

Office of Environmental Management – Grand Junction



Moab UMTRA Project
April 2009 Validation Data Package for
Performance Assessment of the
Monthly Sampling for the Ground Water
Interim Action

July 2009



U.S. Department
of Energy

Office of Environmental Management

**Moab UMTRA Project
April 2009 Validation Data Package for Performance Assessment of
the Monthly Sampling for the
Ground Water Interim Action**

July 2009

**Moab UMTRA Project
April 2009 Monthly Ground Water Sampling Event**

Revision 0

Review and Approval

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Table of Contents

| Section | Page |
|--|-----------|
| Acronyms and Abbreviations | v |
| 1.0 Introduction..... | 1 |
| 1.1 Summary Criteria..... | 1 |
| 1.2 Sampling Event Summary | 2 |
| 1.3 Sampling and Analyses..... | 9 |
| 2.0 Data Assessment Summaries | 10 |
| 2.1 Water Sampling Field Activities Verification | 10 |
| 2.2 Laboratory Performance Assessment | 10 |
| 2.3 Field Analyses/Activities | 15 |
| 2.4 Certification | 16 |
| 3.0 Data Presentation..... | 16 |
| 3.1 Minimums and Maximums Report | 16 |
| 3.2 Anomalous Data Review | 16 |
| 3.3 Water Quality Data | 16 |
| 3.4 Water Level Data | 16 |
| 3.5 Blanks Report..... | 16 |

Figures

| | |
|--|---|
| Figure 1. Map of Sample Locations at the Interim Action Well Field and Baseline Area | 3 |
| Figure 2. April 2009 Sampling Event Site Conditions..... | 4 |
| Figure 3. CF1 Extraction Wells Time Versus Ammonia Total as N Concentration Plot | 5 |
| Figure 4. CF1 Extraction Wells Time Versus TDS Concentration Plot | 5 |
| Figure 5. CF1 Extraction Wells Time Versus Uranium Concentration Plot..... | 6 |
| Figure 6. CF3 Extraction Wells Time Versus Ammonia Total as N Concentration Plot | 6 |
| Figure 7. CF3 Extraction Wells Time Versus TDS Concentration Plot | 7 |
| Figure 8. CF3 Extraction Wells Time Versus Uranium Concentration Plot..... | 7 |
| Figure 9. Evaporation Pond Inlet Time Versus Ammonia Total as N Concentration Plot | 8 |
| Figure 10. Evaporation Pond Inlet Time Versus TDS Concentration Plot | 8 |
| Figure 11. Evaporation Pond Inlet Time Versus Uranium Concentration Plot..... | 9 |

Tables

| | |
|---|----|
| Table 1. Analytes and Methods..... | 10 |
| Table 2. Data Qualifiers | 11 |
| Table 3. Reason Codes for Data Flags..... | 11 |

Appendices

Appendix A. Water Sampling Field Activities Verification A-1
Appendix B. Minimums and Maximums Report B-1
Appendix C. Water Quality Data C-1
Appendix D. Water Level Data D-1

Attachment

Attachment 1. Interim Action Well Field Monthly Sampling Trip Report

Acronyms and Abbreviations

| | |
|--------|--|
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| CF | Configuration |
| cfs | cubic feet per second |
| COC | chain of custody |
| CRI | reporting limit verification |
| EB | equipment blank |
| EDD | electronic data deliverable |
| EPA | Environmental Protection Agency |
| ft | feet |
| gpm | gallons per minute |
| ICB | initial calibration blank |
| ICP | inductively coupled plasma |
| ICP-MS | inductively coupled plasma-mass spectrometry |
| ICS | interface check samples |
| ICV | initial calibration verification |
| IDL | instrument detection limit |
| LCS | laboratory control sample |
| MB | method blank |
| MDL | method detection limit |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| r^2 | correlation coefficient |
| RIN | report identification number |
| RL | reporting limit |
| RPD | relative percent difference |
| RS | replicate sample |
| SD | serial dilution |
| SDG | sample data group |
| TDS | total dissolved solids |
| UMTRA | Uranium Mill Tailings Remedial Action |
| USGS | U.S. Geological Survey |
| VDP | validation data package |

1.0 Introduction

The purpose of this document is to summarize the results of the data validation process associated with ground water and/or surface water samples collected from the Moab Uranium Mill Tailings Remedial Action (UMTRA) site. This data validation follows the criteria according to the *Environmental Procedures Catalog* (STO 6), "Standard Practice for Validation of Laboratory Data," GT-9(P) (2006).

As part of the scope of this document, the complete results of this data validation process are provided. Section 1 presents the Summary Criteria, the Sampling Event Summary, and the Sampling and Analysis. Section 2 provides the Data Assessment Summaries, including the Field Activity Verification, Laboratory Performance Assessment, Field Analyses/Activities description, and the Certification. All flagged data, and the reasons for the applicable flags, are also presented in Section 2. The Data Presentation is contained in Section 3, which includes a summary of the anomalous data generated by the validation process. Various appendices contain the Water Sampling Field Activities Verification, Water Quality Data, Water Level Data, and the Minimums and Maximums Report table. Attachment 1 contains the trip report. All Colorado River flow discussed in this document is measured from the U.S. Geological Survey (USGS) Cisco gaging station No. 09180500.

This validation data package (VDP) presents the results of the April 2009 monthly sampling event completed from April 28 through 30, 2009, in which ground water samples were collected from a variety of locations across the well field. Section 1.0 contains the Summary Criteria with a sample location map (Section 1.1), the Sampling Event Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for this April 2009 monthly sampling event.

1.1 Summary Criteria

Sampling Period: April 28 through 30, 2009

The purpose of this sampling was to collect data that can be used to evaluate the performance of the ground water interim action well field. All sampling locations are shown on Figure 1. A summary of site conditions is presented in Figure 2.

1. As a result of this sampling event, is there any indication of anomalous data that may be related to well field pump rate changes, river flow, or other known causes?

No. There were no anomalous data associated with this sampling event.

2. Were all interim action well field pumps operating within the planned parameters?

Yes. Configuration (CF) 1 wells and SMI-PW02 (PW02) were restarted on April 27 after being shut down on April 22 for system repairs. During the sampling event, CF1 was extracting ground water at a rate of approximately 31 gallons per minute (gpm), while PW02 was extracting at a rate of 17 gpm. CF3 wells were restarted on April 28 and were extracting approximately 50 gpm during this sampling event. As a result, the total well field extraction rate (by the end of the event) was approximately 98 gpm.

3. Was the evaporation pond functioning properly?

Yes. The pond level ranged from 7.5 to 7.7 feet (ft) during this sampling event.

4. Were all proposed well (ground water) and surface water locations sampled during this event?

No. The recirculation pump for the evaporation pond was not running, and the sample for location 0548 could not be collected.

5. Were there any site activities that have impacted or may impact the interim action system?

Yes. The week prior to the completion of this sampling event, it was necessary to shut down the entire well field because of a leak on the main extraction line. The leak was repaired; CF1 and PW02 were restarted on April 27, and CF3 was restarted on April 28.

1.2 Sampling Event Summary

This VDP presents the validated data associated with the ground water collected during the April 2009 interim action monthly sampling event at the former uranium tailings processing site in Moab, Utah. This VDP includes a discussion of the data validation process in Section 2.0, with a description of how these data are qualified based on field and laboratory verification assessments (Sections 2.1 and 2.2). Attachment 1 contains the trip report detailing the field events associated with this sampling event.

A list of flagged data is presented in Table 2 in Section 2.2. No data were rejected (flagged as “R”) as a result of this validation process. A Minimums and Maximums Report (presented in Section 3.1) was generated to determine if the data are within a normal statistical range. Based on the results of the Minimums and Maximums Report, there were no anomalous data associated with this sampling event (see Anomalous Data Review in Section 3.2).

While independent of the data validation process, a brief summary of the most recent concentration trends based on the April 2009 data is provided for CF1 and CF3 within the well field. Standard selected performance indicator monitoring wells were not sampled during this event; however, time versus concentration plots (ammonia, total dissolved solids [TDS], and uranium) for extraction wells located near each end and the middle of CF1 and CF3 are presented to display historical trends exhibited by the data over the past 2 years. Time versus concentration plots are also provided for the evaporation pond inlet sample location in this discussion. Colorado River flows over the same time frame are also plotted to determine whether the magnitude of river flows influences analyte concentrations in CF1 and CF3, while the evaporation pond level is plotted with the inlet analyte concentrations.

