AND APPROACH

As discussed in ODEQ's April 21, 2016, review and acceptance of the previous semi-annual SWRP Groundwater Monitoring Report, implementation of the Comprehensive Remediation Plan under Consent Order No. 15-056 satisfies the permit condition with regard to compliance monitoring and possible corrective action at the SWRP related to the increase in arsenic concentrations. The analytical results continue to be within acceptable ranges for all other analytes sampled. No further action is required at this time.

WRC will continue the post-closure detection monitoring as required by the RCRA Operations and Post-Closure Permit No. 000396549. The next sampling event is scheduled for December 2016.

6.3 OPERATION AND MAINTENANCE RECOMMENDATIONS

WRC does not recommend any changes at this time to the operation and maintenance of the RCRA groundwater monitoring system for the closed SWRP.

7 References

CVR Energy, Inc. and WSP | Parsons Brinckerhoff. 2016. Stormwater Retention Pond Semi-Annual Post-Closure Monitoring Report for Period Ending 12/31/15, Permit No. 000396549, Wynnewood Refining Company. February 29.

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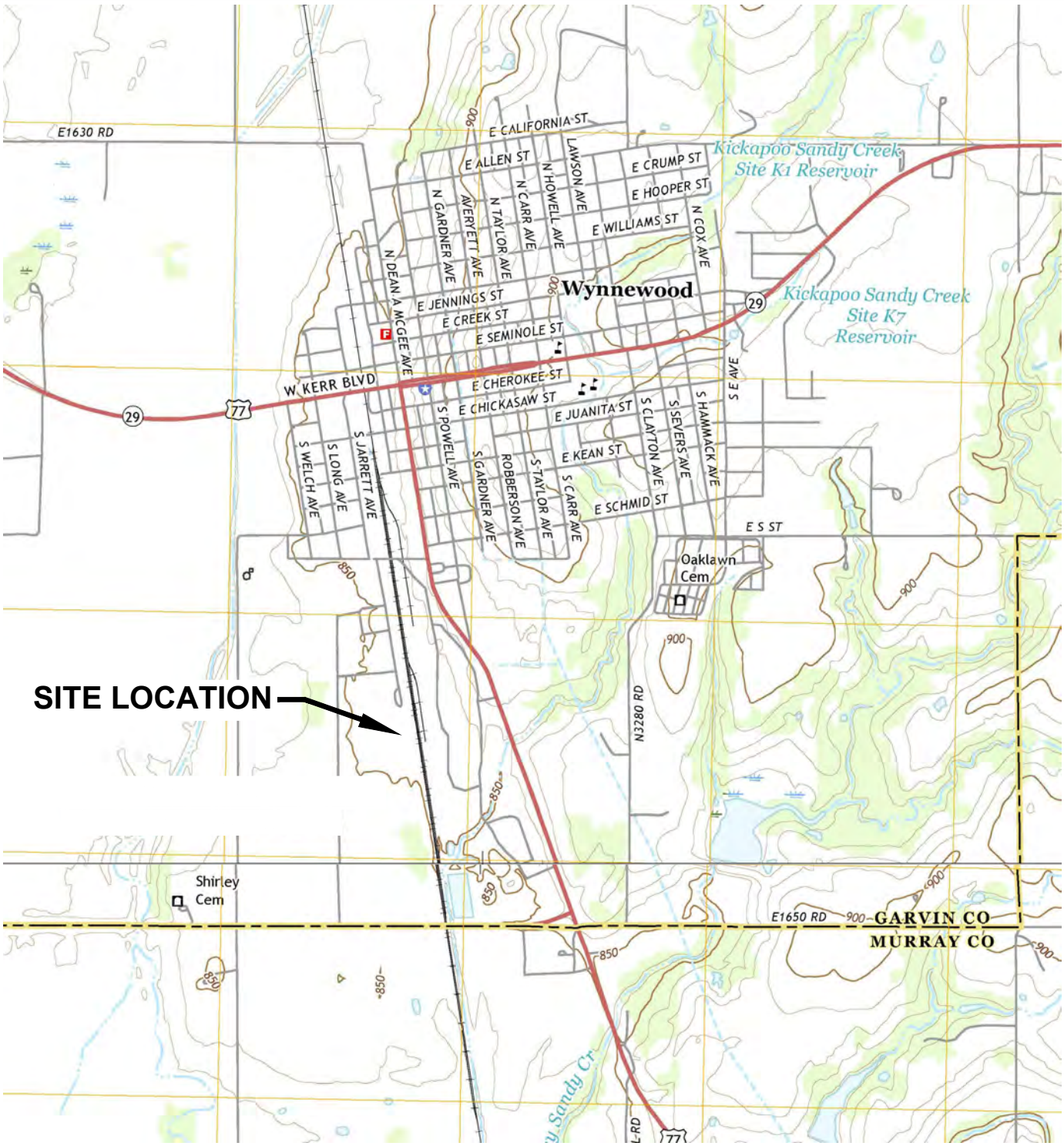
Figures

DWG Name: 314M00030-001

Checked:

Approved:

Drawn By: LS 2/10/2016



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7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLE
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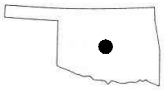
2016
JOY OKLAHOMA
2016



Quadrangle Location

N

0 2,000 4,000

SCALE IN FEET

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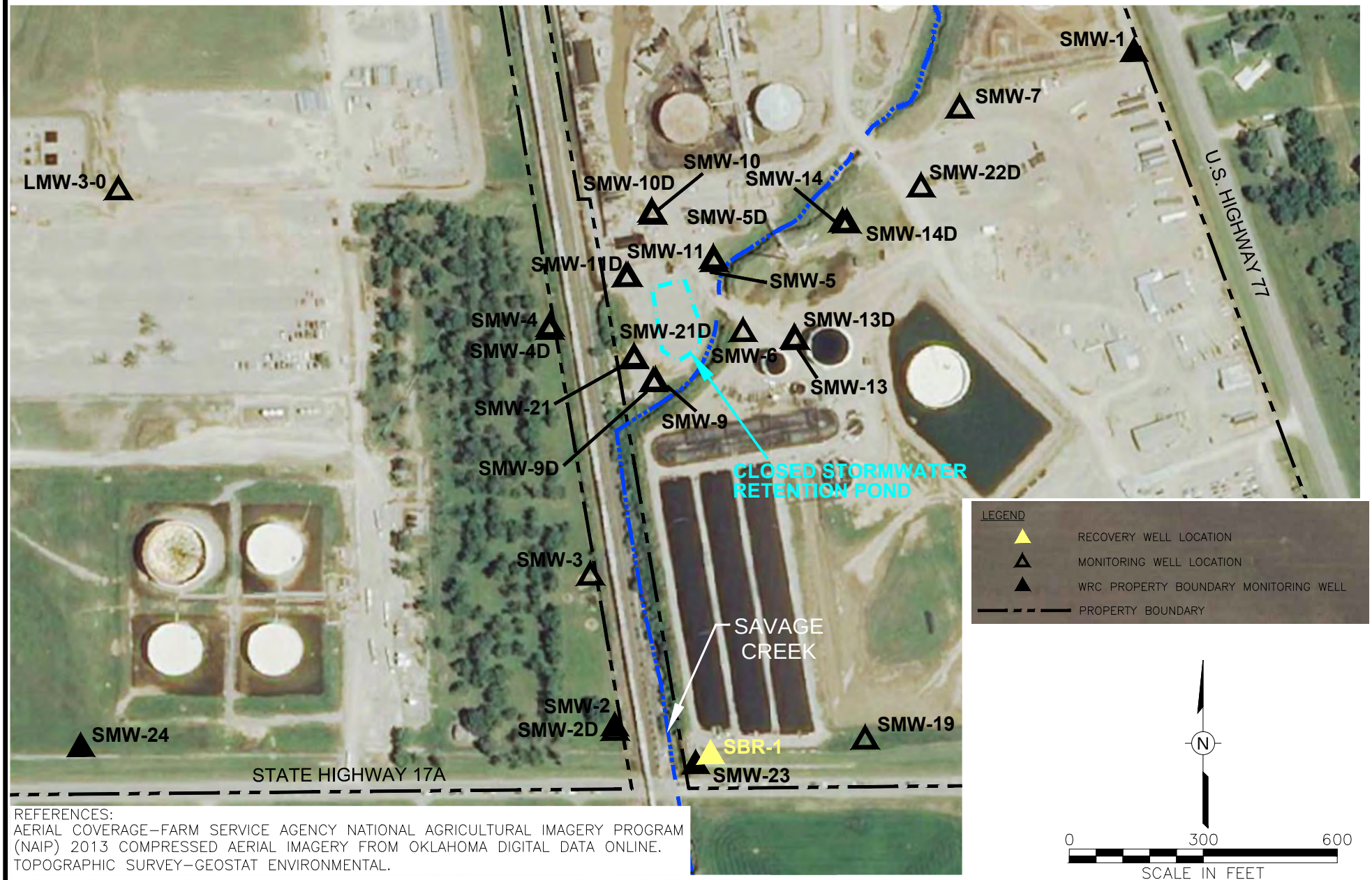
Figure 1

SITE LOCATION

WYNNEWOOD REFINING COMPANY
WYNNEWOOD, OKLAHOMA

PREPARED FOR
WYNNEWOOD REFINING COMPANY
WYNNEWOOD, OKLAHOMA



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AERIAL COVERAGE–FARM SERVICE AGENCY NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP) 2013 COMPRESSED AERIAL IMAGERY FROM OKLAHOMA DIGITAL DATA ONLINE.
TOPOGRAPHIC SURVEY–GEOSTAT ENVIRONMENTAL.

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Figure 2

MONITORING WELL LOCATION MAP

WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

PREPARED FOR
WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

Drawn By: LS 8/8/2016
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DWG Name: 314M00025–013

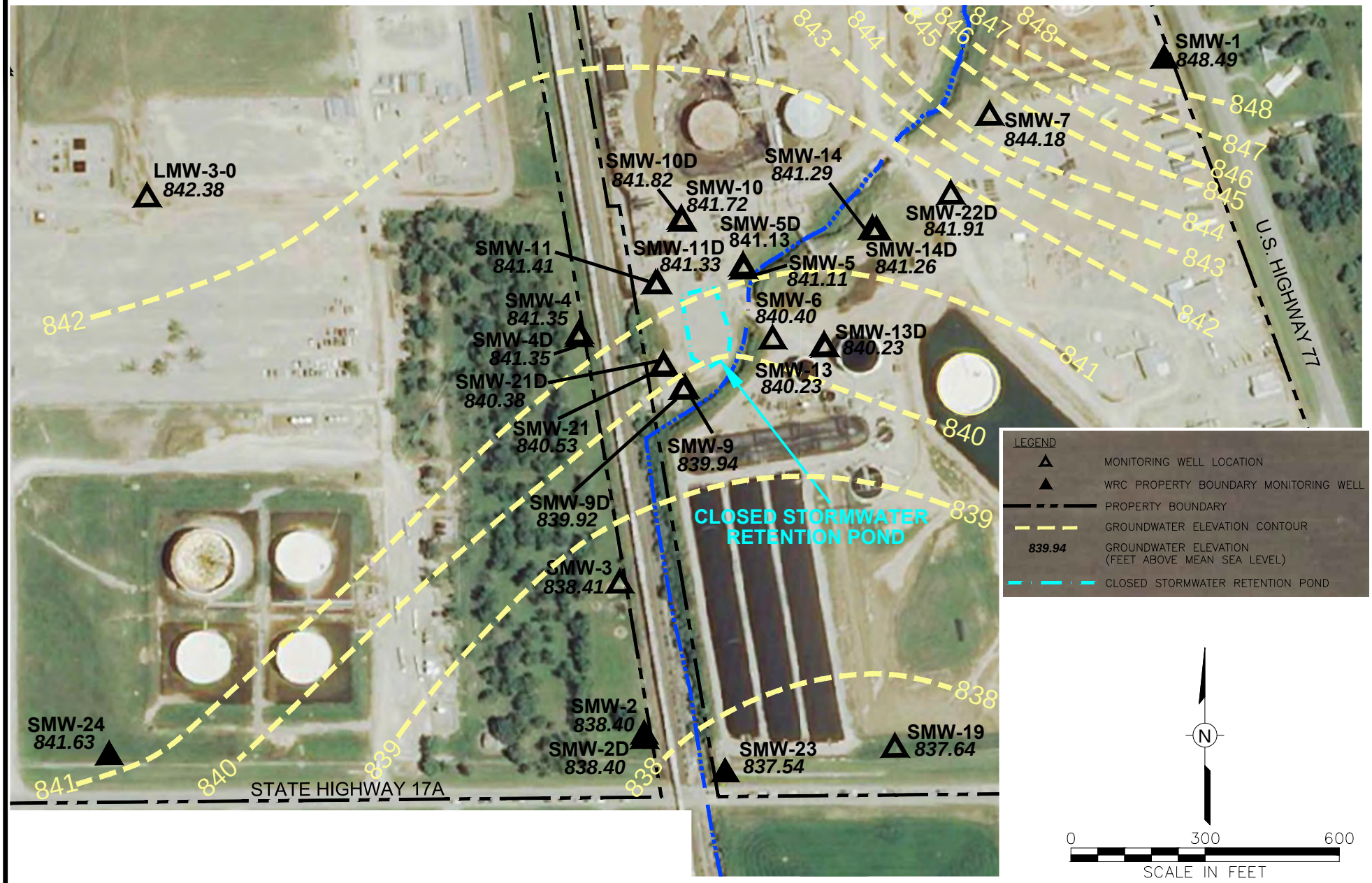

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Figure 3A

GROUNDWATER ELEVATION
MONITORING WELL LOCATION MAP
(MARCH 2016)

WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

PREPARED FOR
WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

Drawn By: LS 8/15/2016
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DWG Name: 314M00025-014

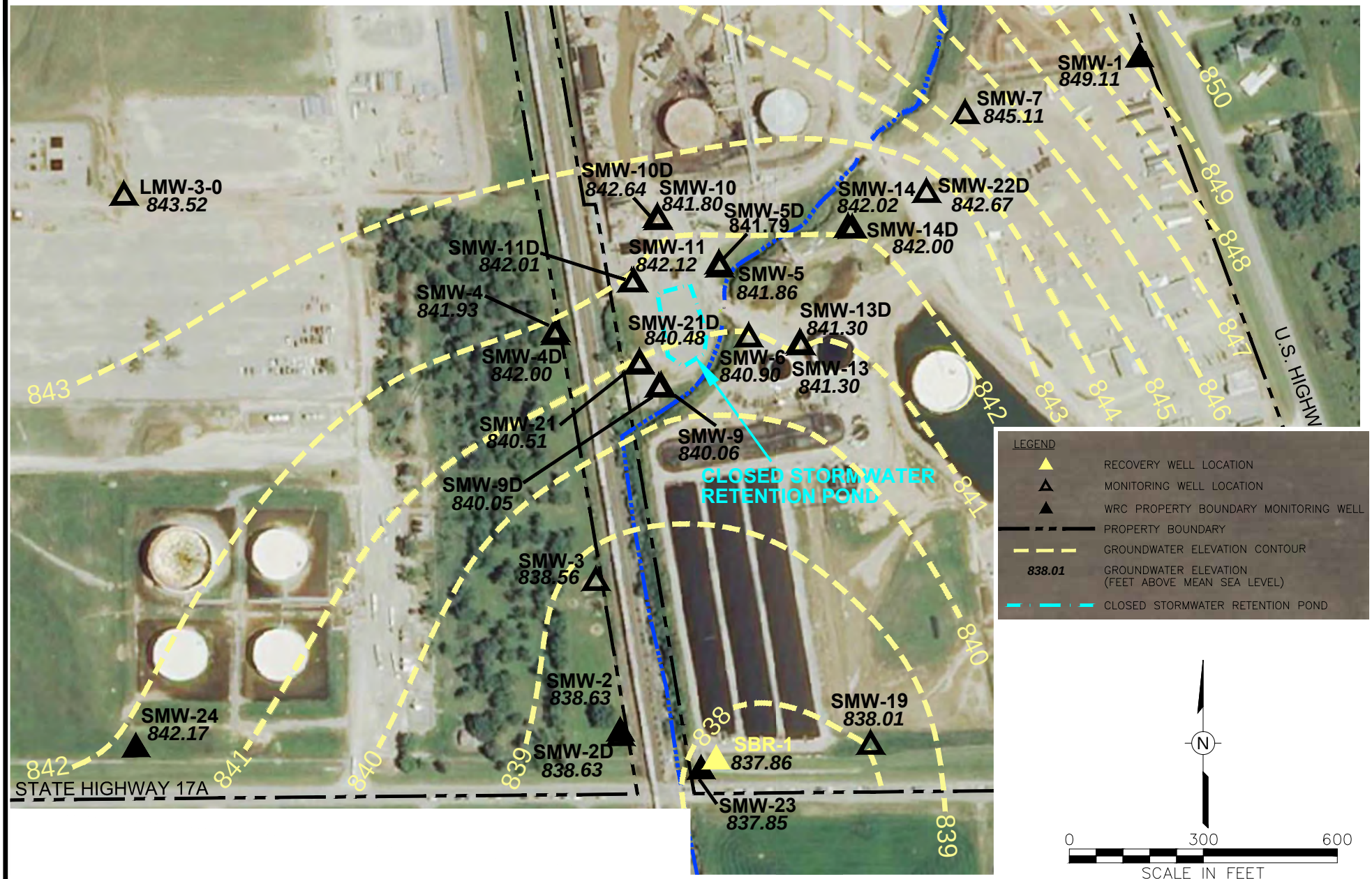

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Figure 3B

GROUNDWATER ELEVATION
MONITORING WELL LOCATION MAP
(JUNE 2016)

WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

PREPARED FOR
WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

Drawn By: LS 8/15/2016
Checked:
Approved:
DWG Name: 314M00025-015

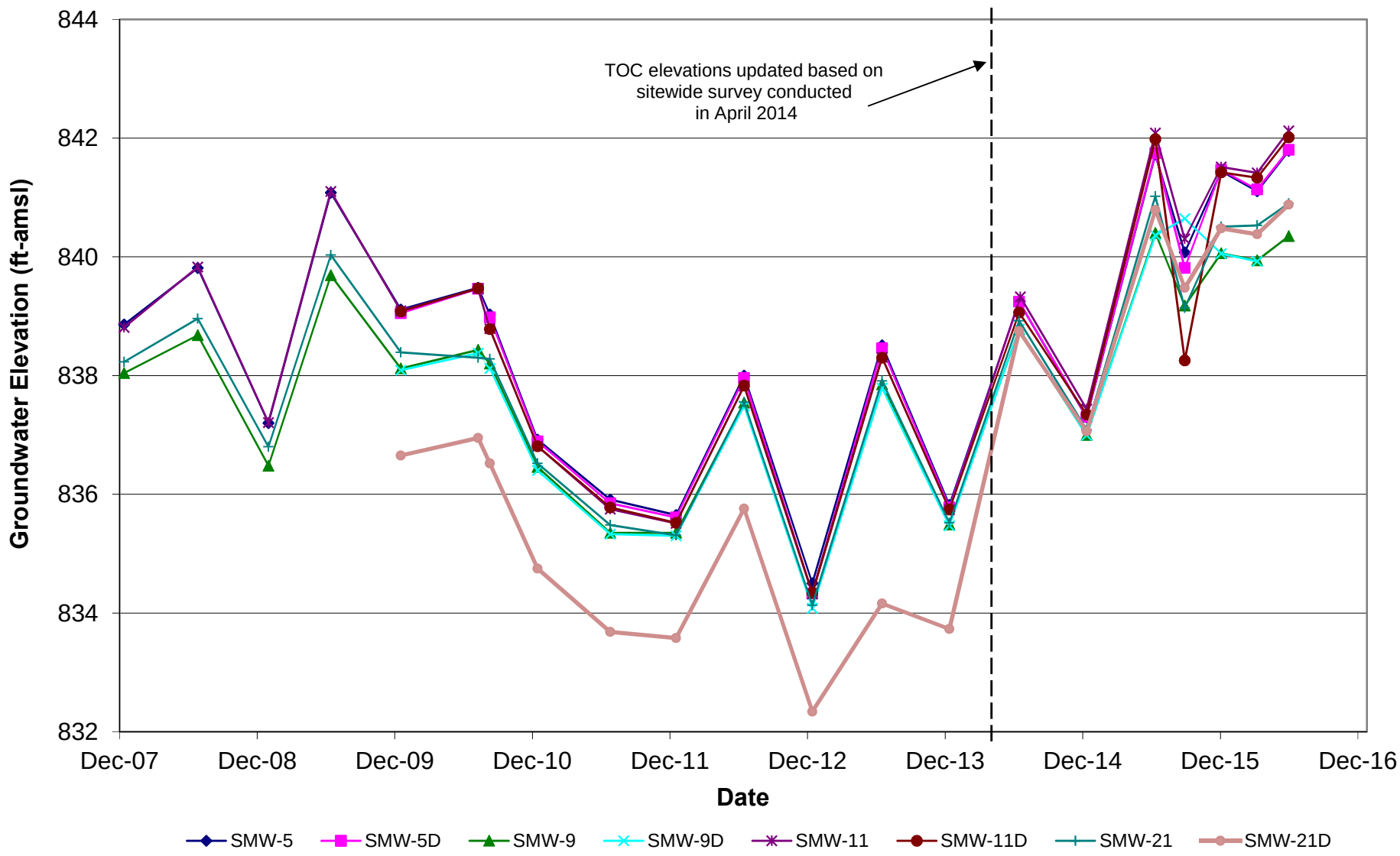

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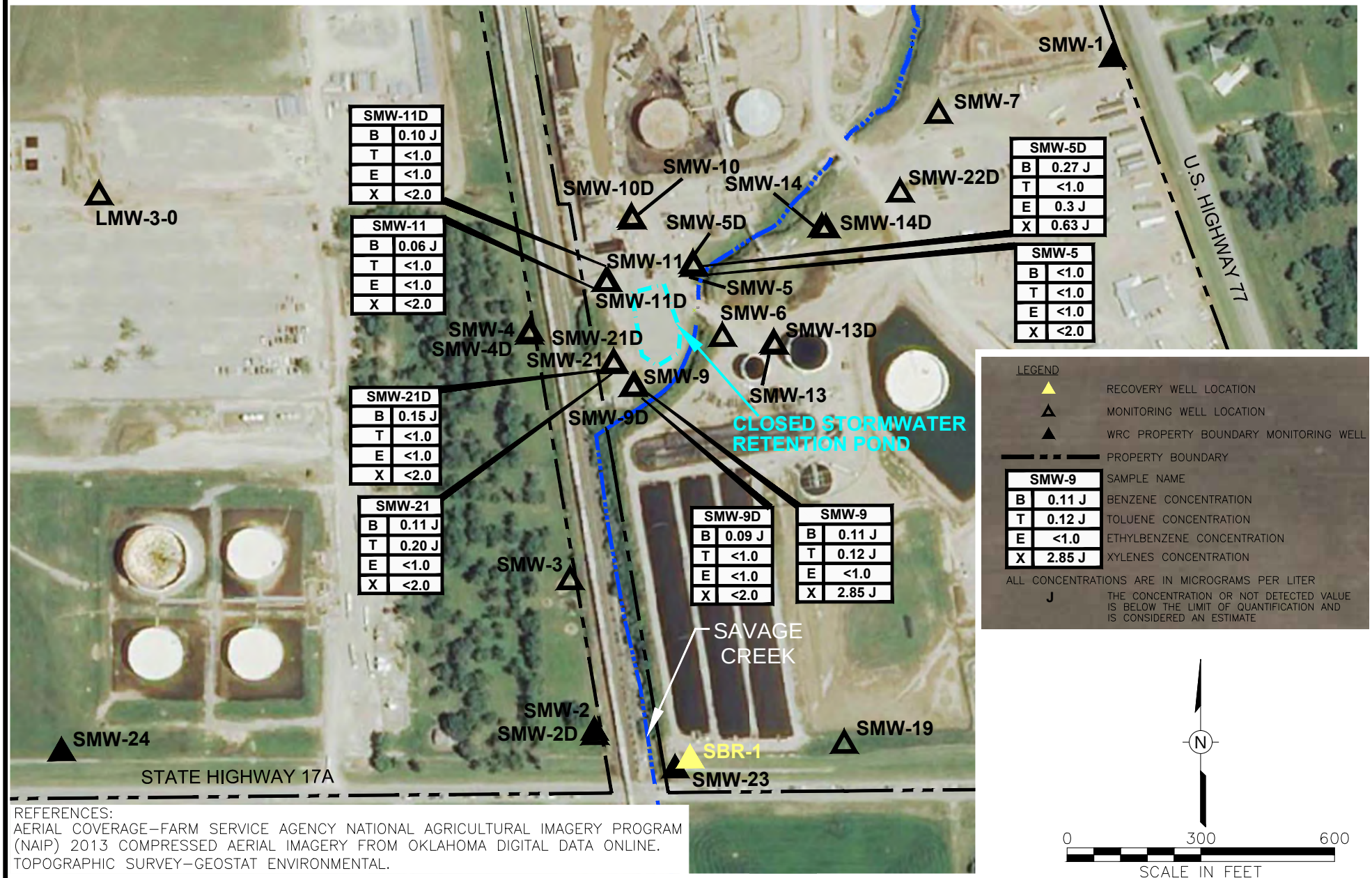
Figure 4
Monitoring Well Hydrographs (2007 - 2016)
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma



REFERENCES:
AERIAL COVERAGE–FARM SERVICE AGENCY NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP) 2013 COMPRESSED AERIAL IMAGERY FROM OKLAHOMA DIGITAL DATA ONLINE.
TOPOGRAPHIC SURVEY–GEOSTAT ENVIRONMENTAL.

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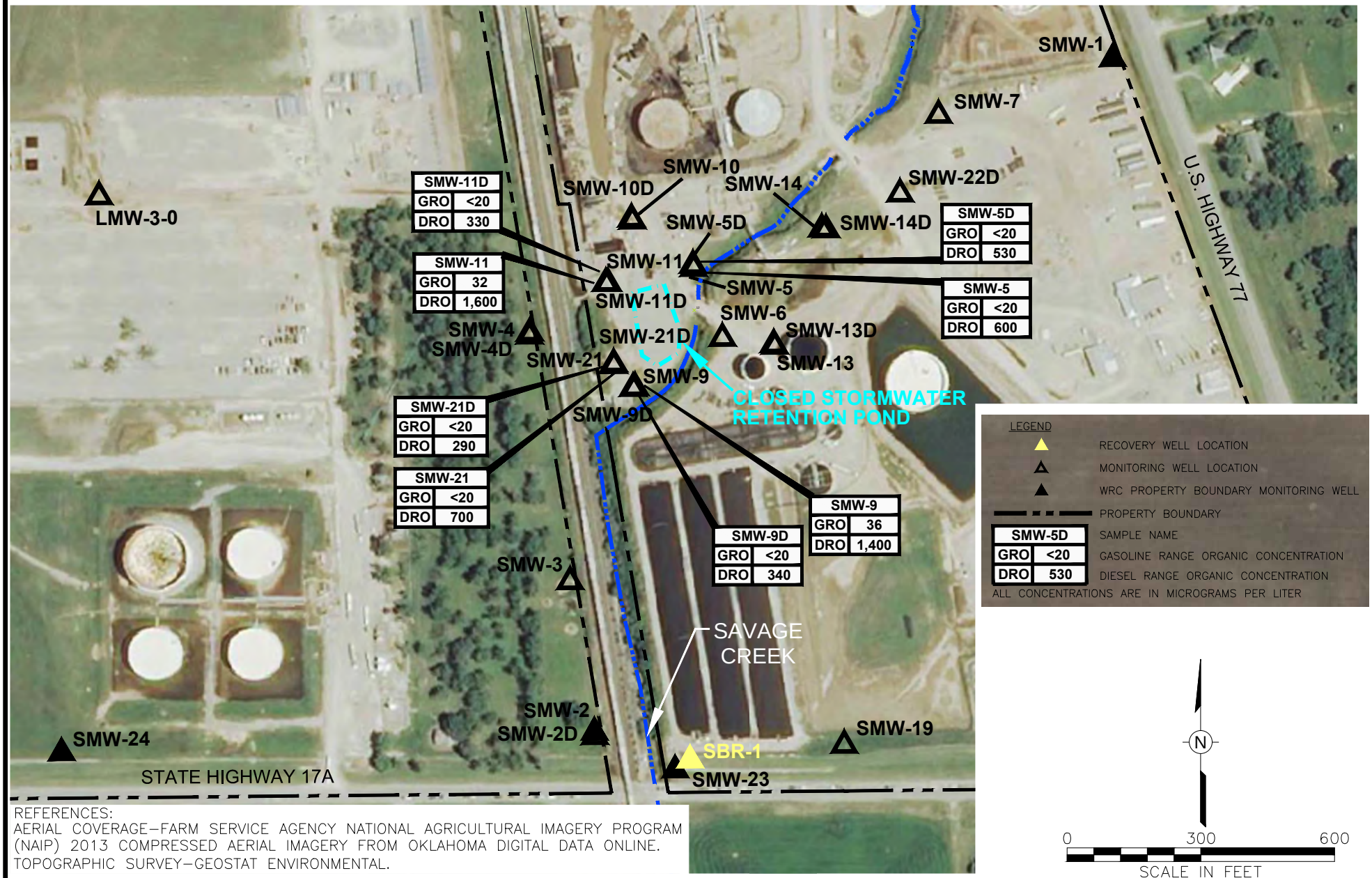
Figure 5

BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES IN GROUNDWATER (JUNE 2016)

WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

PREPARED FOR
WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

Drawn By: LS 8/12/2016
Checked:
Approved:
DWG Name: 314M00025–016



REFERENCES:
AERIAL COVERAGE–FARM SERVICE AGENCY NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP) 2013 COMPRESSED AERIAL IMAGERY FROM OKLAHOMA DIGITAL DATA ONLINE.
TOPOGRAPHIC SURVEY–GEOSTAT ENVIRONMENTAL.

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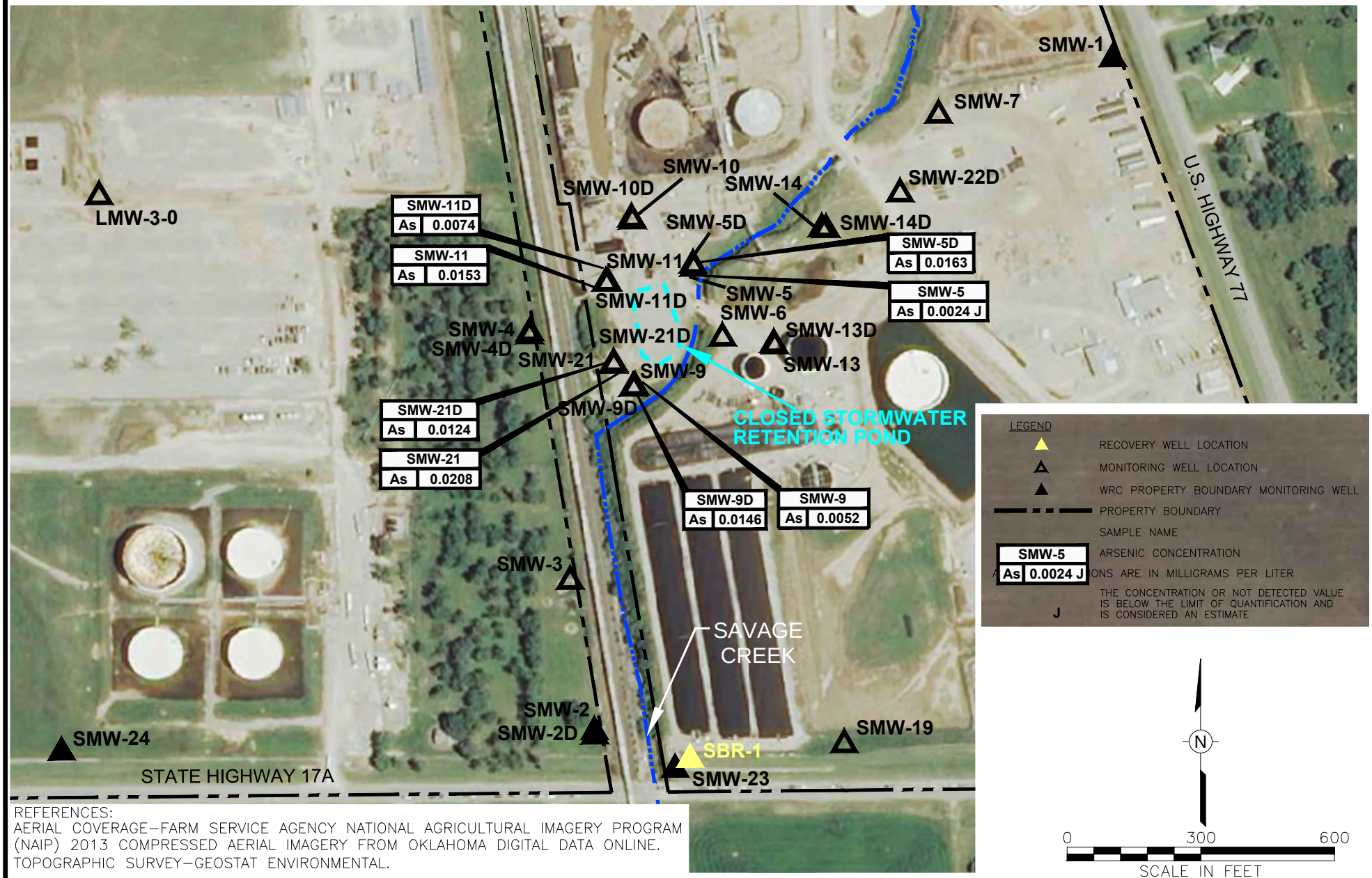
Figure 6

TOTAL PETROLEUM HYDROCARBONS (GRO AND DRO) IN GROUNDWATER (JUNE 2016)

WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

PREPARED FOR
WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

Drawn By: LS 8/12/2016
Checked:
Approved:
DWG Name: 314M00025–017



REFERENCES:
AERIAL COVERAGE–FARM SERVICE AGENCY NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP) 2013 COMPRESSED AERIAL IMAGERY FROM OKLAHOMA DIGITAL DATA ONLINE.
TOPOGRAPHIC SURVEY–GEOSTAT ENVIRONMENTAL.

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Figure 7

TOTAL ARSENIC IN GROUNDWATER
(JUNE 2016)

WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

PREPARED FOR
WYNNEWOOD REFINING COMPANY, LLC
WYNNEWOOD, OKLAHOMA

Drawn By: LS 8/12/2016
Checked:
Approved:
DWG Name: 314M00025–018

Tables

Table 1

Groundwater Elevation Measurements (2007 through 2016)
Closed Storm Water Retention Pond
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma (a)

Well Number	Measurement Date	TOC Elevation (ft-AMSL) (b)	Depth to Water (ft-TOC)	Depth to LNAPL (ft-TOC)	LNAPL Thickness (ft)	Water Table Elevation (ft-AMSL)
SMW-5	12/13/07	853.62	14.76	NP	0.00	838.86
SMW-5	06/26/08	853.62	13.81	NP	0.00	839.81
SMW-5	12/31/08	853.62	16.42	NP	0.00	837.20
SMW-5	06/15/09	853.62	12.54	NP	0.00	841.08
SMW-5	12/18/09	853.62	14.51	NP	0.00	839.11
SMW-5	07/12/10	853.62	14.14	NP	0.00	839.48
SMW-5	08/12/10	853.62	14.59	NP	0.00	839.03
SMW-5	12/17/10	853.62	16.70	NP	0.00	836.92
SMW-5	06/28/11	853.62	17.71	NP	0.00	835.91
SMW-5	12/20/11	853.62	17.97	NP	0.00	835.65
SMW-5	06/18/12	853.62	15.62	NP	0.00	838.00
SMW-5	12/17/12	853.62	19.12	NP	0.00	834.50
SMW-5	06/20/13	853.62	15.11	NP	0.00	838.51
SMW-5	12/16/13	853.62	17.80	NP	0.00	835.82
SMW-5	06/20/14	854.69	15.44	NP	0.00	839.25
SMW-5	12/16/14	854.69	17.39	NP	0.00	837.30
SMW-5	06/17/15	854.69	12.96	NP	0.00	841.73
SMW-5	09/03/15	854.69	14.61	NP	0.00	840.08
SMW-5	12/09/15	854.69	13.24	NP	0.00	841.45
SMW-5	03/14/16	854.69	13.58	NP	0.00	841.11
SMW-5	06/06/16	854.69	12.90	NP	0.00	841.79
SMW-5D	12/18/09	853.51	14.46	NP	0.00	839.05
SMW-5D	07/12/10	853.51	14.05	NP	0.00	839.46
SMW-5D	08/12/10	853.51	14.53	NP	0.00	838.98
SMW-5D	12/17/10	853.51	16.62	NP	0.00	836.89
SMW-5D	06/28/11	853.51	17.66	NP	0.00	835.85
SMW-5D	12/20/11	853.51	17.90	NP	0.00	835.61
SMW-5D	06/18/12	853.51	15.55	NP	0.00	837.96
SMW-5D	12/17/12	853.51	19.18	NP	0.00	834.33
SMW-5D	06/20/13	853.51	15.05	NP	0.00	838.46
SMW-5D	12/16/13	853.51	17.73	NP	0.00	835.78
SMW-5D	06/20/14	854.61	15.37	NP	0.00	839.24
SMW-5D	12/16/14	854.61	17.31	NP	0.00	837.30
SMW-5D	06/17/15	854.61	12.87	NP	0.00	841.74
SMW-5D	09/03/15	854.61	14.80	NP	0.00	839.81
SMW-5D	12/09/15	854.61	13.15	NP	0.00	841.46
SMW-5D	03/14/16	854.61	13.48	NP	0.00	841.13
SMW-5D	06/06/16	854.61	12.81	NP	0.00	841.80

Table 1

Groundwater Elevation Measurements (2007 through 2016)
Closed Storm Water Retention Pond
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma (a)

Well Number	Measurement Date	TOC Elevation (ft-AMSL) (b)	Depth to Water (ft-TOC)	Depth to LNAPL (ft-TOC)	LNAPL Thickness (ft)	Water Table Elevation (ft-AMSL)
SMW-9	12/13/07	852.17	14.13	NP	0.00	838.04
SMW-9	06/26/08	852.17	13.49	NP	0.00	838.68
SMW-9	12/31/08	852.17	15.69	NP	0.00	836.48
SMW-9	06/15/09	852.17	12.48	NP	0.00	839.69
SMW-9	12/18/09	852.17	14.05	NP	0.00	838.12
SMW-9	07/12/10	852.17	13.74	NP	0.00	838.43
SMW-9	08/12/10	852.17	13.97	NP	0.00	838.20
SMW-9	12/17/10	852.17	15.71	NP	0.00	836.46
SMW-9	06/28/11	852.17	16.82	NP	0.00	835.35
SMW-9	12/20/11	852.17	16.82	NP	0.00	835.35
SMW-9	06/18/12	852.17	14.63	NP	0.00	837.54
SMW-9	12/17/12	852.17	- (c)	NP	0.00	- (c)
SMW-9	06/20/13	852.17	14.32	NP	0.00	837.85
SMW-9	12/16/13	852.17	16.68	NP	0.00	835.49
SMW-9	06/20/14	853.27	14.49	NP	0.00	838.78
SMW-9	12/16/14	853.27	16.27	NP	0.00	837.00
SMW-9	06/17/15	853.27	12.87	NP	0.00	840.40
SMW-9	09/03/15	853.27	14.09	NP	0.00	839.18
SMW-9	12/09/15	853.27	13.21	NP	0.00	840.06
SMW-9	03/14/16	853.27	13.33	NP	0.00	839.94
SMW-9	06/06/16	853.27	12.92	NP	0.00	840.35
SMW-9D	12/18/09	852.33	14.24	NP	0.00	838.09
SMW-9D	07/12/10	852.33	13.95	NP	0.00	838.38
SMW-9D	08/12/10	852.33	14.21	NP	0.00	838.12
SMW-9D	12/17/10	852.33	15.93	NP	0.00	836.40
SMW-9D	06/28/11	852.33	17.00	NP	0.00	835.33
SMW-9D	12/20/11	852.33	17.03	NP	0.00	835.30
SMW-9D	06/18/12	852.33	14.84	NP	0.00	837.49
SMW-9D	12/17/12	852.33	18.25	NP	0.00	834.08
SMW-9D	06/20/13	852.33	14.54	NP	0.00	837.79
SMW-9D	12/16/13	852.33	16.86	NP	0.00	835.47
SMW-9D	06/20/14	853.47	14.69	NP	0.00	838.78
SMW-9D	12/16/14	853.47	16.48	NP	0.00	836.99
SMW-9D	06/17/15	853.47	13.11	NP	0.00	840.36
SMW-9D	09/03/15	853.47	12.83	NP	0.00	840.64
SMW-9D	12/09/15	853.47	13.42	NP	0.00	840.05
SMW-9D	03/14/16	853.47	13.55	NP	0.00	839.92
SMW-9D	06/06/16	853.47	13.14	NP	0.00	840.33

Table 1

Groundwater Elevation Measurements (2007 through 2016)
Closed Storm Water Retention Pond
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma (a)

Well Number	Measurement Date	TOC Elevation (ft-AMSL) (b)	Depth to Water (ft-TOC)	Depth to LNAPL (ft-TOC)	LNAPL Thickness (ft)	Water Table Elevation (ft-AMSL)
SMW-11	12/13/07	851.91	13.10	NP	0.00	838.81
SMW-11	06/26/08	851.91	12.08	NP	0.00	839.83
SMW-11	12/31/08	851.91	14.70	NP	0.00	837.21
SMW-11	06/15/09	851.91	10.81	NP	0.00	841.10
SMW-11	12/18/09	851.91	12.82	NP	0.00	839.09
SMW-11	07/12/10	851.91	12.45	NP	0.00	839.46
SMW-11	08/12/10	851.91	13.12	NP	0.00	838.79
SMW-11	12/17/10	851.91	15.10	NP	0.00	836.81
SMW-11	06/28/11	851.91	16.16	NP	0.00	835.75
SMW-11	12/20/11	851.91	16.40	NP	0.00	835.51
SMW-11	06/18/12	851.91	14.09	NP	0.00	837.82
SMW-11	12/17/12	851.91	17.59	NP	0.00	834.32
SMW-11	06/20/13	851.91	13.60	NP	0.00	838.31
SMW-11	12/16/13	851.91	16.17	NP	0.00	835.74
SMW-11	06/23/14	853.13	13.81	NP	0.00	839.32
SMW-11	12/16/14	853.13	15.70	NP	0.00	837.43
SMW-11	06/17/15	853.13	11.05	NP	0.00	842.08
SMW-11	09/03/15	853.13	12.83	NP	0.00	840.30
SMW-11	12/09/15	853.13	11.62	NP	0.00	841.51
SMW-11	03/14/16	853.13	11.72	NP	0.00	841.41
SMW-11	06/06/16	853.13	11.01	NP	0.00	842.12
SMW-11D	12/18/09	851.79	12.71	NP	0.00	839.08
SMW-11D	07/12/10	851.79	12.32	NP	0.00	839.47
SMW-11D	08/12/10	851.79	13.01	NP	0.00	838.78
SMW-11D	12/17/10	851.79	14.98	NP	0.00	836.81
SMW-11D	06/28/11	851.79	16.01	NP	0.00	835.78
SMW-11D	12/20/11	851.79	16.27	NP	0.00	835.52
SMW-11D	06/18/12	851.79	13.96	NP	0.00	837.83
SMW-11D	12/17/12	851.79	17.45	NP	0.00	834.34
SMW-11D	06/20/13	851.79	13.49	NP	0.00	838.30
SMW-11D	12/16/13	851.79	16.05	NP	0.00	835.74
SMW-11D	06/20/14	852.92	13.86	NP	0.00	839.06
SMW-11D	12/16/14	852.92	15.58	NP	0.00	837.34
SMW-11D	06/17/15	852.92	10.94	NP	0.00	841.98
SMW-11D	09/03/15	852.92	14.67	NP	0.00	838.25
SMW-11D	12/09/15	852.92	11.50	NP	0.00	841.42
SMW-11D	03/14/16	852.92	11.59	NP	0.00	841.33
SMW-11D	06/06/16	852.92	10.91	NP	0.00	842.01

Table 1

Groundwater Elevation Measurements (2007 through 2016)
Closed Storm Water Retention Pond
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma (a)

Well Number	Measurement Date	TOC Elevation (ft-AMSL) (b)	Depth to Water (ft-TOC)	Depth to LNAPL (ft-TOC)	LNAPL Thickness (ft)	Water Table Elevation (ft-AMSL)
SMW-21	12/13/07	850.93	12.70	NP	0.00	838.23
SMW-21	06/26/08	850.93	11.97	NP	0.00	838.96
SMW-21	12/31/08	850.93	14.13	NP	0.00	836.80
SMW-21	06/15/09	850.93	10.90	NP	0.00	840.03
SMW-21	12/18/09	850.93	12.54	NP	0.00	838.39
SMW-21	07/12/10	850.93	12.63	NP	0.00	838.30
SMW-21	08/12/10	850.93	12.65	NP	0.00	838.28
SMW-21	12/17/10	850.93	14.41	NP	0.00	836.52
SMW-21	06/28/11	850.93	15.45	NP	0.00	835.48
SMW-21	12/20/11	850.93	15.62	NP	0.00	835.31
SMW-21	06/18/12	850.93	13.38	NP	0.00	837.55
SMW-21	12/17/12	850.93	16.80	NP	0.00	834.13
SMW-21	06/20/13	850.93	13.02	NP	0.00	837.91
SMW-21	12/16/13	850.93	15.41	NP	0.00	835.52
SMW-21	06/20/14	852.09	13.17	NP	0.00	838.92
SMW-21	12/16/14	852.09	15.00	NP	0.00	837.09
SMW-21	06/17/15	852.09	11.07	NP	0.00	841.02
SMW-21	09/03/15	852.09	12.95	NP	0.00	839.14
SMW-21	12/09/15	852.09	11.58	NP	0.00	840.51
SMW-21	03/14/16	852.09	11.56	NP	0.00	840.53
SMW-21	06/06/16	852.09	11.19	NP	0.00	840.90
SMW-21D	12/18/09	849.11	12.46	NP	0.00	836.65
SMW-21D	07/12/10	849.11	12.16	NP	0.00	836.95
SMW-21D	08/12/10	849.11	12.59	NP	0.00	836.52
SMW-21D	12/17/10	849.11	14.36	NP	0.00	834.75
SMW-21D	06/28/11	849.11	15.43	NP	0.00	833.68
SMW-21D	12/20/11	849.11	15.53	NP	0.00	833.58
SMW-21D	06/18/12	849.11	13.35	NP	0.00	835.76
SMW-21D	12/17/12	849.11	16.77	NP	0.00	832.34
SMW-21D	06/20/13	849.11	14.95	NP	0.00	834.16
SMW-21D	12/16/13	849.11	15.38	NP	0.00	833.73
SMW-21D	06/20/14	851.99	13.24	NP	0.00	838.75
SMW-21D	12/16/14	851.99	14.93	NP	0.00	837.06
SMW-21D	06/17/15	851.99	11.20	NP	0.00	840.79
SMW-21D	09/03/15	851.99	12.51	NP	0.00	839.48
SMW-21D	12/09/15	851.99	11.51	NP	0.00	840.48
SMW-21D	03/14/16	851.99	11.61	NP	0.00	840.38
SMW-21D	06/06/16	851.99	11.11	NP	0.00	840.88

a\ TOC = top of casing.
ft-AMSL = feet above mean sea level.
ft-TOC = feet from top of casing.
LNAPL = light non-aqueous phase liquid.
ft = feet.
NP = no LNAPL detected.

b\ TOC elevations were updated in June 2014 based on sitewide survey update conducted in April 2014.

c\ Water level was below the top of the pump and could not be measured.

Table 2

Summary of Groundwater Analytical Results - RCRA Groundwater Sampling
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma
June 2016 (a)

					Total Petroleum Hydrocarbons (OK Methods 8020/8015 and 8000/8100)		BTEX (EPA Method 8260B)						Total Metals (EPA Method 6020A)					
	Monitoring Well ID	Field Sample ID	Laboratory Sample ID	Sample Date	Gasoline Range Organics (µg/l)	Diesel Range Organics (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	m+p-Xylene (µg/l)	o-Xylene (µg/l)	Xylenes (Total) (µg/l)	Arsenic (mg/l)	Barium (mg/l)	Chromium (mg/l)	Lead (mg/l)	Selenium (mg/l)	Vanadium (mg/l)
Storm Water Retention Pond Monitoring Wells	SMW-5	WRCSMW-5	16061012	06/10/16	<20	**600**	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	0.0024 J	**0.125**	<0.005 J	<0.001 J	**0.0102**	0.0022 J
	SMW-5D	WRCSMW-5D	16061011	06/10/16	<20	**530**	0.27 J	<1.0	0.3 J	0.33 J	0.3 J	0.63 J	**0.0163**	**0.22**	<0.005 J	0.0004 J	0.0014 J	0.0034 J
	SMW-9	WRCSMW-9	16061006	06/09/16	**36**	**1,400**	0.11 J	0.12 J	<1.0	0.95 J	1.9 J	2.85 J	**0.0052**	**0.0984**	<0.005 J	<0.001 J	**0.0063 B**	0.0004 J
	SMW-9D	WRCSMW-9D	16061007	06/09/16	<20	**340**	0.09 J	<1.0	<1.0	<1.0	<1.0	<2.0	**0.0146**	**0.165**	<0.005 J	0.0001 J	0.0018 J	0.0028 J
	SMW-11	WRCSMW-11	16061008	06/09/16	**32**	**1,600**	0.06 J	<1.0	<1.0	<1.0	<1.0	<2.0	**0.0153**	**0.304**	<0.005 J	0.0001 J	0.002 J	0.0003 J
	SMW-11D	WRCSMW-11D	16061009	06/09/16	<20	**330**	0.10 J	<1.0	<1.0	<1.0	<1.0	<2.0	**0.0074**	**0.0988**	<0.005 J	<0.001 J	0.0024 J	0.0042 J
	SMW-21	WRCSMW-21	16061002	06/09/16	<20	**700**	0.11 J	0.20 J	<1.0	<1.0	<1.0	<2.0	**0.0208**	**0.2**	<0.005 J	<0.001 J	0.0019 J	<0.005 J
	SMW-21D	WRCSMW-21D	16061003	06/09/16	<20	**280**	0.15 J	<1.0	<1.0	<1.0	<1.0	<2.0	**0.0124**	**0.171**	<0.005 J	0.0001 J	0.0014 J	0.0028 J
	SMW-21D	WRCDUP	16061004	06/09/16	<20	**290**	0.14 J	<1.0	<1.0	<1.0	<1.0	<2.0	**0.0114**	**0.166**	<0.005 J	0.0001 J	0.0012 J	0.0029 J
Quality Control Samples	Equipment Blank	WRCEB	16061010	06/10/16	<20	**120**	0.12 J	0.31 J	<1.0	<1.0	<1.0	<2.0	0.0003 J	<0.005 J	<0.005 J	<0.001 J	0.0006 J	<0.005 J
	Trip Blank	Trip Blank	16061001	06/09/16	<20	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	0.0005 J	0.0005 J	<0.005 J	<0.001 J	0.001 J	<0.005 J
	Field Blank	Field Blank	16061005	06/09/16	<20	**110**	0.12 J	0.22 J	<1.0	<1.0	<1.0	<2.0	0.0003 J	<0.005 J	<0.005 J	<0.001 J	0.0007 J	<0.005 J
Regulatory Screening Criteria	**EPA Primary Drinking Water Regulations**				NE	NE	5	1,000	700	NE	NE	10,000	0.010	2	0.1	0.015	0.05	NE
	EPA Regional Screening Levels (Tap Water)				NE	NE	0.46	110	1.5	19	19	19	0.000052	0.38	NE	0.015	0.01	0.0086
	ODEQ Cleanup Levels				1,000	1,000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

a\ **Bold** values indicate a detection above the reporting limit.

Shading descriptors:

Detected concentration exceeds the EPA Primary Drinking Water Regulations Maximum Contaminant Level, updated May 2009.
Detected concentration exceeds the EPA Regional Screening Level for Tap Water, updated November 2015.
Detected concentration exceeds ODEQ cleanup levels (2004).

OK = Oklahoma.
BTEX = benzene, toluene, ethylbenzene, and xylenes.
EPA = United States Environmental Protection Agency.
ID = identification number.
µg/l = micrograms per liter.
mg/l = milligrams per liter.
J = The concentration or not detected value is below the limit of quantification and is considered an estimated value.
B = Analyte is also present in the method blank or load blank at a concentration of 60 µg/l. The reported concentration has not been blank-corrected.
NE = not established.
ODEQ = Oklahoma Department of Environmental Quality.

Appendix A – Groundwater Flow Data

Table A.1

2011 to 2016 Groundwater Gradient and Velocity Calculations
Closed Storm Water Retention Pond
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma (a)

Month	Distance Between Wells (ft)	Well ID	Well ID	Horizontal Gradient (ft/ft)	Estimated Porosity	Hydraulic Conductivity (ft/day)	Groundwater Velocity (ft/day)	Groundwater Velocity (ft/year)
		SMW-5	**SMW-9**					
June 2011	300	835.91	835.35	0.0019	0.2	62.09	0.58	212
December 2011	300	835.65	835.35	0.0010	0.2	62.09	0.31	113
June 2012	300	838.00	837.54	0.0015	0.2	62.09	0.48	174
December 2012	300	834.50	834.13 (b)	0.0012	0.2	62.09	0.38	140
June 2013	300	838.51	837.85	0.0022	0.2	62.09	0.68	249
December 2013	300	835.82	835.49	0.0011	0.2	62.09	0.34	125
June 2014	300	839.25	838.78	0.0016	0.2	62.09	0.49	178
December 2014	300	837.30	837.00	0.0010	0.2	62.09	0.31	113
June 2015	300	841.73	840.40	0.0044	0.2	62.09	1.4	502
September 2015	300	840.08	839.18	0.0030	0.2	62.09	0.93	340
December 2015	300	841.45	840.06	0.0046	0.2	62.09	1.4	525
March 2016	300	841.11	839.94	0.0039	0.2	62.09	1.2	440
June 2016	300	841.79	840.35	0.0048	0.2	62.09	1.5	542

a/ ft = feet.
ft/ft = foot per foot.
ft/day = foot per day.
ft/year = foot per year.
b/ SMW-9 was dry to the top of the pump in December 2012. The groundwater elevation for SMW-21 was substituted for SMW-9 in this calculation.

Table A.2

Vertical Gradients and Potentiometric Head Differences
Closed Storm Water Retention Pond
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma (a)
March 2016

	Date	Groundwater Elevation (ft-amsl)	Screen Length (feet)	Top of Well Screen Elevation (ft-amsl)	Bottom of Well Screen Elevation (ft-amsl)	Is Well Screen Submerged?	Mid-Point of the Water Level and Bottom of the Well Screen (Water Table Well)	Mid-Point of Well Screen (Submerged Well) (ft-amsl)	Vertical Gradient Calculation Value (ft-amsl)	Head Difference (feet)	Vertical Gradient Value (ft/ft)	**Downward Gradient Value (ft/ft)**	**Upward Gradient Value (ft/ft)**
SMW-5	03/14/16	841.11	10.00	839.21	829.21	YES	835.16	834.21	834.21				
SMW-5D	03/14/16	841.13	14.60	830.63	816.03	YES	828.58	823.33	823.33	0.03	0.003		**0.003**
SMW-9	03/14/16	839.94	10.00	839.63	829.63	YES	834.78	834.63	834.63				
SMW-9D	03/14/16	839.92	14.29	830.55	816.26	YES	828.09	823.41	823.41	-0.02	-0.001	**-0.001**	
SMW-11	03/14/16	841.41	12.12	841.03	828.91	YES	835.16	834.97	834.97				
SMW-11D	03/14/16	841.33	12.13	828.29	816.16	YES	828.75	822.23	822.23	-0.08	-0.006	**-0.006**	
SMW-21	03/14/16	840.53	12.32	841.55	829.23	NO	834.88	835.39	834.88				
SMW-21D	03/14/16	840.38	12.29	827.33	815.04	YES	827.71	821.19	821.19	-0.15	-0.011	**-0.011**	

a\ ft-amsl = feet above mean sea level
ft/ft = foot per foot

Shading descriptors:
Shallow Well
Deep Well

Table A.2

Vertical Gradients and Potentiometric Head Differences
Closed Storm Water Retention Pond
Wynnewood Refining Company, LLC
Wynnewood, Oklahoma (a)
June 2016

	Date	Groundwater Elevation (ft-amsl)	Screen Length (feet)	Top of Well Screen Elevation (ft-amsl)	Bottom of Well Screen Elevation (ft-amsl)	Is Well Screen Submerged?	Mid-Point of the Water Level and Bottom of the Well Screen (Water Table Well)	Mid-Point of Well Screen (Submerged Well) (ft-amsl)	Vertical Gradient Calculation Value (ft-amsl)	Head Difference (feet)	Vertical Gradient Value (ft/ft)	**Downward Gradient Value (ft/ft)**	**Upward Gradient Value (ft/ft)**
SMW-5	06/06/16	841.79	10.00	839.21	829.21	YES	835.50	834.21	834.21				
SMW-5D	06/06/16	841.80	14.60	830.63	816.03	YES	828.92	823.33	823.33	0.02	0.002		**0.002**
SMW-9	06/06/16	840.35	10.00	839.63	829.63	YES	834.99	834.63	834.63				
SMW-9D	06/06/16	840.33	14.29	830.55	816.26	YES	828.30	823.41	823.41	-0.02	-0.001	**-0.001**	
SMW-11	06/06/16	842.12	12.12	841.03	828.91	YES	835.52	834.97	834.97				
SMW-11D	06/06/16	842.01	12.13	828.29	816.16	YES	829.09	822.23	822.23	-0.11	-0.009	**-0.009**	
SMW-21	06/06/16	840.90	12.32	841.55	829.23	NO	835.07	835.39	835.07				
SMW-21D	06/06/16	840.88	12.29	827.33	815.04	YES	827.96	821.19	821.19	-0.02	-0.001	**-0.001**	

a\ ft-amsl = feet above mean sea level
ft/ft = foot per foot

Shading descriptors:
Shallow Well
Deep Well

Appendix B – Analytical Data – Laboratory Reports

Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date and Time Received: 06/10/2016 1500
Pace File No.: 8462
Pace Order No.: 133797
Project ID: WRC Wynnewood

Dear Mr. McCormick:

This laboratory report, containing the samples indicated below, includes 24 pages for the analytical report, 2 page(s) for the chain of custody and/or analysis request, and 4 page(s) for the sample receipt form.

PACE LAB ID #	SAMPLE DESCRIPTION	SAMPLE TYPE	DATE SAMPLED
16061001	Trip Blank	Liquid	6/9/2016
16061002	WRCSMW-21(060916)	Liquid	6/9/2016
16061003	WRCSMW-21D(060916)	Liquid	6/9/2016
16061004	WRCDUP	Liquid	6/9/2016
16061005	Field Blank	Liquid	6/9/2016
16061006	WRCSMW-9(060916)	Liquid	6/9/2016
16061007	WRCSMW-9D(060916)	Liquid	6/9/2016
16061008	WRCSMW-11(060916)	Liquid	6/9/2016
16061009	WRCSMW-11D(060916)	Liquid	6/9/2016
16061010	WRCEB(061016)	Liquid	6/10/2016
16061011	WRCSMW-5D(061016)	Liquid	6/10/2016
16061012	WRCSMW-5(061016)	Liquid	6/10/2016

The Appendix and Quality Control sections are integral parts of this laboratory report and may contain important data qualifiers.

All results are reported on a wet weight basis unless otherwise stated.

Samples will be retained for thirty days unless Pace is otherwise notified. Pace is accredited by the State of Kansas through the National Environmental Laboratory Accreditation Program (NELAP). The results contained in this report were obtained using Pace's Standard Operating Procedures. These procedures are in substantial compliance with the approved methods referenced and the standards published by NELAP unless otherwise noted in the Appendix and Quality Control sections of this report.

Thank you for choosing Pace for this project.

