

Office of Environmental Management – Grand Junction



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

February 2009



U.S. Department
of Energy

Office of Environmental Management

**Moab UMTRA Project
June 2008 Validation Data Package for Routine Ground Water and
Surface Water Sampling Event**

February 2009

**Moab UMTRA Project
June 2008 Routine Ground Water Sampling Event VDP**

Revision 0

Review and Approval

KG Pill

Kenneth G. Pill
TAC Ground Water Manager

2/26/09

Date

Joseph D. Ritchey

Joseph D. Ritchey
TAC Senior Program Manager

2/26/09

Date

REVISION HISTORY

Revision No.	Date	Reason/Basis for Revision
0	February 2009	Initial issue of Moab UMTRA Project June 2008 Routine Ground Water Sampling Event Validation Data Package.

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Acronyms

AWQC	ambient water quality criteria
bgs	below ground surface
BL	baseline area
btoc	below top of casing
cfs	cubic feet per second
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody
CRI	reporting limit verification
DI	deionized
D.O.	dissolved oxygen
EB	equipment blank
EDD	electronic data deliverable
EPA	Environment Protection Agency
ft	feet
ICS	interference check sample
ICP	inductively coupled plasma
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control samples
MDL	method detection limit
mg/L	milligrams per liter
mL/m	milliliter per minute
MS	matrix spike
MSD	matrix spike duplicate
μmhos/cm	micro mhos per centimeter
μS/cm	micro siemens per centimeter
mV	millivolt
NTU	nephelometric turbidity unit
ORP	oxidation reduction potential
PQL	practical quantitation limit
RDL	required detection limit
RIN	report identification number
RPD	relative percent difference
RS	replicate sample
SDG	sample data group
SL	surface location
Spec Cond	special conditions
SU	standard unit
TDS	total dissolved solids
TS	treatment system
Turb.	turbidity
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey
VDP	validation data package
WL	well

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 Sampling Event Summary, which includes an Executive Summary. Section 2 provides the Data Assessment Summary, including the Field Activities 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, Minimums and Maximums Report tables, and the Trip Report. All Colorado River flow data discussed in this document are measured from the U.S. Geological Survey (USGS) Cisco Gaging Station No. 09180500.

1.0 Sampling Event Summary

This section contains the Summary Criteria with a sample location map (Section 1.1), an Executive Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for the June 2008 Routine Sampling event.

1.1 Summary Criteria

Site: Moab, Utah

Sampling Period: June 30 and July 1, 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 during the descending portion of the 2008 spring runoff hydrograph. Sampling locations are shown on Figure 1. Due to access issues, location TP-19 could not be sampled during this event.

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. However, some contaminant concentrations in June 2008 changed

significantly compared to the concentrations measured in May 2008. 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), and TP-17 (located farther south of the well field) are provided in the Executive Summary. Similar plots are provided for the alluvial observation wells within the footprint 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 are more susceptible to changes in concentration related to infiltration during high Colorado River stage. With the extended high river stage (flows exceeded 10,000 cubic feet per second [cfs] for approximately 11 straight weeks between April 20 and July 13) ammonia concentrations in the sample collected from 0492 remained low between the May and June events, while the uranium concentration continued to decrease at 0492 and slightly increased at TP-02.

Samples collected from locations 0437, 0438, and 0439 exhibited a slight decrease in ammonia and uranium concentrations. This trend has been observed in previous sampling events during the early summer months. TDS concentrations have remained consistent.

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

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

Analyte	Standard (mg/L)	Locations Exceeding Standards
Selenium	0.01	0405 ^a (0.013), 0437 (0.06)
Uranium	0.044	0401 ^a (0.44), 0404 ^a (2.1), 0405 ^a (1.8), 0437 (4.4), 0438 (1.9), 0439 (0.91), 0492 (0.14), TP-02 (3.7)

Notes: a – Location sampled in July 2008

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, elevated concentrations of site-related contaminants have periodically occurred in riparian channels adjacent to 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 June 2008 indicate that surface water concentrations in riparian areas are indistinguishable from background concentrations in the main channel of the Colorado River.

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 (°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	6/30/08	20.4	7.83	0.1	8.11	2.23
0226	6/30/08	20.6	8.32	0.18	3.15	1.07
0276	6/30/08	23.2	7.96	0.1	5.62	1.50
CR1	6/30/08	19.9	8.07	0.1	4.64	1.47
CR3	6/30/08	20.8	8.19	0.1	3.83	1.26
CR5	6/30/08	22.0	7.67	0.1	9.65	2.21

Notes: Loc = Location, 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 exceed 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 Executive Summary

This validation data package (VDP) presents the validated data associated with the ground water and surface water samples collected during the June 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.

TDS results were not initially correctly reported for the samples collected from locations 0437 and 0438. After review of the analytical and field data (the specific conductance in particular), Paragon Analytics was contacted to verify these results. The reported values were found to be incorrectly reported due to a dilution error, and Paragon resubmitted the results.

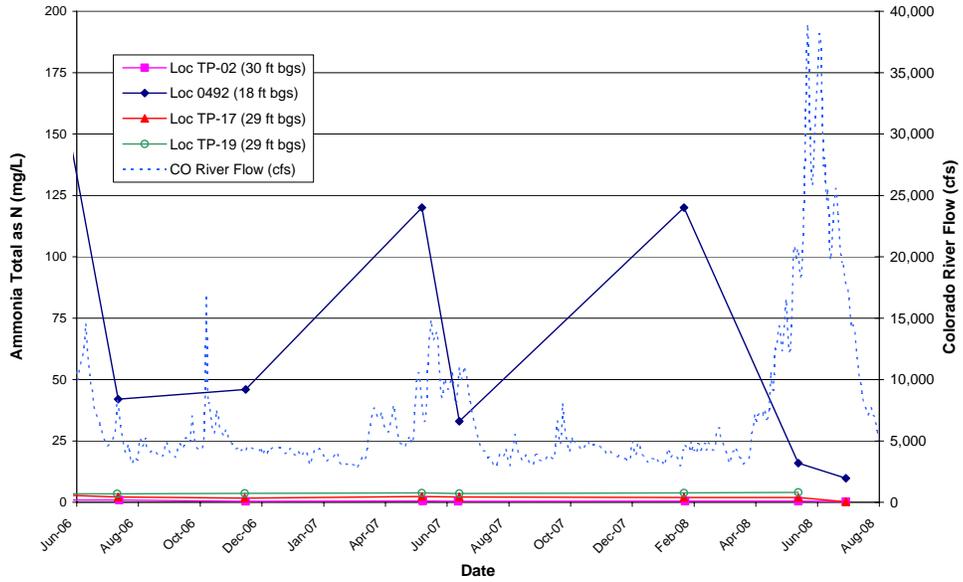
While independent of the data validation process, a brief summary of the most recent concentration trends based on the June 2008 data is provided for the wells located in the flood plain (along the bank of the Colorado River) and in the footprint of the tailings pile. Time versus concentration (ammonia, 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

