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Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project December 2008 Validation Data Package for the Routine Ground Water and Surface Water Sampling Event

April 2009

U.S. Department of Energy

Office of Environmental Management

Prepared by the Technical Assistance Contractor under contract number DE-AC30-07CC60012 for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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December 2008 Routine Ground Water and Surface Water Sampling Event

Revision 0

Review and Approval

4/28/09

Kenneth G. Pill
TAC Ground Water Manager

Date

4/29/09

Joseph D. Ritchey
TAC Senior Program Manager

Date

Revision History

Revision No.	Date	Reason/Basis for Revision
0	April 2009	Initial issue.

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Acronyms and Abbreviations

cfs	cubic feet per second
COC	chain of custody
EB	equipment blank
EDD	electronic data deliverable
EPA	Environmental Protection Agency
ft	feet
ICP	inductively coupled plasma
IDL	instrument detection limit
LCS	laboratory control samples
MB	method blank
MDL	method detection limit
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
RDL	required detection limit
RIN	report identification number
RPD	relative percent difference
RS	replicate sample
SD	serial dilution
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*, "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, Sampling Event Summary, and Sampling and Analyses. Section 2 provides the Data Assessment Summaries, including the Field Activity Verification, Laboratory Performance Assessment, and Field Analyses/Activities description. 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 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 are measured from the U.S. Geological Survey (USGS) Cisco gaging station No. 09180500.

This section 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 the December 2008 routine sampling event.

1.1 Summary Criteria

Sampling Period: December 15 through 17, 2008
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 December 2008 significantly changed compared to the concentrations measured in June 2008, especially in areas that had received infiltration during 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).

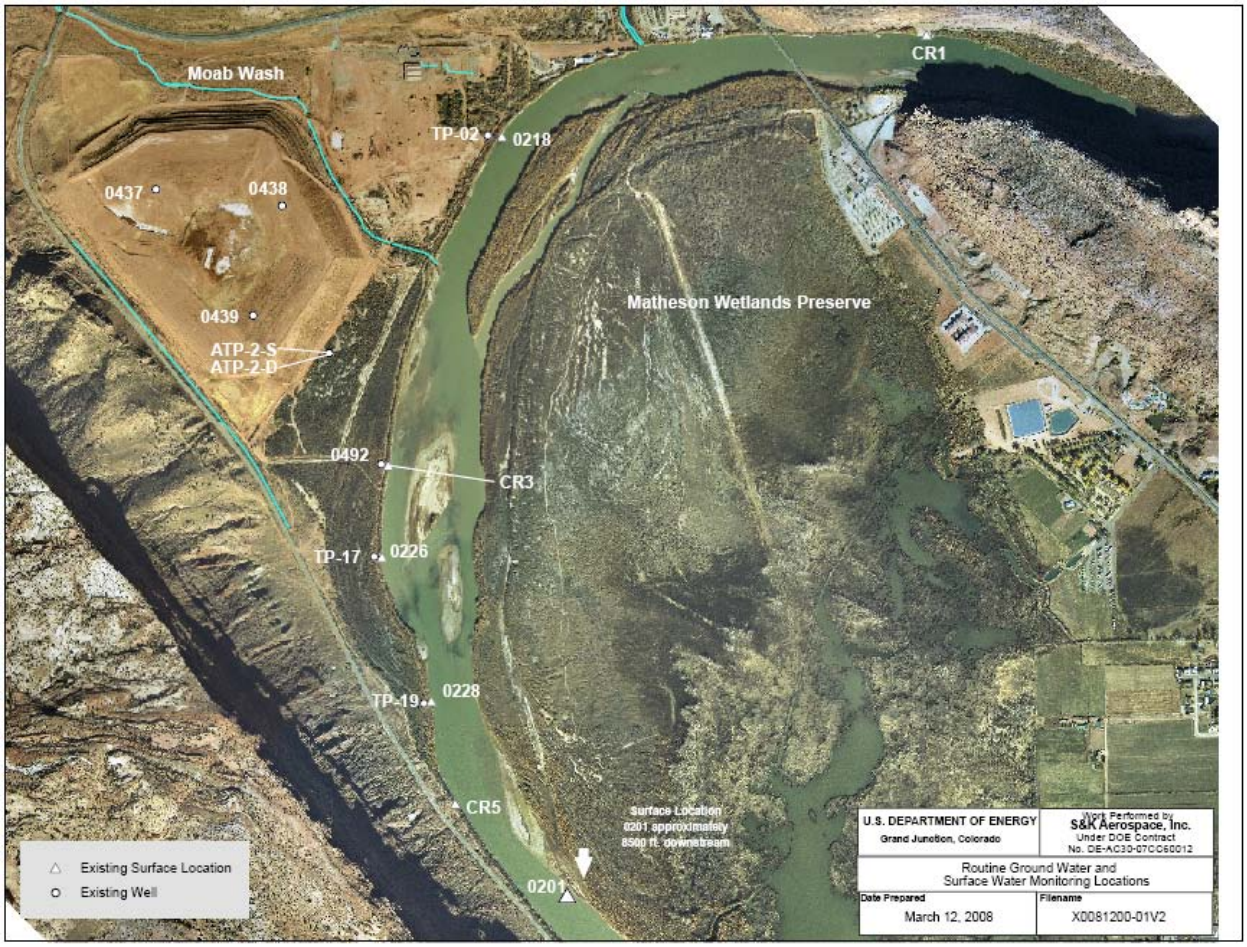

Figure 1. Routine Ground Water and Surface Water Sampling Locations (may include locations not sampled)

Locations 0492 to 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 are more susceptible to changes in concentration resulting from infiltration during high Colorado River stage. Samples collected from 0492 and TP-02 generally indicate the ammonia and uranium concentrations rebounded to prerunoff levels.

Samples collected from locations 0437, 0438, and 0439 (all of which are located on the tailings pile, but are completed in the underlying alluvial aquifer) exhibited ammonia and uranium concentrations that either remained consistent or slightly increased compared to the last sampling event in June 2008. TDS concentrations have remained consistent. 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	0401 (0.01), 0404 (0.017), 0405 (0.024), 0437 (0.073)
Uranium	0.044	0401 (2.5), 0404 (2.4), 0405 (1.6), 0437 (4.3), 0438 (1.9), 0439 (0.85), 0492 (1.9), TP-02 (1.5)

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 sampling event in December 2008 indicate that areas sampled are not distinguishable from background concentrations in the main channel of the Colorado River, despite the fact that some surface water samples were collected from areas of slow-moving water. These low concentrations may be attributable to either the effectiveness of the interim action or dilution from the higher river stage during the sampling time frame.

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 (^{o}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	12/17/08	1.53	7.48	0.1	13.3	4.36
0218	12/17/08	1.58	7.81	0.1	8.11	3.18
0226	12/17/08	1.15	7.48	0.1	13.3	4.36
0228	12/17/08	0.49	8.14	0.1	4.64	2.1
CR1	6/30/08	1.46	8.23	0.1	3.83	1.79
CR3	6/30/08	2.3	8.22	0.42	3.83	1.79
CR5	6/30/08	0.99	7.35	0.1	15.4	4.37

Notes: Loc = Location, mg/L = milligrams per liter; Temp = Temperature, AWQC = ambient water quality criteria

(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.

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 December 2008 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 December 2008 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 2008.

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. Well TP-02 has consistently contained less than 6,000 mg/L TDS. It is apparent that TDS concentrations in well TP-17 decreased due to infiltration of freshwater during the 2008 runoff, and by December, TDS concentrations rebounded to previous levels.

Since late 2005, uranium concentrations have steadily declined in samples collected from wells TP-02, and the sample collected in December 2008 continues this trend (Figure 4). The uranium concentration in the sample collected from well 0492 is consistent with river base-flow conditions. Typical of wells screened within the brine, uranium concentrations in wells TP-17 and TP-19 are considerably lower compared to 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).

