Appendix B

Quality Assurance and Quality Control (QA/QC)

EPAPAV0037031

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B.1 Introduction

Sampling and analysis activities were conducted under an approved Quality Assurance Project Plan (QAPP) titled "Groundwater Investigation in Pavillion, Wyoming, version 6" dated 2/17/2012. In Phase V of the Pavillion study, groundwater samples were collected from April 16 to April 24, 2012. Five domestic wells, one municipal supply well, and two deep monitoring wells were sampled. A total of 457 samples (not including duplicates of glass containers) were collected and delivered to 8 laboratories for analysis: Shaw Environmental, Ada, OK; EPA ORD/NRMRL, Ada, OK; ALS Environmental, Holland, MI; TestAmerica, Savannah, GA; EPA Region 8, Golden, CO; EPA Region 3, Fort Meade, MD; EPA ORD/NERL, Las Vegas, NV; and, Isotech, Champaigne, IL. Measurements were made for over 322 analytes per sample location. Of the 457 samples, 194 samples (42%) were QC samples, including blanks, field duplicates, and matrix spikes. This section describes general QA and results of the QC samples, including discussion of chain of custody, holding times, blank results, field duplicate results, laboratory Quality Assurance narratives, double-lab comparison of volatile organic compounds, Performance Evaluation (PE) samples, QAPP additions and deviations, field QA/QC, application of data qualifiers, and the Audit of Data Quality (ADQ).

B.2 Chain of Custody

Sample types, bottle types, sample preservation methods, analyte holding times, and laboratories receiving samples are listed in Table B1. Samples collected in the field were packed on ice into ice chests for shipment by overnight delivery with completed chain of custody documents and temperature blank containers. With the few exceptions noted below, samples were received by the multiple laboratories in good condition and all temperature blanks read below 5°C.

The first sample shipment to TestAmerica (Methylene Blue Active Substances, MBAS analysis) was delayed in shipment by the carrier. This shipment included the samples: PGDW20-0412, PGDW20d-0412, FieldBlk01, and EquipBlk01 (collected 4/16/2012). Because MBAS analysis has a 48 hour holding time, the samples in this set were not received in time to make the holding time requirement. Consequently, new samples from PGDW20 were collected on 4/18/2012 and submitted for analysis along with fresh field and equipment blanks. The chain-of-custody form accompanying sample PGDW50-0412 shipped on 4/19/2012 for MBAS analysis was signed for, but the time and date were left off the custody form. The case narrative in the data report indicates the sample was received on

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4/20/2012.

An ice chest received by Shaw Environmental on 4/18/2012 was noted to have one of the two custody seals cut, presumably during transport and delivery. The second custody seal was intact and the samples were noted to be in good condition. In other shipments, several glass bottles were received broken (FieldBlk01 for Ethoxylates, 1 L amber glass; PGPW02-0412 for GRO, 40 mL amber glass; EquipBlk03 for EPA Method 8260, 40 mL amber glass; EPAMW02-0412-2 for low molecular weight acids, 40 mL clear glass). Samples stored in glass bottles were all collected in duplicate in case of breakage. One sample delivered to Isotech (EPAMW01d-0412) was compromised in the laboratory (spilled); consequently, dissolved gas isotopic signatures are not available for this field duplicate sample.

B.3 Holding Times

Sample holding times for the various analyses conducted in Phase V are listed in Table B1. Method holding times range from 48 hours to 6 months. As noted above, the short holding time for MBAS analysis required that field samples be shipped to the TestAmerica laboratory on the same day as their collection. In one case, arrangements were made for weekend sample receipt and analysis by TestAmerica. All samples for MBAS were analyzed within the specified holding time. Sample PGDW50-0412 was analyzed outside of holding time guidelines for Gasoline Range Organics (GRO). This sample was not preserved in the field to the pH<2 criterion. The GRO analysis holding time for non-preserved samples is reduced from 14 days to 7 days. Sample PGDW50-0412 was analyzed 3 hours after the 7 day holding time expired; GRO data for this sample are flagged as estimated. Several samples for ethoxylate alcohols and alkyphenols were extracted outside the 30-day holding time; these samples exceeding the holding time for extraction are flagged.

B.4 Blank Samples

An extensive series of blank samples were collected in Phase V, including field blanks, equipment blanks, and trip blanks (Table B2). These quality control samples were intended to test for possible bias from potential sources of contamination during field sample collection, equipment cleaning, sample bottle transport to and from the field, and laboratory procedures. The same source water was used for the preparation of all blank samples (Barnstead NANOpure Diamond UV water). Field blanks were collected to evaluate potential contamination from sample bottles and environmental sources. Equipment blanks were collected to determine if cleaning procedures or sample equipment (filters, fittings, tubing) potentially contributed to analyte detections. Trip blanks consisted of serum bottles or VOC vials filled with NANOpure water and sealed in the laboratory. Trip blanks were used to evaluate whether VOC and dissolved gas serum bottles were contaminated during sample storage, sampling, or shipment to and from the field. All other analyses have associated field and equipment blanks, except isotope analyses for which no blank sampling schemes are appropriate. Sample bottle types, preservation, and holding times were

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applied to blank samples in the same way as applied to field samples (Table B1).

The following criteria are used for flagging samples with potential blank contamination. Sample contamination is considered possible if analyte concentrations in blanks are above the method Quantitation Level (QL) or method Reporting Level (RL) and if the analyte is present in an associated field sample at a level ≤10× the concentration in the blank. Blank samples are associated to field samples by dates of collection; for example, most sample shipments include both field samples and blank samples that are used for blank contamination assessments. See section on QAPP Additions and Deviations for additional information.

Results of blanks analyses are reported in Tables B3-B17.

Dissolved methane was reported above the QL (9×) in one field blank and one equipment blank collected on the same day (4/18/2012; Table B3). These blank detections affect two samples: PGDW50-0412 and PGPW02-0412, both with low-level methane detections. Methane values for these two samples are flagged as estimated. There were no dissolved metal concentrations above QLs in any of the blank samples Tables B4 and B5). One equipment blank (EquipBlk01), contained a total chromium concentration of 0.223 µg/L (just above the QL of 0.222 µg/L; Table B8). Consequently, the total chromium value for sample EPAMW02-0412-1 (1.66 µg/L; 7.4× the blank result) is flagged as estimated. The anions: fluoride, chloride, sulfate, and nitrate+nitrite, were not detected above QLs in any of the blank samples (Table B9). Dissolved inorganic carbon and organic carbon concentrations were not reported above QLs in any of the blank samples (Table B9).

Twelve blank samples were collected for alcohols/aromatic/chlorinated hydrocarbons (Shaw Environmental) and volatile organic compounds (EPA Region 8). Results are presented in Tables B11 and B12. Toluene was detected in one sample (EquipBlk04) by EPA Method 5021A plus 8260C at a concentration of 0.297 µg/L, below the method QL of 0.50 µg/L (Table B11). Toluene was also detected in the same sample by EPA Method 5035 plus 8260C at a concentration of 0.31 µg/L, just above the method QL of 0.25 µg/L (Table B12). This blank detection affects a series of detections of toluene below the QL in EPAMW01 (time series analysis). All other detections of volatile organic compounds in the domestic wells and deep monitoring wells are not impacted by blank contamination.

The only semi-volatile organic contaminant found in field and equipment blanks was isophorone in EquipBlk04 (1.17 µg/L, QL=1.00 µg/L; Table B13). This analyte was not detected in any field sample. None of the detections of semi-volatile organic compounds in the domestic wells and deep monitoring wells are impacted by blank contamination.

Formate was detected in all field samples and in all blank samples at generally comparable levels (Table B10). The formate data are all rejected due to formate contamination of sample vials. For DRO and GRO analyses, blank contamination was detected in EquipBlk04 for GRO at a concentration of 22.4 µg/L, just above the QL of 20 µg/L (Table B14). This result impacts none of the accompanying field samples as all of the

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EPAMW01 time series samples have GRO concentrations >325 µg/L. None of the detections of GRO and DRO in the domestic wells and deep monitoring wells are impacted by blank contamination.

Glycols were not reported above QLs or Minimum Detection Levels (MDLs) in any of the blank samples (Tables B14 and B15). None of the detections of glycols or 2-butoxyethanol in the deep monitoring wells are impacted by blank contamination.

Samples for analysis of acrylamide, alkylphenols, ethoxylated alcohols, and ethoxylated alkyphenols were sent to the EPA ORD/NERL laboratory in Las Vegas. With the exception of acrylamide and octylphenol, other analytes were consistently detected in field blanks, equipment blanks, and laboratory blanks. Other QA/QC issues associated with these data were noted in the Audit of Data Quality (see Table B29).

B.5 Duplicate Samples

Field duplicate samples were collected to measure the reproducibility and precision of field sampling and analytical procedures. Field duplicates were collected for wells PGDW20 and EPAMW01, or for 2 of the 9 wells sampled in Phase V. The relative percent difference was calculated to compare concentration differences between the primary (sample 1) and duplicate sample (sample 2) using the following equation:

RPD(%) = |[2*(sample1-sample2)/((sample1+sample2)]*100|.

RPDs were calculated when constituents in both the primary sample and duplicate sample were above method QLs. Constituents are flagged if RPDs are >30% and if analyte concentrations are >5× the QL. RPDs for the majority of the constituents were less than or equal to 10% (81% of the comparisons), and indicated very good precision for most inorganic and organic analytes. Benzoic acid and acetate had RPDs>30% and concentrations >5× the QL for EPAMW01-0412 and EPAMW01d-0412. Samples with detections of these analytes are flagged accordingly as estimated values. Results of selected duplicate analyses (major constituents) are presented in Tables B18 and B19.

B.6 Laboratory Notes

Tables B20-B28 provide QA/QC requirements for laboratory analyses conducted as part of the Phase V investigation. Table B29 summarizes laboratory QA/QC narratives regarding sample analysis, such as laboratory duplicate analysis, laboratory blank analysis, matrix spike results, calibration, and continuing calibration checks. Impacts on data quality of any issues noted in the QA narratives are also presented in Table B29. Data qualifiers are listed in Table B30. Many of the specific QA/QC observations noted in the Audit of Data Quality are summarized in Table B29.

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B.7 Double-lab Comparison of VOCs

Shaw Environmental and EPA Region 8 analyzed samples for volatile organic compounds using EPA methods (Table B1). Shaw Environmental used EPA Method 5021A plus 8260C (GC-MS, equilibrium headspace analysis). The EPA Region 8 laboratory used EPA Method 5035 plus 8260C (GC-MS, closed-system purge-and-trap). A comparison is made of data for overlapping analytes provided for two samples collected from MW02 (EPAMW02-0412-1 and EPAMW02-0412-2). These two samples are not field duplicates; they were collected at different stages of well purging (see Appendix A for well purging details). For these two samples, detections by both laboratories were reported for 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, acetone, benzene, ethylbenzene, m,p-xylene, naphthalene, o-xylene, and toluene. Results are provided in Table B31 and graphically represented in Figure B1. RPD values for the majority of the constituents are below or equal to 12% (83% of comparisons). Acetone shows the highest deviation, but is within 40% in both comparisons. These results show excellent agreement and demonstrate that the identification and quantitation of volatile organic compounds are accurate.

B.8 Performance Evaluation Samples

A series of performance evaluation (PE) samples were submitted by the EPA Ground Water and Ecosystems Restoration Division QA Manager to selected laboratories conducting critical analyses to support the Phase V effort at Pavillion. Samples were submitted to the EPA Region 8 laboratory for DRO/GRO, semivolatile, and volatile organic compounds; Shaw Environmental for VOCs, tert-butyl alcohol, and potasium; EPA General Parameters laboratory for chloride; and, to the USGS/TestAmerica contract laboratory for GRO/DRO, gasoline additives, semivolatile and volatile organic compounds, and inorganic compounds. PE Samples were delivered to these labs at about the same time samples arrived from the field. In most cases, the PE samples were run in the same laboratory batches as the field samples. Results of the blind PE tests are presented in Tables B32 to B35. These tables show the results for 233 tests; 100% of the reported values fell within the acceptance range. These blind PE sample results further demonstrate the high quality of analytical data reported in this brief.

B.9 QAPP Additions and Deviations

An important addition was made to the sampling approach for MW01 following the preparation and approval of version 6 of the QAPP. This addition was documented in an email (4/12/2012) from a co-PI to the QA Manger overseeing this project. The email text is provided below.

> The following is a change to the sampling strategy for MW01. The sampling methodology below supersedes the presentation in the QAPP titled "Ground-Water Investigation in Pavillion, Wyoming" (v6, 2/17/2012, QA ID NO. G-14478).

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The USGS-EPA technical workgroup, upon consensus agreement, determined that samples were to be collected at MW01 after attainment of stabilization parameters and after purging one borehole volume. Subsequently, a letter from WYDEQ to USGS provided direction for USGS to additionally remove three casing (now borehole, based on current USGS Sampling and Analysis Plan) volumes prior to sampling at MW01. Thus, two sample collection events, at 1 and 3 borehole volumes, respectively, are currently planned. There should be no expectation that the exact same concentration of various analytes will be observed at both sampling points due to laboratory variability and oscillatory behavior frequently observed in published studies on time series testing during purging. When there is oscillatory behavior, two samples cannot define a trend. Also purge volume may impact observed sample concentrations. Consequently, it is necessary for EPA to conduct a time-series analysis at MW01 to fully characterize expected variability in concentration during purging. Time-series analysis typically involves collection of at least 10 samples over time.

The following approach will be followed by EPA during the April 2012 sampling of MW01.

