

Office of Environmental Management – Grand Junction



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

December 2009



U.S. Department
of Energy

Office of Environmental Management

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

December 2009

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

Revision 0

Review and Approval

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12/30/09

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Attachment 1. IA 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
ft bgs	feet below ground surface
gpm	gallons per minute
IA	interim action
ICP	inductively coupled plasma
ICP-MS	inductively coupled plasma-mass spectrometry
ICS	interference check samples
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blank
MDL	method detection limit
MS	matrix spike
r^2	correlation coefficient
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
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 gauging station No. 09180500.

This validation data package (VDP) presents the results of the October 2009 monthly sampling event completed from October 6 through 8, 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 October 2009 monthly sampling event.

1.1 Summary Criteria

Sampling Period: October 6 through 8, 2009

The purpose of this sampling was to collect data that can be used to evaluate the performance of the ground water interim action (IA) well field. All sampling locations are shown on Figure 1, and 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 based on the Minimums and Maximums Report.

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

Yes. Only half of the Configuration (CF) 4 wells were extracting ground water at a rate of approximately 27 gallons per minute (gpm) throughout this sampling event. All other wells were shut down by the end of September 2009. CF1 wells, CF3 wells, and well PW02 were shut down on September 21, September 17, and September 28, respectively.

3. Was the evaporation pond functioning properly?

Yes. The pond level ranged from 8.5 to 8.6 feet (ft) during this sampling event.

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

Yes.

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

No.

1.2 Sampling Event Summary

This VDP presents the validated data associated with the ground water collected during the October 2009 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 1 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 were 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 October 2009 data is provided for the Baseline Area, CF3, CF2, CF1, and CF4 (listed from north to south) within the well field. In most instances, standard selected performance indicator monitoring wells were sampled during this event, and time versus concentration plots (ammonia, total dissolved solids [TDS], and uranium) 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.

Baseline Area

Of the performance indicator wells, ground water samples were collected from Baseline Area locations 0405 (18 ft below ground surface [bgs]) and 0488 (from 39 ft bgs). Time versus concentration plots for ammonia, TDS, and uranium are presented as Figures 3, 4, and 5, respectively. These plots indicate concentrations in the samples collected from these depths remained within the historical range and had a similar response to the river stage changes in 2009 as that detected in 2008.



Figure 2. October 2009 Sampling Event Site Conditions

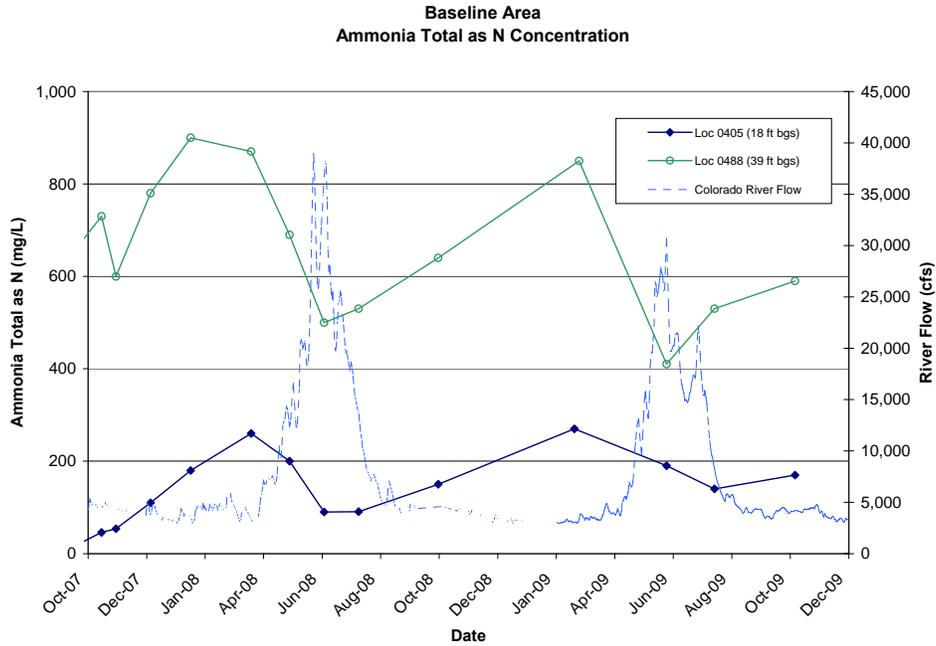


Figure 3. Baseline Area Observation Wells Time Versus Ammonia Total as N Concentration Plot

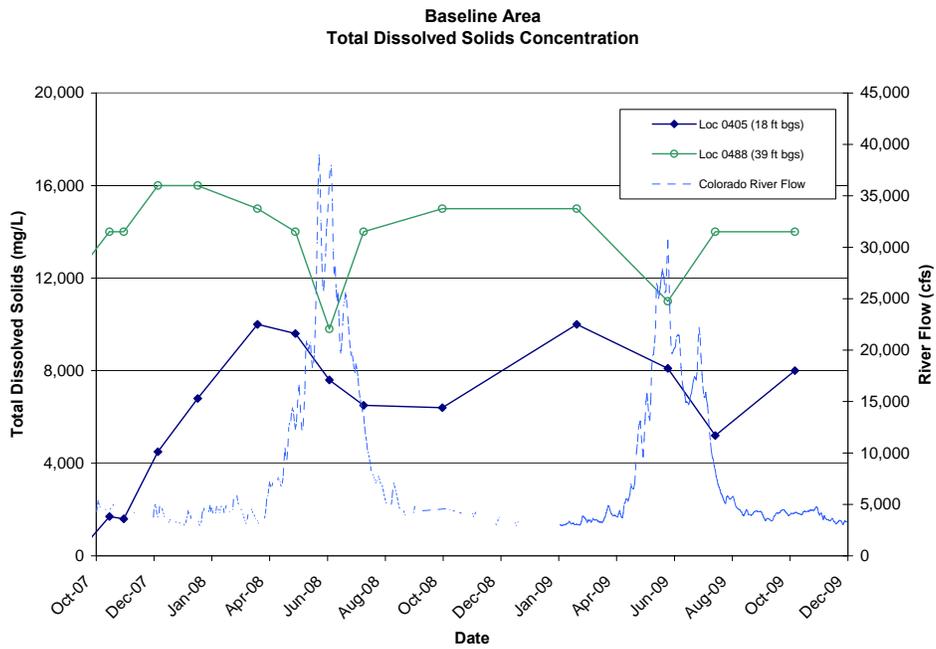


Figure 4. Baseline Area Observation Wells Time Versus TDS Concentration Plot

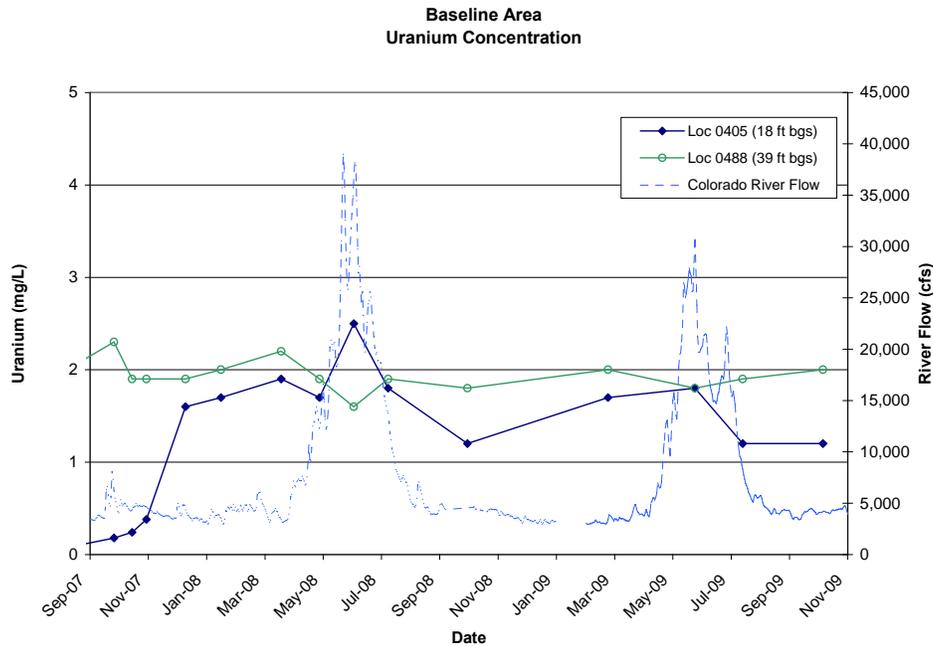


Figure 5. Baseline Area Observation Wells Time Versus Uranium Concentration Plot

CF3

Among the locations typically discussed in this Section for CF3, samples were collected from 0683 (27 ft bgs), 0688 (39 ft bgs), and 0689 (54 ft bgs) during this past month. A review of the time versus concentration plots (Figures 6, 7, and 8) suggests analyte concentrations generally rebounded to pre-runoff levels by October. The TDS plot (Figure 7) indicates the brine interface elevation in this portion of the well field increased during the 2009 spring runoff peak flows and returned to river base flow elevation by October 2009.

CF2

Among the indicator wells, samples were collected only from 0588 (34 ft bgs) and 0589 (52 ft bgs) during this sampling event. The time versus ammonia (Figure 9), TDS (Figure 10), and uranium (Figure 11) concentration plots indicate these analyte concentrations have generally rebounded to pre-runoff levels. Figure 10 is indicative of the brine interface elevation changes in 2009.

CF1

Samples were collected from downgradient locations 0483 (from 18 ft bgs) and 0560 (from 31 ft bgs), and upgradient location 0557 (40 ft bgs) during the October 2009 sampling event. Changes in ammonia, TDS, and uranium concentrations (Figures 12, 13, and 14, respectively) exhibit the analyte concentrations all continued to gradually increase since July 2009, regardless of the sample depth.

