

Office of Environmental Management – Grand Junction



Moab UMTRA Project
June 2009 Validation Data Package for
the Routine Ground Water and Surface
Water Sampling Event

September 2009



U.S. Department
of Energy

Office of Environmental Management

**Moab UMTRA Project
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Surface Water Sampling Event**

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**Moab UMTRA Project
June 2009 Routine Ground Water Sampling Event VDP**

Revision 0

Review and Approval

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Revision History

Revision No.	Date	Reason/Basis for Revision
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Attachment

Attachment 1. June 2009 Routine Sampling Trip Report

Acronyms and Abbreviations

CCB	continuing calibration blank
cfs	cubic feet per second
COC	chain of custody
EB	equipment blank
EDD	electronic data deliverable
EPA	Environment Protection Agency
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blank
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
RL	reporting limit
RIN	report identification number
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 Sampling and Analyses. Section 2 provides the Data Assessment Summaries, including the Field Activity Verification, Laboratory Performance Assessment, Field Analyses/Activities description, and 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, Minimums and Maximums Report, and the Blanks Report. The trip report is included as Attachment 1. All Colorado River flow discussed in this document are measured from the U.S. Geological Survey (USGS) Cisco gauging station No. 09180500.

This section contains the Summary Criteria with a sample location map (Section 1.1), a Sampling Event Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for the June 2009 routine sampling event.

1.1 Summary Criteria

Sampling Period: June 15 through 19, 2009

The purpose of this sampling was to collect ground water and surface water samples from the standard routine event sampling locations in order to evaluate the overall water quality under Colorado River base flow conditions. Sampling locations are shown on Figure 1.

1. Did concentrations in water from any domestic well sampled exceed a ground water standard, primary drinking water standard, or health advisory?

Domestic wells were not sampled during this event.

2. Were standards exceeded at any point-of-compliance wells?

Point-of-compliance wells have not been established at the Moab site.

3. As a result of this sampling round, is there any indication of unexpected contaminated ground water movement?

There is no indication of unexpected contaminated ground water movement along the bank of the Colorado River. In some instances, contaminant concentrations in June 2009 changed compared to the concentrations measured during the previous routine sampling event completed in May 2009, especially in areas of the site impacted by the high river stage.

Time versus concentration plots for ammonia, total dissolved solids (TDS), and uranium for wells TP-02 (northeast portion of the site), 0492 (just south of the well field), TP-17, and TP-19 (both of which are located farther south of the well field) are provided in the

Sampling Event Summary. Similar plots are provided for the observation wells located on top of the tailings pile (0437, 0438, and 0439).

Locations 0492 and TP-02 exhibit the most significant seasonal variations in contaminant concentration of the wells located along the river bank. These wells are not screened within the brine zone (as TP-17 and TP-19 are), and water quality is influenced by changes in the Colorado River stage. In general, samples collected from 0492 and TP-02 followed the same seasonal pattern exhibited in previous years, where the ammonia concentrations measured in the sample from 0492 decreased in response to the higher river stage. TDS concentrations in samples collected from both locations decreased, and uranium concentrations increased in the sample from TP-02 and decreased in the sample from 0492.

Based on the samples collected from locations 0437, 0438, and 0439 (all of which are located on top of the tailings pile but are completed in the underlying alluvial aquifer), contaminant concentrations did not change significantly between May and June 2009. All analyte concentrations remained within the historical range.

Wells that exceeded water quality standards are listed in Table 1.

Table 1. Locations Sampled that Exceeded Selenium and Uranium Ground Water Standards

Analyte	Standard (mg/L)	Locations Exceeding Standards
Selenium	0.01	0437 (0.11)
Uranium	0.044	0401 (0.55), 0404 (0.73), 0437 (4.1), 0438 (2.0), 0439 (0.82), 0492 (0.27), TP-02 (1.7)

mg/L = milligrams per liter

4. Is there statistical evidence that contaminants related to the Moab UMTRA Project were detected in a surface body of water in greater concentrations than upstream ambient water quality?

Since the monitoring of the site began, site contaminants have periodically occurred at elevated concentrations in the Colorado River, primarily adjacent to and just downstream from the tailings pile in isolated pools or slow-moving backwater areas. However, the results from the routine sampling event in June 2009 indicate that areas sampled are not distinguishable from background concentrations in the main channel of the Colorado River, mainly due to the high river stage.

Table 2 presents a summary of the ammonia concentrations associated with the surface water samples collected during this sampling event. For comparison purposes, the applicable state of Utah and federal criteria for both acute and chronic concentrations (along with the temperature and pH data used to calculate these concentrations) are provided.

Table 2. Surface Water Ammonia Concentrations and Comparisons to State of Utah and Federal Criteria

Loc	Date	Temp (°C)	pH	Ammonia as N (mg/L)	State/Federal AWQC-Acute Total as N (mg/L) ¹	State/Federal AWQC-Chronic Total as N (mg/L) ²
0201	6/15/09	16.0	7.93	0.1	6.77	2.54
0218	6/15/09	16.7	8.29	0.1	3.15	1.39
0226	6/15/09	16.9	8.07	0.1	4.64	1.91
0228	6/15/09	18.0	8.12	0.1	4.64	1.68
CR1	6/15/09	15.7	8.04	0.1	5.62	2.21
CR3	6/16/09	17.1	8.08	0.1	4.64	1.68
CR5	6/15/09	15.2	8.28	0.1	3.15	1.39

AWQC = ambient water quality criteria; Loc = location, mg/L = milligrams per liter; Temp = temperature

- (1) State of Utah, Standards of Quality for Waters of the State (Effective May 1, 2008), Rule R317-2, Table 2.14.2, 1-Hour Average (Acute) Concentration of Total Ammonia as N (mg/L)
- (2) State of Utah, Standards of Quality for Waters of the State (Effective May 1, 2008), Rule R317-2, Table 2.14.2, 30-Day Average (Chronic) Concentration of Total Ammonia as N (mg/L), Fish Early Life Stages Present

As shown in Table 2, none of the samples exceeded the state or federal acute or chronic criteria.