CF1

Samples were collected from all odd-numbered CF1 extraction wells during the April 2009 sampling event. Time versus concentration plots were developed using the data collected from extraction wells 0471 (located near the southern end of CF1), 0475 (located in the middle of CF1), and 0479 (located at the northern end of CF1). Figures 3, 4, and 5 suggest ammonia, TDS, and uranium concentrations have in general fully rebounded to pre-2008 spring runoff levels, and in April 2009 the analyte concentrations were comparable at the three locations.



Figure 2. April 2009 Sampling Event Site Conditions

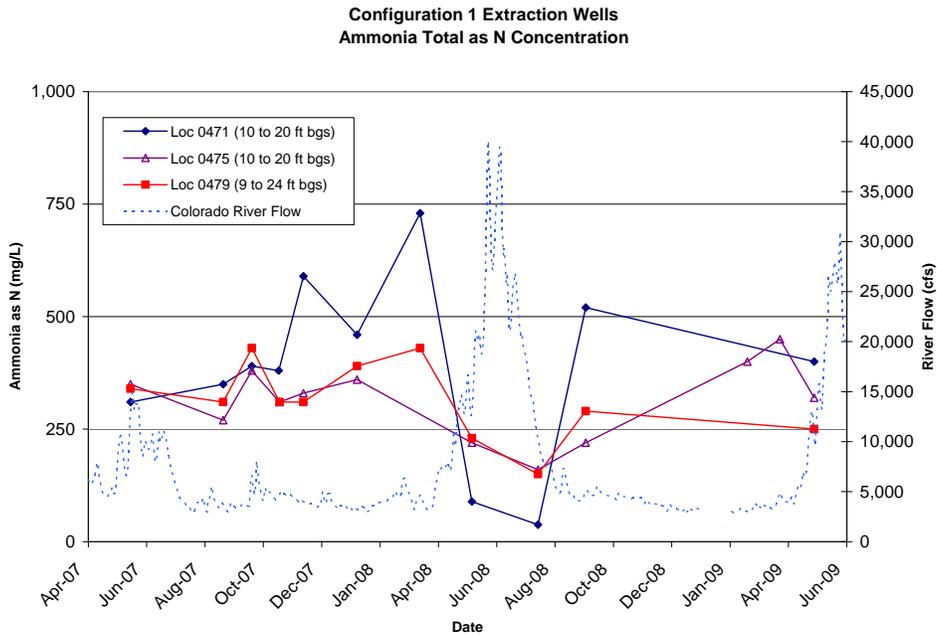


Figure 3. CF1 Extraction Wells Time Versus Ammonia Total as N Concentration Plot

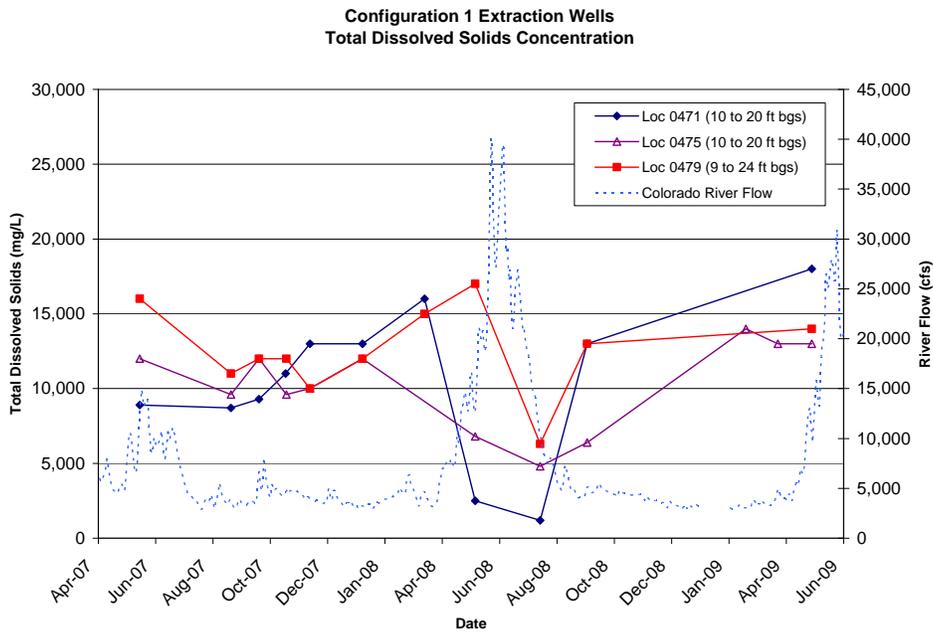


Figure 4. CF1 Extraction Wells Time Versus TDS Concentration Plot

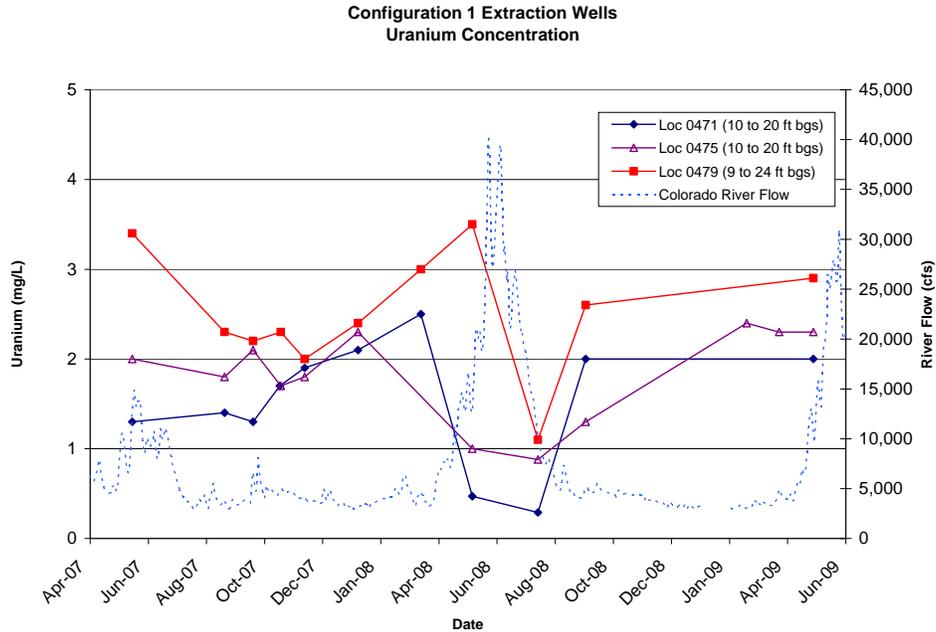


Figure 5. CF1 Extraction Wells Time Versus Uranium Concentration Plot

CF3

Similar to CF1, samples were also collected from all odd-numbered CF3 extraction wells during this event. The time versus concentration plots presented below were developed using the data collected from extraction wells 0671 (located near the southern end of CF3), 0675 (located in the middle), and 0679 (located at the northern end of CF1). Figures 6, 7, and 8 suggest ammonia, TDS, and uranium concentrations measured during April 2009 are similar regardless of the location.