1) A sample will be collected after purging 1 borehole volume (approx. 410 gallons) and after stabilization of field parameters. This is similar to the approach used during the Phase IV sampling event and the approach was agreed on by the USGS-EPA technical workgroup. This sample will be collected in duplicate (labeled EPAMW01-0412 and EPAMW01d-0412).

2) Samples will be collected after approx. every 90 gallons of continuous purging for dissolved metals (filtered), anions (filtered), water isotopes (filtered), RSKSOP259 (alcohols and volatile organics), and GRO. An identical sampling approach will be utilized as described in the QAPPv6 (same bottles, preservation, storage). Sequential samples will be labeled with -x, e.g., EPAMW01-0412-2 or EPAMW01-0412-5, for the second and fifth sample collected in series, respectively. This series of samples is intended to provide reasonable time-dependent data for major and minor elements as well as organic compounds of interest (e.g., GRO and isopropanol). The water isotope data will useful in evaluating whether significantly different water sources are pulled into the screened during interval during the prolonged purging.

3) After approximately every 270 gallons, in addition to the samples noted in 2) above, samples for glycols, MBAS, ethoxylated compounds, DRO, and SVOCs will be collected for analysis. Again see QAPPv6 for sample collection details. These samples are needed to track time-dependent (volume-dependent) behavior of critical organic analytes.

4) Finally after approx. 3 borehole volumes and stabilization of parameters, a final complete sample set will be collected. This sample will be labeled EPAMW01-0412-

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10.

After each sample is collected, the time will noted and water volume pumped will be noted in order to correlate the sampling point with geochemical parameters recorded in the purge log and recorded water levels in the well.

Overall this approach was followed in the field, except the order of samples had to be changed in order to deal with unexpected delays in collecting the first sample. See Table X for details about the time series sampling at MW01.

During the course of the field sampling, a deviation occurred from the guidelines discussed in the QAPP. The QAPP stated that field and equipment blanks would be collected on each day of sampling (Table B2). Sampling occurred on seven days from April 16 to April 24. Collecting blanks on each sampling day would have resulted in an unnecessarily large number of blank samples submitted for analysis, and would have amounted to almost one field and equipment blank per location where a complete sample set was collected (7 field/equipment blank samples to 10 complete sample sets). Consequently, field blanks were collected on the 16th, 18th, 22nd, and 24th of April. Samples collected on April 17th (PGDW23 and PGDW30) were evaluated for blank contamination using blank samples from April 16th. Samples collected on April 19 and April 20 (PGDW20 and PGPW02) were evaluated for blank contamination using blank samples from April 18th. Importantly, field blanks were collected on each occasion that MW01 and MW02 were sampled. Also, Trip Blanks were included in every sample shipment back to the analytical laboratories in accordance with the QAPP guidelines (Table B2). There is no expected impact on data quality stemming from this QAPP deviation.

B10. Field QA/QC

Field measurements in Phase V consisted of YSI Model 556 flow-cell readings for temperature, specific conductance, pH, oxidation-reduction potential, and dissolved oxygen. YSI electrodes were calibrated in the morning. Performance checks were conducted at mid-day and at the end of each day. NIST-traceable 1413 µS/cm specific conductance standard was used for calibration and performance checks. In one case a YSI confidence solution was used to check the electrodes. NIST-traceable buffer solutions (7.00 and 10.01) were used for pH calibration and performance checks. Prior to and after sampling the deep monitoring wells, a pH 12.46 buffer solution was used as an electrode performance check. Orion ORP standard was used for calibration and performance checks of redox potential measurements. Dissolved oxygen sensors were calibrated with air, and low-oxygen measurement performance was tested with a zero-oxygen solution (sodium sulfite). Table B36 provides the results of mid-day and end-of-the-day performance checks. Prior to field deployment, the electrode assembly and meter had been serviced. On 4/22/2012, the conductivity electrode was slightly out of calibration at the end of the day. This affects the specific conductance value recorded for EPAMW02-0412-2; the value is flagged as estimated. In all other cases, performance checks were within acceptance limits (Table B36).

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B11. Data Qualifiers

Data qualifiers are listed in Table B30. Many factors can impact the quality of data reported for environmental samples, including factors related to sample collection in the field, transport of samples to laboratories, and finally to the analytical work conducted by the various analytical laboratories included in this study.

Multiple data qualifiers are available to capture the full extent of these factors that impact data quality. The U and U1 qualifiers are used to indicate when analyte concentration levels are reported below method detection limits (MDLs) and quantification limits (QLs), respectively. A series of data qualifiers are used to note when blank samples show detectable levels of analytes (e.g., LB, TB, FB, EB; see Table B30). When samples are diluted in the laboratory, for example, to decrease sample concentrations into instrument calibration ranges or to remove potential analytical interferences, the D(value) qualifier is used, where (value) indicates the level of dilution, determined by mass or by volume. This flag is additionally important because MDLs and method QLs need to be adjusted for diluted samples; these values vary proportionately to the dilution factor. A series of K-qualifiers are used to denote laboratory issues involving matrix spike samples (Table B30). Matrix spikes can be important in determining whether analytical data could be biased to low or high levels depending on the sample matrix (i.e., the sum combination of all chemical species in a water sample). In addition, a full series of J-qualifiers are available to identify specific data quality issues. In all cases where a J-flag is used, reported concentration levels are understood to be estimated values. As an example, the J0 flag is used in cases where the concentration level is determined to be above the minimum detection level of the analytical technique (i.e., the chemical is present), but below the level where a statistically robust concentration level can be assigned (e.g., the concentration level of J0 flagged analyte is estimated). Other J-flags used for specific purposes are listed in Table B30. It is important to note that is not uncommon for several data flags to be associated with a single measurement, for example, a sample might be diluted and show evidence of a spectral interference. In this case, both D and K qualifiers would apply.

The R qualifier is used in cases where it is determined that data need to be rejected. Data rejection can occur for many reasons that must be explained in QA/QC narratives. In this data set, formate concentration data are rejected because of sample container contamination. Also data for ethoxylated alcohols and alkylphenols are rejected because of lab and field blank contamination as well as other laboratory QA/QC issues (see Table B29). Finally, it was pointed out in the Audit of Data Quality (ADQ) that the list provided in B30 might be added to still; for example, an additional flag might be adapted to account for analytical baseline problems. Many such specific analytical issues are captured in the J2 flag (Data estimated because laboratory QA/QC acceptance criteria not met), but expanding the list J-qualifiers allows for a more detailed assessment of data quality.

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B12. Audits of Data Quality (ADQ)

An Audit of Data Quality (ADQ) was performed per EPA's National Risk Management Research Laboratory (NRMRL) SOP, *Performing Audits of Data Quality (ADQs)*, to verify that requirements of the Quality Assurance Project Plan (QAPP) were properly implemented for the analysis of samples submitted to laboratories identified in the QAPP associated with this project. The ADQ was performed by Neptune and Company, Inc. and reviewed by NRMRL QA staff. NRMRL QA staff provided the ADQ results to PIs for response and assisted in the implementation of corrective actions. The ADQ process is an important element of Category I (highest of four levels in EPA) Quality Assurance Projects, which this study has operated under for all aspects of groundwater collection and analysis.

Complete data packages were provided to the auditors for the Pavillion Wyoming April 2012 sampling event. A complete data package consists of the following: sample information, method information, data summary, laboratory reports, raw data including QC results, and data qualifiers. The QAPP was used to identify data quality indicator requirements and goals, and a checklist was prepared based on the types of data collected.

The data packages were reviewed against the checklist by tracing a representative set of the data in detail from raw data and instrument readouts through data transcription or transference through data manipulation (either manually or electronically by commercial or customized software) through data reduction to summary data, data calculations, and final reported data. All calibration and QA/QC data were reviewed for all available data packages. Auditors also reviewed the a data summary spreadsheet to determine if data had been accurately transcribed from lab summary reports and appropriately qualified based on lab and field QC results.

The critical analytes, as identified in the QAPP (Table 9), are Gasoline Range Organics (GRO); Diesel Range Organics (DRO); Semivolatile Organic Compounds (SVOCs); Volatile Organic Compounds (VOCs, also known as VOAs) of ethanol, isopropyl alcohol, tert butyl alcohol, naphthalene, benzene, toluene, ethylbenzene, and xylene; major cation potassium, major anion chloride. Also included in the ADQ were the following analytes: dissolved inorganic and organic carbon; dissolved gases by GC; stable oxygen and hydrogen isotopes of water; low molecular weight acids by HPLC; stable carbon isotope ratio of dissolved inorganic carbon, stable carbon and hydrogen isotope ratios of dissolved methane; tritium; MBAS (methylene blue active substance), glycols; ethoxylated alcohols and alklyphenols; acrylamide; methanol, ethylene glycol, and propylene glycol.

The findings of an ADQ can consist of the following categories: deficiency (an identified deviation from project QA/QC requirements), finding (a deficiency that has or may have a significant effect on the quality of the reported results; a corrective action response is required), or observation (a deficiency that does not have a significant effect on the quality of the reported results; a corrective action response is required). The ADQ noted a series of 14 observations, most of which resulted in the addition of data qualifiers to a data

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summary spreadsheet (corrective action), or specific additions to this Appendix on QA/QC. Many ADQ observations are included to Table B29 (QA/QC narrative associated with laboratory analysis of Phase V samples).

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Table B1. Sample containers, preservation, and holding times for groundwater samples in Phase V.

Sample Type	Analysis Method (EPA Method)	Sample Bottles/# of bottles*	Preservation/ Storage	Holding Time(s)
Dissolved gases	Shaw Environmental: RSKSOP-194v4 &-175v5 (No EPA Method)	60 mL serum bottles/2	No Headspace TSP†, pH>10; refrigerate ≤6°††	14 days
Metals (filtered)	Shaw Environmental: RSKSOP-213v4 &-257v3 (EPA Methods 200.7 and 6020)	125 mL plastic bottle/1	HNO_3, pH<2; room temperature	6 months (Hg 28 days)
Metals (unfiltered)	Shaw Environmental: RSKSOP-179v2; RSKSOP-213v4 & RSKSOP-257v3 (EPA Methods 200.7 and 6020)	125 mL plastic bottle/1	HNO_3, pH<2; room temperature	6 months (Hg 28 days)
SO_4, Cl, F, Br	ORD/NRMRL (Ada): RSKSOP-276v3 (EPA Method 6500)	30 mL plastic/1	Refrigerate ≤ 6°C	28 days
NO_3 + NO_2, NH_4	ORD/NRMRL (Ada): RSKSOP-214v5 (EPA Method 350.1 and 353.2)	30 mL plastic/1	H_2SO_4, pH<2; refrigerate ≤6°C	28 days
DIC	ORD/NRMRL (Ada): RSKSOP-102v5 or 330v0 (EPA Method 9060A)	40 mL clear glass VOA vial/2	Refrigerate ≤6°C	14 days
DOC	ORD/NRMRL (Ada): RSKSOP-102v5 or 330v0 (EPA Method 9060A)	40 mL clear glass VOA vial/2	H_3PO_4, pH<2; refrigerate ≤6°C	28 days
Alcohols, aromatic, and chlorinated hydrocarbons	Shaw Environmental: RSKSOP- 259v1 (EPA Method 5021A plus 8260C)	40 mL amber glass VOA vial/2	No Headspace TSP†, pH>10; refrigerate ≤6°C	14 days
Volatile Organic Compounds	Region 8: EPA Method 5035 plus 8260C	40 mL amber glass VOA vial/2	No Headspace HCl, pH<2; refrigerate ≤6°C	14 days
Semi-Volatile Organic Compounds	Region 8: EPA Method 8270D, ORGM-508 r1.0	1 L amber glass/2	Refrigerate ≤ 6°C	7 days until extraction; 30 days post-extraction for analysis
Low Molecular Weight Acids	Shaw Environmental: RSKSOP-112v6 (No EPA Method)	40 mL glass VOA vial/2	NaOH, pH>10; refrigerate ≤ 6°C	30 days
O, H stable isotopes of water	Shaw Environmental: RSKSOP-334v0 (No EPA Method)	20 mL glass VOA vial/1	Refrigerate ≤ 6°C	Stable
$\delta^{13}C$ DIC	Isotech: gas stripping and IRMS (No EPA Method)	60 mL plastic bottle/1	Refrigerate ≤ 6°C	No information
$\delta^{13}C$ and δD of methane	Isotech: gas stripping and IRMS (No EPA Method)	1 L plastic bottle/1	Caplet of benzalkonium chloride; refrigerate ≤ 6°C	No information
Tritium	Isotech: electrolytic enrichment and radiometric analysis of ^3H (No EPA Method)	500 mL plastic bottle/1	Refrigerate ≤ 6°C	6 months
DRO	Region 8: EPA Method 8015D, ORGM-508 r1.0	1L amber glass bottle/1	HCl, pH<2; refrigerate ≤ 6°C	7 days until extraction, 40 days after extraction

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GRO	Region 8: EPA Method 8015D	40 mL amber glass VOA vial/2	No headspace; HCl, pH<2; refrigerate ≤ 6°C	14 days
Glycols	Region III method** (No EPA Method)	40 mL amber glass VOA vial/2	Refrigerate ≤ 6°C	14 days
Methanol, propylene glycol, ethylene glycol	ALS Environmental: EPA Method 8015M	40 mL amber glass VOA vial/2	HCl, pH<2; refrigerate ≤ 6°C	14 days
Acrylamide, alkylphenols, ethoxylated alcohols, ethoxylated alkyphenols	ORD/NERL (Las Vegas): (No EPA Method)	1 L amber glass/2	Refrigerate ≤ 6°C	30 days
MBAS	TestAmerica: EPA Method 425.1	500 mL plastic bottle/1	Refrigerate ≤ 6°C	2 days

† Trisodium phosphate. †† Above freezing point of water. *Spare bottles made available for laboratory QC samples and for replacement of compromised samples (broken bottle, QC failures, etc.). **EPA Methods 8000C and 8321 were followed for method development and QA/QC limits were applicable.