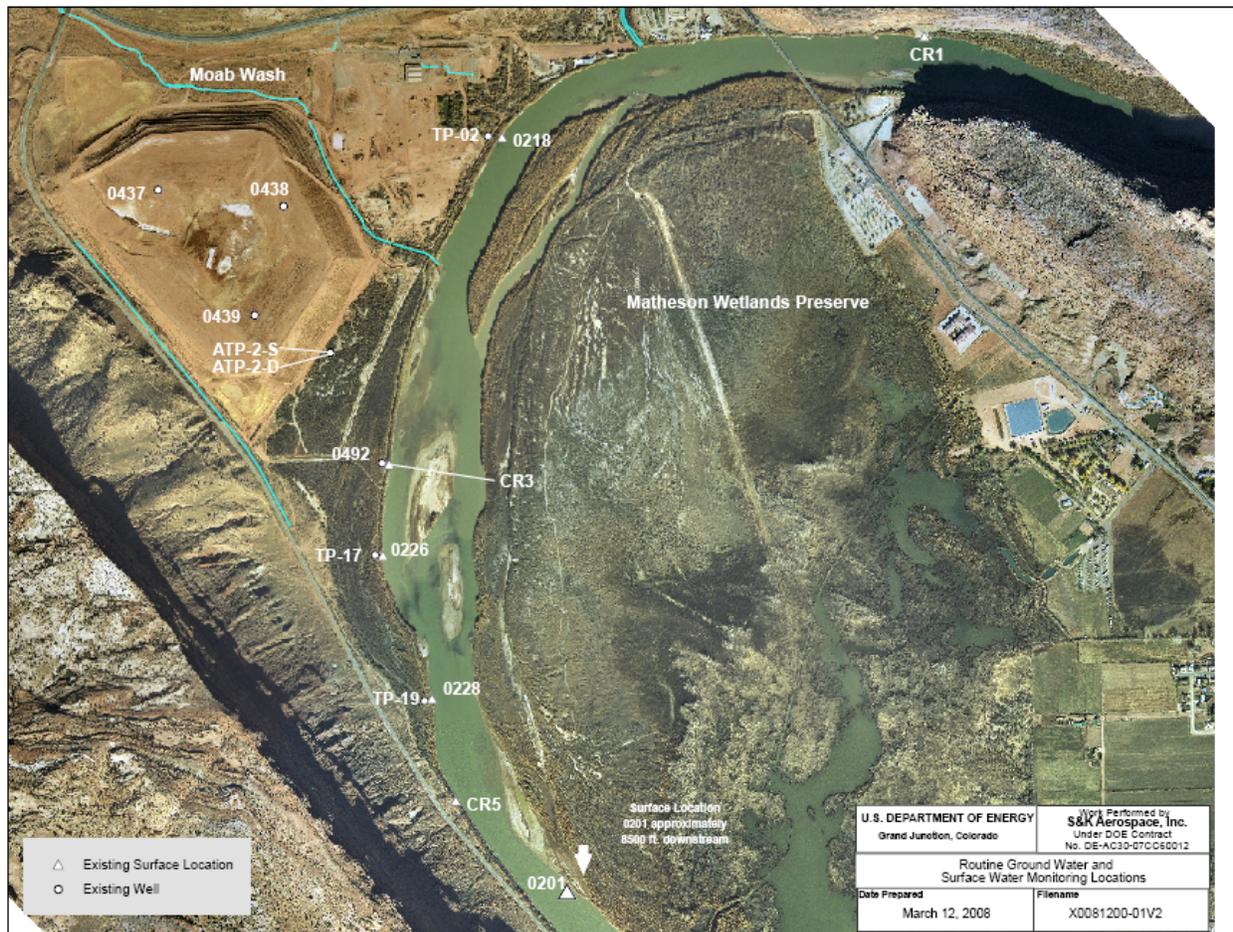


Figure 1. Routine Ground Water and Surface Water Sampling Locations (may include locations not sampled)

1.2 Sampling Event Summary

This validation data package (VDP) presents the validated data associated with the ground water and surface water samples collected during the June 2009 routine 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 4 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. Any anomalous data, based on the results of the Minimums and Maximums Report, are presented in Section 3.2.

While independent of the data validation process, a brief summary of the most recent concentration trends based on the June 2009 data is provided for the wells located in the floodplain (along the bank of the Colorado River) and in the footprint of the tailings pile. Time versus concentration (ammonia, TDS, and uranium) plots for selected monitoring wells over the past 2 years are presented to display historical trends exhibited by the data. Colorado River flows over the same time frame are also plotted to determine whether the magnitude of river flows influences analyte concentrations.

Flood Plain Wells

Time concentration plots were generated for wells TP-02, 0492, TP-17, and TP-19 (from north to south). These plots exhibit that samples collected from wells TP-02, TP-17, and TP-19 have historically contained low ammonia concentrations (Figure 2), while the concentration detected from well 0492 has fluctuated between approximately 10 and 120 milligrams per liter (mg/L) over the past 2 years. The historical trend of samples from 0492 having decreased ammonia, TDS, and uranium concentrations during periods of high river flow was apparent again during June 2009.

The TDS plot (Figure 3) graphically shows that locations TP-17 and TP-19 are screened within the brine, while locations TP-02 and 0492 are screened above the brine-freshwater interface. Seasonal changes in the TDS concentration are indicative of infiltration of freshwater during above average runoff events. Well TP-02 has consistently contained less than 6,000 mg/L TDS.

Over the past 2 years, uranium concentrations have seasonally fluctuated in samples collected from 0492 and TP-02, and the samples collected in June 2009 continue this trend (Figure 4). Typical of wells screened within the brine, uranium concentrations in wells TP-17 and TP-19 are considerably lower compared to concentrations in wells TP-02 and 0492. Since July 2006, samples collected from well TP-17 have contained uranium in concentrations near the 0.044 mg/L standard (Figure 5). The sample collected from TP-17 during June 2009 had the lowest uranium concentration measured within the past 2 years.