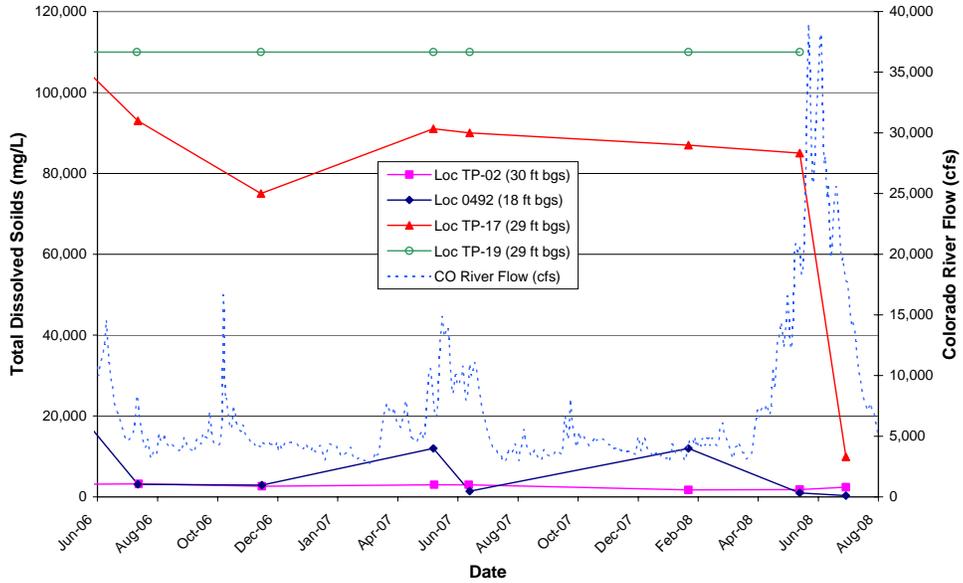
Time versus concentration plots were generated for wells TP-02, 0492, and TP-17 (listed from north to south). These plots exhibit that samples collected from wells TP-02 and TP-17 have historically contained low (below 5 milligrams per liter [mg/L]) ammonia concentrations, while the concentration detected from well 0492 has fluctuated between approximately 20 and 200 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 is apparent again during June 2008.

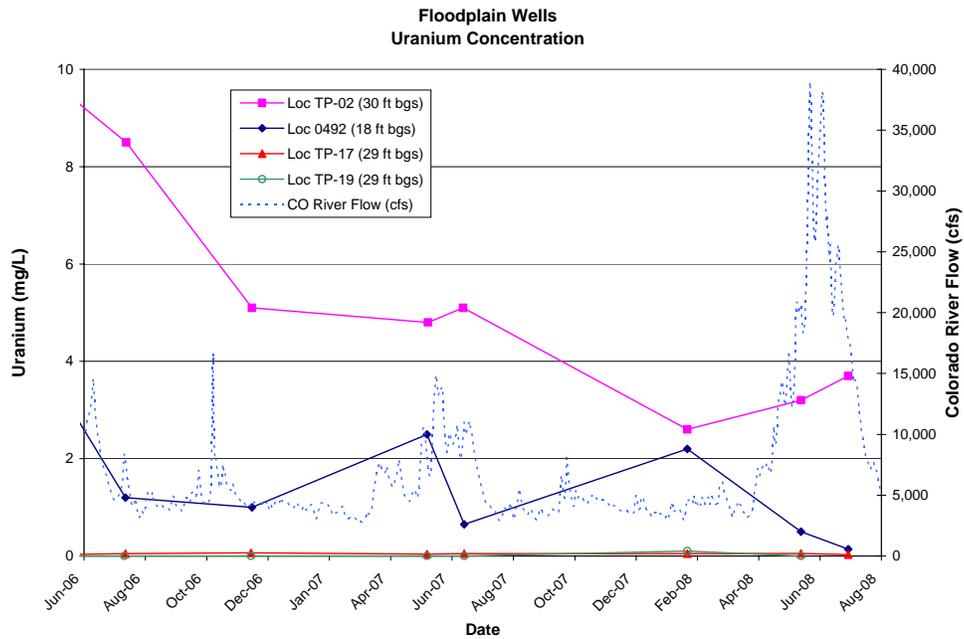
The TDS plot graphically shows that location TP-17 is screened within the brine, while locations TP-02 and 0492 are above the brine-freshwater interface. Well TP-02 has consistently contained less than 6,000 mg/L TDS. Uranium concentrations have steadily declined in samples collected from wells TP-02 and 0492. Typical of wells screened within the brine, uranium concentrations in well TP-17 is considerably lower compared to TP-02 and 0492. Since July 2006, samples collected from well TP-17 have contained uranium concentrations just above the 0.044 mg/L standard. Uranium concentrations in samples collected from well TP-02 have been generally decreasing since late 2005, while the concentrations in samples from 0492 have been fairly consistent.