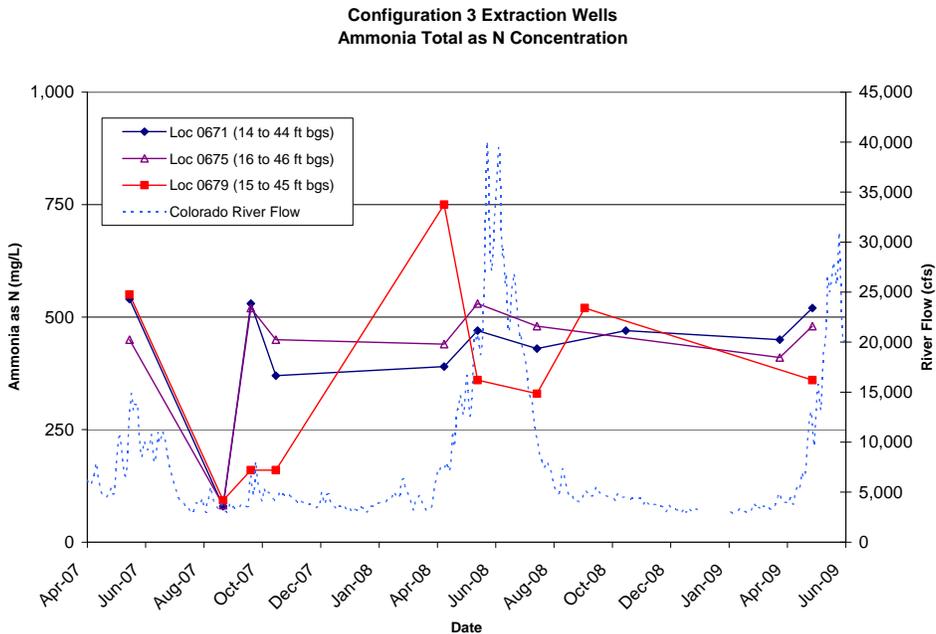


Figure 6. CF3 Extraction Wells Time Versus Ammonia Total as N Concentration Plot

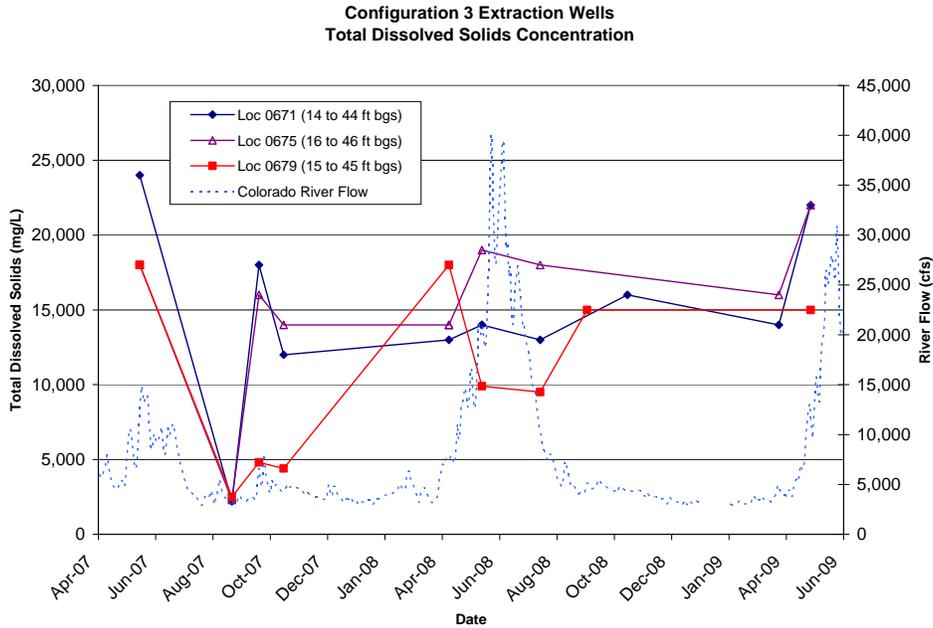


Figure 7. CF3 Extraction Wells Time Versus TDS Concentration Plot

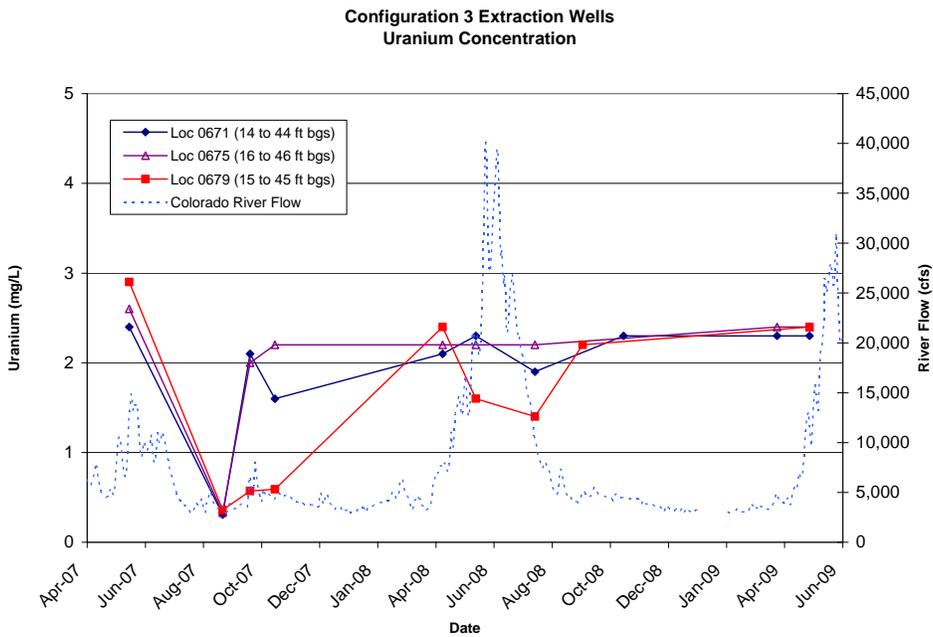


Figure 8. CF3 Extraction Wells Time Versus Uranium Concentration Plot

Evaporation Pond Inlet (Location 0547)

Figures 9, 10, and 11 display the ammonia, TDS, and uranium concentration trends (respectively) for the evaporation pond inlet sampling location. As the plots display, analyte concentrations measured in April 2009 are within the historical range within the past 2 years.

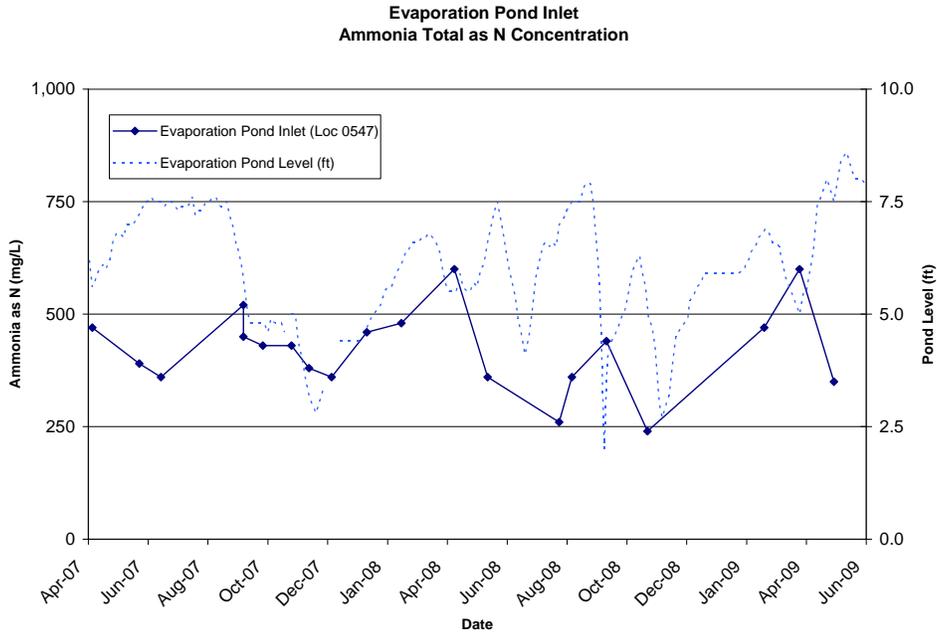


Figure 9. Evaporation Pond Inlet Time Versus Ammonia Total as N Concentration Plot