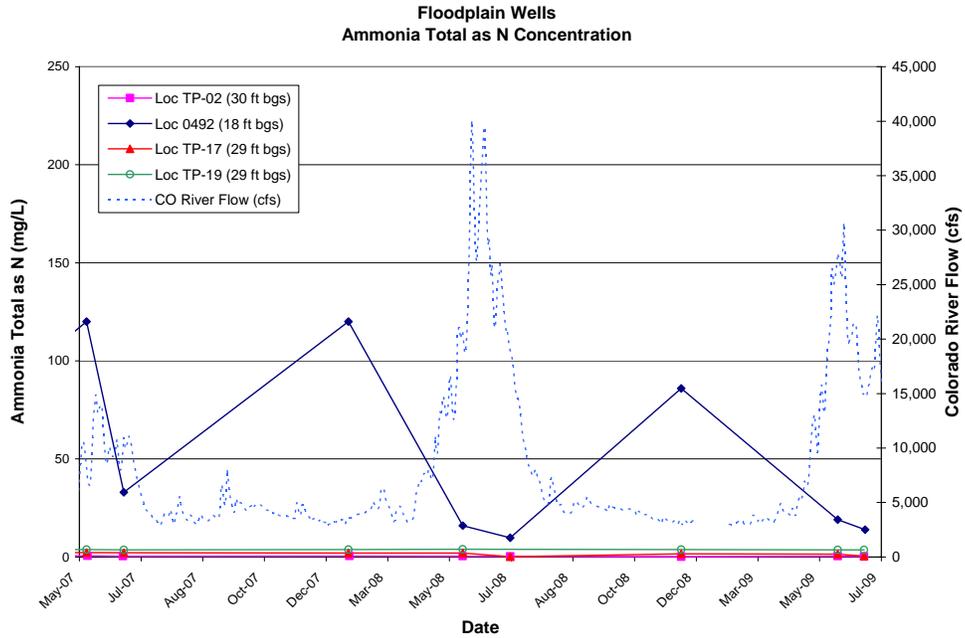


Figure 2. Floodplain Wells Time Versus Ammonia Total (as N) Concentration Plot

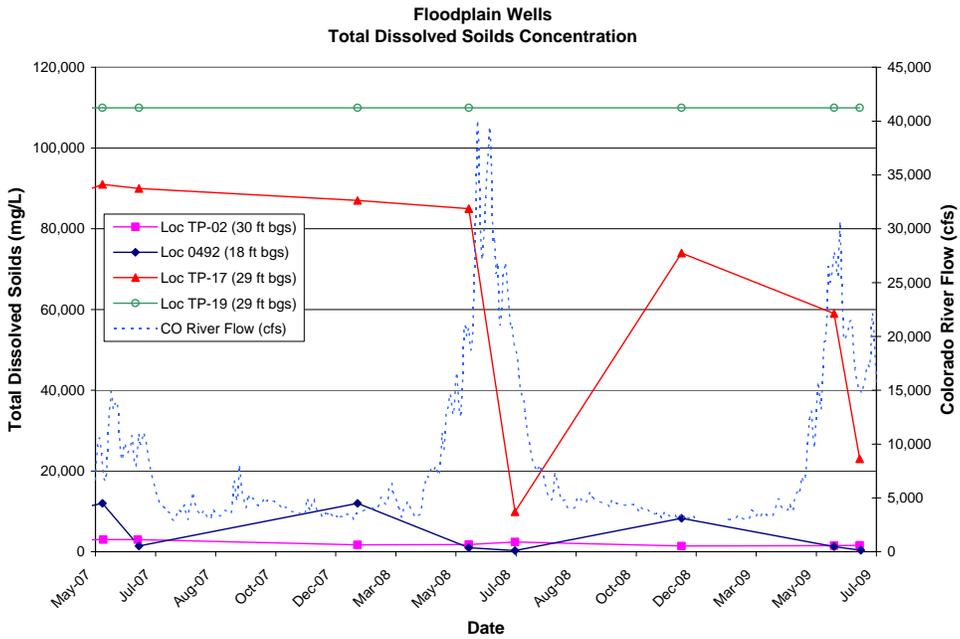


Figure 3. Floodplain Wells Time Versus TDS Concentration Plot

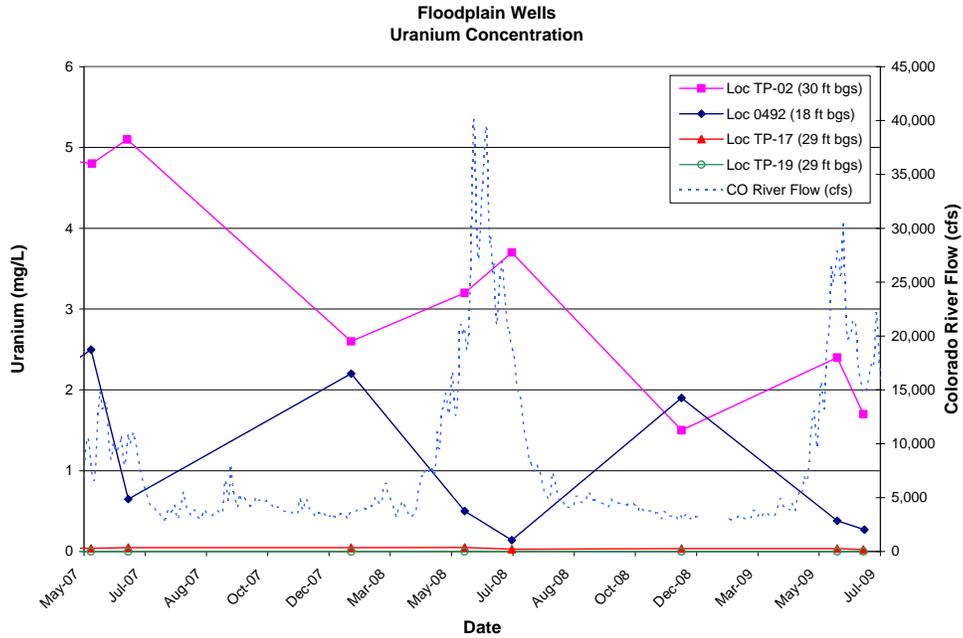


Figure 4. Floodplain Wells Time Versus Uranium Concentration Plot

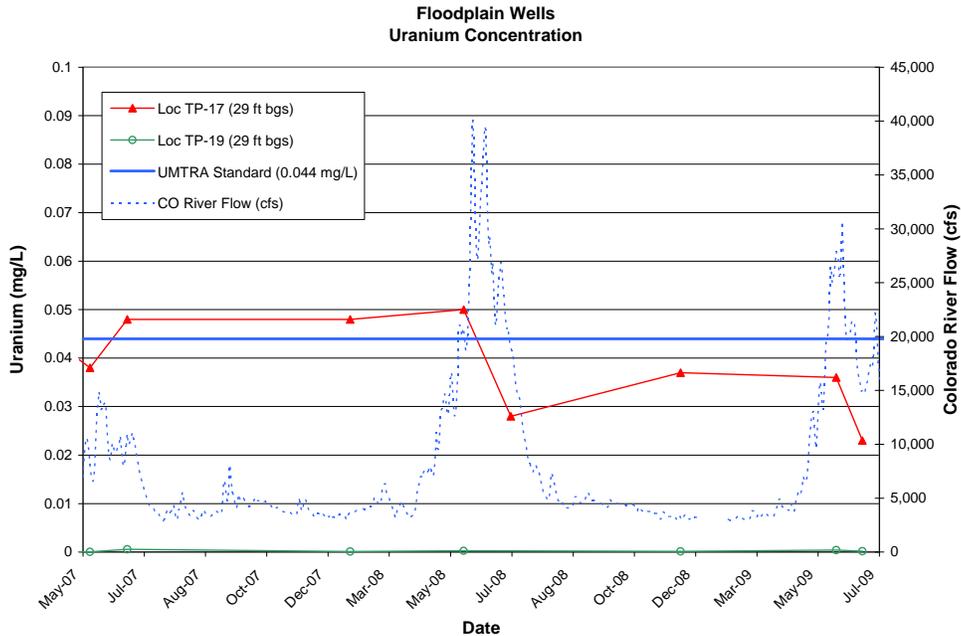


Figure 5. Floodplain Wells TP-17 and TP-19 Uranium Concentration Comparison to UMTRA Standard

Tailings Pile Wells

The wells located on the tailings pile are screened within the alluvial material underlying the tailings. In well 0437 (which is located upgradient of 0438 and 0439) ammonia concentrations remain below 1 mg/L, while samples collected from 0438 and 0439 had comparable concentrations (approximately 5 mg/L) as shown in Figure 6. The TDS time concentration plot (Figure 7) displays that all three wells are screened within the same freshwater unit in the aquifer

(all three had concentrations less than 10,000 mg/L) and have not significantly changed over the past 2 years. The uranium time concentration plots indicate the uranium concentrations measured in June 2009 are consistent with concentrations detected over the past 2 years (Figure 8).

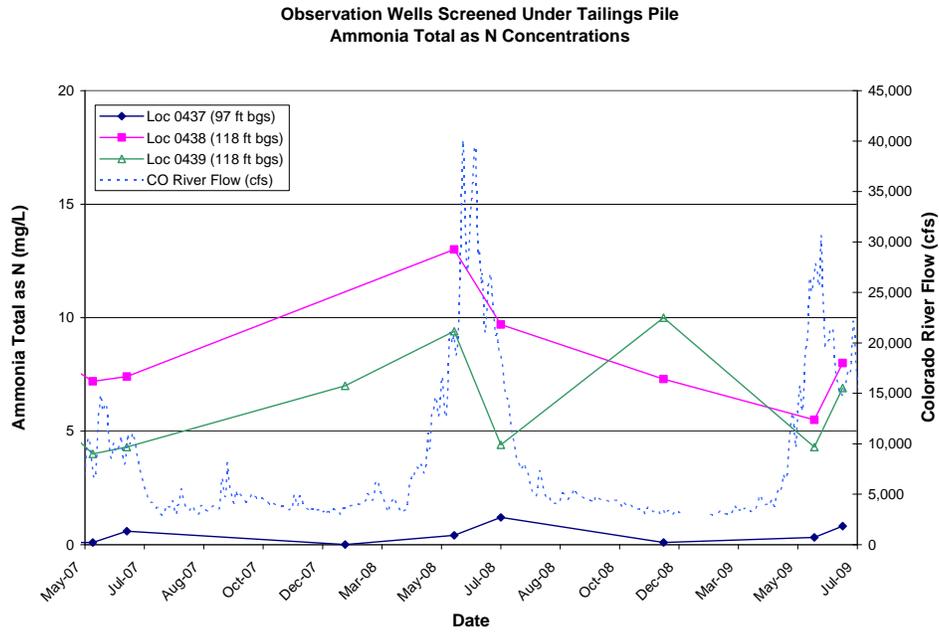


Figure 6. Tailings Pile Wells Time Versus Ammonia Total (as N) Concentration Plot