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Table B2. Field QC samples for groundwater analysis.

QC Sample	Purpose	Method	Frequency
Trip Blanks (VOCs and Dissolved Gases only)	Assess contamination during transportation.	Fill bottles with reagent water and preserve, take to field and returned without opening.	One in an ice chest with VOA and dissolved gas samples.
Equipment Blanks	Assess contamination from field equipment, sampling procedures, decontamination procedures, sample container, preservative, and shipping.	Apply only to samples collected via equipment, such as filtered samples: Reagent water is filtered and collected into bottles and preserved same as filtered samples.	One per day of sampling with submersible pumps.
Field Duplicates	Represent precision of field sampling, analysis, and site heterogeneity.	One or more samples collected immediately after original sample.	One in every 10 samples, or if <10 samples collected for a water type (ground or surface), collect a duplicate for one sample.
Temperature Blanks	Measure temperature of samples in the cooler.	Water sample that is transported in cooler to lab.	One per cooler.
Field Blanks*	Assess contamination introduced from sample container with applicable preservative.	In the field, reagent water is collected into sample containers with preservatives.	One per day of sampling.

* Blank samples were not collected for isotope measurements, including O, H, and C.

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Table B3. Dissolved gas blank results for Phase V.

Label	Date	Methane	Ethane	Propane	n-Butane
		mg/L	mg/L	mg/L	mg/L
FieldBlk01	4/16/2012	<0.0003	<0.0005	<0.0007	<0.0007
FieldBlk02	4/18/2012	0.012	<0.0005	BQL 0.0011	<0.0007
FieldBlk03	4/22/2012	<0.0003	<0.0005	<0.0007	<0.0007
FieldBlk04	4/24/2012	<0.0003	<0.0005	<0.0007	<0.0007
EquipBlk01	4/16/2012	<0.0003	<0.0005	<0.0007	<0.0007
EquipBlk02	4/18/2012	0.012	BQL 0.0016	BQL 0.0008	<0.0007
EquipBlk04	4/24/2012	<0.0003	<0.0005	<0.0007	<0.0007
TripBlk01	4/17/2012	<0.0003	<0.0005	<0.0007	<0.0007
TripBlk02	4/18/2012	<0.0003	<0.0005	<0.0007	<0.0007
TripBlk03	4/22/2012	<0.0003	<0.0005	<0.0007	<0.0007
TripBlk04	4/24/2012	<0.0003	<0.0005	<0.0007	<0.0007
MDL		0.0003	0.0005	0.0007	0.0007
QL		0.0013	0.0027	0.0038	0.0047
Detections in samples		12/12	9/12	7/12	6/12
Concentration min		BQL 0.0013	0.003	BQL 0.0016	BQL 0.0009
Concentration max		22.00	3.07	1.78	0.52

BQL – below quantitation level. Units are mg/L. MDL – method detection level. QL – quantitation level. Detections in samples: the number of times the analyte was detected in Phase V sampling. Minimum and maximum sample concentration in Phase V sampling activities in mg/L. Note: methane detections in FieldBlk02 and EquipBlk02 impact reliability of dissolved gas analysis fo samples PGDW05-0412 and PGPW02-0412.

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Table B4. ICP-OES blank results for undigested samples (field filtered).

Label	Date	Al	Ag	B	Ba	Be	Ca	Co	Fe	K	Mg
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
FieldBlk01	4/16/2012	<0.148	<0.004	<0.100	<0.001	<0.001	<0.086	<0.001	<0.020	<0.106	<0.030
FieldBlk02	4/18/2012	<0.148	<0.004	<0.100	<0.001	<0.001	<0.086	<0.001	<0.020	<0.106	<0.030
FieldBlk03	4/22/2012	<0.148	<0.004	<0.100	<0.001	<0.001	<0.086	<0.001	<0.020	<0.106	<0.030
FieldBlk04	4/24/2012	<0.148	<0.004	<0.100	<0.001	<0.001	<0.086	<0.001	<0.020	<0.106	<0.030
EquipBlk01	4/16/2012	<0.148	<0.004	<0.100	<0.001	<0.001	<0.086	<0.001	<0.020	<0.106	<0.030
EquipBlk02	4/18/2012	<0.148	<0.004	<0.100	<0.001	<0.001	<0.086	<0.001	<0.020	<0.106	<0.030
EquipBlk04	4/24/2012	<0.148	<0.004	<0.100	<0.001	<0.001	<0.086	<0.001	<0.020	<0.106	<0.030
MDL		0.148	0.004	0.100	0.001	0.001	0.086	0.001	0.020	0.106	0.030
QL		0.494	0.014	0.333	0.004	0.003	0.287	0.004	0.067	0.354	0.100
Detections in samples		6/20	0/20	19/20	20/20	0/20	20/20	0/20	4/20	20/20	18/20
Concentration min		BQL 0.205	--	BQL 0.108	0.005	--	3.17	--	BQL 0.055	0.469	BQL 0.069
Concentration max		0.816	--	BQL 0.285	0.147	--	314	--	0.201	31.4	12.8

BQL – below quantitation level. Units are mg/L. MDL – method detection level. QL – quantitation level. Detections in samples: the number of times the analyte was detected in Phase V sampling. Minimum and maximum sample concentration in Phase V sampling in mg/L.

Table B5. ICP-OES blank results for undigested samples (field filtered).

Label	Date	Mn	Mo	Na	Sb	Sr	Ti	Zn	Si	S	P
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
FieldBlk01	4/16/2012	<0.004	<0.005	<0.513	<0.005	<0.001	<0.002	<0.015	<0.130	<0.138	<0.018
FieldBlk02	4/18/2012	<0.004	<0.005	<0.513	<0.005	<0.001	<0.002	<0.015	<0.130	<0.138	<0.018
FieldBlk03	4/22/2012	<0.004	<0.005	<0.513	<0.005	<0.001	<0.002	<0.015	<0.130	<0.138	<0.018
FieldBlk04	4/24/2012	<0.004	<0.005	<0.513	<0.005	<0.001	<0.002	<0.015	<0.130	<0.138	<0.018
EquipBlk01	4/16/2012	<0.004	<0.005	<0.513	<0.005	<0.001	<0.002	<0.015	<0.130	<0.138	<0.018
EquipBlk02	4/18/2012	<0.004	<0.005	<0.513	<0.005	<0.001	<0.002	<0.015	<0.130	<0.138	<0.018
EquipBlk04	4/24/2012	<0.004	<0.005	<0.513	<0.005	<0.001	<0.002	<0.015	<0.130	<0.138	<0.018
MDL		0.004	0.005	0.513	0.005	0.001	0.002	0.015	0.130	0.138	0.018
QL		0.014	0.017	1.71	0.017	0.004	0.007	0.050	0.434	0.460	0.060
Detections in samples		4/20	5/20	20/20	0/20	20/20	1/20	0/20	20/20	20/20	0/20
Concentration min		0.008	BQL 0.005	190	--	0.053	0.003	--	4.71	7.38	--
Concentration max		0.090	BQL 0.008	1290	--	3.00	--	--	12.0	1120	--

BQL – below quantitation level. Units are mg/L. MDL – method detection level. QL – quantitation level. Detections in samples: the number of times the analyte was detected in Phase V sampling.

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Minimum and maximum sample concentration in Phase V sampling in mg/L.

Table B6. ICP-OES blank results for digested samples (unfiltered).

Label	Date	Al	Ag	B	Ba	Be	Ca	Co	Fe	K	Mg
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
FieldBlk01	4/16/2012	<0.164	BQL 0.005	<0.111	<0.001	<0.003	<0.095	<0.001	<0.022	<0.118	<0.033
FieldBlk02	4/18/2012	<0.164	<0.004	<0.111	<0.001	<0.003	<0.095	<0.001	<0.022	<0.118	<0.033
FieldBlk03	4/22/2012	<0.164	<0.004	<0.111	<0.001	<0.003	<0.095	<0.001	<0.022	<0.118	<0.033
FieldBlk04	4/24/2012	<0.164	<0.004	<0.111	<0.001	<0.003	<0.095	<0.001	<0.022	<0.118	<0.033
EquipBlk01	4/16/2012	<0.164	<0.004	<0.111	<0.001	<0.003	<0.095	<0.001	<0.022	<0.118	<0.033
EquipBlk02	4/18/2012	<0.164	<0.004	<0.111	<0.001	<0.003	<0.095	<0.001	<0.022	<0.118	<0.033
EquipBlk04	4/24/2012	<0.164	<0.004	<0.111	<0.001	<0.003	<0.095	<0.001	<0.022	<0.118	<0.033
MDL		0.164	0.004	0.111	0.001	0.003	0.095	0.001	0.022	0.118	0.033
QL		0.548	0.016	0.370	0.004	0.011	0.319	0.004	0.074	0.393	0.111
Detections in samples		4/12	3/12	10/12	12/12	0/12	12/12	0/12	9/12	12/12	11/12
Concentration min		BQL 0.198	BQL 0.005	BQL 0.112	0.005	--	3.34	--	BQL 0.025	0.426	BQL 0.081
Concentration max		1.11	BQL 0.010	BQL 0.215	0.158	--	315	--	2.33	31.7	6.15

BQL – below quantitation level. Units are mg/L. MDL – method detection level. QL – quantitation level. Detections in samples: the number of times the analyte was detected in Phase V sampling. Minimum and maximum sample concentration in Phase V sampling in mg/L.

Table B7. ICP-OES blank results for digested samples (unfiltered).

Label	Date	Mn	Mo	Na	Sb	Sr	Ti	Zn	Si	S	P
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
FieldBlk01	4/16/2012	<0.004	<0.006	<0.569	<0.006	<0.001	<0.002	<0.017	<0.144	<0.153	<0.020
FieldBlk02	4/18/2012	<0.004	<0.006	<0.569	BQL 0.006	<0.001	<0.002	<0.017	<0.144	<0.153	<0.020
FieldBlk03	4/22/2012	<0.004	<0.006	<0.569	<0.006	<0.001	<0.002	<0.017	<0.144	<0.153	<0.020
FieldBlk04	4/24/2012	<0.004	<0.006	<0.569	<0.006	<0.001	<0.002	<0.017	<0.144	<0.153	<0.020
EquipBlk01	4/16/2012	<0.004	<0.006	<0.569	<0.006	<0.001	<0.002	<0.017	<0.144	<0.153	<0.020
EquipBlk02	4/18/2012	<0.004	<0.006	<0.569	BQL 0.007	<0.001	<0.002	<0.017	<0.144	<0.153	<0.020
EquipBlk04	4/24/2012	<0.004	<0.006	<0.569	<0.006	<0.001	<0.002	<0.017	<0.144	<0.153	<0.020
MDL		0.004	0.006	0.569	0.006	0.001	0.002	0.017	0.144	0.153	0.020
QL		0.016	0.019	1.90	0.019	0.004	0.007	0.056	0.482	0.511	0.067
Detections in samples		6/12	5/12	12/12	2/12	12/12	3/12	1/12	12/12	12/12	0/12
Concentration min		BQL 0.005	BQL 0.007	189	BQL 0.006	0.056	BQL 0.003	0.168	4.80	5.35	--
Concentration max		0.092	BQL 0.010	1290	BQL 0.011	2.94	0.011	--	11.9	1130	--

BQL – below quantitation level. Units are mg/L. MDL – method detection level. QL – quantitation level. Detections in samples: the number of times the analyte was detected in Phase V sampling. Minimum and maximum sample concentration in Phase V sampling in mg/L.

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Table B8. ICP-MS blank results for undigested and digested samples.

Label	Date	As	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Tl	U
Undigested (filtered)		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
FieldBlk01	4/16/2012	<0.093	<0.008	<0.015	<0.074	<0.009	<0.099	<0.027	<0.010	<0.132	<0.002	<0.002
FieldBlk02	4/18/2012	<0.093	<0.008	<0.015	<0.074	<0.009	<0.099	<0.027	<0.010	<0.132	<0.002	<0.002
FieldBlk03	4/22/2012	<0.093	<0.008	<0.015	<0.074	<0.009	<0.099	<0.027	<0.010	<0.132	<0.002	<0.002
FieldBlk04	4/24/2012	<0.093	<0.008	<0.015	<0.074	BQL 0.009	<0.099	<0.027	<0.010	<0.132	<0.002	<0.002
EquipBlk01	4/16/2012	<0.093	<0.008	<0.015	<0.074	<0.009	<0.099	<0.027	<0.010	<0.132	<0.002	<0.002
EquipBlk02	4/18/2012	<0.093	<0.008	<0.015	<0.074	<0.009	<0.099	<0.027	<0.010	<0.132	<0.002	<0.002
EquipBlk04	4/24/2012	<0.093	<0.008	<0.015	<0.074	<0.009	<0.099	<0.027	<0.010	<0.132	<0.002	<0.002
MDL		0.093	0.008	0.015	0.074	0.009	0.099	0.027	0.010	0.132	0.002	0.002
QL		0.200	0.025	0.200	1.00	0.032	1.00	0.090	0.032	0.500	0.006	0.007
Label	**Date**	**As**	**Cd**	**Cr**	**Cu**	**Hg**	**Ni**	**Pb**	**Sb**	**Se**	**Tl**	**U**
Digested (total)		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
FieldBlk01	4/16/2012	<0.103	<0.009	<0.017	<0.082	<0.107	<0.110	BQL 0.073	BQL 0.020	BQL 0.150	<0.002	<0.002
FieldBlk02	4/18/2012	<0.103	<0.009	<0.017	<0.082	<0.107	<0.110	<0.030	BQL 0.032	BQL 0.380	0.007	<0.002
FieldBlk03	4/22/2012	<0.103	<0.009	<0.017	<0.082	<0.107	<0.110	<0.030	<0.011	<0.147	<0.002	<0.002
FieldBlk04	4/24/2012	<0.103	<0.009	<0.017	<0.082	<0.107	<0.110	BQL 0.057	BQL 0.013	<0.147	<0.002	<0.002
EquipBlk01	4/16/2012	<0.103	<0.009	0.223	<0.082	<0.107	<0.110	<0.030	BQL 0.013	<0.147	<0.002	<0.002
EquipBlk02	4/18/2012	<0.103	<0.009	<0.017	<0.082	<0.107	<0.110	<0.030	BQL 0.014	<0.147	BQL 0.003	<0.002
EquipBlk04	4/24/2012	<0.103	<0.009	<0.017	<0.082	<0.107	<0.110	<0.030	<0.011	BQL 0.220	<0.002	<0.002
MDL		0.103	0.009	0.017	0.082	0.107	0.11	0.030	0.011	0.147	0.002	0.002
QL		0.222	0.028	0.222	1.11	0.357	1.11	0.100	0.036	1.11	0.007	0.008

BQL – below quantitation level. Units are µg/L. MDL – method detection level. QL – quantitation level.

