

Draft
Data Evaluation Report
Microbac Laboratories
Former STP Percolation Ditches
Second Semi-Annual 2013 Sampling and Analysis

White Sands Missile Range



December 2013



Shaw Environmental, Inc.
(A CB&I Company)
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

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Prepared for:

U.S. Army Garrison White Sands
Directorate of Public Works, Environmental Division
White Sands Missile Range, NM 88002-5048

Prepared by:

Shaw Environmental, Inc.
A CB&I Company
1401 Enclave Parkway, Suite 250
Houston, Texas 77077



Approved by: _____
Mark Lyon, Program Chemist

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Acronyms and Abbreviations

CAR	corrective action report
CCAL	continuing calibration
CCV	continuing calibration verification
CEC	Comprehensive Environmental Contract
COC	chain-of-custody
DER	Data Evaluation Report
DL	detection limit
DoD	U.S. Department of Defense
ELAP	Environmental Laboratory Accreditation Program
FD	field duplicate
ICAL	initial calibration
ICP	inductively coupled plasma
ICP-AES	inductively coupled plasma-atomic emission
ICS	interference check sample
ICV	initial calibration verification
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
LRC	laboratory review checklist
LTM	long term monitoring
MB	method blank
ME	marginal exceedance
MS	matrix spike
MSD	matrix spike duplicate
NFG	National Functional Guidelines
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories
RPD	relative percent difference
SDG	sample delivery group
STP	Former Sewage Treatment Plant
TB	trip blank
TOC	total organic carbon
UCL	upper control limit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WSMR	White Sands Missile Range



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1.0 LABORATORY DOD QSM, VERSION 4.2 CERTIFICATION STATEMENT

Shaw Environmental, Inc. certifies that at the time the laboratory data was generated, Microbac Laboratories (Marietta, OH) was in compliance with the most recently published version of the U.S. Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 4.2 (DoD, 2009) and holding a current DoD Environmental Laboratory Accreditation Program (ELAP) accreditation for the method, matrices, and parameters requested on the chain-of-custody (COC) forms. The DoD QSM, Version 4.2 provides implementation guidance on the establishment and management of quality systems for environmental testing laboratories intending to perform work for DoD. The manual is utilized by the DoD ELAP to accredit laboratories. In addition to DoD ELAP certification, the laboratory holds current certification for all appropriate fields-of-testing required by the state that holds regulatory oversight for the project. A copy of Microbac Laboratories current DoD ELAP certificate is included in Appendix C of this Data Evaluation Report (DER).



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2.0 INTRODUCTION

This report contains the results of the data evaluation conducted for samples collected and analyzed in the second half of 2013 as part of the Former Sewage Treatment Plant (STP) Long Term Monitoring (LTM) groundwater sampling at White Sands Missile Range (WSMR). Shaw performed this work under Contract W91ZLK-05-D-0017, Task Order No. 08 issued by the Army Contracting Agency (Aberdeen Proving Ground) for the U.S. Army Environmental Command. The purpose of the groundwater sampling at the STP is to obtain data for evaluating potential groundwater contamination according to the RCRA Monitoring Plan. Samples were analyzed by Microbac Laboratories (Marietta, OH) in accordance with the DoD QSM and the analytical methods requested on the COC forms. Table 2-1 provides a list of the samples collected, a laboratory sample number cross-reference, sample matrix, date collected, sample purpose, and analytical methods performed for each sample. This DER includes all data review and data validation requirements per the contract.

Analysis data were generated and reviewed in accordance with the DoD QSM, Version 4.2. The data were evaluated against the DoD QSM limits the data quality parameters of sensitivity, accuracy, precision, and completeness. The data were also evaluated for fulfillment of quality parameters of representativeness and comparability as defined in the site Quality Assurance Project Plan (QAPP) Environmental Remediation Services, WSMR. Appendix A contains the laboratory data forms with the case narratives.