**Floodplain Wells
Ammonia Total as N Concentration**



**Floodplain Wells
Total Dissolved Solids Concentration**

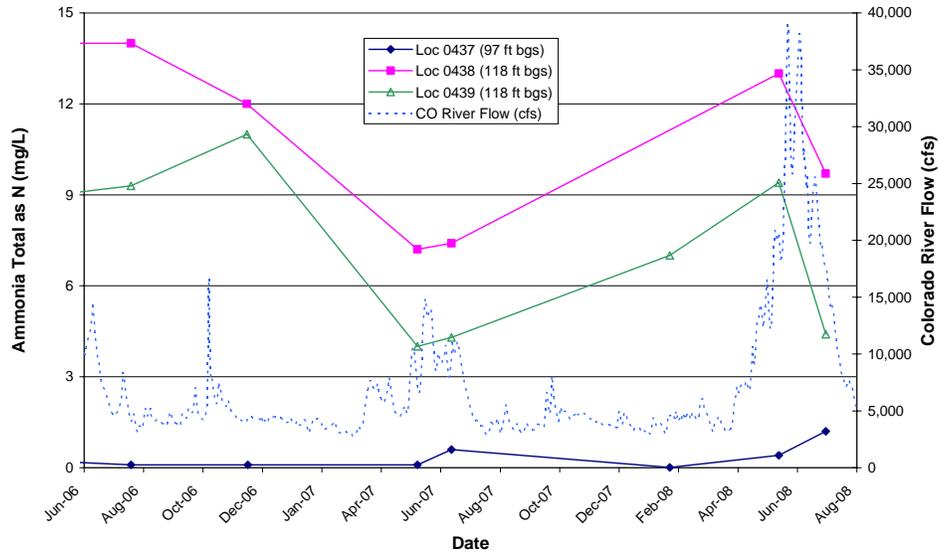




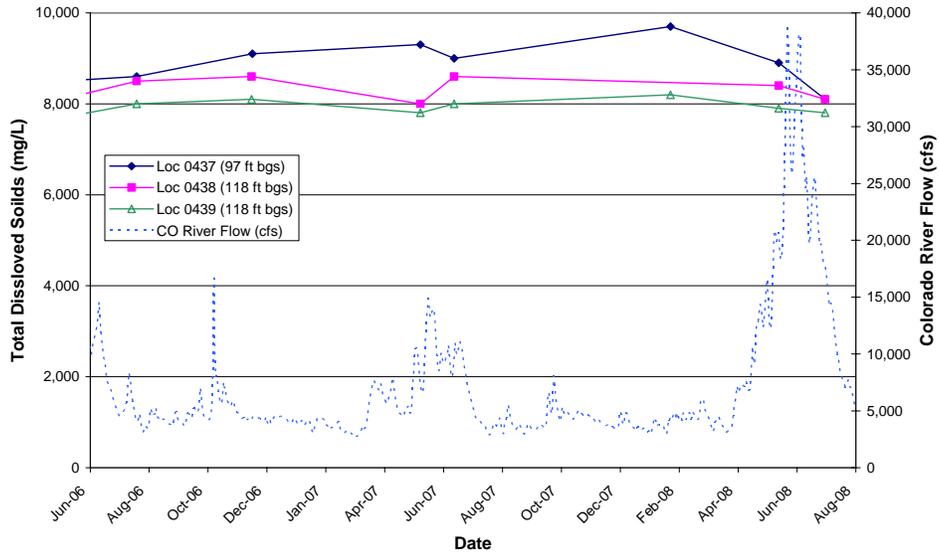
Tailings Pile Wells

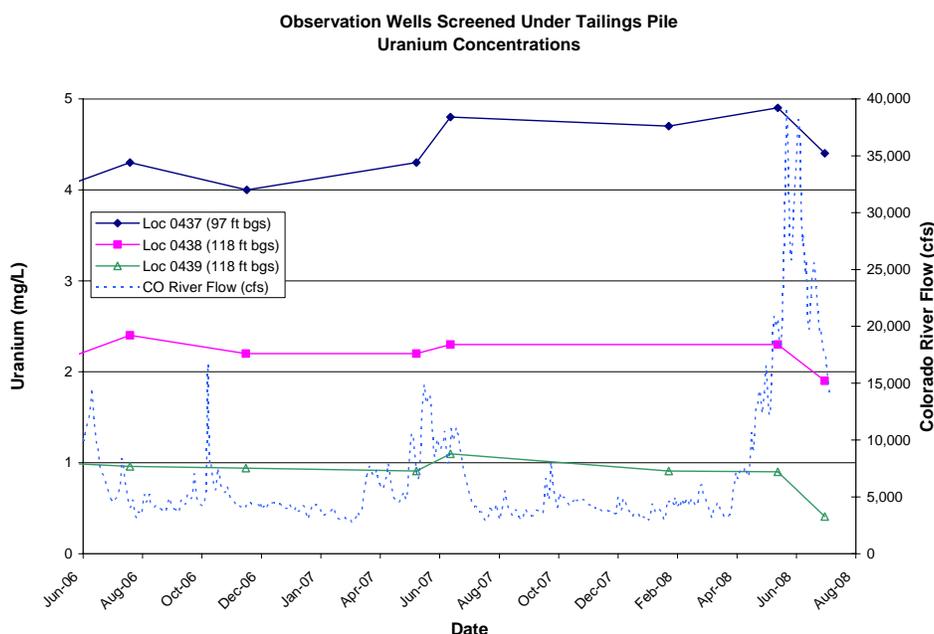
The wells located on the tailings pile are screened within the alluvial material underlying the tailings. Ammonia concentrations in samples collected from wells are below 15 mg/L. In well 0437, which is located upgradient of 0438 and 0439, ammonia concentrations remain below 1 mg/L. The TDS time versus concentration plot 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). The uranium time concentration plots indicate the uranium concentrations continue to remain consistent over the past 2 years.

**Observation Wells Screened Under Tailings Pile
Ammonia Total as N Concentrations**



**Observation Wells Screened Under Tailings Pile
Total Dissolved Solids Concentrations**





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 were collected. No significant discrepancies were noted regarding sample shipping and receiving, preservation times, instrument calibration, method blanks, or matrix spikes, except as qualified or noted in the Laboratory Performance Assessment (Section 2.2).

There were three locations with a total of 10 anomalous data points. Historical low analyte concentrations associated with the samples collected from wells 0492 (which had historic lows for chloride, sulfate, TDS, and uranium) and TP-17 (historic lows for ammonia, chloride, manganese, sulfate, and TDS) can be attributed to ground water dilution due to the influx of surface water from the Colorado River during an above average spring runoff. Uranium concentrations in samples collected from well ATP-2-D (which had an historic low uranium concentration in June 2008) have been steadily decreasing since 2002.

According to the USGS Cisco Gaging Station, the mean daily Colorado River flow rates varied between 18,700 and 18,800 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):	0806017
Sample Event:	Routine Sampling Event, June 2008
Site(s):	Moab, UT
Laboratory:	Paragon Analytics, Fort Collins, CO
Sample Data Group (SDG) No.:	0807017
Analysis:	Metals and Inorganics
Validator:	Rebecca Hollis
Review Date:	September 23, 2008

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 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	Prep Method	Analytical Method
Ammonia as N	WCH-A-005	EPA 350.1	EPA 350.1
Bromide	MIS-A-038	SW-846 9056	SW-846 9056
Chloride	MIS-A-039	SW-846 9056	SW-846 9056
Copper	MET-A-020	SW-846 6010B	SW-846 6010B
Manganese	GJO-17	SW-846 6010B	SW-846 6010B
Selenium	GJO-14	SW-846 6020A	SW-846 6020A
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056
Total Dissolved Solids	WIC-A-033	MCAWW 160.1	MCAWW 160.1
Uranium	GJO-01	SW-846 6020A	SW-846 6020A

Data Qualifier Summary

Analytical results were qualified as listed in Table 4. Refer to Table 5 below for an explanation of the data qualifiers applied.

Table 4. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
0807017-5 through -9	0438, 0439, 0492, 2509, ATP-2-D	Ammonia	J	MS1
All samples	All locations	Manganese	J	LCS1, MS4
0807017-1, -2, -3, -11, -12, -13	0201, 0226, 0276, CR1, CR3, CR5	All	J	B1

Notes: J indicates results are estimated. For nondetected results, flag becomes UJ.

Table 5. Reason Codes for Data Flags

Reason Code	Explanation
B1	Results are considered estimated (J) because the blank frequency criteria were not met.
LCS1	Results for the affected analyte(s) are regarded as estimated (J) because the laboratory control sample was not analyzed at the proper frequency as stated in the appropriate analytical method.
MS1	Results for the affected analyte(s) are regarded as estimated (J) because the matrix spike sample was (a) from another client, (b) of dissimilar matrix, (c) a field blank or equipment blank, or (d) not analyzed at the proper frequency as stated in the appropriate analytical method.
MS4	Results for the affected analyte(s) are regarded as estimated (J) for detected results or rejected (R) for nondetected results because the matrix spike recovery is less than 30%.

Sample Shipping/Receiving

Paragon Analytics in Fort Collins, Colorado, received a total of 15 samples for RIN 0806017 on July 2, 2008, under UPS tracking number 1Z5W1Y510190544830. All samples were accompanied by a COC form. The COC form was 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 form 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 1.2 °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.

Matrix Spike and Replicate Analysis

Matrix spike (MS) sample analysis is performed as a measure of the ability to recover analytes in a particular matrix. Replicate analysis consists of matrix spike duplicate (MSD) samples that are indicators of laboratory precision for each sample matrix.