Gregory J. Groene
Project Manager
Gregory.Groene@pacelabs.com

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061001
Sample Description: Trip Blank

Date Sampled: 06/09/2016
Time Sampled: 0930

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	ND	µg/L	1.0	100	100
BTEX					
Benzene	ND	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0005 J B	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.0005 J	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	ND	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.001 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	ND	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/15/16 1231	1GC2167	1GC2167	SPA	OK GRO
Oklahoma DRO	06/16/16 0945	06/22/16 1454	160616-2	1EX4174	SPA	OK DRO
BTEX	N/A	06/13/16 1701	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 1948	160613-1	2IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2239	160613-1	5IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2239	160613-1	5IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2239	160613-1	5IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1619	160613-1	2IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2239	160613-1	5IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061001

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061002
Sample Description: WRCSMW-21(060916)

Date Sampled: 06/09/2016
Time Sampled: 1015

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	700	µg/L	2.0	200	200
BTEX					
Benzene	0.11 J	µg/L	1.0	0.04	1.0
Toluene	0.20 J	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0208	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.2	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	ND	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0019 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	ND	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/16/16 1156	1GC2168	1GC2168	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 0832	160616-1	3EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 1727	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 1953	160613-1	2IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2244	160613-1	5IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/14/16 1953	160613-1	2IP3166	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2244	160613-1	5IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1624	160613-1	2IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/14/16 1953	160613-1	2IP3166	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061002

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061003
Sample Description: WRCSMW-21D(060916)

Date Sampled: 06/09/2016
Time Sampled: 1105

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	280	µg/L	1.0	100	100
BTEX					
Benzene	0.15 J	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0124	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.171	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	0.0001 J	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0014 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0028 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/16/16 1227	1GC2168	1GC2168	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/23/16 2235	160616-1	2EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 1845	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2019	160613-1	2IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2320	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2320	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2320	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1656	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2320	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061003

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061004
Sample Description: WRCDUP

Date Sampled: 06/09/2016
Time Sampled: 1105

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	290	µg/L	1.0	100	100
BTEX					
Benzene	0.14 J	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0114	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.166	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	0.0001 J	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0012 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0029 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/15/16 1739	1GC2167	1GC2167	SPA	OK GRO
Oklahoma DRO	06/16/16 0945	06/22/16 1522	160616-2	1EX4174	SPA	OK DRO
BTEX	N/A	06/13/16 1911	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2024	160613-1	2IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2326	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2326	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2326	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1701	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2326	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061004

Pace Analytical Services, Inc.
525 N. Eighth St. - Salina, KS 67401
785-827-1273 800-535-3076 Fax 785-823-7830

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061005
Sample Description: Field Blank

Date Sampled: 06/09/2016
Time Sampled: 1240

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	110	µg/L	1.0	100	100
BTEX					
Benzene	0.12 J	µg/L	1.0	0.04	1.0
Toluene	0.22 J	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0003 J B	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	ND	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	ND	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0007 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	ND	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/15/16 1159	1GC2167	1GC2167	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/23/16 2304	160616-1	2EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 1937	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2040	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2331	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2331	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2331	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1706	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2331	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061005

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061006
Sample Description: WRCSMW-9(060916)

Date Sampled: 06/09/2016
Time Sampled: 1306

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	36	µg/L	1.0	20	20
Oklahoma DRO	1400	µg/L	2.0	200	200
BTEX					
Benzene	0.11 J	µg/L	1.0	0.04	1.0
Toluene	0.12 J	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	0.95 J	µg/L	1.0	0.06	1.0
o-Xylene	1.9	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0052	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.0984	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	ND	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0063 B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0004 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/15/16 1708	1GC2167	1GC2167	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 0958	160616-1	3EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 2004	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2045	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2336	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2336	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2336	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1711	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2336	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061006

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061007
Sample Description: WRCSMW-9D(060916)

Date Sampled: 06/09/2016
Time Sampled: 1342

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	340	µg/L	1.0	100	100
BTEX					
Benzene	0.09 J	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0146	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.165	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	0.0001 J	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0018 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0028 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/15/16 1534	1GC2167	1GC2167	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 0001	160616-1	2EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 2030	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2050	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2341	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2341	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2341	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1716	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2341	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061007

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061008
Sample Description: WRCSMW-11(060916)

Date Sampled: 06/09/2016
Time Sampled: 1417

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	32	µg/L	1.0	20	20
Oklahoma DRO	1600	µg/L	4.0	400	400
BTEX					
Benzene	0.06 J	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0153	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.304	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	0.0001 J	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.002 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0003 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/16/16 1125	1GC2168	1GC2168	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 1026	160616-1	3EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 2056	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2055	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2347	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2347	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2347	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1722	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2347	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061008

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061009
Sample Description: WRCSMW-11D(060916)

Date Sampled: 06/09/2016
Time Sampled: 1447

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	330	µg/L	1.0	100	100
BTEX					
Benzene	0.10 J	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0074	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.0988	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	ND	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0024 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0042 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/15/16 1424	1GC2167	1GC2167	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 0059	160616-1	2EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 2123	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2101	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2352	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2352	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2352	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1727	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2352	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061009

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061010
Sample Description: WRCEB(061016)

Date Sampled: 06/10/2016
Time Sampled: 0800

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	120	µg/L	1.0	100	100
BTEX					
Benzene	0.12 J	µg/L	1.0	0.04	1.0
Toluene	0.31 J	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0003 J B	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	ND	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	ND	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0006 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	ND	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/15/16 1128	1GC2167	1GC2167	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 0127	160616-1	2EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 2149	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2106	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/13/16 2357	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/13/16 2357	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/13/16 2357	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1732	160613-1	3IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/13/16 2357	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061010

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061011
Sample Description: WRCSMW-5D(061016)

Date Sampled: 06/10/2016
Time Sampled: 0838

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	530	µg/L	1.0	100	100
BTEX					
Benzene	0.27 J	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	0.3 J	µg/L	1.0	0.1	1.0
m+p-Xylene	0.33 J	µg/L	1.0	0.06	1.0
o-Xylene	0.3 J	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0163	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.22	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	0.0004 J	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0014 J B	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0034 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/16/16 1053	1GC2168	1GC2168	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 0156	160616-1	2EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 2215	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2111	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/14/16 0002	160613-1	6IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/14/16 0002	160613-1	6IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/14/16 0002	160613-1	6IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1748	160613-1	4IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/14/16 0002	160613-1	6IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061011

Sample Results

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Lab Number: 16061012
Sample Description: WRCSMW-5(061016)

Date Sampled: 06/10/2016
Time Sampled: 0925

Analysis	Concentration	Units	Dilution Factor	Reporting Limit LOD	Reporting Limit LOQ
Oklahoma GRO	ND	µg/L	1.0	20	20
Oklahoma DRO	600	µg/L	1.0	100	100
BTEX					
Benzene	ND	µg/L	1.0	0.04	1.0
Toluene	ND	µg/L	1.0	0.06	1.0
Ethylbenzene	ND	µg/L	1.0	0.1	1.0
m+p-Xylene	ND	µg/L	1.0	0.06	1.0
o-Xylene	ND	µg/L	1.0	0.1	1.0
Arsenic, Total, ICP-MS	0.0024 J B	mg/L	1.0	0.0002	0.005
Barium, Total, ICP-MS	0.125	mg/L	1.0	0.0002	0.005
Chromium, Total, ICP-MS	ND	mg/L	1.0	0.0005	0.005
Lead, Total, ICP-MS	ND	mg/L	1.0	0.0001	0.001
Selenium, Total, ICP-MS	0.0102	mg/L	1.0	0.0002	0.005
Vanadium, Total, ICP-MS	0.0022 J	mg/L	1.0	0.0003	0.005

Analysis	Date/Time Prepared	Date/Time Analyzed	QC Batch	Inst. Batch	Analyst	Method(s)
Oklahoma GRO	N/A	06/21/16 1437	1GC2173	1GC2173	SPA	OK GRO
Oklahoma DRO	06/16/16 0800	06/24/16 0225	160616-1	2EX4175	SPA	OK DRO
BTEX	N/A	06/13/16 2241	1MS5165	1MS5165	RKR	8260B
Arsenic, Total, ICP-MS	06/13/16 0754	06/14/16 2116	160613-1	3IP3166	KMW	6020A
Barium, Total, ICP-MS	06/13/16 0754	06/14/16 0018	160613-1	7IP3165	KMW	6020A
Chromium, Total, ICP-MS	06/13/16 0754	06/14/16 0018	160613-1	7IP3165	KMW	6020A
Lead, Total, ICP-MS	06/13/16 0754	06/14/16 0018	160613-1	7IP3165	KMW	6020A
Selenium, Total, ICP-MS	06/13/16 0754	06/16/16 1753	160613-1	4IP3168	KMW	6020A
Vanadium, Total, ICP-MS	06/13/16 0754	06/14/16 0018	160613-1	7IP3165	KMW	6020A
Volatile Analysis Preparation Method						5030B
GC/FID Volatile Preparation Method						5030B
ICP-MS Metals Total Preparation Method						3010A
OK DRO Preparation Method						OK DRO

Conclusion of Lab Number: 16061012

Appendix

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

ND indicates not detected with the Limit of Detection (LOD) in parentheses. The Method Detection Limit (MDL) is a calculated value representing the lowest concentration, that based on a statistical calculation represents the lowest concentration that theoretically, can be detected. The MDL is equivalent to the LOD. The Limit of Quantitation (LOQ) is the lowest concentration of the analytical standard that was used for calibrating the instrument. If an analytical standard is analyzed at the LOQ, an error of as much as +/- 50% can be expected. The MDL and LOQ values have been adjusted for the dilution factor and percent solids, as applicable. Due to rounding differences these values may vary slightly from the reported concentration. N/A, if present, indicates Not Applicable.

All samples which require cooling were received at a temperature of less than 6 degrees Celsius.

No analysis with a holding time of seventy-two hours or less was performed in this Pace order.

J - The concentration or not detected (ND) value is below the Limit of Quantitation (LOQ) and is considered an estimated value.

B - Analyte is also present in the method blank or load blank at the concentration indicated either to the right of the letter B and/or in the Quality Control Report. The reported sample concentration has not been blank corrected.

Accreditation Summary

Client: Coffeyville Resources
Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

NELAP accreditation is issued under each EPA regulatory program for a given matrix/analyte/method combination. Pace is NELAP accredited for each matrix/analyte/method and EPA program cited in this Laboratory Report, except for those listed in the table below and for analyses performed in the field. For most of the analyses listed in the table, NELAP accreditation is not offered under the listed EPA program and Pace is NELAP accredited for the analysis, using the same analytical technology, but under a different EPA program. Pace's full NELAP accreditation status may be viewed at www.kdheks.gov/envlab. Note that unless qualified otherwise in the Laboratory Report, Pace performs all analyses, including each analysis listed in the table below, utilizing NELAP protocol.

Test	Analysis	Matrix-Regulatory Program	Method	Pace NELAP Accredited in Other Reg. Program

Pace is accredited for all analytes.

Quality Control Report
Batch Summary

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Test Code	Testname	QC Batch	Method Blank Date/Time Analyzed	LCS Date/Time Analyzed	MS Lab No. Date/Time Analyzed
CL108	Oklahoma GRO	1GC2167	BLK1GC2167 06/15/16 1057	LCS1GC2167 06/15/16 1025	16061007MS 06/15/16 1605
Lab numbers associated with this batch: 16061001 16061004 16061005 16061006 16061007 16061009 16061010					
CL108	Oklahoma GRO	1GC2168	BLK1GC2168 06/16/16 1022	LCS1GC2168 06/16/16 0852	16061003MS 06/16/16 1258
Lab numbers associated with this batch: 16061002 16061003 16061008 16061011					
CL108	Oklahoma GRO	1GC2173	BLK1GC2173 06/21/16 0848	LCS1GC2173 06/21/16 0817	16061453MS 06/21/16 1815
Lab numbers associated with this batch: 16061012					
CL122	Oklahoma DRO	160616-2	160616BLK2 06/22/16 1034	160616LCS2 06/22/16 1103	16061004MS 06/22/16 1551
Lab numbers associated with this batch: 16061001 16061004					
CL122	Oklahoma DRO	160616-1	160616BLK1 06/23/16 1943	160616LCS1 06/23/16 2012	16061002MS 06/24/16 0900
Lab numbers associated with this batch: 16061002 16061003 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					
MS295	BTEX	1MS5165	BLK1MS5165 06/13/16 1451	LCS1MS5165 06/13/16 1359	16061002MS 06/13/16 1753
Lab numbers associated with this batch: 16061001 16061002 16061003 16061004 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					
SL053	Barium, Total, ICP-MS	160613-1	160613BLK1 06/13/16 2125	160613LCS1 06/13/16 2130	16061002MS 06/13/16 2249
Lab numbers associated with this batch: 16061001 16061002 16061003 16061004 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					
SL058	Chromium, Total, ICP-MS	160613-1	160613BLK1 06/13/16 2125	160613LCS1 06/13/16 2130	16061002MS 06/14/16 1958
Lab numbers associated with this batch: 16061001 16061002 16061003 16061004 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					
SL061	Lead, Total, ICP-MS	160613-1	160613BLK1 N/A	160613LCS1 06/13/16 2130	16061002MS 06/13/16 2249
Lab numbers associated with this batch: 16061001 16061002 16061003 16061004 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					
SL082	Vanadium, Total, ICP-MS	160613-1	160613BLK1 06/13/16 2125	160613LCS1 06/13/16 2130	16061002MS 06/14/16 1958
Lab numbers associated with this batch: 16061001 16061002 16061003 16061004 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					

Quality Control Report
Batch Summary

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Test Code	Testname	QC Batch	Method Blank Date/Time Analyzed	LCS Date/Time Analyzed	MS Lab No. Date/Time Analyzed
SL052	Arsenic, Total, ICP-MS	160613-1	160613BLK1 N/A	160613LCS1 06/14/16 1839	16061002MS 06/14/16 1958
Lab numbers associated with this batch: 16061001 16061002 16061003 16061004 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					
SL073	Selenium, Total, ICP-MS	160613-1	160613BLK1 N/A	160613LCS1 06/16/16 1516	16061002MS 06/16/16 1629
Lab numbers associated with this batch: 16061001 16061002 16061003 16061004 16061005 16061006 16061007 16061008 16061009 16061010 16061011 16061012					

Quality Control Report
Method Blank, LCS, MS/MSD Data

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Analysis	Blank Data	Control Sample (% Recovery) LCS	LCSD	Spike Level	Limits	Control Precision RPD	Limit	Spiked Sample (% Recovery) MS	MSD	Spike Level	Limits	Spiked Sample Precision Data RPD	Limit	Units
QC Batch: 160613-1	**For samples prepared on: 06/13/2016 0754**						**Spiked sample: 16061002**							
Arsenic, Total, ICP-MS	0.4 J	99.7		500	80.0-120		#	98.1	97.7	500	80.0-120	0.40	20.0	µg/L
Barium, Total, ICP-MS	ND(0.2)	103		1500	80.0-120		#	105	104	1500	80.0-120	1.00	20.0	µg/L
Chromium, Total, ICP-MS	ND(0.5)	102		500	80.0-120		#	102	101	500	80.0-120	1.00	20.0	µg/L
Lead, Total, ICP-MS	ND(0.1)	110.		500	80.0-120		#	112	110.	500	80.0-120	1.80	20.0	µg/L
Selenium, Total, ICP-MS	0.8 J	99.6		500	80.0-120		#	99.7	97.3	500	80.0-120	2.40	20.0	µg/L
Vanadium, Total, ICP-MS	ND(0.3)	103		500	80.0-120		#	103	102	500	80.0-120	1.00	20.0	µg/L
QC Batch: 160616-1	**For samples prepared on: 06/16/2016 0800**						**Spiked sample: 16061002**							
Oklahoma DRO	ND(100)	95.2	84.3	500	80.0-120	12.1	#	119	114	500	80.0-120	4.30	20.0	µg/L
QC Batch: 160616-2	**For samples prepared on: 06/16/2016 0945**						**Spiked sample: 16061004**							
Oklahoma DRO	ND(100)	95.1	95.2	500	80.0-120	0.1	#	97.0	F	500	80.0-120	**	20.0	µg/L
QC Batch: 1GC2167	**For sample analyzed on: 06/15/2016**						**Spiked sample: 16061007**							
Oklahoma GRO	ND(20)	102	100.	200	80.0-120	2.0	#	99.7	103	200	80.0-120	3.30	20.0	µg/L
Surrogate Data:														
4-BFB (8015D)	90.9	93.7	91.8	20.0	84.0-121			91.4	91.2	20.0	84.0-121			µg/L
FLUOROBENZENE (8015D)	99.0	99.4	97.4	20.0	71.7-132			96.2	97.3	20.0	71.7-132			µg/L
QC Batch: 1GC2168	**For sample analyzed on: 06/16/2016**						**Spiked sample: 16061003**							
Oklahoma GRO	ND(20)	98.6	104	200	80.0-120	5.3	#	102	103	200	80.0-120	1.00	20.0	µg/L
Surrogate Data:														
4-BFB (8015D)	86.7	88.6	91.0	20.0	84.0-121			91.5	92.6	20.0	84.0-121			µg/L
FLUOROBENZENE (8015D)	95.5	96.2	97.4	20.0	71.7-132			96.8	98.2	20.0	71.7-132			µg/L
QC Batch: 1GC2173	**For sample analyzed on: 06/21/2016**						**Spiked sample: 16061453**							
Oklahoma GRO	ND(20)	102	109	200	80.0-120	6.6	#	MN	MN	200	80.0-120	**	20.0	µg/L
Surrogate Data:														
4-BFB (8015D)	88.7	89.3	93.5	20.0	84.0-121			MN	MN	20.0	84.0-121	**		µg/L
FLUOROBENZENE (8015D)	97.5	96.7	95.4	20.0	71.7-132			MN	MN	20.0	71.7-132	**		µg/L
QC Batch: 1MS5165	**For sample analyzed on: 06/13/2016**						**Spiked sample: 16061002**							
BTEX														
Benzene	ND(0.04)	98.3		10.0	80.0-120		#	99.8	98.3	10.0	79.6-118	1.50	9.8	µg/L
Toluene	ND(0.06)	106		10.0	80.0-120		#	98.9	104	10.0	89.7-116	5.00	8.0	µg/L
Ethylbenzene	ND(0.1)	110.		10.0	80.0-120		#	102	106	10.0	89.1-114	3.80	6.5	µg/L
m+p-Xylene	ND(0.06)	115		20.0	80.0-120		#	104	108	20.0	88.6-116	3.80	6.7	µg/L
o-Xylene	ND(0.1)	103		10.0	80.0-120		#	94.9	95.1	10.0	88.3-115	0.20	8.1	µg/L
Surrogate Data:														
1,2-DICHLOROETHANE-d4	92.7	92.4		10.0	74.3-123			91.7	94.5	10.0	74.3-123			µg/L
TOLUENE-d8	101	102		10.0	80.0-120			96.2	100.	10.0	80.0-120			µg/L

Data Qualifiers:

J - The concentration or not detected (ND) value is below the Limit of Quantitation (LOQ) and is considered an estimated value.

F - MS and/or MSD sample data are not available due to insufficient sample volume.

MN - The MS/MSD sample analyses were not performed on a sample from this Pace order number.

** - RPD calculation not applicable/not available for this analysis.

Quality Control Report
Sample Surrogate Data

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Surrogate	Date Prepared	Date Analyzed	Spike Level	Units	% Recovery	Acceptable % Limits
Lab Number: 16061001		**Sample Description: Trip Blank**				
GC/FID Volatile						
4-BFB (8015D)		06/15/2016	20	µg/L	90.0	84.0-121
FLUOROBENZENE (8015D)		06/15/2016	20	µg/L	97.3	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	98.0	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	95.1	80.0-120
Lab Number: 16061002		**Sample Description: WRCSMW-21(060916)**				
GC/FID Volatile						
4-BFB (8015D)		06/16/2016	20	µg/L	91.2	84.0-121
FLUOROBENZENE (8015D)		06/16/2016	20	µg/L	98.4	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	98.0	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	100.	80.0-120
Lab Number: 16061003		**Sample Description: WRCSMW-21D(060916)**				
GC/FID Volatile						
4-BFB (8015D)		06/16/2016	20	µg/L	90.1	84.0-121
FLUOROBENZENE (8015D)		06/16/2016	20	µg/L	98.7	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	101	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	97.5	80.0-120
Lab Number: 16061004		**Sample Description: WRCDUP**				
GC/FID Volatile						
4-BFB (8015D)		06/15/2016	20	µg/L	90.2	84.0-121
FLUOROBENZENE (8015D)		06/15/2016	20	µg/L	98.2	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	92.7	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	94.7	80.0-120
Lab Number: 16061005		**Sample Description: Field Blank**				
GC/FID Volatile						
4-BFB (8015D)		06/15/2016	20	µg/L	92.8	84.0-121
FLUOROBENZENE (8015D)		06/15/2016	20	µg/L	100.	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	94.2	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	94.6	80.0-120
Lab Number: 16061006		**Sample Description: WRCSMW-9(060916)**				
GC/FID Volatile						
4-BFB (8015D)		06/15/2016	20	µg/L	88.2	84.0-121
FLUOROBENZENE (8015D)		06/15/2016	20	µg/L	95.0	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	90.8	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	93.1	80.0-120
Lab Number: 16061007		**Sample Description: WRCSMW-9D(060916)**				
GC/FID Volatile						
4-BFB (8015D)		06/15/2016	20	µg/L	85.9	84.0-121
FLUOROBENZENE (8015D)		06/15/2016	20	µg/L	97.3	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	92.2	74.3-123

Quality Control Report
Sample Surrogate Data

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Surrogate	Date Prepared	Date Analyzed	Spike Level	Units	% Recovery	Acceptable % Limits
Lab Number: 16061007		**Sample Description: WRCSMW-9D(060916)**				
BTEX						
TOLUENE-d8		06/13/2016	10	µg/L	95.2	80.0-120
Lab Number: 16061008		**Sample Description: WRCSMW-11(060916)**				
GC/FID Volatile						
4-BFB (8015D)		06/16/2016	20	µg/L	92.0	84.0-121
FLUOROBENZENE (8015D)		06/16/2016	20	µg/L	98.1	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	99.3	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	95.3	80.0-120
Lab Number: 16061009		**Sample Description: WRCSMW-11D(060916)**				
GC/FID Volatile						
4-BFB (8015D)		06/15/2016	20	µg/L	86.8	84.0-121
FLUOROBENZENE (8015D)		06/15/2016	20	µg/L	95.4	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	106	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	100.	80.0-120
Lab Number: 16061010		**Sample Description: WRCEB(061016)**				
GC/FID Volatile						
4-BFB (8015D)		06/15/2016	20	µg/L	90.8	84.0-121
FLUOROBENZENE (8015D)		06/15/2016	20	µg/L	98.7	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	105	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	97.8	80.0-120
Lab Number: 16061011		**Sample Description: WRCSMW-5D(061016)**				
GC/FID Volatile						
4-BFB (8015D)		06/16/2016	20	µg/L	91.7	84.0-121
FLUOROBENZENE (8015D)		06/16/2016	20	µg/L	99.5	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	105	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	97.3	80.0-120
Lab Number: 16061012		**Sample Description: WRCSMW-5(061016)**				
GC/FID Volatile						
4-BFB (8015D)		06/21/2016	20	µg/L	89.1	84.0-121
FLUOROBENZENE (8015D)		06/21/2016	20	µg/L	95.6	71.7-132
BTEX						
1,2-DICHLOROETHANE-d4		06/13/2016	10	µg/L	104	74.3-123
TOLUENE-d8		06/13/2016	10	µg/L	96.0	80.0-120

Quality Control Report
Continuing Calib. Blank Report

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Analysis	Date of Analysis	Instrument Batch ID	Units	Result
Arsenic, Total, ICP-MS	06/14/2016	2IP3166	µg/L	0.2 J

Samples associated with this Continuing Calibration Verification:

Laboratory Number	Instrument Batch	Sample Description
16061001	2IP3166	Trip Blank
16061002	2IP3166	WRCSMW-21(060916)
16061003	2IP3166	WRCSMW-21D(060916)
16061004	2IP3166	WRCDUP

Analysis	Date of Analysis	Instrument Batch ID	Units	Result
Arsenic, Total, ICP-MS	06/14/2016	3IP3166	µg/L	0.3 J

Samples associated with this Continuing Calibration Verification:

Laboratory Number	Instrument Batch	Sample Description
16061001	2IP3166	Trip Blank
16061002	2IP3166	WRCSMW-21(060916)
16061003	2IP3166	WRCSMW-21D(060916)
16061004	2IP3166	WRCDUP
16061005	3IP3166	Field Blank
16061006	3IP3166	WRCSMW-9(060916)
16061007	3IP3166	WRCSMW-9D(060916)
16061008	3IP3166	WRCSMW-11(060916)
16061009	3IP3166	WRCSMW-11D(060916)
16061010	3IP3166	WRCEB(061016)
16061011	3IP3166	WRCSMW-5D(061016)
16061012	3IP3166	WRCSMW-5(061016)

Analysis	Date of Analysis	Instrument Batch ID	Units	Result
Arsenic, Total, ICP-MS	06/14/2016	4IP3166	µg/L	0.4 J

Samples associated with this Continuing Calibration Verification:

Laboratory Number	Instrument Batch	Sample Description
16061005	3IP3166	Field Blank
16061006	3IP3166	WRCSMW-9(060916)
16061007	3IP3166	WRCSMW-9D(060916)
16061008	3IP3166	WRCSMW-11(060916)
16061009	3IP3166	WRCSMW-11D(060916)
16061010	3IP3166	WRCEB(061016)
16061011	3IP3166	WRCSMW-5D(061016)
16061012	3IP3166	WRCSMW-5(061016)

Analysis	Date of Analysis	Instrument Batch ID	Units	Result
Barium, Total, ICP-MS	06/13/2016	5IP3165	CCB acceptable for this Instrument Batch.	

Quality Control Report
Continuing Calib. Blank Report

Client: Coffeyville Resources
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Barium, Total, ICP-MS	06/13/2016	6IP3165	CCB acceptable for this Instrument Batch.
Barium, Total, ICP-MS	06/14/2016	7IP3165	CCB acceptable for this Instrument Batch.
Barium, Total, ICP-MS	06/14/2016	8IP3165	CCB acceptable for this Instrument Batch.
Chromium, Total, ICP-MS	06/14/2016	2IP3166	CCB acceptable for this Instrument Batch.
Chromium, Total, ICP-MS	06/14/2016	3IP3166	CCB acceptable for this Instrument Batch.
Chromium, Total, ICP-MS	06/13/2016	5IP3165	CCB acceptable for this Instrument Batch.
Chromium, Total, ICP-MS	06/13/2016	6IP3165	CCB acceptable for this Instrument Batch.
Chromium, Total, ICP-MS	06/14/2016	7IP3165	CCB acceptable for this Instrument Batch.
Chromium, Total, ICP-MS	06/14/2016	8IP3165	CCB acceptable for this Instrument Batch.
Lead, Total, ICP-MS	06/13/2016	5IP3165	CCB acceptable for this Instrument Batch.
Lead, Total, ICP-MS	06/13/2016	6IP3165	CCB acceptable for this Instrument Batch.
Lead, Total, ICP-MS	06/14/2016	7IP3165	CCB acceptable for this Instrument Batch.
Lead, Total, ICP-MS	06/14/2016	8IP3165	CCB acceptable for this Instrument Batch.
Selenium, Total, ICP-MS	06/16/2016	2IP3168	CCB acceptable for this Instrument Batch.
Selenium, Total, ICP-MS	06/16/2016	3IP3168	CCB acceptable for this Instrument Batch.
Selenium, Total, ICP-MS	06/16/2016	4IP3168	CCB acceptable for this Instrument Batch.
Selenium, Total, ICP-MS	06/16/2016	5IP3168	CCB acceptable for this Instrument Batch.
Vanadium, Total, ICP-MS	06/14/2016	2IP3166	CCB acceptable for this Instrument Batch.
Vanadium, Total, ICP-MS	06/14/2016	3IP3166	CCB acceptable for this Instrument Batch.
Vanadium, Total, ICP-MS	06/13/2016	5IP3165	CCB acceptable for this Instrument Batch.
Vanadium, Total, ICP-MS	06/13/2016	6IP3165	CCB acceptable for this Instrument Batch.
Vanadium, Total, ICP-MS	06/14/2016	7IP3165	CCB acceptable for this Instrument Batch.
Vanadium, Total, ICP-MS	06/14/2016	8IP3165	CCB acceptable for this Instrument Batch.

Data Qualifiers:
J - The concentration or not detected (ND) value is below the Limit of Quantitation (LOQ) and is considered an estimated value.

Quality Control Report
Continuing Calibration Report

Client: Coffeyville Resources
Attn: Sam McCormick
10 E. Cambridge Circle Dr.
Kansas City, KS 66103

Date Reported: 07/01/2016
Date Received: 06/10/2016
Pace File No: 8462
Pace Order No: 133797

Analysis	Date of Analysis	Instrument Batch ID	Amount in Standard	Amount Detected	Units	Percent Recovery
Oklahoma GRO	06/15/2016	1GC2167	CCV recovery acceptable for this Instrument Batch.			
Oklahoma GRO	06/15/2016	2GC2167	CCV recovery acceptable for this Instrument Batch.			
Oklahoma GRO	06/16/2016	1GC2168	CCV recovery acceptable for this Instrument Batch.			
Oklahoma GRO	06/16/2016	2GC2168	CCV recovery acceptable for this Instrument Batch.			
Oklahoma GRO	06/21/2016	1GC2173	CCV recovery acceptable for this Instrument Batch.			
Oklahoma GRO	06/21/2016	2GC2173	CCV recovery acceptable for this Instrument Batch.			
Oklahoma DRO	06/22/2016	1EX4174	CCV recovery acceptable for this Instrument Batch.			
Oklahoma DRO	06/22/2016	2EX4174	CCV recovery acceptable for this Instrument Batch.			
Oklahoma DRO	06/23/2016	2EX4175	CCV recovery acceptable for this Instrument Batch.			
Oklahoma DRO	06/24/2016	3EX4175	CCV recovery acceptable for this Instrument Batch.			
Oklahoma DRO	06/24/2016	4EX4175	CCV recovery acceptable for this Instrument Batch.			
BTEX	06/13/2016	1MS5165	CCV recovery acceptable for this Instrument Batch.			
BTEX	06/13/2016	2MS5165	CCV recovery acceptable for this Instrument Batch.			
Arsenic, Total, ICP-MS	06/14/2016	2IP3166	CCV recovery acceptable for this Instrument Batch.			
Arsenic, Total, ICP-MS	06/14/2016	3IP3166	CCV recovery acceptable for this Instrument Batch.			
Arsenic, Total, ICP-MS	06/14/2016	4IP3166	CCV recovery acceptable for this Instrument Batch.			
Barium, Total, ICP-MS	06/13/2016	5IP3165	CCV recovery acceptable for this Instrument Batch.			
Barium, Total, ICP-MS	06/13/2016	6IP3165	CCV recovery acceptable for this Instrument Batch.			
Barium, Total, ICP-MS	06/14/2016	7IP3165	CCV recovery acceptable for this Instrument Batch.			
Barium, Total, ICP-MS	06/14/2016	8IP3165	CCV recovery acceptable for this Instrument Batch.			
Chromium, Total, ICP-MS	06/13/2016	5IP3165	CCV recovery acceptable for this Instrument Batch.			
Chromium, Total, ICP-MS	06/13/2016	6IP3165	CCV recovery acceptable for this Instrument Batch.			
Chromium, Total, ICP-MS	06/14/2016	7IP3165	CCV recovery acceptable for this Instrument Batch.			
Chromium, Total, ICP-MS	06/14/2016	8IP3165	CCV recovery acceptable for this Instrument Batch.			
Chromium, Total, ICP-MS	06/14/2016	2IP3166	CCV recovery acceptable for this Instrument Batch.			
Chromium, Total, ICP-MS	06/14/2016	3IP3166	CCV recovery acceptable for this Instrument Batch.			
Lead, Total, ICP-MS	06/13/2016	5IP3165	CCV recovery acceptable for this Instrument Batch.			
Lead, Total, ICP-MS	06/13/2016	6IP3165	CCV recovery acceptable for this Instrument Batch.			
Lead, Total, ICP-MS	06/14/2016	7IP3165	CCV recovery acceptable for this Instrument Batch.			
Lead, Total, ICP-MS	06/14/2016	8IP3165	CCV recovery acceptable for this Instrument Batch.			
Selenium, Total, ICP-MS	06/16/2016	2IP3168	CCV recovery acceptable for this Instrument Batch.			
Selenium, Total, ICP-MS	06/16/2016	3IP3168	CCV recovery acceptable for this Instrument Batch.			
Selenium, Total, ICP-MS	06/16/2016	4IP3168	CCV recovery acceptable for this Instrument Batch.			
Selenium, Total, ICP-MS	06/16/2016	5IP3168	CCV recovery acceptable for this Instrument Batch.			
Vanadium, Total, ICP-MS	06/13/2016	5IP3165	CCV recovery acceptable for this Instrument Batch.			
Vanadium, Total, ICP-MS	06/13/2016	6IP3165	CCV recovery acceptable for this Instrument Batch.			
Vanadium, Total, ICP-MS	06/14/2016	7IP3165	CCV recovery acceptable for this Instrument Batch.			
Vanadium, Total, ICP-MS	06/14/2016	8IP3165	CCV recovery acceptable for this Instrument Batch.			
Vanadium, Total, ICP-MS	06/14/2016	2IP3166	CCV recovery acceptable for this Instrument Batch.			
Vanadium, Total, ICP-MS	06/14/2016	3IP3166	CCV recovery acceptable for this Instrument Batch.			

Continental Analytical Services, Inc.
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(785)827-1273 (800)535-3076 Fax (785)823-7830
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CHAIN OF CUSTODY RECORD

Continental Order Number: 133797

Client/Reporting Information	Invoice Information
Company Name: Coffeyville Resources, LLC	Company Name: Coffeyville Resources, LLC
Address: 10 East Cambridge Circle Dr. / Suite 250	Address: 10 East Cambridge Circle Dr. / Suite 250
City: Kansas City State: Kansas Zip: 66103	City: Kansas City State: Kansas Zip: 66103
Contact: Sam McCormick / Jerome McSorley	Contact: Sam McCormick
E-mail: samccormick@cvrenergy.com / jdmcsorley@cvrenergy.com	E-mail:
Phone Number: 913-982-0457 Fax Number:	Phone Number: 913-982-0457 Fax Number:
Sampler's Name / Company (Printed): Jerome McSorley CVR Energy	Sampler's Name (Signature):
Project Name: WRC SWRP Wells	Facility Name / Address: WRC Wynnewood, OK
	Purchase Order Number:

SAMPLE IDENTIFICATION (30 Characters or less)	Matrix (Sample Type)	Regulatory Program	Date Sampled	Time Sampled	C-Composite G-Grab	Total Containers	Number of Preserved Bottles: HCl	NaOH	HNO3	H2SO4	NONE	OTHER:	BTEX (8020/8015) - 3x glass 40 ml vials (HCL)	Oklahoma GRO (8020/8015) - 3x glass 40 ml vials (HCL)	Oklahoma DRO (8000/8100) - 2x amber 1L (HCL)	Metals (As, Ba, Cr, Pb, Se, V) (6020A) - 1 plastic 500 ml (HNO3)						COMMENTS
Trip Blank	O	R	June 9, 2016	9:30	G	9	8		1				X	X	X	X						
WRCSMW-21(060916)	GW	R	June 9, 2016	10:15	G	9	8		1				X	X	X	X						Provided by Pace
WRCSMW-21 MS/MSD	GW	R	June 9, 2016	10:15	G	10	9		1				X	X	X	X						
WRCSMW-21D(060916)	GW	R	June 9, 2016	11:05	G	9	8		1				X	X	X	X						
WRCDUP	GW	R	June 9, 2016	11:05	G	9	8		1				X	X	X	X						
Field Blank	GW	R	June 9, 2016	12:40	G	9	8		1				X	X	X	X						
WRCSMW-9(060916)	GW	R	June 9, 2016	13:06	G	9	8		1				X	X	X	X						Deionized water
WRCSMW-9D(060916)	GW	R	June 9, 2016	13:42	G	9	8		1				X	X	X	X						
WRCSMW-11(060916)	GW	R	June 9, 2016	14:17	G	9	8		1				X	X	X	X						
WRCSMW-11D(060916)	GW	R	June 9, 2016	14:47	G	9	8		1				X	X	X	X						
WRCEB(061016)	O	R	June 10, 2016	8:00	G	9	8		1				X	X	X	X						Deionized water

Matrix (Sample Type): DW=Drinking Water, GW=Ground Water, WW=Waste Water, W=Wipe, S=Solid/Soil, SL=Sludge, A=Air, OL= Oil/Organic Liquid, O=Other,

Regulatory Program: N=NPDES, R=RCRA, D=Drinking Water, SL=503 Sludge, O=Other, nR=Non RCRA IMW

(Please note if non-standard turnaround. Rush & Emergency subject to additional charge)
Standard TAT: (15 working days) Rush TAT: (5 working days) Emergency TAT: (3 working days)

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
	6-10-16	1310		6-10-16	1310
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
	6-10-16	1500			
RECEIVED AT LAB BY: Mamie Caines	DATE: 6/10/16	TIME: 15:00	SHIPPED VIA: AIRBILL:	SEAL #: SEAL DATE:	

H:\COC\COC_SWSP_June 2016.xls WRC_SWRP_PO 16 9 2016

PLEASE NOTE THE ATTACHED CONTINENTAL SAMPLE ACCEPTANCE POLICY

Continental Analytical Services, Inc.
525 N. 8th Street, Salina, KS 67401
(785)827-1273 (800)535-3076 Fax (785)823-7830
www.cas-lab.com

CHAIN OF CUSTODY RECORD

Continental Order Number: 133797

Client/Reporting Information	Invoice Information
Company Name: Coffeyville Resources, LLC	Company Name: Coffeyville Resources, LLC
Address: 10 East Cambridge Circle Dr. / Suite 250	Address: 10 East Cambridge Circle Dr. / Suite 250
City: Kansas City State: Kansas Zip: 66103	City: Kansas City State: Kansas Zip: 66103
Contact: Sam McCormick / Jerome McSorley	Contact: Sam McCormick
E-mail: samccormick@cvrenergy.com / jdmcsorley@cvrenergy.com	E-mail:
Phone Number: 913-982-0457 Fax Number:	Phone Number: 913-982-0457 Fax Number:
Sampler's Name / Company:(Printed) Jerome McSorley CVR Energy	Sampler's Name:(Signature)
Project Name: WRC SWRP Wells	Facility Name / Address: WRC Wynnewood, OK
Purchase Order Number:	

SAMPLE IDENTIFICATION (30 Characters or less)	Matrix (Sample Type)	Regulatory Program	Date Sampled	Time Sampled	C-Composite G-Grab	Total Containers	Number of Preserved Bottles: HCl	NaOH	HNO3	H2SO4	NONE	Initials:	BTEX (8020/8015) - 3x glass 40 ml vials (HCL)	Oklahoma GRO (8020/8015) - 3x glass 40 ml vials (HCL)	Oklahoma DRO (8000/8100) - 2x amber 1L (HCL)	Metals (As, Ba, Cr, Pb, Se, V) (6020A) - 1 plastic 500 ml (HNO3)						COMMENTS
WRCSMW-5D(061016)	GW	R	June 10, 2016	8:38	G	9	8		1				X	X	X	X						
WRCSMW-5(061016)	GW	R	June 10, 2016	9:25	G	9	8		1				X	X	X	X						

Matrix (Sample Type): DW=Drinking Water, GW=Ground Water, WW=Waste Water, W=Wipe, S=Solid/Soil, SL=Sludge, A=Air, OL= Oil/Organic Liquid, O=Other,

Regulatory Program: N=NPDES, R=RCRA, D=Drinking Water, SL=503 Sludge, O=Other, nR=Non RCRA IMW

(Please note if non-standard turnaround. Rush & Emergency subject to additional charge)
Standard TAT: (15 working days) Rush TAT: (5 working days) Emergency TAT: (3 working days)

	DATE:	TIME:		DATE:	TIME:
RELINQUISHED BY:	6-10-16	1310	RECEIVED BY:	6/10/16	1310
RELINQUISHED BY:	6/10/16	1500	RECEIVED BY:		
RECEIVED AT LAB BY: Mamie Cavins	6/10/16	15:00	SHIPPED VIA: AIRBILL:	SEAL #: SEAL DATE:	

PLEASE NOTE THE ATTACHED CONTINENTAL SAMPLE ACCEPTANCE POLICY

Pace Analytical
Cooler/Sample Receipt Form (C/S RF)

Pace Order No.: 133797

Client Name: Coffeyville

Pace File No.: 8402

Sample ID's in cooler:

MW-5
MW-5D
WREEB
MW-11D

2-2A
1-500P

Cooler 1 **of** 4 **for this Pace Order No.**

Cooler Identification: Pace Cooler #: 4117 / Client's Cooler / Box / Letter / Hand-delivered
Other: _____

Date/Time Cooler Received: 6/10/16 15:00

Delivered By: UPS / FedX / AB Express / Field Svcs / Mail / Walk-In / Other: _____

Custody Seal: Present: Intact / Broken / Absent: ✓ Seal No: _____
Seal Name: _____ Seal Date: _____
Seal matches Chain of Custody: Yes / No / N/A

Type of Packing Material: Blue Ice / Ice / Melted Ice / Bubble / Foam / Paper / Peanuts / Vermiculite / None / Other: _____

Cooler Temperature (°C): Original Reading (°C) 3.5 Corrected Reading (°C) 3.4
Temperature. By: ~~Temperature Blank~~ Surface Temperature
Thermo. ID No.: 585 Thermo. Correction Factor (°C): -0.1

☐ Evidence of Cooling and date received = date sampled

Sample Receipt Discrepancies: ☑ No ☐ Yes **(See below for discrepancies.)**

Note: If discrepancies are present, Pace will proceed with analyses until/unless directed otherwise by the client.

☐ Chain of Custody not present - information taken from:
Cover Letter ☐ Container ☐
PO ☐ Pace Proj. Mgr. ☐
☐ Container label absent
☐ Chain of Custody incomplete [see detail below]
☐ Chain of Custody missing date/time sampled (excl. TB or Dup.)
☐ Date or Time sampled obtained from container label
☐ Chain of Custody missing sampler's name
☐ Chain of Custody missing matrix (sample type)
☐ Missing relinquished information: signature date time

☐ Sample excluded from Chain of Custody
☐ Sample listed on Chain of Custody, not received
☐ Sample identification on container and Chain of Custody do not agree
☐ Air bubbles in Aqueous VOA vials larger than pea-size [approx. 6 mm]
☐ Cooler temperature exceeded 0.1 - 6.0 °C requirement
[Do not mark if samples do not require cooling to 0.1 - 6.0 °C.]
☐ Broken or leaking containers (detail actions below)
☐ Sample container type or labeled chemical preservation inappropriate
☐ Other discrepancies: _____

Detail to discrepancies/comments:

Completed by: SA **Date Completed:** 6-10-16

Pace Analytical
Cooler/Sample Receipt Form (C/S RF)

Pace Order No.: 133797

Client Name: Coffeyville

Pace File No.: 8462

Sample ID's in cooler:

Trip Blank	3-2A	1-500p
MW-21 MS/MSD	3-2A	1-500p
MW-21	2-2A	1-500p

Cooler 2 **of** 4 **for this Pace Order No.**

Cooler Identification: Pace Cooler #: 4142 / Client's Cooler / Box / Letter / Hand-delivered
Other: _____

Date/Time Cooler Received: 6/10/16 15:00

Delivered By: UPS / FedX / AB Express / Field Svcs / Mail / Walk-In / Other: _____

Custody Seal: Present: Intact / Broken Absent: ✓ Seal No: —
Seal Name: — Seal Date: —
Seal matches Chain of Custody: Yes / No / N/A

Type of Packing Material: Blue Ice / Ice / Melted Ice / Bubble / Foam / Paper / Peanuts / Vermiculite / None / Other: _____

Cooler Temperature (°C): Original Reading (°C) 2.4 Corrected Reading (°C) 2.3
Temperature. By: Temperature Blank / Surface Temperature
Thermo. ID No.: 533 Thermo. Correction Factor (°C): -0.1

☐ Evidence of Cooling and date received = date sampled

Sample Receipt Discrepancies: ☑ No ☐ Yes **(See below for discrepancies.)**

Note: If discrepancies are present, Pace will proceed with analyses until/unless directed otherwise by the client.

☐ Chain of Custody not present - information taken from:
Cover Letter ☐ Container ☐
PO ☐ Pace Proj. Mgr. ☐
☐ Container label absent
☐ Chain of Custody incomplete [see detail below]
☐ Chain of Custody missing date/time sampled (excl. TB or Dup.)
☐ Date or Time sampled obtained from container label
☐ Chain of Custody missing sampler's name
☐ Chain of Custody missing matrix (sample type)
☐ Missing relinquished information: signature date time

☐ Sample excluded from Chain of Custody
☐ Sample listed on Chain of Custody, not received
☐ Sample identification on container and Chain of Custody do not agree
☐ Air bubbles in Aqueous VOA vials larger than pea-size [approx. 6 mm]
☐ Cooler temperature exceeded 0.1 - 6.0 °C requirement
[Do not mark if samples do not require cooling to 0.1 - 6.0 °C.]
☐ Broken or leaking containers (detail actions below)
☐ Sample container type or labeled chemical preservation inappropriate
☐ Other discrepancies: _____

Detail to discrepancies/comments:

Completed by: SKL **Date Completed:** 6-10-16

Pace Analytical
Cooler/Sample Receipt Form (C/S RF)

Pace Order No.: 133797

Client Name: Cofsen Ville **Pace File No.:** 8462

Sample ID's in cooler: WRC DUP (2-VA All VOCS
MW 27D (2-500P

Cooler 3 **of** 4 **for this Pace Order No.**

Cooler Identification: Pace Cooler #: 4201 / Client's Cooler / Box / Letter / Hand-delivered
Other: _____

Date/Time Cooler Received: 6/10/16 15:00

Delivered By: UPS / FedX / AB Express / Field Svcs / Mail / Walk-In / Other: _____

Custody Seal: Present: Intact / Broken Absent: ✓ Seal No: —
Seal Name: — Seal Date: —
Seal matches Chain of Custody: Yes / No / N/A

Type of Packing Material: Blue Ice / Ice / Melted Ice / Bubble / Foam / Paper / Peanuts / Vermiculite / None / Other: _____

Cooler Temperature (°C): Original Reading (°C) 4.4 Corrected Reading (°C) 4.3
Temperature. By: Temperature Blank Surface Temperature
Thermo. ID No.: 585 Thermo. Correction Factor (°C): -0.1

☐ Evidence of Cooling and date received = date sampled

Sample Receipt Discrepancies: ☒ No ☐ Yes (See below for discrepancies.)

Note: If discrepancies are present, Pace will proceed with analyses until/unless directed otherwise by the client.

☐ Chain of Custody not present - information taken from:
Cover Letter ☐ Container ☐
PO ☐ Pace Proj. Mgr. ☐
☐ Container label absent
☐ Chain of Custody incomplete [see detail below]
☐ Chain of Custody missing date/time sampled (excl. TB or Dup.)
☐ Date or Time sampled obtained from container label
☐ Chain of Custody missing sampler's name
☐ Chain of Custody missing matrix (sample type)
☐ Missing relinquished information: signature date time

☐ Sample excluded from Chain of Custody
☐ Sample listed on Chain of Custody, not received
☐ Sample identification on container and Chain of Custody do not agree
☐ Air bubbles in Aqueous VOA vials larger than pea-size [approx. 6 mm]
☐ Cooler temperature exceeded 0.1 - 6.0 °C requirement
[Do not mark if samples do not require cooling to 0.1 - 6.0 °C.]
☐ Broken or leaking containers (detail actions below)
☐ Sample container type or labeled chemical preservation inappropriate
☐ Other discrepancies: _____

Detail to discrepancies/comments:

Completed by: SKR **Date Completed:** 6-10-16

Pace Analytical
Cooler/Sample Receipt Form (C/S RF)

Pace Order No.: 133797

Client Name: Coffeyville **Pace File No.:** 8962

Sample ID's in cooler: WRCS MW-11 2LA 1-500D
MW-9D
MW-9
Field Blank

Cooler 4 **of** 4 **for this Pace Order No.**

Cooler Identification: Pace Cooler #: 4029 / Client's Cooler / Box / Letter / Hand-delivered
Other: _____

Date/Time Cooler Received: 6/10/16 15:00

Delivered By: UPS / FedX / AB Express / Field Svcs / Mail / Walk-In / Other: _____

Custody Seal: Present: Intact / Broken Absent: ✓ Seal No: —
Seal Name: _____ Seal Date: —
Seal matches Chain of Custody: Yes / No / N/A

Type of Packing Material: Blue Ice / Ice / Melted Ice / Bubble / Foam / Paper / Peanuts / Vermiculite / None / Other: _____

Cooler Temperature (°C): Original Reading (°C) 2.9 Corrected Reading (°C) 2.8
Temperature. By: Temperature Blank Surface Temperature
Thermo. ID No.: 585 Thermo. Correction Factor (°C): -0.1

☐ Evidence of Cooling and date received = date sampled

Sample Receipt Discrepancies: ☐ No ☐ Yes **(See below for discrepancies.)**

Note: If discrepancies are present, Pace will proceed with analyses until/unless directed otherwise by the client.

☐ Chain of Custody not present - information taken from:
Cover Letter ☐ Container ☐
PO ☐ Pace Proj. Mgr. ☐
☐ Container label absent
☐ Chain of Custody incomplete [see detail below]
☐ Chain of Custody missing date/time sampled (excl. TB or Dup.)
☐ Date or Time sampled obtained from container label
☐ Chain of Custody missing sampler's name
☐ Chain of Custody missing matrix (sample type)
☐ Missing relinquished information: signature date time

☐ Sample excluded from Chain of Custody
☐ Sample listed on Chain of Custody, not received
☐ Sample identification on container and Chain of Custody do not agree
☐ Air bubbles in Aqueous VOA vials larger than pea-size [approx. 6 mm]
☐ Cooler temperature exceeded 0.1 - 6.0 °C requirement
[Do not mark if samples do not require cooling to 0.1 - 6.0 °C.]
☐ Broken or leaking containers (detail actions below)
☐ Sample container type or labeled chemical preservation inappropriate
☐ Other discrepancies: _____

Detail to discrepancies/comments:

Completed by: SKR **Date Completed:** 6-10-16

Appendix C – Statistical Analysis – Summary Reports and Tables

GeoStat **Environmental, LLC**

Office (620) 241-6090 Fax (620) 241-6490

July 28, 2016

Mr. Jerome McSorley, PG
Geologist
CVR Energy, Inc.
1207 Sovereign Row
Oklahoma City, OK 73108

RE: GeoStat Support for CVR Energy, Inc. - Statistical Analysis for Groundwater Data at the Wynnewood Facility

Dear Mr. McSorley;

Attached please find results of the 8 year rolling average Mann-Kendall statistical analysis for groundwater samples taken from monitoring wells associated with the closed storm water retention pond at the Wynnewood refinery facility. Analysis included Sen's Slope (Mann-Kendall) trend analysis, intra-well tolerance limit analysis, time series plots, and box & whisker plots. Statistical analysis was completed for analyzed constituents utilizing all available data from May 2008 through June 2016. Monitoring wells analyzed consist of:

Upgradient Wells:
SMW-5, SMW-5D

Downgradient Wells:
SMW-9, SMW-9D, SMW-11, SMW-11D, SMW-21, SMW-21D

Appropriate statistical methodology from 40 CFR 258.53 (g) were utilized to analyze these constituents. TPH (as GRO and DRO), BTEX, and arsenic levels were evaluated using the Sen's Slope (Mann-Kendall) trend evaluation in accordance with the EPA Practical Methods for Data Analysis, EPA QA/G-9 QA00 Update, July 2000, Section 4.3.4, as outlined in Attachment 13 of the WRC RCRA permit. The trend evaluation compares results from the latest 16 sampling events (8 years) and determines if the analyte concentration in the well is increasing, decreasing, or stable/no trend. Copies of the Sen's Slope (Mann-Kendall) trend evaluation charts are included below.

The TPH Mann-Kendall trend evaluation tables show TPH (as GRO and DRO) concentrations as flat or decreasing in all downgradient wells. Of note, TPH (as GRO and DRO) concentrations have been generally trending down in all deep and shallow wells since 2010. Upgradient well SMW-5D indicates a slight increasing trend, which may begin to impact downgradient well concentrations in the future.

Previous Mann-Kendall trend evaluations indicated that both upgradient and downgradient well locations showed increasing TPH trends, suggesting that the increasing trend in TPH is the result of TPH (from an upgradient source) migrating past the SWRP.

The arsenic Sen's Slope (Mann-Kendall) trend evaluation show an overall downward trend for arsenic in shallow SWRP well SMW-5, and a stable trend (SMW-9D, SMW-11D) and slight uptrend in two deep SWRP wells (SMW-5D, and SMW-21D). Note that the trend in SMW-21D has been decreasing since June

2011, while the last four events at upgradient well SMW-5D have exhibited increasing detections. Two shallow SWRP wells (SMW-11 and SMW-21) exhibit an upward trend. For the additional RCRA metals, (barium, chromium, lead, selenium, vanadium) analysis indicated the trends were either stable or trending down.

Benzene, ethylbenzene, toluene, xylene (BTEX) was not detected above the respective practical quantitation limit (PQL) in any monitoring well in June 2016, with the exception of xylene in SMW-5D and SMW-9D. A limited number of BTEX detections below the PQL (J flagged) were noted, therefore Sen's Slope (Mann-Kendall) analysis was completed for BTEX. Analysis indicated either a stable trend (sampling data either non-detect or below the applicable PQL) or a decreasing trend.

Intra-well tolerance limit analysis was also completed. As shown on the summary table and graphical analysis, no statistical exceedances were noted for analyzed constituents associated with sampling data for the June 2016 sampling event, with the exception of arsenic in upgradient well SMW-5D.

GeoStat appreciates the opportunity to provide our technical services to you on this project. Please call me at (620) 241-6090, if you have any questions regarding this report.