In accordance with project QAPP and DoD QSM, Version 4.2, a performance based review of the data was conducted independent of the laboratory. This performance based review consisted of an evaluation of laboratory performance criteria using guidance from the USACE Environmental Quality guidance for Evaluating Performance-Based Chemical data, Engineer Manual (EM 200-1-10), (June 2005). The independent performance based data review is summarized below.

First review consists of an evaluation of the laboratory performance criteria by the independent reviewer based on review of the laboratory case narrative and associated Corrective Action Reports (CAR). Additionally, laboratory performance parameters: initial calibration procedures and results, continuing calibration procedures and results, interference check sample (ICS) analysis, post digestion spike recoveries, serial dilution, and other items identified as “supporting data” in the laboratory case narrative.

Table 2-1
Field Sample and Laboratory ID Numbers

Field Sample Number	Lab Report Number	Matrix	Date Collected	Purpose	Analytical Methods
MPL13-1013-1 MPL13-1013-2 MPL1-1013-1 MPL18-1013-1 MPL6-1013-1	L13101868	Water	10/30/2013	Field Sample Field Duplicate of MPL13-1013-1 Field Sample Field Sample Field Sample	Metals - 6010B/6020/7470A Anions - 300.0 pH - 9040C Conductivity - 120.1 Alkalinity - 310.2/SM2320B Cyanide - 9014-9010C/SM4500-CN Ammonia-Nitrogen - 350.1 Nitrate-Nitrite as N - 353.2 Orthophosphate - SM4500-P Total Dissolved Solids - 160.1 Total Organic Carbon - 415.1 Total Suspended Solids - 160.2
MPL28-1013-1 T40-1013-1 MPL17-1013-1 MPL10-1013-1	L13110051	Water	10/31/2013	Field Sample Field Sample Field Sample Field Sample	Ditto
MPL4-1113-1 MPL3-1113-1 MPL3-1113-2 MPL2-1113-1	L13110146	Water	11/01/2013	Field Sample with MS/MSD Field Sample Field Duplicate of MPL3-1113-1 Field Sample	Ditto
MPL30-1113-1 MPL16-1113-1 MPL26-1113-1	L13110337	Water	11/05/2013	Field Sample Field Sample Field Sample	Ditto
MPL29-1113-1 MPL7-1113-1 MPL5-1113-1	L13110465	Water	11/07/2013	Field Sample Field Sample Field Sample	Ditto
MPL21-1113-1	L13110584	Water	11/08/2013	Field Sample with MS/MSD	Ditto
MPL22-1113-1 MPL23-1113-1	L13110758	Water	11/12/2013	Field Sample Field Sample	Ditto
MPL24-1113-1 MPL19-1113-1	L13110833	Water	11/13/2013	Field Sample Field Sample	Ditto
MPL20-1113-1 MPL20-1113-2 MPL25-1113-1	L13110928	Water	11/14/2013	Field Sample Field Duplicate of MPL20-1113-1 Field Sample	Ditto
SMW1-1113-1 SMW4-1113-1	L13111086	Water	11/15/2013	Field Sample Field Sample	Ditto

Second review consists of an evaluation of the sample-specific criteria included in the laboratory data packages and an evaluation of the field data. The sample specific evaluation parameters include holding time, blank contamination, laboratory control sample (LCS) analysis, and matrix spike (MS) and matrix spike duplicate (MSD) sample analyses. Field quality control (QC) samples were taken for comparison to project decision criteria.

The levels of review are discussed further in Sections 3.0 thru 5.0 of this DER report, respectively. The results of the data review and validation are presented in Sections 6.0 thru 8.0. An overall assessment of the data relative to the quantitative and qualitative data quality assurance parameters is provided in Section 9.0.

Following the specifications in the EM 200-1-10 related to the data validation process, the data were annotated with validation qualifiers and associated bias codes on the analytical data sheets. Table 2-2 provides definitions of the data qualifiers, and Table 2-3 lists and defines the data qualifiers and bias codes.