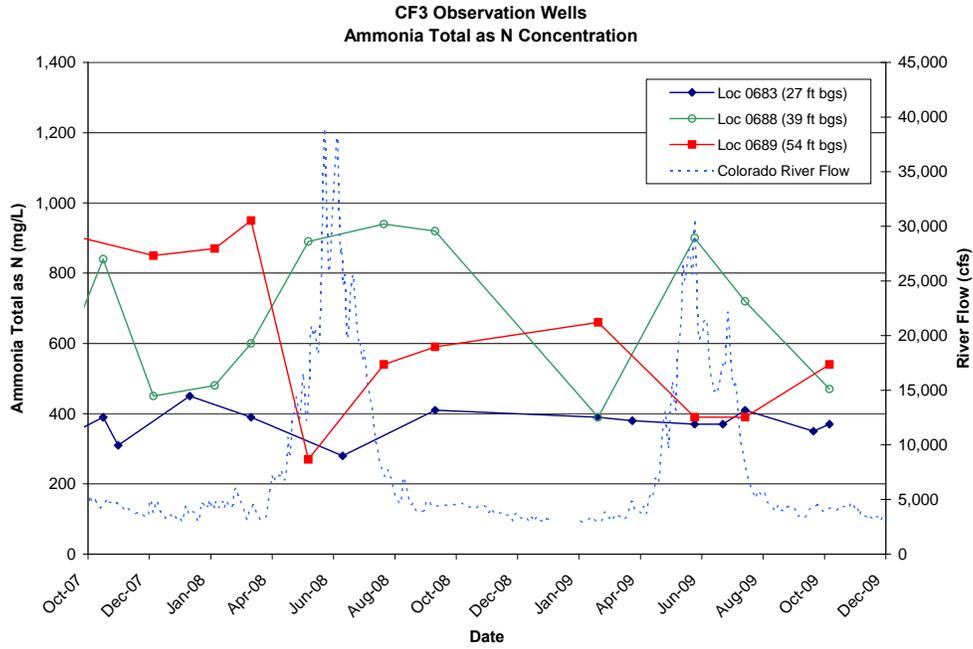


Figure 6. CF3 Observation Wells Time Versus Ammonia Total as N Concentration Plot

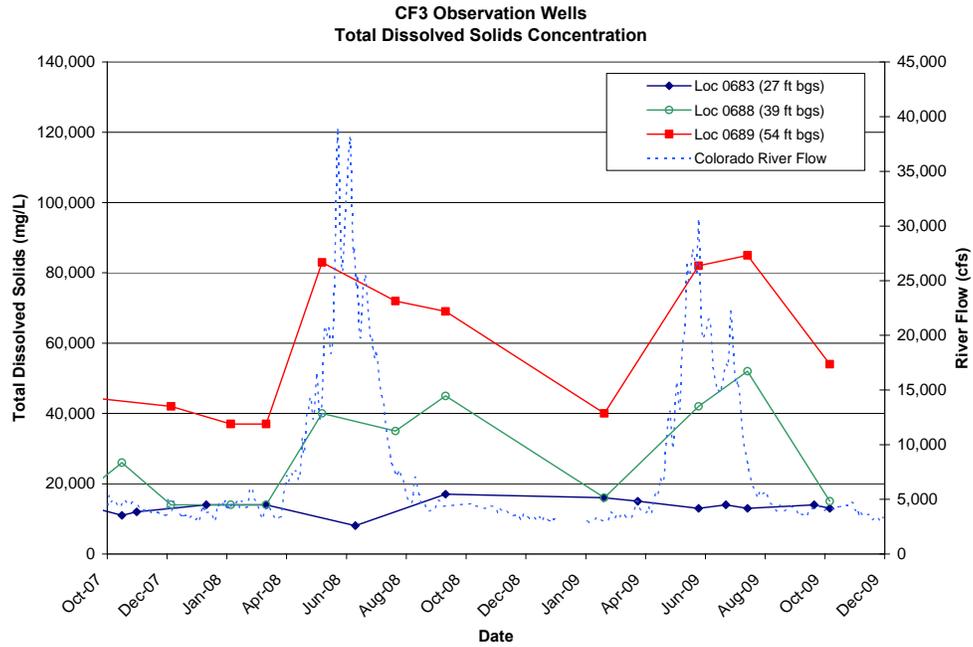


Figure 7. CF3 Observation Wells Time Versus TDS Concentration Plot

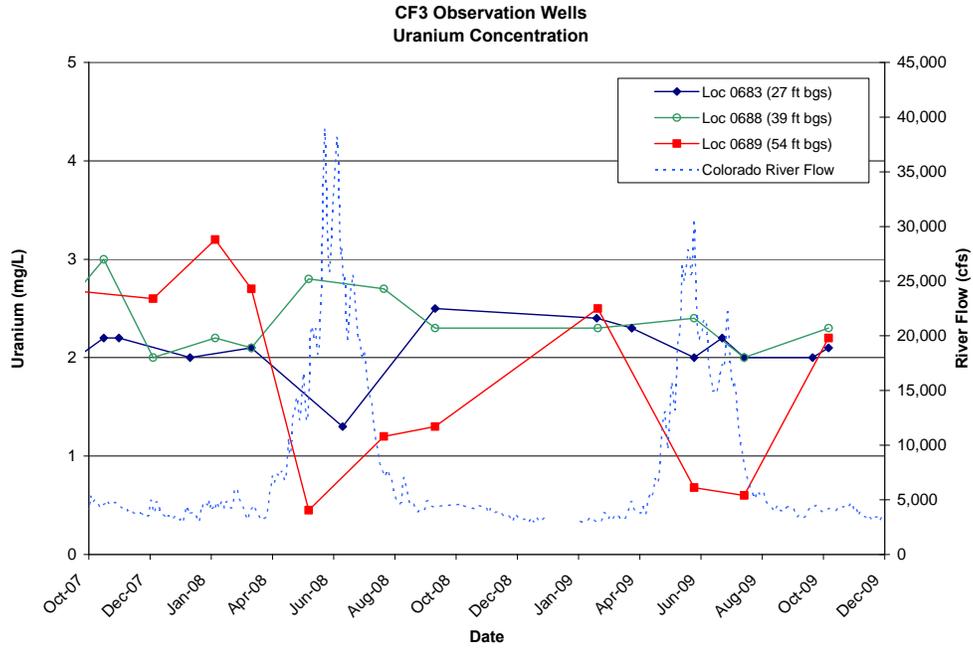


Figure 8. CF3 Observation Wells Time Versus Uranium Concentration Plot

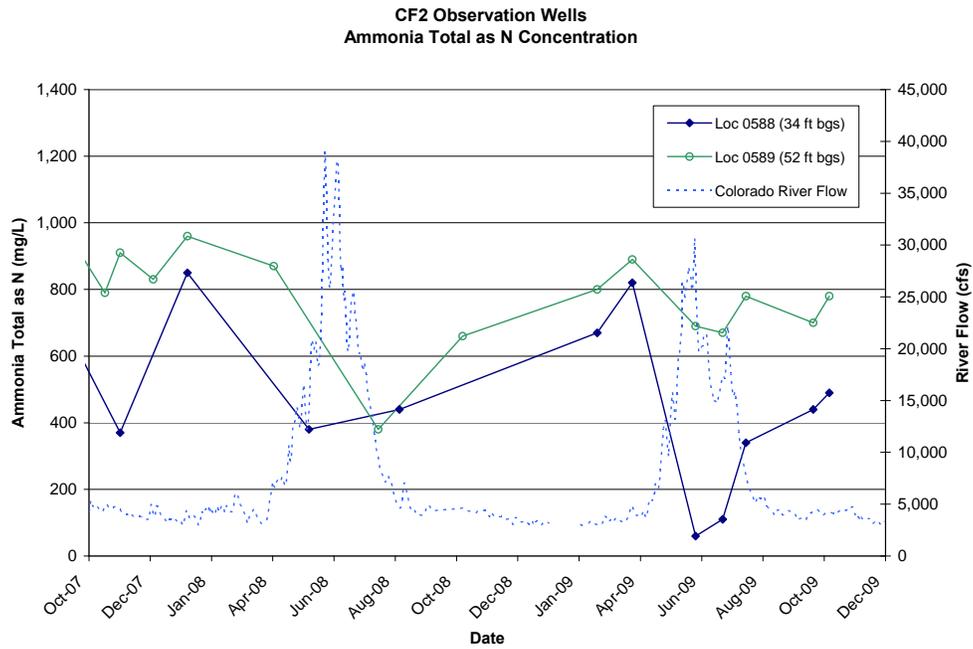


Figure 9. CF2 Observation Wells Time Versus Ammonia Total as N Concentration Plot