Sincerely,
***GeoStat* Environmental, LLC**

Kurt Shobe, MS, PG, CHMM
Project Manager

Wynnewood June 2016 S en's Slope/Mann-Kendall

Constituent	Well	Slope	Mann-K.	Critical	Sig.	N	Alpha
Arsenic (mg/l)	**SMW-11**	**0.002313**	**61**	**58**	**Yes**	**17**	**0.02**
Arsenic (mg/l)	**SMW-21**	**0.001522**	**72**	**58**	**Yes**	**17**	**0.02**
Arsenic (mg/l)	SMW-21D	0.000...	23	58	No	17	0.02
Arsenic (mg/l)	**SMW-5 (bg)**	**-0.00...**	**-78**	**-58**	**Yes**	**17**	**0.02**
Arsenic (mg/l)	**SMW-5D (bg)**	**0.000...**	**61**	**58**	**Yes**	**17**	**0.02**
Arsenic (mg/l)	SMW-9	-0.00...	-39	-58	No	17	0.02
Arsenic (mg/l)	SMW-9D	0.000...	37	58	No	17	0.02
Arsenic (mg/l)	SMW-11D	0.000...	2	58	No	17	0.02
Barium (mg/L)	SMW-11	-0.01059	-10	-58	No	17	0.02
Barium (mg/L)	SMW-21	0.008738	50	58	No	17	0.02
Barium (mg/L)	SMW-21D	-0.00...	-20	-58	No	17	0.02
Barium (mg/L)	SMW-5 (bg)	0.001036	6	58	No	17	0.02
Barium (mg/L)	SMW-5D (bg)	0.001106	6	58	No	17	0.02
Barium (mg/L)	SMW-9	-0.01105	-58	-58	No	17	0.02
Barium (mg/L)	SMW-9D	-0.00...	-25	-58	No	17	0.02
Barium (mg/L)	SMW-11D	-0.00...	-13	-58	No	17	0.02
benzene (ug/l)	SMW-11	-0.03419	-56	-58	No	17	0.02
benzene (ug/l)	SMW-21	-0.00...	-37	-58	No	17	0.02
benzene (ug/l)	SMW-21D	0	-46	-58	No	17	0.02
benzene (ug/l)	SMW-5 (bg)	-0.03718	-58	-58	No	17	0.02
benzene (ug/l)	**SMW-5D (bg)**	**-0.1013**	**-76**	**-58**	**Yes**	**17**	**0.02**
benzene (ug/l)	SMW-9	0	-45	-58	No	17	0.02
benzene (ug/l)	SMW-9D	0	-45	-58	No	17	0.02
benzene (ug/l)	SMW-11D	0	-46	-58	No	17	0.02
Chromium (mg/l)	**SMW-11**	**-0.00...**	**-71**	**-58**	**Yes**	**17**	**0.02**
Chromium (mg/l)	**SMW-21**	**-0.00...**	**-71**	**-58**	**Yes**	**17**	**0.02**
Chromium (mg/l)	**SMW-21D**	**-0.00...**	**-69**	**-58**	**Yes**	**17**	**0.02**
Chromium (mg/l)	**SMW-5 (bg)**	**-0.00...**	**-69**	**-58**	**Yes**	**17**	**0.02**
Chromium (mg/l)	**SMW-5D (bg)**	**-0.00...**	**-74**	**-58**	**Yes**	**17**	**0.02**
Chromium (mg/l)	**SMW-9**	**-0.00...**	**-74**	**-58**	**Yes**	**17**	**0.02**
Chromium (mg/l)	**SMW-9D**	**-0.00...**	**-71**	**-58**	**Yes**	**17**	**0.02**
Chromium (mg/l)	**SMW-11D**	**-0.00...**	**-71**	**-58**	**Yes**	**17**	**0.02**
Ethylbenzene (ug/l)	SMW-11	0	-47	-58	No	17	0.02
Ethylbenzene (ug/l)	SMW-21	0	-23	-58	No	17	0.02
Ethylbenzene (ug/l)	SMW-21D	0	-47	-58	No	17	0.02
Ethylbenzene (ug/l)	SMW-5 (bg)	0	-47	-58	No	17	0.02
Ethylbenzene (ug/l)	**SMW-5D (bg)**	**-0.09978**	**-75**	**-58**	**Yes**	**17**	**0.02**
Ethylbenzene (ug/l)	SMW-9	0	-47	-58	No	17	0.02
Ethylbenzene (ug/l)	SMW-9D	0	-47	-58	No	17	0.02
Ethylbenzene (ug/l)	SMW-11D	0	-47	-58	No	17	0.02
GRO+DRO (ug/l)	SMW-11	-103.5	-16	-58	No	17	0.02
GRO+DRO (ug/l)	SMW-21	0	4	58	No	17	0.02
GRO+DRO (ug/l)	SMW-21D	-42.83	-47	-58	No	17	0.02
GRO+DRO (ug/l)	**SMW-5 (bg)**	**-58.19**	**-60**	**-58**	**Yes**	**17**	**0.02**
GRO+DRO (ug/l)	SMW-5D (bg)	10.85	21	58	No	17	0.02
GRO+DRO (ug/l)	SMW-9	-50.1	-24	-58	No	17	0.02
GRO+DRO (ug/l)	SMW-9D	-48.27	-53	-58	No	17	0.02
GRO+DRO (ug/l)	SMW-11D	-30.79	-46	-58	No	17	0.02
Lead (mg/l)	**SMW-11**	**-0.00...**	**-86**	**-58**	**Yes**	**17**	**0.02**
Lead (mg/l)	**SMW-21**	**-0.00...**	**-86**	**-58**	**Yes**	**17**	**0.02**
Lead (mg/l)	**SMW-21D**	**-0.00...**	**-84**	**-58**	**Yes**	**17**	**0.02**
Lead (mg/l)	**SMW-5 (bg)**	**-0.00...**	**-71**	**-58**	**Yes**	**17**	**0.02**
Lead (mg/l)	**SMW-5D (bg)**	**-0.00...**	**-71**	**-58**	**Yes**	**17**	**0.02**
Lead (mg/l)	**SMW-9**	**-0.00...**	**-82**	**-58**	**Yes**	**17**	**0.02**
Lead (mg/l)	**SMW-9D**	**-0.00...**	**-68**	**-58**	**Yes**	**17**	**0.02**
Lead (mg/l)	**SMW-11D**	**-0.00...**	**-82**	**-58**	**Yes**	**17**	**0.02**
Selenium (mg/l)	**SMW-11**	**-0.00...**	**-68**	**-58**	**Yes**	**17**	**0.02**
Selenium (mg/l)	SMW-21	-0.00...	-57	-58	No	17	0.02
Selenium (mg/l)	**SMW-21D**	**-0.00...**	**-77**	**-58**	**Yes**	**17**	**0.02**
Selenium (mg/l)	SMW-5 (bg)	0	-5	-58	No	17	0.02
Selenium (mg/l)	**SMW-5D (bg)**	**-0.00...**	**-62**	**-58**	**Yes**	**17**	**0.02**
Selenium (mg/l)	SMW-9	0.000...	20	58	No	17	0.02
Selenium (mg/l)	**SMW-9D**	**-0.00...**	**-71**	**-58**	**Yes**	**17**	**0.02**
Selenium (mg/l)	**SMW-11D**	**-0.00...**	**-64**	**-58**	**Yes**	**17**	**0.02**
toluene (ug/l)	SMW-11	0	-56	-58	No	17	0.02
toluene (ug/l)	SMW-21	-0.09035	-52	-58	No	17	0.02
toluene (ug/l)	SMW-21D	0	-47	-58	No	17	0.02
toluene (ug/l)	SMW-5 (bg)	-0.00...	-55	-58	No	17	0.02

Wynnewood June 2016 S en's Slope/Mann-Kendall

Constituent	Well	Slope	Mann-K.	Critical	Sig.	N	Alpha
toluene (ug/l)	SMW-5D (bg)	0	-47	-58	No	17	0.02
toluene (ug/l)	SMW-9	-0.07561	-56	-58	No	17	0.02
toluene (ug/l)	**SMW-9D**	**-0.07728**	**-60**	**-58**	**Yes**	**17**	**0.02**
toluene (ug/l)	SMW-11D	0	-47	-58	No	17	0.02
Xylenes (ug/l)	SMW-11	-0.166	-43	-44	No	14	0.02
Xylenes (ug/l)	SMW-21	0	-34	-44	No	14	0.02
Xylenes (ug/l)	SMW-21D	0	-24	-44	No	14	0.02
Xylenes (ug/l)	SMW-5 (bg)	0	-24	-44	No	14	0.02
Xylenes (ug/l)	**SMW-5D (bg)**	**-0.1905**	**-50**	**-44**	**Yes**	**14**	**0.02**
Xylenes (ug/l)	SMW-9	0	-9	-44	No	14	0.02
Xylenes (ug/l)	**SMW-9D**	**-0.2935**	**-56**	**-44**	**Yes**	**14**	**0.02**
Xylenes (ug/l)	SMW-11D	0	-24	-44	No	14	0.02

Wynnewood June 2016 Tolerance Limit

Constituent	Well	Upper Lim.	Date	Observ.	Sig.	Bg N	%NDs	Transform	Alpha	Method
Arsenic (mg/l)	SMW-11	0.04838	6/9/2016	0.0153	No	16	0	No	0.01	Intra
Arsenic (mg/l)	SMW-21	0.05897	6/9/2016	0.0208	No	16	0	sqrt(x)	0.01	Intra
Arsenic (mg/l)	SMW-21D	0.02794	6/9/2016	0.0124	No	16	0	No	0.01	Intra
Arsenic (mg/l)	SMW-5	0.01449	6/9/2016	0.0024	No	16	6.25	sqrt(x)	0.01	Intra
Arsenic (mg/l)	**SMW-5D**	**0.0155**	**6/10/2016**	**0.0163**	**Yes**	**16**	**0**	**No**	**0.01**	**Intra**
Arsenic (mg/l)	SMW-9	0.03645	6/10/2016	0.0052	No	16	0	No	0.01	Intra
Arsenic (mg/l)	SMW-9D	0.209	6/10/2016	0.0146	No	16	0	n/a	0.4401	NP Intra(normal...
Arsenic (mg/l)	SMW-11D	0.02827	6/9/2016	0.0074	No	16	0	No	0.01	Intra
Barium (mg/L)	SMW-11	0.8101	6/9/2016	0.304	No	16	0	No	0.01	Intra
Barium (mg/L)	SMW-21	0.643	6/9/2016	0.2	No	16	0	n/a	0.4401	NP Intra(normal...
Barium (mg/L)	SMW-21D	0.2803	6/9/2016	0.171	No	16	0	No	0.01	Intra
Barium (mg/L)	SMW-5	0.2842	6/9/2016	0.125	No	16	6.25	No	0.01	Intra
Barium (mg/L)	SMW-5D	0.3028	6/10/2016	0.22	No	16	0	No	0.01	Intra
Barium (mg/L)	SMW-9	0.2094	6/10/2016	0.0984	No	16	0	No	0.01	Intra
Barium (mg/L)	SMW-9D	1.05	6/10/2016	0.165	No	16	0	n/a	0.4401	NP Intra(normal...
Barium (mg/L)	SMW-11D	0.2681	6/9/2016	0.0988	No	16	0	No	0.01	Intra
benzene (ug/l)	SMW-11	5	6/9/2016	0.06	No	16	87.5	n/a	0.4401	NP Intra(NDs)
benzene (ug/l)	SMW-21	5	6/9/2016	0.11	No	16	68.75	n/a	0.4401	NP Intra(normal...
benzene (ug/l)	SMW-21D	5	6/9/2016	0.15	No	16	93.75	n/a	0.4401	NP Intra(NDs)
benzene (ug/l)	SMW-5	5	6/9/2016	<0.04	No	16	93.75	n/a	0.4401	NP Intra(NDs)
benzene (ug/l)	SMW-5D	5	6/10/2016	0.27	No	16	56.25	n/a	0.4401	NP Intra(normal...
benzene (ug/l)	SMW-9	5	6/10/2016	0.11	No	16	100	n/a	0.4401	NP Intra(NDs)
benzene (ug/l)	SMW-9D	5	6/10/2016	0.09	No	16	100	n/a	0.4401	NP Intra(NDs)
benzene (ug/l)	SMW-11D	5	6/9/2016	0.1	No	16	93.75	n/a	0.4401	NP Intra(NDs)
Chromium (mg/l)	SMW-11	0.01	6/9/2016	<0.0005	No	16	56.25	n/a	0.4401	NP Intra(normal...
Chromium (mg/l)	SMW-21	0.01	6/9/2016	<0.0005	No	16	50	n/a	0.4401	NP Intra(normal...
Chromium (mg/l)	SMW-21D	0.01	6/9/2016	<0.0005	No	16	50	n/a	0.4401	NP Intra(normal...
Chromium (mg/l)	SMW-5	0.01	6/9/2016	<0.0005	No	16	43.75	n/a	0.4401	NP Intra(normal...
Chromium (mg/l)	SMW-5D	0.01	6/10/2016	<0.0005	No	16	50	n/a	0.4401	NP Intra(normal...
Chromium (mg/l)	SMW-9	0.01	6/10/2016	<0.0005	No	16	50	n/a	0.4401	NP Intra(normal...
Chromium (mg/l)	SMW-9D	0.01	6/10/2016	<0.0005	No	16	56.25	n/a	0.4401	NP Intra(normal...
Chromium (mg/l)	SMW-11D	0.01	6/9/2016	<0.0005	No	16	56.25	n/a	0.4401	NP Intra(normal...
Ethylbenzene (ug/l)	SMW-11	5	6/9/2016	<0.1	No	16	100	n/a	0.4401	NP Intra(NDs)
Ethylbenzene (ug/l)	SMW-21	5	6/9/2016	<0.1	No	16	100	n/a	0.4401	NP Intra(NDs)
Ethylbenzene (ug/l)	SMW-21D	5	6/9/2016	<0.1	No	16	100	n/a	0.4401	NP Intra(NDs)
Ethylbenzene (ug/l)	SMW-5	5	6/9/2016	<0.1	No	16	100	n/a	0.4401	NP Intra(NDs)
Ethylbenzene (ug/l)	SMW-5D	5	6/10/2016	0.3	No	16	56.25	n/a	0.4401	NP Intra(normal...
Ethylbenzene (ug/l)	SMW-9	5	6/10/2016	<0.1	No	16	100	n/a	0.4401	NP Intra(NDs)
Ethylbenzene (ug/l)	SMW-9D	5	6/10/2016	<0.1	No	16	100	n/a	0.4401	NP Intra(NDs)
Ethylbenzene (ug/l)	SMW-11D	5	6/9/2016	<0.1	No	16	100	n/a	0.4401	NP Intra(NDs)
GRO+DRO (ug/l)	SMW-11	10299	6/9/2016	1632	No	16	0	sqrt(x)	0.01	Intra
GRO+DRO (ug/l)	SMW-21	3113	6/9/2016	700	No	16	0	No	0.01	Intra
GRO+DRO (ug/l)	SMW-21D	1231	6/9/2016	280	No	16	0	No	0.01	Intra
GRO+DRO (ug/l)	SMW-5	1625	6/9/2016	600	No	16	0	No	0.01	Intra
GRO+DRO (ug/l)	SMW-5D	1588	6/10/2016	530	No	16	0	sqrt(x)	0.01	Intra
GRO+DRO (ug/l)	SMW-9	1780	6/10/2016	1436	No	16	6.25	No	0.01	Intra
GRO+DRO (ug/l)	SMW-9D	2898	6/10/2016	340	No	16	0	sqrt(x)	0.01	Intra
GRO+DRO (ug/l)	SMW-11D	1138	6/9/2016	330	No	16	0	No	0.01	Intra
Lead (mg/l)	SMW-11	0.005	6/9/2016	0.0001	No	16	43.75	n/a	0.4401	NP Intra(normal...
Lead (mg/l)	SMW-21	0.005	6/9/2016	<0.0001	No	16	43.75	n/a	0.4401	NP Intra(normal...
Lead (mg/l)	SMW-21D	0.005	6/9/2016	0.0001	No	16	12.5	n/a	0.4401	NP Intra(normal...
Lead (mg/l)	SMW-5	0.005	6/9/2016	<0.0001	No	16	43.75	n/a	0.4401	NP Intra(normal...
Lead (mg/l)	SMW-5D	0.005	6/10/2016	0.0004	No	16	12.5	n/a	0.4401	NP Intra(normal...
Lead (mg/l)	SMW-9	0.005	6/10/2016	<0.0001	No	16	50	n/a	0.4401	NP Intra(normal...
Lead (mg/l)	SMW-9D	0.005	6/10/2016	0.0001	No	16	18.75	n/a	0.4401	NP Intra(normal...
Lead (mg/l)	SMW-11D	0.005	6/9/2016	<0.0001	No	16	50	n/a	0.4401	NP Intra(normal...
Selenium (mg/l)	SMW-11	0.01108	6/9/2016	0.002	No	16	12.5	sqrt(x)	0.01	Intra
Selenium (mg/l)	SMW-21	0.006	6/9/2016	0.0019	No	16	6.25	n/a	0.4401	NP Intra(normal...
Selenium (mg/l)	SMW-21D	0.005	6/9/2016	0.0014	No	16	12.5	n/a	0.4401	NP Intra(normal...
Selenium (mg/l)	SMW-5	0.02368	6/9/2016	0.0102	No	16	6.25	sqrt(x)	0.01	Intra
Selenium (mg/l)	SMW-5D	0.005	6/10/2016	0.0014	No	16	12.5	n/a	0.4401	NP Intra(normal...
Selenium (mg/l)	SMW-9	0.017	6/10/2016	0.0063	No	16	6.25	n/a	0.4401	NP Intra(normal...
Selenium (mg/l)	SMW-9D	0.005	6/10/2016	0.0018	No	16	12.5	n/a	0.4401	NP Intra(normal...
Selenium (mg/l)	SMW-11D	0.005	6/9/2016	0.0024	No	16	12.5	n/a	0.4401	NP Intra(normal...
toluene (ug/l)	SMW-11	5	6/9/2016	<0.06	No	16	93.75	n/a	0.4401	NP Intra(NDs)
toluene (ug/l)	SMW-21	5	6/9/2016	0.2	No	16	62.5	n/a	0.4401	NP Intra(Cohens...
toluene (ug/l)	SMW-21D	5	6/9/2016	<0.06	No	16	100	n/a	0.4401	NP Intra(NDs)
toluene (ug/l)	SMW-5	5	6/9/2016	<0.06	No	16	87.5	n/a	0.4401	NP Intra(NDs)

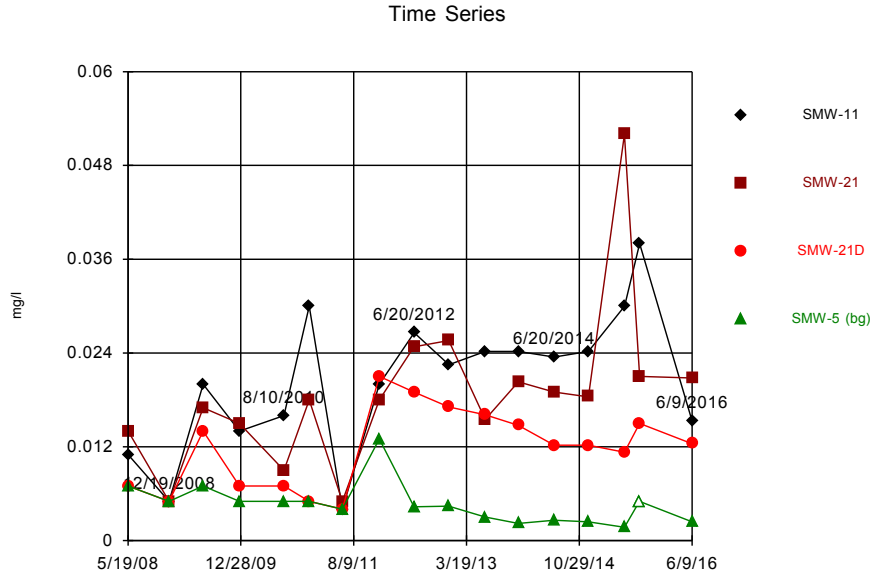
Wynnewood June 2016 Tolerance Limit

Constituent	Well	Upper Lim.	Date	Observ.	Sig.	Bg N	%NDs	Transform	Alpha	Method
toluene (ug/l)	SMW-5D	5	6/10/2016	<0.06	No	16	100	n/a	0.4401	NP Intra(NDs)
toluene (ug/l)	SMW-9	5	6/10/2016	0.12	No	16	62.5	n/a	0.4401	NP Intra(normal...
toluene (ug/l)	SMW-9D	5	6/10/2016	<0.06	No	16	81.25	n/a	0.4401	NP Intra(NDs)
toluene (ug/l)	SMW-11D	5	6/9/2016	<0.06	No	16	100	n/a	0.4401	NP Intra(NDs)
Xylenes (ug/l)	SMW-9	6.726	6/10/2016	2.85	No	13	53.85	No	0.01	Intra

Appendix A
Time Series, Box & Whisker Plots

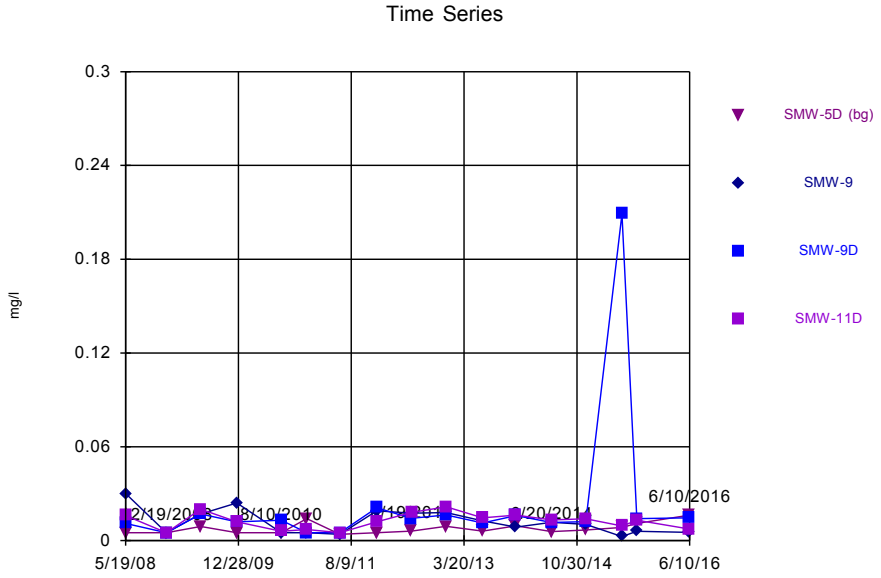
v.9.1.21 n/a. UG

Hollow symbols indicate censored values.



Constituent: Arsenic Analysis Run 7/28/2016 6:48 PM

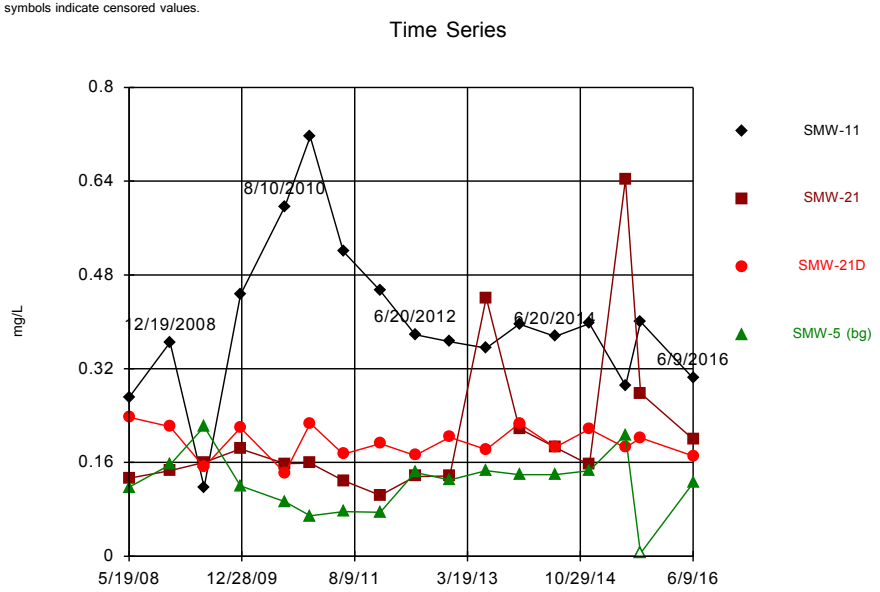
v.9.1.21 n/a. UG



Constituent: Arsenic Analysis Run 7/28/2016 6:48 PM

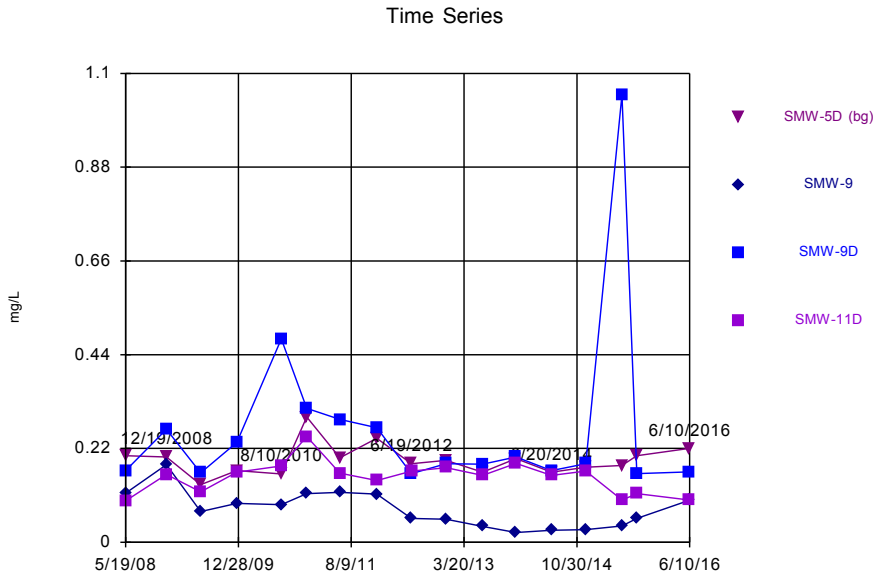
v.9.1.21 n/a. UG

Hollow symbols indicate censored values.



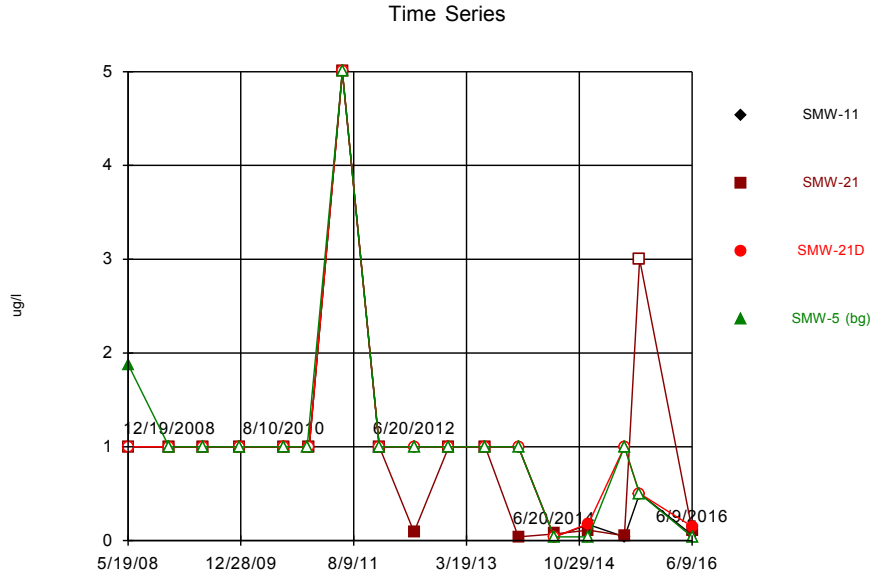
Constituent: Barium Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG



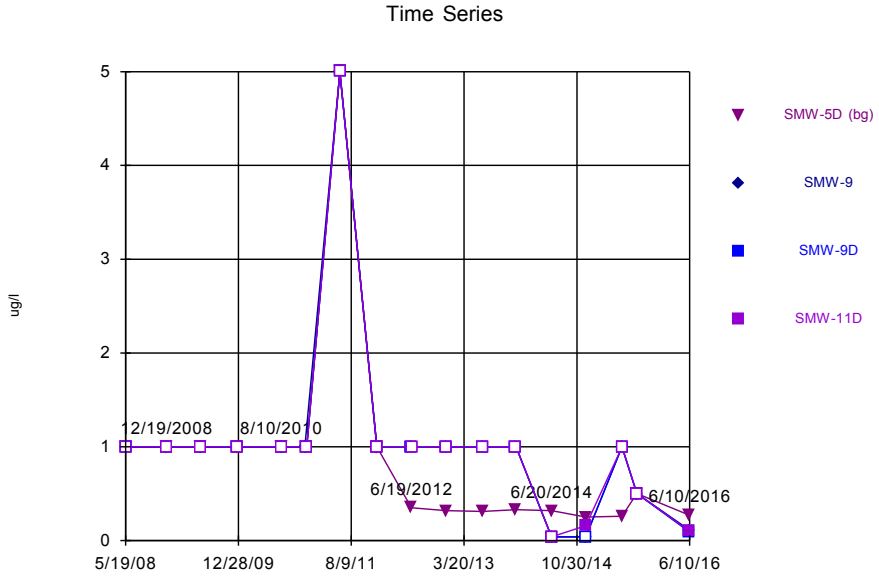
Constituent: Barium Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



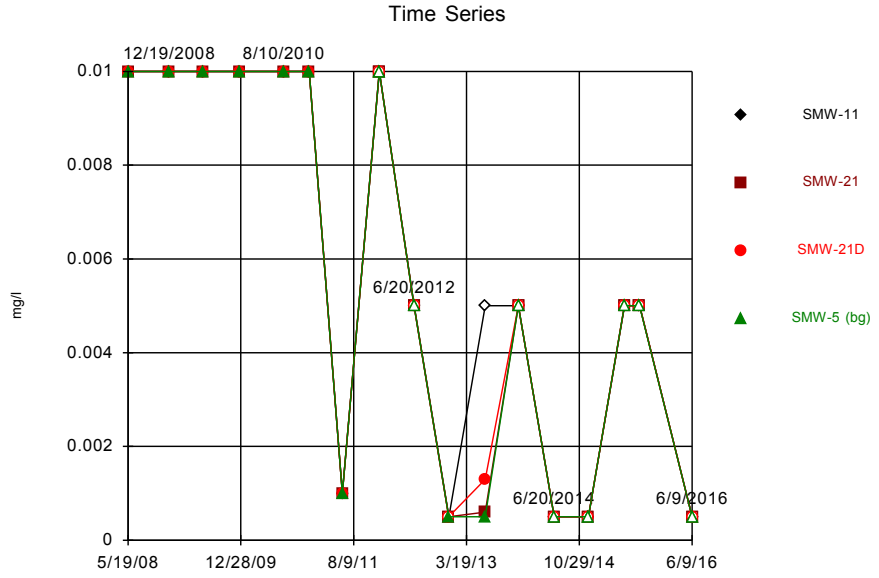
Constituent: benzene Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



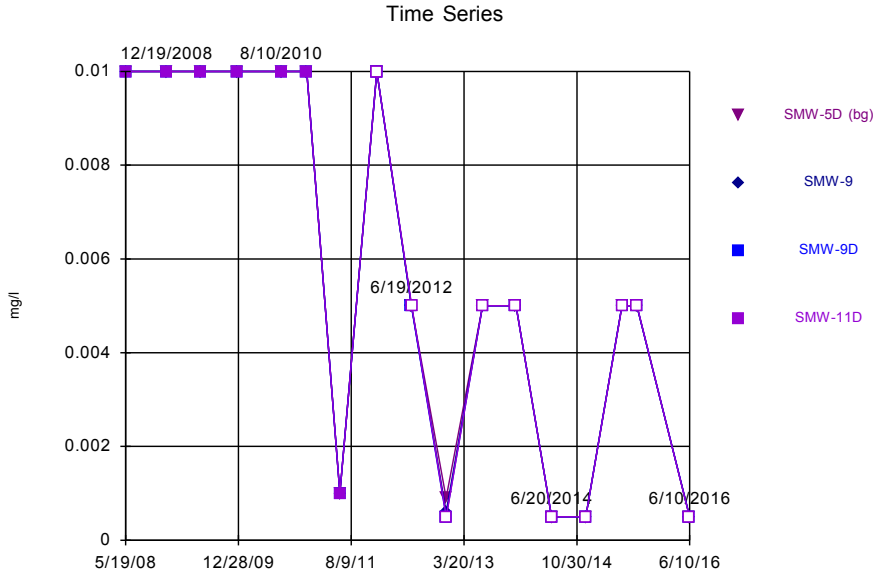
Constituent: benzene Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



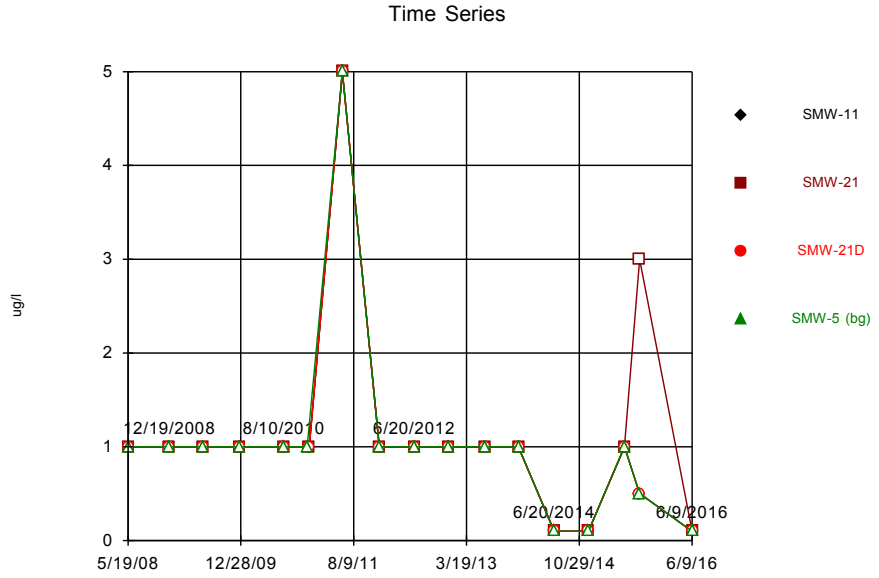
Constituent: Chromium Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



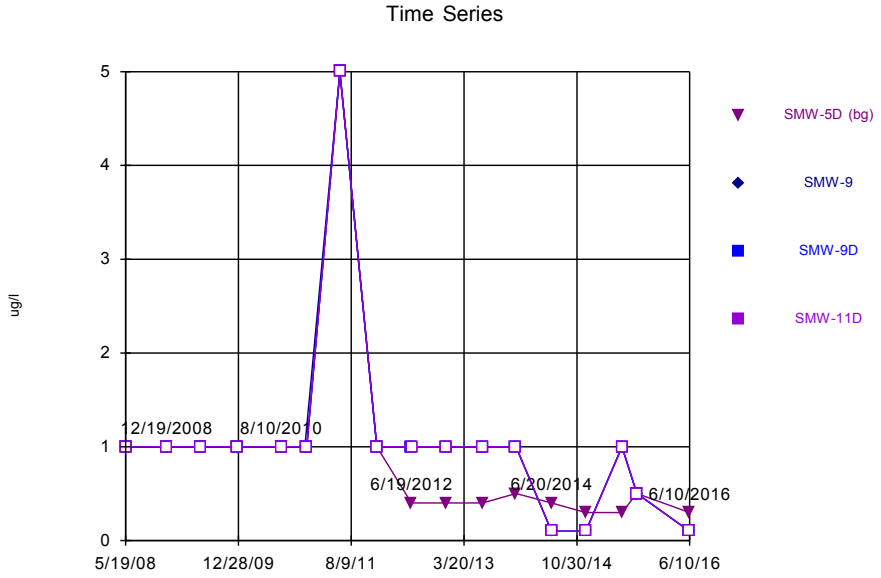
Constituent: Chromium Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



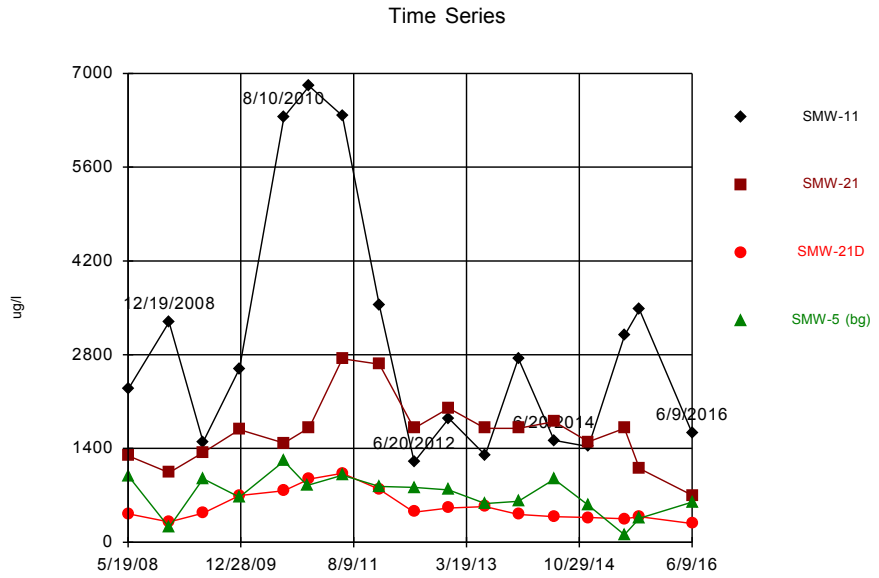
Constituent: Ethylbenzene Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



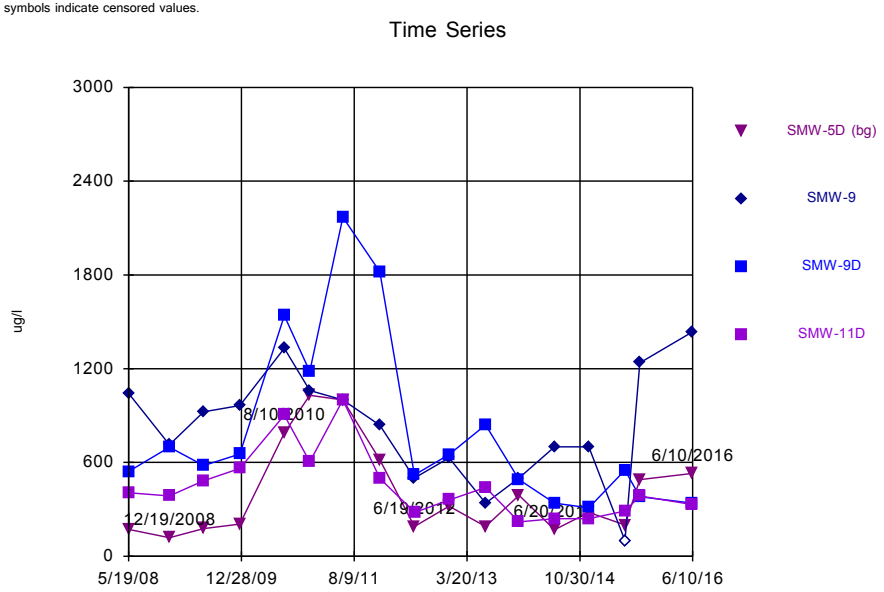
Constituent: Ethylbenzene Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG



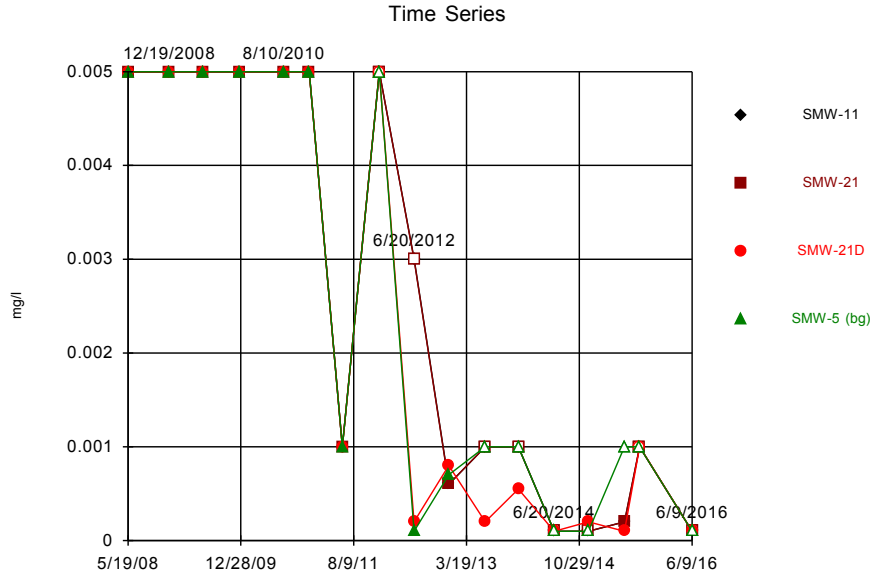
Constituent: GRO+DRO Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



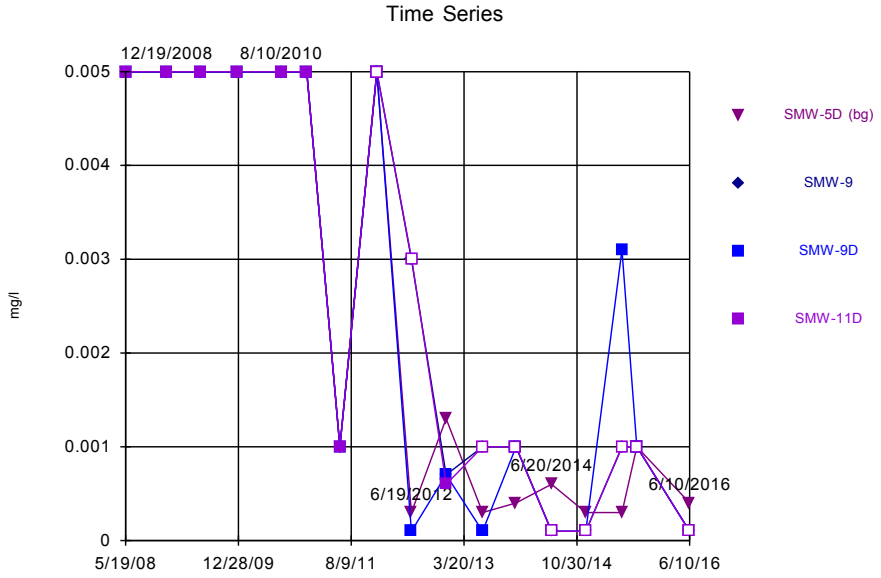
Constituent: GRO+DRO Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



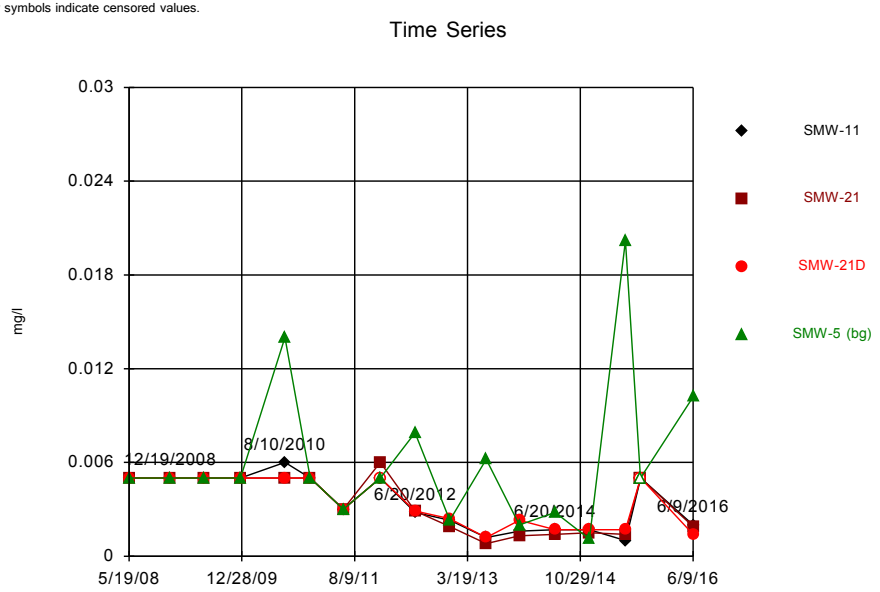
Constituent: Lead Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



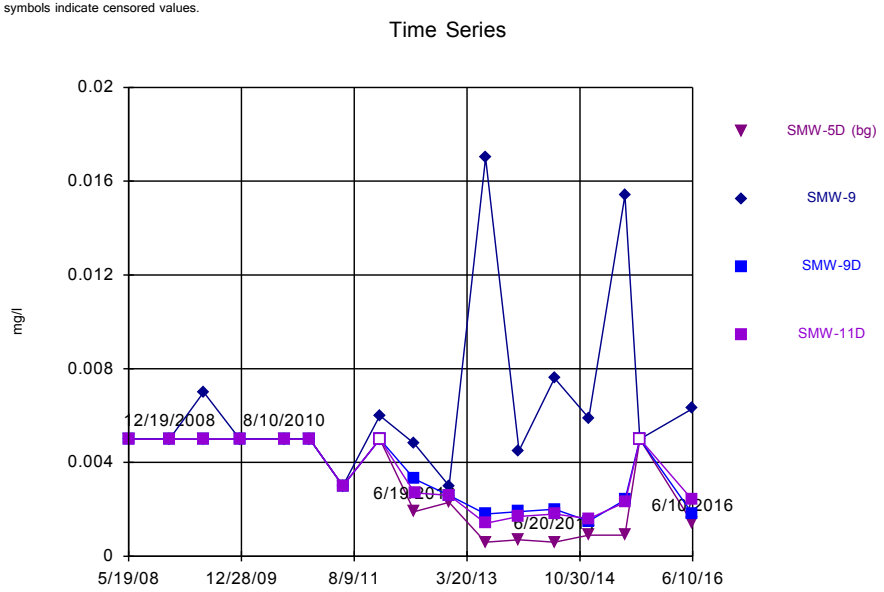
Constituent: Lead Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



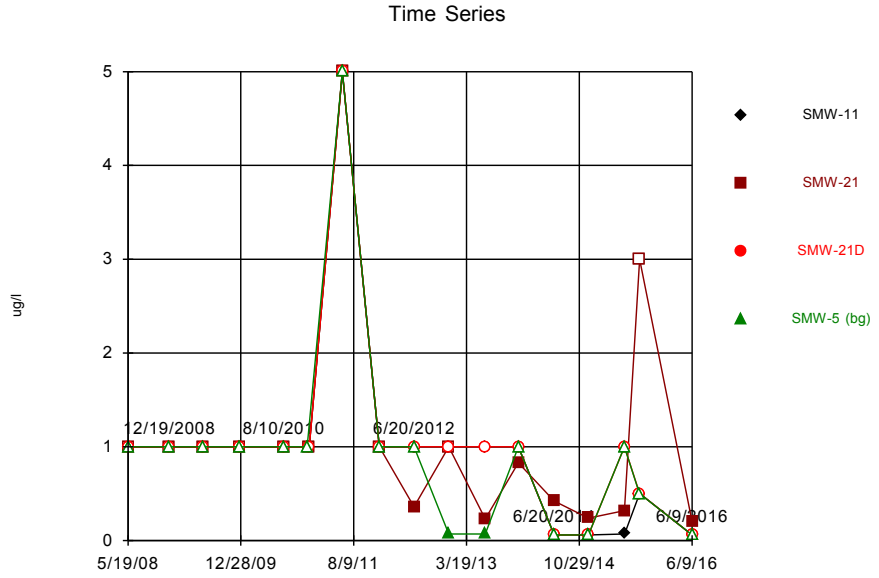
Constituent: Selenium Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



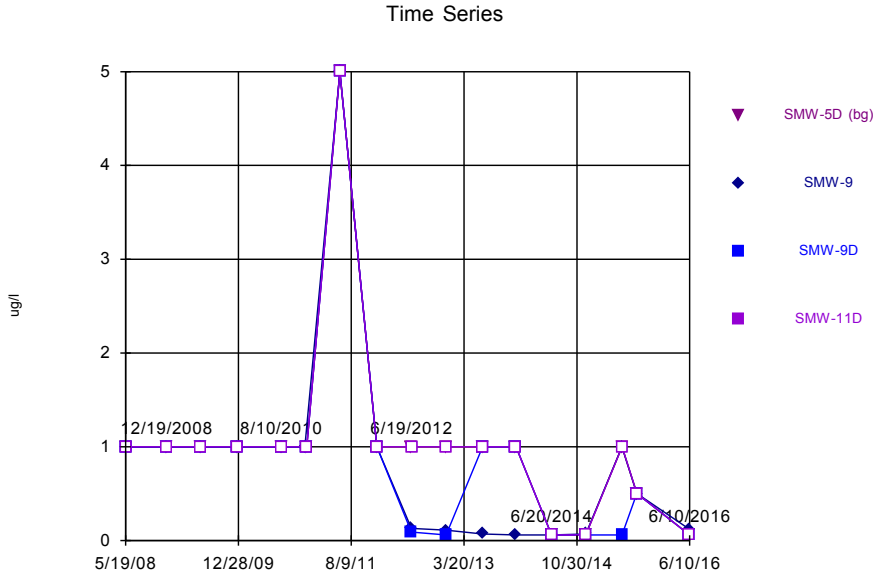
Constituent: Selenium Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



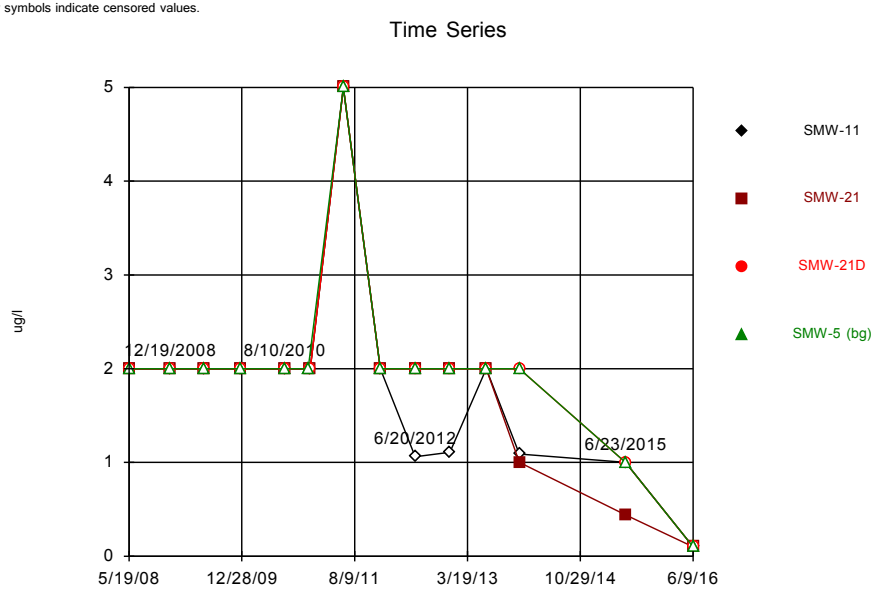
Constituent: toluene Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



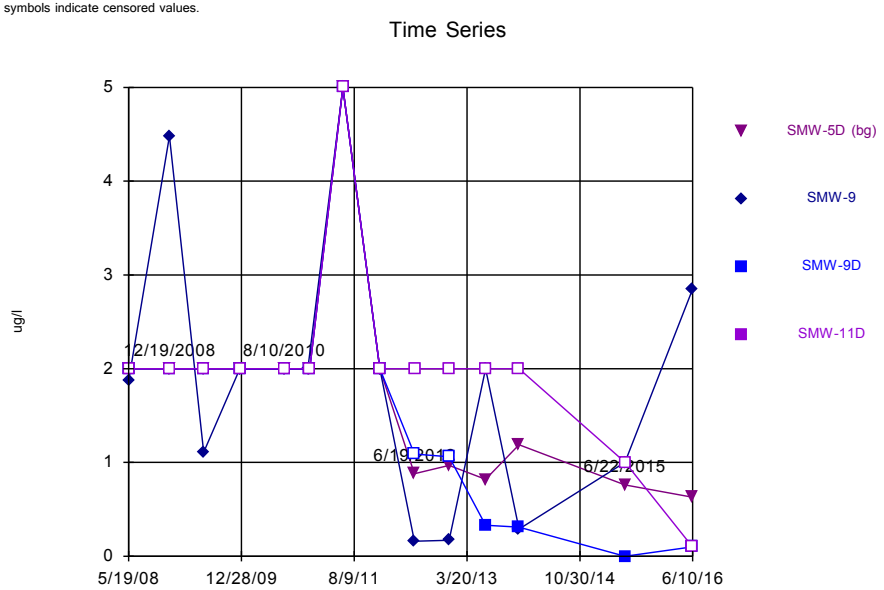
Constituent: toluene Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



Constituent: Xylenes Analysis Run 7/28/2016 6:48 PM

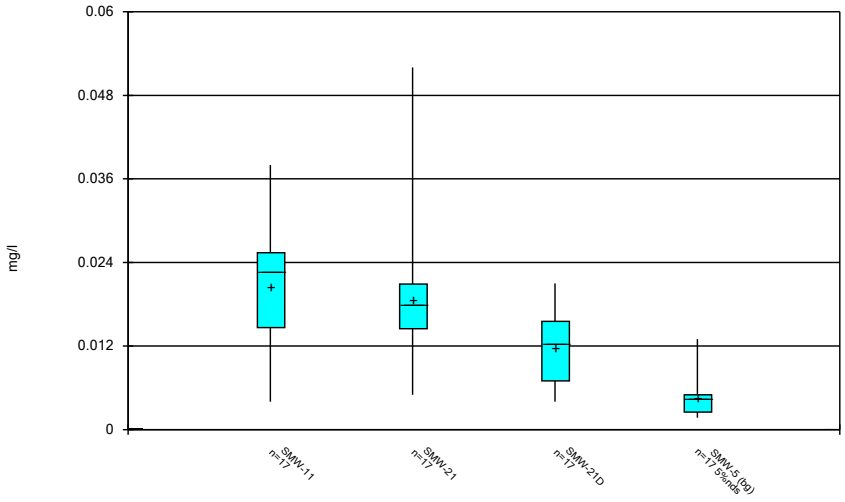
v.9.1.21 n/a. UG
Hollow symbols indicate censored values.



Constituent: Xylenes Analysis Run 7/28/2016 6:48 PM

v.9.1.21 n/a. UG

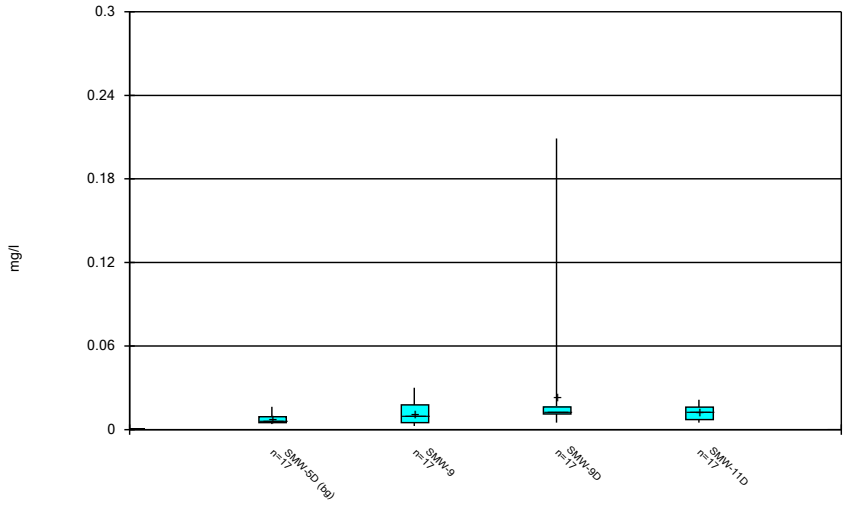
Box & Whiskers Plot



Constituent: Arsenic Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

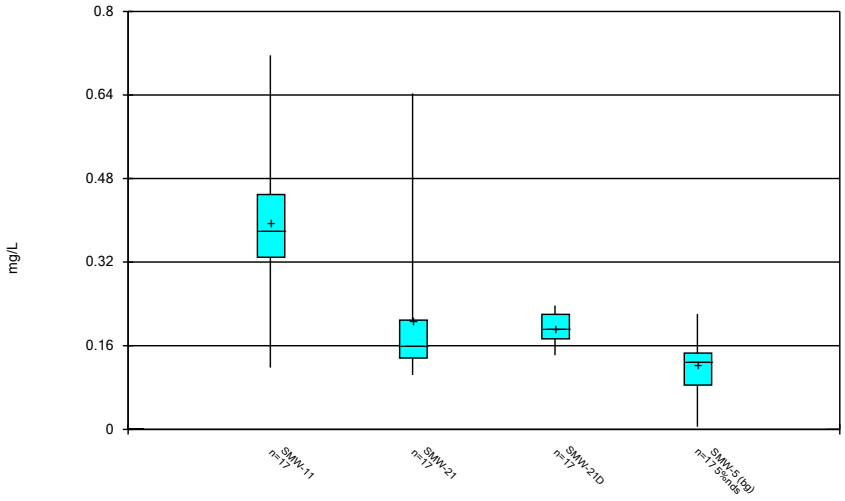
Box & Whiskers Plot



Constituent: Arsenic Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

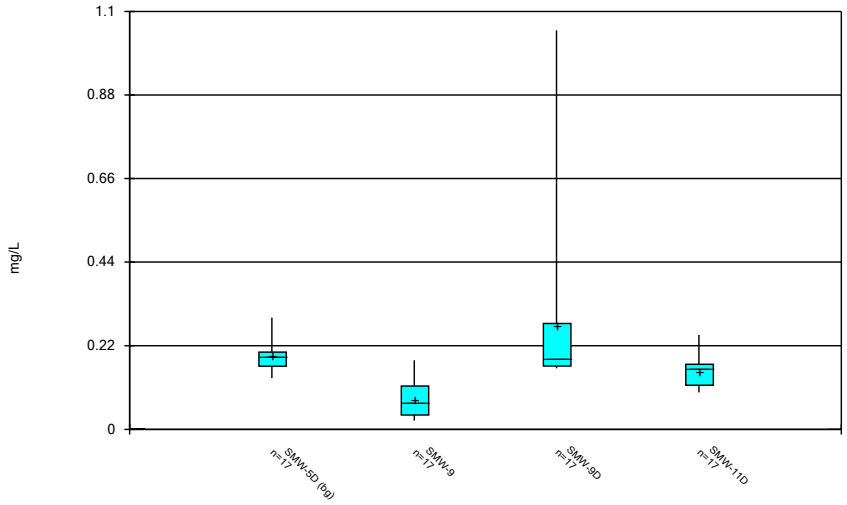
Box & Whiskers Plot



Constituent: Barium Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

Box & Whiskers Plot



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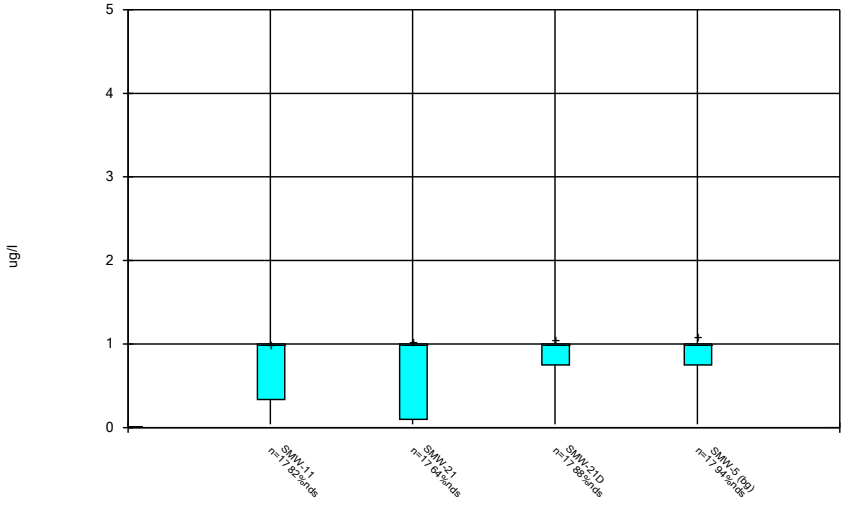
v.9.1.21 n/a. UG

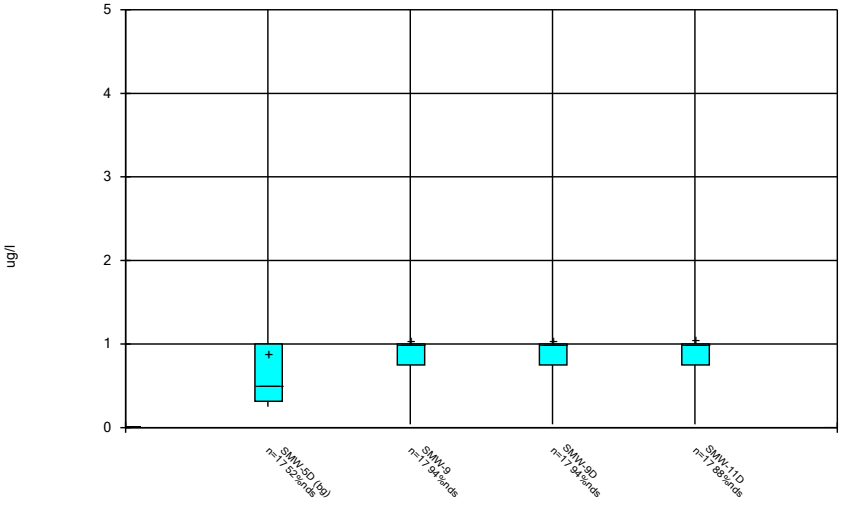
Box & Whiskers Plot



Constituent: benzene Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

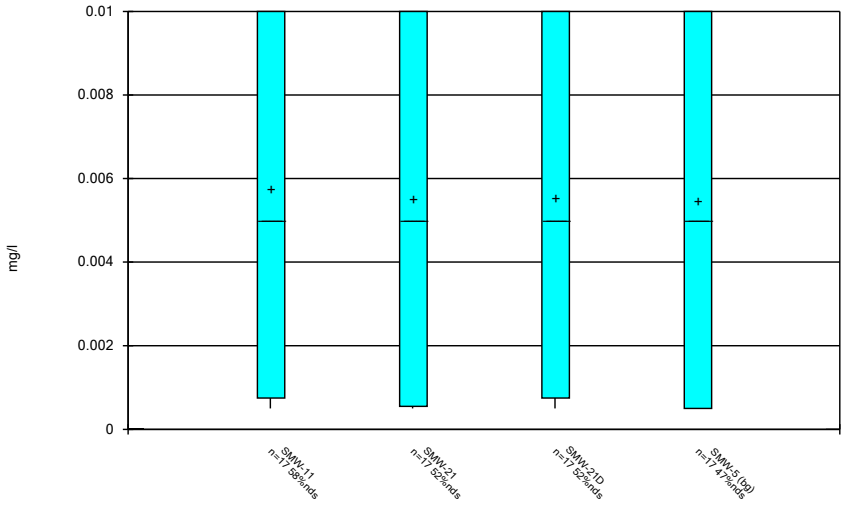
Box & Whiskers Plot



Constituent: benzene Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

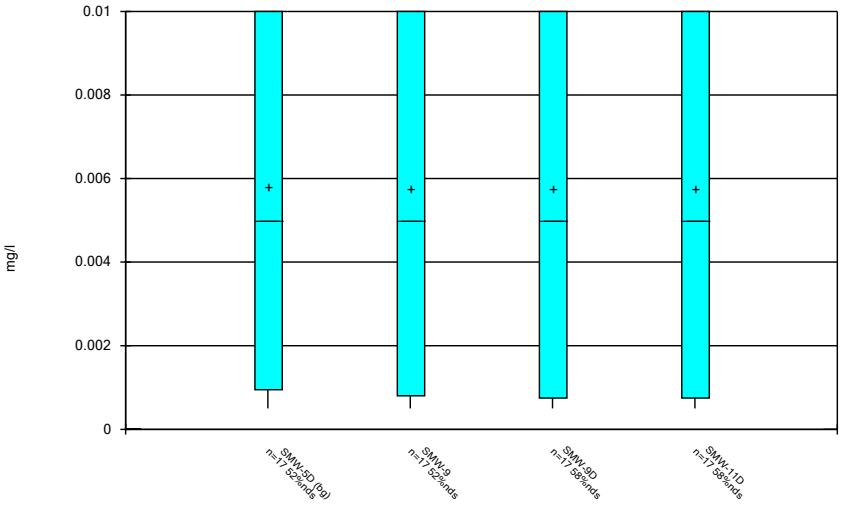
Box & Whiskers Plot



Constituent: Chromium Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

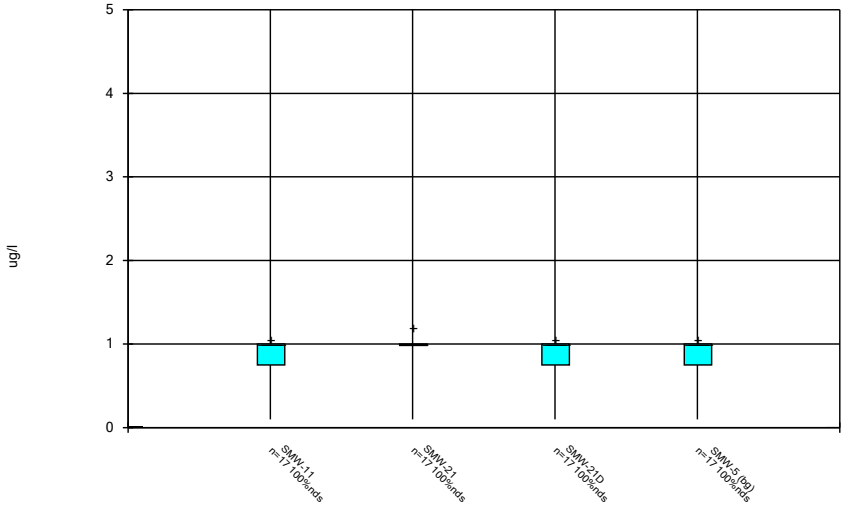
Box & Whiskers Plot



Constituent: Chromium Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

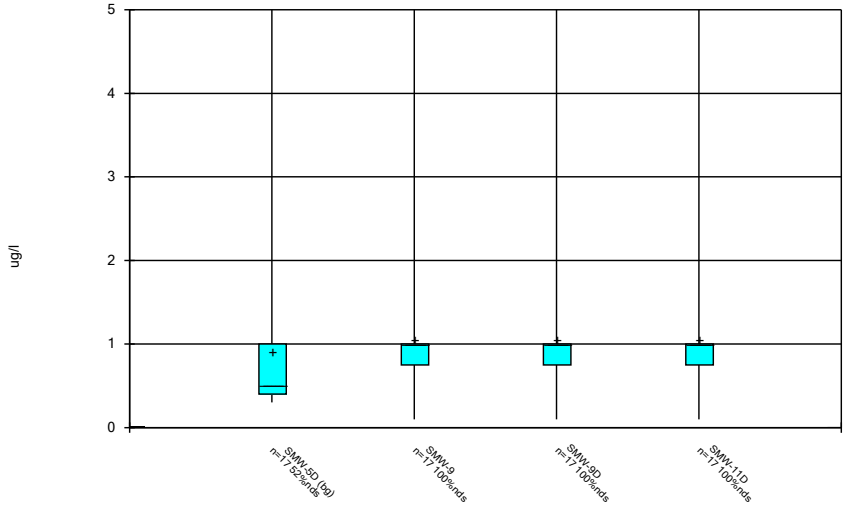
Box & Whiskers Plot



Constituent: Ethylbenzene Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

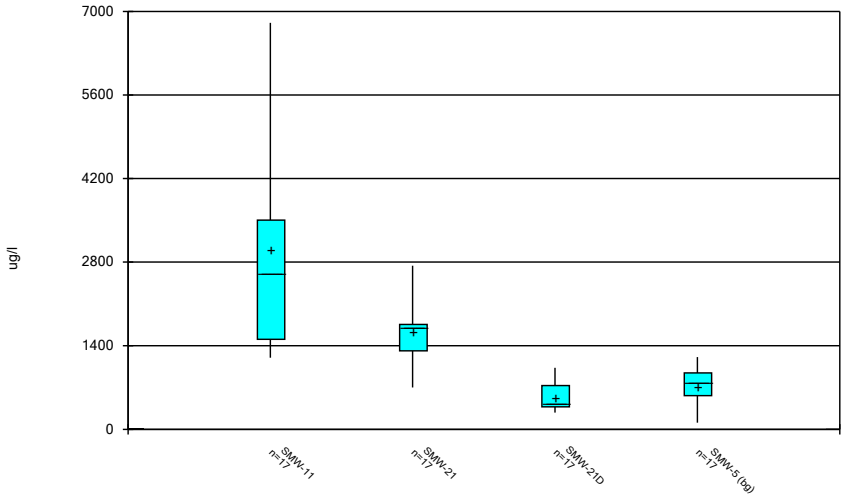
Box & Whiskers Plot



Constituent: Ethylbenzene Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

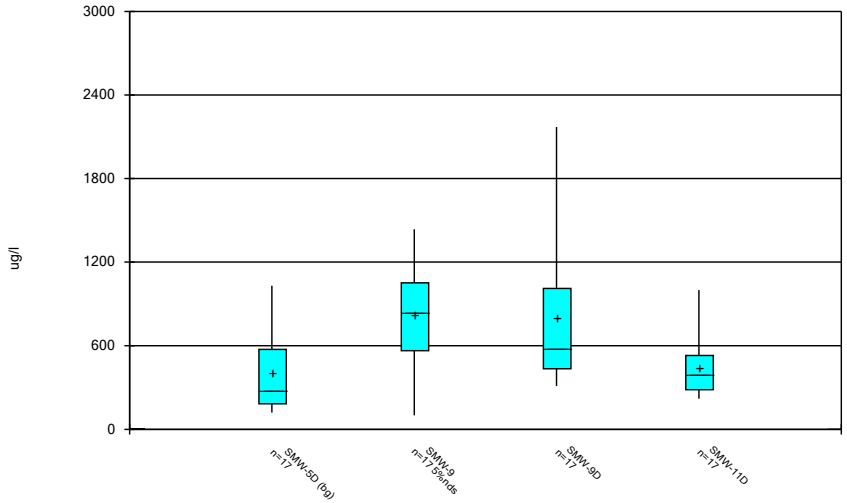
Box & Whiskers Plot



Constituent: GRO+DRO Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

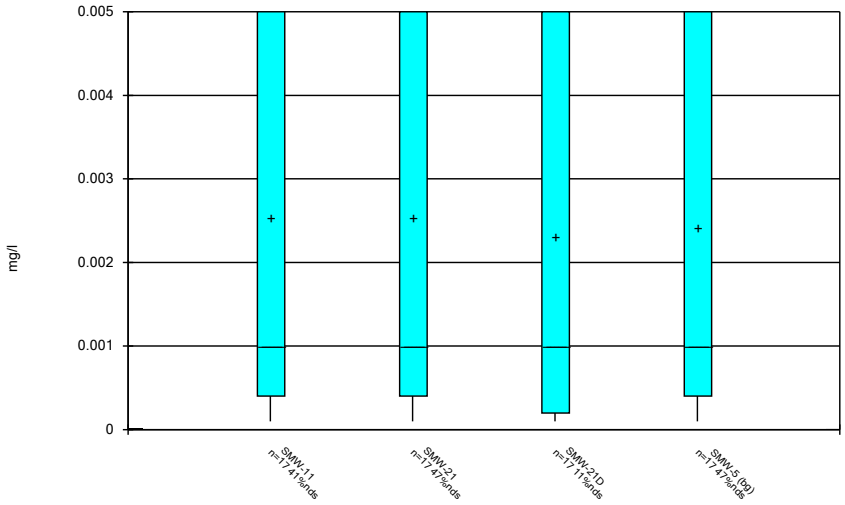
Box & Whiskers Plot



Constituent: GRO+DRO Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

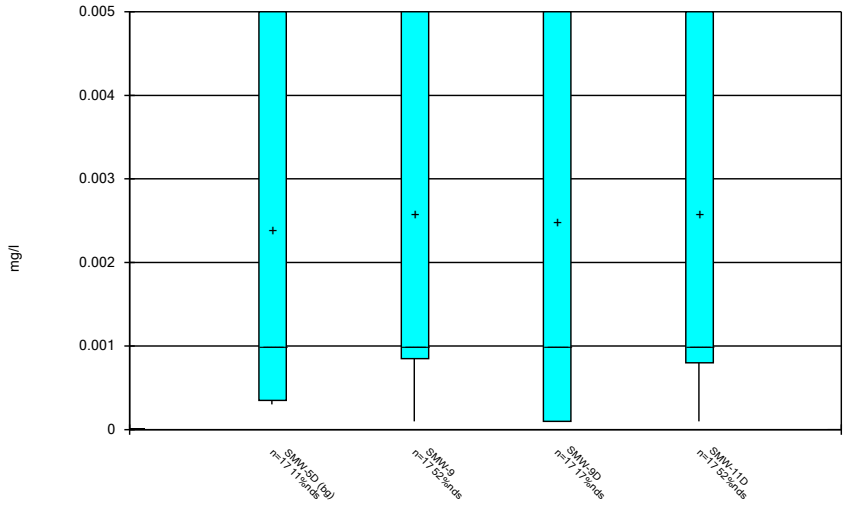
Box & Whiskers Plot



Constituent: Lead Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

Box & Whiskers Plot



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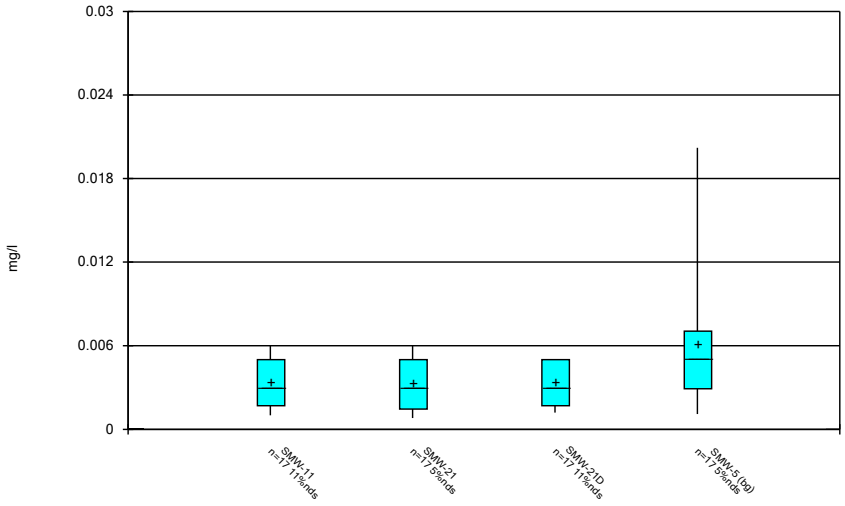
v.9.1.21 n/a. UG