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Table B9. Blank results for capillary electrophoresis, Lachat flow injection analysis, inorganic carbon and organic carbon analyses in Phase V.

Label	Date	Cl	SO_4	F	NO_3+NO_2	NH_4	DIC	DOC
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
FieldBlk01	4/16/2012	<0.106	<0.049	<0.029	<0.008	<0.006	BQL 0.220	<0.044
FieldBlk02	4/18/2012	<0.106	<0.049	<0.029	BQL 0.009	<0.006	BQL 0.229	BQL 0.076
FieldBlk03	4/22/2012	<0.106	<0.049	<0.029	<0.008	<0.006	BQL 0.203	<0.044
FieldBlk04	4/24/2012	<0.106	<0.049	<0.029	BQL 0.028	<0.006	BQL 0.220	BQL 0.067
EquipBlk01	4/16/2012	<0.106	<0.049	<0.029	<0.008	<0.006	BQL 0.214	<0.044
EquipBlk02	4/18/2012	<0.106	<0.049	<0.029	BQL 0.008	<0.006	BQL 0.208	<0.044
EquipBlk04	4/24/2012	<0.106	<0.049	<0.029	<0.008	<0.006	BQL 0.203	BQL 0.067
MDL		0.106	0.049	0.029	0.008	0.006	0.067	0.044
QL		1.00	1.00	0.200	0.050	0.100	0.50	1.00
Detections in samples		20/20	20/20	20/20	10/20	12/20	12/12	12/12
Concentration min		8.51	13.5	BQL 0.382	BQL 0.019	BQL 0.062	1.25	BQL 0.370
Concentration max		495	3470	2.37	0.138	2.61	19.8	19.4

BQL – below quantitation level. Units are mg/L. MDL – method detection level. QL – quantitation level. Detections in samples: the number of times the analyte was detected in Phase V sampling. Minimum and maximum sample concentration in Phase V sampling in mg/L.

Table B10. Blank results for organic acid analyses in Phase V.

Label	Date	Lactate	Formate	Acetate	Propionate	Isobutyrate	Butyrate
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
FieldBlk01	4/16/2012	<0.009	1.69	<0.009	<0.016	<0.008	<0.009
FieldBlk02	4/18/2012	<0.009	1.77	<0.009	<0.016	<0.008	<0.009
FieldBlk03	4/22/2012	<0.009	2.12	<0.009	<0.016	<0.008	<0.009
FieldBlk04	4/24/2012	<0.009	2.67	<0.009	<0.016	<0.008	<0.009
EquipBlk01	4/16/2012	<0.009	1.63	<0.009	<0.016	<0.008	<0.009
EquipBlk02	4/18/2012	<0.009	1.83	<0.009	<0.016	<0.008	<0.009
EquipBlk04	4/24/2012	<0.009	2.67	<0.009	<0.016	<0.008	<0.009
MDL		0.009	0.012	0.009	0.016	0.008	0.009
QL		0.10	0.10	0.10	0.10	0.10	0.10
Detections in samples		1/12	12/12	5/12	5/12	0/12	0/12
Concentration min		0.25	0.55	2.84	BQL 0.075	--	--

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Concentration max		--	3.06	6.08	0.844	--	--

BQL – below quantitation level. Units are mg/L. MDL – method detection level. QL – quantitation level. Detections in samples: the number of times the analyte was detected in Phase V sampling. Minimum and maximum sample concentration in Phase V sampling in mg/L. Note: all formate results rejected due to formate contamination in blank samples.

Table B11. Blank results for alcohols, aromatic, and chlorinated hydrocarbons (µg/L) in Phase V (Shaw Environmental, Ada, OK).

Label	FieldBlk01	FieldBlk02	FieldBlk03	FieldBlk04	EquipBlk01	EquipBlk02	EquipBlk04	TripBlk01	TripBlk02	TripBlk03	TripBlk04	MDL	QL
Date	4/16/12	4/18/12	4/22/12	4/24/12	4/16/12	4/18/12	4/24/12	4/17/12	4/18/12	4/22/12	4/24/12		
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Vinyl chloride	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	0.14	1.0
1,1-Dichloroethene	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.07	0.5
Methylene Chloride	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	0.19	0.5
trans-1,2-Dichloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.5
1,1-dichloroethane	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.15	0.5
cis-1,2-Dichloroethene	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.07	0.5
Chloroform	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
1,1,1-Trichloroethane	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.5
Carbon Tetrachloride	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
1,2-Dichloroethane	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.07	0.5
Trichloroethene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
1,1,2-Trichloroethane	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	0.09	0.5
Tetrachloroethene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.5
Chlorobenzene	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.5
1,3-Dichlorobenzene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.5
1,4-Dichlorobenzene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5

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1,2-Dichlorobenzene	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.11	1.0
Ethanol	<24.7	<24.7	<24.7	<24.7	<24.7	<24.7	<24.7	<24.7	<24.7	<24.7	<24.7	24.7	100
Isopropanol	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	11.4	100
n-Propanol	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	13.5	100
Isobutanol	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6	15.6	100
n-Butanol	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	<15.5	15.5	100
Acetone	<3.97	<3.97	<3.97	<3.97	<3.97	<3.97	<3.97	<3.97	<3.97	<3.97	<3.97	3.97	5.0
tert-Butyl Alcohol	<1.72	<1.72	<1.72	<1.72	<1.72	<1.72	<1.72	<1.72	<1.72	<1.72	<1.72	1.72	5.0
Methyl tert-Butyl Ether	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.11	0.5
di-Isopropyl Ether	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.11	0.5
Ethyl tert-Butyl Ether	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
Benzene	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.5
tert-Amyl Methyl Ether	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.5
2,5-Dimethylfuran	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
Toluene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	BQL 0.297	<0.03	<0.03	<0.03	<0.03	0.03	0.5
1,2-Dibromoethane	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	0.09	1.0
Ethyl Benzene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
m+p Xylene	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.08	0.5
o-Xylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
1,3,5-Trimethylbenzene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	1.0
1,2,4-Trimethylbenzene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	1.0
1,2,3-Trimethylbenzene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	1.0
Naphthalene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	1.0

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All results in µg/L. BQL – below quantitation level. MDL – method detection level. QL – quantitation level.

Table B12. Blank results for Volatile Organic Compounds (µg/L) in Phase V (Region 8, Golden, CO).

Label	FieldBlk01	FieldBlk02	FieldBlk03	FieldBlk04	EquipBlk01	EquipBlk02	EquipBlk03	EquipBlk04	TripBlk01	TripBlk02	TripBlk03	TripBlk04	QL
Date	4/16/12	4/18/12	4/22/12	4/24/12	4/16/12	4/18/12	4/22/12	4/24/12	4/17/12	4/18/12	4/22/12	4/24/12	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1,1,1,2-Tetrachloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,1,1-Trichloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,1,2,2-Tetrachloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,1,2-Trichloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,1-Dichloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,1-Dichloroethene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,1-Dichloropropene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2,3-Trichlorobenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2,3-Trichloropropane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2,4-Trichlorobenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2,4-Trimethylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2-Dibromo-3-chloropropane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2-Dibromoethane (EDB)	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2-Dichlorobenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2-Dichloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,2-Dichloropropane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,3,5-Trimethylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,3-Dichlorobenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25

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1,3-Dichloropropane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,3-Dimethyl adamantane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
1,4-Dichlorobenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
2,2-Dichloropropane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
2-Butanone	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
2-Chlorotoluene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
2-Hexanone	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
4-Chlorotoluene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
4-Methyl-2-pentanone	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Acetone	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Acrylonitrile	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Adamantane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Allyl chloride	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Benzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Bromobenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Bromochloromethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Bromodichloromethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Bromoform	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Bromomethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Carbon disulfide	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Carbon tetrachloride	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25

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Chlorobenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Chlorodibromomethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Chloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Chloroform	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Chloromethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
cis-1,2-Dichloroethene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
cis-1,3-Dichloropropene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Dibromomethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Dichlorodifluoromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Ethyl Ether	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Ethylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Hexachloroethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Iodomethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Isopropylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
m,p-Xylene	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Methacrylonitrile	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Methyl Acrylate	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Methyl tert-Butyl Ether	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Methylene chloride	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Naphthalene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
n-Butyl Benzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25

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n-Propyl Benzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
o-Xylene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
p-Isopropyltoluene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
sec-Butylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Styrene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
tert-Butylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Tetrachloroethene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Toluene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.310	<0.25	<0.25	<0.25	<0.25	0.25
trans-1,2-Dichloroethene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
trans-1,3-Dichloropropene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Trichloroethene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Trichlorofluoromethane	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Vinyl chloride	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25
Xylenes (total)	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00

All results in µg/L. QL – Quantitation level. Note all values flagged as estimated due to missing second source calibration verification.

Table B13. Blank results for Semi-Volatile Organic Compounds (µg/L) in Phase V (Region 8 laboratory, Golden, CO).

Label	FieldBlk01	FieldBlk02	FieldBlk03	FieldBlk04	EquipBlk01	EquipBlk02	EquipBlk03	EquipBlk04	QL
Date	4/16/12	4/18/12	4/22/12	4/24/12	4/16/12	4/18/12	4/22/12	4/24/12	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Limonene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,2,4-Trichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,2-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,2-Dinitrobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,3-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,3-Dinitrobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,3-Dimethyl adamantane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,4-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1,4-Dinitrobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
1-Methylnaphthalene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2,3,4,6-Tetrachlorophenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
2,3,5,6-Tetrachlorophenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00

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2,4,5-Trichlorophenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
2,4,6-Trichlorophenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
2,4-Dichlorophenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
2,4-Dimethylphenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
2,4-Dinitrophenol	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.00
2,4-Dinitrotoluene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2,6-Dinitrotoluene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2-Butoxyethanol	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2-Butoxyethanol phosphate	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2-Chloronaphthalene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2-Chlorophenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
2-Methylnaphthalene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2-Methylphenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
2-Nitroaniline	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
2-Nitrophenol	<2.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2.00
3 & 4-Methylphenol	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	5.00
3,3´-Dichlorobenzidine	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
3-Nitroaniline	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.00
4,6-Dinitro-2-methylphenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
4-Bromophenyl phenyl ether	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
4-Chloro-3-methylphenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00

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4-Chloroaniline	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.00
4-Chlorophenyl phenyl ether	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
4-Nitroaniline	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.00
4-Nitrophenol	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.00
Acenaphthene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Acenaphthylene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Adamantane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Aniline	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Anthracene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Azobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Benzo (a) anthracene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Benzo (a) pyrene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Benzo(b)fluoranthene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Benzo (g,h,i) perylene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Benzo (k) fluoranthene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Benzoic acid	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.00
Benzyl alcohol	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Bis(2-chloroethoxy)methane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Bis(2-chloroethyl)ether	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Bis(2-chloroisopropyl)ether	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Bis-(2-Ethylhexyl) adipate	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Bis(2-ethylhexyl)phthalate	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00

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Butyl benzyl phthalate	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Carbazole	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.00
Chrysene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Dibenz (a,h) anthracene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Dibenzofuran	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Diethyl phthalate	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Dimethyl phthalate	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Di-n-butyl phthalate	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Di-n-octyl phthalate	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Diphenylamine	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Fluoranthene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Fluorene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Hexachlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Hexachlorobutadiene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Hexachlorocyclopentadiene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Hexachloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Indeno (1,2,3-cd) pyrene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Isophorone	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.17	1.00
Naphthalene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Nitrobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
N-Nitrosodimethylamine	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00

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N-Nitrosodi-n-propylamine	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Pentachlorophenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
Phenanthrene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Phenol	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
Pyrene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Pyridine	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00
Squalene	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	2.00
Terpinol	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.00

All results in µg/L. QL – Quantitation level.

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Table B14. Blank results for GRO and DRO analyses in Phase V (Region 8 laboratory, Golden, CO) and blank results for 2-butoxyethanol and glycol ethers in Phase V sampling (Region 3 laboratory, Fort Meade, MD).

	FieldBlk01	FieldBlk02	FieldBlk03	FieldBlk04	EquipBlk01	EquipBlk02	EquipBlk03	EquipBlk04	QL
Date	4/16/12	4/18/12	4/22/12	4/24/12	4/16/12	4/18/12	4/22/12	4/24/12	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Gasoline Range Organics	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	22.4	20.0
Diesel Range Organics	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	20.0
2-Butoxyethanol	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	<5.0	5.0
Diethylene Glycol	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	<5.0	5.0
Triethylene Glycol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	<10.0	10.0
Tetraethylene Glycol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	<10.0	10.0

All results in µg/L. QL – Quantitation level. – No sample.