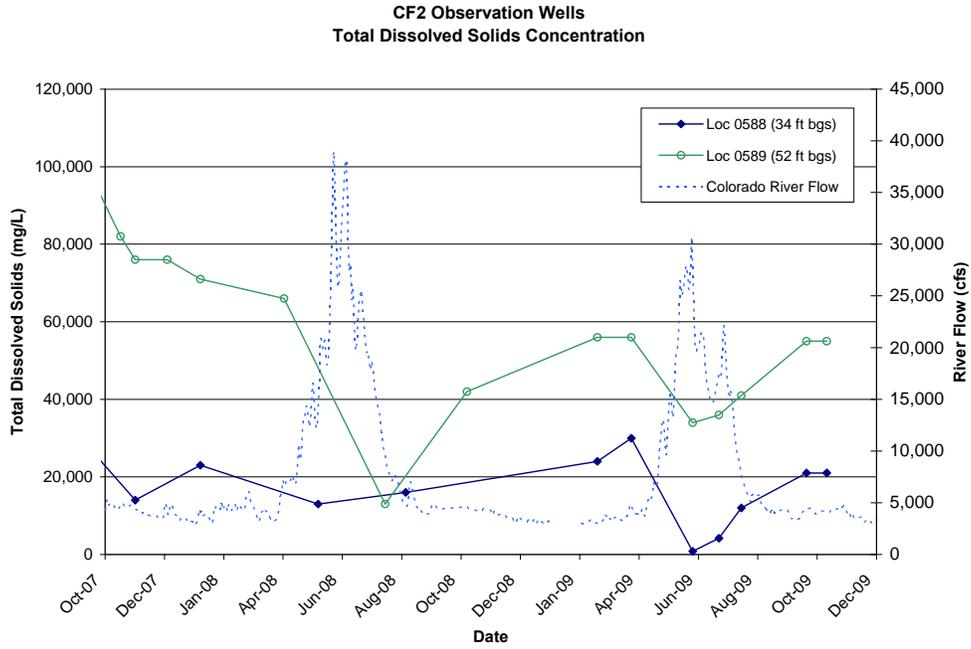


Figure 10. CF2 Observation Wells Time Versus TDS Concentration Plot

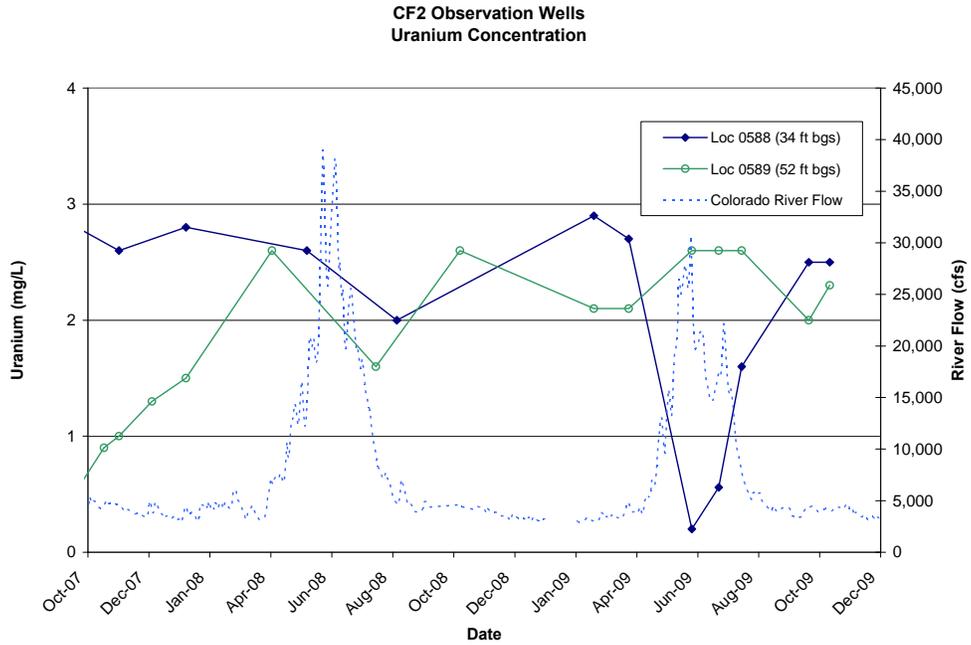


Figure 11. CF2 Observation Wells Time Versus Uranium Concentration Plot

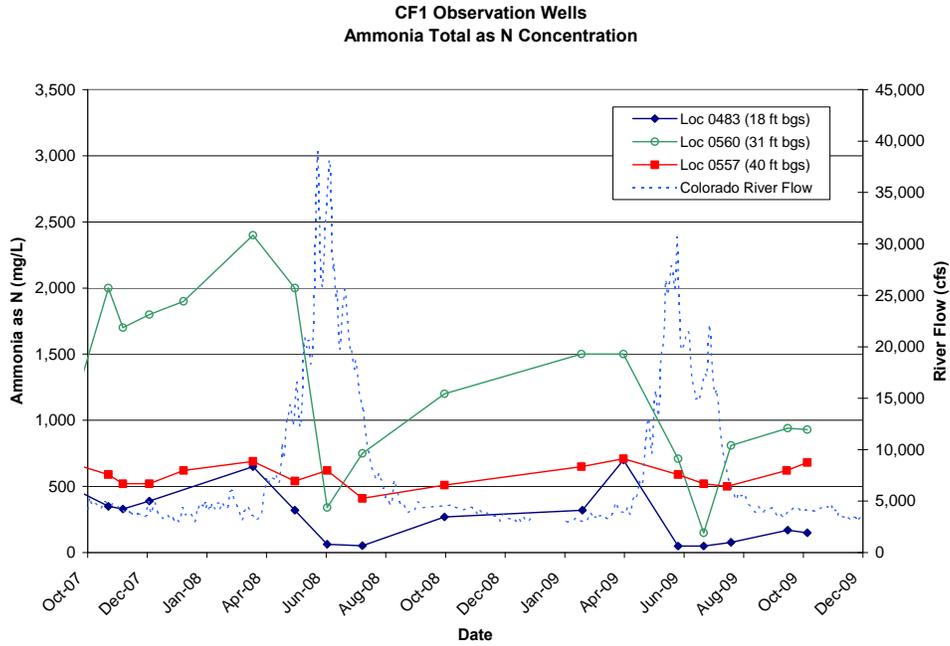


Figure 12. CF1 Observation Wells Time Versus Ammonia Total as N Concentration Plot

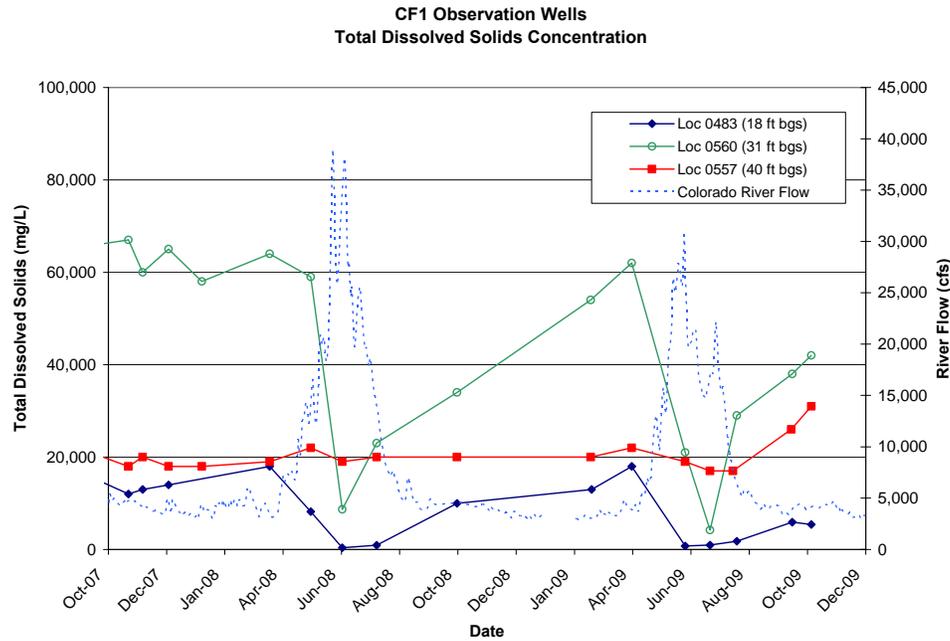


Figure 13. CF1 Observation Wells Time Versus TDS Concentration Plot

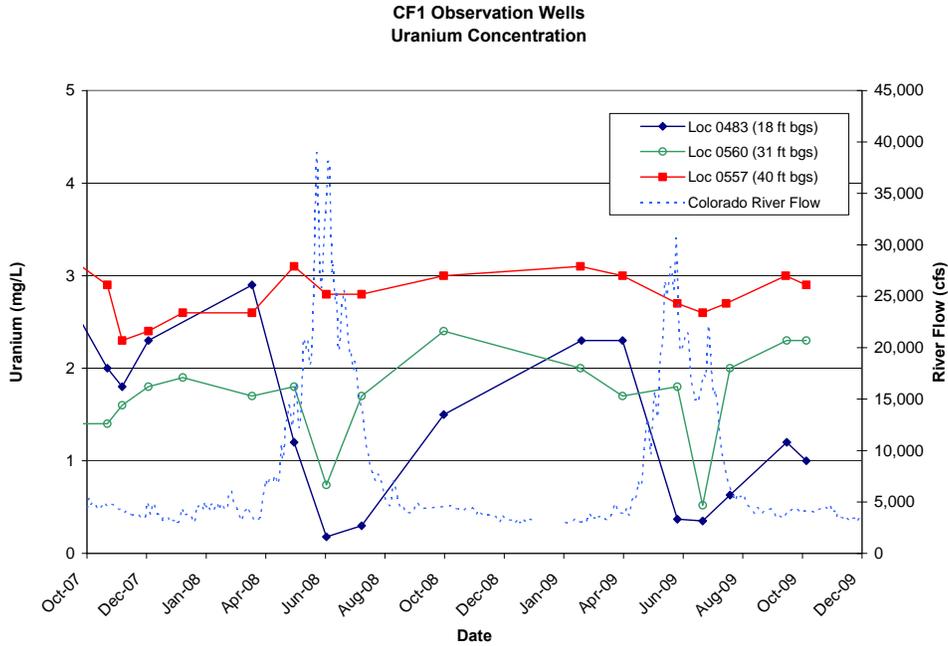


Figure 14. CF1 Observation Wells Time Versus Uranium Concentration Plot

CF1 Observation Wells 0403 and 0407

These locations are located along the river bank within CF1. As shown in the time versus analyte concentration plots below (Figures 15, 16, and 17), the analyte concentrations in samples collected from both ends of CF1 did not significantly change since November 2009.

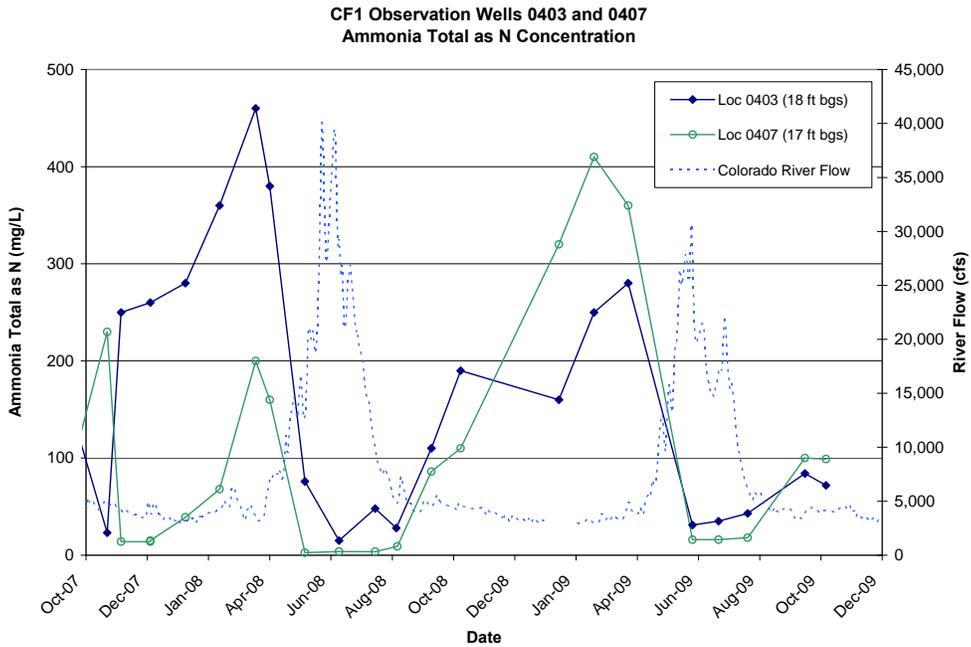


Figure 15. CF1 Observation Wells 0403 and 0407 Time Versus Ammonia Total as N Concentration Plot

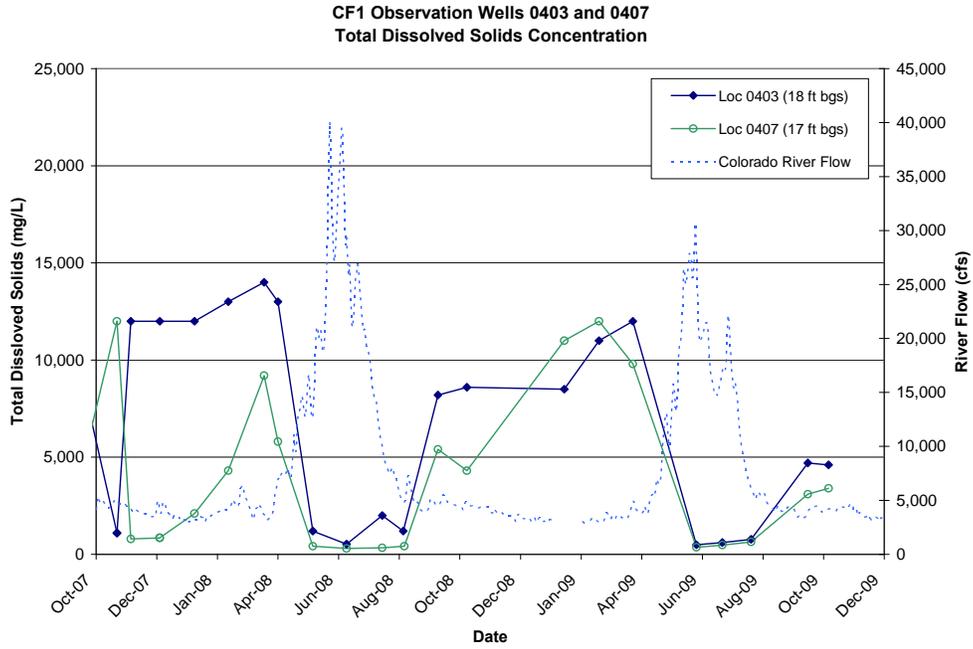


Figure 16. CF1 Observation Wells 0403 and 0407 Time Versus TDS Concentration Plot