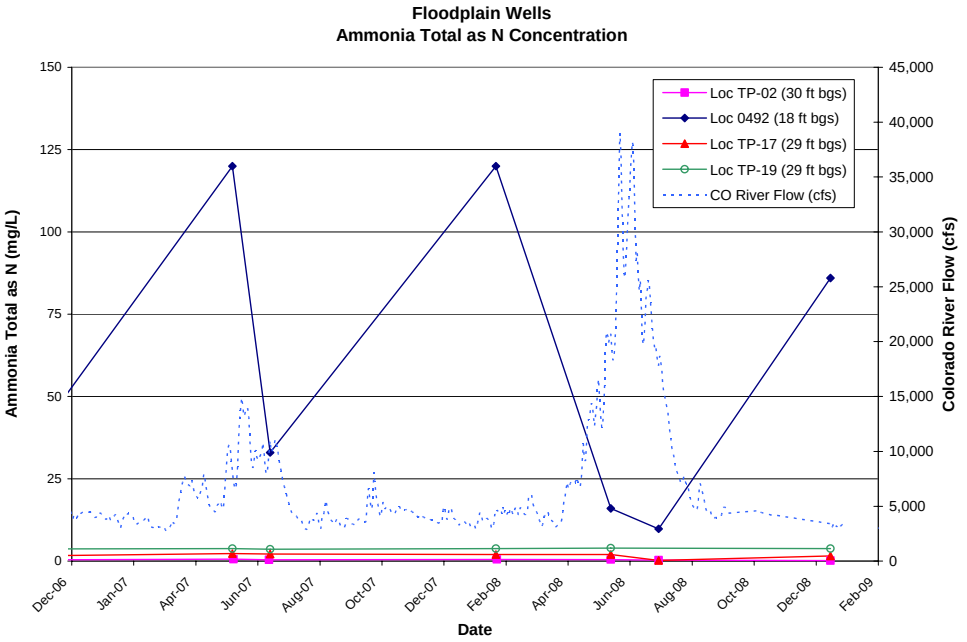

Figure 2. Floodplain Wells Time Versus Ammonia Total (as N) Concentration Plot

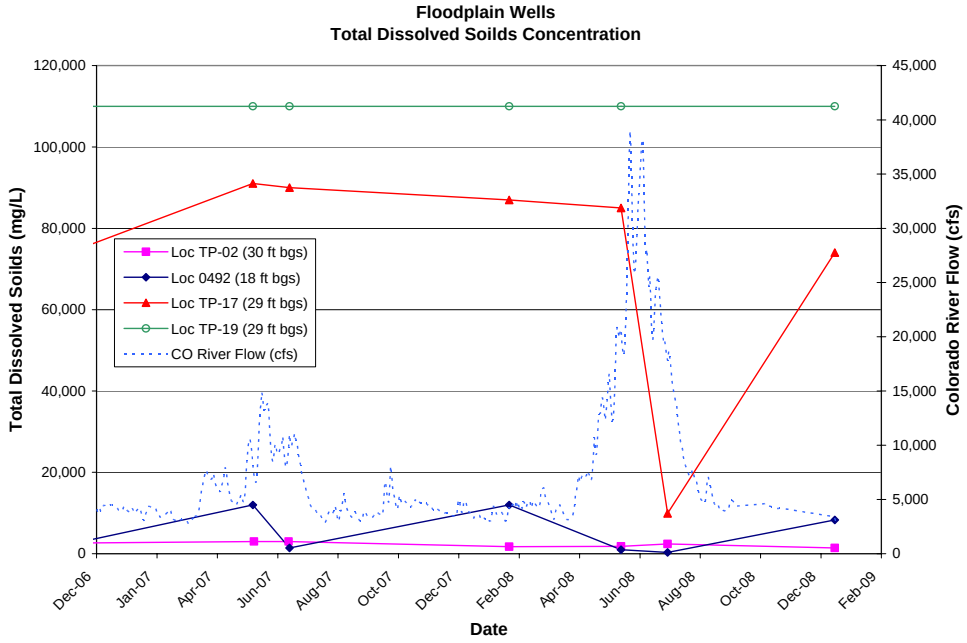

Figure 3. Floodplain Wells Time Versus TDS Concentration Plot

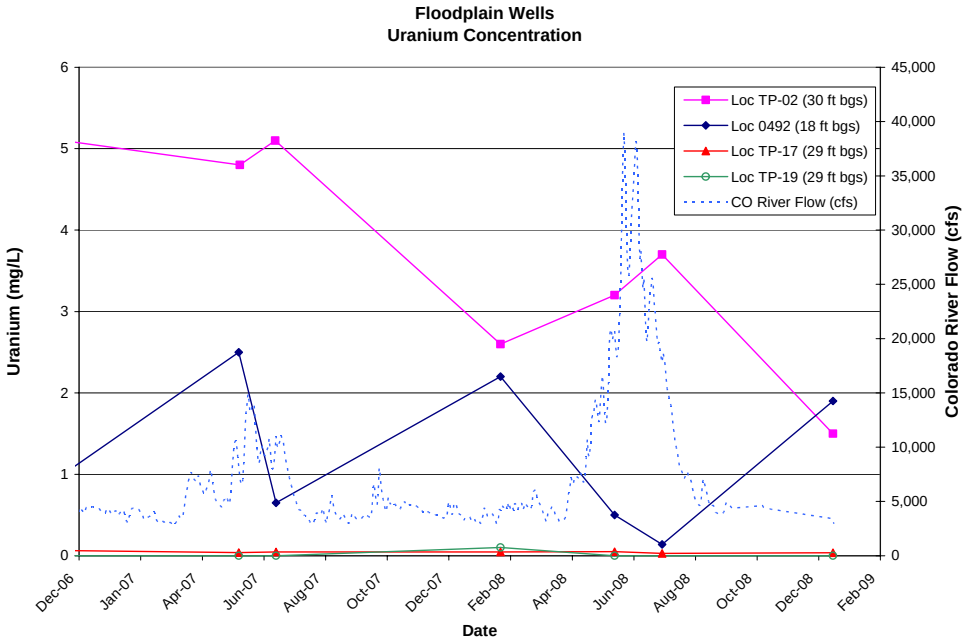

Figure 4. Floodplain Wells Time Versus Uranium Concentration Plot

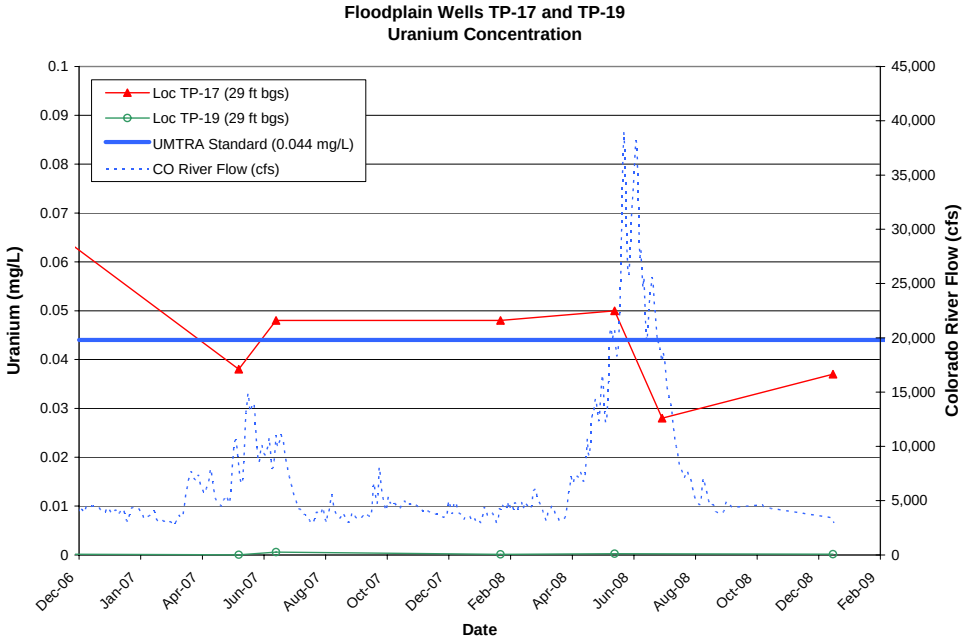

Figure 5. Floodplain Wells TP-17 and TP-19 Uranium Concentration Comparison to the UMTRA Standard

Tailings Pile Wells

The wells located on the tailings pile are all 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 less than 10 mg/L ammonia (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 two years. The uranium time

concentration plots indicate the uranium concentrations measured in December 2008 are consistent with concentrations detected over the past 2 years (Figure 8).