**Table 2-2
Data Validation Qualifier Definitions**

Qualifier	Definitions
U	Not detected. The analyte was analyzed for but was not detected above the level of the associated value. The associated value is the Limit of Quantitation (LOQ).
J	Estimated. The analyte was detected and positively identified. The associated numerical value is the approximate concentration of the analyte in the sample and the bias is in determinable.
J-	Estimated. The analyte was detected and positively identified. The associated numerical value is the approximate concentration of the analyte in the sample and the bias is low due to associated quality control indicators.
J+	Estimated. The analyte was detected and positively identified. The associated numerical value is the approximate concentration of the analyte in the sample and the bias is determined high due to associated quality control indicators.
N	Tentatively identified. The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UN	Tentatively not detected, the LOQ is estimated. The analyte was analyzed for but was not detected above the reported LOQ. However, the reported LOQ is an estimate and may not be accurate or precise.
NJ	Tentatively identified. The reported concentration is an estimate. The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents the approximate concentration.
R	Rejected. The data are not usable. The presence or absence of the analyte cannot be confirmed.

**Table 2-3
Data Validation Qualifier Reason Codes**

Reason Code	Data Quality Condition Resulting In Assigned Qualification
General Use	
FB	Field blank contamination
FD	Field duplicate evaluation criteria not met
HT	Holding time requirement was not met
PR	Preservation requirements not met
LCS	Laboratory control sample evaluation criteria not met
MB	Preparation blank or preparation blank contamination
RB	Rinsate blank contamination
TB	Trip blank contamination
SDL	Sample detection limit exceeds decision criteria (for nondetected results)
Inorganic Methods	
CCB	Continuing calibration blank contamination
CCV	Continuing calibration verification evaluation criteria not met
D	Laboratory duplicate precision evaluation criteria not met
DL	Serial dilution results did not meet evaluation criteria
ICS	Interference check sample evaluation criteria not met
ICV	Initial calibration verification evaluation criteria not met
MS	Matrix spike recovery outside acceptance range
PDS	Post-digestion spike recovery outside acceptance range
MSA	Method of standard additions correlation coefficient < 0.995
PB	Preparation blank
Organic Methods	
CCAL	Continuing calibration evaluation criteria not met
ICAL	Initial calibration evaluation criteria not met
ID	Target compound identification criteria not met
IS	Internal standard evaluation criteria not met
MS/SD	Matrix spike/matrix spike duplicate accuracy and/or precision criteria not met
SUR	Surrogate recovery outside acceptance range
TUNE	Instrument performance (tuning) criteria not met
P	The detected concentration difference between the primary and secondary column is greater than 25%.

3.0 LABORATORY CASE NARRATIVE REVIEW

Review of the analytical laboratory case narrative included laboratory and sample-specific performance criteria. Results not meeting the QC acceptance criteria were documented in the laboratory case narrative and associated CARs. The laboratory performance criteria noted in the case narrative include: initial calibration procedures and results, continuing calibration procedures and results, and other items potentially affecting the data. The sample specific criteria reviewed from the case narrative includes: internal standard recoveries, surrogate spike recoveries, and other items identified as potentially affecting the data. The subsections below discuss how each of the parameters was evaluated. If the case narrative described a criterion not covered by the subsections below, the data were evaluated and qualified using guidance from the National Functional Guidelines (NFG) as applicable to the analytical method.

3.1 Initial Calibration

The DoD QSM, Version 4.2, Appendix F contains the QC acceptance criteria for initial calibration for analytical methods required for the project. If the case narrative indicated that the initial calibration for any analyte did not meet the acceptance criteria, then the CARs was evaluated and all results for that given analyte associated with the initial calibration were qualified as estimated (“J/UN”) with a qualifier code of “ICAL.”

3.2 Initial and/or Continuing Calibration Verification

The DoD QSM, Version 4.2, Appendix F contains the QC acceptance criteria for initial and continuing calibration verification for each analytical method used in the project. If the case narrative indicates that the initial or continuing calibration verification for any analyte did not meet the acceptance criteria, then all results for that given analyte associated with the initial or continuing calibration verification were qualified as estimated (“J/UN”) with a qualifier of “ICV” or “CCV” for inorganics and “ICAL” or “CCAL” for organics.