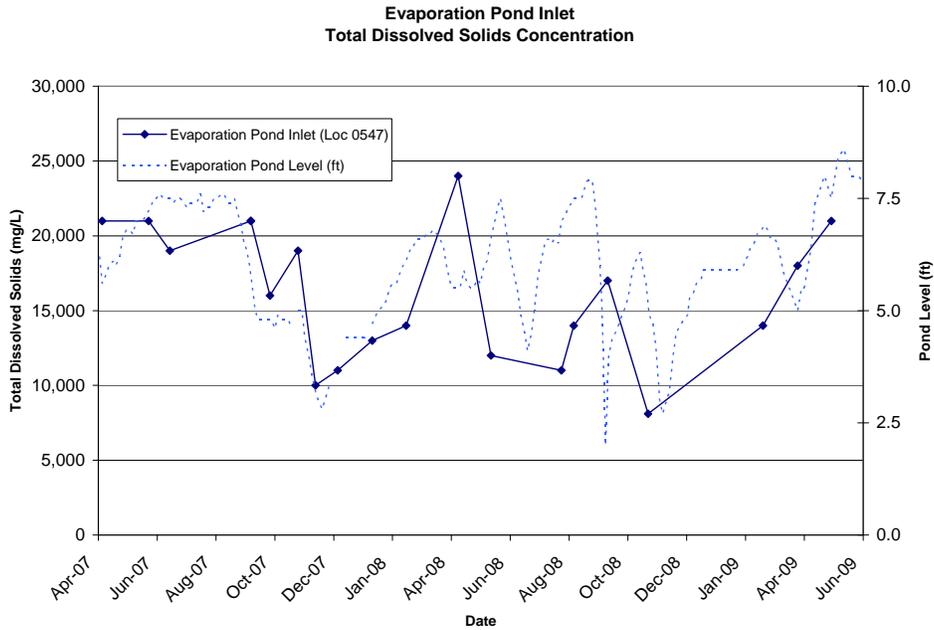


Figure 10. Evaporation Pond Inlet Time Versus TDS Concentration Plot

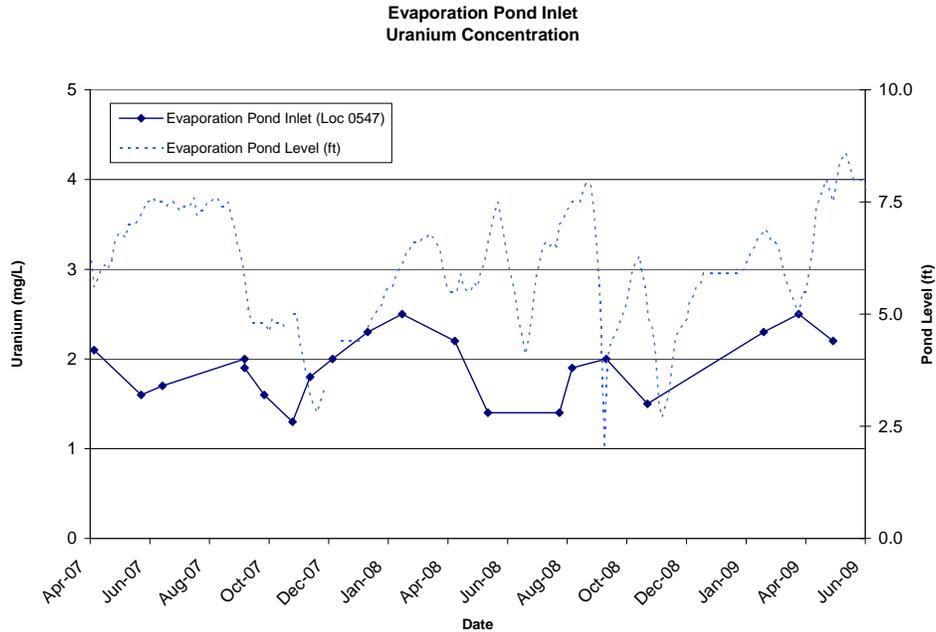


Figure 11. Evaporation Pond Inlet Time Versus Uranium Concentration Plot

Surface Water Sampling Results

No surface water samples were collected as part of the April 2009 sampling event.

1.3 Sampling and Analyses

Sampling and analyses were conducted in accordance with the *Operations, Maintenance, and Performance Monitoring Plan for the Interim Action Ground Water Treatment System, April 2008* (DOE-EM/GJ1220). Although not listed here, the normal set of locations were sampled. Please refer to the attached trip report (Attachment 1) for specific sampled locations and an explanation of why some locations were not sampled.

The data validations indicate that the data meet the quality-control criteria specified for this project. An adequate number of duplicates were collected, and all samples were collected using dedicated equipment; therefore, no equipment blanks (EBs) were required. All samples were analyzed within their prescribed holding times. No significant discrepancies were noted regarding sample shipping and receiving, preservation times, instrument calibration, method blanks (MBs), or matrix spikes (MSs), except as qualified or noted in the Laboratory Performance Assessment (Section 2.2).

There were no anomalous data points associated with this sampling event. See the Anomalous Data Review (Section 3.2) for more details.

According to the USGS Cisco gaging station, the mean daily Colorado River flow rates varied between 9,590 and 11,600 cubic feet per second (cfs) during this sampling period.

2.0 Data Assessment Summaries

This section contains the Water Sampling Field Activities Verification (Section 2.1), the Laboratory Performance Assessment (Section 2.2), the Field Analyses/Activities (Section 2.3), and Certification (Section 2.4).

2.1 Water Sampling Field Activities Verification

The field activities verification process for this sampling event was documented using the checklist in Appendix A. As the checklist exhibits, all sampling was conducted following the applicable procedures. Please see Appendix A for the field activities verification checklist.

2.2 Laboratory Performance Assessment

General Information

Report Identification Number (RIN): 0904029

Sample Event: April 2009 Interim Action Well Field Monthly Sampling Event

Site(s): Moab, Utah

Laboratory: ALS Laboratory Group (formerly Paragon Analytics),
Fort Collins, Colorado

Sample Data Group (SDG) Number: 0904013

Analysis: Metals and Inorganics

Validator: Rachel Cowan

Review Date: June 11, 2009

This validation was performed according to the *Environmental Procedures Catalog* (STO 6), “Standard Practice for Validation of Laboratory Data,” GT-9(P) (2006). The procedure was applied at Level 3, Data Deliverables Examination. The level 3 validation was performed on 100 percent of the samples, which included a review of the chain of custody (COC), case narratives, field and sample identifications, holding times, preservation, and cooler receipt. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

| Analyte | Line Item Code | Preparation Method | Analytical Method |
|--------------|----------------|--------------------|-------------------|
| Ammonia as N | WCH-A-005 | EPA 350.1 | EPA 350.1 |
| Chloride | MIS-A-039 | SW-846 9056 | SW-846 9056 |
| Manganese | G17 | SW-846 3005A | SW-846 6010B |
| Sulfate | MIS-A-044 | SW-846 9056 | SW-846 9056 |
| TDS | WIC-A-033 | EPA 160.1 | EPA 160.1 |
| Uranium | G1 | SW-846 3005A | SW-846 6020A |

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to Table 3 below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

| Sample Number | Location | Analyte | Flag | Reason |
|-------------------------|--|-----------|------|--------|
| All SDG 0904013 samples | 0671, 0673, 0675, 0677, 0679. 0471, 0473, 0475, 0477, 0479, SMI-PW02, and 0547 | Manganese | J | SD1 |
| All SDG 0904013 samples | 0671, 0673, 0675, 0677, 0679. 0471, 0473, 0475, 0477, 0479, SMI-PW02, and 0547 | Manganese | J | MS1 |

J indicates results are estimated and becomes a UJ for analytical results below the detection limit.

Table 3. Reason Codes for Data Flags

| Reason Code | Qualifier (Detects) | Qualifier (Nondetects) | Explanation |
|-------------|---------------------|------------------------|---|
| SD1 | J | UJ | The frequency requirements for inductively coupled plasma serial dilution are not met. |
| MS1 | J | UJ | Results for the affected analyte(s) are regarded as estimated (J) because the MS sample was (a) from another client, (b) of dissimilar matrix, (c) a field blank or EB, or (d) not analyzed at the proper frequency as stated in the appropriate analytical method. |

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received a total of 13 samples for RIN 0904029 in one shipment, which arrived on May 1, 2009 (UPS tracking number 1Z5W1Y510197651167). The sample group was accompanied by a COC form. The COC form was checked to confirm that all of the samples were listed on the form with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The sample submittal documents, including the COC forms and the sample tickets, had no errors or omissions.

Preservation and Holding Times

SDG 0904013 was received intact in one cooler with the temperature of 1.4°C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. Calibration standards were prepared from independent sources.

In addition, for inductively coupled plasma (ICP) analytes (manganese, copper, selenium, uranium), reporting limit verifications (CRIs) verify the linearity of the calibration curve near the reporting limit (RL). For ICP-mass spectrometry (ICP-MS) analytes (selenium and uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. And also for ICP-MS, internal standards are analyzed to indicate stability of the instruments.