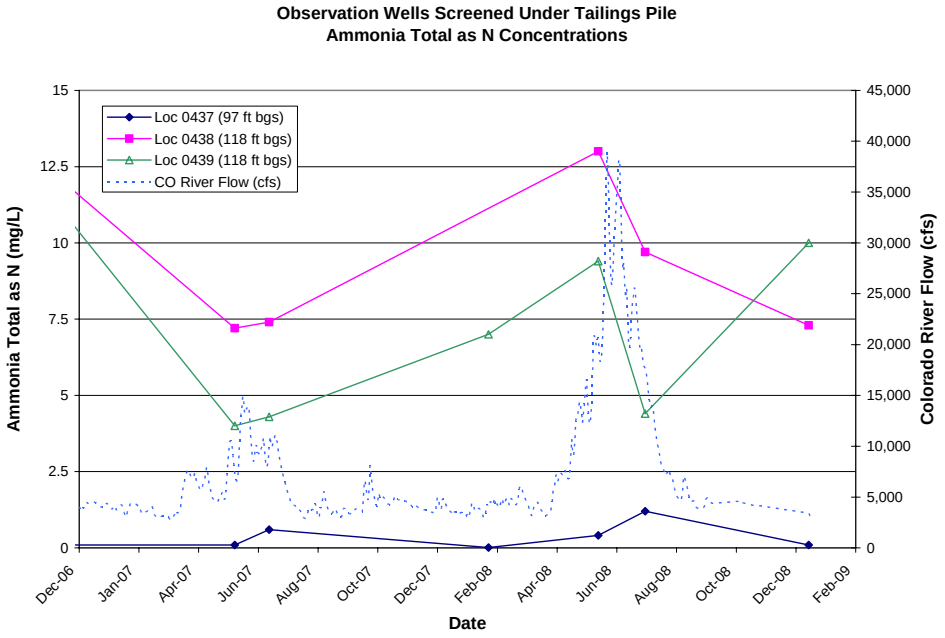

Figure 6. Tailings Pile Wells Time Versus Ammonia Total (as N) Concentration Plot

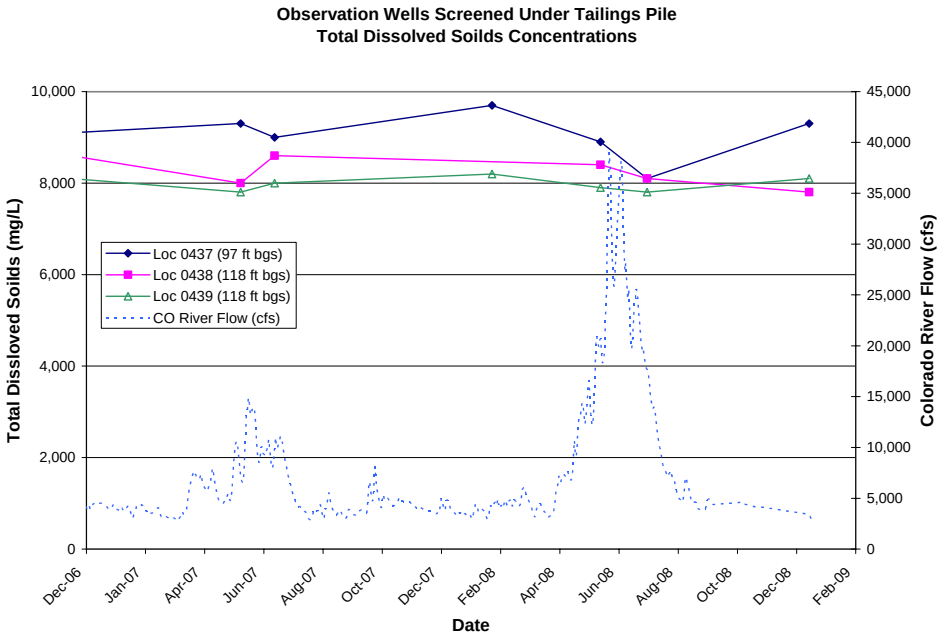

Figure 7. Tailings Pile Wells Time Versus TDS Concentration Plot

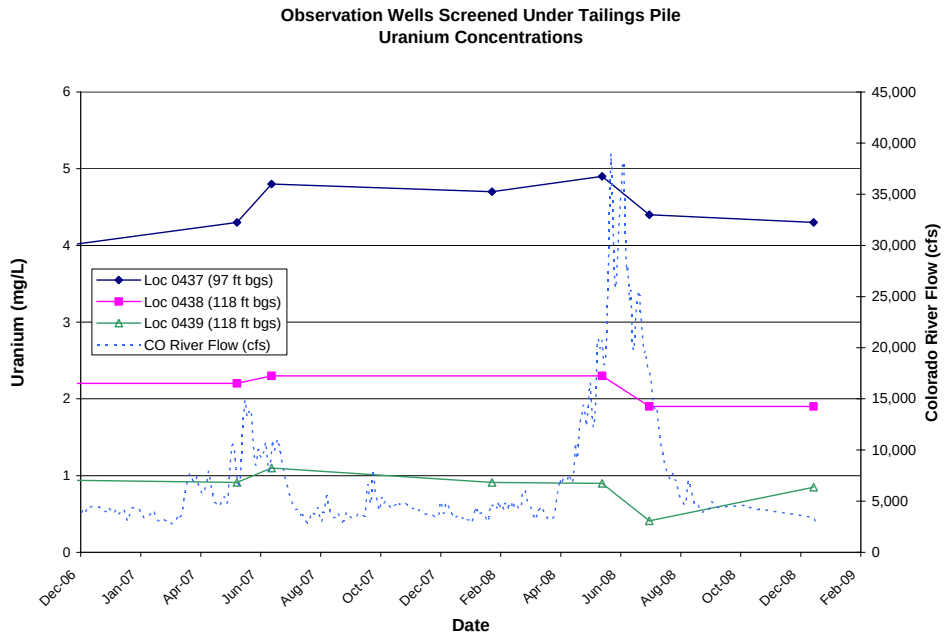

Figure 8. Tailings Pile Wells Time Versus Uranium Concentration Plot

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*. 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 were no anomalous data points associated with this sampling event.

According to the USGS Cisco gaging station, the mean daily Colorado River flow rates ranged from 2,950 to 3,420 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):0812025
Sample Event:	Interim Action Well Field Routine Sampling Event – December 2008
Site(s):	Moab, Utah
Laboratory:	Paragon Analytics, Fort Collins, Colorado
Sample Data Group:	0812213
Analysis:	Metals and Inorganics
Validator:	Rachel Cowan
Review Date:	January 31, 2009

This validation was performed according to the *Environmental Procedures Catalog*, "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	WCH-A-005	EPA 350.1	EPA 350.1
Chloride	MIS-A-039	SW-846 9056	SW-846 9056
Manganese	G17	SW-846 6010B	SW-846 6010B
Selenium	G14	SW-846 6020A	SW-846 6020A
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056
TDS	WCH-A-033	MCAWW 160.1	MCAWW 160.1
Uranium	G1	SW-846 6020A	EPA 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
0812213-1 to -4	0201, 0218, 0226, and 0228	All Analytes	J	ICE
0812213-21	TP-19	Chloride	J	MS1, RS1
0812213-7	0437	Selenium	J	SD2

Notes: Flags are for detects. See reason codes in Table 5 for nondetect codes.