Method SW-846 9056, Chloride

A chloride MS and MSD check was made at the required frequency for the SDG 0807017 sample preparation batch. However, the native sample for the MS analysis had a concentration that was greater than four times the spike concentrations, so MS criteria do not apply to this sample. In addition, the associated field duplicate sample passed validation criteria, so chloride results were not J-flagged for failing the replicate check.

Method SW-846 6010B, Manganese

The percent recovery of the MS sample was less than 30 percent. Therefore all manganese results were J-flagged for this reason.

Method SW-846 9056, Sulfate

A sulfate MS and MSD check was made at the required frequency for the SDG 0807017 sample preparation batch. However, the native sample for the MS analysis had a sulfate concentration that was greater than four times the spike concentrations, so MS criteria do not apply to this sample. In addition, the associated field duplicate sample passed validation criteria, so chloride results were not J-flagged for failing the replicate check.

Field Duplicate

One field duplicate was collected from sample location 0276 during the sampling activities. This duplicate was labeled with the blind location ID 2509 and submitted with the regular samples to be analyzed by Paragon Analytics. This sample was assigned sample number 0807017-8. Comparison with the results of the sample reported to Paragon from location 0276 (sample 0807017-2) passed the acceptance criteria of $\pm 20\%$ relative percent difference (RPD) for all analytes.

Laboratory Control Sample

A laboratory control sample (LCS) must be analyzed at the correct frequency (one LCS per

SDG) 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 exceptions.

LCSs were not reported for manganese or uranium. As a standard practice, Paragon Analytics does not prepare LCSs for samples that were field-filtered and acidified and then run directly on the instrument without any additional sample preparation. Per national environmental laboratory accreditation requirements provided by the National Environmental Laboratory Accreditation Conference, an MS may be used in place of an LCS provided the acceptance criteria are as stringent.

Method SW-846 6010B, Manganese

The manganese MS analysis for SDG 0807017 failed, so all associated manganese results were J-flagged for this reason. In addition, all manganese results were flagged for not having an LCS.

Method SW-846 6020, Uranium

There was a uranium MS analysis for SDG 0807017, so there is no flag for associated uranium results for not having an LCS.

Detection Limits/Dilutions

The required detection limit (RDL) for all analytes was achieved for the SDG. Serial dilution samples were required for inductively coupled plasma (ICP) sample analysis (manganese, selenium, and uranium). Serial dilutions were run for all ICP analyses. For the manganese analysis, the percent difference between the chosen sample result and its serial dilution result was greater than the acceptance criteria. However, the serial dilution concentration was less than 100 times the reporting limit.

TDS results were not initially correctly reported for the samples collected from locations 0437 and 0438. The initial results reported were 1600 mg/L TDS for both locations; however, after further review of the analytical and field data (the specific conductance in particular), Paragon was contacted to verify these results on December 30, 2008. The reported values were found to be incorrectly reported due to a dilution error, and Paragon resubmitted the results on January 2, 2009.

Method and Calibration Blanks

Method blanks 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 or instrument detection limit (depending on method requirements) were J-qualified when the detections were less than five times the blank concentration. Nondetects were not qualified.

One or more calibration blanks for sulfate, chloride, and uranium were greater than the practical quantitation limit. However, none of the results bounded by these CCBs required qualification because their concentrations were greater than 10 times the blank concentration.

Equipment Blanks

Equipment blanks (EB) are samples of analyte-free media that have been used to rinse the nondedicated sampling equipment. EBs are collected to document adequate decontamination of nondedicated equipment. EBs are considered to be preparation blanks, and one EB should be prepared with each preparation batch.

Surface Water Samples

There were six samples collected on nondedicated equipment from surface water locations 0226 (0807017-2), 0201 (0807017-1), 0276 (0807017-3), CR1 (0807017-11), CR3 (0807017-12), and CR5 (0807017-13). Since no EBs were collected, all results from these locations were J-qualified for this reason.

Completeness

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

Electronic Data Deliverable File

The initial Electronic Data Deliverable (EDD) file arrived on July 17, 2008, and the revised EDD (issued as result of incorrectly reported TDS results for locations 0437 and 0438) was received on January 2, 2009. The contents of the EDD were manually examined to verify that the sample results accurately reflect 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 this sampling event period.

Field Activities

All monitor wells were purged and sampled using the low-flow sampling method; this method was not used at extraction wells. No EBs were collected. One duplicate sample was collected for 14 samples. 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 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 Check Sheet (Section 3.2), a table containing the Water Quality and Water Level Data (Sections 3.3 and 3.4, respectively), and the Blanks Report (Section 3.5).

3.1 Minimums and Maximums Report

The Minimums and Maximums Report (see Appendix B) is generated by the Sample Management System used to query the SEEPro database. The DataVal program compares the new data set with historical data and lists all new data that fall outside the historical data range. Values listed in the 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 anomalous data based on the criteria described in Section 3.1 associated with this sampling event.

Site: Moab UMTRA Site Sampling Date: June 30 – July 1, 2008

Loc. No.	Analyte	Type of Anomaly	Disposition
0492	Chloride	Low	Concentration diluted from influx of surface water during above average runoff event.
0492	Sulfate	Low	Concentration diluted from influx of surface water during above average runoff event.
0492	TDS	Low	Concentration diluted from influx of surface water during above average runoff event.
0492	Uranium	Low	Concentration diluted from influx of surface water during above average runoff event.
ATP-2-D	Uranium	Low	Concentrations have been steadily decreasing since 2002.
TP-17	Ammonia	Low	Concentration diluted from influx of surface water during above average runoff event.
TP-17	Chloride	Low	Concentration diluted from influx of surface water during above average runoff event.
TP-17	Manganese	Low	Concentration diluted from influx of surface water during above average runoff event.
TP-17	Sulfate	Low	Concentration diluted from influx of surface water during above average runoff event.
TP-17	TDS	Low	Concentration diluted from influx of surface water during above average runoff 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

An EB was not collected, so there is no report.

Appendix A. Water Sampling Field Activities Verification

Sampling Event / RIN	June Routine Event / 0806017	Date(s) of Water Sampling	June 30 – July 1, 2008
Date(s) of Verification	August 28, 2008	Name of Verifier	Rachel Cowan

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List other documents, standard operating procedures, instructions.	Yes	
	NA	
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Was a pretrip calibration conducted as specified in the aforementioned documents?	Yes	
4. Was an operational check of the field equipment conducted twice daily? 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 (mL/min)? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes	
	NA	
8. Were the following conditions met when purging a Category II well: Was the flow rate less than 500 mL/min? Was one pump/tubing volume removed prior to sampling?	Yes	
	Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	

Appendix A. Water Sampling Field Activities Verification

- | | |
|---|---|
| 10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment? | No Although there were six samples collected using nondedicated equipment, an equipment blank was not collected. |
| 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

June 2008 Routine Sampling Event - Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: PARAGON (Fort Collins, CO)