Method SW-846 6010B, Manganese

The manganese calibration was performed on May 7, 2009. The calibration used three calibration standards and a blank, resulting in a calibration curve with a correlation coefficient (r^2) value greater than 0.995. The manganese calibration curve intercept was positive, and its value was less than three times the method detection level (MDL).

Initial and continuing calibration verification (ICV and CCV) checks were made at the required frequency, resulting in two CCVs for manganese. All calibration checks met the acceptance criteria.

A CRI was analyzed to verify the linearity of the calibration curve near the RL. The CRI verification was within the acceptance range.

Method SW-846 6020A, Uranium

The uranium calibration was performed on May 5, 2009. The initial calibration was performed using eight calibration standards and one blank, resulting in a calibration curve with an r^2 value greater than 0.995. The calibration curve intercept for uranium was negative, and its absolute value was greater than three times the MDL. Therefore, all uranium results were checked to confirm that all results were greater than three times the absolute value of the intercept. All uranium results were greater than three times the absolute value of the intercept, and so none needed to be flagged for this reason.

ICV and CCV checks were made at the required frequency, resulting in three CCVs (May 5, 2009) for uranium. All calibration checks met the acceptance criteria.

A CRI was analyzed to verify the linearity of the calibration curve near the RL. The CRI verification was within the acceptance criteria range.

Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure and were in acceptable range. Internal standard recoveries were stable and within acceptable range.

Method EPA 350.1, Ammonia as N

The initial calibration for ammonia as N was performed using six calibration standards and a blank on May 5, 2009. The calibration curve had an r^2 value greater than 0.995 and an intercept less than three times the MDL. ICV and CCV checks were made at the required frequency resulting in two CCVs (May 5, 2009). All calibration check results were within the acceptance criteria.

Method SW-846 9056, Chloride and Sulfate

Initial calibrations for chloride and sulfate were performed using five calibration standards and a blank on March 25, 2009. The calibration curve r^2 values were greater than 0.995, and the

absolute values of the intercepts were less than three times the MDL. ICV and CCV checks were made at the required frequency, resulting in four CCVs (May 4, 2009). All calibration checks met the acceptance criteria.

Method EPA 160.1, TDS

There is no initial or continuing calibration requirement associated with the determination of TDS.

Method and Calibration Blanks

MBs are analyzed to assess any contamination that may have occurred during sample preparation. Both initial calibration and continuing calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. Detected sample results associated with blanks results greater than the MDL or instrument detection limit (IDL) (depending on method requirements) were “U”-qualified when the detections were less than five times the blank concentration. Nondetects were not qualified.

The manganese initial calibration blank (ICB) and continuing calibration blanks (CCBs) had results that were less than the MDL.

The uranium ICB and all uranium CCBs results were greater than the respective MDLs/IDLs. However, all results were greater than five times the associated blanks’ concentrations, so no uranium results needed to be qualified.

The ammonia MB and some ammonia CCBs results were greater than the IDL, and the ammonia MB and some CCBs results were negative and had absolute values greater than the IDL. However, the ammonia results were all greater than five times the associated blanks’ concentrations, and so no ammonia results needed to be flagged for this reason.

Some chloride and sulfide CCBs and the sulfate MB had results that were greater than the associated IDLs; however, all affected results were greater than five times the related blanks’ concentrations, and so no results were qualified.

ICP Interference Check Sample Analysis

ICP interference check samples (ICSA and ICSAB) are analyzed to verify the instrument interelement and background correction factors.

For the manganese results in SDG 0904013, interelement interference was not a factor based on the aluminum, calcium, iron, and magnesium results in all samples being lower than the corresponding amounts of aluminum, calcium, iron, and magnesium in the ICSA standard. The recovery of the ICSAB samples was acceptable as well.

For the uranium analyses, the ICSA values for calcium, magnesium, aluminum, and iron were not provided for verification of the instrument’s interelement and background correction factors. The percent recovery of the ICSAB sample was provided and was acceptable for all uranium analyses.

MS Analysis

MS samples were prepared and analyzed for all analytes as a measure of method performance in the sample matrix. Laboratory spike standards are prepared from independent sources. The spike recoveries met the recovery and precision criteria for all analytes, with the exceptions detailed below.

The MS recovery could not be evaluated for the ammonia MS sample in SDG 0904013 because the analyte concentration in the native sample was above the analytical range. Based on validation protocol, qualification requirements are not applicable when the native sample concentration exceeds four times the spike concentration. Therefore, no qualifiers were applied to samples associated with this unusable MS.

The MS recovery could not be evaluated for the chloride MS sample in SDG 0904013 because the analyte concentration in the native sample was above the analytical range. Based on validation protocol, qualification requirements are not applicable when the native sample concentration exceeds four times the spike concentration. Therefore, no qualifiers were applied to samples associated with this unusable MS.

Laboratory Replicate Analysis

The laboratory replicate sample (RS) results demonstrate acceptable laboratory precision. The relative percent difference (RPD) values for the reported laboratory replicate sample (for TDS) and the matrix spike duplicate (MSD) results for all other analytes were less than 20 percent for results greater than five times the RL with the exceptions detailed below.

The RPD could not be determined for the ammonia MSD because the analyte concentrations in the native sample were above the analytical range. However, the field duplicate sample was analyzed (sample 0904013-11), and its ammonia result met the precision requirements. Therefore, no qualification for RS failure was required.

The RPD could not be determined for the chloride MSD because the analyte concentrations in the native sample were above the analytical range. However, the field duplicate sample was analyzed (sample 0904013-11), and its chloride result met the precision requirements. Therefore, no qualification for RS failure was required.

Field Duplicate Analysis

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory replicates, which measure only laboratory performance. A duplicate sample was collected from location 0479 (0904013-11) in the April 2009 sampling event. The duplicate results met the U.S. Environmental Protection Agency (EPA) recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL.

Laboratory Control Sample

Laboratory control samples (LCSs) provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCS results were acceptable for all analyses with the exceptions detailed below.

LCSs were not reported for manganese or uranium. As a standard practice, ALS Laboratory Group does not prepare LCSs for samples that were field-filtered and acidified and run directly on the instrument without any additional sample preparation. Per national environmental laboratory accreditation requirements, an MS may be used in place of an LCS provided the acceptance criteria are as stringent. Therefore, no qualification was required due to the lack of LCS results, because all of the MS results for manganese and uranium were acceptable. See MS Analysis section for required qualification.

Metals Serial Dilution

Serial dilution (SD) samples were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. ICP-MS SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. ICP-atomic emission spectroscopy SD data are evaluated when the concentration of the undiluted sample is greater than 50 times the RL. All evaluated serial dilution data were acceptable with the following exception.

The SD sample selected as the quality-control sample for the May 5, 2009, manganese analytical run was not one of the samples in SDG 0904013. Therefore, all associated manganese results were “J”-flagged for reason SD1 and MS1.

Detection Limits/Dilutions

Dilutions were prepared in a consistent and acceptable manner when dilutions were required. The required detection limits were achieved for all analytes.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The electronic data deliverable (EDD) files arrived on May 11, 2009. The contents of the EDD were manually examined to ensure all and only the requested data are delivered in compliance with requirements and that the sample results accurately reflect the data contained in the sample data package.

2.3 Field Analyses/Activities

The following information summarizes the field analyses and activities for the April 2009 sampling event.

Field Activities

All monitor wells were purged and sampled using the low-flow sampling method; this method was not used at extraction wells. One duplicate sample was collected. There are no established regulatory criteria for the evaluation of field duplicate samples; therefore, EPA guidance for laboratory duplicates (which is conservative for field duplicates) was used to assess the precision of the field duplicates. All results met the criteria of ± 20 RPD and are considered acceptable.

2.4 Certification

Results were reported in correct units for all analytes requested. Appropriate contract-required laboratory qualifiers and target analyte lists were used. The RLs were met. All analytical quality-control criteria were met except as qualified on the Ground Water Quality Data by Parameter, Surface Water Quality by Parameter, or equipment/trip blank database printouts. The meaning of data qualifiers is defined on the database printouts or defined in the EPA *Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media Multi-Concentration*, (ILMO2.0) (1991). All data in this package are considered validated and may be treated as final results.