Table 5. Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Nondetects)	Explanation
ICE	J	UJ	Results for the affected analyte(s) are regarded as estimated (J) because ice was found in the samples upon arrival at the analytical laboratory.
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.
RS1	J	UJ	Results for the affected analyte(s) are regarded as estimated (J) because (a) the replicate sample, matrix spike duplicate, or laboratory control sample duplicate was not analyzed at the appropriate frequency for each matrix or for each data package, or (b) a field blank or EB was used for the replicate analysis.
SD2	J	N/A	Results for the affected analyte(s) are regarded as estimated (J) because the result of the sample used for serial dilution analysis is greater than or equal to 50 times (100 times for inductively coupled plasma-mass spectroscopy) the practical quantitation limit, and the percent difference is greater than 10%.

Sample Shipping/Receiving

Paragon Analytics in Fort Collins, Colorado, received a total of 21 samples for RIN 0812025 on December 22, 2008. These samples were shipped under UPS tracking number 1Z5W1Y510195495330 and were assigned to sample data group 0812213. All samples were accompanied by a COC form. The COC forms were checked to confirm that all of the samples were listed on each 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

The sample shipments were received intact with the temperature within the cooler at 1.0 °C, which is within the temperature acceptance range. All samples were received in the correct container types and had been preserved correctly for the requested analyses. However, samples 0812213-1 (location 0201), 0812213-2 (location 0218), 0812213-3 (location 0226), and 0812213-4 (location 0288) had ice in the containers. This resulted in a “J” flag for all analytes in these samples. 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 performed as 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 SW-846 9056, Chloride
The chloride concentration in one of the native samples selected for the MS/MSD 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 qualification was required based on MS criteria.

Per validation procedure requirements, one replicate is required for every preparation batch of 20 samples. Therefore, one of the samples, 0812213-21 (location TP-19), is qualified with a "J" flag for this reason. There was only one field duplicate prepared and analyzed with this work order (see field duplicate section below for details), so the "J" flag remains. In addition, this sample is "J"-flagged for RS.

Method EPA SW-846 6010B, Manganese
The manganese samples had the required number of MS and MSD samples; however, the metals case narrative provided by Paragon Analytics incorrectly stated that only one MS/MSD pair had been analyzed for manganese when, in fact, two MS/MSD pairs had been analyzed for manganese.

Field Duplicates
Field duplicates are collected during sampling activities and may be used as RSs to confirm precision for validation purposes. They are labeled with false identifications and submitted with the samples to be analyzed by Paragon Analytics. Sample 0812213-13 (2001) was the duplicate sample taken from location 0492 (regular sample 0812213-11). This sample passed the Environmental Protection Agency (EPA) criteria of ±20 relative percent difference (RPD) for all analytes. However, the field notebook quality assurance log was not filled out.

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 manganese or uranium. As a standard practice, Paragon Analytics 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

criteria are as stringent. An MS met the LCS requirements for all analytes listed above, thus no samples are "J"-qualified for LCS failure.

Detection Limits/Dilutions
The required detection limit (RDL) for all analytes was achieved for all work orders. Serial dilution (SD) samples were required for inductively coupled plasma (ICP) sample analysis (manganese, selenium, and uranium). The percent difference of the SDs and their native samples were acceptable for all ICP analyses except selenium. For this analyte, samples having results greater than 100 times the reporting limit were "J"-flagged because of potential dilution concerns; this occurred in only one sample (0812213-7).

Method and Calibration Blanks
MBs are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks 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 (MDL) 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.

Three calibration blanks for manganese, all calibration blanks for selenium and uranium, and one calibration blank for sulfate were greater than each analyte's associated MDL or IDL. Of the samples associated with these blanks, there was only one result (manganese) that was less than five times its associated blank. However, since this sample (0812213-12) is an EB, instead of being "J"-flagged for this reason, it is discussed in the Blanks Report (Section 3.5).

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 the IDL. The manganese result was less than five times the IDL, and so no manganese results needed to be qualified. The uranium result was greater than five times the IDL, so all surface water uranium results were checked. Since all surface water uranium results were greater than five times the EB's uranium concentrations, none needed to be qualified.

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 January 6, 2009. The contents of the EDD 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 December 2008 routine sampling event.

Field Activities
All monitor wells were purged and sampled using the low-flow sampling method. One EB was collected for the nondedicated surface water collection equipment, and one duplicate sample was collected for the 19 samples collected at various locations. There are no established regulatory criteria for the evaluation of field duplicate samples; therefore, EPA guidance for laboratory duplicates (which is conservative for field duplicates) was used to assess the precision of the field duplicates. All results met the criteria of ±20 RPD and are considered acceptable.

2.4 Certification

Results were reported in correct units for all analytes requested. Appropriate contract-required laboratory qualifiers and target analyte lists were used. The RDLs were met when possible, or an explanation of why they were not met was 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 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) are 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

Based on the Minimums and Maximums Report, there were no anomalous data points associated with the December 2008 sampling event.

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 below. 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, and so the results were due to potential machine error being so close to the detection limit. The EB uranium result is well below the reporting limit, 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, and so none needed to be flagged. The Blanks Report is presented in Appendix E.

Appendix A.
Water Sampling Field Activities Verification

Appendix A. Water Sampling Field Activities Verification

Sampling Event/RIN	December Routine Event/0812025	**Date(s) of Water Sampling**	December 15 to 17, 2008
Date(s) of Verification	February 2, 2009	**Name of Verifier**	Rachel Cowan

		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan the primary document directing field procedures?	Yes	
	List other documents, standard operating procedures, and instructions.	NA	
2.	Were the sampling locations specified in the planning documents sampled?	No	Three interim action wells (0401, 0401, and 0405) were added to routine sampling for December 2008.
3.	Was a pretrip calibration conducted as specified in the aforementioned documents?	Yes	
4.	Was an operational check of the field equipment conducted twice daily?	Yes	
	Did the operational checks meet criteria?	Yes	
5.	Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, dissolved oxygen, oxidation reduction potential) of field measurements taken as specified?	Yes	
6.	Was the category of the well documented?	Yes	
7.	Were the following conditions met when purging a Category I well:		
	Was one pump/tubing volume purged prior to sampling?	Yes	
	Did the water level stabilize prior to sampling?	Yes	
	Did pH, specific conductance, and turbidity measurements stabilize prior to sampling?	Yes	
	Was the flow rate less than 500 milliliters per minute?	Yes	
	If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	
8.	Were the following conditions met when purging a Category II well:		
	Was the flow rate less than 500 mL/min?	Yes	
	Was one pump/tubing volume removed prior to sampling?	Yes	
9.	Were duplicates taken at a frequency of one per 20 samples?	Yes	

Appendix A. Water Sampling Field Activities Verification

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?	No	The identity of the duplicate sample was only recorded on the sample ticket.
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: 0812025
Comparison: All Historical Data
Report Date: 1/30/2009

				Current			Historical Maximum			Historical Minimum			Count	
					Qualifiers			Qualifiers			Qualifiers			
Site Code	Location Code	Sample Date	Analyte	Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect
MOA01	0438	12/15/2008	Chloride	810			1100		F	910			16	0
MOA01	ATP-2-D	12/16/2008	Ammonia Total as N	680			670			300		FQ	20	0
MOA01	TP-02	12/17/2008	Ammonia Total as N	0.14			4			0.28			29	3
MOA01	TP-02	12/17/2008	Chloride	190			579			230		F	29	0
MOA01	TP-02	12/17/2008	Manganese	0.27			0.75			0.33			17	1
MOA01	TP-02	12/17/2008	Sulfate	530			2810			650			29	0
MOA01	TP-02	12/17/2008	Total Dissolved Solids	1400			5820			1700			26	0
MOA01	TP-02	12/17/2008	Uranium	1.5			26			2.3			30	0
MOA01	TP-17	12/17/2008	Selenium	0.00045	B		0.11			0.00073	B		7	2

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 (TIC) 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: TIC.
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.

Appendix B. Minimums and Maximums Report

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.		