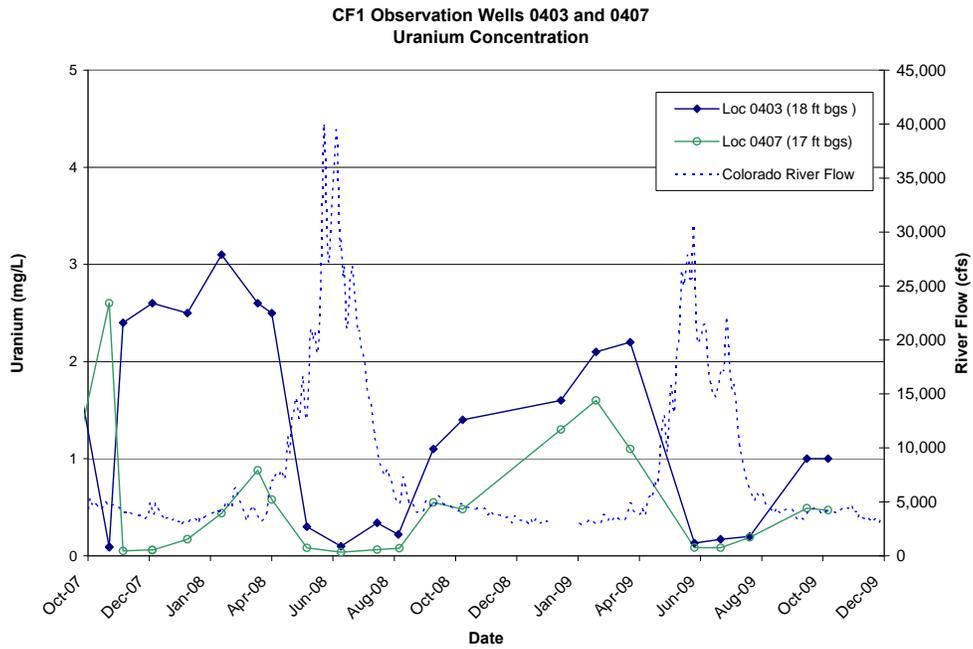


Figure 17. CF1 Observation Wells 0403 and 0407 Time Versus Uranium Concentration Plot

CF4

Of the indicator wells typically discussed in this summary for CF4, locations 0780 (28 ft bgs), 0786 (28 ft bgs), 0782 (33 ft bgs), and 0787 (36 ft bgs) were sampled during this sampling event. Ammonia, TDS, and uranium concentration trends over the past 2 years are displayed in Figures 18, 19, and 20, respectively. In general, analyte concentrations continued to rebound to pre-runoff levels in October 2009 in all four locations.

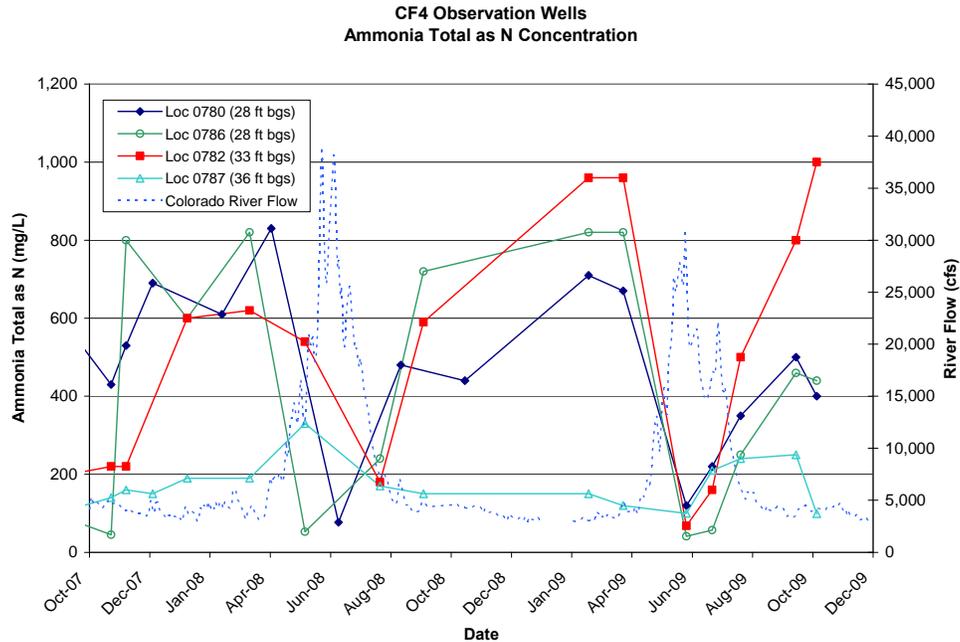


Figure 18. CF4 Observation Wells Time Versus Ammonia Total as N Concentration Plot

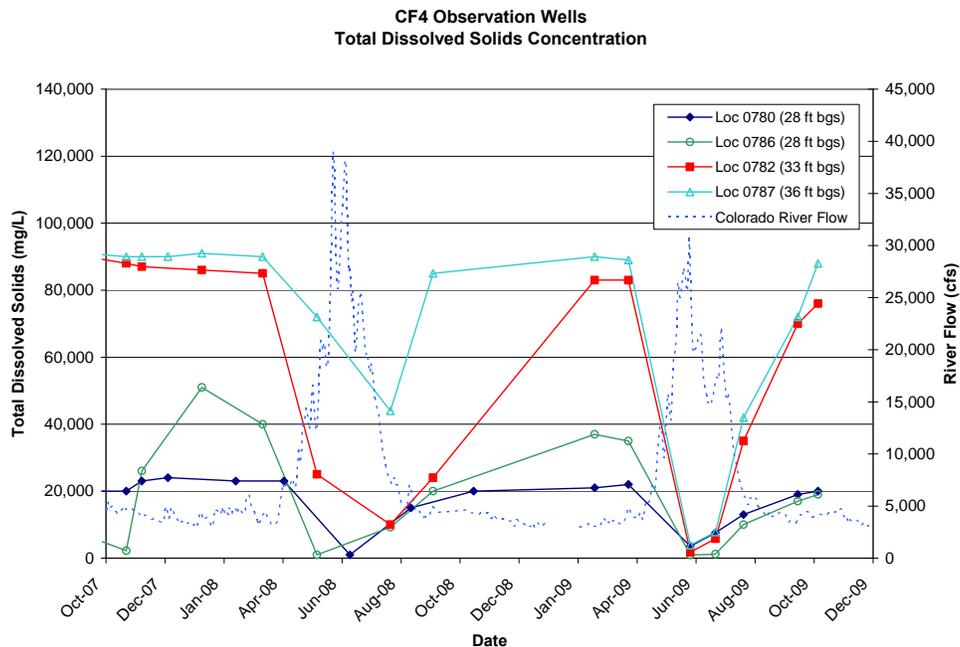


Figure 19. CF4 Observation Wells Time Versus TDS Concentration Plot

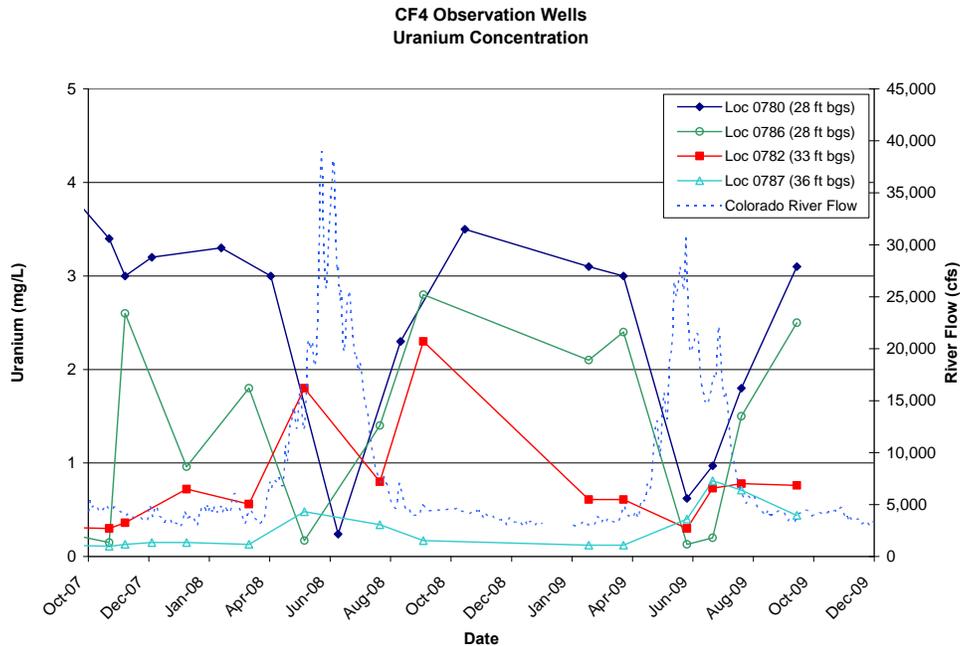


Figure 20. CF4 Observation Wells Time Versus Uranium Concentration Plot

Surface Water Sampling Results

There were no surface water locations sampled during this 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.

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 chain of custody (COC), case narratives, presence of field and sample identifications, holding times, preservation, and cooler receipts, except as qualified or noted in the Laboratory Performance Assessment (Section 2.2).