3.0 Data Presentation

This section contains the Minimums and Maximums Report (Section 3.1), the Anomalous Data Review (Section 3.2), tables containing the Water Quality Data and Water Level Data (Sections 3.3 and 3.4, respectively), and the Blanks Report (Section 3.5).

3.1 Minimums and Maximums Report

The Minimums and Maximums Report (see Appendix B) is generated by the Sample Management System used to query the SEEPro database. The DataVal program compares the new data set with historical data and lists all new data that fall outside the historical data range. Values listed in the reports are further screened, and the results are not considered anomalous if: (1) identified low concentrations are the result of low detection limits; (2) the concentration detected is less or more than 50 percent of historical minimum or maximum values; or (3) there were fewer than five historical samples for comparison.

3.2 Anomalous Data Review

There were no sample locations with any analytical results that were considered anomalous based on the Minimums and Maximums Report.

3.3 Water Quality Data

All water quality data are presented in Appendix C.

3.4 Water Level Data

All water level data are presented in Appendix D.

3.5 Blanks Report

All samples were collected using dedicated equipment; therefore, an EB was not required for this sampling event.

Appendix A.
Water Sampling Field Activities Verification

Appendix A. Water Sampling Field Activities Verification

| | | | |
|--------------------------------|------------------------|----------------------------------|---------------------|
| Sampling Event / RIN | April 2009/RIN 0904029 | Date(s) of Water Sampling | April 28 – 30, 2009 |
| Date(s) of Verification | June 16, 2009 | Name of Verifier | Rachel Cowan |

| | Response (Yes, No, NA) | Comments |
|---|---------------------------------------|-----------------|
| 1. Is the Sampling Analysis Plan the primary document directing field procedures? List other documents, standard operating procedures, instructions. | Yes | |
| | NA | |
| 2. Were the sampling locations specified in the planning documents sampled? | Yes | |
| 3. Was a pretrip calibration conducted as specified in the aforementioned documents? | Yes | |
| 4. Was an operational check of the field equipment conducted twice daily? | Yes | |
| Did the operational checks meet criteria? | Yes | |
| 5. Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, dissolved oxygen, oxidation reduction potential) of field measurements taken as specified? | Yes | |
| 6. Was the category of the well documented? | Yes | |
| 7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? | Yes | |
| Did the water level stabilize prior to sampling? | Yes | |
| Did pH, specific conductance, and turbidity measurements stabilize prior to sampling? | Yes | |
| Was the flow rate less than 500 milliliters per minute? | Yes | |
| If a portable pump was used, was there a 4-hour delay between pump installation and sampling? | NA | |

Appendix A. Water Sampling Field Activities Verification (continued)

- | | |
|--|--|
| 8. Were the following conditions met when purging a Category II well: | |
| Was the flow rate less than 500 milliliters per minute? | Yes _____ |
| Was one pump/tubing volume removed prior to sampling? | Yes _____ |
| 9. Were duplicates taken at a frequency of one per 20 samples? | Yes There were 13 samples, and 1 duplicate was collected. _____ |
| 10. Were EBs taken at a frequency of one per 20 samples that were collected with nondedicated equipment? | NA All samples were collected on dedicated equipment; therefore, it was not necessary to collect an EB. _____ |
| 11. Were trip blanks prepared and included with each shipment of volatile organic compound samples? | NA _____ |
| 12. Were quality-control samples assigned a fictitious site identification number? | Yes _____ |
| Was the true identity of the samples recorded on the quality assurance sample log? | Yes _____ |
| 13. Were samples collected in the containers specified? | Yes _____ |
| 14. Were samples filtered and preserved as specified? | Yes _____ |
| 15. Were the number and types of samples collected as specified? | Yes _____ |
| 16. Were COC records completed, and was sample custody maintained? | Yes _____ |
| 17. Are field data sheets signed and dated by both team members? | Yes _____ |
| 18. Was all other pertinent information documented on the field data sheets? | Yes _____ |
| 19. Was the presence or absence of ice in the cooler documented at every sample location? | Yes _____ |
| 20. Were water levels measured at the locations specified in the planning documents? | Yes _____ |

Appendix B.
Minimums and Maximums Report

Appendix B. Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: PARAGON (Fort Collins, CO)

RIN: 0904029

Comparison: All Historical Data

Report Date: 6/15/2009

| Site Code | Location Code | Sample Date | Analyte | Current | | Historical Maximum | | Historical Minimum | | Count | |
|-----------|---------------|-------------|-----------|---------|------------------------|--------------------|------------------------|--------------------|------------------------|-------|----------------|
| | | | | Result | Qualifiers Lab Data | Result | Qualifiers Lab Data | Result | Qualifiers Lab Data | N | N Below Detect |
| MOA01 | 0671 | 04/28/2009 | Manganese | 5.7 | J | 5.3 | | 0.71 | | 10 | 0 |
| MOA01 | 0671 | 04/28/2009 | Sulfate | 9000 | | 8900 | | 1200 | | 24 | 0 |
| MOA01 | 0673 | 04/28/2009 | Manganese | 6 | J | 5.8 | | 0.69 | | 8 | 0 |
| MOA01 | 0675 | 04/28/2009 | Manganese | 5.7 | J | 4.9 | | 0.73 | | 9 | 0 |
| MOA01 | 0677 | 04/28/2009 | Manganese | 5.7 | J | 5.5 | | 0.66 | | 9 | 0 |

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique.
- X Location is undefined.
- J Estimated value.
- R Unusable result.

Appendix C.
Water Quality Data

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 6/24/2009

| Parameter | Units | Location ID | Location Type | Sample | | Depth Range (Ft BLS) | | | Result | Qualifiers | | Detection Limit | Uncertainty |
|------------------------------|-------|-------------|---------------|------------|------|----------------------|---|---|--------|------------|---------|-----------------|-------------|
| | | | | Date | ID | | | | | Lab | Data QA | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 718 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 580 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 710 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 790 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 788 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 304 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 940 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 740 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 778 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 848 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 742 | | # | | |
| Alkalinity, Total (As CaCO3) | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 884 | | # | | |
| Ammonia Total as N | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 400 | | # | 20 | |
| Ammonia Total as N | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 320 | | # | 20 | |
| Ammonia Total as N | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 320 | | # | 20 | |
| Ammonia Total as N | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 240 | | # | 20 | |
| Ammonia Total as N | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 250 | | # | 20 | |
| Ammonia Total as N | mg/L | 0479 | WL | 04/29/2009 | 0002 | 0 | - | 0 | 230 | | # | 20 | |
| Ammonia Total as N | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 350 | | # | 20 | |
| Ammonia Total as N | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 520 | | # | 20 | |
| Ammonia Total as N | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 460 | | # | 20 | |
| Ammonia Total as N | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 480 | | # | 20 | |
| Ammonia Total as N | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 440 | | # | 20 | |
| Ammonia Total as N | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 360 | | # | 20 | |
| Ammonia Total as N | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 530 | | # | 20 | |
| Chloride | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 5500 | | # | 100 | |

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 6/24/2009

| Parameter | Units | Location ID | Location Type | Sample | | Depth Range (Ft BLS) | | | Result | Qualifiers | | Detection Limit | Uncertainty |
|------------------|-------|-------------|---------------|------------|------|----------------------|---|---|--------|------------|---------|-----------------|-------------|
| | | | | Date | ID | | | | | Lab | Data QA | | |
| Chloride | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2700 | | # | 40 | |
| Chloride | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2400 | | # | 40 | |
| Chloride | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2100 | | # | 40 | |
| Chloride | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2400 | | # | 40 | |
| Chloride | mg/L | 0479 | WL | 04/29/2009 | 0002 | 0 | - | 0 | 2200 | | # | 40 | |
| Chloride | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 7300 | | # | 200 | |
| Chloride | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6300 | | # | 200 | |
| Chloride | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 9300 | | # | 100 | |
| Chloride | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6200 | | # | 100 | |
| Chloride | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 4800 | | # | 100 | |
| Chloride | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2300 | | # | 40 | |
| Chloride | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 15000 | | # | 200 | |
| Dissolved Oxygen | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.28 | | # | | |
| Dissolved Oxygen | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.3 | | # | | |
| Dissolved Oxygen | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.18 | | # | | |
| Dissolved Oxygen | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 3.51 | | # | | |
| Dissolved Oxygen | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 1.21 | | # | | |
| Dissolved Oxygen | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 5.43 | | # | | |
| Dissolved Oxygen | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 1.54 | | # | | |
| Dissolved Oxygen | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 1.53 | | # | | |
| Dissolved Oxygen | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.7 | | # | | |
| Dissolved Oxygen | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.31 | | # | | |
| Dissolved Oxygen | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 3.25 | | # | | |
| Dissolved Oxygen | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 5.37 | | # | | |
| Manganese | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 3.8 | J | # | 0.0012 | |
| Manganese | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.5 | J | # | 0.0012 | |
| Manganese | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.9 | J | # | 0.0012 | |