Appendix C.
Water Quality Data

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	0201	SL	12/15/2008	0001	0	-	0	136			#		
Alkalinity, Total (As CaCO3)	mg/L	0218	SL	12/17/2008	0001	0	-	0	250			#		
Alkalinity, Total (As CaCO3)	mg/L	0226	SL	12/17/2008	0001	1	-	1	160			#		
Alkalinity, Total (As CaCO3)	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	180			#		
Alkalinity, Total (As CaCO3)	mg/L	0401	WL	12/16/2008	0001	18	-	18	784			#		
Alkalinity, Total (As CaCO3)	mg/L	0404	WL	12/16/2008	0001	18	-	18	676			#		
Alkalinity, Total (As CaCO3)	mg/L	0405	WL	12/16/2008	0001	18	-	18	610			#		
Alkalinity, Total (As CaCO3)	mg/L	0437	WL	12/15/2008	0001	97	-	97	650			#		
Alkalinity, Total (As CaCO3)	mg/L	0438	WL	12/15/2008	0001	118	-	118	652			#		
Alkalinity, Total (As CaCO3)	mg/L	0439	WL	12/15/2008	0001	118	-	118	760			#		
Alkalinity, Total (As CaCO3)	mg/L	0492	WL	12/16/2008	0001	18	-	18	582			#		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	148			#		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	218			#		
Alkalinity, Total (As CaCO3)	mg/L	CR1	SL	12/16/2008	0001	1	-	1	216			#		
Alkalinity, Total (As CaCO3)	mg/L	CR3	SL	12/16/2008	0001	0	-	0	200			#		
Alkalinity, Total (As CaCO3)	mg/L	CR5	SL	12/15/2008	0001	0.33	-	0.33	174			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	420			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	284			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	262			#		
Ammonia Total as N	mg/L	0201	SL	12/15/2008	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0218	SL	12/17/2008	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0226	SL	12/17/2008	0001	1	-	1	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0401	WL	12/16/2008	0001	18	-	18	330			#	10	
Ammonia Total as N	mg/L	0404	WL	12/16/2008	0001	18	-	18	400			#	10	
Ammonia Total as N	mg/L	0405	WL	12/16/2008	0001	18	-	18	160			#	10	
Ammonia Total as N	mg/L	0437	WL	12/15/2008	0001	97	-	97	0.1	U		#	0.1	

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	0438	WL	12/15/2008	0001	118	-	118	7.3			#	1	
Ammonia Total as N	mg/L	0439	WL	12/15/2008	0001	118	-	118	10			#	1	
Ammonia Total as N	mg/L	0492	WL	12/16/2008	0001	18	-	18	86			#	10	
Ammonia Total as N	mg/L	0492	WL	12/16/2008	0002	18	-	18	83			#	10	
Ammonia Total as N	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	680			#	20	
Ammonia Total as N	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	470			#	10	
Ammonia Total as N	mg/L	CR1	SL	12/16/2008	0001	1	-	1	0.1	U		#	0.1	
Ammonia Total as N	mg/L	CR3	SL	12/16/2008	0001	0	-	0	0.42			#	0.1	
Ammonia Total as N	mg/L	CR5	SL	12/15/2008	0001	0.33	-	0.33	0.1	U		#	0.1	
Ammonia Total as N	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	0.14			#	0.1	
Ammonia Total as N	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	1.6			#	0.1	
Ammonia Total as N	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	3.8			#	0.1	
Chloride	mg/L	0201	SL	12/15/2008	0001	0	-	0	130		J	#	2	
Chloride	mg/L	0218	SL	12/17/2008	0001	0	-	0	140		J	#	2	
Chloride	mg/L	0226	SL	12/17/2008	0001	1	-	1	140		J	#	2	
Chloride	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	140		J	#	2	
Chloride	mg/L	0401	WL	12/16/2008	0001	18	-	18	1400			#	40	
Chloride	mg/L	0404	WL	12/16/2008	0001	18	-	18	1700			#	40	
Chloride	mg/L	0405	WL	12/16/2008	0001	18	-	18	640			#	20	
Chloride	mg/L	0437	WL	12/15/2008	0001	97	-	97	1200			#	20	
Chloride	mg/L	0438	WL	12/15/2008	0001	118	-	118	810			#	20	
Chloride	mg/L	0439	WL	12/15/2008	0001	118	-	118	1100			#	20	
Chloride	mg/L	0492	WL	12/16/2008	0001	18	-	18	1500			#	20	
Chloride	mg/L	0492	WL	12/16/2008	0002	18	-	18	1500			#	20	
Chloride	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	52000			#	1000	
Chloride	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	2400			#	40	
Chloride	mg/L	CR1	SL	12/16/2008	0001	1	-	1	130			#	2	

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Chloride	mg/L	CR3	SL	12/16/2008	0001	0	-	0	140			#	2	
Chloride	mg/L	CR5	SL	12/15/2008	0001	0.33	-	0.33	130			#	2	
Chloride	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	190			#	4	
Chloride	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	43000			#	1000	
Chloride	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	62000		J	#	1000	
Dissolved Oxygen	mg/L	0201	SL	12/15/2008	0001	0	-	0	12.82			#		
Dissolved Oxygen	mg/L	0218	SL	12/17/2008	0001	0	-	0	12.97			#		
Dissolved Oxygen	mg/L	0226	SL	12/17/2008	0001	1	-	1	13.39			#		
Dissolved Oxygen	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	14.41			#		
Dissolved Oxygen	mg/L	0401	WL	12/16/2008	0001	18	-	18	0.44			#		
Dissolved Oxygen	mg/L	0404	WL	12/16/2008	0001	18	-	18	0.62			#		
Dissolved Oxygen	mg/L	0405	WL	12/16/2008	0001	18	-	18	0.24			#		
Dissolved Oxygen	mg/L	0437	WL	12/15/2008	0001	97	-	97	3.04			#		
Dissolved Oxygen	mg/L	0438	WL	12/15/2008	0001	118	-	118	0.65			#		
Dissolved Oxygen	mg/L	0439	WL	12/15/2008	0001	118	-	118	0.55			#		
Dissolved Oxygen	mg/L	0492	WL	12/16/2008	0001	18	-	18	0.77			#		
Dissolved Oxygen	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	0.07			#		
Dissolved Oxygen	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	0.38			#		
Dissolved Oxygen	mg/L	CR1	SL	12/16/2008	0001	1	-	1	12.97			#		
Dissolved Oxygen	mg/L	CR3	SL	12/16/2008	0001	0	-	0	12.47			#		
Dissolved Oxygen	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	0.54			#		
Dissolved Oxygen	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	0.36			#		
Dissolved Oxygen	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	0.53			#		
Manganese	mg/L	0201	SL	12/15/2008	0001	0	-	0	0.014		J	#	0.00026	
Manganese	mg/L	0218	SL	12/17/2008	0001	0	-	0	0.029		J	#	0.00026	
Manganese	mg/L	0226	SL	12/17/2008	0001	1	-	1	0.02		J	#	0.00026	
Manganese	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	0.017		J	#	0.00026	

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Manganese	mg/L	0401	WL	12/16/2008	0001	18	-	18	4.9			#	0.0026	
Manganese	mg/L	0404	WL	12/16/2008	0001	18	-	18	5.2			#	0.0026	
Manganese	mg/L	0405	WL	12/16/2008	0001	18	-	18	4			#	0.0013	
Manganese	mg/L	0437	WL	12/15/2008	0001	97	-	97	0.6			#	0.0013	
Manganese	mg/L	0438	WL	12/15/2008	0001	118	-	118	2.4			#	0.0013	
Manganese	mg/L	0439	WL	12/15/2008	0001	118	-	118	2			#	0.0013	
Manganese	mg/L	0492	WL	12/16/2008	0001	18	-	18	3.1			#	0.0013	
Manganese	mg/L	0492	WL	12/16/2008	0002	18	-	18	3			#	0.0013	
Manganese	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	3			#	0.026	
Manganese	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	0.18			#	0.0026	
Manganese	mg/L	CR1	SL	12/16/2008	0001	1	-	1	0.013			#	0.00026	
Manganese	mg/L	CR3	SL	12/16/2008	0001	0	-	0	0.042			#	0.00026	
Manganese	mg/L	CR5	SL	12/15/2008	0001	0.33	-	0.33	0.015			#	0.00026	
Manganese	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	0.27			#	0.00026	
Manganese	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	2.9			#	0.026	
Manganese	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	0.032	B		#	0.026	
Oxidation Reduction Potential	mV	0201	SL	12/15/2008	0001	0	-	0	-46			#		
Oxidation Reduction Potential	mV	0218	SL	12/17/2008	0001	0	-	0	-101			#		
Oxidation Reduction Potential	mV	0226	SL	12/17/2008	0001	1	-	1	-106			#		
Oxidation Reduction Potential	mV	0228	SL	12/17/2008	0001	0.66	-	0.66	-198			#		
Oxidation Reduction Potential	mV	0401	WL	12/16/2008	0001	18	-	18	-50			#		
Oxidation Reduction Potential	mV	0404	WL	12/16/2008	0001	18	-	18	-44			#		
Oxidation Reduction Potential	mV	0405	WL	12/16/2008	0001	18	-	18	-41			#		
Oxidation Reduction Potential	mV	0437	WL	12/15/2008	0001	97	-	97	-94			#		
Oxidation Reduction Potential	mV	0438	WL	12/15/2008	0001	118	-	118	-80			#		