RIN: 0806017

Comparison: All Historical Data

Report Date: 9/2/2008

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	0201	06/30/2008	Total Dissolved Solids	250		1070		270		16	0
MOA01	0201	06/30/2008	Uranium	0.0017		0.0088		0.0018		17	0
MOA01	0492	06/30/2008	Chloride	21		17000	F	50	F	15	0
MOA01	0492	06/30/2008	Sulfate	83		15000	F	190	F	15	0
MOA01	0492	06/30/2008	Total Dissolved Solids	300		50000	F	860	F	15	0
MOA01	0492	06/30/2008	Uranium	0.14		6	F	0.5	J	15	0
MOA01	ATP-2-D	07/01/2008	Chloride	58000		55000	F	940		48	0
MOA01	ATP-2-D	07/01/2008	Uranium	0.0035		8.64		0.011	J	47	0
MOA01	CR1	06/30/2008	Total Dissolved Solids	240		1060		280		23	0
MOA01	CR3	06/30/2008	Manganese	0.0025	B	0.15		0.0037	B	13	2
MOA01	CR3	06/30/2008	Total Dissolved Solids	240		1780		290		8	0
MOA01	CR3	06/30/2008	Uranium	0.0017		0.0516		0.0019	J	14	0
MOA01	CR5	06/30/2008	Manganese	0.0031	B	0.11		0.0032	B J	17	5
MOA01	CR5	06/30/2008	Total Dissolved Solids	230		1110		270		19	0

Appendix B. Minimums and Maximums Report

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	CR5	06/30/2008	Uranium	0.0017		0.0115		0.0018	J	26	0		
MOA01	TP-02	06/30/2008	Ammonia Total as N	0.31		4		0.43	J	27	3		
MOA01	TP-17	06/30/2008	Ammonia Total as N	0.2		7.3		1.7	F	17	0		
MOA01	TP-17	06/30/2008	Chloride	5000		63000	F	33000	F	17	0		
MOA01	TP-17	06/30/2008	Manganese	0.26		3.9	J	2.07		6	0		
MOA01	TP-17	06/30/2008	Sulfate	1300		6000	F	3970		17	0		
MOA01	TP-17	06/30/2008	Total Dissolved Solids	9900		110000	F	75000	F	16	0		

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Alkalinity, Total (As CaCO3)	mg/L	0201	SL	06/30/2008	0001	0	-	0	130		0		
Alkalinity, Total (As CaCO3)	mg/L	0226	SL	06/30/2008	0001	0	-	0	130		0		
Alkalinity, Total (As CaCO3)	mg/L	0276	SL	06/30/2008	0001	0	-	0	200		0		
Alkalinity, Total (As CaCO3)	mg/L	0437	WL	07/01/2008	0001	97	-	97	610		0		
Alkalinity, Total (As CaCO3)	mg/L	0438	WL	07/01/2008	0001	118	-	118	740		0		
Alkalinity, Total (As CaCO3)	mg/L	0439	WL	07/01/2008	0001	118	-	118	820		0		
Alkalinity, Total (As CaCO3)	mg/L	0492	WL	06/30/2008	0001	18	-	18	200		0		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-D	WL	07/01/2008	0001	88	-	88	150		0		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-S	WL	07/01/2008	0001	38	-	38	290		0		
Alkalinity, Total (As CaCO3)	mg/L	CR1	SL	06/30/2008	0001	0	-	0	200		0		
Alkalinity, Total (As CaCO3)	mg/L	CR3	SL	06/30/2008	0001	0	-	0	130		0		
Alkalinity, Total (As CaCO3)	mg/L	CR5	SL	06/30/2008	0001	0	-	0	130		0		
Alkalinity, Total (As CaCO3)	mg/L	TP-02	WL	06/30/2008	0001	30	-	30	480		0		
Alkalinity, Total (As CaCO3)	mg/L	TP-17	WL	06/30/2008	0001	28	-	28	540		0		
Ammonia Total as N	mg/L	0201	SL	06/30/2008	0001	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	0226	SL	06/30/2008	0001	0	-	0	0.18		0	0.1	
Ammonia Total as N	mg/L	0276	SL	06/30/2008	0001	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	0276	SL	06/30/2008	0002	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	0437	WL	07/01/2008	0001	97	-	97	1.2		0	0.1	
Ammonia Total as N	mg/L	0438	WL	07/01/2008	0001	118	-	118	9.7		0	0.5	
Ammonia Total as N	mg/L	0439	WL	07/01/2008	0001	118	-	118	4.4		0	0.1	
Ammonia Total as N	mg/L	0492	WL	06/30/2008	0001	18	-	18	9.8		0	0.5	
Ammonia Total as N	mg/L	ATP-2-D	WL	07/01/2008	0001	88	-	88	360		0	20	
Ammonia Total as N	mg/L	ATP-2-S	WL	07/01/2008	0001	38	-	38	360		0	20	
Ammonia Total as N	mg/L	CR1	SL	06/30/2008	0001	0	-	0	0.1	U	0	0.1	

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Ammonia Total as N	mg/L	CR3	SL	06/30/2008	0001	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	CR5	SL	06/30/2008	0001	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	TP-02	WL	06/30/2008	0001	30	-	30	0.31		0	0.1	
Ammonia Total as N	mg/L	TP-17	WL	06/30/2008	0001	28	-	28	0.2		0	0.1	
Bromide	mg/L	0201	SL	06/30/2008	0001	0	-	0	0.2	U	0	0.2	
Bromide	mg/L	0226	SL	06/30/2008	0001	0	-	0	0.2	U	0	0.2	
Bromide	mg/L	0276	SL	06/30/2008	0001	0	-	0	0.2	U	0	0.2	
Bromide	mg/L	0276	SL	06/30/2008	0002	0	-	0	0.2	U	0	0.2	
Bromide	mg/L	0437	WL	07/01/2008	0001	97	-	97	1	U	0	1	
Bromide	mg/L	0438	WL	07/01/2008	0001	118	-	118	1	U	0	1	
Bromide	mg/L	0439	WL	07/01/2008	0001	118	-	118	1	U	0	1	
Bromide	mg/L	0492	WL	06/30/2008	0001	18	-	18	0.2	U	0	0.2	
Bromide	mg/L	ATP-2-D	WL	07/01/2008	0001	88	-	88	20	U	0	20	
Bromide	mg/L	ATP-2-S	WL	07/01/2008	0001	38	-	38	2	U	0	2	
Bromide	mg/L	CR1	SL	06/30/2008	0001	0	-	0	0.2	U	0	0.2	
Bromide	mg/L	CR3	SL	06/30/2008	0001	0	-	0	0.2	U	0	0.2	
Bromide	mg/L	CR5	SL	06/30/2008	0001	0	-	0	0.2	U	0	0.2	
Bromide	mg/L	TP-02	WL	06/30/2008	0001	30	-	30	0.4	U	0	0.4	
Bromide	mg/L	TP-17	WL	06/30/2008	0001	28	-	28	2	U	0	2	
Chloride	mg/L	0201	SL	06/30/2008	0001	0	-	0	22		0	1	
Chloride	mg/L	0226	SL	06/30/2008	0001	0	-	0	22		0	1	
Chloride	mg/L	0276	SL	06/30/2008	0001	0	-	0	23		0	1	
Chloride	mg/L	0276	SL	06/30/2008	0002	0	-	0	22		0	1	
Chloride	mg/L	0437	WL	07/01/2008	0001	97	-	97	1000		0	20	
Chloride	mg/L	0438	WL	07/01/2008	0001	118	-	118	1000		0	20	