3.3 Other Items Identified in the Laboratory Case Narrative

Other items which the laboratory may note upon in the case narrative include: tuning, system performance, internal standard area counts, Methods of Standard Additions, and method or standard operating procedure deviations. If the case narrative describes a laboratory performance criterion not covered by the DoD QSM, Version 4.2, the data is evaluated and qualified using guidance from the NFG as applicable to the analytical method, or professional judgment is used.



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4.0 FIELD AND LABORATORY DATA PACKAGE REVIEW

The sample specific evaluation parameters include: sample temperature, sample preservation, holding times, blank sample contamination, LCS analysis, MS sample, MSD sample, and field duplicate (FD) results. The subsections below discuss how each of these sample specific parameters was evaluated. Field analytical data are not considered in this review. Only analytical data generated by an off-site or fixed laboratory are subject to review in this DER.

4.1 Holding Times

Holding times were calculated by computing the difference between the sample collection date found on the COC and the sample analysis date found on the sample test reports. Results for analyses not performed within holding time limits were qualified as estimated (“J/UN”).

4.2 Blanks

Blanks are assessed to determine the existence and magnitude of contamination problems and measure of the *representativeness*. Blanks reflect the amount of contamination inadvertently introduced into the environmental samples during sample collection, transfer or analysis. In particular, method blank (MB) or preparation blank (PB) samples are a check for laboratory contamination from both the determinative and preparatory methods. Field blanks (e.g., trip blanks and equipment or rinsate blanks) account for accumulative contamination from field and laboratory activities. In general, the samples associated with each blank (e.g., method and field blanks) must not be corrected for blank contamination (e.g., unless QAPP or the method of analysis describes a valid procedure for correcting for blank contamination).

When a target analyte is detected above the limit of detection (LOD) in any blank, qualification for the associated environmental samples for blank contamination is *not* required when any of the following occur:

1. The target analyte is not detected in the environmental samples.
2. The target analyte is detected in the blank less than ½ the limit of quantitation (LOQ).
3. The target analyte is detected in the blank at a concentration less than 5% to 10% of the corresponding environmental sample concentration.

In general, qualification is required when a target analyte is detected in a blank at a concentration *greater than 5 or 10%* of the corresponding environmental sample concentration. Samples are qualified for blank contamination using the following strategies:

J+ flag. If the analyte concentration for an environmental sample is less than ten times higher than the analyte concentration in the corresponding blank, qualify the reported sample result with a J+ flag. Under these circumstances, the J+ flag indicates that the analyte is present in the sample but the reported concentration of the analyte believed to be biased high because of blank contamination.

Surrogate recoveries: results for the surrogate spike compound recoveries were compared to the DoD QSM criteria. For those samples where one surrogate spike compound per extraction fraction recovered outside acceptance limits qualifications were made as follows:

- If the surrogate is greater than upper control limits (UCL) all positive results for the associated analytes were qualified estimated (“J+”) with a bias high; whereas non-detect results are acceptable without qualification.
- If the surrogate recovery is less than lower control limits (LCL), but greater than 10%, the associated analytes were qualified estimated (“J-/UN”) with bias low.
- If any surrogate recovery is less than 10%, positive results shall be qualified estimated (“NJ”) and non-detects shall be qualified as unusable (“R”).

A qualifier code of “SUR” shall be assigned to all results qualified or rejected on the basis of surrogate recoveries.

4.3 Laboratory Control Sample (LCS) Results

The LCS recoveries were compared to the DoD QSM acceptance criteria. Positive results associated with LCS outside QC limit, but above the upper marginal exceedance (ME) limit were qualified as estimated (“J+”); non-detects sample results associated LCS recoveries below the LCL but above the lower ME limit were qualified “UN”; and non-detect sample results associated with LCS recoveries above the UCL did not require qualification. According to EM 200-1-10, in the absence of reasonable LCS recovery limits, the following limits are recommended: The recovery for each target analyte should fall within 80-120% for inorganic analyses and within 60-140% for organic analyses.