There were no anomalous data associated with this sampling event. According to the USGS Cisco gauging station, the mean daily Colorado River flow rates varied between 4,220 and 4,300 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 No. (RIN): 0910037
Sample Event: October 2009 IA Well Field Monthly Sampling Event
Site(s): Moab, Utah
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Sample Data Group (SDG) No.: 0910107
Analysis: Metals and Inorganics
Validator: Rachel Cowan
Review Date: December 22, 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, on 100 percent of the samples. 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, NH ₃ -N	WCH-A-005	EPA 350.1	EPA 350.1
Copper	MET-A-020	SW-846 3005A	SW-846 6010B
Manganese	G17	SW-846 3005A	SW-846 6010B
Selenium	G14	SW-846 3005A	SW-846 6020A
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 for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
0910107-24	0787	Copper	J	LCS1, MS1, RS1, SD1
0910107-2 through -9; -19 through -26	0405, 0407, 0480, 0483, 0488, 0547, 0557, 0559, 0780, 0782, 0786, 0787	Ammonia	J	MS1
0910107-21 through -26	0780, 0782, 0786, 0787	Ammonia	J	RS1
0910107-21 through -26	0780, 0782, 0786, 0787	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
LCS1	J	UJ	A laboratory control sample was not analyzed.
MS1	J	UJ	Results for the affected analyte(s) are regarded as estimated (J) because the matrix spike 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.
RS1	J	J or R	Results for the affected analyte(s) are regarded as estimated (J) because replicate samples were not analyzed at the frequency stated in the procedure.
SD1	J	N/A	Frequency requirements for serial dilution were not met.

Sample Shipping/Receiving

ALS Laboratory Group received a total of 26 samples for RIN 0910037 in one shipment. SDG 0910107 of 26 samples arrived on October 9, 2009 (UPS tracking number 1Z5W1Y510191806493). 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 except for the following.

Two sample bottles from sample 0910107-16 apparently had the labels switched, but were corrected by ALS Laboratory Group.

Although the temperature was low in one of the shipping coolers (-0.4°C), no ice had formed, so no results were qualified.

Preservation and Holding Times

SDG 0910107 was received intact in two coolers with the temperatures within the coolers ranging from -0.4 to 0.2°C, which comply 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, and 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. Also, internal standards for ICP-MS are analyzed to indicate the stability of the instruments.

Method SW-846 6010B, Copper and Manganese

Calibrations for copper and manganese were performed on October 21, 2009. All calibrations used three calibration standards and a blank, resulting in calibration curves with correlation coefficient (r^2) values greater than 0.995. Both the manganese and copper intercepts were negative, but the intercepts' absolute values were not more than three times the instrument detection limit (IDL). No manganese or copper results needed to be qualified with a "J."

Initial and continuing calibration verification (ICV and CCV) checks were made at the required frequency, resulting in two CCVs for copper analysis and four CCVs for manganese on October 21. All calibration checks met the acceptance criteria. The CRI verifications were within the acceptance range.

Method SW-846 6020A, Selenium and Uranium

The calibration for the selenium analyses was performed on October 21, 2009. The uranium calibration was performed on October 14, 2009. The initial calibrations for both analytes were performed using eight calibration standards and one blank, resulting in calibration curves with r^2 values greater than 0.995. The absolute value of the calibration curve intercept for selenium was less than three times the IDL. Although the calibration curve intercept for uranium was positive, its absolute value was greater than three times the IDL. Therefore, all uranium results were checked to confirm that all results were greater than three times the absolute value of the intercept; however, none needed to be flagged for this reason.

ICV and CCV checks were made at the required frequency, resulting in eight CCVs for selenium and five CCVs for uranium. All calibration checks met the acceptance criteria. CRIs were made at the required frequency to verify the linearity of the calibration curve near the RL.

The CRI verifications were 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. Internal standard recoveries were stable and within acceptable ranges.

Method EPA 350.1, Ammonia as N

Initial calibration for ammonia as N was performed using six calibration standards and a blank on October 12, 2009. The calibration curves had correlation coefficient values greater than 0.995 and intercepts less than three times the method detection limit (MDL). ICV and CCV checks were made at the required frequency, resulting in five CCVs. All calibration check results were within the acceptance criteria.

Method EPA 160.1, Total Dissolved Solids (TDS)

There are no initial or continuing calibration requirements associated with the determination of TDS.

Method and Calibration Blanks

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

One manganese CCB had results that were greater than the IDL. However, the manganese results were greater than five times this blank's concentration, so no results were qualified.

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 results needed to be qualified. One selenium CCB had results that were greater than the IDL; however, all selenium results were greater than five times this blank's concentration, so no results were qualified.

Three ammonia CCB results were greater than the MDL; however, the ammonia results were all greater than five times the associated blank's concentrations, so no ammonia results were flagged for this reason.

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

For the uranium and selenium 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 recoveries of the ICSAB samples were provided and were acceptable for all uranium and selenium analyses. All other check sample results met the acceptance criteria, so no qualification of the sample results was deemed necessary.

Matrix Spike Analysis

Matrix spike (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 following exceptions.

There were not enough MSs for ammonia (only two MSs for 26 samples, although the method states that one MS must be analyzed per 10 field samples). One of the ammonia MSs failed, and all associated samples were qualified “J.” The second MS recovery could not be evaluated because the ammonia 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 ammonia results associated with this unanalyzed MS.

There was no copper MS sample, so the copper result was qualified “J” for reason MS1.

Laboratory Replicate Analysis

The laboratory replicate results demonstrate acceptable laboratory precision. The relative percent difference (RPD) values for the reported laboratory replicate sample (for TDS), and the MS results for all other analytes were less than 20 percent for results greater than five times the RL with the following exceptions.

The RPD could not be determined for either of the ammonia MSDs, one because the MS failed, and the other because the ammonia concentrations in the native sample were above the analytical range. However, one of the two field duplicate samples were analyzed (sample 0910107-25) met the precision requirements for ammonia. Therefore, only six ammonia results required “J” qualification for reason RS1.

There was no copper replicate sample, so the copper result was qualified “J” for reason RS1.

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. Duplicate samples were collected from locations 0547 (0910107-26) and 0589 (0910107-25) in the October 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, except for ammonia in sample 0910107-26, which had a 24 RPD.

Laboratory Control Sample

Laboratory control samples (LCS) 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 following exception.

LCSs were not reported for copper, 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 provided by the NELAC Institute, an MS

may be used in place of an LCS provided the acceptance criteria are as stringent. Therefore, no qualification was required because of lack of LCS results, because all of the MS results for manganese, selenium, and uranium were acceptable. However, there was no copper MS, so the copper result is qualified “J” for reason LCS1. See the Matrix Spike 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 SD data were acceptable with the following exception.

There was no copper SD sample from SDG 0910107 selected as the quality-control sample for the copper analytical run. Therefore, the copper result was “J”-flagged for reason SD2 in this SDG.

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 October 30, 2009. The contents of the EDD files were manually examined to ensure all and only the requested data were delivered in compliance with requirements and that the sample results accurately reflected the data contained in the sample data package

2.3 Field Analyses/Activities

The following information summarizes the field analyses and activities for the October 2009 monthly 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. Three duplicate samples were 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, except for the ammonia result from the duplicate from 0589 (0910107-25), which had a 24 RPD. Because both MSDs for ammonia for this SDG had failed, six ammonia results were qualified “J” for reason RS1.

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*, Document Number 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 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 are fewer than five historical samples for comparison.

3.2 Anomalous Data Review

There were no sample locations with 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	October 2009/RIN 0910037	Date(s) of Water Sampling	October 6-8, 2009
Date(s) of Verification	December 21, 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 pre-trip 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)

Sampling Event / RIN	October 2009/RIN 0910037	Date(s) of Water Sampling	October 6-8, 2009
Date(s) of Verification	December 21, 2009	Name of Verifier	Rachel Cowan

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 a total of 26 samples collected, which included two duplicates.
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 The presence of ice was not documented for samples 0560 and 0779, but ice was documented for the samples before and after.
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: 0910037

Comparison: All Historical Data

Report Date: 12/23/2009

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	0557	10/06/2009	Manganese	7.4		6.4	J	4.6		25	0
MOA01	0779	10/08/2009	Ammonia Total as N	560	J	1700	F	580		10	0
MOA01	0779	10/08/2009	Manganese	4.1		13	F	4.4	J	7	0
MOA01	0782	10/06/2009	Ammonia Total as N	1000	J	960		63		30	0

Analyte concentrations presented in blue text represent the historical value exceeded by the concentration presented in red, which is associated with this current sampling event.