Table B15. Blank results for methanol, propylene glycol, and ethylene glycol (ALS Environmental, Holland, MI).

	FieldBlk01	FieldBlk02	FieldBlk03	FieldBlk04	EquipBlk01	EquipBlk02	EquipBlk04	QL
Date	4/16/12	4/18/12	4/22/12	4/24/12	4/16/12	4/18/12	4/24/12	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methanol	<5000	<5000	<5000	<5000	<5000	<5000	<5000	5000
Propylene Glycol	<5000	<5000	<5000	<5000	<5000	<5000	<5000	5000
Ethylene Glycol	<5000	<5000	<5000	<5000	<5000	<5000	<5000	5000

All results in µg/L. QL – Quantitation level.

Table B16. Blank results for ethoxylates (EPA ORD/NERL Las Vegas).

	FieldBlk01	FieldBlk02	FieldBlk03	FieldBlk04	EquipBlk01	EquipBlk02	EquipBlk03	EquipBlk04	QL
Date	4/16/12	4/18/12	4/22/12	4/24/12	4/16/12	4/18/12	4/22/12	4/24/12	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
Nonylphenol ethoxylate	0.37	0.09	0.07	0.09	0.17	0.09	0.07	0.09	0.2
Nonylphenol	0.42	0.06	<0.05	0.07	0.05	0.06	0.07	<0.05	0.05
Octylphenol	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Ethoxylated alcohol C12	0.30	0.24	<0.05	0.08	0.10	0.44	0.12	0.05	0.05
Ethoxylated alcohol C13	0.58	<0.05	0.05	0.06	0.15	<0.05	0.17	0.09	0.05
Ethoxylated alcohol C14	0.38	0.65	0.06	0.24	0.14	1.16	0.12	0.11	0.05
Ethoxylated alcohol C15	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.07	<0.05	0.05
Acrylamide	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.2

Table B17. Blank results for Methylene Blue Active Substances (TestAmerica, Savannah, GA).

	FieldBlk01	FieldBlk02	FieldBlk03	FieldBlk04	EquipBlk01	EquipBlk02	EquipBlk04		QL
Date	4/16/12	4/18/12	4/22/12	4/24/12	4/16/12	4/18/12	4/24/12		
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L
Methylene Blue Active Substances (MBAS)	*	<0.20	<0.20	<0.20	*	<0.20	<0.20		0.20

QL – Quantitation level. *- samples lost during shipment. Units are in mg/L as linear alkyl benzene sulfonate (LAS, molecular weight = 340).

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Table B18. Duplicate data for selected major ions, DOC, and DIC in ground water samples collected during Phase V.

Sample	Date	Na	K	Ca	Mg	Ba	Sr	Si	Cl	SO4	F	NO3	DOC	DIC
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
PGDW20-0412	4/16/2012	490	1.64	57.9	5.93	0.008	0.864	5.69	32.3	1130	0.94	0.073	0.632	14.9
PGDW20d-0412	4/16/2012	493	1.27	58.3	5.95	0.009	0.873	5.68	32.3	1240	1.03	BQL 0.045	0.627	14.8
RPD (%)		0.4	25.4	0.7	0.3	3.6	1.0	0.2	0.0	9.3	8.8	NC	0.8	0.7
EPAMW01-0412	4/30/2012	276	17.3	9.87	0.139	0.021	0.315	10.5	19.4	390	2.29	0.120	5.63	15.2
EPAMW01d-0412	4/30/2012	277	17.2	9.91	0.152	0.021	0.314	10.5	20.9	388	2.33	BQL 0.045	5.75	15.2
RPD (%)		0.4	0.6	0.4	8.9	1.4	0.3	0.0	7.4	0.5	1.7	NC	2.1	0.0

RPD is the calculated relative percent difference: RPD = |[2*(sample1-sample2)/((sample1+sample2)]*100|. NC – not calculated. BQL – below quantitation level. Units are mg/L. RPD only calculated if both the primary and duplicate samples show analyte concentrations above the method quantitation limit (QL).

Table B19. Duplicate data for methane and selected dissolved organic compounds in ground water samples collected during Phase V sampling.

Sample	Date	Methane	Benzene	Toluene	m,p-Xylenes	Isopropyl alcohol	Tert-butyl alcohol	Phenol	Diethylene Glycol	Triethylene Glycol	Acetone
		mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
PGDW20-0412	4/16/2012	0.111	<0.06	<0.03	<0.08	<11.4	<1.72	<2.0	<5.0	<10.0	<1.0
PGDW20d-0412	4/16/2012	0.108	<0.06	<0.03	<0.08	<11.4	<1.72	<2.0	<5.0	<10.0	<1.0
RPD (%)		2.7	NC	NC	NC	NC	NC	NC	NC	NC	NC
EPAMW01-0412	4/30/2012	17.3	<0.06	BQL 0.262	<0.08	BQL 69.8	<1.72	8.09	53.9	11.5	155
EPAMW01d-0412	4/30/2012	17.3	<0.06	BQL 0.259	<0.08	BQL 69.2	<1.72	8.42	53.9	11.6	133
RPD (%)		0.0	NC	NC	NC	NC	NC	4.0	0.0	0.9	15.3

RPD is the calculated relative percent difference: RPD = |[2*(sample1-sample2)/((sample1+sample2)]*100|. NC – not calculated. Methane from dissolved gas analysis. Benzene, toluene, m,p-

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xylenes, isopropyl alcohol, and ter-butyl alcohol from RSKSOP259v1 (alcohols, aromatics, and chlorinated hydrocarbons). Phenol from EPA Method 8270D (semi-volatile organic compounds). Diethylene and triethylene glycol from Region 3 method. Acetone from EPA Method 5035 plus 8260C (volatile organic compounds). RPD only calculated if both the primary and duplicate samples showed analyte concentrations above the method quantitation limit (QL).

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Table B20. QA/QC requirements for analysis of metals and major ions.

Measurement	Analysis Method	Blanks (Frequency)	Calibration Checks (Frequency)	Second Source (Frequency)	Duplicates (Frequency)	Matrix Spikes (Frequency)
Metals	RSKSOP-213v4 (EPA Methods 200.7 and 6020)	<QL for 80% of metals; (Beginning and end of each sample queue, 10-15 samples)	90-110% of known value (Beginning and end of each sample queue, 10-15 samples)	PE sample acceptance limits or 90-110% of known value (Immediately after first calibration check)	RPD<10 for 80% of metals; for results <5x QL, difference of ≤QL(Every 15 samples)	90-110% Rec. for 80% of metals w/ no individual exceeding 50-150% Rec. (one per sample set, 10-15 samples)
Metals	RSKSOP-257v3 (EPA Methods 200.7 and 6020)	<QL for 80% of metals; none>10xMDL (Beginning and end of each sample queue, 10-15 samples)	90-110% of known value (Beginning and end of each sample queue, 10-15 samples)	PE sample acceptance limits or 90-110% of known value (Immediately after first calibration check)	RPD<10 for 80% of metals; for results <5xQL, difference of <QL (Every 15 samples)	90-110% Rec. for 80% of metals w/ no individual exceeding 70-130% (one per sample set, 10-15 samples)
SO_4, Cl, F, Br	RSKSOP-2 (EPA Method 6500)76v3	<MDL (Beginning and end of each sample queue)	90-110% Rec. (Beginning, end, and every 10 samples)	PE sample acceptance limits (One per sample set)	RPD<10 (every 15 samples)	80-120% Rec. (one per every 20 samples)
NO_3 + NO_2, NH_4	RSKSOP-214v5 (EPA Method 350.1 and 353.2)	<½ lowest calib. std. (Beginning and end of each sample queue)	90-110% Rec. (Beginning, end, and every 10 samples)	PE sample acceptance limits (One per sample set)	RPD<10 (every 10 samples)	80-120% Rec. (one per every 20 samples)

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Table B21. QA/QC requirements for analysis of dissolved gases, DIC/DOC, VOCs, low molecular weight acids and stable isotopes of water.

Measurement	Analysis Method	Blanks (Frequency)	Calibration Checks (Frequency)	Second Source (Frequency)	Duplicates (Frequency)	Matrix Spikes (Frequency)
Dissolved gases	RSKSOP-194v4 &-175v5 (No EPA Method)	≤MDL (He/Ar blank, first and last in sample queue; water blank before samples)	85-115% of known value (After helium/Ar blank at first of analysis queue, before helium/Ar blank at end of sample set, and every 15 samples)	85-115% of known value (After first calibration check)	RPD≤20 (Every 15 samples)	NA
DIC/DOC	RSKSOP- 330v0 (EPA Method 9060A)	<MDL (Beginning and end of sample set)	90-100% of known value (Beginning and end of sample set and every 10 samples)	PE sample reported acceptance limits. Others: 90-100% recovery (one per sample set)	RPD<10 (every 10 samples)	80-120% Rec.
Alcohols, aromatics, and chlorinated hydrocarbons*	RSKSOP-259v1 (EPA Method 5021A plus 8260C)	<MDL (Beginning and end of each sample set)	80-120% Rec. (Beginning, end, and every 20 samples)	80-120% of known value Once at beginning	RPD<25 (every 20 samples)	70-130% Rec. (every 20 samples)
Low Molecular Weight Acids	RSKSOP-112v6 (No EPA Method)	<MDL (Beginning of a sample queue; every 10 samples; and end of sample queue)	85-115% of the recovery (Prior to sample analysis; every 10 samples; end of sample queue)	85-115% of recovery (Prior to sample analysis)	<15 RPD (Every 20 samples through a sample queue)	80-120 % recovery (Every 20 samples through a sample queue)
O, H stable isotopes of water**	RSKSOP-334v0 (No EPA Method)	NA	Difference of calibrated/true < 1.5‰ for δ2H & < 0.3‰ for δ18O (Beginning, end, and every 20 samples)	Working stds calibrated against IAEAstds.† (Beginning, end, and every tenth sample)	Difference ≤ 1.5 ‰ for δ^2H and < 0.3‰ for δ^{18}O (Beginning and end of sample set and every twenty samples)	NA

*Surrogate compounds spiked at 100 ug/L: p-bromofluorobenzene and 1,2-dichlorobenzene-d4, 85-115% recovery. **Additional checks: internal reproducibility prior to each sample set, std dev ≤ 1‰ for δ^2H and ≤ 1‰ for δ^{18}O. †International Atomic Energy Agency (VSMOW, GISP, and SLAP). Corrective actions are outlined in the SOPs. MDL = Method Detection Limit. QL = Quantitation Limit. PE = Performance Evaluation.

Table B22. Region VIII laboratory QA/QC requirements for semi-volatiles, GRO, DRO.

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QC Type	Semivolatiles	DRO	GRO	Frequency
Method Blanks	<RL Preparation or Method Blank, one with each set of extraction groups. Calibration Blanks are also analyzed	<RL Preparation or Method Blank	<RL Preparation or Method Blank and IBL	At least one per sample set
Surrogate Spikes	Limits based upon DoD statistical study (rounded to 0 or 5) for the target compound analyses.	60-140% of expected value	70-130% of expected value	Every field and QC sample
Internal Standards Verification	Every sample, EICP area within -50% to +100% of last ICV or first CCV.	NA	NA	Every field and QC sample
Initial multilevel calibration	ICAL: minimum of 6 levels (0.25 -12.5 ug/L) , one is at the MRL (0.50 ug/L), prior to sample analysis (not daily) RSD≤20%, r^2≥0.990	ICAL: 10-500 ug/L RSD<=20% or r^2>=0.990	ICAL: .25-12.5 ug/L for gasoline (different range for other compounds) RSD<=20% or r2>=0.990	As required (not daily if pass ICV)
Initial and Continuing Calibration Checks	80-120% of expected value	80-120% of expected value	80-120% of expected value	At beginning of sample set, every tenth sample, and end of sample set
Second Source Standards	ICV1 70-130% of expected value	ICV1 80-120% of expected value	ICVs 80-120% of expected value	Each time calibration performed
Laboratory Control Samples (LCS)	Statistical Limits from DoD LCS Study (rounded to 0 or 5) or if SRM is used based on those certified limits	Use an SRM: Values of all analytes in the LCS should be within the limits determined by the supplier. Otherwise 70-130% of expected value	Use and SRM: Values of all analytes in the LCS should be within the limits determined by the supplier. Otherwise 70-130% of expected value	One per analytical batch or every 20 samples, whichever is greater
Matrix Spikes (MS)	Same as LCS	Same as LCS	70-130% of expected value	One per sample set or every 20 samples, whichever is more frequent
MS/MSD	% Recovery same as MS RPD ≤ 30	% Recovery same as MS RPD ≤ 25	% Recovery same as MS RPD ≤ 25	One per sample set or every 20 samples, whichever is more frequent
Reporting Limits*	0.1 µg/L (generally)[1] for target compounds HF special compounds are higher	20 µg/L[1]	20 µg/L[2]	NA

[1]Based on 1000 mL sample to 1 mL extract. [2]Based on a 5 mL purge.

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Table B23. Isotech laboratory QA/QC requirements for $\delta^{13}C$ of DIC (Dissolved Inorganic Carbon).

QC Type	Performance Criteria	Frequency
Mass Spec Calibration Check	Difference of calibrated/true ≤0.5‰	One at beginning of day, and one after samples are analyzed.
Mass Spec Zero Enrichment Check	0 ± 0.1‰	Once a day
Lab Duplicates	≤1‰	1 per every 5 samples**

Working standards calibrated against IAEA (International Atomic Energy Agency) standard LSVEC and NBS-19; referenced to $\delta^{13}C$ of the Peedee belemnite (NIST material). **If < 5 samples are submitted, run a duplicate regardless of total number.