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers		Detection Limit	Uncertainty
								Lab	Data QA		
Chloride	mg/L	0439	WL	07/01/2008	0001	118 - 118	1300		0	20	
Chloride	mg/L	0492	WL	06/30/2008	0001	18 - 18	21		0	1	
Chloride	mg/L	ATP-2-D	WL	07/01/2008	0001	88 - 88	58000		0	1000	
Chloride	mg/L	ATP-2-S	WL	07/01/2008	0001	38 - 38	2700		0	40	
Chloride	mg/L	CR1	SL	06/30/2008	0001	0 - 0	22		0	1	
Chloride	mg/L	CR3	SL	06/30/2008	0001	0 - 0	22		0	1	
Chloride	mg/L	CR5	SL	06/30/2008	0001	0 - 0	22		0	1	
Chloride	mg/L	TP-02	WL	06/30/2008	0001	30 - 30	390		0	4	
Chloride	mg/L	TP-17	WL	06/30/2008	0001	28 - 28	5000		0	100	
Dissolved Oxygen	mg/L	0201	SL	06/30/2008	0001	0 - 0	6.48		0		
Dissolved Oxygen	mg/L	0226	SL	06/30/2008	0001	0 - 0	7.59		0		
Dissolved Oxygen	mg/L	0276	SL	06/30/2008	0001	0 - 0	8.55		0		
Dissolved Oxygen	mg/L	0437	WL	07/01/2008	0001	97 - 97	1.54		0		
Dissolved Oxygen	mg/L	0438	WL	07/01/2008	0001	118 - 118	1.57		0		
Dissolved Oxygen	mg/L	0439	WL	07/01/2008	0001	118 - 118	1.22		0		
Dissolved Oxygen	mg/L	0492	WL	06/30/2008	0001	18 - 18	1.04		0		
Dissolved Oxygen	mg/L	ATP-2-D	WL	07/01/2008	0001	88 - 88	0.26		0		
Dissolved Oxygen	mg/L	ATP-2-S	WL	07/01/2008	0001	38 - 38	0.84		0		
Dissolved Oxygen	mg/L	CR1	SL	06/30/2008	0001	0 - 0	7.93		0		
Dissolved Oxygen	mg/L	CR3	SL	06/30/2008	0001	0 - 0	7.63		0		
Dissolved Oxygen	mg/L	CR5	SL	06/30/2008	0001	0 - 0	7.82		0		
Dissolved Oxygen	mg/L	TP-02	WL	06/30/2008	0001	30 - 30	0.59		0		
Dissolved Oxygen	mg/L	TP-17	WL	06/30/2008	0001	28 - 28	0.27		0		
Manganese	mg/L	0201	SL	06/30/2008	0001	0 - 0	0.015	EN	0	0.00013	
Manganese	mg/L	0226	SL	06/30/2008	0001	0 - 0	0.0034	B	0	0.00013	

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Manganese	mg/L	0276	SL	06/30/2008	0001	0	-	0	0.0022	B		0	0.00013	
Manganese	mg/L	0276	SL	06/30/2008	0002	0	-	0	0.0022	B		0	0.00013	
Manganese	mg/L	0437	WL	07/01/2008	0001	97	-	97	0.8			0	0.00026	
Manganese	mg/L	0438	WL	07/01/2008	0001	118	-	118	3			0	0.00026	
Manganese	mg/L	0439	WL	07/01/2008	0001	118	-	118	1.8			0	0.00026	
Manganese	mg/L	0492	WL	06/30/2008	0001	18	-	18	0.18			0	0.00013	
Manganese	mg/L	ATP-2-D	WL	07/01/2008	0001	88	-	88	2.1			0	0.0064	
Manganese	mg/L	ATP-2-S	WL	07/01/2008	0001	38	-	38	0.21			0	0.00064	
Manganese	mg/L	CR1	SL	06/30/2008	0001	0	-	0	0.0027	B		0	0.00013	
Manganese	mg/L	CR3	SL	06/30/2008	0001	0	-	0	0.0025	B		0	0.00013	
Manganese	mg/L	CR5	SL	06/30/2008	0001	0	-	0	0.0031	B		0	0.00013	
Manganese	mg/L	TP-02	WL	06/30/2008	0001	30	-	30	0.5			0	0.00013	
Manganese	mg/L	TP-17	WL	06/30/2008	0001	28	-	28	0.26			0	0.00064	
Oxidation Reduction Potential	mV	0201	SL	06/30/2008	0001	0	-	0	-8			0		
Oxidation Reduction Potential	mV	0226	SL	06/30/2008	0001	0	-	0	-89			0		
Oxidation Reduction Potential	mV	0276	SL	06/30/2008	0001	0	-	0	-50			0		
Oxidation Reduction Potential	mV	0437	WL	07/01/2008	0001	97	-	97	7			0		
Oxidation Reduction Potential	mV	0438	WL	07/01/2008	0001	118	-	118	-20			0		
Oxidation Reduction Potential	mV	0439	WL	07/01/2008	0001	118	-	118	107			0		
Oxidation Reduction Potential	mV	0492	WL	06/30/2008	0001	18	-	18	-45			0		
Oxidation Reduction Potential	mV	ATP-2-D	WL	07/01/2008	0001	88	-	88	-214			0		
Oxidation Reduction Potential	mV	ATP-2-S	WL	07/01/2008	0001	38	-	38	-192			0		
Oxidation Reduction Potential	mV	CR1	SL	06/30/2008	0001	0	-	0	-28			0		

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Oxidation Reduction Potential	mV	CR3	SL	06/30/2008	0001	0	-	0	-34		0		
Oxidation Reduction Potential	mV	CR5	SL	06/30/2008	0001	0	-	0	-53		0		
Oxidation Reduction Potential	mV	TP-02	WL	06/30/2008	0001	30	-	30	-102		0		
Oxidation Reduction Potential	mV	TP-17	WL	06/30/2008	0001	28	-	28	-186		0		
pH	s.u.	0201	SL	06/30/2008	0001	0	-	0	7.83		0		
pH	s.u.	0226	SL	06/30/2008	0001	0	-	0	8.32		0		
pH	s.u.	0276	SL	06/30/2008	0001	0	-	0	7.96		0		
pH	s.u.	0437	WL	07/01/2008	0001	97	-	97	7.25		0		
pH	s.u.	0438	WL	07/01/2008	0001	118	-	118	6.79		0		
pH	s.u.	0439	WL	07/01/2008	0001	118	-	118	6.77		0		
pH	s.u.	0492	WL	06/30/2008	0001	18	-	18	8.03		0		
pH	s.u.	ATP-2-D	WL	07/01/2008	0001	88	-	88	7.54		0		
pH	s.u.	ATP-2-S	WL	07/01/2008	0001	38	-	38	8.45		0		
pH	s.u.	CR1	SL	06/30/2008	0001	0	-	0	8.07		0		
pH	s.u.	CR3	SL	06/30/2008	0001	0	-	0	8.19		0		
pH	s.u.	CR5	SL	06/30/2008	0001	0	-	0	7.67		0		
pH	s.u.	TP-02	WL	06/30/2008	0001	30	-	30	6.83		0		
pH	s.u.	TP-17	WL	06/30/2008	0001	28	-	28	7.68		0		
Selenium	mg/L	0437	WL	07/01/2008	0001	97	-	97	0.059		0	0.0004	
Selenium	mg/L	0438	WL	07/01/2008	0001	118	-	118	0.00065		0	4.E-005	
Selenium	mg/L	0439	WL	07/01/2008	0001	118	-	118	0.0017		0	4.E-005	
Specific Conductance	umhos/cm	0201	SL	06/30/2008	0001	0	-	0	426		0		
Specific Conductance	umhos/cm	0226	SL	06/30/2008	0001	0	-	0	1062		0		