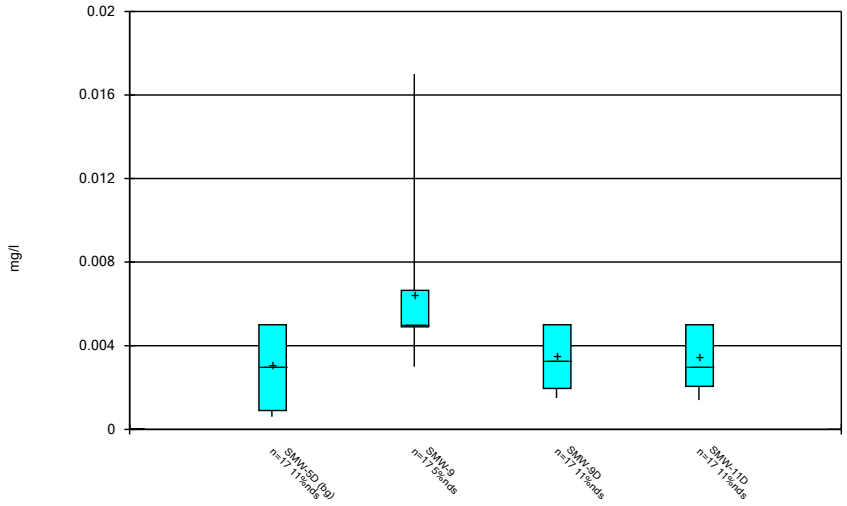
Box & Whiskers Plot



Constituent: Selenium Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

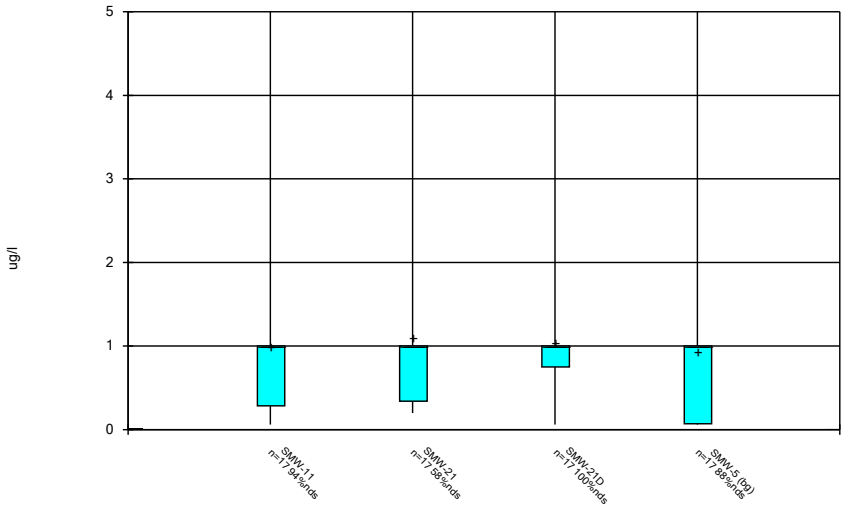
Box & Whiskers Plot



Constituent: Selenium Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

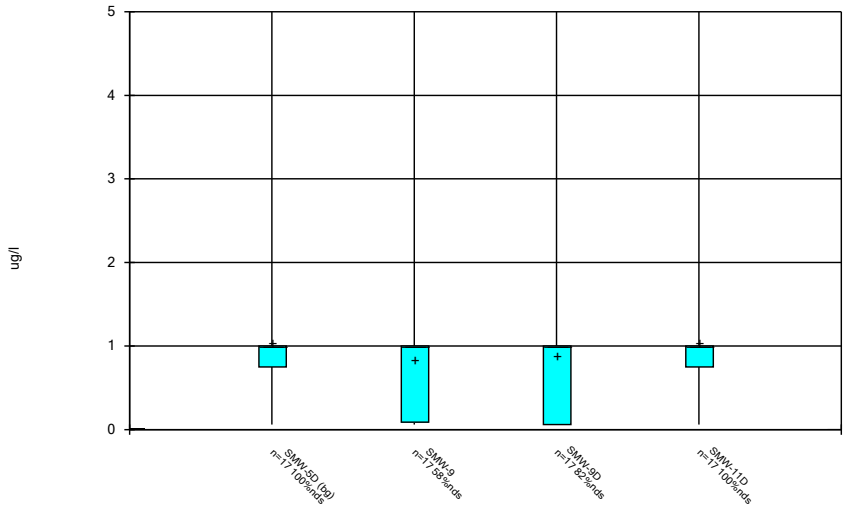
Box & Whiskers Plot



Constituent: toluene Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

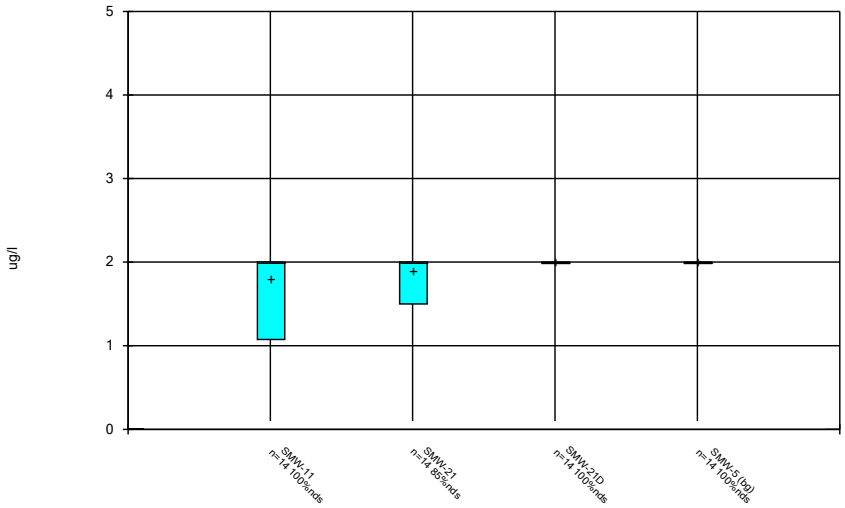
Box & Whiskers Plot



Constituent: toluene Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

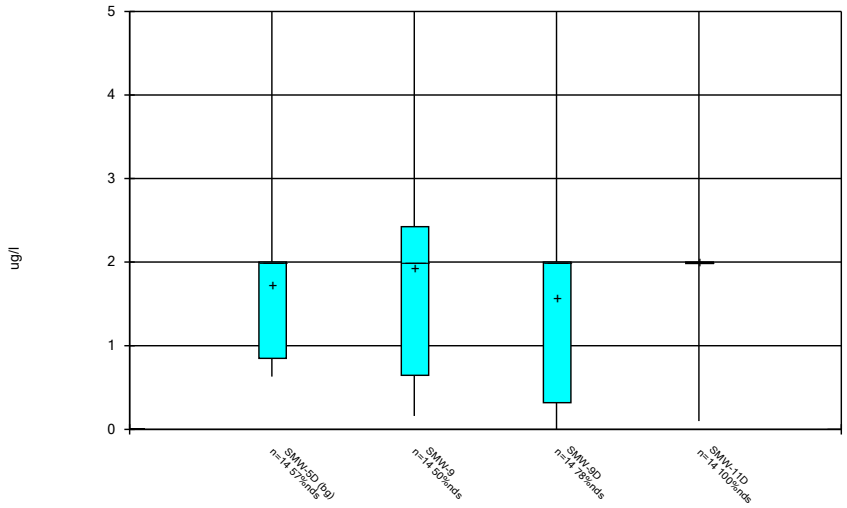
Box & Whiskers Plot



Constituent: Xylenes Analysis Run 7/28/2016 6:50 PM

v.9.1.21 n/a. UG

Box & Whiskers Plot



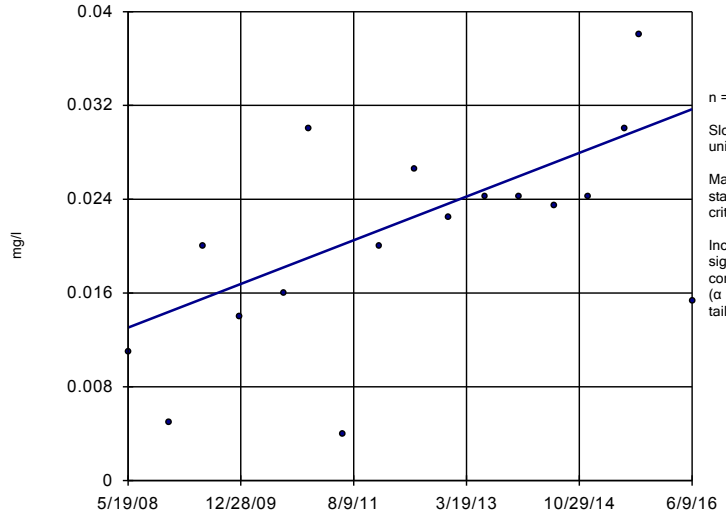
Constituent: Xylenes Analysis Run 7/28/2016 6:50 PM

Appendix B
Mann-Kendall Graphs

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-11



n = 17

Slope = 0.002313 units per year.

Mann-Kendall statistic = 61 critical = 58

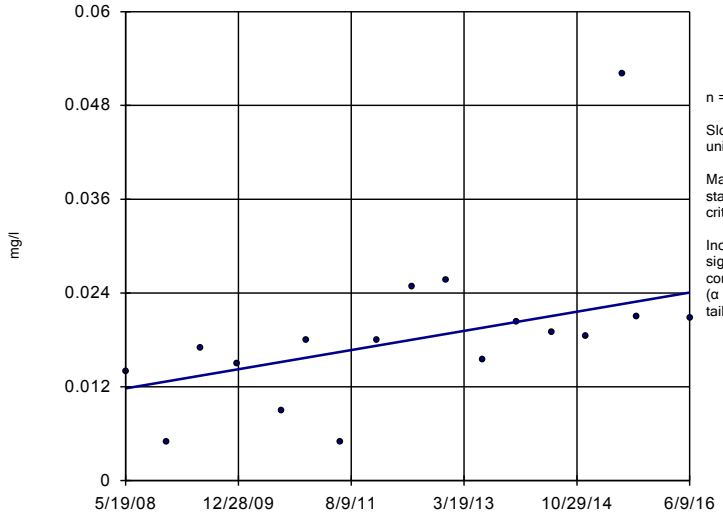
Increasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 7/28/2016 6:51 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-21



n = 17

Slope = 0.001522 units per year.

Mann-Kendall statistic = 72 critical = 58

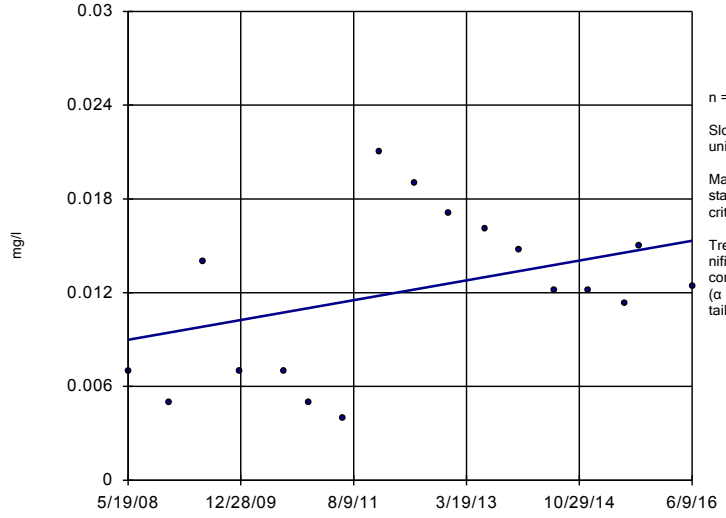
Increasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 7/28/2016 6:51 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-21D



n = 17

Slope = 0.0007857 units per year.

Mann-Kendall statistic = 23 critical = 58

Trend not significant at 98% confidence level (α = 0.01 per tail).

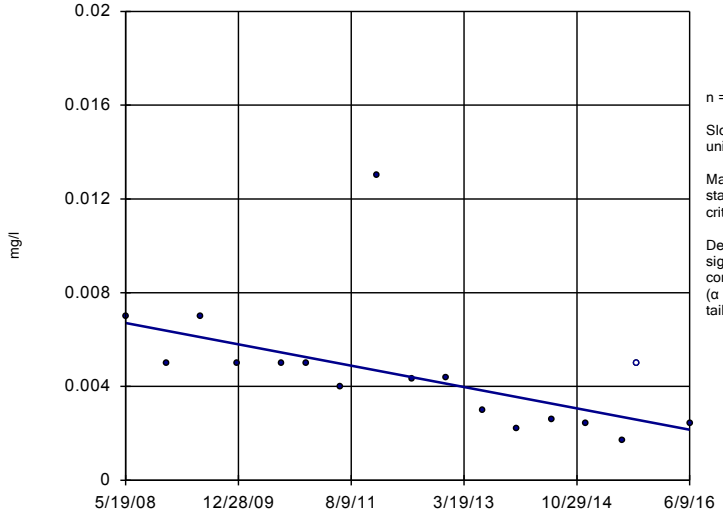
Constituent: Arsenic Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = -0.0005639 units per year.

Mann-Kendall statistic = -78 critical = -58

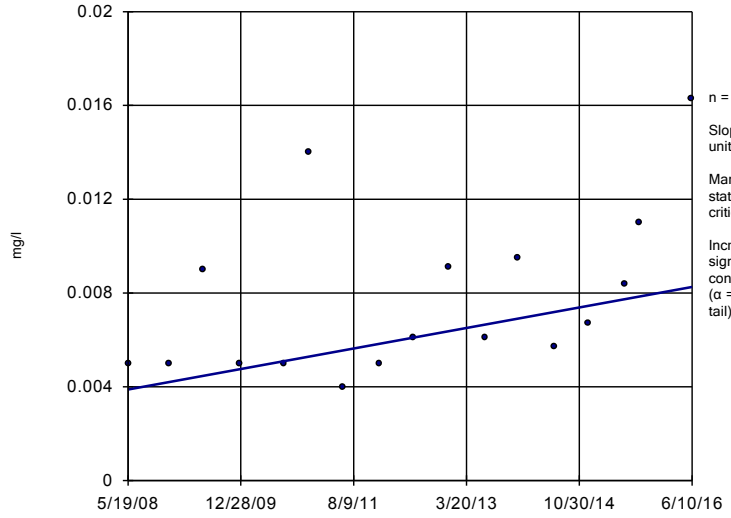
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = 0.0005419 units per year.

Mann-Kendall statistic = 61 critical = 58

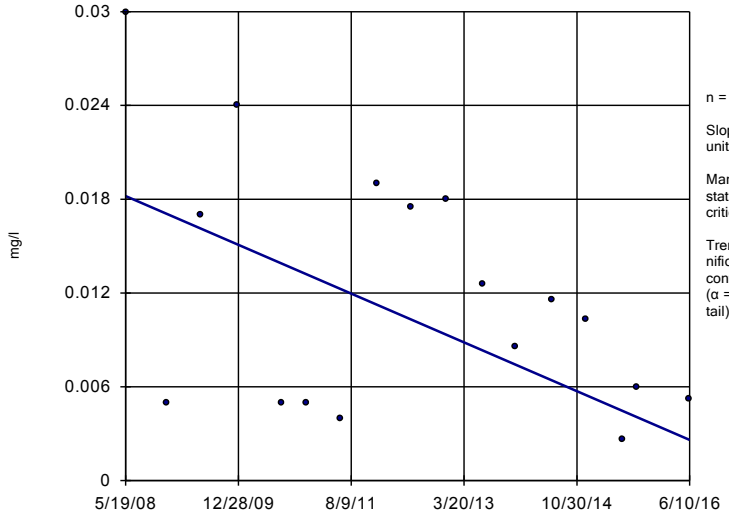
Increasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-9



n = 17

Slope = -0.001935 units per year.

Mann-Kendall statistic = -39 critical = -58

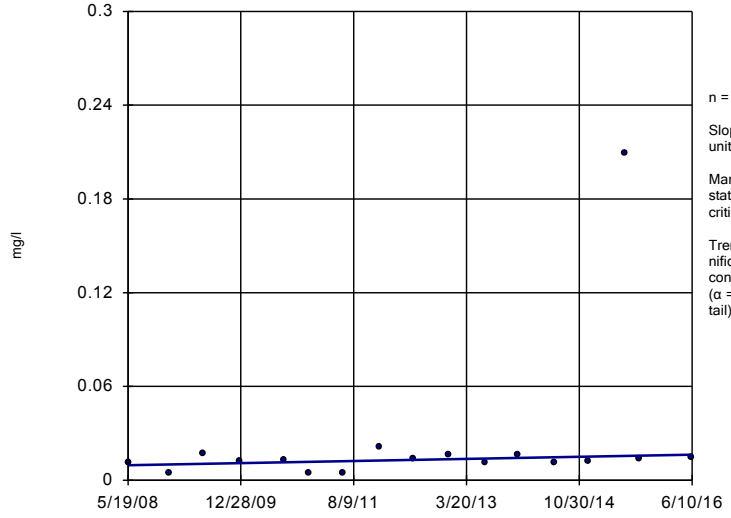
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-9D



n = 17

Slope = 0.0008375 units per year.

Mann-Kendall statistic = 37 critical = 58

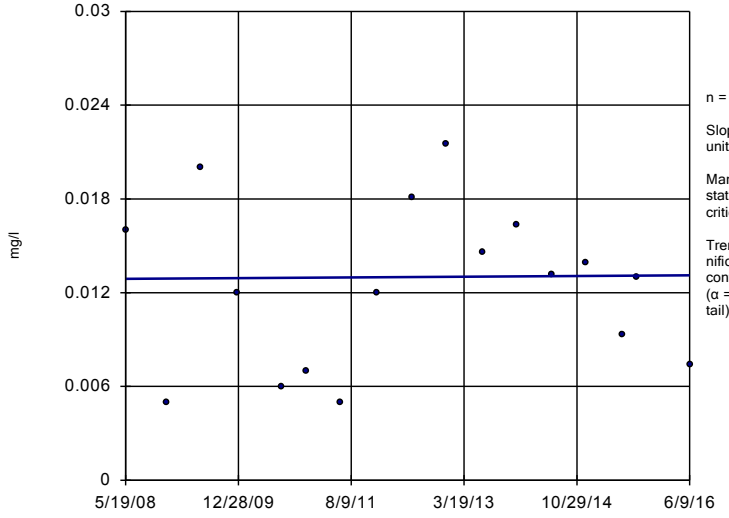
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-11D



n = 17

Slope = 0.00002688 units per year.

Mann-Kendall statistic = 2 critical = 58

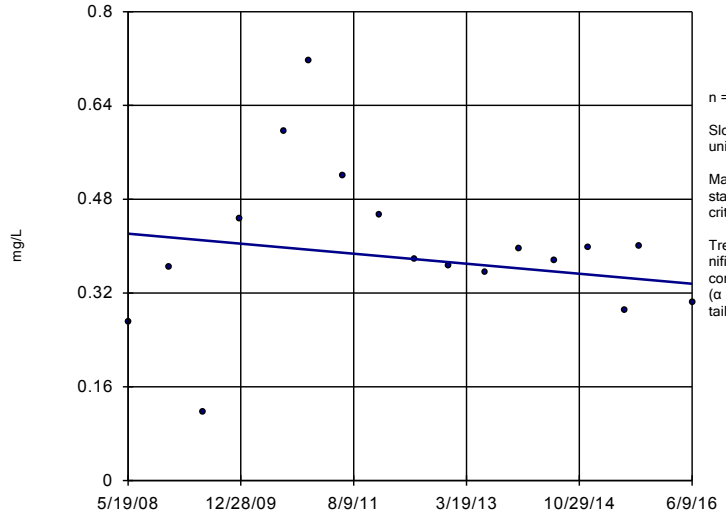
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-11



n = 17

Slope = -0.01059 units per year.

Mann-Kendall statistic = -10 critical = -58

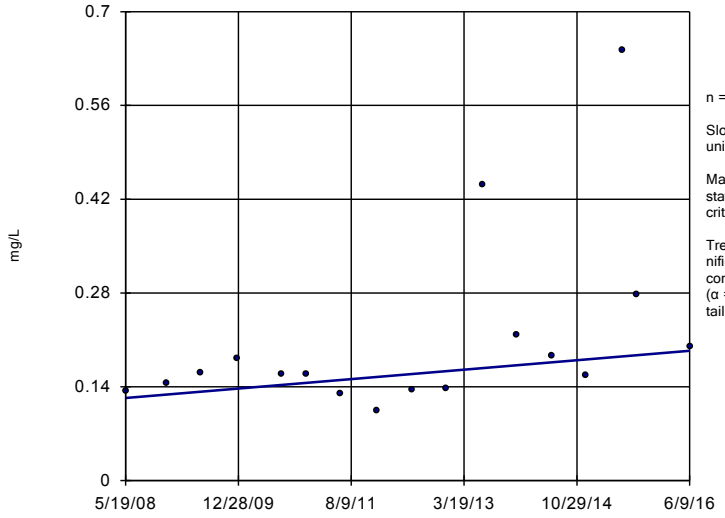
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-21



n = 17

Slope = 0.008738 units per year.

Mann-Kendall statistic = 50 critical = 58

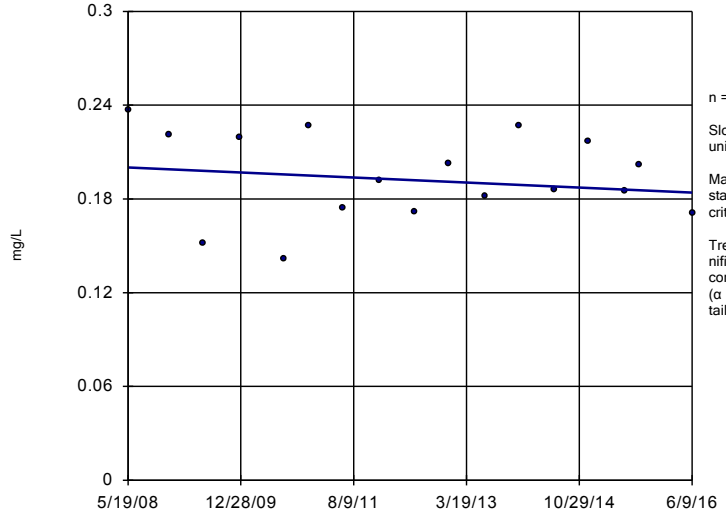
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-21D



n = 17

Slope = -0.001993 units per year.

Mann-Kendall statistic = -20 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

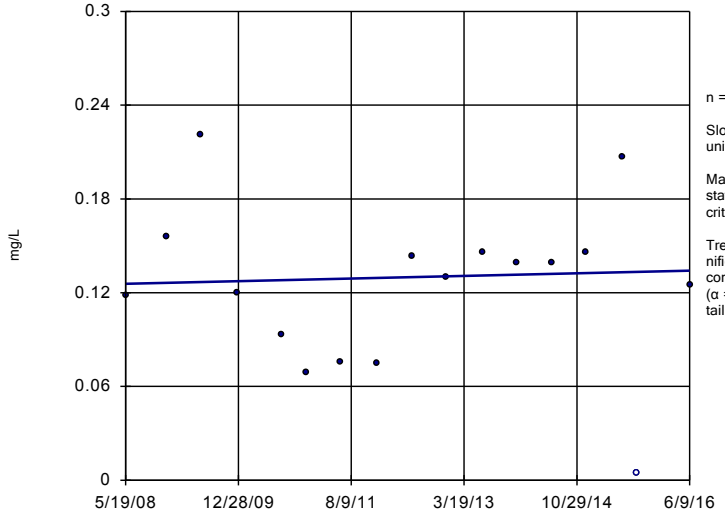
Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = 0.001036 units per year.

Mann-Kendall statistic = 6 critical = 58

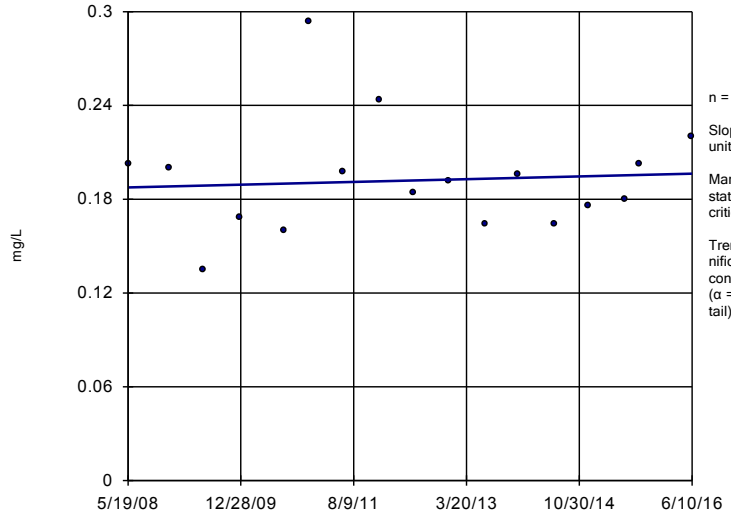
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = 0.001106 units per year.

Mann-Kendall statistic = 6 critical = 58

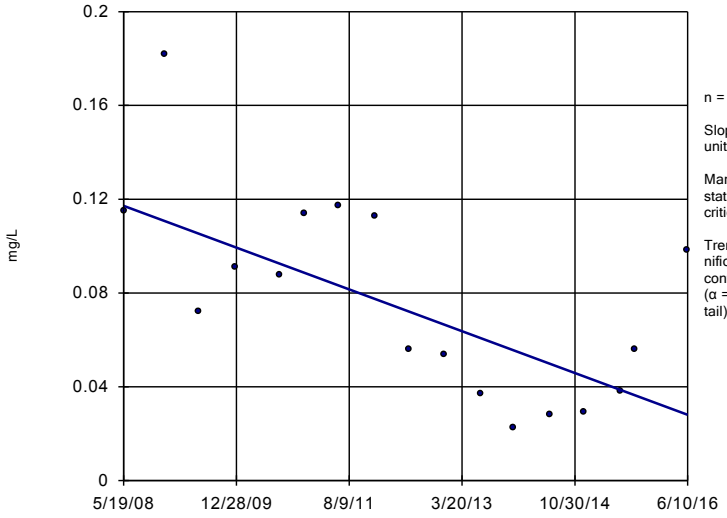
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-9



n = 17

Slope = -0.01105 units per year.

Mann-Kendall statistic = -58 critical = -58

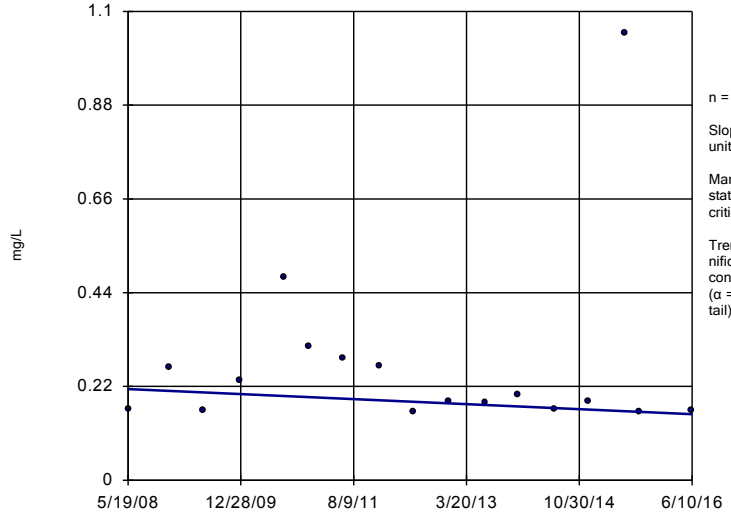
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-9D



n = 17

Slope = -0.007257 units per year.

Mann-Kendall statistic = -25 critical = -58

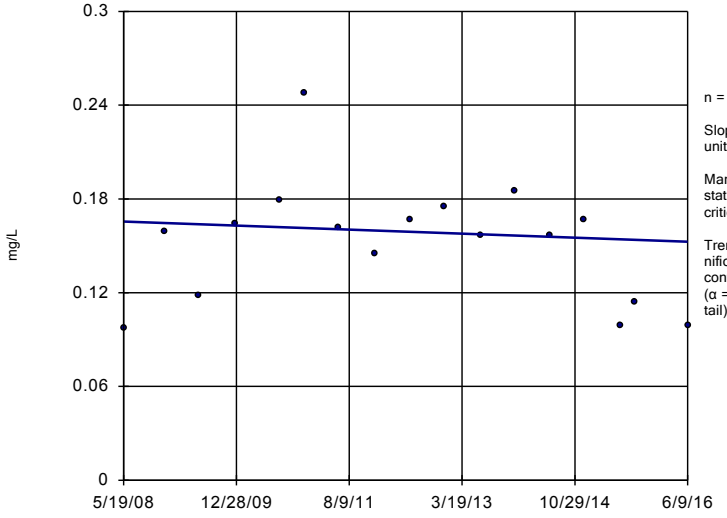
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-11D



n = 17

Slope = -0.001604 units per year.

Mann-Kendall statistic = -13 critical = -58

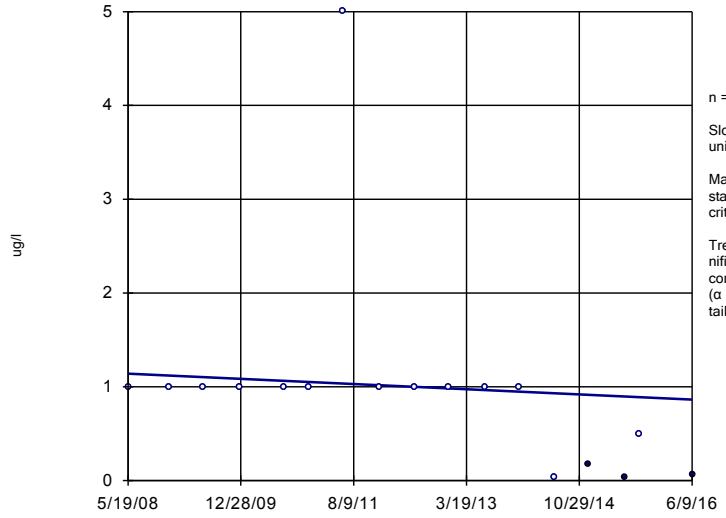
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11



n = 17

Slope = -0.03419 units per year.

Mann-Kendall statistic = -56 critical = -58

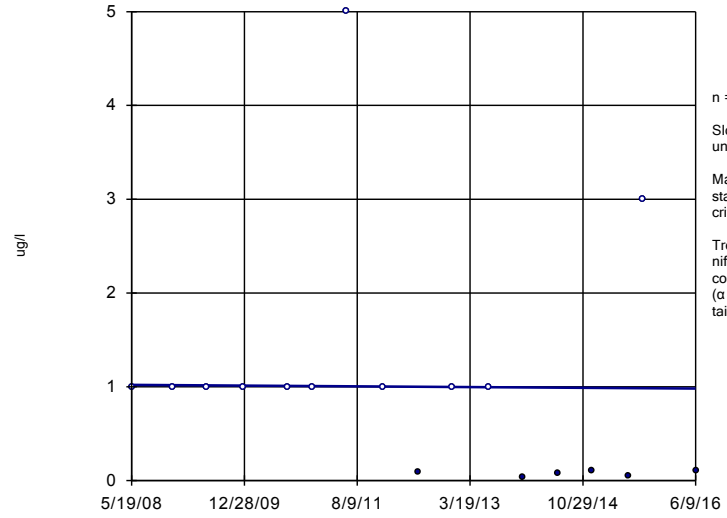
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21



n = 17

Slope = -0.004993 units per year.

Mann-Kendall statistic = -37 critical = -58

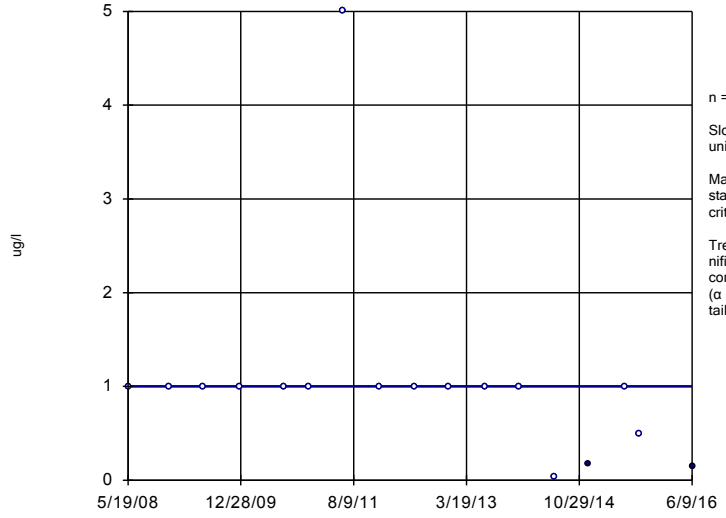
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21D



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -46 critical = -58

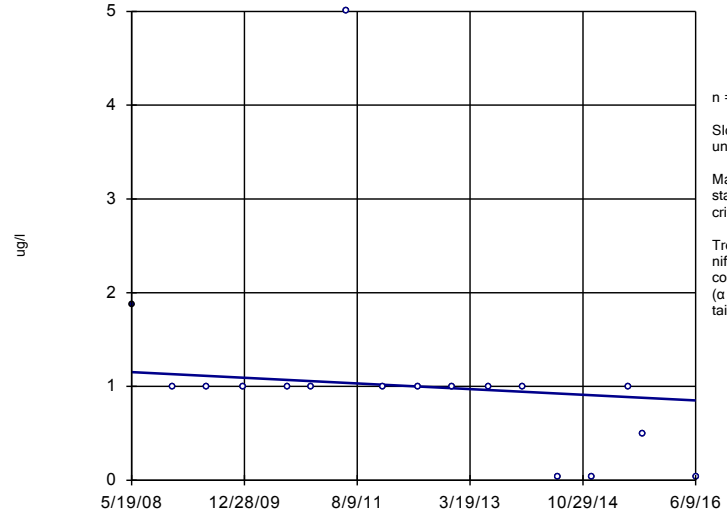
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = -0.03718 units per year.

Mann-Kendall statistic = -58 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

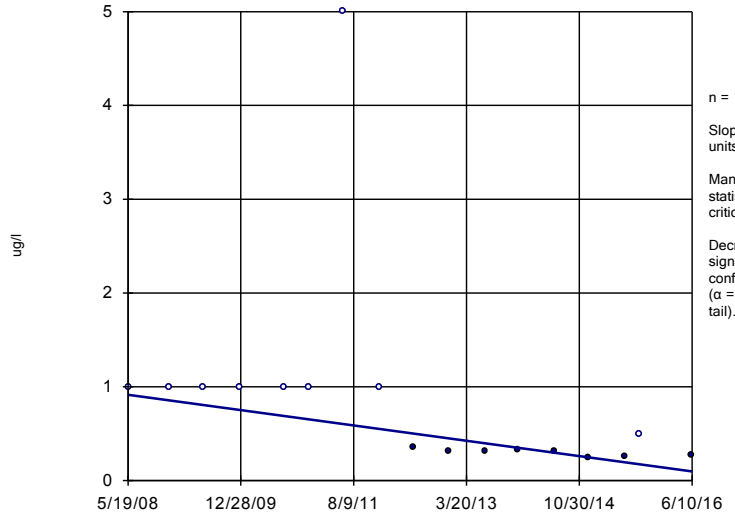
Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = -0.1013 units per year.

Mann-Kendall statistic = -76 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

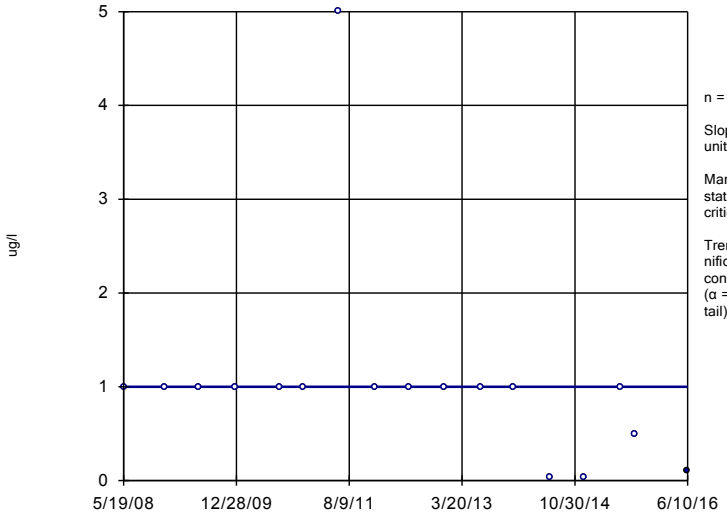
Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -45 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

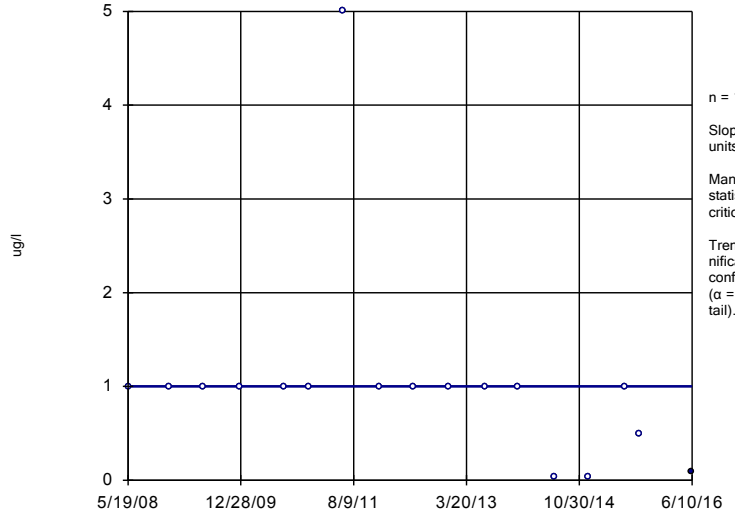
Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9D



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -45 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

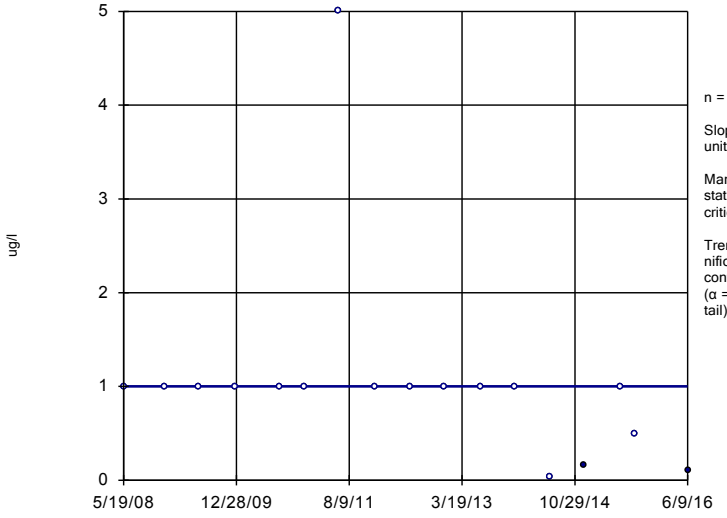
Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11D



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -46 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

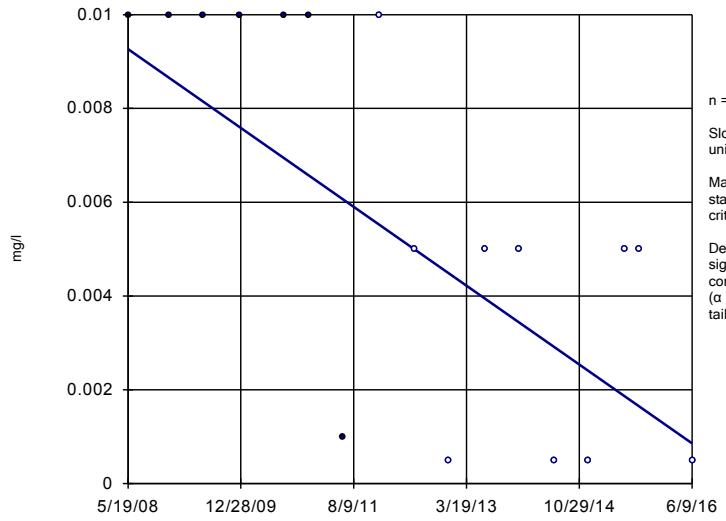
Constituent: benzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11



n = 17

Slope = -0.001043 units per year.

Mann-Kendall statistic = -71 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

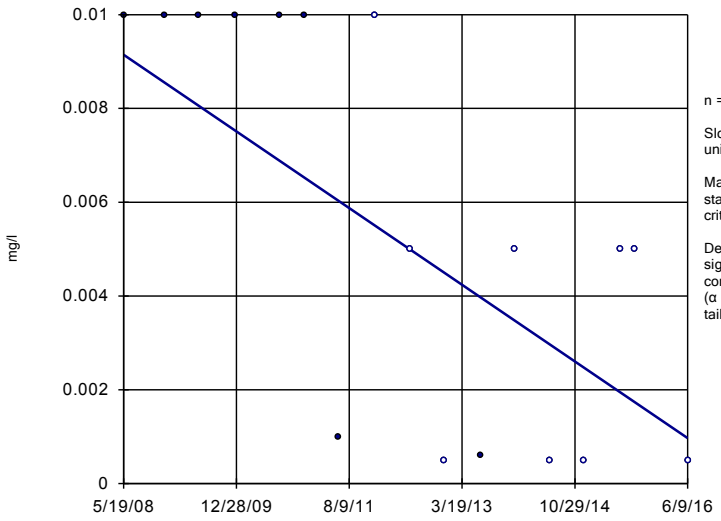
Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21



n = 17

Slope = -0.001014 units per year.

Mann-Kendall statistic = -71 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

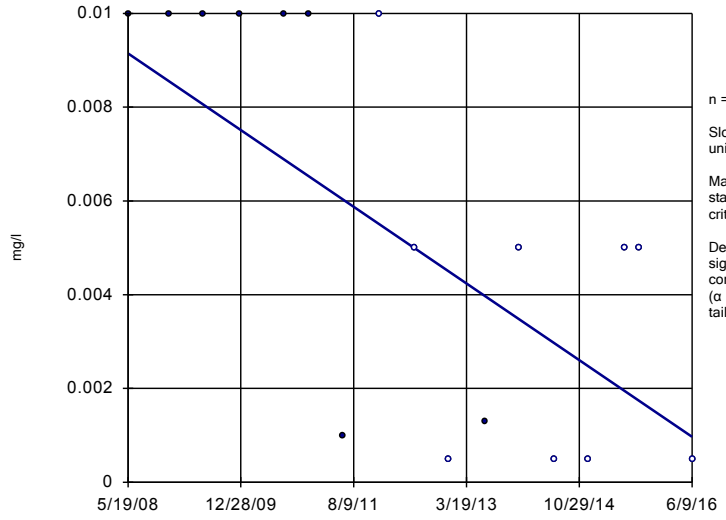
Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21D



n = 17

Slope = -0.001014 units per year.

Mann-Kendall statistic = -69 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

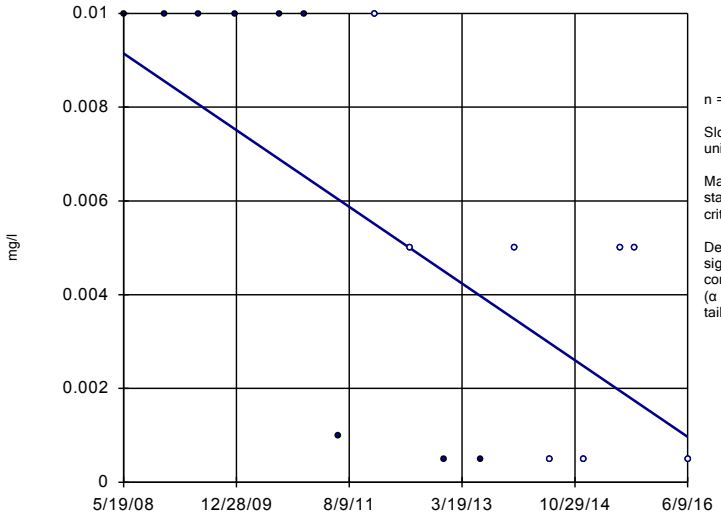
Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = -0.001014 units per year.

Mann-Kendall statistic = -69 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

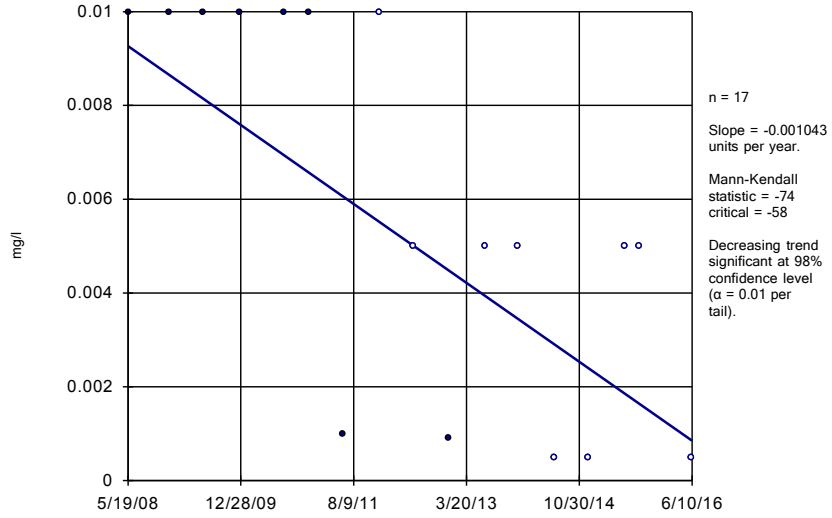
Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = -0.001043 units per year.

Mann-Kendall statistic = -74
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

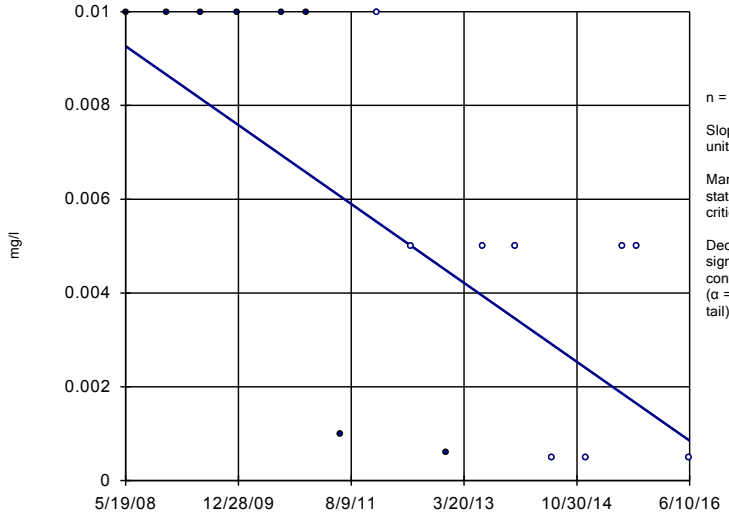
Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 17

Slope = -0.001043 units per year.

Mann-Kendall statistic = -74
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

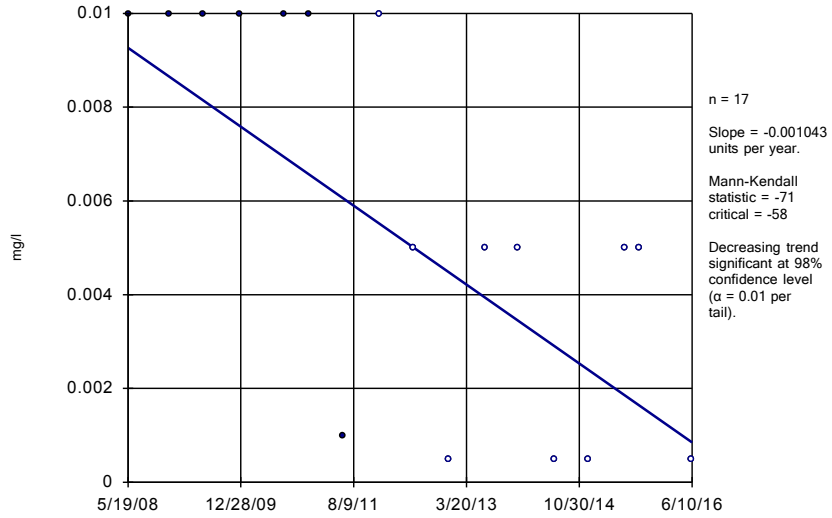
Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9D



n = 17

Slope = -0.001043 units per year.

Mann-Kendall statistic = -71
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

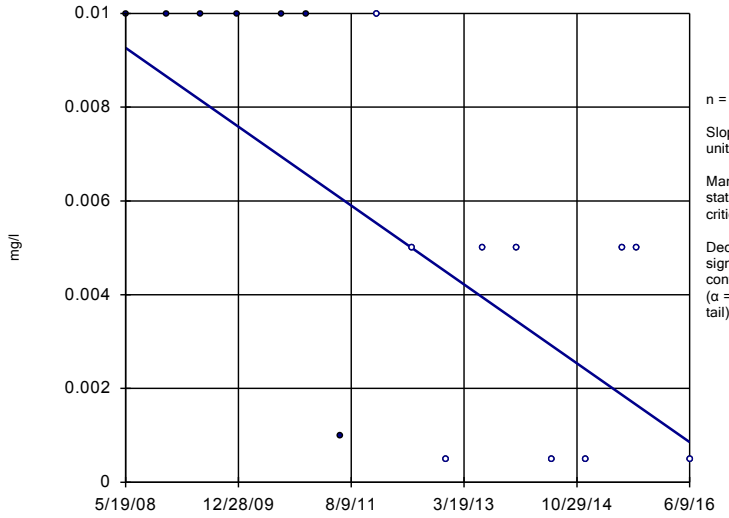
Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11D



n = 17

Slope = -0.001043 units per year.

Mann-Kendall statistic = -71
critical = -58

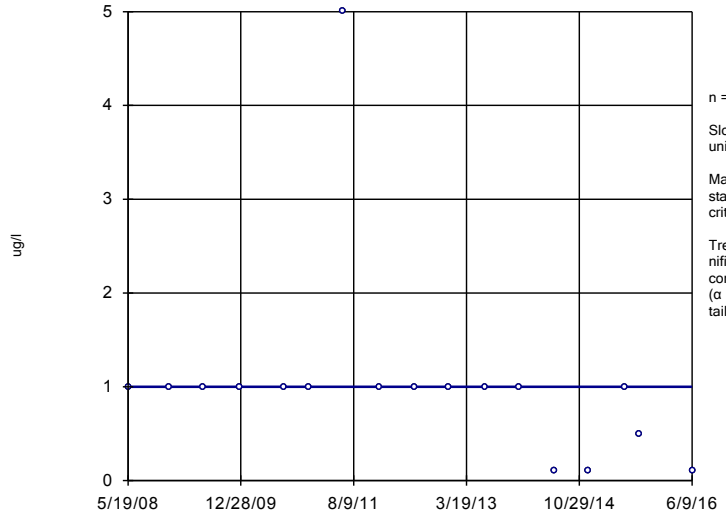
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Chromium Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -47
critical = -58

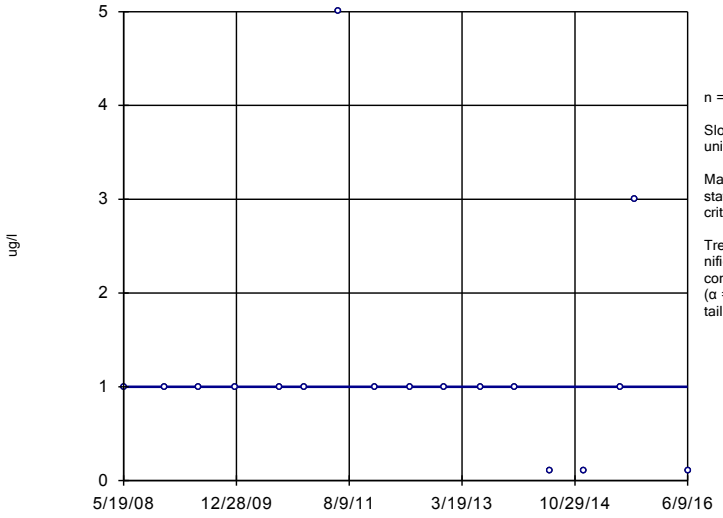
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -23
critical = -58

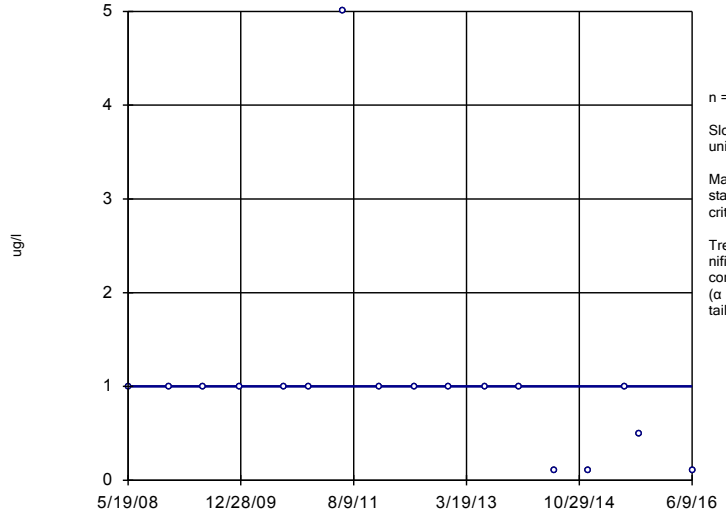
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21D



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -47
critical = -58

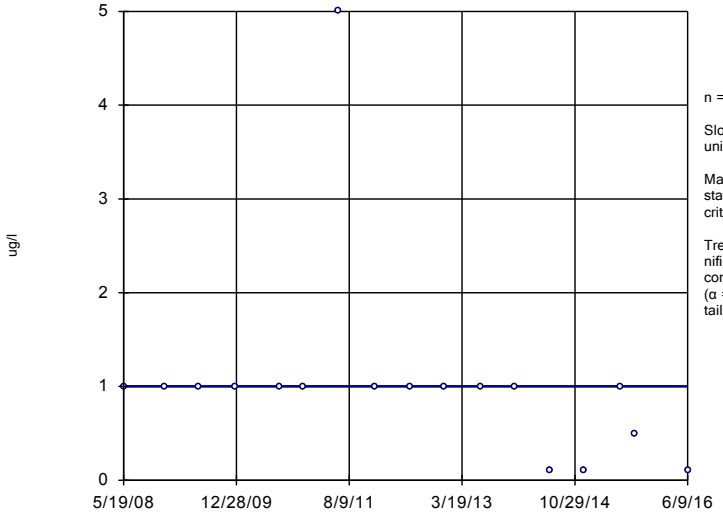
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -47
critical = -58

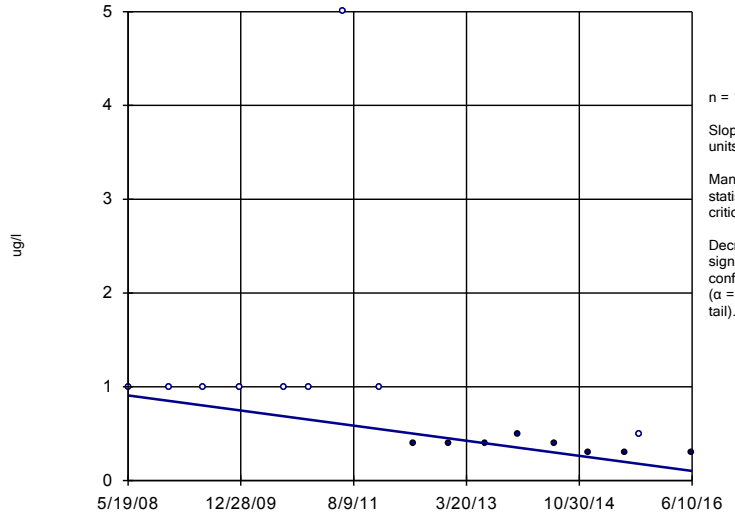
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = -0.09978 units per year.