SAMPLE ID CODES: 000X = Filtered sample (0.45 micrometer); 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 IDL and the contract-required detection limit. Organic: Analyte also found in MB.
- 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 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 three 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: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Ammonia Total as N	mg/L	0403	WL	10/07/2009	0001	18	-	18	72			#	10	
Ammonia Total as N	mg/L	0405	WL	10/07/2009	0001	18	-	18	170		J	#	10	
Ammonia Total as N	mg/L	0407	WL	10/07/2009	0001	17	-	17	99		J	#	10	
Ammonia Total as N	mg/L	0480	WL	10/06/2009	0001	18	-	18	140		J	#	10	
Ammonia Total as N	mg/L	0483	WL	10/06/2009	0001	18	-	18	150		J	#	10	
Ammonia Total as N	mg/L	0488	WL	10/07/2009	0001	39	-	39	590		J	#	20	
Ammonia Total as N	mg/L	0547	TS	10/08/2009	0001	0	-	0	470		J	#	10	
Ammonia Total as N	mg/L	0547	TS	10/08/2009	0002	0	-	0	370		J	#	10	
Ammonia Total as N	mg/L	0557	WL	10/06/2009	0001	40	-	40	680		J	#	20	
Ammonia Total as N	mg/L	0559	WL	10/06/2009	0001	18	-	18	110		J	#	10	
Ammonia Total as N	mg/L	0560	WL	10/06/2009	0001	31	-	31	930			#	50	
Ammonia Total as N	mg/L	0583	WL	10/07/2009	0001	18	-	18	79			#	10	
Ammonia Total as N	mg/L	0588	WL	10/07/2009	0001	34	-	34	490			#	10	
Ammonia Total as N	mg/L	0589	WL	10/07/2009	0001	52	-	52	760			#	20	
Ammonia Total as N	mg/L	0589	WL	10/07/2009	0002	52	-	52	780		J	#	20	
Ammonia Total as N	mg/L	0683	WL	10/07/2009	0001	27	-	27	370			#	10	
Ammonia Total as N	mg/L	0688	WL	10/07/2009	0001	39	-	39	470			#	20	
Ammonia Total as N	mg/L	0689	WL	10/07/2009	0001	54	-	54	540			#	20	
Ammonia Total as N	mg/L	0770	WL	10/08/2009	0001	14.9	-	34.8	290			#	10	
Ammonia Total as N	mg/L	0772	WL	10/08/2009	0001	15.15	-	35.05	250			#	10	
Ammonia Total as N	mg/L	0776	WL	10/08/2009	0001	15.15	-	35.05	500		J	#	10	
Ammonia Total as N	mg/L	0779	WL	10/08/2009	0001	15.66	-	35.56	560		J	#	20	
Ammonia Total as N	mg/L	0780	WL	10/06/2009	0001	28	-	28	400	N	J	#	10	
Ammonia Total as N	mg/L	0782	WL	10/06/2009	0001	33	-	33	1000		J	#	50	
Ammonia Total as N	mg/L	0786	WL	10/06/2009	0001	28	-	28	440		J	#	10	
Ammonia Total as N	mg/L	0787	WL	10/06/2009	0001	36	-	36	99		J	#	10	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Copper	mg/L	0787	WL	10/06/2009	0001	36	-	36	0.071	B	J	#	0.036	
Dissolved Oxygen	mg/L	0403	WL	10/07/2009	0001	18	-	18	0.68			#		
Dissolved Oxygen	mg/L	0405	WL	10/07/2009	0001	18	-	18	0.4			#		
Dissolved Oxygen	mg/L	0407	WL	10/07/2009	0001	17	-	17	0.52			#		
Dissolved Oxygen	mg/L	0480	WL	10/06/2009	0001	18	-	18	0.5			#		
Dissolved Oxygen	mg/L	0483	WL	10/06/2009	0001	18	-	18	0.07			#		
Dissolved Oxygen	mg/L	0488	WL	10/07/2009	0001	39	-	39	0.34			#		
Dissolved Oxygen	mg/L	0547	TS	10/08/2009	0001	0	-	0	3.97			#		
Dissolved Oxygen	mg/L	0557	WL	10/06/2009	0001	40	-	40	-0.31			#		
Dissolved Oxygen	mg/L	0559	WL	10/06/2009	0001	18	-	18	-0.1			#		
Dissolved Oxygen	mg/L	0560	WL	10/06/2009	0001	31	-	31	-0.59			#		
Dissolved Oxygen	mg/L	0583	WL	10/07/2009	0001	18	-	18	0.51			#		
Dissolved Oxygen	mg/L	0588	WL	10/07/2009	0001	34	-	34	-0.1			#		
Dissolved Oxygen	mg/L	0589	WL	10/07/2009	0001	52	-	52	0.02			#		
Dissolved Oxygen	mg/L	0683	WL	10/07/2009	0001	27	-	27	-0.47			#		
Dissolved Oxygen	mg/L	0688	WL	10/07/2009	0001	39	-	39	0.1			#		
Dissolved Oxygen	mg/L	0688	WL	10/07/2009	0001	31	-	31	0.16			#		
Dissolved Oxygen	mg/L	0689	WL	10/07/2009	0001	54	-	54	-0.04			#		
Dissolved Oxygen	mg/L	0689	WL	10/07/2009	0001	46	-	46	0.3			#		
Dissolved Oxygen	mg/L	0770	WL	10/08/2009	0001	14.9	-	34.8	1.43			#		
Dissolved Oxygen	mg/L	0772	WL	10/08/2009	0001	15.15	-	35.05	0.94			#		
Dissolved Oxygen	mg/L	0776	WL	10/08/2009	0001	15.15	-	35.05	2.5			#		
Dissolved Oxygen	mg/L	0779	WL	10/08/2009	0001	15.66	-	35.56	0.32			#		
Dissolved Oxygen	mg/L	0780	WL	10/06/2009	0001	28	-	28	0.46			#		
Dissolved Oxygen	mg/L	0782	WL	10/06/2009	0001	33	-	33	0.14			#		
Dissolved Oxygen	mg/L	0786	WL	10/06/2009	0001	28	-	28	0.08			#		
Dissolved Oxygen	mg/L	0787	WL	10/06/2009	0001	36	-	36	-0.06			#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID	Lab	Data	QA					
Manganese	mg/L	0403	WL	10/07/2009	0001	18	-	18	2		#	0.00052	
Manganese	mg/L	0405	WL	10/07/2009	0001	18	-	18	4.2		#	0.00052	
Manganese	mg/L	0407	WL	10/07/2009	0001	17	-	17	1.5		#	0.00052	
Manganese	mg/L	0480	WL	10/06/2009	0001	18	-	18	1.9		#	0.00052	
Manganese	mg/L	0483	WL	10/06/2009	0001	18	-	18	2.1		#	0.00052	
Manganese	mg/L	0488	WL	10/07/2009	0001	39	-	39	5.8		#	0.001	
Manganese	mg/L	0547	TS	10/08/2009	0001	0	-	0	4.4		#	0.001	
Manganese	mg/L	0547	TS	10/08/2009	0002	0	-	0	4.4	J	#	0.0026	
Manganese	mg/L	0557	WL	10/06/2009	0001	40	-	40	7.4		#	0.01	
Manganese	mg/L	0559	WL	10/06/2009	0001	18	-	18	2.1		#	0.00052	
Manganese	mg/L	0560	WL	10/06/2009	0001	31	-	31	6.5		#	0.0052	
Manganese	mg/L	0583	WL	10/07/2009	0001	18	-	18	0.7		#	0.0001	
Manganese	mg/L	0588	WL	10/07/2009	0001	34	-	34	4.5		#	0.001	
Manganese	mg/L	0589	WL	10/07/2009	0001	52	-	52	7.4		#	0.0026	
Manganese	mg/L	0589	WL	10/07/2009	0002	52	-	52	7.4	J	#	0.0052	
Manganese	mg/L	0683	WL	10/07/2009	0001	27	-	27	4.9		#	0.001	
Manganese	mg/L	0688	WL	10/07/2009	0001	39	-	39	3.8		#	0.001	
Manganese	mg/L	0689	WL	10/07/2009	0001	54	-	54	7.4		#	0.01	
Manganese	mg/L	0770	WL	10/08/2009	0001	14.9	-	34.8	3.8		#	0.001	
Manganese	mg/L	0772	WL	10/08/2009	0001	15.15	-	35.05	4.6		#	0.001	
Manganese	mg/L	0776	WL	10/08/2009	0001	15.15	-	35.05	4.8		#	0.001	
Manganese	mg/L	0779	WL	10/08/2009	0001	15.66	-	35.56	4.1		#	0.0026	
Manganese	mg/L	0780	WL	10/06/2009	0001	28	-	28	5.3	J	#	0.001	
Manganese	mg/L	0782	WL	10/06/2009	0001	33	-	33	9.7	J	#	0.0052	
Manganese	mg/L	0786	WL	10/06/2009	0001	28	-	28	5.9	J	#	0.001	
Manganese	mg/L	0787	WL	10/06/2009	0001	36	-	36	7.2	J	#	0.0052	
Oxidation Reduction Potential	mV	0403	WL	10/07/2009	0001	18	-	18	-7.9		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Oxidation Reduction Potential	mV	0405	WL	10/07/2009	0001	18	-	18	11		#		
Oxidation Reduction Potential	mV	0407	WL	10/07/2009	0001	17	-	17	-17.9		#		
Oxidation Reduction Potential	mV	0480	WL	10/06/2009	0001	18	-	18	30.3		#		
Oxidation Reduction Potential	mV	0483	WL	10/06/2009	0001	18	-	18	-4.2		#		
Oxidation Reduction Potential	mV	0488	WL	10/07/2009	0001	39	-	39	29.6		#		
Oxidation Reduction Potential	mV	0547	TS	10/08/2009	0001	0	-	0	39		#		
Oxidation Reduction Potential	mV	0557	WL	10/06/2009	0001	40	-	40	35.2		#		
Oxidation Reduction Potential	mV	0559	WL	10/06/2009	0001	18	-	18	-26.9		#		
Oxidation Reduction Potential	mV	0560	WL	10/06/2009	0001	31	-	31	-3.1		#		
Oxidation Reduction Potential	mV	0583	WL	10/07/2009	0001	18	-	18	-34.8		#		
Oxidation Reduction Potential	mV	0588	WL	10/07/2009	0001	34	-	34	15.2		#		
Oxidation Reduction Potential	mV	0589	WL	10/07/2009	0001	52	-	52	17.5		#		
Oxidation Reduction Potential	mV	0683	WL	10/07/2009	0001	27	-	27	61.7		#		
Oxidation Reduction Potential	mV	0688	WL	10/07/2009	0001	31	-	31	20		#		
Oxidation Reduction Potential	mV	0688	WL	10/07/2009	0001	39	-	39	47.3		#		
Oxidation Reduction Potential	mV	0689	WL	10/07/2009	0001	54	-	54	32		#		
Oxidation Reduction Potential	mV	0689	WL	10/07/2009	0001	46	-	46	49		#		
Oxidation Reduction Potential	mV	0770	WL	10/08/2009	0001	14.9	-	34.8	157.1		#		
Oxidation Reduction Potential	mV	0772	WL	10/08/2009	0001	15.15	-	35.05	51.3		#		
Oxidation Reduction Potential	mV	0776	WL	10/08/2009	0001	15.15	-	35.05	43.7		#		
Oxidation Reduction Potential	mV	0779	WL	10/08/2009	0001	15.66	-	35.56	28		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Oxidation Reduction Potential	mV	0780	WL	10/06/2009	0001	28	-	28	39.9			#		
Oxidation Reduction Potential	mV	0782	WL	10/06/2009	0001	33	-	33	126			#		
Oxidation Reduction Potential	mV	0786	WL	10/06/2009	0001	28	-	28	41			#		
Oxidation Reduction Potential	mV	0787	WL	10/06/2009	0001	36	-	36	39.4			#		
pH	s.u.	0403	WL	10/07/2009	0001	18	-	18	6.99			#		
pH	s.u.	0405	WL	10/07/2009	0001	18	-	18	6.89			#		
pH	s.u.	0407	WL	10/07/2009	0001	17	-	17	7.33			#		
pH	s.u.	0480	WL	10/06/2009	0001	18	-	18	6.99			#		
pH	s.u.	0483	WL	10/06/2009	0001	18	-	18	7.12			#		
pH	s.u.	0488	WL	10/07/2009	0001	39	-	39	6.99			#		
pH	s.u.	0547	TS	10/08/2009	0001	0	-	0	7.03			#		
pH	s.u.	0557	WL	10/06/2009	0001	40	-	40	6.83			#		
pH	s.u.	0559	WL	10/06/2009	0001	18	-	18	7.12			#		
pH	s.u.	0560	WL	10/06/2009	0001	31	-	31	6.92			#		
pH	s.u.	0583	WL	10/07/2009	0001	18	-	18	7.27			#		
pH	s.u.	0588	WL	10/07/2009	0001	34	-	34	7.05			#		
pH	s.u.	0589	WL	10/07/2009	0001	52	-	52	6.84			#		
pH	s.u.	0683	WL	10/07/2009	0001	27	-	27	6.84			#		
pH	s.u.	0688	WL	10/07/2009	0001	31	-	31	6.91			#		
pH	s.u.	0688	WL	10/07/2009	0001	39	-	39	6.93			#		
pH	s.u.	0689	WL	10/07/2009	0001	54	-	54	5.85			#		
pH	s.u.	0689	WL	10/07/2009	0001	46	-	46	6.96			#		
pH	s.u.	0770	WL	10/08/2009	0001	14.9	-	34.8	6.9			#		
pH	s.u.	0772	WL	10/08/2009	0001	15.15	-	35.05	6.89			#		
pH	s.u.	0776	WL	10/08/2009	0001	15.15	-	35.05	6.97			#		
pH	s.u.	0779	WL	10/08/2009	0001	15.66	-	35.56	7.15			#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
pH	s.u.	0780	WL	10/06/2009	0001	28	-	28	6.88		#		
pH	s.u.	0782	WL	10/06/2009	0001	33	-	33	6.81		#		
pH	s.u.	0786	WL	10/06/2009	0001	28	-	28	6.95		#		
pH	s.u.	0787	WL	10/06/2009	0001	36	-	36	6.97		#		
Selenium	mg/L	0405	WL	10/07/2009	0001	18	-	18	0.018		#	0.00016	
Selenium	mg/L	0683	WL	10/07/2009	0001	27	-	27	0.019		#	0.00016	
Specific Conductance	µmhos/cm	0403	WL	10/07/2009	0001	18	-	18	6450		#		
Specific Conductance	µmhos/cm	0405	WL	10/07/2009	0001	18	-	18	11073		#		
Specific Conductance	µmhos/cm	0407	WL	10/07/2009	0001	17	-	17	5664		#		
Specific Conductance	µmhos/cm	0480	WL	10/06/2009	0001	18	-	18	4665		#		
Specific Conductance	µmhos/cm	0483	WL	10/06/2009	0001	18	-	18	8256		#		
Specific Conductance	µmhos/cm	0488	WL	10/07/2009	0001	39	-	39	19796		#		
Specific Conductance	µmhos/cm	0547	TS	10/08/2009	0001	0	-	0	33161		#		
Specific Conductance	µmhos/cm	0557	WL	10/06/2009	0001	40	-	40	46403		#		
Specific Conductance	µmhos/cm	0559	WL	10/06/2009	0001	18	-	18	6654		#		
Specific Conductance	µmhos/cm	0560	WL	10/06/2009	0001	31	-	31	67484		#		
Specific Conductance	µmhos/cm	0583	WL	10/07/2009	0001	18	-	18	3342		#		
Specific Conductance	µmhos/cm	0588	WL	10/07/2009	0001	34	-	34	29506		#		
Specific Conductance	µmhos/cm	0589	WL	10/07/2009	0001	52	-	52	84293		#		
Specific Conductance	µmhos/cm	0683	WL	10/07/2009	0001	27	-	27	18786		#		
Specific Conductance	µmhos/cm	0688	WL	10/07/2009	0001	31	-	31	18605		#		
Specific Conductance	µmhos/cm	0688	WL	10/07/2009	0001	39	-	39	22266		#		
Specific Conductance	µmhos/cm	0689	WL	10/07/2009	0001	46	-	46	34152		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Specific Conductance	µmhos/cm	0689	WL	10/07/2009	0001	54	-	54	80583			#		
Specific Conductance	µmhos/cm	0770	WL	10/08/2009	0001	14.9	-	34.8	32787			#		
Specific Conductance	µmhos/cm	0772	WL	10/08/2009	0001	15.15	-	35.05	30760			#		
Specific Conductance	µmhos/cm	0776	WL	10/08/2009	0001	15.15	-	35.05	34383			#		
Specific Conductance	µmhos/cm	0779	WL	10/08/2009	0001	15.66	-	35.56	39072			#		
Specific Conductance	µmhos/cm	0780	WL	10/06/2009	0001	28	-	28	23081			#		
Specific Conductance	µmhos/cm	0782	WL	10/06/2009	0001	33	-	33	107419			#		
Specific Conductance	µmhos/cm	0786	WL	10/06/2009	0001	28	-	28	25066			#		
Specific Conductance	µmhos/cm	0787	WL	10/06/2009	0001	36	-	36	119265			#		
Temperature	C	0403	WL	10/07/2009	0001	18	-	18	15.27			#		
Temperature	C	0405	WL	10/07/2009	0001	18	-	18	16.74			#		
Temperature	C	0407	WL	10/07/2009	0001	17	-	17	14.21			#		
Temperature	C	0480	WL	10/06/2009	0001	18	-	18	15.81			#		
Temperature	C	0483	WL	10/06/2009	0001	18	-	18	16.49			#		
Temperature	C	0488	WL	10/07/2009	0001	39	-	39	16.01			#		
Temperature	C	0547	TS	10/08/2009	0001	0	-	0	14.16			#		
Temperature	C	0557	WL	10/06/2009	0001	40	-	40	16.07			#		
Temperature	C	0559	WL	10/06/2009	0001	18	-	18	15.58			#		
Temperature	C	0560	WL	10/06/2009	0001	31	-	31	16			#		
Temperature	C	0583	WL	10/07/2009	0001	18	-	18	15.82			#		
Temperature	C	0588	WL	10/07/2009	0001	34	-	34	14.97			#		
Temperature	C	0589	WL	10/07/2009	0001	52	-	52	14.84			#		
Temperature	C	0683	WL	10/07/2009	0001	27	-	27	16.09			#		
Temperature	C	0688	WL	10/07/2009	0001	39	-	39	15.09			#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID	Lab	Data	QA					
Temperature	C	0688	WL	10/07/2009	0001	31	-	31	15.27		#		
Temperature	C	0689	WL	10/07/2009	0001	54	-	54	15.39		#		
Temperature	C	0689	WL	10/07/2009	0001	46	-	46	16.05		#		
Temperature	C	0770	WL	10/08/2009	0001	14.9	-	34.8	15.18		#		
Temperature	C	0772	WL	10/08/2009	0001	15.15	-	35.05	15.53		#		
Temperature	C	0776	WL	10/08/2009	0001	15.15	-	35.05	15.02		#		
Temperature	C	0779	WL	10/08/2009	0001	15.66	-	35.56	18.99		#		
Temperature	C	0780	WL	10/06/2009	0001	28	-	28	15.16		#		
Temperature	C	0782	WL	10/06/2009	0001	33	-	33	15.11		#		
Temperature	C	0786	WL	10/06/2009	0001	28	-	28	14.4		#		
Temperature	C	0787	WL	10/06/2009	0001	36	-	36	13.89		#		
Total Dissolved Solids	mg/L	0403	WL	10/07/2009	0001	18	-	18	4600		#	80	
Total Dissolved Solids	mg/L	0405	WL	10/07/2009	0001	18	-	18	8000		#	200	
Total Dissolved Solids	mg/L	0407	WL	10/07/2009	0001	17	-	17	3400		#	80	
Total Dissolved Solids	mg/L	0480	WL	10/06/2009	0001	18	-	18	3000		#	80	
Total Dissolved Solids	mg/L	0483	WL	10/06/2009	0001	18	-	18	5400		#	80	
Total Dissolved Solids	mg/L	0488	WL	10/07/2009	0001	39	-	39	14000		#	400	
Total Dissolved Solids	mg/L	0547	TS	10/08/2009	0001	0	-	0	21000		#	400	
Total Dissolved Solids	mg/L	0547	TS	10/08/2009	0002	0	-	0	21000		#	400	
Total Dissolved Solids	mg/L	0557	WL	10/06/2009	0001	40	-	40	31000		#	2000	
Total Dissolved Solids	mg/L	0559	WL	10/06/2009	0001	18	-	18	4300		#	80	
Total Dissolved Solids	mg/L	0560	WL	10/06/2009	0001	31	-	31	42000		#	1000	
Total Dissolved Solids	mg/L	0583	WL	10/07/2009	0001	18	-	18	1700		#	40	
Total Dissolved Solids	mg/L	0588	WL	10/07/2009	0001	34	-	34	21000		#	400	
Total Dissolved Solids	mg/L	0589	WL	10/07/2009	0001	52	-	52	55000		#	1000	
Total Dissolved Solids	mg/L	0589	WL	10/07/2009	0002	52	-	52	55000		#	2000	
Total Dissolved Solids	mg/L	0683	WL	10/07/2009	0001	27	-	27	13000		#	200	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