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 6/24/2009

| Parameter | Units | Location ID | Location Type | Sample | | Depth Range | | | Result | Qualifiers | | | Detection Limit | Uncertainty |
|-------------------------------|-------|-------------|---------------|------------|------|-------------|-----|------|--------|------------|---|--------|-----------------|-------------|
| | | | | Date | ID | (Ft BLS) | Lab | Data | | QA | | | | |
| Manganese | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.6 | J | # | 0.0012 | | |
| Manganese | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 3.5 | J | # | 0.0012 | | |
| Manganese | mg/L | 0479 | WL | 04/29/2009 | 0002 | 0 | - | 0 | 3.5 | J | # | 0.0012 | | |
| Manganese | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 4.6 | J | # | 0.0012 | | |
| Manganese | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 5.7 | J | # | 0.0012 | | |
| Manganese | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6 | J | # | 0.0029 | | |
| Manganese | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 5.7 | J | # | 0.0012 | | |
| Manganese | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 5.7 | J | # | 0.0012 | | |
| Manganese | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 4.9 | J | # | 0.0012 | | |
| Manganese | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 6.7 | J | # | 0.0058 | | |
| Oxidation Reduction Potential | mV | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 243 | | # | | | |
| Oxidation Reduction Potential | mV | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 183 | | # | | | |
| Oxidation Reduction Potential | mV | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 197 | | # | | | |
| Oxidation Reduction Potential | mV | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 142 | | # | | | |
| Oxidation Reduction Potential | mV | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 194 | | # | | | |
| Oxidation Reduction Potential | mV | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 252 | | # | | | |
| Oxidation Reduction Potential | mV | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 231 | | # | | | |
| Oxidation Reduction Potential | mV | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 217 | | # | | | |
| Oxidation Reduction Potential | mV | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 215 | | # | | | |
| Oxidation Reduction Potential | mV | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 206 | | # | | | |
| Oxidation Reduction Potential | mV | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 209 | | # | | | |
| Oxidation Reduction Potential | mV | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 276 | | # | | | |
| pH | s.u. | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6.74 | | # | | | |
| pH | s.u. | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6.98 | | # | | | |

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 6/24/2009

| Parameter | Units | Location ID | Location Type | Sample | | Depth Range | | | Result | Qualifiers | | Detection Limit | Uncertainty |
|----------------------|----------|-------------|---------------|------------|------|-------------|-----|------|--------|------------|---|-----------------|-------------|
| | | | | Date | ID | (Ft BLS) | Lab | Data | | QA | | | |
| pH | s.u. | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6.84 | | # | | |
| pH | s.u. | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6.91 | | # | | |
| pH | s.u. | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6.69 | | # | | |
| pH | s.u. | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 6.81 | | # | | |
| pH | s.u. | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6.71 | | # | | |
| pH | s.u. | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6.56 | | # | | |
| pH | s.u. | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6.53 | | # | | |
| pH | s.u. | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6.76 | | # | | |
| pH | s.u. | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 6.78 | | # | | |
| pH | s.u. | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 6.83 | | # | | |
| Specific Conductance | µmhos/cm | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 27991 | | # | | |
| Specific Conductance | µmhos/cm | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 18565 | | # | | |
| Specific Conductance | µmhos/cm | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 18933 | | # | | |
| Specific Conductance | µmhos/cm | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 18106 | | # | | |
| Specific Conductance | µmhos/cm | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 19076 | | # | | |
| Specific Conductance | µmhos/cm | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 34916 | | # | | |
| Specific Conductance | µmhos/cm | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 32391 | | # | | |
| Specific Conductance | µmhos/cm | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 44574 | | # | | |
| Specific Conductance | µmhos/cm | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 33167 | | # | | |
| Specific Conductance | µmhos/cm | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 30611 | | # | | |
| Specific Conductance | µmhos/cm | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 20933 | | # | | |
| Specific Conductance | µmhos/cm | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 58232 | | # | | |
| Sulfate | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6600 | | # | 100 | |
| Sulfate | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 5000 | | # | 100 | |

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 6/24/2009

| Parameter | Units | Location ID | Location Type | Sample | | Depth Range (Ft BLS) | | | Result | Qualifiers | | Detection Limit | Uncertainty |
|------------------------|-------|-------------|---------------|------------|------|----------------------|---|---|--------|------------|---------|-----------------|-------------|
| | | | | Date | ID | | | | | Lab | Data QA | | |
| Sulfate | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6200 | | # | 100 | |
| Sulfate | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 5700 | | # | 100 | |
| Sulfate | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 6800 | | # | 100 | |
| Sulfate | mg/L | 0479 | WL | 04/29/2009 | 0002 | 0 | - | 0 | 6600 | | # | 100 | |
| Sulfate | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 7700 | | # | 100 | |
| Sulfate | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 9000 | | # | 100 | |
| Sulfate | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 7100 | | # | 250 | |
| Sulfate | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 8600 | | # | 100 | |
| Sulfate | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 9800 | | # | 100 | |
| Sulfate | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 7600 | | # | 100 | |
| Sulfate | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 7700 | | # | 500 | |
| Temperature | C | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 14.91 | | # | | |
| Temperature | C | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 15.31 | | # | | |
| Temperature | C | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 15.38 | | # | | |
| Temperature | C | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 14.71 | | # | | |
| Temperature | C | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 14.65 | | # | | |
| Temperature | C | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 20.18 | | # | | |
| Temperature | C | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 15.27 | | # | | |
| Temperature | C | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 16.4 | | # | | |
| Temperature | C | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 15.68 | | # | | |
| Temperature | C | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 15.44 | | # | | |
| Temperature | C | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 15.01 | | # | | |
| Temperature | C | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 18.36 | | # | | |
| Total Dissolved Solids | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 18000 | | # | 400 | |
| Total Dissolved Solids | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 11000 | | # | 200 | |
| Total Dissolved Solids | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 13000 | | # | 200 | |
| Total Dissolved Solids | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 12000 | | # | 200 | |

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 6/24/2009

| Parameter | Units | Location ID | Location Type | Sample | | Depth Range | | | Result | Qualifiers | | Detection Limit | Uncertainty |
|------------------------|-------|-------------|---------------|------------|------|-------------|-----|------|--------|------------|---|-----------------|-------------|
| | | | | Date | ID | (Ft BLS) | Lab | Data | | QA | | | |
| Total Dissolved Solids | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 14000 | | # | 200 | |
| Total Dissolved Solids | mg/L | 0479 | WL | 04/29/2009 | 0002 | 0 | - | 0 | 14000 | | # | 200 | |
| Total Dissolved Solids | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 21000 | | # | 400 | |
| Total Dissolved Solids | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 22000 | | # | 400 | |
| Total Dissolved Solids | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 28000 | | # | 1000 | |
| Total Dissolved Solids | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 22000 | | # | 400 | |
| Total Dissolved Solids | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 21000 | | # | 400 | |
| Total Dissolved Solids | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 15000 | | # | 200 | |
| Total Dissolved Solids | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 38000 | | # | 2000 | |
| Turbidity | NTU | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.95 | | # | | |
| Turbidity | NTU | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.95 | | # | | |
| Turbidity | NTU | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 3.26 | | # | | |
| Turbidity | NTU | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.67 | | # | | |
| Turbidity | NTU | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 1.61 | | # | | |
| Turbidity | NTU | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 0.92 | | # | | |
| Turbidity | NTU | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 3.73 | | # | | |
| Turbidity | NTU | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.04 | | # | | |
| Turbidity | NTU | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 1.63 | | # | | |
| Turbidity | NTU | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 5.84 | | # | | |
| Turbidity | NTU | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 5.62 | | # | | |
| Turbidity | NTU | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 2.66 | | # | | |
| Uranium | mg/L | 0471 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2 | | # | 0.00022 | |
| Uranium | mg/L | 0473 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 1.7 | | # | 0.00022 | |
| Uranium | mg/L | 0475 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.3 | | # | 0.00022 | |
| Uranium | mg/L | 0477 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.2 | | # | 0.00022 | |
| Uranium | mg/L | 0479 | WL | 04/29/2009 | 0001 | 0 | - | 0 | 2.8 | | # | 0.00022 | |
| Uranium | mg/L | 0479 | WL | 04/29/2009 | 0002 | 0 | - | 0 | 2.9 | | # | 0.00022 | |