Table B24. Isotech Laboratory QA/QC requirements for $\delta^{13}C$ of dissolved methane (and >C1) and δD of dissolved methane.

QC Type	Performance Criteria	Frequency
Mass Spec Calibration Check	Difference of calibrated/true ≤0.5‰ for $\delta^{13}C$ and ≤3‰ for δD	One at beginning of day and after samples are analyzed for $\delta^{13}C$*; one at beginning of day and every tenth sample for δD**
Mass Spec Zero Enrichment Check	0±0.1‰ for $\delta^{13}C$ and 0 ±1 ‰ for δD	Once a day for $\delta^{13}C$ and every tenth sample for δD
Lab Duplicates	≤1 ‰ for $\delta^{13}C$ and ≤3‰ for δD	1 per every 10 samples***
Preparation System Check/Reference Standards	≤1 ‰ for $\delta^{13}C$ and ≤3‰ for δD	One per every 10 samples

*Working standards calibrated against IAEA (International Atomic Energy Agency) standard LSVEC and NBS-19; referenced to $\delta^{13}C$ of the PeeDee belemnite (NIST material). **Working standards calibrated against VSMOW, SLAP, and GISP; referenced to VSMOW.***If < 10 samples are submitted, run a duplicate regardless of total number.

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Table B25. QA/QC requirements for LC/MS/MS analysis of glycols.

QC Type	Performance Criteria	Frequency
Method Blanks	<RL	One per every 20 samples
Solvent Blanks	<RL	One per every 10 samples
Initial and Continuing Calibration Checks	80-120% of expected value	At beginning of sample set, after every tenth sample, and end of sample set
Second Source Standards	80-120% of expected value	Each time calibration performed
Laboratory Control Samples (LCS)	80-120% of expected value	One per analytical batch or every 20 samples, whichever is greater
Matrix Spikes (MS)	70-130% of expected value	One per sample set or every 20 samples, whichever is more frequent
MS/MSD	RPD ≤ 25	One per sample set or every 20 samples, whichever is more frequent

RL = Reporting Limit. Corrective Actions: If re-analysis was not possible (such as lack of sample volume), the data was qualified with a determination about the impact on the sample data.

Table B26. Isotech Laboratory QA/QC requirements for tritium.

QC Type	Performance Criteria	Frequency
Calibration Check	Accuracy criteria based on 1 sigma limits of existing data	Dead water blank in every set or minimum of 1 per 12 samples; calibrated with NIST 4361C, 1 per every 12 samples
Lab Duplicates	Precision based on 1 sigma limits of existing data	1 per every 10 samples
Preparation System Check/Reference Standards	Accuracy criteria based on 1 sigma limits of existing data	One per every 12 samples, checks against prepared dilutions of NIST 4361C

Table B27. ALS Environmental QA/QC requirements for methanol, ethylene glycol, and propylene glycol.

Blanks (frequency)	Calibration Checks (frequency)	Second Source (frequency)	Duplicates (frequency)	Matrix Spikes
<1/2QL (1 per batch of 20 or less samples)	85-115% of known value (after calibration, every 20 samples, end)	85-115% of known value (Each new calibration)	RPD≤50 For MS/MSD pair (every 20 samples or less)	50-150% recovery (One per 20 samples, or less),

Table B28. TestAmerica QA/QC requirements for MBAS.

Blanks (frequency)	Calibration Checks (frequency)	Second Source (frequency)	Duplicates (frequency)	Matrix Spikes
Method Blank, 1 per batch, result <0.5 RL of 0.2 mg/L	At beginning and at end and after every 10 samples, 90-110%	After initial calibration, 90-110% of known value	RPD<10	80-120% recovery (one per 20 or every set)

The holding time for this analysis is 2 days.

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Analysis/Lab	QC Narrative	Impact on Data
Dissolved gases/Shaw Environmental	Data are reported for detections below QLs but above MDLs. FieldBlk01 arrived with 5mm bubble; TripBlk01 arrived with 10 mm bubble; TripBlk03 arrived with 7 mm bubble; PGDW50 arrived with 6 mm bubble; EPAMW02-0412-2 arrived with 15 mm bubble; TripBlk04 arrived with 6 mm bubble; EPAMW01-0412 arrived with 6 mm bubble; EPAMW01d-0412 arrived with 7 mm bubble; EPAMW01-0412-10 arrived with 12 mm bubble.	Detections below the QL are flagged as J0, estimated value and quantitation uncertain. Bubbles in samples from EPAMW01 and EPAMW02 are from gas exsolution and pressure change. Trip Blank bubbles result from pressure changes and filling and sealing sample vials in lab prior to deployment in the field.
Metals (filtered)/Shaw Environmental	Data are reported for detections below QLs but above MDLs. Performance Evaluation (PE) sample run for K in same sample set. PE result met acceptance criteria (measured value = 25.6 mg K/L; certified value 26.6 mg/L; acceptance limits = 21.9 - 31.7 mg/L). Not every element was included in CC checks to bracket all of the reported samples. However, these samples were bracketed in the beginning with a second source standard indicating the instrument was within acceptance limits for these elements. Samples analyzed initially with a report date of 5/14/12 were not analyzed using the CCT-KED, ICS (Interference Check Standards), LLICV (Low Level Initial Calibration Verification), or LCS (Laboratory Control Sample). The samples were re-analyzed for As, Cr, Cu, Ni, and Se (report date 6/11/12) as directed by the PI, to include method revisions which incorporate corrective actions from recent ADQs that address implementation of these QC checks.	Detections below the QL are flagged with J0. All samples reported for dissolved metals/cations are flagged as J2 due to incomplete CCC frequency for the elements Al, Ag, B, Ba, K, Na, S, Si, and P.
Metals (unfiltered)/Shaw Environmental	Data are reported for detections below QLs but above MDLs. Pre-digestion spike for Ag had a low recovery. Hg analyzed using mass 201 due to possible interferences from $^{186}W^{16}O$. ICP-OES for total metals/cations were all analyzed where there was not both a beginning and ending continuing calibration (CC) check for the elements Al, Ag, B, Ba, K, Na, S, Si, and P. The analytical sequence did include an initial calibration, and second source calibration check for all metals at the beginning and multiple CC checks. However, not every element was included in each CC to bracket all samples. Silicon was only included in CCC standard 6 (an ending calibration check). Sulfur, phosphorous and uranium were only included in CCC standard 7, also an ending check. However, these samples were bracketed in the beginning with a second source standard indicating the instrument was within acceptance limits for these elements. Total lead and thorium were above the quantitation limits (QL) in the digestion blank. Lead was 0.274 µg/L and thorium was 0.076 µg/L. Samples analyzed initially with a report date of 5/14/12 were not analyzed using the CCT-KED, ICS (Interference Check Standards), LLICV (Low Level Initial Calibration Verification), or LCS (Laboratory Control Sample). But, the samples were re-analyzed for As, Cr, Cu, Ni, and Se (report date 6/11/12) as directed by the PI, to include method revisions which incorporate corrective actions from recent ADQs that address implementation of these QC checks. No LCS sample was available to evaluate matrix spike issues as	Detections below the QL are flagged with J0. Samples may be biased low for Ag because of low % recoveries in some LCS and/or MS/MSD samples. All total Ag data flagged with K2. All total metals samples flagged J2 due to incomplete CCC frequency for the elements Al, Ag, B, Ba, K, Na, S, Si, and P. Samples for Pb and Th flagged as LB. Na and S flagged as J2 for incomplete spike evaluations.

Qualifier	Definition
U	The analyte was analyzed for but not detected above the reported method detection limit (MDL). Results are displayed as <MDL value.
U1	The analyte was analyzed for but not detected above the reported quantification limit (QL). Results are displayed as <QL value.
LB	Analyte is found in an associated laboratory blank above QL or RL and is less than 10 times the concentration found in the blank.
TB	Analyte is found in an associated trip blank above QL or RL and is less than 10 times the concentration found in the blank.
FB	Analyte is found in an associated field blank above QL or RL and is less than 10 times the concentration found in the blank.
EB	Analyte is found in an associated equipment blank above QL or RL and is less than 10 times the concentration found in the blank.
D(value)	The reported value is from a dilution. (Value) is equal to the dilution factor.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and/or meet quality control criteria.
K1	Samples may be biased high because of high % recoveries in some LCS and/or MS/MSD samples.
K2	Samples may be biased low because of low % recoveries in some LCS and/or MS/MSD samples.
K3	Potential spectral (mass or emission) interference.
J0	Estimated value. Results displayed are above method detection limit (MDL) and below quantitation limit (QL).
J1	Estimated value. Laboratory calibration criteria not met.
J2	Estimated value. Laboratory QA/QC acceptance criteria not met.
J3	Estimated value. Sample bottles received from the field were damaged.
J4	Estimated value. Problem with sample extraction.
J5	Estimated value. Holding time exceeded.
J6	Estimated value. Laboratory duplicate not within control limits.
J7	Estimated value. Field duplicate not within control limits.
J8	Estimated value. Screening data.
J9	Estimated value. Sample not properly preserved (e.g., cooler temperature >6°C, or acid insufficient to reach pH<2).
T	Tentatively Identified Compound (TIC) - Compound identification is not considered absolute or confirmed until a known standard for the suspect compound can be analyzed.
NA	Data not reported or collected.

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Table B31. Volatile organic compounds reported by Shaw Environmental and EPA Region 8 laboratories for samples EPAMW02-0412-1 and EPAMW02-0412-2.

	EPAMW02-0412-1			**EPAMW02-0412-2**		
Compound	Shaw	EPA R8	RPD	Shaw	EPA R8	RPD
	µg/L	µg/L	%	µg/L	µg/L	%
1,2,4-TMB	74.9	77 (J2)	2.8	137	148 (J2)	7.7
1,3,5-TMB	39.5	39.5 (J2)	0.0	71.4	74 (J2)	3.6
Acetone	1460 (D10)	982 (J2)	39.1	231	157 (J2)	38.1
Benzene	166	175 (J2)	5.3	232	247 (J2)	6.3
Ethylbenzene	61.1	57 (J2)	6.9	101	89.6 (J2)	12.0
m,p-Xylene	549	578 (J2)	5.1	894	973 (J2)	8.5
Naphthalene	4.89	7.19 (J2)	38.1	7.49	7.2 (J2)	3.9
o-Xylene	161	164 (J2)	1.8	245	253 (J2)	3.2
Toluene	402	437 (J2)	8.3	607	677 (J2)	10.9

Note: J2 flags for Region 8 data are because a second source verification standard was not run immediately after the samples (see Table B29).

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Figure B1. Comparison of volatile organic compound concentrations determined at two laboratories.

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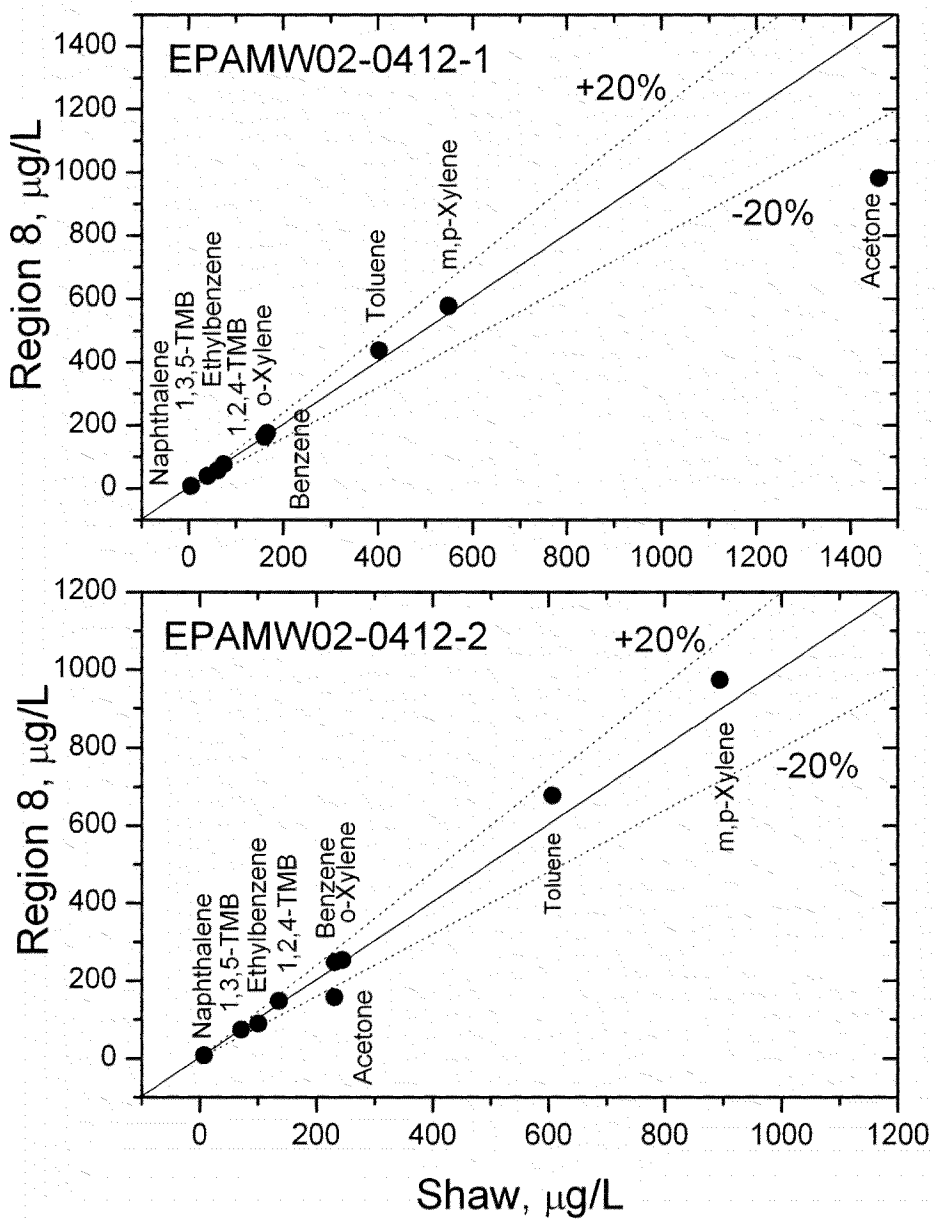

Table B32. Performance Evaluation sample results returned by EPA Region 8 laboratory for Gasoline Range Organics, Diesel Range Organics, Semivolatile Organic Compounds, and Volatile Organic Compounds.