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Oxidation Reduction Potential	mV	0439	WL	12/15/2008	0001	118	-	118	-121			#		
Oxidation Reduction Potential	mV	0492	WL	12/16/2008	0001	18	-	18	-113			#		
Oxidation Reduction Potential	mV	ATP-2-D	WL	12/16/2008	0001	88	-	88	-280			#		
Oxidation Reduction Potential	mV	ATP-2-S	WL	12/16/2008	0001	40	-	40	-166			#		
Oxidation Reduction Potential	mV	CR1	SL	12/16/2008	0001	1	-	1	-63			#		
Oxidation Reduction Potential	mV	CR3	SL	12/16/2008	0001	0	-	0	-87			#		
Oxidation Reduction Potential	mV	CR5	SL	12/15/2008	0001	0.33	-	0.33	-19			#		
Oxidation Reduction Potential	mV	TP-02	WL	12/17/2008	0001	30	-	30	-150			#		
Oxidation Reduction Potential	mV	TP-17	WL	12/17/2008	0001	28	-	28	-186			#		
Oxidation Reduction Potential	mV	TP-19	WL	12/17/2008	0001	29	-	29	-307			#		
pH	s.u.	0201	SL	12/15/2008	0001	0	-	0	7.48			#		
pH	s.u.	0218	SL	12/17/2008	0001	0	-	0	7.81			#		
pH	s.u.	0226	SL	12/17/2008	0001	1	-	1	7.48			#		
pH	s.u.	0228	SL	12/17/2008	0001	0.66	-	0.66	8.14			#		
pH	s.u.	0401	WL	12/16/2008	0001	18	-	18	6.68			#		
pH	s.u.	0404	WL	12/16/2008	0001	18	-	18	6.69			#		
pH	s.u.	0405	WL	12/16/2008	0001	18	-	18	6.77			#		
pH	s.u.	0437	WL	12/15/2008	0001	97	-	97	7.12			#		
pH	s.u.	0438	WL	12/15/2008	0001	118	-	118	6.64			#		
pH	s.u.	0439	WL	12/15/2008	0001	118	-	118	6.74			#		
pH	s.u.	0492	WL	12/16/2008	0001	18	-	18	6.89			#		
pH	s.u.	ATP-2-D	WL	12/16/2008	0001	88	-	88	7.81			#		
pH	s.u.	ATP-2-S	WL	12/16/2008	0001	40	-	40	8.54			#		
pH	s.u.	CR1	SL	12/16/2008	0001	1	-	1	8.23			#		
pH	s.u.	CR3	SL	12/16/2008	0001	0	-	0	8.22			#		

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
pH	s.u.	CR5	SL	12/15/2008	0001	0.33	-	0.33	7.35			#		
pH	s.u.	TP-02	WL	12/17/2008	0001	30	-	30	6.9			#		
pH	s.u.	TP-17	WL	12/17/2008	0001	28	-	28	6.95			#		
pH	s.u.	TP-19	WL	12/17/2008	0001	29	-	29	6.38			#		
Selenium	mg/L	0218	SL	12/17/2008	0001	0	-	0	0.0033	E	J	#	5.6E-005	
Selenium	mg/L	0226	SL	12/17/2008	0001	1	-	1	0.0035		J	#	5.6E-005	
Selenium	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	0.0036		J	#	5.6E-005	
Selenium	mg/L	0401	WL	12/16/2008	0001	18	-	18	0.01			#	5.6E-005	
Selenium	mg/L	0404	WL	12/16/2008	0001	18	-	18	0.017			#	5.6E-005	
Selenium	mg/L	0405	WL	12/16/2008	0001	18	-	18	0.024			#	5.6E-005	
Selenium	mg/L	0437	WL	12/15/2008	0001	97	-	97	0.073		J	#	5.6E-005	
Selenium	mg/L	0438	WL	12/15/2008	0001	118	-	118	0.0034			#	5.6E-005	
Selenium	mg/L	0439	WL	12/15/2008	0001	118	-	118	0.00093			#	5.6E-005	
Selenium	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	0.00012	B		#	5.6E-005	
Selenium	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	0.00045	B		#	5.6E-005	
Selenium	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	0.0012			#	5.6E-005	
Specific Conductance	µmhos /cm	0201	SL	12/15/2008	0001	0	-	0	1249			#		
Specific Conductance	µmhos /cm	0218	SL	12/17/2008	0001	0	-	0	1292			#		
Specific Conductance	µmhos /cm	0226	SL	12/17/2008	0001	1	-	1	1238			#		
Specific Conductance	µmhos /cm	0228	SL	12/17/2008	0001	0.66	-	0.66	1444			#		
Specific Conductance	µmhos /cm	0401	WL	12/16/2008	0001	18	-	18	14863			#		
Specific Conductance	µmhos /cm	0404	WL	12/16/2008	0001	18	-	18	18455			#		
Specific Conductance	µmhos /cm	0405	WL	12/16/2008	0001	18	-	18	9615			#		
Specific Conductance	µmhos /cm	0437	WL	12/15/2008	0001	97	-	97	11662			#		
Specific Conductance	µmhos /cm	0438	WL	12/15/2008	0001	118	-	118	9036			#		

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Specific Conductance	µmhos /cm	0439	WL	12/15/2008	0001	118	-	118	9692			#		
Specific Conductance	µmhos /cm	0492	WL	12/16/2008	0001	18	-	18	10753			#		
Specific Conductance	µmhos /cm	ATP-2-D	WL	12/16/2008	0001	88	-	88	123640			#		
Specific Conductance	µmhos /cm	ATP-2-S	WL	12/16/2008	0001	40	-	40	19181			#		
Specific Conductance	µmhos /cm	CR1	SL	12/16/2008	0001	1	-	1	1313			#		
Specific Conductance	µmhos /cm	CR3	SL	12/16/2008	0001	0	-	0	1780			#		
Specific Conductance	µmhos /cm	CR5	SL	12/15/2008	0001	0.33	-	0.33	1426			#		
Specific Conductance	µmhos /cm	TP-02	WL	12/17/2008	0001	30	-	30	2247			#		
Specific Conductance	µmhos /cm	TP-17	WL	12/17/2008	0001	28	-	28	100092			#		
Specific Conductance	µmhos /cm	TP-19	WL	12/17/2008	0001	29	-	29	139838			#		
Sulfate	mg/L	0201	SL	12/15/2008	0001	0	-	0	290		J	#	5	
Sulfate	mg/L	0218	SL	12/17/2008	0001	0	-	0	270		J	#	5	
Sulfate	mg/L	0226	SL	12/17/2008	0001	1	-	1	280		J	#	5	
Sulfate	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	270		J	#	5	
Sulfate	mg/L	0401	WL	12/16/2008	0001	18	-	18	6500			#	100	
Sulfate	mg/L	0404	WL	12/16/2008	0001	18	-	18	7800			#	100	
Sulfate	mg/L	0405	WL	12/16/2008	0001	18	-	18	4300			#	50	
Sulfate	mg/L	0437	WL	12/15/2008	0001	97	-	97	3700			#	50	
Sulfate	mg/L	0438	WL	12/15/2008	0001	118	-	118	3400			#	50	
Sulfate	mg/L	0439	WL	12/15/2008	0001	118	-	118	3400			#	50	
Sulfate	mg/L	0492	WL	12/16/2008	0001	18	-	18	3600			#	50	
Sulfate	mg/L	0492	WL	12/16/2008	0002	18	-	18	3600			#	50	
Sulfate	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	6300			#	100	
Sulfate	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	7700			#	100	
Sulfate	mg/L	CR1	SL	12/16/2008	0001	1	-	1	270			#	5	