4.4 Matrix Spike Sample Analysis

According to DoD QSM, MS and MSD recoveries are evaluated using the QC acceptance criteria specified by DoD for LCS. Analytes without specified DoD criteria are evaluated using laboratory calculated control limits. No qualification of associated samples in the batch

or data package shall be performed on the basis of MS recoveries alone. Professional judgment and consideration of other associated QC measures are reviewed in conjunction with MS/MSD results to determine the need for qualification of associated samples.

4.5 Duplicate Sample Analysis

Results for the laboratory duplicate sample analyses were compared to the acceptance criteria in DoD QSM. The relative percent difference (RPD) criterion of $\leq 20\%$ for inorganics was applied for cases in which both the sample and duplicate results were greater than five times the LOQ. Otherwise, the absolute difference between the samples was compared to one times the greater limit of detection (LOD) for aqueous samples and two times greater LOD limit for solid samples. If the duplicate results for an analyte did not satisfy the applicable evaluation criterion, results for that analyte in all associated samples were qualified as estimated (“J/UN”).

4.6 Field Duplicate Results

Results for FD sample analyses were compared to the following concentration-dependent acceptance criteria. The RPD criterion $\leq 30\%$ for aqueous samples, was applied for cases in which both the sample and duplicate results were greater than 5 times the LOQ. Otherwise, the absolute difference between the sample results was compared to 2 times the greater LOD. If the FD results for an analyte did not satisfy the applicable criterion, results for that analyte in all associated samples were qualified (“J/UN”).



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5.0 VALIDATION REVIEW CRITERIA

As specified in the QAPP, Level III validation of project data is performed on 100 percent of the project data packages. Validation of analytical data package was performed following the protocol specified in the QAPP. Data validation is implemented to provide a quality check on the laboratory system generating the data. The data validation process consisted of reviewing supplemental raw data supplied with the analytical data package. The supplemental raw data included the following:

- Initial calibration data for the method including all raw data for each calibration standard and the quantitation report for the calibration.
- Continuing calibration data for the method including raw data for the calibration standard and the quantitation report for the calibration.
- Instrument run logs documenting the laboratory analysis of the samples.
- Ten percent of the data were checked for transcription and calculation errors. No data used for decision making on the project were generated in the field.



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6.0 DATA REVIEW RESULTS

6.1 Laboratory Data Package Reviews

The samples reported and the QC designations are listed in Table 2-1. When quality control measurements exceeded control limits and associated field sample data were qualified, those instances are detailed below. Data review qualifiers assigned to field sample analysis data were entered into electronic data deliverable spreadsheet files and uploaded into the project database.

6.2 Review of the Laboratory Review Checklist

Items identified in the laboratory review checklists (LRC) as outside of control limits for laboratory performance criteria were evaluated for the SDGs. The evaluation of laboratory performance criteria was conducted as summarized in Section 2.0 above and sample-specific criteria as summarized in Sections 3.0 and Sections 4.0 above.

The actual methods used for sample analysis were based upon the COC. All samples arrived at the laboratory intact, on time, and within acceptable temperature range. A copy of the COC and cooler receipt form are included with the data package.

The LRC indicated that initial calibrations (ICAL) and continuing calibrations (CCAL) were within laboratory quality control limits. The LRC indicates that the ICAL and CCAL for metals were within QC limits. The LRC indicated that the serial dilutions for the metals agreed within 10% when the results were > 50 times the instrument detection limit (IDL). The LRC also indicated that the interference check standards (ICS) were within acceptance criteria.

6.3 Holding Times

Holding times were calculated by computing the difference between the sample collection date found on the COC and the sample analysis date found on the sample test reports.