Gasoline Range Organics by GC PID/FID (Lot #P192-762). Region 8 – EPA Method 8021B and 8015D (SOP ORGM-506v10)

Analyte	Reported Value, µg/L	Certified Value, µg/L	Acceptance Range	Performance Evaluation
Gasoline Range Organics (GRO)	2540	2370	921-4180	Acceptable
Benzene in GRO	28.5	25.3	10.9-42.4	Acceptable
Ethylbenzene in GRO	81.9	76.1	43.9-105	Acceptable
Toluene in GRO	201	224	118-293	Acceptable
Xylene, total in GRO[A]	249	224	128-302	Acceptable

Diesel Range Organics (Lot #P192-764). Region 8 – EPA Method 8015D (SOP ORGM-508-508v10)

Analyte	Reported Value, µg/L	Certified Value, µg/L	Acceptance Range	Performance Evaluation
Diesel Range Organics (DRO)	2690	2960	714-3830	Acceptable

Semivolatiles base/neutrals by GC/MS (Lot #P186-711&712). Region 8 – EPA Method 8270D (SOP ORGM-515)

Analyte	Reported Value, µg/L	Certified Value, µg/L	Acceptance Range	Performance Evaluation
Acenaphthene	67.7	76.7	30.8 - 91.9	Acceptable
Benzo(b)fluoranthene	27.5	28.7	9.38 - 40.2	Acceptable
Benzo(k)fluoranthene	57.6	60.8	14.6 - 89.3	Acceptable
Benzo(g,h,i)perylene	18.2	25.4	5.35 - 38.1	Acceptable
4-Bromophenyl-phenylether	26.7	28.6	10.8 - 40.2	Acceptable
Butylbenzylphthalate	118	123	23.7 - 175	Acceptable
bis(2-Chloroethoxy)methane	43.1	49.5	19.3 - 60.0	Acceptable
bis(2-Chloroethyl)ether	161	175	46.0 - 211	Acceptable
bis(2-Chloroisopropyl)ether	36.5	37.6	11.2 - 49.4	Acceptable
2-Chloronaphthalene	27.4	29.8	8.47 - 37.3	Acceptable
4-Chlorophenyl-phenylether	115	120	44.9 - 149	Acceptable
Chrysene	31.3	34.7	14.6 - 47.6	Acceptable
Dibenzofuran	29.0	32.1	12.5 - 43.6	Acceptable
Di-n-butylphthalate	82.9	88.4	29.2 - 117	Acceptable
1,2-Dichlorobenzene	75.0	93.8	11.2 - 113	Acceptable
1,3-Dichlorobenzene	111	142	17.0 - 164	Acceptable
Diethylphthalate	117	122	22.6 - 167	Acceptable
Dimethylphthalate	135	132	13.2 - 190	Acceptable
Di-n-octylphthalate	146	141	27.6 - 207	Acceptable
bis(2-Ethylhexyl)phthalate	74.3	81.4	24.3 - 113	Acceptable
Fluoranthene	56.2	57.4	26.2 - 71.9	Acceptable
Fluorene	62.5	66.2	27.4 - 81.3	Acceptable
Hexachlorocyclopentadiene	118	179	17.9 - 230	Acceptable
Hexachloroethane	92.8	116	12.2 - 136	Acceptable
Isophorone	93.0	105	41.1 - 135	Acceptable
2-Methylnaphthalene	49.5	53.4	8.89 - 67.8	Acceptable
Naphthalene	99.3	114	30.1 - 135	Acceptable

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Nitrobenzene	53.8	56.0	18.1 - 69.8	Acceptable
N-Nitroso-di-n-propylamine	86.1	89.2	25.8 - 115	Acceptable
Pyrene	40.1	41.1	13.3 - 59.4	Acceptable
Benzoic acid	<30.0	<30	-	Acceptable
4-Chloro-3-methylphenol	150	160	63.1 - 206	Acceptable
2-Chlorophenol	156	176	49.4 - 220	Acceptable
2,4-Dichlorophenol	117	137	44.6 - 168	Acceptable
2,4,Dimethylphenol	159	173	39.0 - 226	Acceptable
4,6-Dinitro-2-methylphenol	128	152	53.9 - 217	Acceptable
2,4-Dinitrophenol	79.5	121	12.1 - 170	Acceptable
2-Methylphenol	153	152	28.6 - 187	Acceptable
4-Methylphenol[B]	103	104	10.4 - 135	Acceptable
2-Nitrophenol	60.4	72.2	20.3 - 91.9	Acceptable
4-Nitrophenol	77.2	108	10.8 - 146	Acceptable
Pentachlorophenol	57.7	69.7	15.8 - 96.3	Acceptable
Phenol	163	177	17.7 - 237	Acceptable
2,3,4,6-Tetrachlorophenol	89.7	98.2	22.1 - 132	Acceptable
2,4,5-Trichlorophenol	56.0	64.4	24.3 - 85.1	Acceptable
2,4,6-Trichlorophenol	50.5	54.2	17.3 - 70.9	Acceptable
Volatiles by GC/MS (Lot #P186-710). Region 8 – EPA Method 8260C (SOP ORGM-501)[C]				
Analyte	**Reported Value, µg/L**	**Certified Value, µg/L**	**Acceptance Range**	**Performance Evaluation**
Benzene	20.2	20.0	13.6 - 26.4	Acceptable
Bromodichloromethane	20.8	20.1	13.8 - 27.0	Acceptable
Bromoform	30.2	30.2	18.6 - 41.2	Acceptable
2-Butanone (MEK)	138	110	32.0 - 172	Acceptable
t-Butyl methyl ether (MTBE)	44.2	43.7	27.1 - 62.1	Acceptable
Carbon tetrachloride	34.2	31.8	17.7 - 43.7	Acceptable
Chlorobenzene	88.0	84.7	61.1 - 106	Acceptable
Chlorodibromomethane	119	107	73.5 - 142	Acceptable
Chloroform	64.6	63.0	43.6 - 81.0	Acceptable
1,2-Dichlorobenzene	78.3	80.7	56.2 - 104	Acceptable
1,3-Dichlorobenzene	67.6	71.0	48.2 - 90.4	Acceptable
1,4-Dichlorobenzene	66.9	68.0	46.1 - 85.2	Acceptable
1,2-Dichloroethane	22.6	22.7	15.7 - 30.7	Acceptable
c-1,2-Dichloroethene	26.6	26.0	17.9 - 34.8	Acceptable
c-1,3-Dichloropropylene	45.0	45.0	31.5 - 58.5	Acceptable
Ethylbenzene	47.6	43.0	29.5 - 54.9	Acceptable
Methylene chloride	87.4	90.5	55.5 - 125	Acceptable
4-Methyl-2-pentanone (MIBK)	81.7	78.0	36.0 - 117	Acceptable
Naphthalene	29.8	32.8	11.1 - 42.6	Acceptable
1,1,2,2-Tetrachloroethane	50.0	55.7	31.8 - 82.5	Acceptable
Tetrachloroethylene	27.5	45.9	25.3 - 60.1	Acceptable
Toluene	36.6	35.5	24.7 - 44.9	Acceptable
1,2,4-Trichlorobenzene	68.1	70.5	14.6 - 86.0	Acceptable
1,1,1-Trichloroethane	28.4	27.3	17.2 - 36.5	Acceptable
1,1,2-Trichloroethane	35.0	35.8	25.0 - 47.3	Acceptable
Trichloroethylene	72.4	69.9	44.4 - 91.1	Acceptable
Trichlorofluoromethane	<1.25	<5.0	-	Acceptable

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1,2,3-Trichloropropane (TCP)	<1.25	<5.0	-	Acceptable
Vinyl Acetate	<1.25	<5.0	-	Acceptable
Vinyl Chloride	<1.25	<5.0	-	Acceptable
o-Xylene	20.4	18.9	13.4 - 23.4	Acceptable
Total Xylenes	93.7	85.6	48.6 - 116	Acceptable

A. m,p-xylene and o-xylene analyzed separately, value indicates total xylene. B. Analyzed as 3&4 methylphenol. C. All values in the volatile organic compound scan are qualified as estimated (J2) because initial calibrations were not immediately verified by a second source calibration standard. The table only shows results where analytes in the lab method matched analytes in the blind sample, i.e., other compounds were present in the PE sample but they were not included in the method SOP or were not requested for analysis.

Table B33. Performance Evaluation sample results returned by Shaw Environmental Volatile Organic Compounds, Gasoline Additives, and Minerals.

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Volatiles by GC/MS (Lot #P186-710). Shaw Environmental – EPA Method 5021A and 8260C (RSKSOP259v1)				
Analyte	**Reported Value, µg/L**	**Certified Value, µg/L**	**Acceptance Range**	**Performance Evaluation**
Benzene	18.5	20.0	13.6 - 26.4	Acceptable
Carbon tetrachloride	20.5	31.8	17.7 - 43.7	Acceptable
Chlorobenzene	89.8	84.7	61.1 - 106	Acceptable
1,2-Dichlorobenzene	74.7	80.7	56.2 - 104	Acceptable
1,4-Dichlorobenzene	67.1	68.0	46.1 - 85.2	Acceptable
1,2-Dichloroethane	24.9	22.7	15.7 - 30.7	Acceptable
1,1-Dichloroethene	ND	<5.0	-	Acceptable
c-1,2-Dichloroethene	24.6	26.0	17.9 - 34.8	Acceptable
t-1,2-Dichloroethene	ND	<5.0	-	Acceptable
Ethylbenzene	40.4	43.0	29.5 - 54.9	Acceptable
Methylene chloride	89.6	90.5	55.5 - 125	Acceptable
Tetrachloroethylene	32.9	45.9	25.3 - 60.1	Acceptable
Toluene	32.5	35.5	24.7 - 44.9	Acceptable
1,1,1-Trichloroethane	21.0	27.3	17.2 - 36.5	Acceptable
1,1,2-Trichloroethane	33.5	35.8	25.0 - 47.3	Acceptable
Trichloroethylene	66.8	69.9	44.4 - 91.1	Acceptable
Vinyl Chloride	ND	<5.0	-	Acceptable
o-Xylene	18.6	18.9	13.4 - 23.4	Acceptable
Total Xylenes	84.3	85.6	48.6 - 116	Acceptable
Gasoline Additives by GC/MS (Lot #S183-909)[A]. Shaw Environmental – EPA Method 5021A and 8260C (RSKSOP259v1)				
Analyte	**Reported Value, µg/L**	**Certified Value, µg/L**	**Acceptance Range**	**Performance Evaluation**
t-Butyl Alcohol	50.8	46.6	28.0 - 65.2	Acceptable
Minerals by ICP-OES (Lot #P202-506)[B]. EPA Method 200.7 (RSKSOP-213v4).				
Analyte	**Reported Value, mg/L**	**Certified Value, mg/L**	**Acceptance Range**	**Performance Evaluation**
Potassium	25.6	26.6	21.9 - 31.7	Acceptable

A. Only tert-butyl alcohol was requested for evaluation. B. Only potassium was requested for evaluation. ND – not detected. The table only shows results where analytes in the lab method matched analytes in the blind sample, i.e., other compounds were present in the PE sample but they were not included in the method SOP or were not requested for analysis.

Table B34. Performance Evaluation sample results returned by EPA General Parameters Lab for chloride.

Minerals (Lot# P202-506)[A]. EPA General Parameters Lab – EPA Method 6500 (RSKSOP-276v4)

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Analyte	Reported Value, mg/L	Certified Value, mg/L	Acceptance Range	Performance Evaluation
Chloride	34.7	36.0	30.2 - 42.5	Acceptable

A. Only chloride was requested for evaluation.

Table B35. Performance Evaluation sample results returned by USGS/TestAmerica for Gasoline Range Organics, Diesel Range Organics, Gasoline Additives, Semivolatile Organic Compounds, and Inorganic Compounds.