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	0688	WL	10/07/2009	0001	39	- 39	15000		#	400	
Total Dissolved Solids	mg/L	0689	WL	10/07/2009	0001	54	- 54	54000		#	2000	
Total Dissolved Solids	mg/L	0770	WL	10/08/2009	0001	14.9	- 34.8	21000		#	400	
Total Dissolved Solids	mg/L	0772	WL	10/08/2009	0001	15.15	- 35.05	20000		#	400	
Total Dissolved Solids	mg/L	0776	WL	10/08/2009	0001	15.15	- 35.05	22000		#	400	
Total Dissolved Solids	mg/L	0779	WL	10/08/2009	0001	15.66	- 35.56	23000		#	400	
Total Dissolved Solids	mg/L	0780	WL	10/06/2009	0001	28	- 28	20000		#	400	
Total Dissolved Solids	mg/L	0782	WL	10/06/2009	0001	33	- 33	76000		#	2000	
Total Dissolved Solids	mg/L	0786	WL	10/06/2009	0001	28	- 28	19000		#	400	
Total Dissolved Solids	mg/L	0787	WL	10/06/2009	0001	36	- 36	88000		#	2000	
Turbidity	NTU	0403	WL	10/07/2009	0001	18	- 18	0.8		#		
Turbidity	NTU	0405	WL	10/07/2009	0001	18	- 18	0.83		#		
Turbidity	NTU	0407	WL	10/07/2009	0001	17	- 17	0.73		#		
Turbidity	NTU	0480	WL	10/06/2009	0001	18	- 18	0.7		#		
Turbidity	NTU	0483	WL	10/06/2009	0001	18	- 18	0.62		#		
Turbidity	NTU	0488	WL	10/07/2009	0001	39	- 39	2.18		#		
Turbidity	NTU	0547	TS	10/08/2009	0001	0	- 0	2.46		#		
Turbidity	NTU	0557	WL	10/06/2009	0001	40	- 40	3.3		#		
Turbidity	NTU	0559	WL	10/06/2009	0001	18	- 18	1.09		#		
Turbidity	NTU	0560	WL	10/06/2009	0001	31	- 31	2.2		#		
Turbidity	NTU	0588	WL	10/07/2009	0001	34	- 34	2.03		#		
Turbidity	NTU	0589	WL	10/07/2009	0001	52	- 52	2.15		#		
Turbidity	NTU	0683	WL	10/07/2009	0001	27	- 27	1.58		#		
Turbidity	NTU	0688	WL	10/07/2009	0001	39	- 39	2.84		#		
Turbidity	NTU	0688	WL	10/07/2009	0001	31	- 31	4.27		#		
Turbidity	NTU	0689	WL	10/07/2009	0001	46	- 46	2.29		#		
Turbidity	NTU	0689	WL	10/07/2009	0001	54	- 54	4.08		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Turbidity	NTU	0770	WL	10/08/2009	0001	14.9	-	34.8	0.77		#		
Turbidity	NTU	0772	WL	10/08/2009	0001	15.15	-	35.05	1.2		#		
Turbidity	NTU	0776	WL	10/08/2009	0001	15.15	-	35.05	2.21		#		
Turbidity	NTU	0779	WL	10/08/2009	0001	15.66	-	35.56	0.79		#		
Turbidity	NTU	0780	WL	10/06/2009	0001	28	-	28	1.08		#		
Turbidity	NTU	0782	WL	10/06/2009	0001	33	-	33	3.52		#		
Turbidity	NTU	0786	WL	10/06/2009	0001	28	-	28	2.57		#		
Turbidity	NTU	0787	WL	10/06/2009	0001	36	-	36	0.98		#		
Uranium	mg/L	0403	WL	10/07/2009	0001	18	-	18	1		#	8.7E-005	
Uranium	mg/L	0405	WL	10/07/2009	0001	18	-	18	1.2		#	8.7E-005	
Uranium	mg/L	0407	WL	10/07/2009	0001	17	-	17	0.47		#	8.7E-005	
Uranium	mg/L	0480	WL	10/06/2009	0001	18	-	18	0.67		#	8.7E-005	
Uranium	mg/L	0483	WL	10/06/2009	0001	18	-	18	1		#	8.7E-005	
Uranium	mg/L	0488	WL	10/07/2009	0001	39	-	39	2		#	8.7E-005	
Uranium	mg/L	0547	TS	10/08/2009	0001	0	-	0	2		#	8.7E-005	
Uranium	mg/L	0547	TS	10/08/2009	0002	0	-	0	1.9		#	8.7E-005	
Uranium	mg/L	0557	WL	10/06/2009	0001	40	-	40	2.9		#	8.7E-005	
Uranium	mg/L	0559	WL	10/06/2009	0001	18	-	18	0.86		#	8.7E-005	
Uranium	mg/L	0560	WL	10/06/2009	0001	31	-	31	2.3		#	8.7E-005	
Uranium	mg/L	0583	WL	10/07/2009	0001	18	-	18	0.63		#	8.7E-005	
Uranium	mg/L	0588	WL	10/07/2009	0001	34	-	34	2.5		#	8.7E-005	
Uranium	mg/L	0589	WL	10/07/2009	0001	52	-	52	2.3		#	8.7E-005	
Uranium	mg/L	0589	WL	10/07/2009	0002	52	-	52	2.2		#	8.7E-005	
Uranium	mg/L	0683	WL	10/07/2009	0001	27	-	27	2.1		#	8.7E-005	
Uranium	mg/L	0688	WL	10/07/2009	0001	39	-	39	2.3		#	8.7E-005	
Uranium	mg/L	0689	WL	10/07/2009	0001	54	-	54	2.2		#	8.7E-005	
Uranium	mg/L	0770	WL	10/08/2009	0001	14.9	-	34.8	1.7		#	8.7E-005	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 12/23/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Uranium	mg/L	0772	WL	10/08/2009	0001	15.15	-	35.05	2.4		#	8.7E-005	
Uranium	mg/L	0776	WL	10/08/2009	0001	15.15	-	35.05	2.2		#	8.7E-005	
Uranium	mg/L	0779	WL	10/08/2009	0001	15.66	-	35.56	1.6		#	8.7E-005	
Uranium	mg/L	0780	WL	10/06/2009	0001	28	-	28	3.4		#	8.7E-005	
Uranium	mg/L	0782	WL	10/06/2009	0001	33	-	33	0.85		#	8.7E-005	
Uranium	mg/L	0786	WL	10/06/2009	0001	28	-	28	3		#	8.7E-005	
Uranium	mg/L	0787	WL	10/06/2009	0001	36	-	36	0.16		#	8.7E-005	