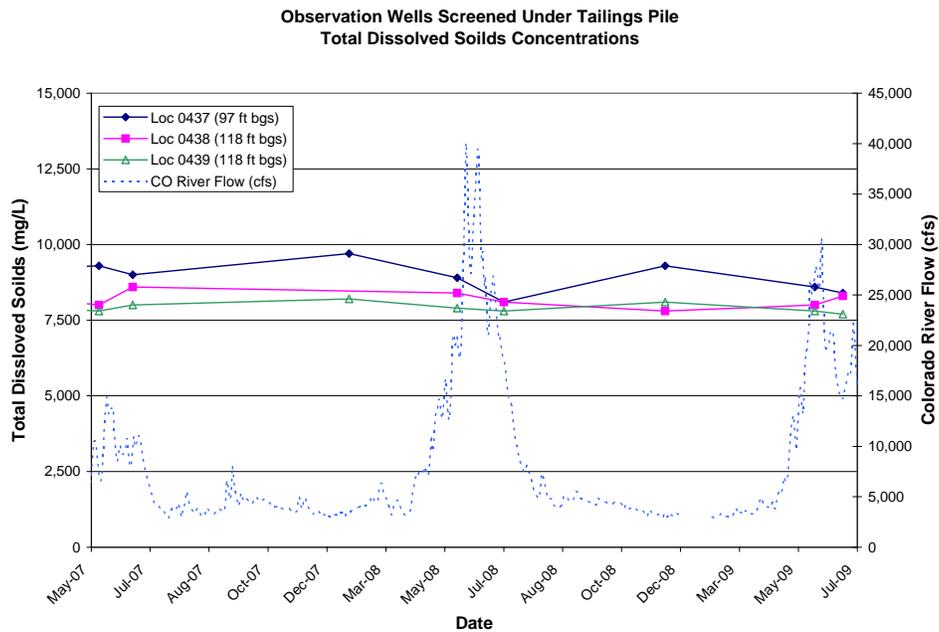


Figure 7. Tailings Pile Wells Time Versus TDS Concentration Plot

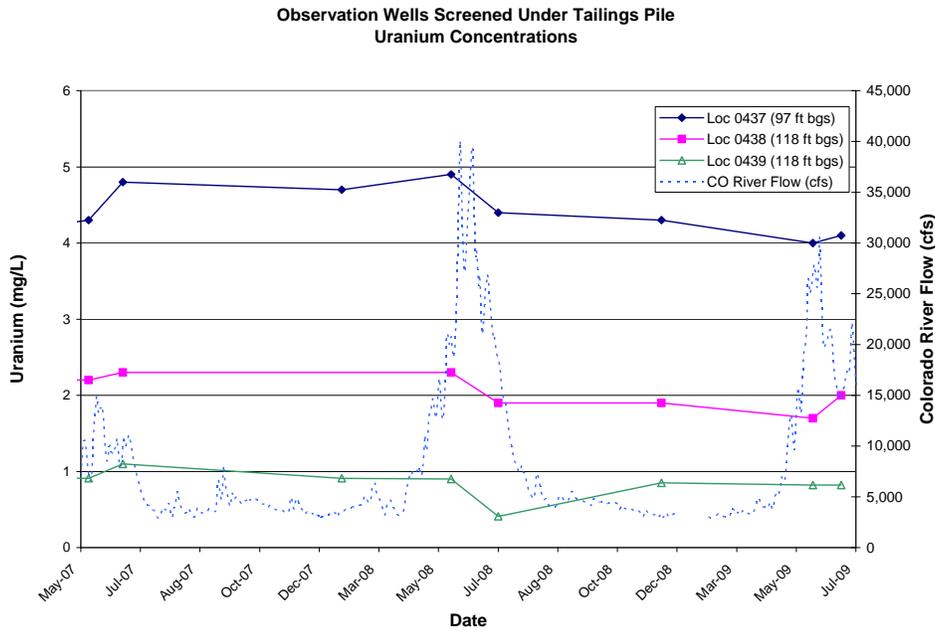


Figure 8. Tailings Pile Wells Time Versus Uranium Concentration Plot

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). 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 holding times were met. No equipment blanks (EBs) were collected. 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 was one anomalous data point associated with surface water location (0226), in which the historical maximum concentration was exceeded.

According to the USGS Cisco gauging station, the mean daily Colorado River flow rates ranged from 14,700 to 15,000 cubic feet per second (cfs) during this sampling period.

2.0 Data Assessment Summary

This section contains the Water Sampling Field Activities Verification (Section 2.1), the Laboratory Performance Assessments (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 list provided in Appendix A. As the list exhibits, all sampling was conducted following the applicable procedures.

2.2 Laboratory Performance Assessment

General Information

Report Identification No. (RIN): 0906033
Sample Event: June 2009 Interim Action Well Field Routine Sampling
Site(s): Moab, Utah
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Sample Data Group (SDG) No.: 0906191
Analysis: Metals and Inorganics
Validator: Rachel Cowan
Review Date: August 30, 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 1, Data Deliverables Examination. The Level 1 validation was performed on 100 percent of the samples, which included review of the chain of custody (COC), case narratives, field and sample identifications, holding times, preservation, and cooler receipt. When the case narrative identified items of concern, these items were further investigated in a targeted Level 3 validation. 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 3.

Table 3. 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
Chloride	MIS-A-039	SW-846 9056	SW-846 9056
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
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056
Total Dissolved Solids	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 4. Refer to Table 5 for an explanation of the data qualifiers applied.

Table 4. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
0905200-2 through -9, -19, -20, -21	0218, 0226, 0228, 0401, 0404, 0437, 0438, 0439, TP-17, TP-19, 0537	Ammonia	J	MS1
0906191-15, -17	CR-1, CR-5	Manganese	U	B2

Notes: Flags are for detects. See reason codes below for nondetect codes. J indicates results are estimated and becomes a UJ for analytical results below the detection limit.

Table 5. Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Nondetects)	Explanation
B2	U	N/A	Results for the affected analyte(s) are regarded as undetected (U) because the result for an associated blank is between the method detection limit and the practical quantitation limit, and the sample result is less than five times the blank concentration.
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 21 samples for RIN 0906033 in one shipment, which arrived on June 19, 2009 (UPS tracking number 1Z5W1Y510193126296). 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 0906191 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.

Case Narratives

The case narratives were reviewed, and all detects were found to be within quality-control procedures except for the following.

MS and Replicate Analysis

MS sample analysis, performed at a frequency of one per 20 samples unless otherwise noted, is a measure of the ability to recover analytes in a particular matrix. Replicate sample (RS) analysis consists of matrix spike duplicate (MSD) samples and field duplicates, analyzed at a frequency of one per 20 samples per method or procedural requirements. These RSs are indicators of laboratory precision for each sample matrix.

Method EPA 350.1, Ammonia

One of the ammonia samples selected for MS analysis had a concentration above the analytical range; therefore, the ammonia samples did not have the appropriate number of MS/MSD samples as per method requirements. Samples 0905200-2 through 9, -19, 20, and -21 were flagged for MS1. However, the field duplicate sample passed for ammonia results, so no samples had to be “J”-flagged for RS reasons.

Laboratory Control Sample

A laboratory control sample (LCS) must be analyzed at the correct frequency (one LCS per 20 samples) to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCSs were prepared and analyzed as appropriate 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 are field-filtered and acidified and then 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 samples are “J”-qualified for LCS failure.

The copper, manganese, and uranium MSs passed requirements, so no copper, manganese, or uranium samples needed to be qualified for LCS failure.

Method and Calibration Blanks

MBs are analyzed to assess any contamination that may have occurred during sample preparation. Initial calibration blanks 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 method detection limit or instrument detection limit (IDL) (depending on method requirements) were “J”-qualified when the detections were less than five times the associated blank concentration. Nondetects were not qualified. All blanks passed these criteria with the following exceptions.

All calibration blanks for uranium, five CCBs for chloride, and one for manganese were greater than each analyte’s associated IDL. The corresponding samples’ uranium, chloride, and manganese results were checked; as no results were less than five times their associated blank’s concentration, no results were flagged for this reason.

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. Inductively coupled plasma-mass spectrometry SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the reporting limit (RL). Inductively coupled plasma-atomic emission spectroscopy SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. All evaluated SD data were acceptable with the following exceptions.

Method SW-846 6020A, Selenium

The SD sample (0906191-5) selected as the quality-control sample for the selenium analytical run in SDG 0906191 had a percent recovery greater than the maximum limit, which is

10 percent. However, the selenium concentration in the SD sample was less than 100 times the RL, so no selenium results were “J”-flagged for reason SD2.

EBs

An EB is a sample of analyte-free media collected from a rinse of nondedicated sampling equipment used to sample surface water. EBs are collected to document adequate decontamination of nondedicated equipment. One EB should be prepared with each preparation batch.

Seven surface water samples were collected using nondedicated equipment. One EB was collected and analyzed, so no results from this location were “J”-qualified for this reason. Chloride, selenium, sulfate, and TDS results from the EB were nondetectable. However, manganese and uranium were above their respective IDLs and were also greater than five times their respective IDLs. All surface water manganese and uranium results were checked. There were two surface water manganese results that were less than five times the EB’s manganese concentration; these were “U”-qualified for reason B2.

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 June 26, 2009. The contents of the EDD files were manually examined to verify that the sample results accurately reflected the data contained in the sample data package and that all and only the requested data were delivered.

2.3 Field Analyses/Activities

The following information summarizes the field analyses and activities for the June 2009 routine 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 EB was collected for the surface water samples collected using nondedicated equipment, and one ground water duplicate sample was collected for the 20 other samples collected during this event. There are no established regulatory criteria for the evaluation of field duplicate samples; therefore, Environmental Protection Agency (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 relative percent difference 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 when possible, or an explanation of why they were not met is given in the laboratory case narrative. 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 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 report 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 within 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 was only one anomalous result based on the Minimums and Maximums Report (Appendix B), from surface water location 0226.

Loc. No.	Analyte	Type of Anomaly	Disposition
0226	Manganese	High	Only five samples collected from location, still establishing range

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

Seven samples were collected using nondedicated equipment, and as a result, an EB was collected during this sampling event. The results from the EB collected during this sampling event are presented in Appendix E. As the results show, ammonia, chloride, sulfate, and TDS were below the associated detection limit. The EB manganese results were within five times the IDL, so the results were due to potential machine error because of being so close to the detection limit. The EB uranium result is well below the RL, and all associated samples (surface water)

were checked. None of the surface water uranium results, however, were within five times the uranium concentration in the EB, so none needed to be flagged.