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Sulfate	mg/L	CR3	SL	12/16/2008	0001	0	-	0	300			#	5	
Sulfate	mg/L	CR5	SL	12/15/2008	0001	0.33	-	0.33	280			#	5	
Sulfate	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	530			#	10	
Sulfate	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	5800			#	100	
Sulfate	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	5500			#	100	
Temperature	C	0201	SL	12/15/2008	0001	0	-	0	1.53			#		
Temperature	C	0218	SL	12/17/2008	0001	0	-	0	1.58			#		
Temperature	C	0226	SL	12/17/2008	0001	1	-	1	1.15			#		
Temperature	C	0228	SL	12/17/2008	0001	0.66	-	0.66	0.49			#		
Temperature	C	0401	WL	12/16/2008	0001	18	-	18	15.28			#		
Temperature	C	0404	WL	12/16/2008	0001	18	-	18	15.1			#		
Temperature	C	0405	WL	12/16/2008	0001	18	-	18	15.33			#		
Temperature	C	0437	WL	12/15/2008	0001	97	-	97	13.4			#		
Temperature	C	0438	WL	12/15/2008	0001	118	-	118	14.69			#		
Temperature	C	0439	WL	12/15/2008	0001	118	-	118	14.4			#		
Temperature	C	0492	WL	12/16/2008	0001	18	-	18	15.55			#		
Temperature	C	ATP-2-D	WL	12/16/2008	0001	88	-	88	15.46			#		
Temperature	C	ATP-2-S	WL	12/16/2008	0001	40	-	40	15.31			#		
Temperature	C	CR1	SL	12/16/2008	0001	1	-	1	1.46			#		
Temperature	C	CR3	SL	12/16/2008	0001	0	-	0	2.3			#		
Temperature	C	CR5	SL	12/15/2008	0001	0.33	-	0.33	0.99			#		
Temperature	C	TP-02	WL	12/17/2008	0001	30	-	30	14.86			#		
Temperature	C	TP-17	WL	12/17/2008	0001	28	-	28	12.52			#		
Temperature	C	TP-19	WL	12/17/2008	0001	29	-	29	13.6			#		
Total Dissolved Solids	mg/L	0201	SL	12/15/2008	0001	0	-	0	790		J	#	40	
Total Dissolved Solids	mg/L	0218	SL	12/17/2008	0001	0	-	0	790		J	#	40	
Total Dissolved Solids	mg/L	0226	SL	12/17/2008	0001	1	-	1	790		J	#	40	

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Total Dissolved Solids	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	790		J	#	40	
Total Dissolved Solids	mg/L	0401	WL	12/16/2008	0001	18	-	18	13000			#	400	
Total Dissolved Solids	mg/L	0404	WL	12/16/2008	0001	18	-	18	16000			#	400	
Total Dissolved Solids	mg/L	0405	WL	12/16/2008	0001	18	-	18	8200			#	200	
Total Dissolved Solids	mg/L	0437	WL	12/15/2008	0001	97	-	97	9300			#	200	
Total Dissolved Solids	mg/L	0438	WL	12/15/2008	0001	118	-	118	7800			#	200	
Total Dissolved Solids	mg/L	0439	WL	12/15/2008	0001	118	-	118	8100			#	200	
Total Dissolved Solids	mg/L	0492	WL	12/16/2008	0001	18	-	18	8300			#	200	
Total Dissolved Solids	mg/L	0492	WL	12/16/2008	0002	18	-	18	8200			#	200	
Total Dissolved Solids	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	91000			#	2000	
Total Dissolved Solids	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	14000			#	400	
Total Dissolved Solids	mg/L	CR1	SL	12/16/2008	0001	1	-	1	750			#	40	
Total Dissolved Solids	mg/L	CR3	SL	12/16/2008	0001	0	-	0	780			#	40	
Total Dissolved Solids	mg/L	CR5	SL	12/15/2008	0001	0.33	-	0.33	780			#	40	
Total Dissolved Solids	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	1400			#	40	
Total Dissolved Solids	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	74000			#	2000	
Total Dissolved Solids	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	110000			#	2000	
Turbidity	NTU	0201	SL	12/15/2008	0001	0	-	0	9.92			#		
Turbidity	NTU	0218	SL	12/17/2008	0001	0	-	0	131			#		
Turbidity	NTU	0226	SL	12/17/2008	0001	1	-	1	389			#		
Turbidity	NTU	0228	SL	12/17/2008	0001	0.66	-	0.66	12.3			#		
Turbidity	NTU	0401	WL	12/16/2008	0001	18	-	18	1.69			#		
Turbidity	NTU	0404	WL	12/16/2008	0001	18	-	18	0.84			#		
Turbidity	NTU	0405	WL	12/16/2008	0001	18	-	18	1.57			#		
Turbidity	NTU	0437	WL	12/15/2008	0001	97	-	97	9.15			#		
Turbidity	NTU	0438	WL	12/15/2008	0001	118	-	118	9.04			#		
Turbidity	NTU	0439	WL	12/15/2008	0001	118	-	118	1.88			#		

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Turbidity	NTU	0492	WL	12/16/2008	0001	18	-	18	1.6			#		
Turbidity	NTU	ATP-2-D	WL	12/16/2008	0001	88	-	88	126			#		
Turbidity	NTU	ATP-2-S	WL	12/16/2008	0001	40	-	40	3.57			#		
Turbidity	NTU	CR1	SL	12/16/2008	0001	1	-	1	6.89			#		
Turbidity	NTU	CR3	SL	12/16/2008	0001	0	-	0	63.9			#		
Turbidity	NTU	CR5	SL	12/15/2008	0001	0.33	-	0.33	6.54			#		
Turbidity	NTU	TP-02	WL	12/17/2008	0001	30	-	30	44.8			#		
Turbidity	NTU	TP-17	WL	12/17/2008	0001	28	-	28	23.3			#		
Turbidity	NTU	TP-19	WL	12/17/2008	0001	29	-	29	24.9			#		
Uranium	mg/L	0201	SL	12/15/2008	0001	0	-	0	0.006		J	#	3.6E-006	
Uranium	mg/L	0218	SL	12/17/2008	0001	0	-	0	0.013		J	#	3.6E-006	
Uranium	mg/L	0226	SL	12/17/2008	0001	1	-	1	0.0091		J	#	3.6E-006	
Uranium	mg/L	0228	SL	12/17/2008	0001	0.66	-	0.66	0.0073		J	#	3.6E-006	
Uranium	mg/L	0401	WL	12/16/2008	0001	18	-	18	2.5			#	0.00036	
Uranium	mg/L	0404	WL	12/16/2008	0001	18	-	18	2.4			#	0.00036	
Uranium	mg/L	0405	WL	12/16/2008	0001	18	-	18	1.6			#	0.00018	
Uranium	mg/L	0437	WL	12/15/2008	0001	97	-	97	4.3			#	0.00036	
Uranium	mg/L	0438	WL	12/15/2008	0001	118	-	118	1.9			#	0.00018	
Uranium	mg/L	0439	WL	12/15/2008	0001	118	-	118	0.85			#	7.2E-005	
Uranium	mg/L	0492	WL	12/16/2008	0001	18	-	18	1.9			#	0.00018	
Uranium	mg/L	0492	WL	12/16/2008	0002	18	-	18	1.9			#	0.00018	
Uranium	mg/L	ATP-2-D	WL	12/16/2008	0001	88	-	88	0.007			#	1.8E-005	
Uranium	mg/L	ATP-2-S	WL	12/16/2008	0001	40	-	40	0.013			#	3.6E-006	
Uranium	mg/L	CR1	SL	12/16/2008	0001	1	-	1	0.0053			#	3.6E-006	
Uranium	mg/L	CR3	SL	12/16/2008	0001	0	-	0	0.014			#	3.6E-006	
Uranium	mg/L	CR5	SL	12/15/2008	0001	0.33	-	0.33	0.0067			#	3.6E-006	
Uranium	mg/L	TP-02	WL	12/17/2008	0001	30	-	30	1.5			#	0.00018	