SDG L13110146

- For Method SM4500-P E\|EPA 365.2 orthophosphate as phosphorous, two of the four samples arrived at the laboratory in time to perform the analyses within the 48-hour holding time. Samples MPL4-1113-1 and MPL3-1113-1 arrived at the laboratory a day later and were analyzed past holding time but within 2-times the hold time. Positive results are qualified “J” as estimates with reason code “HT.”

All other samples were analyzed within the required holding times. No qualification of those data is required due to hold time violation.

6.4 Blanks

SDG L13110337

- For Method EPA6010, vanadium was detected in the method blank greater than ½ the LOQ. Additionally, vanadium was reported above the method detection limit but less than the reporting limit in the ICB and four of six CCB. Concentrations reported for vanadium in all samples are less than 2-times the LOQ. Using professional judgment, vanadium results are qualified as non-detect with “U” at the LOQ and reason codes “PB, ICB, and CCB.”

SDG L13110465

- For Method EPA350.1, ammonia as nitrogen, the preparation blank, ICB, and CCB all showed negative results the absolute value of which exceeded the LOQ. Sample results were non-detect and are qualified “UN” for estimated non-detect with reason codes “PB, ICB, and CCB.”

SDG L13110584

- For Method EPA350.1, ammonia as nitrogen, the preparation blank, ICB, and CCB all showed negative results the absolute value of which exceeded the LOQ. Sample results were non-detect and are qualified “UN” for estimated non-detect with reason codes “PB, ICB, and CCB.”

SDG L13110758

- For Method EPA350.1, ammonia as nitrogen, the preparation blank, ICB, and CCB all showed negative results the absolute value of which exceeded the LOQ. Sample results were non-detect and are qualified “UN” for estimated non-detect with reason codes “PB, ICB, and CCB.”

6.5 Initial, Continuing, and Alternate Source Calibrations

ICAL, CCAL, and alternate source calibration checks met acceptance criteria for all reported sample analysis data. No data were qualified due to QC failures relating to calibration checks.

6.6 Laboratory Control Sample Recovery

Laboratory control sample recoveries met acceptance criteria for all reported sample analysis data. No data were qualified due to QC failures relating to laboratory control sample recoveries.

6.7 Matrix Spike/Matrix Spike Duplicate Recoveries

SDG L13110146

- For Method EPA6010, MS/MSD analyses were performed on sample MPL4-1113-1. Magnesium recovery was 130% which exceeded the upper limit of 120%. The result for magnesium in MPL4-1113-1 is qualified “J” for estimated with reason code “MS.”
- For Method SM4500-CN-I, cyanide, weak/dissociable, MS/MSD analyses were performed on sample MPL4-1113-1. Percent recoveries were greater than 35% but less than the lower acceptance limit of 90%. Positive results in MPL4-1113-1 are qualified as estimated with “J” and reason code “MS.”
- For Method EPA350.1, ammonia as nitrogen, MS/MSD analyses were performed on sample MPL4-1113-1. Percent recoveries were less than the lower acceptance limit at 66.5% and 69.5%, respectively. The MPL4-1113-1 detected result is qualified as estimated with “J” and reason code “MS.”

SDG L13110584

- For Method EPA350.1, ammonia as nitrogen, MS/MSD analyses were performed on sample MPL21-1113-1. MS/MSD percent recoveries were less than the lower acceptance limit but greater than 40 percent. Non-detect results were previously qualified “UN” as estimated non-detect for negative blank sample responses and reason code “MS” is added to that qualification.

6.8 Post Digestion Spike Recoveries

Post digestion spikes were either made by the laboratory on non-project samples or met acceptance criteria.

6.9 Laboratory Duplicate Percent Difference

Laboratory duplicate or replicate samples met acceptance criteria.

6.10 Serial Dilution

Serial dilution checks met acceptance criteria.