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Specific Conductance	umhos /cm	0276	SL	06/30/2008	0001	0	-	0	434		0		
Specific Conductance	umhos /cm	0437	WL	07/01/2008	0001	97	-	97	10532		0		
Specific Conductance	umhos /cm	0438	WL	07/01/2008	0001	118	-	118	9407		0		
Specific Conductance	umhos /cm	0439	WL	07/01/2008	0001	118	-	118	95.6		0		
Specific Conductance	umhos /cm	0492	WL	06/30/2008	0001	18	-	18	6.35		0		
Specific Conductance	umhos /cm	ATP-2-D	WL	07/01/2008	0001	88	-	88	126185		0		
Specific Conductance	umhos /cm	ATP-2-S	WL	07/01/2008	0001	38	-	38	19856		0		
Specific Conductance	umhos /cm	CR1	SL	06/30/2008	0001	0	-	0	415		0		
Specific Conductance	umhos /cm	CR3	SL	06/30/2008	0001	0	-	0	425		0		
Specific Conductance	umhos /cm	CR5	SL	06/30/2008	0001	0	-	0	412		0		
Specific Conductance	umhos /cm	TP-02	WL	06/30/2008	0001	30	-	30	3349		0		
Specific Conductance	umhos /cm	TP-17	WL	06/30/2008	0001	28	-	28	15998		0		
Sulfate	mg/L	0201	SL	06/30/2008	0001	0	-	0	78		0	0.5	
Sulfate	mg/L	0226	SL	06/30/2008	0001	0	-	0	78		0	0.5	
Sulfate	mg/L	0276	SL	06/30/2008	0001	0	-	0	78		0	0.5	
Sulfate	mg/L	0276	SL	06/30/2008	0002	0	-	0	79		0	0.5	
Sulfate	mg/L	0437	WL	07/01/2008	0001	97	-	97	4400		0	25	
Sulfate	mg/L	0438	WL	07/01/2008	0001	118	-	118	4200		0	25	
Sulfate	mg/L	0439	WL	07/01/2008	0001	118	-	118	3500		0	25	
Sulfate	mg/L	0492	WL	06/30/2008	0001	18	-	18	83		0	0.5	
Sulfate	mg/L	ATP-2-D	WL	07/01/2008	0001	88	-	88	6800		0	2500	
Sulfate	mg/L	ATP-2-S	WL	07/01/2008	0001	38	-	38	8800		0	50	

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Sulfate	mg/L	CR1	SL	06/30/2008	0001	0	-	0	79		0	0.5	
Sulfate	mg/L	CR3	SL	06/30/2008	0001	0	-	0	78		0	0.5	
Sulfate	mg/L	CR5	SL	06/30/2008	0001	0	-	0	78		0	0.5	
Sulfate	mg/L	TP-02	WL	06/30/2008	0001	30	-	30	990		0	10	
Sulfate	mg/L	TP-17	WL	06/30/2008	0001	28	-	28	1300		0	50	
Temperature	C	0201	SL	06/30/2008	0001	0	-	0	20.37		0		
Temperature	C	0226	SL	06/30/2008	0001	0	-	0	20.58		0		
Temperature	C	0276	SL	06/30/2008	0001	0	-	0	23.16		0		
Temperature	C	0437	WL	07/01/2008	0001	97	-	97	17.1		0		
Temperature	C	0438	WL	07/01/2008	0001	118	-	118	18.69		0		
Temperature	C	0439	WL	07/01/2008	0001	118	-	118	17.22		0		
Temperature	C	0492	WL	06/30/2008	0001	18	-	18	14.65		0		
Temperature	C	ATP-2-D	WL	07/01/2008	0001	88	-	88	19.74		0		
Temperature	C	ATP-2-S	WL	07/01/2008	0001	38	-	38	20.18		0		
Temperature	C	CR1	SL	06/30/2008	0001	0	-	0	19.93		0		
Temperature	C	CR3	SL	06/30/2008	0001	0	-	0	20.75		0		
Temperature	C	CR5	SL	06/30/2008	0001	0	-	0	22		0		
Temperature	C	TP-02	WL	06/30/2008	0001	30	-	30	18.87		0		
Temperature	C	TP-17	WL	06/30/2008	0001	28	-	28	13.32		0		
Total Dissolved Solids	mg/L	0201	SL	06/30/2008	0001	0	-	0	250		0	20	
Total Dissolved Solids	mg/L	0226	SL	06/30/2008	0001	0	-	0	260		0	20	
Total Dissolved Solids	mg/L	0276	SL	06/30/2008	0001	0	-	0	220		0	20	
Total Dissolved Solids	mg/L	0276	SL	06/30/2008	0002	0	-	0	250		0	20	

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
						Lab	Data	QA					
Total Dissolved Solids	mg/L	0439	WL	07/01/2008	0001	118	-	118	7800		0	80	
Total Dissolved Solids	mg/L	0492	WL	06/30/2008	0001	18	-	18	300		0	20	
Total Dissolved Solids	mg/L	ATP-2-D	WL	07/01/2008	0001	88	-	88	95000		0	2000	
Total Dissolved Solids	mg/L	ATP-2-S	WL	07/01/2008	0001	38	-	38	15000		0	200	
Total Dissolved Solids	mg/L	CR1	SL	06/30/2008	0001	0	-	0	240		0	20	
Total Dissolved Solids	mg/L	CR3	SL	06/30/2008	0001	0	-	0	240		0	20	
Total Dissolved Solids	mg/L	CR5	SL	06/30/2008	0001	0	-	0	230		0	20	
Total Dissolved Solids	mg/L	TP-02	WL	06/30/2008	0001	30	-	30	2400		0	40	
Total Dissolved Solids	mg/L	TP-17	WL	06/30/2008	0001	28	-	28	9900		0	200	
Turbidity	NTU	0201	SL	06/30/2008	0001	0	-	0	326		0		
Turbidity	NTU	0226	SL	06/30/2008	0001	0	-	0	143		0		
Turbidity	NTU	0276	SL	06/30/2008	0001	0	-	0	108		0		
Turbidity	NTU	0437	WL	07/01/2008	0001	97	-	97	23.3		0		
Turbidity	NTU	0438	WL	07/01/2008	0001	118	-	118	29.7		0		
Turbidity	NTU	0439	WL	07/01/2008	0001	118	-	118	20.1		0		
Turbidity	NTU	0492	WL	06/30/2008	0001	18	-	18	36.1		0		
Turbidity	NTU	ATP-2-D	WL	07/01/2008	0001	88	-	88	84.6		0		
Turbidity	NTU	ATP-2-S	WL	07/01/2008	0001	38	-	38	7.55		0		
Turbidity	NTU	CR1	SL	06/30/2008	0001	0	-	0	99.3		0		
Turbidity	NTU	CR3	SL	06/30/2008	0001	0	-	0	81.4		0		
Turbidity	NTU	CR5	SL	06/30/2008	0001	0	-	0	212		0		
Turbidity	NTU	TP-02	WL	06/30/2008	0001	30	-	30	221		0		
Turbidity	NTU	TP-17	WL	06/30/2008	0001	28	-	28	229		0		
Uranium	mg/L	0201	SL	06/30/2008	0001	0	-	0	0.0017		0	3.5E-006	
Uranium	mg/L	0226	SL	06/30/2008	0001	0	-	0	0.0017		0	3.5E-006	