Appendix A.
Water Sampling Field Activities Verification

Appendix A. Water Sampling Field Activities Verification

Sampling Event / RIN	June 2009 Routine Event/0906033	Date(s) of Water Sampling	June 15 to 18, 2009
Date(s) of Verification	August 31, 2009	Name of Verifier	Rachel Cowan

	Response (Yes, No, NA)	Comments
1. Is the Sampling and 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?	No	Surface water location CR-5 was sampled 40 feet downriver of its usual location because of access issues.
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? Did the operational checks meet criteria?	Yes 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? Did the water level stabilize prior to sampling? Did pH, specific conductance, and turbidity measurements stabilize prior to sampling? Was the flow rate less than 500 milliliters per minute? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes Yes Yes Yes NA	
8. Were the following conditions met when purging a Category II well: Was the flow rate less than 500 milliliters per minute? Was one pump/tubing volume removed prior to sampling?	Yes Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	One ground water duplicate was collected for 20 samples.

Appendix A. Water Sampling Field Activities Verification (continued)

10. Were EBs taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	Yes	Surface water samples are collected on nondedicated equipment; one EB was collected for seven surface water samples.
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: 0906033

Comparison: All Historical Data

Report Date: 8/30/2009

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	0226	06/15/2009	Manganese	0.53		0.048		0.0032	B	5	0
MOA01	0492	06/16/2009	Chloride	20		17000	F	21		19	0
MOA01	0492	06/16/2009	Manganese	0.07		6.7		0.14		9	0
MOA01	0492	06/16/2009	Sulfate	76		15000	F	83		19	0
MOA01	0537	06/18/2009	Chloride	2100		6610	Q	2500		5	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 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 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 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.