6.11 Field Duplicate Result Agreement

SDG L13101868

- For Method SM4500-P E\EPA 365.2 orthophosphate as phosphorous, the field duplicate pair MPL13-1013-1 and MPL13-1013-2 failed precision criteria. Results in the parent sample were more than twice the LOQ while the analyte was not detected in the field duplicate. Analysis results for the parent and duplicate sample were qualified “J” and “UN” respectively and with reason code “FD.”

SDG L13110146

- For Method SM4500-CN-I, cyanide, weak/dissociable, .the field duplicate pair MPL3-1113-1 and MPL3-1113-2 failed precision criteria. The absolute difference between the two low-level results slightly exceeded twice the detection limit. Results for the parent and field duplicate sample are qualified estimated “J” with reason code “FD.”

7.0 DATA VALIDATION RESULTS

Data packages were reviewed and validated in accordance with the approved QAPP. The data packages provided a case narrative which addressed all analytes of concern plus QC data to support Level III review and Level IV data validation. No transcription or calculation errors were found in the data. All instances in which the analytical QC results fell outside the laboratory acceptance criteria were fully and correctly reported in the LRC.



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8.0 OVERALL ASSESSMENT

The data reported in the SDGs are considered acceptable for use (as qualified) in meeting project objectives. An overall assessment of each of the data quality assurance objectives is provided below.

8.1 Accuracy

Accuracy is defined as the degree of agreement of a measurement to an accepted reference or true value. Accuracy was measured as the percent recovery (%R) of an analyte in a reference standard or spiked sample. The LCS, MS, MSD, and surrogate recoveries were within quality control limits, except as noted in Section 6.0. None of the data was rejected and estimated data are considered acceptable. Therefore, the overall level of accuracy demonstrated by the analyses is considered acceptable.

8.2 Precision

Precision is defined as the agreement between a set of replicate measurements without assumption and knowledge of the true value. Precision of laboratory measurements was evaluated by the comparison of sample/sample duplicate results.

The MS/MSD RPD was within the QAPP quality control limits with the exceptions noted in Section 6.6. As such, the overall level of precision demonstrated by the analyses is acceptable.

8.3 Completeness

None of the data was considered unusable for reconciliation with project objectives. Analytical completeness is defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis. The completeness goal for the data packages is 100%, which satisfies the site QAPP goal of 95% for aqueous samples.

8.4 Representativeness

Representativeness is the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness was evaluated by comparing the results obtained for the field duplicate sample pairs. Representativeness was maintained during the sampling event by conducting sampling in accordance with the QAPP and relevant Standard Operating Procedures (SOPs). Results for all analytes in the field duplicate met the evaluation criteria; except as noted in Section 6.9.

8.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision because these quantities are measures of data reliability. Data are comparable if collection techniques, measurement procedures, method and reporting are equivalent for the samples within a sample set. As the samples in this set and the other samples collected under the site QAPP were analyzed in accordance with the quality assurance and quality control measures prescribed in the site QAPP; and acceptable levels of overall accuracy and precision were attained, the data within this set are considered to be comparable to each other and to the other samples collected under the site QAPP.

8.6 Sensitivity

Sensitivity is evaluated in Section 9.1.

9.0 DATA USABILITY RELATIVE TO PROJECT OBJECTIVES

The usability of the sample data relative to the intended end uses is discussed in this section. To facilitate the discussion, the project objectives and associated decisions for which sampling data are to be used as a data source are discussed.

The groundwater samples were collected to meet the following objective:

- Objective: The purpose of the Former STP percolation ditch sampling is to provide data to evaluate groundwater contamination according to the RCRA Monitoring Plan.

In order to evaluate the usability of the data for making project decisions, the data must be reconciled with the project objectives and decision criteria. Only data considered to be valid (i.e., the quality of the data is known) as determined through data validation, may be considered for reconciliation with the project objectives.

The reconciliation process begins with a comparison of the maximum sample detection limits obtained to the decision criteria. In general, for the data to be considered to be usable for making the project decisions, the sample detection limits obtained for each analyte must be less than or equal to the decision criteria. Non-detect results at sample detection limits which exceed decision criteria are not sufficient for making project decisions based on those criteria.