Appendix C. Water Quality Data

December 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 4/14/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Uranium	mg/L	TP-17	WL	12/17/2008	0001	28	-	28	0.037			#	1.8E-005	
Uranium	mg/L	TP-19	WL	12/17/2008	0001	29	-	29	0.00016	B		#	1.8E-005	

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

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

LAB QUALIFIERS:

*	Replicate analysis not within control limits.
>	Result above upper detection limit.
A	Tentatively identified compound (TIC) 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: TIC.
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

December 2008 Routine Sampling Event - STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 1/30/2009

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Measurement Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0401	O	3969.6	12/16/2008		15.69	3953.91	
0404	O	3968.3	12/16/2008		14.11	3954.19	
0405	O	3968.47	12/16/2008		14.17	3954.3	
0437	O	4048.25	12/15/2008		89.41	3958.84	
0438	O	4054.22	12/15/2008		96.9	3957.32	
0439	O	4055.27	12/15/2008		98.25	3957.02	
0492		3967.64	12/16/2008		15.63	3952.01	
ATP-2-D	O	3967.05	12/16/2008		14.76	3952.29	
ATP-2-S	O	3967.04	12/16/2008		12.08	3954.96	
TP-17	D	3963.69	12/17/2008		11.33	3952.36	
TP-19	D	3962.17	12/17/2008		10.5	3951.67	

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

Appendix E.
Blanks Report

Appendix E. Blanks Report

BLANKS REPORT
LAB: PARAGON (Fort Collins, CO)
RIN: 0812025
Report Date: 1/30/2009

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Uncertainty	Sample Type
Ammonia Total as N	MOA01	0999	12/15/2008	0001	mg/L	0.1	U		0.1		E
Chloride	MOA01	0999	12/15/2008	0001	mg/L	0.2	U		0.2		E
Manganese	MOA01	0999	12/15/2008	0001	mg/L	0.0012	B		0.00026		E
Sulfate	MOA01	0999	12/15/2008	0001	mg/L	0.5	U		0.5		E
Total Dissolved Solids	MOA01	0999	12/15/2008	0001	mg/L	20	U		20		E
Uranium	MOA01	0999	12/15/2008	0001	mg/L	5.1E-005	B		3.6E-006		E

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 (TIC) 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: TIC.
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.		

SAMPLE TYPES:

E	EB

Attachment 1.
December 2008 Routine Sampling Event Trip Report

Attachment 1.
December 2008 Routine Sampling Event Trip Report

Moab TAC Team

Date: December 30, 2008

To: K. Pill, M. Mullis

From: Elizabeth Glowiak

Subject: Routine Sampling Trip Report

Site: Moab – Ground Water and Surface Water Sampling Event – December 2008

Date of Sampling Event: December 15-17, 2008

Team Members: K. Pill, E. Glowiak

RIN Number Assigned: All samples were assigned to RIN 0812025.

Sample Shipment: The coolers were shipped overnight UPS to Paragon Analytics, Inc., from Moab, Utah, on December 18, 2008 (Tracking No. 195495330). The shipment of this cooler was delayed 3 days by FedEx.

Number of Locations Sampled: The December 2008 routine sampling event was conducted during baseline conditions of the Colorado River hydrograph. Thirteen monitor wells and seven surface water locations were sampled during the sampling event. Including one duplicate and one EB, a total of 20 samples were collected.

Locations Not Sampled/Reason: None.

Field Variance: Interim action monitoring wells 0401, 0404, and 0405 were added to the routine sampling list for the month of December 2008.

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

False ID	True ID	Sample Type	Associated matrix	Ticket Number
2000	N/A	EB	DI Water	NFC 981
2001	0492	Duplicate from 18 ft bgs	Ground Water	NFC 989

Note: DI = deionized; EB = equipment blank; ft bgs = feet below ground surface; ID = identification

Attachment 1.
December 2008 Routine Sampling Event Trip Report (continued)

Location Specific Information: Wells 0437, 0438, and 0439 were sampled using dedicated bladder pumps. 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
NFC 976	0201	12/15/2008	Unknown	Taken 1.5 ft off bank; slow water flow
NFC 977	CR5	12/15/2008	~4-inches	Taken approximately 3 ft off bank; DO was not recorded
NFC 978	0437	12/15/2008	97 ft bgs	
NFC 979	0439	12/15/2008	118 ft bgs	
NFC 980	0438	12/15/2008	118 ft bgs	
NFC 982	ATP-2-S	12/16/2008	40 ft bgs	
NFC 983	ATP-2-D	12/16/2008	88 ft bgs	Sulfur odor; preserved samples were clear; nonpreserved samples were yellow; high turbidity
NFC 984	CR1	12/16/2008	~1 ft	Taken 10 ft off of the old boat ramp; slow velocity
NFC 985	0405	12/16/2008	18 ft bgs	
NFC 986	0404	12/16/2008	18 ft bgs	
NFC 987	0401	12/16/2008	18 ft bgs	
NFC 988	0492	12/16/2008	18 ft bgs	Duplicate collected
NFC 990	CR3	12/16/2008	Unknown	Taken 2 ft off bank; very turbid; slow velocity
NFC 991	TP-02	12/17/2008	30 ft bgs	High turbidity
NFC 992	TP-19	12/17/2008	29 ft bgs	Sulfur odor; water is gray
NFC 993	0228	12/17/2008	~8-inches	Taken 3 ft off bank
NFC 994	TP-17	12/17/2008	28 ft bgs	Sulfur odor
NFC 996	0218	12/17/2008	Unknown	Taken approximately 2 ft off bank; slow velocity
NFC 997	0226	12/17/2008	1 ft	Taken 4 ft off bank; slow velocity

Note: DO = dissolved oxygen; ft bgs = feet below ground surface; ID = identification

Surface Water Location 201

Attachment 1.
December 2008 Routine Sampling Event Trip Report (continued)

Surface Water Location CR-1

Surface Water Location CR-5

Attachment 1.
December 2008 Routine Sampling Event Trip Report (continued)

Surface Water Location CR-3

Surface Water Location 0226

Attachment 1.
December 2008 Routine Sampling Event Trip Report (continued)

Surface Water Location 0228

Surface Water Location 0218

Attachment 1.
December 2008 Routine Sampling Event Trip Report (continued)

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

Well No.	Date	Time	Depth to Water (ft btoc)
ATP-2-S	12/16/2008	09:53	12.03
ATP-2-D	12/16/2008	10:16	14.76
0401	12/16/2008	15:00	15.69
0404	12/16/2008	14:40	14.11
0405	12/16/2008	14:18	14.17
0437	12/15/2008	15:02	89.41
0438	1215//2008	15:57	96.90
0439	12/15/2008	15:30	98.25
0492	12/16/2008	15:28	15.63
TP-02	12/17/2008	09:00	N/A*
TP-17	12/17/2008	14:14	11.38
TP-19	12/17/2008	10:43	10.30

*Could not record water level during pumping due to 1-inch casing; btoc = below top of casing

Well Inspection Summary: A well inspection was not conducted.

Equipment: No issues.

Regulatory: None.

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

Date	Daily Mean Flow (cfs)
12/15/2008	3,420
12/16/2008	3,180
12/17/2008	2,950

Corrective Action Required/Taken: None