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 6/24/2009

| Parameter | Units | Location ID | Location Type | Sample | | Depth Range | | | Result | Qualifiers | | | Detection Limit | Uncertainty |
|-----------|-------|-------------|---------------|------------|------|-------------|-----|------|--------|------------|--|---|-----------------|-------------|
| | | | | Date | ID | (Ft BLS) | Lab | Data | | QA | | | | |
| Uranium | mg/L | 0547 | TS | 04/30/2009 | 0001 | 0 | - | 0 | 2.2 | | | # | 0.00022 | |
| Uranium | mg/L | 0671 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.3 | | | # | 0.00022 | |
| Uranium | mg/L | 0673 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.2 | | | # | 0.00022 | |
| Uranium | mg/L | 0675 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.4 | | | # | 0.00022 | |
| Uranium | mg/L | 0677 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.6 | | | # | 0.00022 | |
| Uranium | mg/L | 0679 | WL | 04/28/2009 | 0001 | 0 | - | 0 | 2.4 | | | # | 0.00022 | |
| Uranium | mg/L | SMI-PW02 | WL | 04/30/2009 | 0001 | 0 | - | 0 | 3.1 | | | # | 0.00022 | |

Note: BLS = below land surface; C = centigrade; µmhos/cm = micromhos per centimeter; mV = millivolt; NTU = nephelometric turbidity unit; SL = surface location; S.U. = standard unit; TS = treatment system; WL = well

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- > Result above upper detection limit.
- A Tentatively identified compound is a suspected aldol-condensation product.
- B Inorganic: Result is between the instrument detection limit and contract-required detection limit. Organic: Analyte also found in method blank.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference; see case narrative.
- H Holding time expired; value suspect.
- I Increased detection limit due to required dilution.
- J Estimated.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound.
- P > 25% difference in detected pesticide or Aroclor concentrations between two columns.
- U Analytical result below detection limit.
- W Postdigestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier; see case narrative.

DATA QUALIFIERS:

- | | | |
|--|---|--------------------|
| F Low-flow sampling method used. | G Possible grout contamination; pH > 9. | J Estimated value. |
| L Less than three bore volumes purged prior to sampling. | Q Qualitative result due to sampling technique. | R Unusable result. |
| U Parameter analyzed for but was not detected. | X Location is undefined. | |

QA QUALIFIER:

- # Validated according to quality assurance guidelines.

Appendix D.
Water Level Data

Appendix D. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 6/15/2009

| Location Code | Flow Code | Top of Casing Elevation (Ft) | Measurement Date | Time | Depth From Top of Casing (Ft) | Water Elevation (Ft) | Water Level Flag |
|---------------|-----------|------------------------------|------------------|------|-------------------------------|----------------------|------------------|
| 0471 | | 3964.37 | 04/29/2009 | | 11.43 | 3952.94 | |
| 0473 | | 3964.66 | 04/29/2009 | | 11.17 | 3953.49 | |
| 0475 | | 3964.97 | 04/29/2009 | | 12.06 | 3952.91 | |
| 0477 | | 3965.08 | 04/29/2009 | | 12.66 | 3952.42 | |
| 0479 | | 3964.67 | 04/29/2009 | | 13.1 | 3951.57 | |
| 0671 | | 3969.5 | 04/28/2009 | | 15.89 | 3953.61 | |
| 0673 | | 3969.44 | 04/28/2009 | | 16.5 | 3952.94 | |
| 0675 | | 3969.64 | 04/28/2009 | | 15.88 | 3953.76 | |
| 0677 | | 3969.61 | 04/28/2009 | | 15.33 | 3954.28 | |
| 0679 | | 3969.59 | 04/28/2009 | | 14.77 | 3954.82 | |

Flow Codes: B = background; C = cross gradient; D = downgradient; O = on site; U = upgradient
Water Level Flags: D = dry

Attachment 1.
Interim Action Well Field Monthly Sampling Trip Report

Attachment 1.
Interim Action Well Field Monthly Sampling Trip Report



DATE: May 21, 2009
TO: K. Pill
FROM: E. Glowiak
SUBJECT: April 2009 Monthly Sampling Trip Report

Site: Moab April Interim Action Well Field Monthly Sampling

Date of Sampling Event: April 28-29, 2009

Team Members: Elizabeth Glowiak

RIN Number Assigned: All samples were assigned to RIN 0904029.

Sample Shipment: All samples were shipped in a cooler overnight via UPS to ALS Laboratory Group from Moab, Utah, on May 1, 2009 (Tracking No. 1Z5W1Y510197651167).

April 2009 CF1 Sampling

Number of Locations Sampled: Six extraction wells (0471, 0473, 0475, 0477, 0479, and SMI-PW02) were sampled. Including one duplicate and one evaporation pond sample (0547), a total of eight samples were collected from CF1 during the April 2009 Monthly Sampling Event.

Locations Not Sampled: The recirculation pump for the evaporation pond was not running, and it was not possible to collect a sample from location 0548.

Field Variance: None

Quality-Control Sample Cross Reference: The following table shows the false identifications assigned to the quality-control samples.

| False ID | True ID | Sample Type | Associated Matrix | Ticket Number |
|----------|---------|--------------------------|-------------------|---------------|
| 2000 | 0479 | Duplicate from 23 ft bgs | Ground Water | APR 011 |

bgs = below ground surface; ID = identification

Attachment 1.
Interim Action Well Field Monthly Sampling Trip Report (continued)

Location-Specific Information – CF1 Extraction Wells: Extraction wells were sampled using dedicated submersible pumps.

| Well No. | Date | Time | Water Level (ft btoc) | Pump Intake (ft bgs) |
|----------|------------|-------|-----------------------|----------------------|
| 0471 | 04/29/2009 | 13:56 | 11.43 | 18 |
| 0473 | 04/29/2009 | 14:23 | 11.17 | 18 |
| 0475 | 04/29/2009 | 14:23 | 12.06 | 18 |
| 0477 | 04/29/2009 | 14:43 | 12.66 | 23 |
| 0479 | 04/29/2009 | 14:48 | 13.10 | 23 |
| SMI-PW02 | 04/30/2009 | 11:30 | NA* | 55 |

bgs = below ground surface; btoc = below top of casing; NA = not applicable
 *Water level access port was blocked by equipment

April 2009 CF3 Sampling

Number of Locations Sampled: Five remediation wells (0671, 0673, 0675, 0677, and 0679) from CF3 were sampled during the April 2009 Monthly Sampling Event.

Locations Not Sampled: None.

Field Variance: None.

Location-Specific Information – CF3 Remediation Wells: Extraction wells were sampled using dedicated submersible pumps.

| Well No. | Date | Time | Water Level (ft btoc) | Pump Intake (ft bgs) |
|----------|------------|-------|-----------------------|----------------------|
| 0671 | 04/28/2009 | 14:33 | 15.89 | 35 |
| 0673 | 04/28/2009 | 14:52 | 16.50 | 35 |
| 0675 | 04/28/2009 | 15:04 | 15.88 | 35 |
| 0677 | 04/28/2009 | 15:16 | 15.33 | 35 |
| 0679 | 04/28/2009 | 15:25 | 14.77 | 35 |

bgs = below ground surface; btoc = below top of casing

Well Inspection Summary: A well inspection was not conducted.

Site Issues: According to the USGS Cisco gaging station (Station No. 09180500), the mean daily Colorado River flows during this sampling event are provided below.

| Date | Daily Mean Flow (cfs) |
|------------|-----------------------|
| 04/28/2009 | 11,600 |
| 04/29/2009 | 10,300 |
| 4/30/2009 | 9,590 |

Equipment Issues: None.

Corrective Action Required/Taken: None.