Mann-Kendall statistic = -75
critical = -58

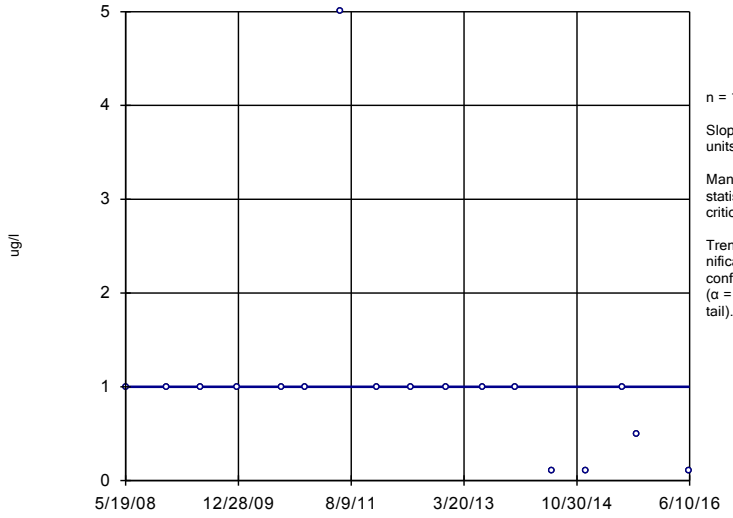
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -47
critical = -58

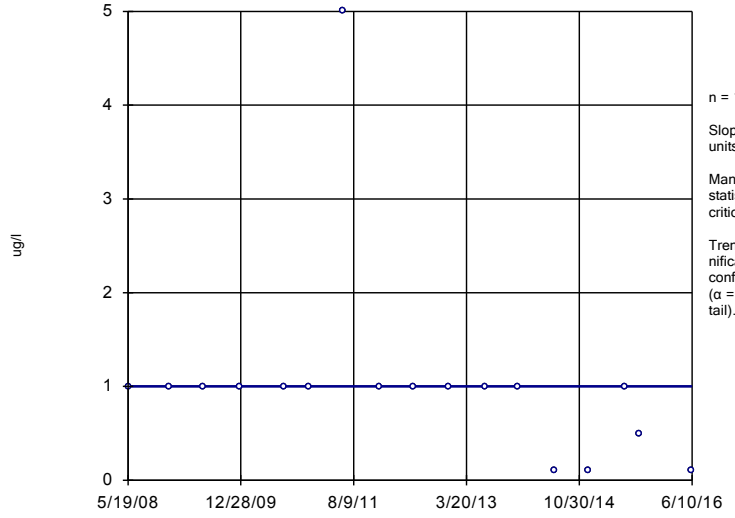
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9D



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -47
critical = -58

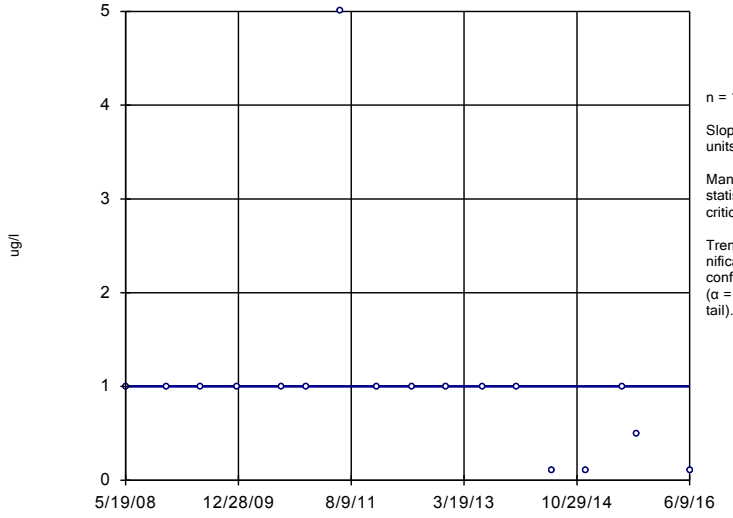
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11D



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -47
critical = -58

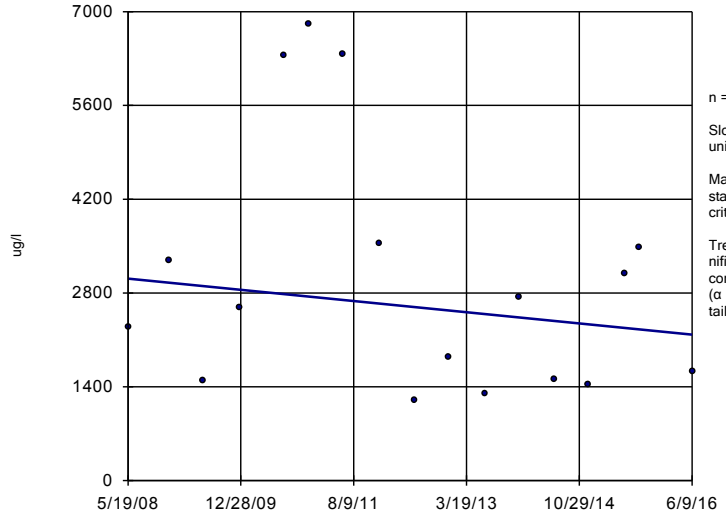
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-11



n = 17

Slope = -103.5 units per year.

Mann-Kendall statistic = -16 critical = -58

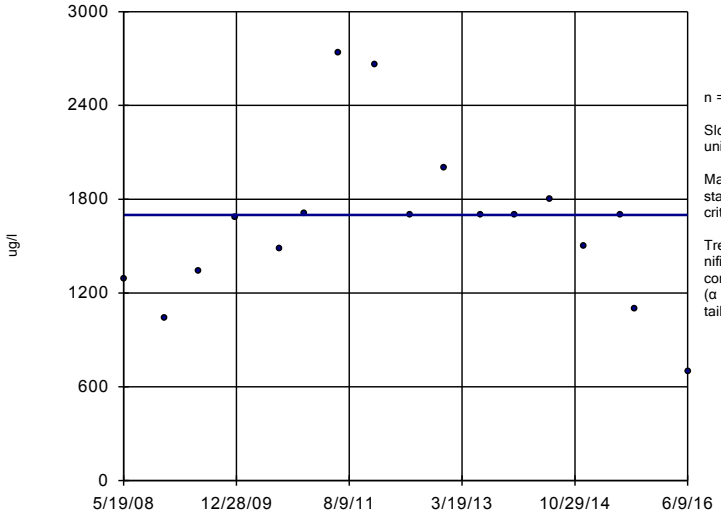
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: GRO+DRO Analysis Run 7/28/2016 6:52 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-21



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = 4 critical = 58

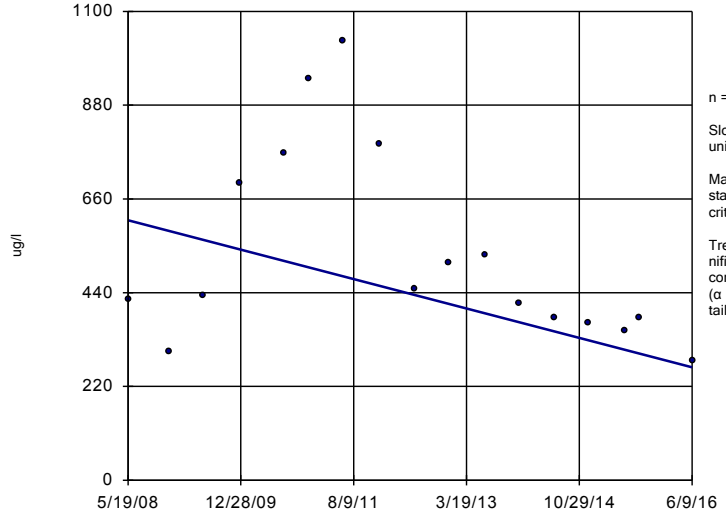
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: GRO+DRO Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-21D



n = 17

Slope = -42.83 units per year.

Mann-Kendall statistic = -47 critical = -58

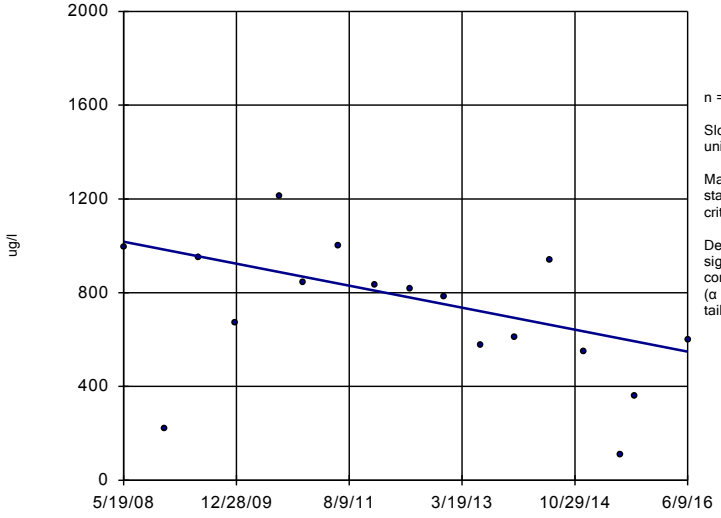
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: GRO+DRO Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = -58.19 units per year.

Mann-Kendall statistic = -60 critical = -58

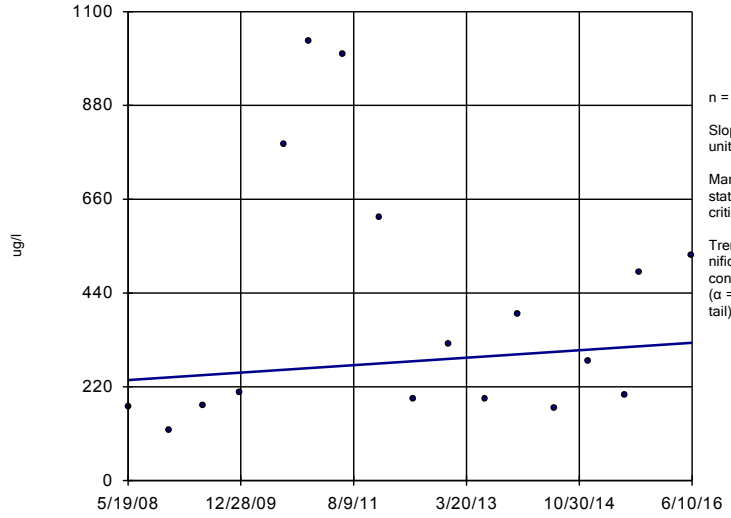
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: GRO+DRO Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = 10.85 units per year.

Mann-Kendall statistic = 21 critical = 58

Trend not significant at 98% confidence level (α = 0.01 per tail).

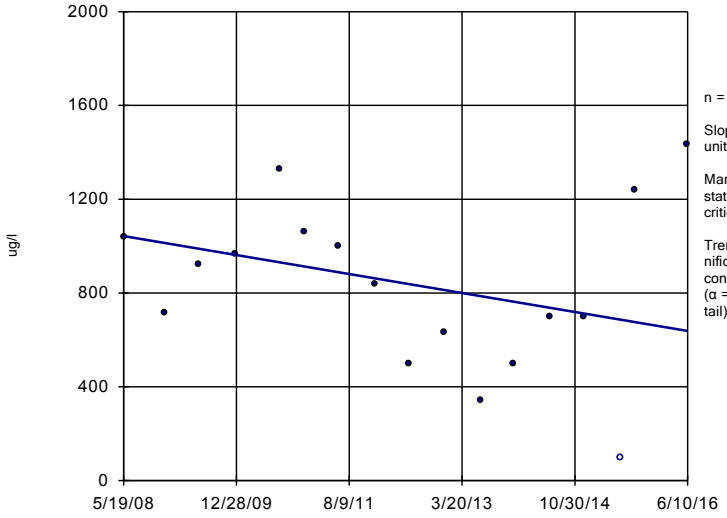
Constituent: GRO+DRO Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 17

Slope = -50.1 units per year.

Mann-Kendall statistic = -24 critical = -58

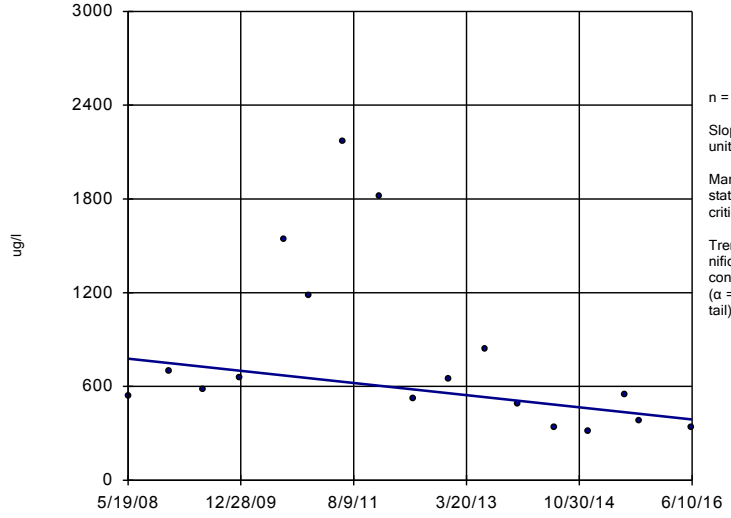
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: GRO+DRO Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-9D



n = 17

Slope = -48.27 units per year.

Mann-Kendall statistic = -53 critical = -58

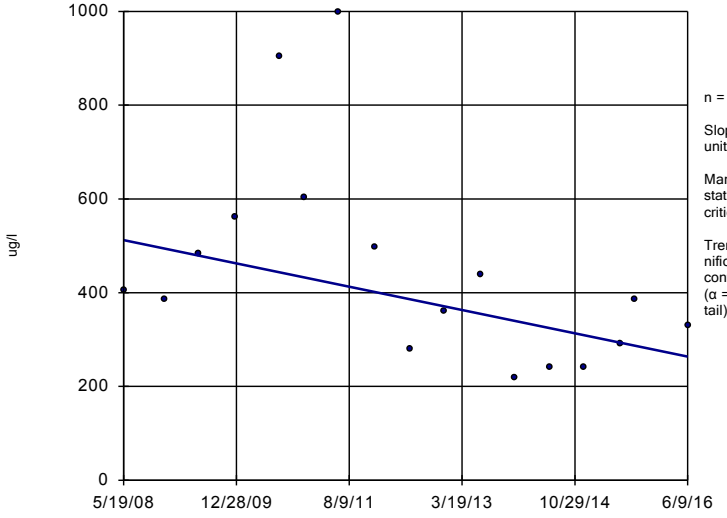
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: GRO+DRO Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Sen's Slope Estimator

SMW-11D



n = 17

Slope = -30.79 units per year.

Mann-Kendall statistic = -46 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

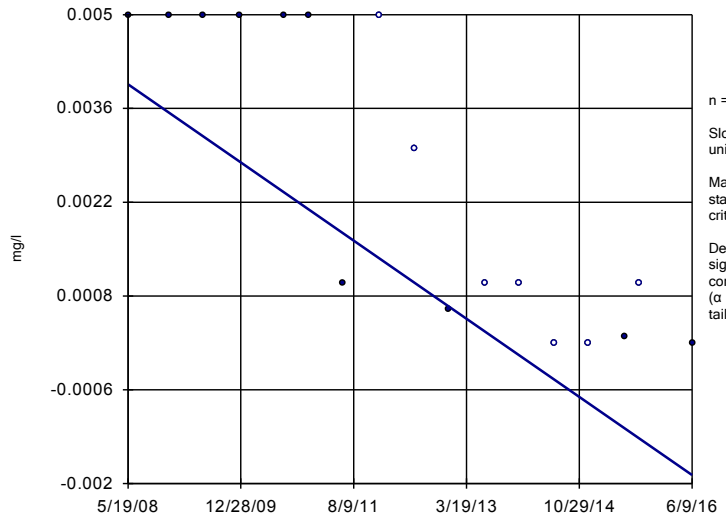
Constituent: GRO+DRO Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11



n = 17

Slope = -0.0007234 units per year.

Mann-Kendall statistic = -86
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

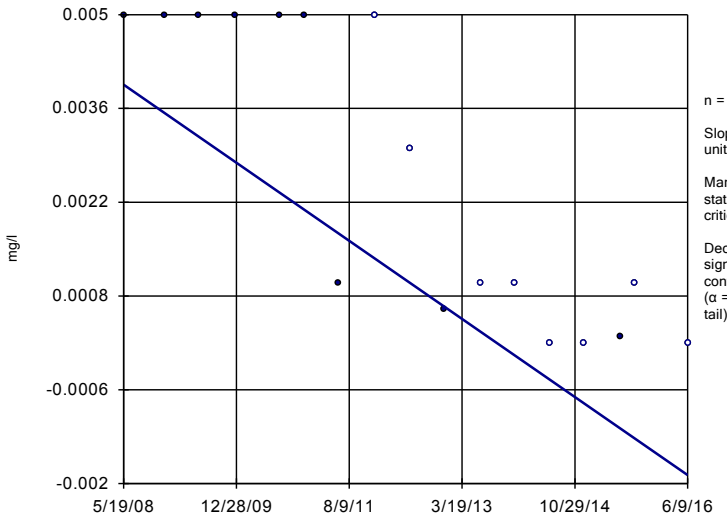
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21



n = 17

Slope = -0.0007231 units per year.

Mann-Kendall statistic = -86
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

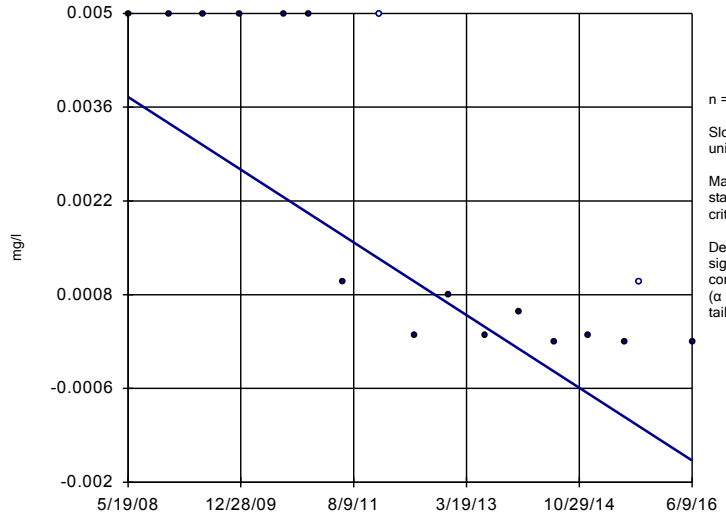
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21D



n = 17

Slope = -0.000673 units per year.

Mann-Kendall statistic = -84
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

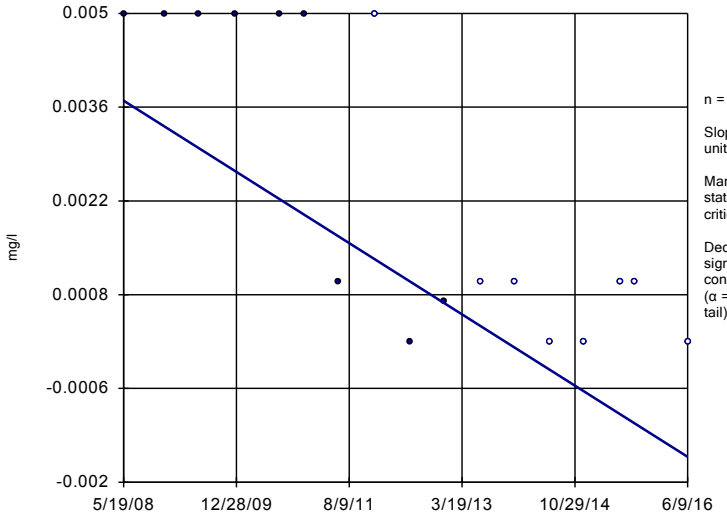
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = -0.0006598 units per year.

Mann-Kendall statistic = -71
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

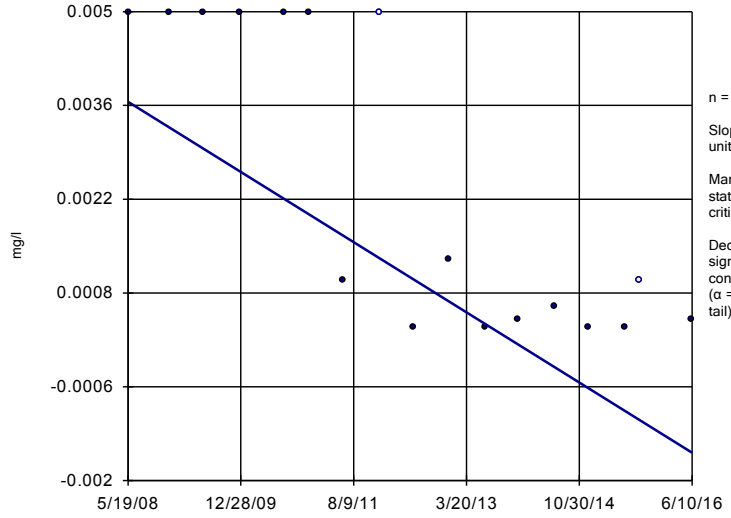
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = -0.0006497 units per year.

Mann-Kendall statistic = -71
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

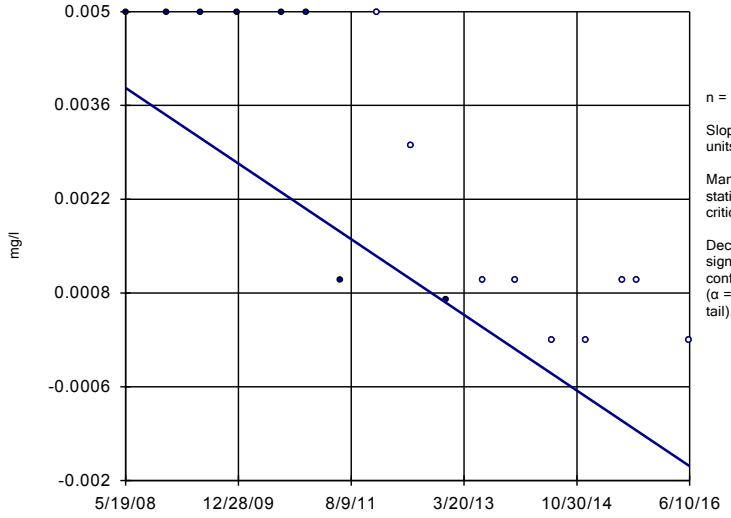
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 17

Slope = -0.0007002 units per year.

Mann-Kendall statistic = -82
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

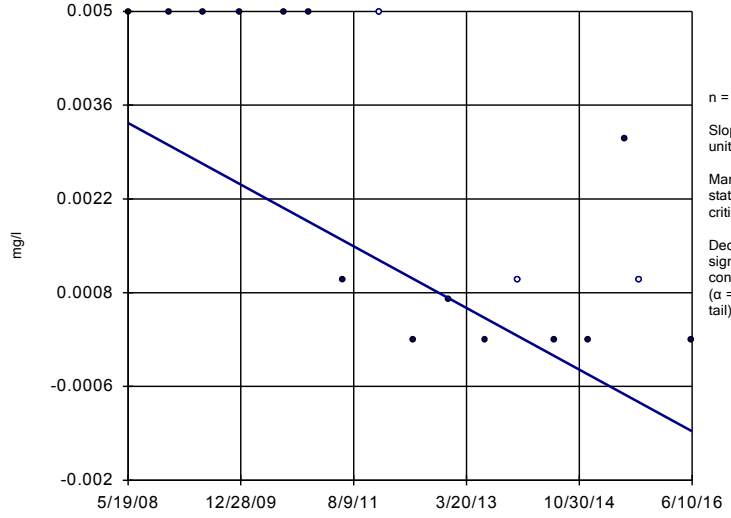
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9D



n = 17

Slope = -0.0005711 units per year.

Mann-Kendall statistic = -68
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

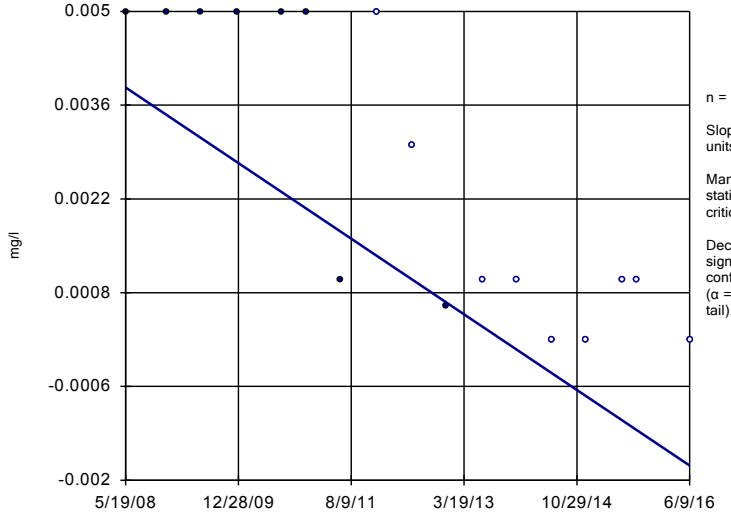
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11D



n = 17

Slope = -0.0007002 units per year.

Mann-Kendall statistic = -82
critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

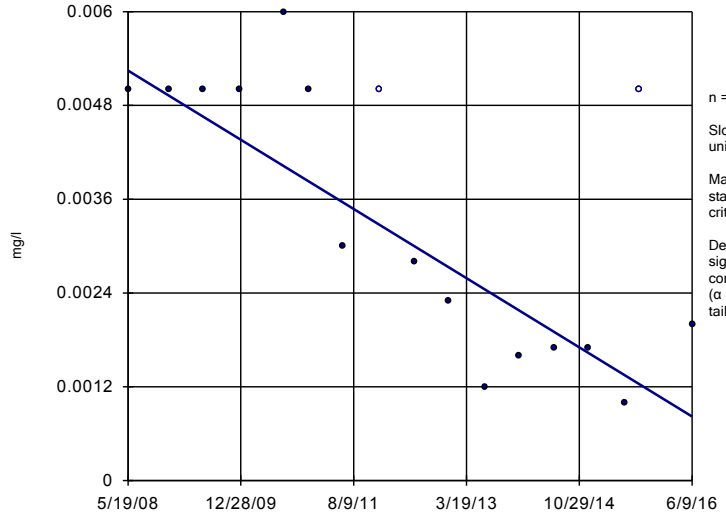
Constituent: Lead Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11



n = 17

Slope = -0.0005492 units per year.

Mann-Kendall statistic = -68 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

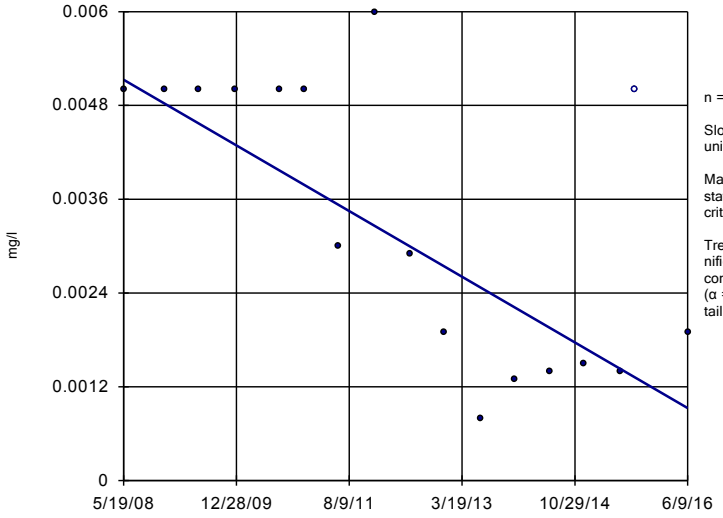
Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21



n = 17

Slope = -0.0005211 units per year.

Mann-Kendall statistic = -57 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

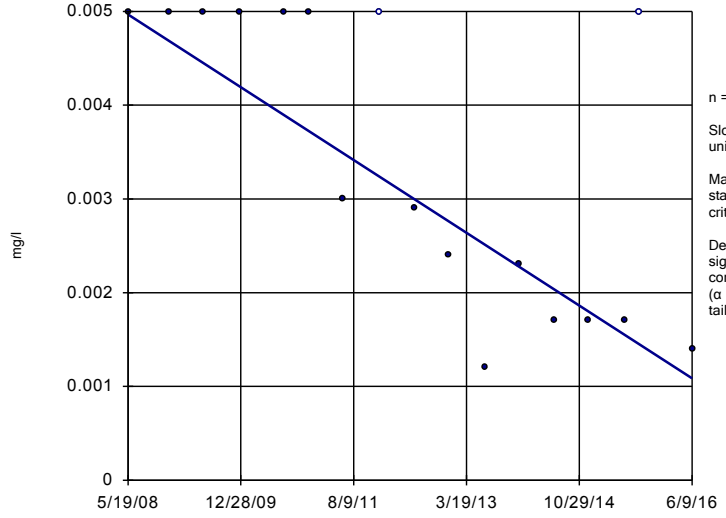
Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21D



n = 17

Slope = -0.0004814 units per year.

Mann-Kendall statistic = -77 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

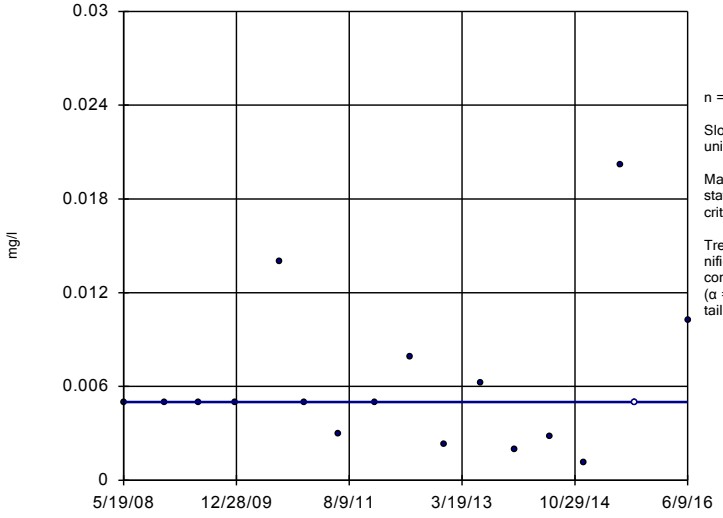
Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = 0 units per year.

Mann-Kendall statistic = -5 critical = -58

Trend not significant at 98% confidence level (α = 0.01 per tail).

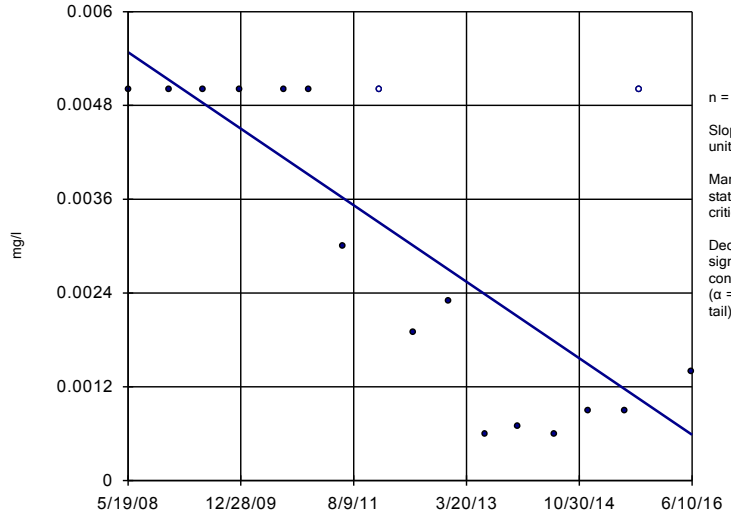
Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = -0.0006068 units per year.

Mann-Kendall statistic = -62 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

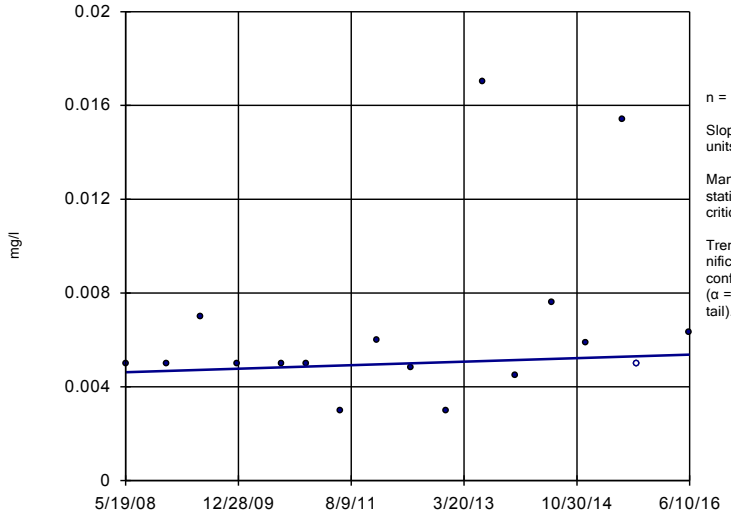
Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 17

Slope = 0.00009333 units per year.

Mann-Kendall statistic = 20 critical = 58

Trend not significant at 98% confidence level (α = 0.01 per tail).

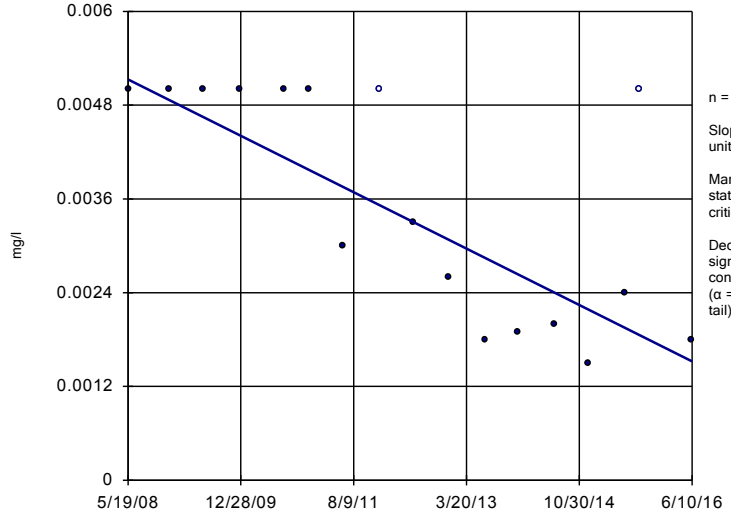
Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9D



n = 17

Slope = -0.0004473 units per year.

Mann-Kendall statistic = -71 critical = -58

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

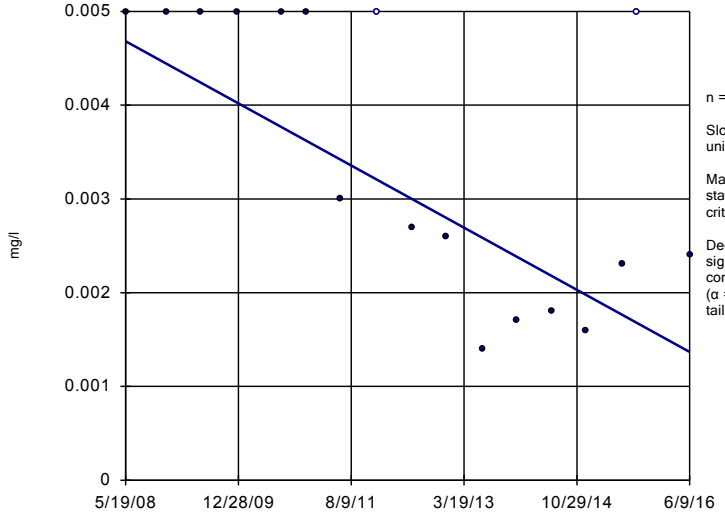
Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11D



n = 17

Slope = -0.0004112 units per year.

Mann-Kendall statistic = -64 critical = -58

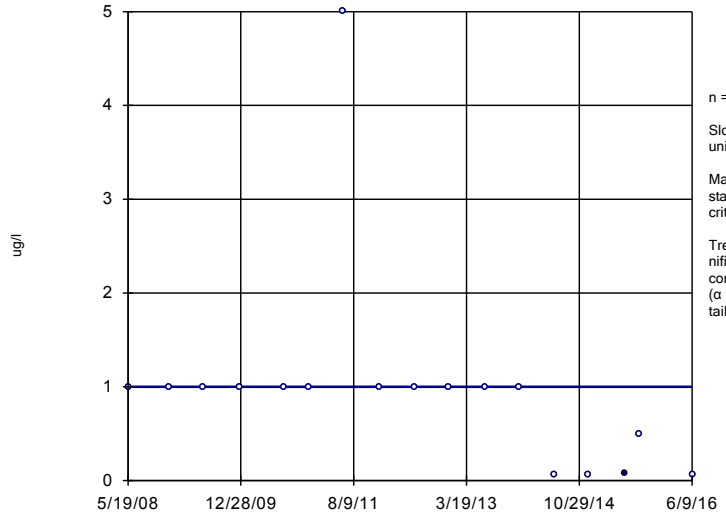
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Selenium Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -56
critical = -58

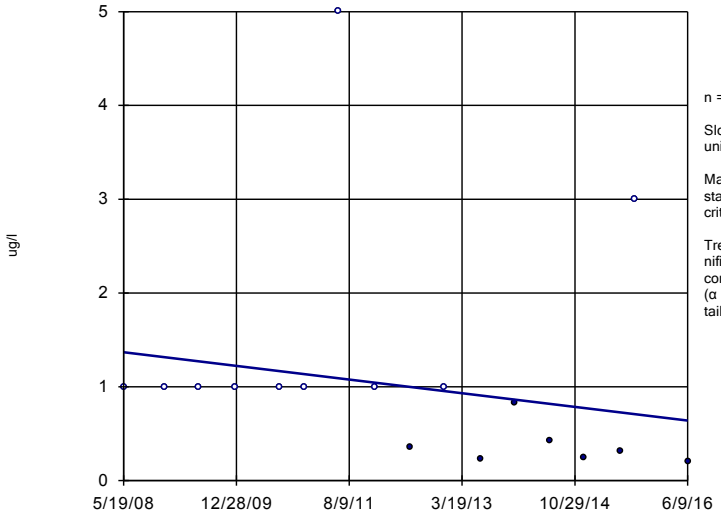
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21



n = 17

Slope = -0.09035
units per year.

Mann-Kendall
statistic = -52
critical = -58

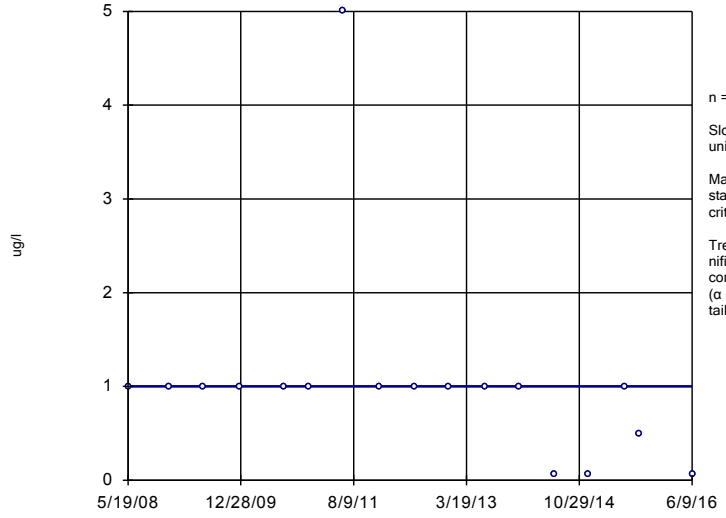
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21D



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -47
critical = -58

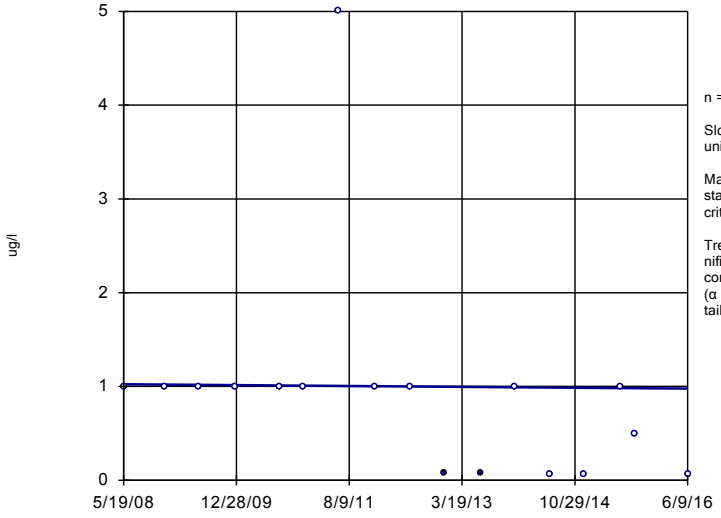
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 17

Slope = -0.005822
units per year.

Mann-Kendall
statistic = -55
critical = -58

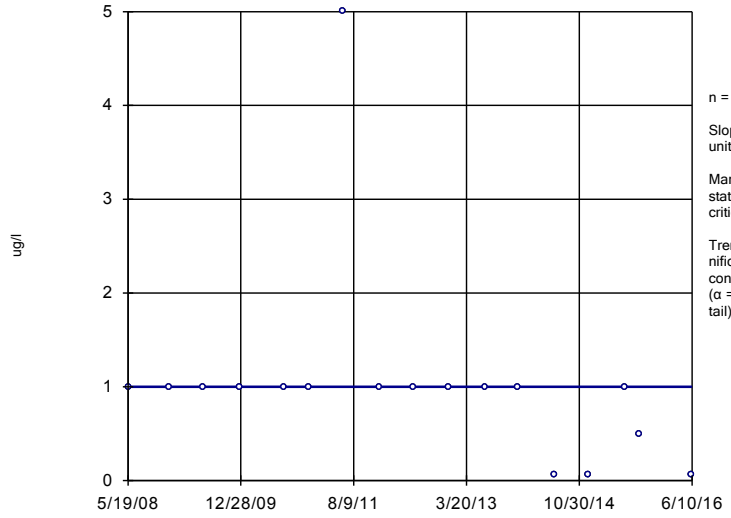
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5D (bg)



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -47
critical = -58

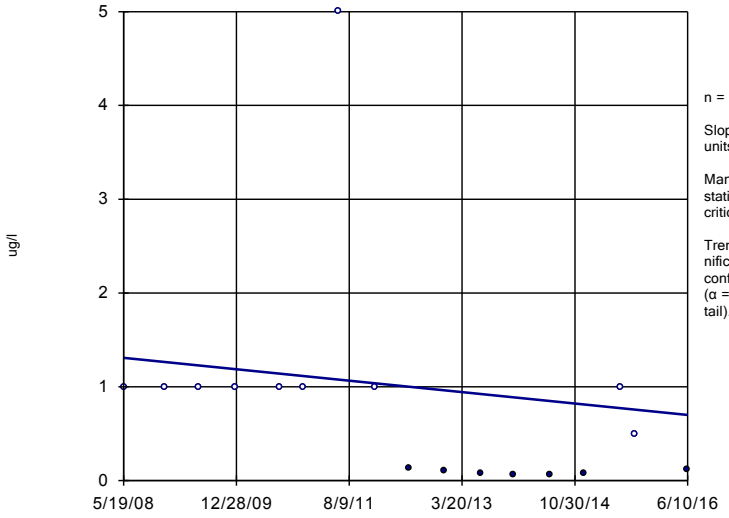
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 17

Slope = -0.07561
units per year.

Mann-Kendall
statistic = -56
critical = -58

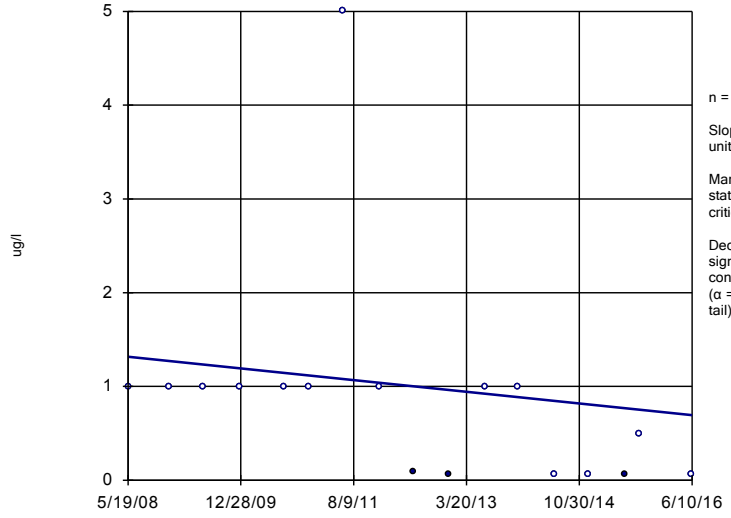
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9D



n = 17

Slope = -0.07728
units per year.

Mann-Kendall
statistic = -60
critical = -58

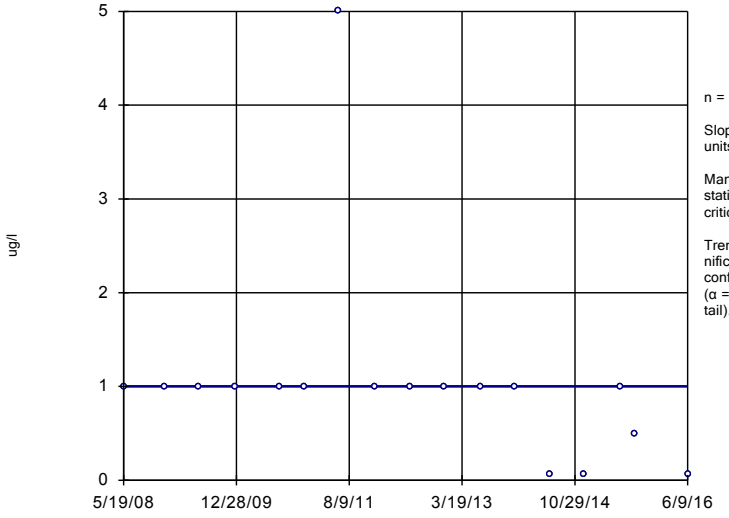
Decreasing trend
significant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11D



n = 17

Slope = 0
units per year.

Mann-Kendall
statistic = -47
critical = -58

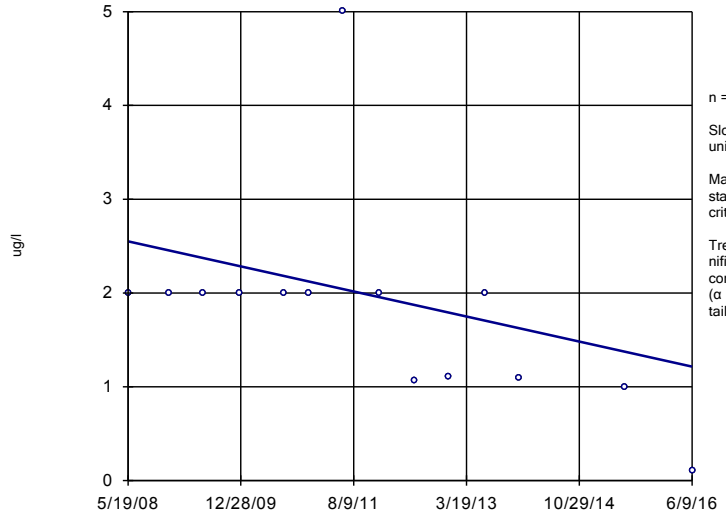
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: toluene Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11



n = 14

Slope = -0.166 units per year.

Mann-Kendall statistic = -43 critical = -44

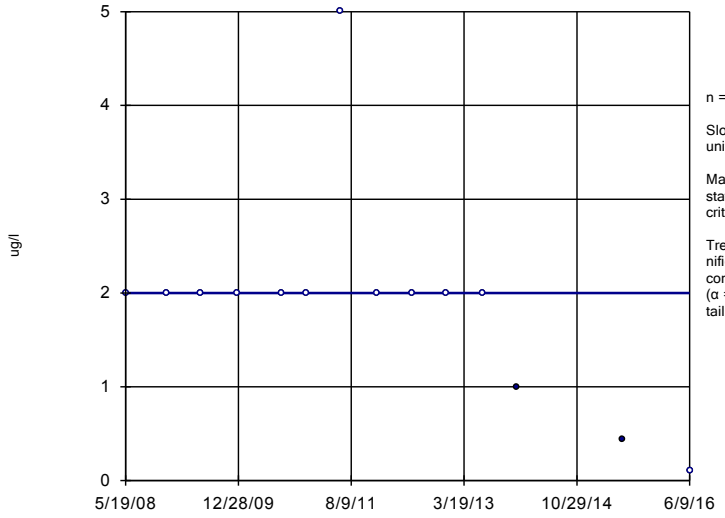
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21



n = 14

Slope = 0 units per year.

Mann-Kendall statistic = -34 critical = -44

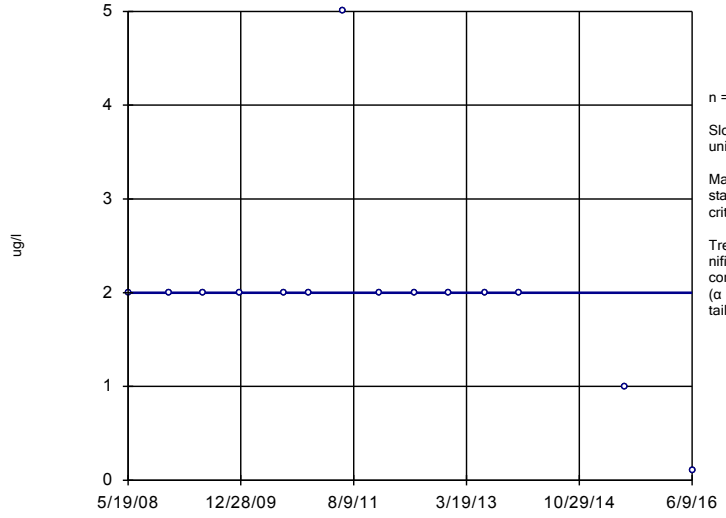
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-21D



n = 14

Slope = 0 units per year.

Mann-Kendall statistic = -24 critical = -44

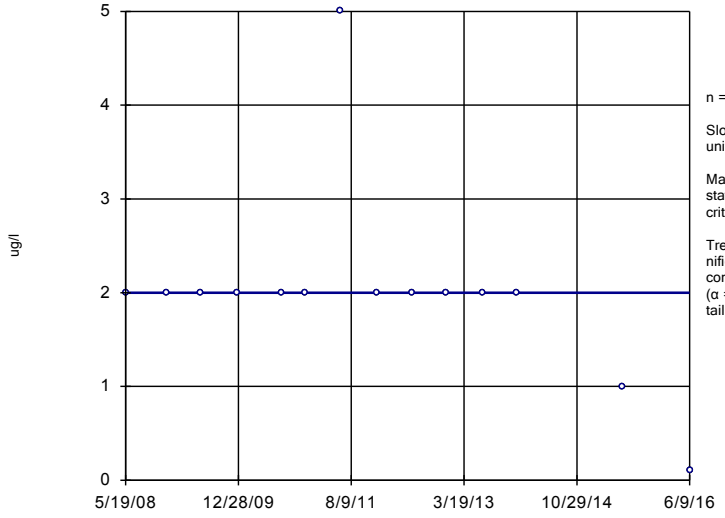
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5 (bg)



n = 14

Slope = 0 units per year.

Mann-Kendall statistic = -24 critical = -44

Trend not significant at 98% confidence level (α = 0.01 per tail).

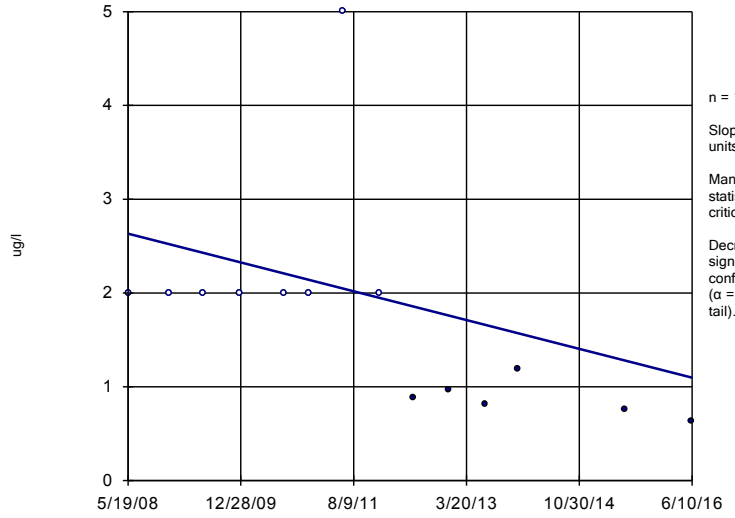
Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-5D (bg)



n = 14

Slope = -0.1905 units per year.

Mann-Kendall statistic = -50 critical = -44

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

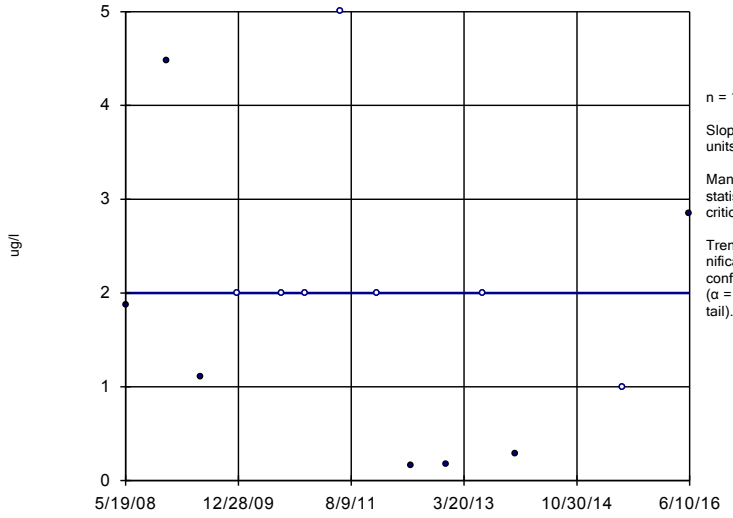
Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9



n = 14

Slope = 0 units per year.

Mann-Kendall statistic = -9 critical = -44

Trend not significant at 98% confidence level (α = 0.01 per tail).

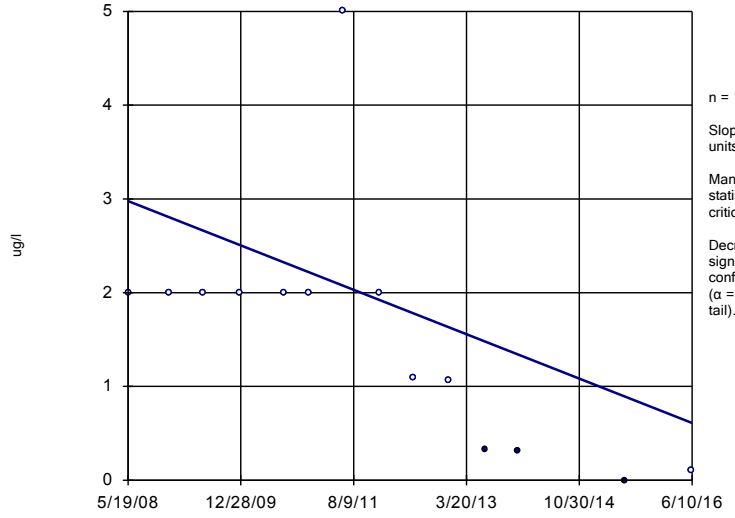
Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-9D



n = 14

Slope = -0.2935 units per year.

Mann-Kendall statistic = -56 critical = -44

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

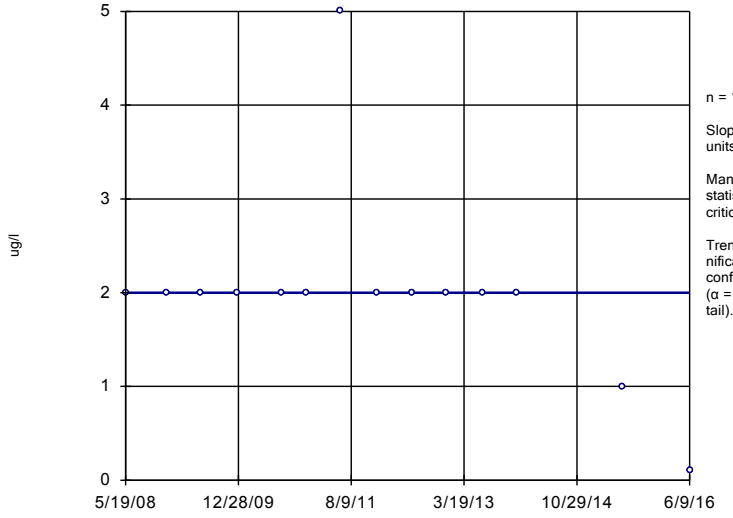
Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SMW-11D



n = 14

Slope = 0 units per year.

Mann-Kendall statistic = -24 critical = -44

Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Xylenes Analysis Run 7/28/2016 6:53 PM

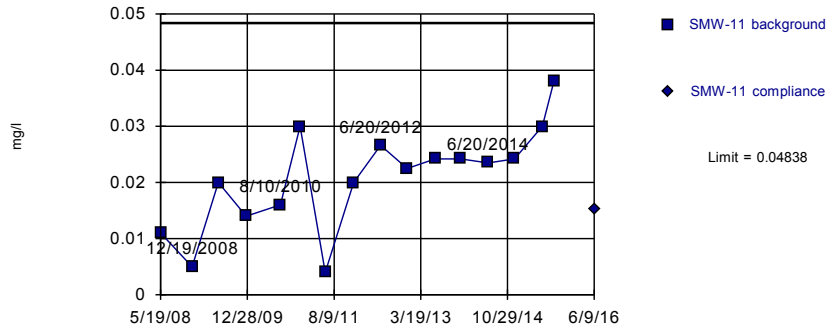
Appendix C
Tolerance Limit Graphs

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.02083, Std. Dev.=0.0091, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9597, critical = 0.844. Report alpha = 0.01.

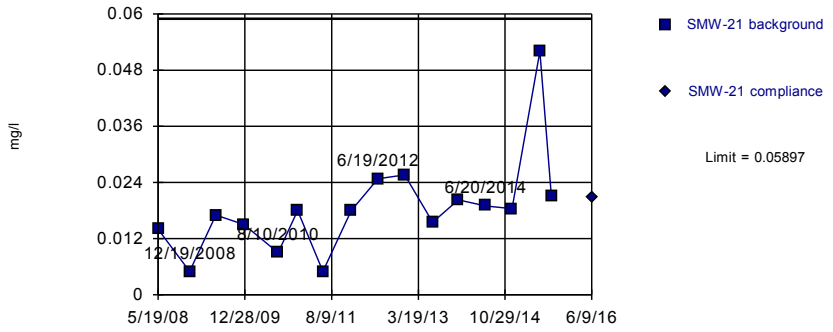
Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=0.1317, Std. Dev.=0.03671, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8936, critical = 0.844. Report alpha = 0.01.

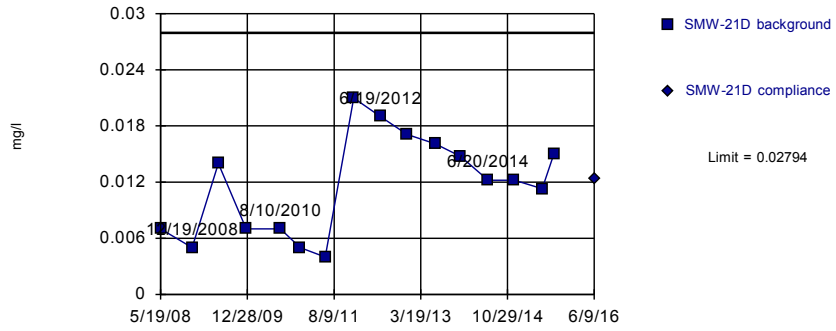
Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.01173, Std. Dev.=0.005353, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9412, critical = 0.844. Report alpha = 0.01.

Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

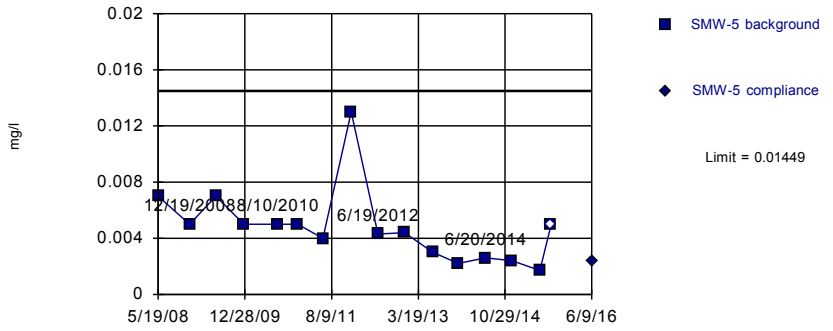
v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=0.06706, Std. Dev.=0.01761, n=16, 6.25% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9061, critical = 0.844. Report alpha = 0.01.

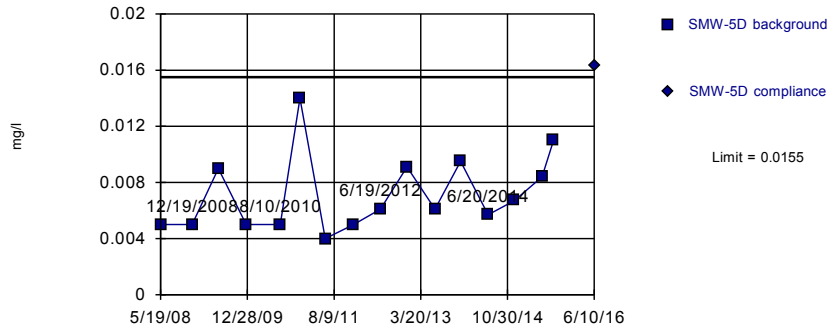
Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Exceeds Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.007163, Std. Dev.=0.002752, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8696, critical = 0.844. Report alpha = 0.01.

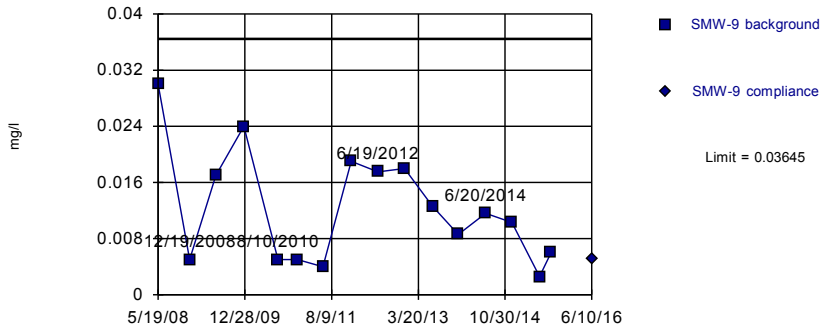
Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.01226, Std. Dev.=0.007989, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9188, critical = 0.844. Report alpha = 0.01.