Appendix C.
Water Quality Data

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
										Lab	Data	QA		
Alkalinity, Total (As CaCO3)	mg/L	0218	SL	06/15/2009	0001	0	-	0	102			#		
Alkalinity, Total (As CaCO3)	mg/L	0401	WL	06/16/2009	0001	18	-	18	344			#		
Alkalinity, Total (As CaCO3)	mg/L	0404	WL	06/16/2009	0001	18	-	18	386			#		
Alkalinity, Total (As CaCO3)	mg/L	0492	WL	06/16/2009	0001	18	-	18	230			#		
Alkalinity, Total (As CaCO3)	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	104			#		
Alkalinity, Total (As CaCO3)	mg/L	CR5	SL	06/15/2009	0001	0	-	0	104			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	358			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	388			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	198			#		
Ammonia Total as N	mg/L	0201	SL	06/15/2009	0001	0	-	0	0.1	U		#	0.1	
Ammonia Total as N	mg/L	0218	SL	06/15/2009	0001	0	-	0	0.1	U		#	0.1	
Ammonia Total as N	mg/L	0226	SL	06/15/2009	0001	0	-	0	0.1	U		#	0.1	
Ammonia Total as N	mg/L	0228	SL	06/15/2009	0001	0	-	0	0.1	U		#	0.1	
Ammonia Total as N	mg/L	0401	WL	06/16/2009	0001	18	-	18	82		J	#	5	
Ammonia Total as N	mg/L	0401	WL	06/18/2009	0002	13	-	17.9	89			#	5	
Ammonia Total as N	mg/L	0404	WL	06/16/2009	0001	18	-	18	87		J	#	5	
Ammonia Total as N	mg/L	0437	WL	06/17/2009	0001	97	-	97	0.82		J	#	0.1	
Ammonia Total as N	mg/L	0438	WL	06/17/2009	0001	118	-	118	8		J	#	0.5	
Ammonia Total as N	mg/L	0439	WL	06/17/2009	0001	118	-	118	6.9		J	#	0.5	
Ammonia Total as N	mg/L	0492	WL	06/16/2009	0001	18	-	18	14			#	0.5	
Ammonia Total as N	mg/L	0537	TS	06/18/2009	0001	0	-	0	6500		J	#	200	
Ammonia Total as N	mg/L	ATP-2-D	WL	06/18/2009	0001	88	-	88	410			#	10	
Ammonia Total as N	mg/L	ATP-2-S	WL	06/18/2009	0001	38	-	38	370			#	10	
Ammonia Total as N	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	0.1	U		#	0.1	
Ammonia Total as N	mg/L	CR3	SL	06/16/2009	0001	0	-	0	0.1	U		#	0.1	
Ammonia Total as N	mg/L	CR5	SL	06/15/2009	0001	0	-	0	0.1	U		#	0.1	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID	(Ft BLS)	Lab	Data		QA			
Ammonia Total as N	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	0.27		#	0.1	
Ammonia Total as N	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	0.5	J	#	0.1	
Ammonia Total as N	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	3.6	J	#	0.1	
Chloride	mg/L	0201	SL	06/15/2009	0001	0	-	0	31		#	0.4	
Chloride	mg/L	0218	SL	06/15/2009	0001	0	-	0	30		#	0.4	
Chloride	mg/L	0226	SL	06/15/2009	0001	0	-	0	31		#	0.4	
Chloride	mg/L	0228	SL	06/15/2009	0001	0	-	0	31		#	0.4	
Chloride	mg/L	0401	WL	06/16/2009	0001	18	-	18	250		#	10	
Chloride	mg/L	0401	WL	06/18/2009	0002	13	-	17.9	240		#	10	
Chloride	mg/L	0404	WL	06/16/2009	0001	18	-	18	330		#	10	
Chloride	mg/L	0437	WL	06/17/2009	0001	97	-	97	950		#	20	
Chloride	mg/L	0438	WL	06/17/2009	0001	118	-	118	910		#	20	
Chloride	mg/L	0439	WL	06/17/2009	0001	118	-	118	1300		#	20	
Chloride	mg/L	0492	WL	06/16/2009	0001	18	-	18	20		#	1	
Chloride	mg/L	0537	TS	06/18/2009	0001	0	-	0	2100		#	400	
Chloride	mg/L	ATP-2-D	WL	06/18/2009	0001	88	-	88	52000		#	1000	
Chloride	mg/L	ATP-2-S	WL	06/18/2009	0001	38	-	38	2400		#	40	
Chloride	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	30		#	0.4	
Chloride	mg/L	CR3	SL	06/16/2009	0001	0	-	0	31		#	0.4	
Chloride	mg/L	CR5	SL	06/15/2009	0001	0	-	0	30		#	0.4	
Chloride	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	230		#	4	
Chloride	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	12000		#	200	
Chloride	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	60000		#	1000	
Copper	mg/L	0537	TS	06/18/2009	0001	0	-	0	1.3		#	0.069	
Dissolved Oxygen	mg/L	0201	SL	06/15/2009	0001	0	-	0	7.56		#		
Dissolved Oxygen	mg/L	0218	SL	06/15/2009	0001	0	-	0	8.29		#		
Dissolved Oxygen	mg/L	0226	SL	06/15/2009	0001	0	-	0	7.38		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data		
Dissolved Oxygen	mg/L	0228	SL	06/15/2009	0001	0	-	0	8.56		#		
Dissolved Oxygen	mg/L	0401	WL	06/16/2009	0001	18	-	18	0.71		#		
Dissolved Oxygen	mg/L	0404	WL	06/16/2009	0001	18	-	18	0.53		#		
Dissolved Oxygen	mg/L	0437	WL	06/17/2009	0001	97	-	97	1.35		#		
Dissolved Oxygen	mg/L	0438	WL	06/17/2009	0001	118	-	118	2.09		#		
Dissolved Oxygen	mg/L	0439	WL	06/17/2009	0001	118	-	118	1.54		#		
Dissolved Oxygen	mg/L	0492	WL	06/16/2009	0001	18	-	18	0.65		#		
Dissolved Oxygen	mg/L	0537	TS	06/18/2009	0001	0	-	0	3.55		#		
Dissolved Oxygen	mg/L	ATP-2-D	WL	06/18/2009	0001	88	-	88	0.19		#		
Dissolved Oxygen	mg/L	ATP-2-S	WL	06/18/2009	0001	38	-	38	0.87		#		
Dissolved Oxygen	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	8.29		#		
Dissolved Oxygen	mg/L	CR3	SL	06/16/2009	0001	0	-	0	10.43		#		
Dissolved Oxygen	mg/L	CR5	SL	06/15/2009	0001	0	-	0	8.27		#		
Dissolved Oxygen	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	1.2		#		
Dissolved Oxygen	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	0.1		#		
Dissolved Oxygen	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	0.05		#		
Manganese	mg/L	0201	SL	06/15/2009	0001	0	-	0	0.046	N	#	0.00012	
Manganese	mg/L	0218	SL	06/15/2009	0001	0	-	0	0.0055		#	0.00012	
Manganese	mg/L	0226	SL	06/15/2009	0001	0	-	0	0.53		#	0.00012	
Manganese	mg/L	0228	SL	06/15/2009	0001	0	-	0	0.018		#	0.00012	
Manganese	mg/L	0401	WL	06/16/2009	0001	18	-	18	1.3		#	0.00023	
Manganese	mg/L	0401	WL	06/18/2009	0002	13	-	17.9	1.2		#	0.00023	
Manganese	mg/L	0404	WL	06/16/2009	0001	18	-	18	1.7		#	0.00023	
Manganese	mg/L	0437	WL	06/17/2009	0001	97	-	97	0.8		#	0.00058	
Manganese	mg/L	0438	WL	06/17/2009	0001	118	-	118	3.1		#	0.00058	
Manganese	mg/L	0439	WL	06/17/2009	0001	118	-	118	2		#	0.00058	
Manganese	mg/L	0492	WL	06/16/2009	0001	18	-	18	0.07		#	0.00012	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID	(Ft BLS)	Lab	Data		QA				
Manganese	mg/L	0537	TS	06/18/2009	0001	0	-	0	67			#	0.0058	
Manganese	mg/L	ATP-2-D	WL	06/18/2009	0001	88	-	88	2.5			#	0.0058	
Manganese	mg/L	ATP-2-S	WL	06/18/2009	0001	38	-	38	0.19			#	0.0012	
Manganese	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	0.0043	B	U	#	0.00012	
Manganese	mg/L	CR3	SL	06/16/2009	0001	0	-	0	0.013			#	0.00012	
Manganese	mg/L	CR5	SL	06/15/2009	0001	0	-	0	0.0037	B	U	#	0.00012	
Manganese	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	0.33			#	0.00012	
Manganese	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	0.76			#	0.0029	
Manganese	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	0.068	B		#	0.0058	
Oxidation Reduction Potential	mV	0201	SL	06/15/2009	0001	0	-	0	-107			#		
Oxidation Reduction Potential	mV	0218	SL	06/15/2009	0001	0	-	0	44			#		
Oxidation Reduction Potential	mV	0226	SL	06/15/2009	0001	0	-	0	-102.5			#		
Oxidation Reduction Potential	mV	0228	SL	06/15/2009	0001	0	-	0	173			#		
Oxidation Reduction Potential	mV	0401	WL	06/16/2009	0001	18	-	18	23			#		
Oxidation Reduction Potential	mV	0404	WL	06/16/2009	0001	18	-	18	67			#		
Oxidation Reduction Potential	mV	0437	WL	06/17/2009	0001	97	-	97	110.2			#		
Oxidation Reduction Potential	mV	0438	WL	06/17/2009	0001	118	-	118	169.5			#		
Oxidation Reduction Potential	mV	0439	WL	06/17/2009	0001	118	-	118	122.8			#		
Oxidation Reduction Potential	mV	0492	WL	06/16/2009	0001	18	-	18	46			#		
Oxidation Reduction Potential	mV	0537	TS	06/18/2009	0001	0	-	0	31			#		
Oxidation Reduction Potential	mV	ATP-2-D	WL	06/18/2009	0001	88	-	88	-244.6			#		
Oxidation Reduction Potential	mV	ATP-2-S	WL	06/18/2009	0001	38	-	38	-208.8			#		
Oxidation Reduction Potential	mV	CR1	SL	06/15/2009	0001	0.42	-	0.42	197			#		
Oxidation Reduction Potential	mV	CR3	SL	06/16/2009	0001	0	-	0	-72			#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data		
Oxidation Reduction Potential	mV	CR5	SL	06/15/2009	0001	0	-	0	13		#		
Oxidation Reduction Potential	mV	TP-02	WL	06/15/2009	0001	30	-	30	-101		#		
Oxidation Reduction Potential	mV	TP-17	WL	06/15/2009	0001	28	-	28	-193		#		
Oxidation Reduction Potential	mV	TP-19	WL	06/15/2009	0001	29	-	29	-189		#		
pH	s.u.	0201	SL	06/15/2009	0001	0	-	0	7.93		#		
pH	s.u.	0218	SL	06/15/2009	0001	0	-	0	8.29		#		
pH	s.u.	0226	SL	06/15/2009	0001	0	-	0	8.07		#		
pH	s.u.	0228	SL	06/15/2009	0001	0	-	0	8.12		#		
pH	s.u.	0401	WL	06/16/2009	0001	18	-	18	7.4		#		
pH	s.u.	0404	WL	06/16/2009	0001	18	-	18	7.07		#		
pH	s.u.	0437	WL	06/17/2009	0001	97	-	97	7.38		#		
pH	s.u.	0438	WL	06/17/2009	0001	118	-	118	6.83		#		
pH	s.u.	0439	WL	06/17/2009	0001	118	-	118	7		#		
pH	s.u.	0492	WL	06/16/2009	0001	18	-	18	8.58		#		
pH	s.u.	0537	TS	06/18/2009	0001	0	-	0	6.25		#		
pH	s.u.	ATP-2-D	WL	06/18/2009	0001	88	-	88	7.78		#		
pH	s.u.	ATP-2-S	WL	06/18/2009	0001	38	-	38	8.47		#		
pH	s.u.	CR1	SL	06/15/2009	0001	0.42	-	0.42	8.04		#		
pH	s.u.	CR3	SL	06/16/2009	0001	0	-	0	8.08		#		
pH	s.u.	CR5	SL	06/15/2009	0001	0	-	0	8.28		#		
pH	s.u.	TP-02	WL	06/15/2009	0001	30	-	30	7.29		#		
pH	s.u.	TP-17	WL	06/15/2009	0001	28	-	28	7.87		#		
pH	s.u.	TP-19	WL	06/15/2009	0001	29	-	29	7.07		#		
Selenium	mg/L	0401	WL	06/16/2009	0001	18	-	18	0.0071	E	#	9.1E-005	
Selenium	mg/L	0401	WL	06/18/2009	0002	13	-	17.9	0.0067		#	9.1E-005	
Selenium	mg/L	0404	WL	06/16/2009	0001	18	-	18	0.008		#	9.1E-005	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID	(Ft BLS)	Lab	Data		QA			
Selenium	mg/L	0437	WL	06/17/2009	0001	97	-	97	0.11		#	0.00018	
Selenium	mg/L	0438	WL	06/17/2009	0001	118	-	118	0.00068		#	9.1E-005	
Selenium	mg/L	0439	WL	06/17/2009	0001	118	-	118	0.0017		#	9.1E-005	
Selenium	mg/L	0537	TS	06/18/2009	0001	0	-	0	1.4		#	0.0091	
Selenium	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	0.0012		#	9.1E-005	
Selenium	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	0.0033		#	9.1E-005	
Specific Conductance	µmhos/cm	0201	SL	06/15/2009	0001	0	-	0	668		#		
Specific Conductance	µmhos/cm	0218	SL	06/15/2009	0001	0	-	0	578		#		
Specific Conductance	µmhos/cm	0226	SL	06/15/2009	0001	0	-	0	606		#		
Specific Conductance	µmhos/cm	0228	SL	06/15/2009	0001	0	-	0	569		#		
Specific Conductance	µmhos/cm	0401	WL	06/16/2009	0001	18	-	18	4092		#		
Specific Conductance	µmhos/cm	0404	WL	06/16/2009	0001	18	-	18	7060		#		
Specific Conductance	µmhos/cm	0437	WL	06/17/2009	0001	97	-	97	11551		#		
Specific Conductance	µmhos/cm	0438	WL	06/17/2009	0001	118	-	118	10213		#		
Specific Conductance	µmhos/cm	0439	WL	06/17/2009	0001	118	-	118	10496		#		
Specific Conductance	µmhos/cm	0492	WL	06/16/2009	0001	18	-	18	869		#		
Specific Conductance	µmhos/cm	0537	TS	06/18/2009	0001	0	-	0	78350		#		
Specific Conductance	µmhos/cm	ATP-2-D	WL	06/18/2009	0001	88	-	88	136877		#		
Specific Conductance	µmhos/cm	ATP-2-S	WL	06/18/2009	0001	38	-	38	21078		#		
Specific Conductance	µmhos/cm	CR1	SL	06/15/2009	0001	0.42	-	0.42	599		#		
Specific Conductance	µmhos/cm	CR3	SL	06/16/2009	0001	0	-	0	568		#		
Specific Conductance	µmhos/cm	CR5	SL	06/15/2009	0001	0	-	0	562		#		
Specific Conductance	µmhos/cm	TP-02	WL	06/15/2009	0001	30	-	30	2634		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID	(Ft BLS)	Lab	Data		QA				
Specific Conductance	µmhos/cm	TP-17	WL	06/15/2009	0001	28	-	28	41529			#		
Specific Conductance	µmhos/cm	TP-19	WL	06/15/2009	0001	29	-	29	152440			#		
Sulfate	mg/L	0201	SL	06/15/2009	0001	0	-	0	98			#	1	
Sulfate	mg/L	0218	SL	06/15/2009	0001	0	-	0	100			#	1	
Sulfate	mg/L	0226	SL	06/15/2009	0001	0	-	0	98			#	1	
Sulfate	mg/L	0228	SL	06/15/2009	0001	0	-	0	100			#	1	
Sulfate	mg/L	0401	WL	06/16/2009	0001	18	-	18	1400			#	25	
Sulfate	mg/L	0401	WL	06/18/2009	0002	13	-	17.9	1300			#	25	
Sulfate	mg/L	0404	WL	06/16/2009	0001	18	-	18	2400			#	25	
Sulfate	mg/L	0437	WL	06/17/2009	0001	97	-	97	4100			#	50	
Sulfate	mg/L	0438	WL	06/17/2009	0001	118	-	118	3800			#	50	
Sulfate	mg/L	0439	WL	06/17/2009	0001	118	-	118	3100			#	50	
Sulfate	mg/L	0492	WL	06/16/2009	0001	18	-	18	76			#	2.5	
Sulfate	mg/L	0537	TS	06/18/2009	0001	0	-	0	52000			#	1000	
Sulfate	mg/L	ATP-2-D	WL	06/18/2009	0001	88	-	88	4700			#	250	
Sulfate	mg/L	ATP-2-S	WL	06/18/2009	0001	38	-	38	8000			#	100	
Sulfate	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	100			#	1	
Sulfate	mg/L	CR3	SL	06/16/2009	0001	0	-	0	99			#	1	
Sulfate	mg/L	CR5	SL	06/15/2009	0001	0	-	0	99			#	1	
Sulfate	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	600			#	10	
Sulfate	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	2200			#	250	
Sulfate	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	4500			#	250	
Temperature	C	0201	SL	06/15/2009	0001	0	-	0	15.95			#		
Temperature	C	0218	SL	06/15/2009	0001	0	-	0	16.65			#		
Temperature	C	0226	SL	06/15/2009	0001	0	-	0	16.88			#		
Temperature	C	0228	SL	06/15/2009	0001	0	-	0	18.04			#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Temperature	C	0401	WL	06/16/2009	0001	18	-	18	15.22		#		
Temperature	C	0404	WL	06/16/2009	0001	18	-	18	14.8		#		
Temperature	C	0437	WL	06/17/2009	0001	97	-	97	17.6		#		
Temperature	C	0438	WL	06/17/2009	0001	118	-	118	17.49		#		
Temperature	C	0439	WL	06/17/2009	0001	118	-	118	17.09		#		
Temperature	C	0492	WL	06/16/2009	0001	18	-	18	15.06		#		
Temperature	C	0537	TS	06/18/2009	0001	0	-	0	19.68		#		
Temperature	C	ATP-2-D	WL	06/18/2009	0001	88	-	88	17.92		#		
Temperature	C	ATP-2-S	WL	06/18/2009	0001	38	-	38	18.03		#		
Temperature	C	CR1	SL	06/15/2009	0001	0.42	-	0.42	15.69		#		
Temperature	C	CR3	SL	06/16/2009	0001	0	-	0	17.12		#		
Temperature	C	CR5	SL	06/15/2009	0001	0	-	0	15.19		#		
Temperature	C	TP-02	WL	06/15/2009	0001	30	-	30	16.61		#		
Temperature	C	TP-17	WL	06/15/2009	0001	28	-	28	14.32		#		
Temperature	C	TP-19	WL	06/15/2009	0001	29	-	29	14.44		#		
Total Dissolved Solids	mg/L	0201	SL	06/15/2009	0001	0	-	0	310		#	20	
Total Dissolved Solids	mg/L	0218	SL	06/15/2009	0001	0	-	0	310		#	20	
Total Dissolved Solids	mg/L	0226	SL	06/15/2009	0001	0	-	0	310		#	20	
Total Dissolved Solids	mg/L	0228	SL	06/15/2009	0001	0	-	0	310		#	20	
Total Dissolved Solids	mg/L	0401	WL	06/16/2009	0001	18	-	18	2800		#	80	
Total Dissolved Solids	mg/L	0401	WL	06/18/2009	0002	13	-	17.9	2600		#	80	
Total Dissolved Solids	mg/L	0404	WL	06/16/2009	0001	18	-	18	4400		#	80	
Total Dissolved Solids	mg/L	0437	WL	06/17/2009	0001	97	-	97	8400		#	200	
Total Dissolved Solids	mg/L	0438	WL	06/17/2009	0001	118	-	118	8300		#	200	
Total Dissolved Solids	mg/L	0439	WL	06/17/2009	0001	118	-	118	7700		#	200	
Total Dissolved Solids	mg/L	0492	WL	06/16/2009	0001	18	-	18	390		#	20	
Total Dissolved Solids	mg/L	0537	TS	06/18/2009	0001	0	-	0	84000		#	2000	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 8/31/2009