After evaluating the usability of the data with respect to LOD obtained and project decision criteria, any potential biases and imprecision in results suggested by QC results must be assessed in order to evaluate the ultimate usability of the data for making decision. Potential biases and imprecision in analytical results and data usability are discussed in Section 9.2.

Since multiple samples and field duplicates were collected, these data can be used to evaluate the representativeness of the samples to the medium sampled. The results of this evaluation are discussed in Section 9.3.

9.1 Level of Detection and Field Sampling Plan Decision Criteria Comparison

The LOQ is the concentration of the lowest non-zero standard (adjusted for sample size and dilutions) in the laboratory's initial calibration curve. The LOD represents the detection limit for an analyte adjusted for sample size and dilutions.

The majority of the aqueous data are considered usable for meeting project objectives of sensitivity, as the LOQ for each analyte is at or below the data quality objectives.

When required, samples were analyzed at diluted concentrations (2-100X) due to constituent recoveries above the upper calibration range or matrix interferences. In instances where the analysis required dilutions, only the constituents that exceeded the upper calibration range are reported. High screening results required the analysis be performed at diluted concentrations.

9.2 Effects of Potential Biases and Imprecision on Usability of the Data

After evaluating the usability of the data with respect to detection limits and project decision criteria, any potential biases and imprecision in results is assessed in order to evaluate the usability of the data for making decisions. Potential biases and imprecision in analytical results are inferred from the results obtained for various types of quality control sample analyses. Potential bias and imprecision can result from the analytical system or the specific matrix analyzed.

Quality control analyses that provide an indication of the potential bias and imprecision in the analytical system relative to the specific sample matrix include matrix spike analyses, post digestion spiked analyses, laboratory duplicate analyses of field duplicate samples, and field duplicate analyses. Matrix spike samples are site-specific samples into which target analytes are spiked. As such, the percent recoveries obtained from the matrix spike analyses provide an indication of the potential biases of the analytical method on site-specific samples. Additionally, laboratory duplicate results provide an indication of the precision of the analyses on site-specific samples.

There is no potential bias or imprecision for the results presented in these data packages.

9.3 Representativeness

Representativeness is the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Sampling and analyses were conducted in compliance with the QAPP and relevant standard operating procedures (SOPs) in order to maintain representativeness. Field duplicate samples were outside QC limits for only a few analytes.

10.0 CORRECTIVE ACTIONS AND WORK PLAN DEVIATIONS

No field corrective actions were required during the course of the field investigation. No QAPP modifications were implemented.



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11.0 REJECTED DATA AND PROJECT CONSEQUENCES

None of the data were rejected during data review and validation. As a result, all data were considered to be usable for reconciliation with project objectives.

As discussed in Section 6.0 and Section 9.0, some results were qualified estimated based on a variety of minor QC problems. Section 9.2 discussed the direction and magnitude of the bias associated with the qualified results.

After reconciliation of the data with project objective (by means of evaluating the data set relative to sample detection limits, the magnitude and direction of any potential biases, and representativeness), all results for the samples are considered to be suitable for making decision of whether individual analyte concentrations exceed the decision criteria specified in the QAPP.



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12.0 CONCLUSIONS

With the exception of limitations noted in Section 9.0, the data are considered to be usable for making project decisions. As described in Section 10.0, these data are also considered to be of sufficient analytical quality for a variety of other end uses including baseline risk assessment. For end uses of the data other than those for which decision criteria are specified in Section 9.0 the end user of the data should perform a data quality assessment relative to their specific end use objectives. This assessment should include an evaluation of whether the analytical data are sufficiently representative of the medium under evaluation for their specific data use.



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Appendix A
Laboratory Analytical Data Reporting Forms
Chain of Custody Forms
Laboratory Narrative/Corrective Action Reports



Appendix B
Sample Delivery Group Data Validation
Checklists and Review Notes



Appendix C
Laboratory DoD ELAP Accreditation Certificate