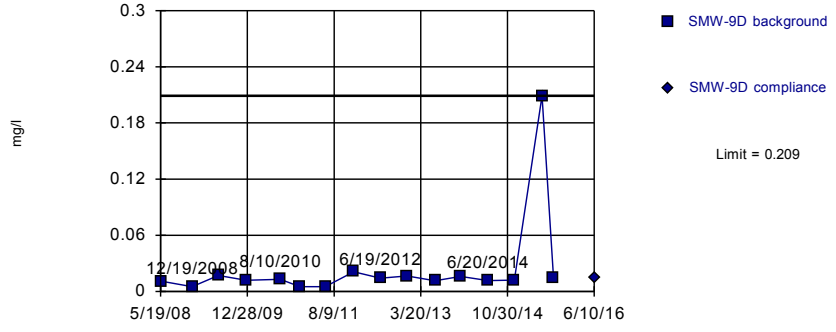
Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

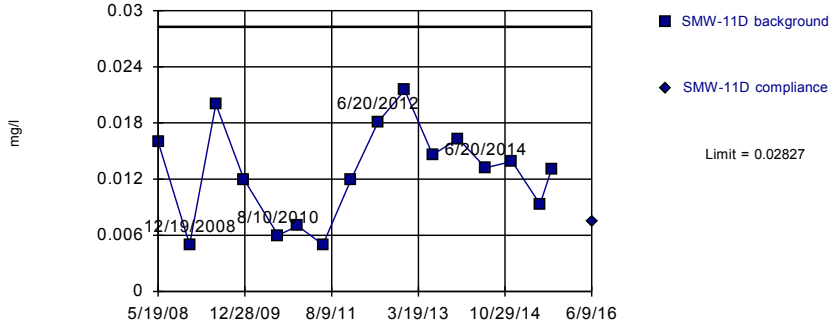
Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.01268, Std. Dev.=0.005149, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9542, critical = 0.844. Report alpha = 0.01.

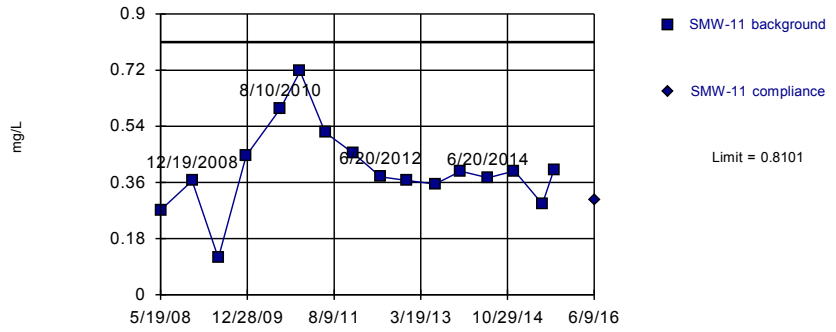
Constituent: Arsenic Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.4028, Std. Dev.=0.1345, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9325, critical = 0.844. Report alpha = 0.01.

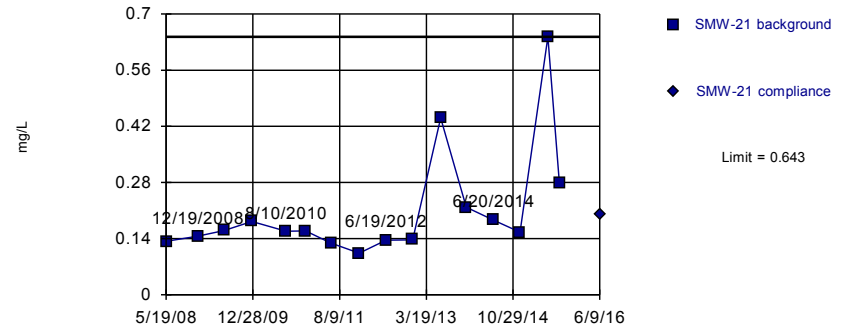
Constituent: Barium Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

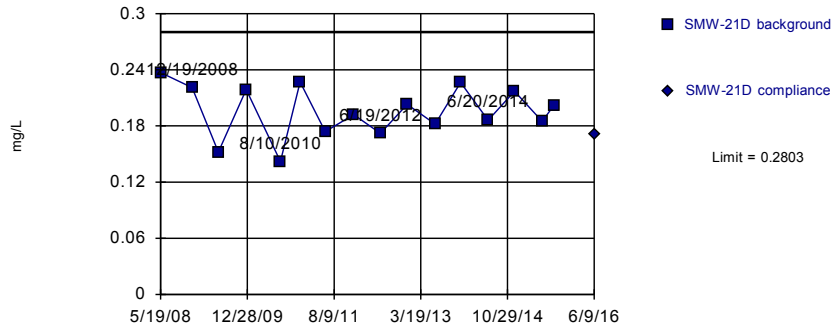
Constituent: Barium Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.1961, Std. Dev.=0.02781, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9567, critical = 0.844. Report alpha = 0.01.

Constituent: Barium Analysis Run 7/28/2016 6:54 PM

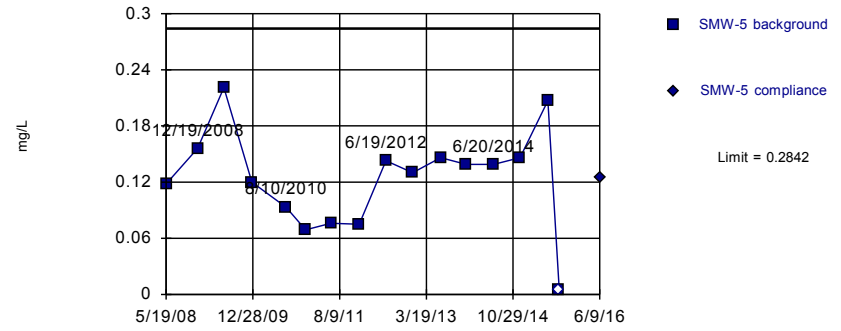
v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.1239, Std. Dev.=0.05294, n=16, 6.25% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9523, critical = 0.844. Report alpha = 0.01.

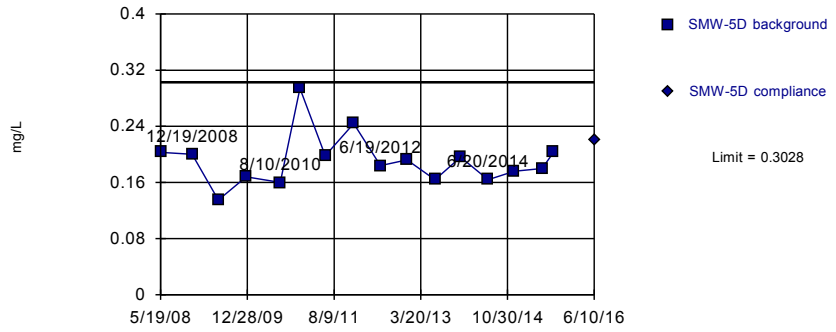
Constituent: Barium Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.1913, Std. Dev.=0.03682, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8745, critical = 0.844. Report alpha = 0.01.

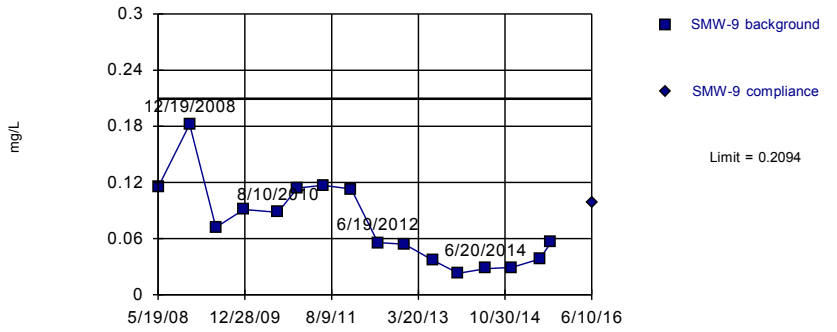
Constituent: Barium Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=0.07581, Std. Dev.=0.04412, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9109, critical = 0.844. Report alpha = 0.01.

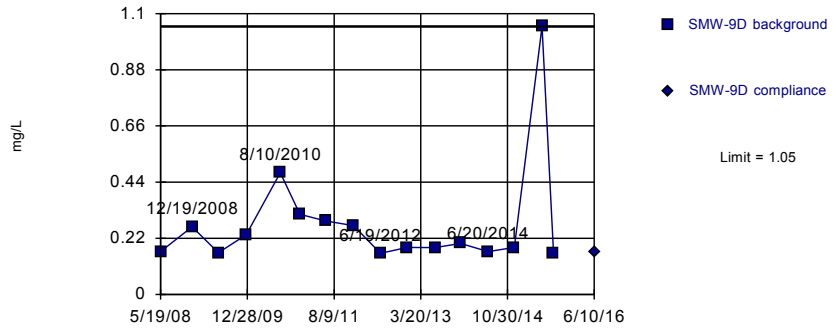
Constituent: Barium Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

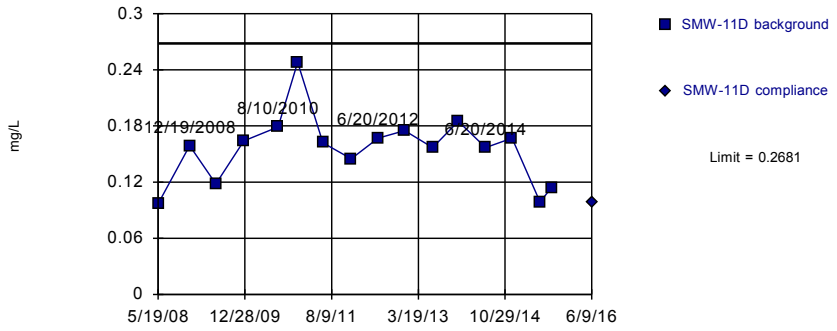
Constituent: Barium Analysis Run 7/28/2016 6:54 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



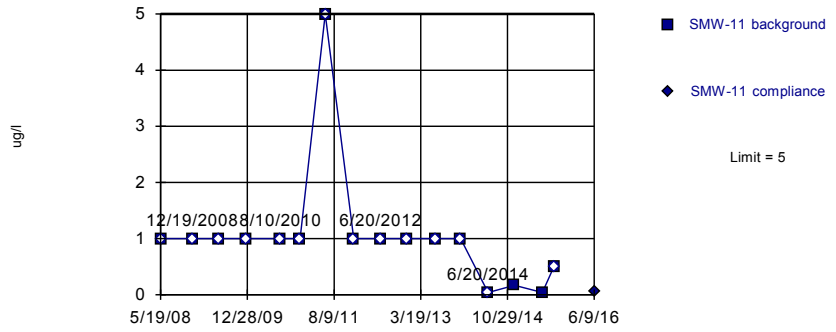
95% coverage. Background Data Summary: Mean=0.1558, Std. Dev.=0.03708, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9073, critical = 0.844. Report alpha = 0.01.

Constituent: Barium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



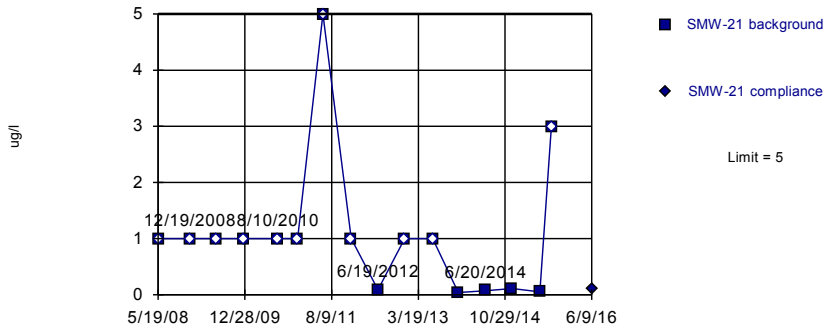
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 87.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



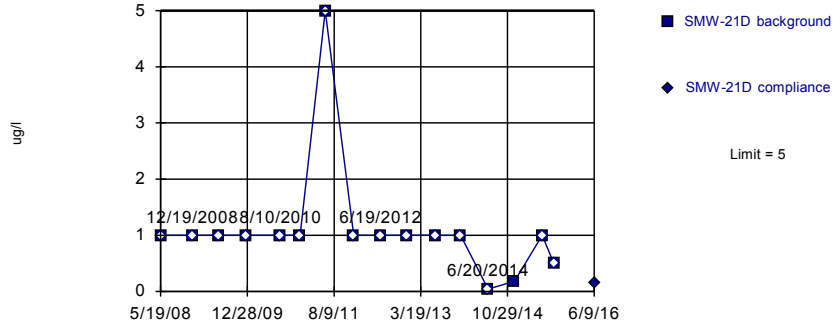
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 68.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



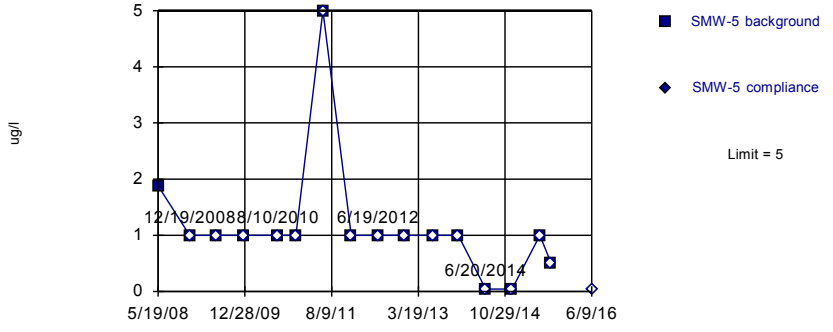
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 93.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



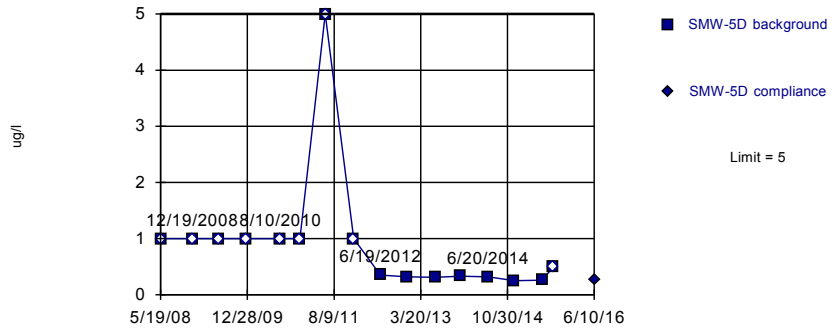
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 93.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



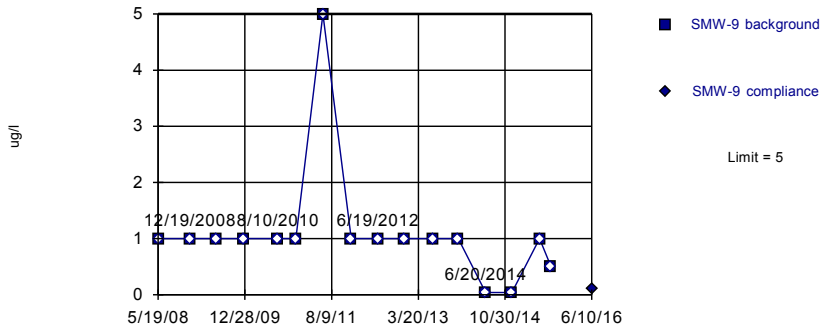
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 56.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



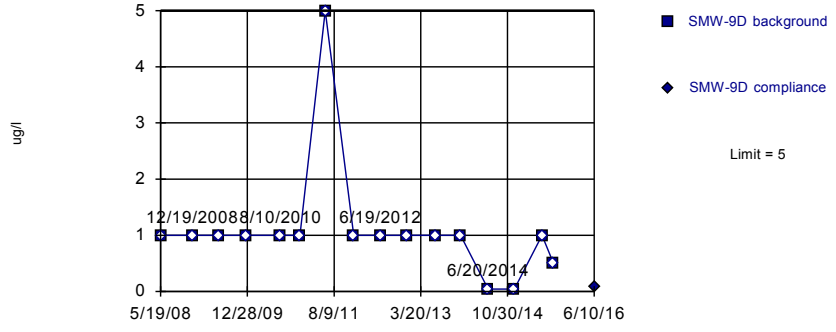
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



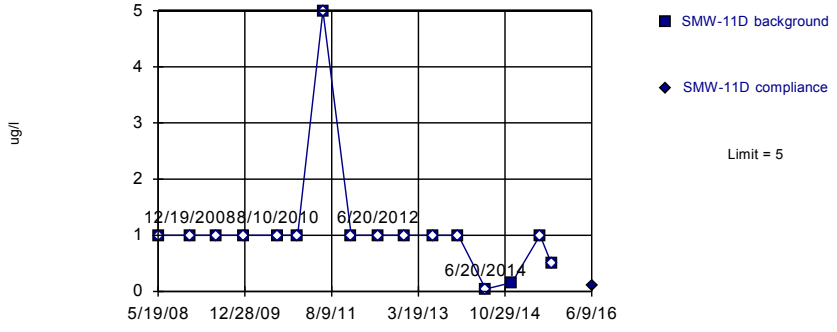
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



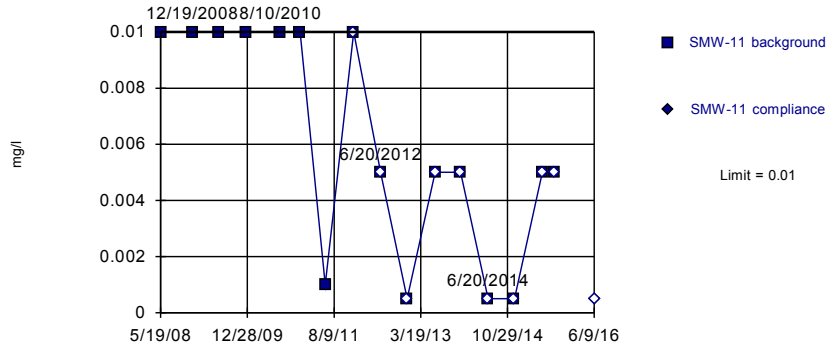
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 93.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: benzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



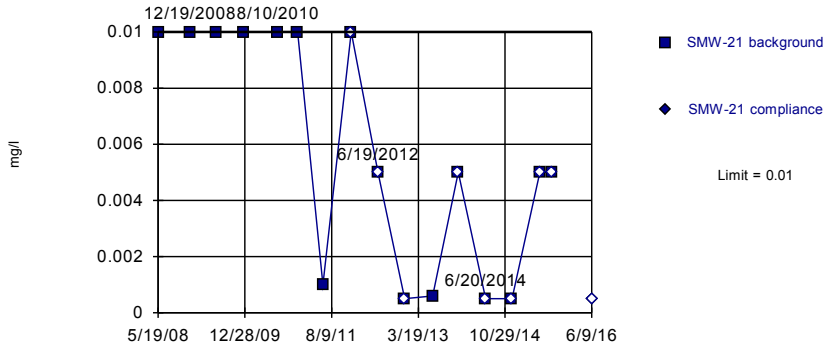
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 56.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



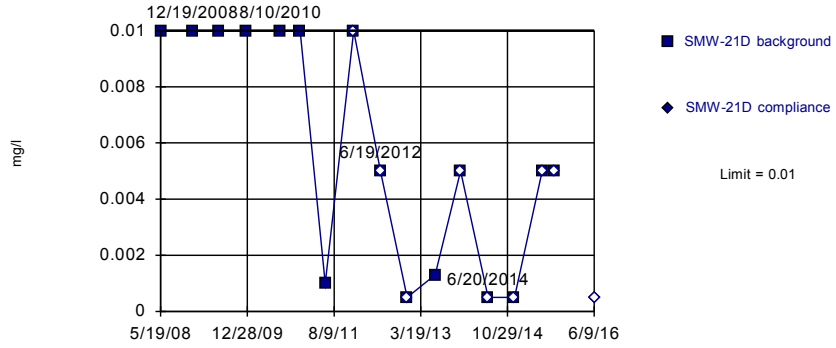
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



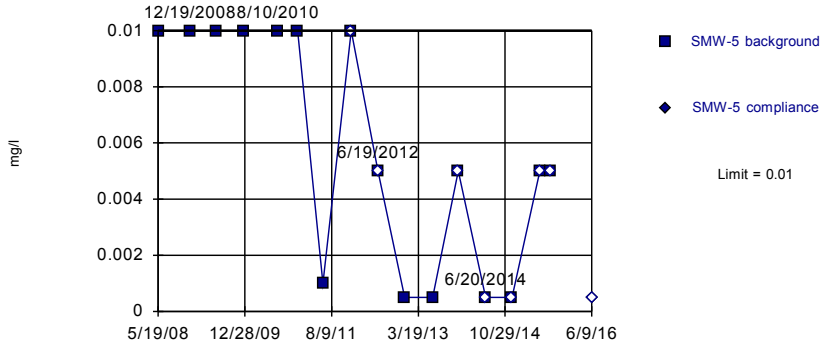
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



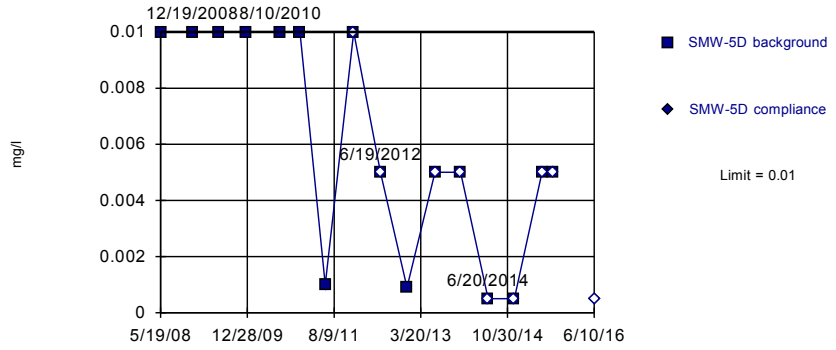
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 43.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



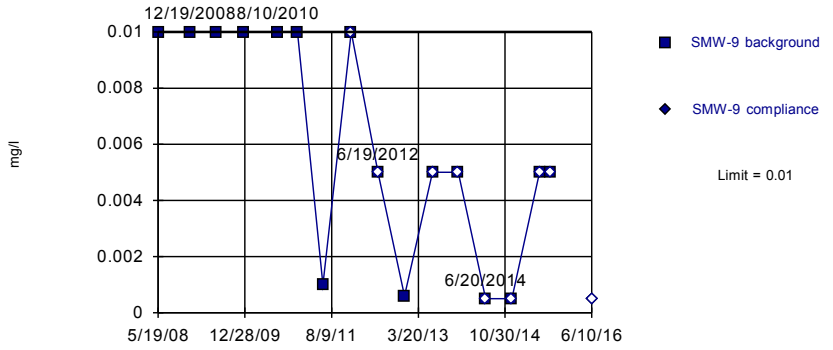
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



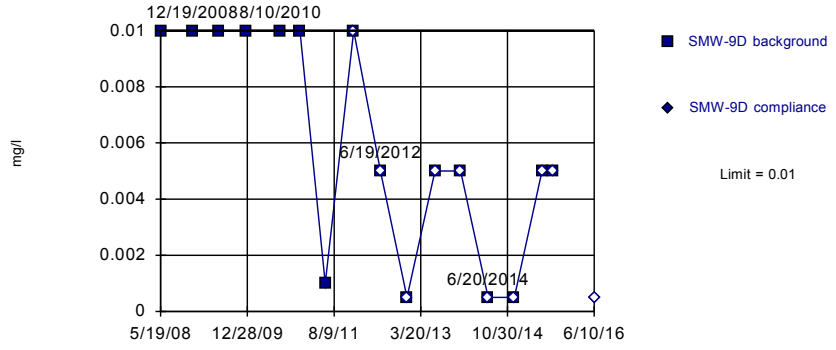
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



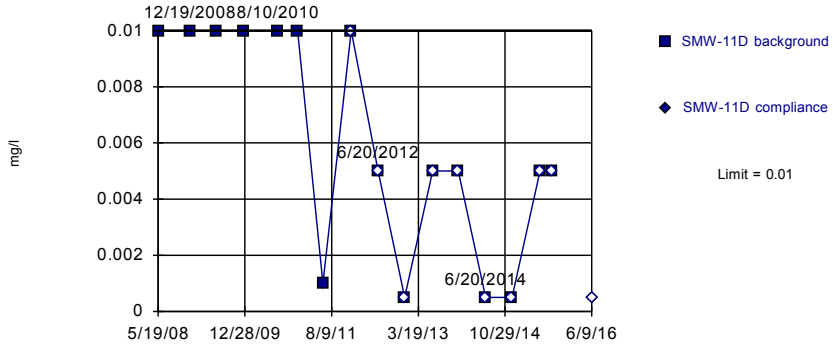
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 56.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



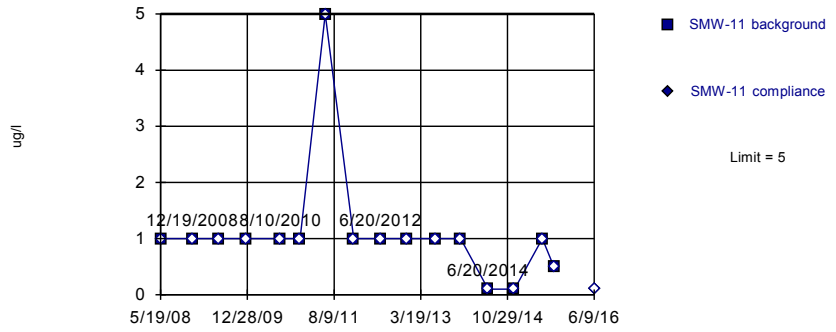
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 56.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Chromium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



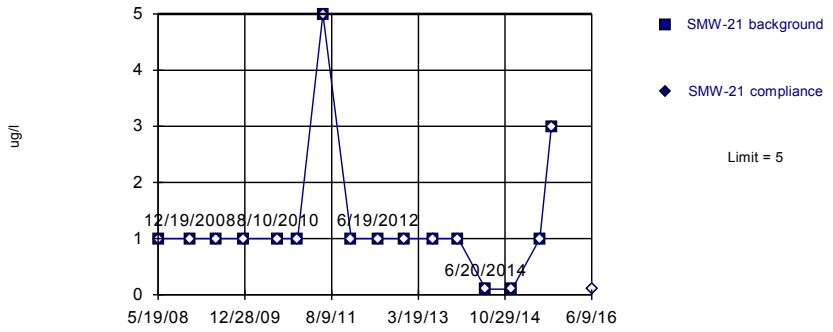
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



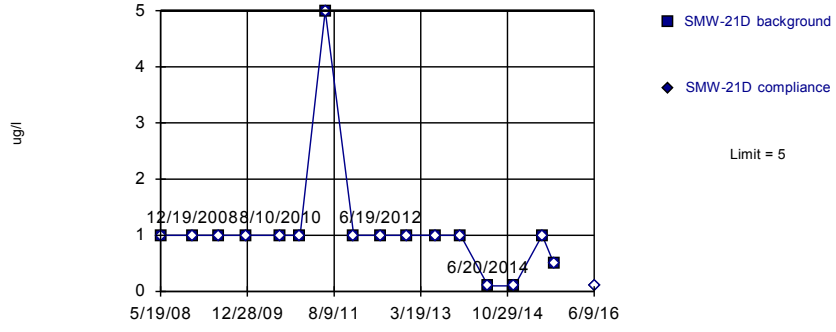
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



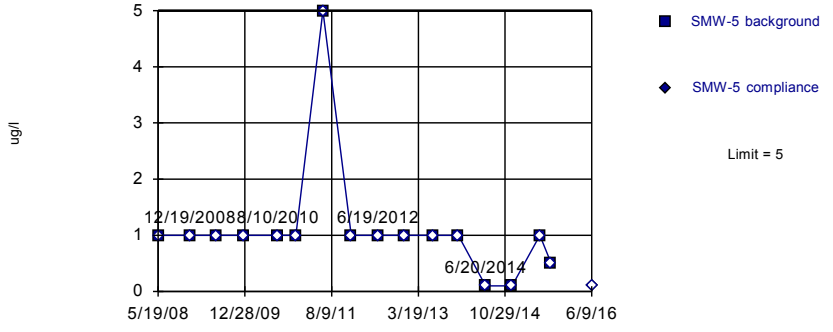
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



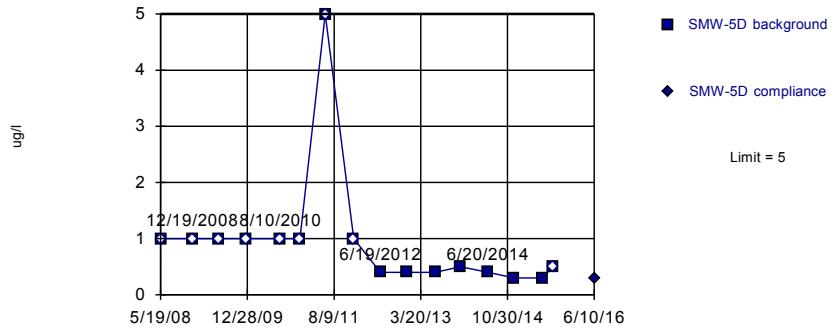
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



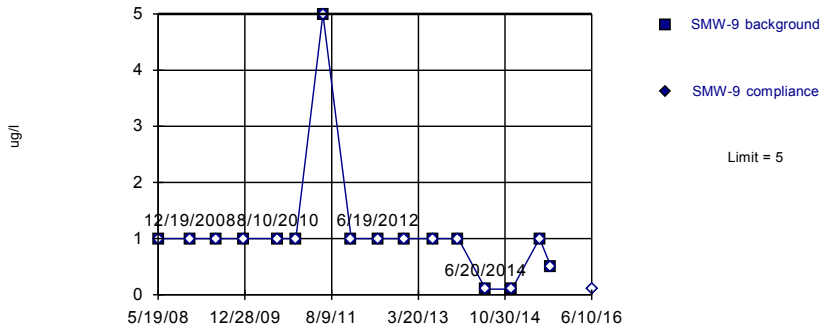
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 56.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



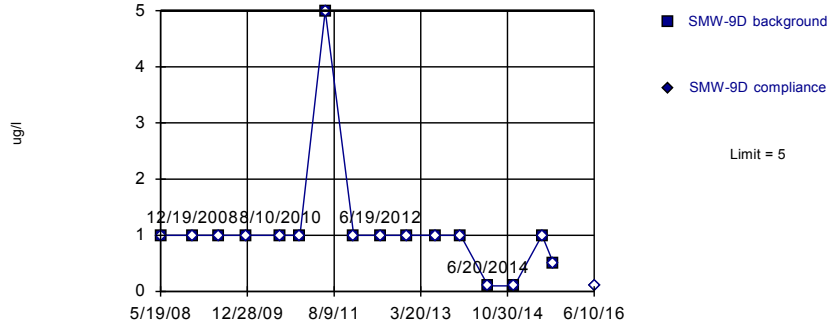
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



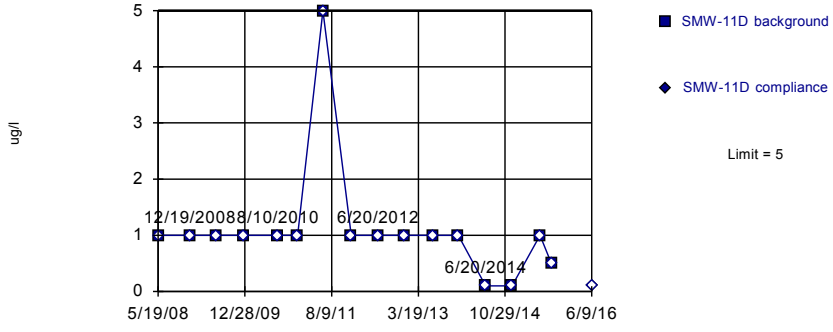
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

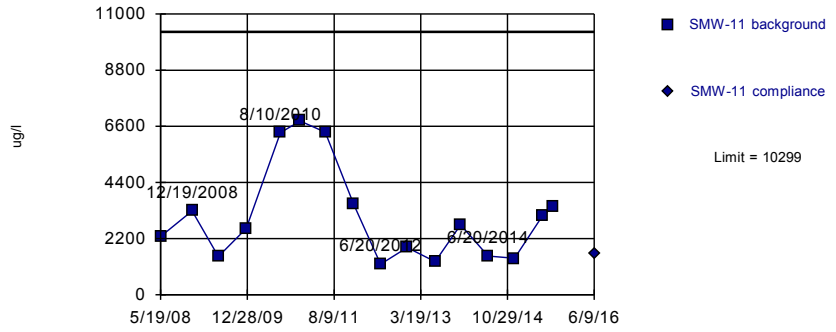
Constituent: Ethylbenzene Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=53.35, Std. Dev.=15.9, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8877, critical = 0.844. Report alpha = 0.01.

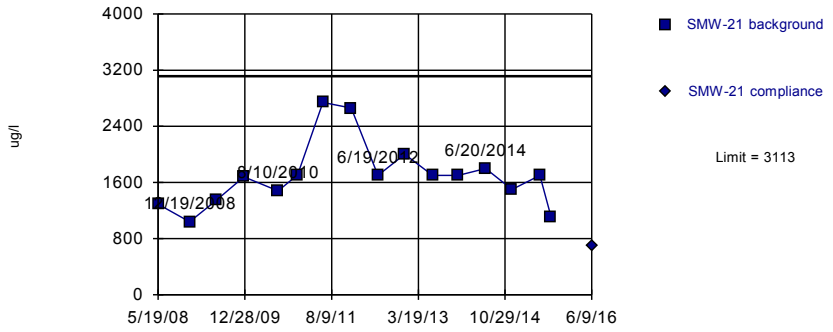
Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=1696, Std. Dev.=468, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8751, critical = 0.844. Report alpha = 0.01.

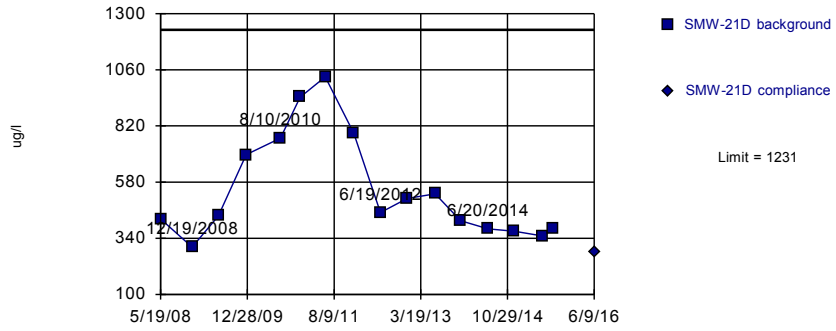
Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=548.3, Std. Dev.=225.5, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8541, critical = 0.844. Report alpha = 0.01.

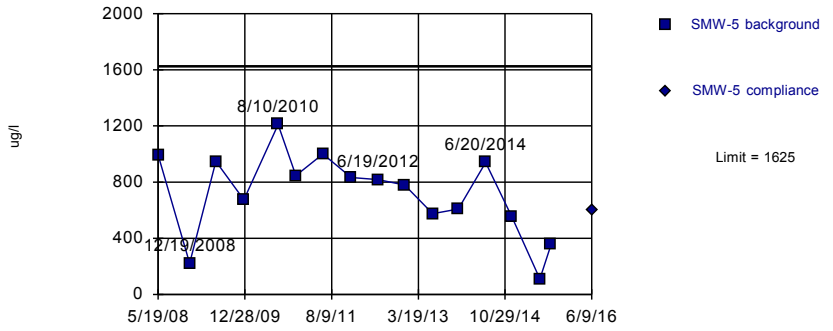
Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=716.6, Std. Dev.=300.1, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9556, critical = 0.844. Report alpha = 0.01.

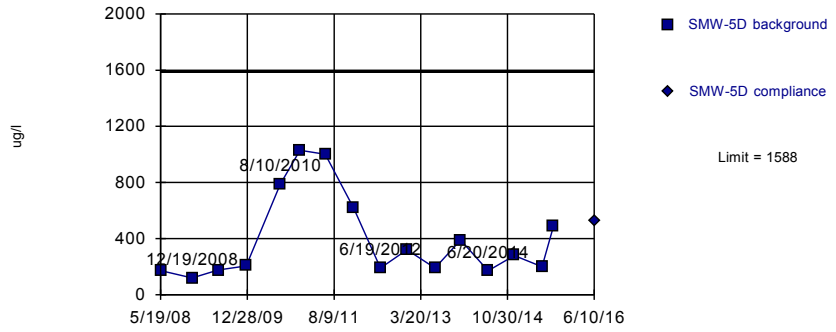
Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=18.72, Std. Dev.=6.98, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8495, critical = 0.844. Report alpha = 0.01.

Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

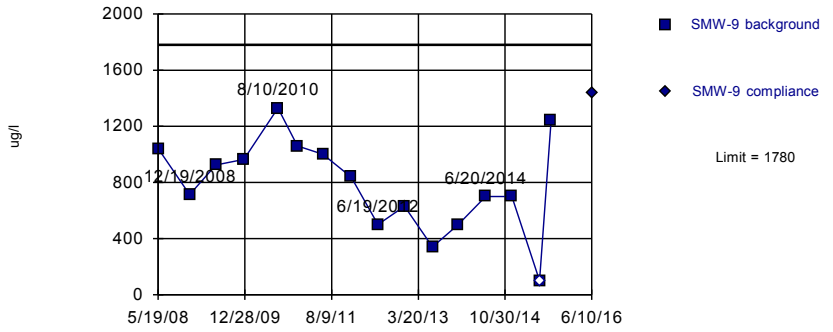
v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary: Mean=786.2, Std. Dev.=328.3, n=16, 6.25% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9806, critical = 0.844. Report alpha = 0.01.

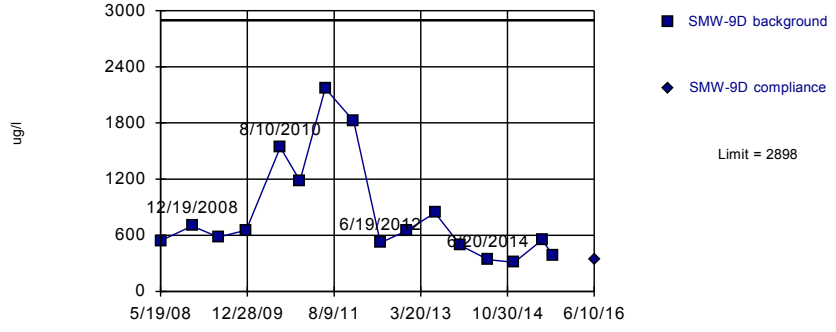
Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=27.54, Std. Dev.=8.683, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8682, critical = 0.844. Report alpha = 0.01.

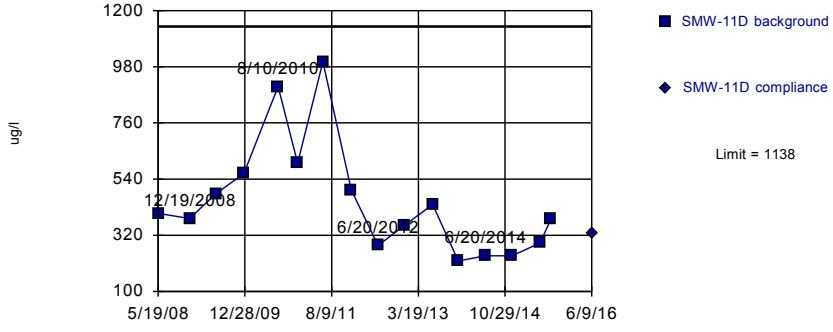
Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG

Within Limit

Tolerance Limit

Intrawell Parametric



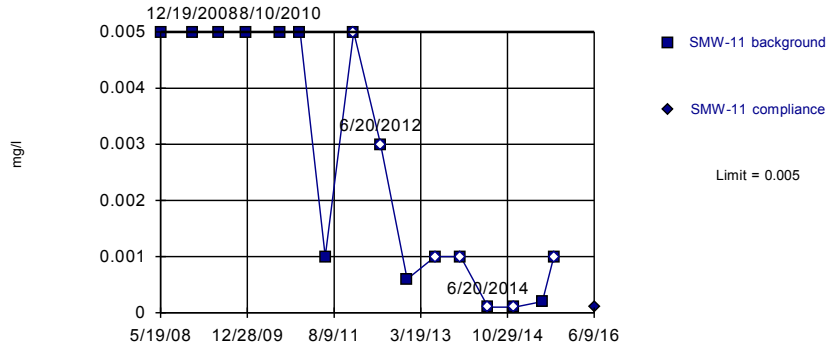
95% coverage. Background Data Summary: Mean=456.1, Std. Dev.=225.2, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8517, critical = 0.844. Report alpha = 0.01.

Constituent: GRO+DRO Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



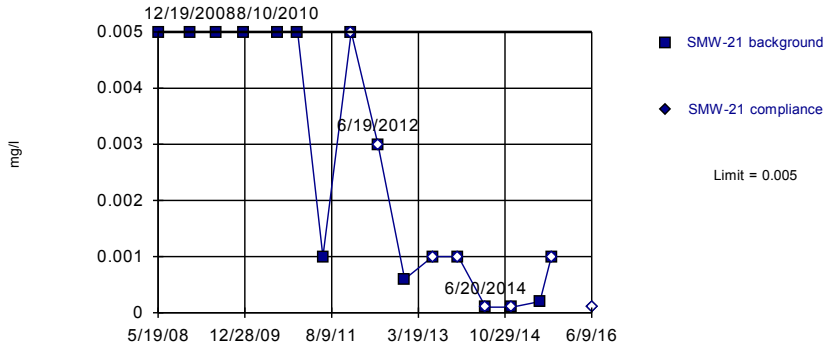
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 43.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



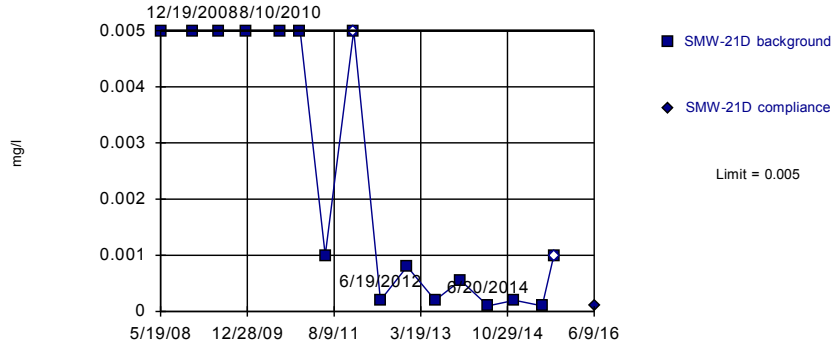
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 43.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



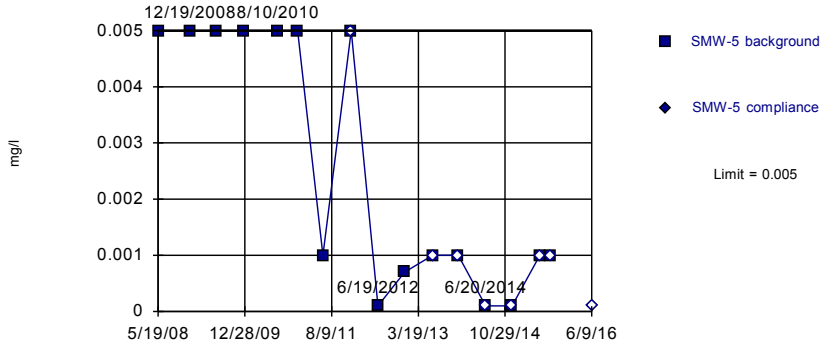
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 12.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



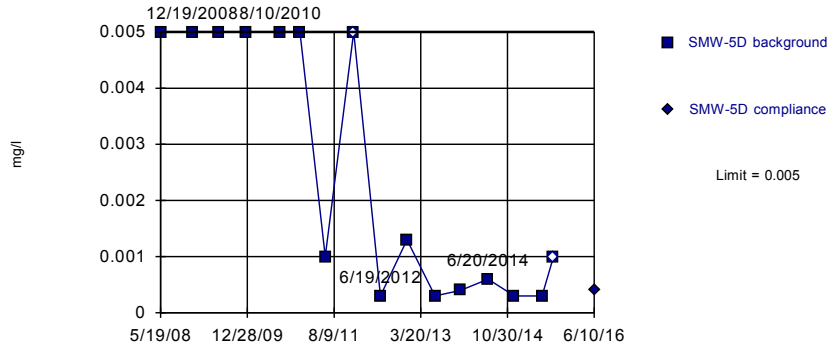
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 43.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



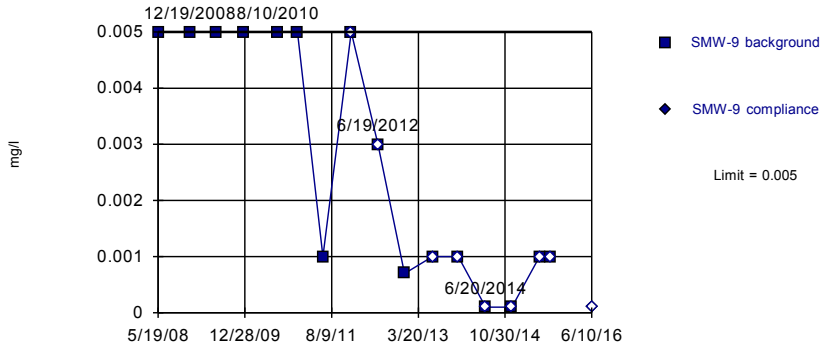
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 12.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



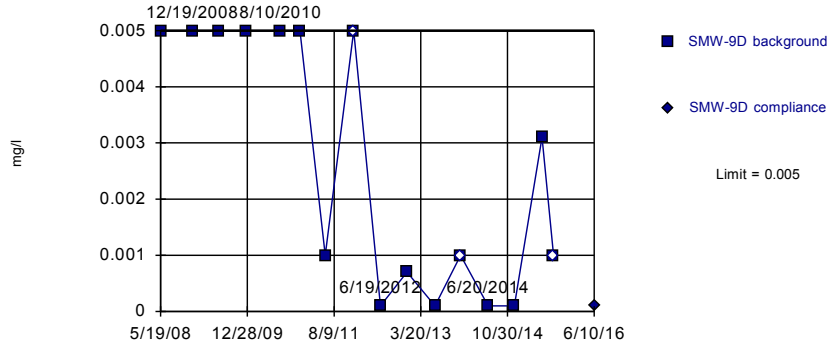
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



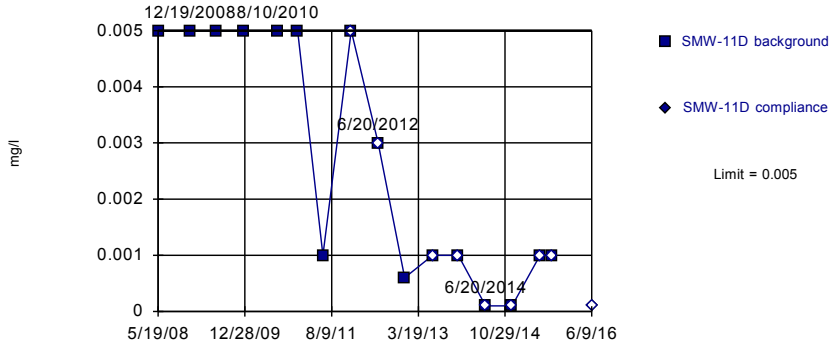
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 18.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



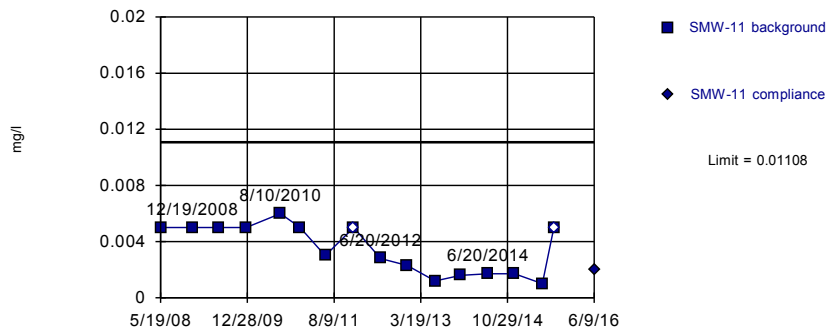
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Lead Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Parametric



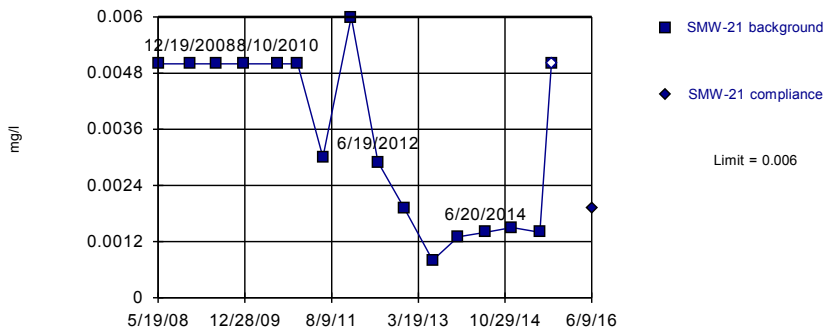
95% coverage. Background Data Summary (based on square root transformation): Mean=0.0573, Std. Dev.=0.01585, n=16, 12.5% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8451, critical = 0.844. Report alpha = 0.01.

Constituent: Selenium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



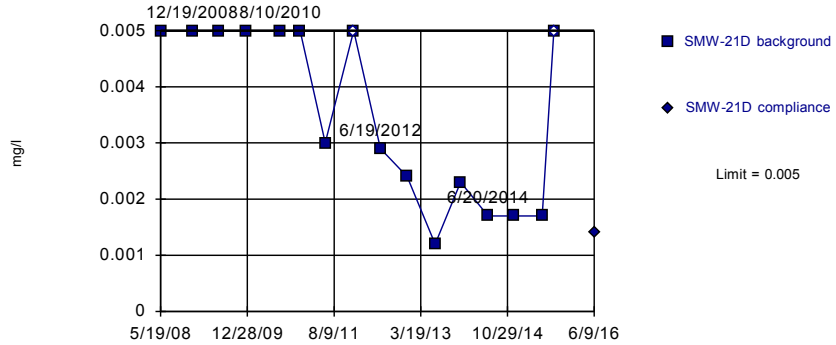
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 6.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Selenium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



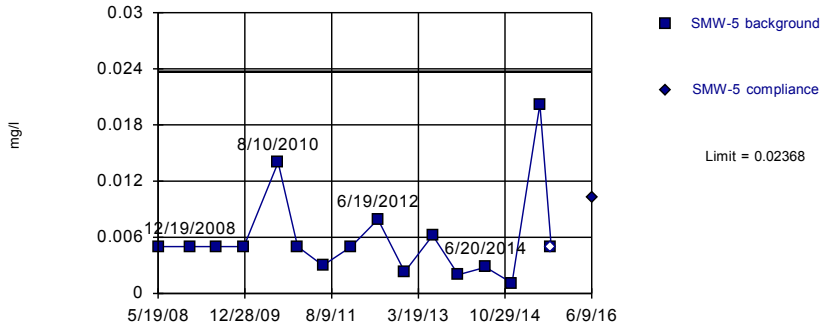
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 12.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Selenium Analysis Run 7/28/2016 6:55 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Parametric



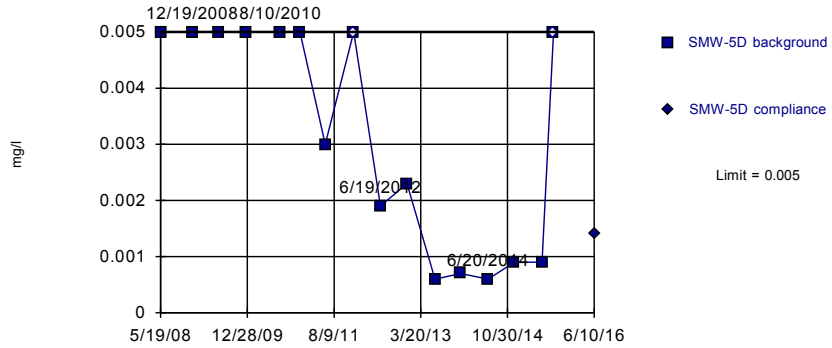
95% coverage. Background Data Summary (based on square root transformation): Mean=0.07229, Std. Dev.=0.02695, n=16, 6.25% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8624, critical = 0.844. Report alpha = 0.01.

Constituent: Selenium Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



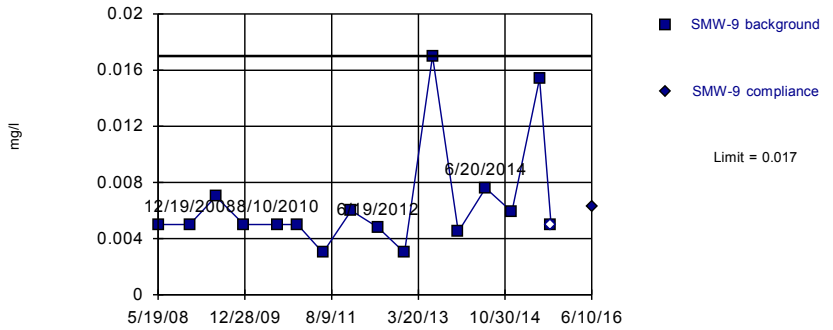
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 12.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Selenium Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 6.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

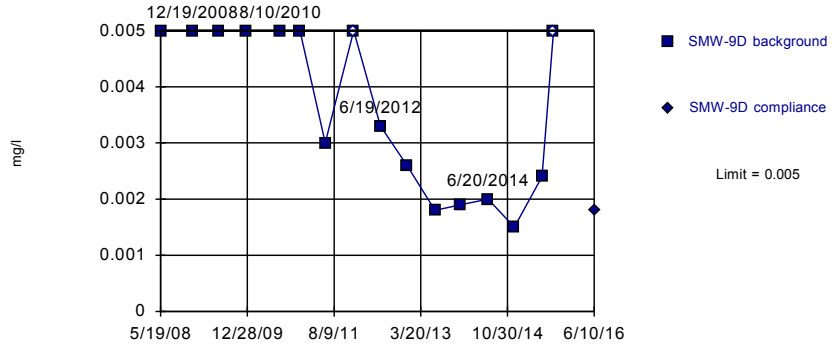
Constituent: Selenium Analysis Run 7/28/2016 6:56 PM

F

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



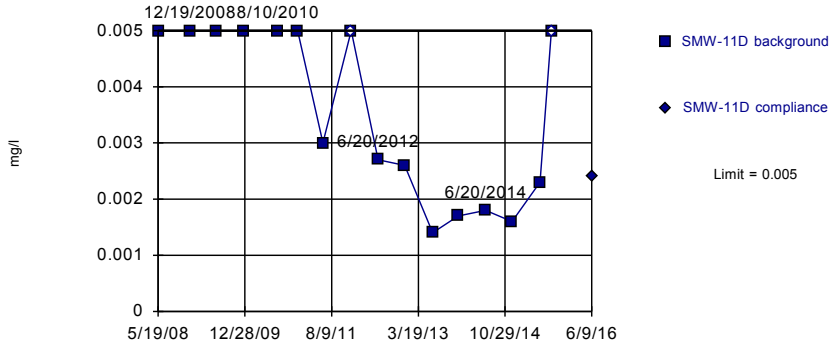
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 12.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Selenium Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



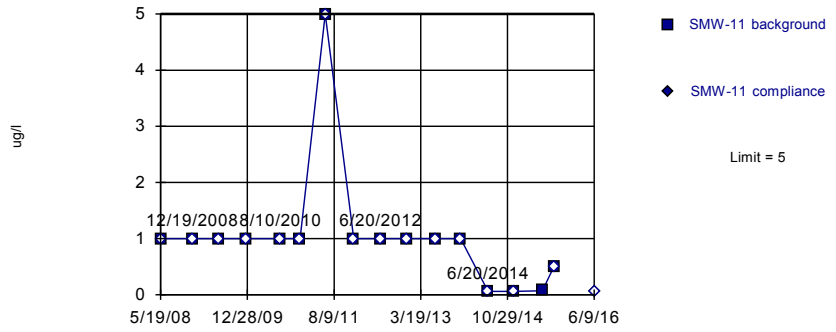
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 12.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: Selenium Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



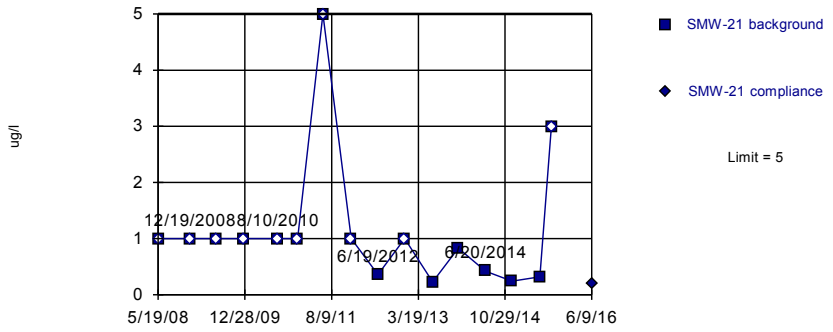
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 93.75% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



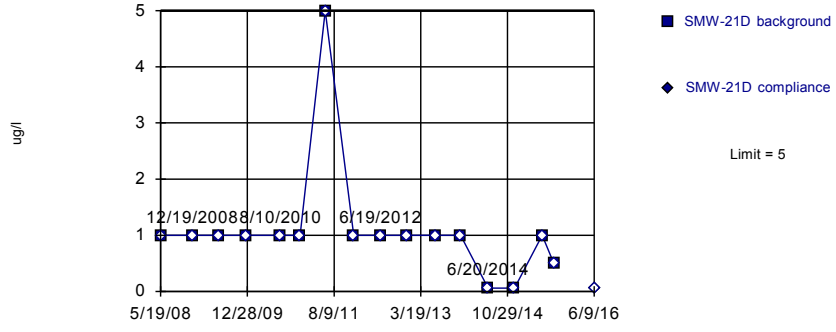
Non-parametric test used in lieu of parametric tolerance limit because the data required both a power transformation and Cohen's adjustment. Limit is highest of 16 background values. 62.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



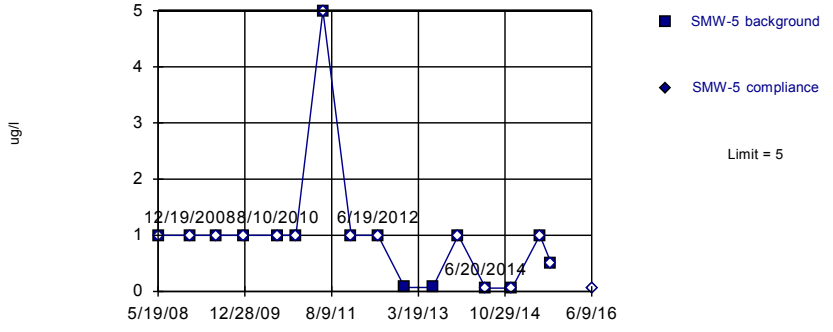
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



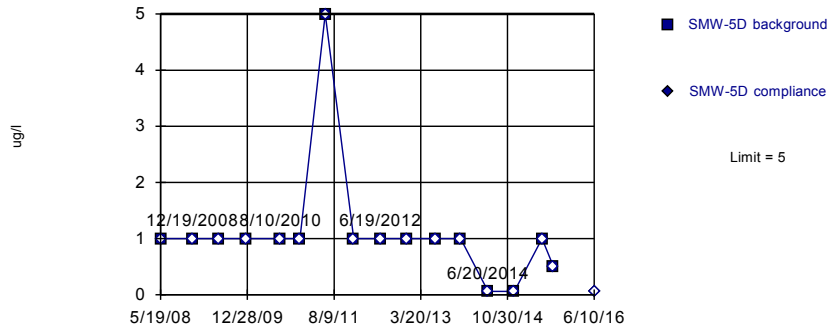
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 87.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



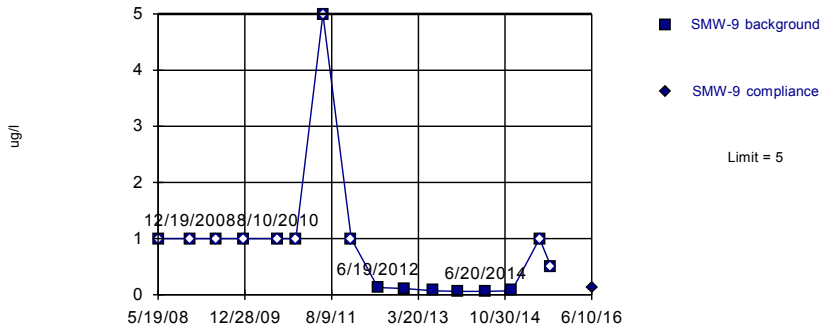
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



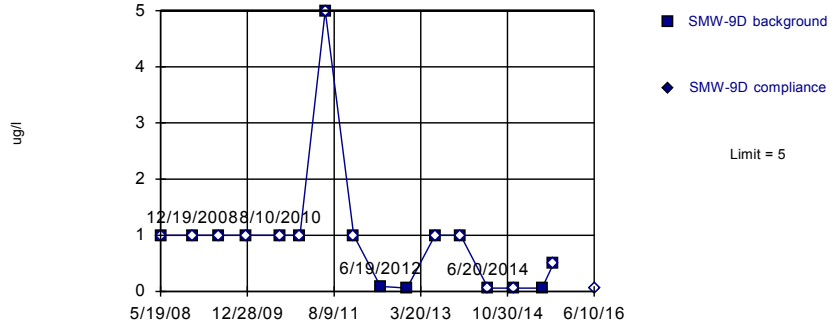
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 62.5% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



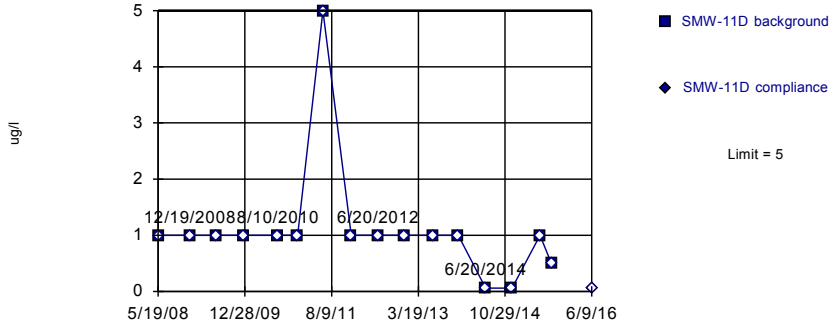
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 81.25% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

v.9.1.21 n/a. UG
Hollow symbols indicate censored values.
Within Limit

Tolerance Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 75%. Limit is highest of 16 background values. 100% NDs. 74.8% coverage at alpha=0.01; 83.01% coverage at alpha=0.05; 95.9% coverage at alpha=0.5. Report alpha = 0.4401.