Ft BLS = feet 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 micrometer); 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.
- L Less than three 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.

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: 12/23/2009

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0403	O	3968.95	10/07/2009		16.09	3952.86	
0405	O	3968.47	10/07/2009		14.3	3954.17	
0407	O	3969.09	10/07/2009		16.71	3952.38	
0480		3968.65	10/06/2009		15.95	3952.7	
0483		3968.9	10/06/2009		16.22	3952.68	
0488		3968.48	10/07/2009		14.29	3954.19	
0557		3968.85	10/06/2009		15.75	3953.1	
0559		3969.92	10/06/2009		17.28	3952.64	
0560		3968.77	10/06/2009		15.81	3952.96	
0583		3969.64	10/07/2009		16.19	3953.45	
0588		3968.82	10/07/2009		15.49	3953.33	
0589		3968.87	10/07/2009		15.28	3953.59	
0683		3970.73	10/07/2009		16.79	3953.94	
0688		3968.66	10/07/2009		14.9	3953.76	
0689		3968.66	10/07/2009		15.04	3953.62	
0770		3968.86	10/08/2009		17.49	3951.37	
0772		3969.21	10/08/2009		17.98	3951.23	
0776		3968.97	10/08/2009		17.38	3951.59	
0779		3968.43	10/08/2009		16.36	3952.07	
0780		3968.45	10/06/2009		16.45	3952	
0782		3968.46	10/06/2009		16.43	3952.03	
0786		3968.14	10/06/2009		16.21	3951.93	
0787		3968.43	10/06/2009		16.2	3952.23	

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

Attachment 1.
IA Well Field Monthly Sampling Trip Report

Attachment 1.
IA Well Field Monthly Sampling Trip Report



DATE: October 15, 2009
TO: K. Pill
FROM: J. Ritchey
SUBJECT: October 2009 Interim Action Well Field Monthly Sampling Trip Report

Site: Moab, Utah

Date of Sampling Event: October 6-8, 2009

Team Members: James Ritchey, Tyler Meadows

RIN Number Assigned: All samples were assigned to RIN 0910037.

Sample Shipment: All samples were shipped in a cooler overnight UPS to ALS Laboratory Group from Moab, Utah, on October 8, 2009 (Tracking Nos. 0191921680 and 0191806493).

October 2009 CF1 Sampling

Number of Locations Sampled: Seven observation wells (0403, 0407, 0480, 0483, 0557, 0559, and 0560) and one evaporation pond location (0547) were sampled. Including one duplicate, a total of nine samples were collected during the October 2009 monthly sampling event.

Locations Not Sampled: The extraction wells were not in operation during the sampling event and were not sampled.

Field Variance: None

Quality-Control Sample Cross Reference: The false identifications assigned to the quality-control samples are shown below

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
2001	0547	Duplicate from evaporation pond inlet	Ground Water	OCT 026

ID = identification

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

Location-Specific Information – Observation Wells: All observation wells were sampled using micropurge techniques with a peristaltic pump and dedicated downhole and pump-head tubing. Sample depths and water levels for each observation well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0403	10/07/2009	09:58	16.09	18
0407	10/07/2009	09:38	16.71	17
0480	10/06/2009	13:32	15.95	18
0483	10/06/2009	13:51	16.22	18
0557	10/06/2009	13:12	15.75	40
0559	10/06/2009	14:38	17.28	18
0560	10/06/2009	14:16	15.81	31

ft btoc = feet below top of casing

October 2009 CF2 Sampling

Number of Locations Sampled: Three observation wells (0583, 0588, and 0589) were sampled during the October 2009 monthly sampling event. Including one duplicate, a total of four samples were collected.

Locations Not Sampled: None.

Field Variance: None.

Quality-Control Sample Cross Reference: The false identifications assigned to the quality-control samples are shown below.

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
2000	0589	Duplicate from 52 ft bgs	Ground Water	OCT 014

ID = identification

Location-Specific Information – Observation Wells: All observation wells were sampled using micropurge techniques with a peristaltic pump and dedicated pump-head and downhole tubing. Sample depths and water levels for each observation well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0583	10/07/2009	10:20	16.19	18
0588	10/07/2009	11:02	15.49	34
0589	10/07/2009	10:40	15.28	52

ft btoc = feet below top of casing

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

October 2009 CF3 Sampling

Number of Locations Sampled: Three observation wells (0683, 0688-39, and 0689-54) were sampled during the October 2009 monthly sampling event.

Locations Not Sampled: The remediation wells were not in operation during the sampling event and were not sampled.

Field Variance: None.

Locations in Which Field Parameters Were Measured Only: Parameters were measured at locations 0688 at 31 ft and 0689 at 46 ft.

Well No.	Date	Time	Depth (ft bgs)	Depth to Water (ft btoc)	Field Parameters					
					Temp (°C)	Spec Cond (µS/cm)	D.O. (mg/L)	pH	ORP	Turb. (NTUs)
0688	10/07/2009	13:47	31	14.90	15.27	18,605	0.16	6.91	20	4.27
0689	10/07/2009	14:17	46	15.04	16.05	34,152	-0.30	6.96	49	2.29

D.O. = dissolved oxygen; ft btoc = feet below top of casing; µS/cm = microSiemens per centimeter; mg/L = milligrams per liter; NTUs = nephelometric turbidity units; ORP = oxygen reduction potential; Temp = temperature; Turb = turbidity; Spec Cond = special conditions

Location-Specific Information – Observation Wells: All observation wells were sampled using micropurge techniques with a peristaltic pump and dedicated pump-head and downhole tubing. Sample depths and water levels for each observation well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0683	10/07/2009	14:35	16.79	27
0688-39	10/07/2009	13:29	14.90	39
0689-54	10/07/2009	14:00	15.04	54

ft btoc = feet below top of casing

October 2009 CF4 Sampling

Number of Locations Sampled: Four observation wells (0780, 0782, 0786, and 0787) were collected during the October 2009 monthly sampling event.

Locations Not Sampled: None.

Field Variance: None.

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

Location-Specific Information – CF 4 Remediation Wells: Extraction wells were sampled using dedicated submersible pumps.

Well No.	Date	Time	Water Level (ft btoc)	Pump Intake (ft bgs)
0770	10/08/2009	09:13	17.49	35
0772	10/08/2009	09:25	17.98	35
0776	10/08/2009	09:41	17.38	35
0779	10/08/2009	09:50	16.36	35

ft btoc = feet below top of casing

Location-Specific Information – Observation Wells: All observation wells were sampled using micropurge techniques with a peristaltic pump and dedicated pump-head and downhole tubing. Sample depths and water levels for each observation well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0780	10/06/2009	09:15	16.45	28
0782	10/06/2009	09:45	16.43	33
0786	10/06/2009	10:25	16.21	28
0787	10/06/2009	10:06	16.20	36

ft btoc = feet below top of casing

October 2009 Baseline Sampling

Number of Locations Sampled: Two observation wells (0405 and 0488) were sampled during the October 2009 monthly sampling event.

Locations Not Sampled: None.

Field Variance: None.

Location-Specific Information – Observation Wells: All observation wells were sampled using micropurge techniques with a peristaltic pump and dedicated pump-head and downhole tubing. Sample depths and water levels for each observation well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0405	10/07/2009	15:32	14.30	18
0488	10/07/2009	15:52	14.29	39

ft btoc = feet below top of casing

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

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

Date	Daily Mean Flow (cfs)
10/06/2009	4,220
10/07/2009	4,280
10/08/2009	4,300

Equipment Issues: None.

Corrective Action Required/Taken: None.