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	ATP-2-D	WL	06/18/2009	0001	88	-	88	91000		#	2000	
Total Dissolved Solids	mg/L	ATP-2-S	WL	06/18/2009	0001	38	-	38	15000		#	400	
Total Dissolved Solids	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	310		#	20	
Total Dissolved Solids	mg/L	CR3	SL	06/16/2009	0001	0	-	0	320		#	20	
Total Dissolved Solids	mg/L	CR5	SL	06/15/2009	0001	0	-	0	310		#	20	
Total Dissolved Solids	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	1600		#	40	
Total Dissolved Solids	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	23000		#	400	
Total Dissolved Solids	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	110000		#	2000	
Turbidity	NTU	0201	SL	06/15/2009	0001	0	-	0	831		#		
Turbidity	NTU	0218	SL	06/15/2009	0001	0	-	0	97.3		#		
Turbidity	NTU	0226	SL	06/15/2009	0001	0	-	0	988		#		
Turbidity	NTU	0228	SL	06/15/2009	0001	0	-	0	153		#		
Turbidity	NTU	0401	WL	06/16/2009	0001	18	-	18	3.3		#		
Turbidity	NTU	0404	WL	06/16/2009	0001	18	-	18	6.1		#		
Turbidity	NTU	0438	WL	06/17/2009	0001	118	-	118	3.33		#		
Turbidity	NTU	0439	WL	06/17/2009	0001	118	-	118	0.43		#		
Turbidity	NTU	0492	WL	06/16/2009	0001	18	-	18	1.7		#		
Turbidity	NTU	0537	TS	06/18/2009	0001	0	-	0	908		#		
Turbidity	NTU	ATP-2-D	WL	06/18/2009	0001	88	-	88	4.29		#		
Turbidity	NTU	ATP-2-S	WL	06/18/2009	0001	38	-	38	2.51		#		
Turbidity	NTU	CR1	SL	06/15/2009	0001	0.42	-	0.42	53.9		#		
Turbidity	NTU	CR3	SL	06/16/2009	0001	0	-	0	425		#		
Turbidity	NTU	CR5	SL	06/15/2009	0001	0	-	0	643		#		
Turbidity	NTU	TP-02	WL	06/15/2009	0001	30	-	30	26		#		
Turbidity	NTU	TP-17	WL	06/15/2009	0001	28	-	28	7.06		#		
Turbidity	NTU	TP-19	WL	06/15/2009	0001	29	-	29	7.73		#		
Uranium	mg/L	0201	SL	06/15/2009	0001	0	-	0	0.002		#	4.5E-006	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 8/31/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data		
Uranium	mg/L	0218	SL	06/15/2009	0001	0	-	0	0.0021		#	4.5E-006	
Uranium	mg/L	0226	SL	06/15/2009	0001	0	-	0	0.0022		#	4.5E-006	
Uranium	mg/L	0228	SL	06/15/2009	0001	0	-	0	0.0021		#	4.5E-006	
Uranium	mg/L	0401	WL	06/16/2009	0001	18	-	18	0.55		#	9.E-005	
Uranium	mg/L	0401	WL	06/18/2009	0002	13	-	17.9	0.51		#	9.E-005	
Uranium	mg/L	0404	WL	06/16/2009	0001	18	-	18	0.73		#	9.E-005	
Uranium	mg/L	0437	WL	06/17/2009	0001	97	-	97	4.1		#	0.00022	
Uranium	mg/L	0438	WL	06/17/2009	0001	118	-	118	2		#	0.00022	
Uranium	mg/L	0439	WL	06/17/2009	0001	118	-	118	0.82		#	9.E-005	
Uranium	mg/L	0492	WL	06/16/2009	0001	18	-	18	0.27		#	4.5E-005	
Uranium	mg/L	0537	TS	06/18/2009	0001	0	-	0	8.5		#	0.0009	
Uranium	mg/L	ATP-2-D	WL	06/18/2009	0001	88	-	88	0.0047		#	4.5E-006	
Uranium	mg/L	ATP-2-S	WL	06/18/2009	0001	38	-	38	0.02		#	4.5E-006	
Uranium	mg/L	CR1	SL	06/15/2009	0001	0.42	-	0.42	0.0021		#	4.5E-006	
Uranium	mg/L	CR3	SL	06/16/2009	0001	0	-	0	0.0021		#	4.5E-006	
Uranium	mg/L	CR5	SL	06/15/2009	0001	0	-	0	0.0021		#	4.5E-006	
Uranium	mg/L	TP-02	WL	06/15/2009	0001	30	-	30	1.7		#	0.00022	
Uranium	mg/L	TP-17	WL	06/15/2009	0001	28	-	28	0.023		#	4.5E-006	
Uranium	mg/L	TP-19	WL	06/15/2009	0001	29	-	29	0.00017		#	4.5E-006	