Appendix C. Water Quality Data

June 2008 Routine Sampling Event - General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/2/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Uranium	mg/L	0276	SL	06/30/2008	0001	0	-	0	0.0018			0	3.5E-006	
Uranium	mg/L	0276	SL	06/30/2008	0002	0	-	0	0.0017			0	3.5E-006	
Uranium	mg/L	0437	WL	07/01/2008	0001	97	-	97	4.4			0	0.00035	
Uranium	mg/L	0438	WL	07/01/2008	0001	118	-	118	1.9			0	0.00018	
Uranium	mg/L	0439	WL	07/01/2008	0001	118	-	118	0.91			0	0.00018	
Uranium	mg/L	0492	WL	06/30/2008	0001	18	-	18	0.14			0	3.5E-005	
Uranium	mg/L	ATP-2-D	WL	07/01/2008	0001	88	-	88	0.0035			0	3.5E-006	
Uranium	mg/L	ATP-2-S	WL	07/01/2008	0001	38	-	38	0.016			0	3.5E-006	
Uranium	mg/L	CR1	SL	06/30/2008	0001	0	-	0	0.0018			0	3.5E-006	
Uranium	mg/L	CR3	SL	06/30/2008	0001	0	-	0	0.0017			0	3.5E-006	
Uranium	mg/L	CR5	SL	06/30/2008	0001	0	-	0	0.0017			0	3.5E-006	
Uranium	mg/L	TP-02	WL	06/30/2008	0001	30	-	30	3.7			0	0.00035	
Uranium	mg/L	TP-17	WL	06/30/2008	0001	28	-	28	0.028			0	3.5E-006	

Appendix C. Water Quality Data

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

F Low flow sampling method used. G Possible grout contamination, pH > 9. J Estimated value.
L Less than 3 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

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site

REPORT DATE: 1/13/2009

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0437	O	4048.25	07/01/2008		87.43	3960.82	
0438	O	4054.22	07/01/2008		93.72	3960.5	
0439	O	4055.27	07/01/2008		94.96	3960.31	
0492		3967.64	06/30/2008		8.73	3958.91	
ATP-2-D	O	3967.05	07/01/2008		10.66	3956.39	
ATP-2-S	O	3967.04	07/01/2008		8.9	3958.14	
TP-02	O	3975.55	06/30/2008		15.31	3960.24	
TP-17	D	3963.69	06/30/2008		5.42	3958.27	

FLOW CODES: B BACKGROUND
U UPGRADIENT

C CROSS GRADIENT

D DOWN GRADIENT

O ON SITE

WATER LEVEL FLAGS: D Dry

Attachment 1. Routine Ground Water Sampling Event



Date: July 30, 2008

To: Ken Pill, M. Mullis

From: E.M. Glowiak

Subject: June 2008 Routine Sampling Trip Report

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

Date of Sampling Event: June 30 and July 1, 2008

Team Members: S. Back, E. Glowiak

RIN Number Assigned: All samples were assigned to RIN 0806017.

Sample Shipment: The coolers were shipped overnight UPS to Paragon Analytics, Inc. from Moab, Utah, on July 2, 2008 (Tracking No. 90544830).

Number of Locations Sampled: The July Routine Sampling was conducting during the descending limb of the hydrograph after the peak runoff. Eight monitor wells and six surface water locations were sampled during the July Routine Sampling Event. Including one duplicate, a total of 15 samples were collected.

Locations Not Sampled/Reason: Observation well TP-19 and surface water location 0228 were inaccessible due to hazardous road conditions.

Field Variance: None.

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

False ID	True ID	Sample Type	Associated matrix	Ticket Number
2509	0276	Duplicate of Surface Water	Surface Water	NFC 735

Attachment 1. Routine Ground Water Sampling Event (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 730	CR1	06/30/2008	Unknown	Taken off of the old boat ramp, moderate flow, sandy substrate
NFC 728	0492	06/30/2008	18 ft bgs	Well located south of well field
NFC 729	CR3	06/30/2008	Unknown	Taken 5 ft off bank, very turbid
NFC 726	TP-17	06/30/2008	28 ft bgs	Sulfur odor
NFC 727	0226	06/30/2008	Unknown	Taken 3 ft off bank, very turbid, slow flow
NFC 733	TP-02	06/30/2008	30 ft bgs	High turbidity
NFC 734	0276	06/30/2008	Unknown	New surface water location, collected off of river pump cat-walk, moderate flow
NFC 740	ATP-2-S	07/01/2008	38 ft bgs	Water level constantly dropping, even with slow pumping, Category II Well
NFC 739	ATP-2-D	07/01/2008	88 ft bgs	Sulfur odor, preserved samples were clear, nonpreserved samples were yellow, high turbidity
NFC 732	CR5	06/30/2008	Unknown	Taken 3 ft off bank, moderate flow, turbid
NFC 731	0201	06/30/2008	Unknown	Taken 2 ft off bank, slow water flow, turbid
NFC 737	0437	07/01/2008	97 ft bgs	Well located on top of pile
NFC 738	0438	07/01/2008	118 ft bgs	Well located on top of pile
NFC736	0439	07/01/2008	118 ft bgs	Well located on top of pile

Note: ft bgs = feet below ground surface



Location CR1.

Attachment 1. Routine Ground Water Sampling Event (continued)



Location 201.



Location CR3.

Attachment 1. Routine Ground Water Sampling Event (continued)



Location CR5.



Location 0226.

Attachment 1. Routine Ground Water Sampling Event (continued)



Location 0276.

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

Well No.	Date	Time	Depth to Water (ft btoc)
ATP-2-S	07/01/2008	11:16	8.90
ATP-2-D	07/01/2008	10:55	10.66
0437	07/01/2008	08:45	87.43
0438	07/01/2008	09:30	93.72
0439	07/01/2008	08:16	94.96
0492	06/30/2008	09:00	8.73
TP-02	06/30/2008	13:30	15.31
TP-17	06/30/2008	08:21	5.42

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)
06/30/2008	18,800
07/01/2008	18,700