Constituent: toluene Analysis Run 7/28/2016 6:56 PM

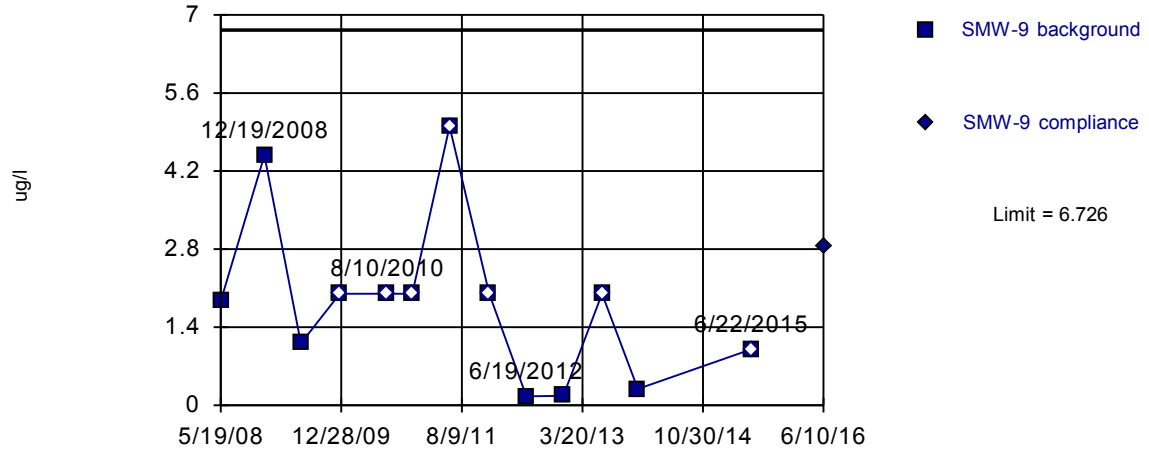
v.9.1.21 n/a. UG

Hollow symbols indicate censored values.

Within Limit

Tolerance Limit

Intrawell Parametric

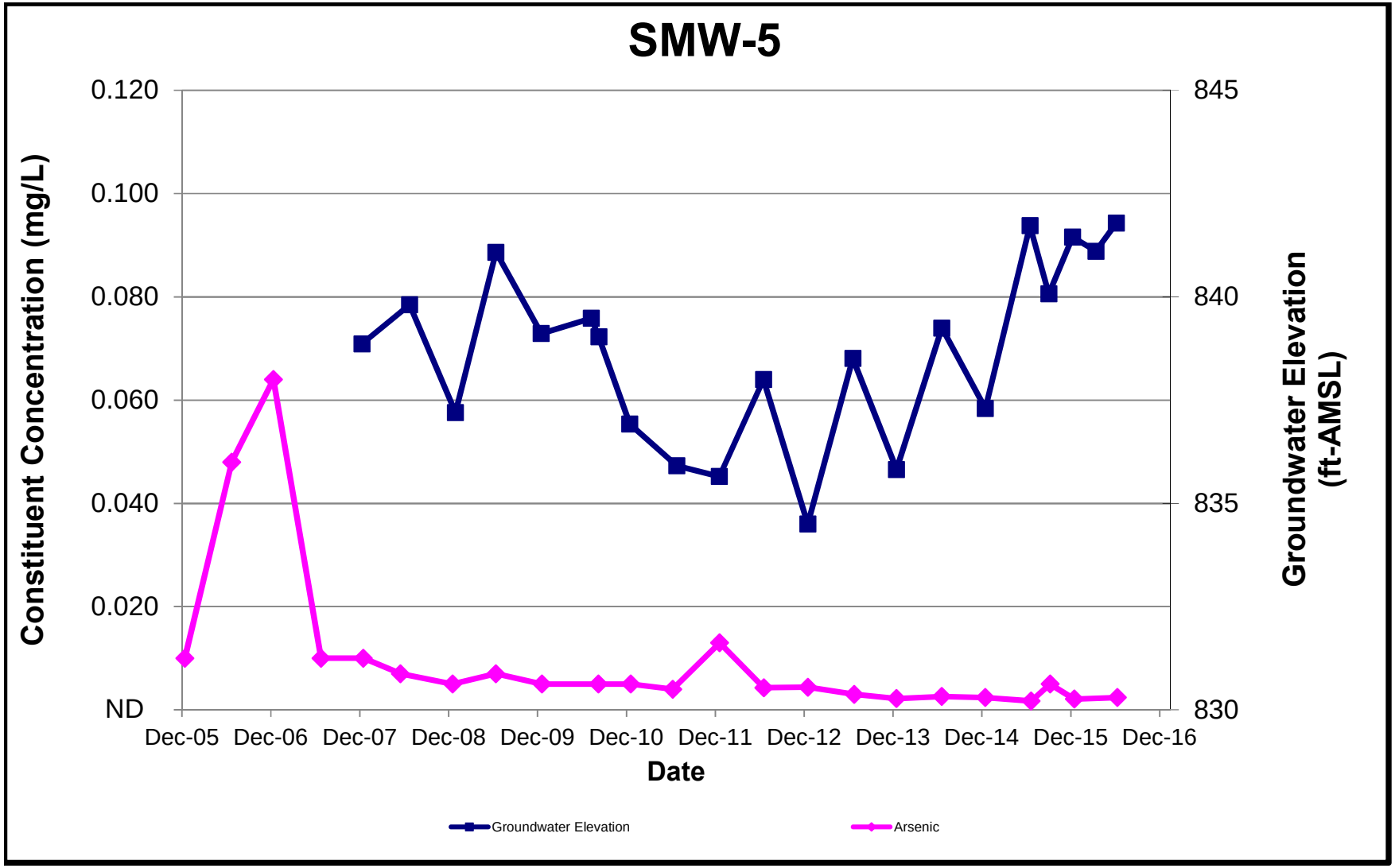


95% coverage. Background Data Summary: Mean=1.852, Std. Dev.=1.481, n=13, 53.85% NDs (maximum before substituting non-parametric 75%). Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8441, critical = 0.814. Report alpha = 0.01.

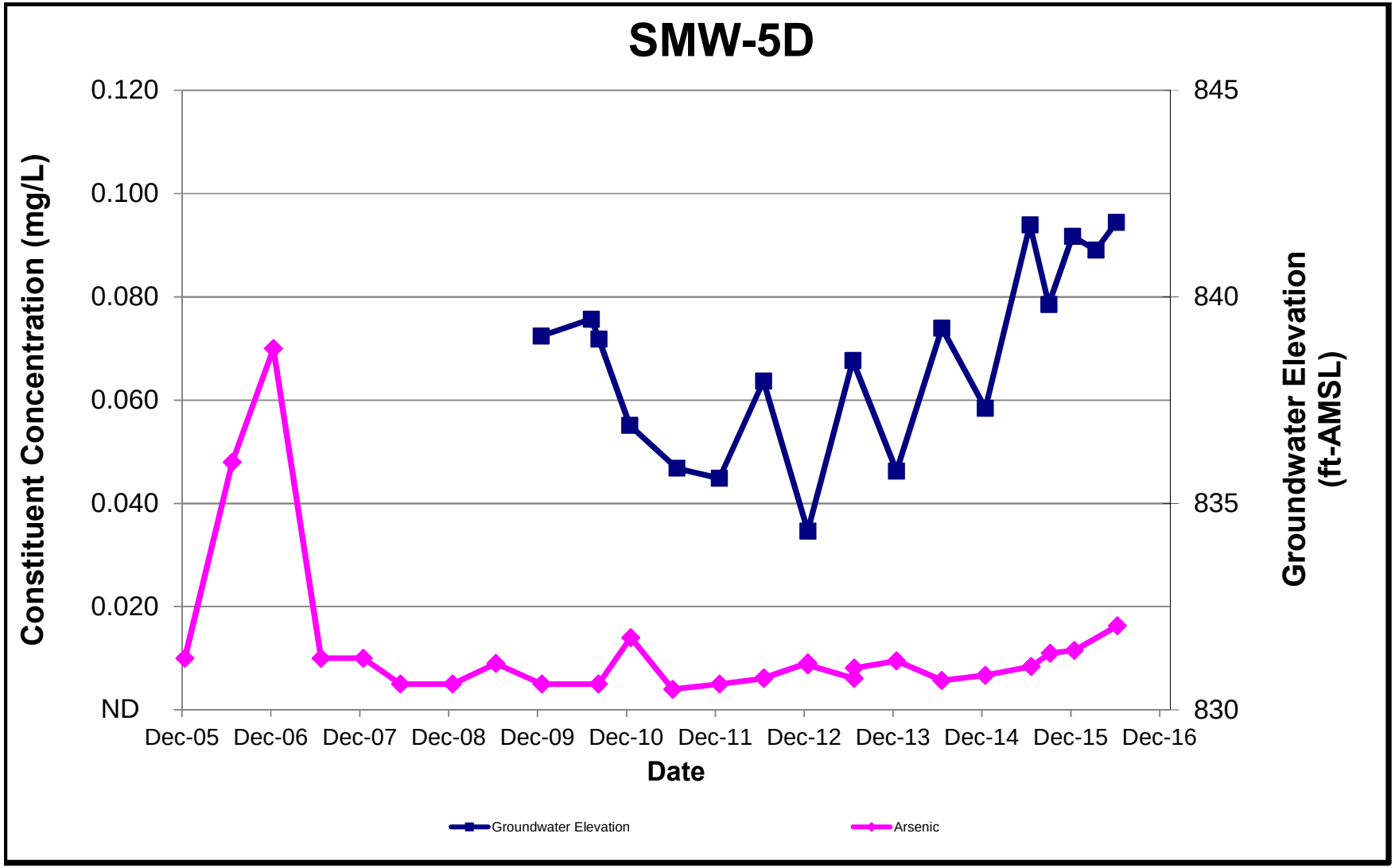
Constituent: Xylenes Analysis Run 7/28/2016 6:56 PM

Appendix D – Groundwater Constituent Trend Graphs

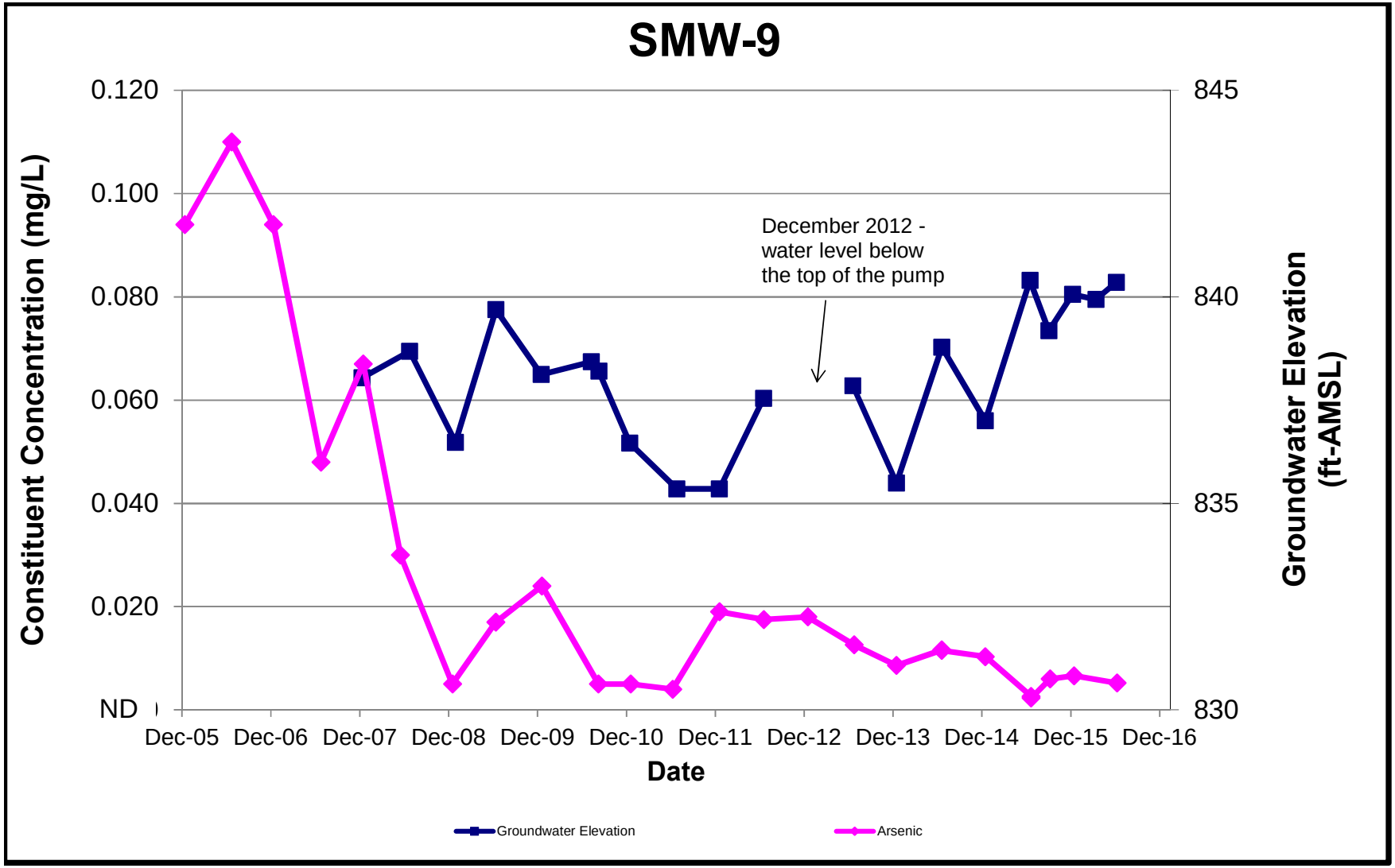
Arsenic Concentration Trend in SMW-5
Wynnewood Refining Company
Wynnewood, Oklahoma



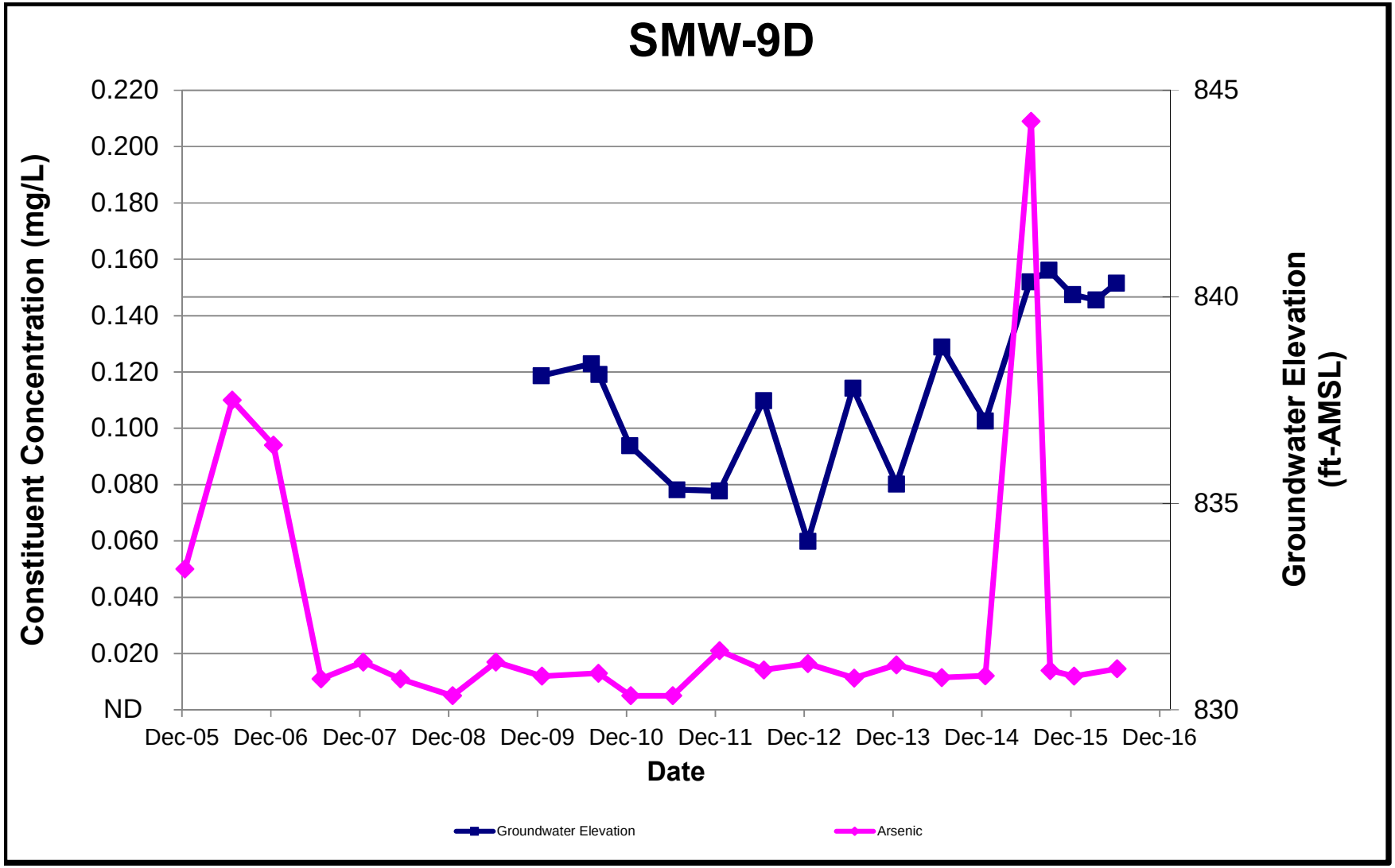
Arsenic Concentration Trend in SMW-5D
Wynnewood Refining Company
Wynnewood, Oklahoma



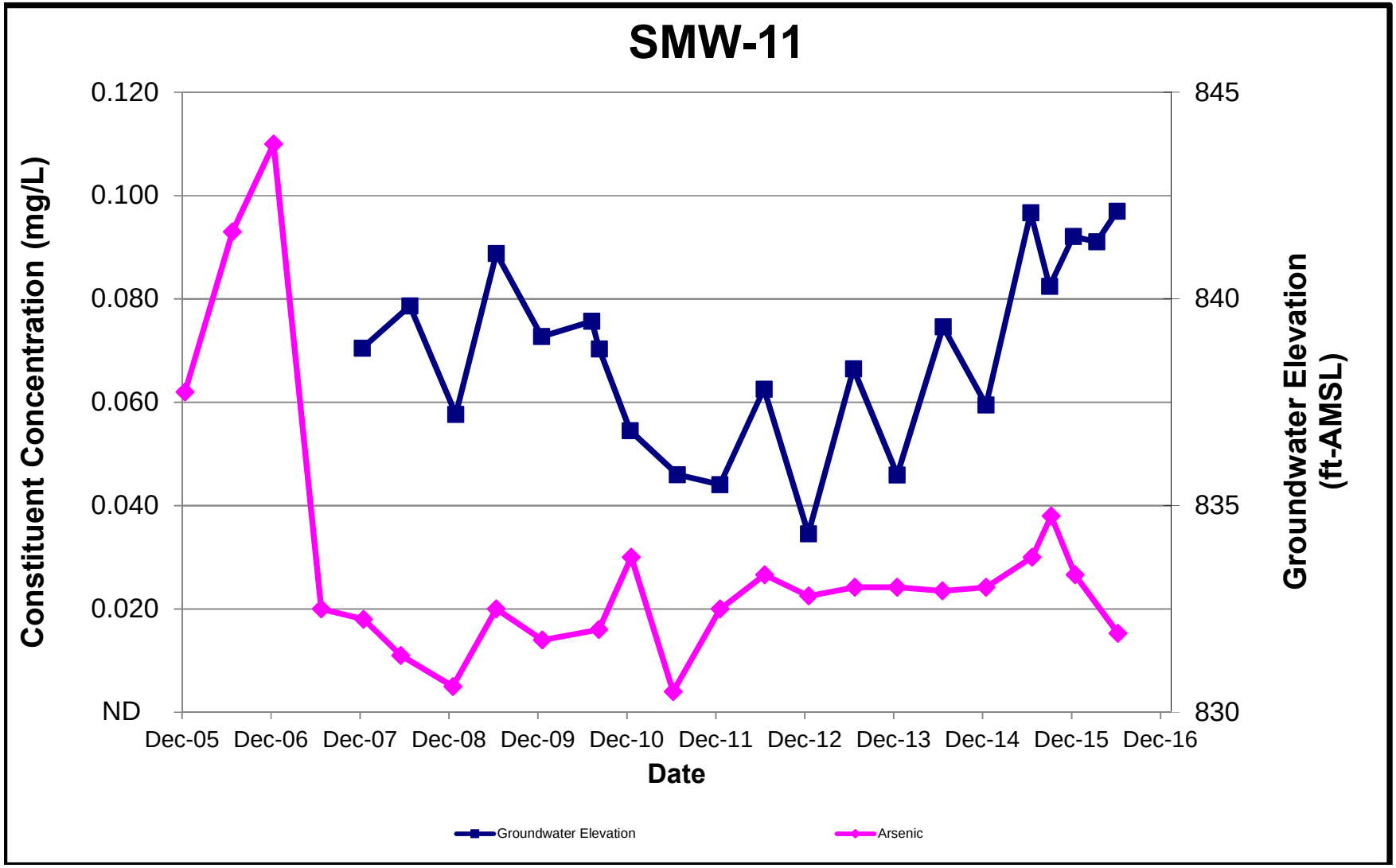
Arsenic Concentration Trend in SMW-9
Wynnewood Refining Company
Wynnewood, Oklahoma



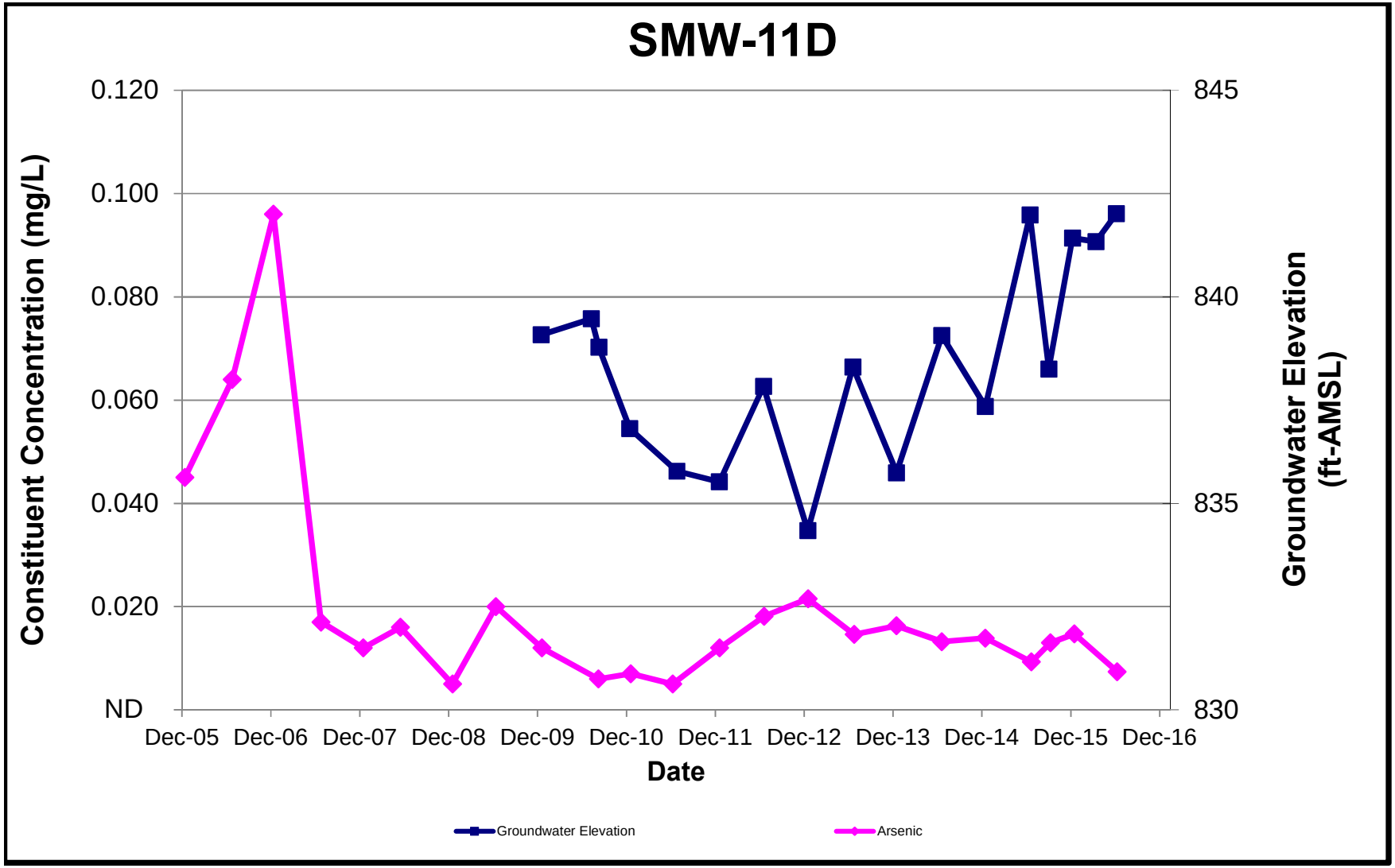
Arsenic Concentration Trend in SMW-9D
Wynnewood Refining Company
Wynnewood, Oklahoma



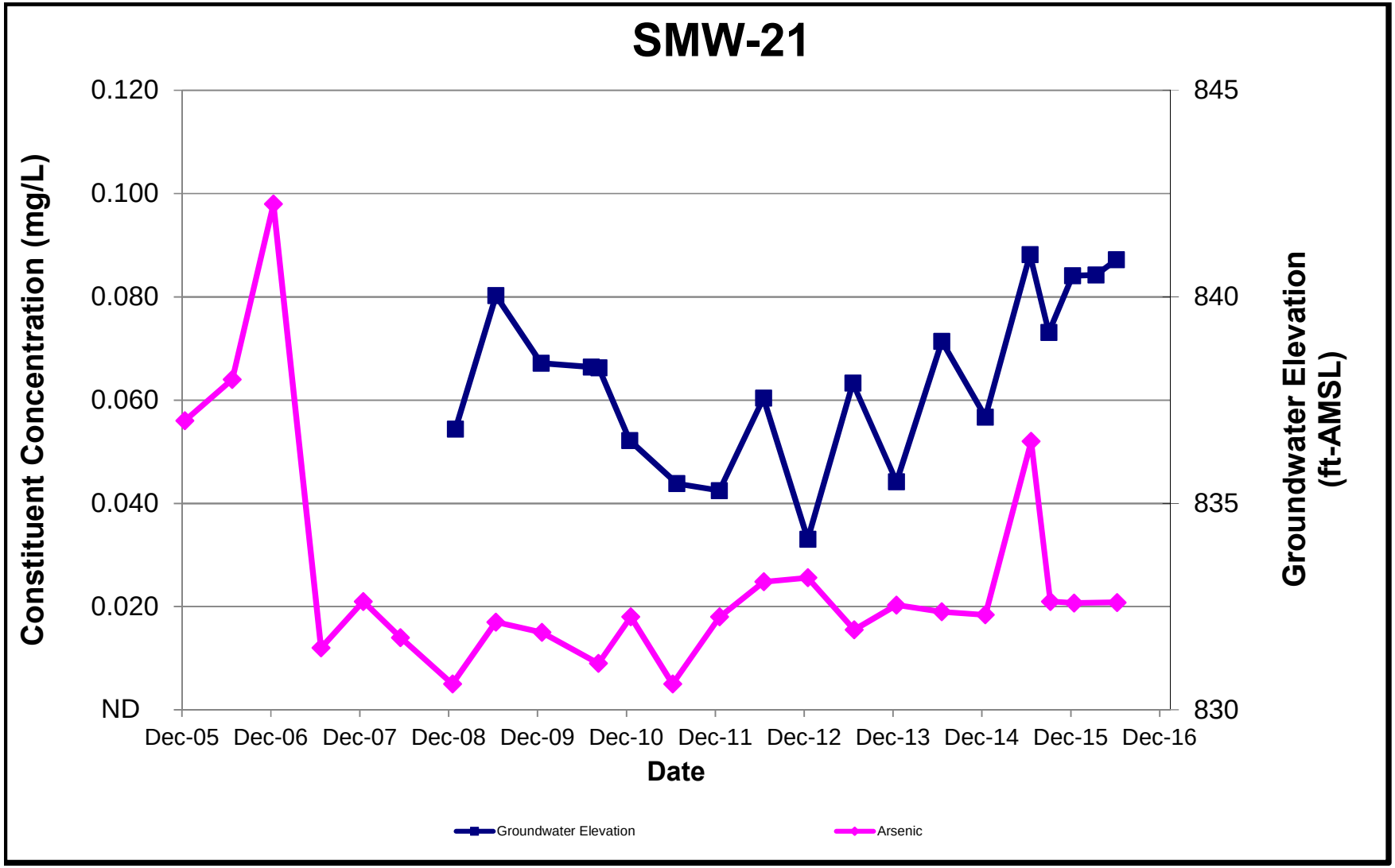
Arsenic Concentration Trend in SMW-11
Wynnewood Refining Company
Wynnewood, Oklahoma



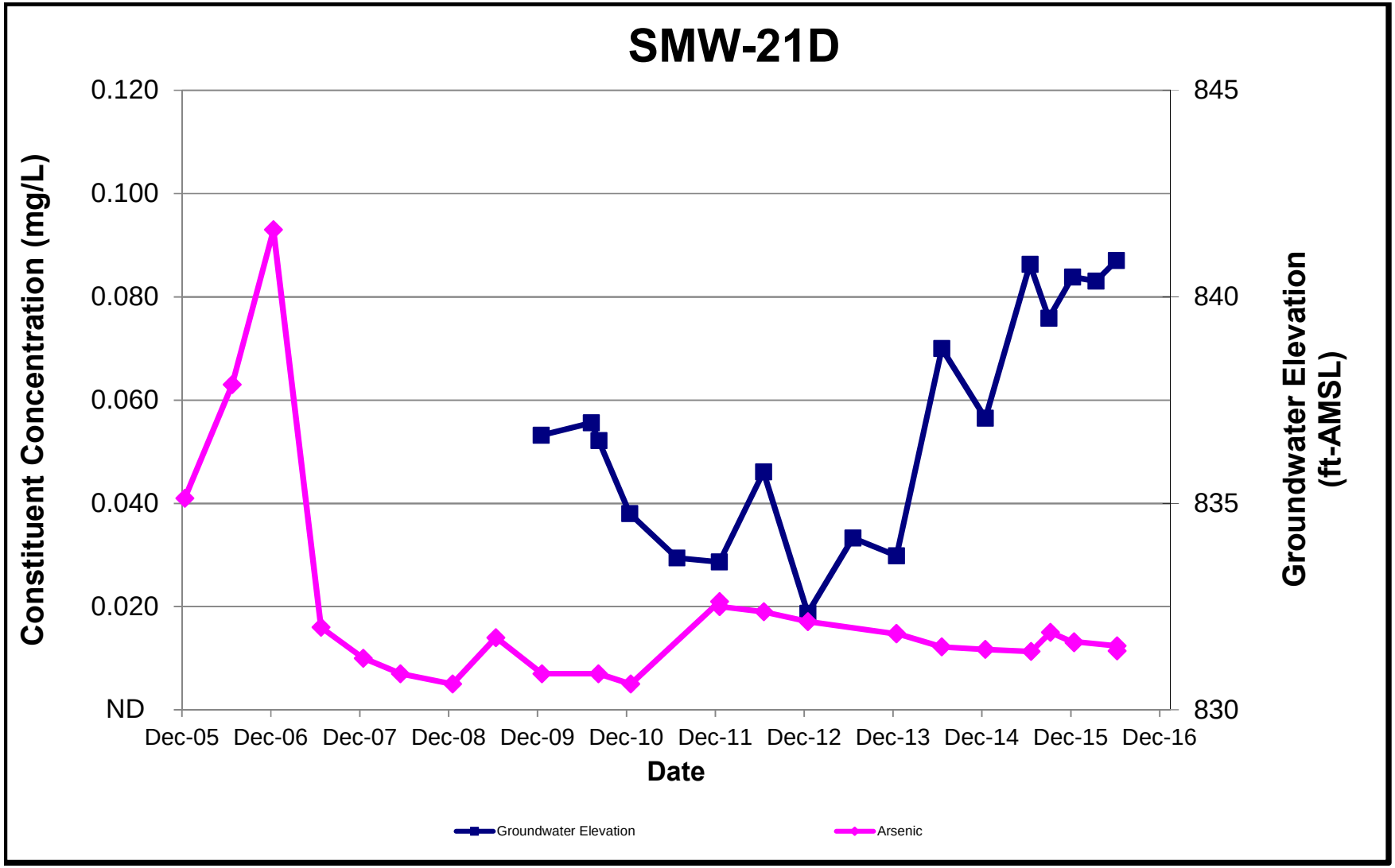
Arsenic Concentration Trend in SMW-11D
Wynnewood Refining Company
Wynnewood, Oklahoma



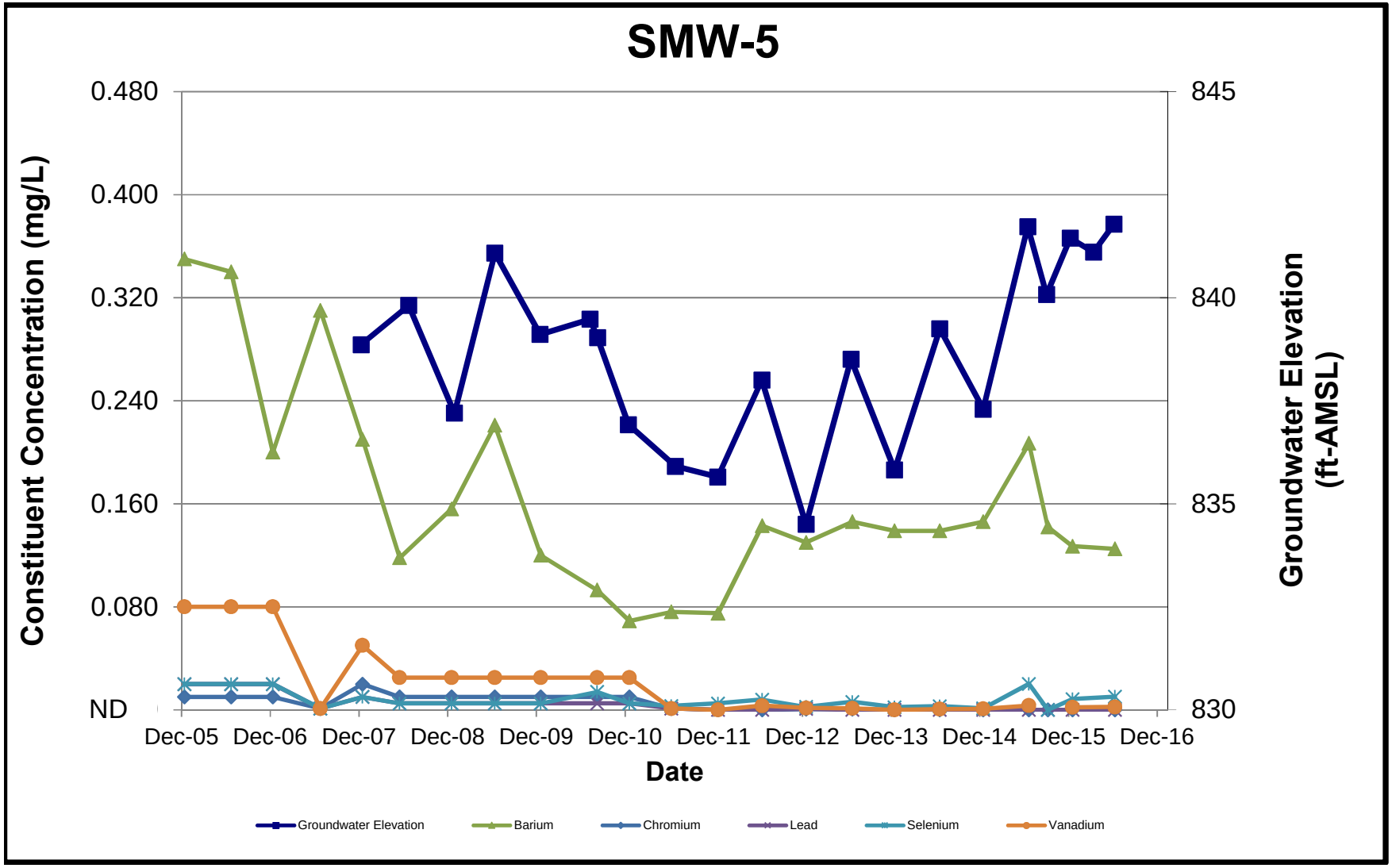
Arsenic Concentration Trend in SMW-21
Wynnewood Refining Company
Wynnewood, Oklahoma



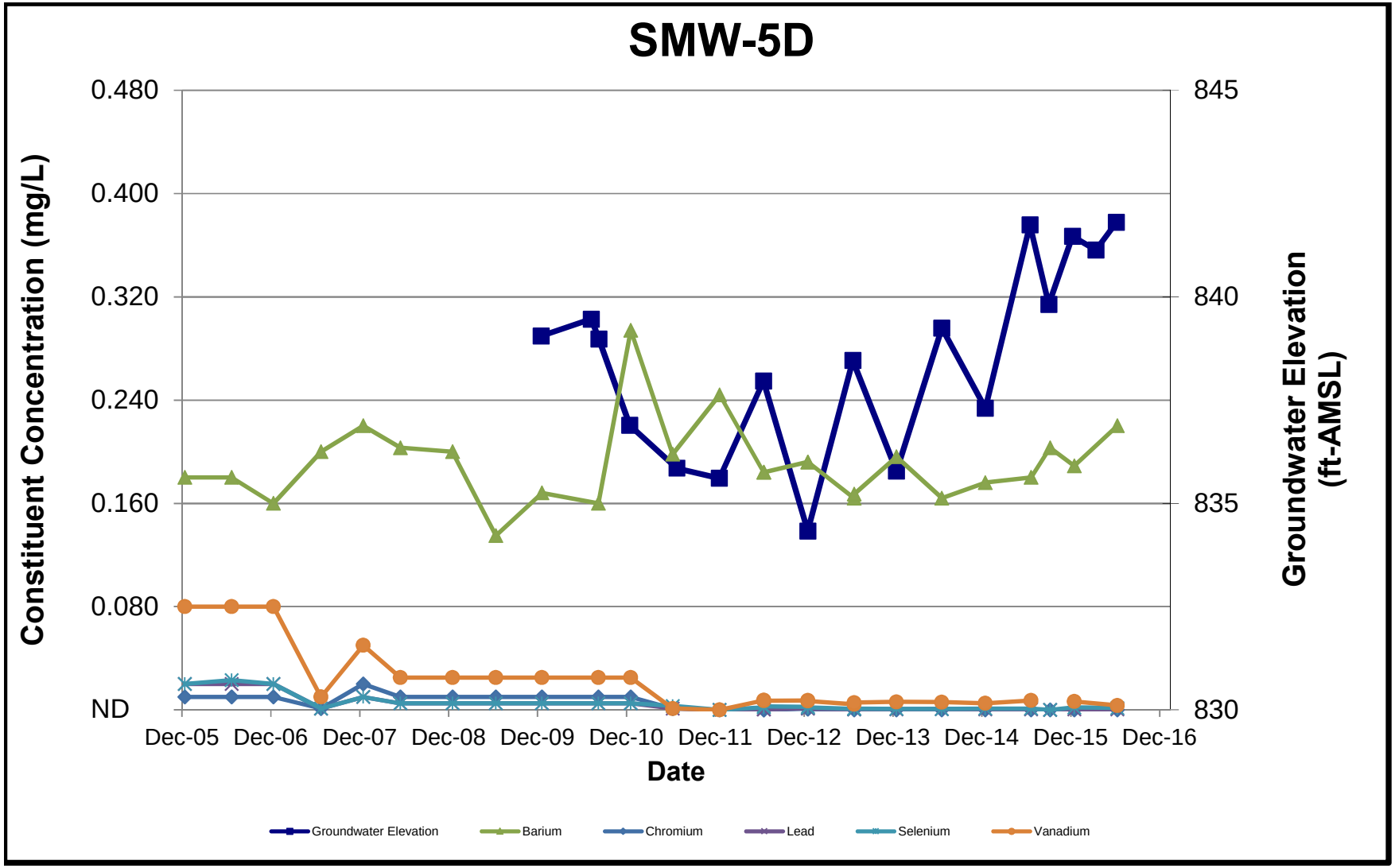
Arsenic Concentration Trend in SMW-21D
Wynnewood Refining Company
Wynnewood, Oklahoma



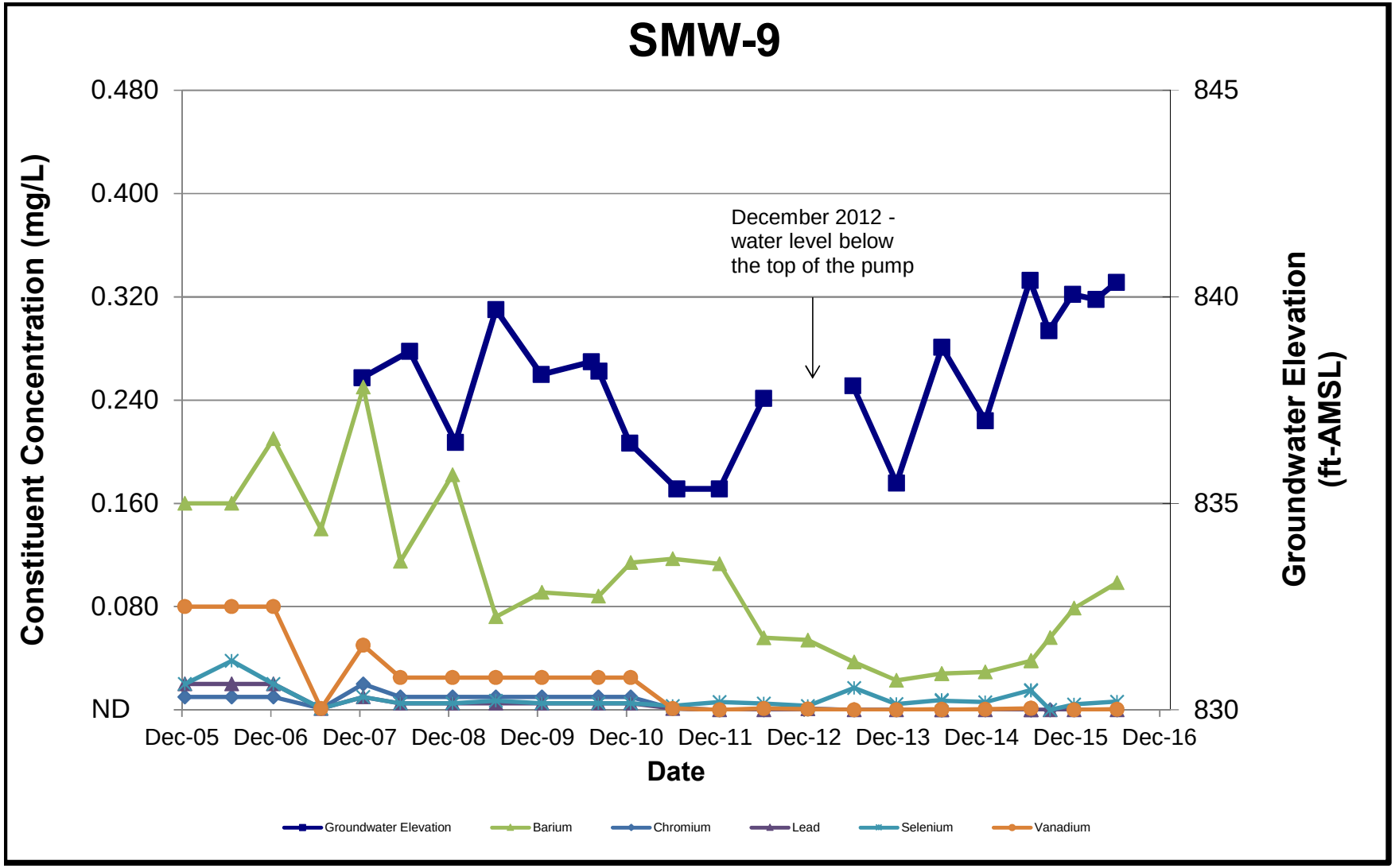
Inorganic Concentration Trends in SMW-5
Wynnewood Refining Company
Wynnewood, Oklahoma



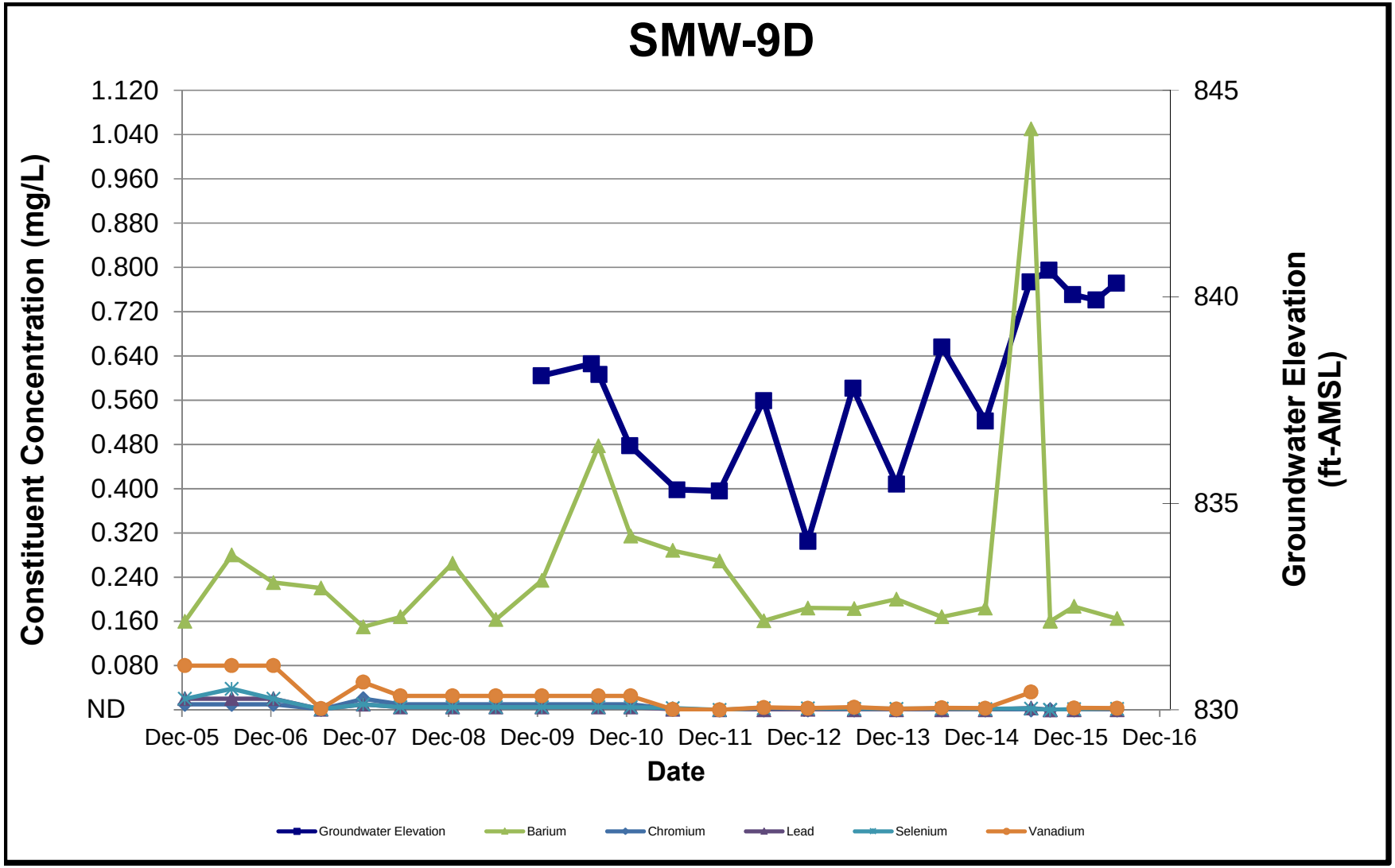
Inorganic Concentration Trends in SMW-5D
Wynnewood Refining Company
Wynnewood, Oklahoma



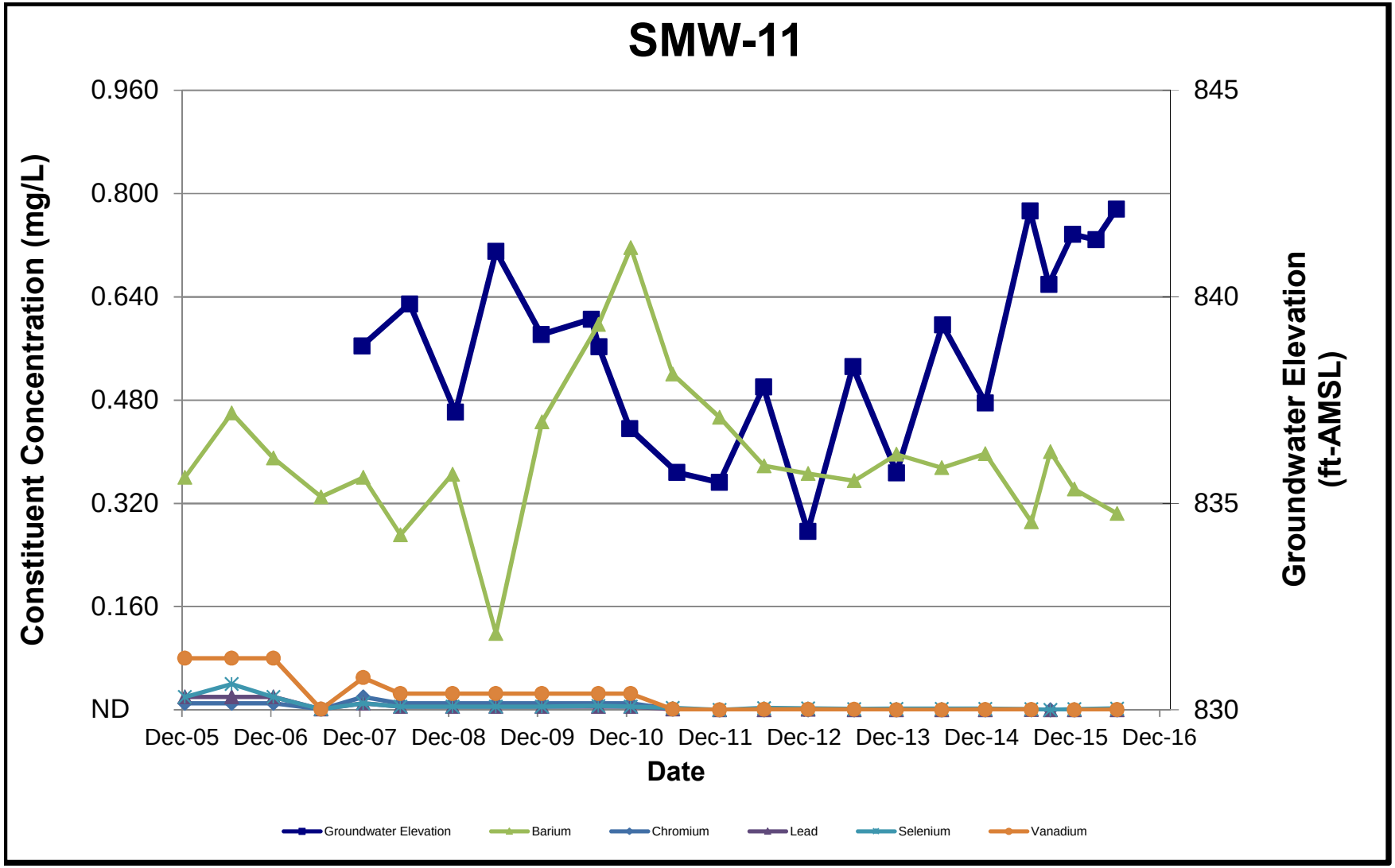
Inorganic Concentration Trends in SMW-9
Wynnewood Refining Company
Wynnewood, Oklahoma



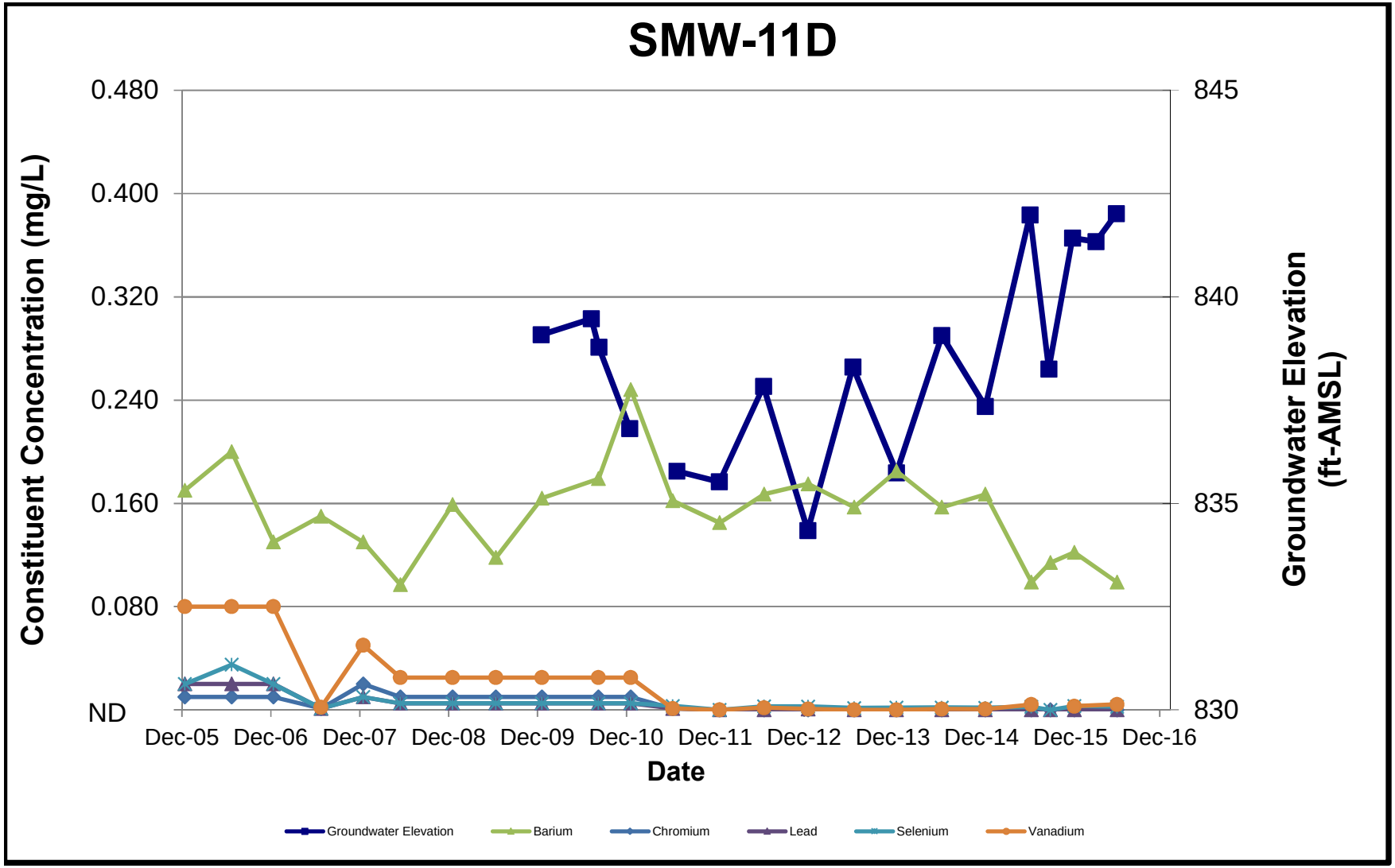
Inorganic Concentration Trends in SMW-9D
Wynnewood Refining Company
Wynnewood, Oklahoma



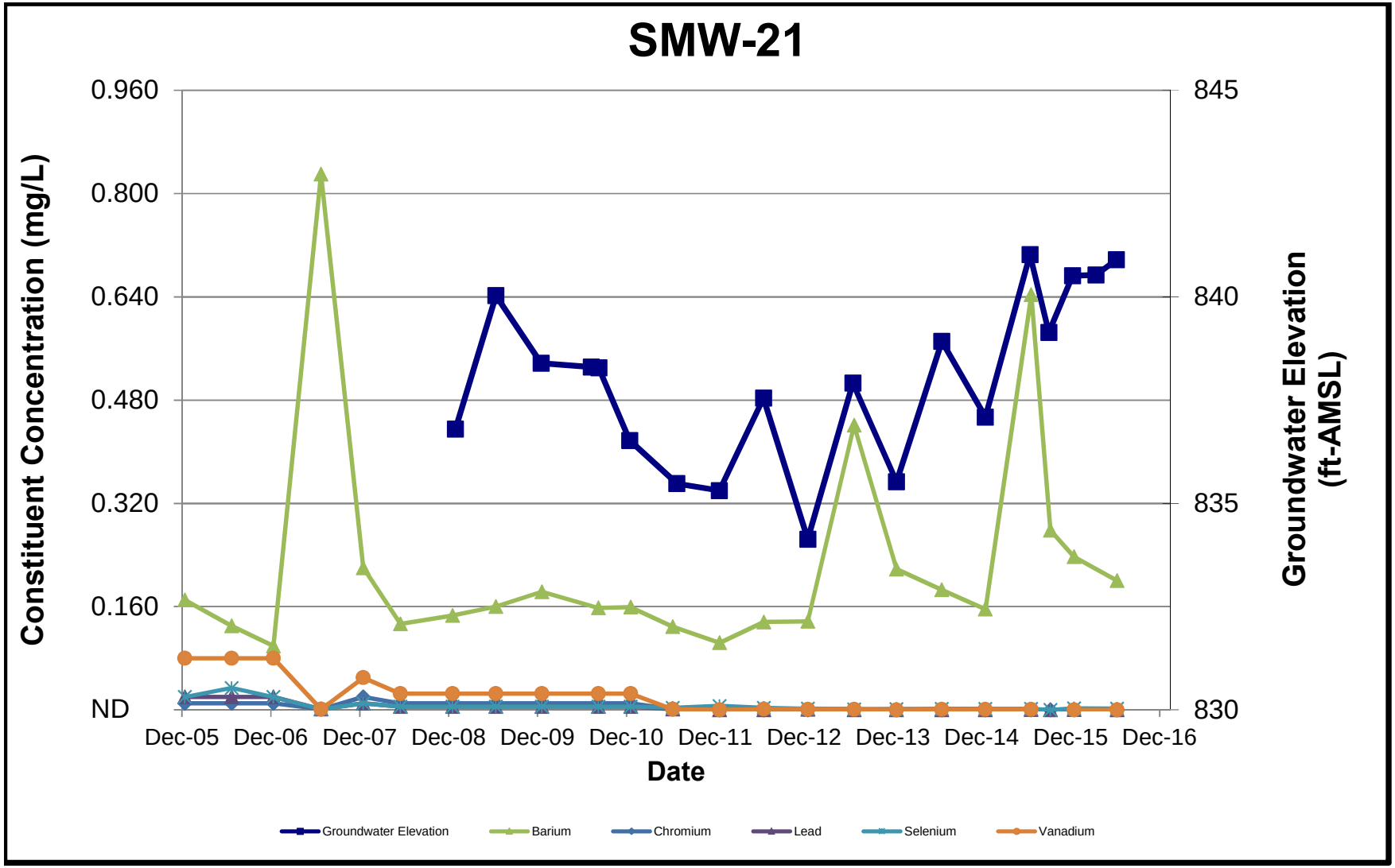
Inorganic Concentration Trends in SMW-11
Wynnewood Refining Company
Wynnewood, Oklahoma