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

Appendix C. Water Quality Data (continued)

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: 8/30/2009

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0401	O	3969.6	06/16/2009		12.34	3957.26	
0404	O	3968.3	06/16/2009		12.37	3955.93	
0437	O	4048.25	06/17/2009		87.95	3960.3	
0438	O	4054.22	06/17/2009		94.5	3959.72	
0439	O	4055.27	06/17/2009		95.65	3959.62	
0492		3967.64	06/16/2009		10.1	3957.54	
ATP-2-D	O	3967.05	06/18/2009		11.65	3955.4	
ATP-2-S	O	3967.04	06/18/2009		8.63	3958.41	
TP-02	O	3975.55	06/15/2009		16.72	3958.83	
TP-17	D	3963.69	06/15/2009		6.58	3957.11	
TP-19	D	3962.17	06/15/2009		5.4	3956.77	

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

Appendix E.
Blanks Report

Appendix E. Blanks Report

BLANKS REPORT
LAB: PARAGON (Fort Collins, CO)
RIN: 0906033
Report Date: 8/30/2009

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab Data	Detection Limit	Uncertainty	Sample Type
Ammonia Total as N	MOA01	0999	06/18/2009	0001	mg/L	0.1	U	0.1		E
Chloride	MOA01	0999	06/18/2009	0001	mg/L	0.21		0.2		E
Manganese	MOA01	0999	06/18/2009	0001	mg/L	0.00093	B	0.00012		E
Sulfate	MOA01	0999	06/18/2009	0001	mg/L	0.5	U	0.5		E
Total Dissolved Solids	MOA01	0999	06/18/2009	0001	mg/L	20	U	20		E
Uranium	MOA01	0999	06/18/2009	0001	mg/L	4.6E-005	B	4.5E-006		E

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 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 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.

SAMPLE TYPES:

- E Equipment blank.

Attachment 1.
June 2009 Routine Sampling Trip Report

Attachment 1.
June 2009 Routine Sampling Event Trip Report



Date: July 08, 2009

To: Ken Pill, Marianne Mullis

From: Elizabeth Glowiak

Subject: June 2009 Routine Ground Water and Surface Water Sampling Trip Report

Site: Moab, Utah

Date of Sampling Event: June 15-18, 2009

Team Members: K. Pill, E. Glowiak, J. Ritchey

RIN Number Assigned: All samples were assigned to RIN 0906033.

Sample Shipment: The coolers were shipped overnight UPS to ALS Laboratory Group from Moab, Utah, on June 18, 2009 (Tracking No. 1Z5W1Y510193126296).

Number of Locations Sampled: The June 2009 routine sampling event was conducted during the decreasing limb of the of the Colorado River Cisco gauge hydrograph. Eleven monitor wells and seven surface water locations were sampled during the sampling event. Also, one sample was collected from the wick pond. Including one duplicate and one EB, a total of 21 samples were collected.

Locations Not Sampled/Reason: None.

Field Variance: Interim action monitoring wells 0401, 0404, and 0537 were added to the routine sampling list for the month of June. The location of sample 0201 was collected approximately 20 feet downriver from the actual location due to access issues and high river flow.

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

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
2000	0401	Duplicate from 18 ft bgs	Ground Water	JUN 003
2003	N/A	Equipment Blank	DI Water	JUN 021

ft bgs; feet below ground surface; DI = deionized; ID = identification

Attachment 1. June 2009 Routine Sampling Event Trip Report (continued)

Location-Specific Information: Wells 0437, 0438, and 0439 were sampled using dedicated bladder pumps. Sample 0537 was collected from the outlet to the wick pond. All other remaining monitor wells were sampled using a peristaltic pump and dedicated tubing. Each surface water sample was collected using a peristaltic pump and hose reel. The table below provides additional information.

Sample ID	Location	Date	Sample Depth	Comments
JUN 001	CR1	06/15/2009	~ 5 in bws	Taken off of the old boat ramp; moderate velocity
JUN 002	0201	06/15/2009	Unknown	Taken 20 feet downriver off of main river channel
JUN 003	CR5	06/15/2009	Unknown	Moderate flow; taken from main channel
JUN 004	TP-02	06/15/2009	30 ft bgs	
JUN 005	0218	06/15/2009	Unknown	Collected in eddy; moderate flow
JUN 006	0228	06/15/2009	Unknown	Slow velocity; water lapping the shore
JUN 007	TP-19	06/15/2009	29 ft bgs	Sulfur odor; gray water
JUN 008	TP-17	06/15/2009	28 ft bgs	Sulfur odor; gray water
JUN 009	0226	06/15/2009	Unknown	
JUN 010	0492	06/16/2009	18 ft bgs	
JUN 011	CR3	06/16/2009	Unknown	Moderate velocity
JUN 012	0401	06/16/2009	18 ft bgs	Duplicate collected
JUN 014	0404	06/16/2009	18 ft bgs	
JUN 015	0437	06/17/2009	97 ft bgs	
JUN 016	0438	06/17/2009	118 ft bgs	Well was uncapped upon arrival
JUN 017	0439	06/17/2009	118 ft bgs	
JUN 018	0537	06/18/2009	Unknown	Readings measured 25 minutes after collecting sample; turned pump off the night before to allow sump to recharge
JUN 019	ATP-2-S	06/18/2009	38 ft bgs	
JUN 020	ATP-2-D	06/18/2009	88 ft bgs	

bws = below water surface; ft bgs = feet below ground surface; ID = identification; in = inch



Surface Water Location CR-1

Attachment 1.
June 2009 Routine Sampling Event Trip Report (continued)



Surface Water Location 0201



Surface Water Location CR-5

Attachment 1.
June 2009 Routine Sampling Event Trip Report (continued)



Surface Water Location 0218



Surface Water Location 0228

Attachment 1.
June 2009 Routine Sampling Event Trip Report (continued)



Surface Water Location 0226



Surface Water Location CR-3

Attachment 1.
June 2009 Routine Sampling Event Trip Report (continued)

Water Level Measurements: Water level data are provided in the table below. These data represent depth to water (feet below top of casing) measurements.

Well No.	Date	Time	Depth to Water (ft btoc)
0401	06/16/2009	15:58	12.34
0404	06/16/2009	16:20	12.37
0437	06/17/2009	14:17	87.95
0438	06/17/2009	15:01	94.50
0439	06/17/2009	15:31	95.65
0492	06/16/2009	15:00	10.10
ATP-2-S	06/18/2009	09:16	8.63
ATP-2-D	06/19/2009	09:39	11.65
TP-02	06/15/2009	10:36	16.72
TP-17	06/15/2009	16:01	6.58
TP-19	06/15/2009	14:56	5.40

ft btoc = feet below top of casing

Well Inspection Summary: A well inspection was not conducted.

Equipment: Well 0437 is located within the Envirocon excavation area and will be trimmed when necessary. Therefore, the installed bladder pump has been removed to facilitate excavation activities.

Regulatory: None.

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)
06/15/2009	15,000
06/16/2009	14,900
06/17/2009	14,700
06/18/2009	15,000

Corrective Action Required/Taken: None