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Gasoline Range Organics by GC PID/FID (Lot #P192-762). USGS/TestAmerica - EPA Method 8015B

Analyte	Reported Value, µg/L	Certified Value, µg/L	Acceptance Range	Performance Evaluation
Gasoline Range Organics (GRO)	2900	2370	921 - 4180	Acceptable

Diesel Range Organics (Lot #P192-764). USGS/TestAmerica - EPA Method 8015B

Analyte	Reported Value, µg/L	Certified Value, µg/L	Acceptance Range	Performance Evaluation
Diesel Range Organics (DRO)	2400	2960	714 - 3830	Acceptable

Gasoline Additives by GC/MS (Lot #S183-909)[A]. *USGS/TestAmerica – EPA Method 8260B*

Analyte	Reported Value, µg/L	Certified Value, µg/L	Acceptance Range	Performance Evaluation
t-Amyl methyl ether	33	36.8	22.1 - 51.5	Acceptable
t-Butyl Alcohol	52	46.6	28.0 - 65.2	Acceptable
t-Butyl ethyl ether	12	15.3	9.18 - 21.4	Acceptable
t-Butyl methyl ether	12	13.9	8.34 - 19.5	Acceptable
Diisopropyl ether	40	40.0	24.0 - 56.0	Acceptable
Trichlorofluoromethane (Freon 11)	25	21.9	13.1 - 30.7	Acceptable

Semivolatiles base/neutrals and acids by GC/MS (Lot #P186-711&712). USGS/TestAmerica – EPA Method 8270C

Analyte	Reported Value, µg/L	Certified Value, µg/L	Acceptance Range	Performance Evaluation
Acenaphthene[B]	62	76.7	30.8 - 91.9	Acceptable
Acenaphthylene[B]	ND	<10	-	Acceptable
Aniline	ND	<10	-	Acceptable
Anthracene[B]	ND	<10	-	Acceptable
Benzo(a)anthracene[B]	0.27	<10	-	Acceptable
Benzo(b)fluoranthene[B]	24	28.7	9.38 - 40.2	Acceptable
Benzo(k)fluoranthene[B]	53	60.8	14.6 - 89.3	Acceptable
Benzo(g,h,i)perylene[B]	21	25.4	5.35 - 38.1	Acceptable
Benzo(a)pyrene[B]	0.15	<10	-	Acceptable
Benzyl alcohol	0.55	<10	-	Acceptable
4-Bromophenyl-phenylether	19	28.6	10.8 - 40.2	Acceptable
Butylbenzylphthalate	110	123	23.7 - 175	Acceptable
Carbazole	ND	<10	-	Acceptable
4-Chloroaniline	ND	<10	-	Acceptable
bis(2-Chloroethoxy)methane	41	49.5	19.3 - 60.0	Acceptable
bis(2-Chloroethyl)ether	150	175	46.0 - 211	Acceptable
bis(2-Chloroisopropyl)ether	33	37.6	11.2 - 49.4	Acceptable
2-Chloronaphthalene	12	29.8	8.47 - 37.3	Acceptable
4-Chlorophenyl-phenylether	82	120	44.9 - 149	Acceptable
Chrysene[B]	29	34.7	14.6 - 47.6	Acceptable
Dibenz(a,h)anthracene[B]	ND	<10	-	Acceptable
Dibenzofuran	18	32.1	12.5 - 43.6	Acceptable

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Di-n-butylphthalate	73	88.4	29.2 - 117	Acceptable
3,3'-Dichlorobenzidine	ND	<10	-	Acceptable
Diethylphthalate	110	122	22.6 - 167	Acceptable
Dimethylphthalate	130	132	13.2 - 190	Acceptable
2,4-Dinitrotoluene	ND	<10	-	Acceptable
2,6-Dinitrotoluene	ND	<10	-	Acceptable
Di-n-octylphthalate	150	141	27.6 - 207	Acceptable
bis(2-Ethylhexyl)phthalate	75	81.4	24.3 - 113	Acceptable
Fluoranthene[B]	47	57.4	26.2 - 71.9	Acceptable
Fluorene[B]	58	66.2	27.4 - 81.3	Acceptable
Hexachlorobenzene	ND	<10	-	Acceptable
Hexachlorocyclopentadiene	18	179	17.9 - 230	Acceptable
Hexachloroethane	13	116	12.2 - 136	Acceptable
Indeno(1,2,3-cd)pyrene[B]	ND	<10	-	Acceptable
Isophorone	89	105	41.1 - 135	Acceptable
2-Methylnaphthalene[B]	38	53.4	8.89 - 67.8	Acceptable
Naphthalene	34	114	30.1 - 135	Acceptable
2-Nitroaniline	ND	<10	-	Acceptable
3-Nitroaniline	ND	<10	-	Acceptable
4-Nitroaniline	ND	<10	-	Acceptable
Nitrobenzene	47	56.0	18.1 - 69.8	Acceptable
N-Nitrosodiethylamine	ND	<10	-	Acceptable
N-Nitroso-di-n-propylamine	80	89.2	25.8 - 115	Acceptable
Phenanthrene[B]	ND	<10	-	Acceptable
Pyrene[B]	31	41.1	13.3 - 59.4	Acceptable
Pyridine	ND	<10	-	Acceptable
Benzoic acid	ND	<30	-	Acceptable
4-Chloro-3-methylphenol	160	160	63.1 - 206	Acceptable
2-Chlorophenol	150	176	49.4 - 220	Acceptable
2,4-Dichlorophenol	130	137	44.6 - 168	Acceptable
2,4,Dimethylphenol	150	173	39.0 - 226	Acceptable
4,6-Dinitro-2-methylphenol	160	152	53.9 - 217	Acceptable
2,4-Dinitrophenol	110	121	12.1 - 170	Acceptable
2-Methylphenol	150	152	28.6 - 187	Acceptable
4-Methylphenol[C]	92	104	10.4 - 135	Acceptable
2-Nitrophenol	62	72.2	20.3 - 91.9	Acceptable
4-Nitrophenol	130	108	10.8 - 146	Acceptable
Pentachlorophenol	63	69.7	15.8 - 96.3	Acceptable
Phenol	170	177	17.7 - 237	Acceptable
2,3,4,6-Tetrachlorophenol	98	98.2	22.1 - 132	Acceptable
2,4,5-Trichlorophenol	62	64.4	24.3 - 85.1	Acceptable
2,4,6-Trichlorophenol	51	54.2	17.3 - 70.9	Acceptable
Volatiles by GC/MS (Lot #P186-710). USGS/TestAmerica – EPA Method 8260B.				
Analyte	**Reported Value, µg/L**	**Certified Value, µg/L**	**Acceptance Range**	**Performance Evaluation**
Acetone	ND	<5.0	-	Acceptable
Acrylonitrile	ND	<5.0	-	Acceptable
Benzene	18	20.0	13.6 - 26.4	Acceptable
Bromodichloromethane	23	20.1	13.8 - 27.0	Acceptable

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Bromoform	36	30.2	18.6 - 41.2	Acceptable
Bromomethane	ND	<5.0	-	Acceptable
2-Butanone (MEK)	110	110	32.0 - 172	Acceptable
t-Butyl methyl ether (MTBE)	42	43.7	27.1 - 62.1	Acceptable
Carbon disulfide	ND	<5.0	-	Acceptable
Carbon tetrachloride	36	31.8	17.7 - 43.7	Acceptable
Chlorobenzene	75	84.7	61.1 - 106	Acceptable
Chlorodibromomethane	120	107	73.5 - 142	Acceptable
Chloroethane	ND	<5.0	-	Acceptable
Chloroform	64	63.0	43.6 - 81.0	Acceptable
Chloromethane	ND	<5.0	-	Acceptable
1,2-Dibromo-3-chloropropane	ND	<5.0	-	Acceptable
1,2-Dibromoethane (EDB)	ND	<5.0	-	Acceptable
1,2-Dichlorobenzene	70	80.7	56.2 - 104	Acceptable
1,3-Dichlorobenzene	60	71.0	48.2 - 90.4	Acceptable
1,4-Dichlorobenzene	60	68.0	46.1 - 85.2	Acceptable
Dichlorodifluoromethane (Freon 12)	ND	<5.0	-	Acceptable
1,1-Dichloroethane	ND	<5.0	-	Acceptable
1,2-Dichloroethane	27	22.7	15.7 - 30.7	Acceptable
1,1-Dichloroethene	0.58	<5.0	-	Acceptable
c-1,2-Dichloroethene	24	26.0	17.9 - 34.8	Acceptable
t-1,2-Dichloroethene	ND	<5.0	-	Acceptable
1,2-Dichloropropane	ND	<5.0	-	Acceptable
c-1,3-Dichloropropylene	39	45.0	31.5 - 58.5	Acceptable
t-1,3-Dichloropropylene	ND	<5.0	-	Acceptable
Ethylbenzene	40	43.0	29.5 - 54.9	Acceptable
Hexachlorobutadiene	ND	<5.0	-	Acceptable
2-Hexanone	ND	<5.0	-	Acceptable
Methylene chloride	92	90.5	55.5 - 125	Acceptable
4-Methyl-2-pentanone (MIBK)	83	78.0	36.0 - 117	Acceptable
Naphthalene	30	32.8	11.1 - 42.6	Acceptable
Styrene	ND	<5.0	-	Acceptable
1,1,1,2-Tetrachloroethane	ND	<5.0	-	Acceptable
1,1,2,2-Tetrachloroethane	53	55.7	31.8 - 82.5	Acceptable
Tetrachloroethylene	42	45.9	25.3 - 60.1	Acceptable
Toluene	33	35.5	24.7 - 44.9	Acceptable
1,2,4-Trichlorobenzene	62	70.5	14.6 - 86.0	Acceptable
1,1,1-Trichloroethane	28	27.3	17.2 - 36.5	Acceptable
1,1,2-Trichloroethane	36	35.8	25.0 - 47.3	Acceptable
Trichloroethylene	64	69.9	44.4 - 91.1	Acceptable
Trichlorofluoromethane	ND	<5.0	-	Acceptable
1,2,3-Trichloropropane (TCP)	ND	<5.0	-	Acceptable
Vinyl Chloride	ND	<5.0	-	Acceptable
o-Xylene	18	18.9	13.4 - 23.4	Acceptable
Total Xylenes	81	85.6	48.6 - 116	Acceptable
Minerals (Lot# P202-506)[D]. USGS/TestAmerica – EPA Method 6010B				

Analyte	Reported Value, mg/L	Certified Value, mg/L	Acceptance Range	Performance Evaluation
Potassium	26	26.6	21.9 - 31.7	Acceptable
Sodium	44	42.5	36.1 - 48.9	Acceptable
Minerals (Lot# P202-506)[E]. USGS/TestAmerica				
Analyte	**Reported Value, mg/L**	**Certified Value, mg/L**	**Acceptance Range**	**Performance Evaluation**
Chloride	37	36.0	30.2 - 42.5	Acceptable
Sulfate	27	28.0	22.3 - 33.0	Acceptable
Fluoride	1.9	1.82	1.47 - 2.17	Acceptable
Total Dissolved Solids	210	196	177 - 249	Acceptable

A. Only tert-butyl alcohol was requested for evaluation. B. EPA Method 8270C-SIM was used with sample dilution of 20x. C. Analyzed as 3&4 methylphenol. D. Only potassium was requested for analysis. E. Only chloride was requested for analysis. ND – not detected. The table only shows results where analytes in the lab method matched analytes in the blind sample, i.e., other compounds were present in the PE sample but they were not included in the method SOP or were not requested for analysis.

Table B36. Field QC data for YSI electrode measurements.

Standard Solution for Mid-day and End-of-the-day	Electrode Reading	Acceptance Range

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Electrode Performance Checks **Standard Solution**		
4/16/2012 Mid-day		
pH 7.00	7.12	6.80-7.20
Specific Conductance 7630-7970 µs/cm	7970 µs/cm	7630-7970
pH 12.46	12.49	12.26-12.66
4/16/2012 End-of -day		
pH 10.01	10.05	9.81-10.21
pH 12.46	12.40	12.26-12.66
Specific Conductance 1413 µs/cm	1400 µs/cm	1342-1484
Zero-oxygen	0.05 mg/L	0.00-0.10
4/17/2012 Mid-day		
pH 7.00	7.02	6.80-7.20
Specific Conductance 1413 µs/cm	1390 µs/cm	1342-1484
4/17/2012 End-of -day		
pH 10.01	9.98	9.81-10.21
Specific Conductance 1413 µs/cm	1382 µs/cm	1342-1484
4/18/2012 Mid-day		
pH 12.46	12.49	12.26-12.66
Specific Conductance 1413 µs/cm	1390 µs/cm	1342-1484
4/18/2012 End-of -day		
pH 10.01	9.97	9.81-10.21
pH 12.46	12.42	12.26-12.66
Specific Conductance 1413 µs/cm	1380 µs/cm	1342-1484
Zero-oxygen	0.01 mg/L	0.00-0.10
4/19/2012 Mid-day (completed sampling)		
pH 7.00	7.03	6.80-7.20
Specific Conductance 1413 µs/cm	1398 µs/cm	1342-1484
Zero-oxygen	0.02 mg/L	0.00-0.10
4/20/2012 Mid-day		
pH 12.46	12.43	12.26-12.66
Specific Conductance 1413 µs/cm	1390 µs/cm	1342-1484
4/20/2012 End-of -day		
pH 10.01	9.99	9.81-10.21
Specific Conductance 1413 µs/cm	1387 µs/cm	1342-1484
4/22/2012 Initial calibration checks		
pH 10.01	10.01	9.81-10.21
pH 12.46	12.41	12.26-12.66
Specific Conductance 1413 µs/cm	1410 µs/cm	1342-1484
Zero-oxygen	0.01 mg/L	0.00-0.10

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4/22/2012 End-of -day		
pH 12.46	12.35	12.26-12.66
Specific Conductance 1413 µs/cm	1490 µs/cm	1342-1484
Zero-oxygen	0.00 mg/L	0.00-0.10
4/24/2012 Initial calibration checks		
pH 10.01	10.01	9.81-10.21
pH 12.46	12.41	12.26-12.66
Specific Conductance 1413 µs/cm	1410 µs/cm	1342-1484
Zero-oxygen	0.01 mg/L	0.00-0.10
4/24/2012 End-of -day		
pH 12.46	12.61	12.26-12.66
Specific Conductance 1413 µs/cm	1370 µs/cm	1342-1484
Zero-oxygen	0.02 mg/L	0.00-0.10

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