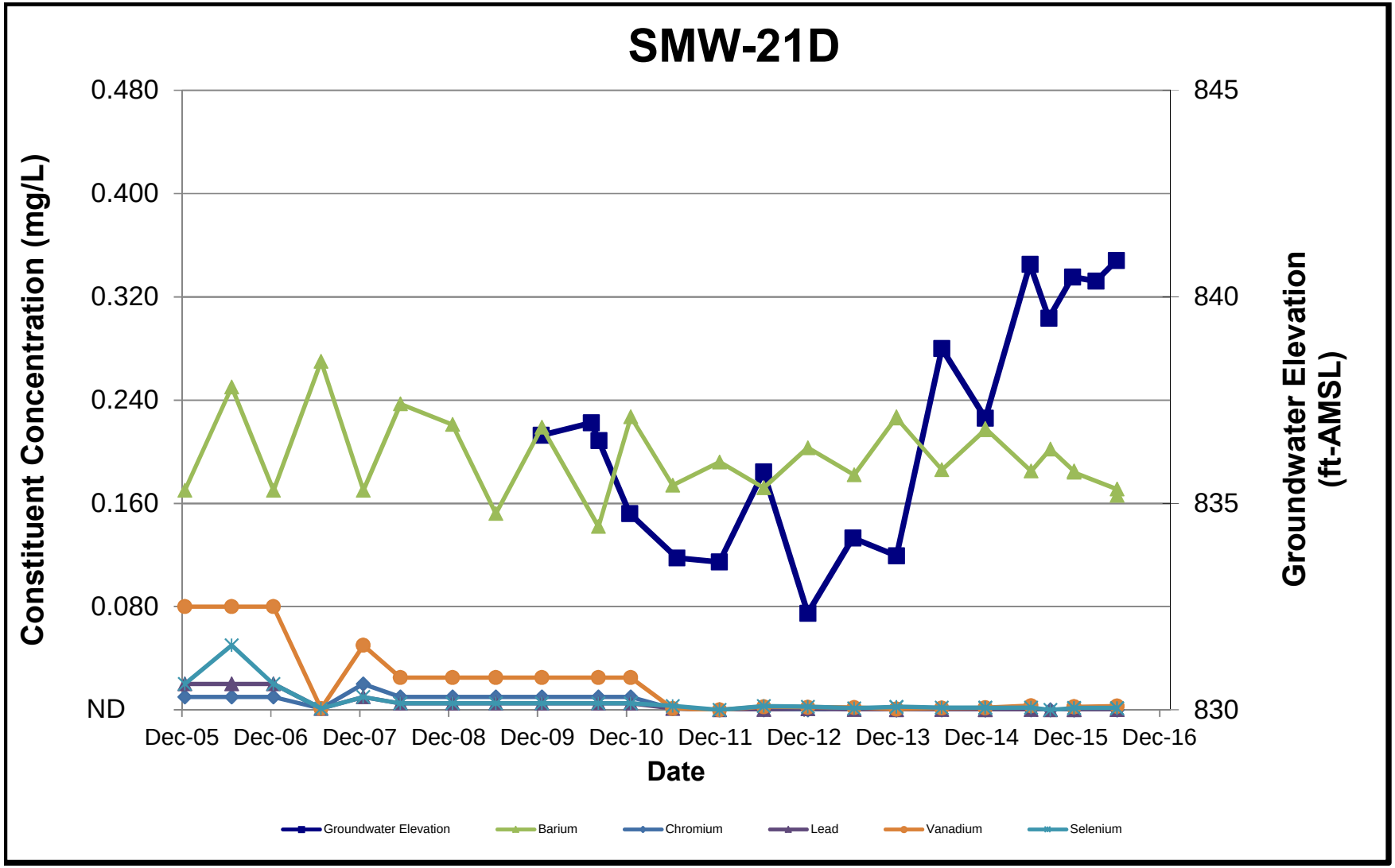
Inorganic Concentration Trends in SMW-11D
Wynnewood Refining Company
Wynnewood, Oklahoma



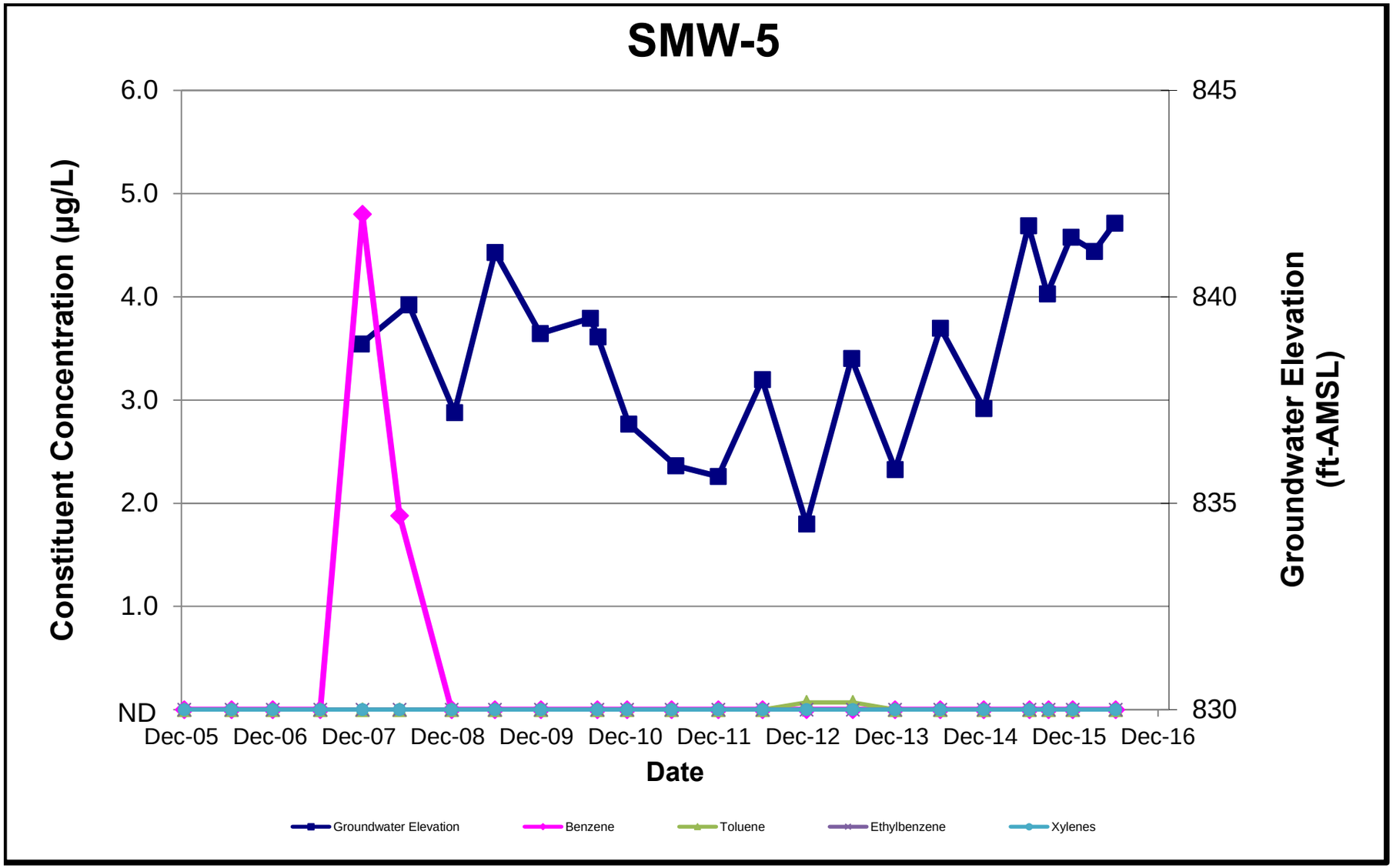
Inorganic Concentration Trends in SMW-21
Wynnewood Refining Company
Wynnewood, Oklahoma



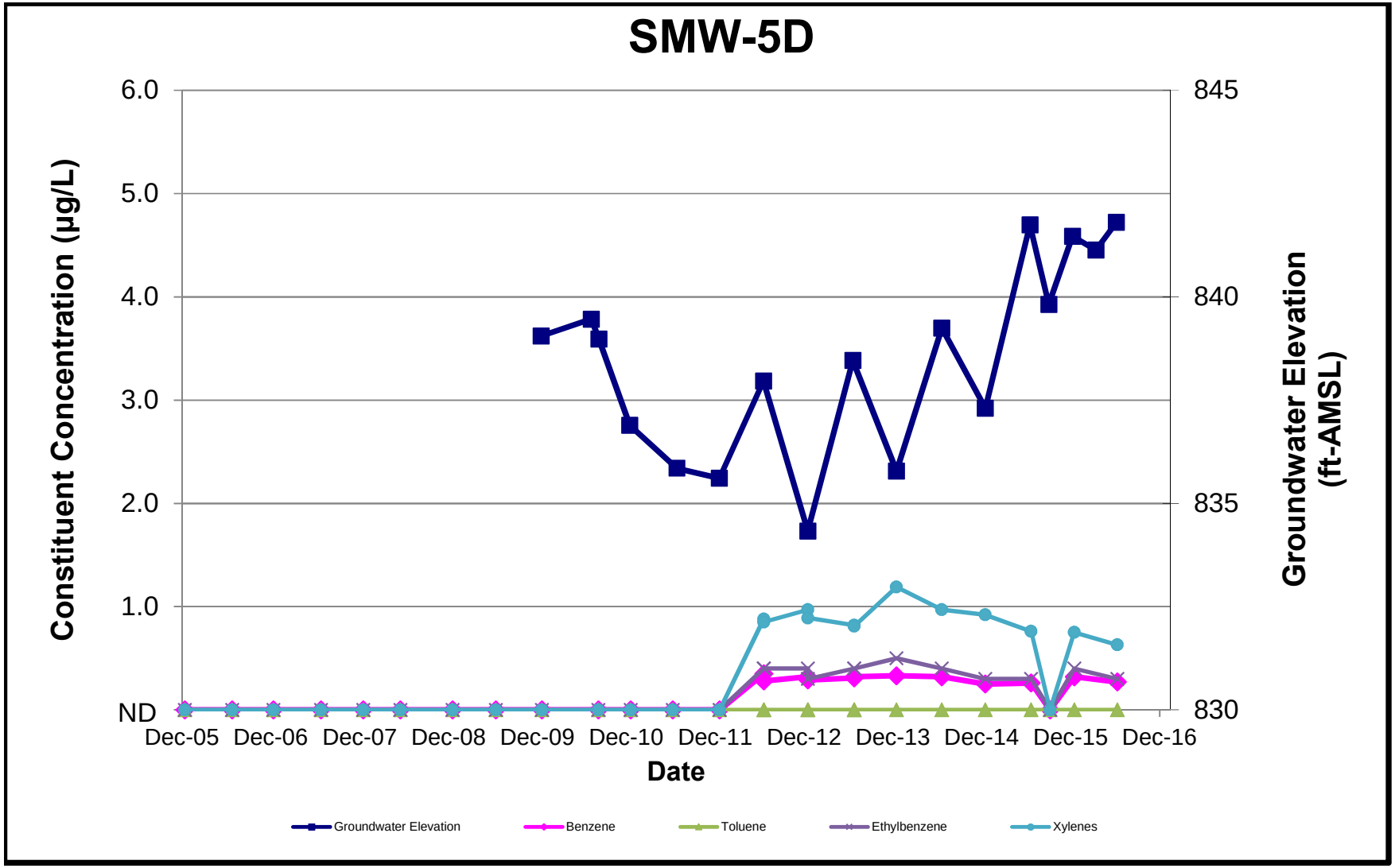
Inorganic Concentration Trends in SMW-21D
Wynnewood Refining Company
Wynnewood, Oklahoma



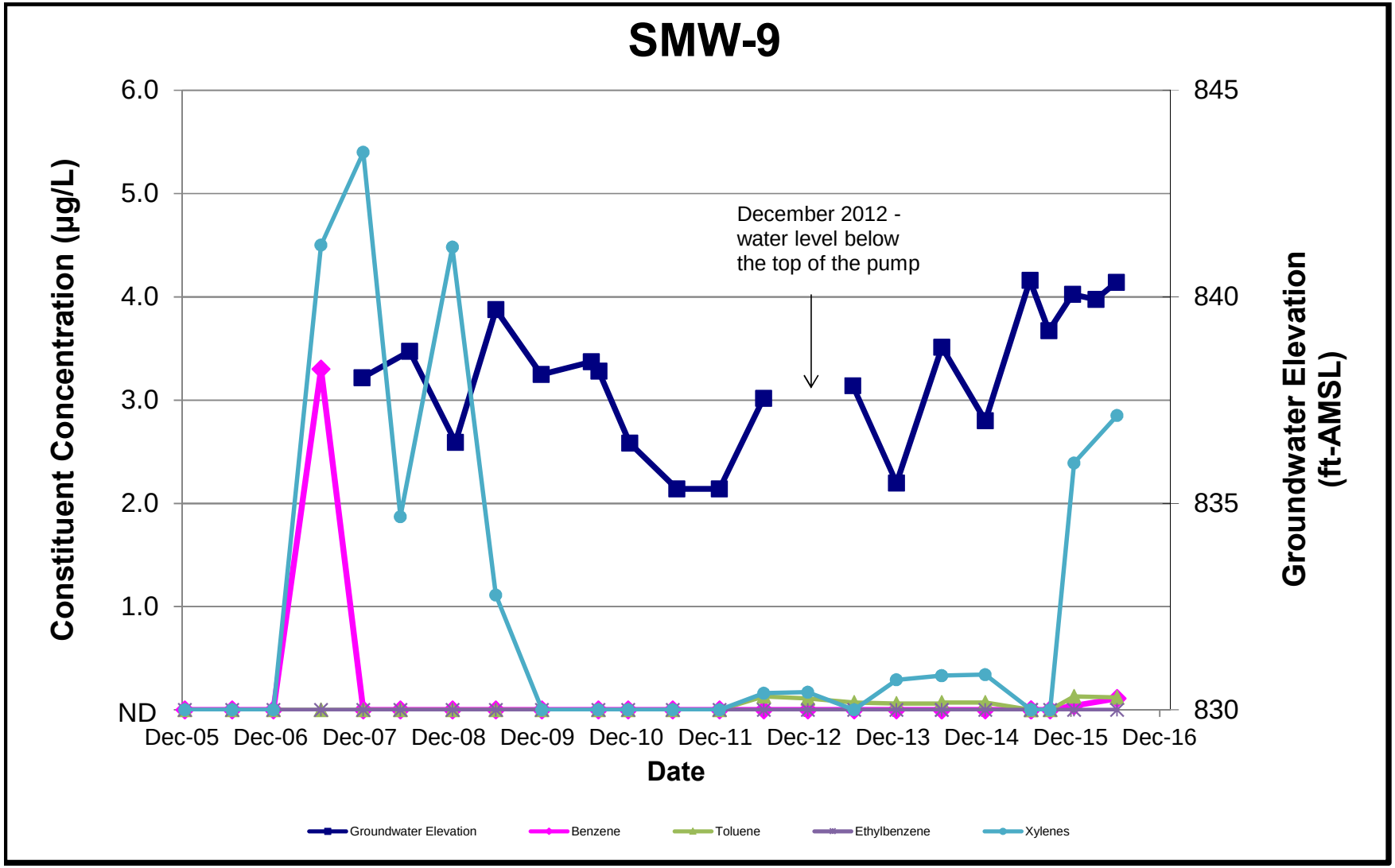
BTEX Concentration Trend in SMW-5
Wynnewood Refining Company
Wynnewood, Oklahoma



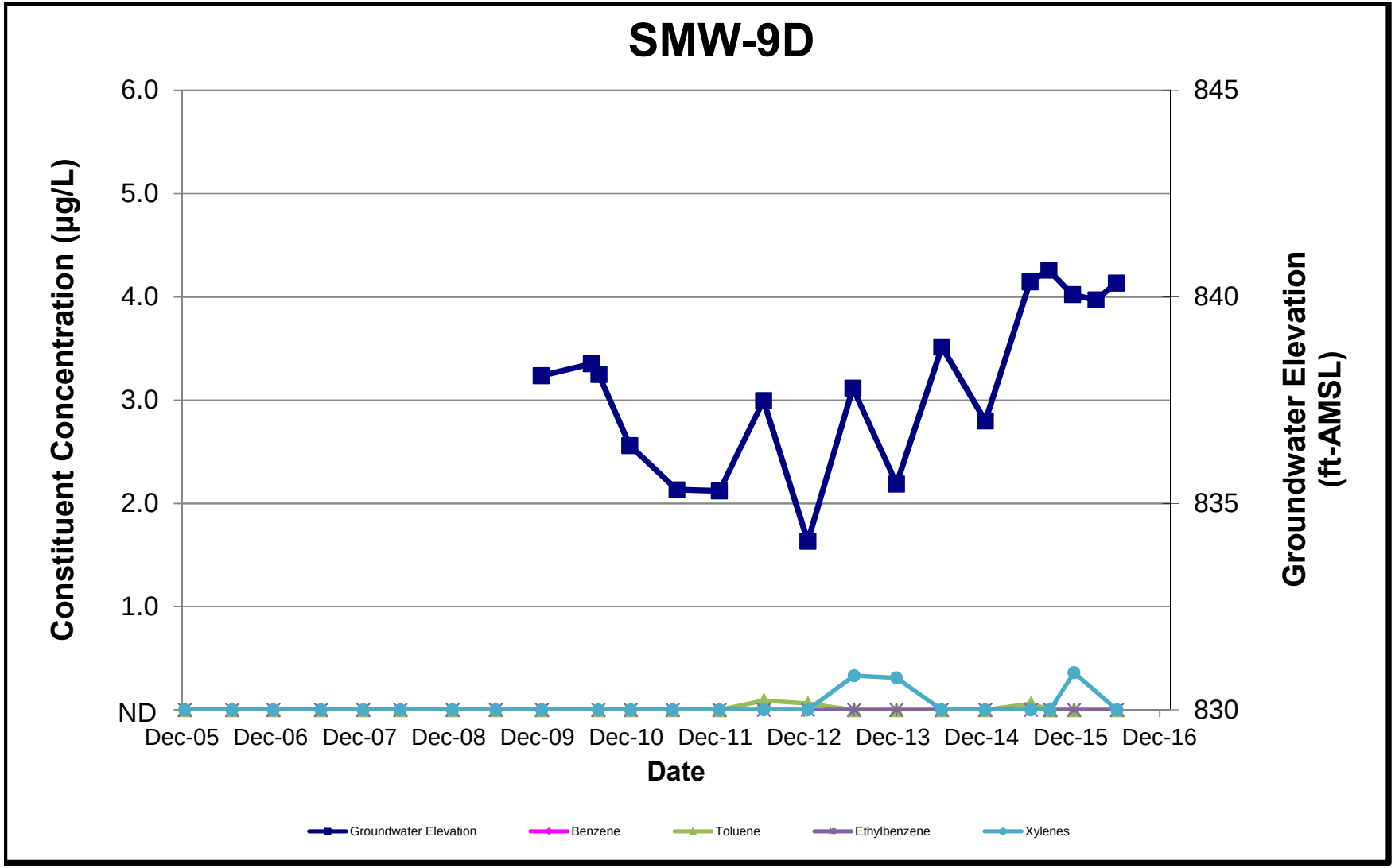
BTEX Concentration Trend in SMW-5D
Wynnewood Refining Company
Wynnewood, Oklahoma



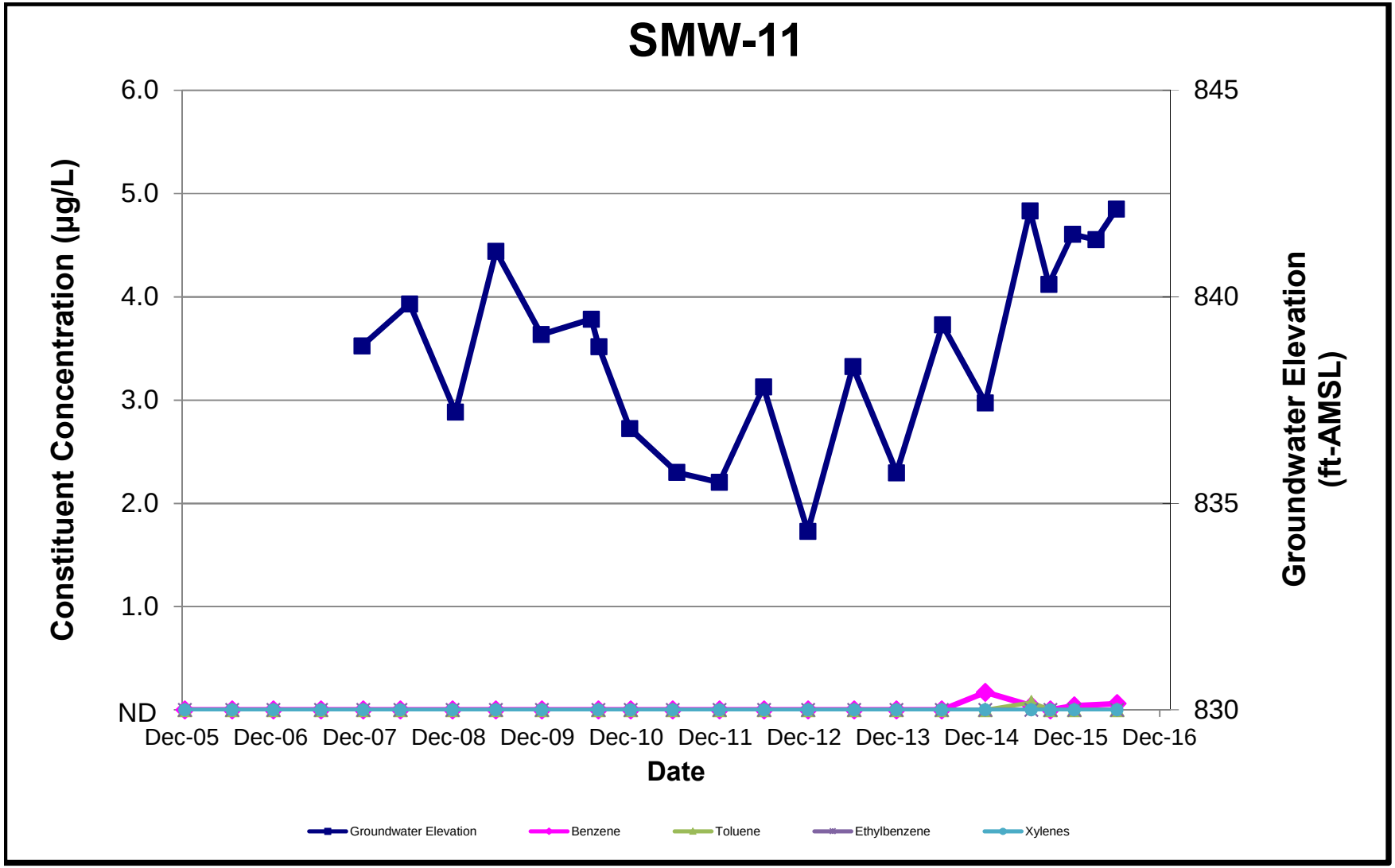
BTEX Concentration Trend in SMW-9
Wynnewood Refining Company
Wynnewood, Oklahoma



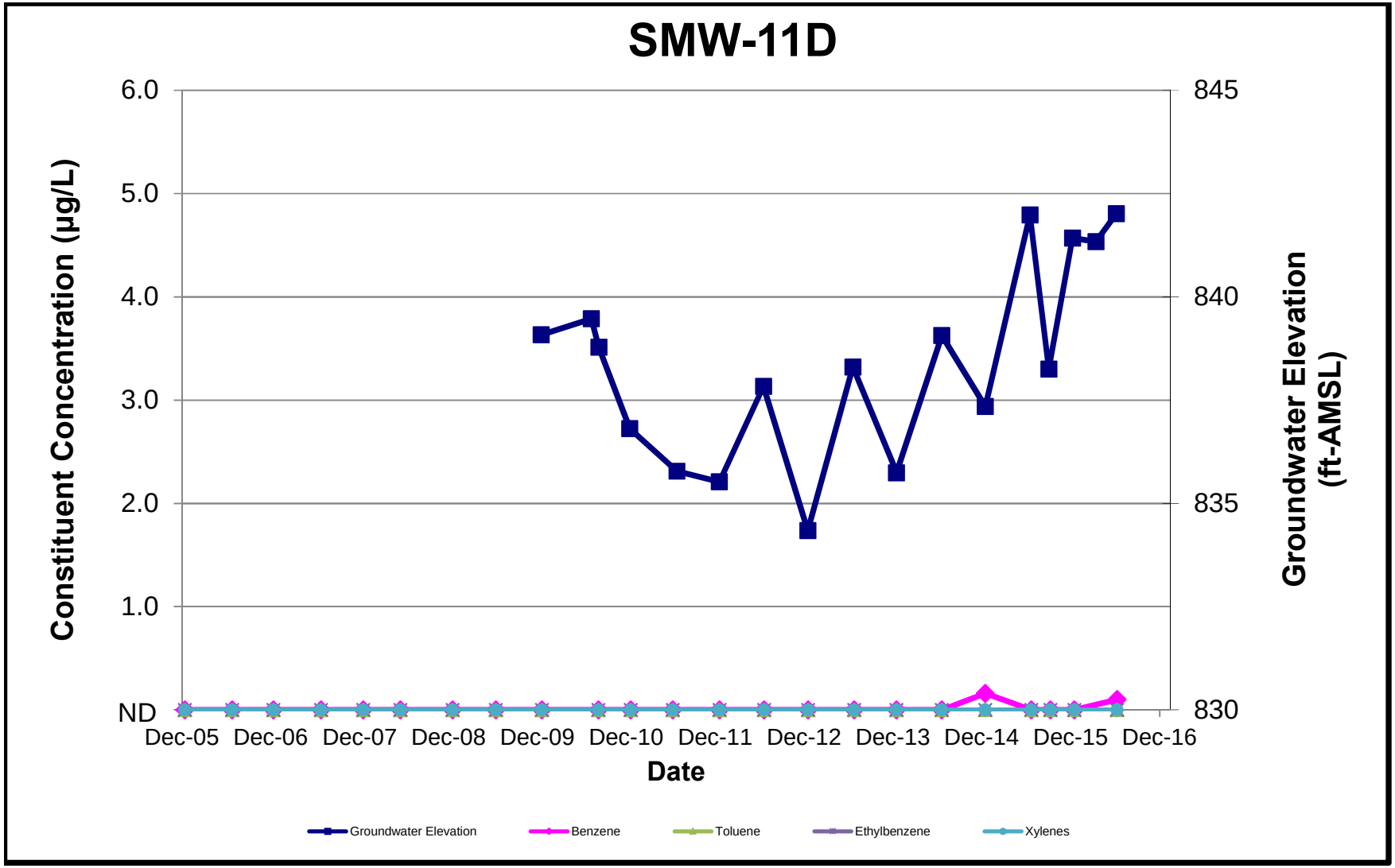
BTEX Concentration Trend in SMW-9D
Wynnewood Refining Company
Wynnewood, Oklahoma



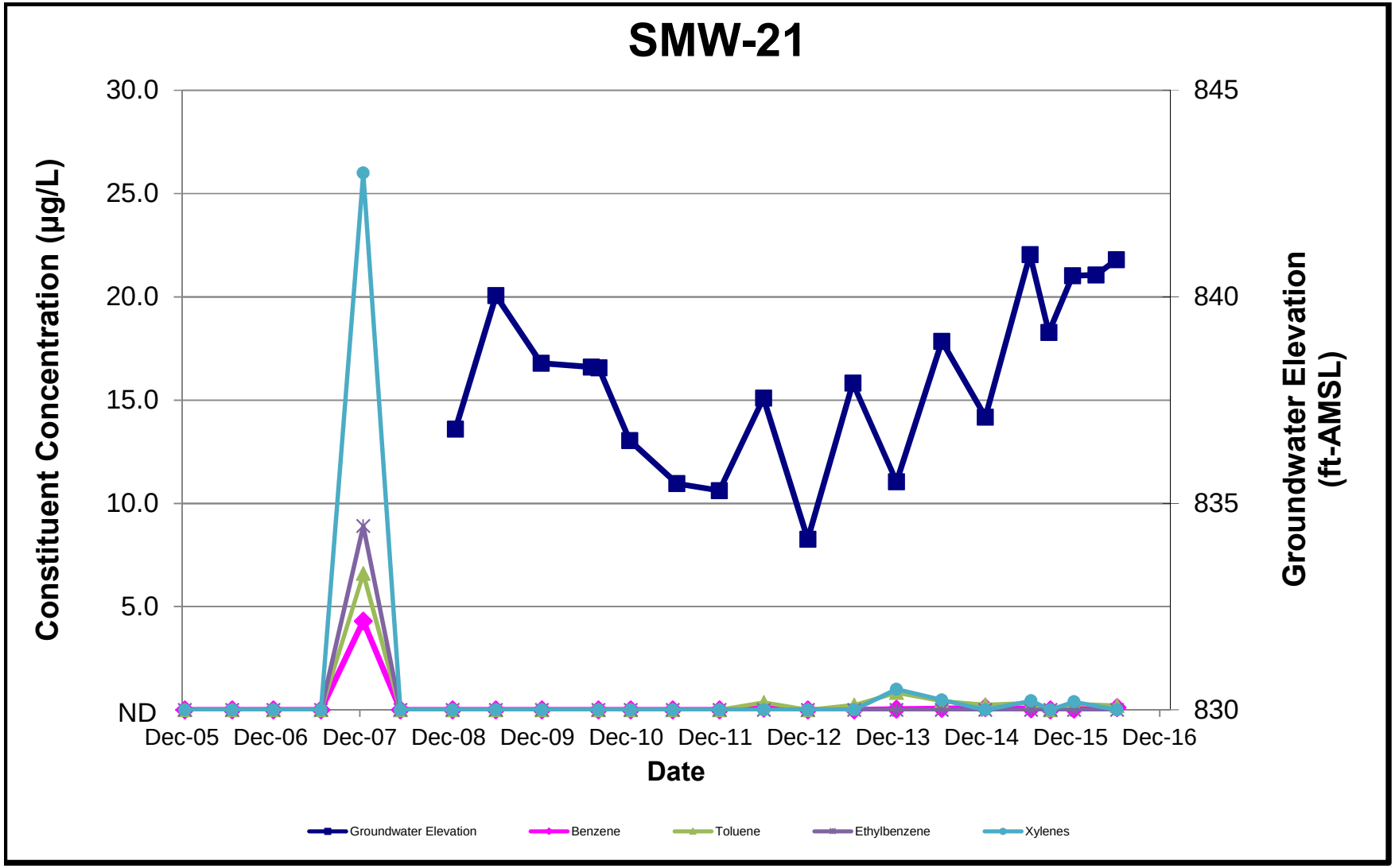
BTEX Concentration Trend in SMW-11
Wynnewood Refining Company
Wynnewood, Oklahoma



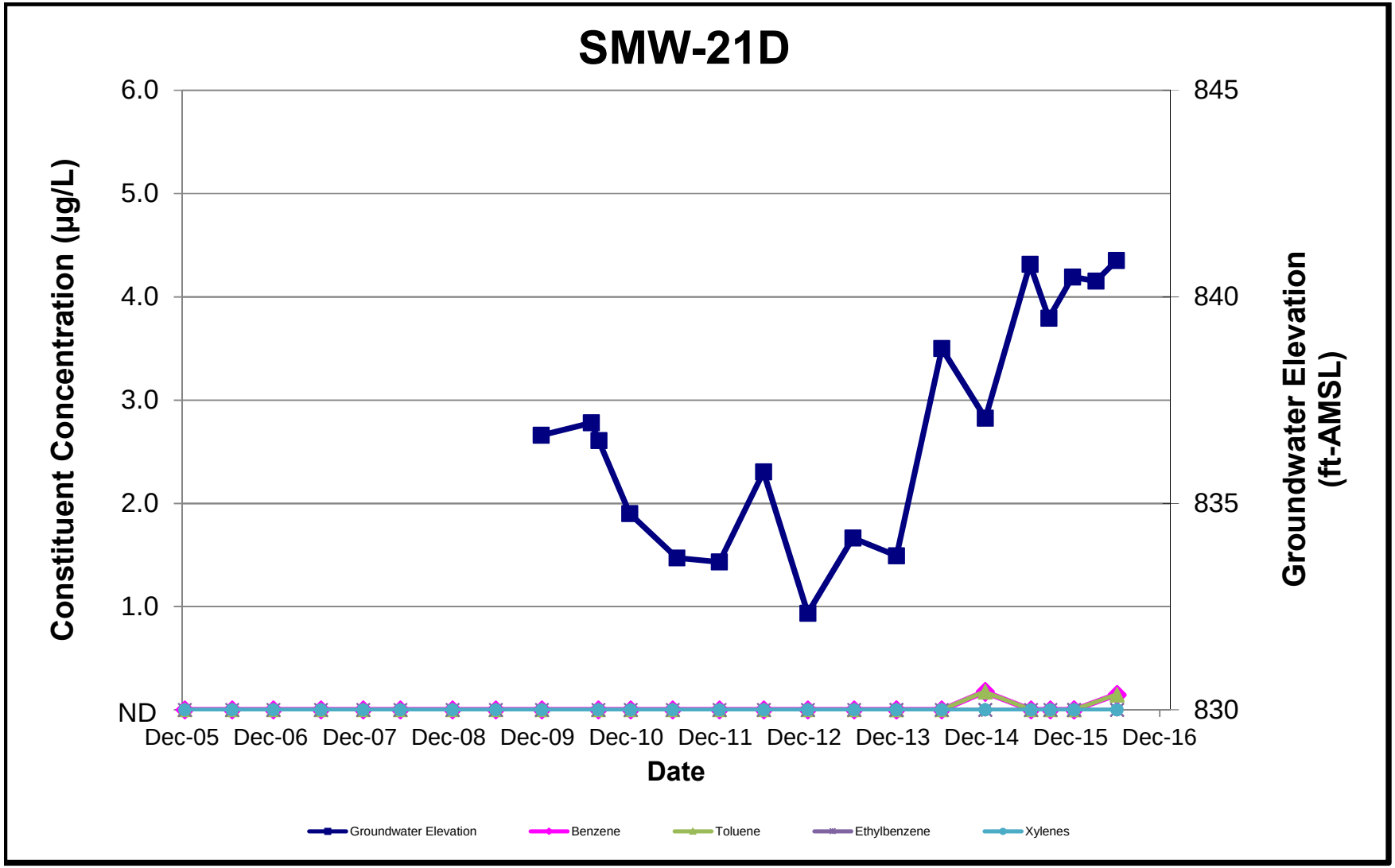
BTEX Concentration Trend in SMW-11D
Wynnewood Refining Company
Wynnewood, Oklahoma



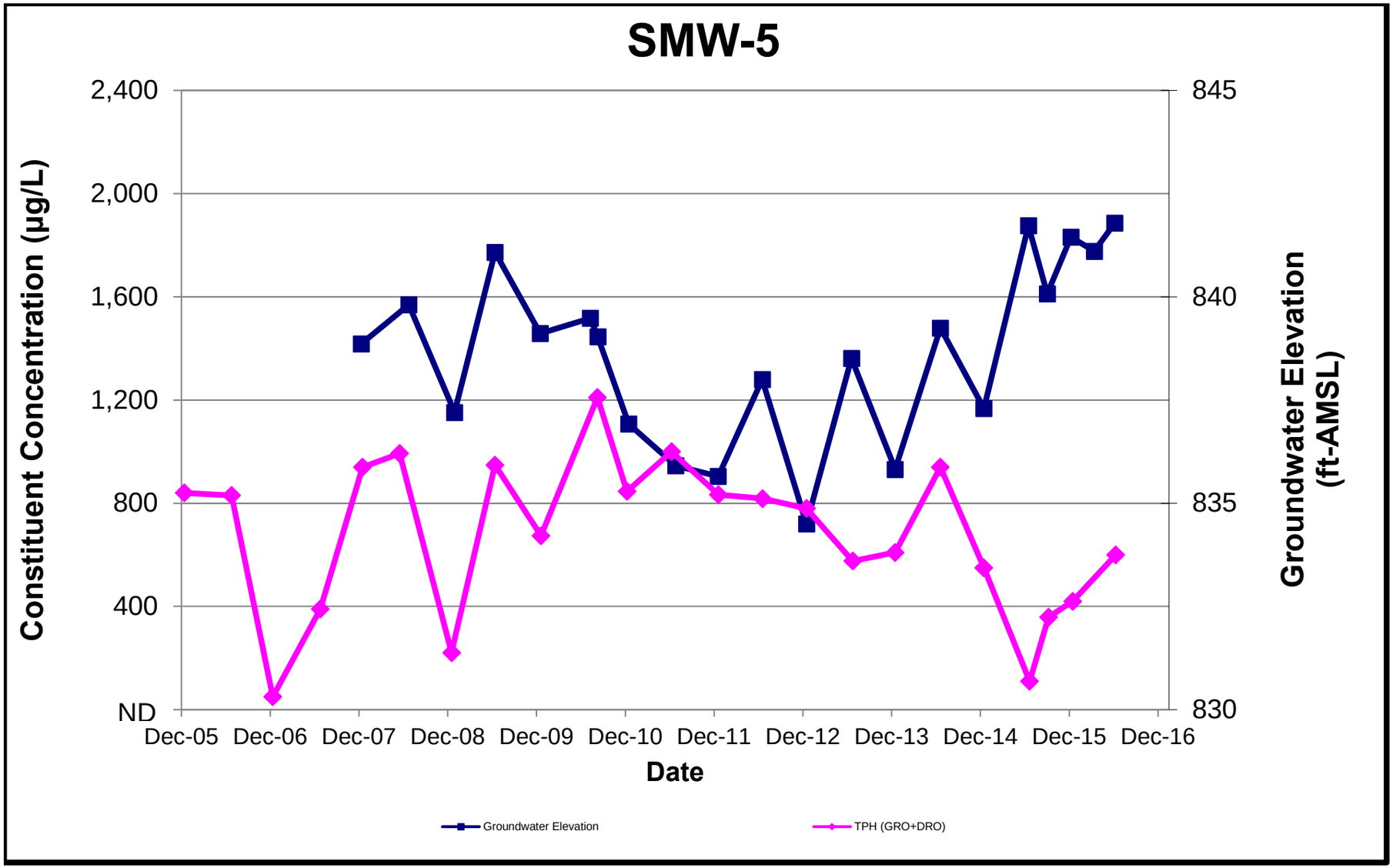
BTEX Concentration Trend in SMW-21
Wynnewood Refining Company
Wynnewood, Oklahoma



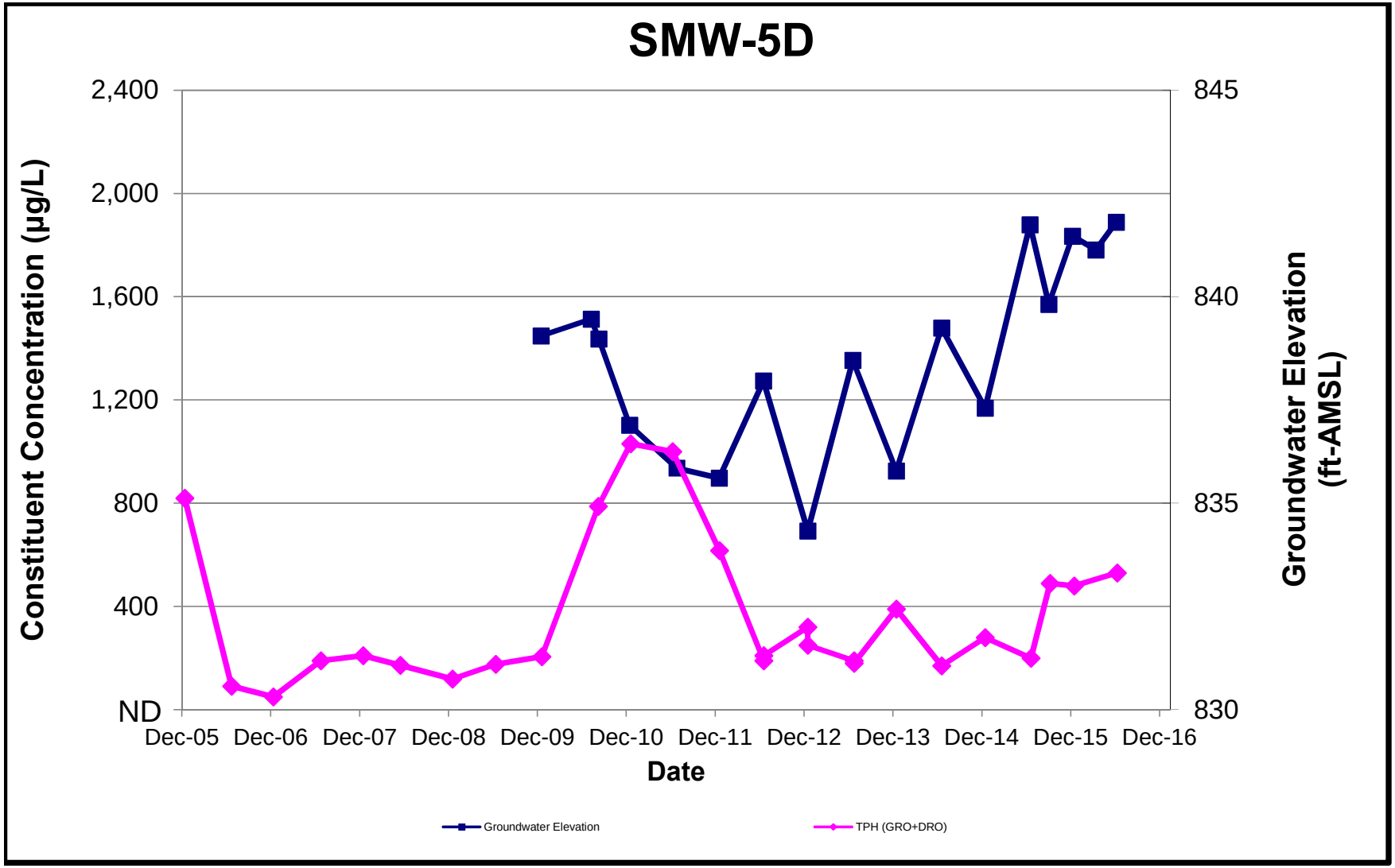
BTEX Concentration Trend in SMW-21D
Wynnewood Refining Company
Wynnewood, Oklahoma



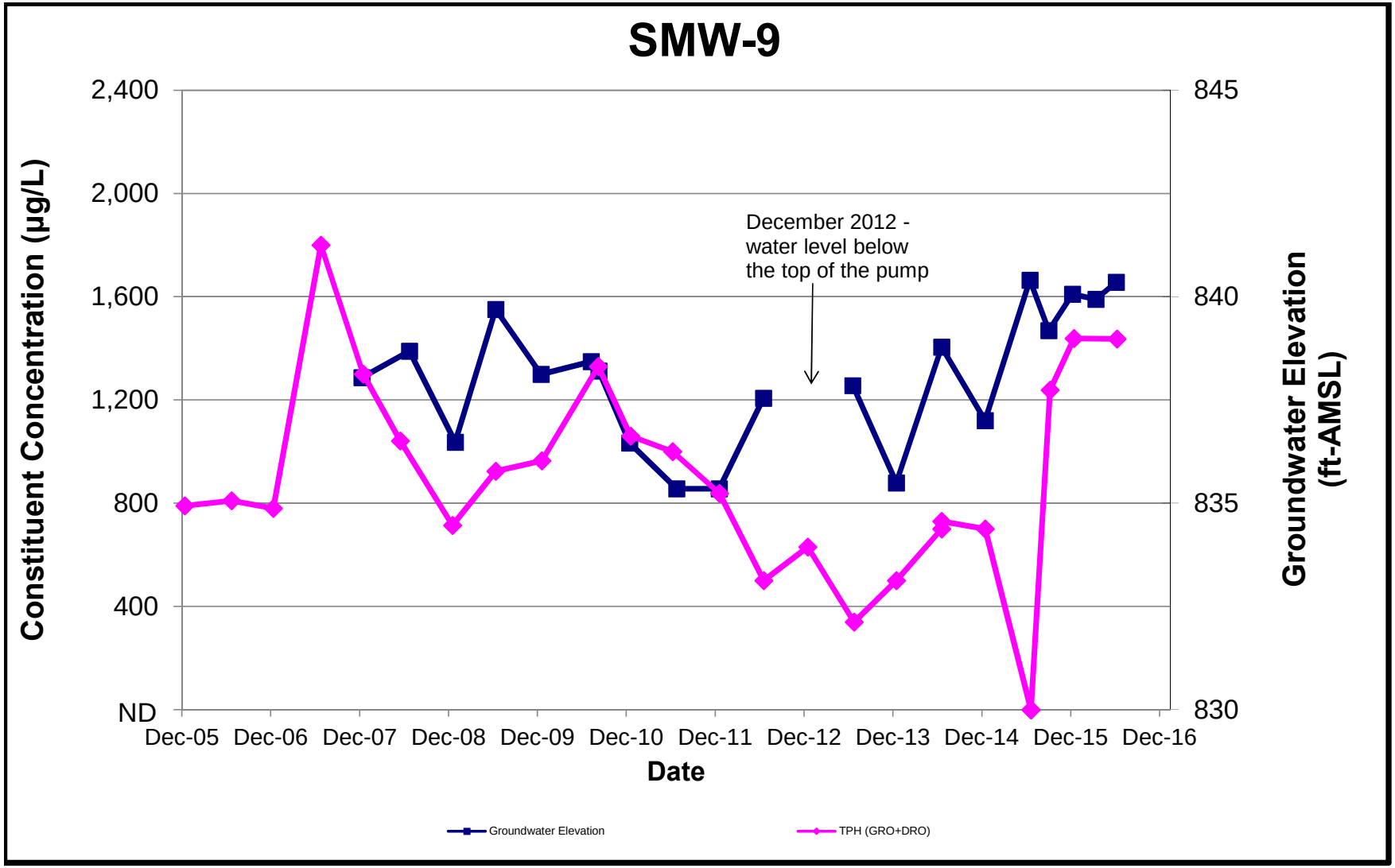
TPH Concentration Trends in SMW-5
Wynnewood Refining Company
Wynnewood, Oklahoma



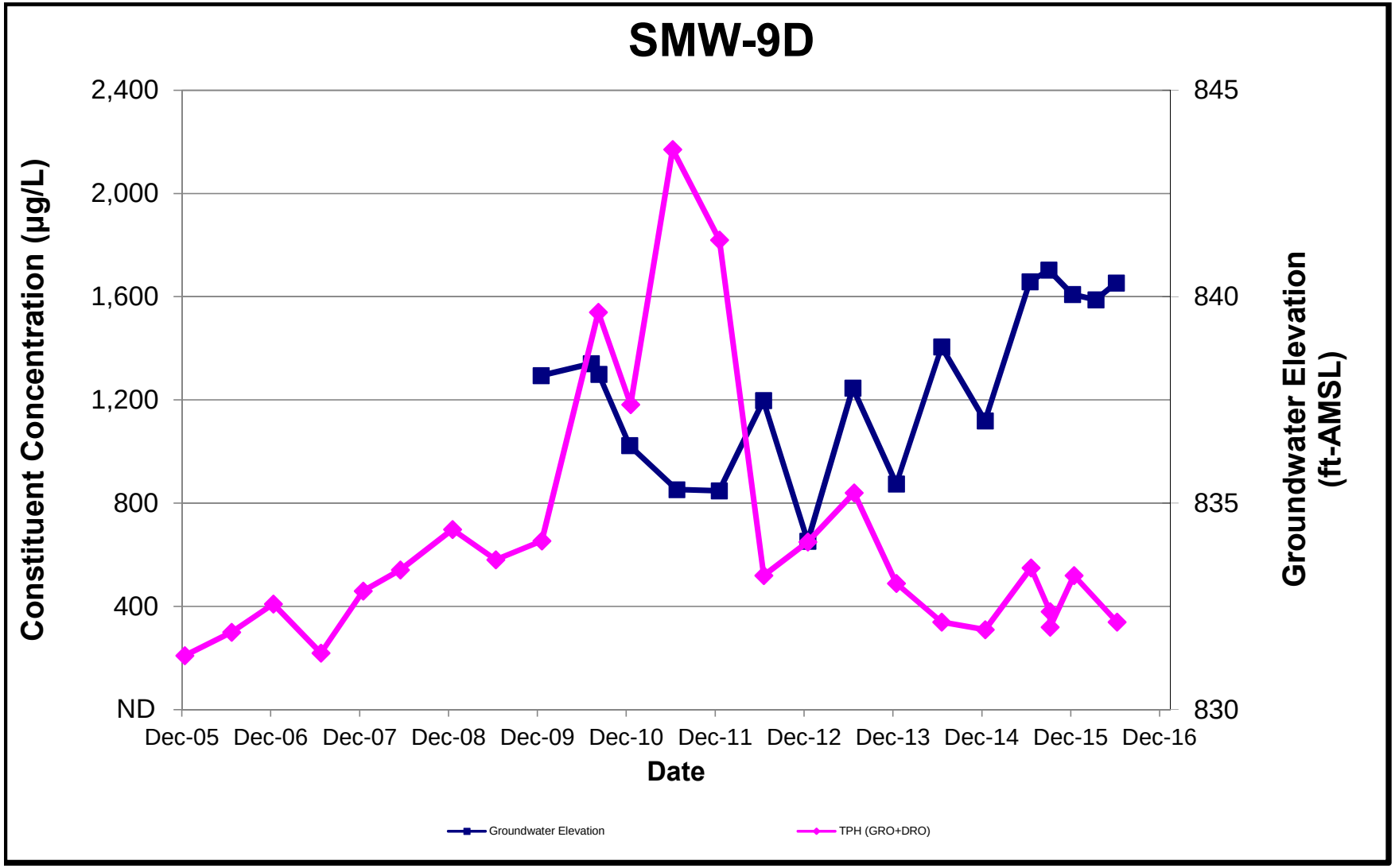
TPH Concentration Trends in SMW-5D
Wynnewood Refining Company
Wynnewood, Oklahoma



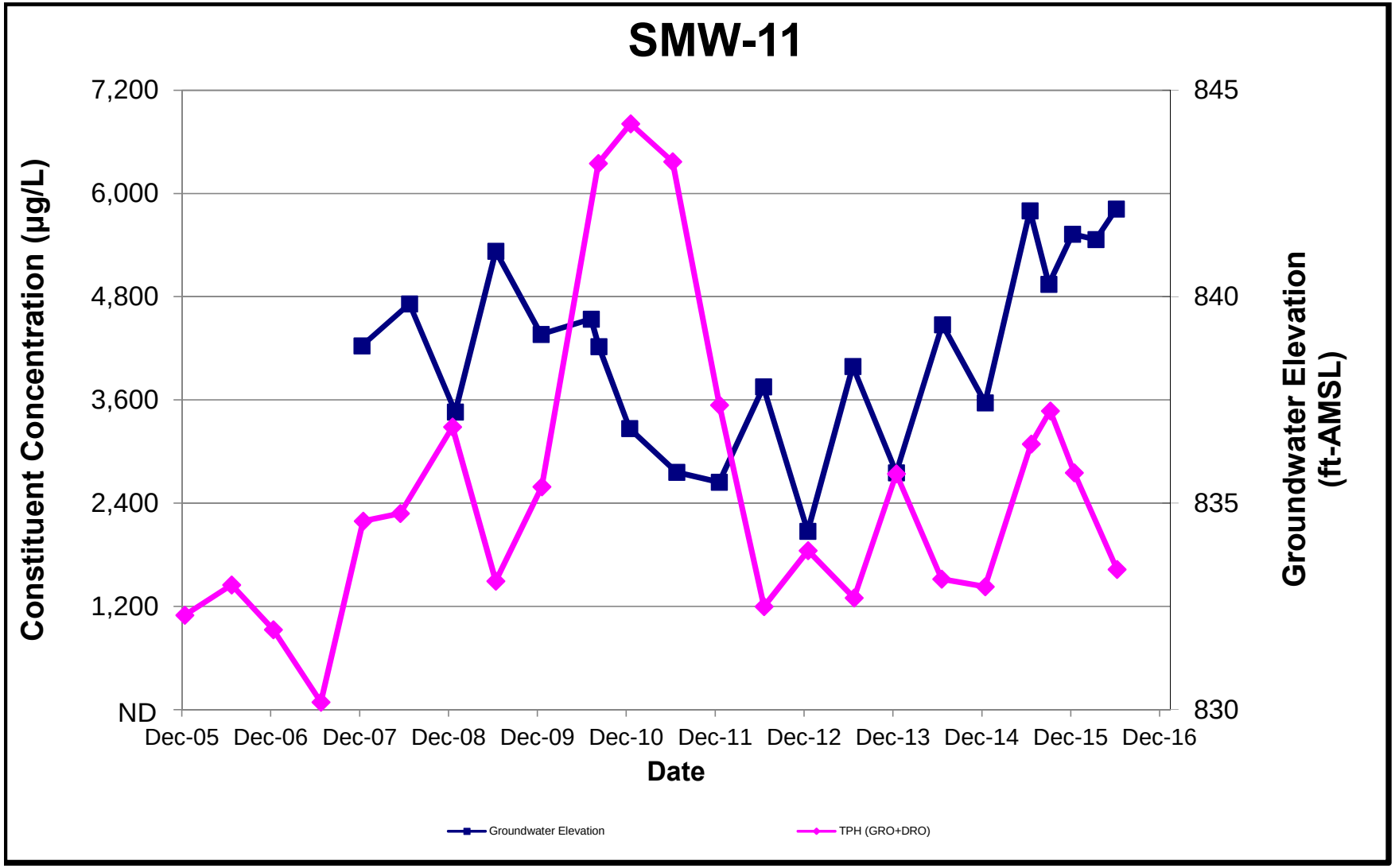
TPH Concentration Trends in SMW-9
Wynnewood Refining Company
Wynnewood, Oklahoma



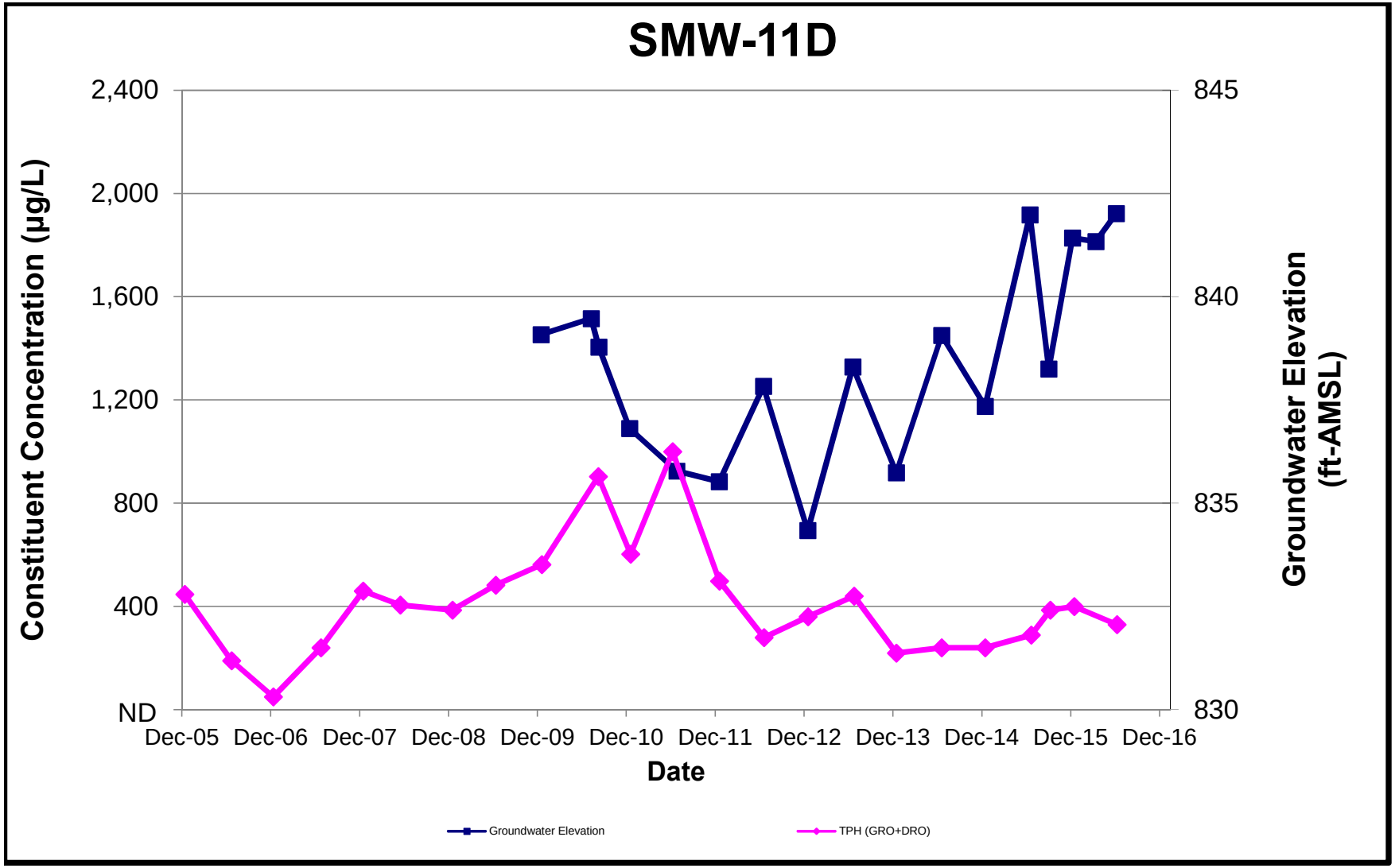
TPH Concentration Trends in SMW-9D
Wynnewood Refining Company
Wynnewood, Oklahoma



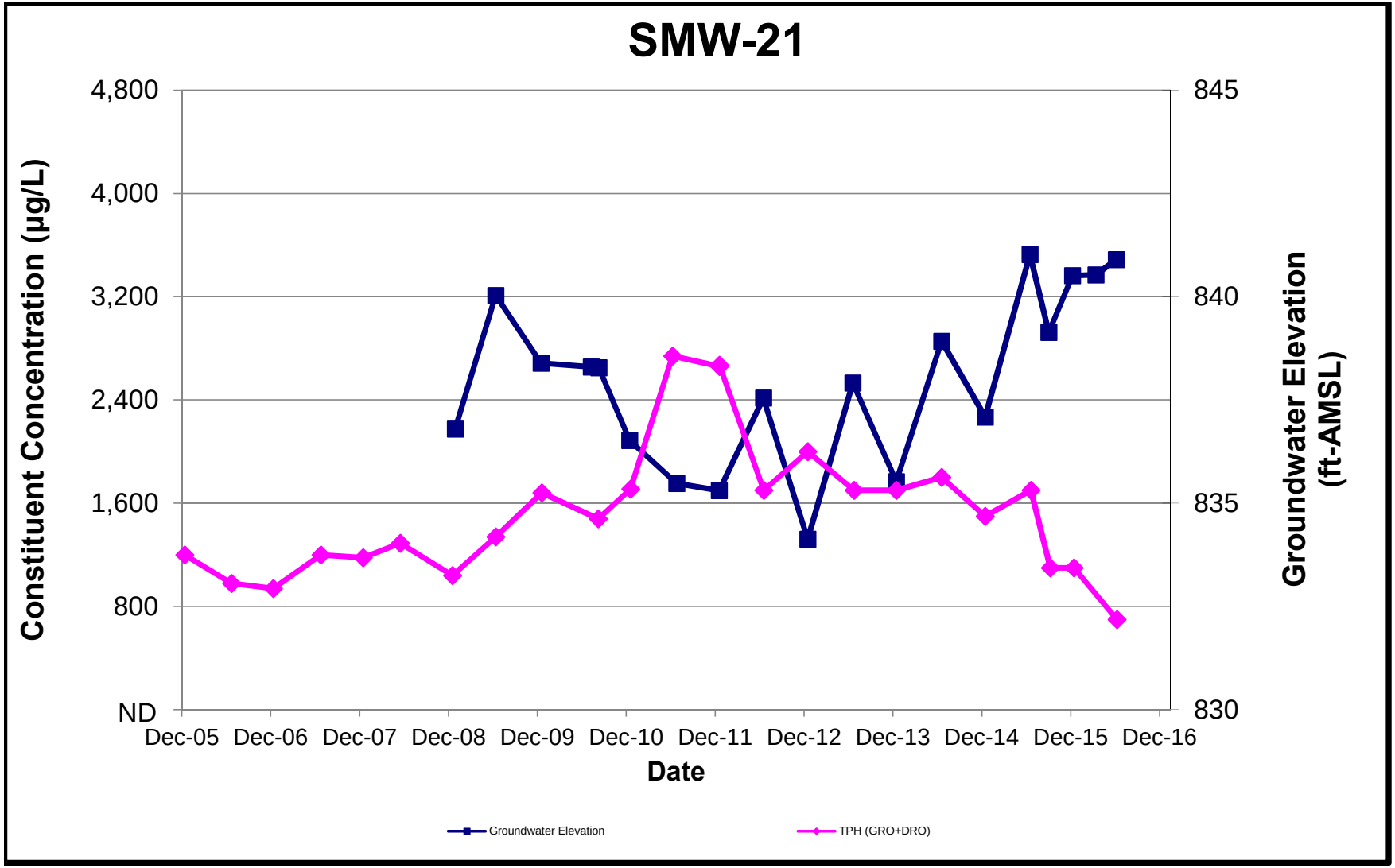
TPH Concentration Trends in SMW-11
Wynnewood Refining Company
Wynnewood, Oklahoma



TPH Concentration Trends in SMW-11D
Wynnewood Refining Company
Wynnewood, Oklahoma



TPH Concentration Trends in SMW-21
Wynnewood Refining Company
Wynnewood, Oklahoma



TPH Concentration Trends in SMW-21D
Wynnewood Refining Company
Wynnewood, Oklahoma